2 Anhang: Bilder und Tabellen im A4-Format

Die Seiten 1 bis 547 enthalten 545 Bilder. Sie sind entsprechend dem Buch nach Kapiteln geordnet. Die Bilder, Tabellen und Testbilder für das DINA4-Ausgabeformat sind mit dem Anfangsbuchstaben G (Großbild) gekennzeichnet und haben in der Regel die Größe 216 mm x 160 mm. Entsprechende Bilder im Regelformat 54 mm x 40 mm tragen den Anfangsbuchstaben B (Bild).

Kapitel	**A4-Dateiname (.EPS und umgewandelt in .PDF)**
Kapitel und Bilder:	
01	G1_1F.eps bis G1_7F.eps
02	G2_1F.eps bis G2_64F.eps
03	G3_1F.eps bis G3_18F.eps
04	G4_1F.eps bis G4_71F.eps
05	G5_1F.eps bis G5_32F.eps
06	G6_1F.eps bis G6_36F.eps
07	G7_1F.eps bis G7_6F.eps
08	G8_1F.eps bis G8_51F.eps
09	keine Bilder
10	G9_1F.eps bis G9_7F.eps
Kapitel und Tabellen	
02 bis 10	GT2_01F.eps bis GT9_10F.eps
Kapitel und Testbilder	
08	GTe01F.eps bis GTe14F.eps

Die Bilder können unter *Adobe Acrobat* gefunden werden:

- durch "Blättern" in den Seiten
- Über das Menü "Find" und z. B. die Eingabe "Bild 1_5" (zeitaufwendig)
  Dieses Menü enthält der lizenzfreie *Adobe Acrobate Reader*.
- Über das Menü "Search" und z. B. die Eingabe "Bild 1_5" (schnell)
  Dieses Menü enthalten *Adobe Acrobat Search, Exchange* und *Pro.*

Eine Ausgabe ist z. B. unter Windows auf *jedem* installierten Drucker möglich, Farbbilder erscheinen auch auf Schwarz-Weiß-Matrixdruckern. Bessere Qualität wird auf PostScript-Druckern erreicht. Eine weitere Steigerung der Ausgabe-Qualität ist auf PostScript-Druckern in Schwarz-Weiß oder Farbe unter Windows/DOS-Befehlsfolge möglich:

`"COPY` *`Dateiname`* `Druckerschittstelle"`

Als *Dateiname* steht z. B. G1_5F.eps, als Druckerschittstelle *"LPT1:"* oder *"COM2:"*. Ein möglicher DOS-Befehl lautet daher (nur für PS-Drucker):

```
COPY  G1_5F.EPS  COM2:
```

Auf PS-Druckern erscheint hiermit das Bild, auf anderen der PS-Programmtext.

Fehlerhinweise:

Die PS-Dateien enthalten in der Regel als **letztes Zeichen** ein **"CONTROL D"** (ein beim Druck *unsichtbares* Zeichen). Durch dieses Zeichen wird der PS-Drucker nach der Ausgabe einer Seite neu normiert. Auf diese Weise ist die Druckausgabe von mehreren Dateien möglich, z. Bsp. unter WINDOWS mit

```
COPY  G1_*f.ps LPT1:
```

Der Stern steht für die sieben Bilder von Kapitel 1. Fehlende Normierung erzeugt oft auf PSL1-Druckern einen *DICTFULL-Error* nach Ausgabe mehrerer Seiten oder Bilder. Beim Versand der PS-Dateien mit "CONROL D" am Ende über Netzwerke kann es zu Schwierigkeiten kommen, wenn dieses Zeichen für die Übertragungs-Steuerung eine Bedeutung hat.

Das Zeichen "CONTROL D" kann mit einem Editor gelöscht werden. Unter WINDOWS wird es mit den *"Write-Editor"* bei *"unformatiertem Einlesen"* als quadratisches Kissen dargestellt. Die letzte Zeile mit diesem Zeichen kann bei Bedarf gelöscht werden. Ein Löschen dieses Zeichens ist unter Umständen auch bei Einfügungen von EPS-Dateien in DTP-Programmen erforderlich, sofern es nicht vom DTP-Programm (wie z. Beispiel bei DECWrite) automatisch gelöscht wird.

Adobe Acrobat Distiller *Version 2.1* wandelt PS-Dateien mit Halbton-Rastern in **fehlerhafte PDF-Dateien** (gekennzeichnet durch *PDF in der Bildunterschrift) um. Bei Darstellung von Raster-Halbtönen entfallen die Raster-Orientierungen, z. B. diagonal, vertikal und horizontal.

Diese Fehler entstehen nicht bei Bildschirmdarstellung von PS-Dateien mit Hilfe von Display-PostScript (z. Bsp. unter DECwrite). Diese Fehler entstehen auch nicht bei Ausgabe von PS-Dateien auf PostScript-Druckern, z. Bsp. mit `"COPY Dateiname.ps LPT1:"` unter WINDOWS/DOS.

Betroffen von diesem Raster-Fehler in PDF-Dateien sind die Bilder 8_7 bis 8_11 mit den Dateinamen G8_07*f.eps bis G8_11*f.eps (10 Bilder)

Hinweise zu den 16 EPS-Testbildern (Serie a4q0630f.ps; letzte Seite)

Die ca. 550 EPS-Bilder enthalten **im PostScript-Code einen Vorspann (von `%!PS bis %%Prolog`)**, der in der Regel eine Ausgabe auf **allen** PostSript-Druckern (PSL1 und PSL2) erlaubt. Einige Serien erfordern einen PSL2-Drucker

Die **EPS-Test**bilder (Gtexxf.eps mit xx=01 bis 14) enthalten **keinen Vorspann** und sind in Kapitel 8 beschrieben. Eine Ausnahme bilden die Testbilder GTe06*.eps, die zur Erzeugung von Farbseparationen den Vorspann benötigen. Die Testbilder GTe08f.eps bis GTe14f.eps erfordern einen PSL2-(Farb-)Drucker. Die Testbilder GTe11f.eps und GTe12f.eps zeigen unkorrigierte Photo-CD-Bilder und die nach Abschnitt 8.19 des Buches farbmetrisch optimierten Ergebnisse zeigen die Testbilder GTe13f.eps und GTe14f.eps

Die Testbilder GTe06_1f.eps bis GTe06_3f.eps zeigen Variationen bei Farbseparationen (Auszug Cyanblau C in Farbe und Auszug Schwarz N)

Die übrigen Farbseparationen (C, M, Y *in Schwarz-Weiß*) werden automatisch erzeugt, z. Bsp. durch Änderung der PostScript-Programmzeile in der Datei GTe06_1f.eps von

`/ausz 8 def` in
`/ausz 1 def (für Cyanblau C)` oder
`/ausz 2 def (für Magentarot M)` oder
`/ausz 3 def (für Gelb Y)`

Überfüllung erfordert die Änderung in `/ausz 9 def` und eine Änderung des Vorspanns zwischen den Zeilen `%ANFA OULINO0` bis `%%Prolog` durch die Datei OUTLINO1.eps mit den Zeilen `%ANFA OUTLINO1` bis `%%Prolog.`

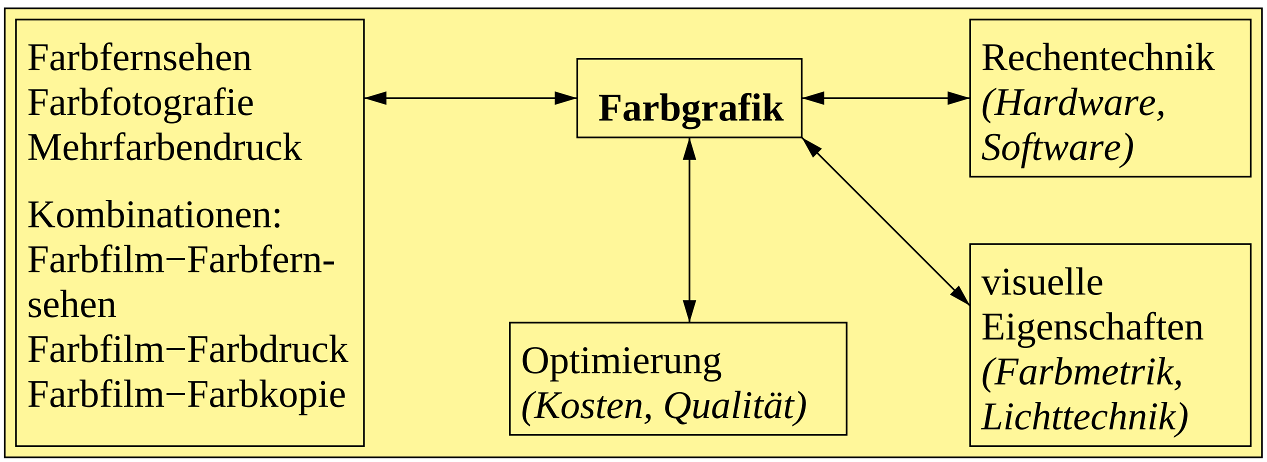
Raster-Schwellendaten für z. B. 3600 dpi erfordern eine Änderung der Zeilen
`/half 0 def /Halbt` nach `/half 3 def /Halbt`

und zusätzlich Ersatz der drei Zeilen (der *leeren* Prozedur)

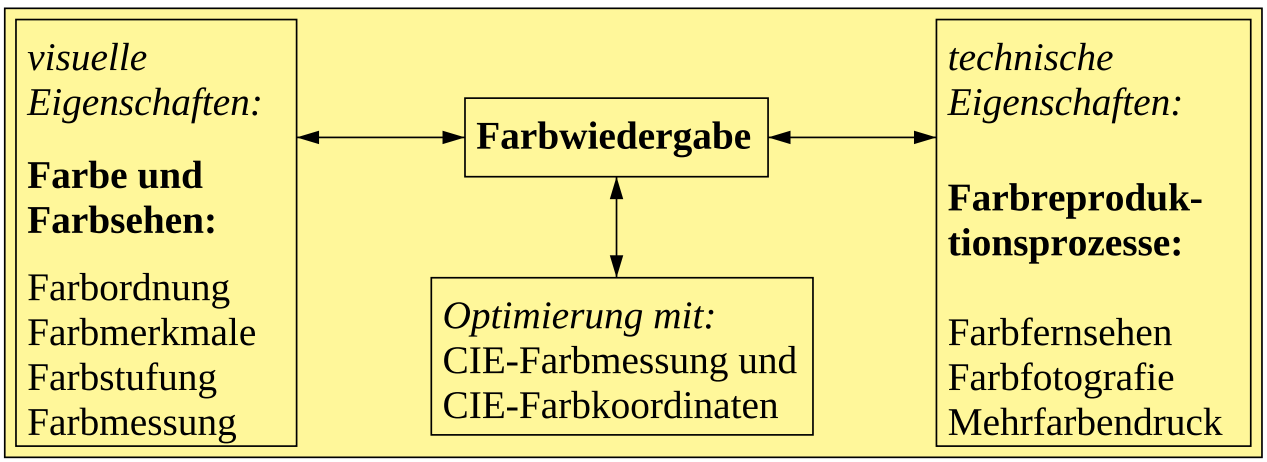
```
%ANFA HALBTON
/Halbt {     %wrbie:HalbtoA0.eps
  } bind def
```

z. B. durch den Inhalt der Datei HALBTOCD.eps

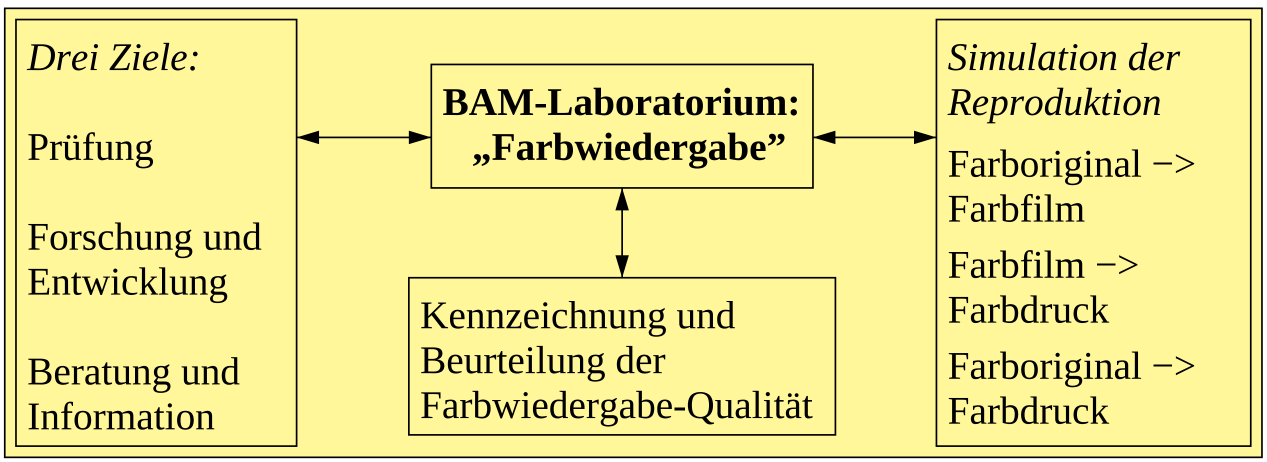
Die Dateien OUTLINO1.eps (91 Zeilen) und HALBTOCD.EPS (135 Zeilen) befinden sich ebenfalls auf der CD



G8280_1f.eps, G0110_1f.eps, G1_01f.eps, Bild 1_1, 2x1



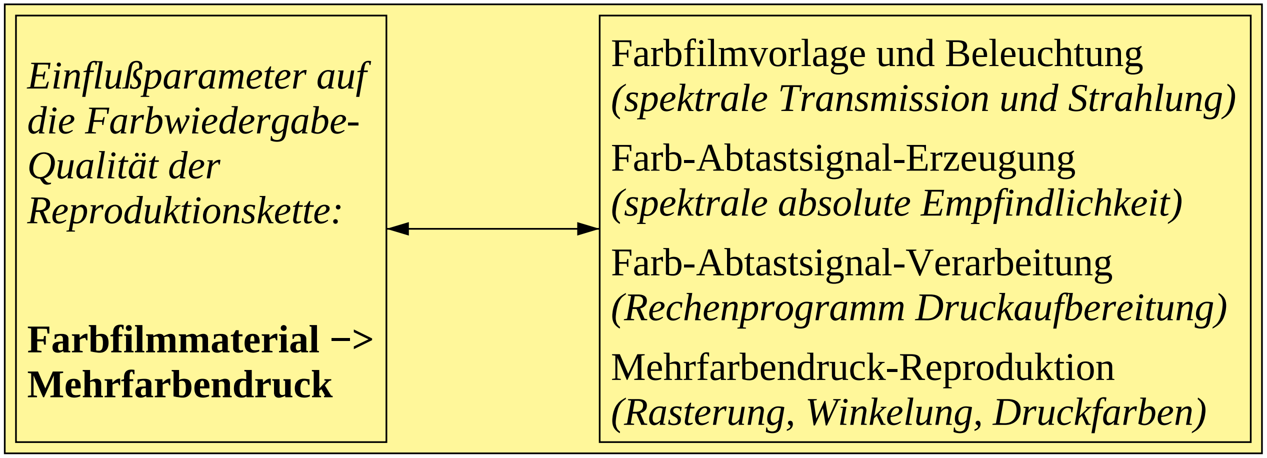
G8280_3f.eps, G0110_3f.eps, G1_02f.eps, Bild 1_2, 2x1



G8280_5f.eps, G0110_5f.eps, G1_03f.eps, Bild 1_3, 2x1

Einflußparameter auf die Farbwiedergabe-Qualität der Reproduktionskette: **Farboriginal −> Farbfilmmaterial**	(Test-)Farboriginal und Beleuchtung *(spektrale Reflexion und Strahlung)* Kamera, Aufnahmefilter, Belichtung *(spektrale Strahlung, Normalbelichtung)* Filmmaterial und Entwicklung *(spektrale absolute Empfindlichkeit)* Weiterbehandlung und Projektion *(Rahmung, spektrale Strahlung)*

G8281_1f.eps, G0110_7f.eps, G1_04f.eps, Bild 1_4, 2x1



G8281_3f.eps, G0111_1f.eps, G1_05f.eps, Bild 1_5, 2x1

Einflußparameter auf die Farbwiedergabe-Qualität der Reproduktionskette:

Farboriginal −> Farbfilmmaterial −> Mehrfarbendruck

↔

Aufnahmelichtart und Belichtung
(3200 / 6500 / 9000 K; −3 / 0 / +3 DIN)

Farbfilmmaterial
(Agfa, Fuji, Kodak, Konika, 3M)

Farbabtastsignal-Eigenschaften
(spektrale absolute Empfindlichkeit)

Reproduktionsmodell und Druckfarben
(Signalverarbeitung, Eurofarbskala)

G8281_5f.eps, G0111_3f.eps, G1_06f.eps, Bild 1_6, 2x1

Farbdiamaterial-Scanner:
- drei lichtelektrische Empfänger
- 0,01 mm Bildpunktdurchmesser
- 4096 (12 bit) Leuchtdichtewerte

Messung an jedem Farbbildpunkt:
drei Farbwertsignale *R, G und B*

Entwicklungsziel:
farbmetrischer Gerätetreiber:

Umwandlung von drei Farbwertsignalen ***R, G und B*** in Farbwerte ***L*, a* und b**** (CIELAB-System)

Probleme:
sehr große Bildpunktanzahl:
etwa 3000 × 2000 Bildpunkte pro Farbdia 36 mm × 24 mm,
oft Vorlagenflächen größer DIN-A2 bei Trommelscannern

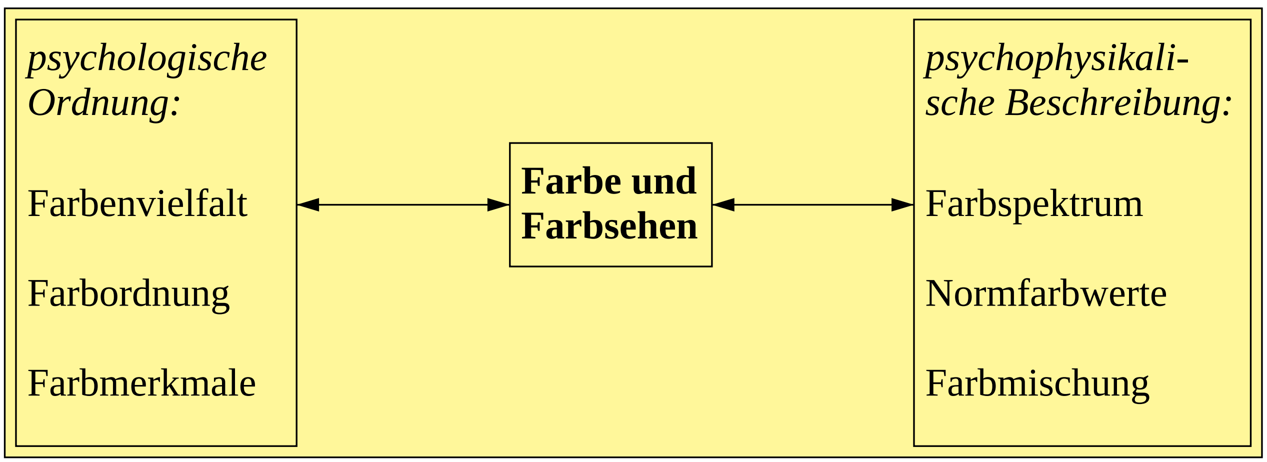
Drei Verfahren zur Optimierung von farbmetrischem Gerätetreiber:

- Anpassung der spektralen Empfindlichkeiten an die drei Normspektralwertfunktionen

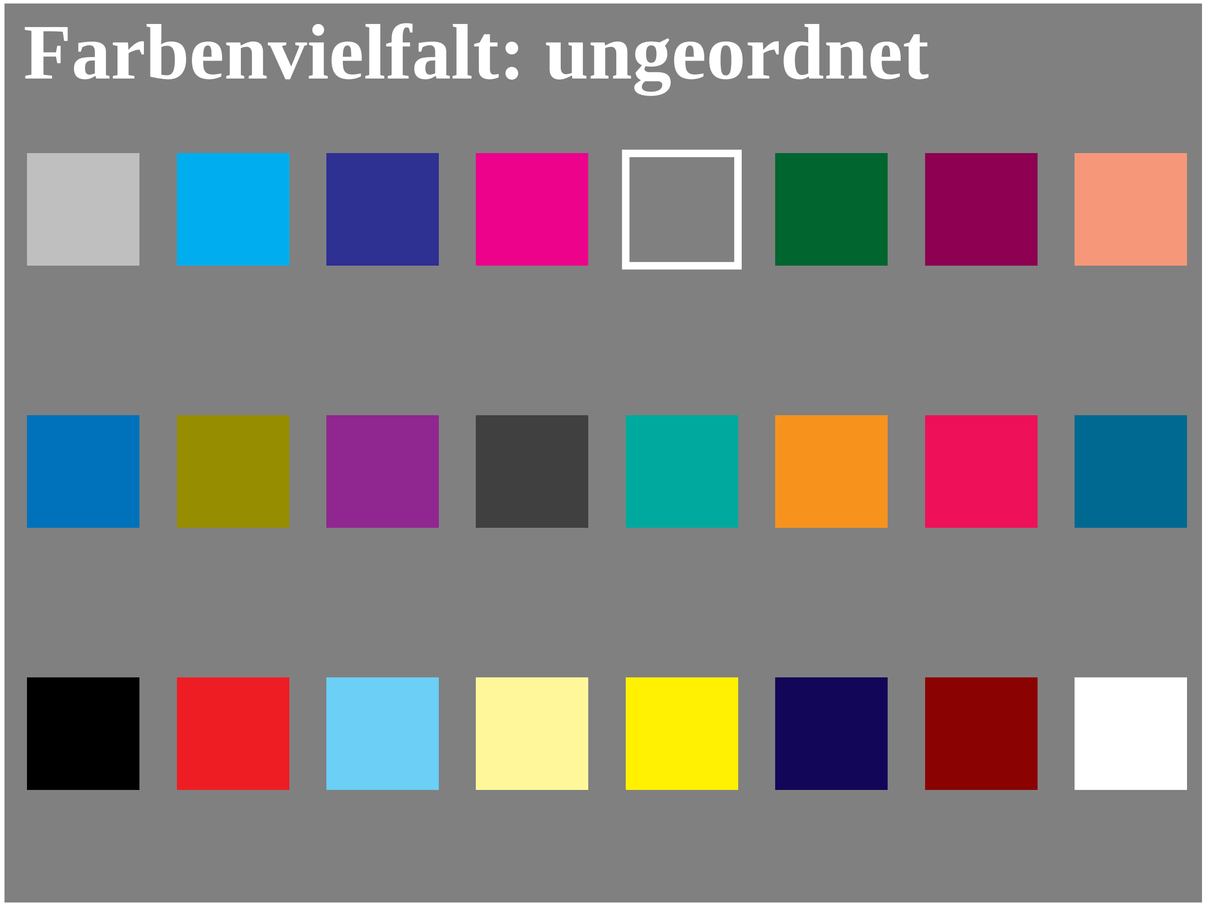
- Optimierung einer 3 × 3- oder 3 × 6-Gerätematrix zur Umrechnung von ***RGB nach L*a*b**** mit 17 CIE-Testfarben

- Berechnung der spektralen Farbmaterial-Reflexion oder Transmission an jeder Bildstelle, z. B. mit drei Dichten von drei bekannten Farbstoffen (Farbpigmenten), nur möglich bei immer gleichartigen Materialvorlagen (Diamaterial, Druckmaterial)

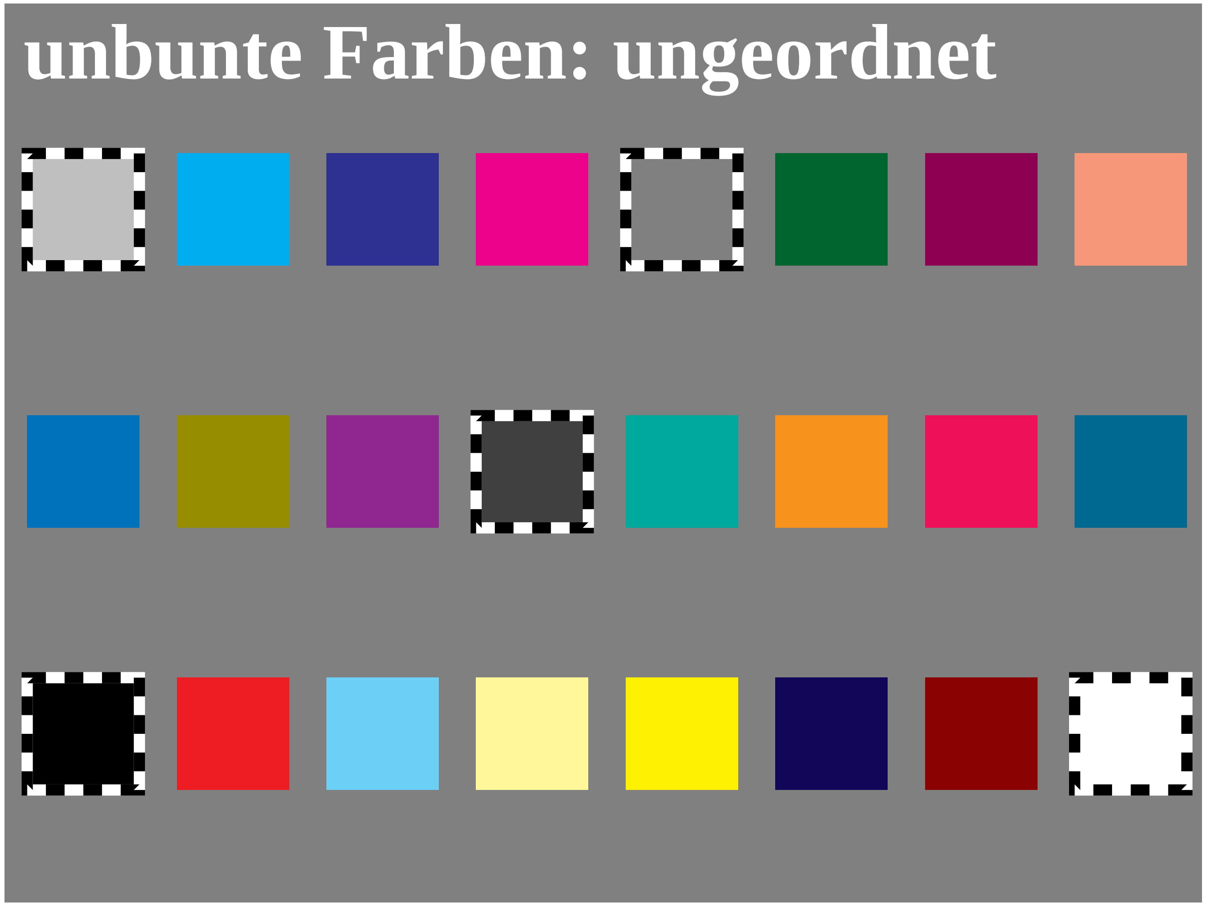
G8191_3f.eps, G0111_7f.eps, G1_07f.eps, Bild 1_7, 2x2



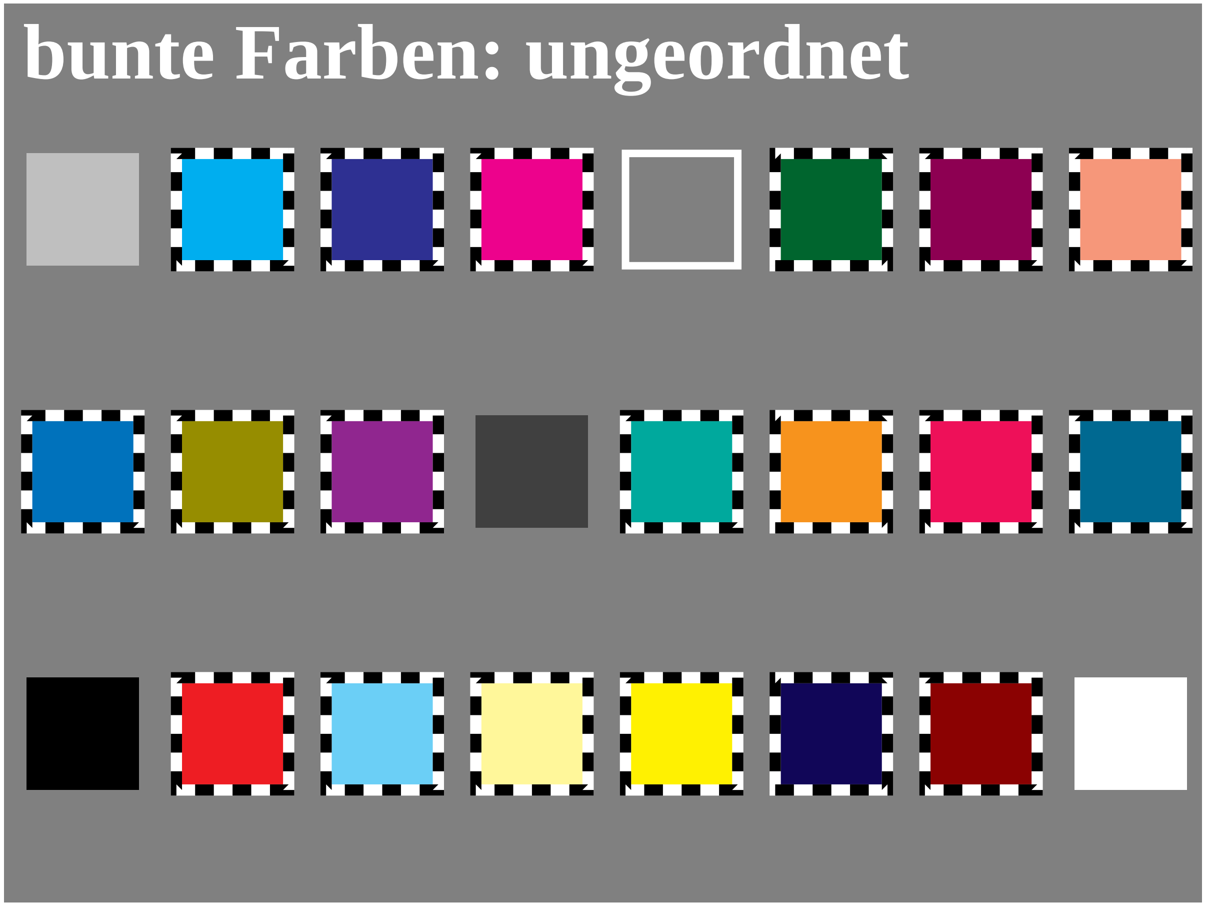
G8280_7f.eps, G0120_1f.eps, G2_01f.eps, Bild 2_01 2x1



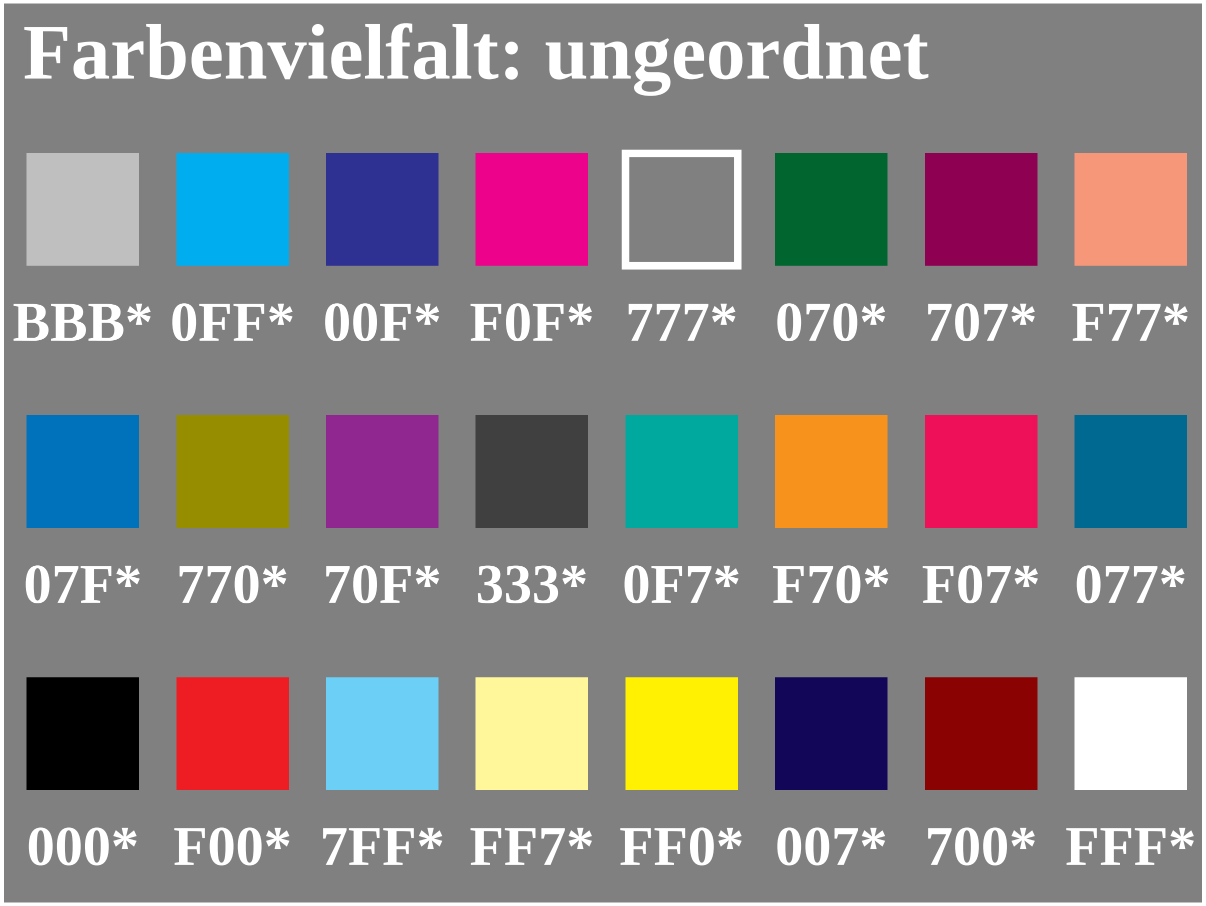
G8510_1f.eps, G0130_1f.eps, G2_02f.eps, Bild 2_2



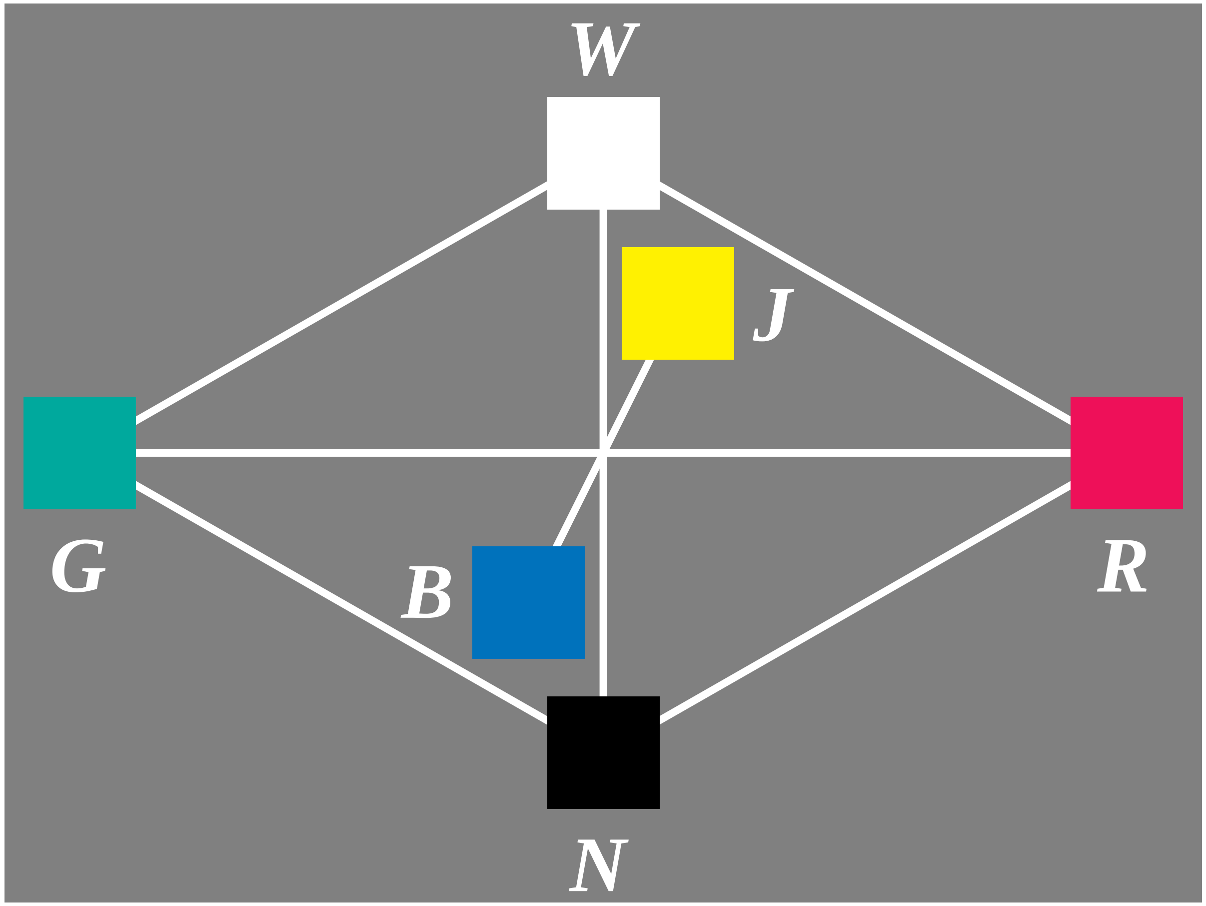
G8510_2f.eps, G0130_2f.eps, G2_03f.eps, Bild 2_3



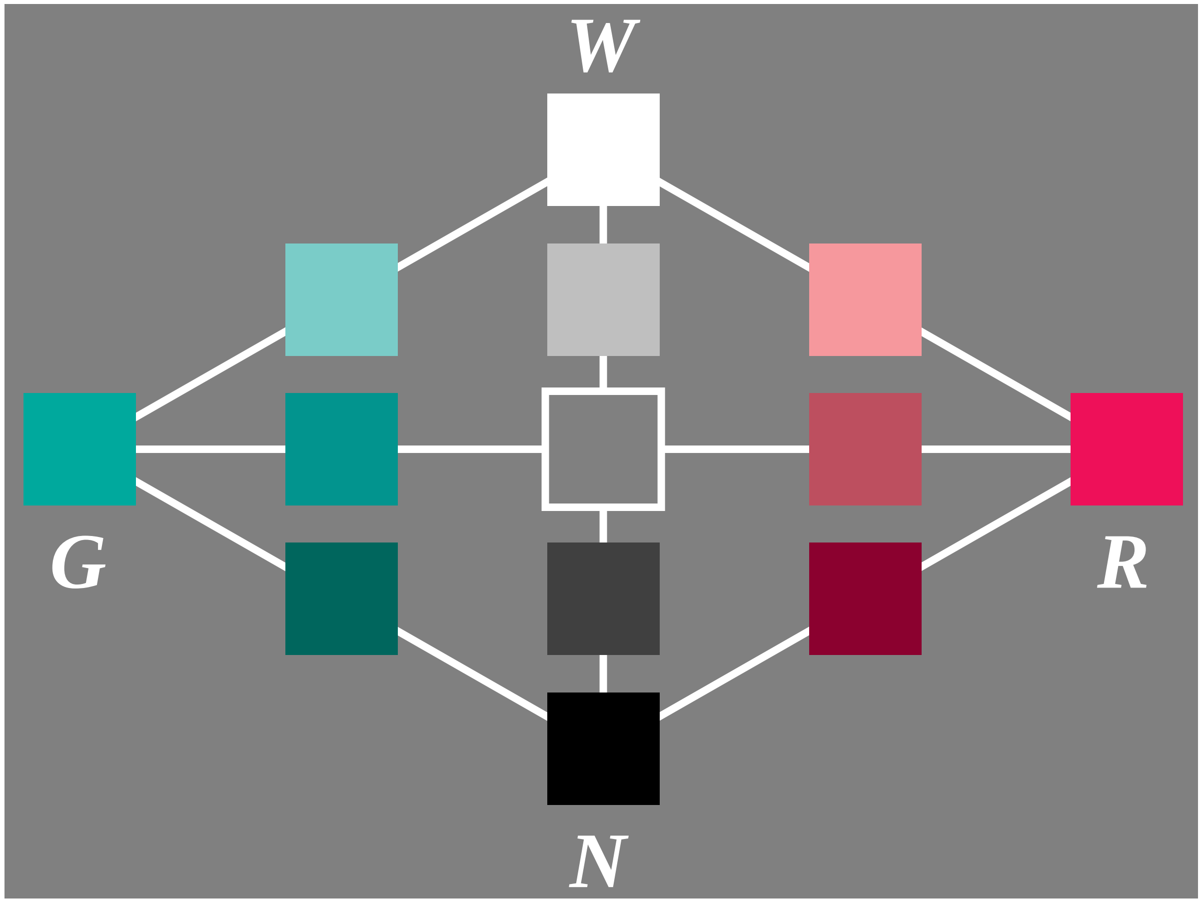
G8510_3f.eps, G0130_3f.eps, G2_04f.eps, Bild 2_4



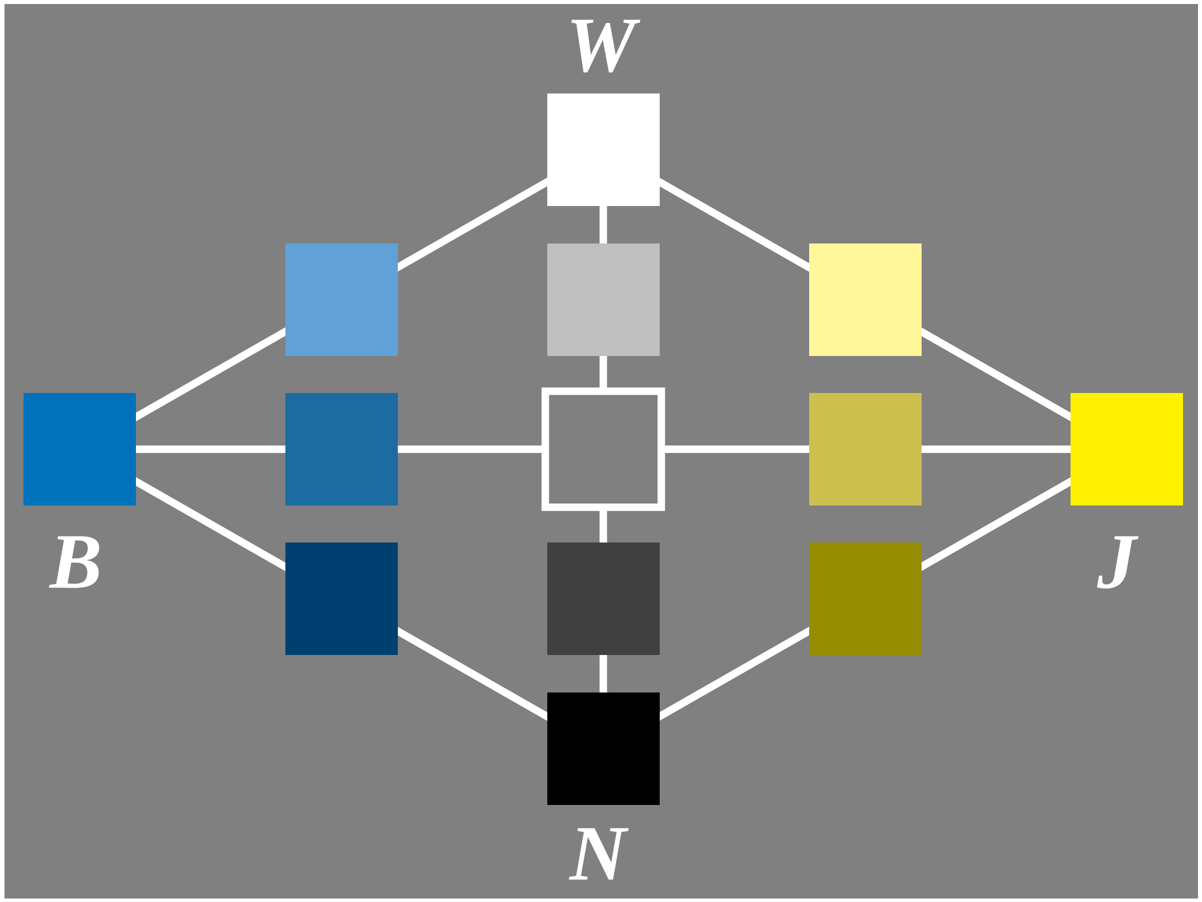
G8511_1f.eps, G0130_4f.eps, G2_05f.eps, Bild 2_5



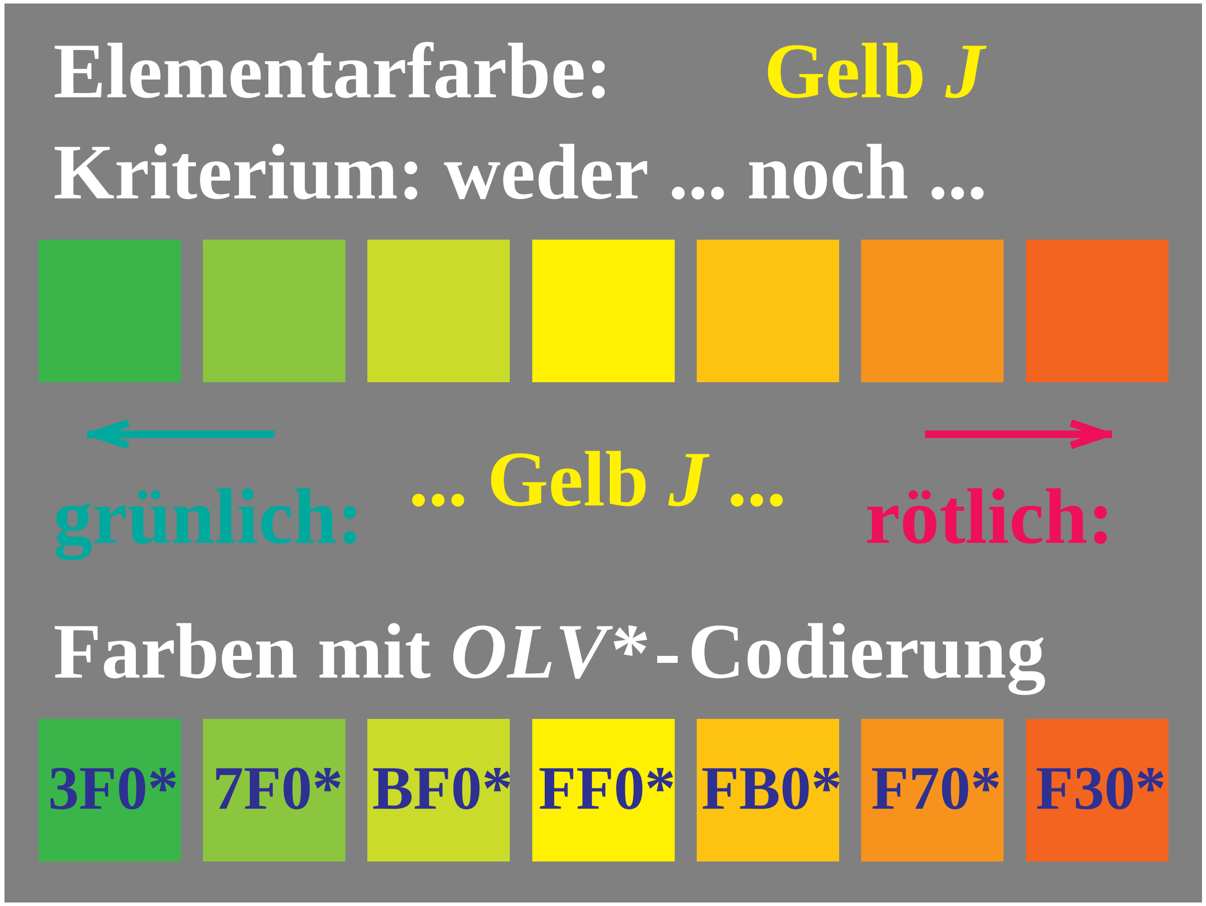
G8520_1f.eps, G0130_5f.eps, G2_06f.eps, Bild 2_6



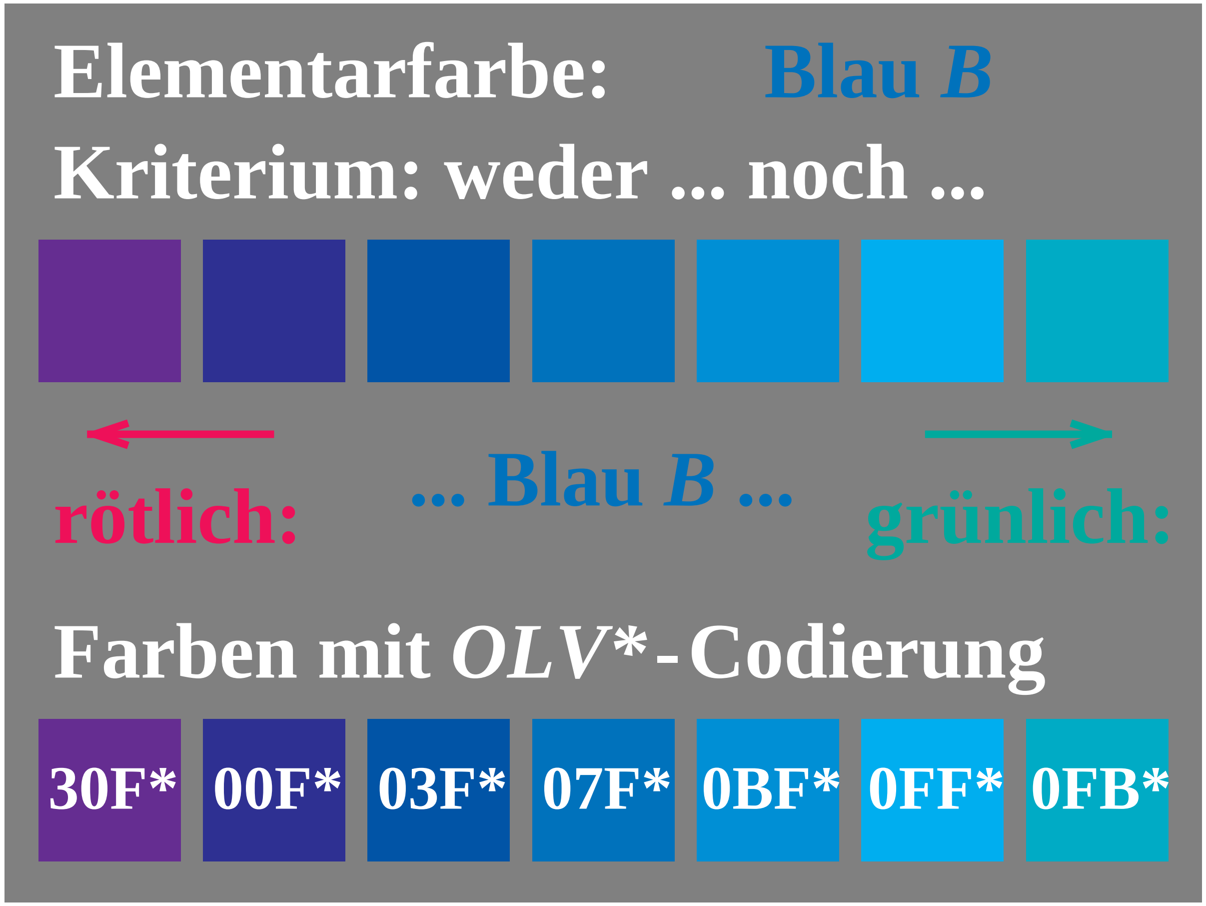
G8520_2f.eps, G0130_6f.eps, G2_07f.eps, Bild 2_7



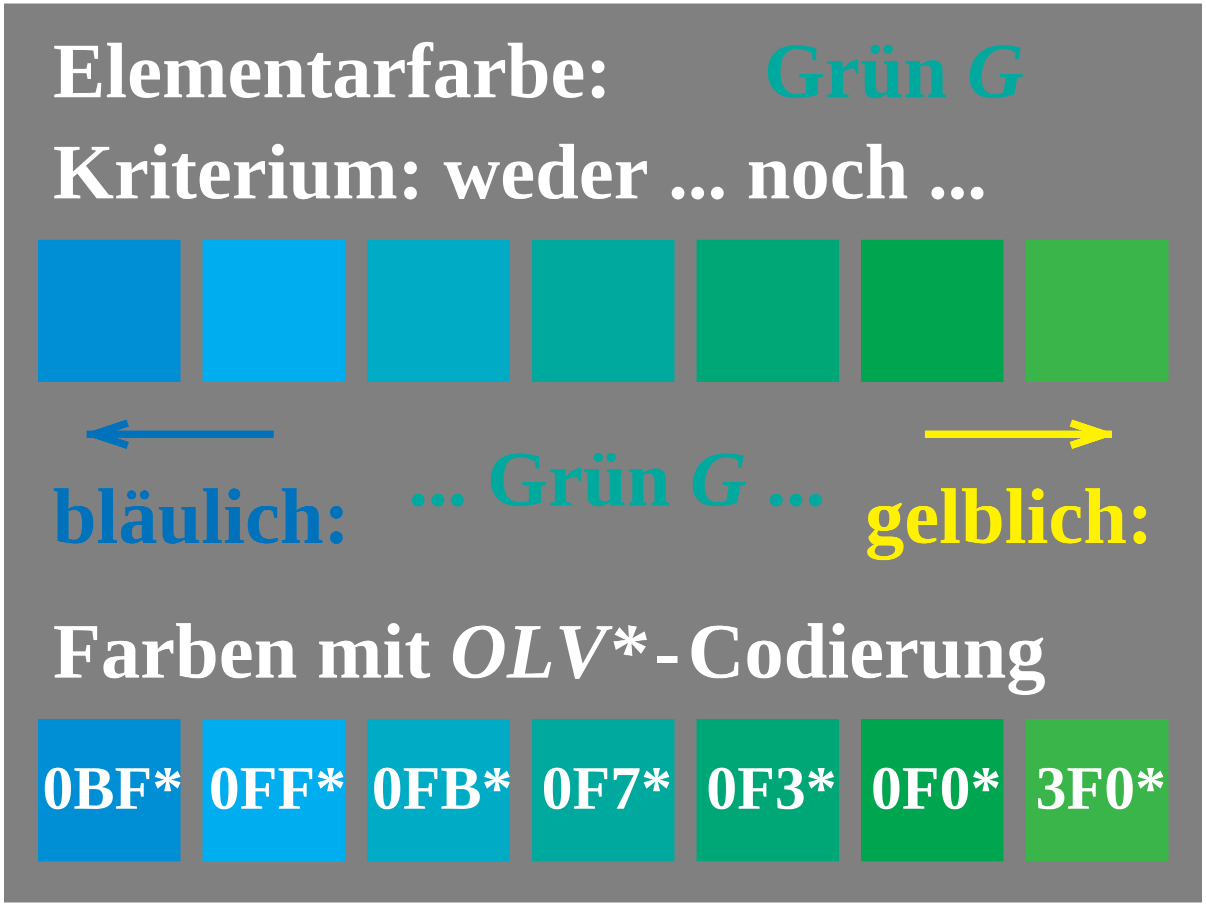
G8520_3f.eps, G0130_7f.eps, G2_08f.eps, Bild 2_8



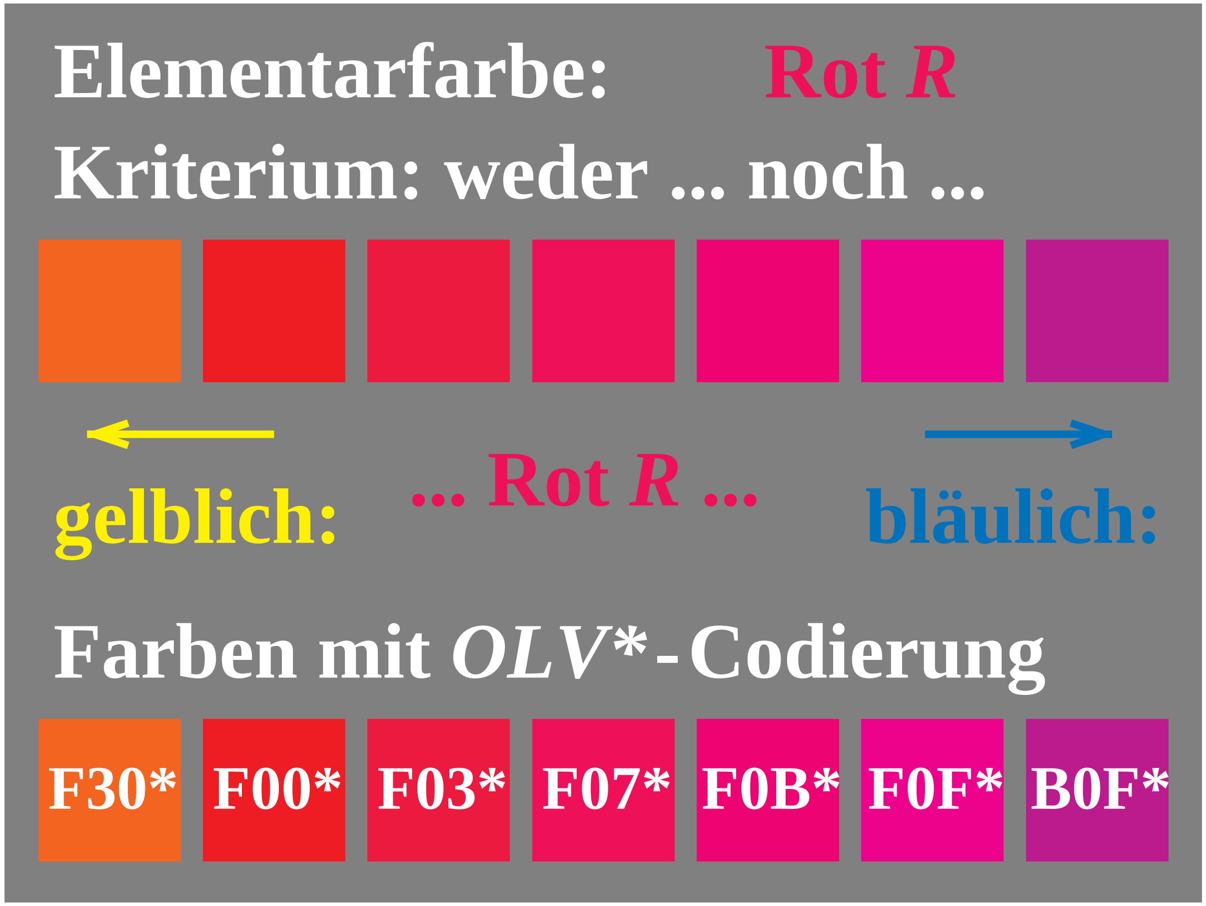
G8520_5f.eps, G0130_8f.eps, G2_09f.eps, Bild 2_9



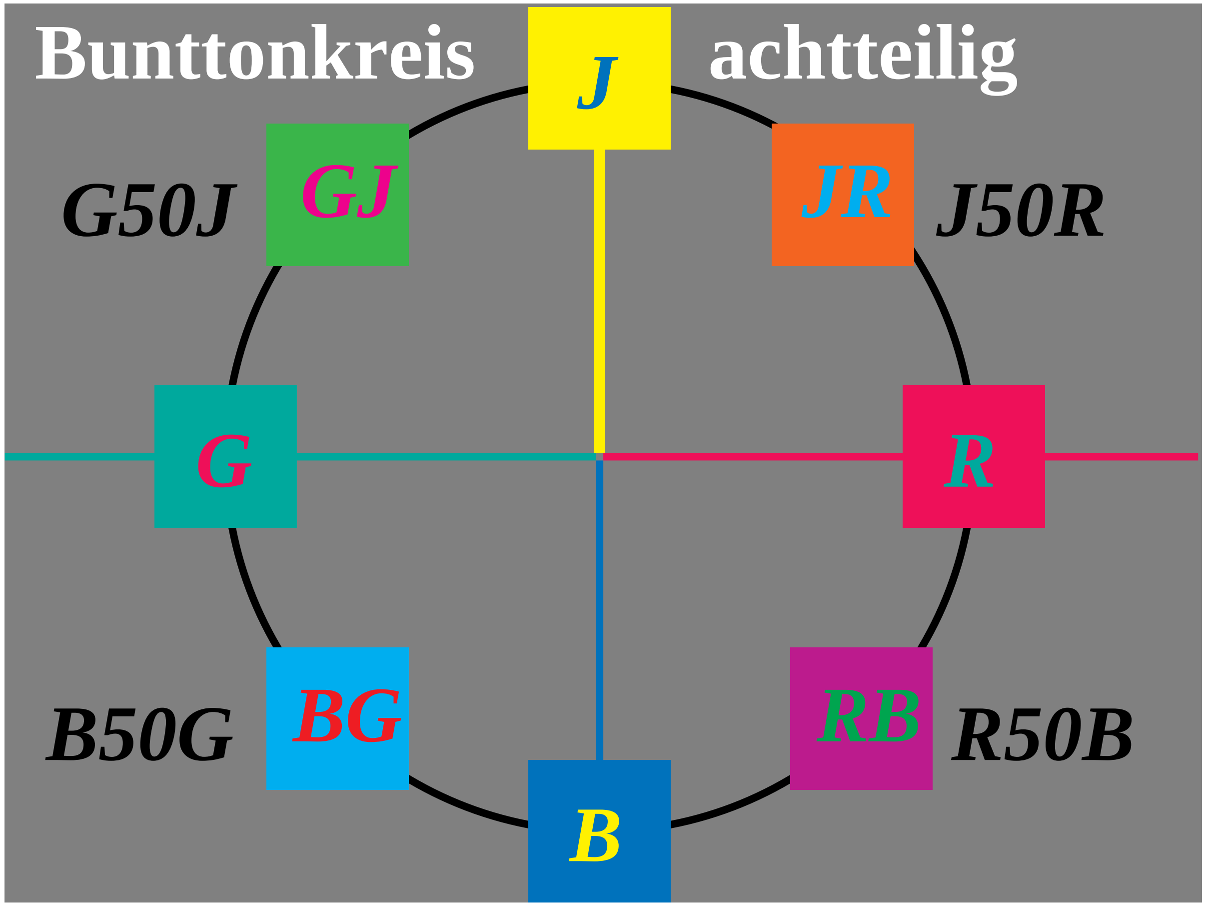
G8520_6f.eps, G0131_1f.eps, G2_10f.eps, Bild 2_10



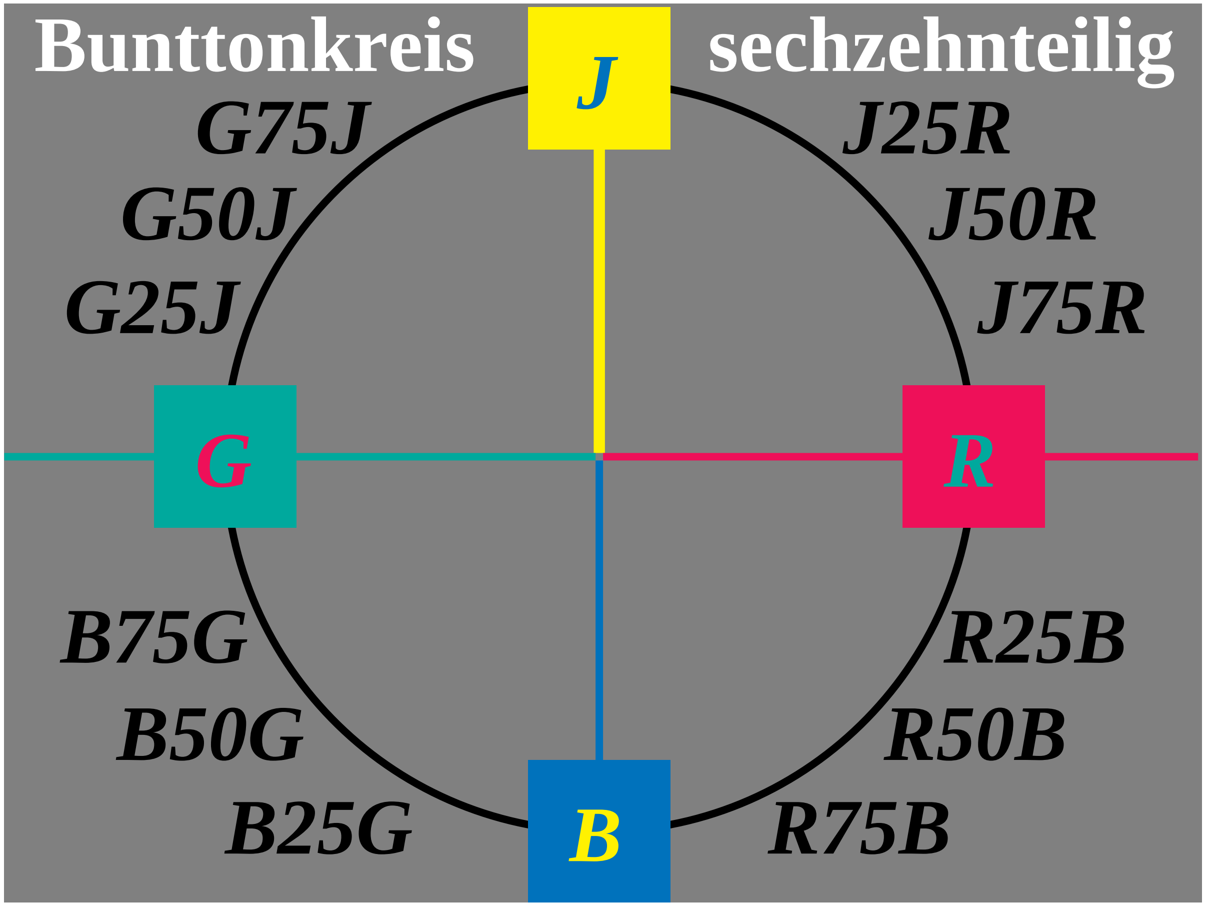
G8520_7f.eps, G0131_2f.eps, G2_11f.eps, Bild 2_11



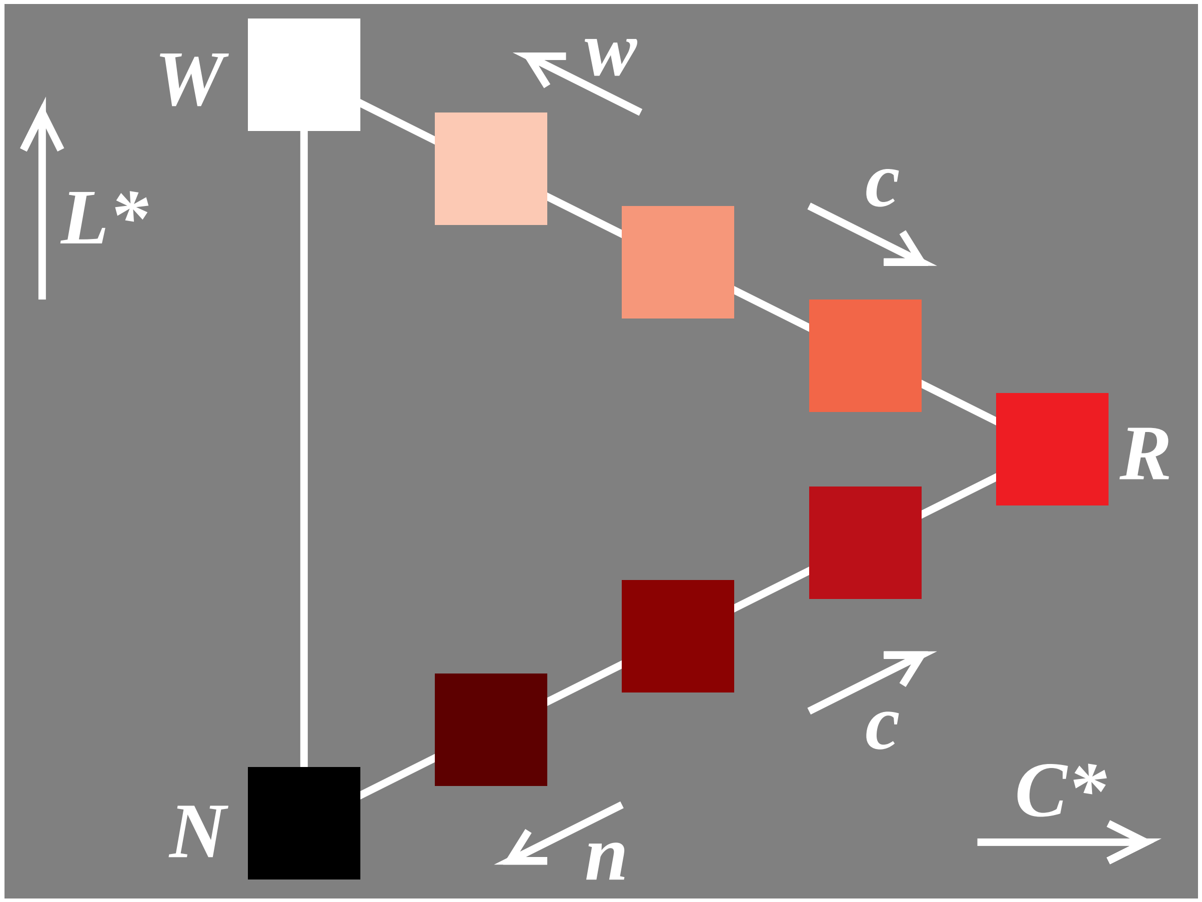
G8520_8f.eps, G0131_3f.eps, G2_12f.eps, Bild 2_12



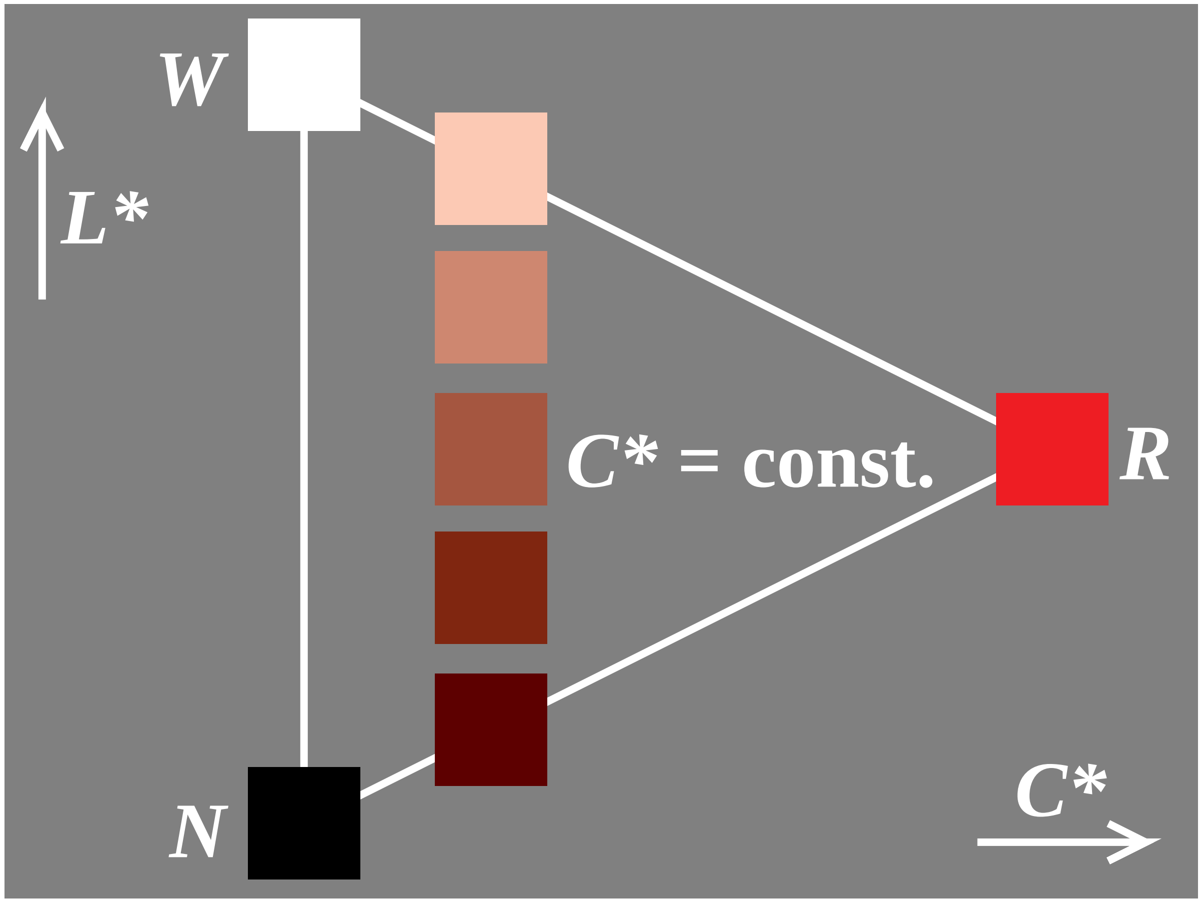
G8670_3f.eps, G0131_4f.eps, G2_13f.eps, Bild 2_13



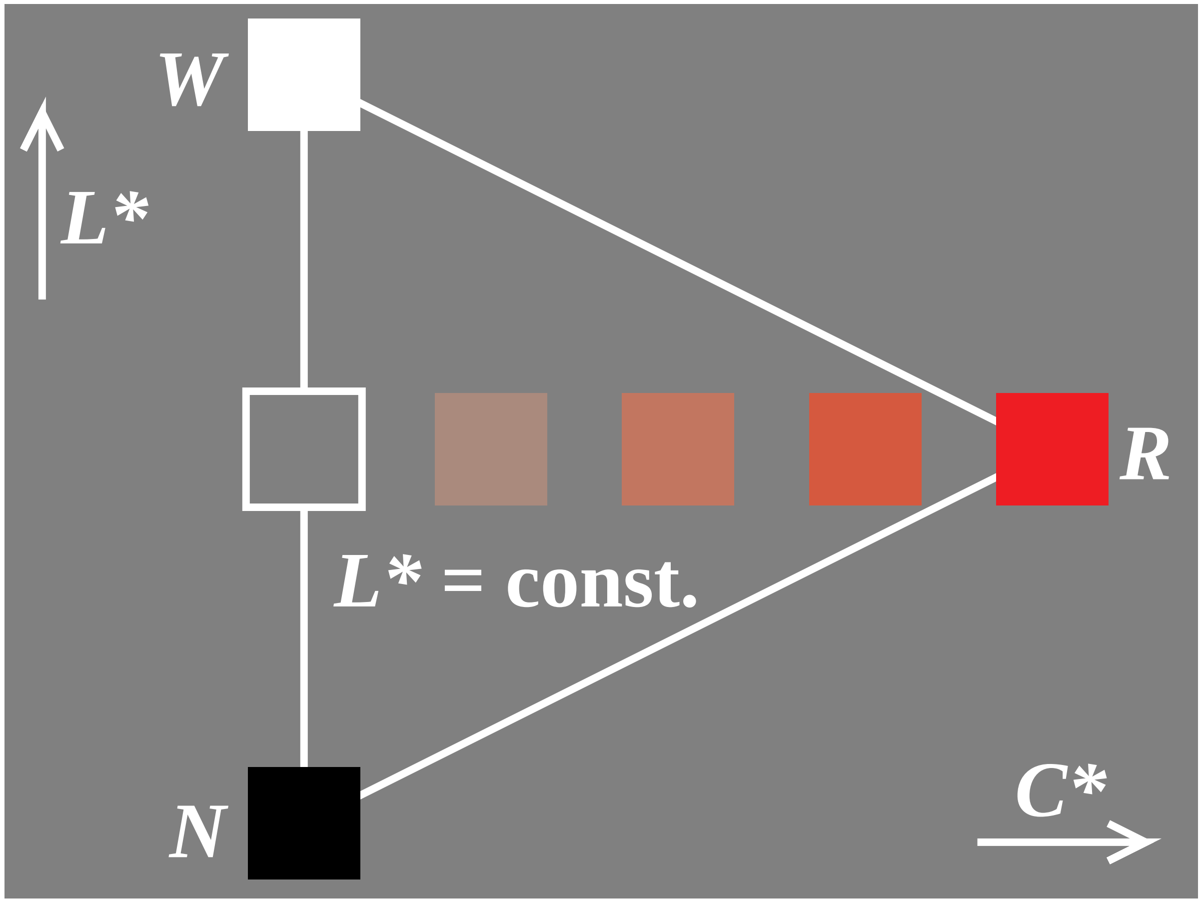
G8670_4f.eps, G0131_5f.eps, G2_14f.eps, Bild 2_14



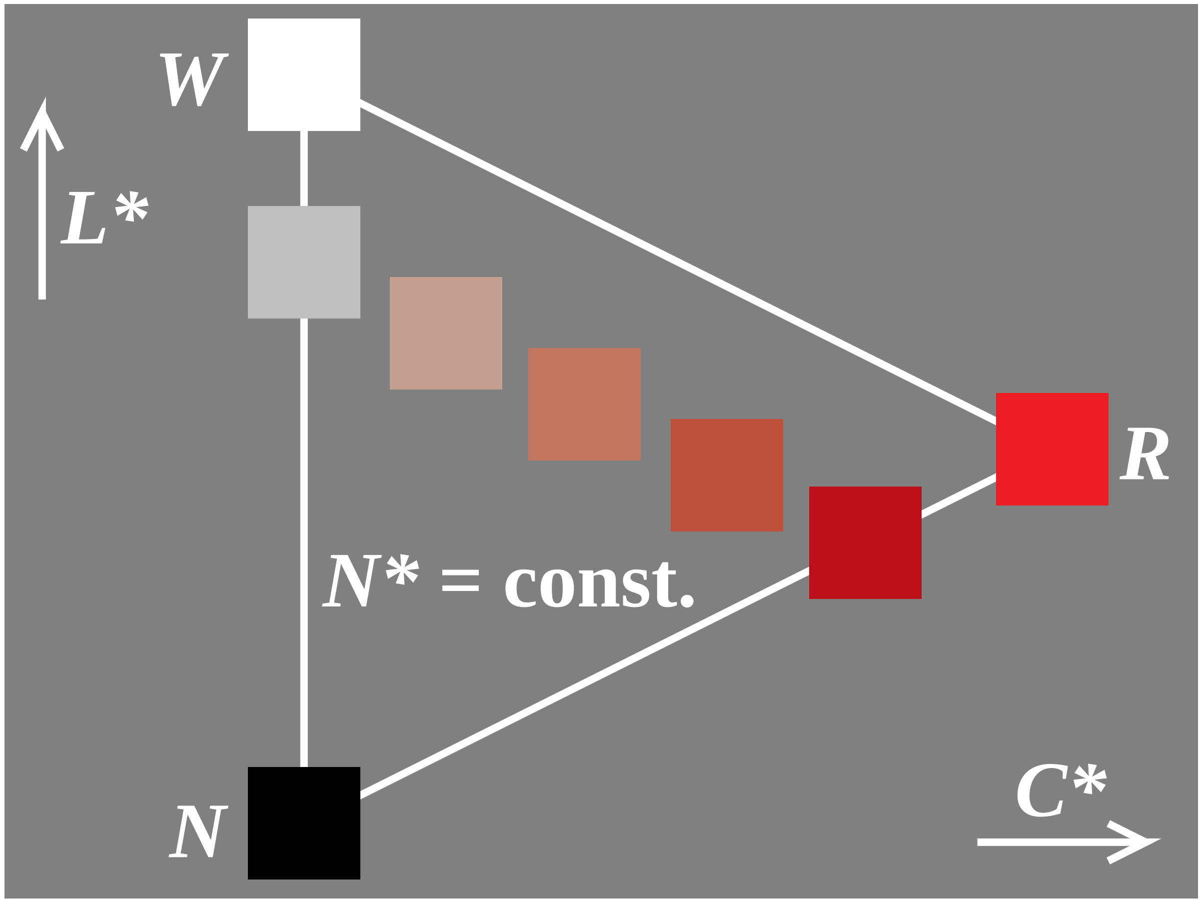
G8521_1f.eps, G0131_6f.eps, G2_15f.eps, Bild 2_15



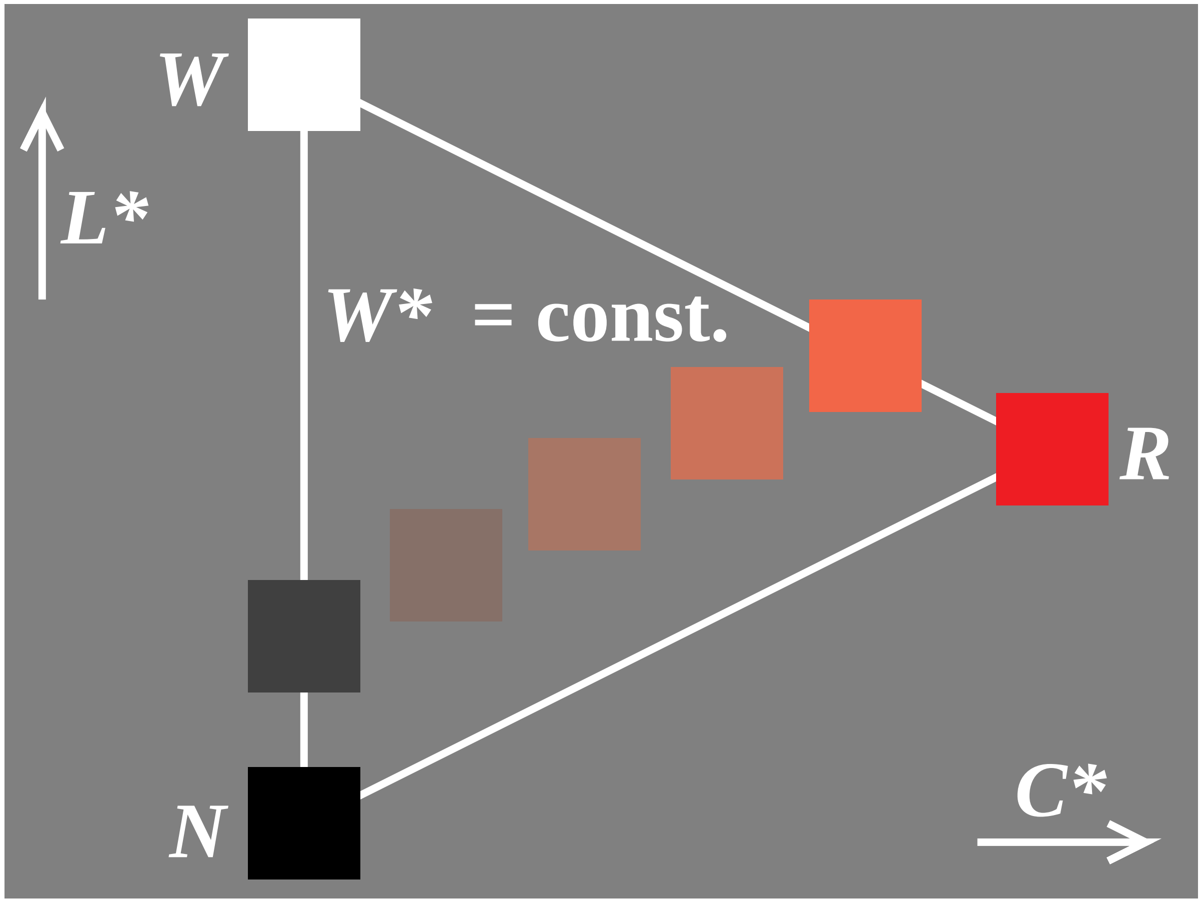
G8521_2f.eps, G0131_7f.eps, G2_16f.eps, Bild 2_16



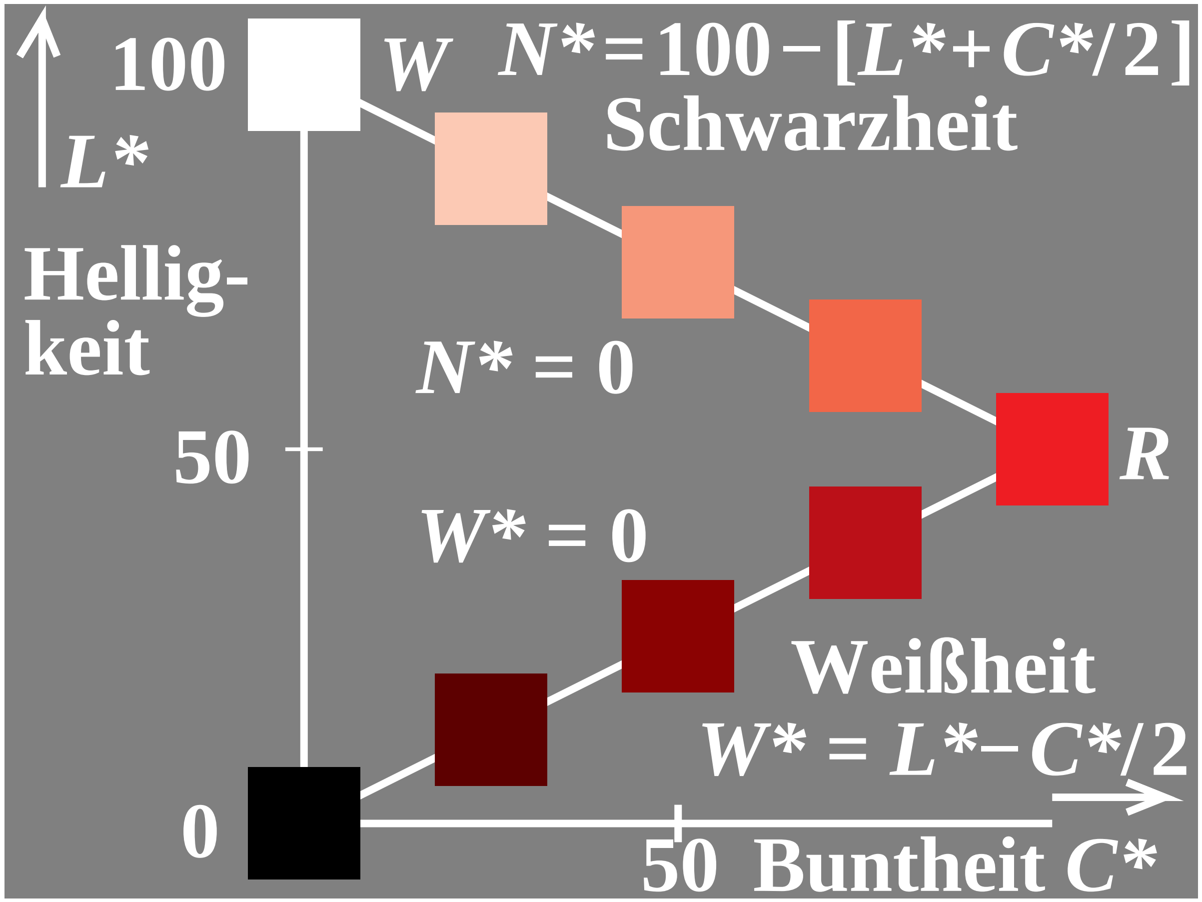
G8521_3f.eps, G0131_8f.eps, G2_17f.eps, Bild 2_17



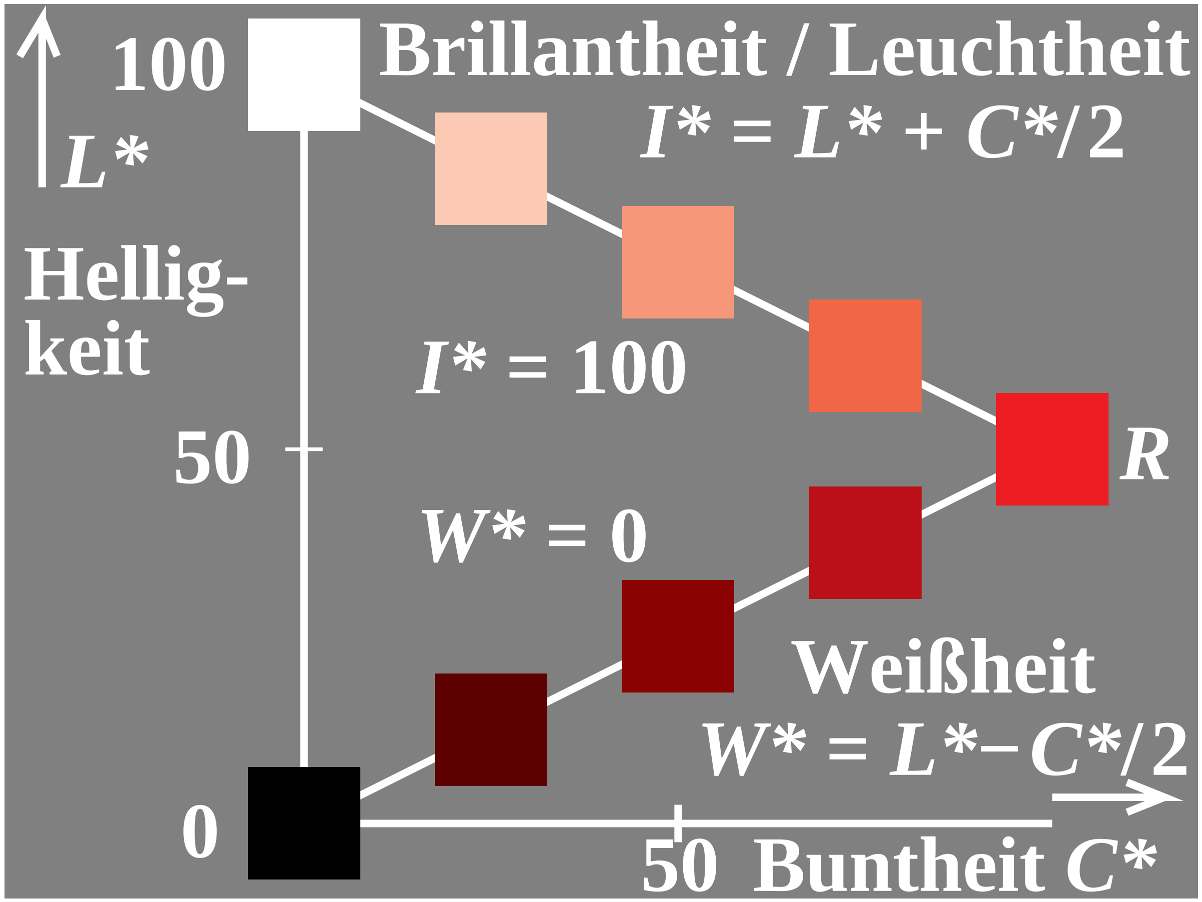
G8521_5f.eps, G0140_1f.eps, G2_18_1f.eps, Bild 2_18_1



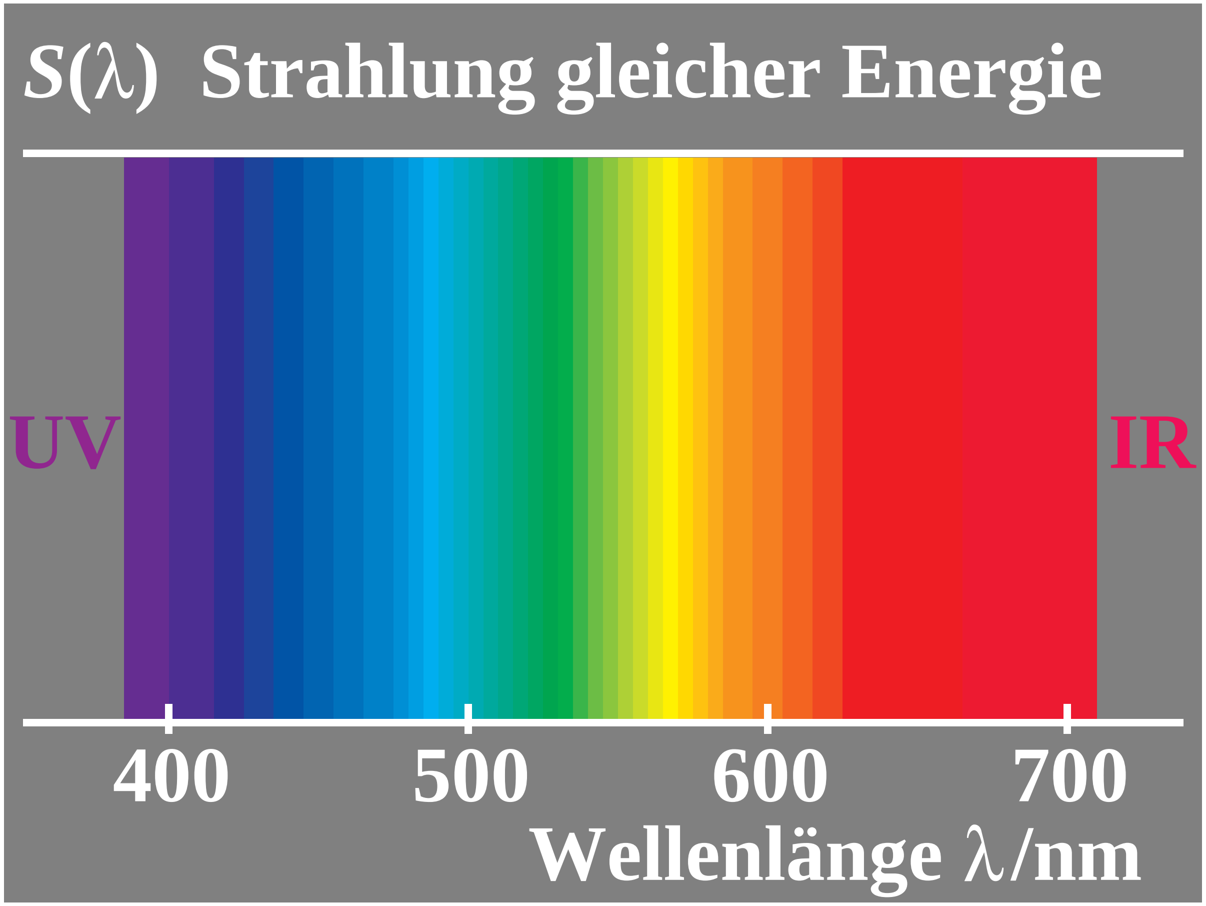
G8521_6f.eps, G0140_2f.eps, G2_18_2f.eps, Bild 2_18_2



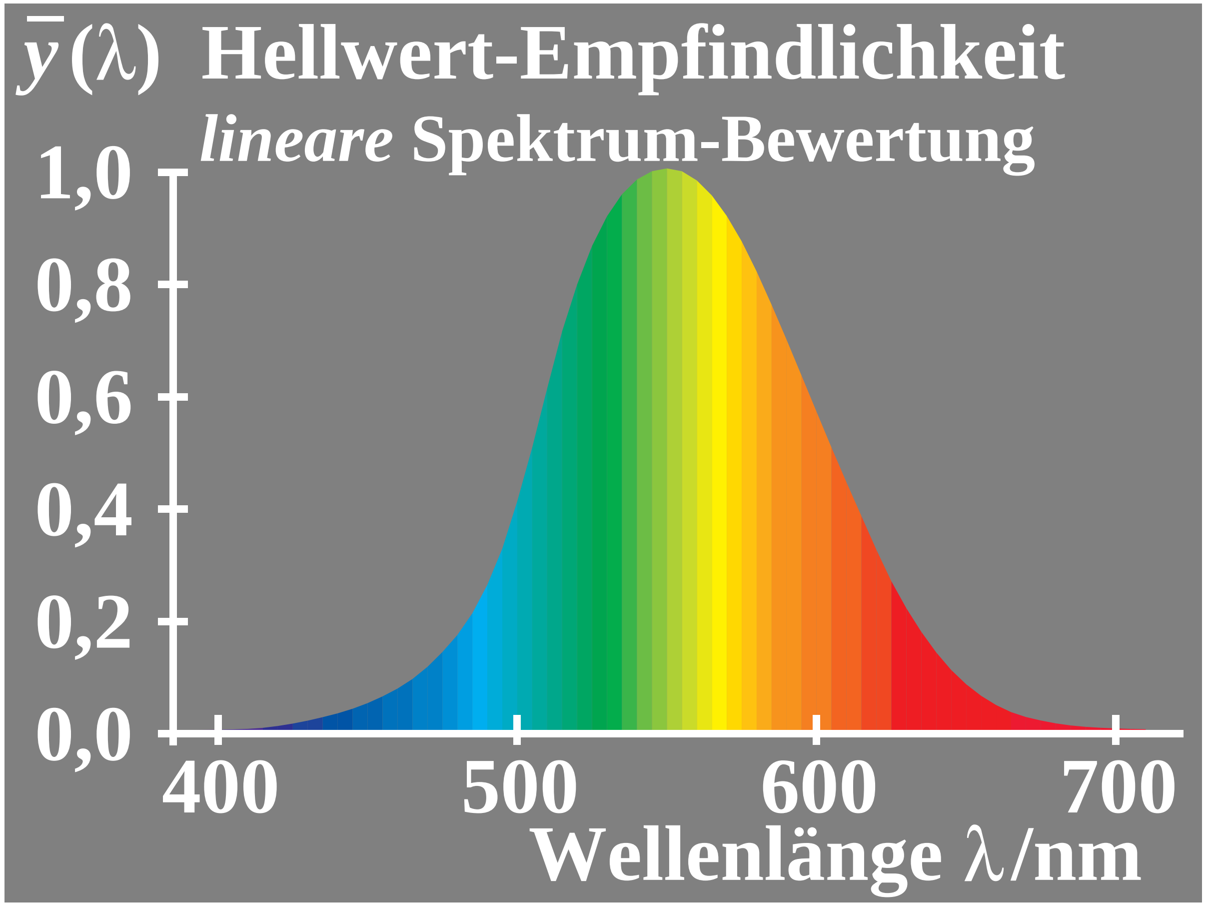
G8580_2f.eps, G0140_3f.eps, G2_19_1f.eps, Bild 2_19_1



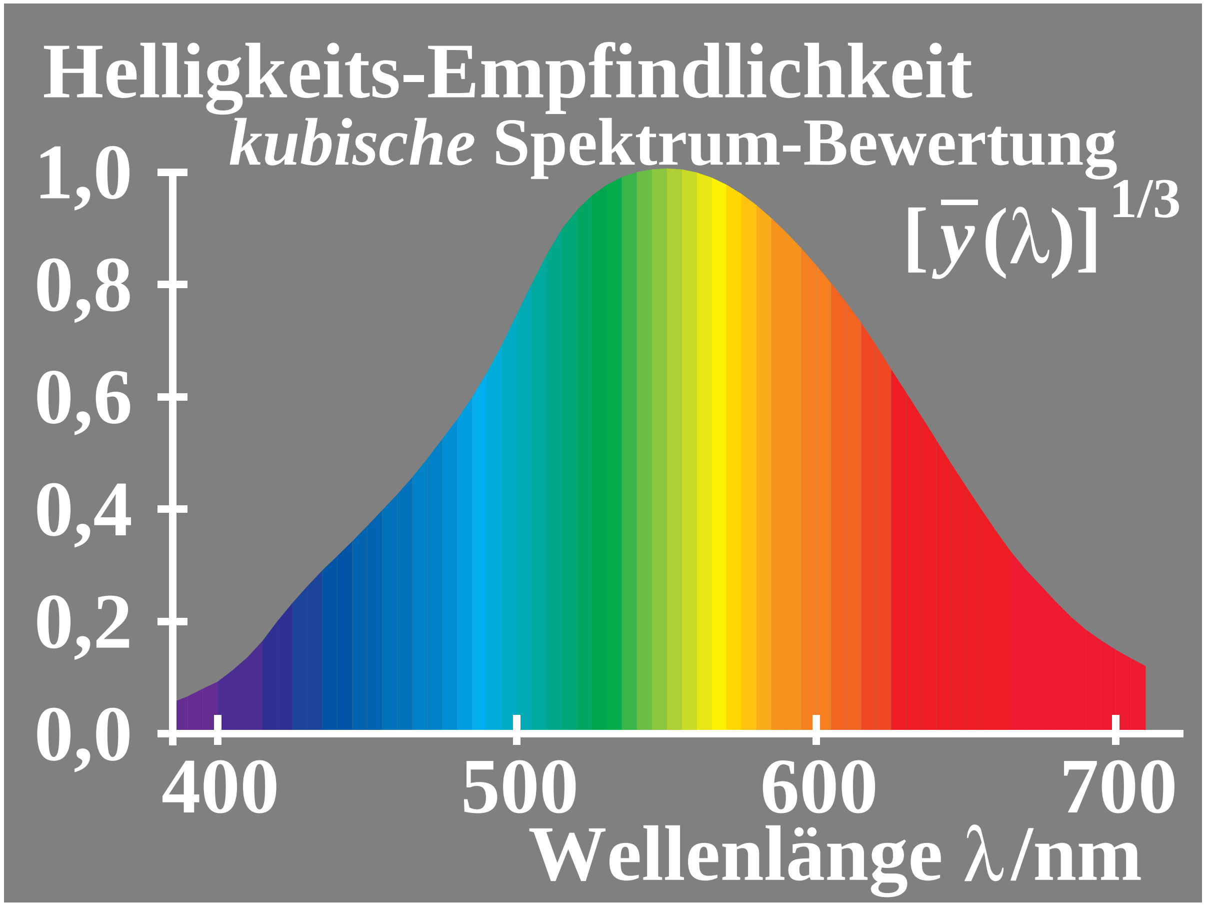
G8580_4f.eps, G0140_4f.eps, G2_19_2f.eps, Bild 2_19_2



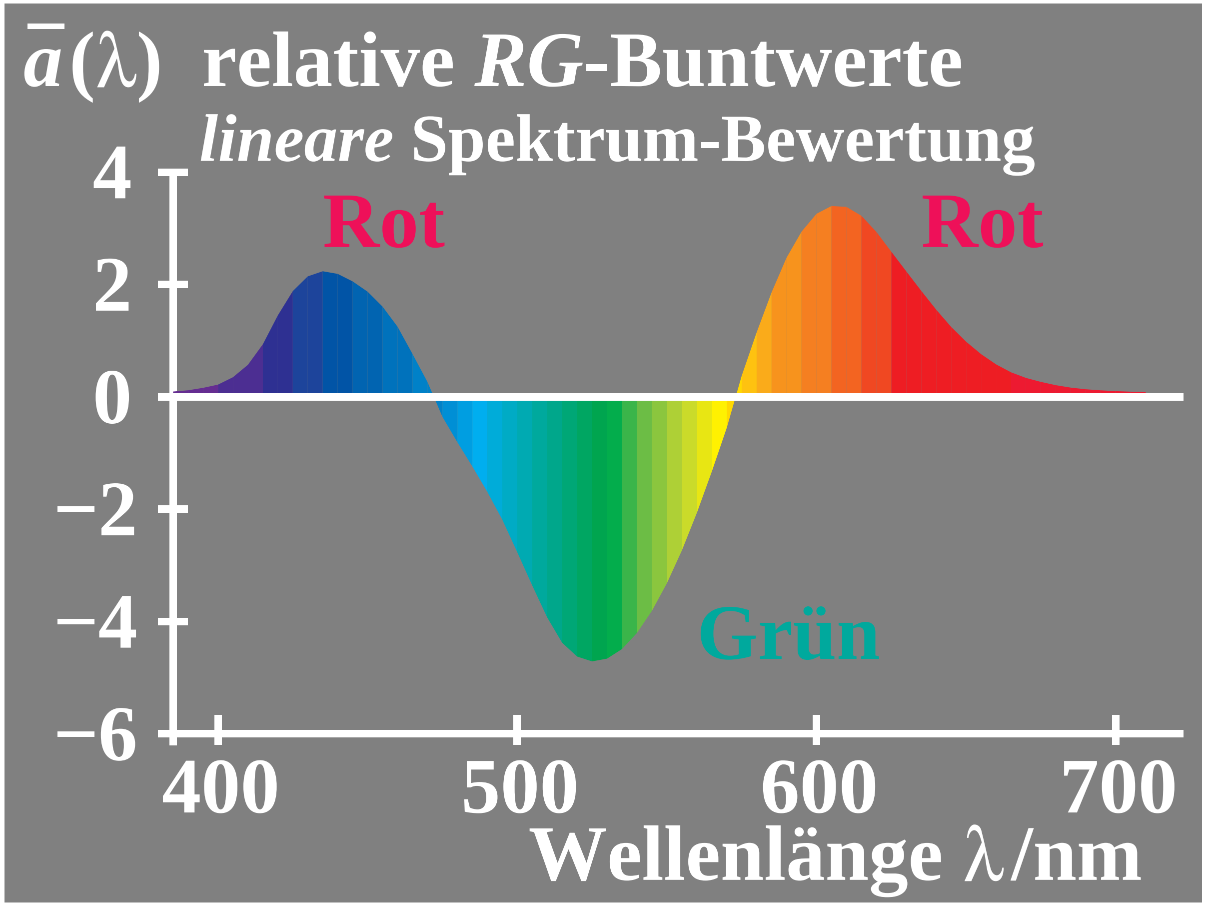
G8521_7f.eps, G0140_5f.eps, G2_20f.eps, Bild 2_20



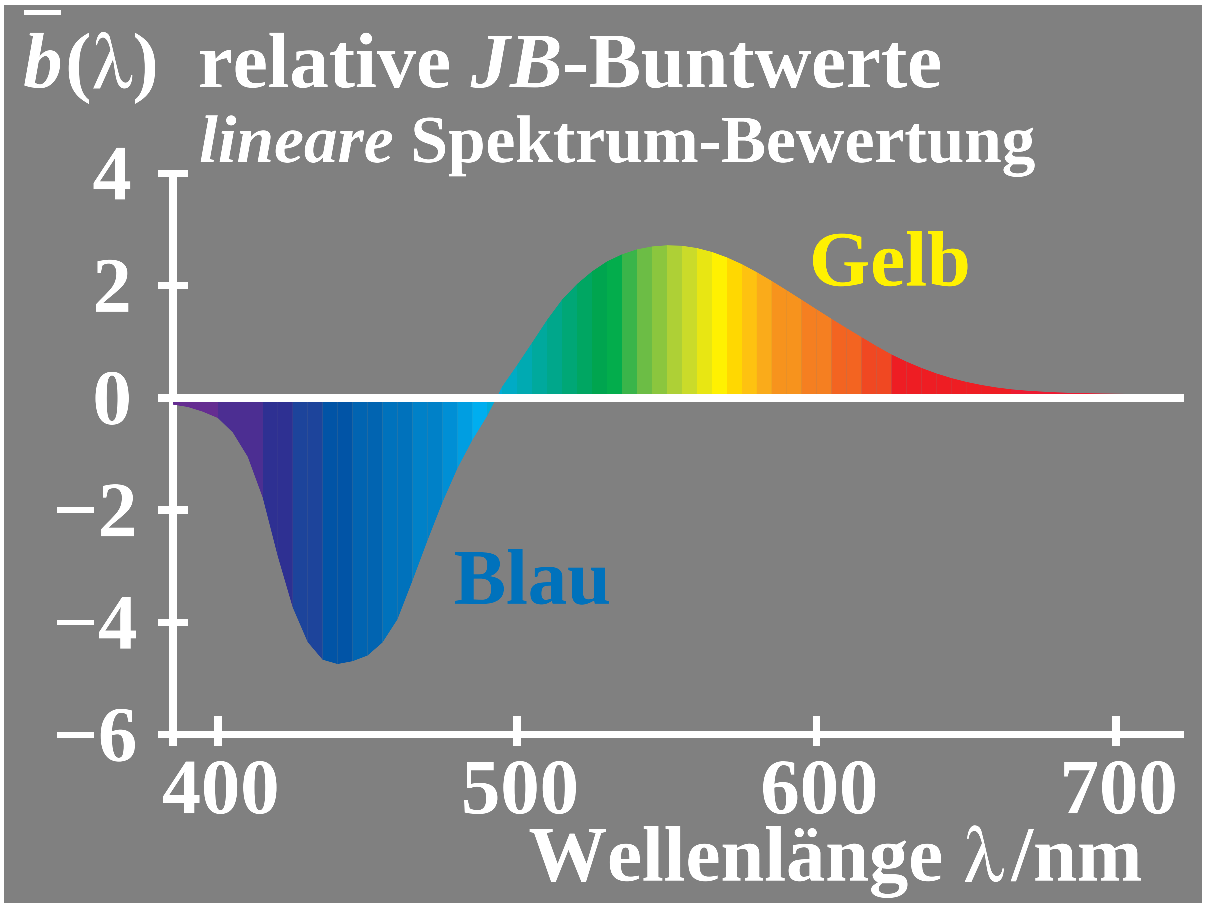
G8530_1f.eps, G0140_6f.eps, G2_21f.eps, Bild 2_21



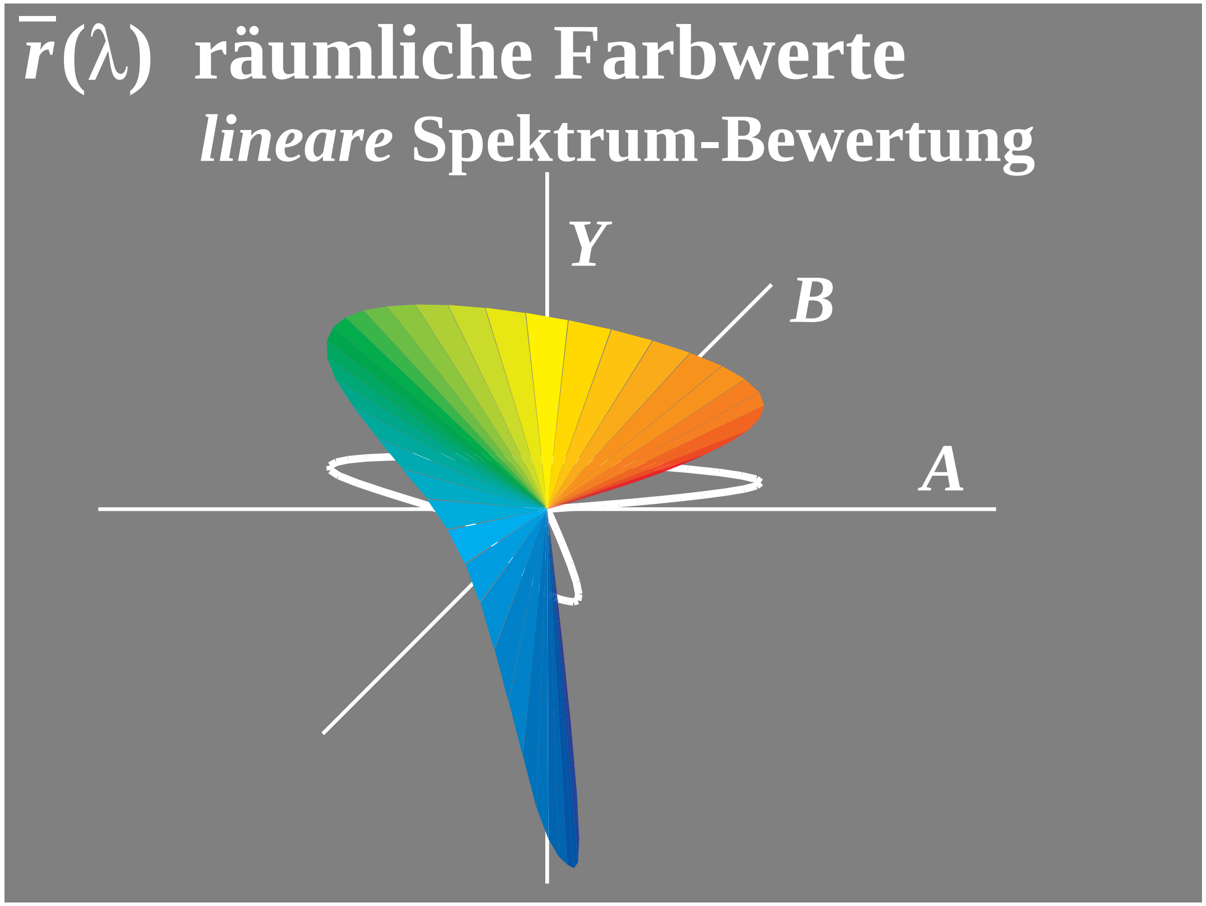
G8530_2f.eps, G0140_7f.eps, G2_22f.eps, Bild 2_22



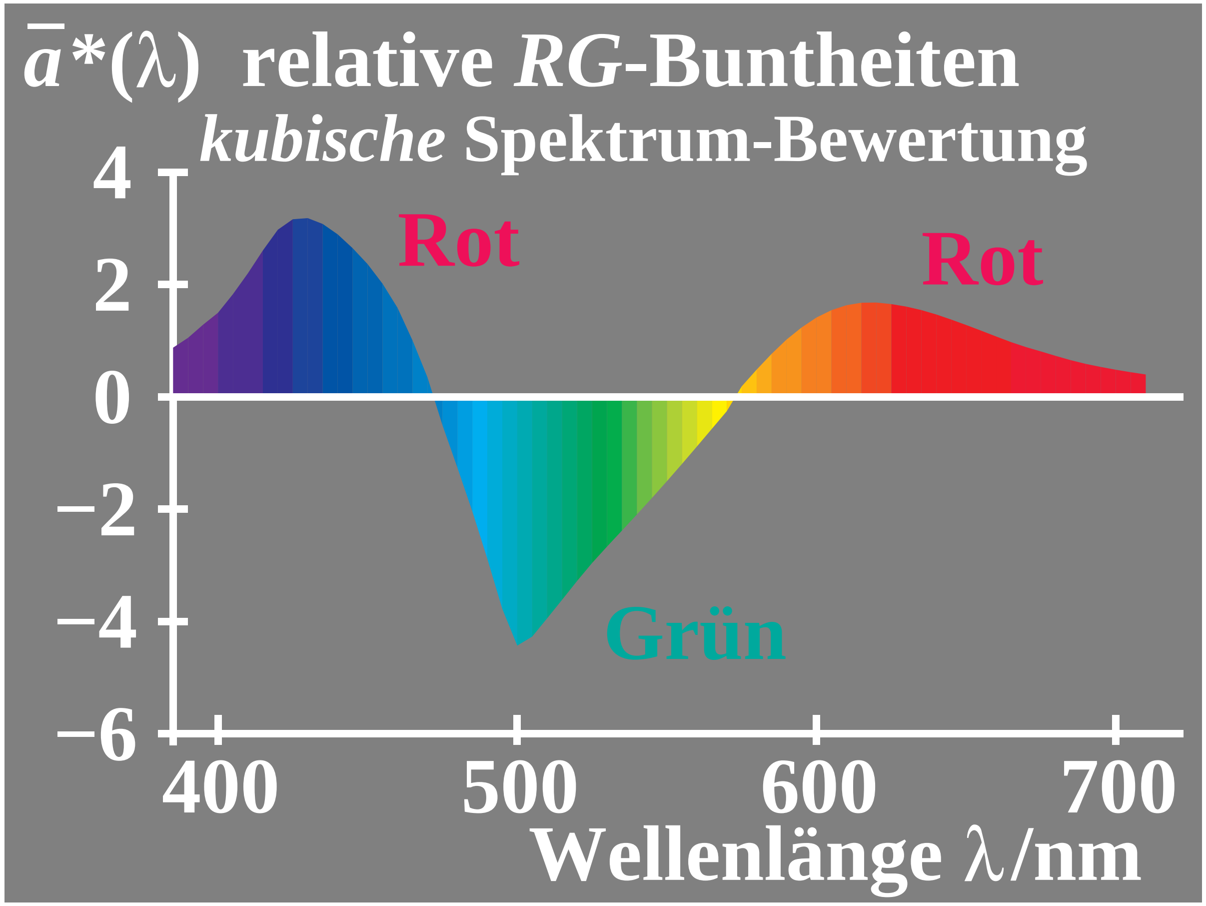
G8530_5f.eps, G0140_8f.eps, G2_23f.eps, Bild 2_23



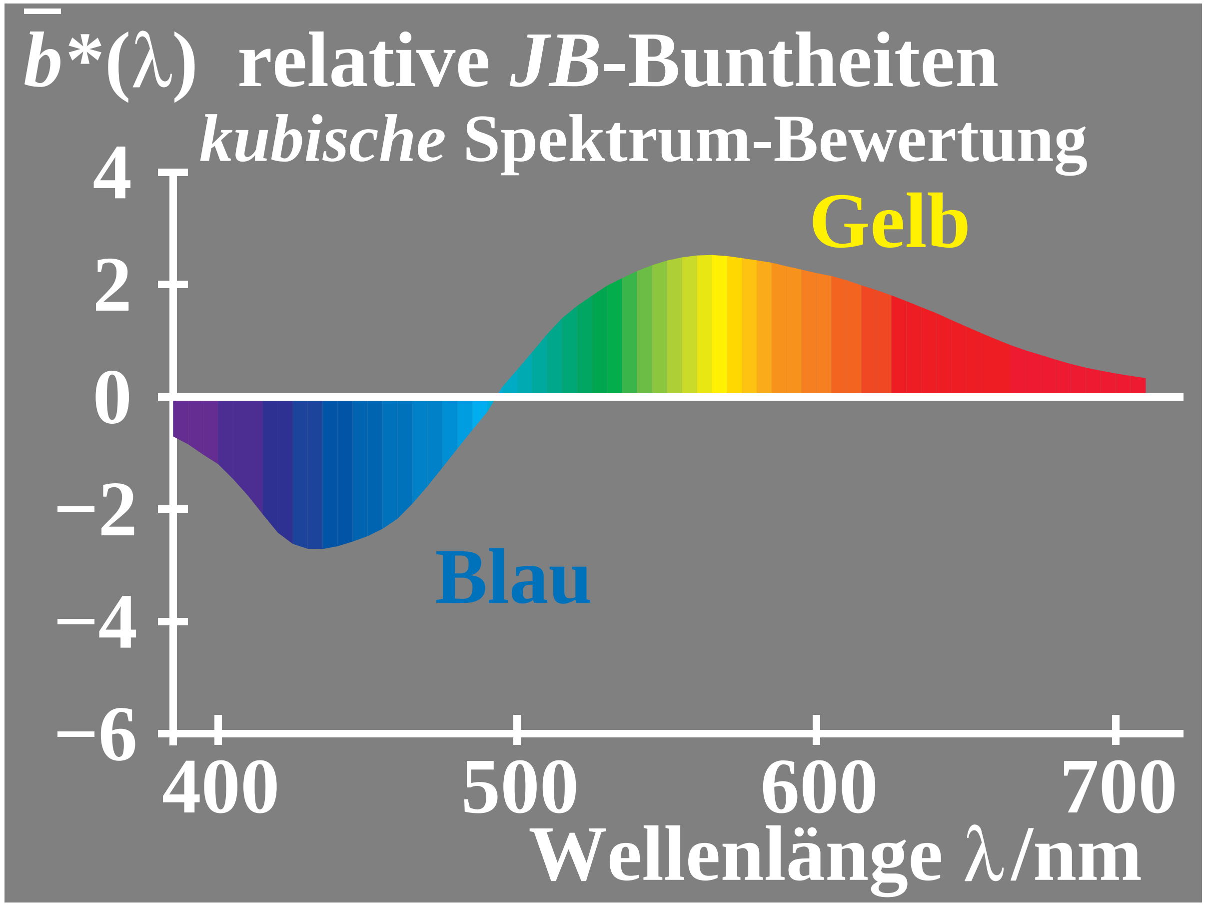
G8530_6f.eps, G0141_1f.eps, G2_24f.eps, Bild 2_24



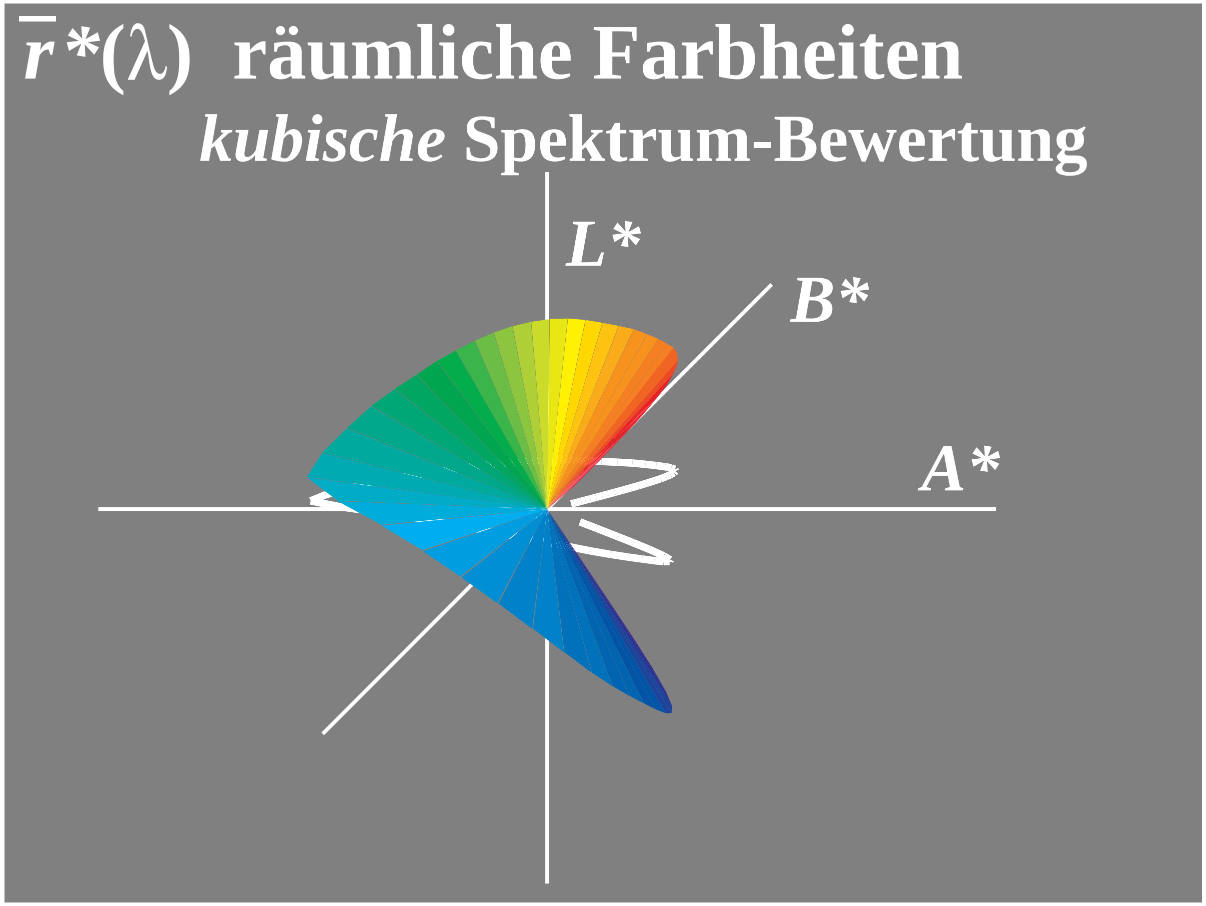
G8530_3f.eps, G0141_2f.eps, G2_25f.eps, Bild 2_25



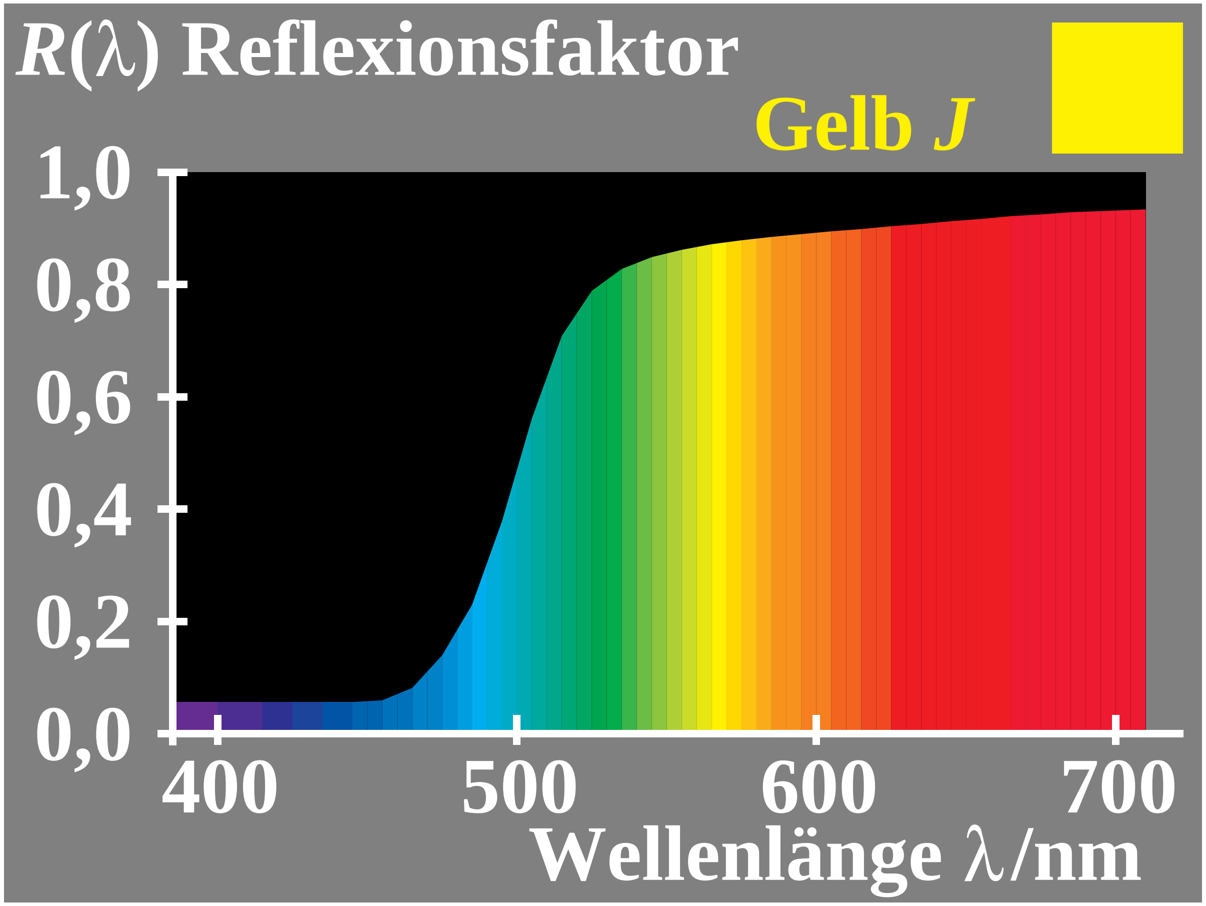
G8530_7f.eps, G0141_3f.eps, G2_26f.eps, Bild 2_26



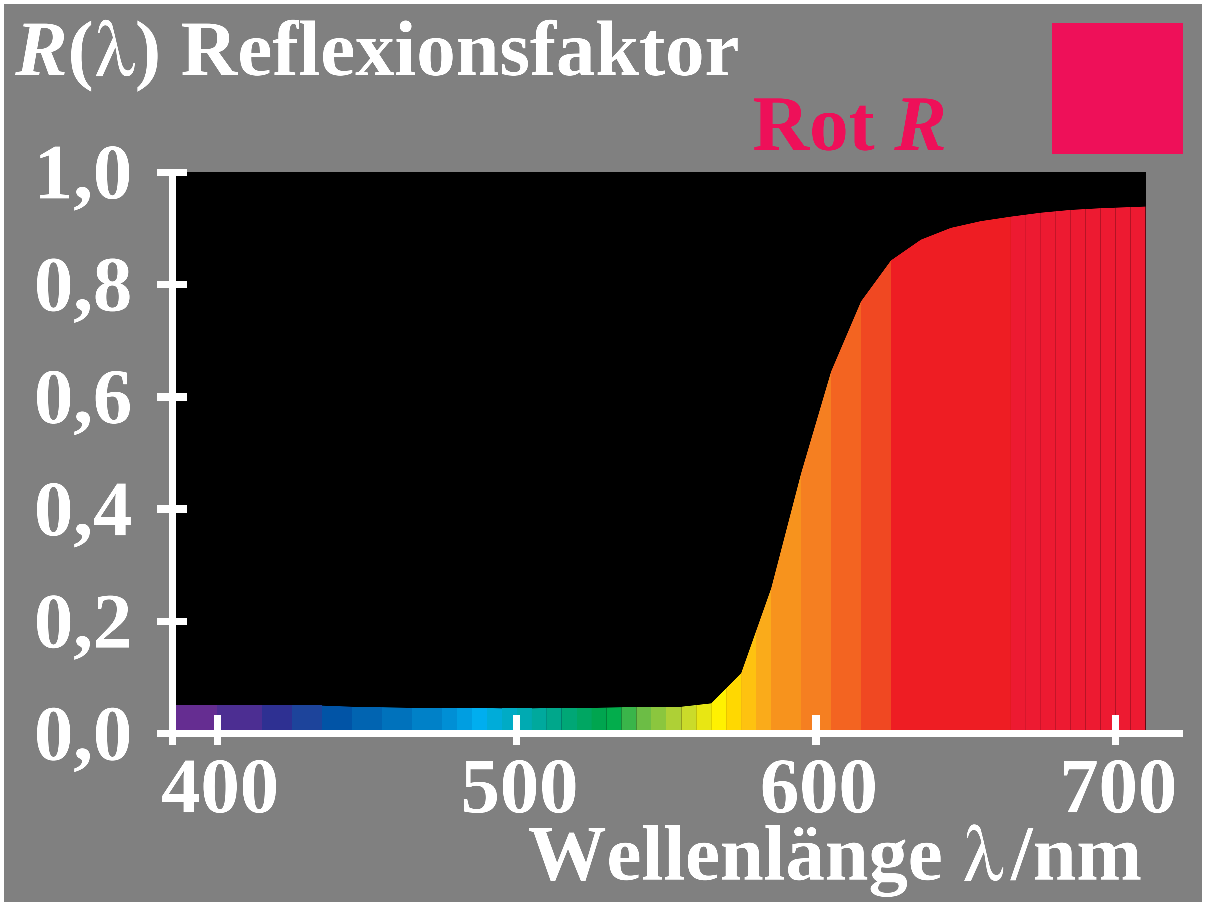
G8530_8f.eps, G0141_4f.eps, G2_27f.eps, Bild 2_27



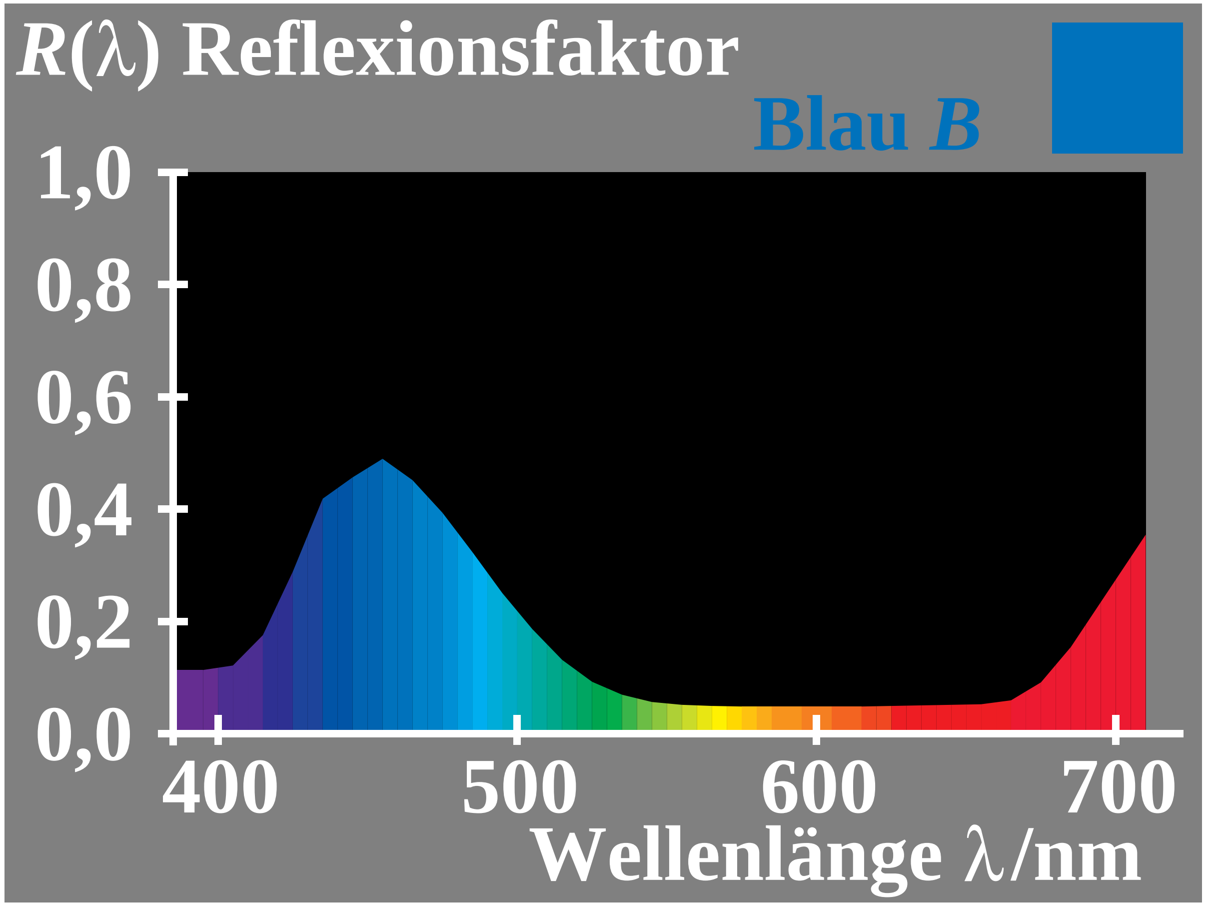
G8530_4f.eps, G0141_5f.eps, G2_28f.eps, Bild 2_28



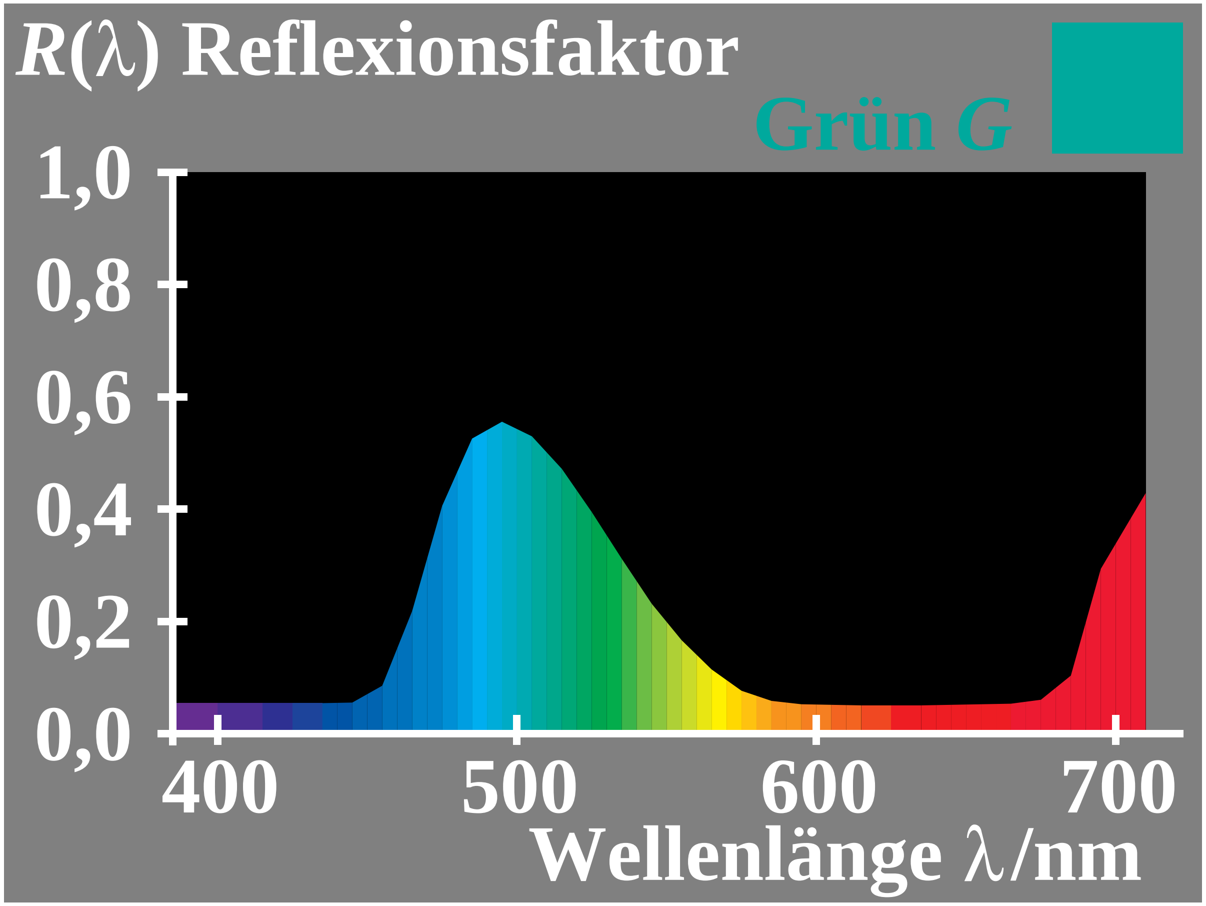
G8531_1f.eps, G0141_6f.eps, G2_29_1f.eps, Bild 2_29_1



G8531_2f.eps, G0141_7f.eps, G2_29_2f.eps, Bild 2_29_2



G8531_3f.eps, G0141_8f.eps, G2_29_3f.eps, Bild 2_29_3



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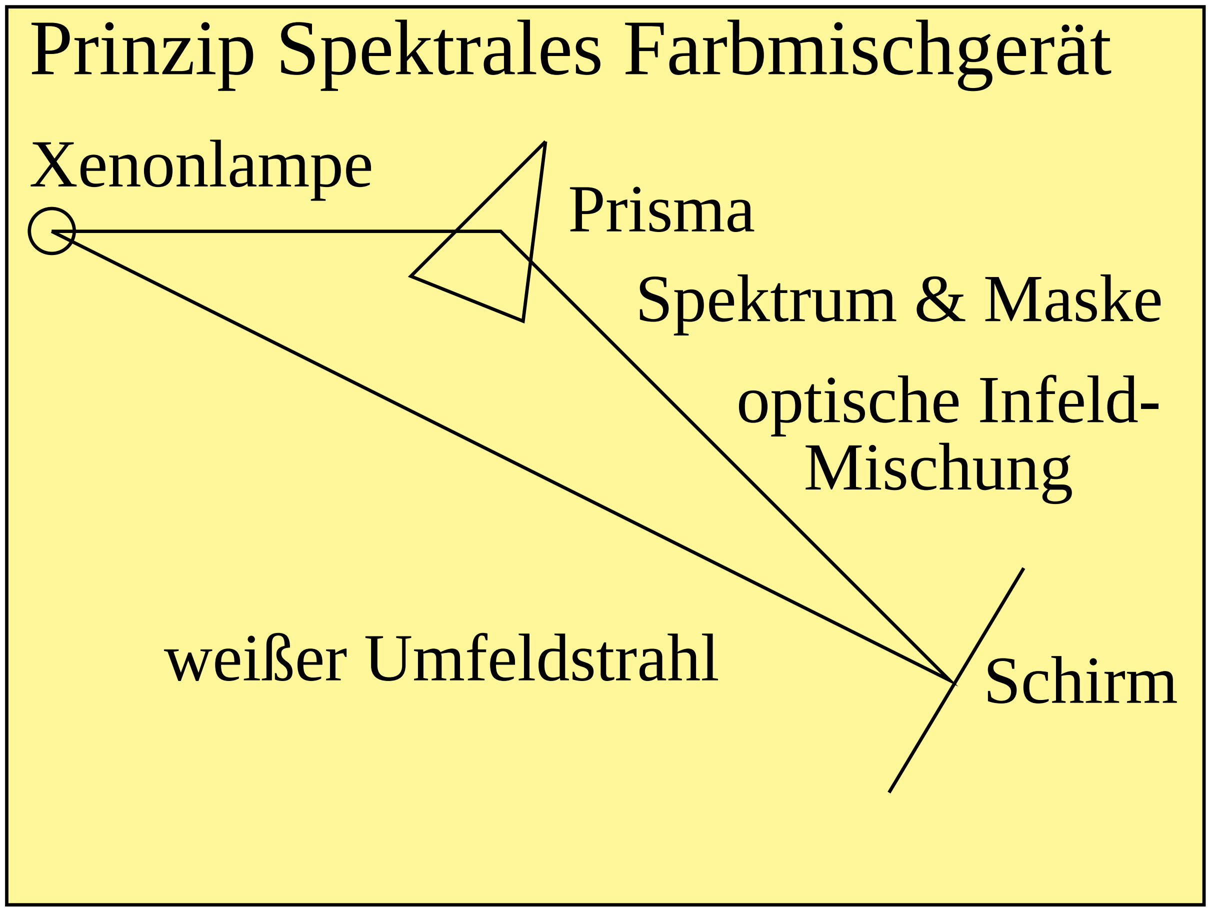

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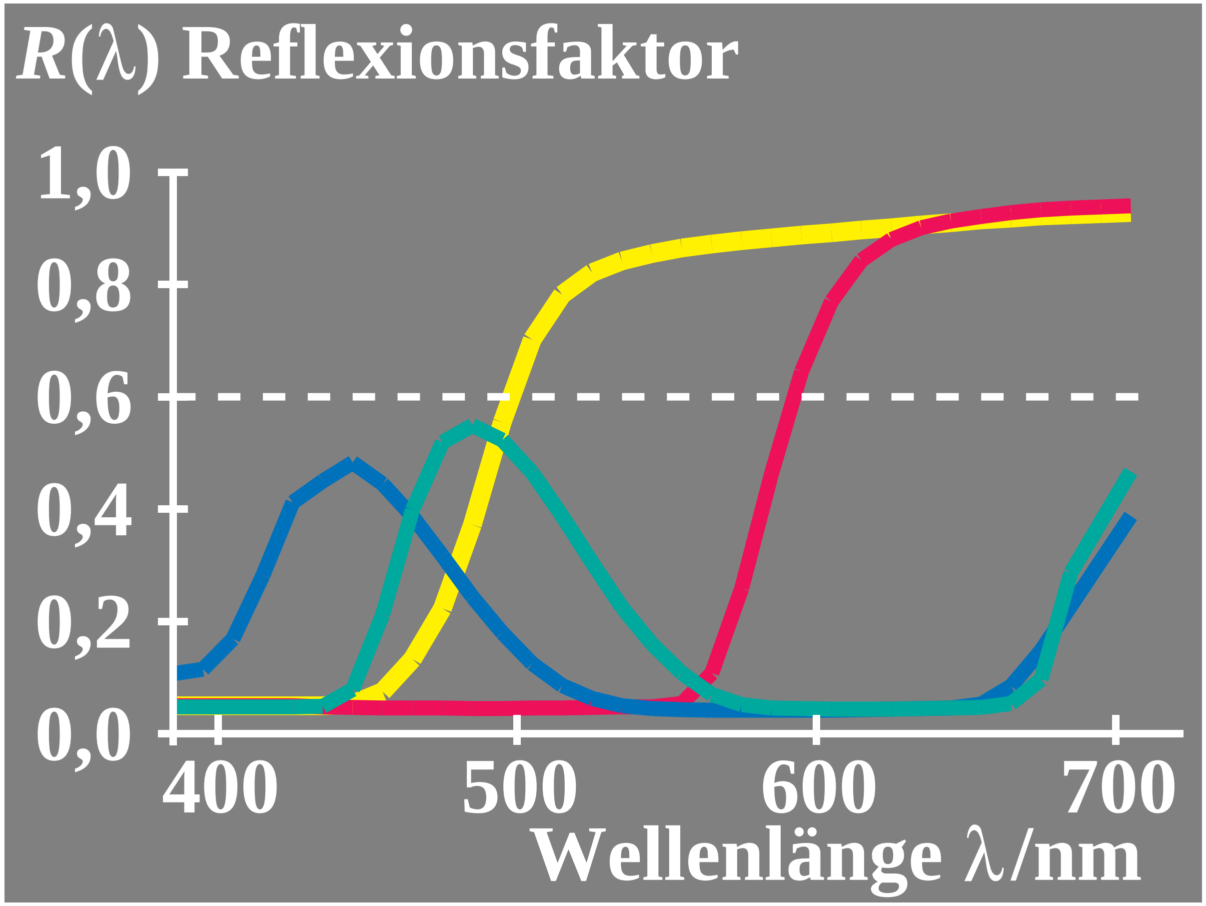

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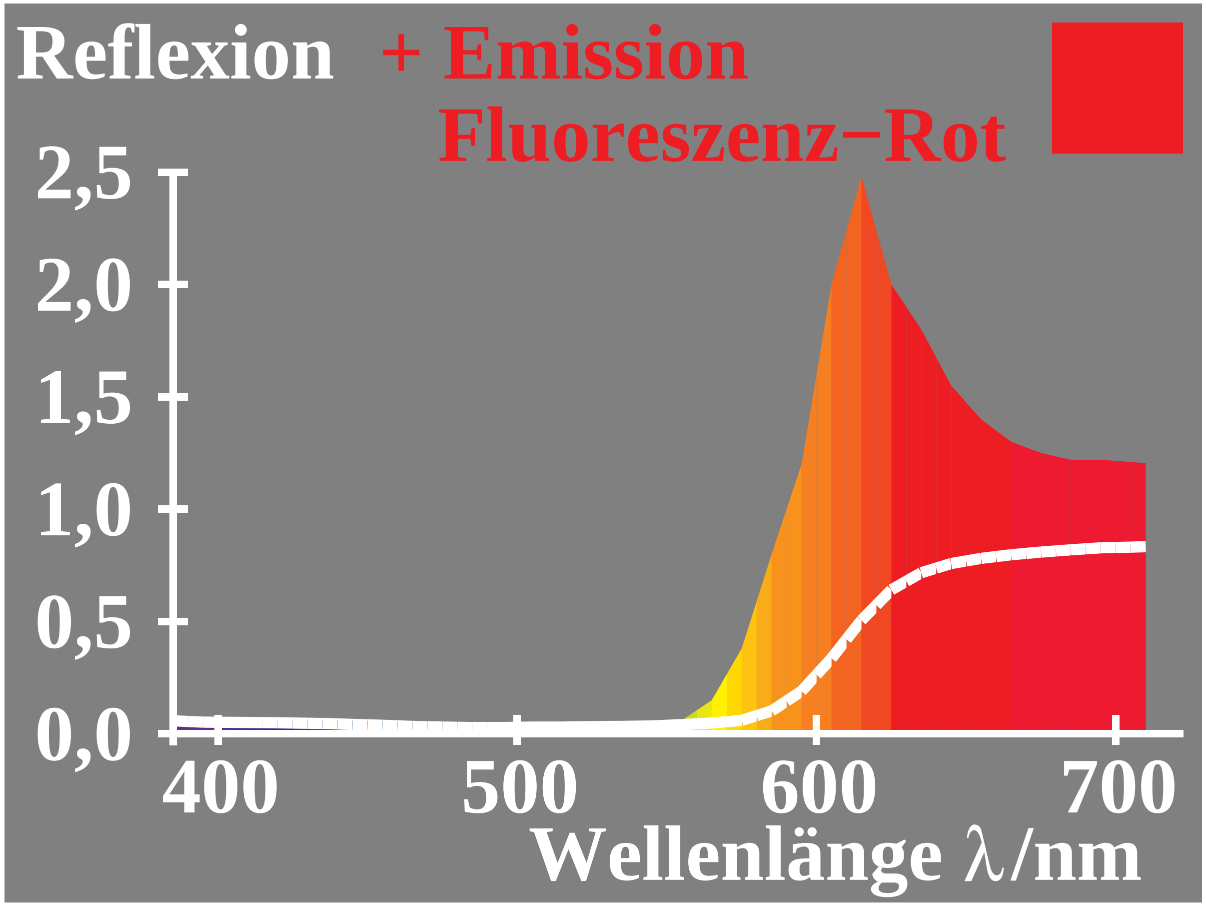

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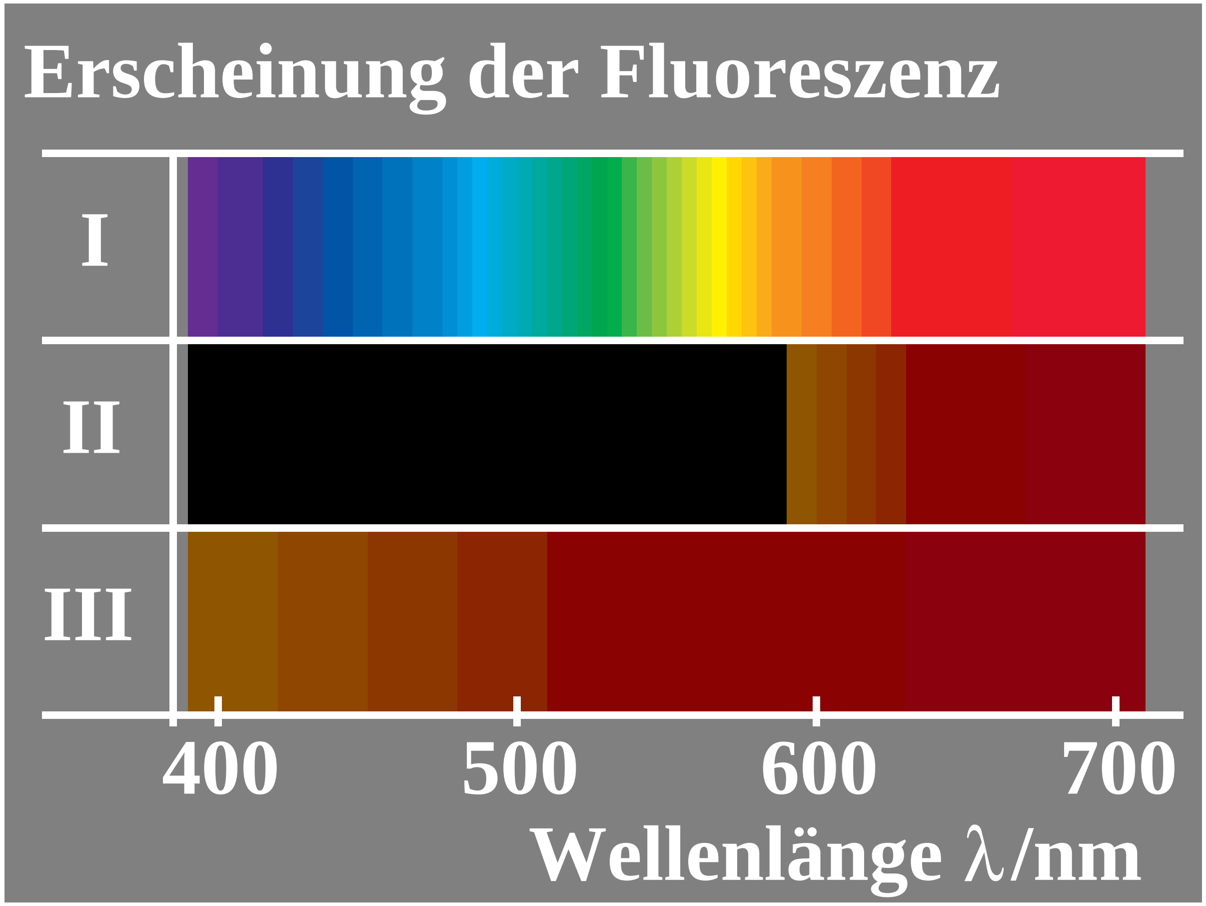

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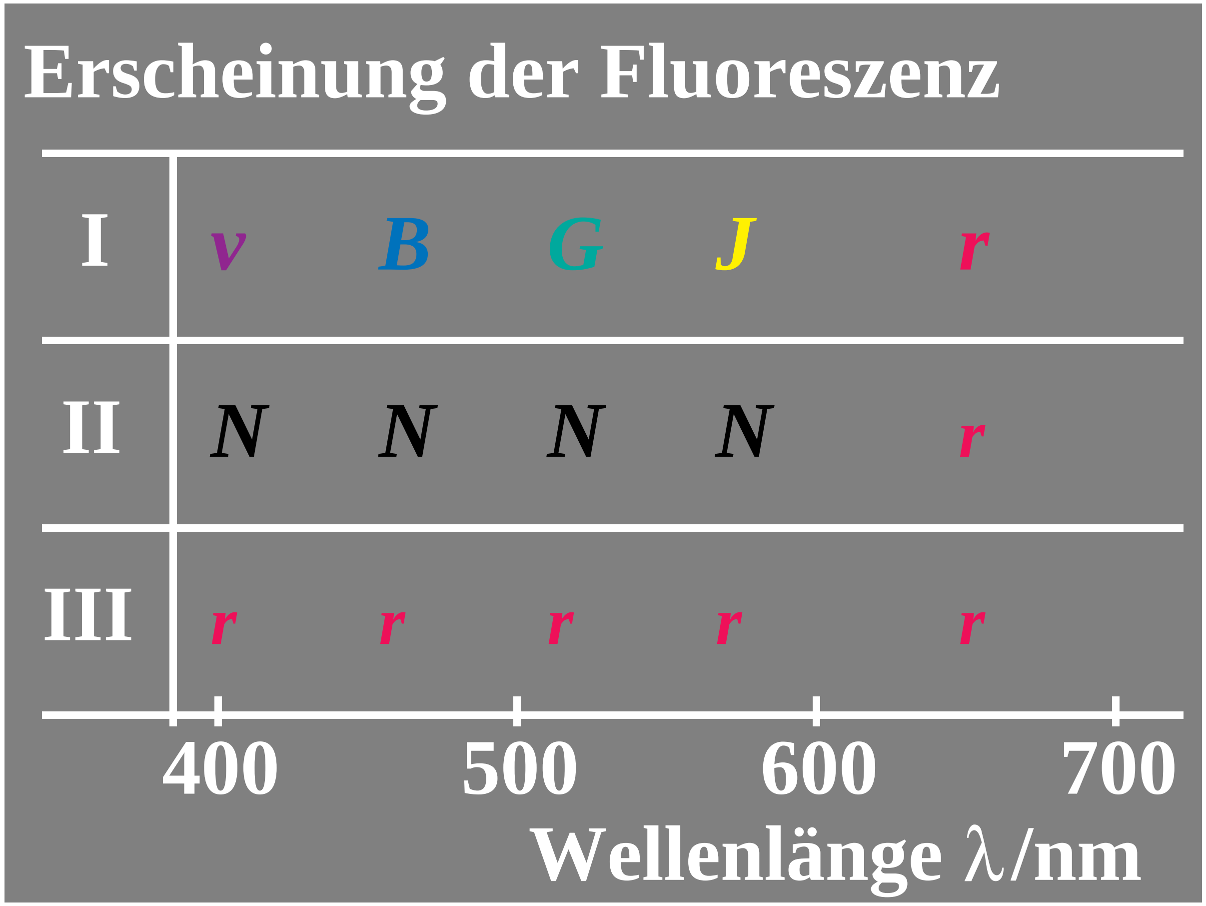

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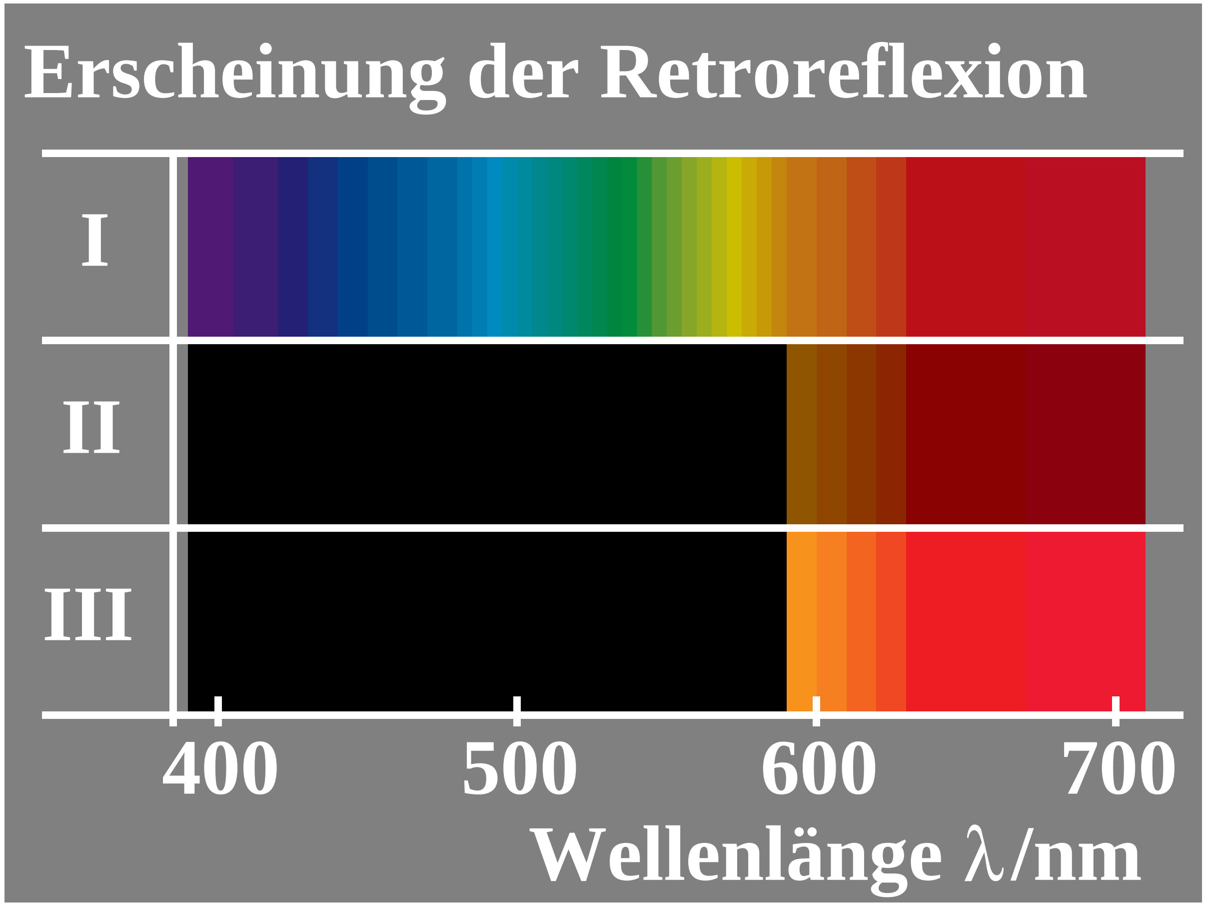

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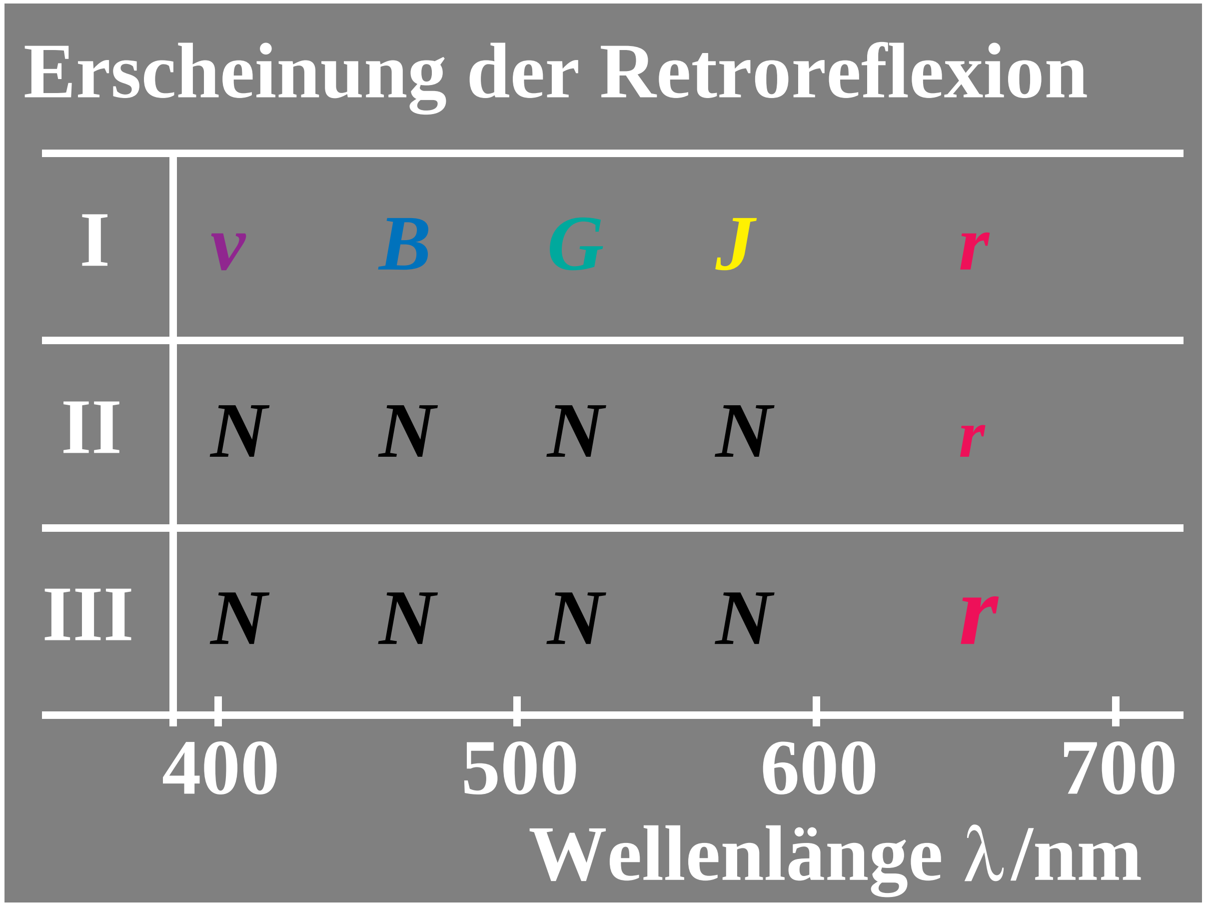

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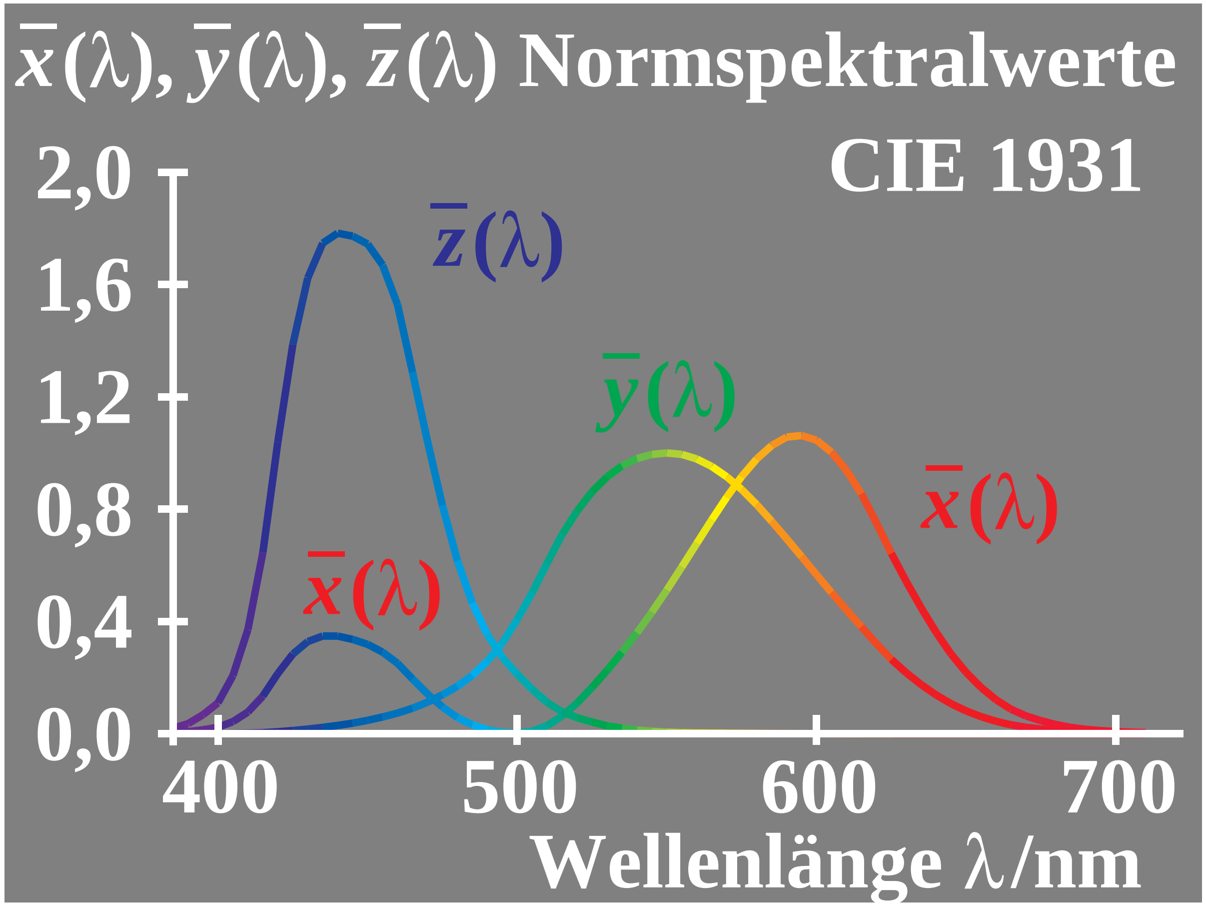

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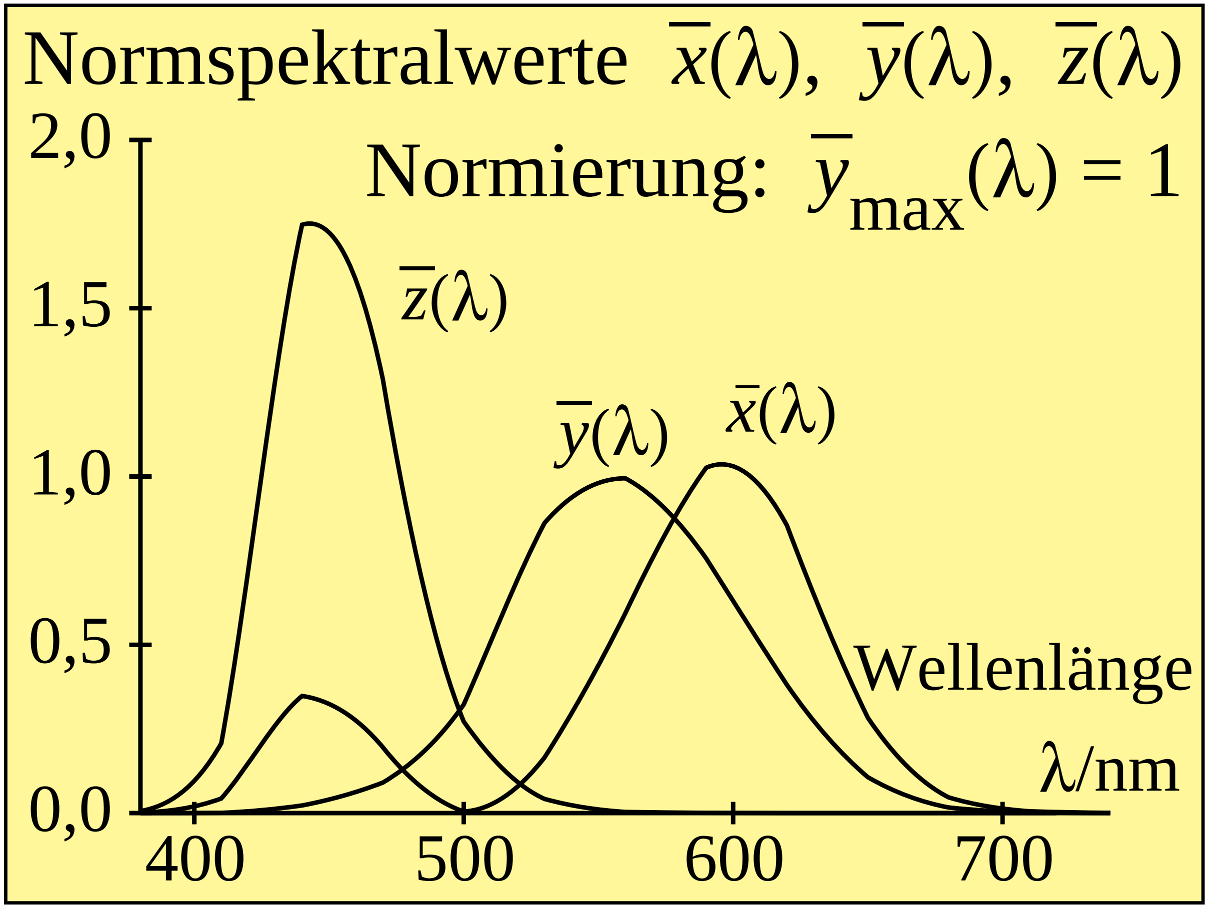

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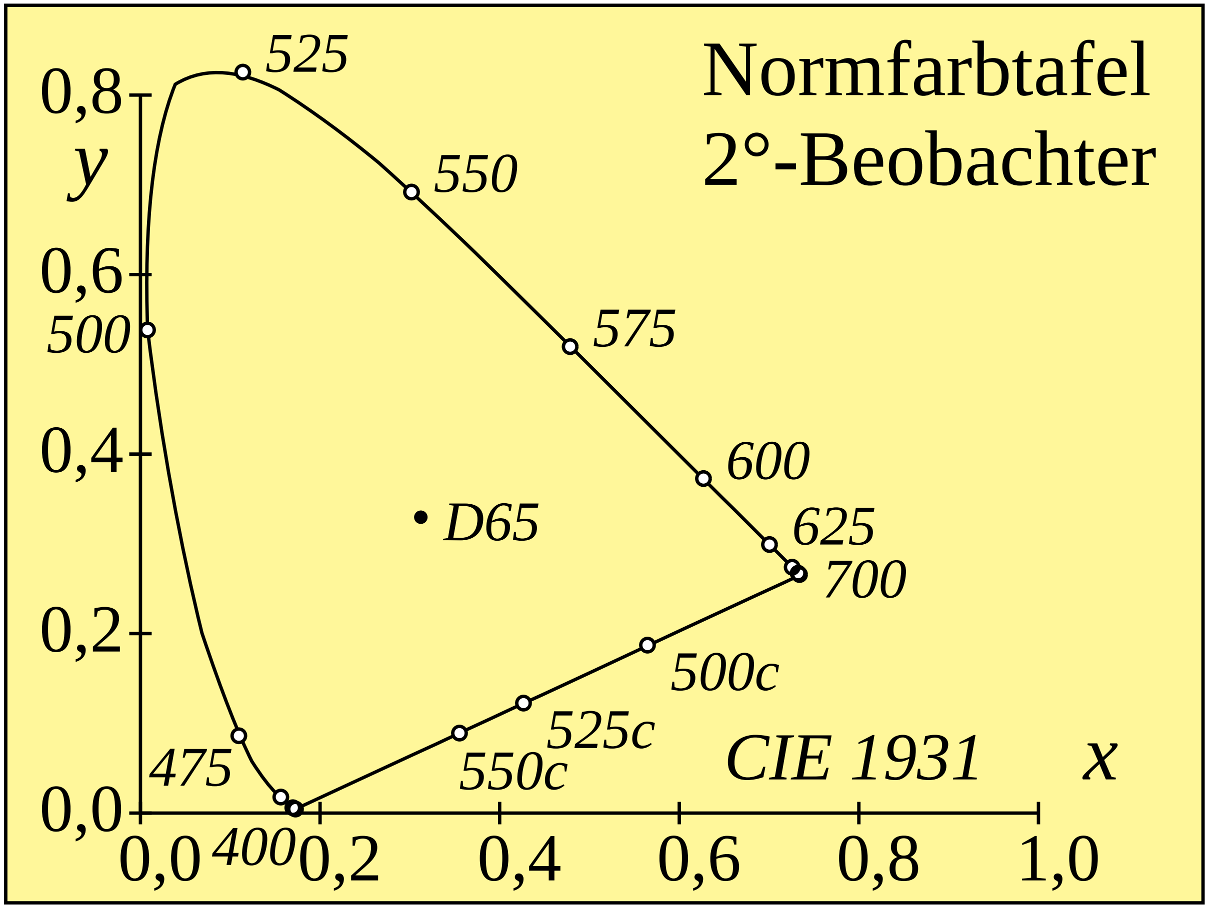

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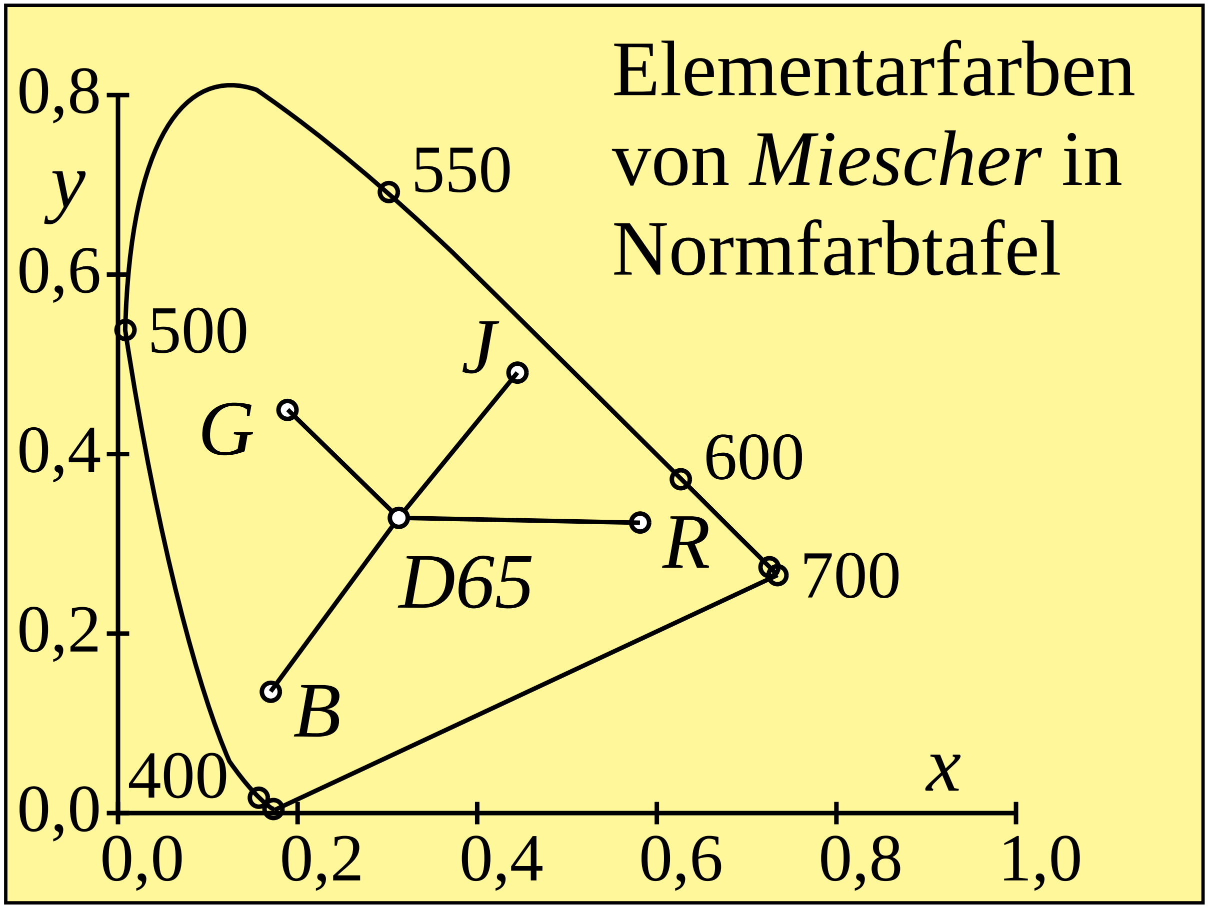

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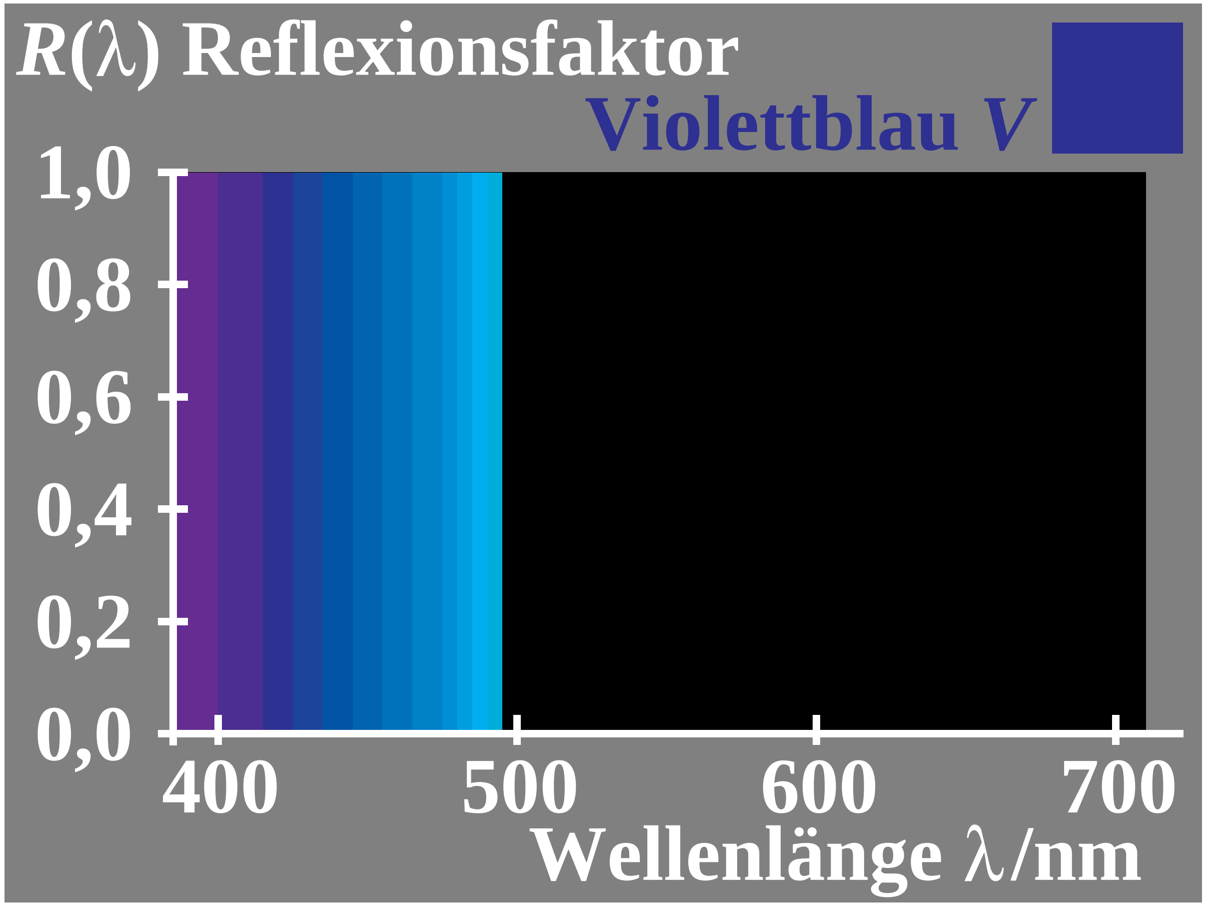

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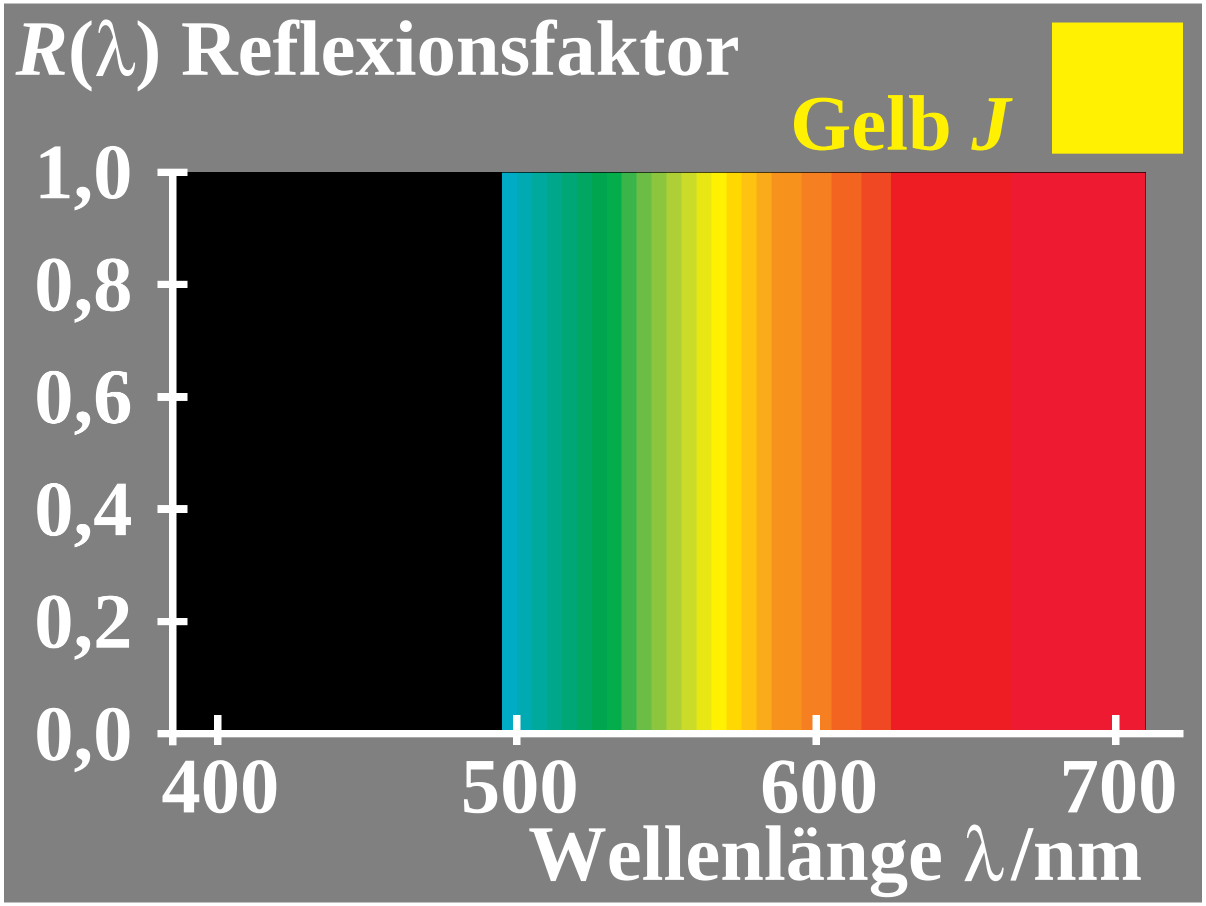

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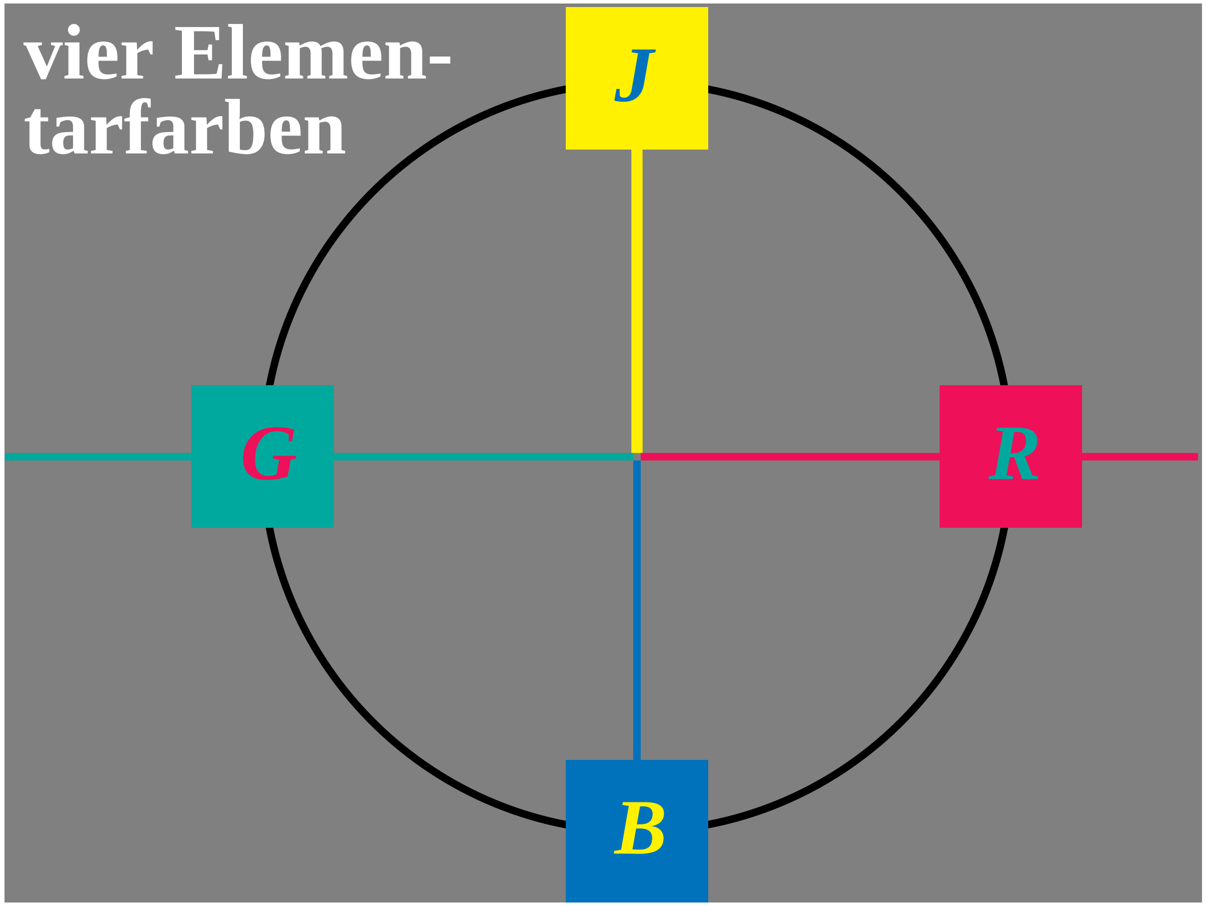

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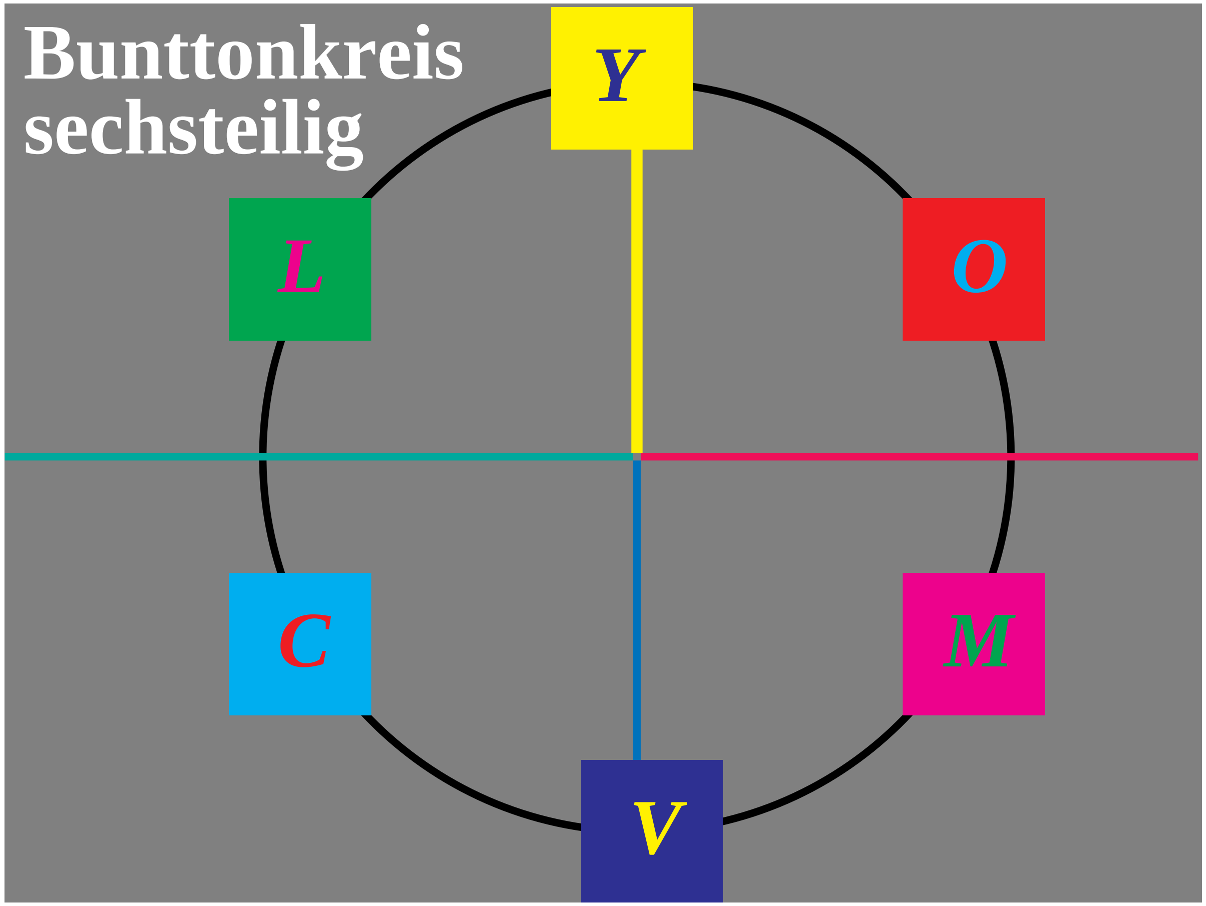

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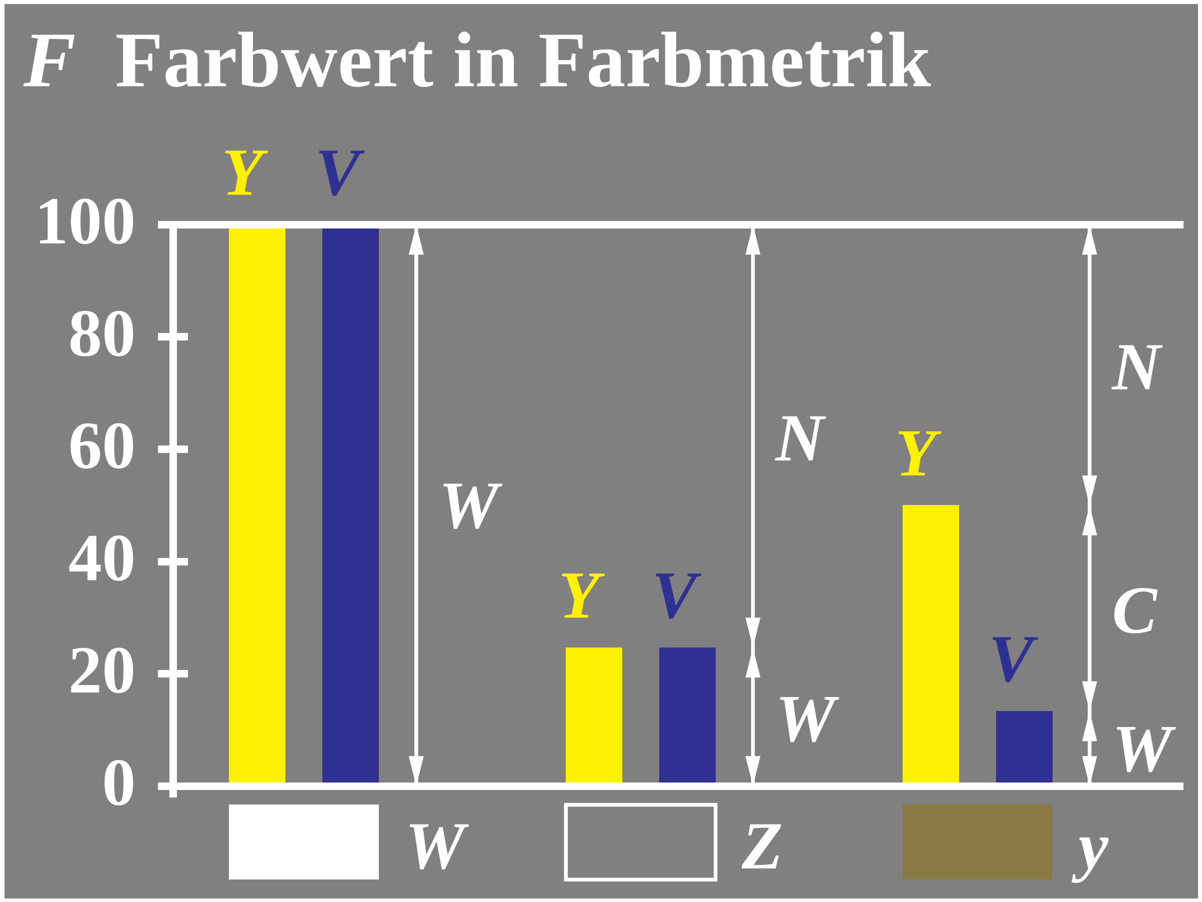

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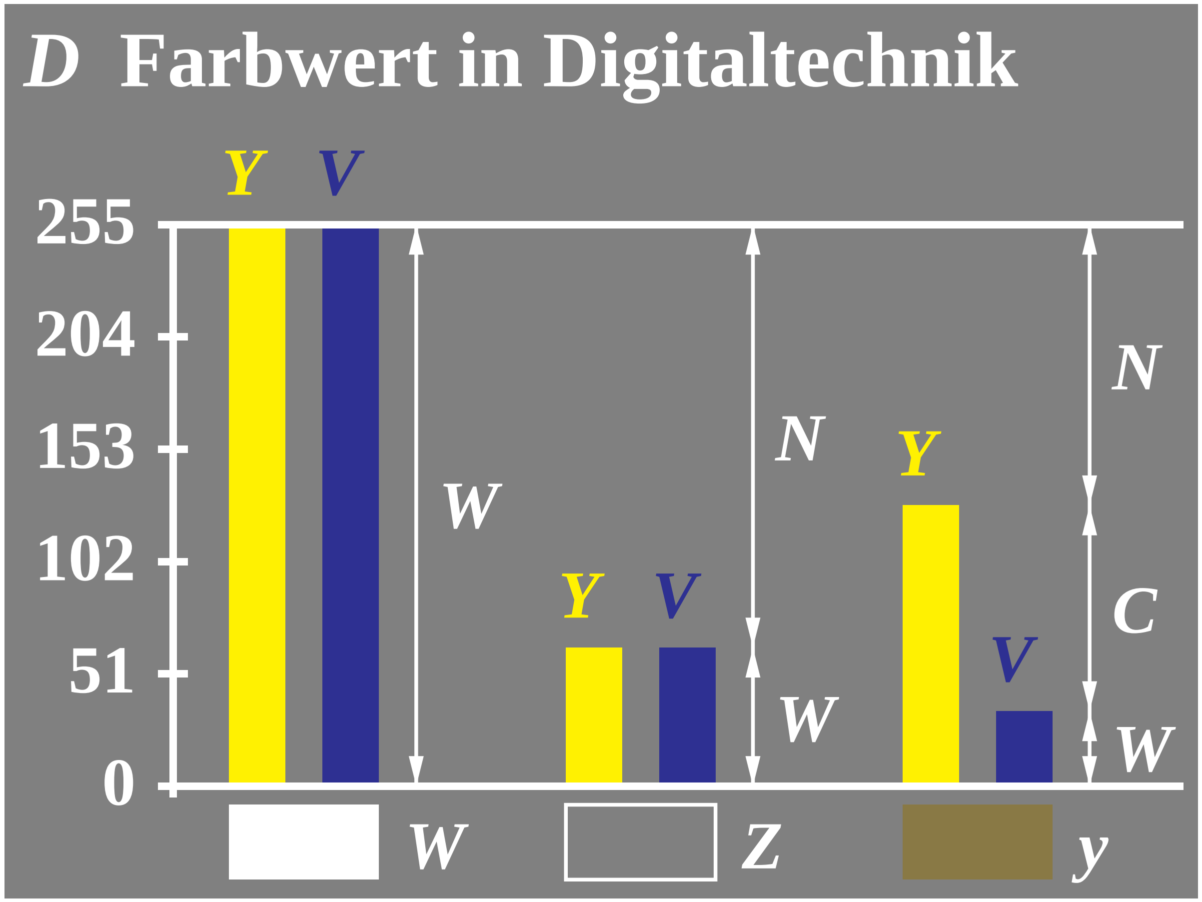

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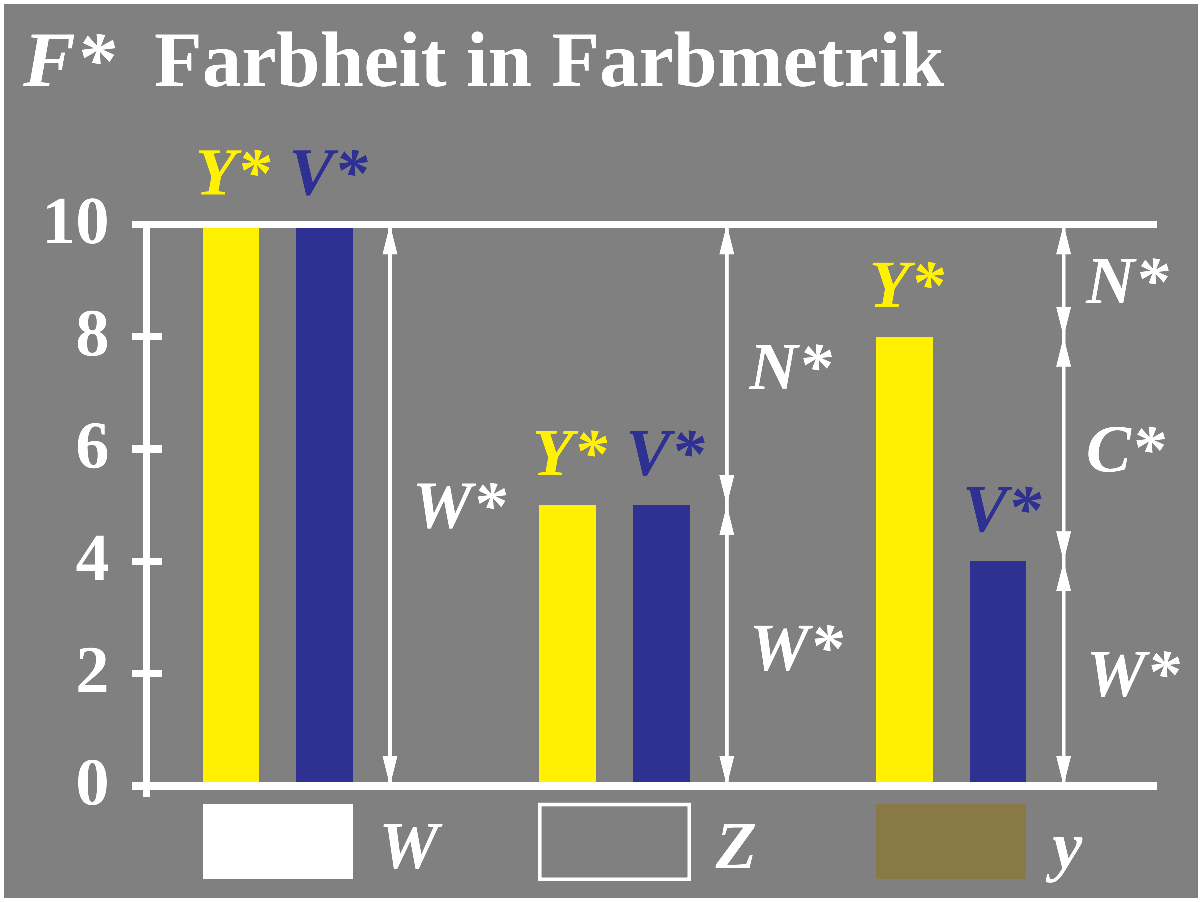

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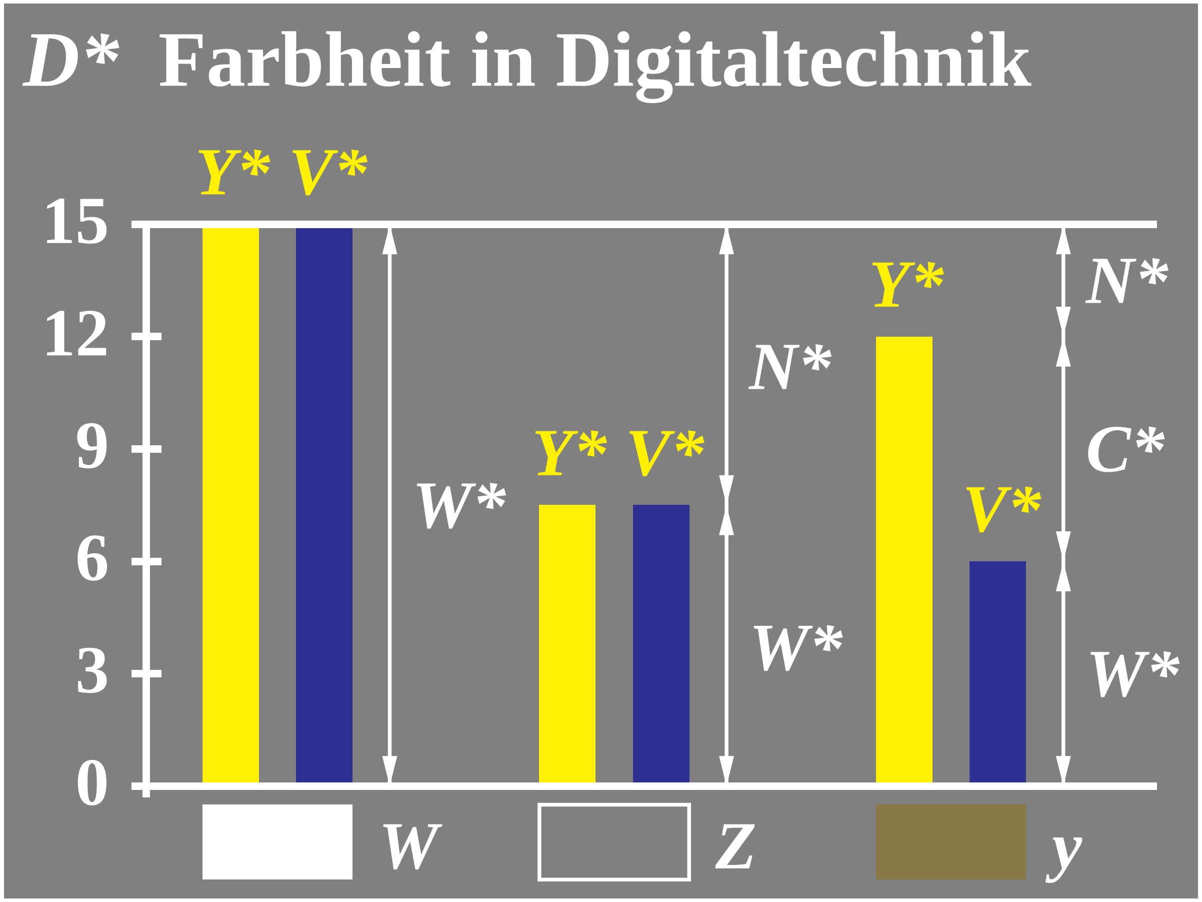

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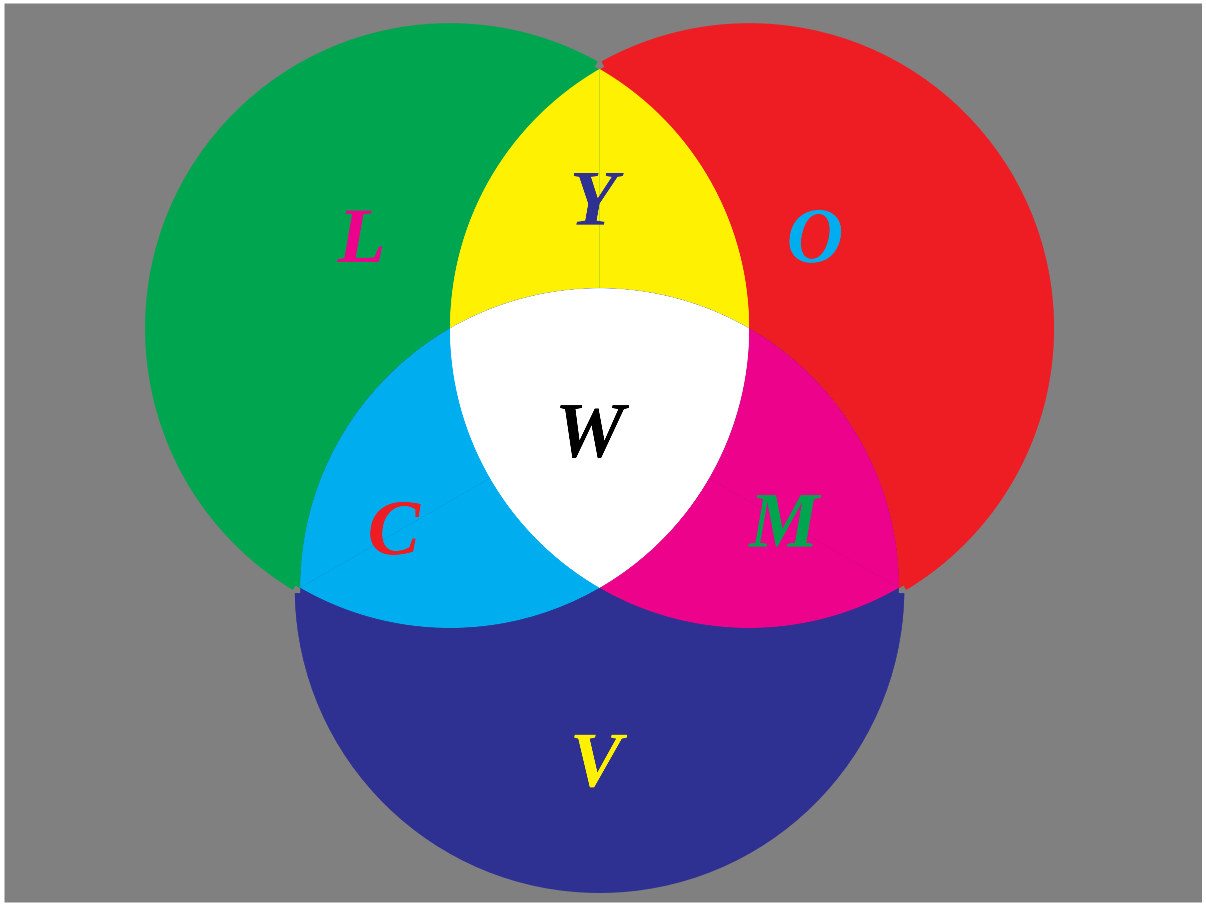

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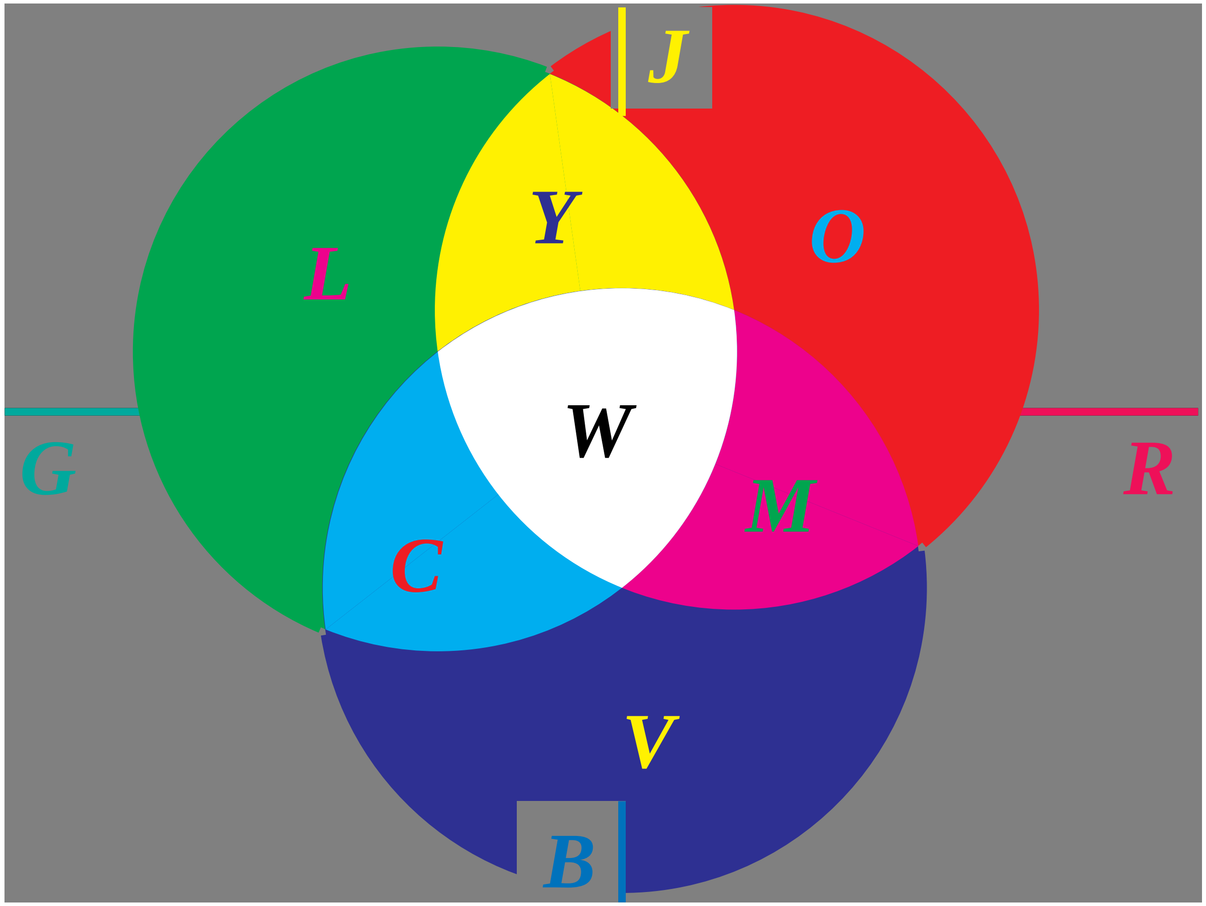

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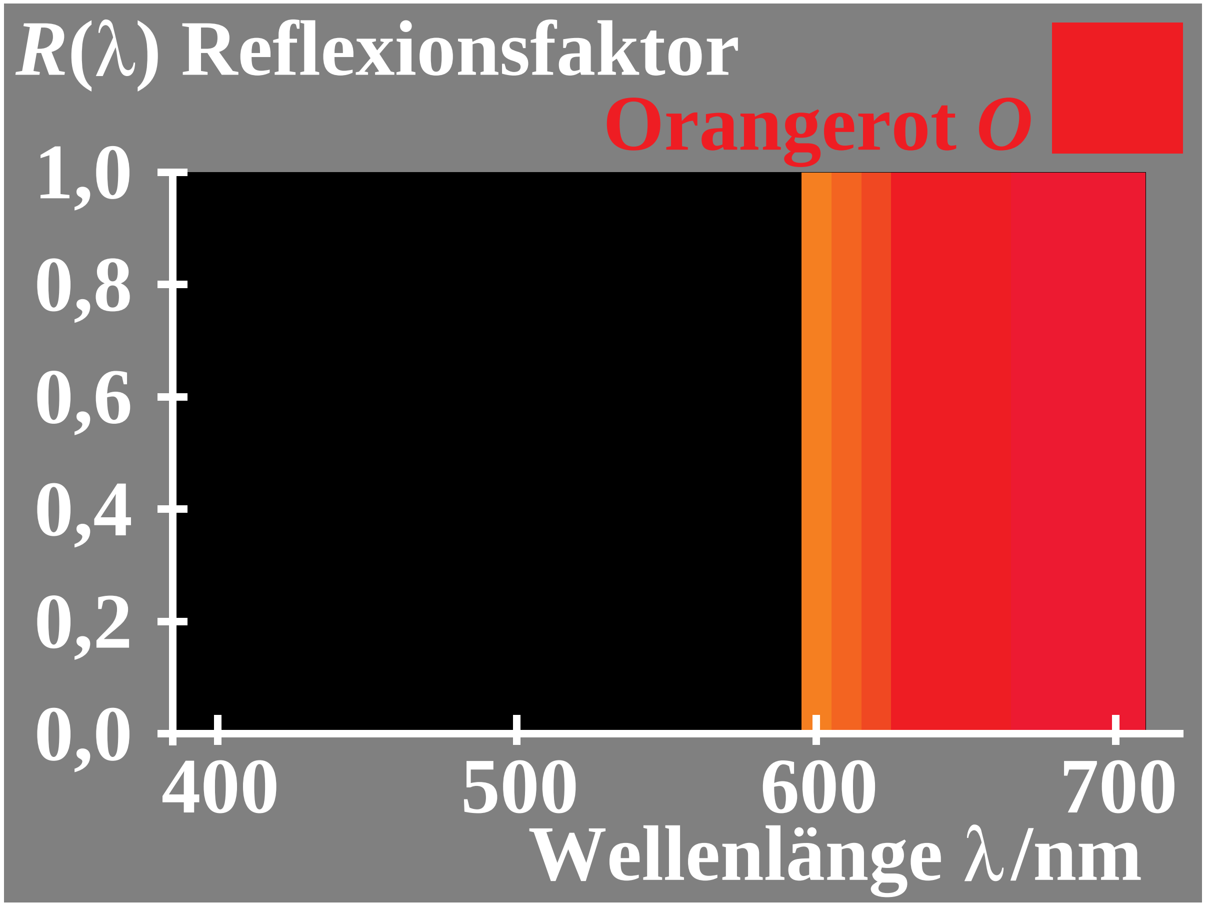

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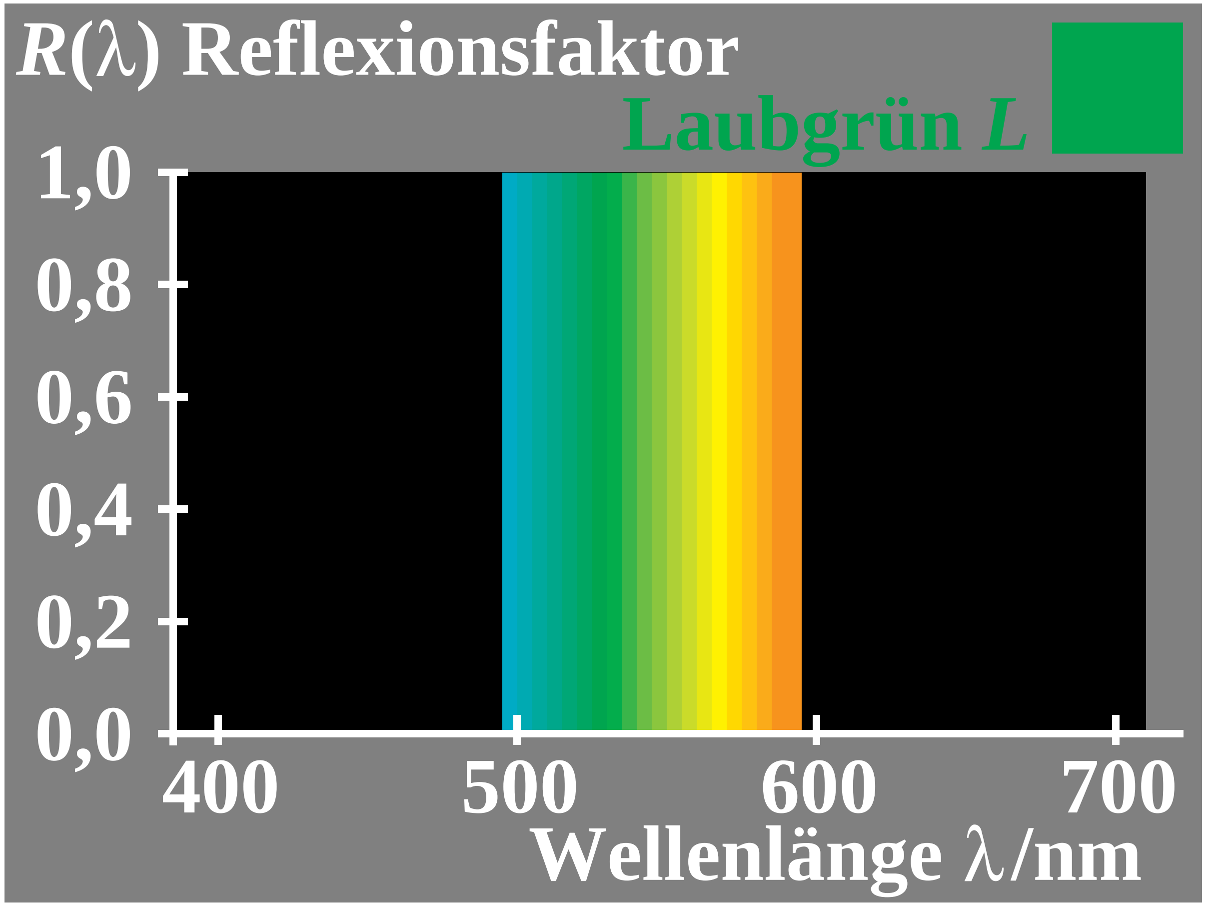

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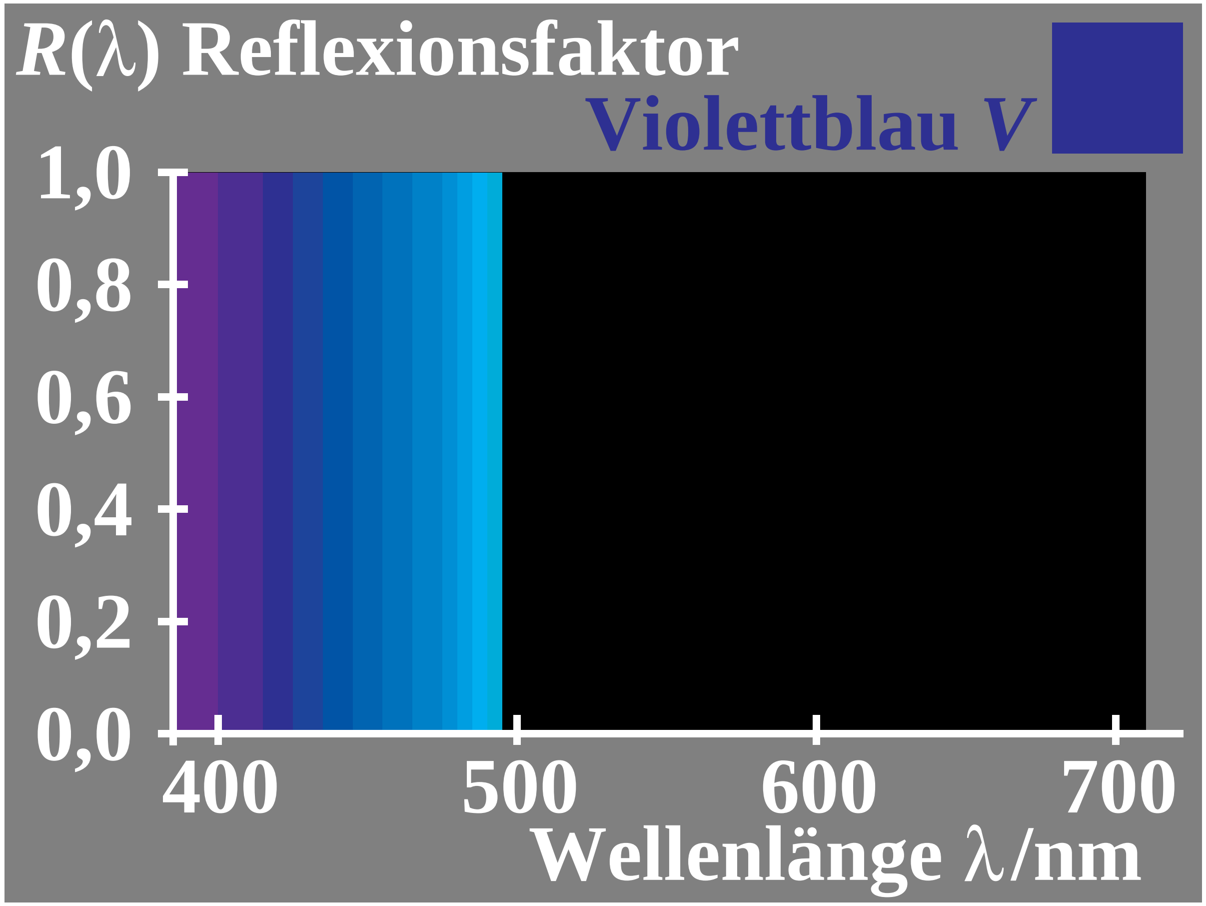

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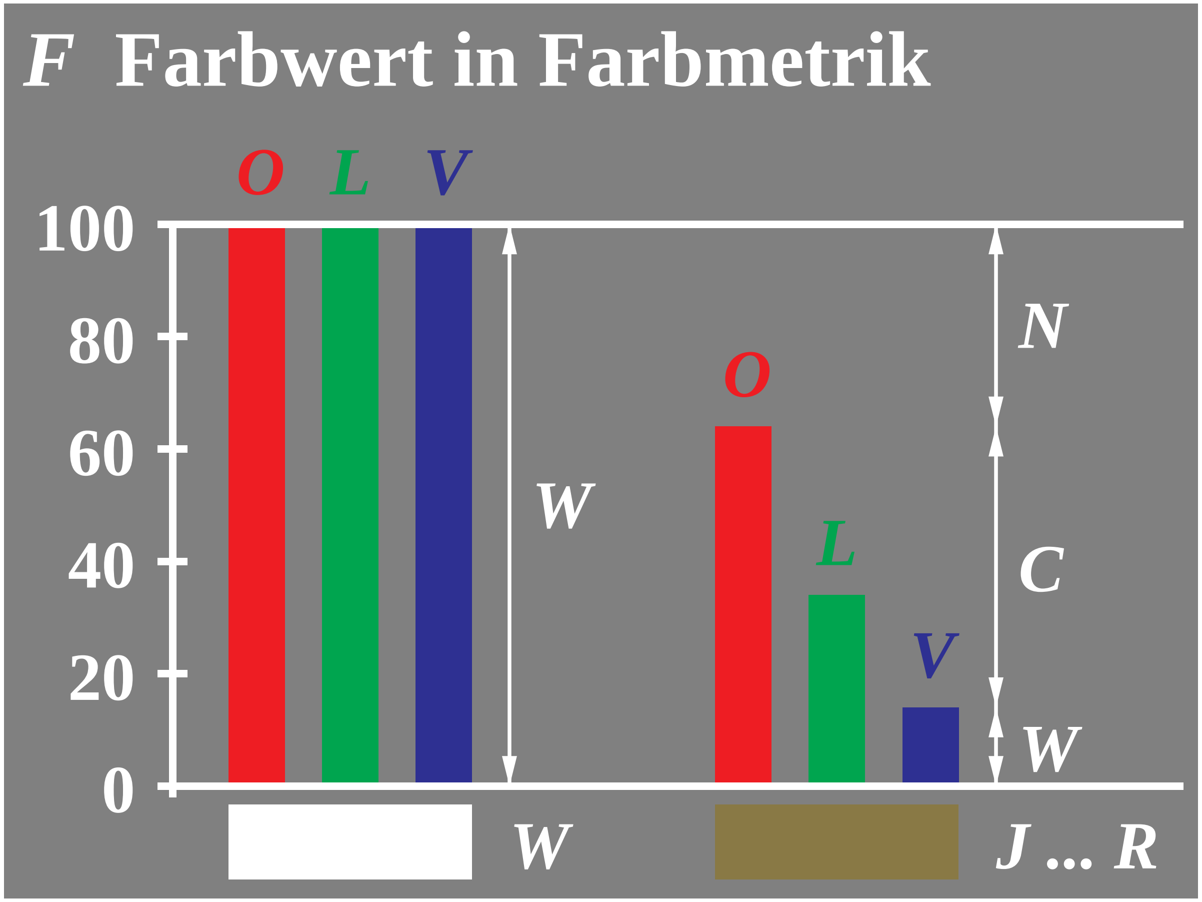

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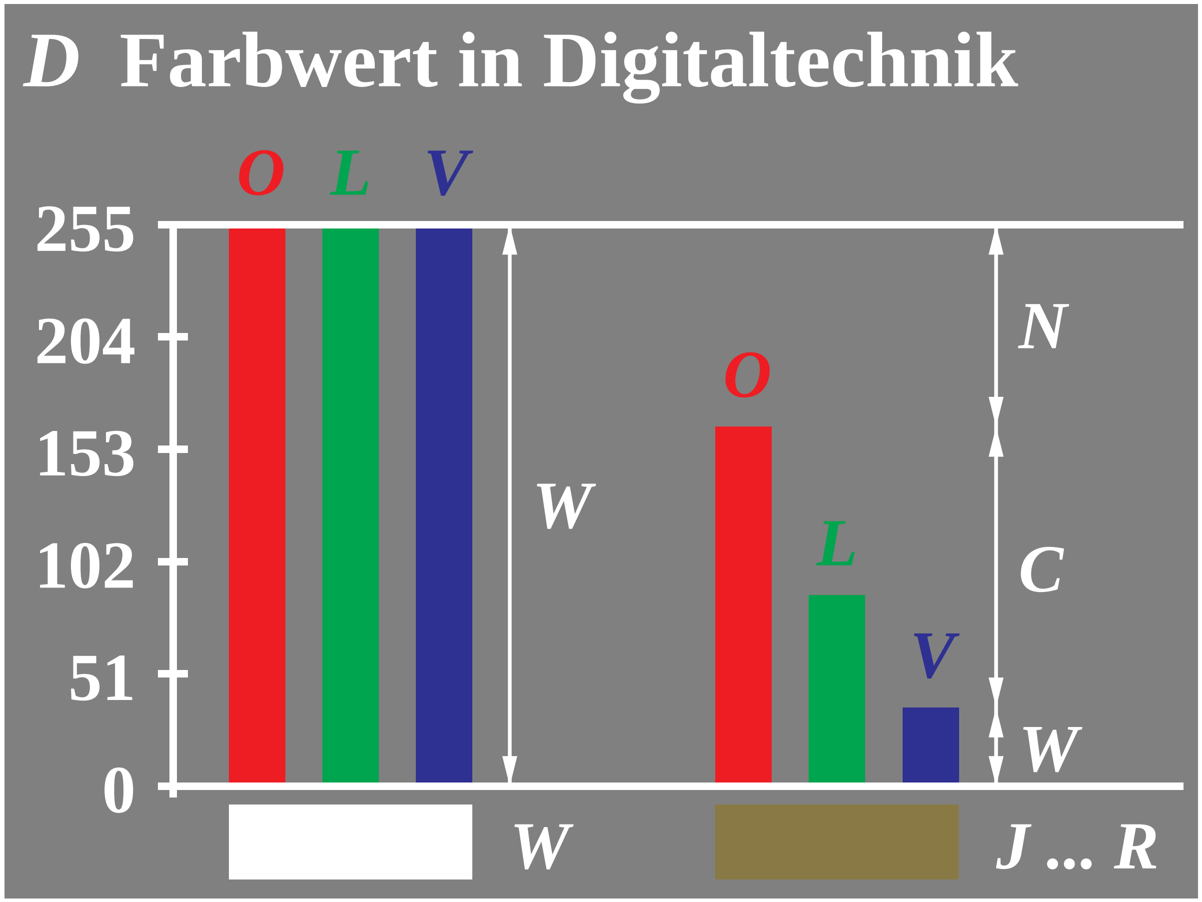

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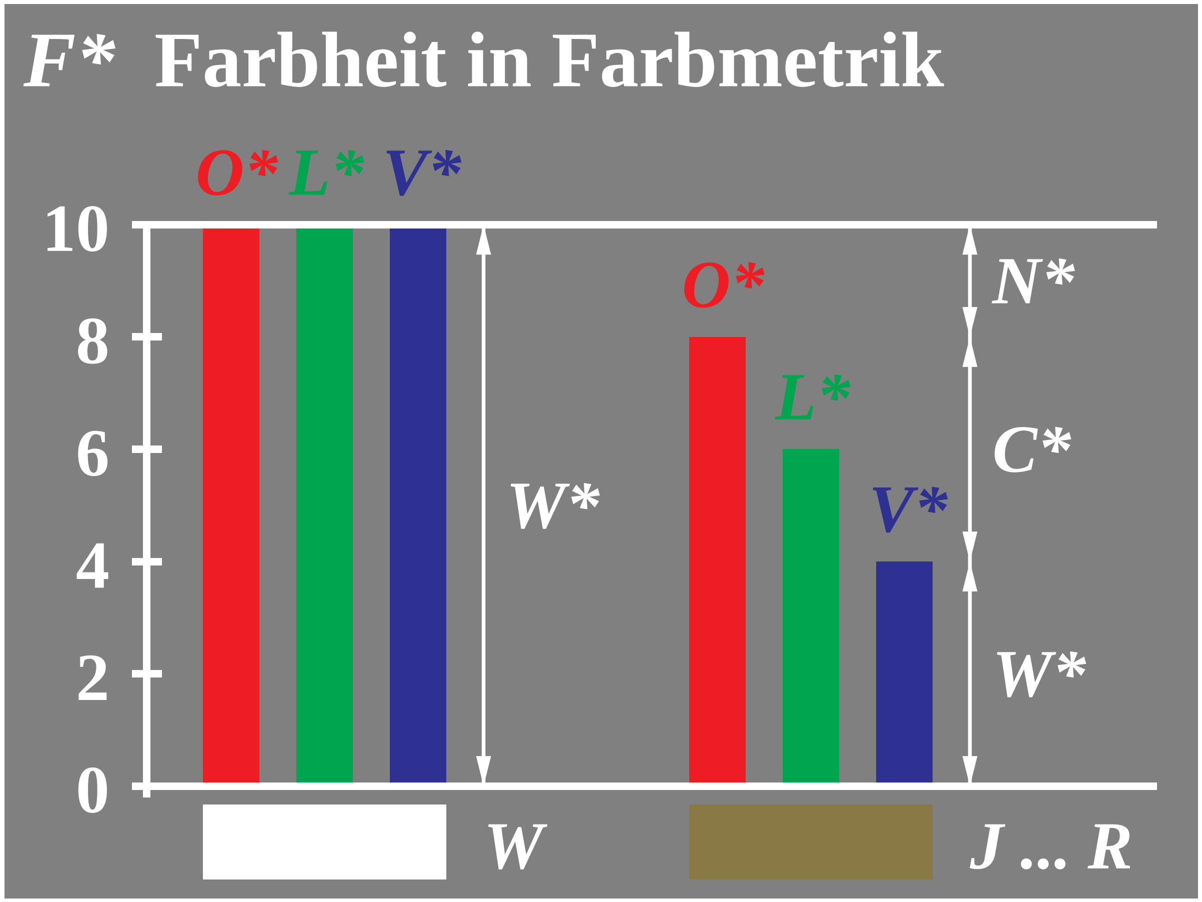

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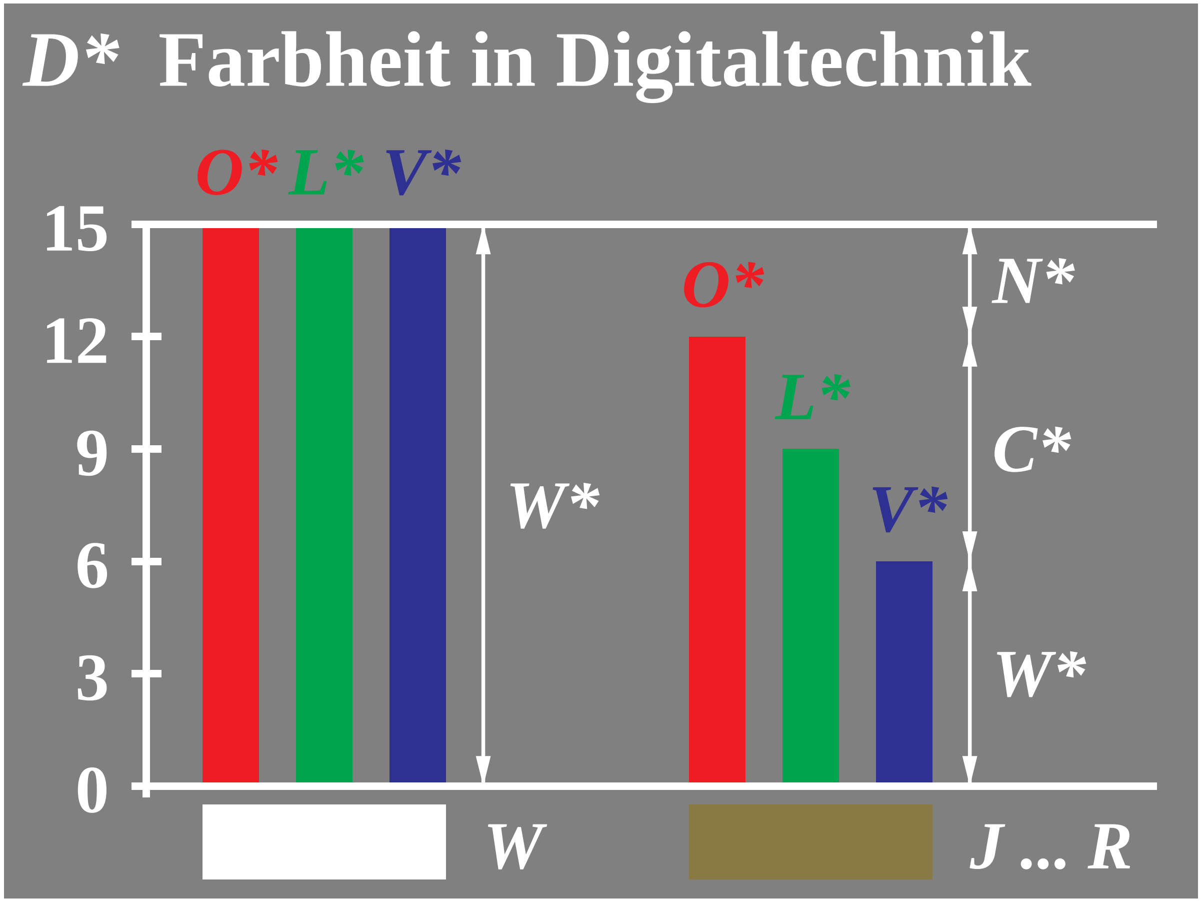

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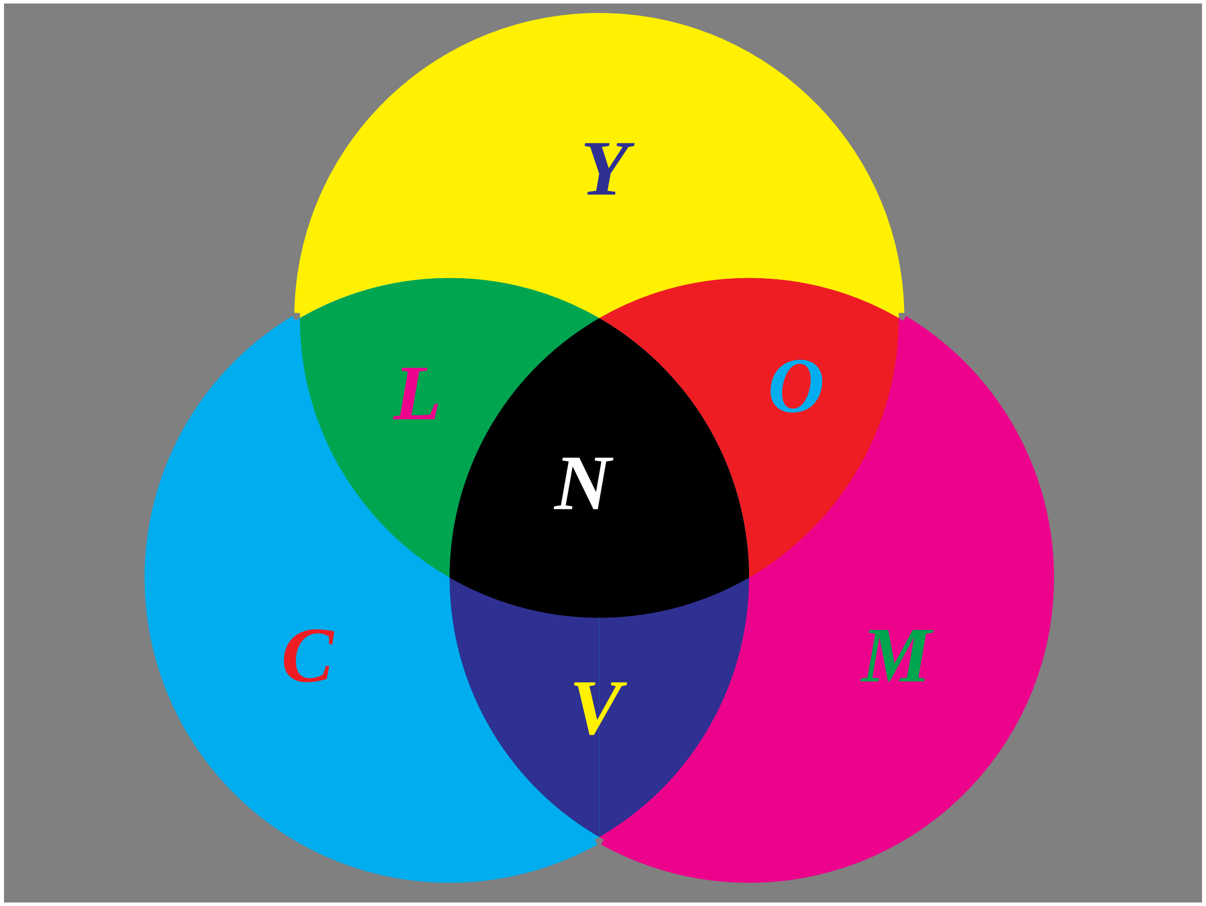

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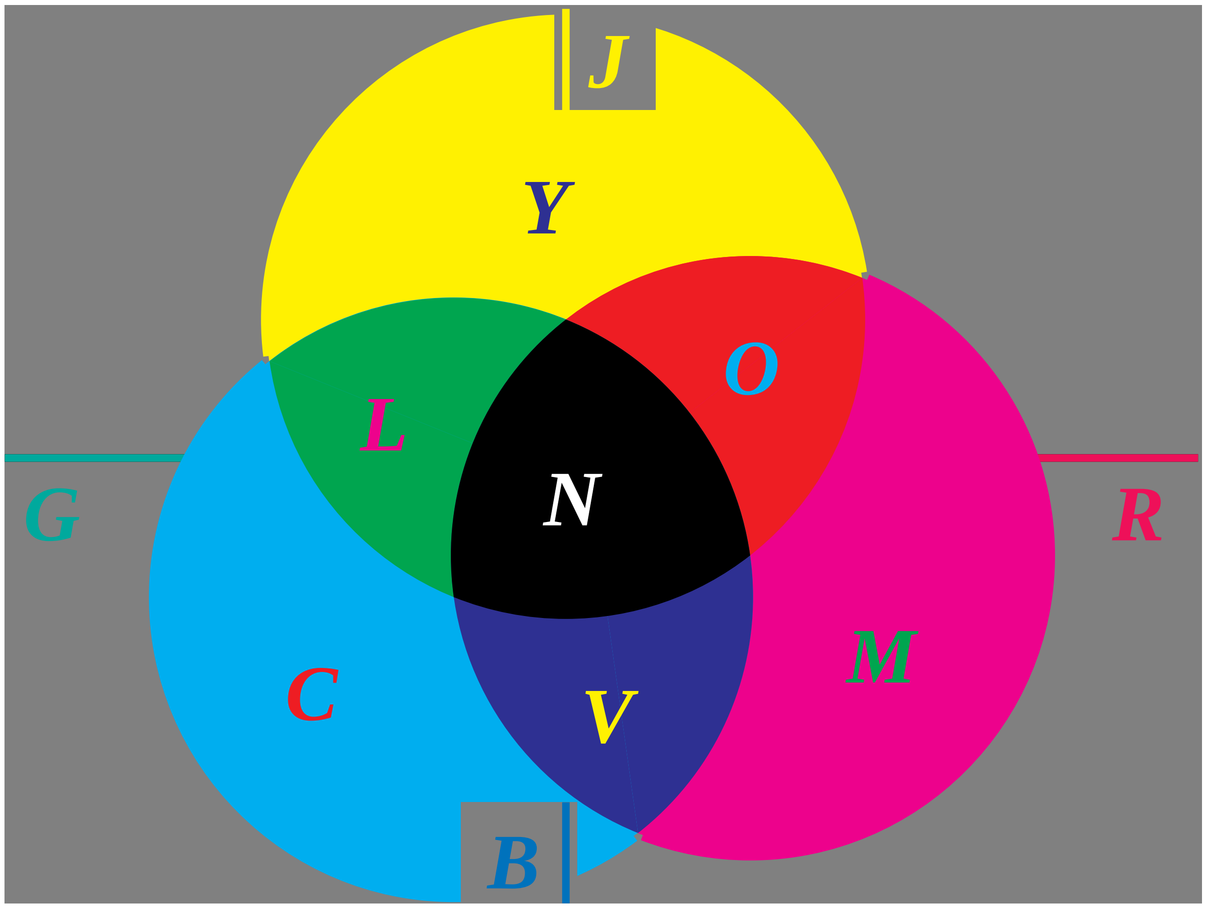

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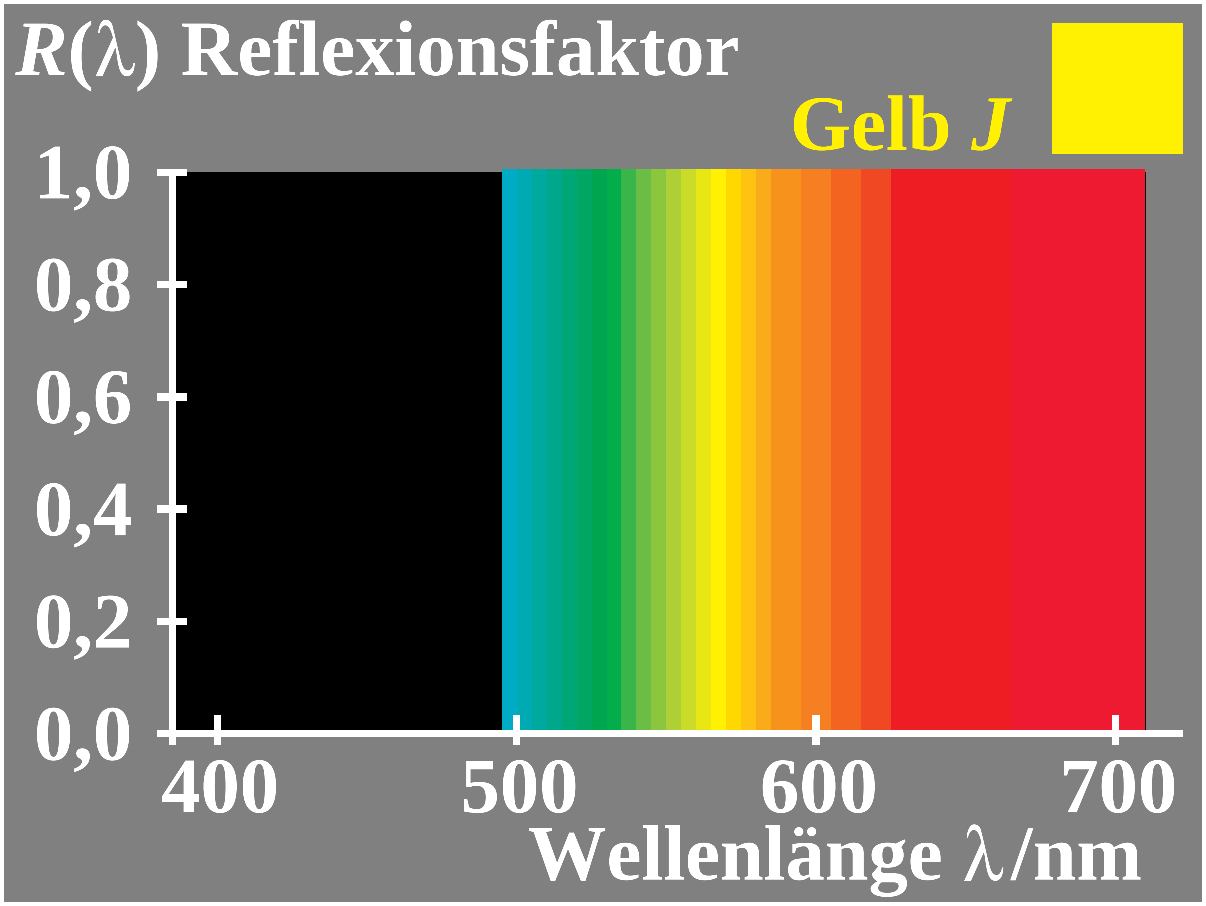

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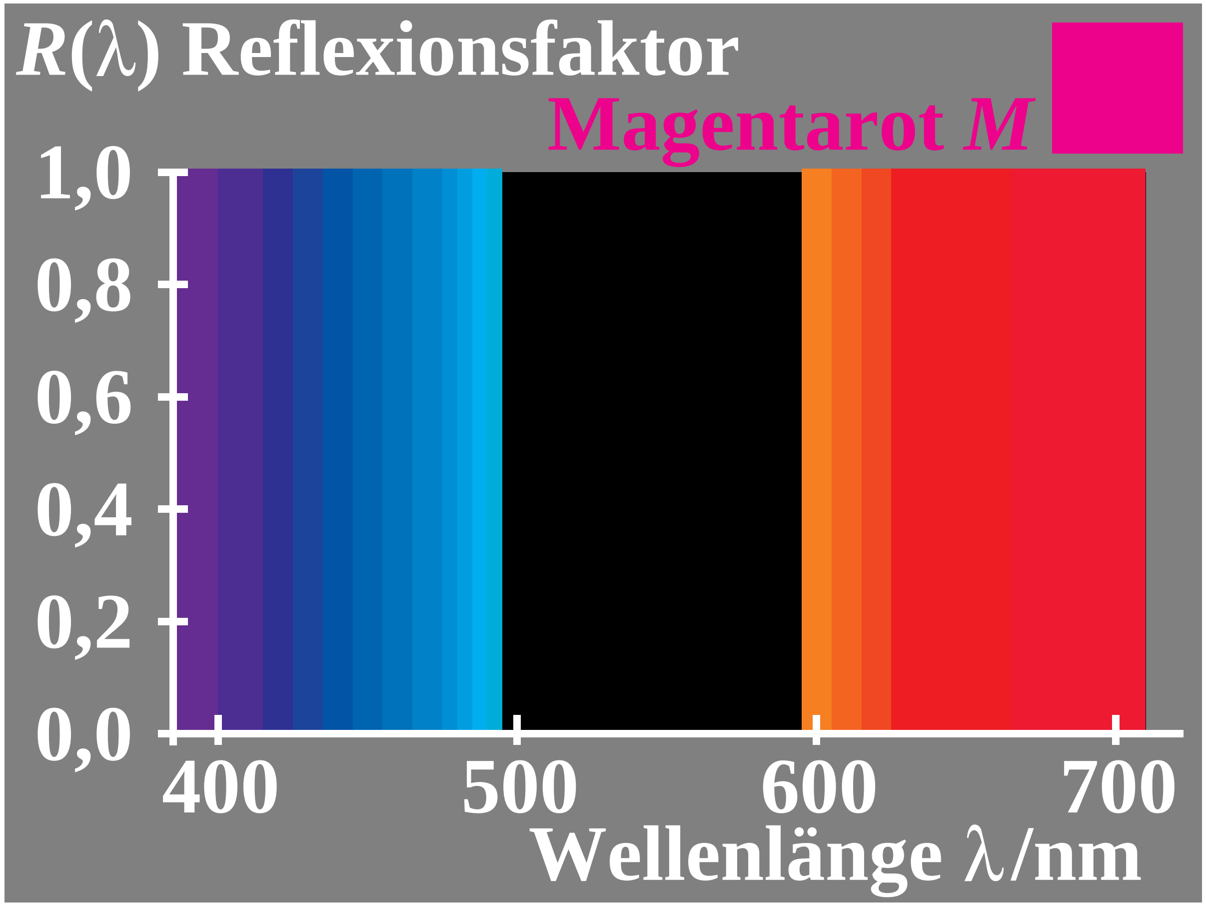

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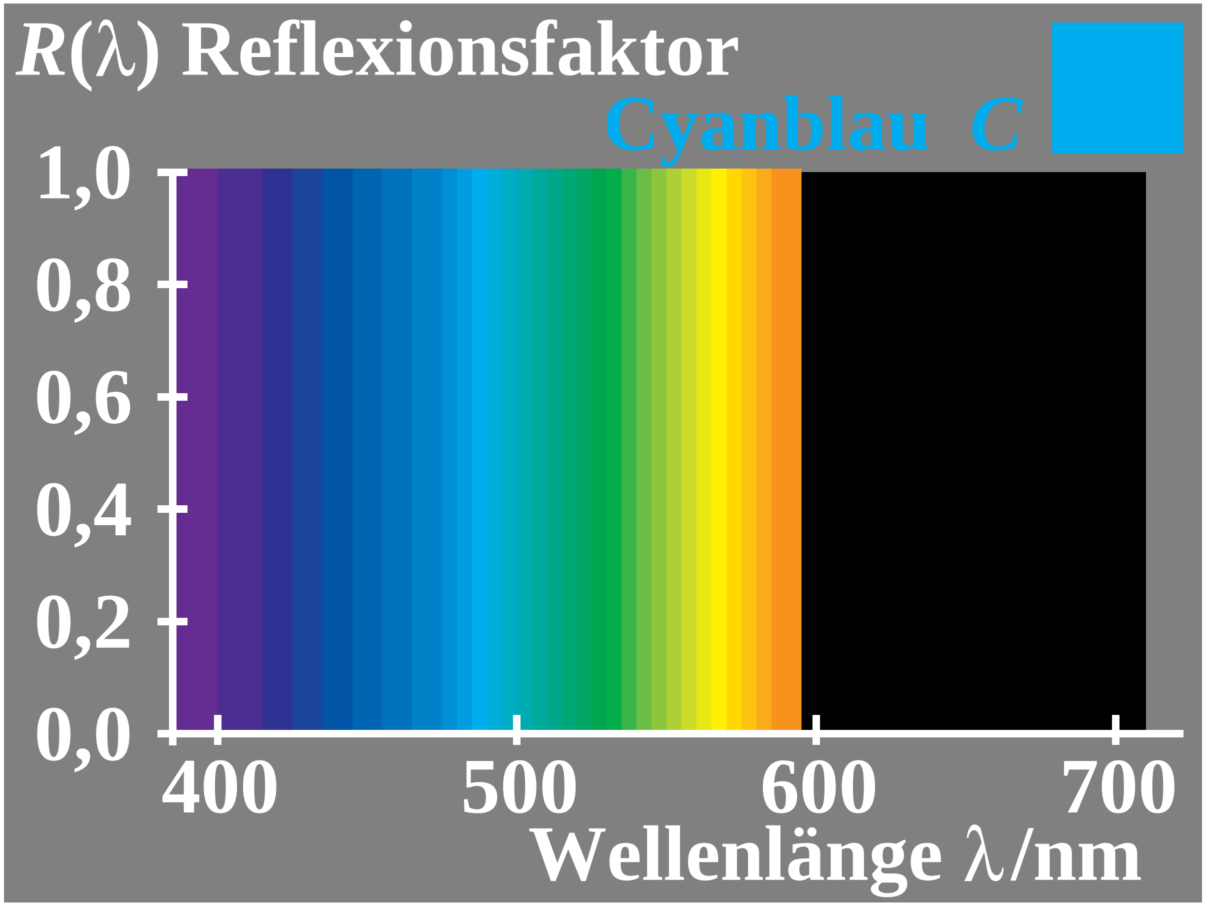

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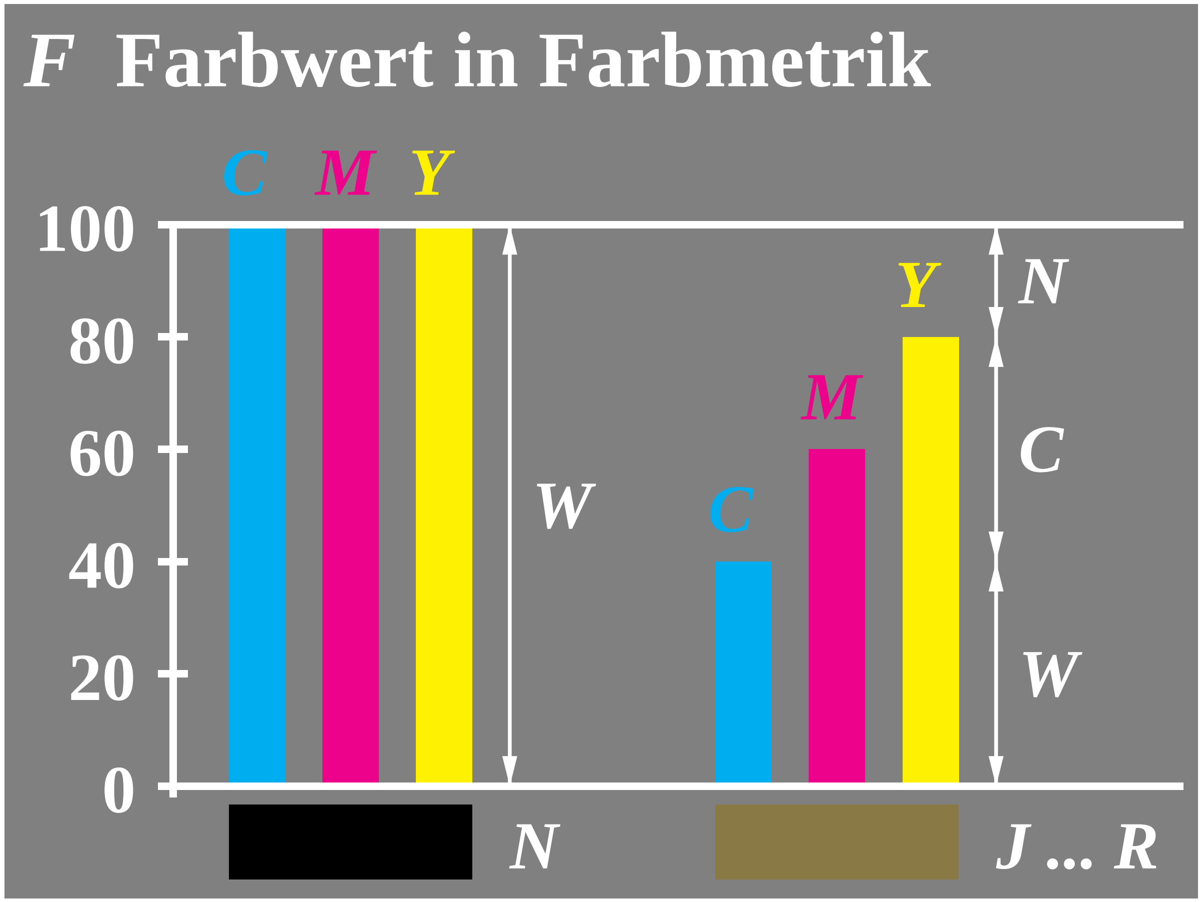

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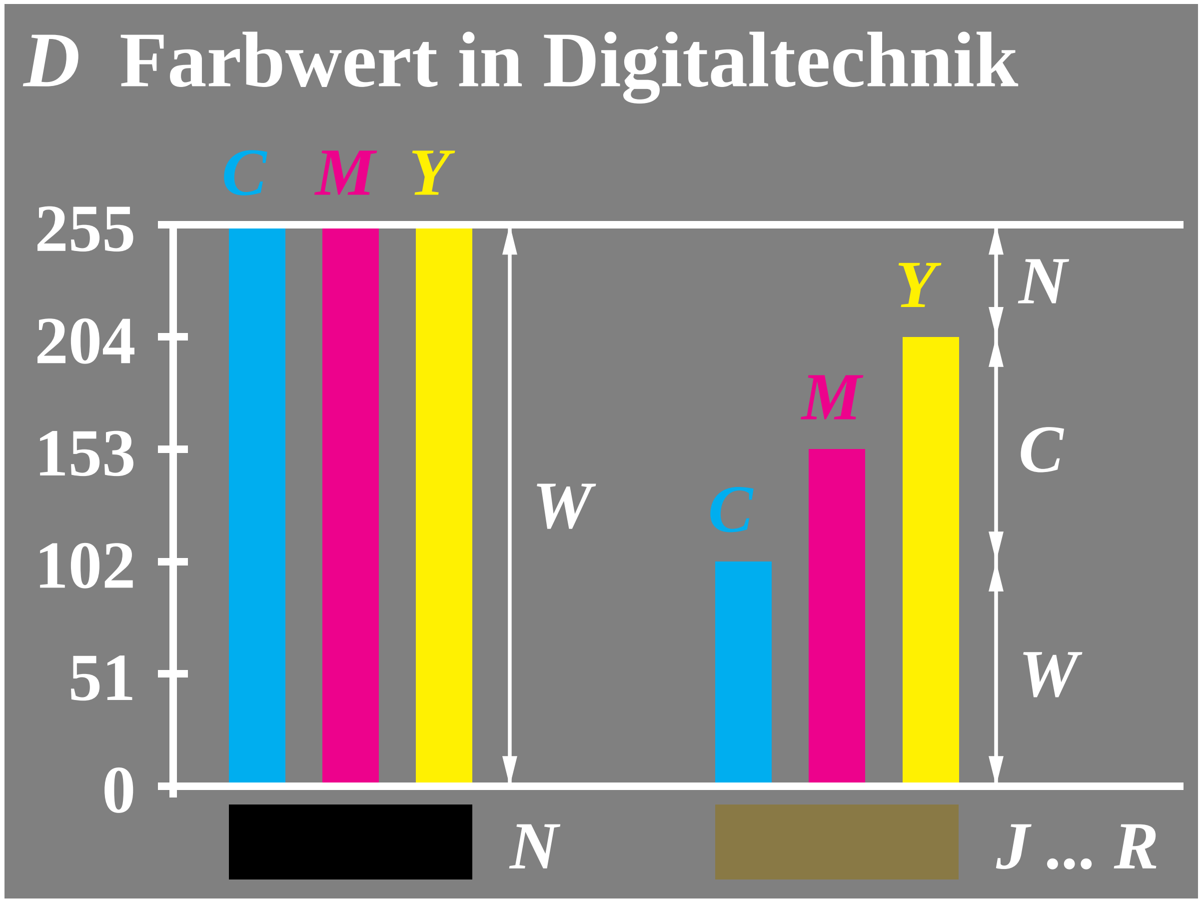

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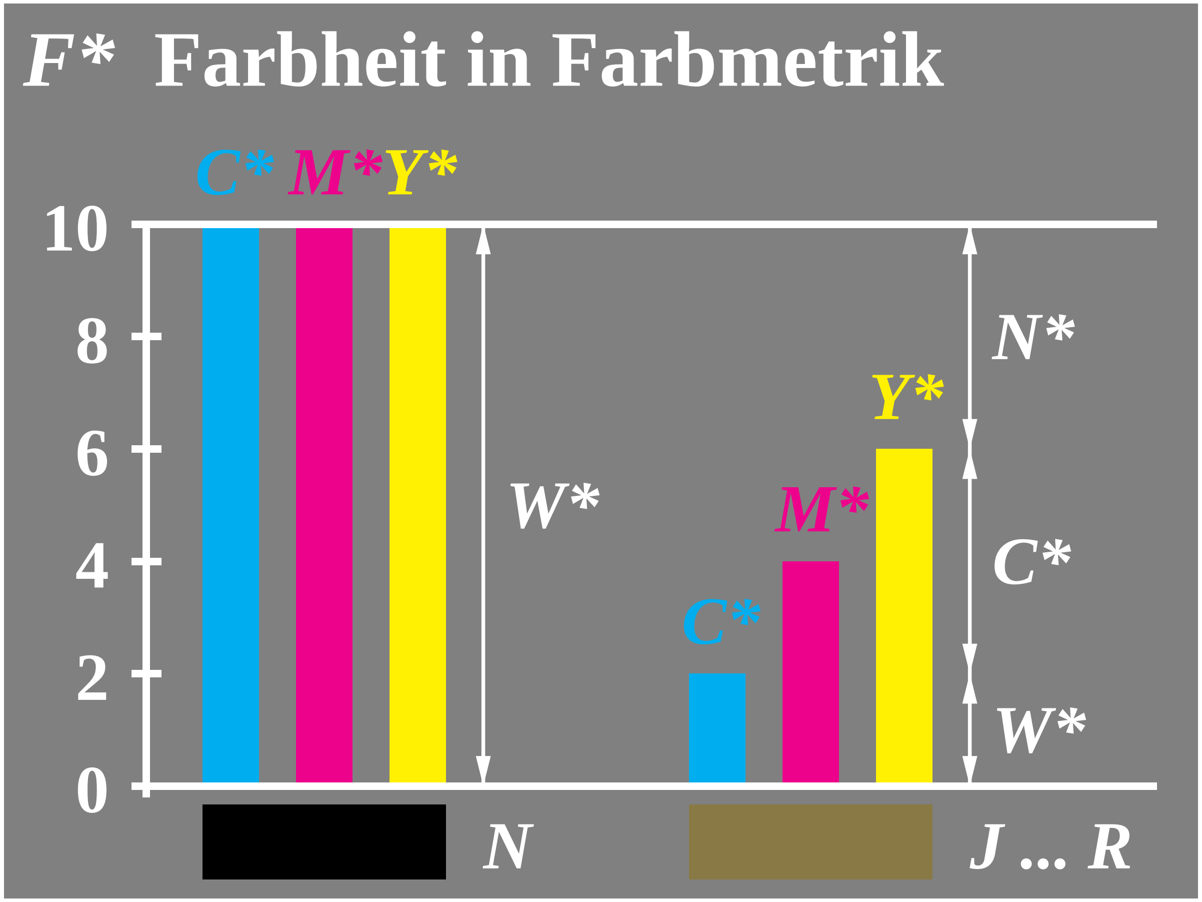

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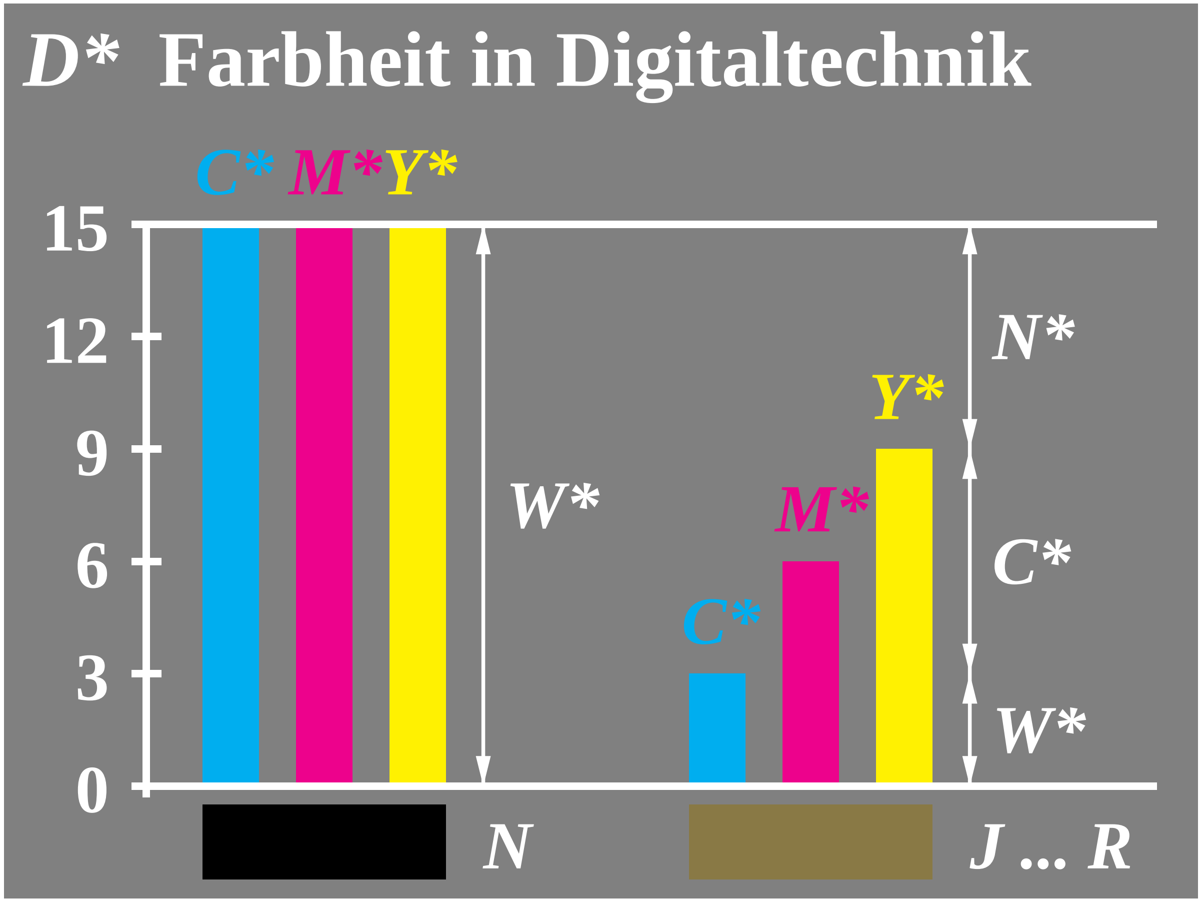

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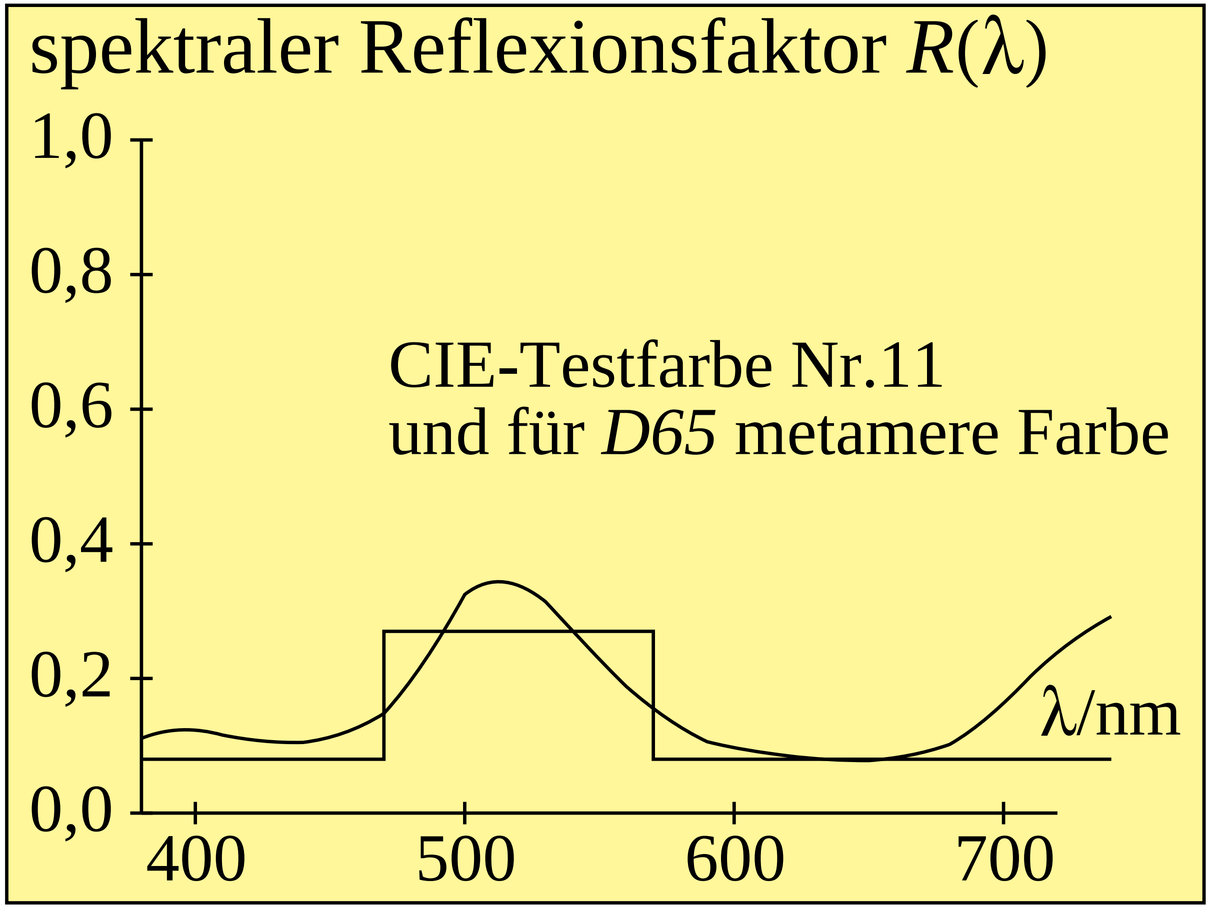

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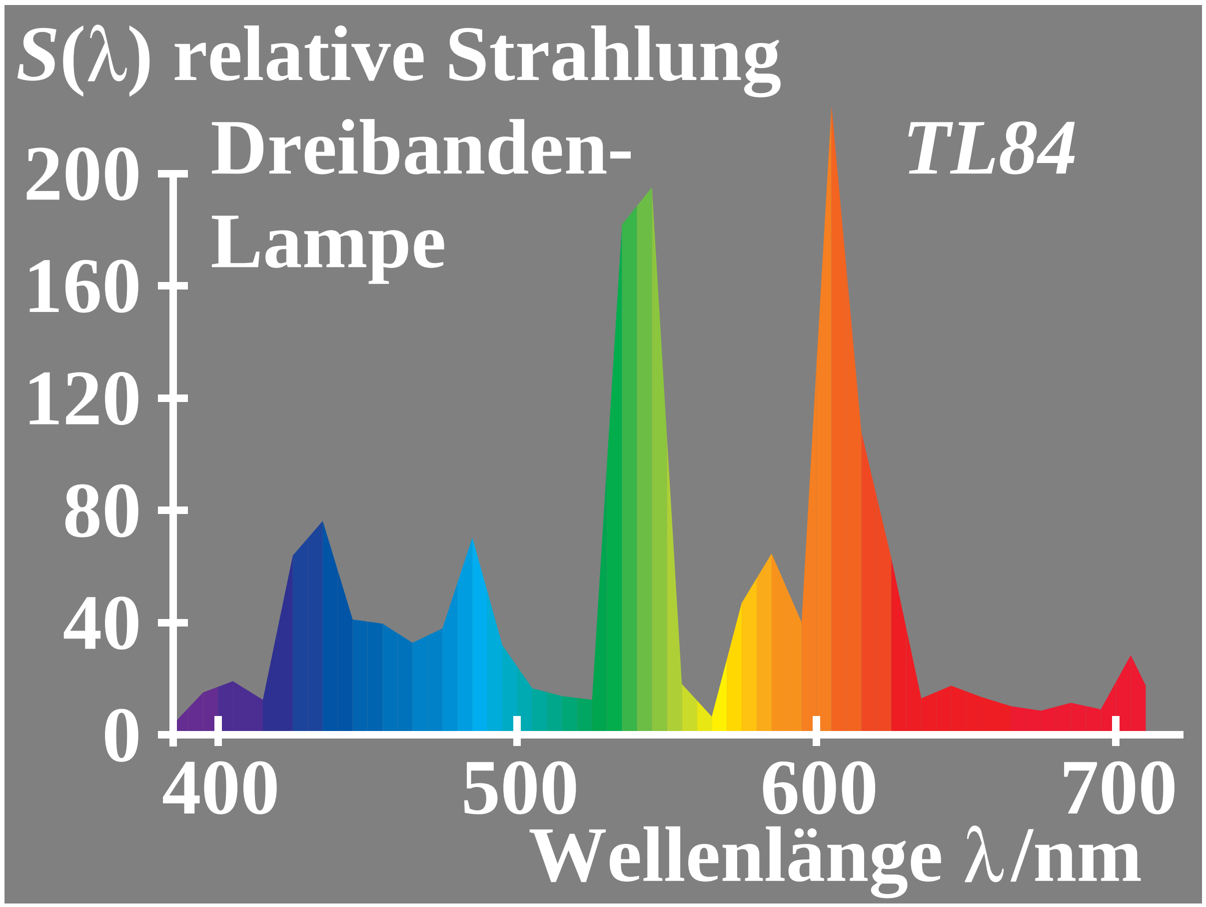

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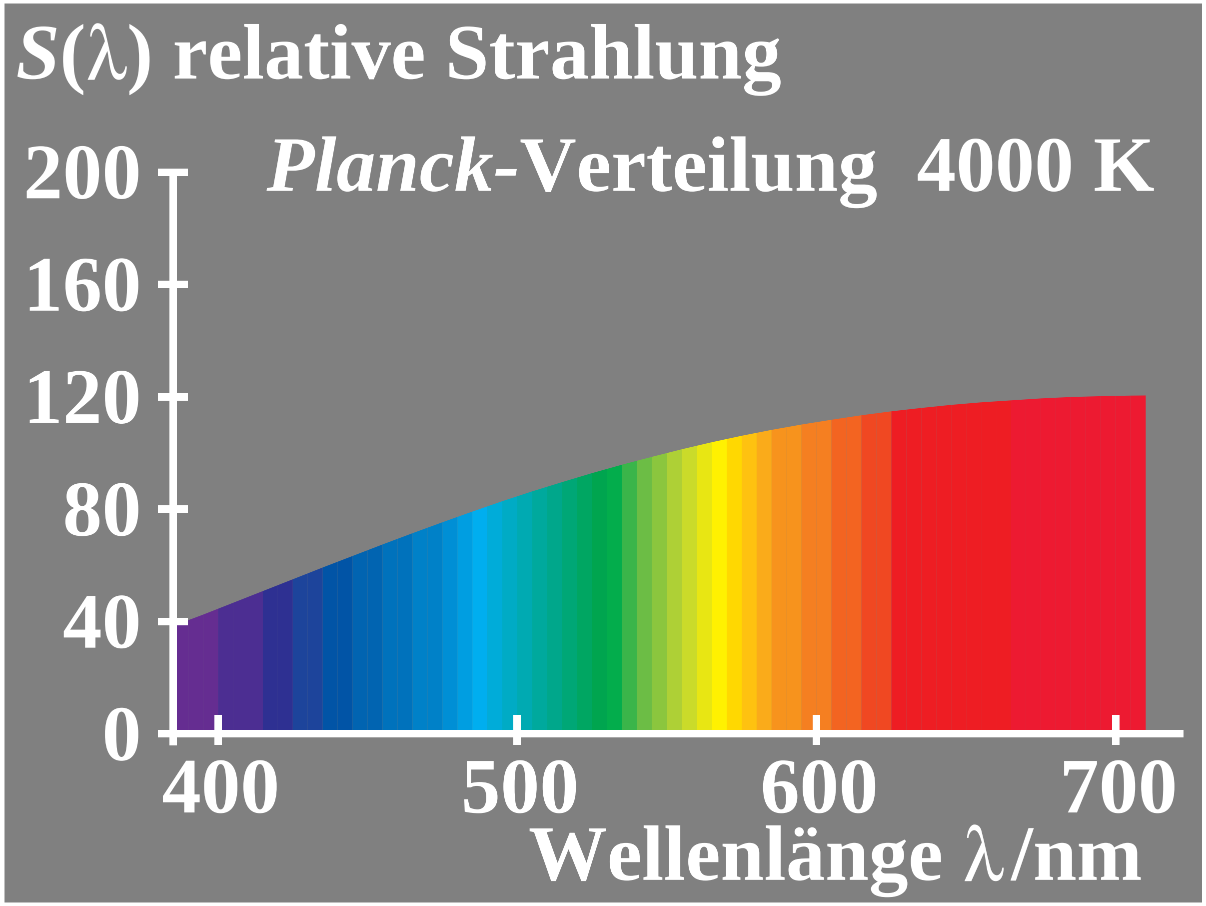

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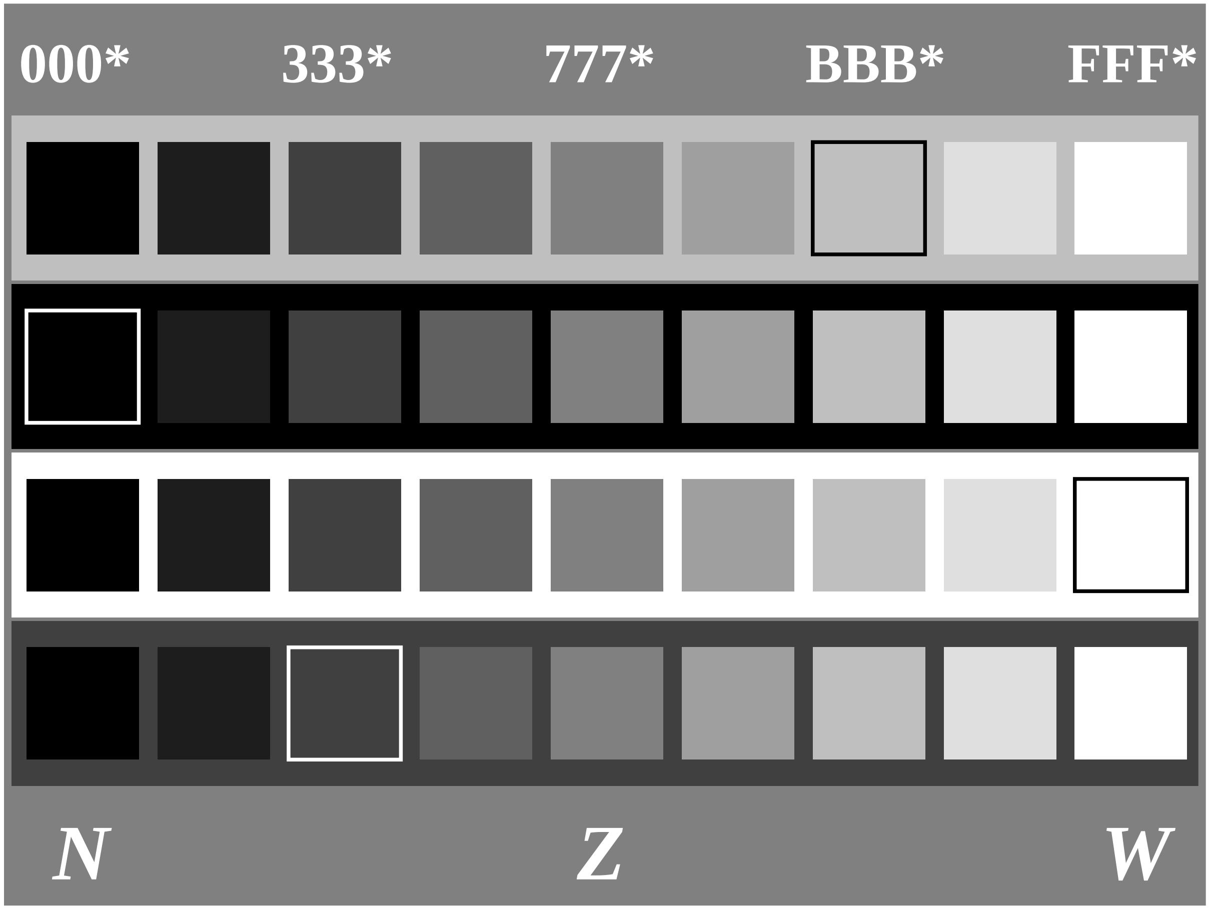

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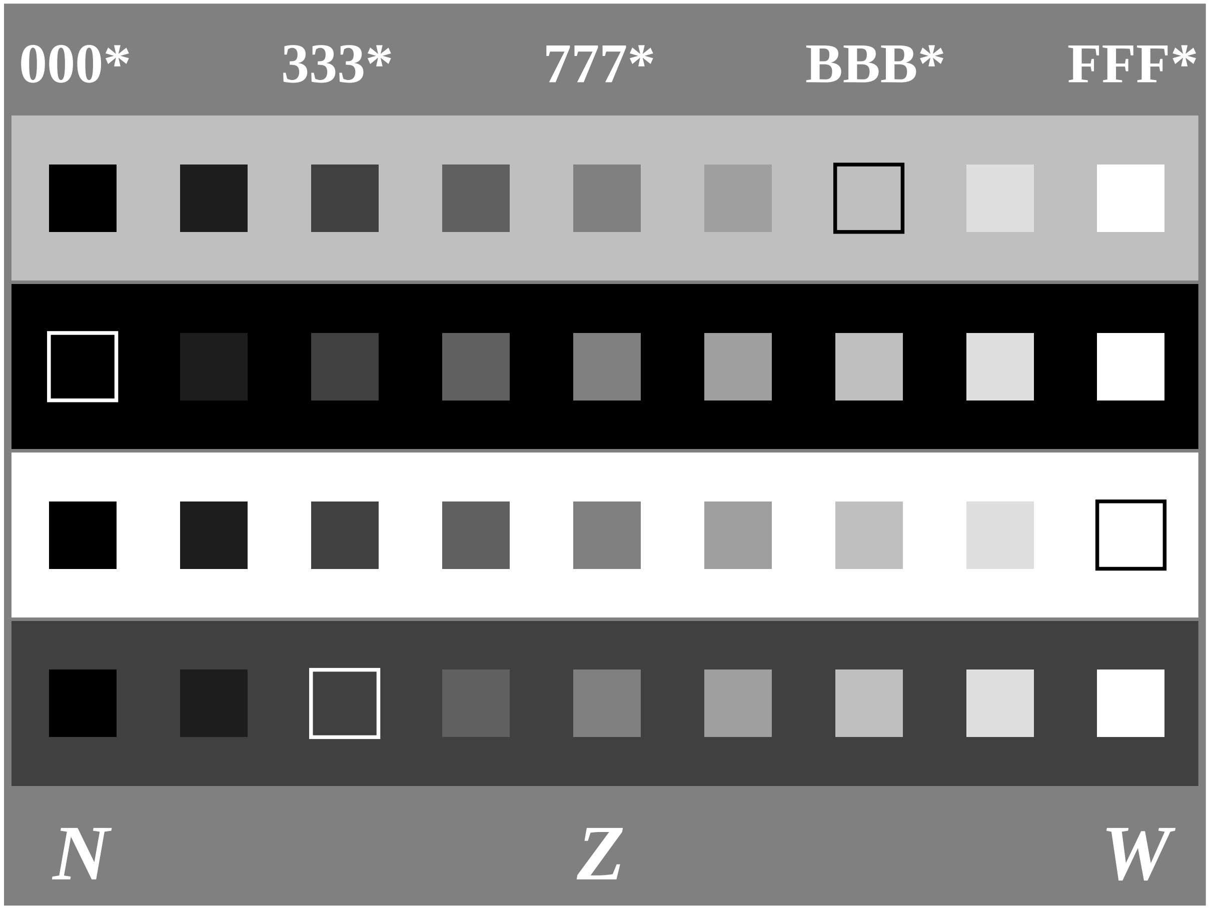

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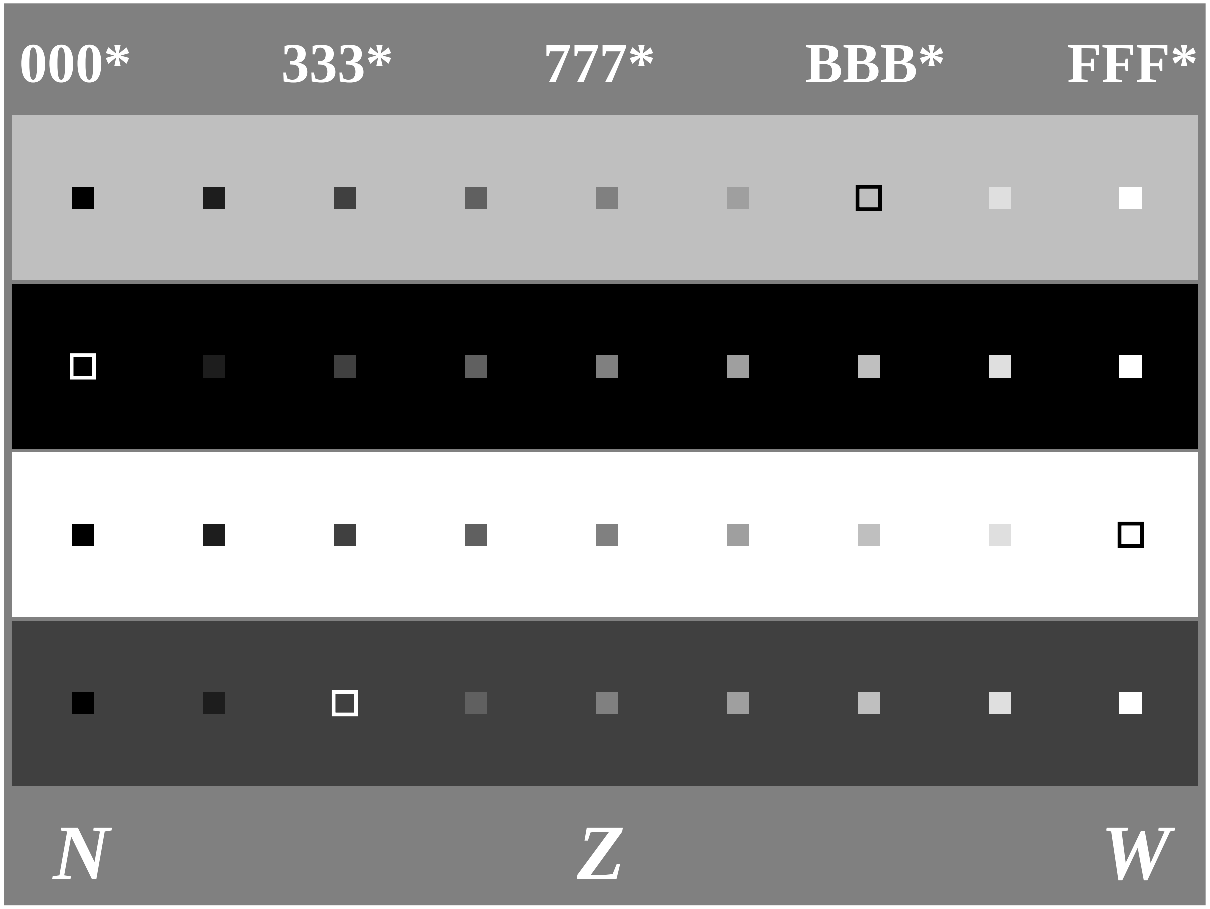

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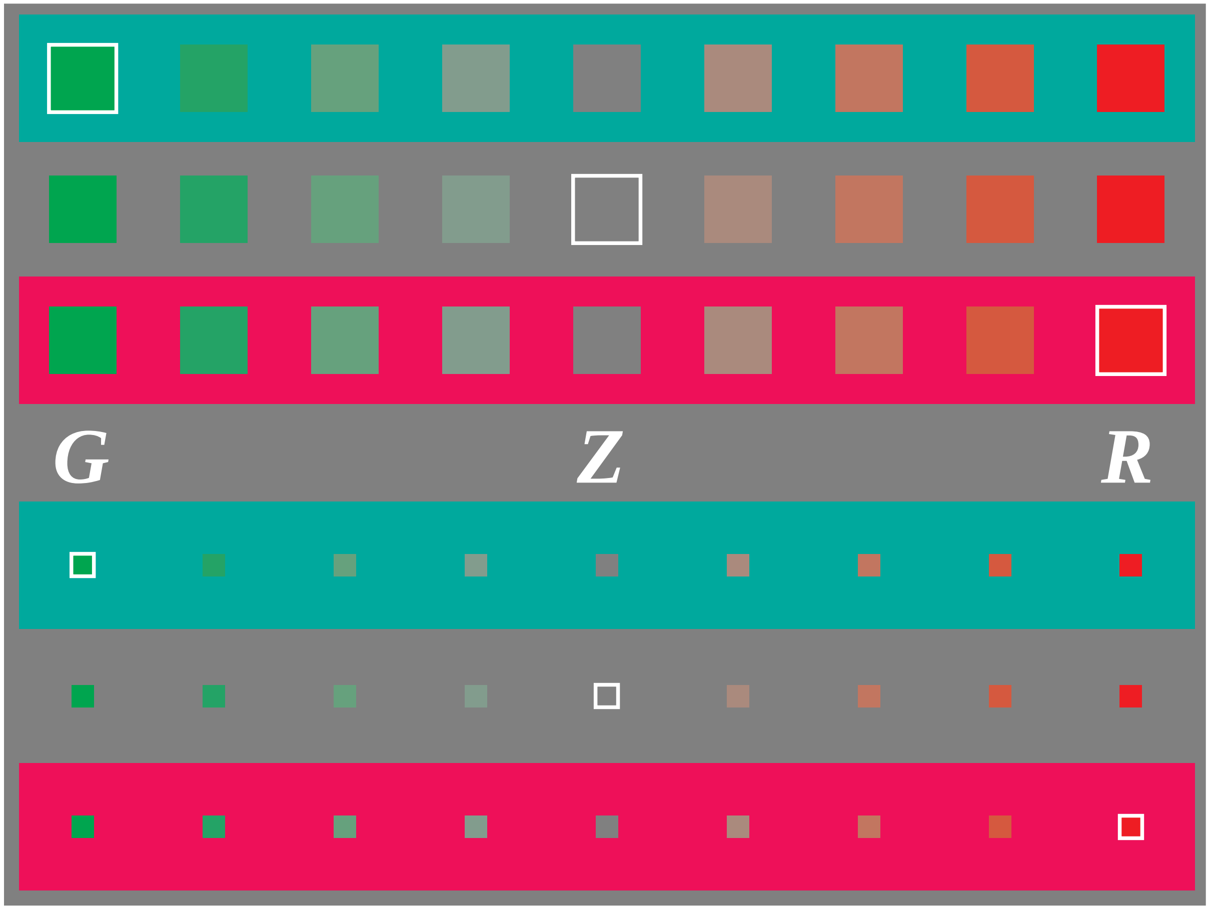

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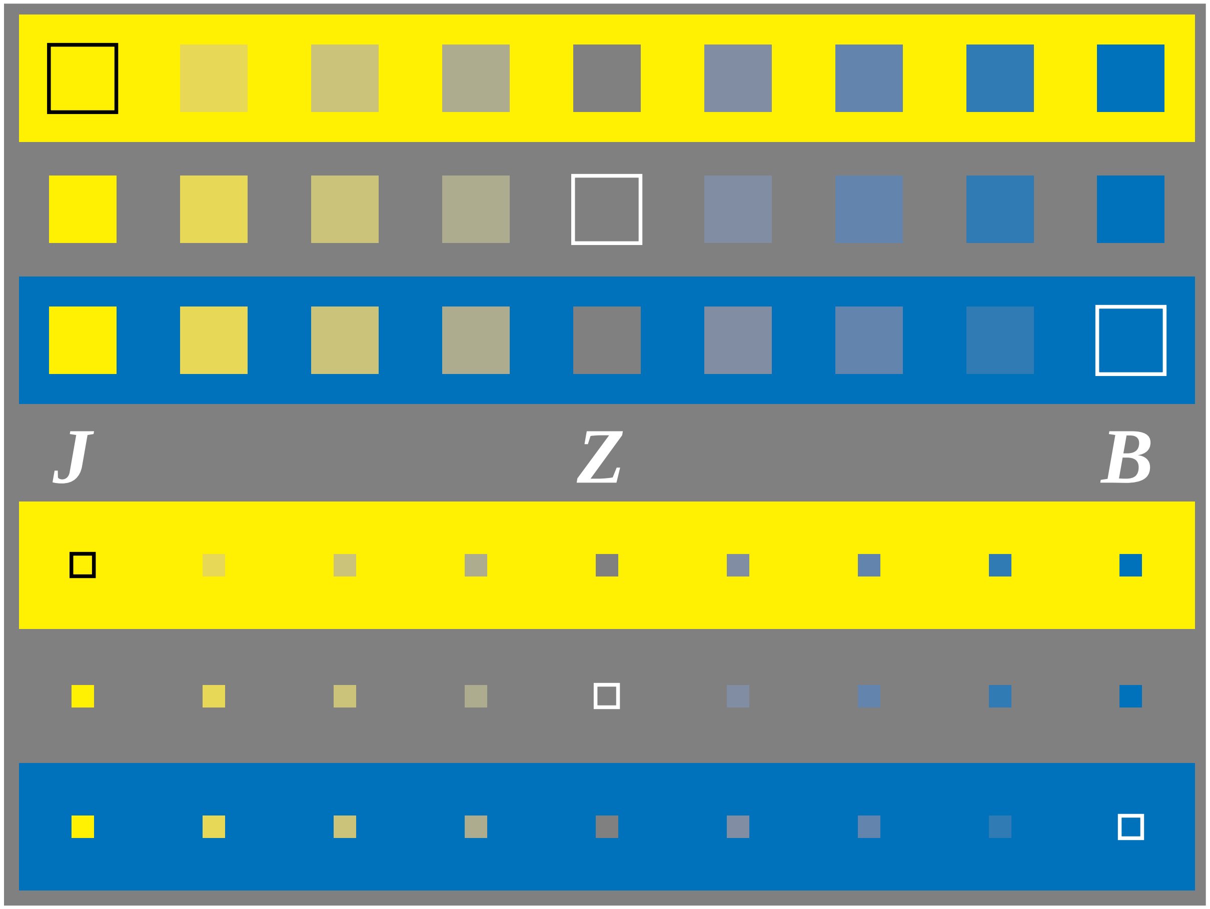

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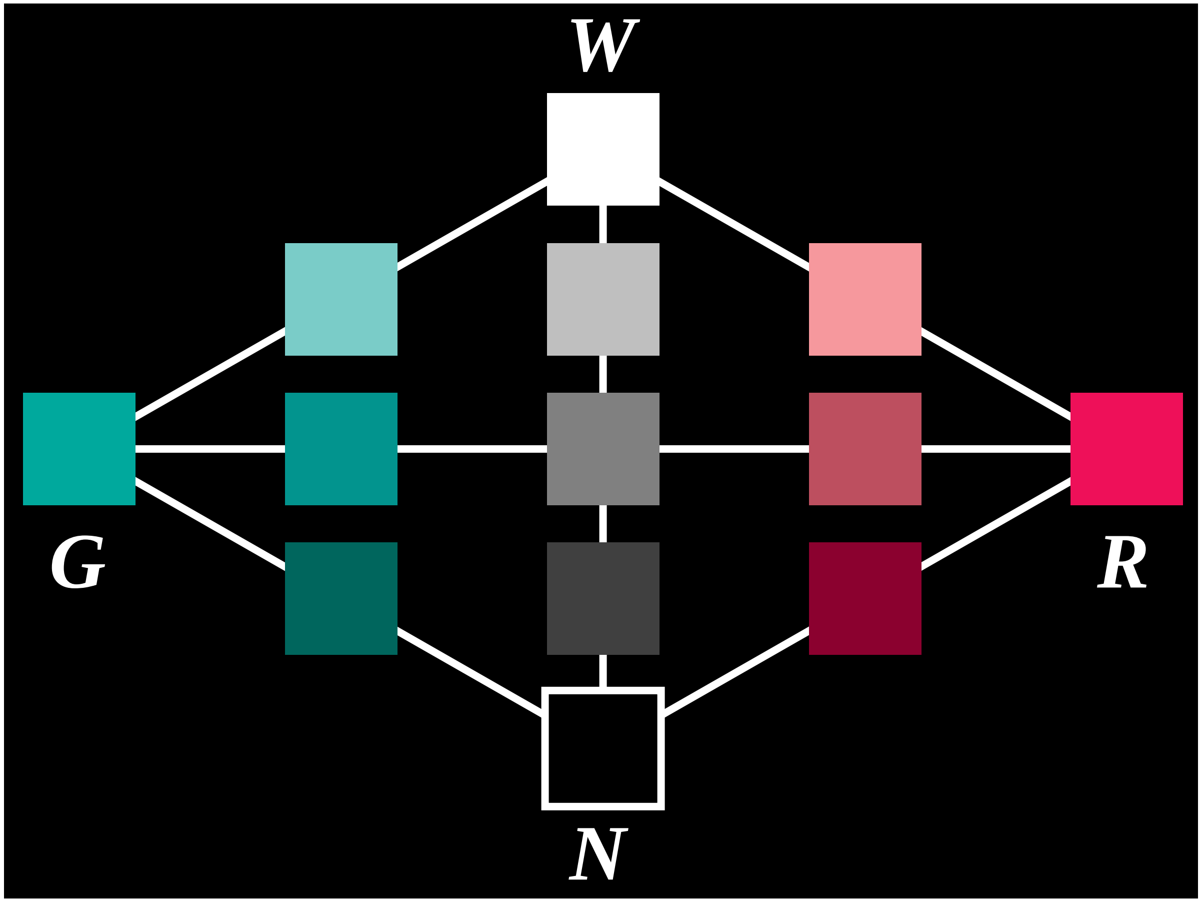

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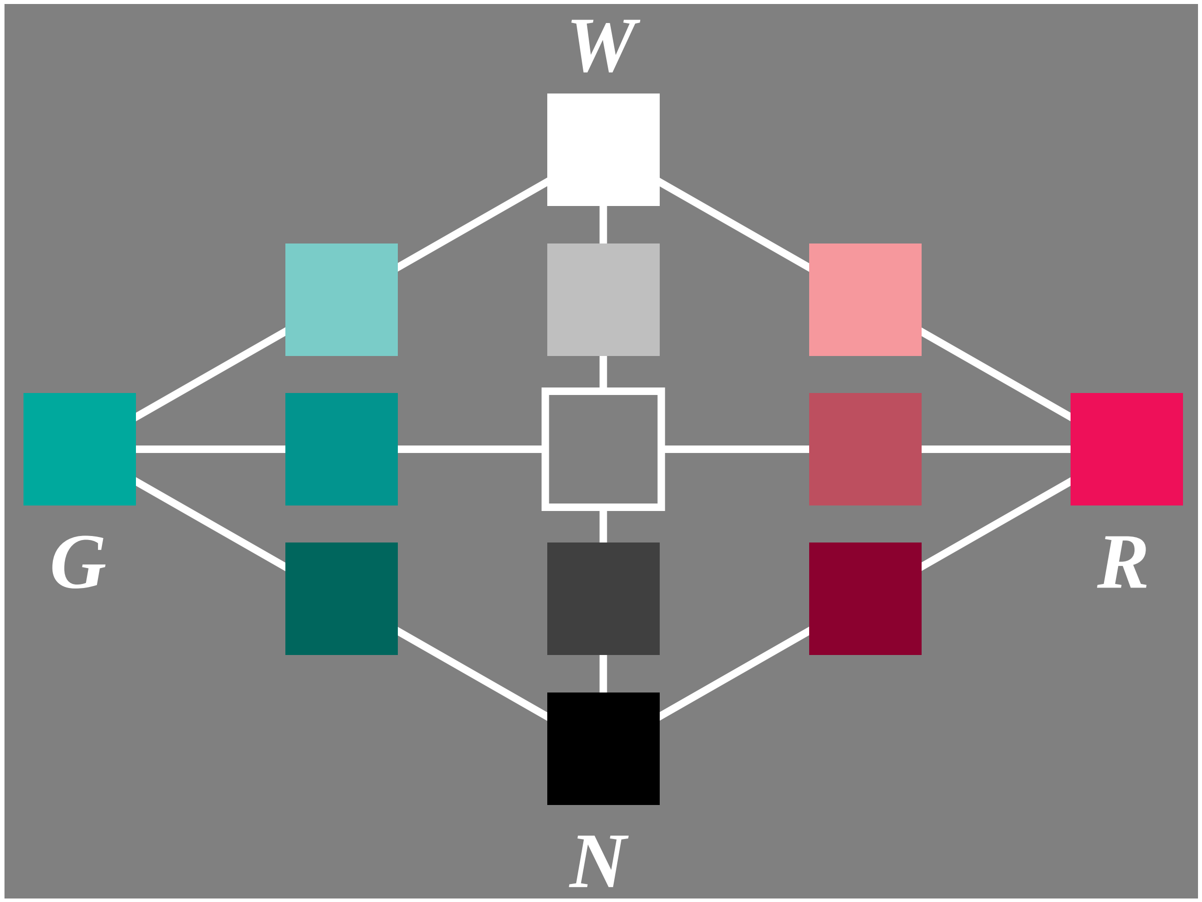

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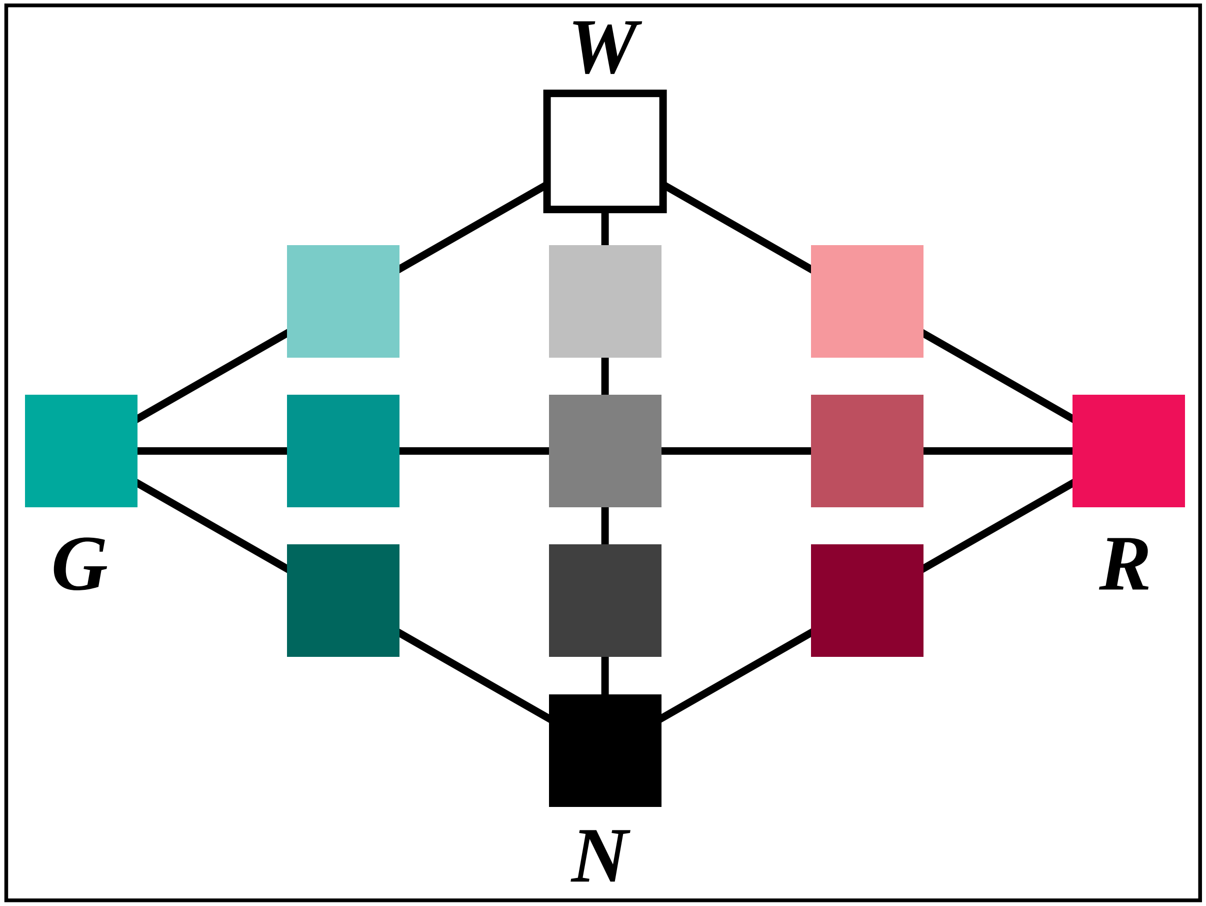

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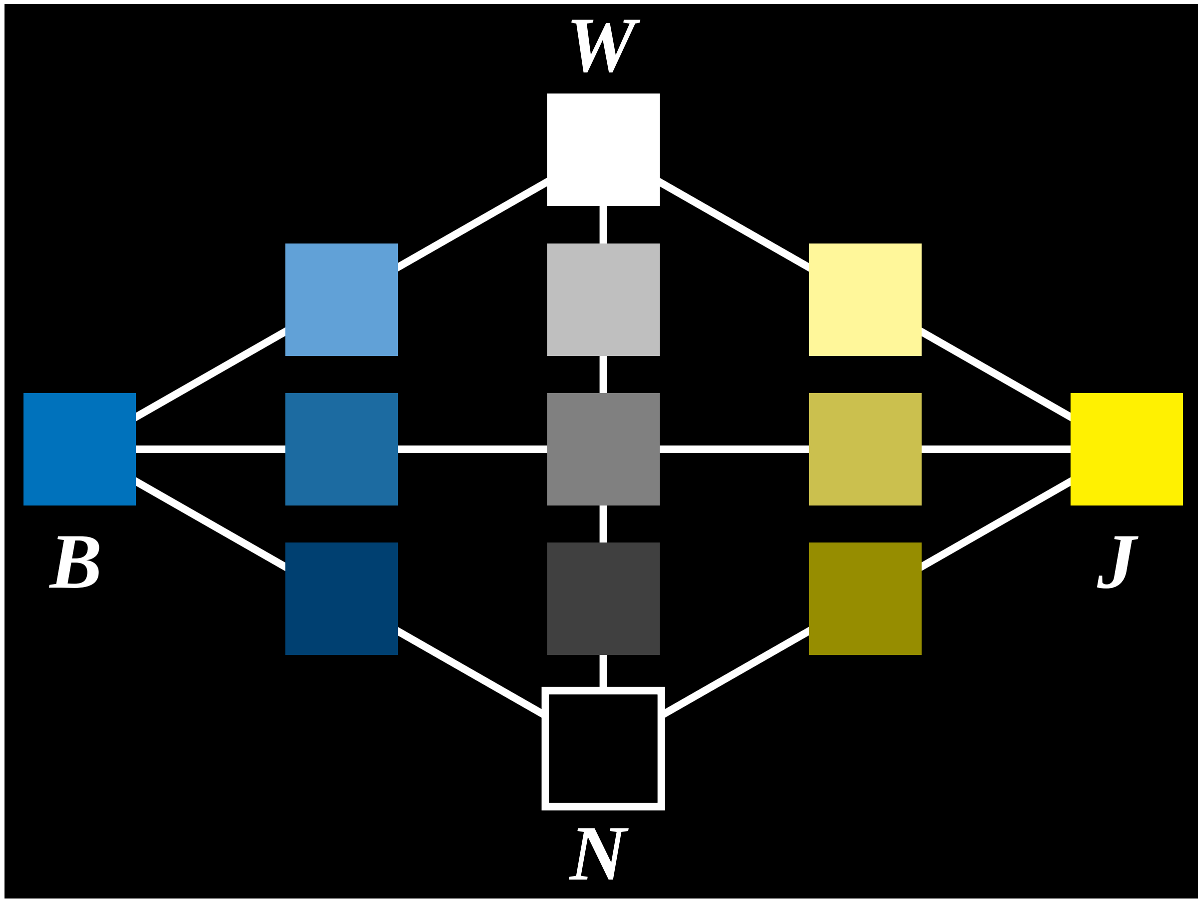

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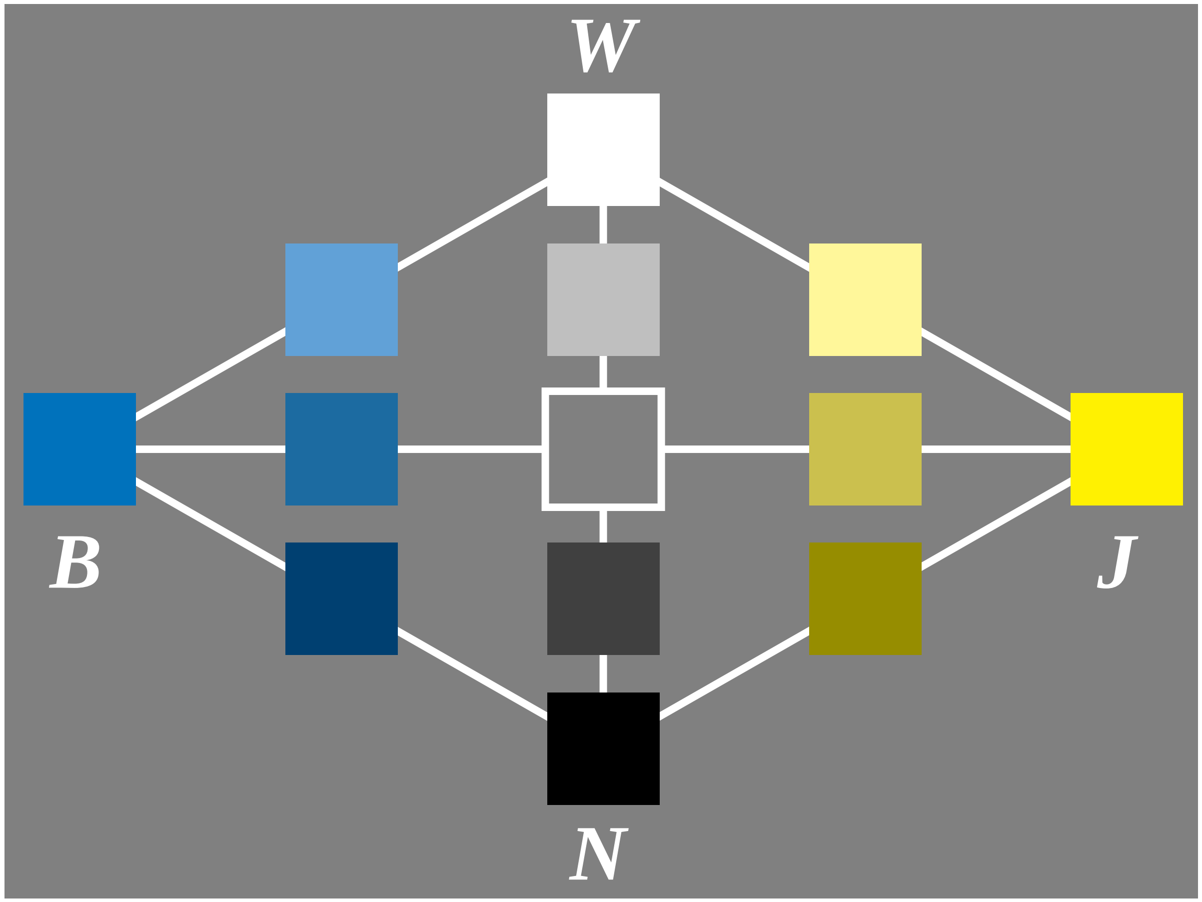

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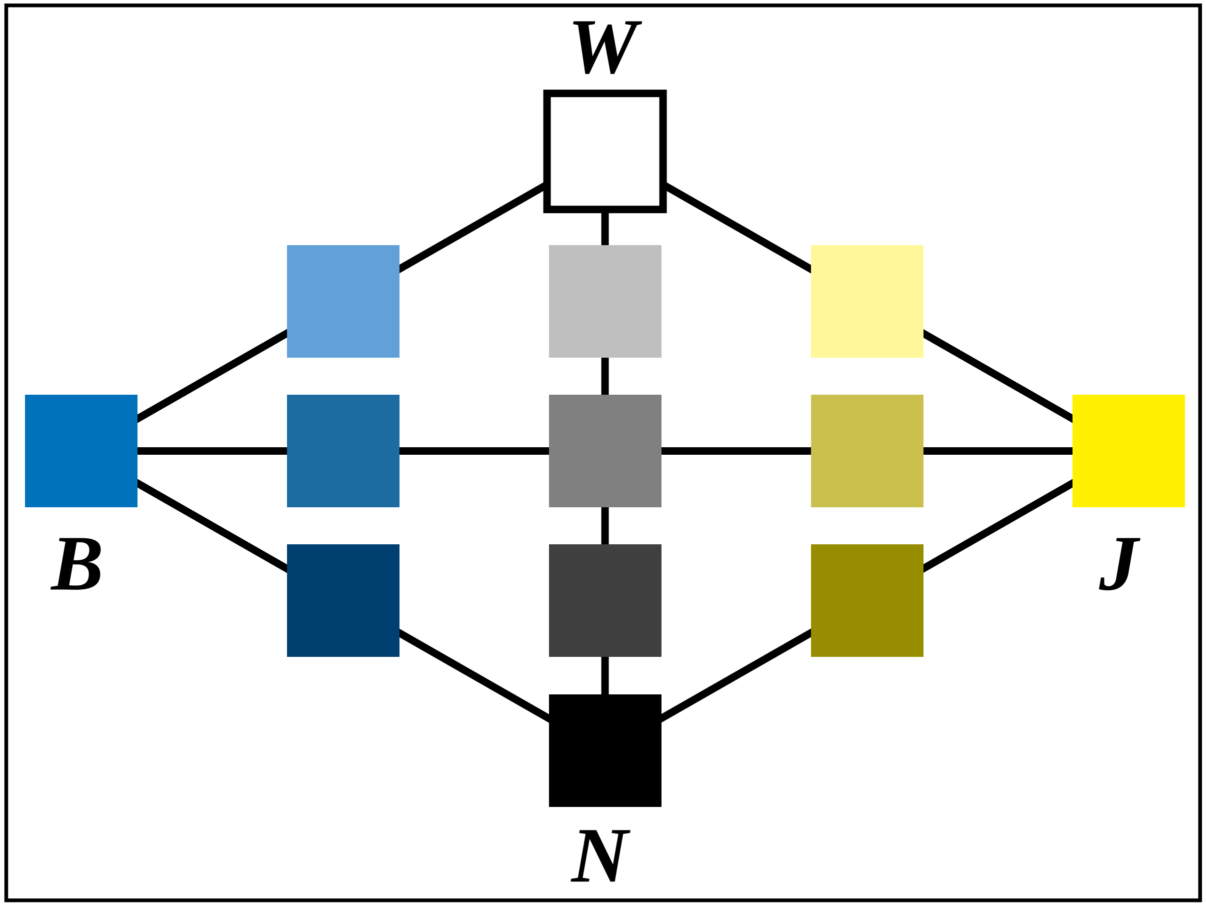

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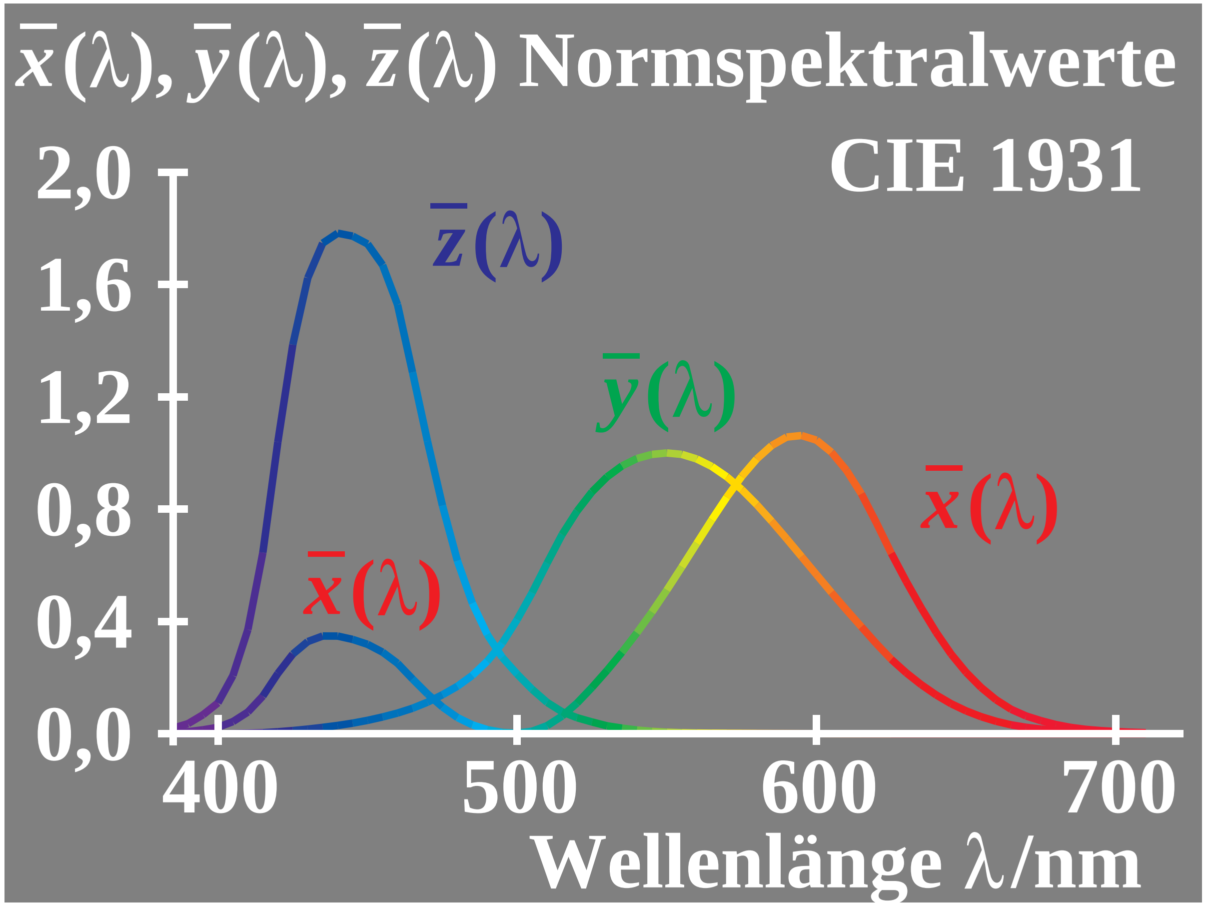

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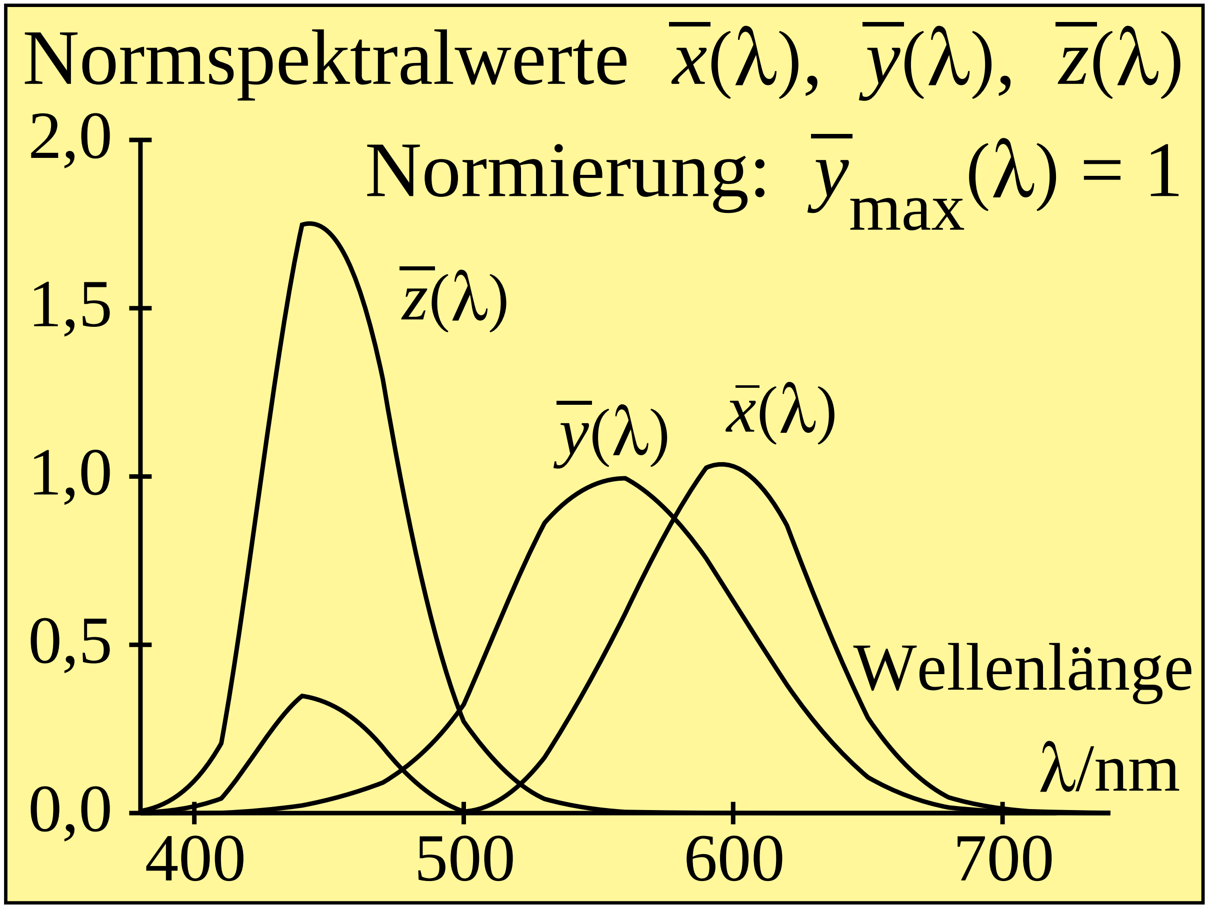

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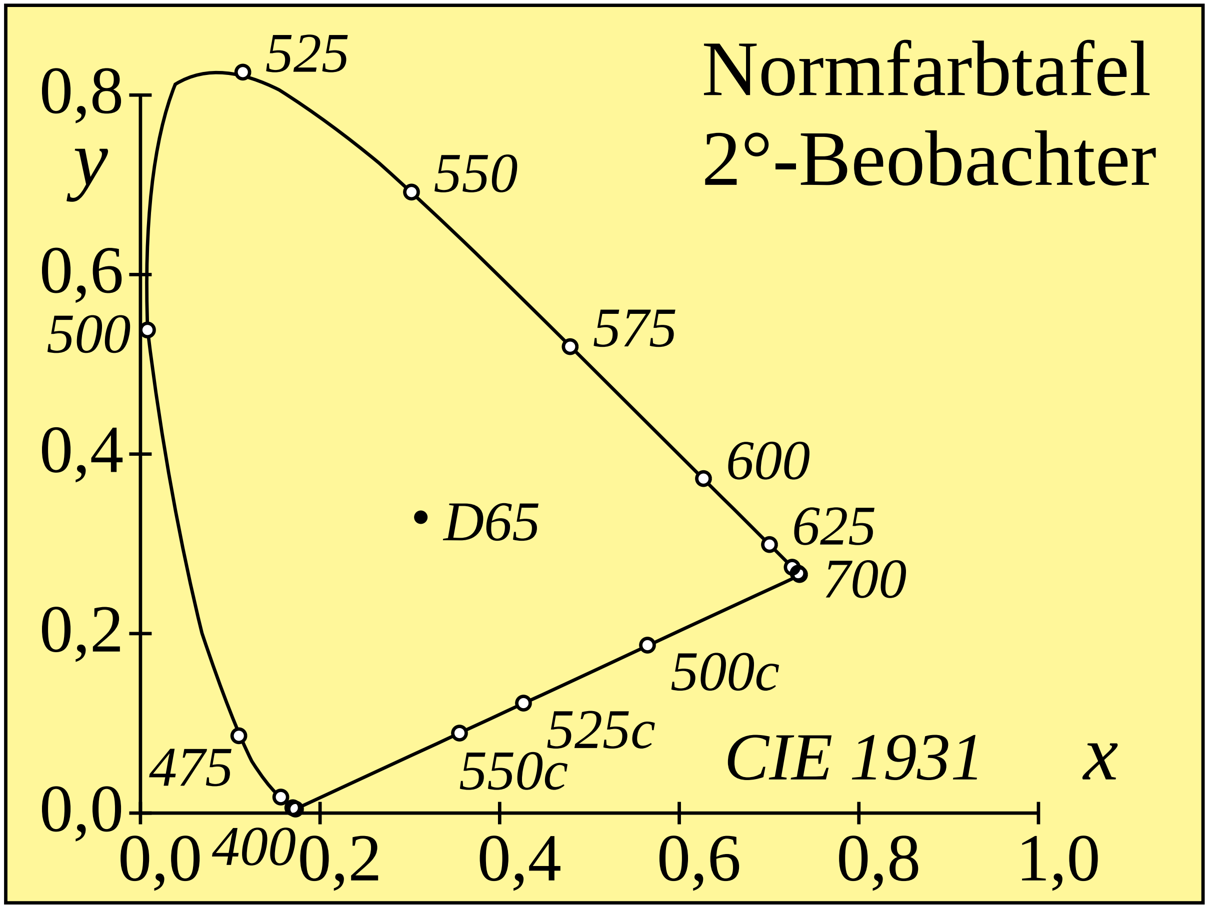

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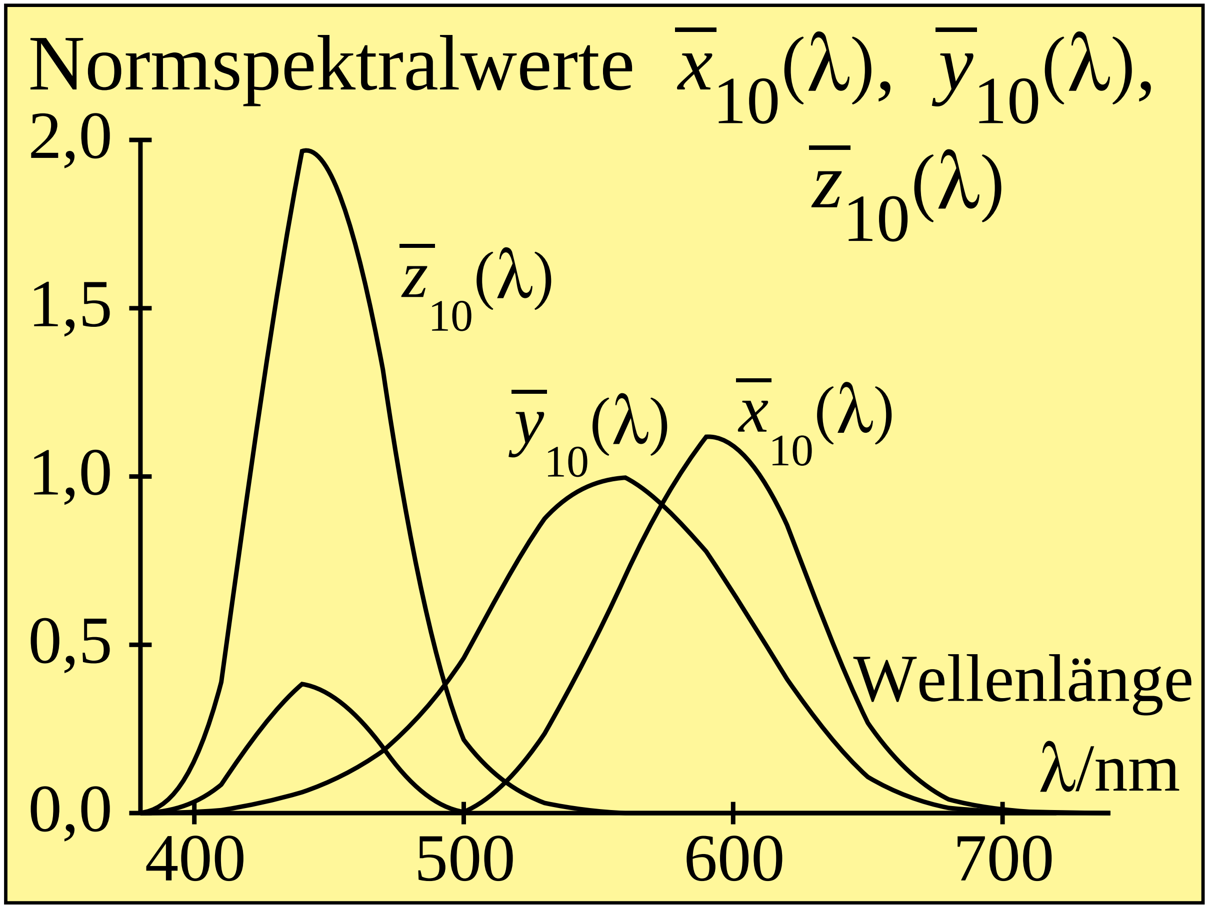

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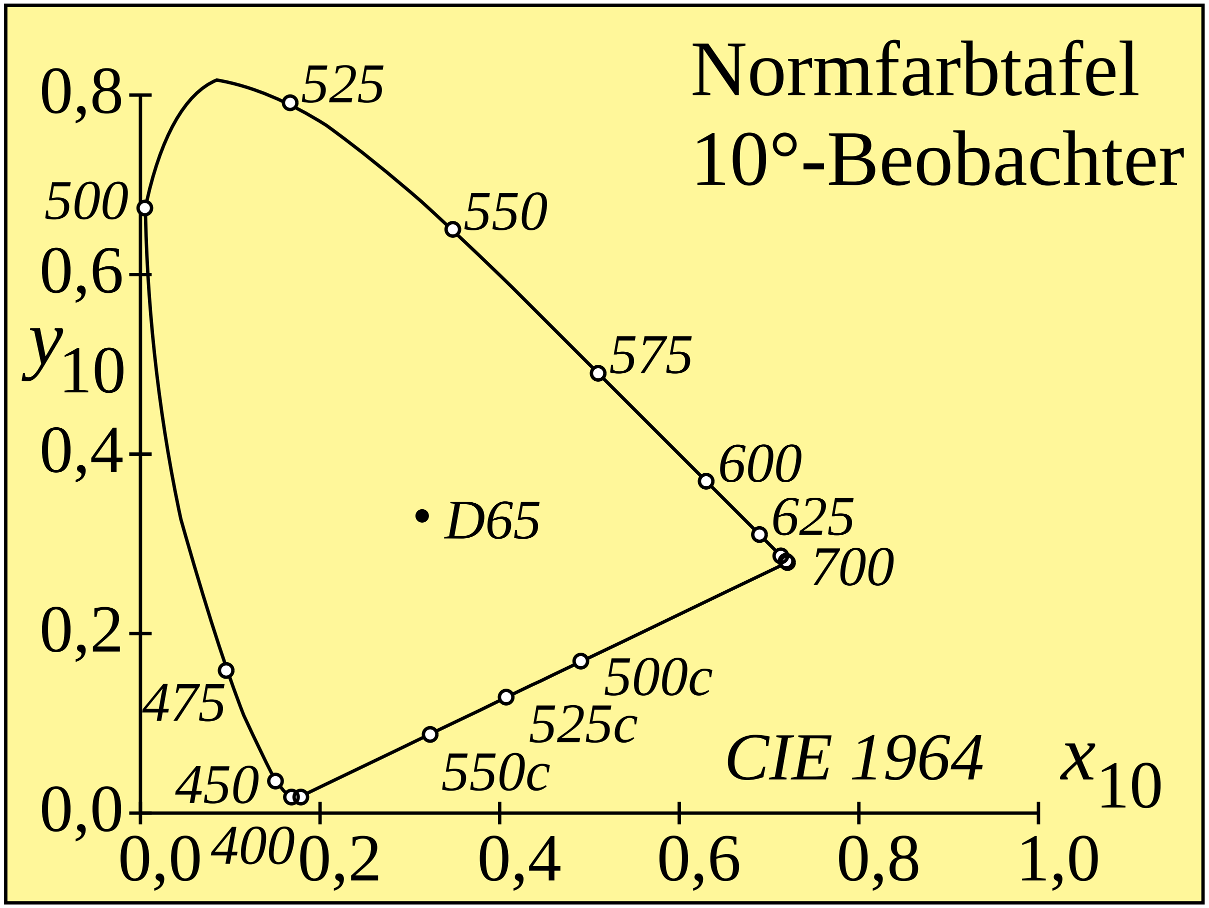

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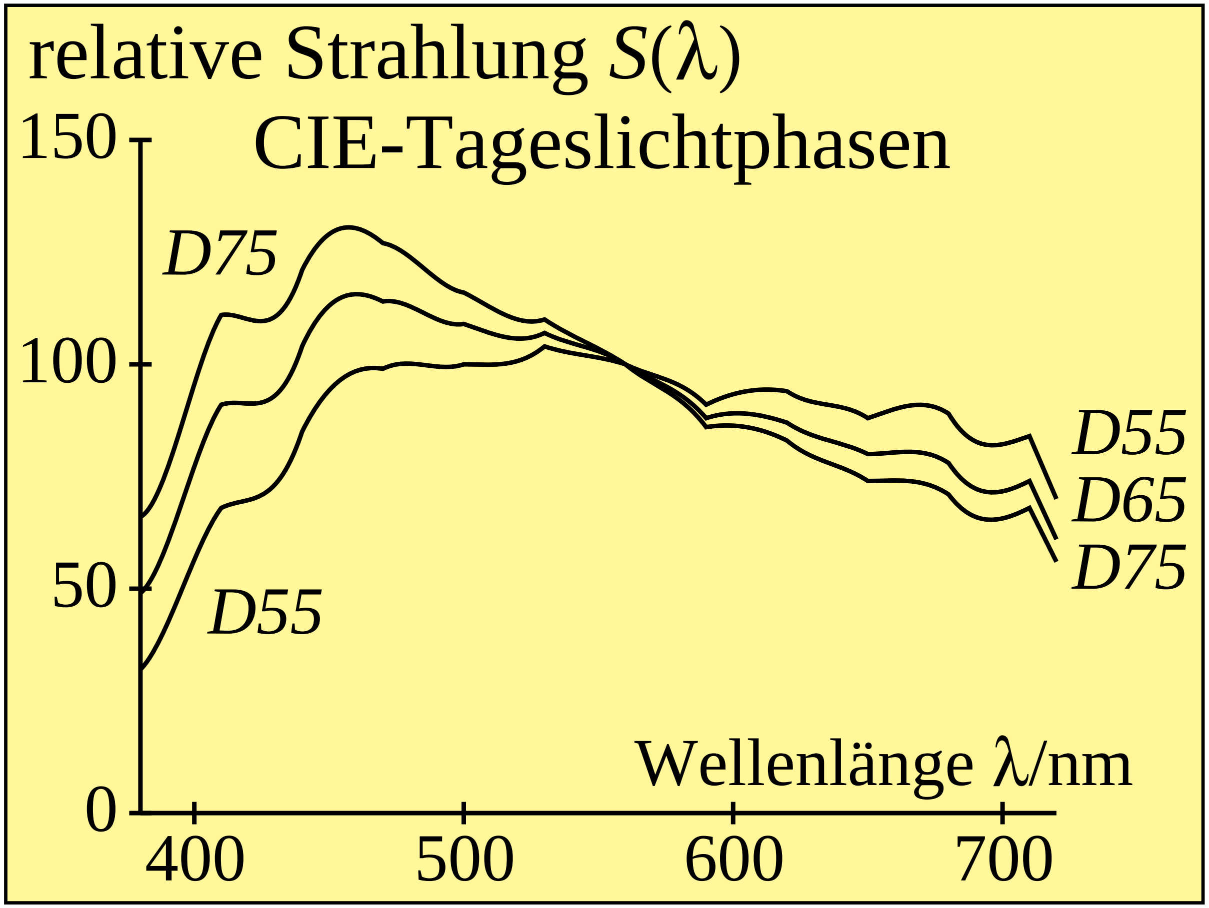

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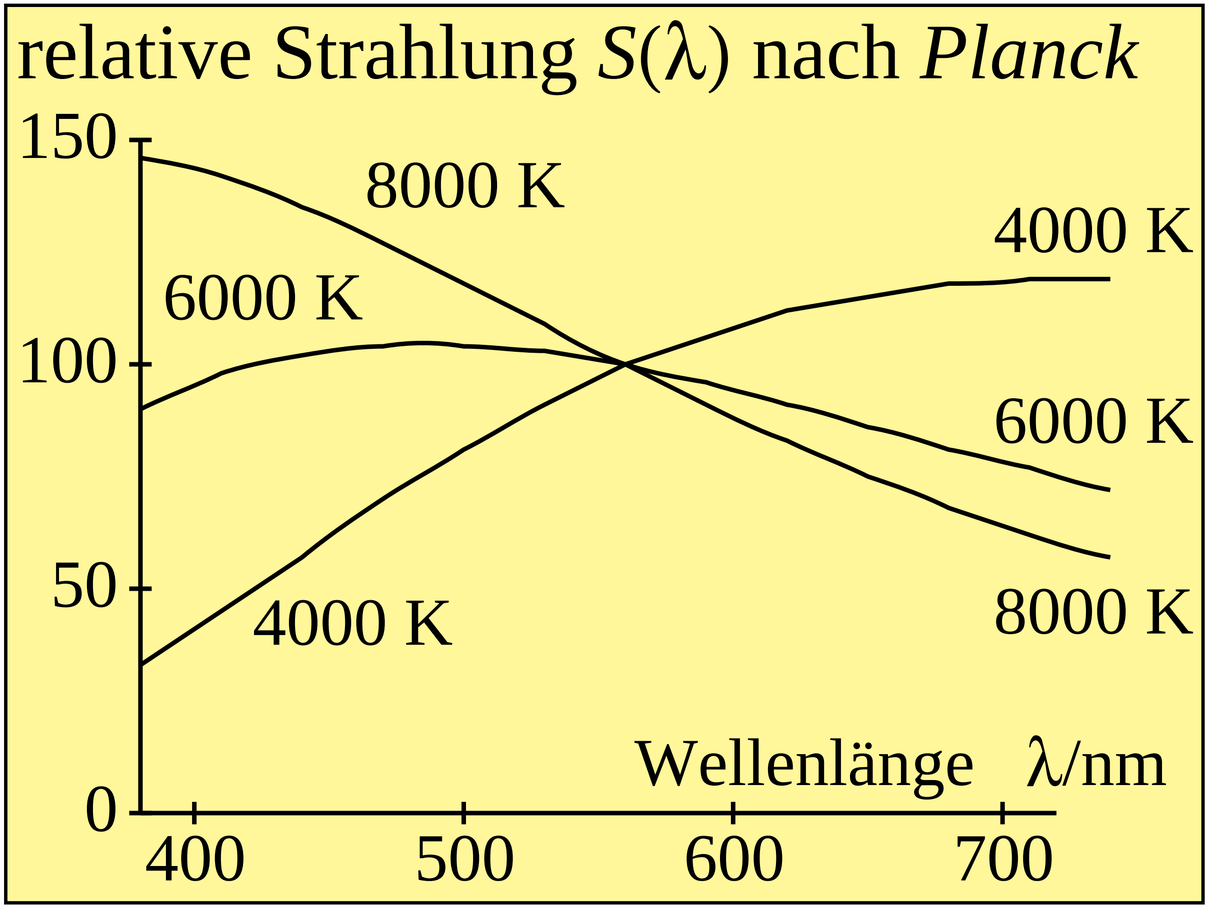

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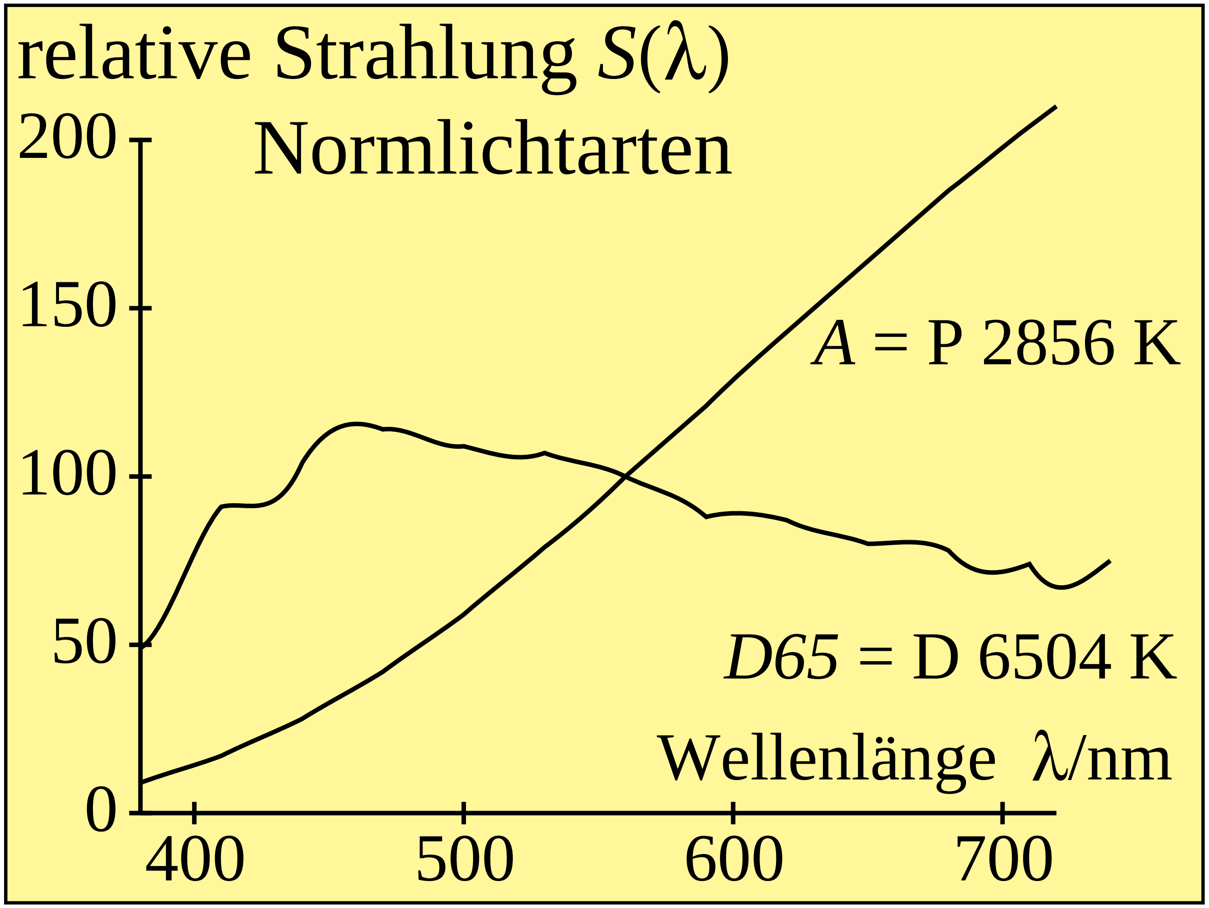

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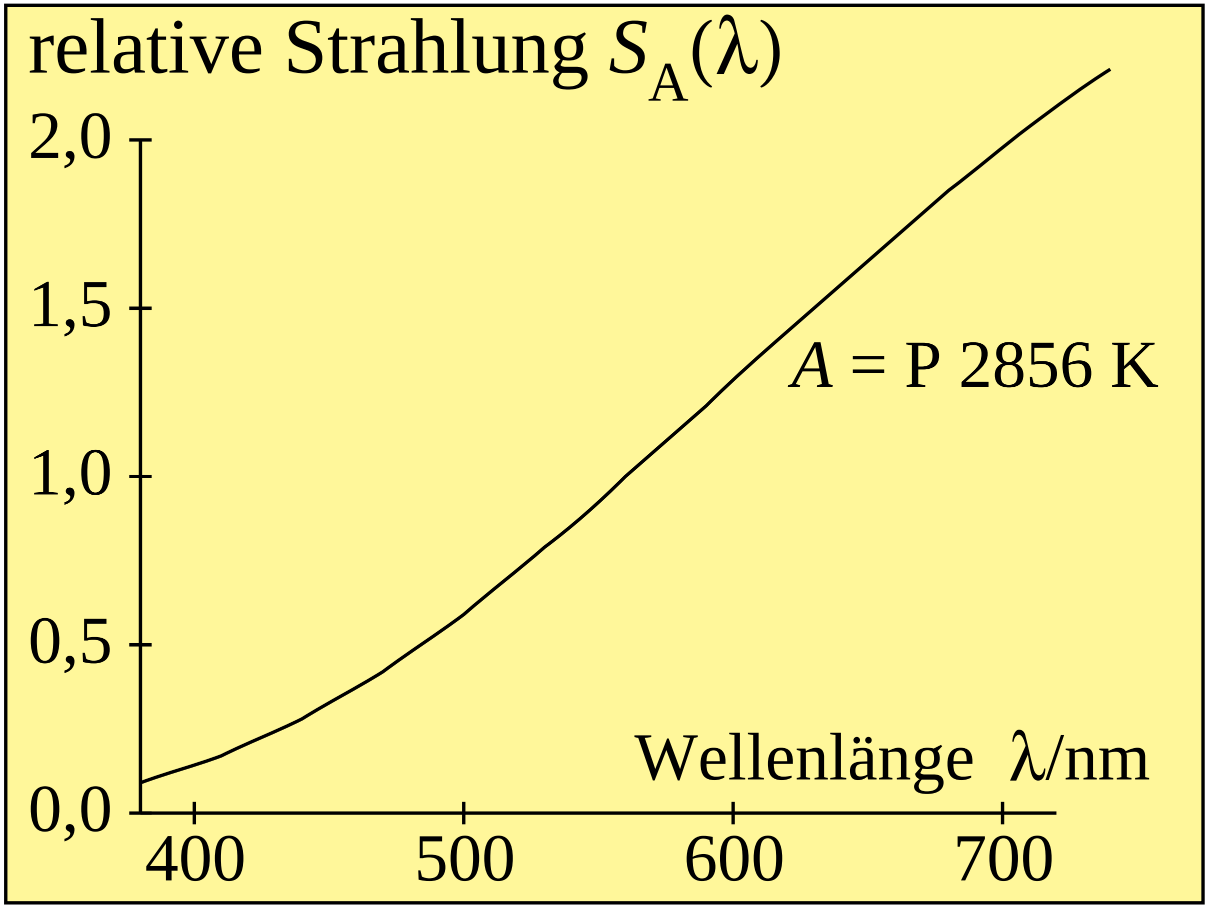

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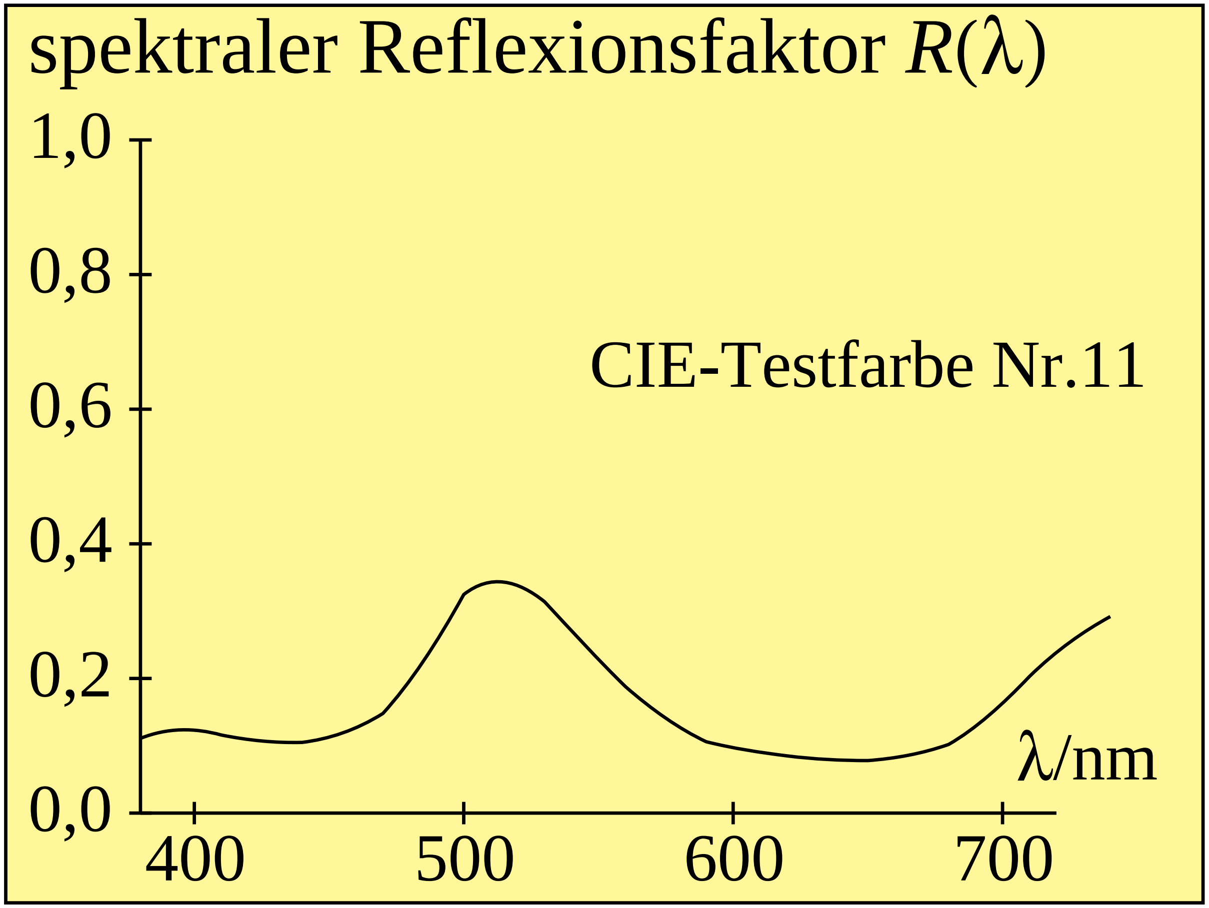

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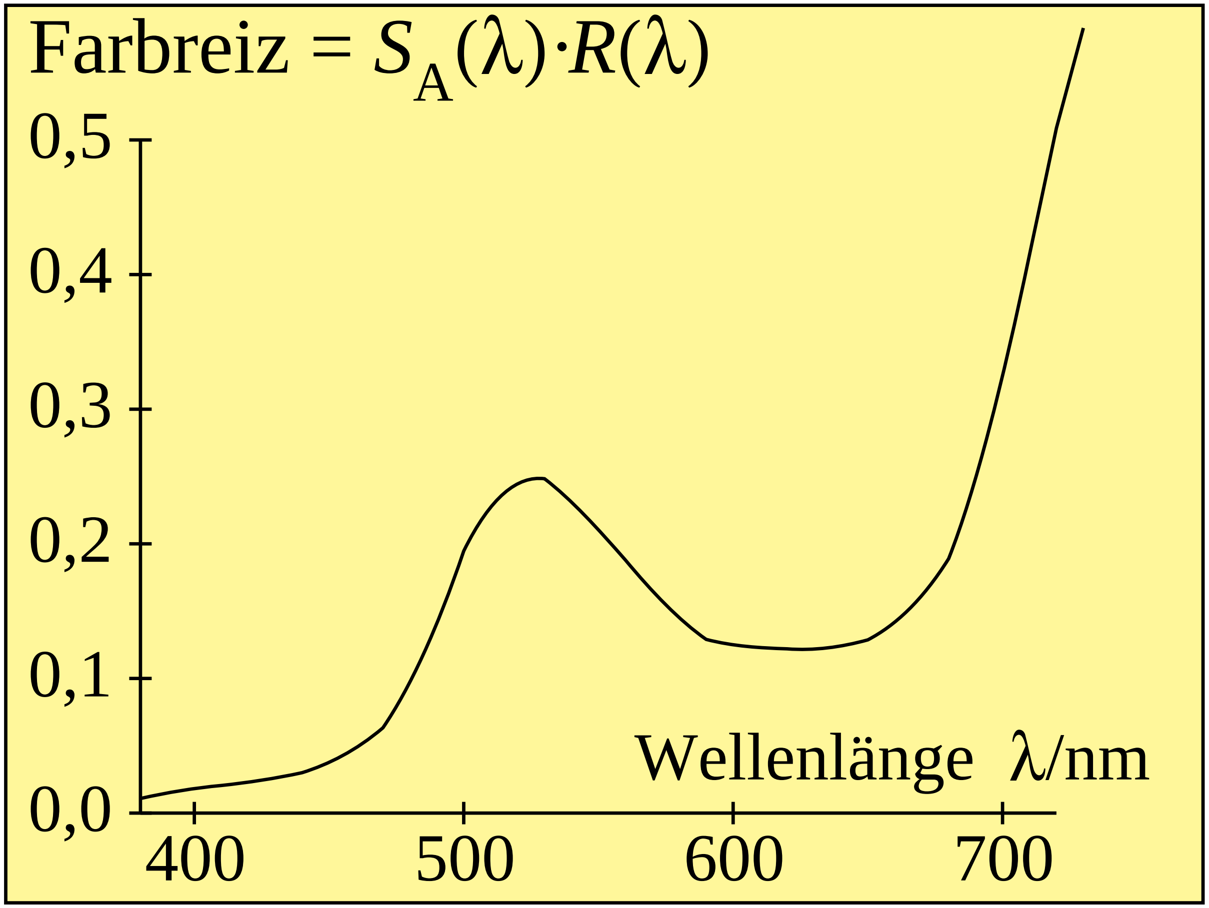

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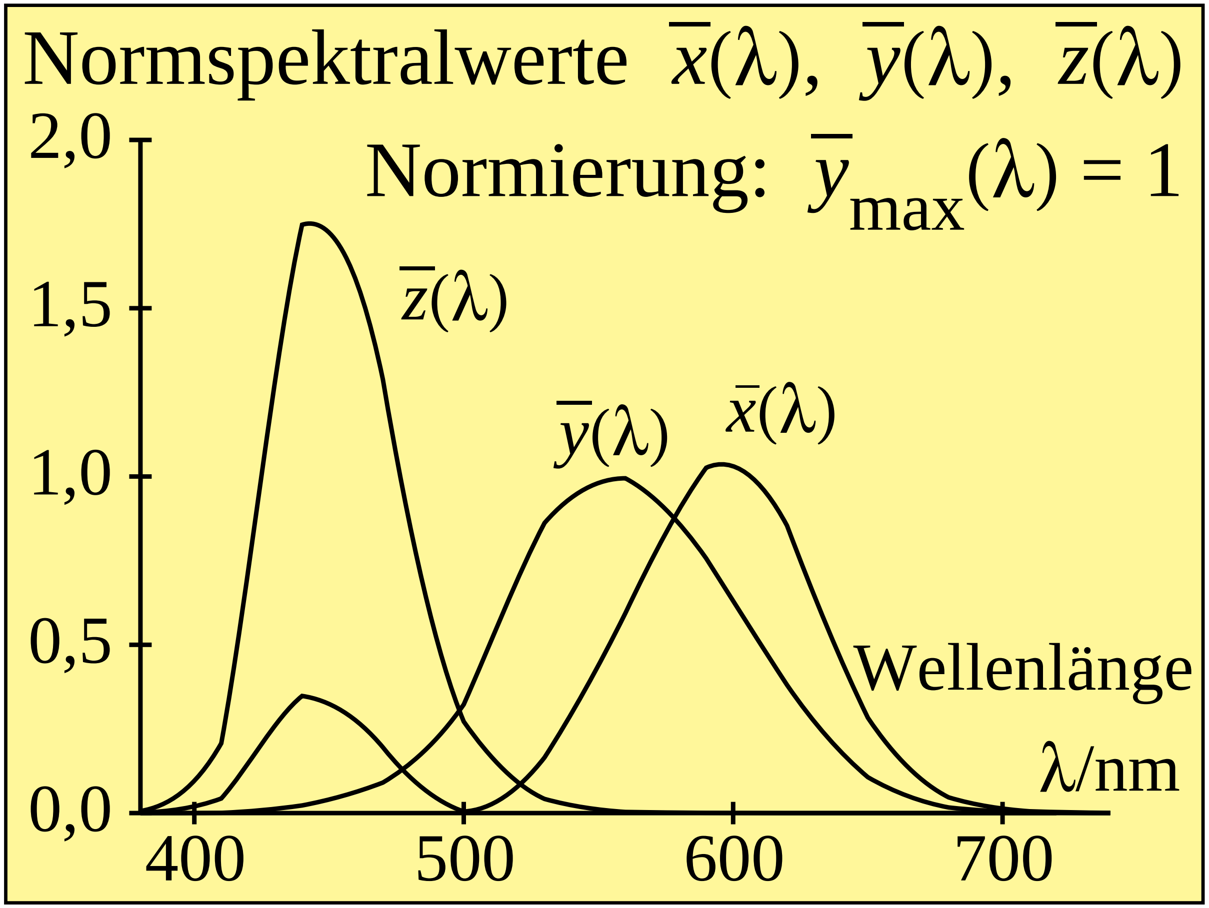

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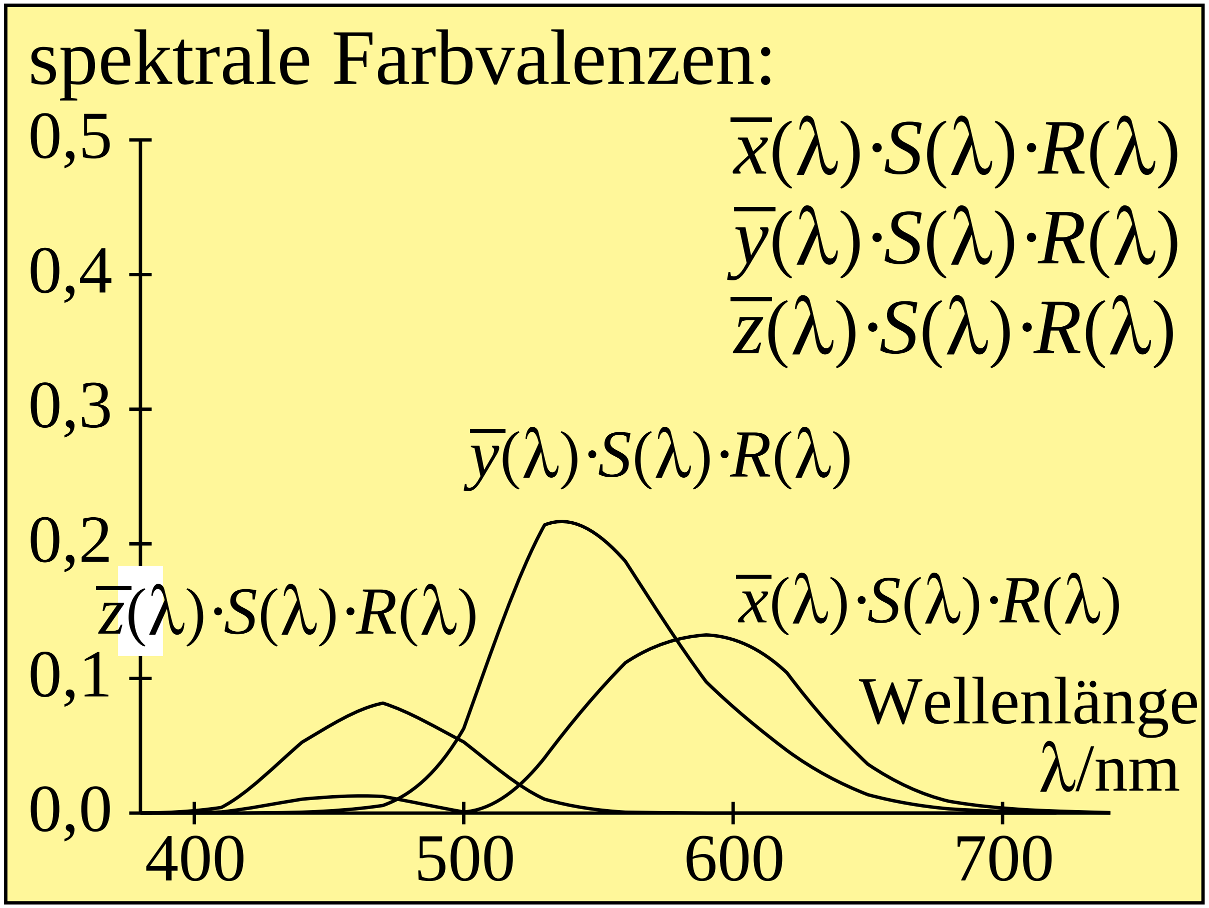

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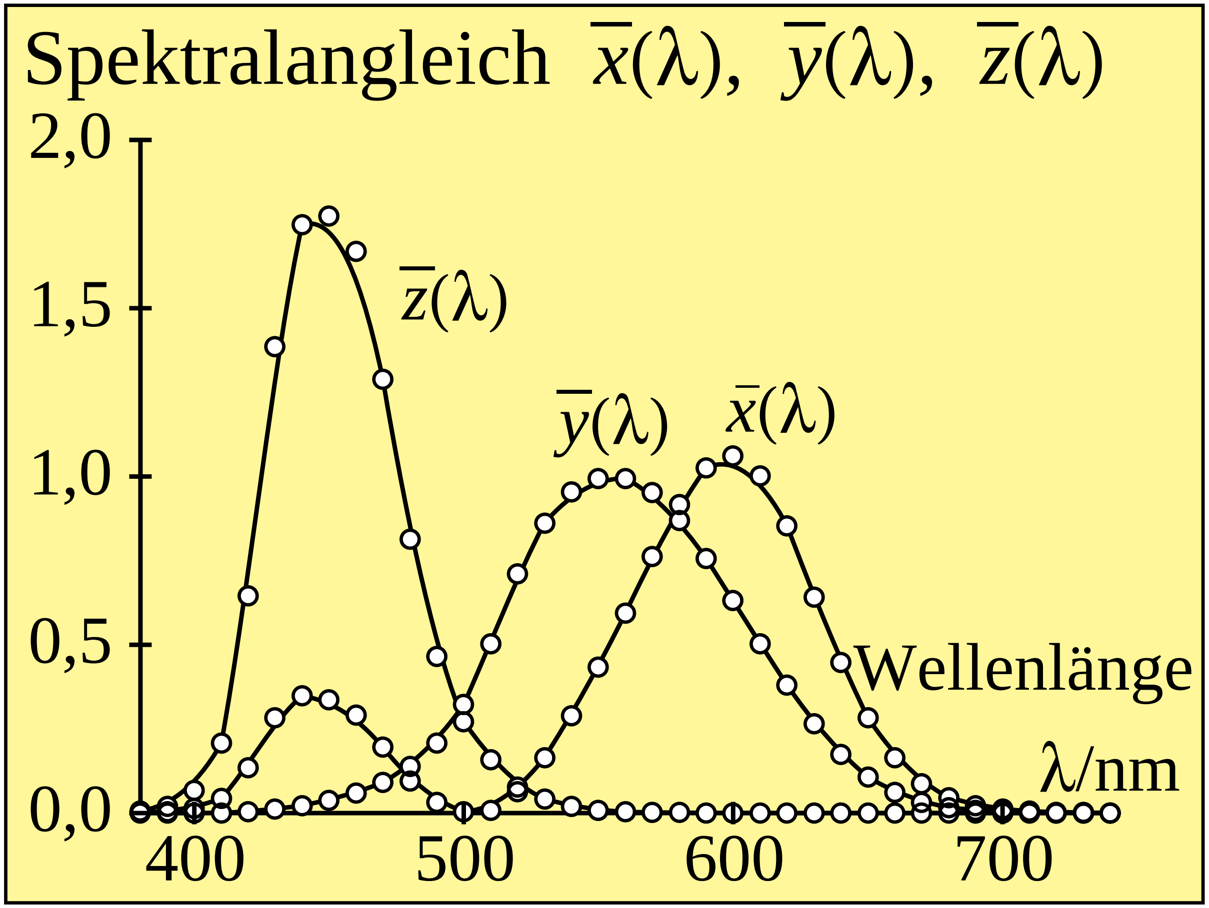

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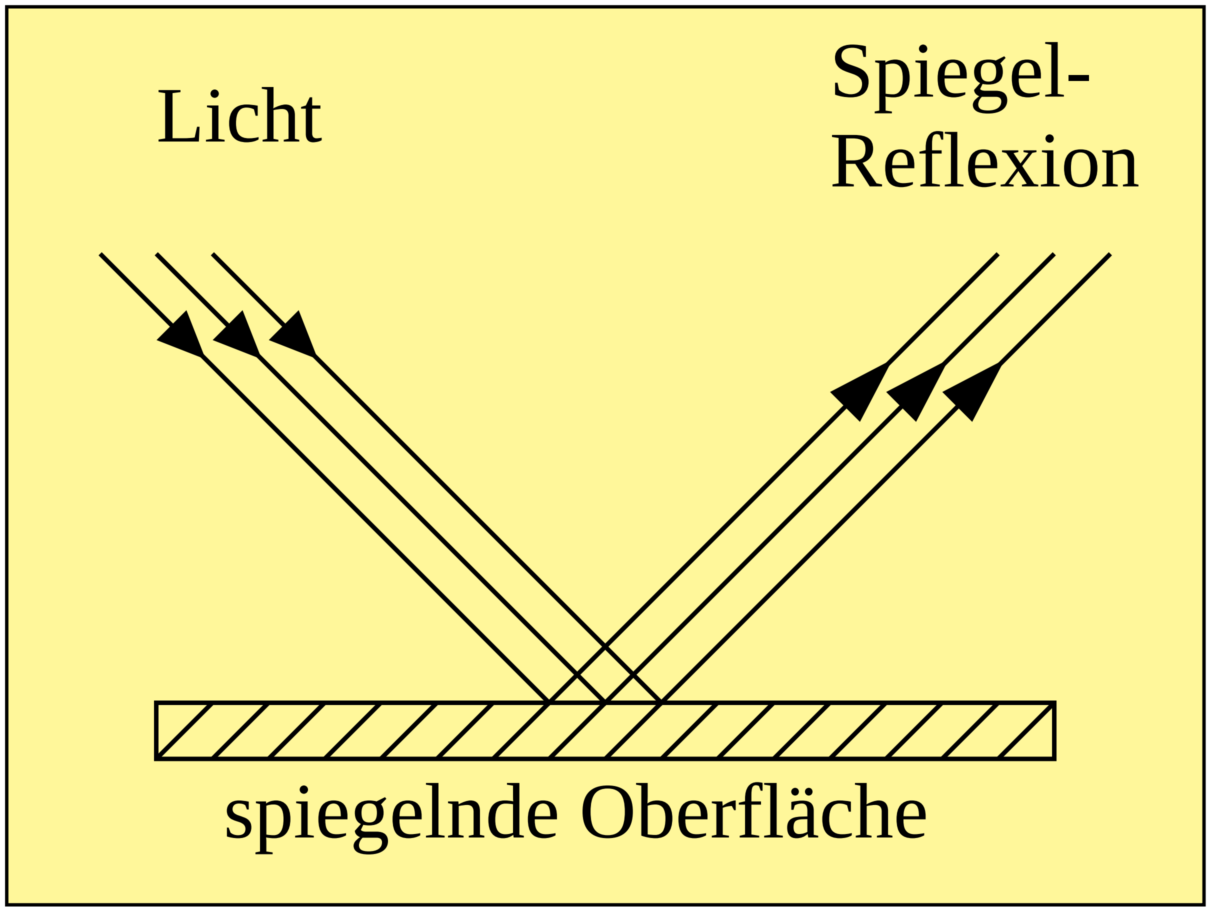

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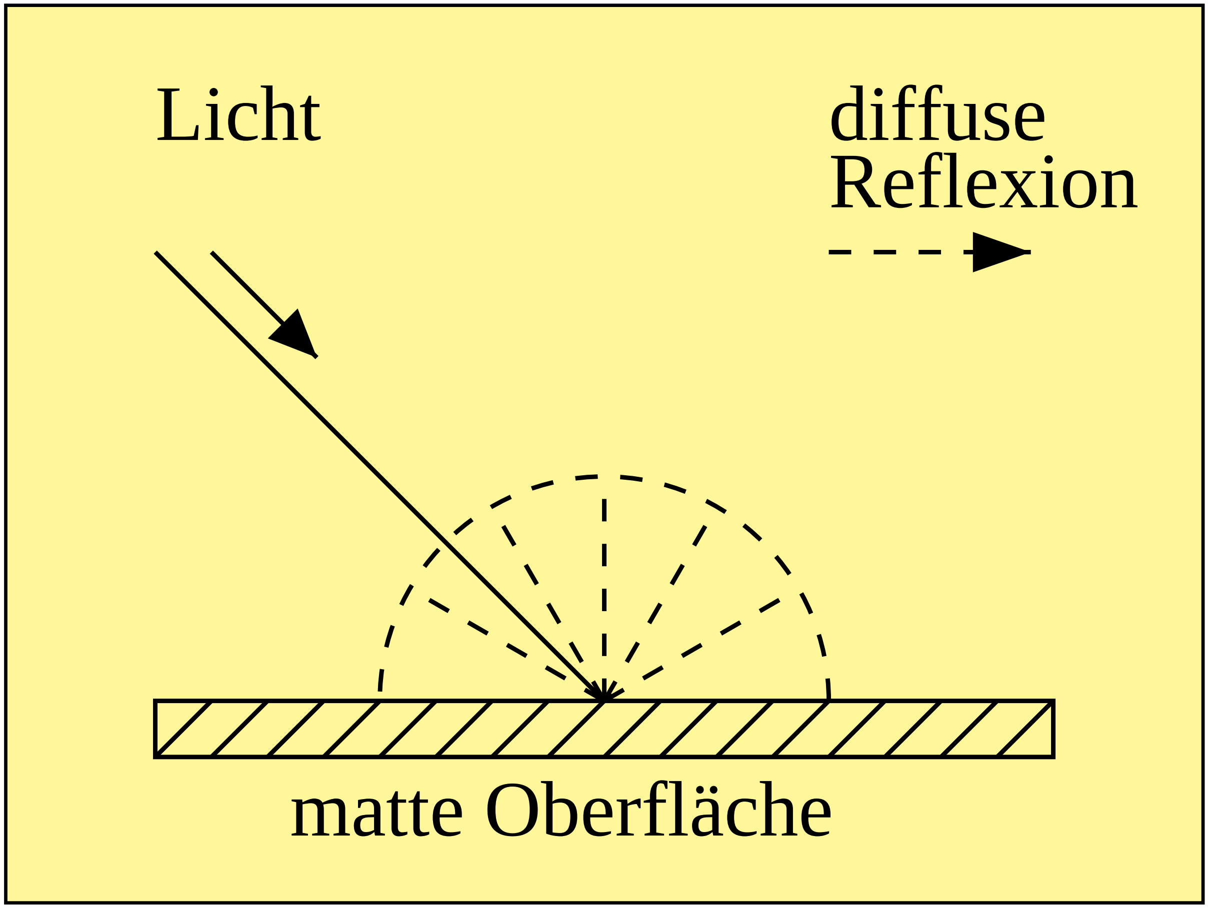

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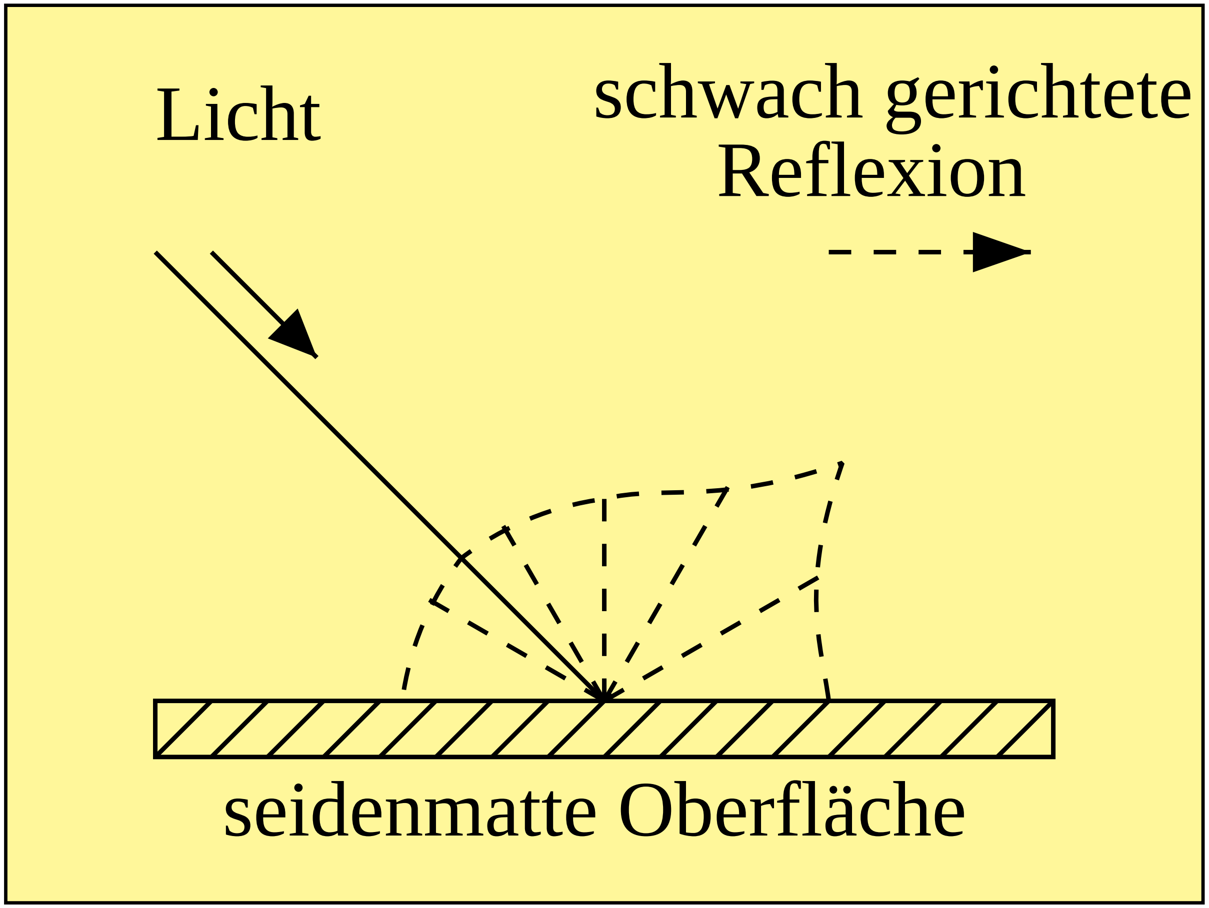

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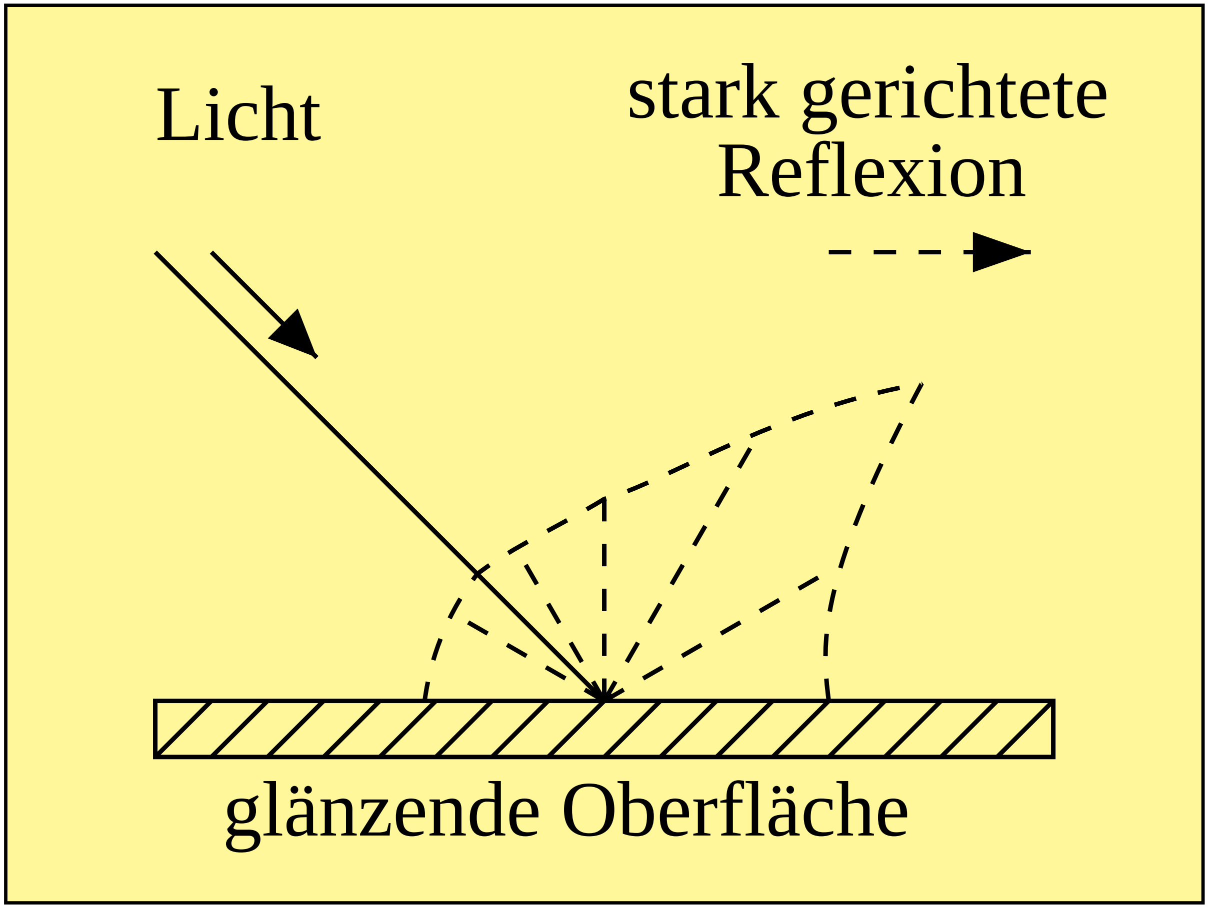

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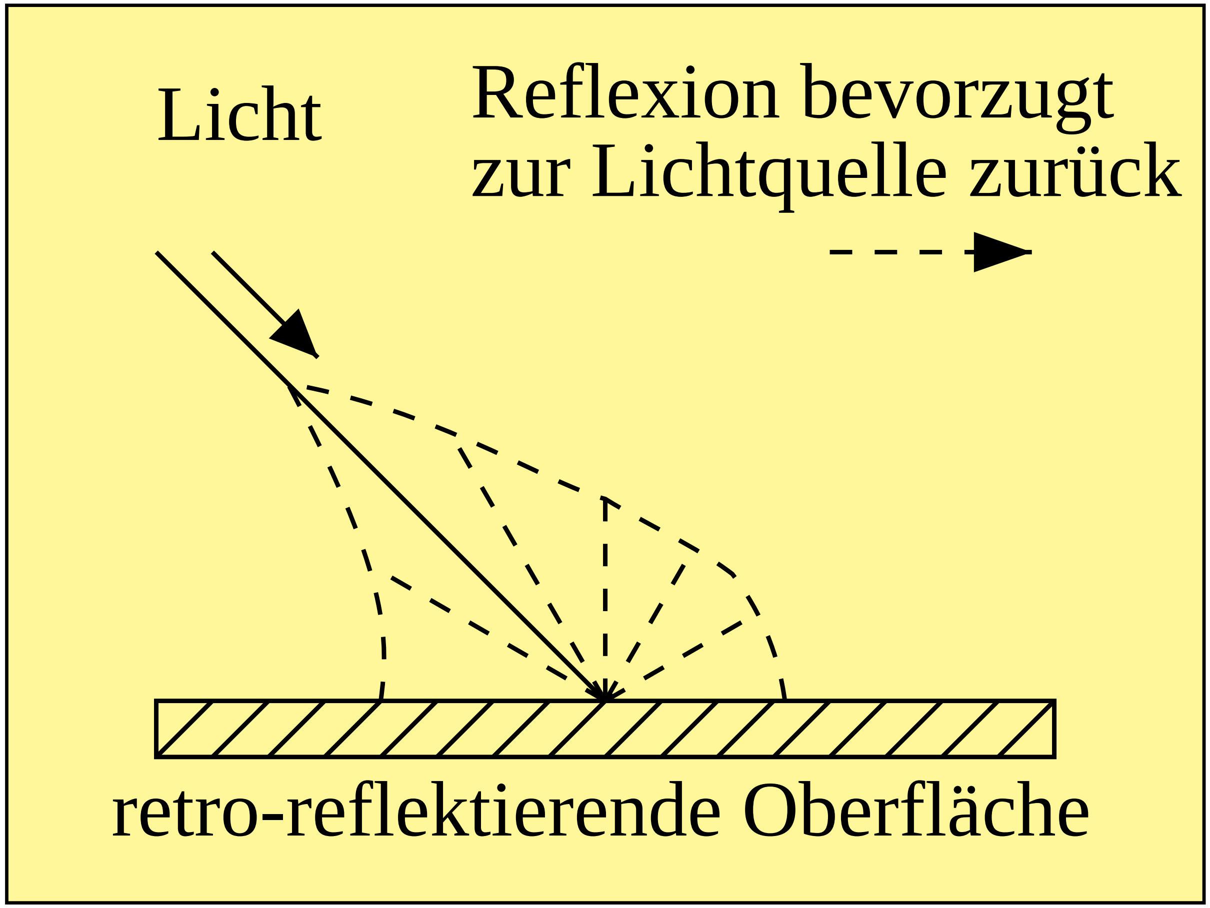

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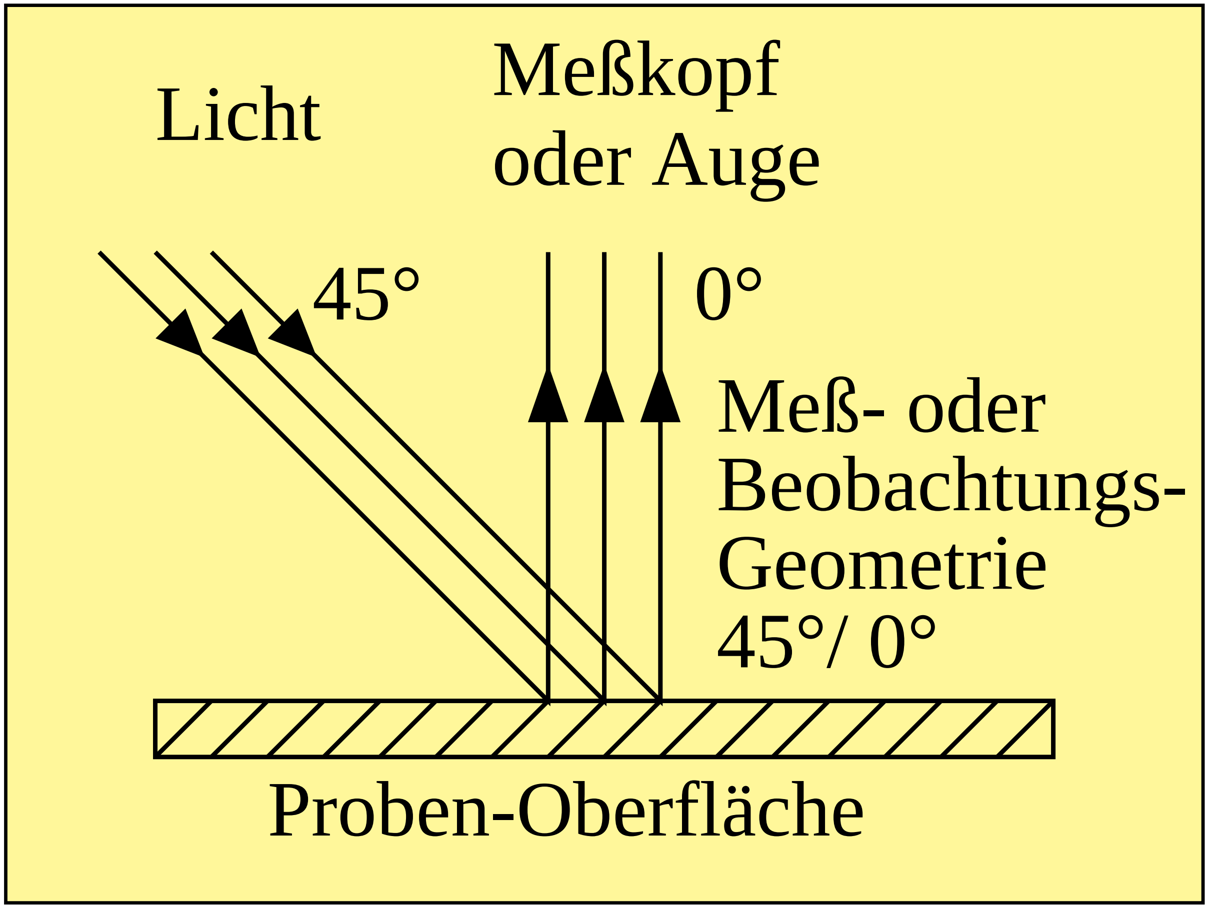

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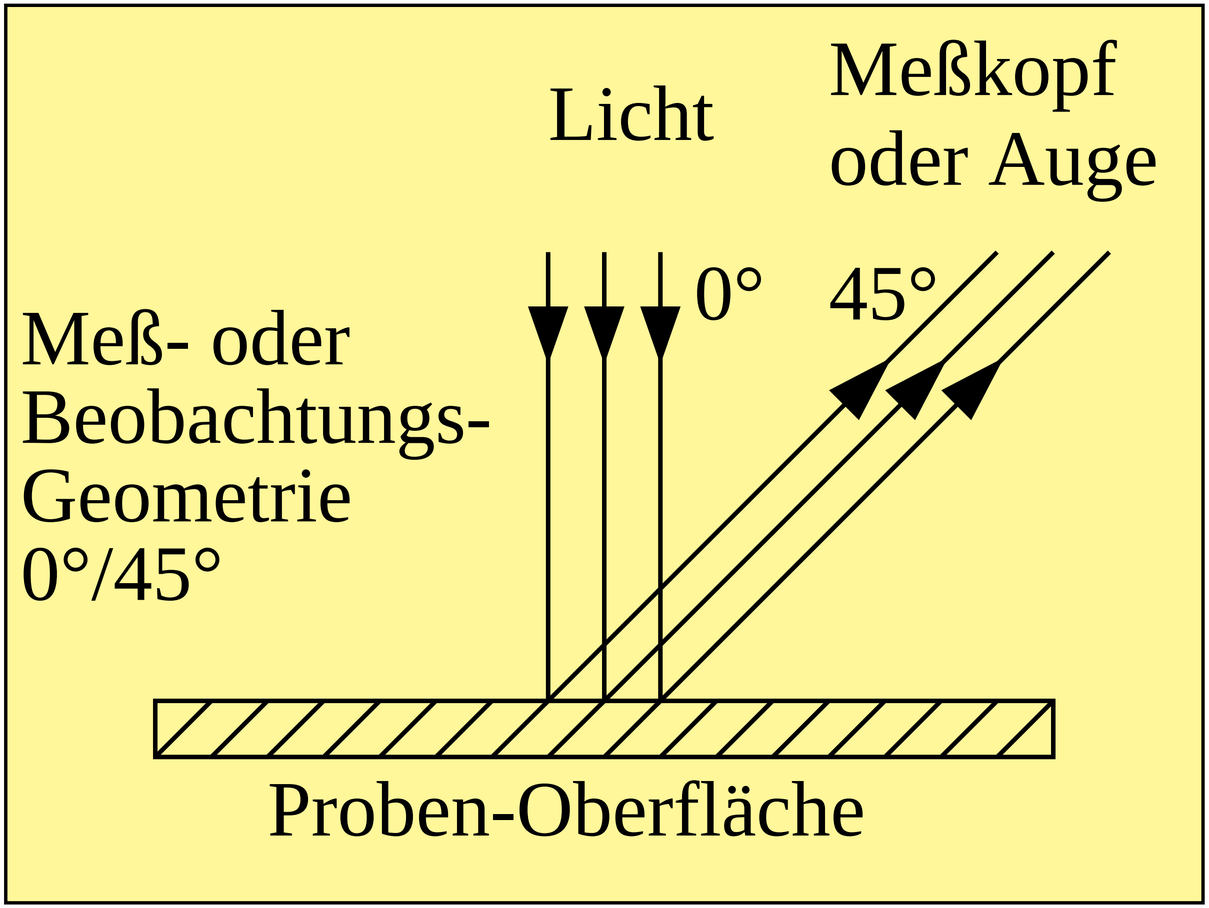

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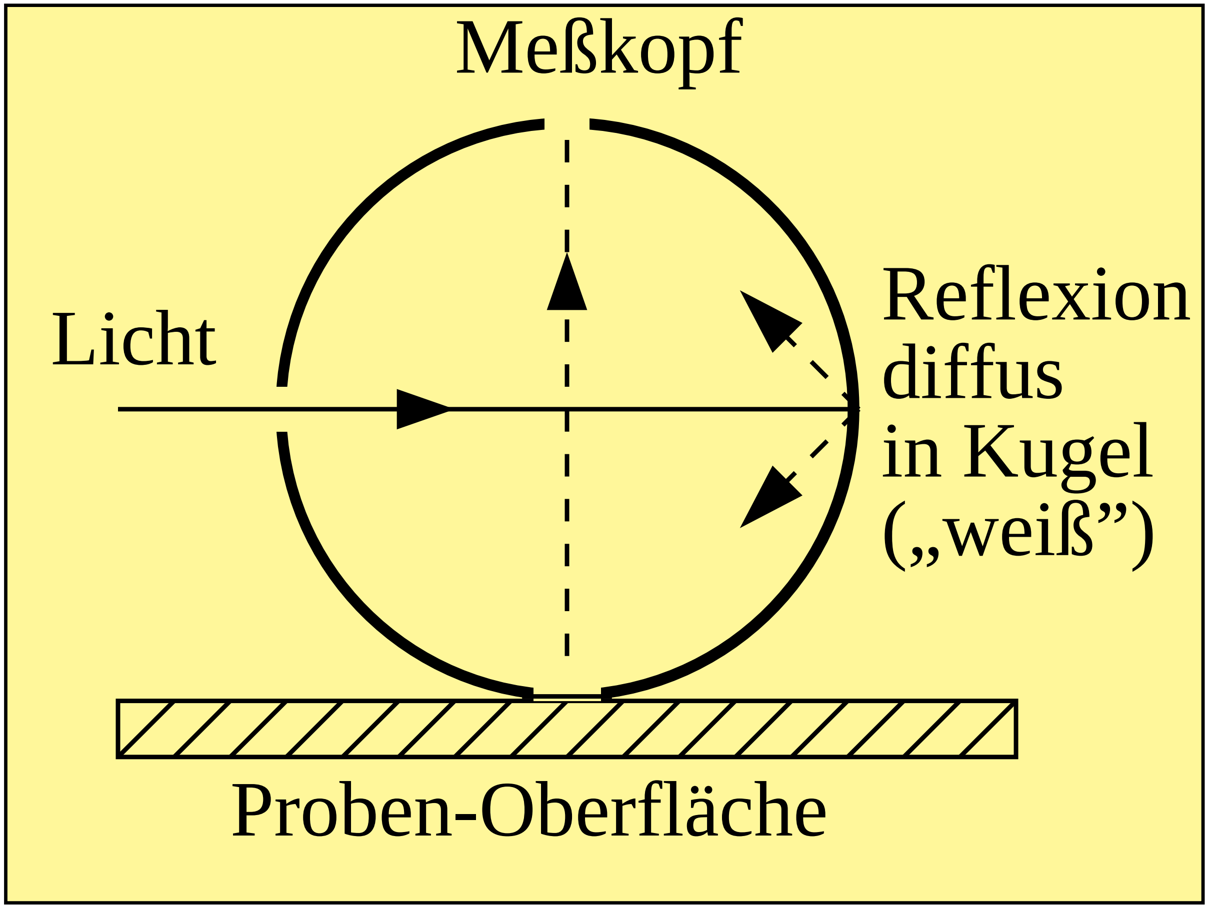

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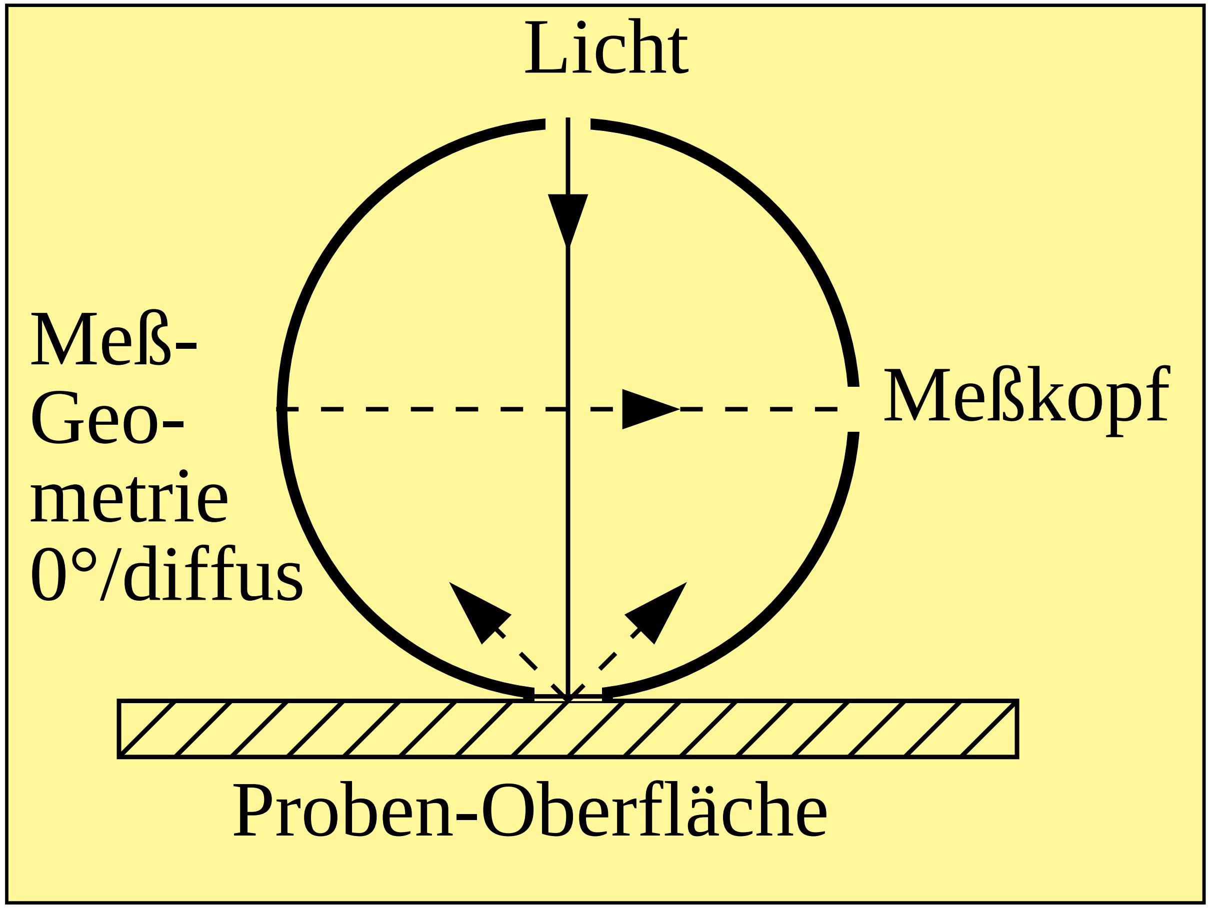

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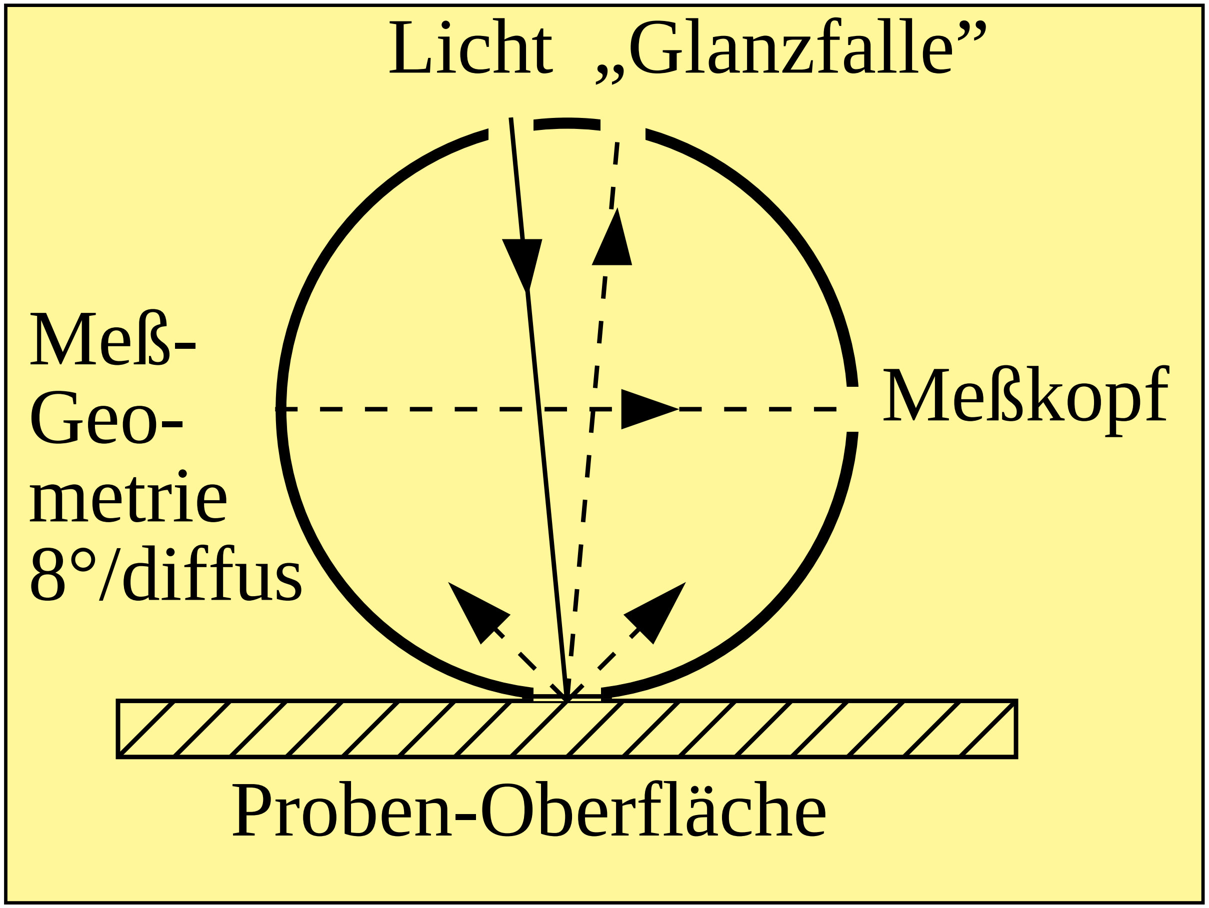

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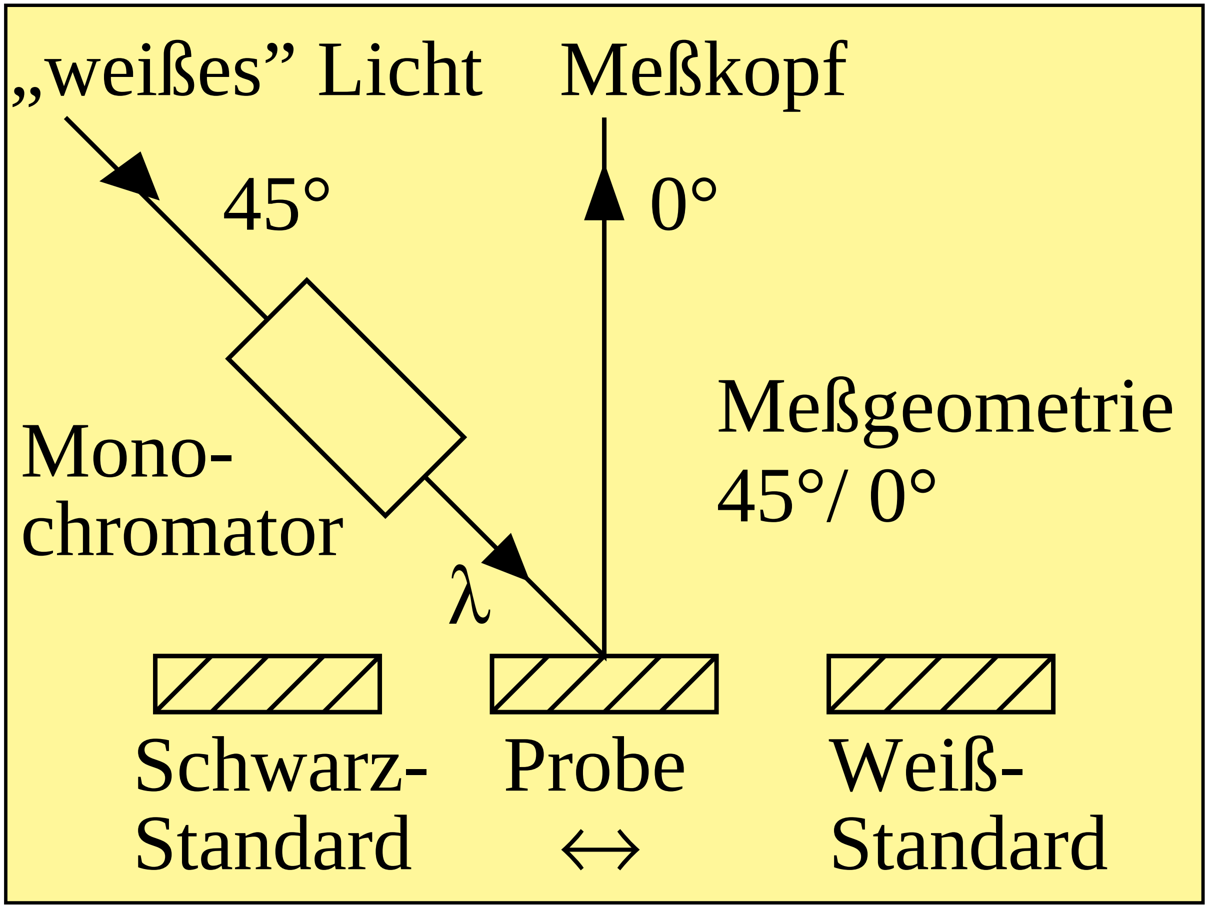

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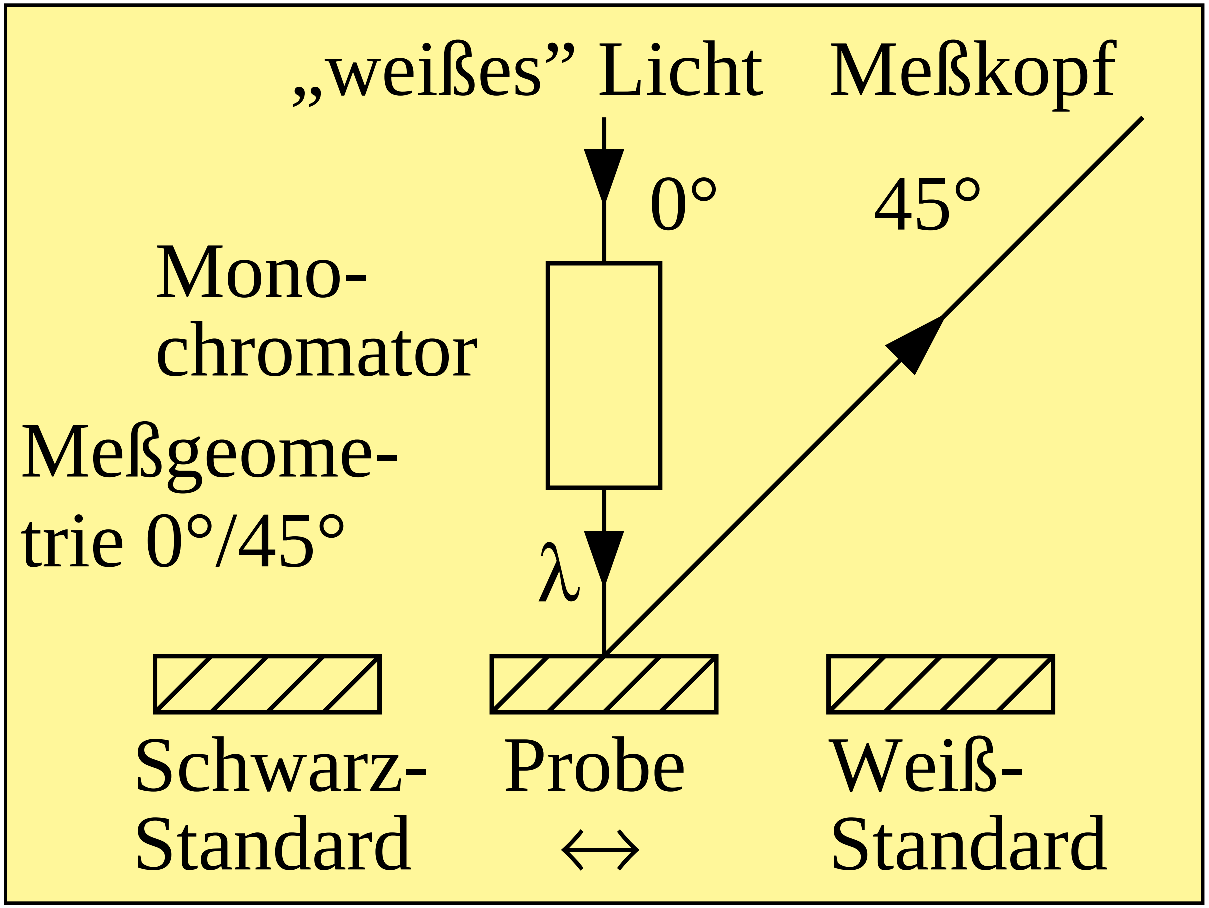

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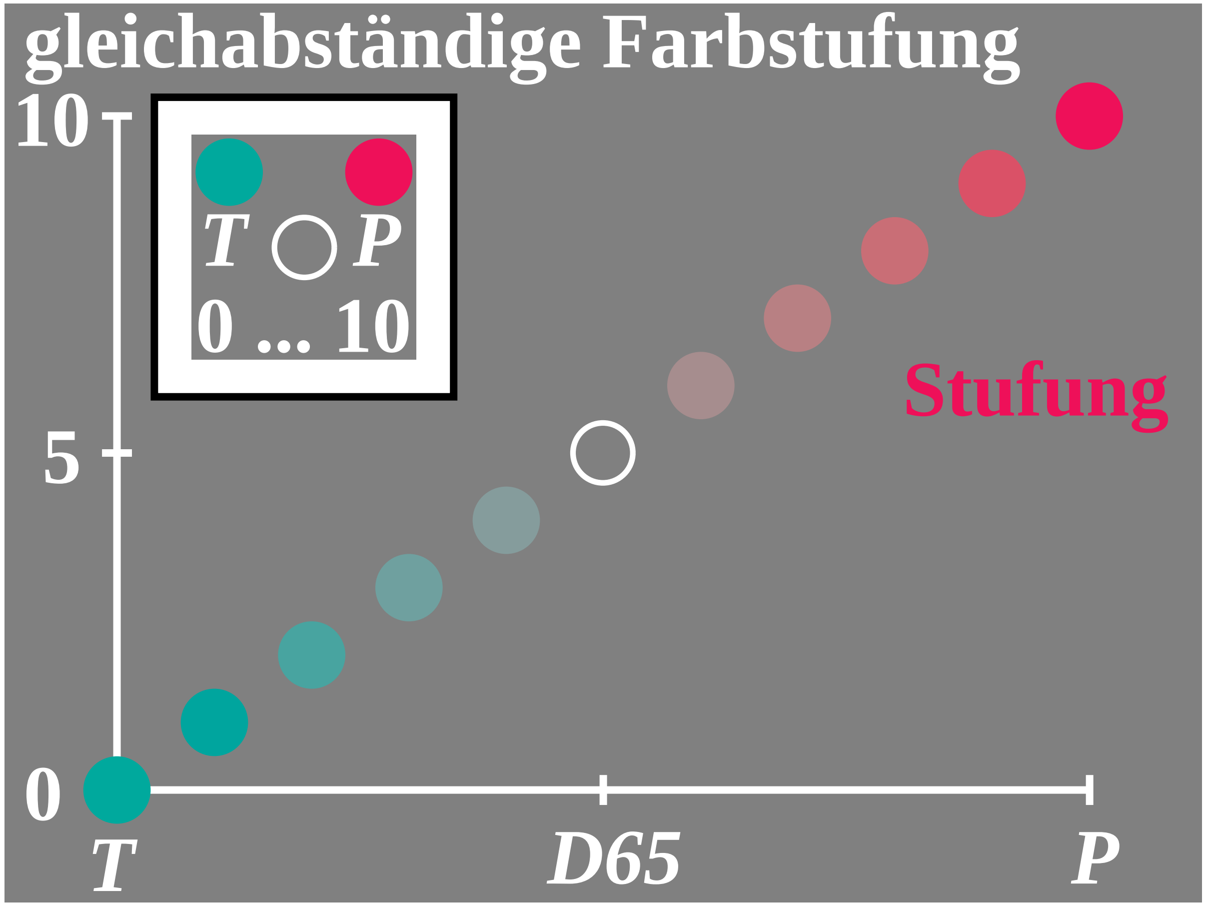

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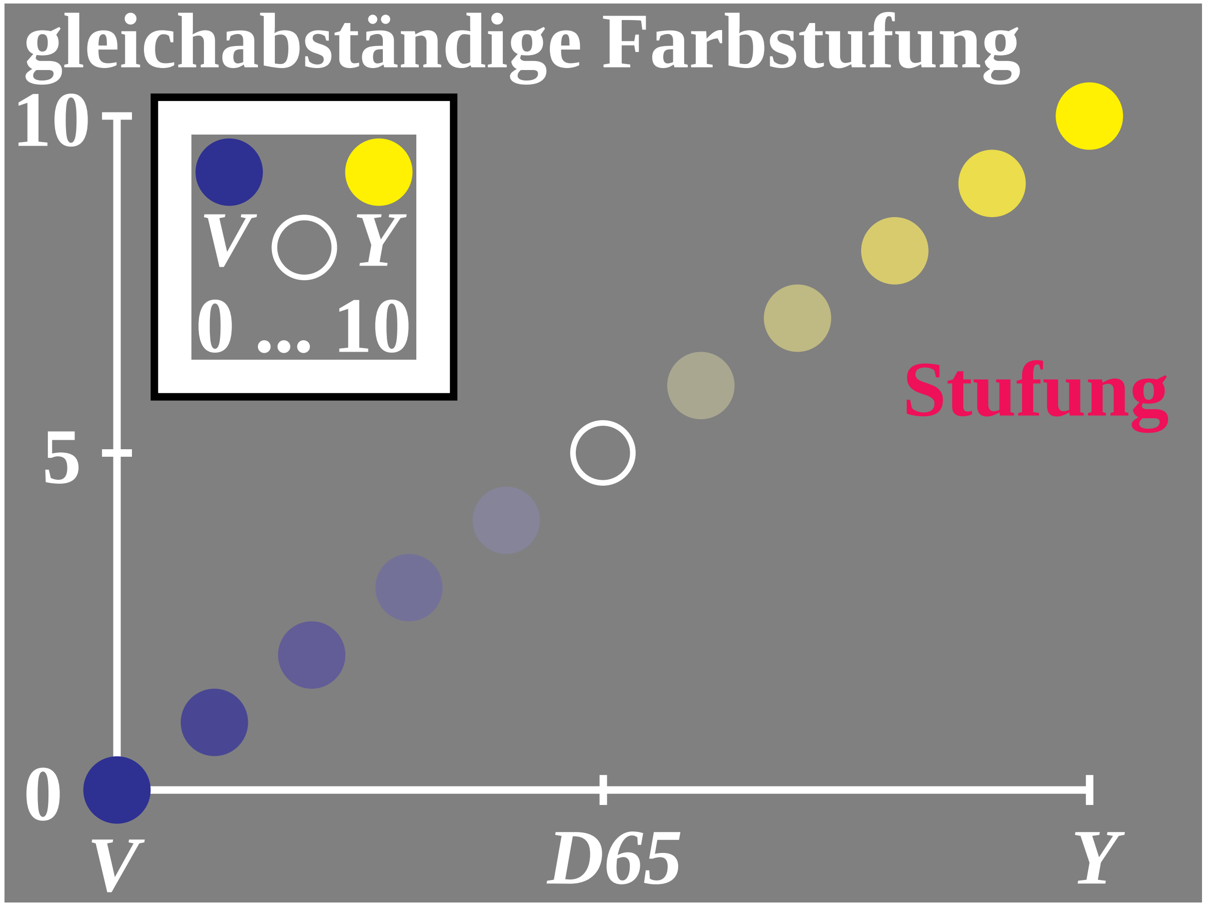

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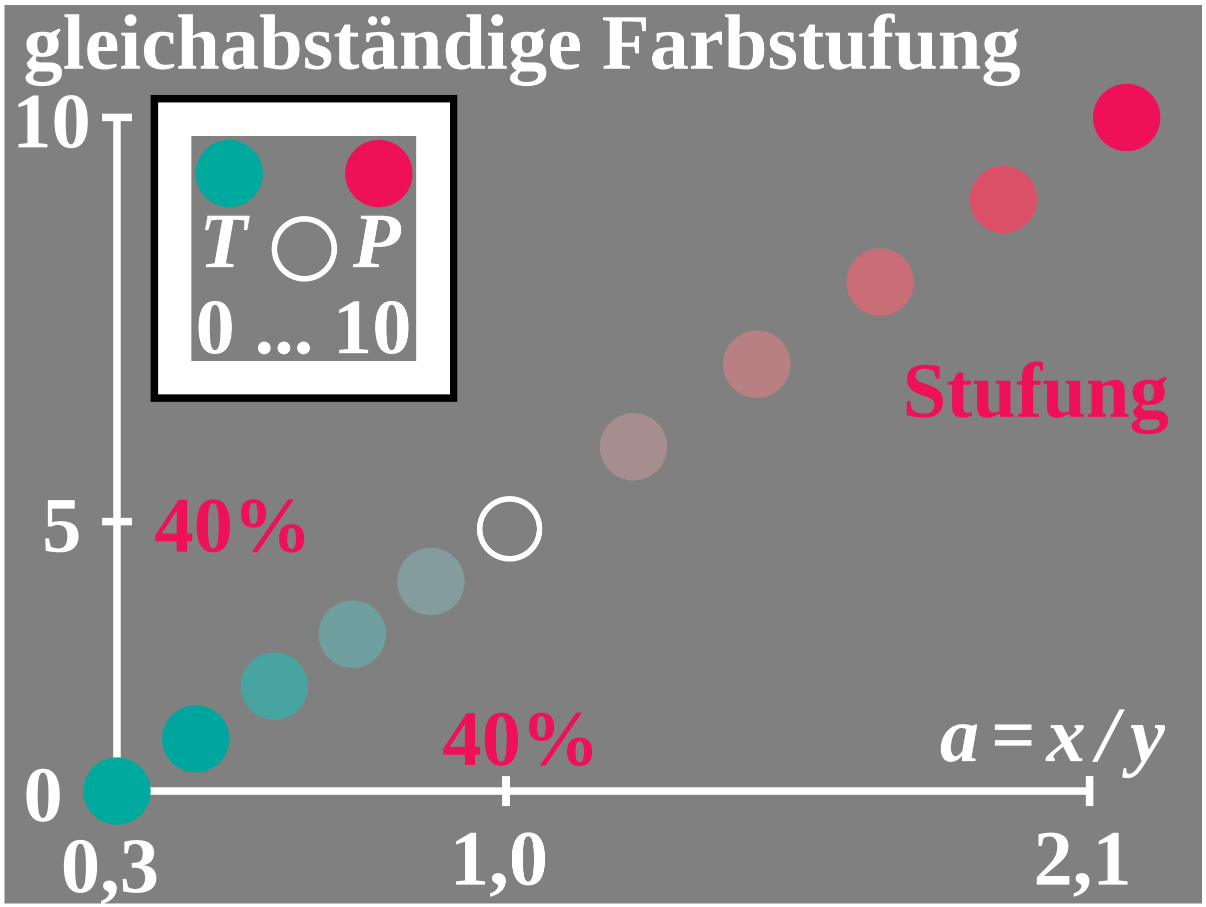

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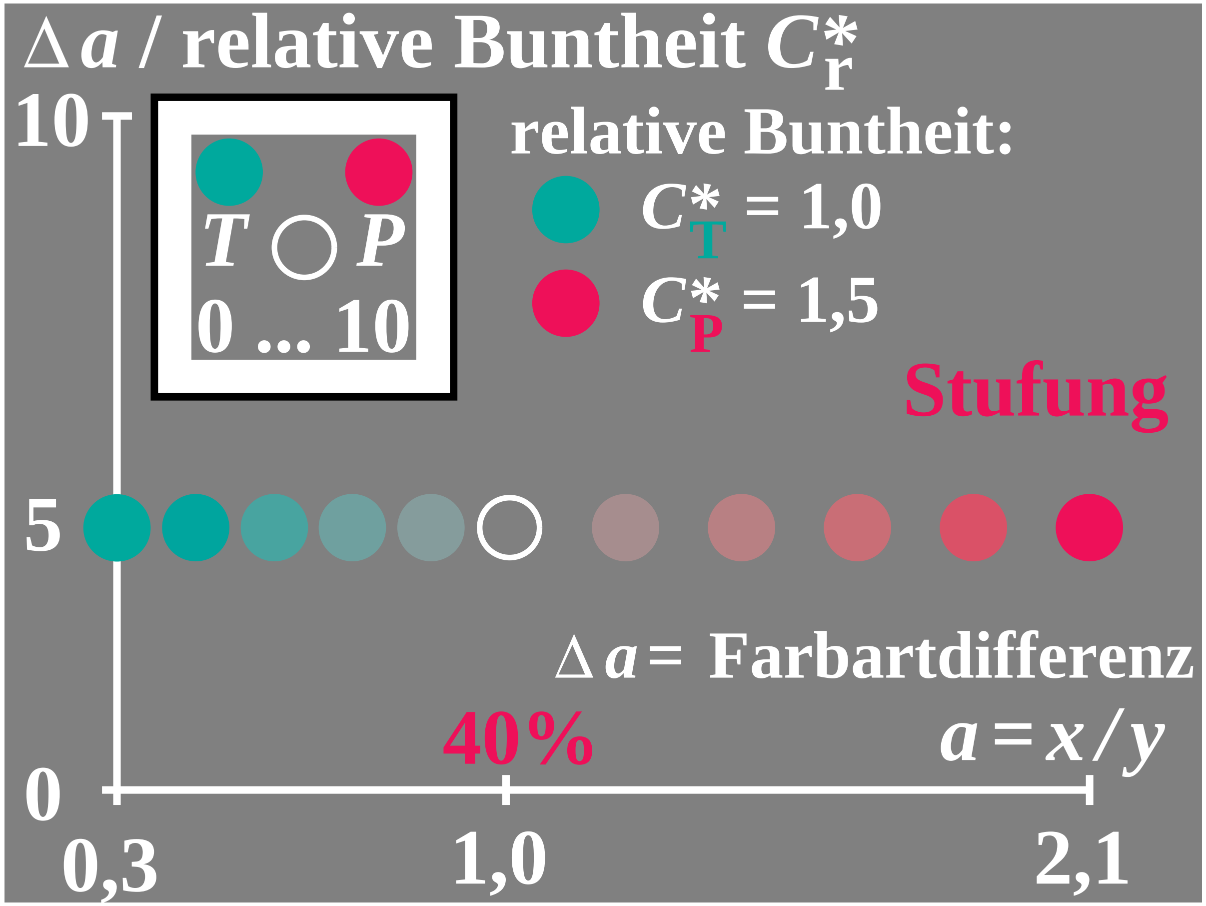

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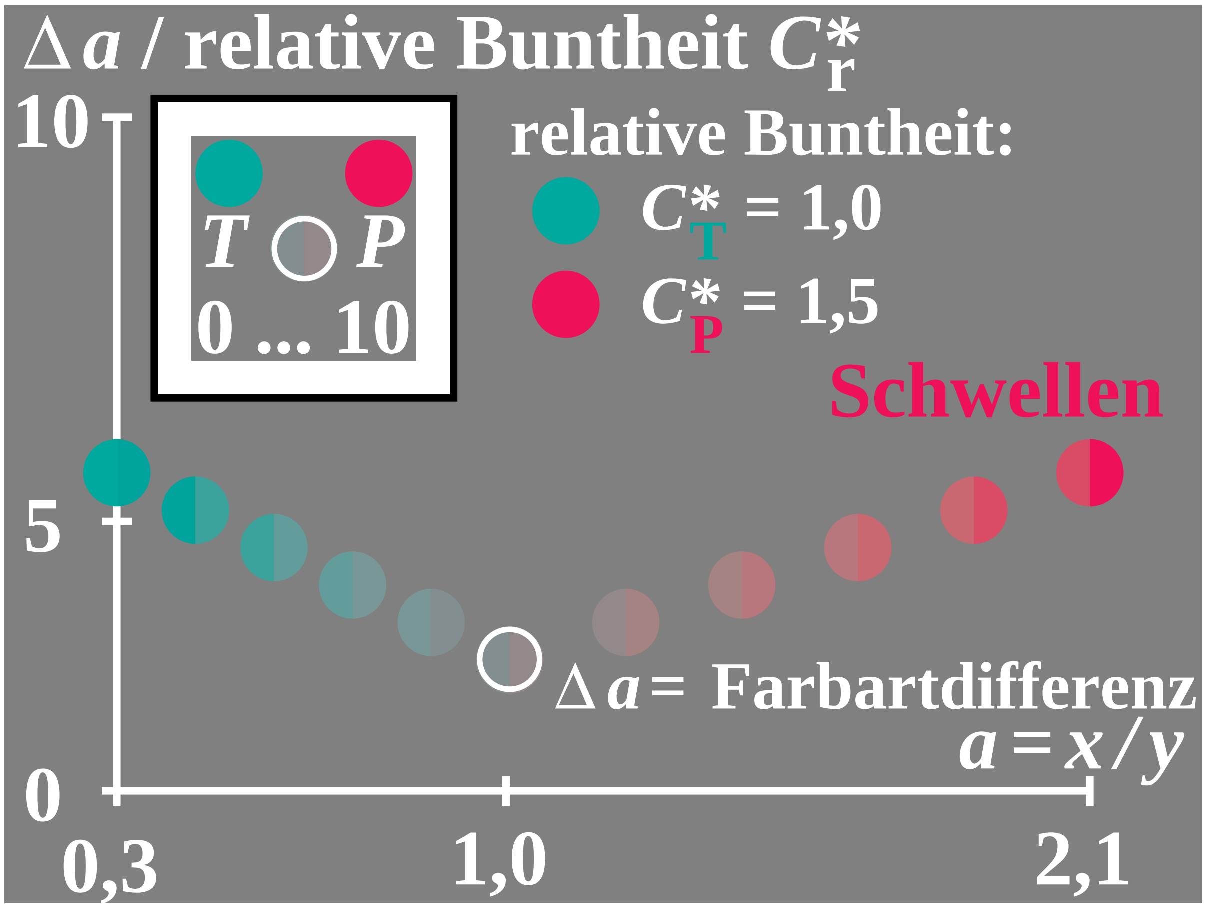

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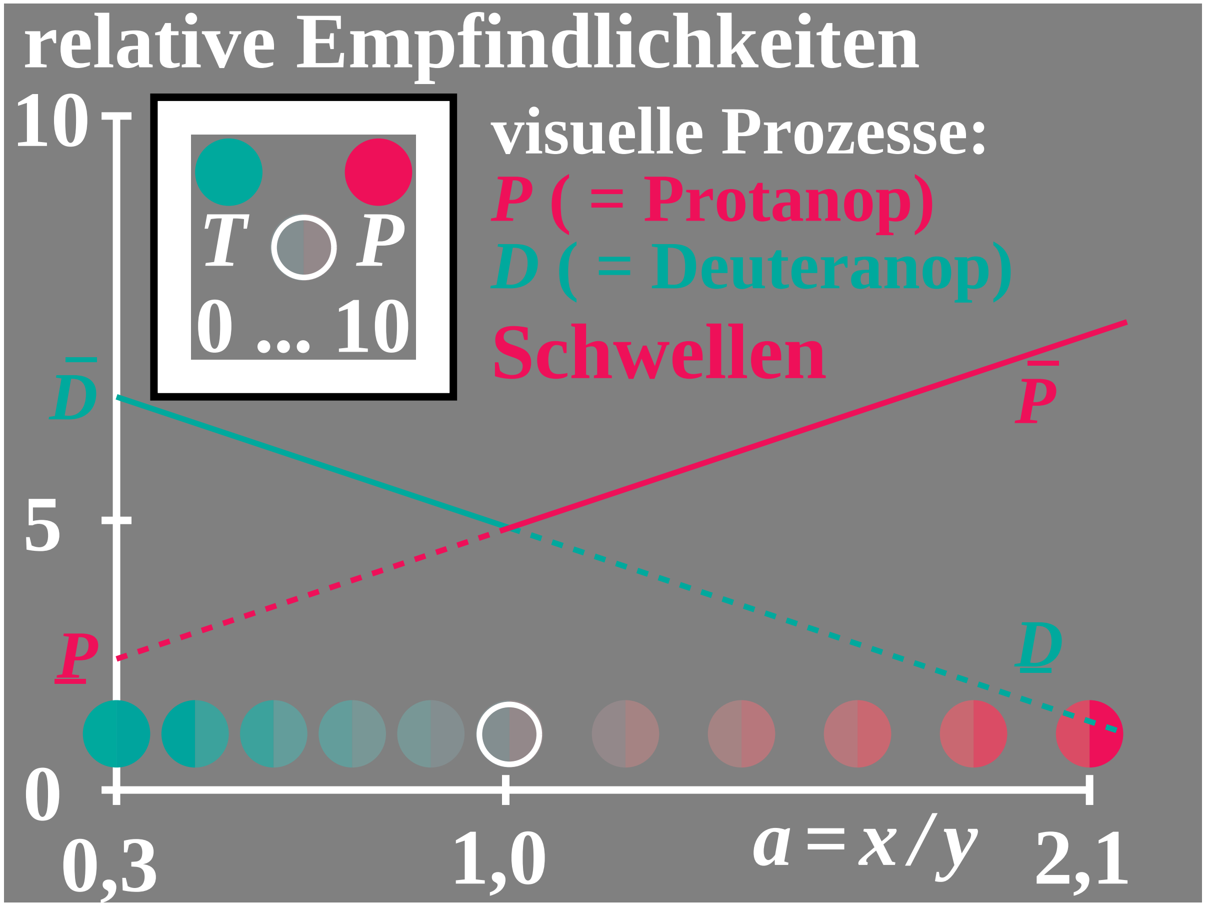

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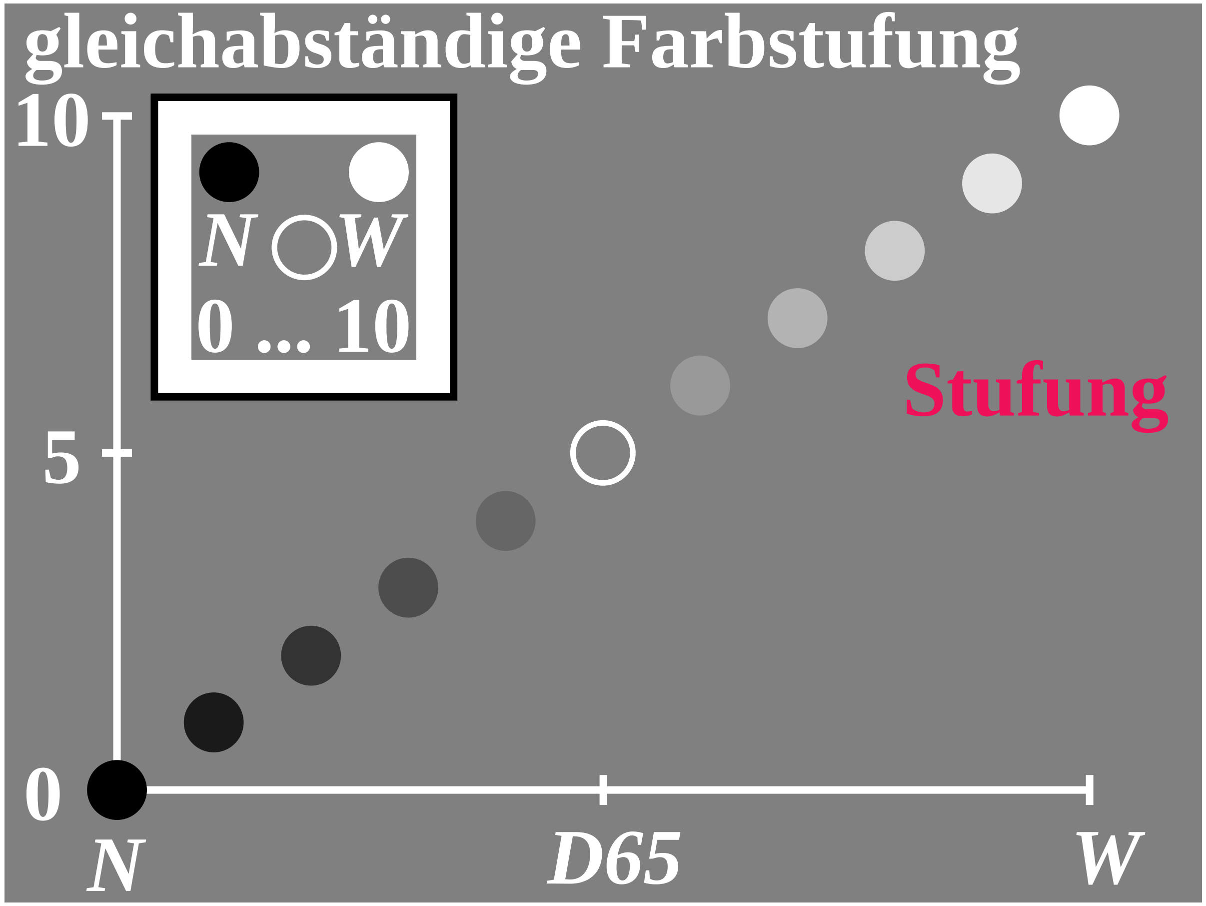

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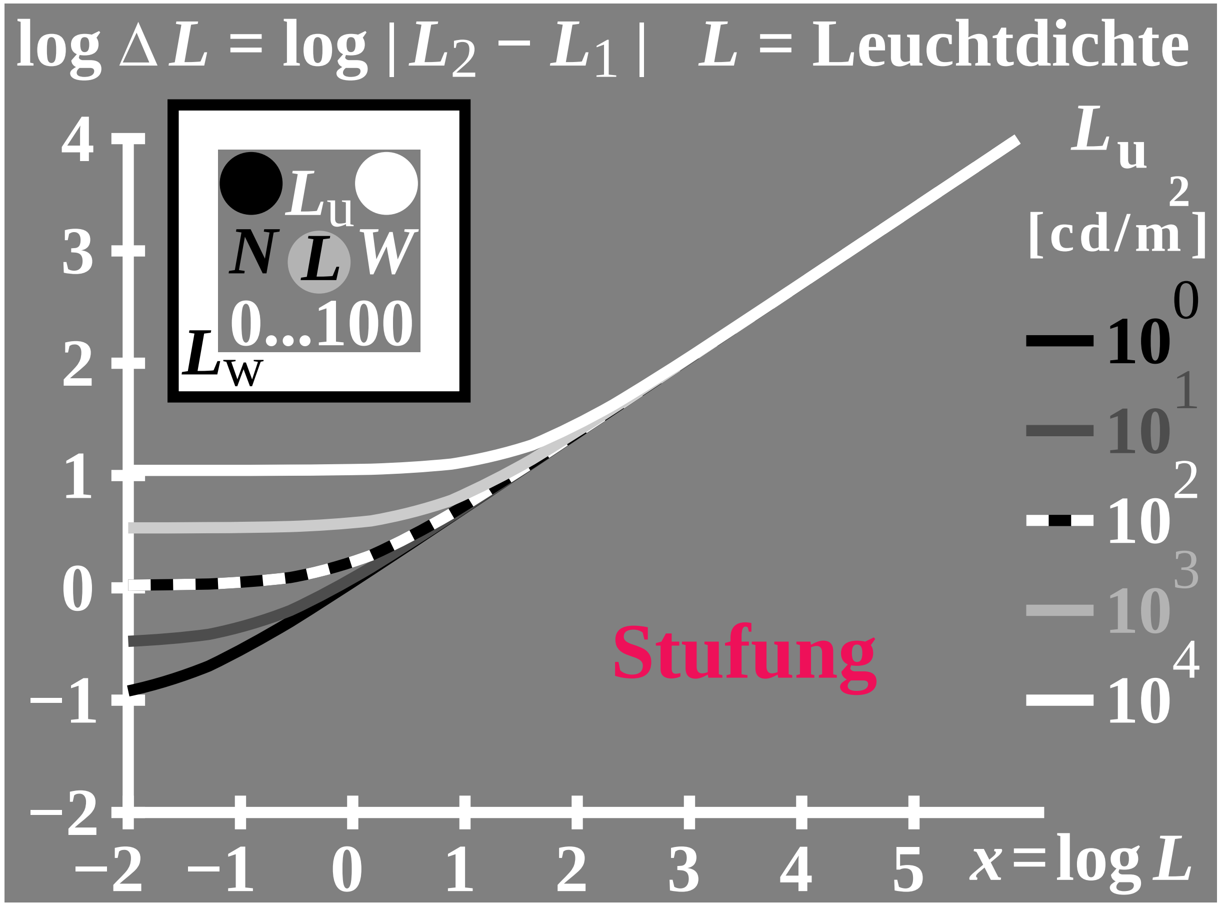

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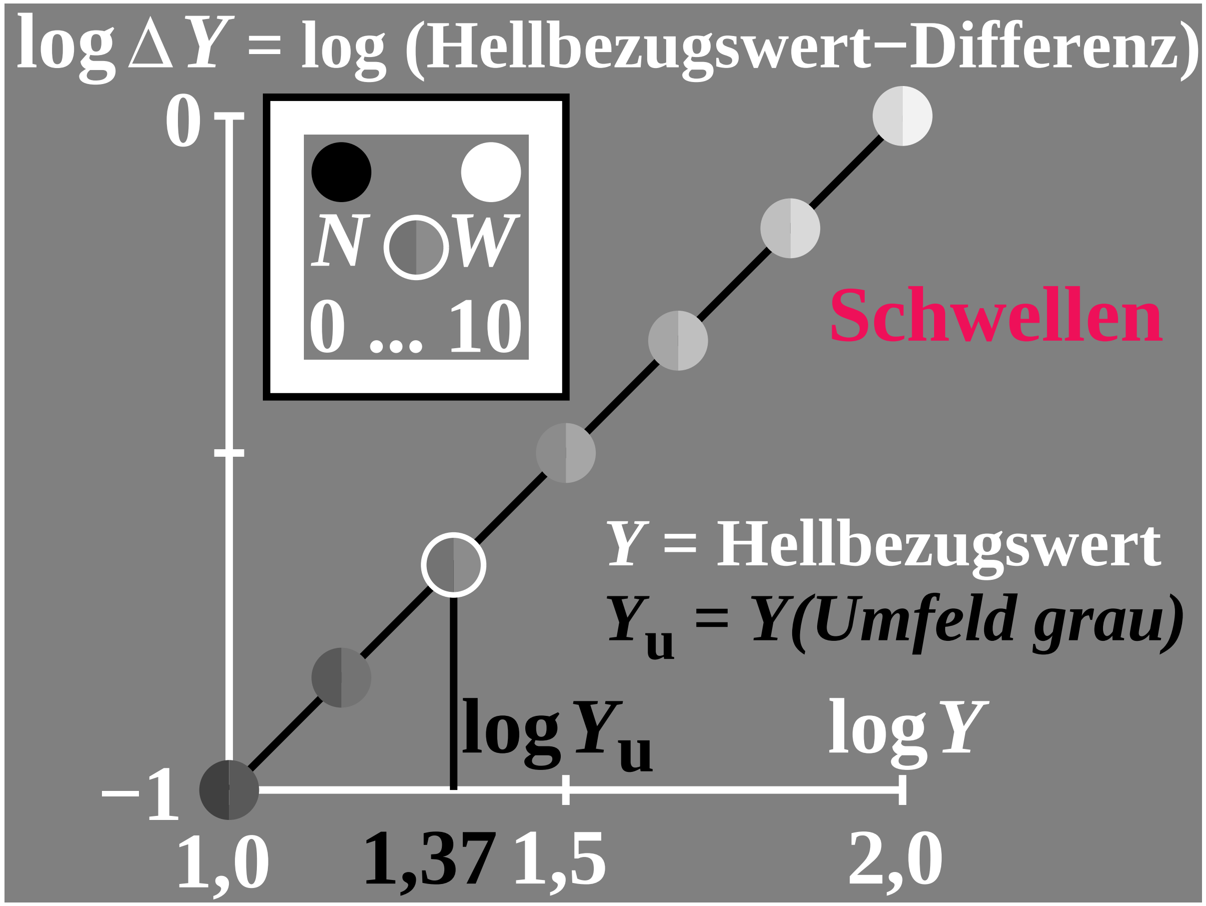

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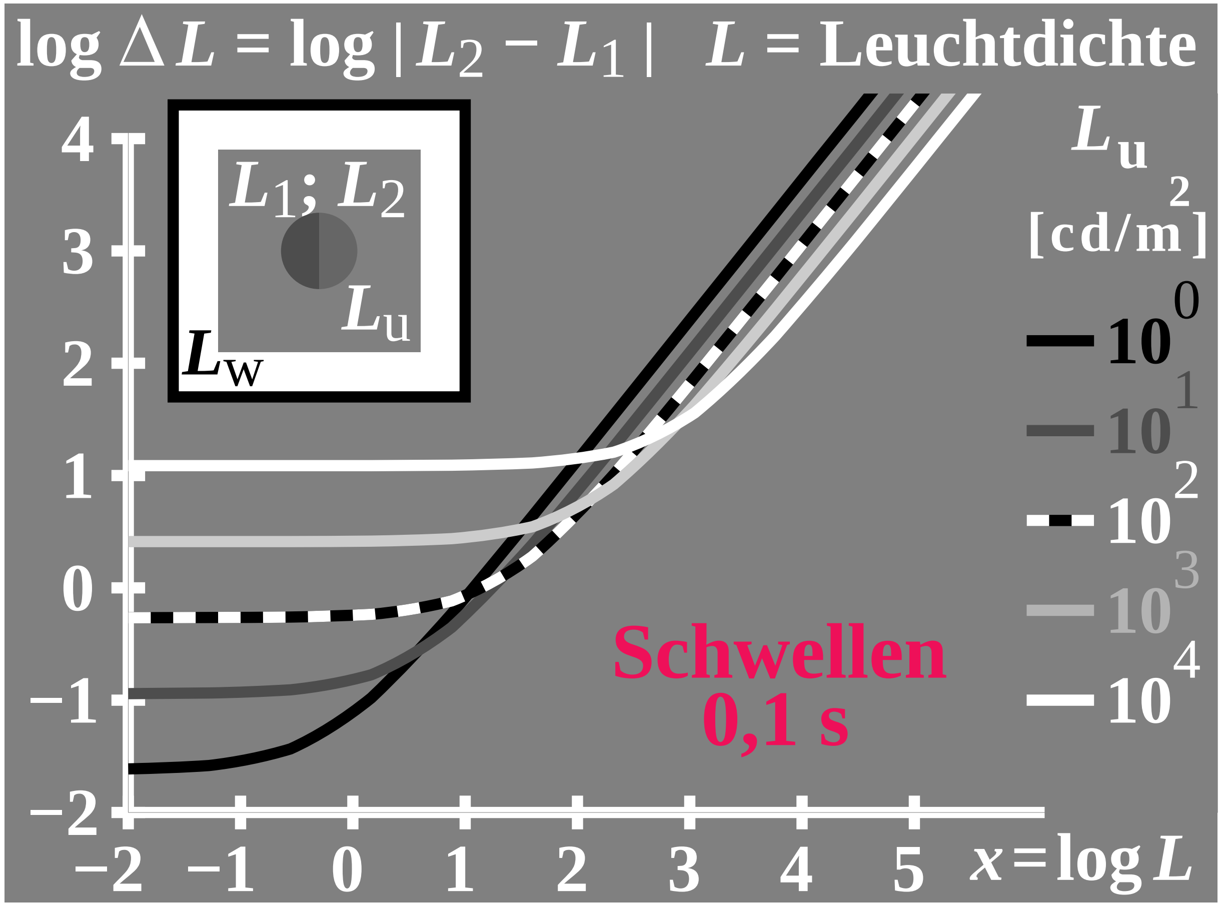

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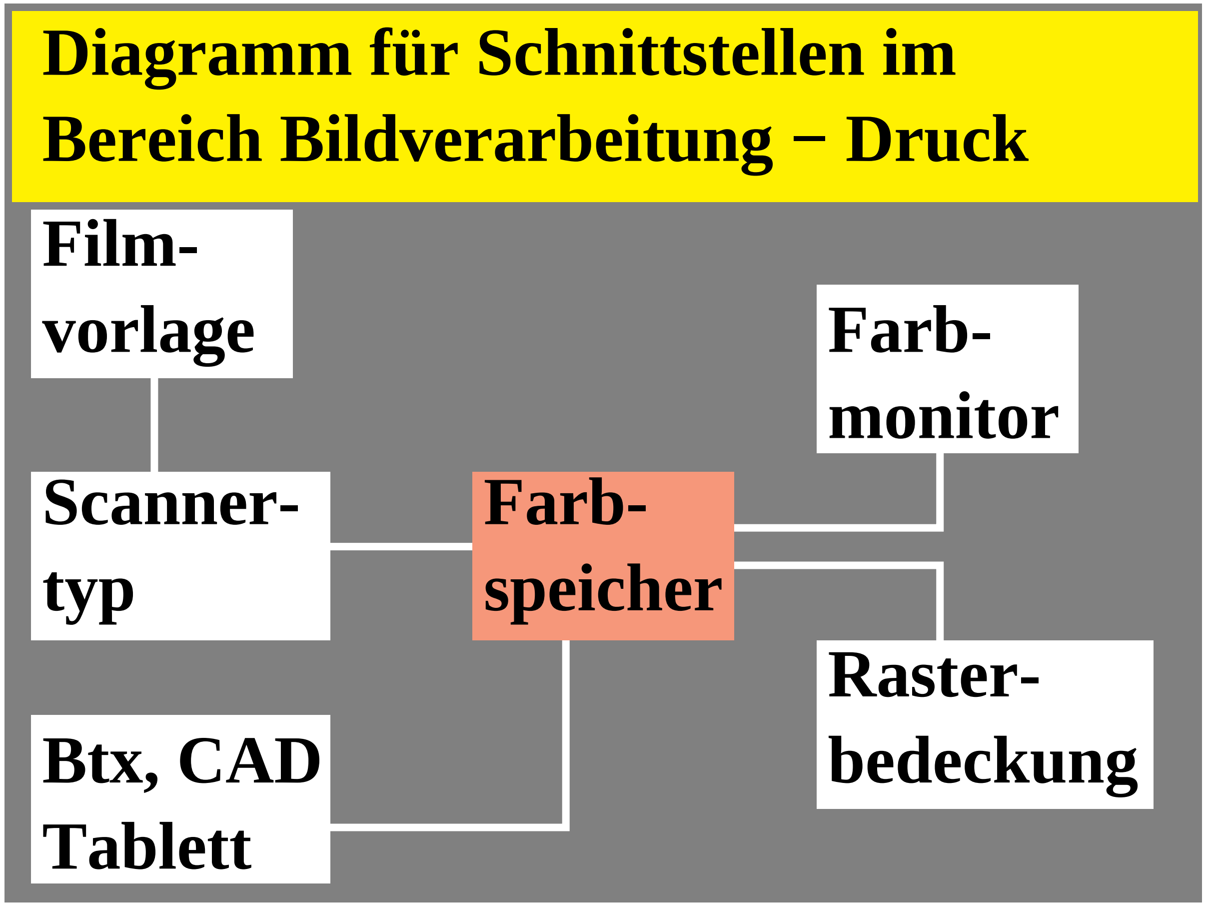


G8690_1f.eps, G0211_3f.eps, G4_11f.eps, Bild 4_11

Farbenraum CIELAB 1976, Farbwerte, -merkmale und -arten *(a', b')*

Normfarbwerte *X, Y, Z* –> Farbmerkmale *L*, a*, b**

Helligkeit	$L^* =$	$116\,(Y/Y_n)^{1/3} - 16$
RG-Buntheit	$a^* =$	$500\,[\,(X/X_n)^{1/3} - (Y/Y_n)^{1/3}\,] = 500\,[\,a' - a'_n]\,Y^{1/3}$
JB-Buntheit	$b^* =$	$200\,[\,(Y/Y_n)^{1/3} - (Z/Z_n)^{1/3}\,] = 500\,[\,b' - b'_n]\,Y^{1/3}$

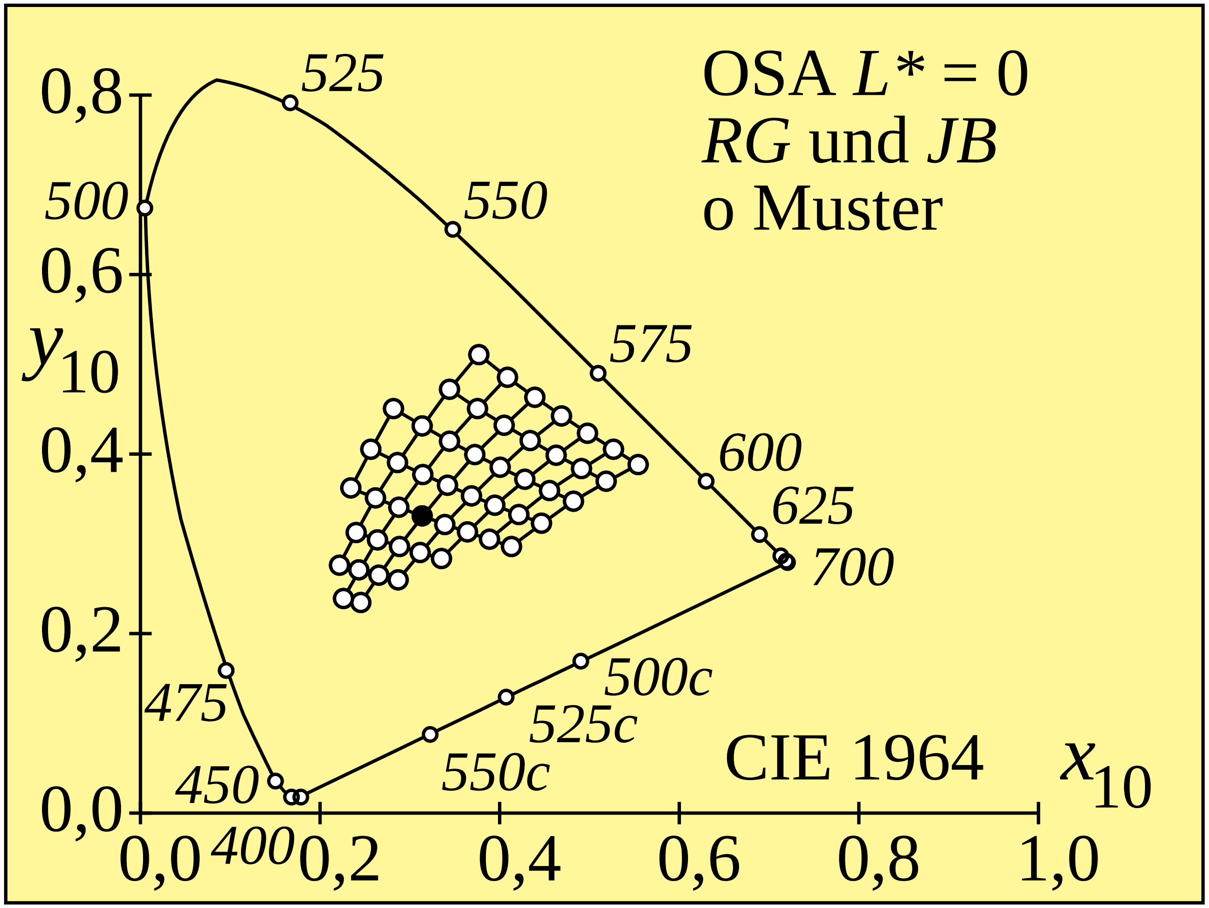
Farbmerkmale *L*, a*, b –> Normfarbwerte *X, Y, Z***

Normfarbwerte	$X =$	$X_n\,[\,(L^* + 16) / 116 + a^*/500\,]^3$
	$Y =$	$Y_n\,[\,(L^* + 16) / 116\,]^3$
	$Z =$	$Z_n\,[\,(L^* + 16) / 116 - b^*/200\,]^3$

Farbarten für CIELAB 1976, LABHNU 1977, LABHNU1 1979

CIELAB 1976, 2^o	$a' = 0{,}2191\,(x/y)^{1/3}$		$b' = -\,0{,}08376\,(z/y)^{1/3}$
LABHNU 1977	$a' = (x/y + 1/6)^{1/3} / 4$		$b' = -\,(z/y + 1/6)^{1/3} / 12$
LABHNU1 1979	$a' = (x/y + 1) / 15$	*linear!*	$b' = -\,(z/y + 1/6)^{1/3} / 12$
LABHNU2 1979	$a' = (x/y + 1/6)^{2/3} / 15$		$b' = -\,(z/y + 1/6)^{1/3} / 12$
CIELAB 1976, 10^o	$a' = 0{,}2193\,(x_{10} / y_{10})^{1/3}$		$b' = -\,0{,}08417\,(z_{10} / y_{10})^{1/3}$
Farbart-Konstanten	$a_2 = 500\,(1/X_n)^{1/3} = 0{,}2191$		$b_2 = -\,200\,(1/Z_n)^{1/3} = -\,0{,}08376$
CIELAB, 2^o,10^o	$a_{10} = 500\,(1/X_{n10})^{1/3} = 0{,}2193$		$b_{10} = -\,200\,(1/Z_{n10})^{1/3} = -\,0{,}08417$

G8190_3f.eps, G0270_3f.eps, G4_12f.eps, Bild 4_12 2x2



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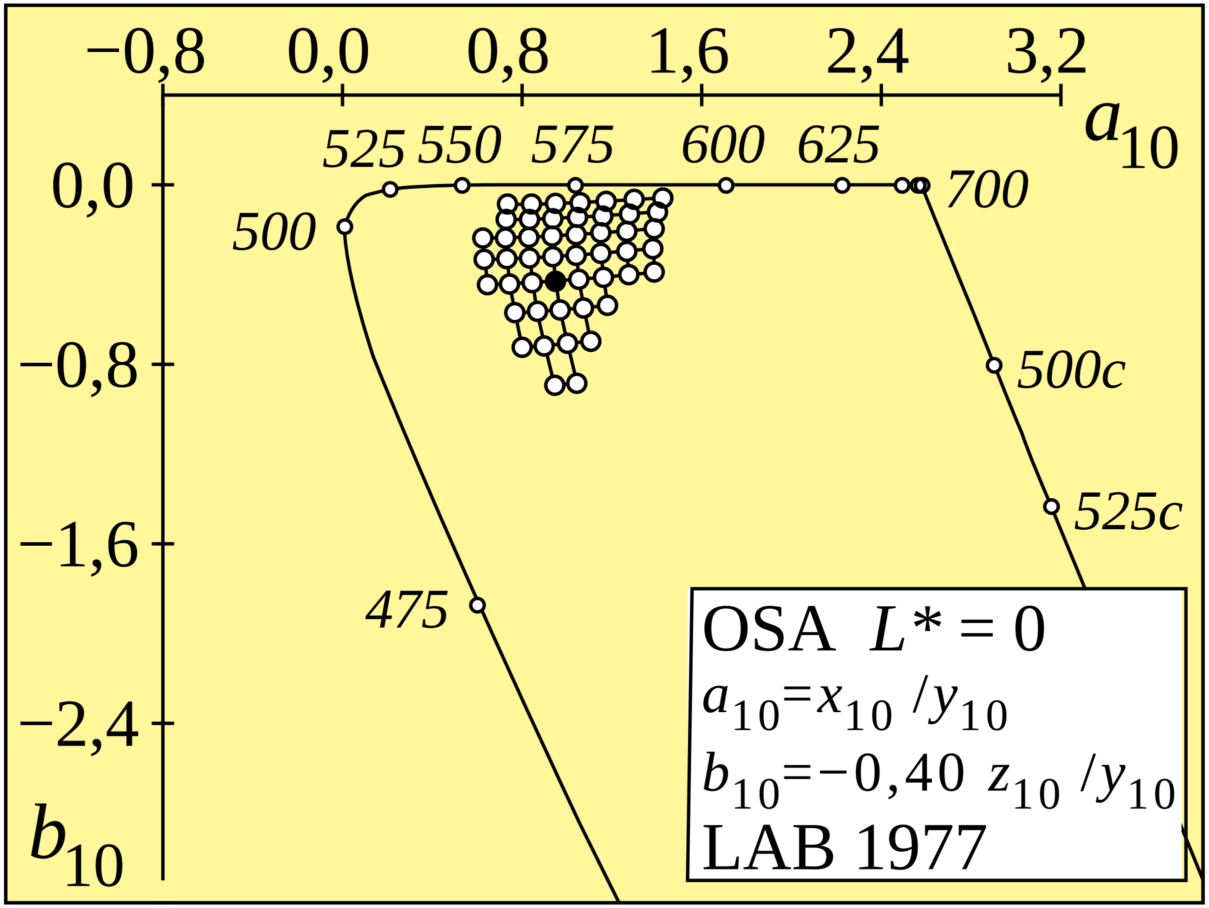

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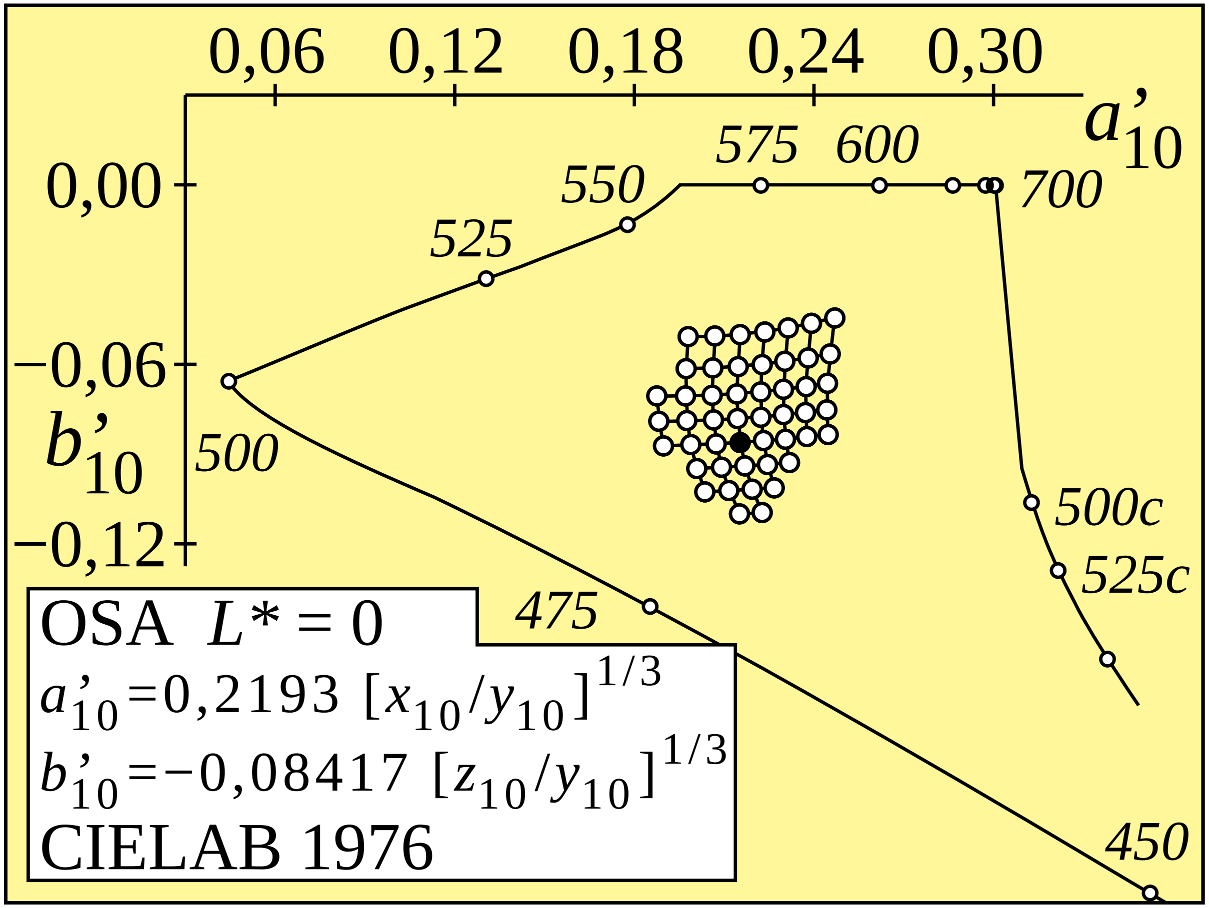

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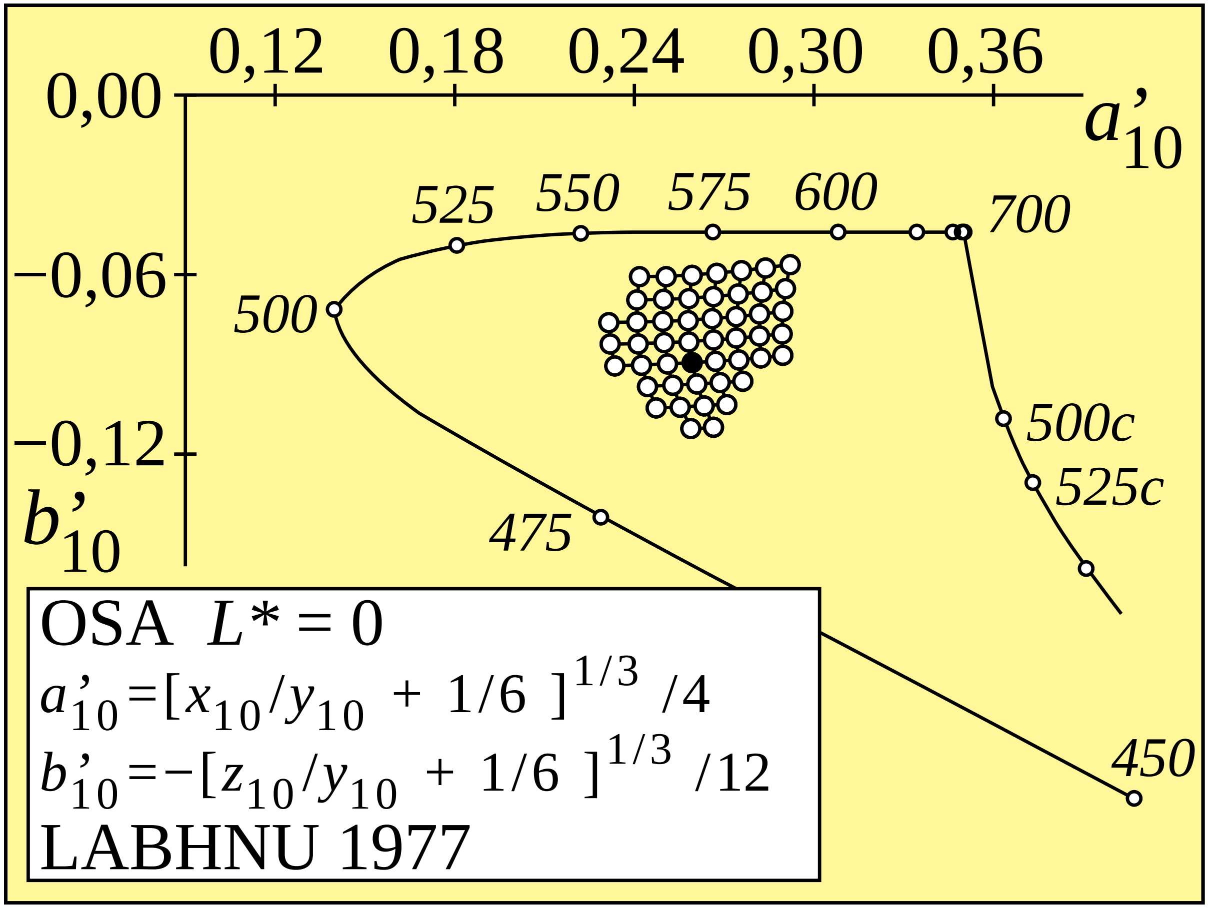

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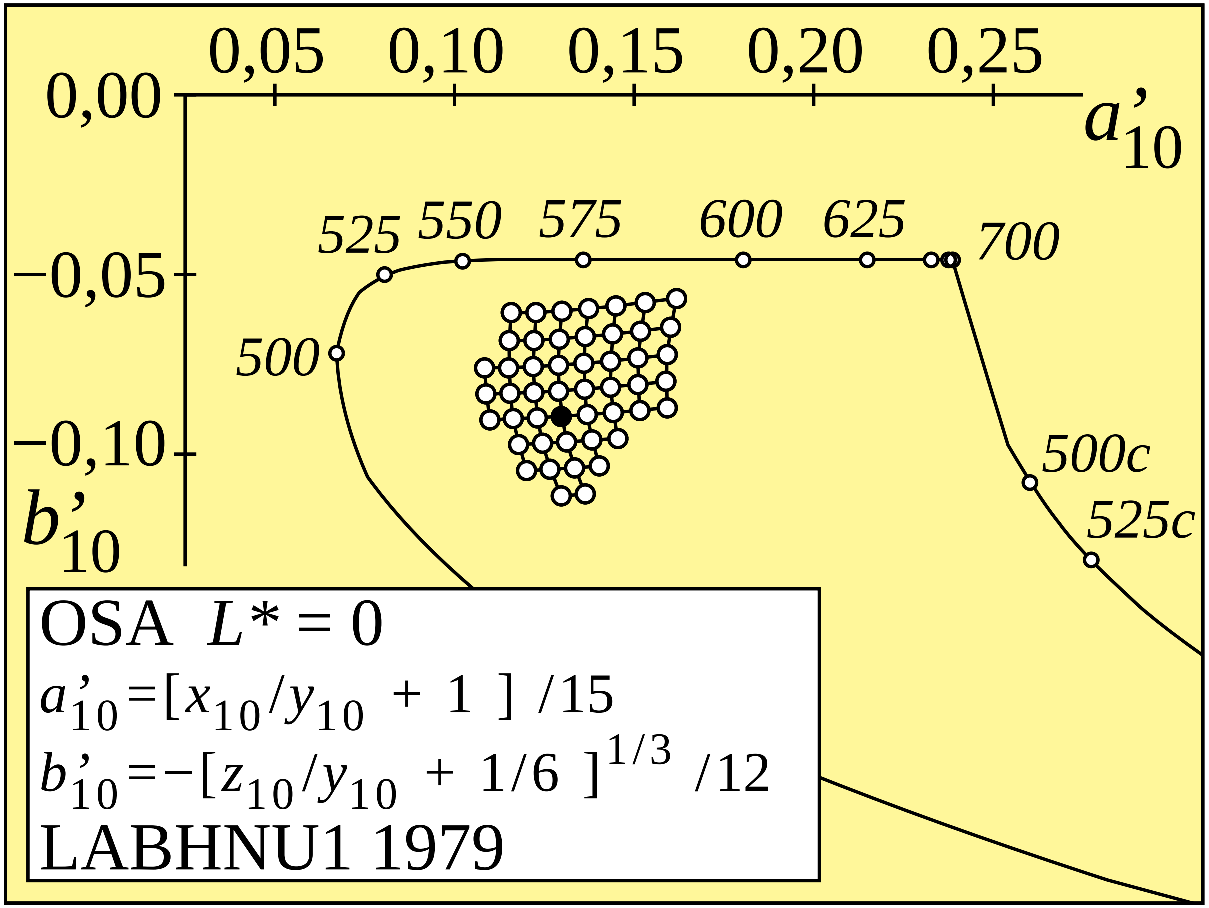

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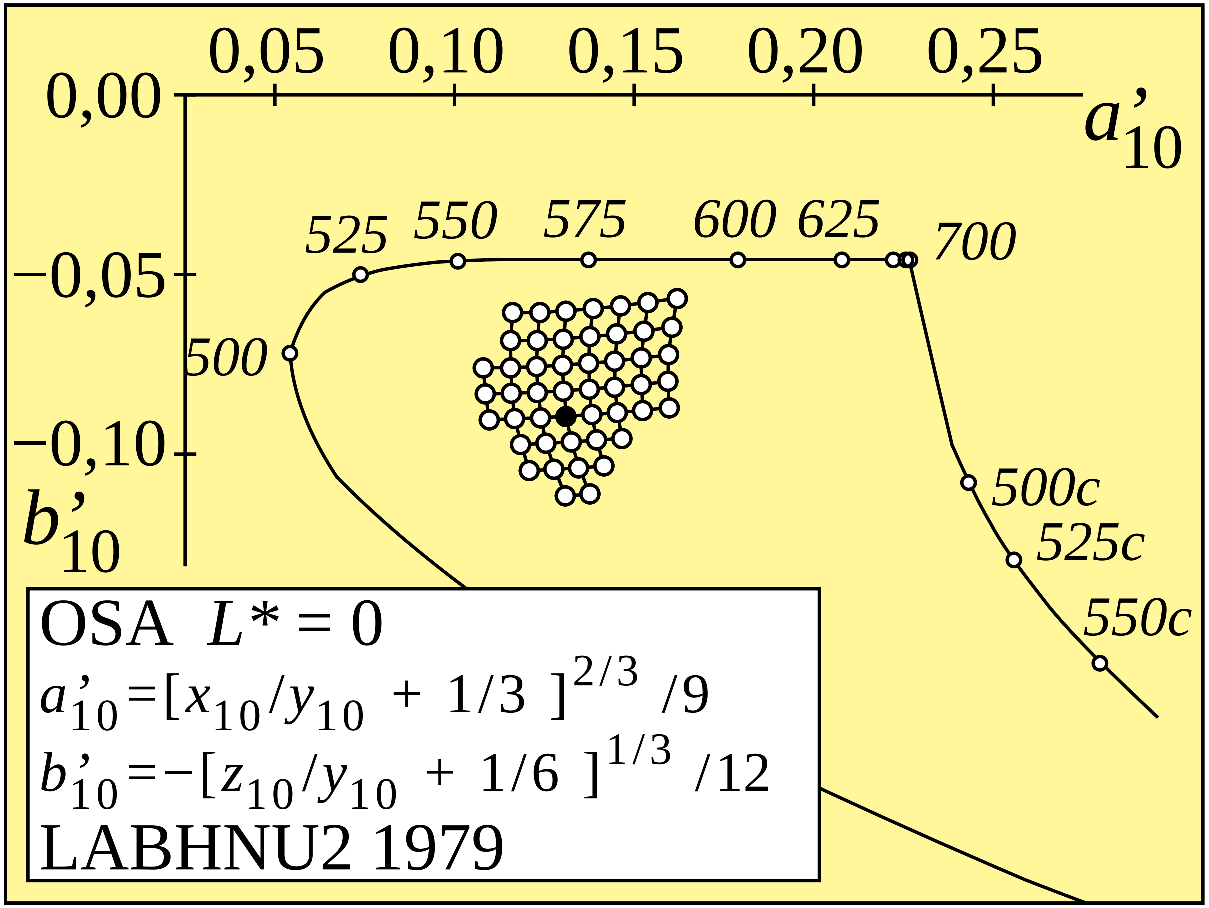

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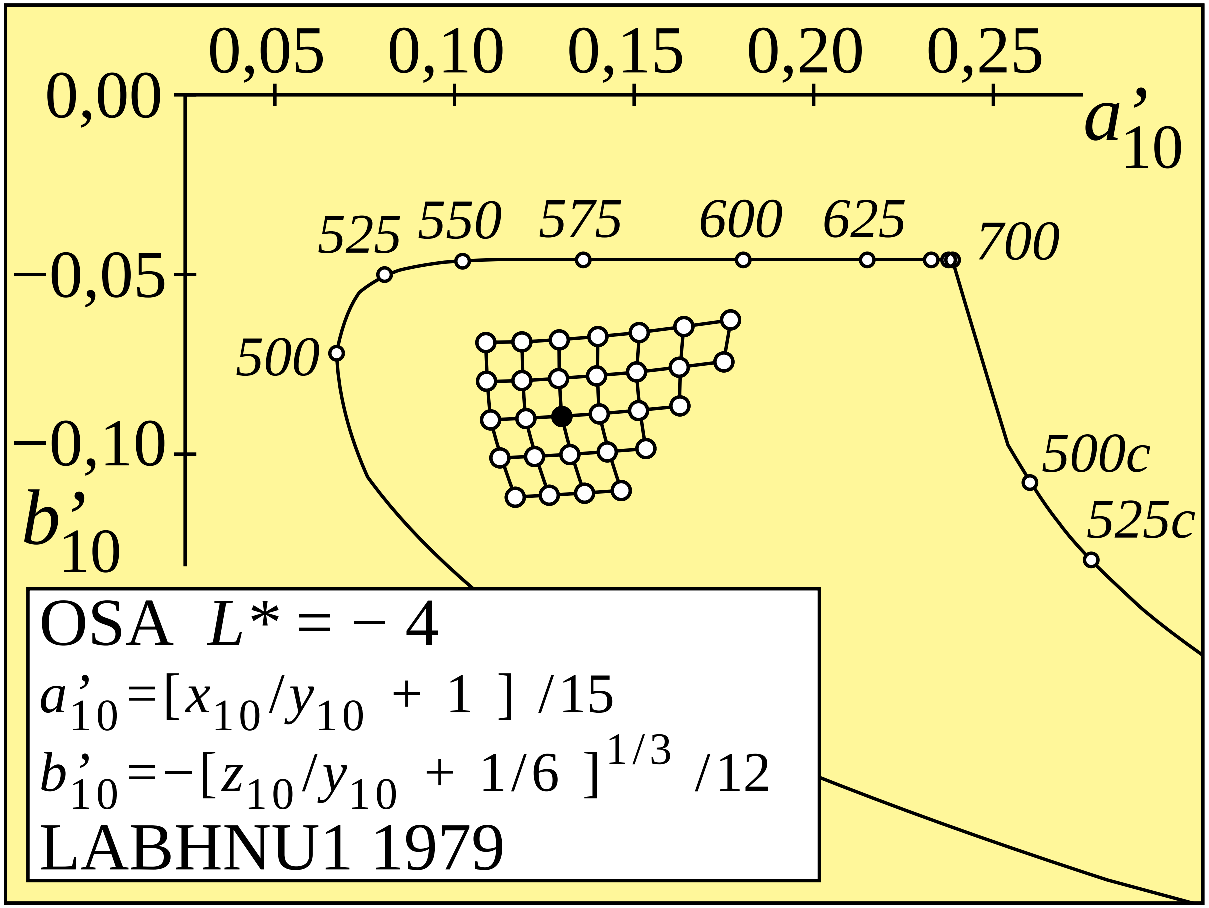

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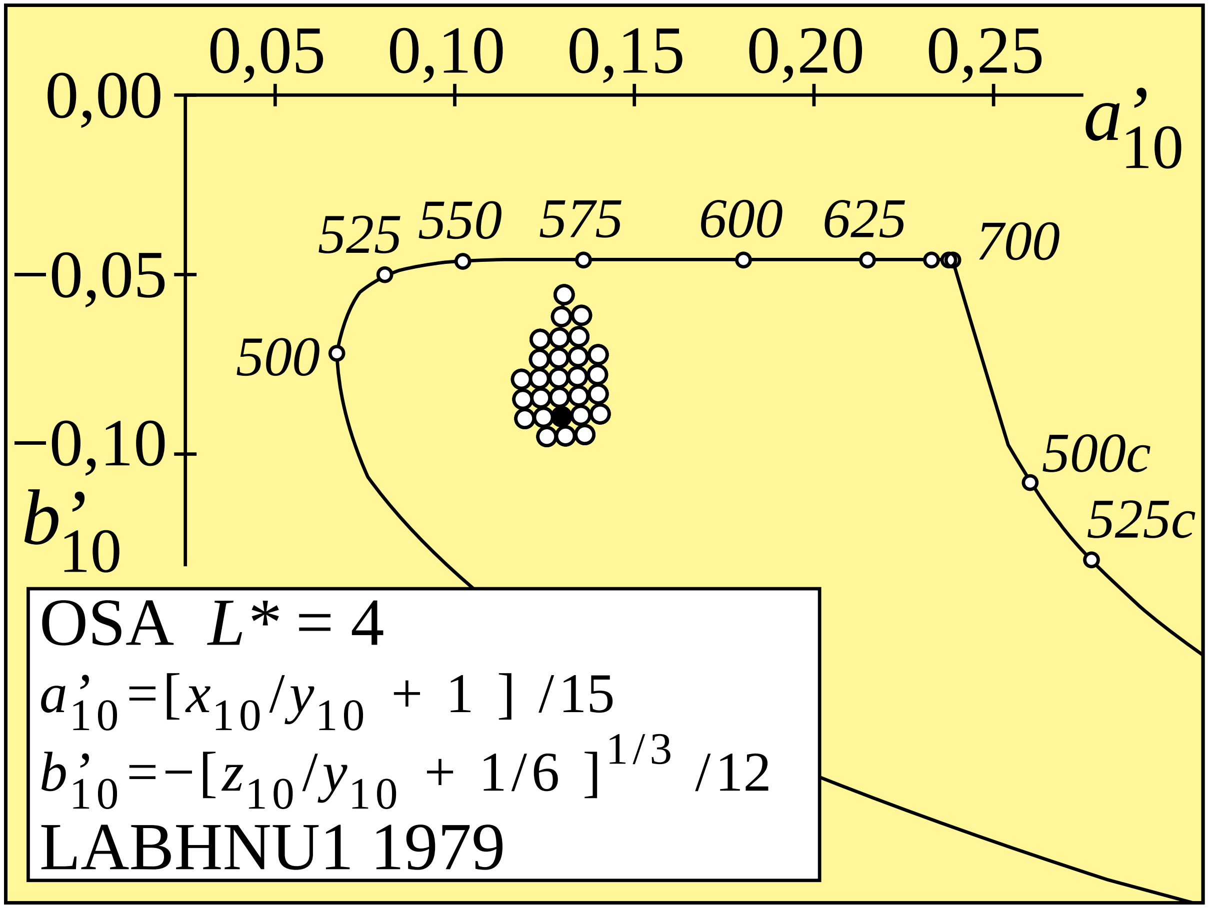

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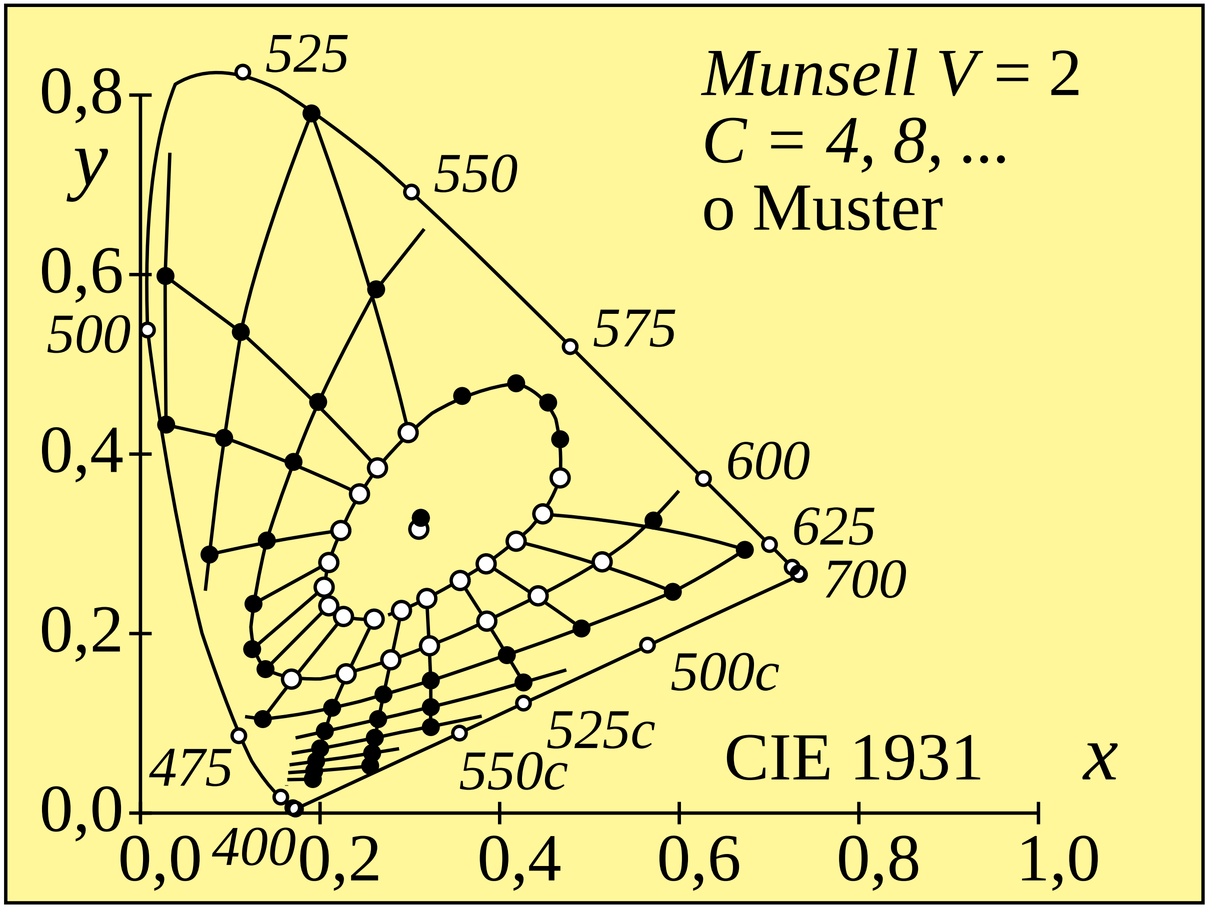

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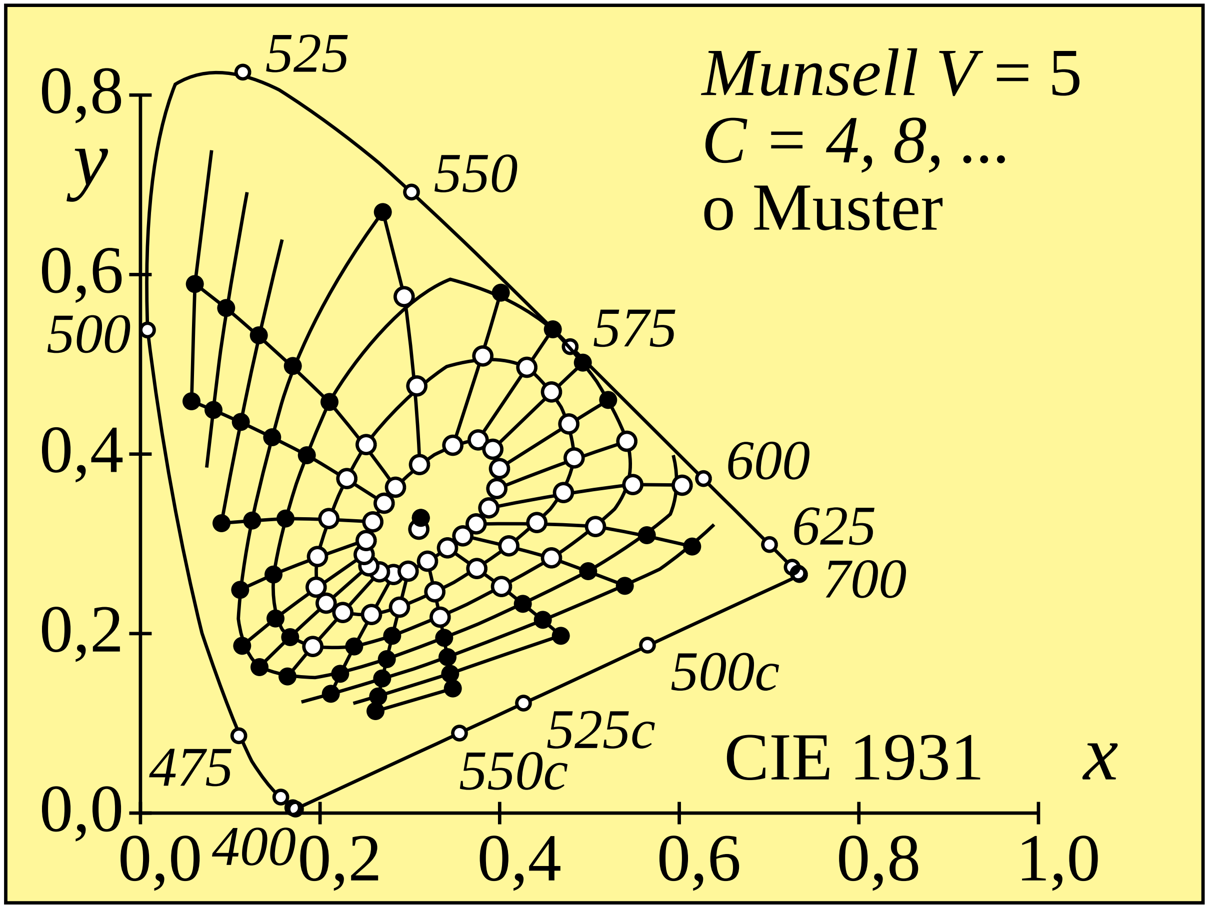

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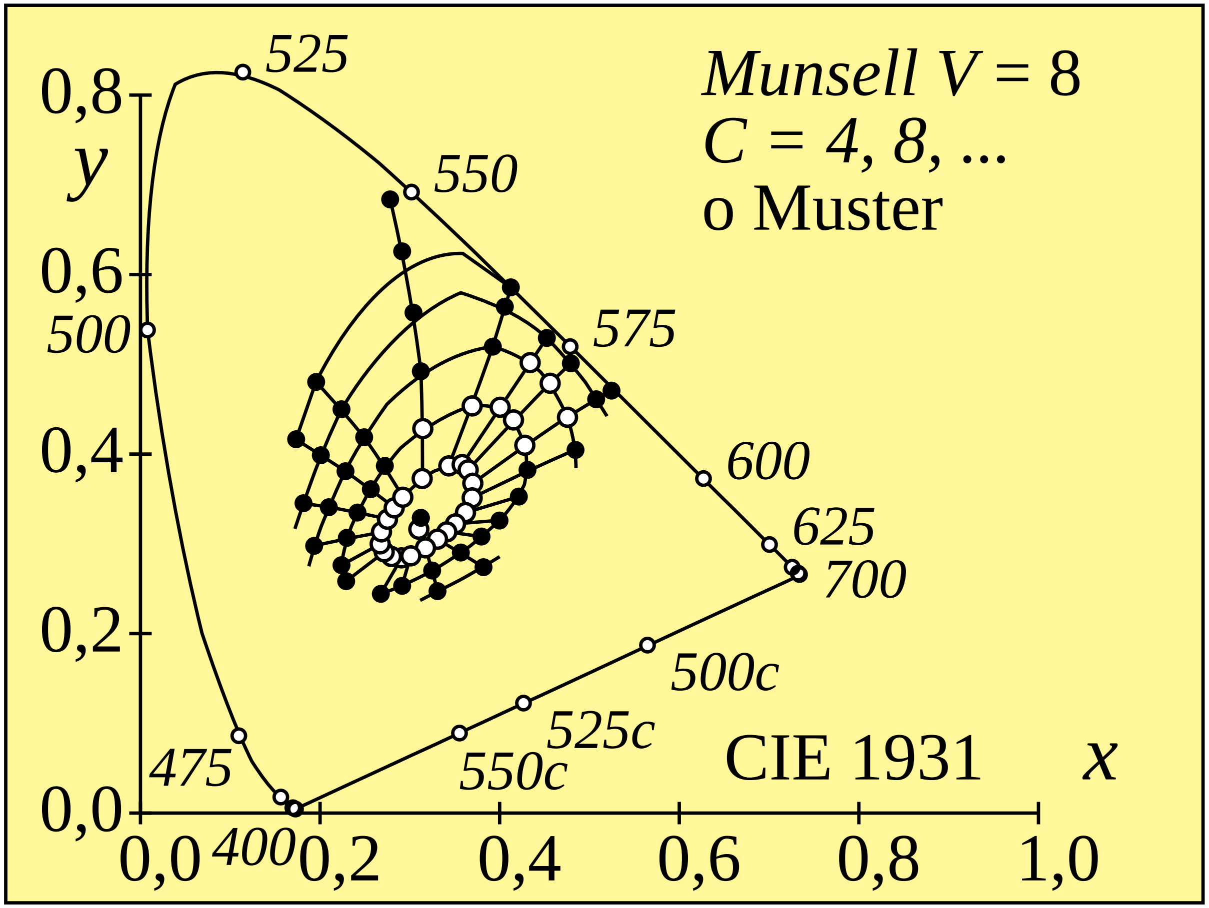

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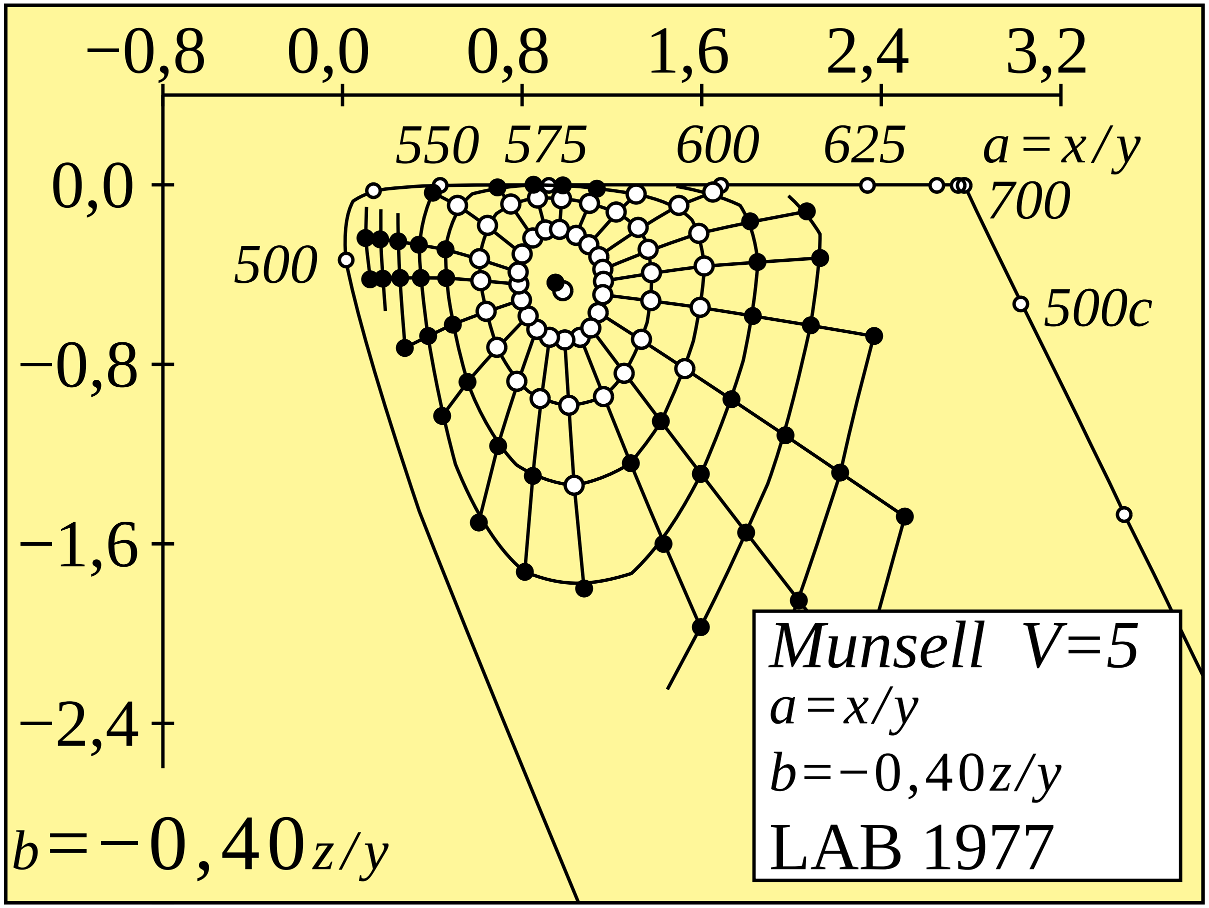

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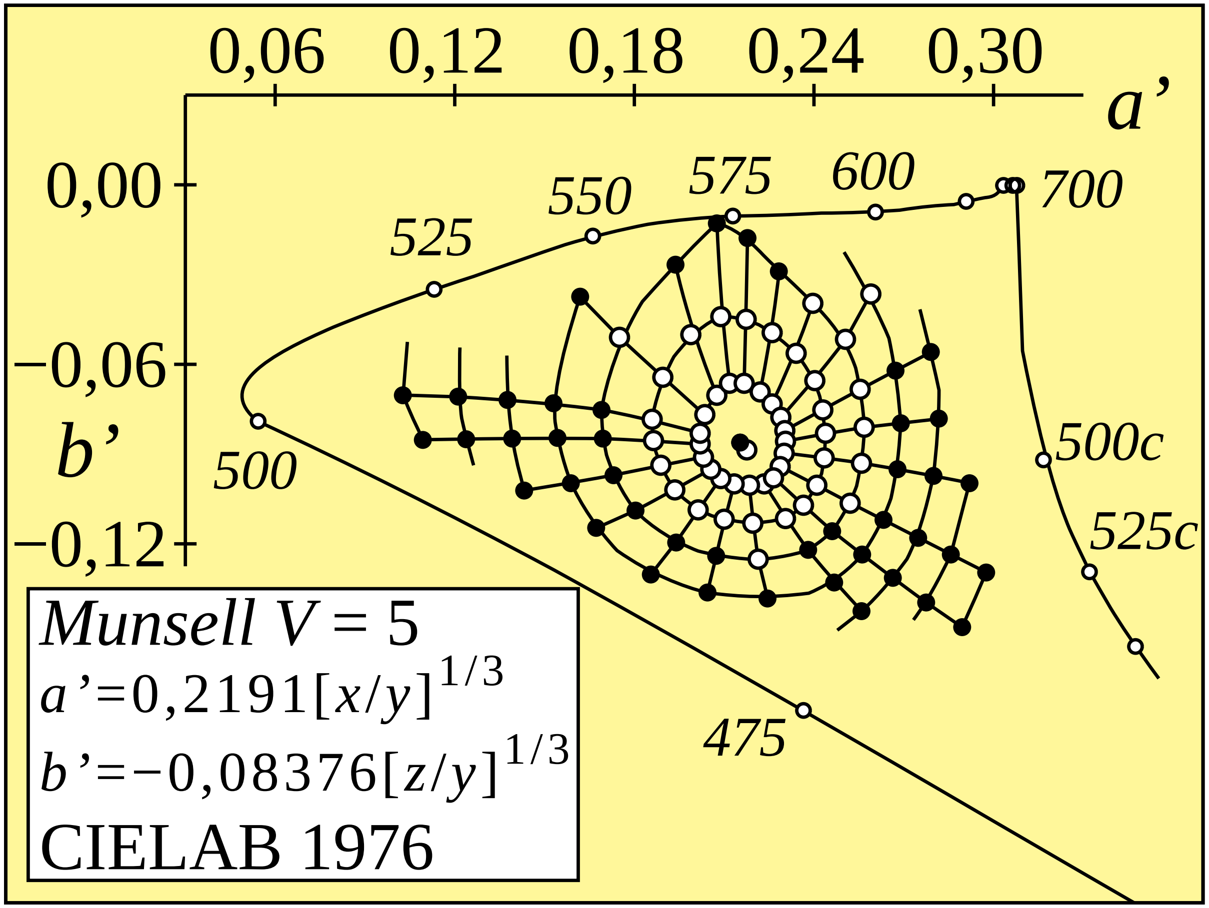

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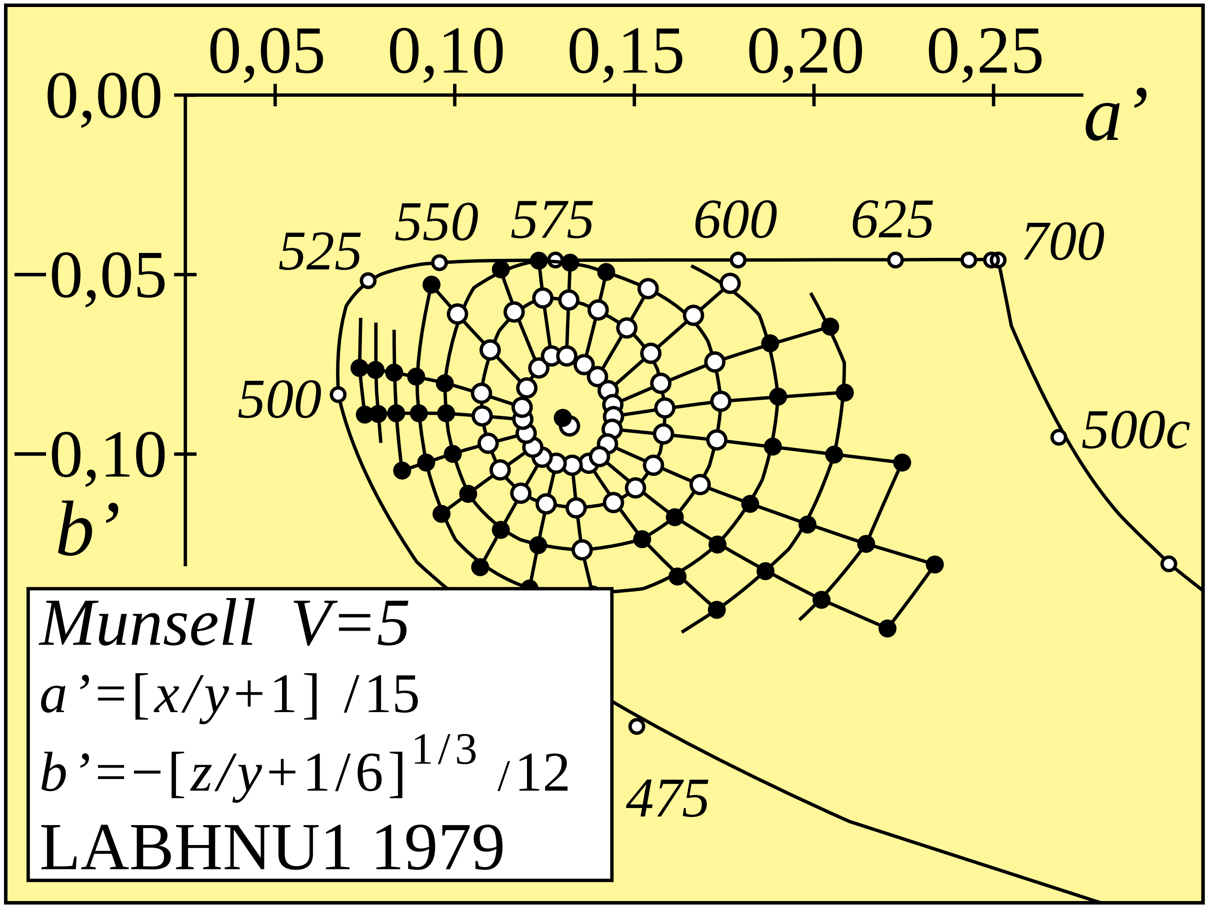

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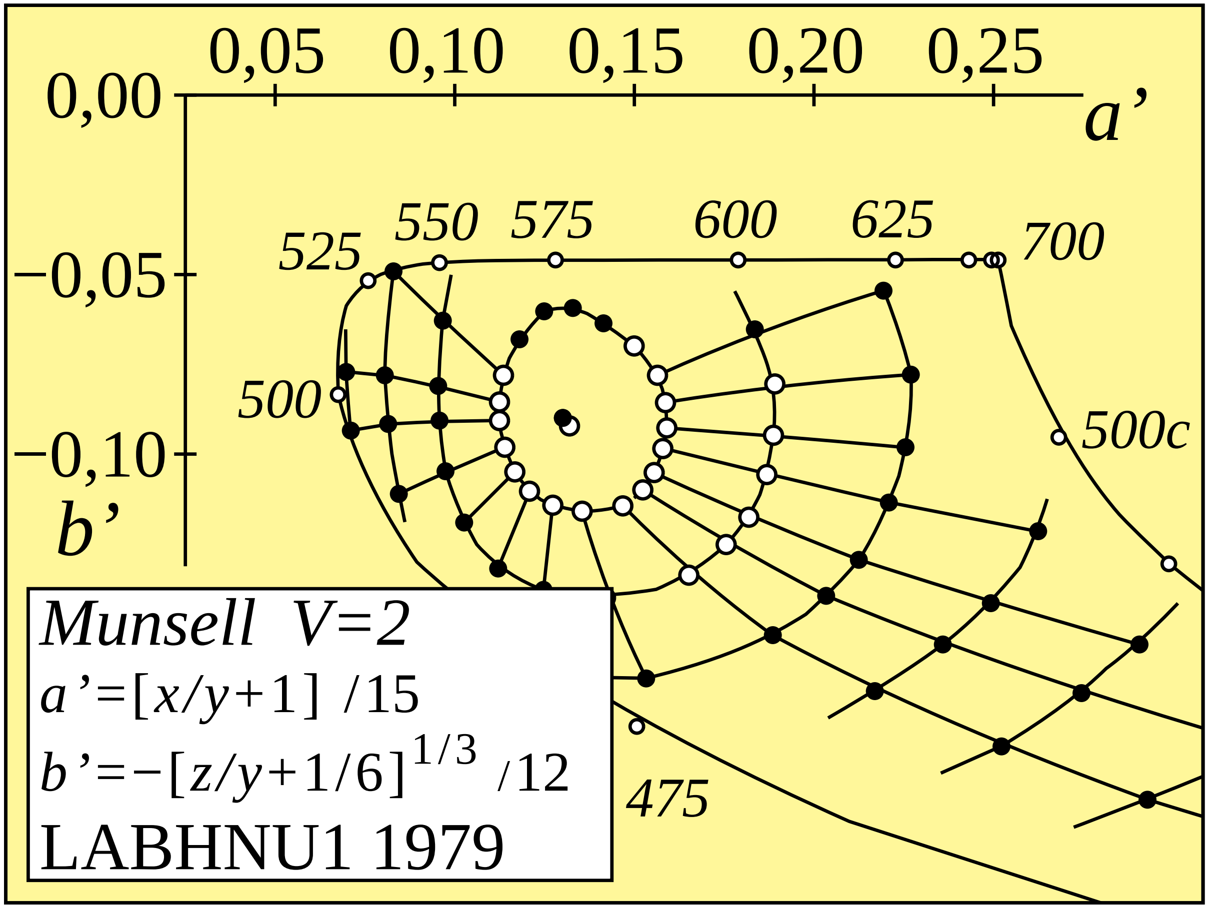

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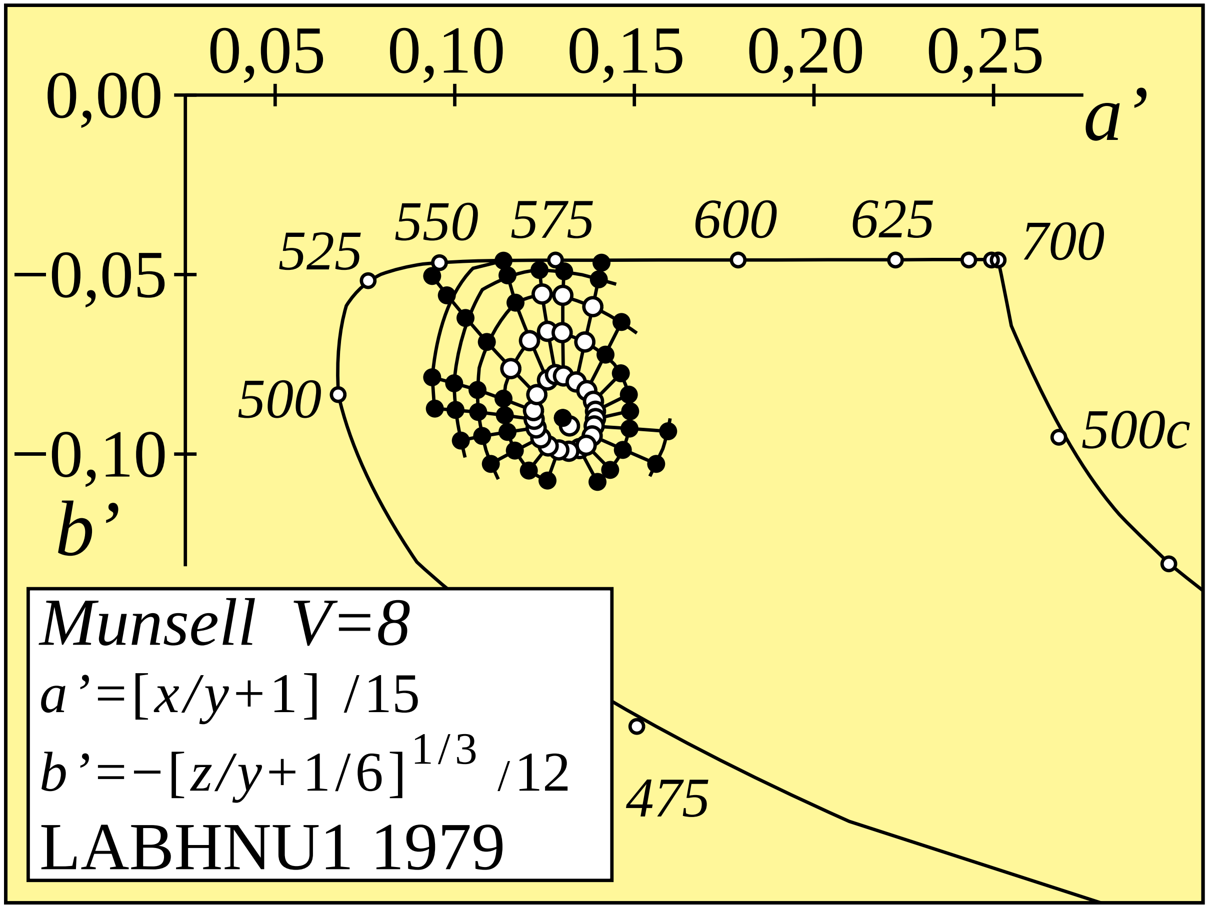

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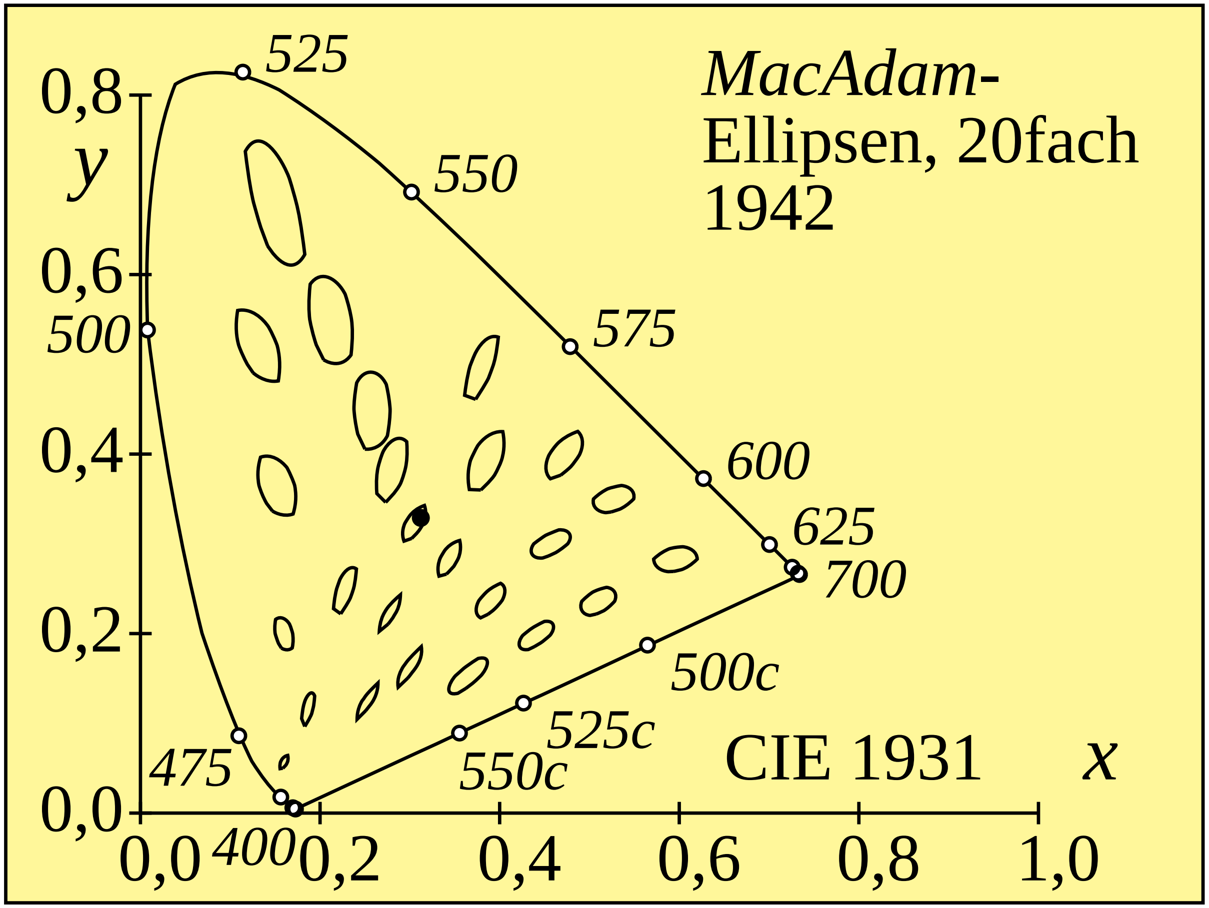

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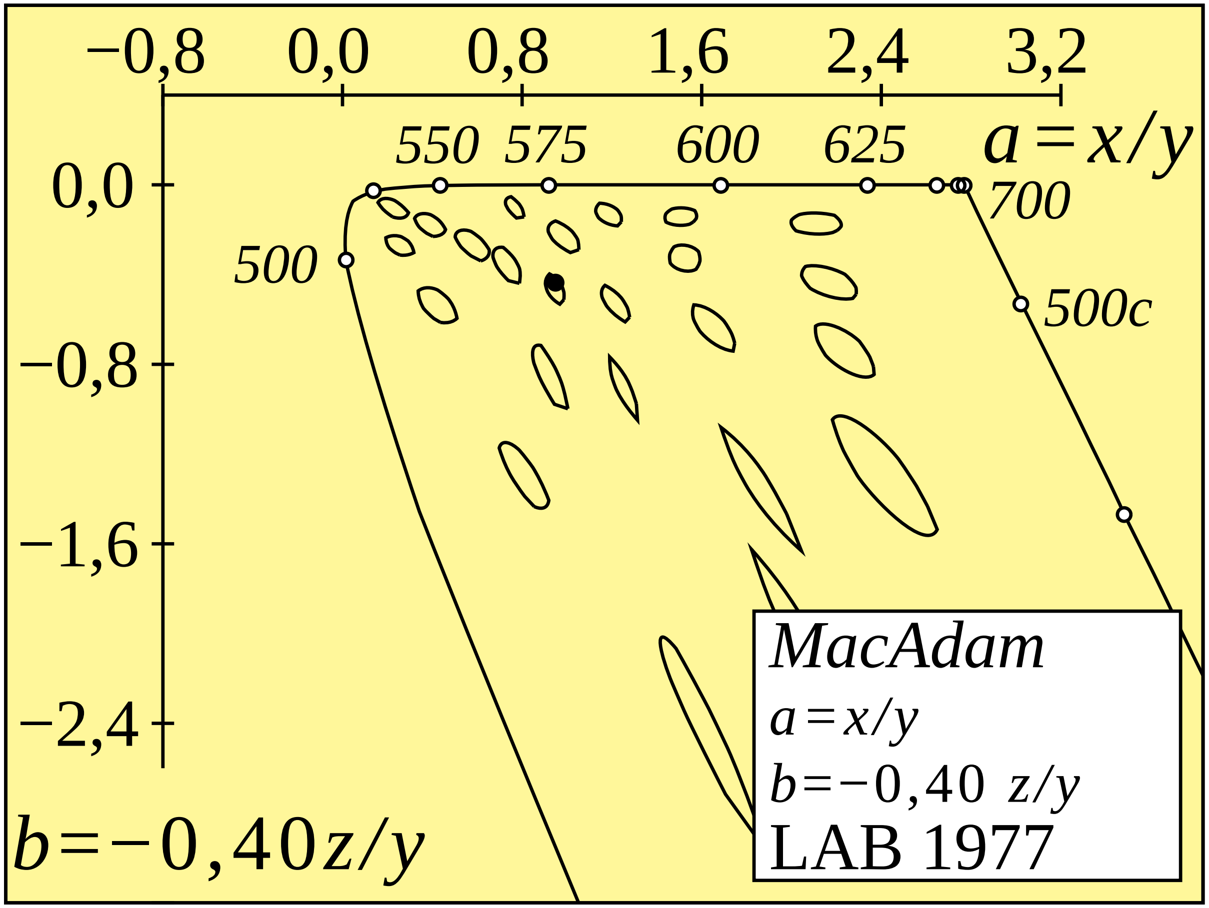

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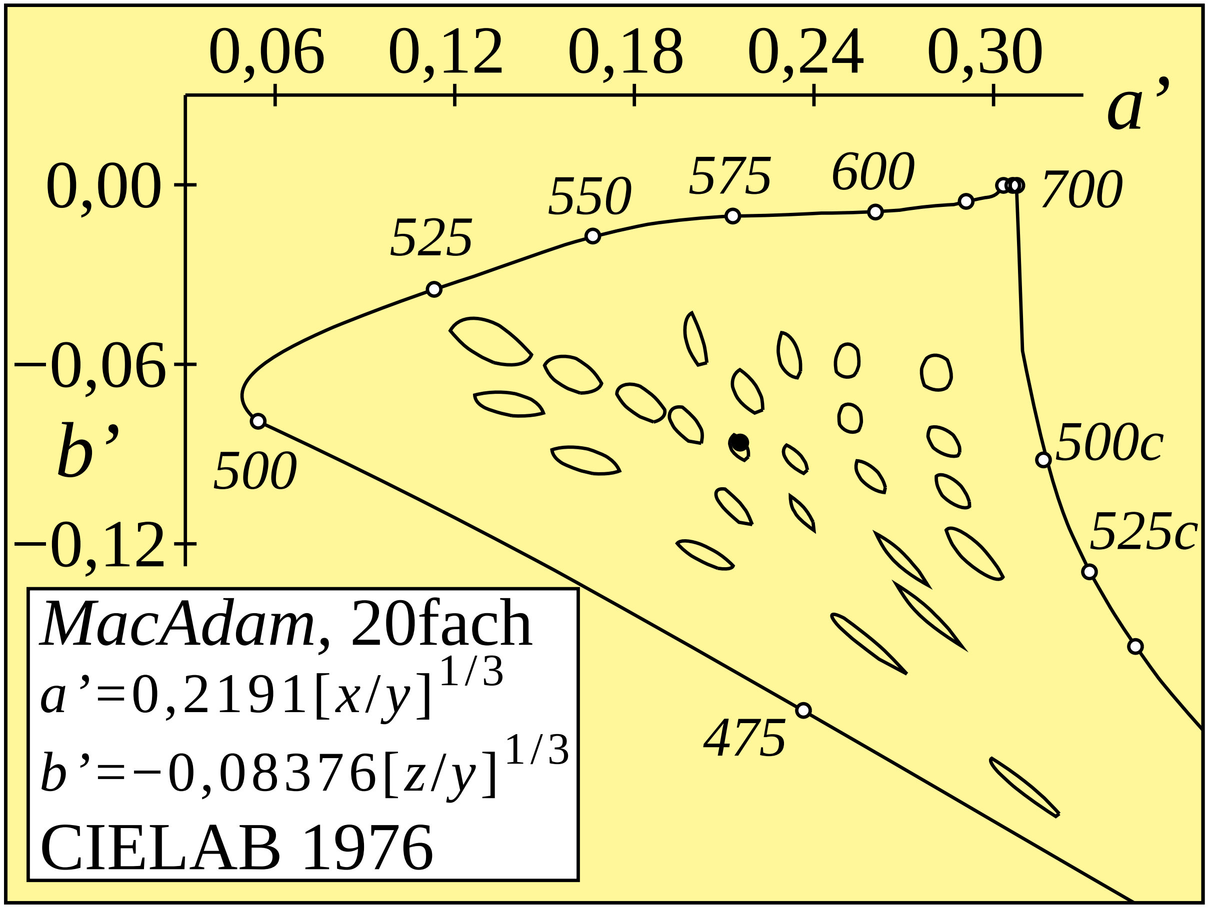

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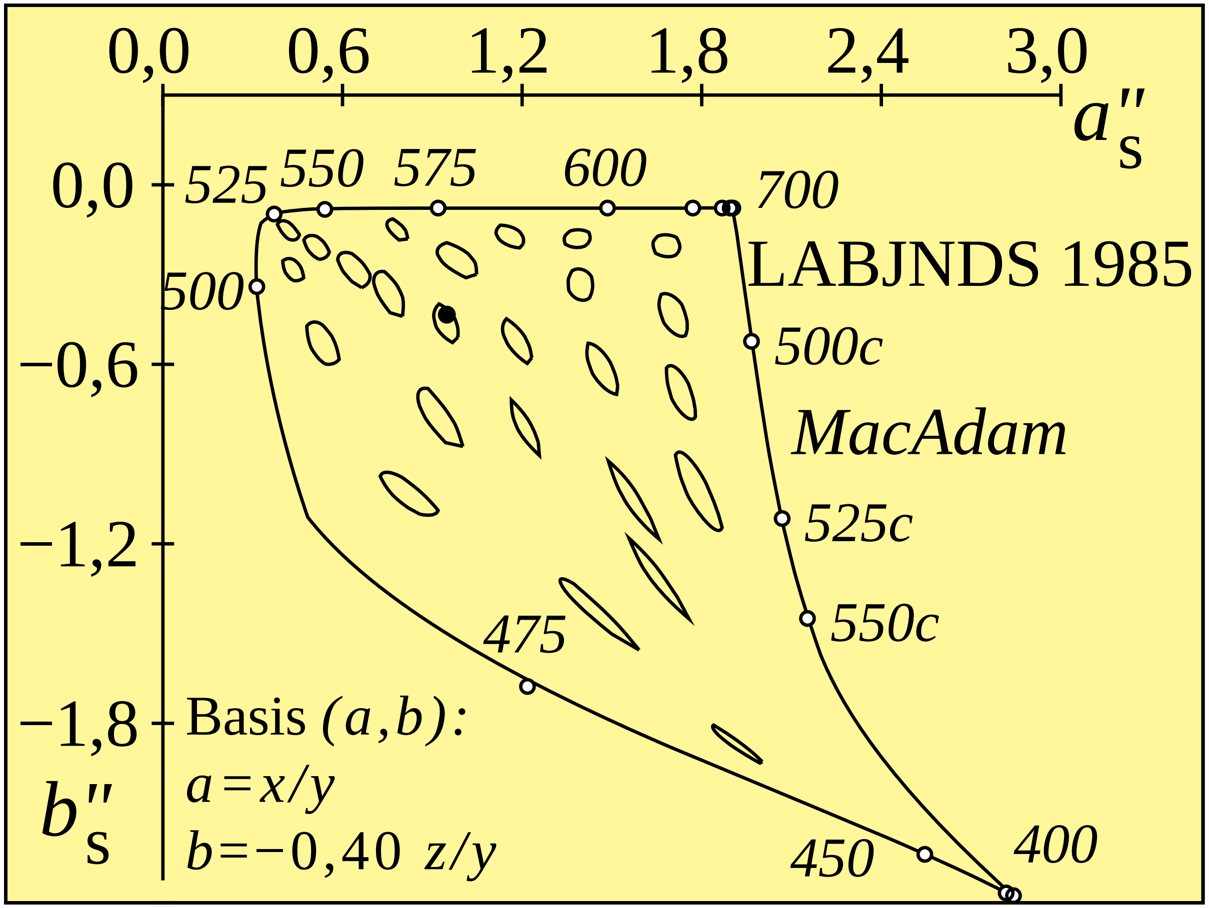

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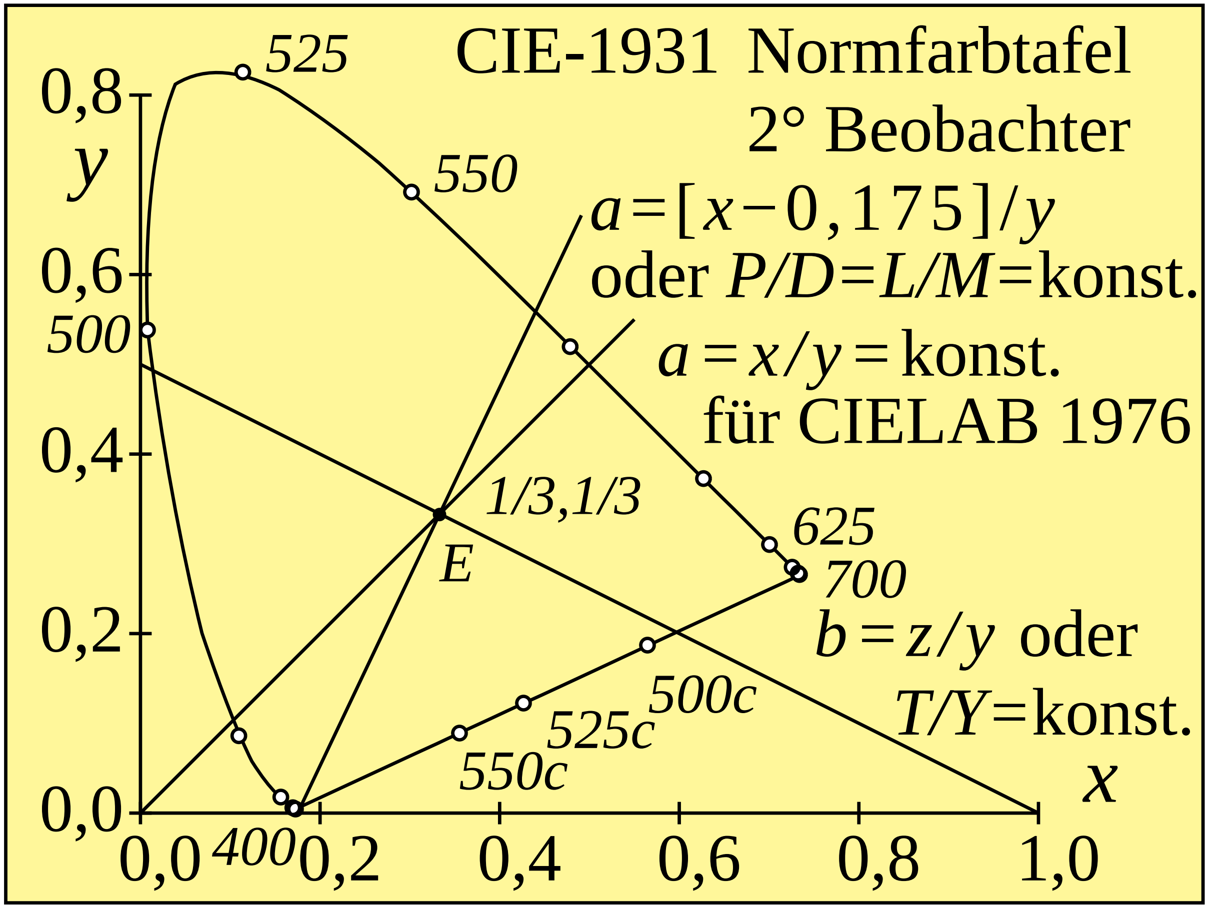

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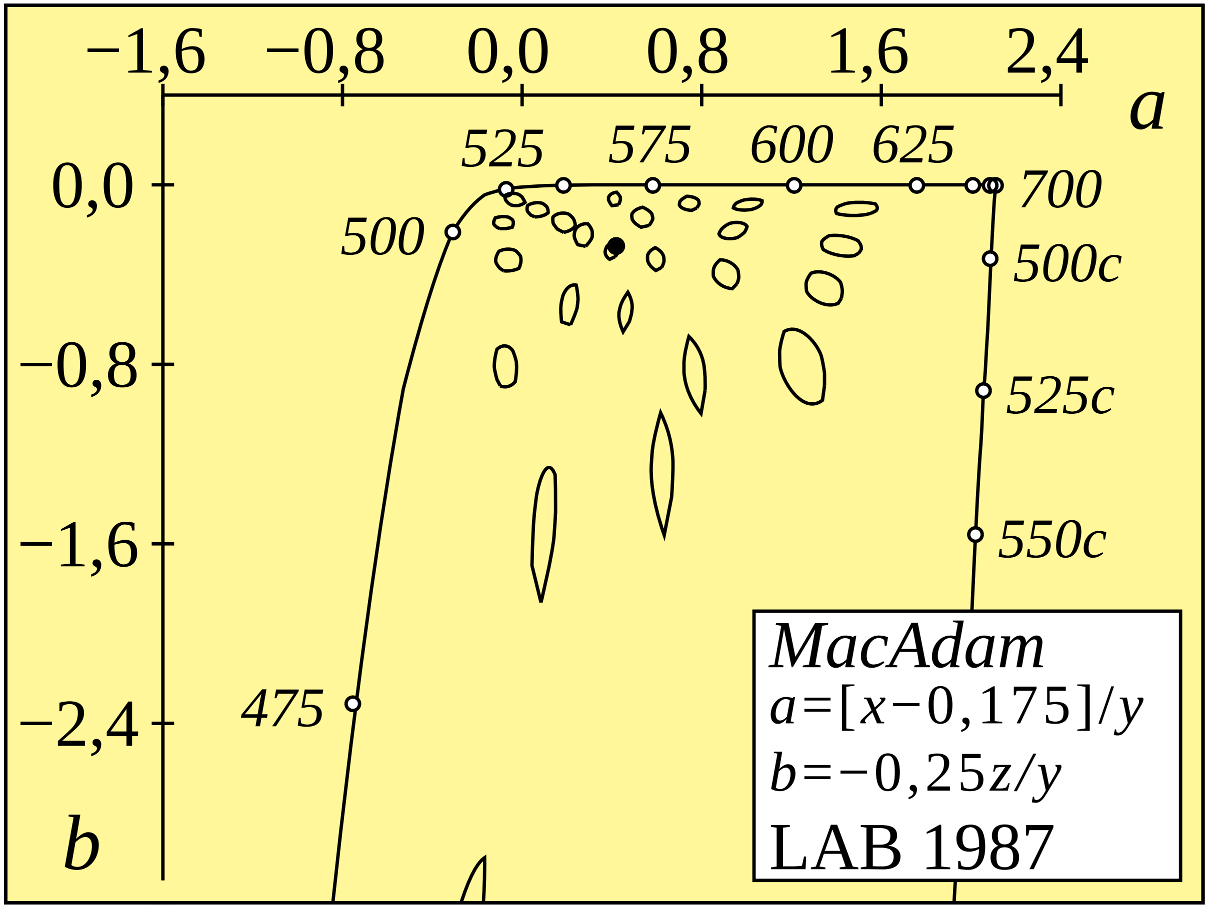
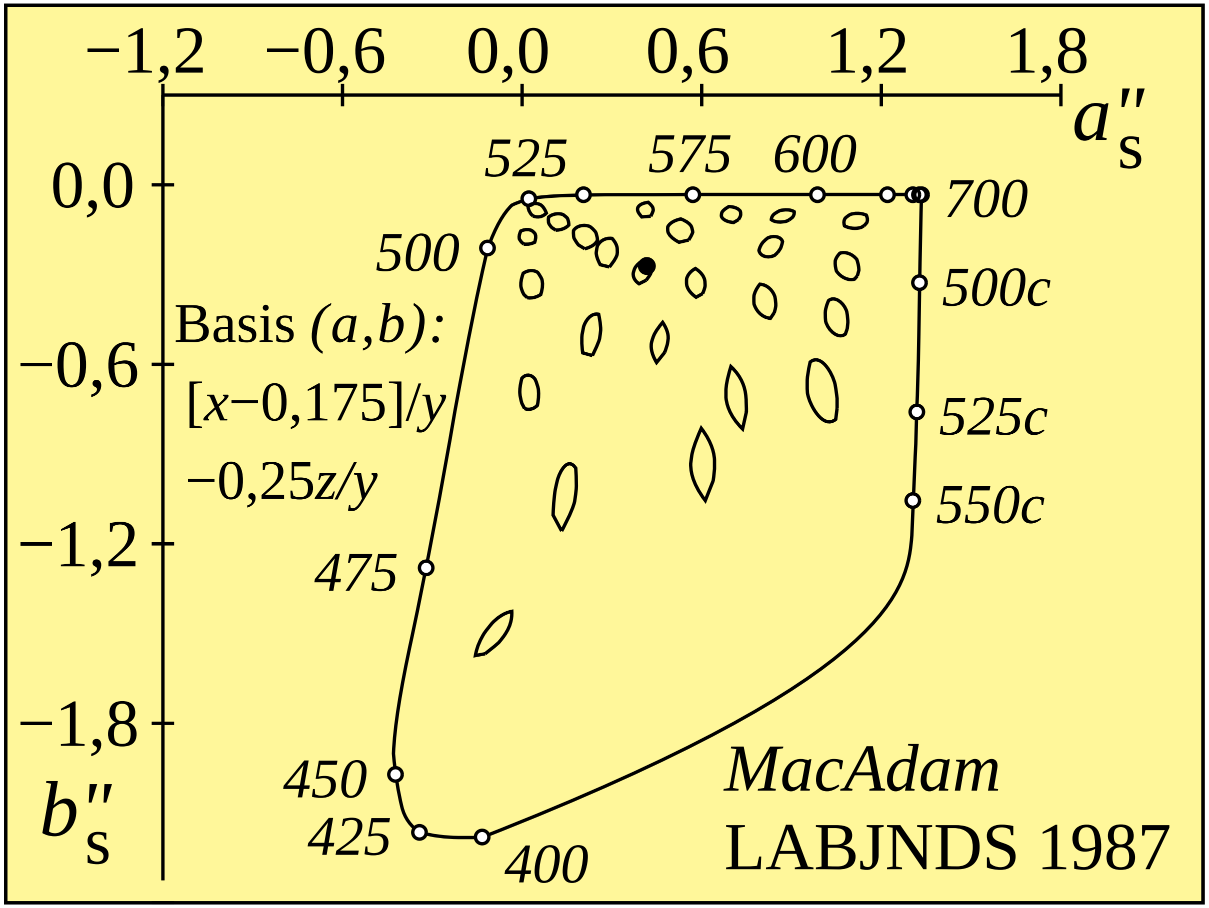
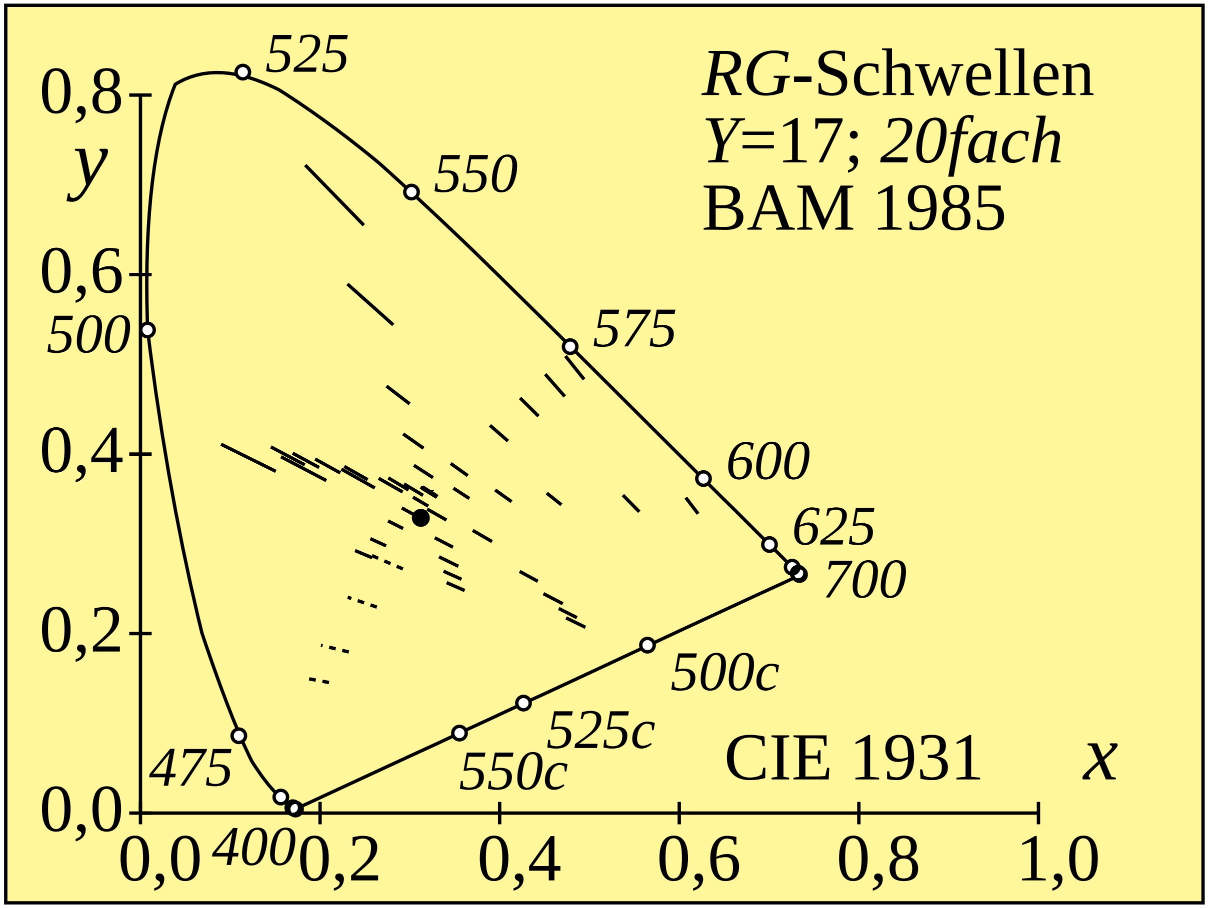


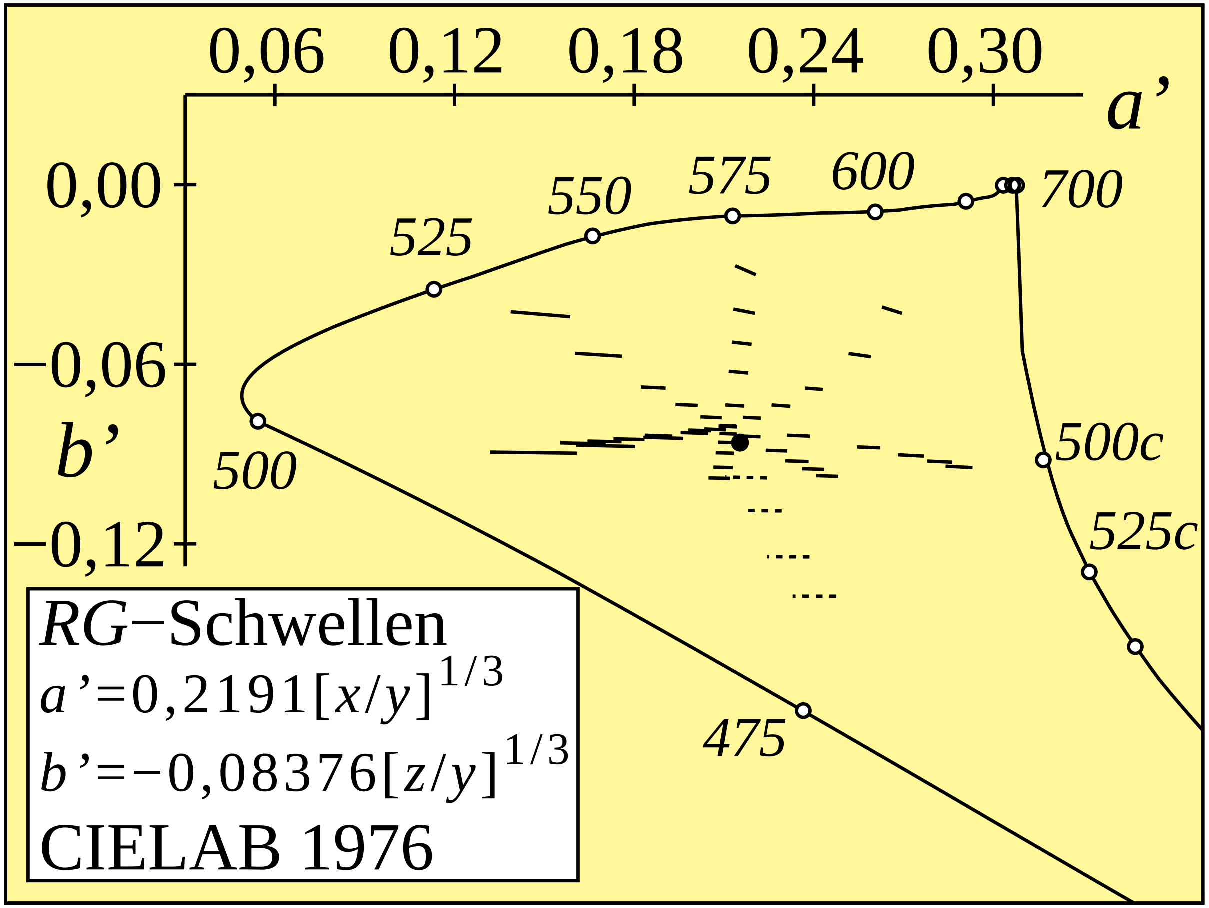
G8141_4f.eps, G0281_2f.eps, B4_21_2f.eps, Bild 4_21−2



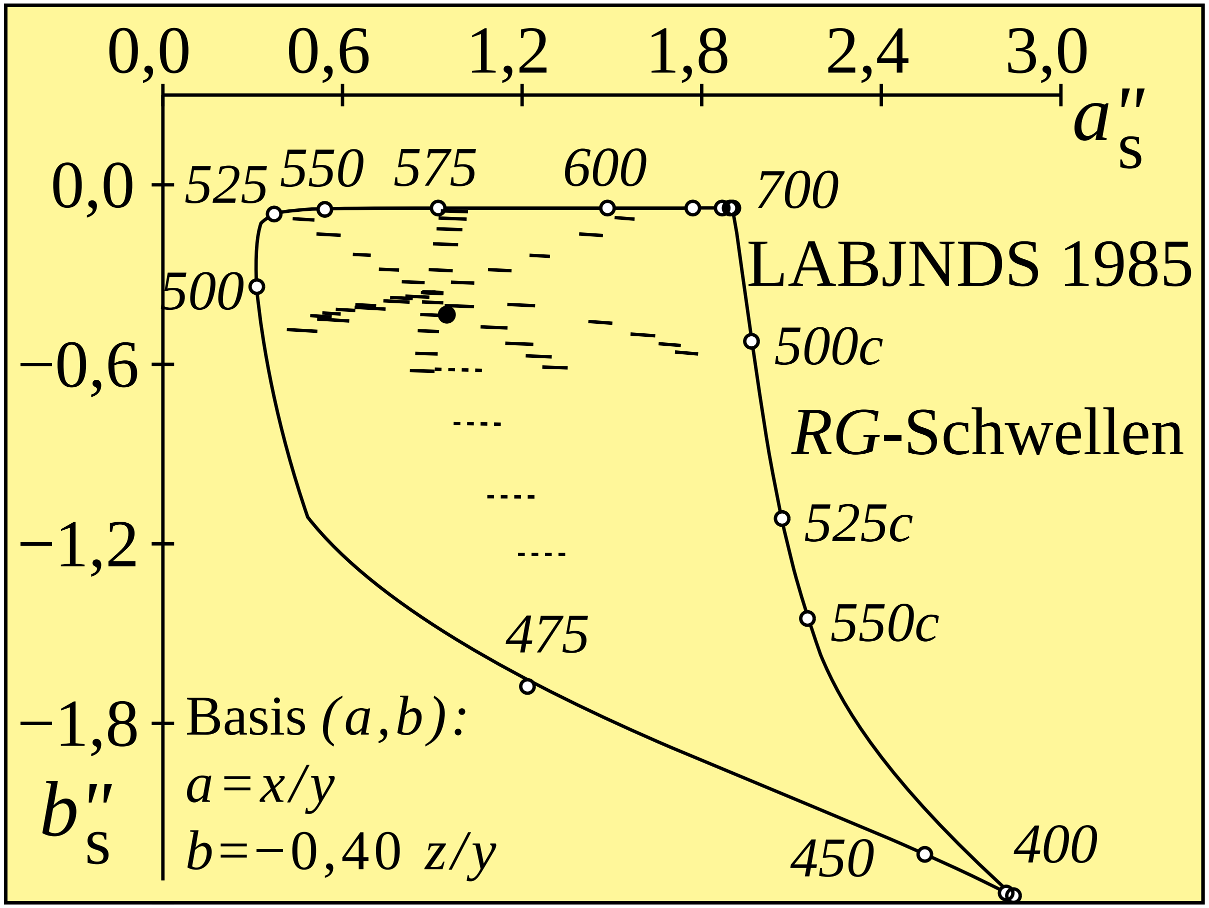
G8141_7f.eps, G0281_3f.eps, B4_21_3f.eps, Bild 4_21_3



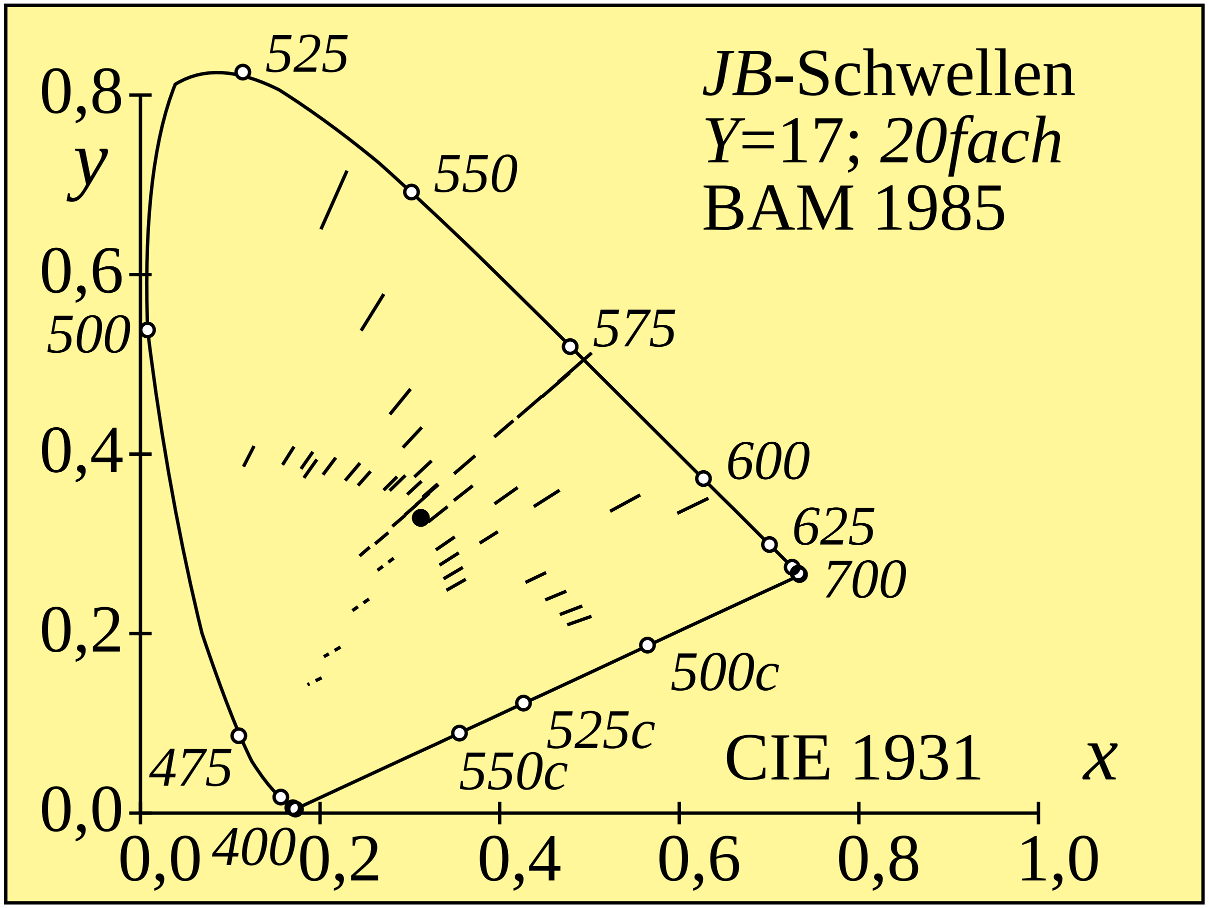
G8150_1f.eps, G0281_4f.eps, B4_22_1f.eps, Bild 4_22_1



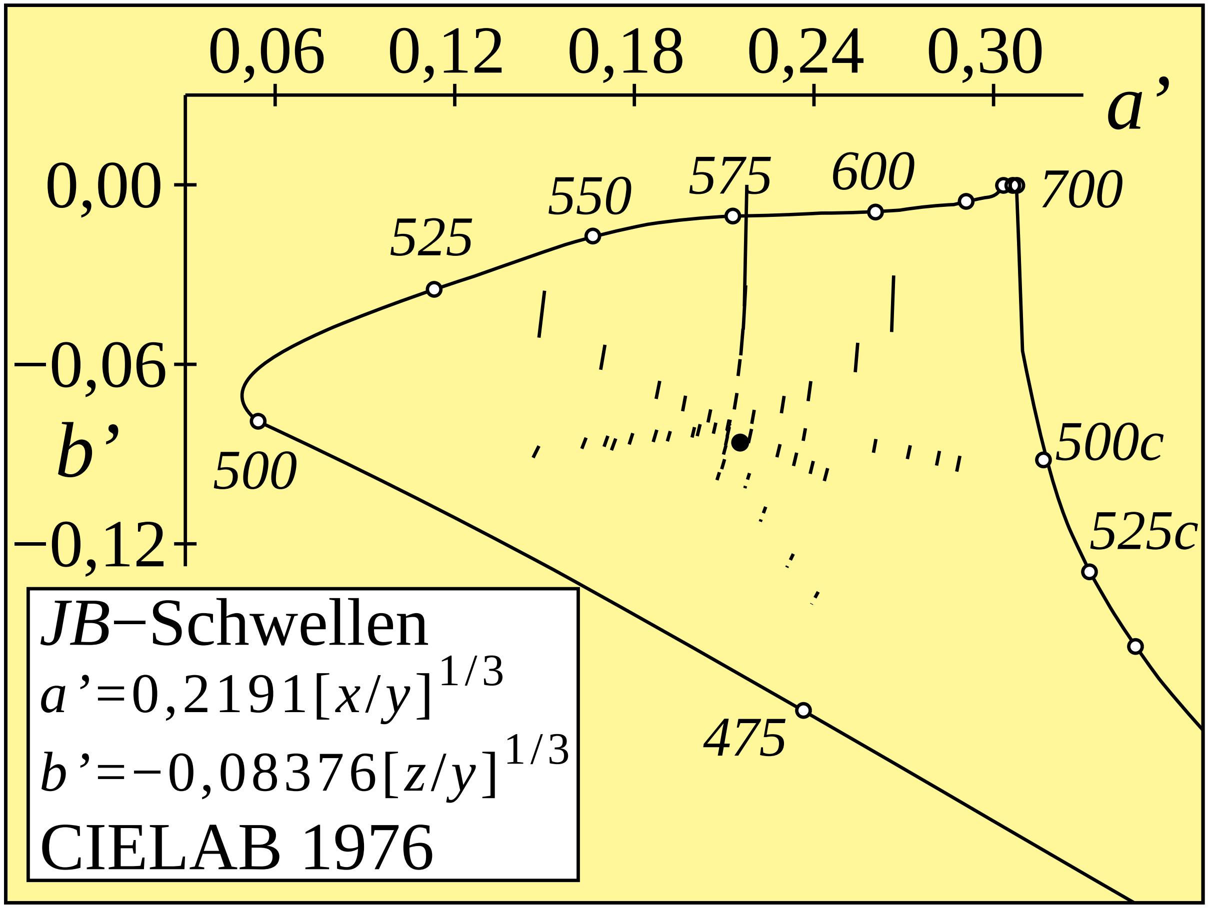
G8150_3f.eps, G0281_5f.eps, B4_22_2f.eps, Bild 4_22_2



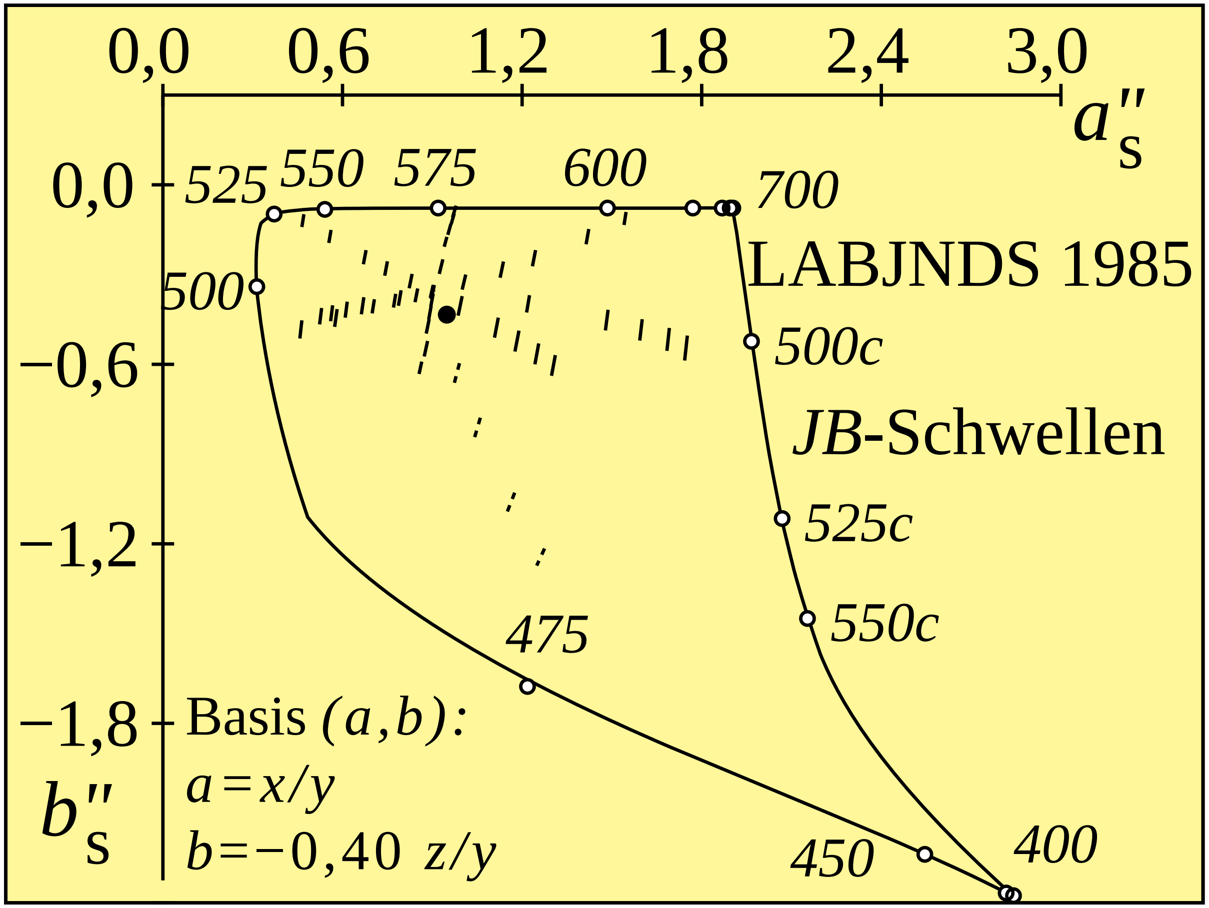
G8150_7f.eps, G0281_6f.eps, B4_22_3f.eps, Bild 4_22_3



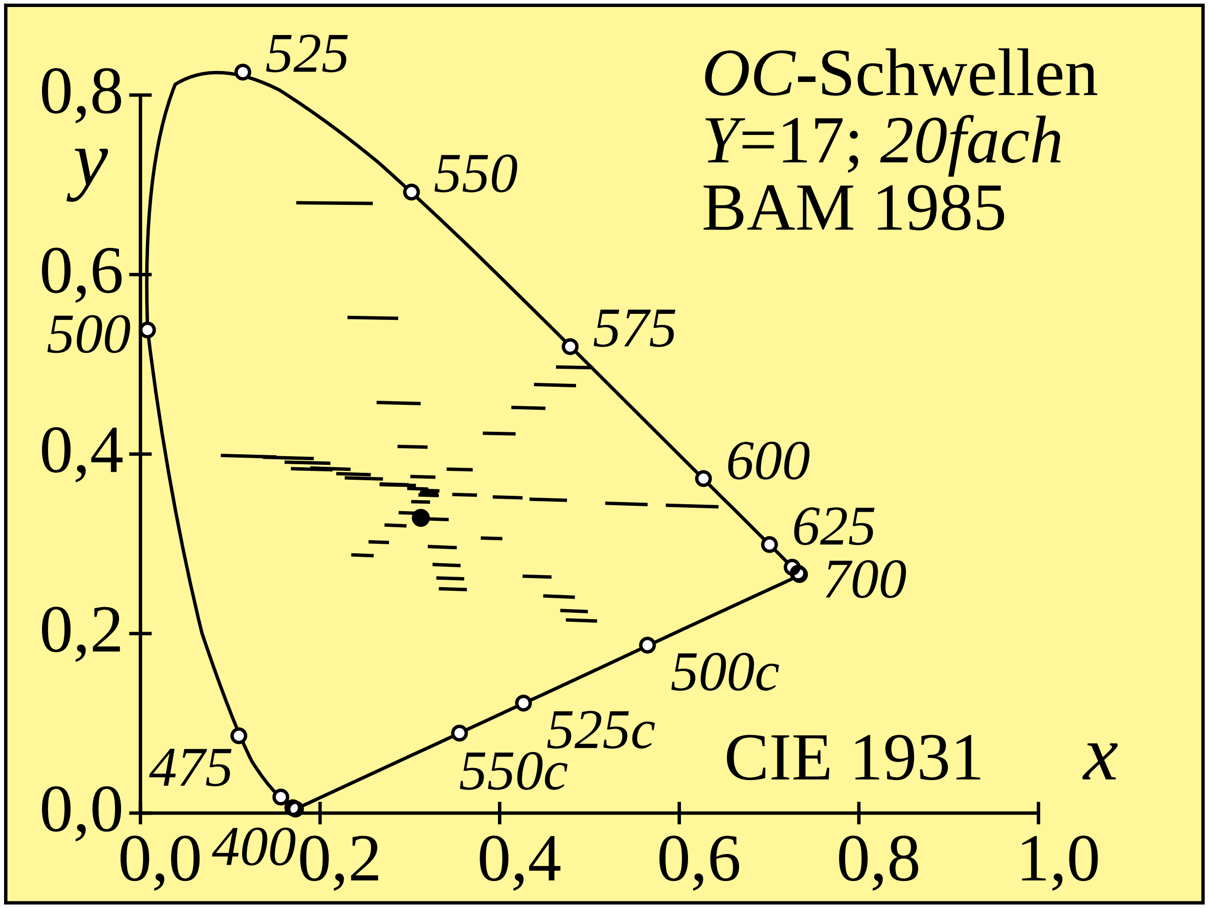
G8160_1f.eps, G0281_7f.eps, B4_23_1f.eps, Bild 4_23_1



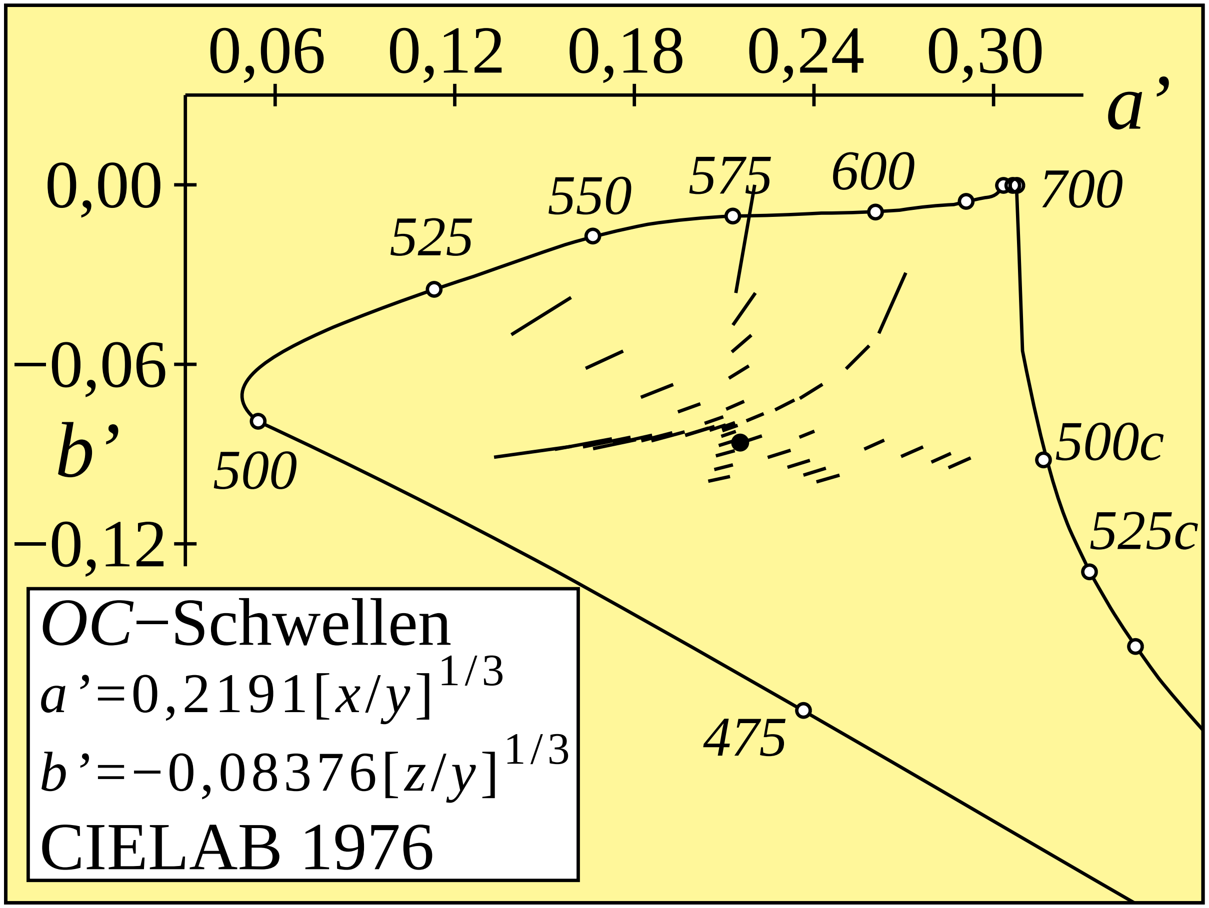
G8160_3f.eps, G0281_8f.eps, B4_23_2f.eps, Bild 4_23_2



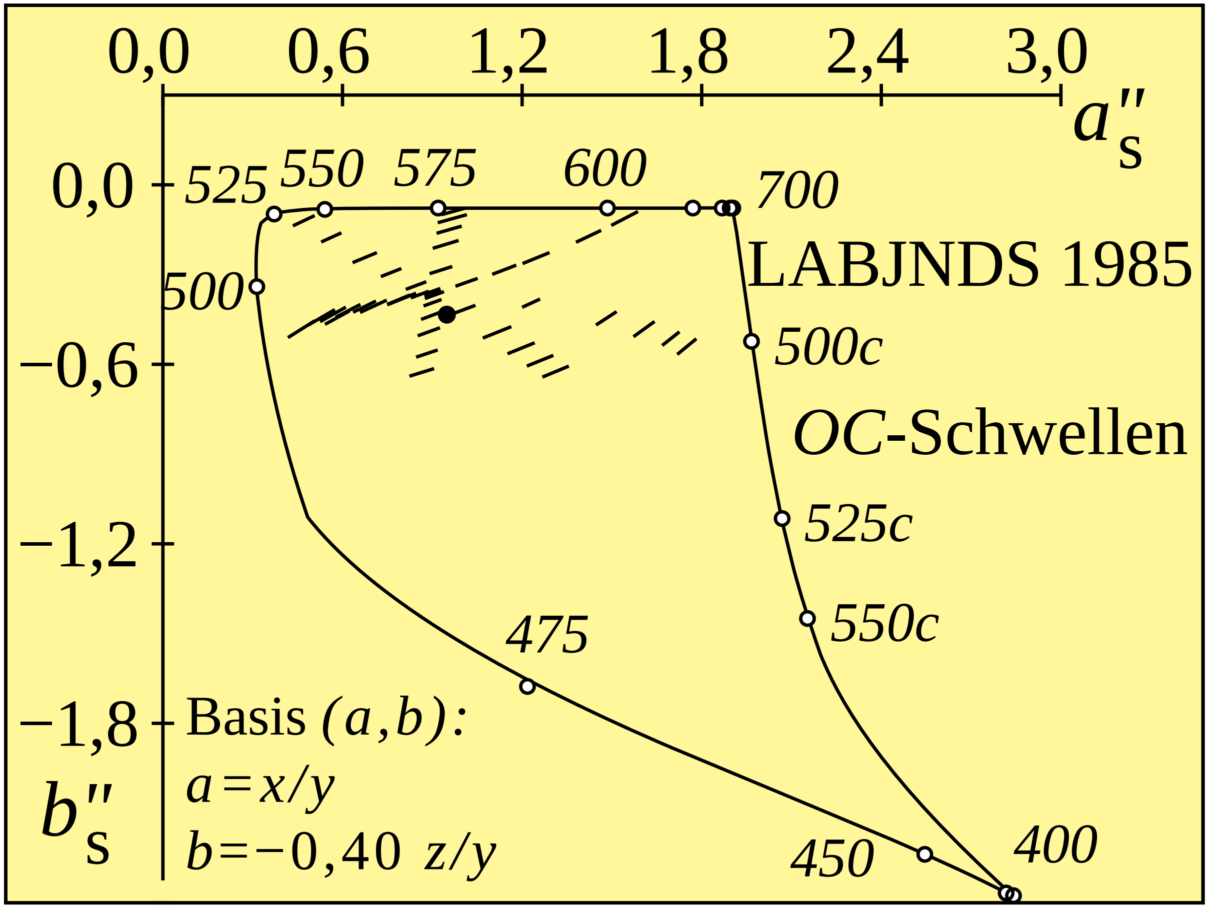
G8160_7f.eps, G0211_8f.eps, G4_23_3f.eps, Bild 4_23_3



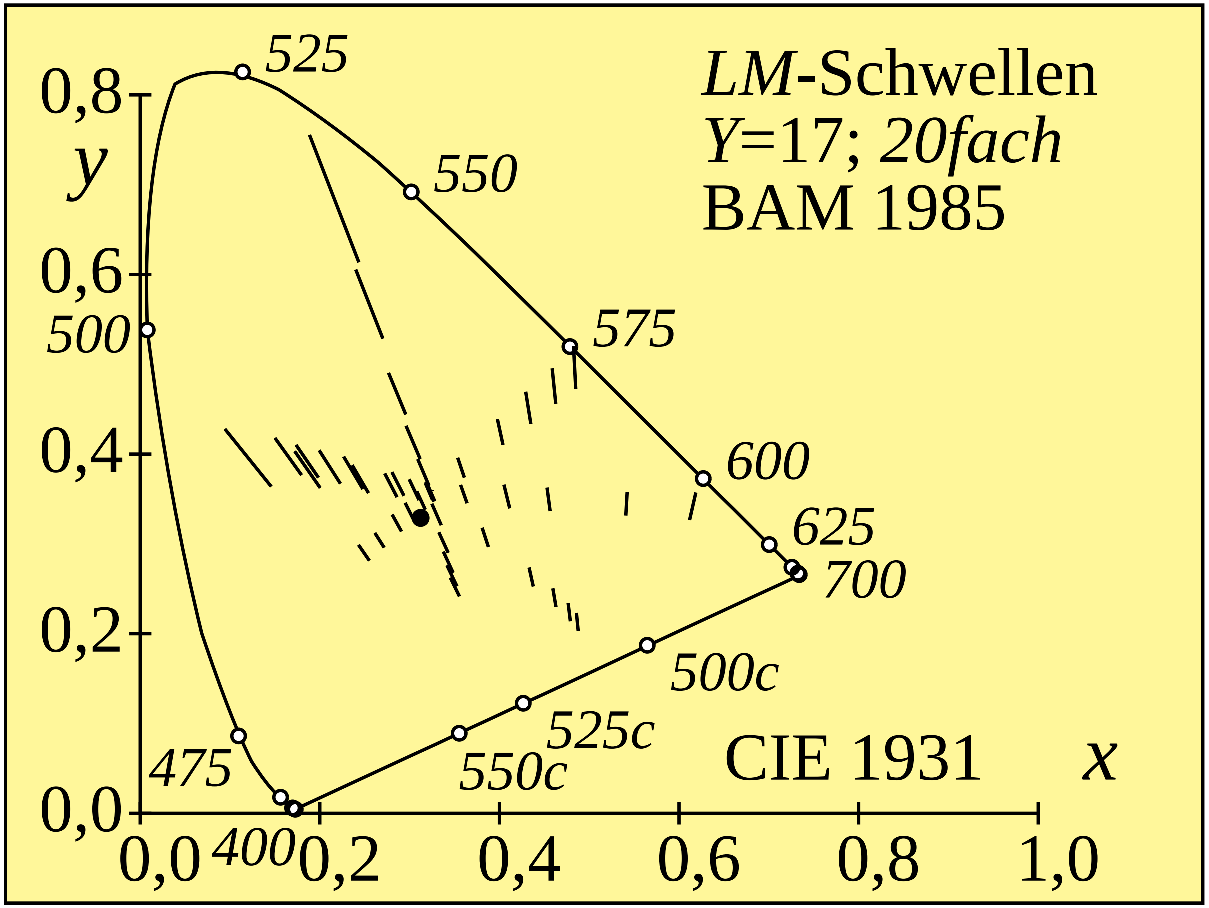
G8170_1f.eps, G0310_1f.eps, G4_24_1f.eps, Bild 4_24_1



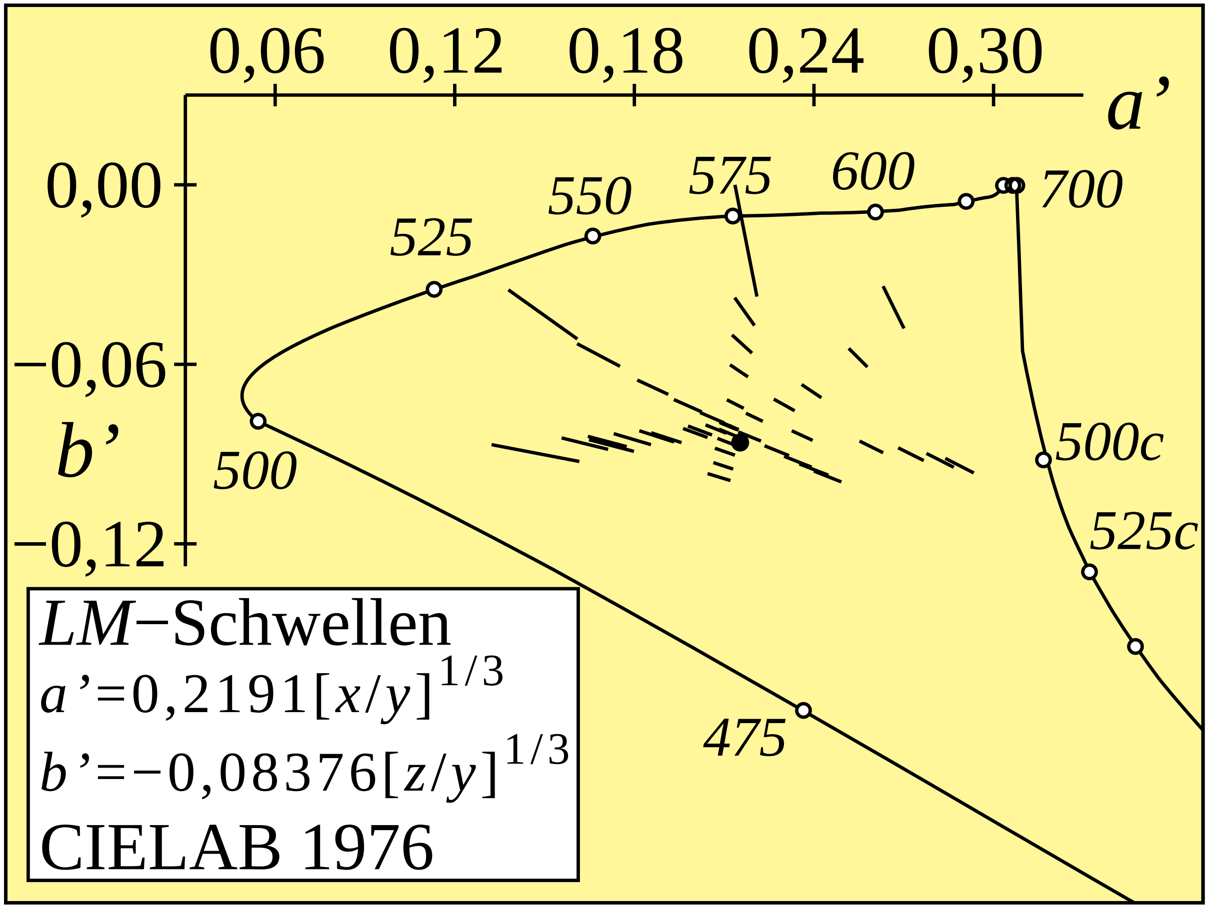
G8170_3f.eps, G0310_2f.eps, G4_24_2f.eps, Bild 4_24_2



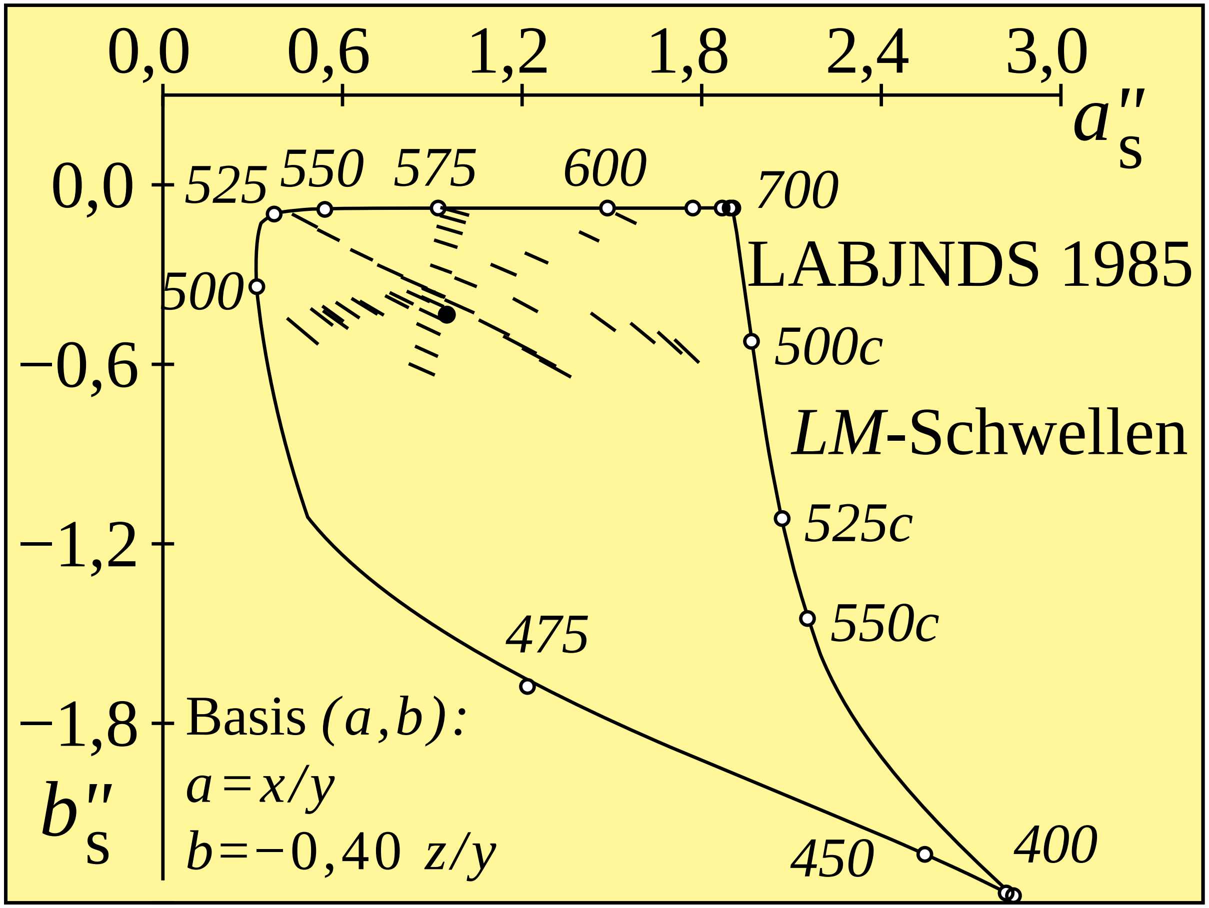
G8170_7f.eps, G0310_3f.eps, G4_24_3f.eps, Bild 4_24_3



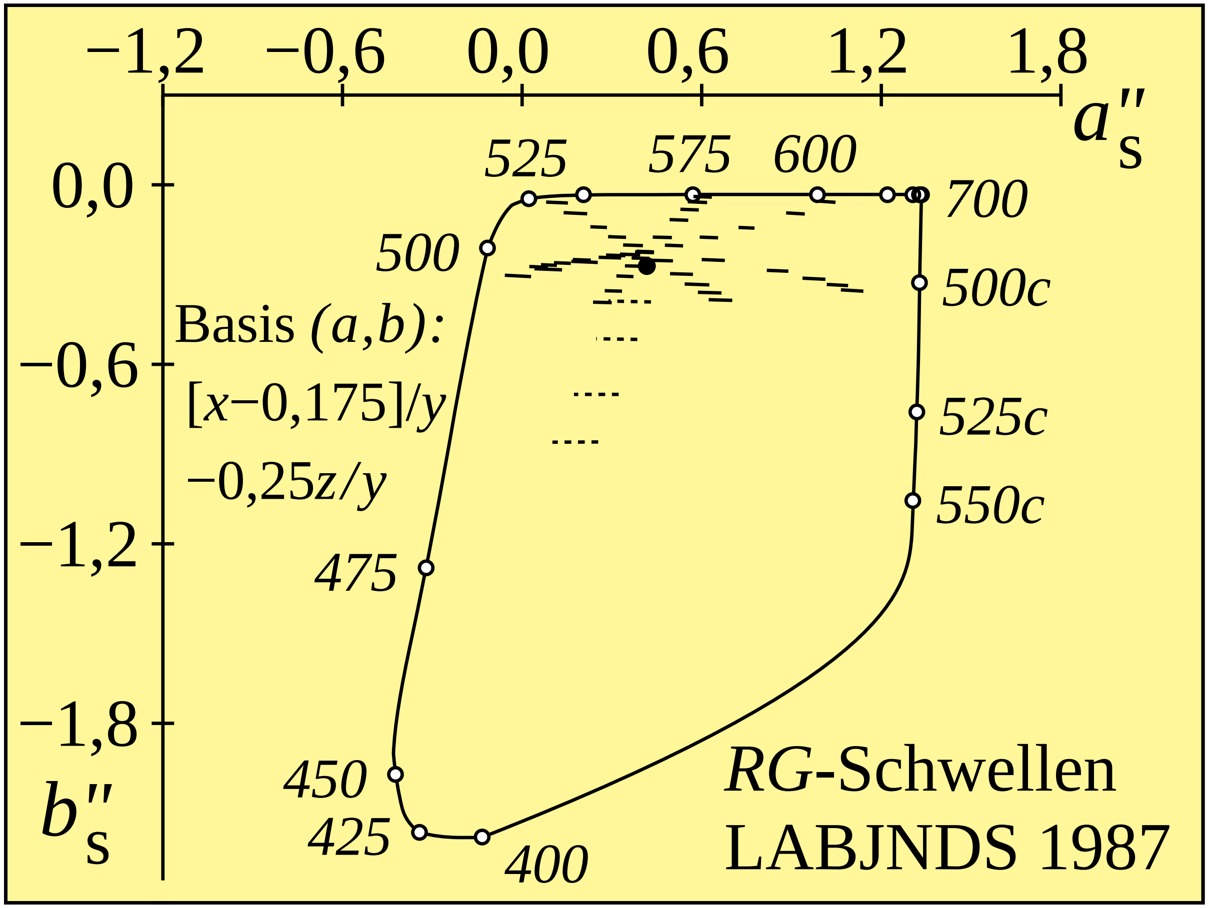
G8180_1f.eps, G0310_4f.eps, G4_25_1f.eps, Bild 4_25_1



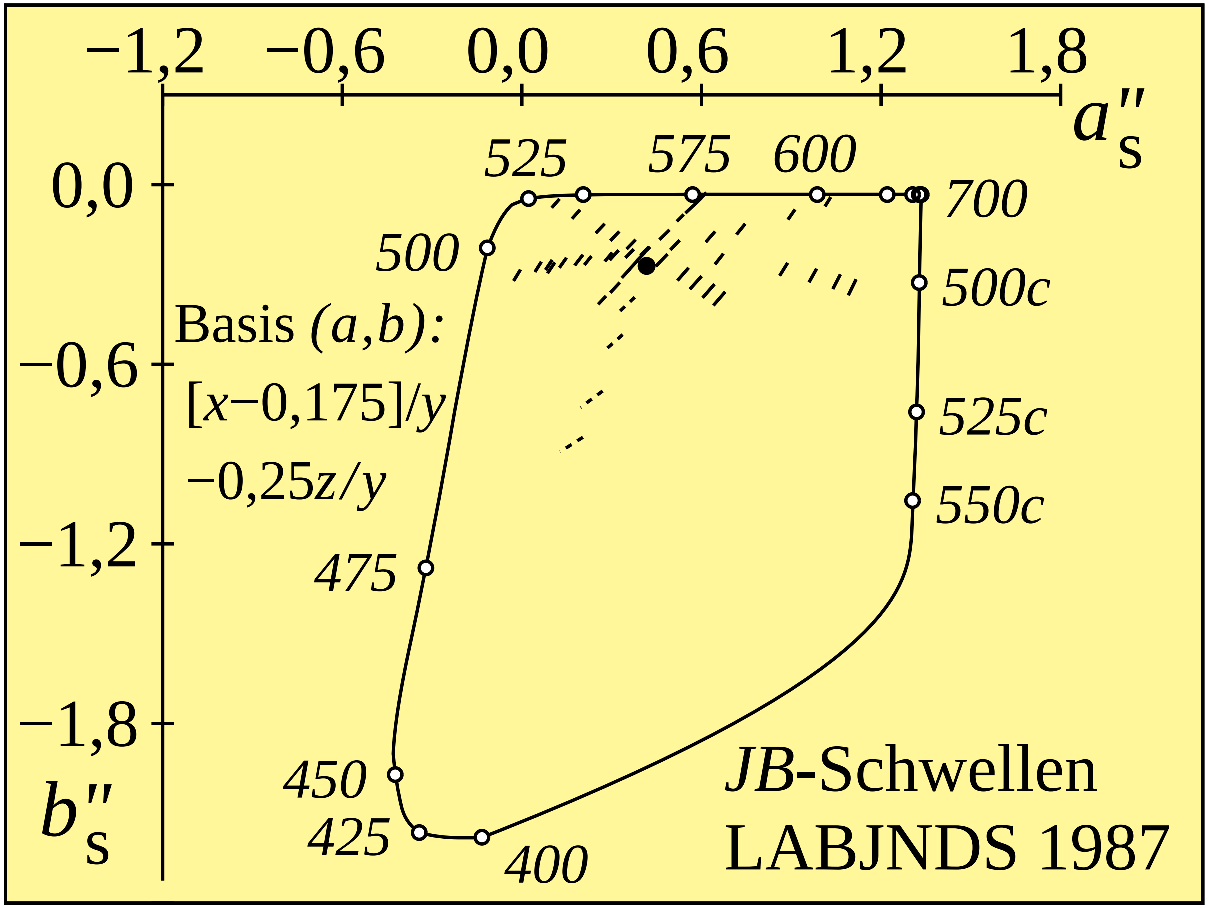
G8180_3f.eps, G0310_5f.eps, G4_25_2f.eps, Bild 4_25_2



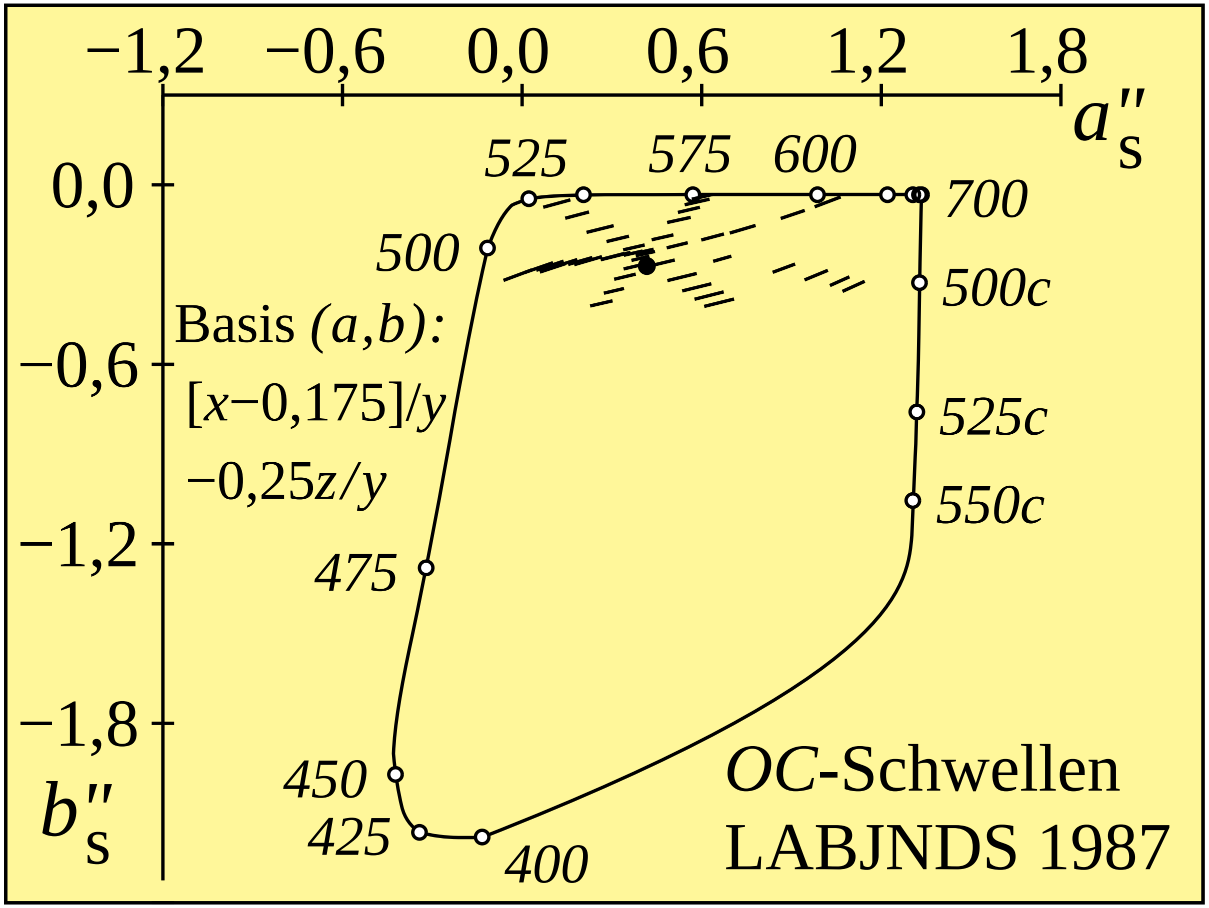
G8180_7f.eps, G0310_6f.eps, G4_25_3f.eps, Bild 4_25_3



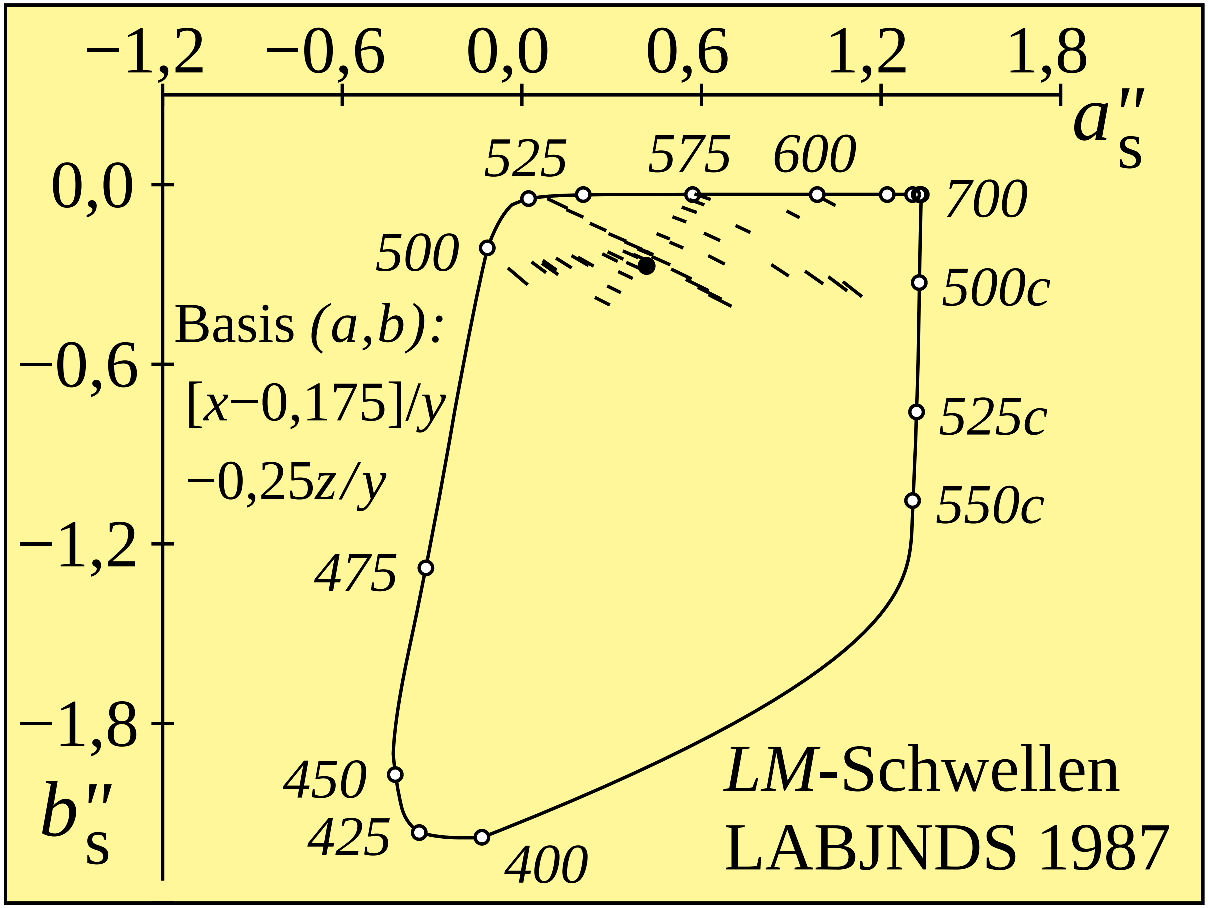
G8151_7f.eps, G0310_7f.eps, G4_26_1f.eps, Bild 4_26_1



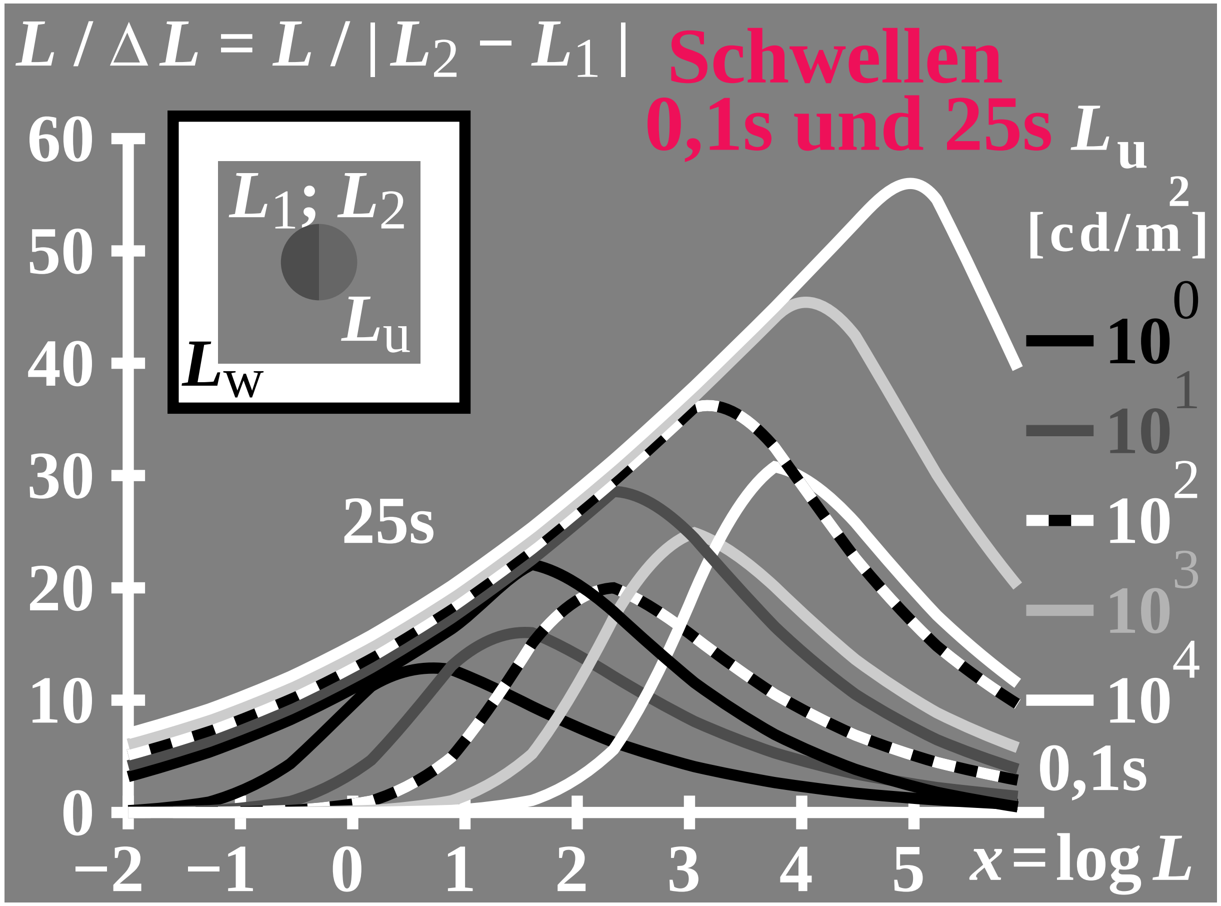
G8161_7f.eps, G0310_8f.eps, G4_26_2f.eps, Bild 4_26_2



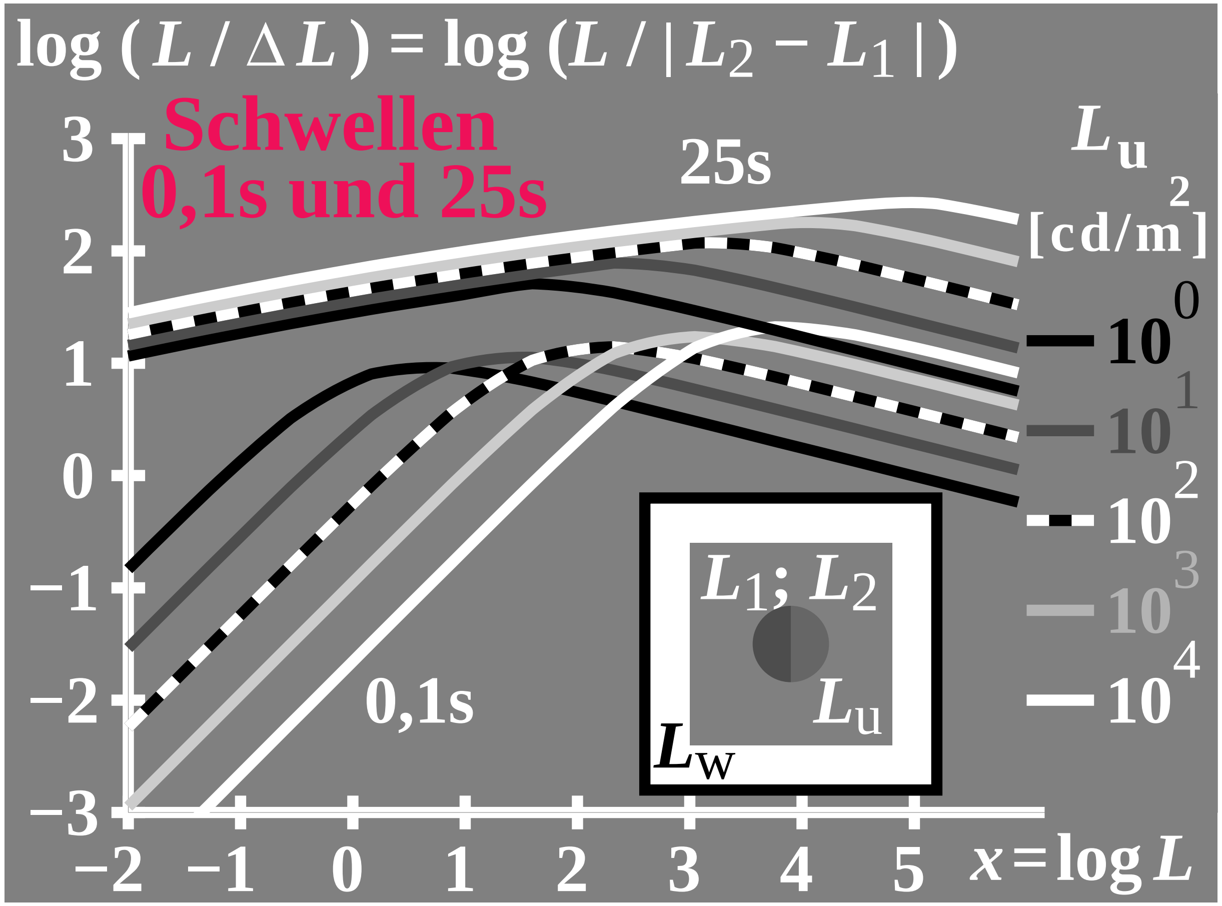
G8171_7f.eps, G0311_1f.eps, G4_26_3f.eps, Bild 4_26_3



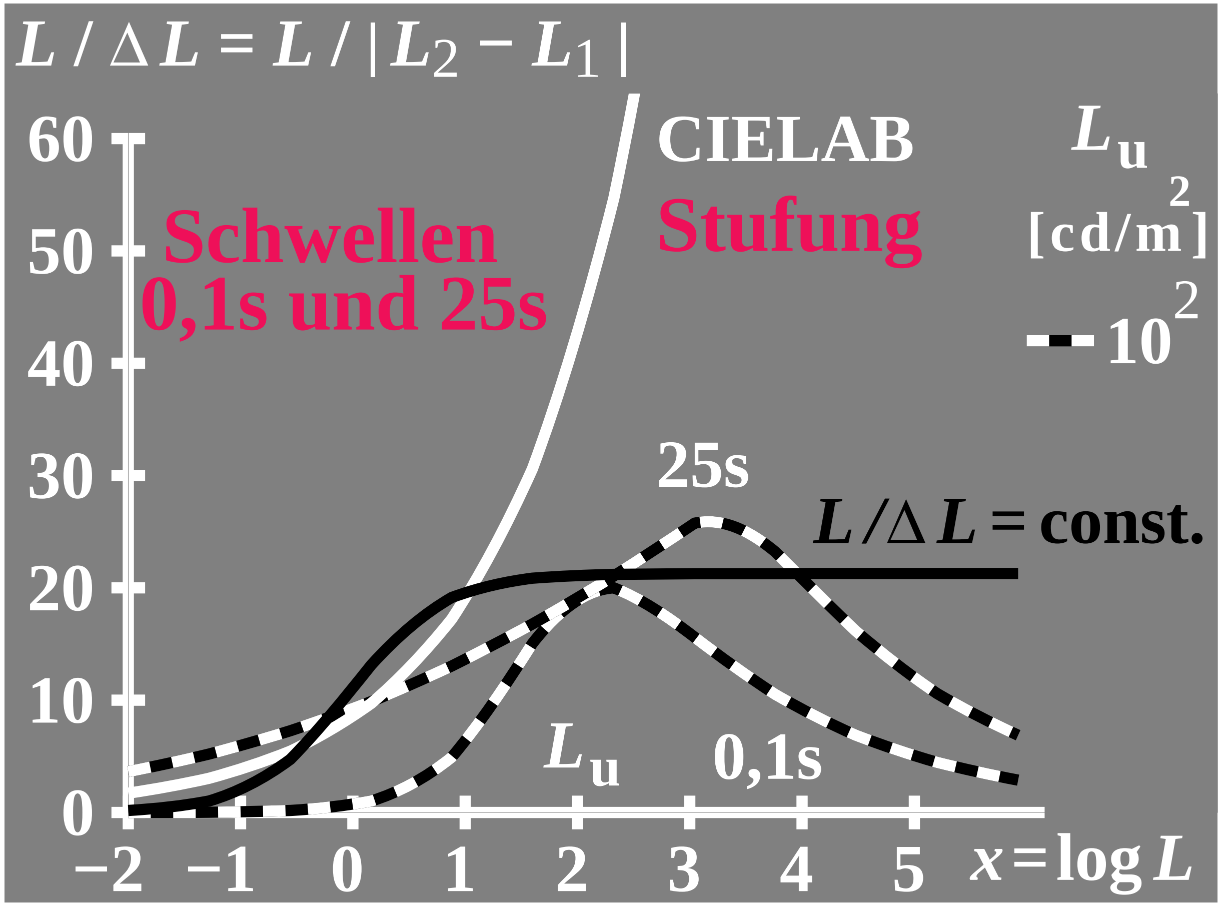
G8181_7f.eps, G0311_2f.eps, G4_26_4f.eps, Bild 4_26_4



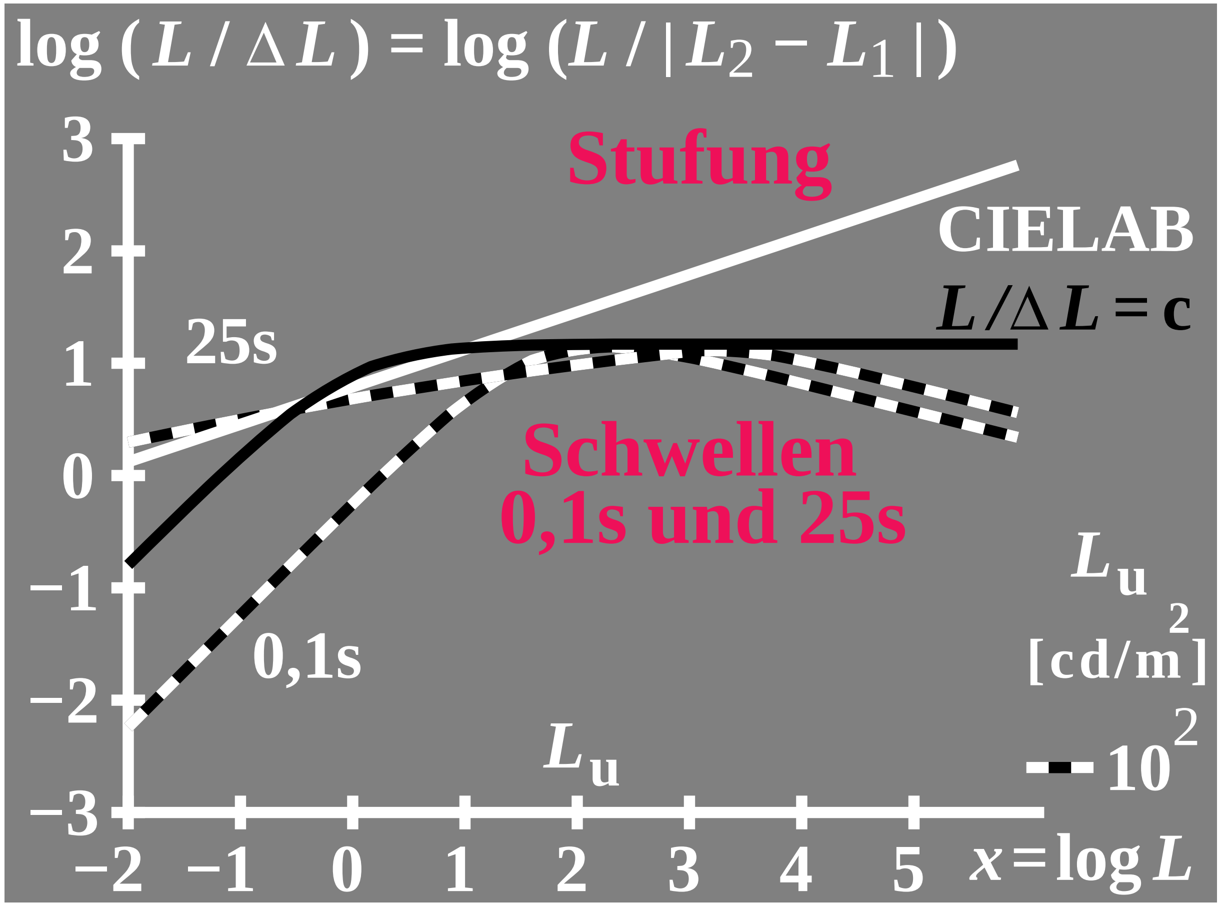
G9080_6f.eps, G0211_4f.eps, G4_27f.eps, Bild 4_27



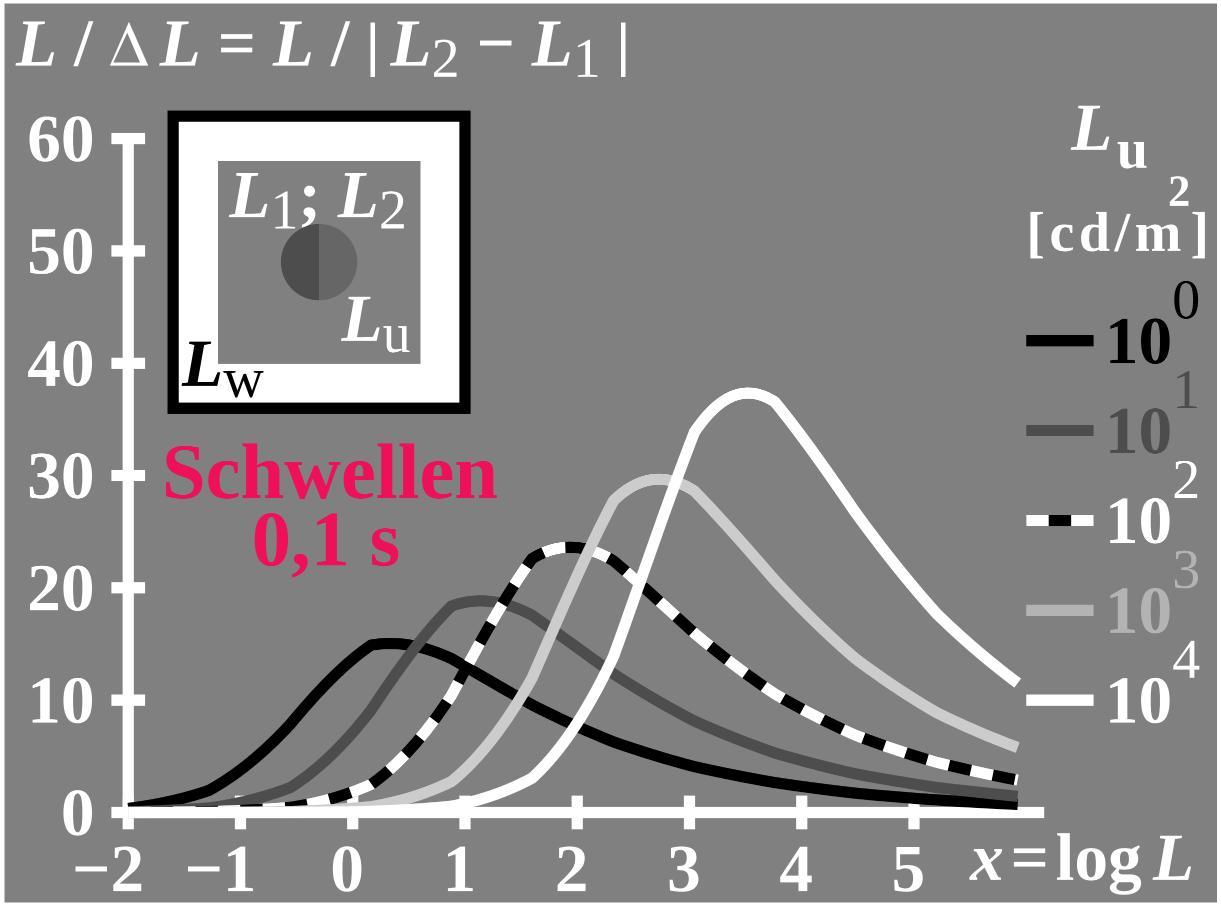
G9080_2f.eps, G0211_5f.eps, G4_28f.eps, Bild 4_28



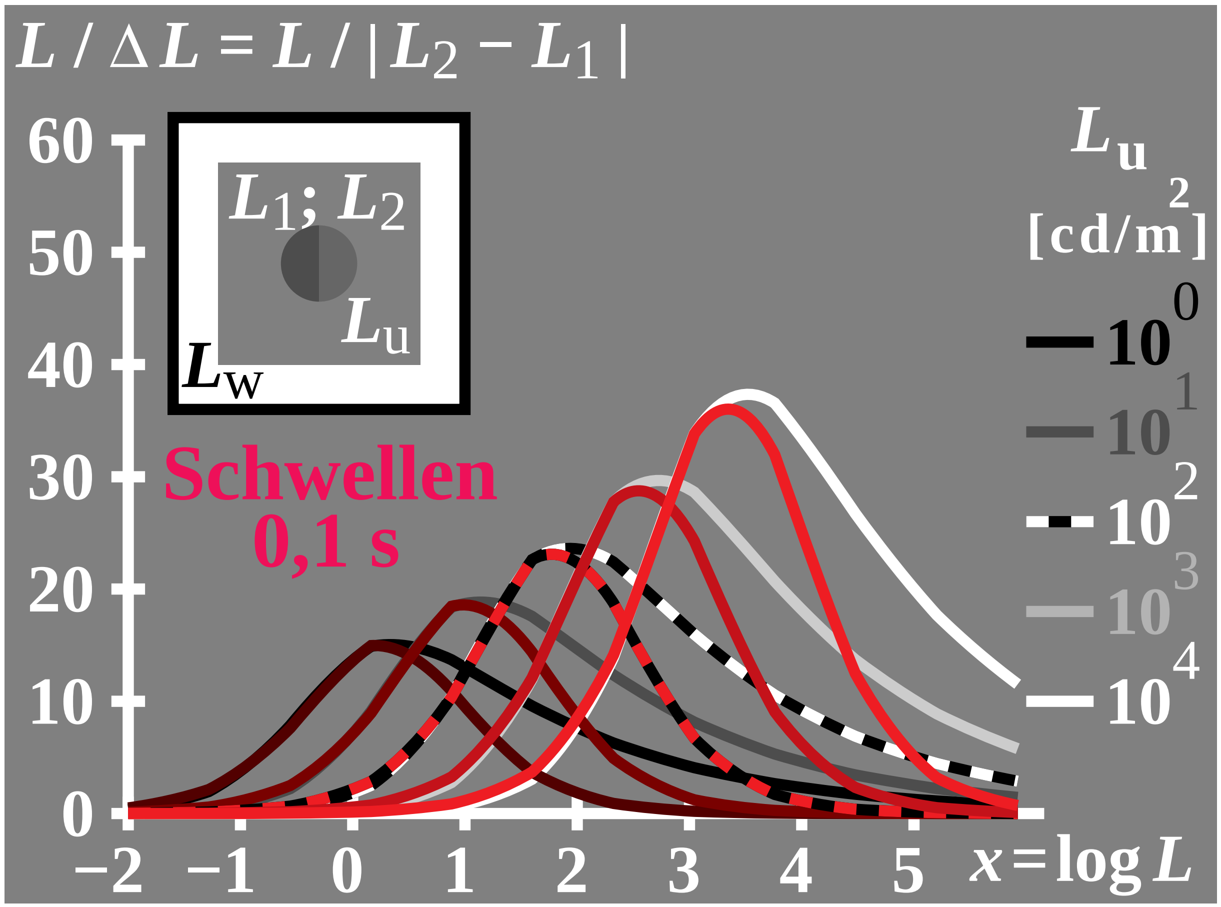
G9081_6f.eps, G0211_6f.eps, G4_29f.eps, Bild 4_29



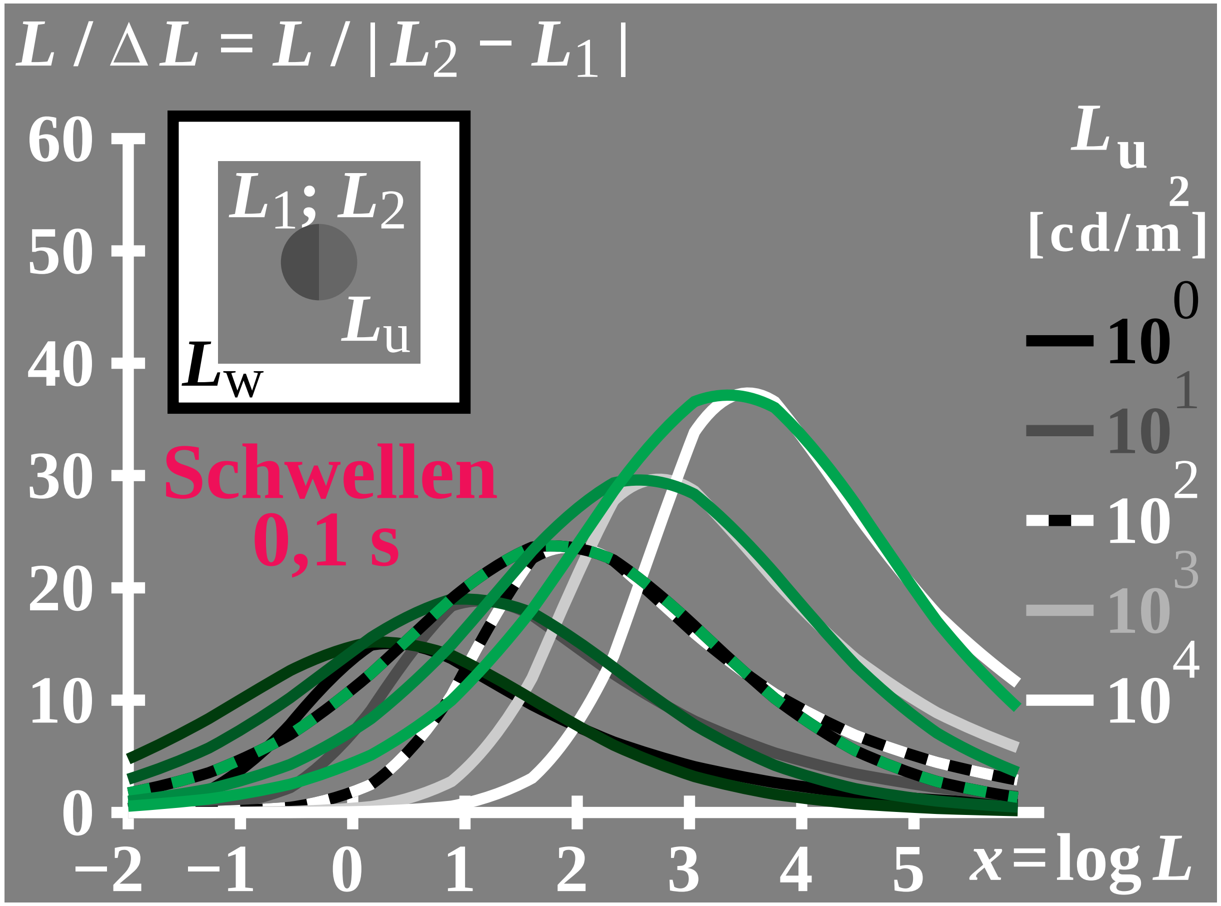
G9081_2f.eps, G0211_7f.eps, G4_30f.eps, Bild 4_30



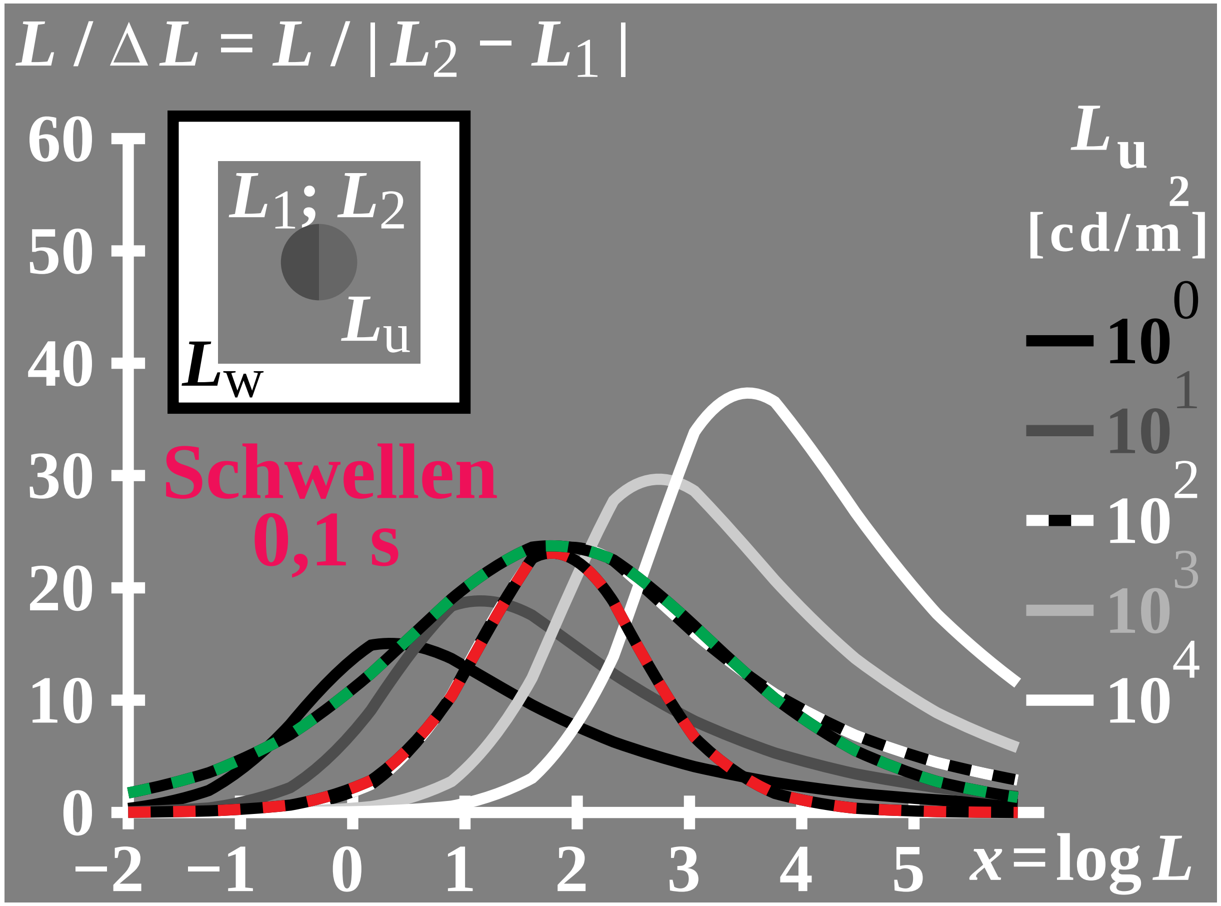
G8751_1f.eps, G0220_1f.eps, G4_31_1f.eps, Bild 4_31_1



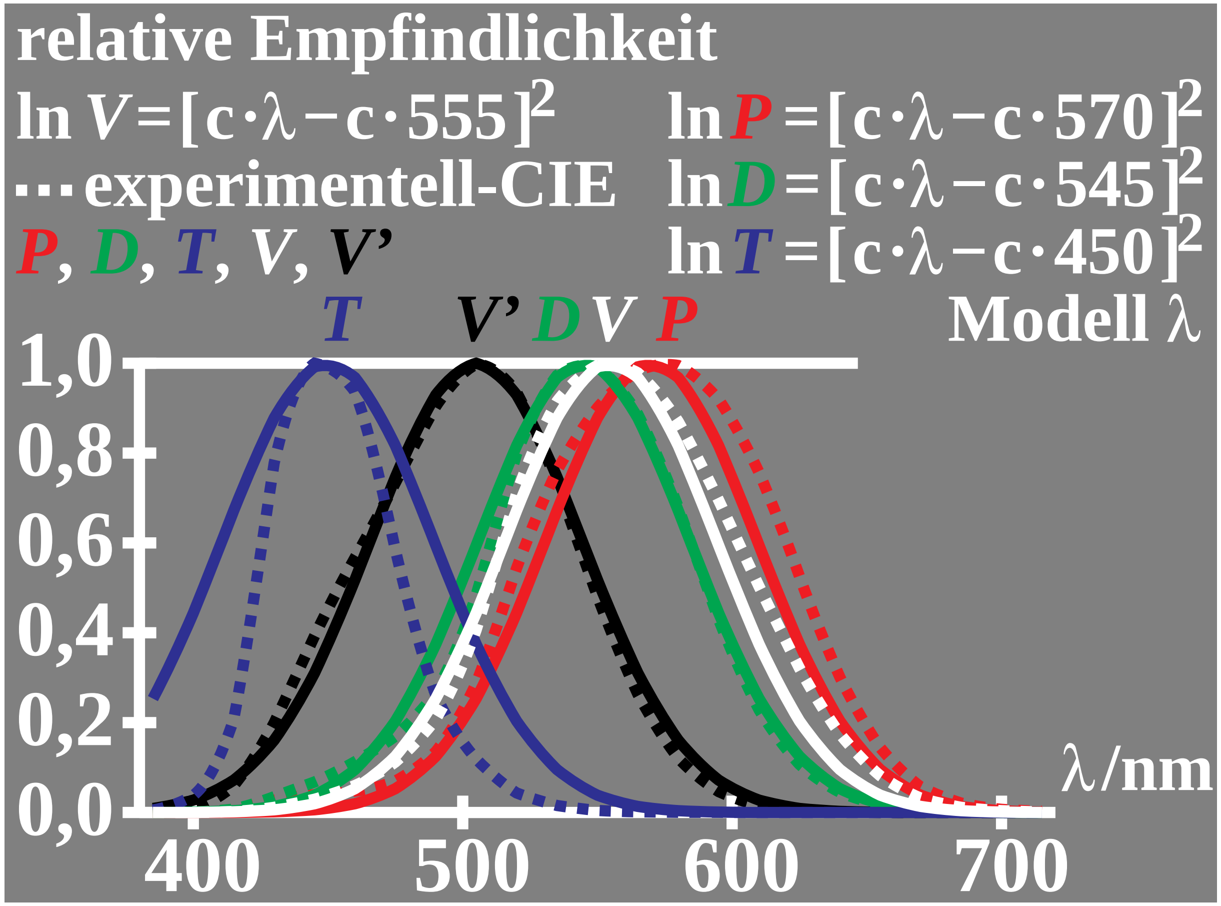
G8751_2f.eps, G0220_2f.eps, G4_31_2f.eps, Bild 4_31_2



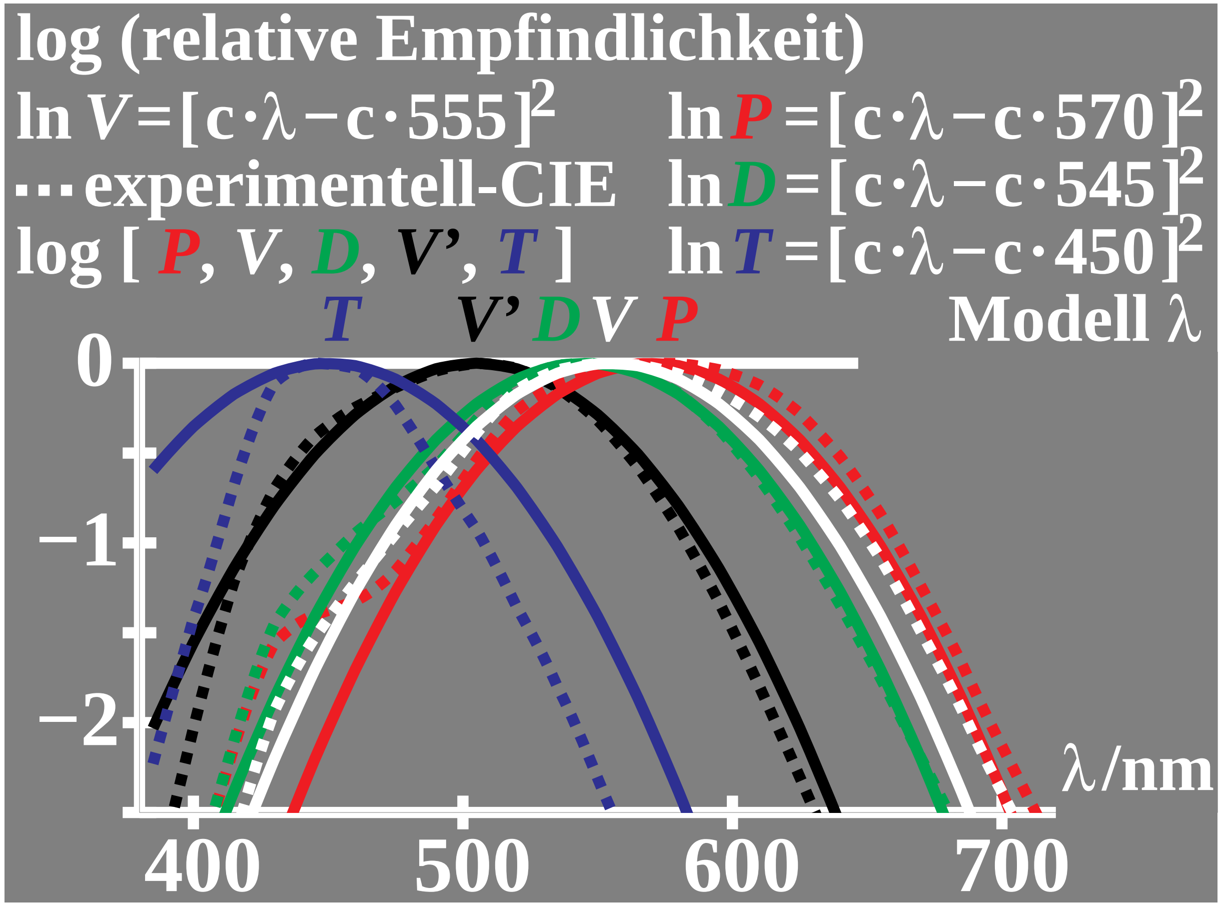
G8751_3f.eps, G0220_3f.eps, G4_32_1f.eps, Bild 4_32_1



G8751_4f.eps, G0220_4f.eps, G4_32_2f.eps, Bild 4_32_2



G8620_4f.eps, G0220_5f.eps, G4_33_1f.eps, Bild 4_33_1



G8620_8f.eps, G0220_6f.eps, G4_33_2f.eps, Bild 4_33_2

Spektrale Empfindlichkeiten *s* von Rezeptorsystemen *P*, *D*, *T*, *V*, *V'*

***u*=λ=Wellenlänge; *u*=ν=Frequenz**

$$s(u) = e^{-u^2} \qquad e=2{,}7183 \qquad \nu = 1/\lambda$$

Modell λ: $u = \frac{1}{55{,}5}(\lambda - \lambda_0)$

Modell ν: $u = 5550\,(\nu - \nu_0)$

Maxima λ_0 von *P*, *D*, *T*, *V*, *V'* in Nanometer: 570, 545, 450, 555, 505

G8780_1f.eps, G0220_7f.eps, G4_34_1f.eps, Bild 4_34_1

Spektrale Sättigungen p (=purity) von Rezeptorsystemen P, D, T, V, V'

$u=\lambda=$Wellenlänge; $u=\nu=$Frequenz

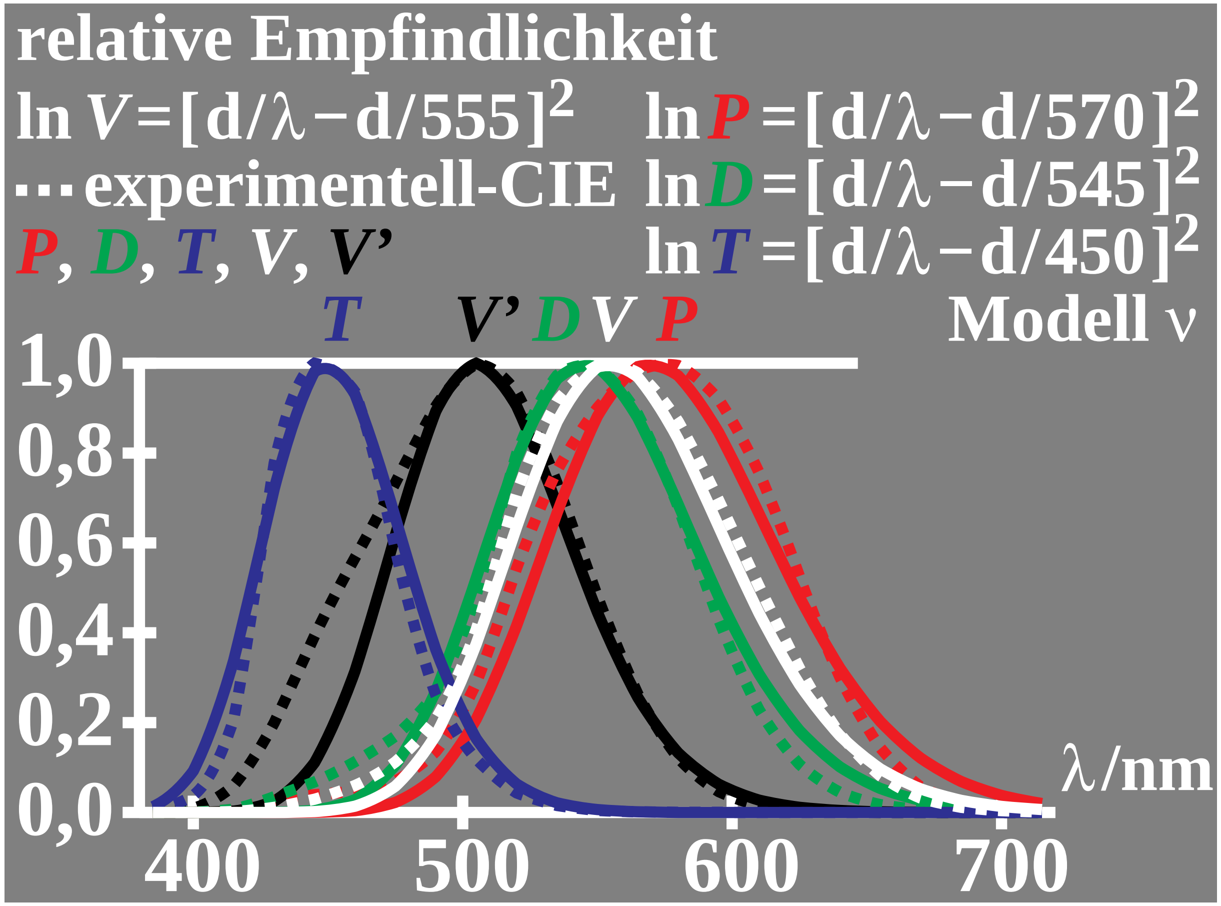
$s(u) = e^{-u^2}$ $\quad i=2/5$; $j=3/5$ $\quad \nu=1/\lambda$

Modell Y: $p = \dfrac{s(P, D, T,)}{i\,s(P) + j\,s(D)}$

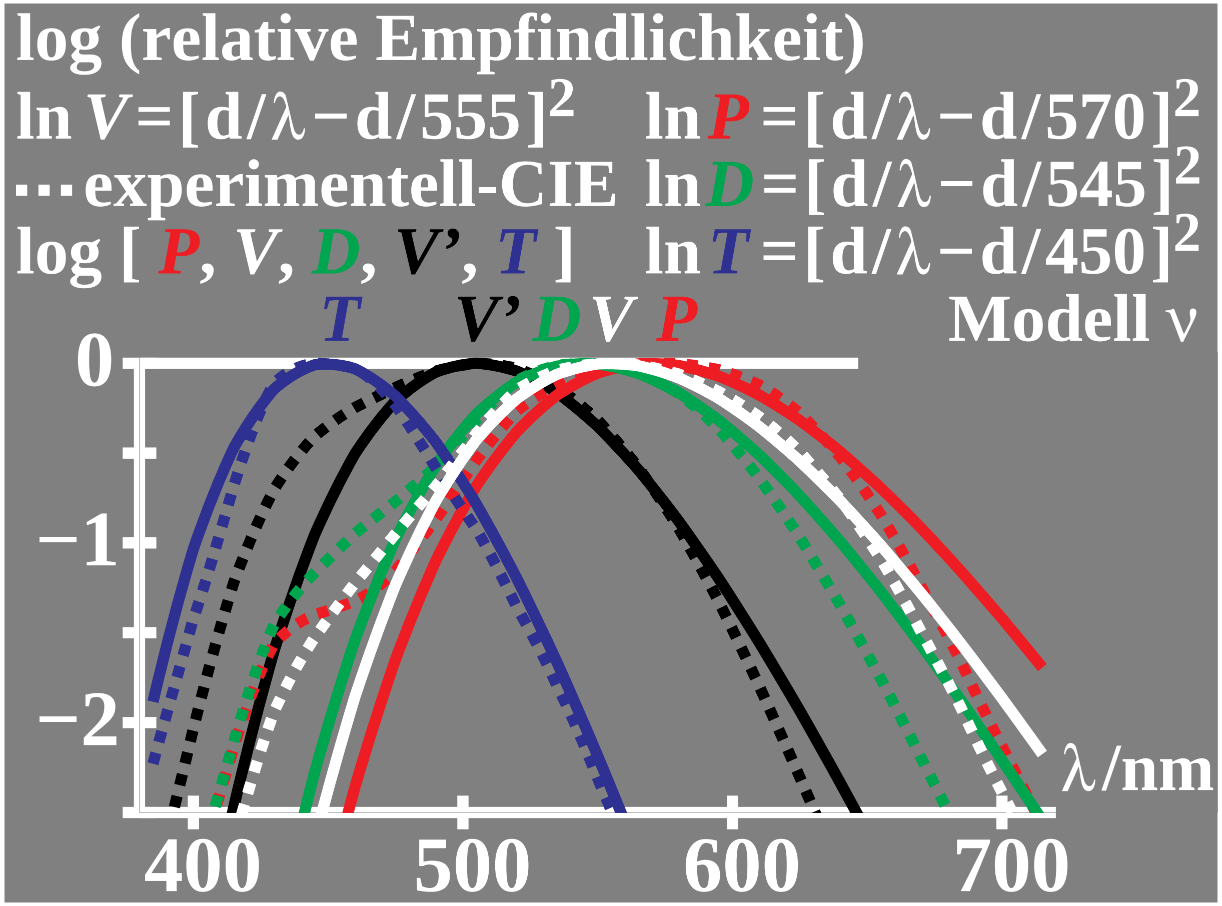
Modell V: $p = \dfrac{s(P, D, T,)}{s(V)}$

Modell U: $p = \dfrac{s(P, D, T,)}{e^{[i \ln(P) + j \ln(D)]}}$

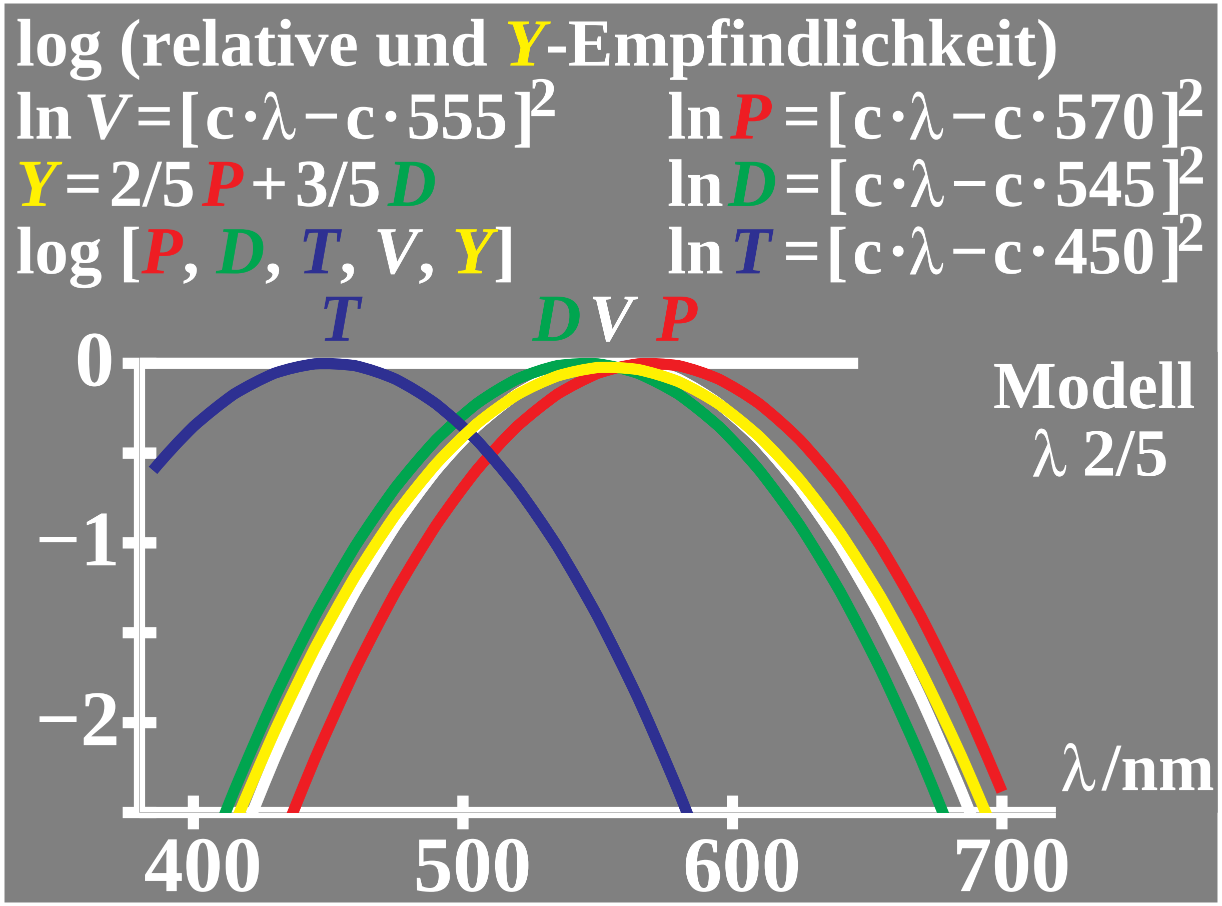
G8780_2f.eps, G0220_8f.eps, G4_34_2f.eps, Bild 4_34_2



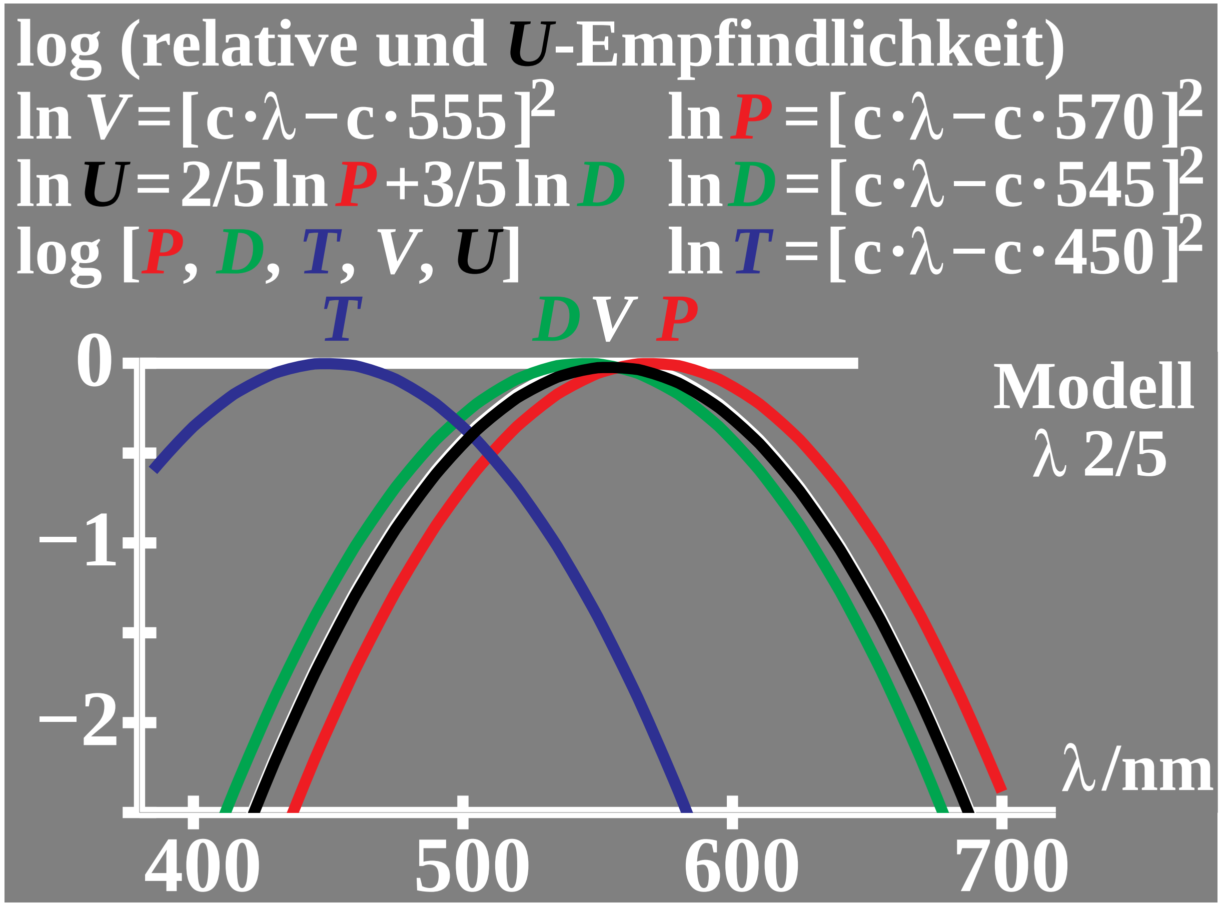
G8621_4f.eps, G0221_1f.eps, G4_35_1f.eps, Bild 4_35_1



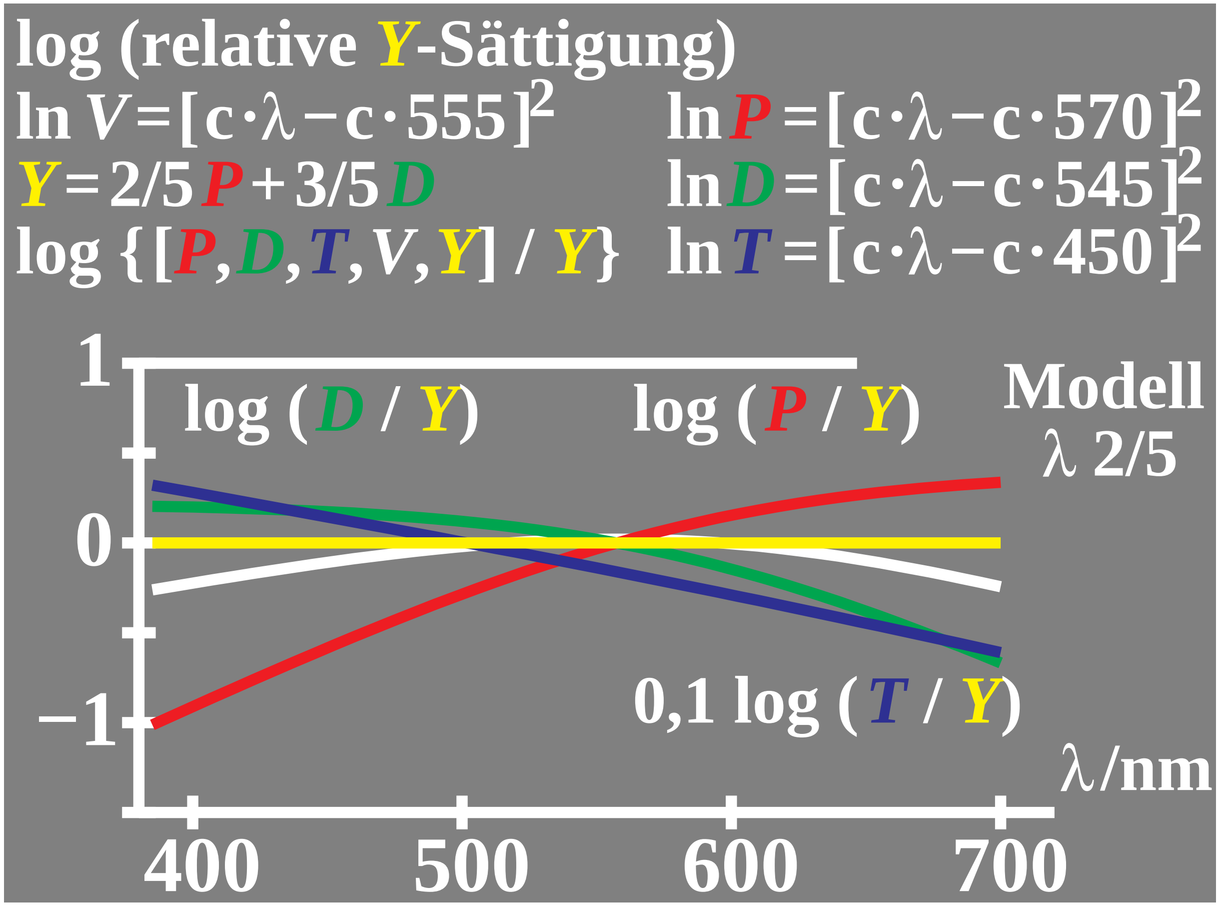
G8621_8f.eps, G0221_2f.eps, G4_35_2f.eps, Bild 4_35_1



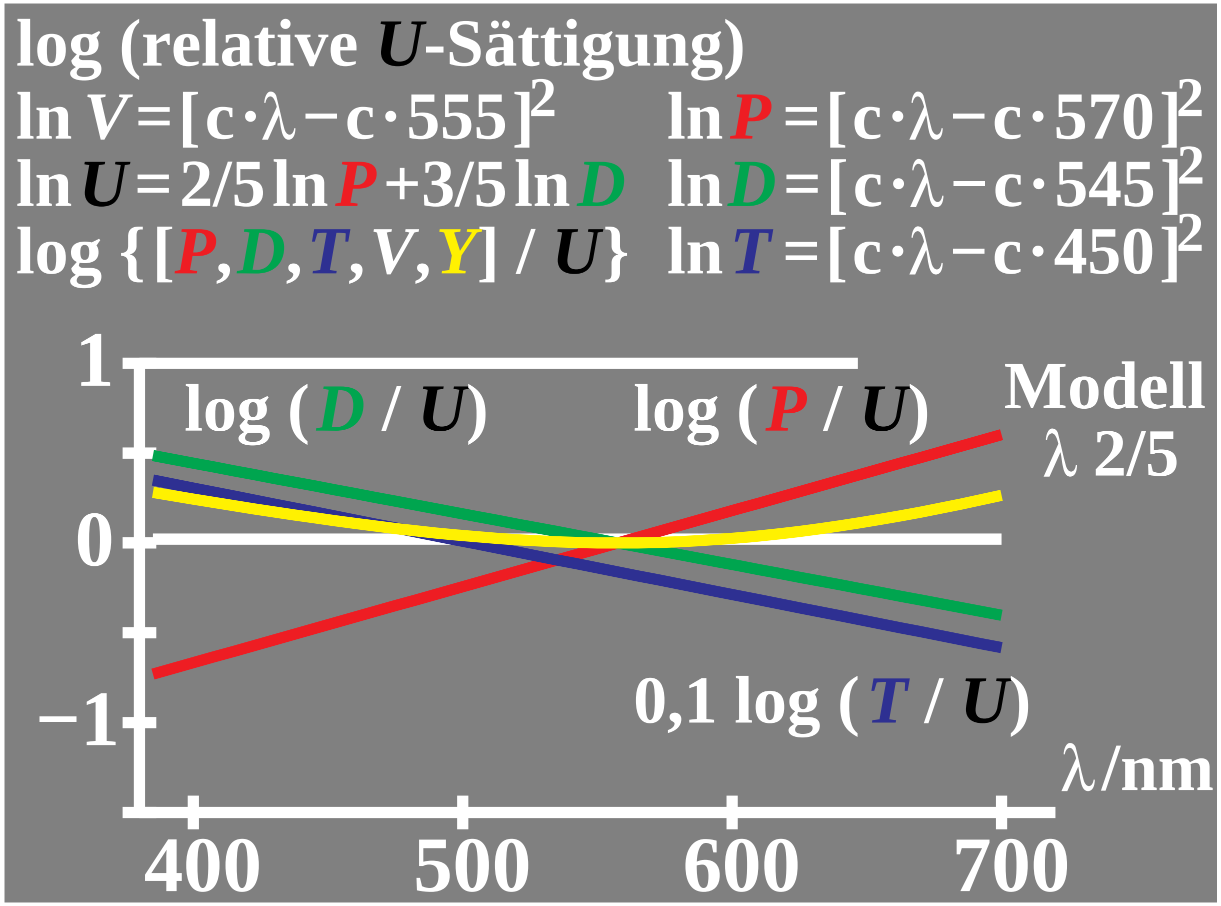
G8630_5f.eps, G0221_3f.eps, G4_36_1f.eps, Bild 4_36_1



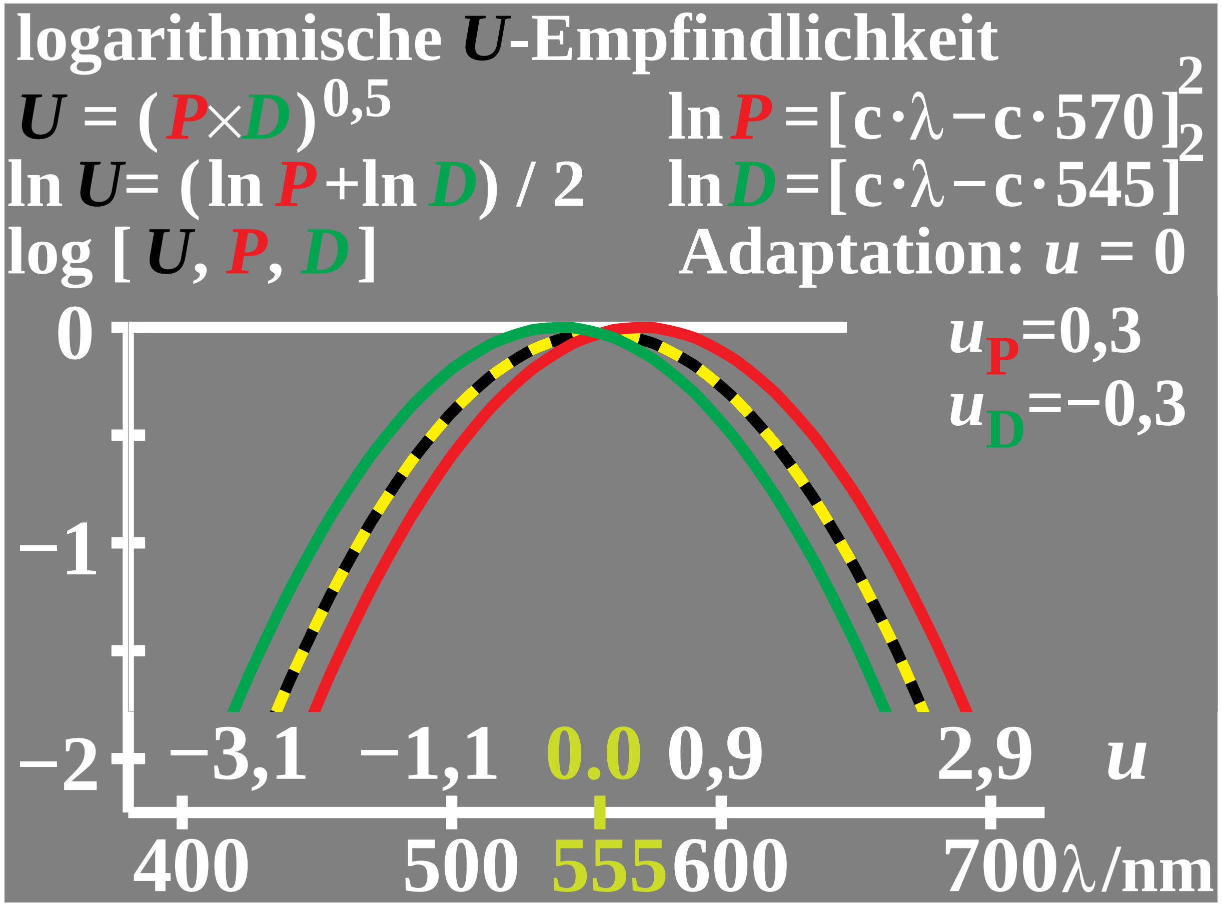
G8630_7f.eps, G0221_4f.eps, G4_36_2f.eps, Bild 4_36_2



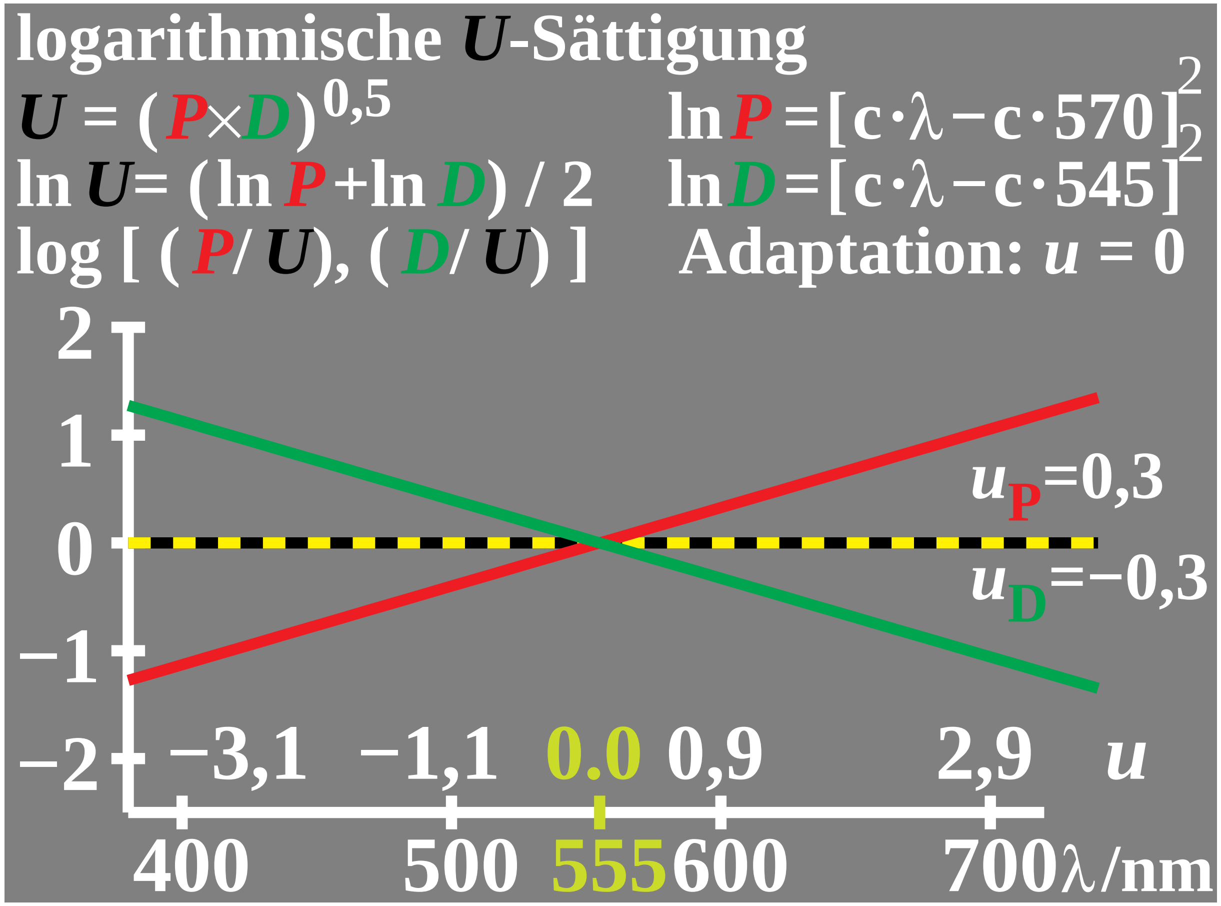
G8631_5f.eps, G0221_5f.eps, G4_37_1f.eps, Bild 4_37_1



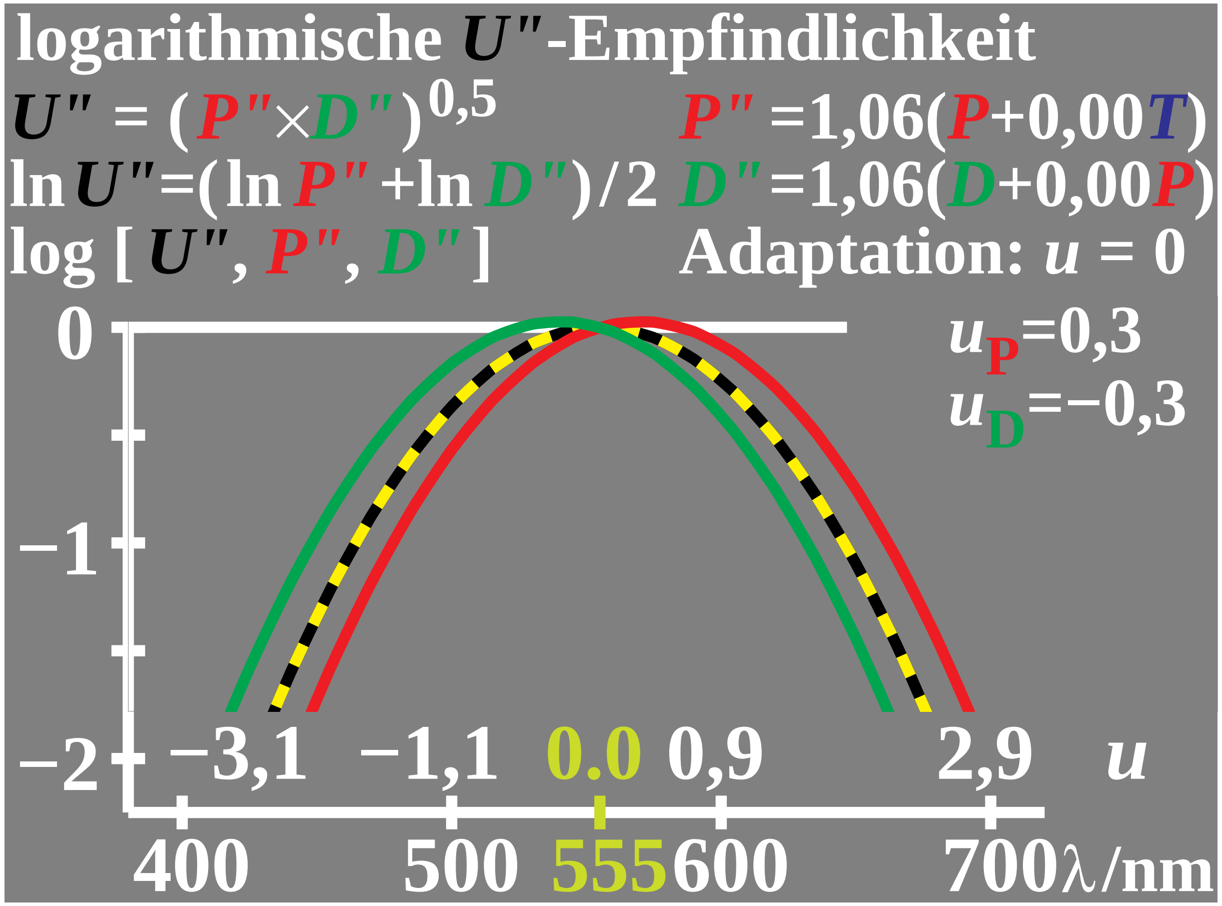
G8631_7f.eps, G0221_6f.eps, G4_37_2f.eps, Bild 4_37_2



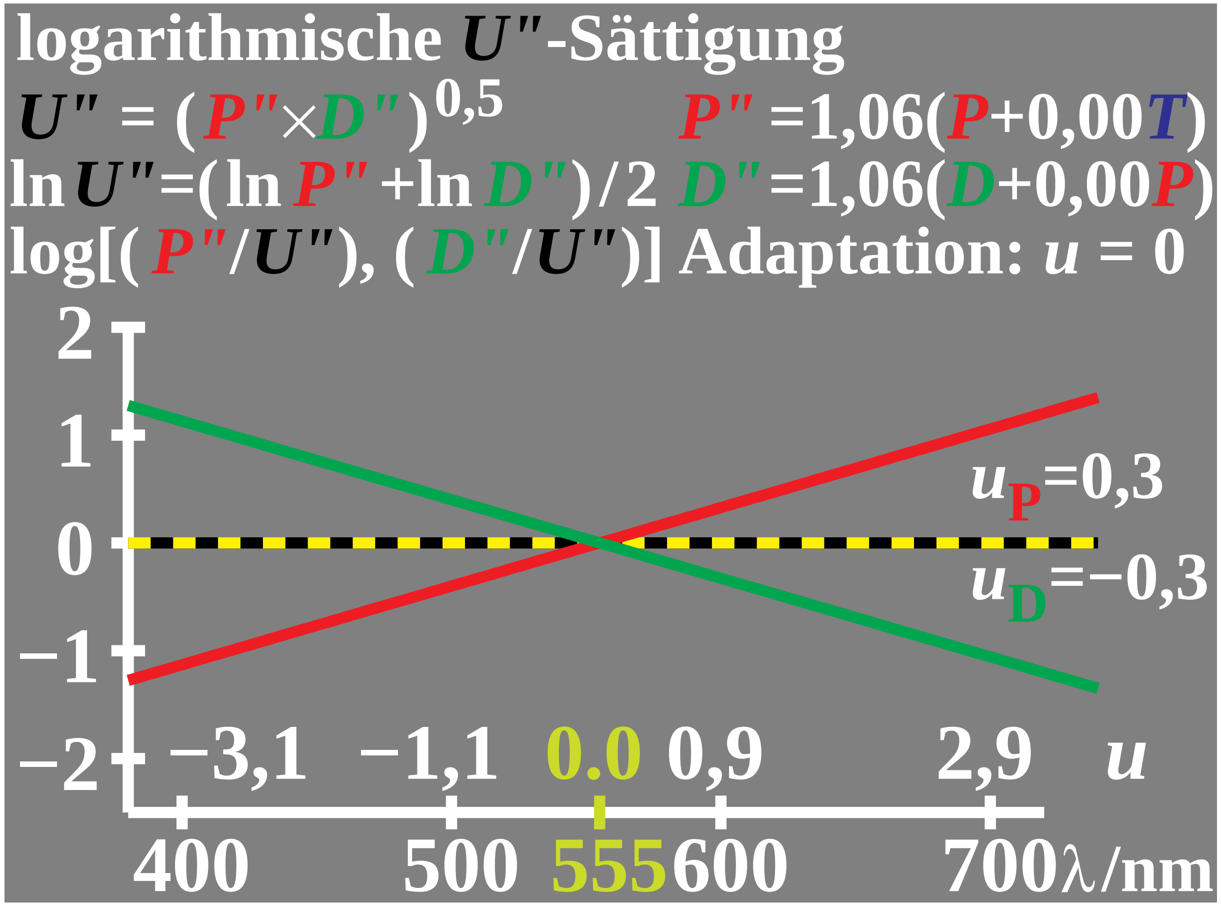
G9050_1f.eps, G0221_7f.eps, G4_38_1f.eps, Bild 4_38_1



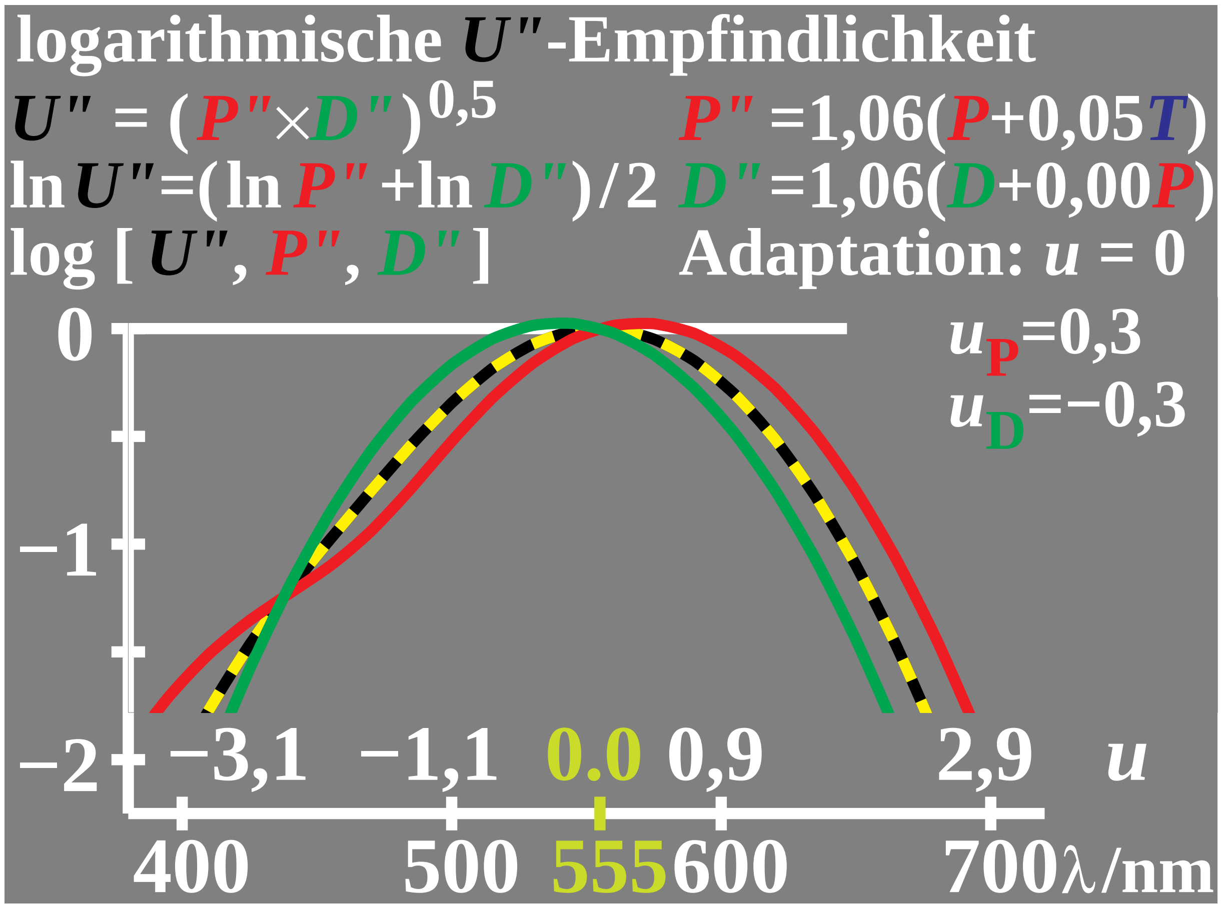
G9050_2f.eps, G0221_8f.eps, G4_38_2f.eps, Bild 4−38−2



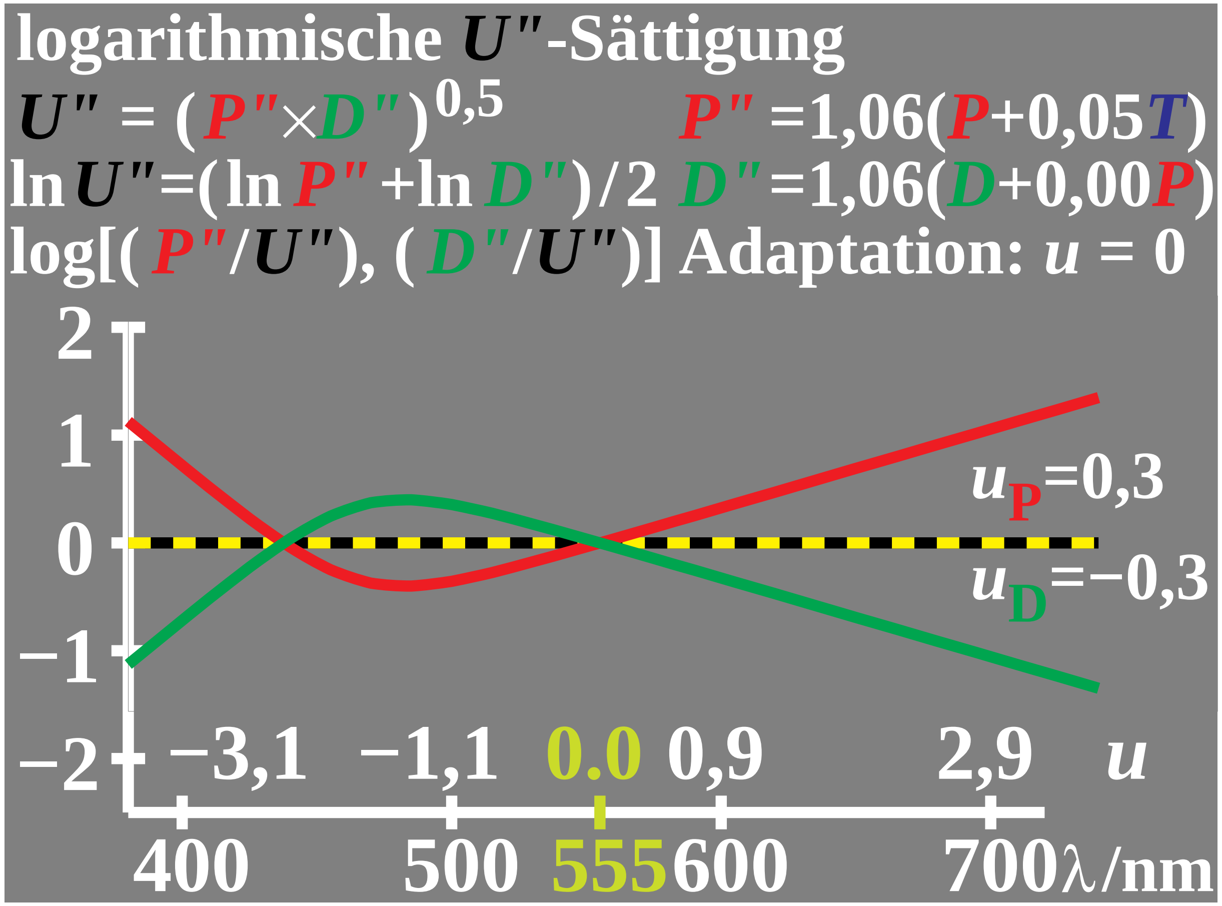
G9051_1f.eps, G0230_1f.eps, G4_39_1f.eps, Bild 4_39_1



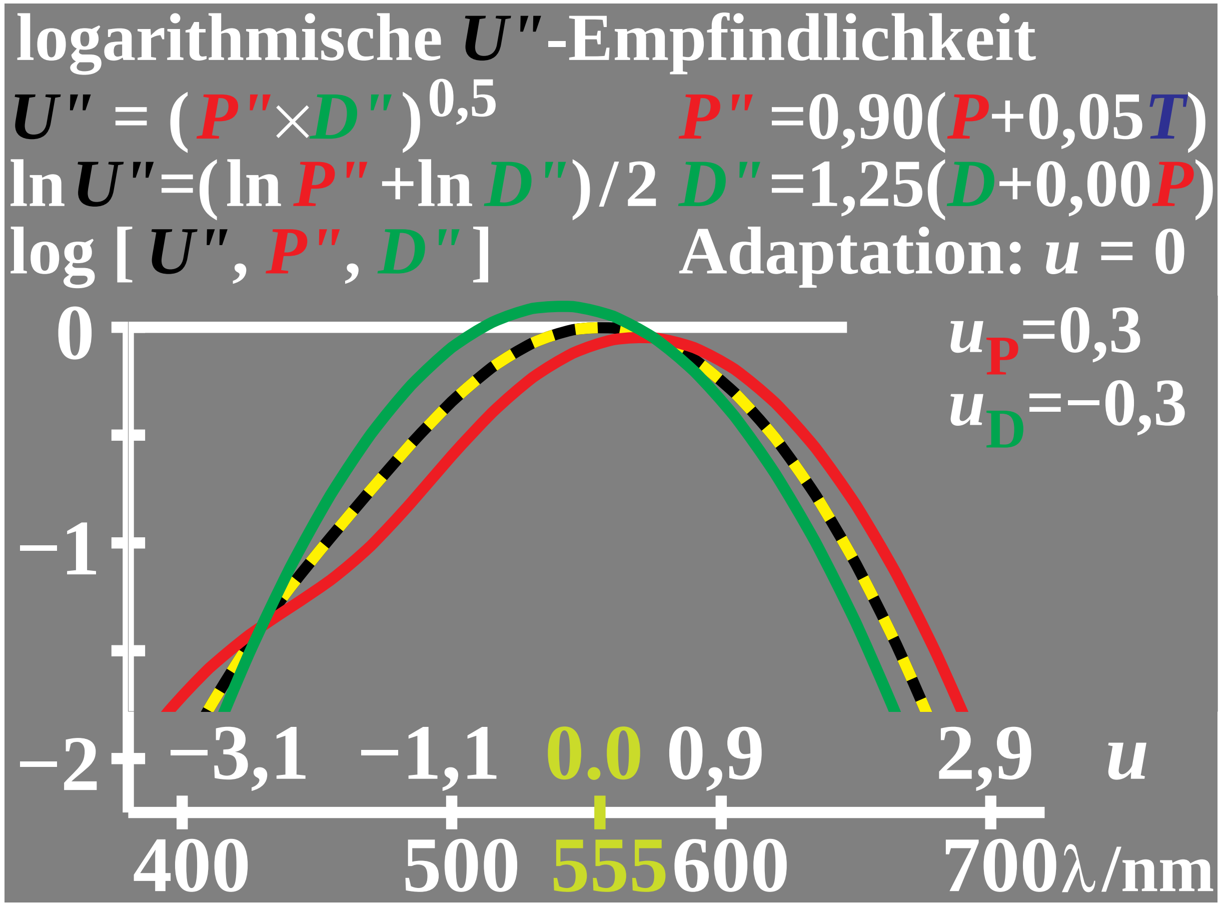
G9051_2f.eps, G0230_2f.eps, G4_39_2f.eps, Bild 4_39_2



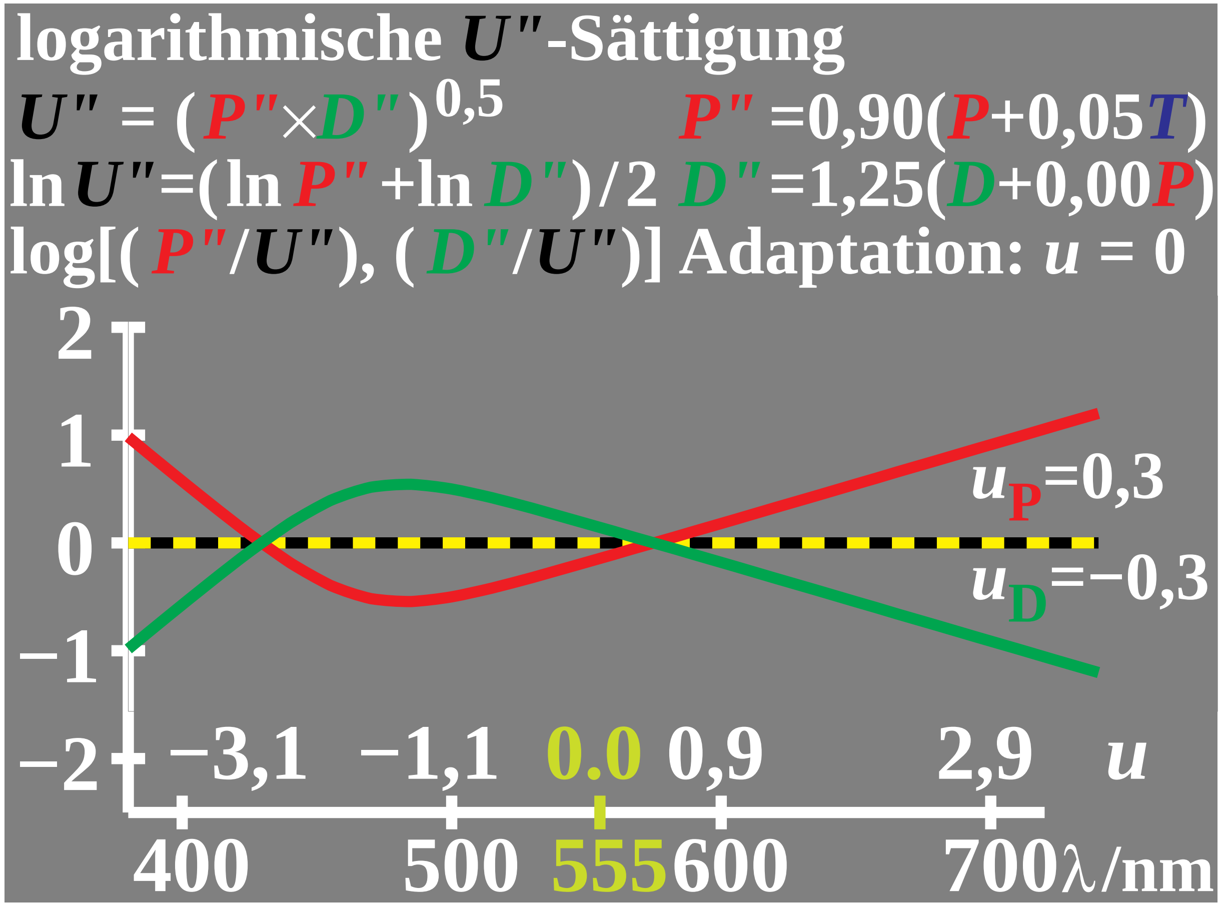
G9060_1f.eps, G0230_3f.eps, G4_40_1f.eps, Bild 4_40_1



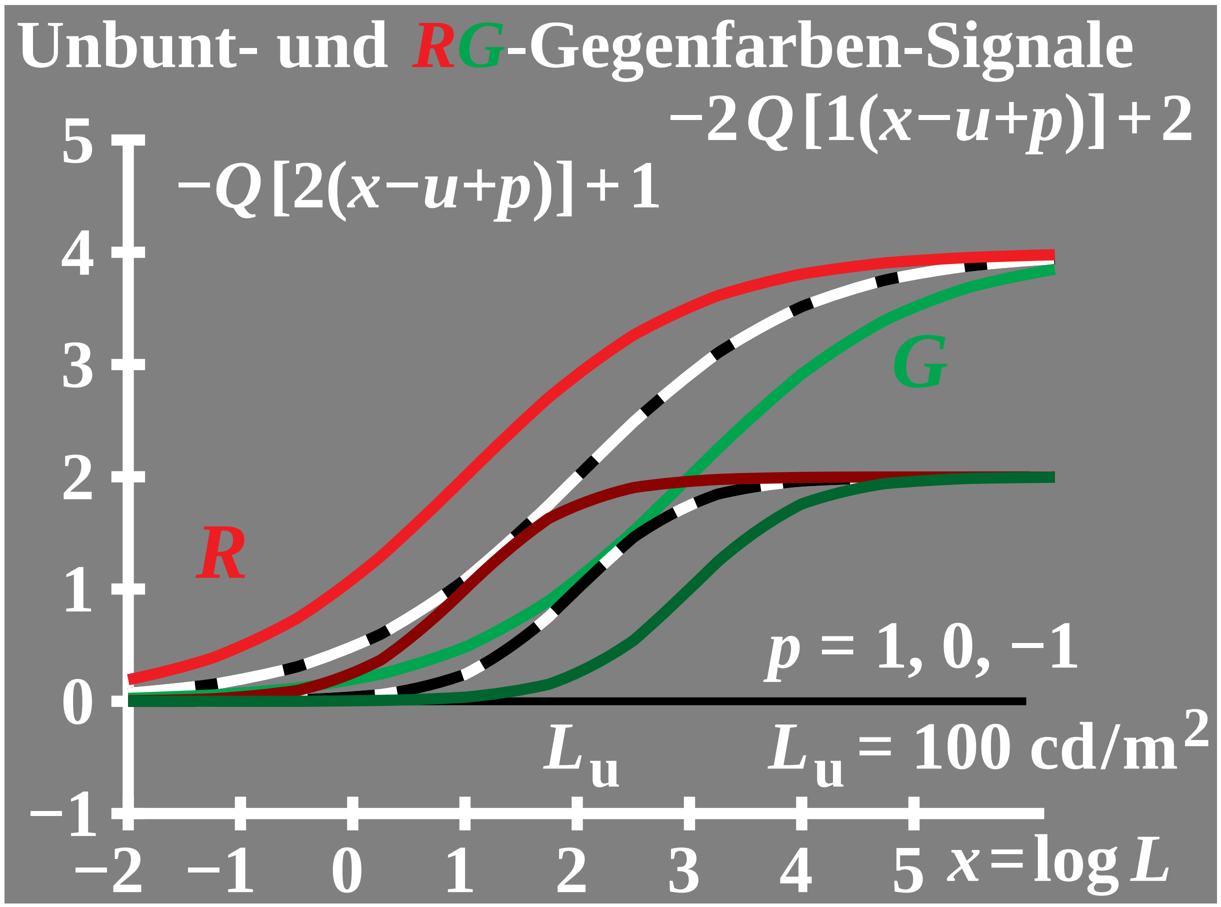
G9060_2f.eps, G0230_4f.eps, G4_40_2f.eps, Bild 4_40_2



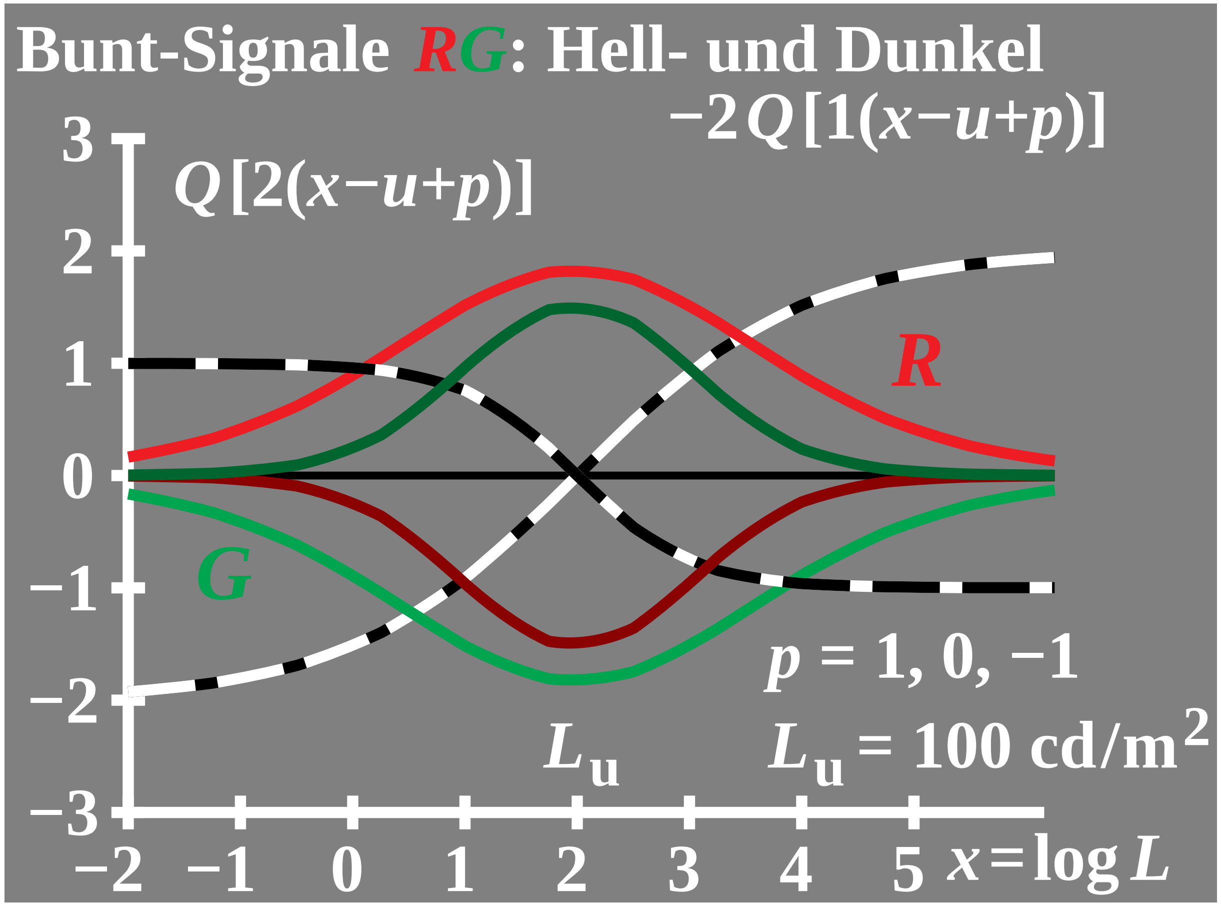
G9061_1f.eps, G0230_5f.eps, G4_41_1f.eps, Bild 4_41_1



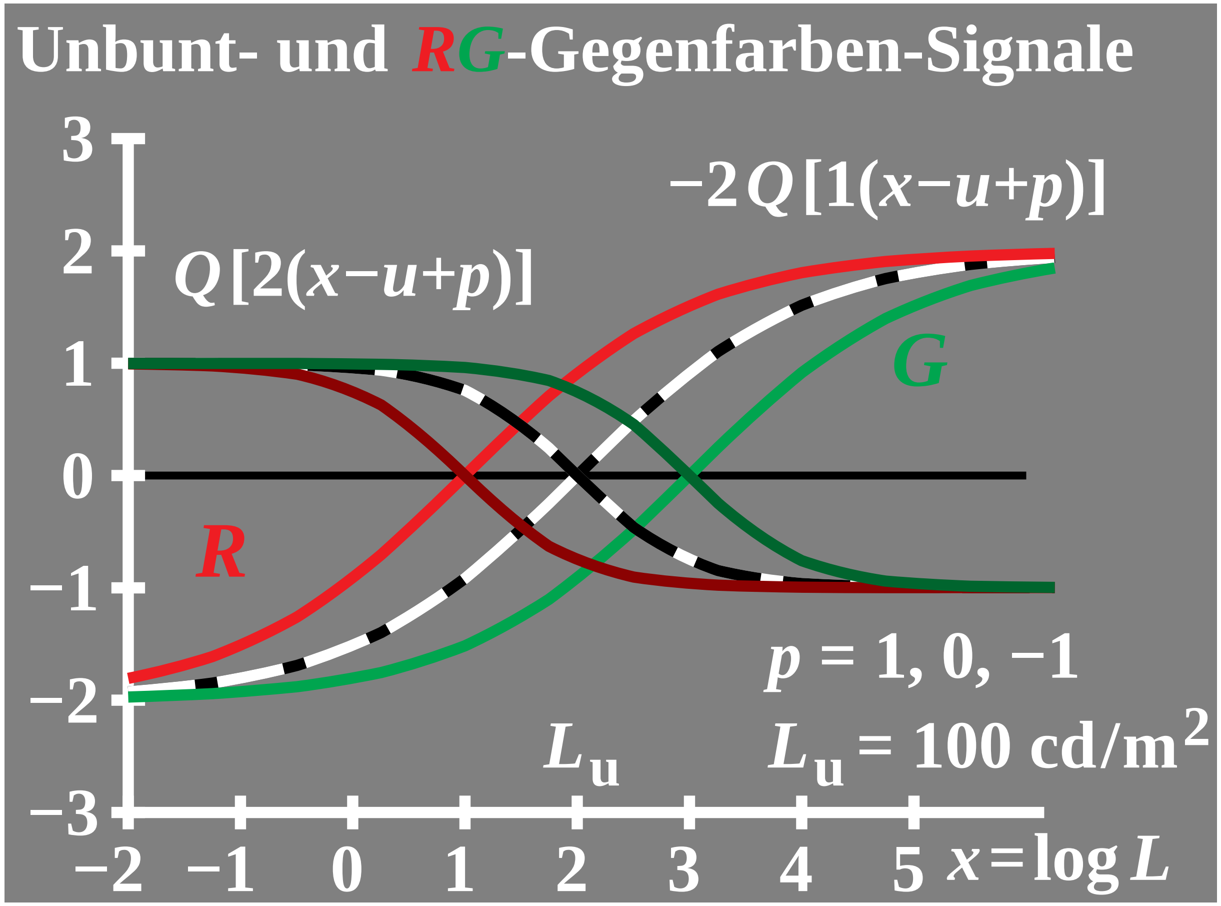
G9061_2f.eps, G0230_6f.eps, G4_41_2f.eps, Bild 4_41_2



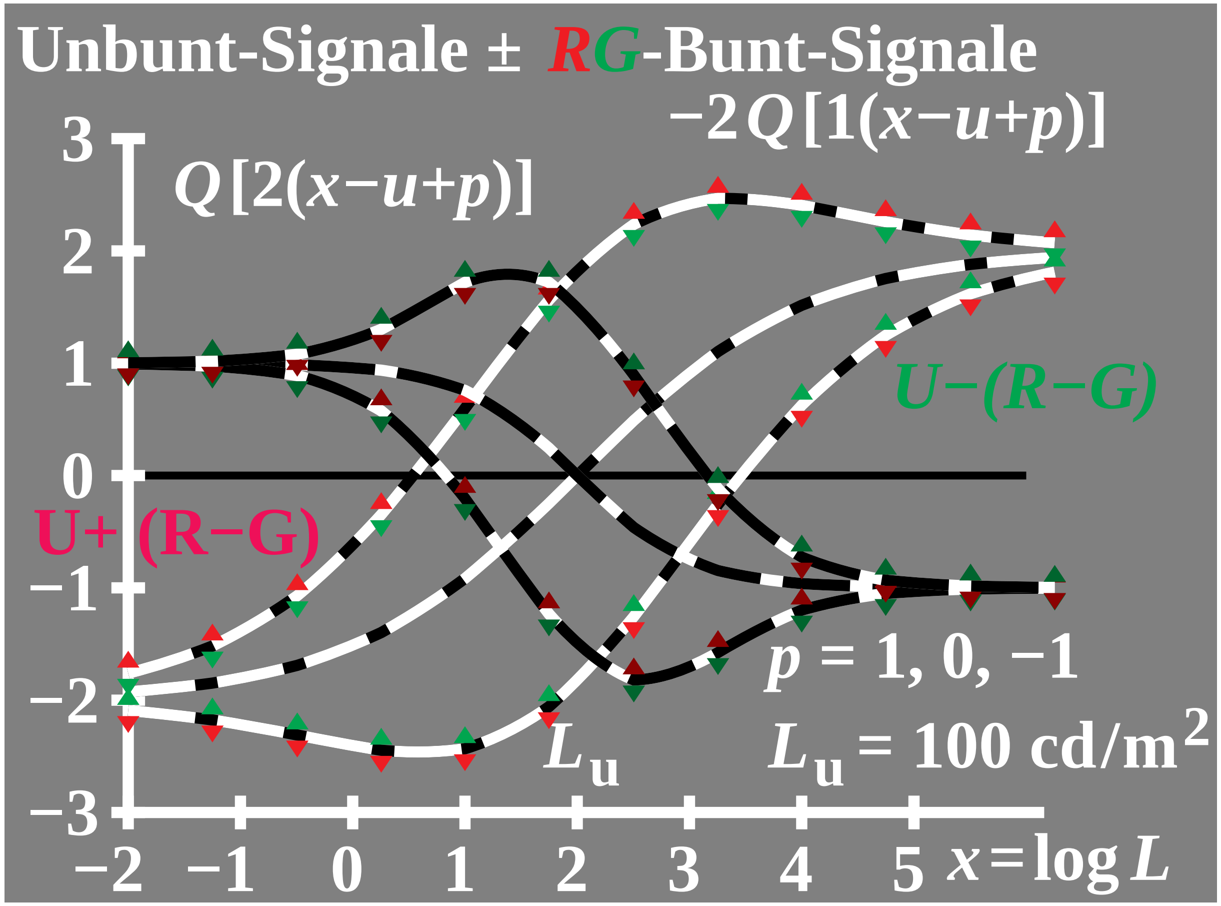
G8730_1f.eps, G0230_7f.eps, G4_42_1f.eps, Bild 4_42_1



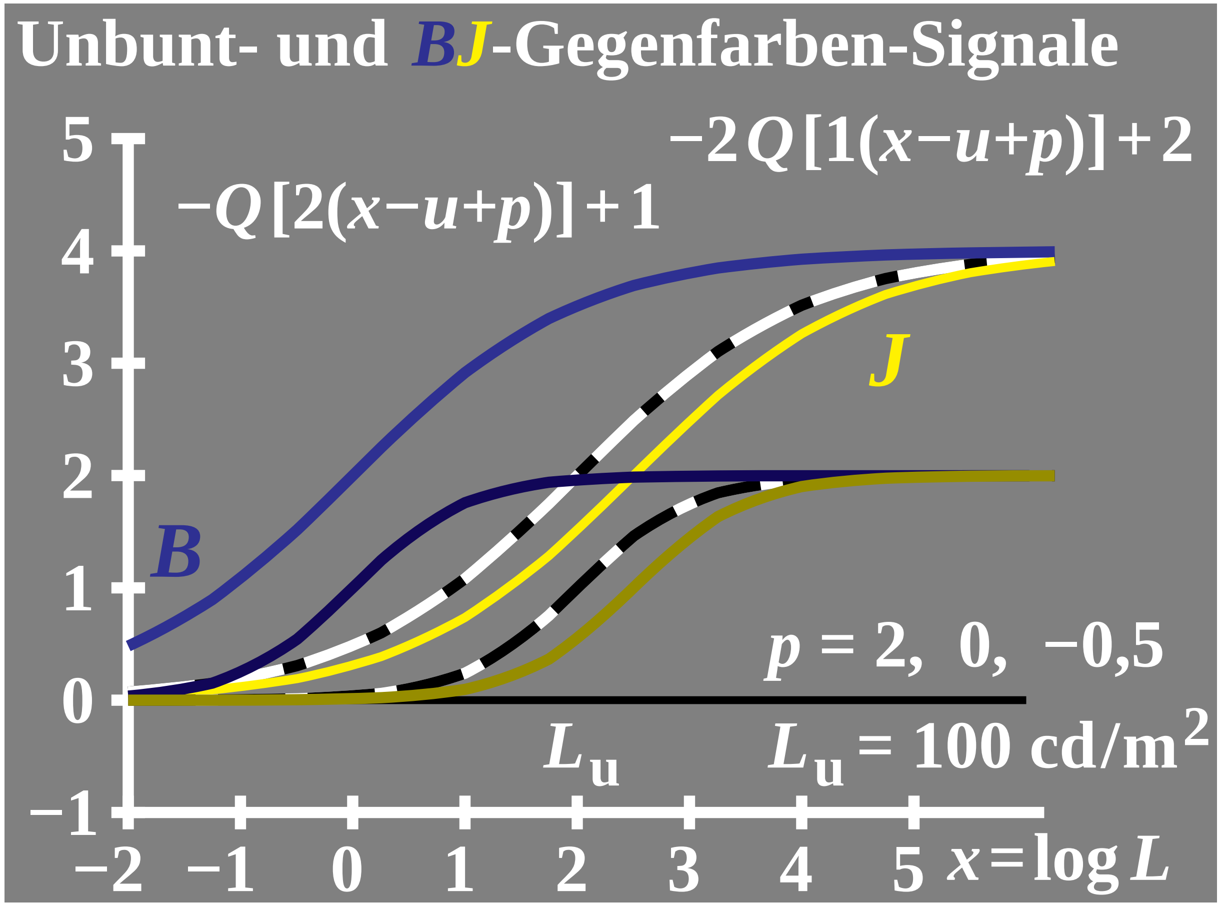
G8730_2f.eps, G0230_8f.eps, G4_42_2f.eps, Bild 4_42_2



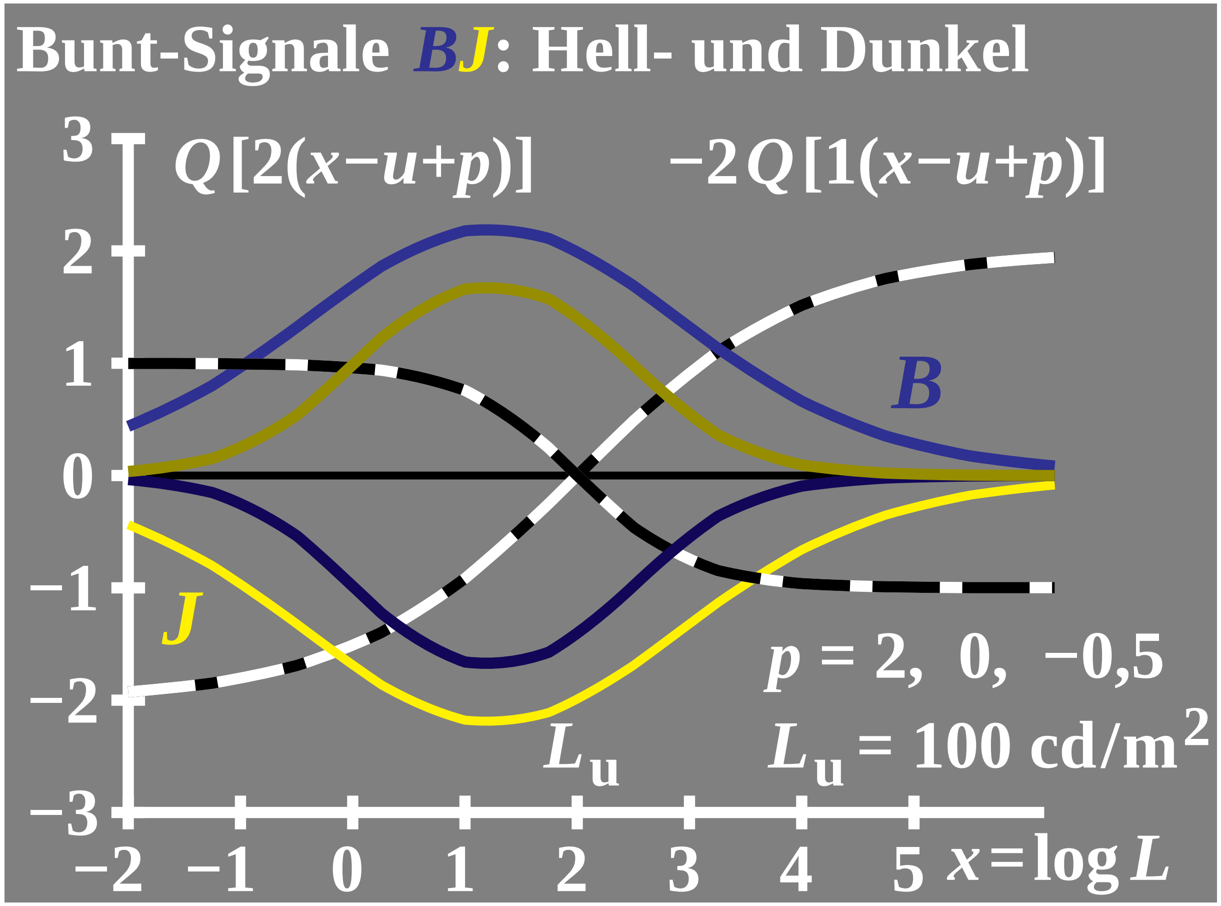
G8730_3f.eps, G0231_1f.eps, G4_43_1f.eps, Bild 4_43_1



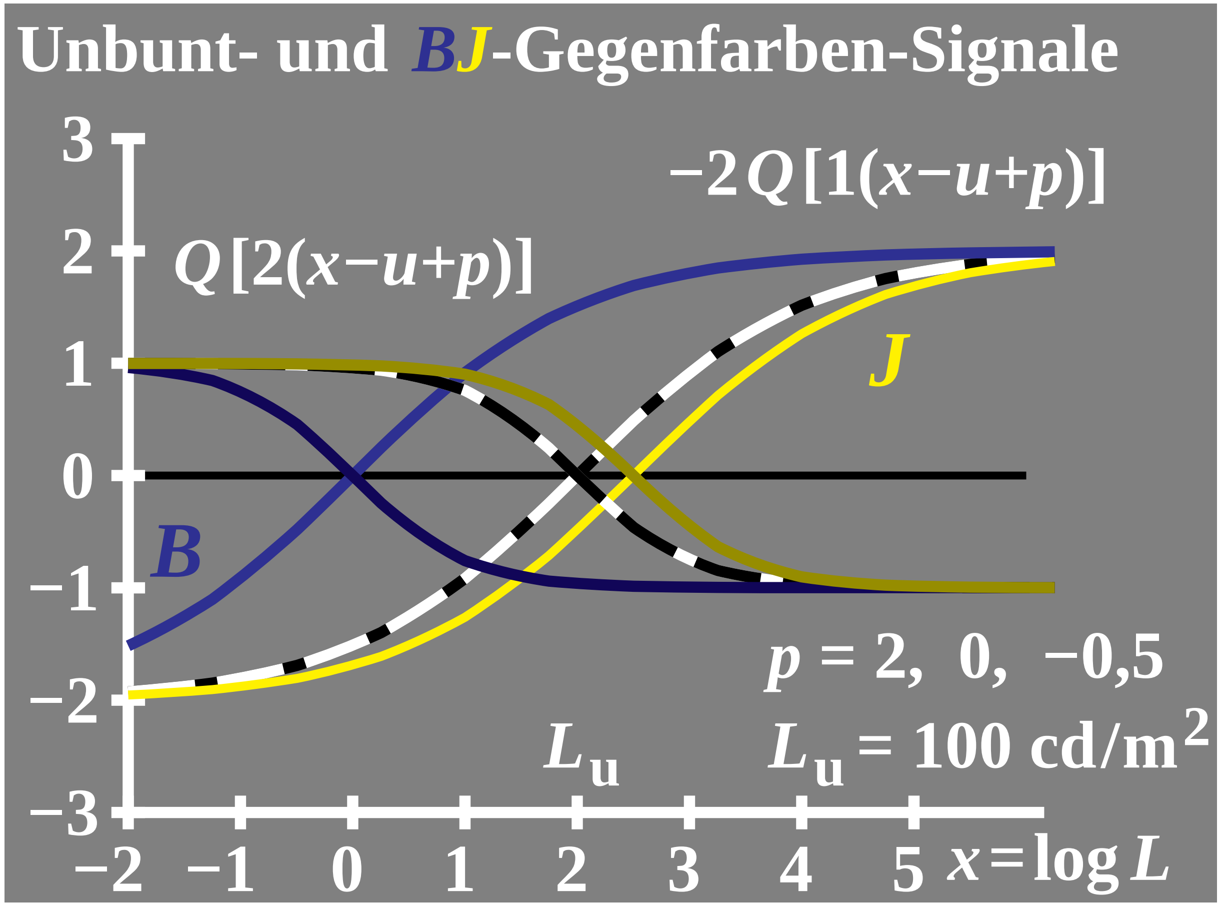
G8730_4f.eps, G0231_2f.eps, G4_43_2f.eps, Bild 4_43_2



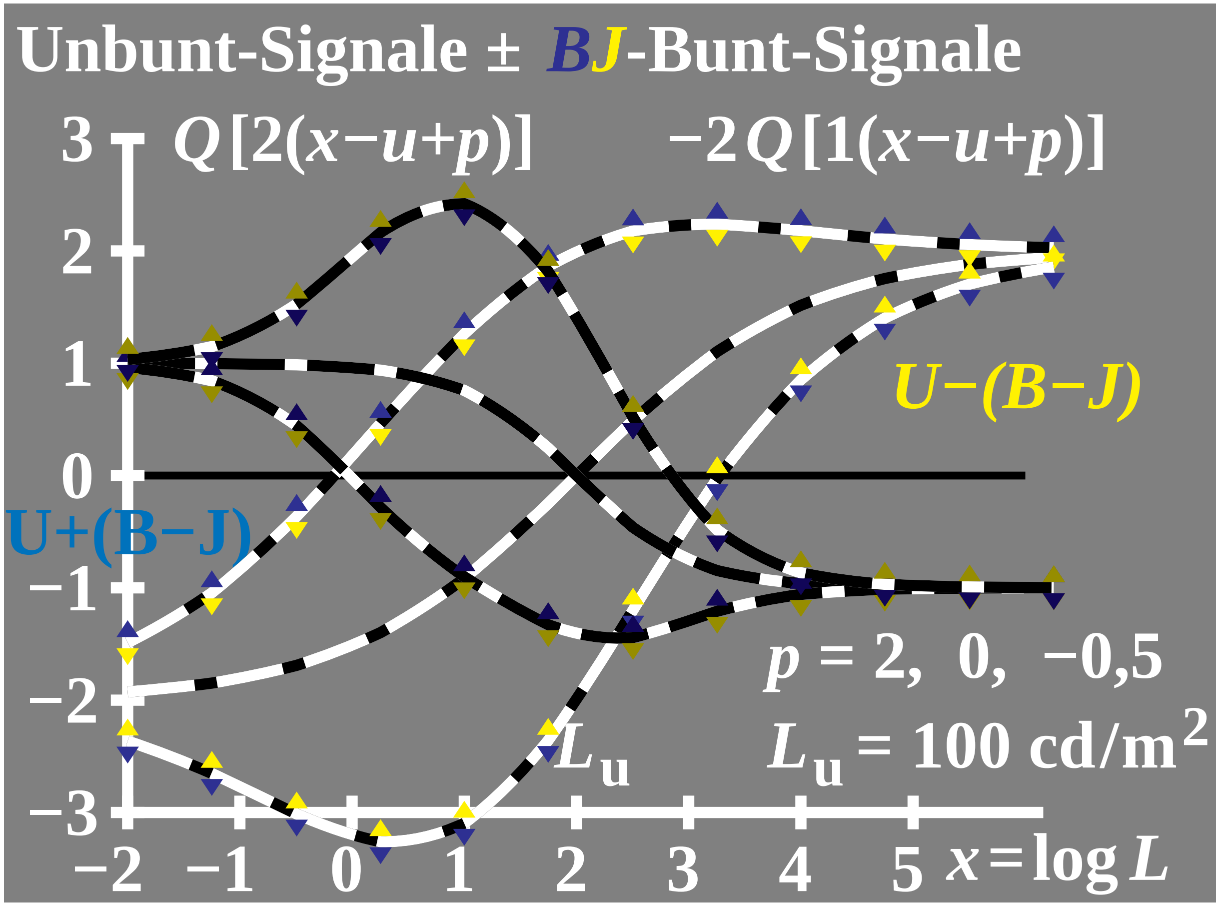
G8731_1f.eps, G0231_3f.eps, G4_44_1f.eps, Bild 4_44_1



G8731_2f.eps, G0231_4f.eps, G4_44_2f.eps, Bild 4_44_2



G8731_3f.eps, G0231_5f.eps, G4_45_1f.eps, Bild 4_45_1



G8731_4f.eps, G0231_6f.eps, G4_45_2f.eps, Bild 4_45_2

Linien−Element von Lichttechnik (Leuchtdichte *L*) und Farbmetrik mit „Farbwerten” *P*, *D* und *T*

Leuchtdichte-Signalfunktion *F*(*L*)

Farb-Signalfunktion *F*(*P*, *D*, *T*)

***Taylor*-Ableitungen:**

$$\Delta F(L) = \frac{\mathrm{d}F}{\mathrm{d}L}\Delta L$$

$$\Delta F(P, D, T) = \frac{\mathrm{d}F}{\mathrm{d}P}\Delta P + \frac{\mathrm{d}F}{\mathrm{d}D}\Delta D + \frac{\mathrm{d}F}{\mathrm{d}T}\Delta T$$

G8720_5f.eps, G0231_7f.eps, G4_46_1f.eps, Bild 4_46_1

Linien-Element von *Helmholtz* (1896) mit „Farbwerten” P, D, T

Drei separate Farb−Signalfunktionen

$$F(P) = i \ln P$$

$$F(D) = j \ln D$$

$$F(T) = k \ln T$$

***Taylor*-Ableitungen:**

$$\Delta F(P, D, T) = \frac{\mathrm{d}F}{\mathrm{d}P}\Delta P + \frac{\mathrm{d}F}{\mathrm{d}D}\Delta D + \frac{\mathrm{d}F}{\mathrm{d}T}\Delta T$$

$$\Delta F(P, D, T) = \frac{i}{P}\Delta P + \frac{j}{D}\Delta D + \frac{k}{T}\Delta T$$

G8720_6f.eps, G0231_8f.eps, G4_46_2f.eps, Bild 4_46_2

**Linien-Element von *Stiles* (1946)
mit „Farbwerten” *P*, *D* und *T***

Drei separate Farb−Signalfunktionen

$$F(P) = i \ln(1+9P)$$

$$F(D) = j \ln(1+9D)$$

$$F(T) = k \ln(1+9T)$$

***Taylor*-Ableitungen:**

$$\Delta F(P, D, T) = \frac{\mathrm{d}F}{\mathrm{d}P}\Delta P + \frac{\mathrm{d}F}{\mathrm{d}D}\Delta D + \frac{\mathrm{d}F}{\mathrm{d}T}\Delta T$$

$$= \frac{9i}{1+9P}\Delta P + \frac{9j}{1+9D}\Delta D + \frac{9k}{1+9T}\Delta T$$

G8720_7f.eps, G0240_1f.eps, G4_47_1f.eps, Bild 4_47_1

Linien-Element von *Vos&Walraven* (1972) mit „Farbwerten" *P*, *D*, *T*

Drei separate Farb−Signalfunktionen

$$F(P) = -2i\sqrt{P}$$
$$F(D) = -2j\sqrt{D}$$
$$F(T) = -2k\sqrt{T}$$

***Taylor*-Ableitungen:**

$$\Delta F(P, D, T) = \frac{dF}{dP}\Delta P + \frac{dF}{dD}\Delta D + \frac{dF}{dT}\Delta T$$

$$\Delta F(P, D, T) = \frac{i}{\sqrt{P}}\Delta P + \frac{j}{\sqrt{D}}\Delta D + \frac{k}{\sqrt{T}}\Delta T$$

G8720_8f.eps, G0240_2f.eps, G4_47_2f.eps, Bild 4_47_2

Funktionen $q[\mathrm{k}(x-u)]$ zur „Unbuntsignal”-Beschreibung

mit $x = \log L$ (L = Leuchtdichte)
$u = \log L_{\mathrm{u}}$ (L_{u} = Umfeld-Leuchtd.)

$$q[\mathrm{k}(x-u)] = 1 + 1/[1 + \sqrt{2}\,\mathrm{e}^{\mathrm{k}(x-u)}]$$

Funktionswerte:

$$q[\mathrm{k}(x-u) \to +\infty] = 1$$
$$q[\mathrm{k}(x-u) = 0] = \sqrt{2}$$
$$q[\mathrm{k}(x-u) \to -\infty] = 2$$

G8720_1f.eps, G0240_3f.eps, G4_48_1f.eps, Bild 4_48_1

„Unbuntsignal"-Beschreibung mit Funktionen $Q_{\mathrm{lm}}[\mathrm{k}(x-u)]$

mit $x = \log L$ (L = Leuchtdichte)
$u = \log L_{\mathrm{u}}$ (L_{u} = Umfeld-Leuchtd.)

$$Q_{\mathrm{lm}}[\mathrm{k}(x-u)] = \frac{l}{\ln\sqrt{2}} \ln q[\mathrm{k}(x-u)] - m$$

Funktionswerte mit $l = m = 1$:

$Q[\mathrm{k}(x-u) \rightarrow +\infty] = 1$
$Q[\mathrm{k}(x-u) = 0] = 0$
$Q[\mathrm{k}(x-u) \rightarrow -\infty] = -1$

G8720_2f.eps, G0240_4f.eps, G4_48_2f.eps, Bild 4_48_2

„Unbuntsignal"-Unterscheidung als Funktion der relativen Helldichte $h=\ln H=\mathrm{k}(x-u)$ ln = natürl. Log.

$$Q' = \frac{\mathrm{d}}{\mathrm{d}H}[\ln\{1+1/(1+\sqrt{2}H)\}]/\ln\sqrt{2}$$

$$= -\sqrt{2}/[\ln\sqrt{2}(1+\sqrt{2}H)(2+\sqrt{2}H)]$$

Funktionswerte:

$$Q'[\mathrm{k}(x-u) \rightarrow +\infty] = 0$$

$$Q'[\mathrm{k}(x-u) = 0] = -0{,}5$$

$$Q'[\mathrm{k}(x-u) \rightarrow -\infty] = 0$$

G8720_3f.eps, G0240_5f.eps, G4_49_1f.eps, Bild 4_49−1

Leuchtdichte-Unterscheidungsvermögen $L/\Delta L$ als Funktion von H

mit: $L = 10^{x}$ $\quad H = \mathrm{e}^{h} = 10^{\log \mathrm{e}\, \mathrm{k}(x-u)}$

$\mathrm{d}L/\mathrm{d}x = \ln 10\, L \qquad \mathrm{d}H/\mathrm{d}x = \mathrm{k}\, H$

Es folgt: $L/\Delta L = [\mathrm{k}H/(\mathrm{d}H \ln 10)]$

$$\frac{L}{\mathrm{d}L} = \mathrm{const}\; H/[(1+\sqrt{2}H)(2+\sqrt{2}H)]$$

$$Q'[\mathrm{k}(x-u) \to +\infty] = 0$$

$$Q'[\mathrm{k}(x-u) = 0] = \text{Maximum}$$

$$Q'[\mathrm{k}(x-u) \to -\infty] = 0$$

G8720_4f.eps, G0240_6f.eps, G4_49_2f.eps, Bild 4_49_2

Doppel-Linienelement von *Richter* (1987) für die Lichttechnik mit der Leuchtdichte $L = F(P, D, T)$

Leuchtdichte-Signalfunktion $F(L)$

$$F(L) = iQ(H) = \begin{cases} \underline{i}\, Q(\underline{H}) & (x < u) \\ \bar{i}\, Q(\bar{H}) & (x \geq u) \end{cases}$$

mit: $\underline{k} = 1{,}4 \quad \bar{k} = 1 \quad \underline{i} = 1 \quad \bar{i} = -2$

$x = \log L \quad u = \log L_{\mathrm{u}}$

$H = e^{k(x-u)}, \; \underline{H} = e^{\underline{k}(x-u)}, \; \bar{H} = e^{\bar{k}(x-u)}$

G8780_7f.eps, G0240_7f.eps, G4_50_1f.eps, Bild 4_50_1

Doppel-Linienelement von *Richter* (1987) für die Lichttechnik mit der Leuchtdichte $L=F(P, D, T)$

Leuchtdichte-Signalfunktion $F(L)$

$$F(L) = i\,Q(H) \qquad H = e^{k(x-u)}$$

$$Q[\ln\{1+1/(1+\sqrt{2}H)\}]/\ln\sqrt{2}-1$$

***Taylor*-Ableitungen:**

$$\Delta F(L) = \frac{dF}{dL}\Delta L = i\,\frac{dQ}{dH}\Delta H$$

$$= -i\sqrt{2}\Delta H/[\ln\sqrt{2}(1+\sqrt{2}H)(2+\sqrt{2}H)]$$

G8780_8f.eps, G0240_8f.eps, G4_50_2f.eps, Bild 4_50_2

Q-Funktions-Änderung; Übergang von der Licht- zur Farb-Metrik

Stufungsfunktion der **Lichtmetrik:**

$\boldsymbol{Q}\ \mathbf{[k(}\boldsymbol{x} - \boldsymbol{u}\mathbf{]} = Q[\mathrm{k}(\log L - \log L_{\mathrm{u}})]$

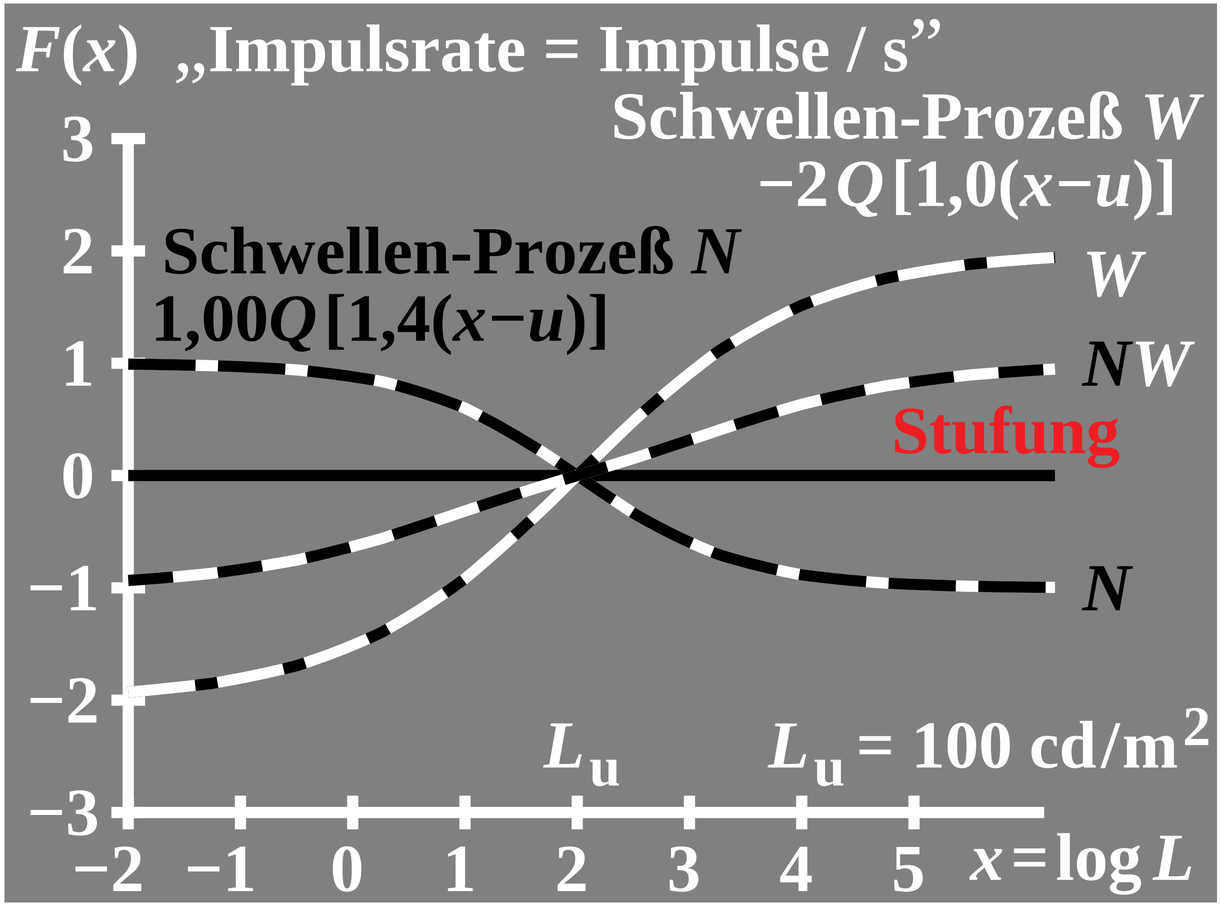
Ersatz $\log L \rightarrow \log P$ für Farbmetrik:

$Q[\mathrm{k}(\log P - \log L_{\mathrm{u}})]$

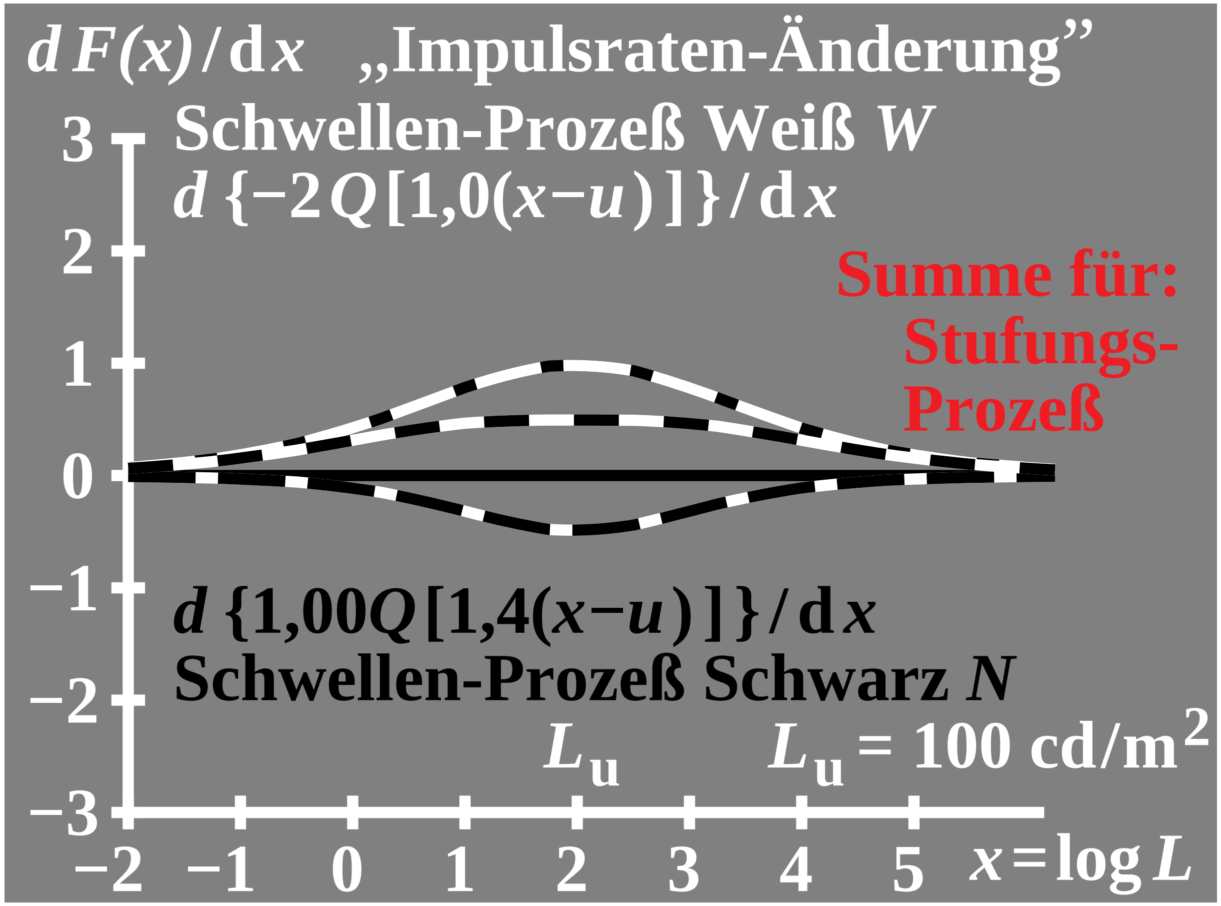
$= Q[\mathrm{k}(\log L - \log L_{\mathrm{u}} + \log P - \log L)]$

mit Sättigung $p = \log P - \log L$ folgt für **Farbmetrik:** $\boldsymbol{Q}\ \mathbf{[k(}\ \boldsymbol{x} - \boldsymbol{u} + \boldsymbol{p}\mathbf{)]}$

G8240_2f.eps, G0311_3f.eps, G4_51f.eps, Bild 4_51



G8830_7f.eps, G0241_1f.eps, G4_52_1f.eps, Bild 4_52_1



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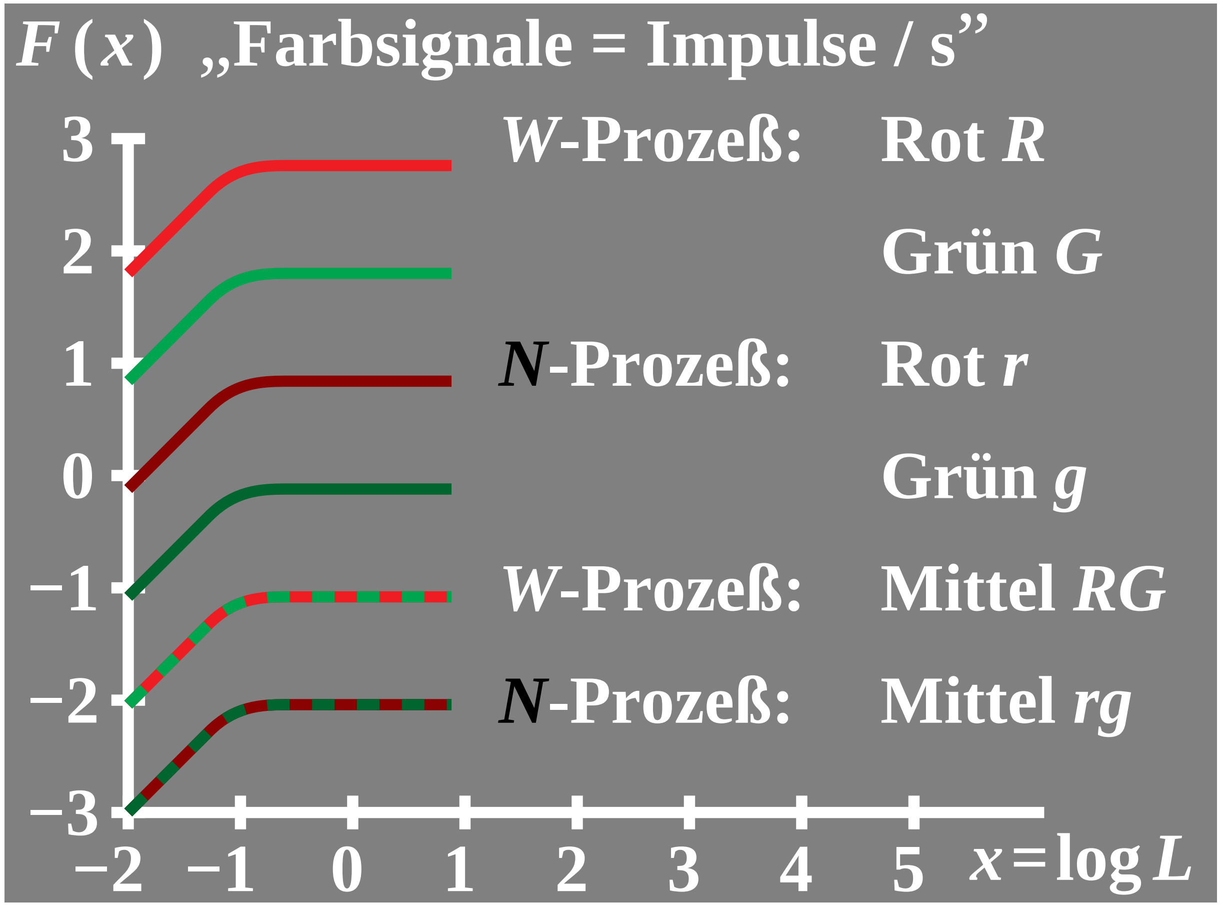

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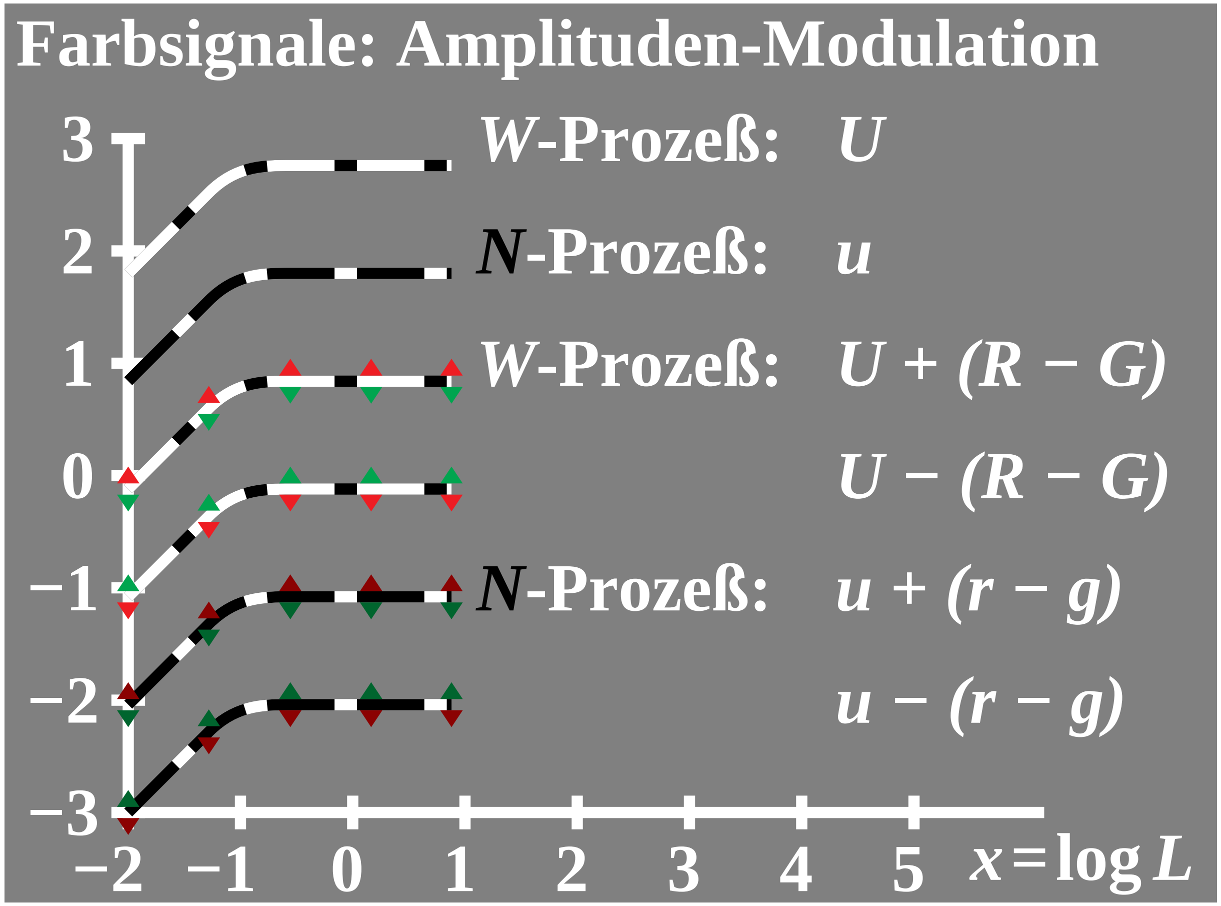

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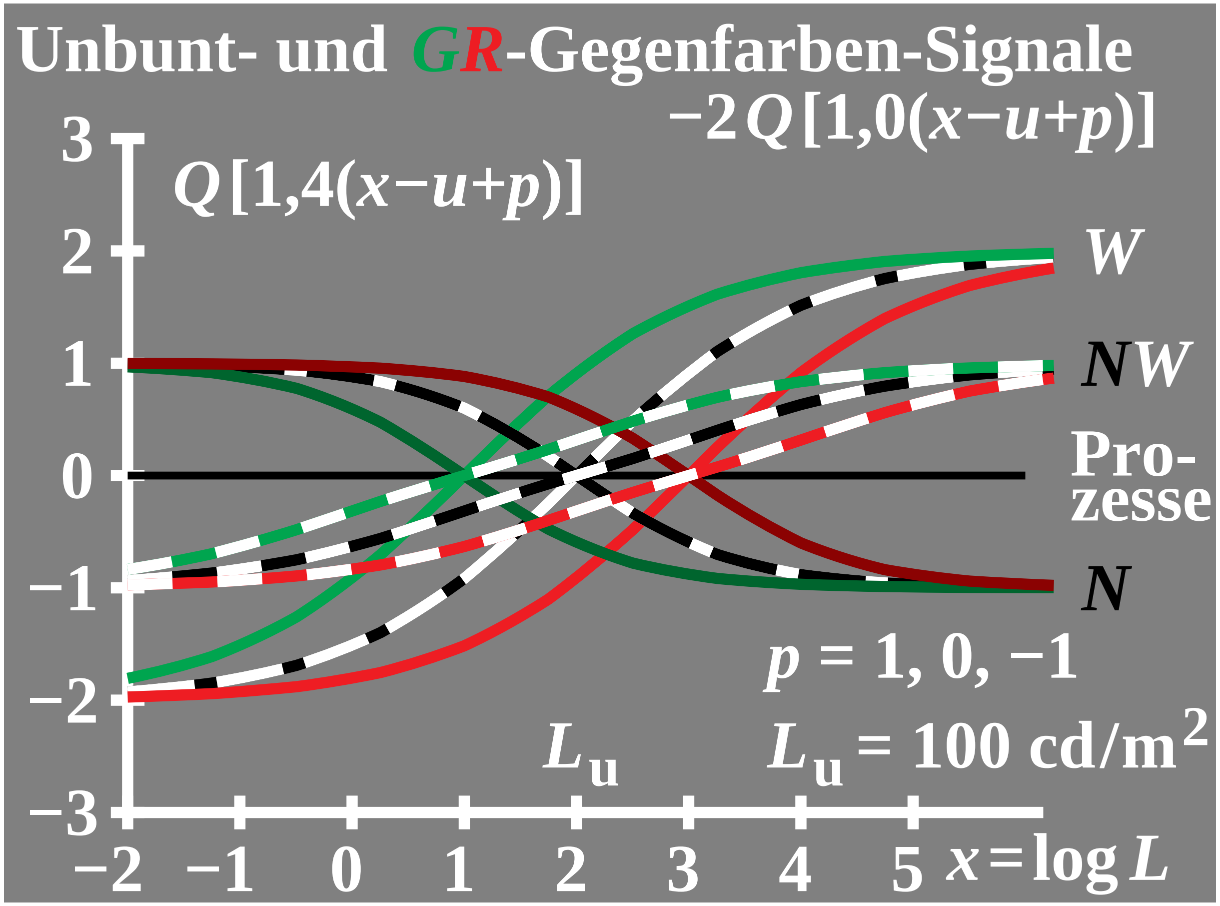

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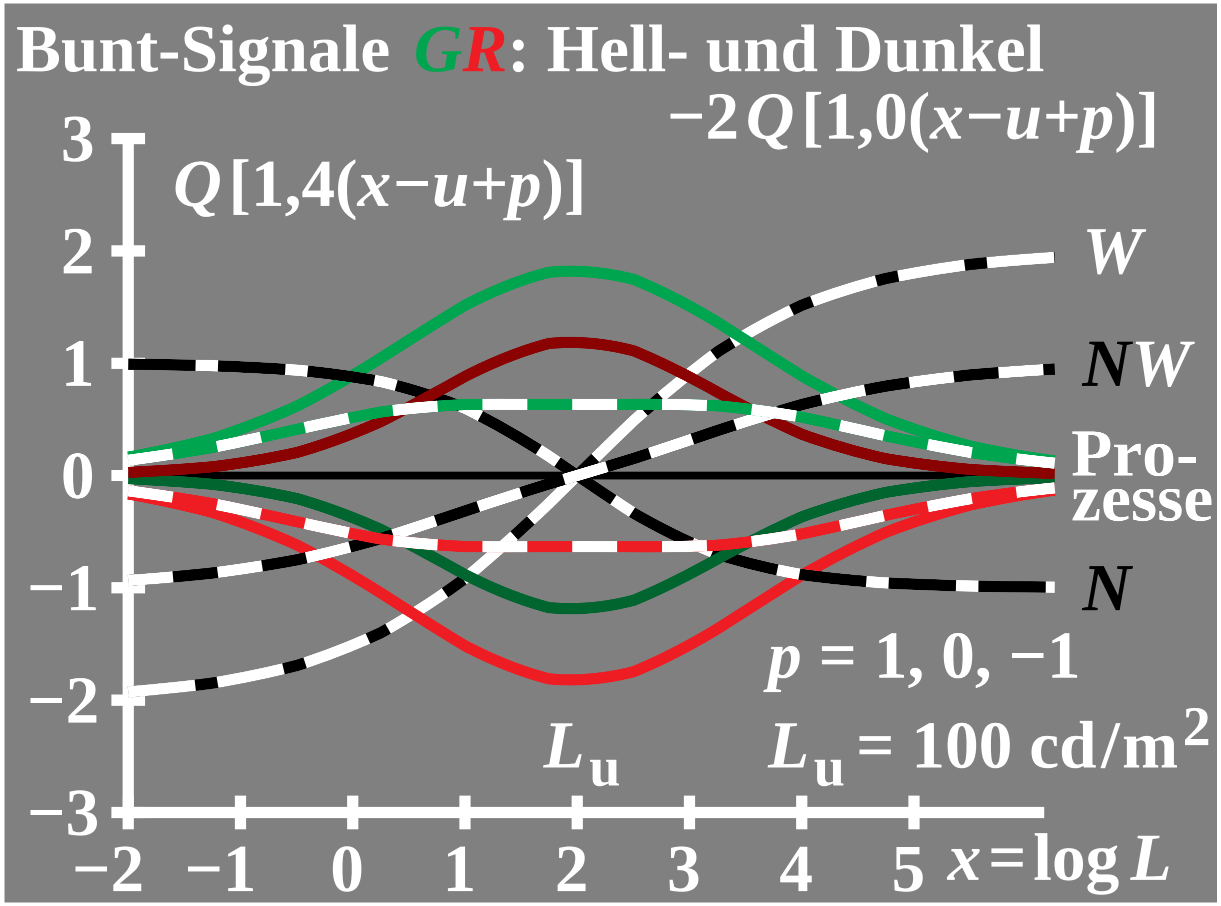

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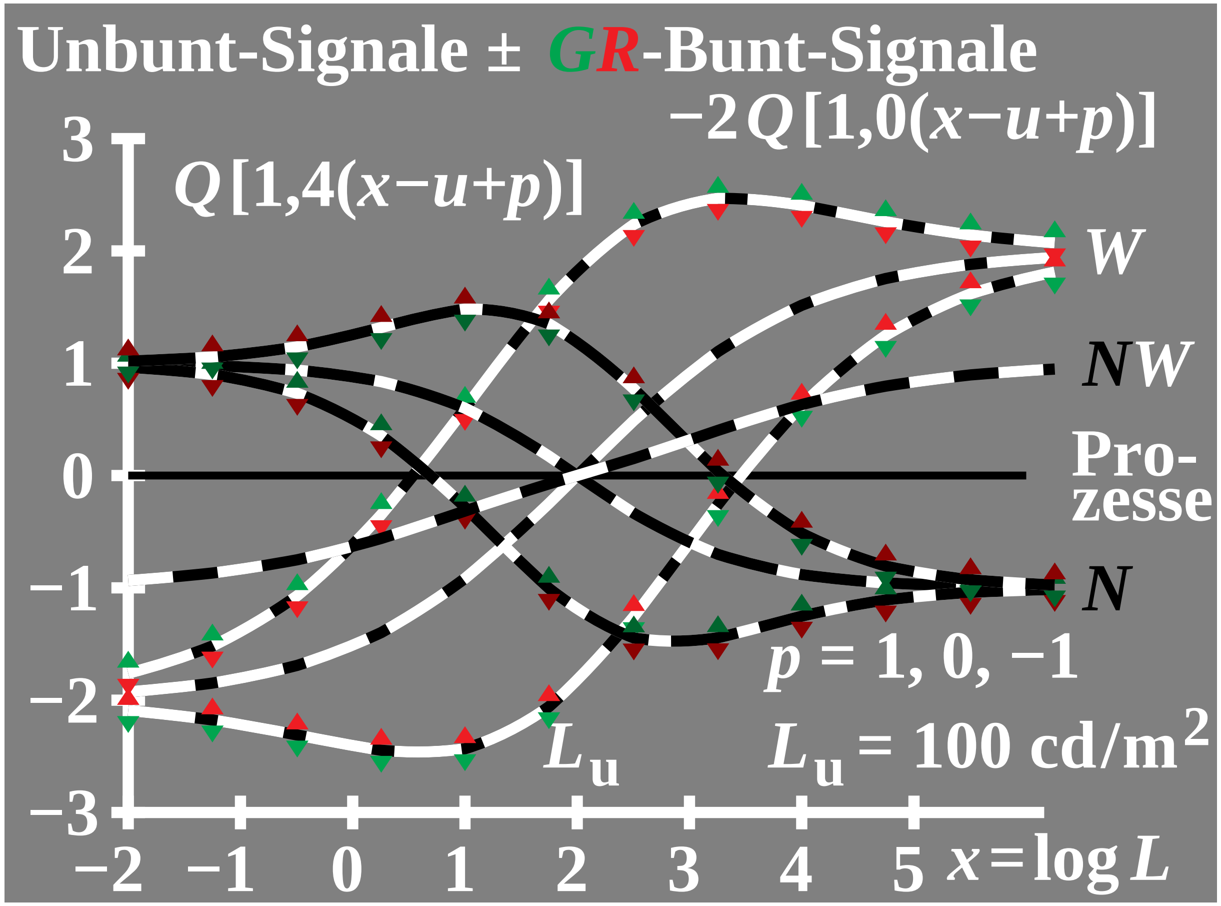

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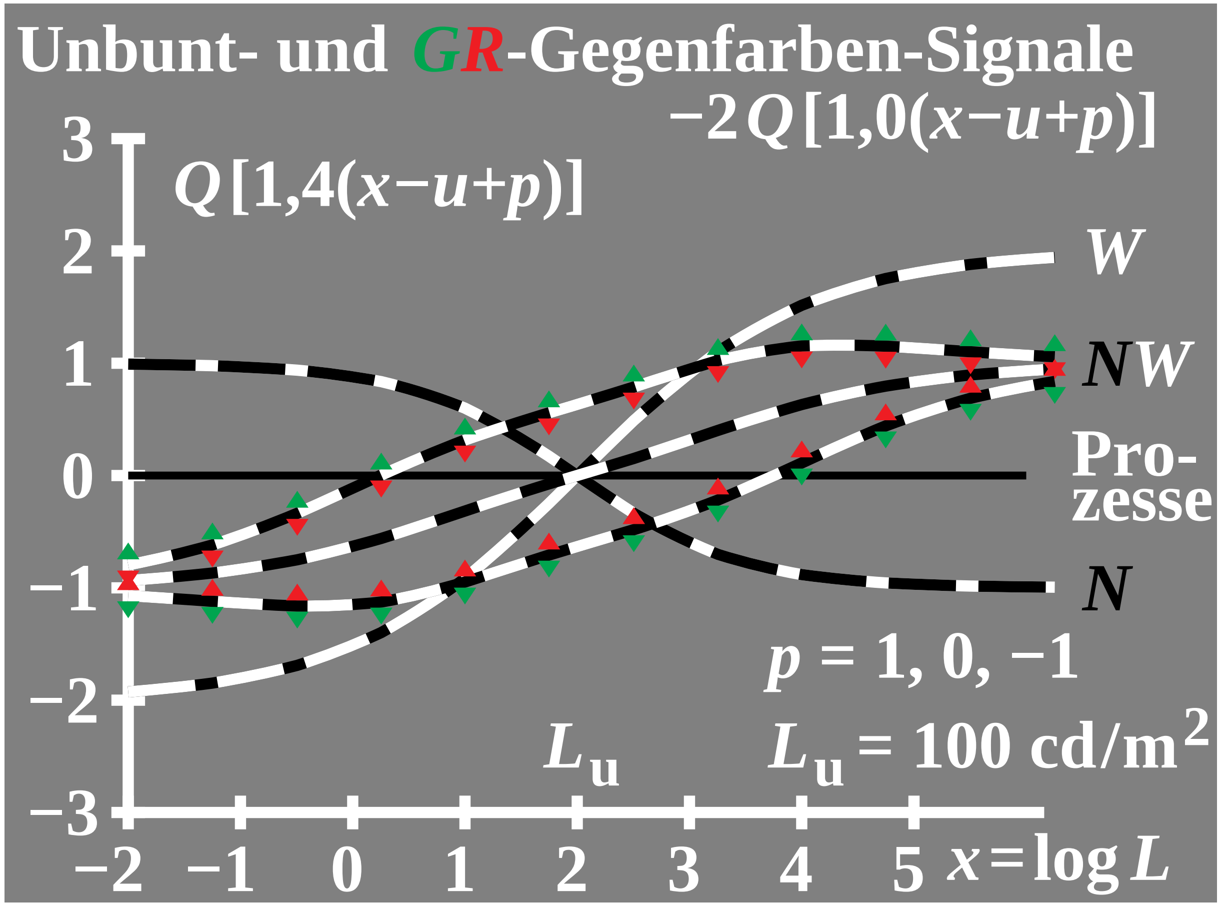

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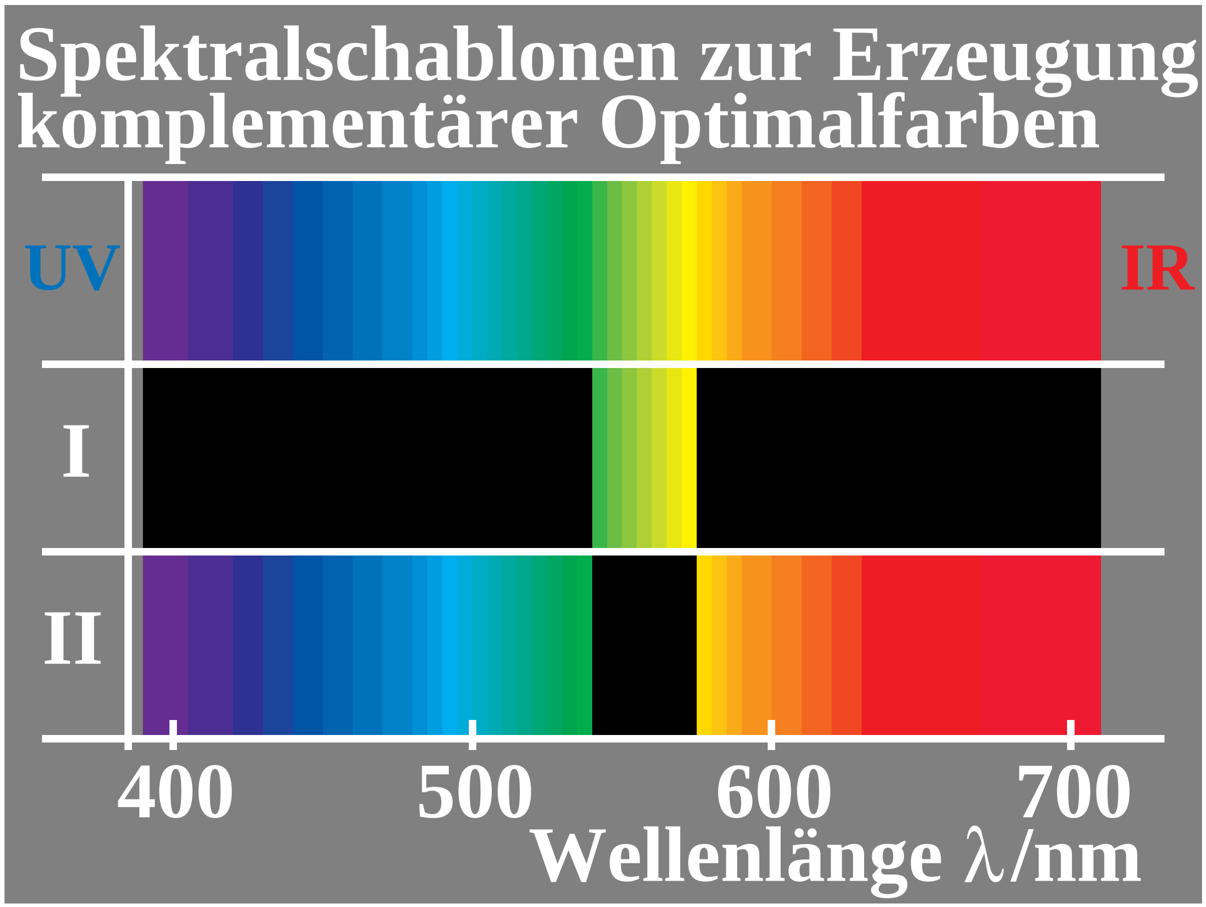

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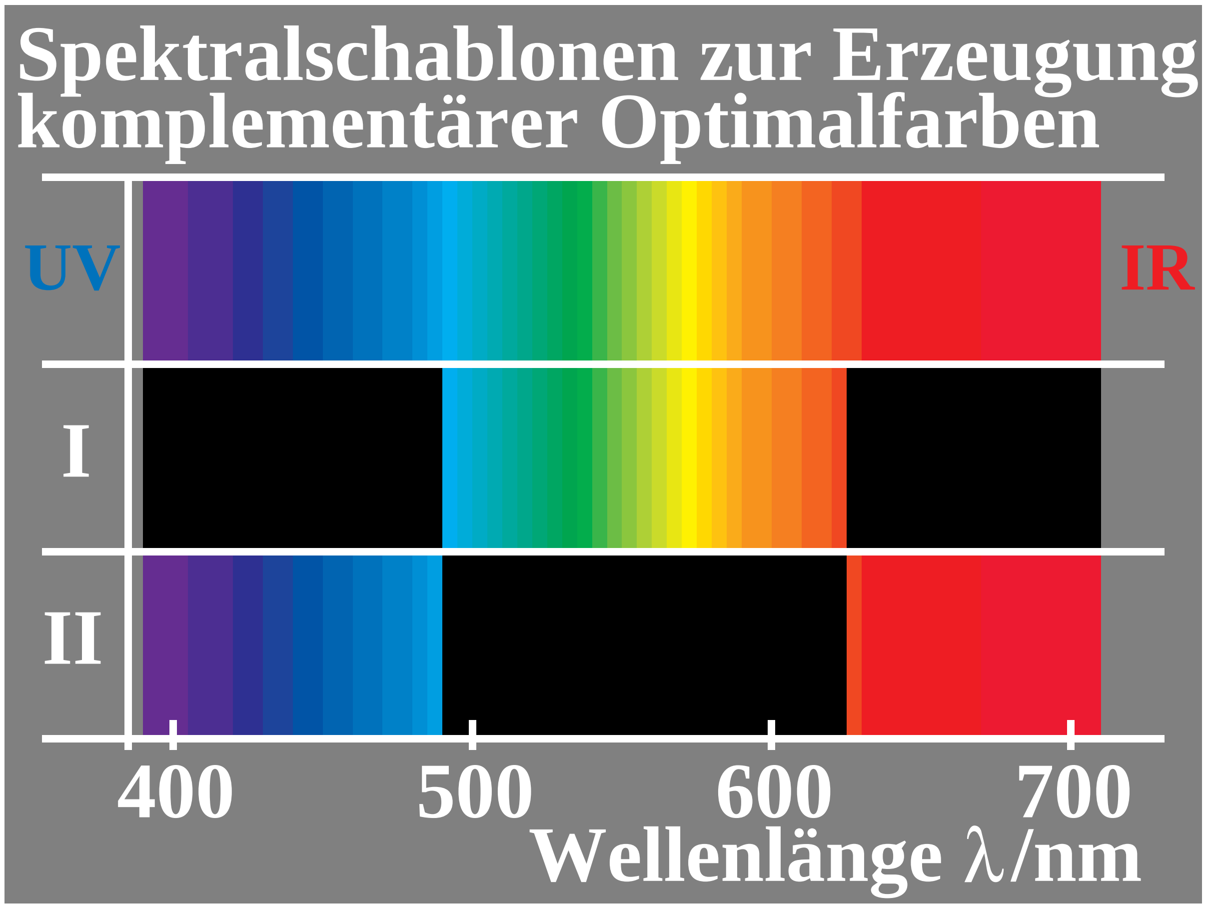
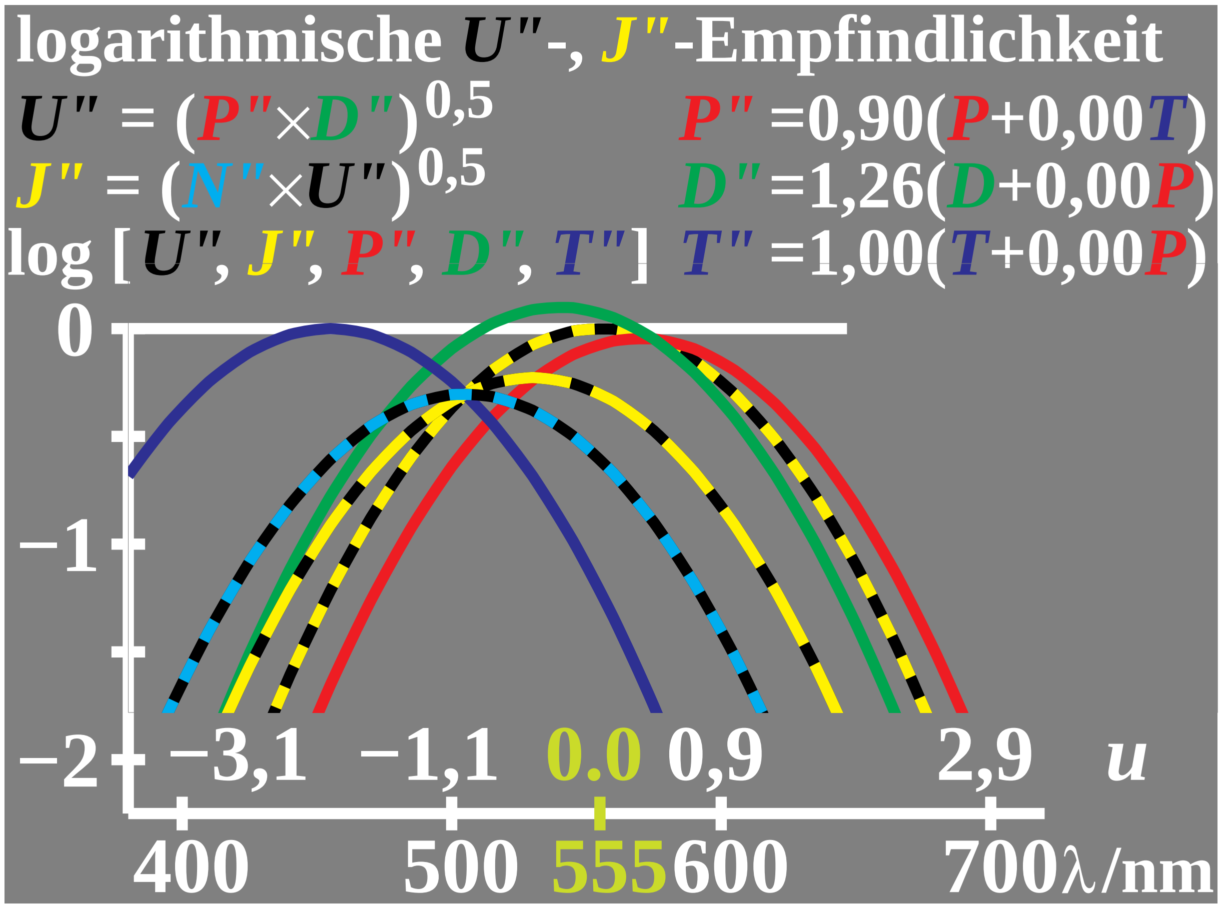
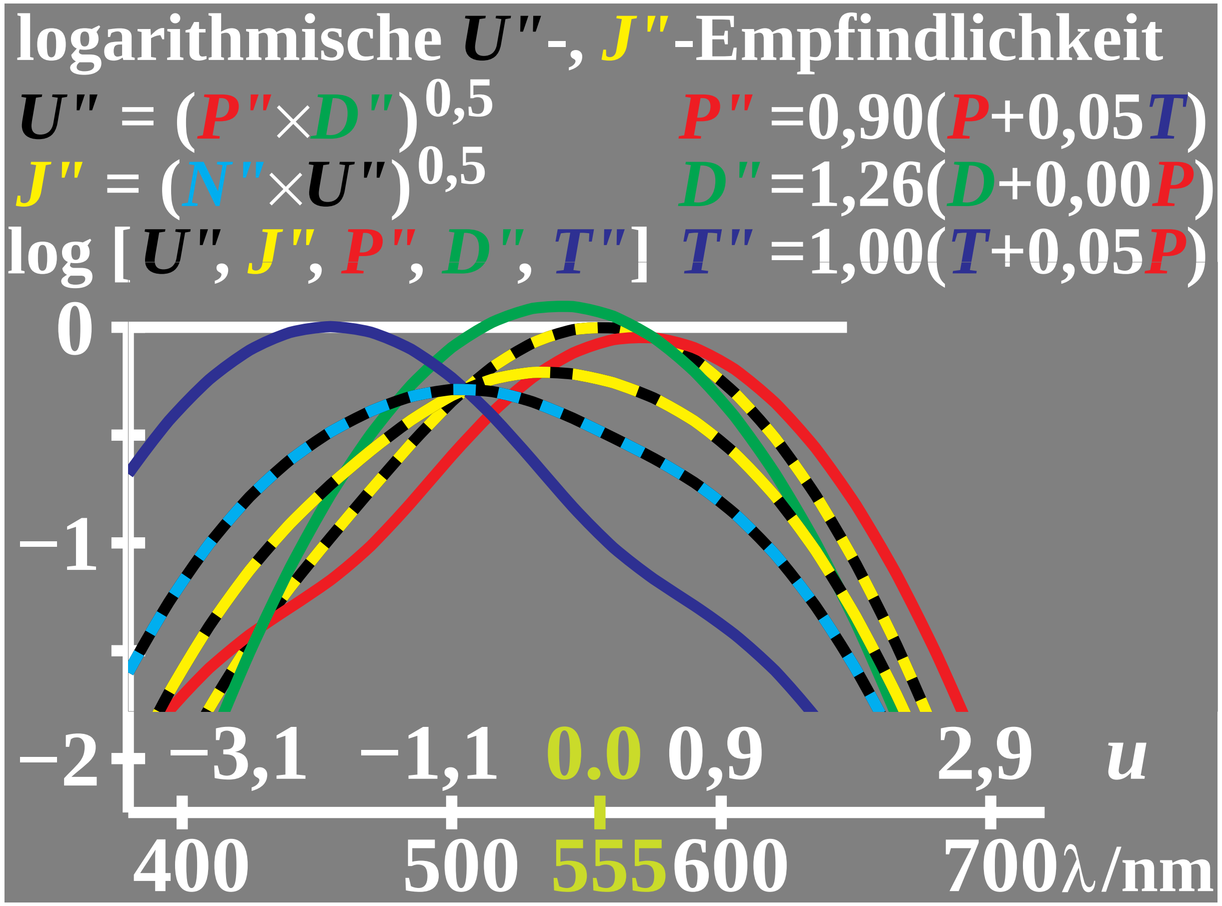


G8570_4f.eps, G0250_2f.eps, G4_57f.eps, Bild 4_57



G9011_1f.eps, G0250_3f.eps, G4_58_1f.eps, Bild 4_58_1



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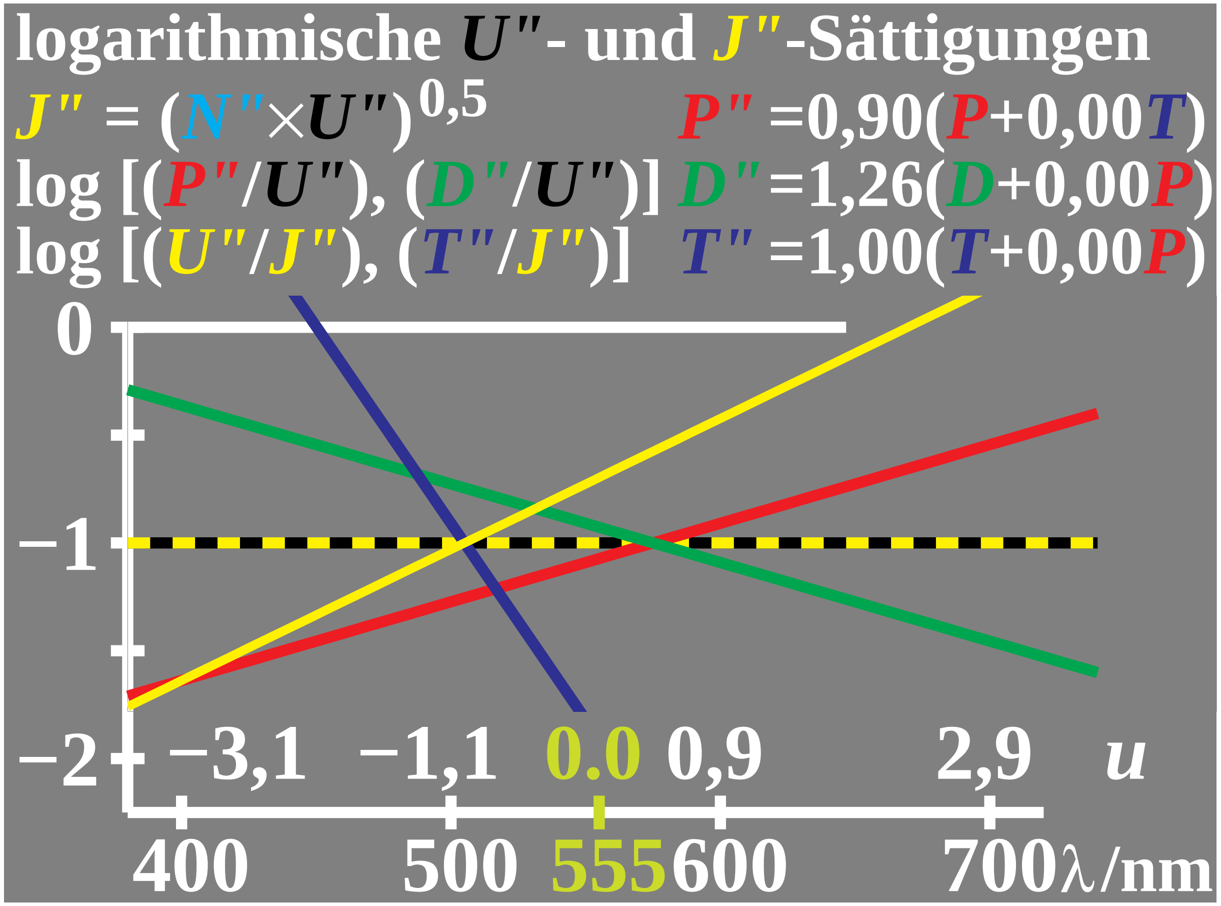

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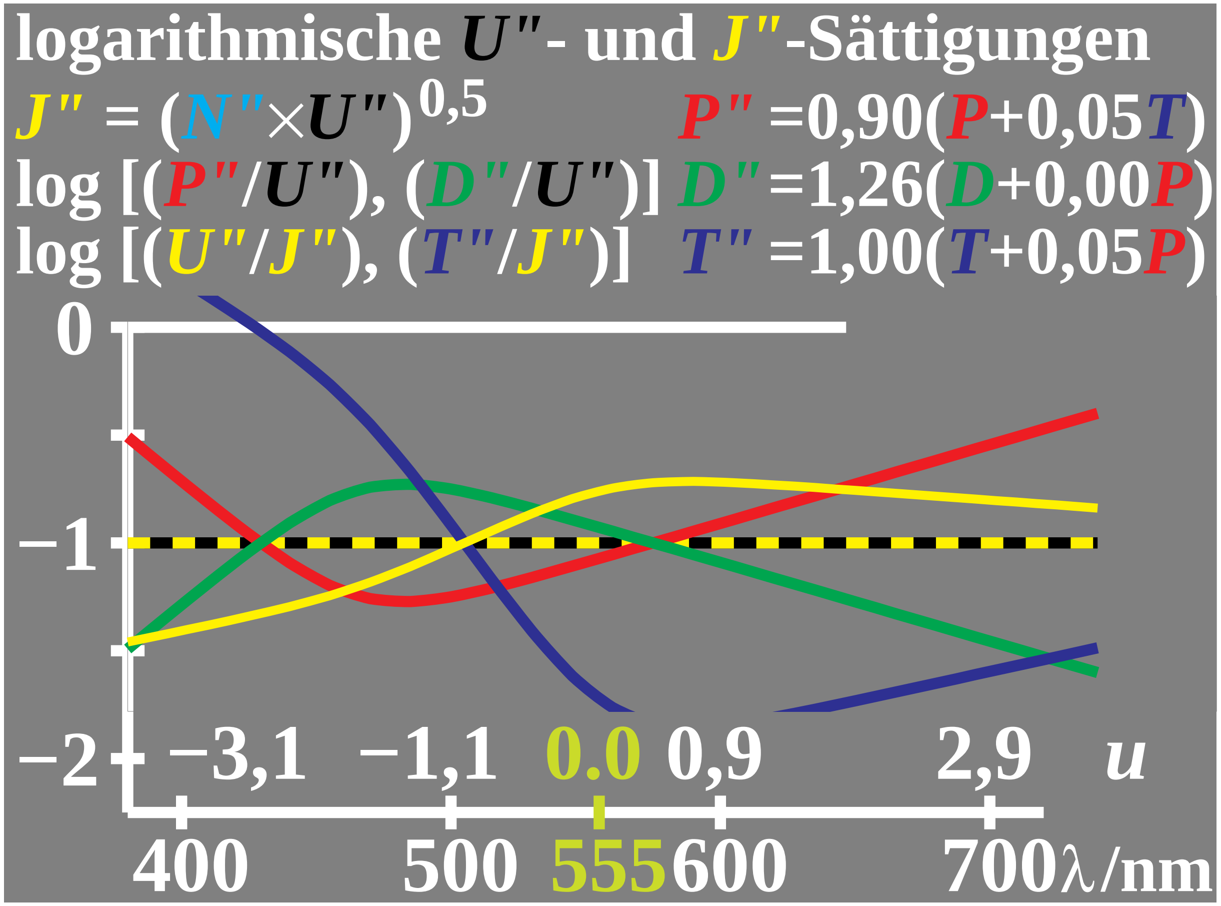

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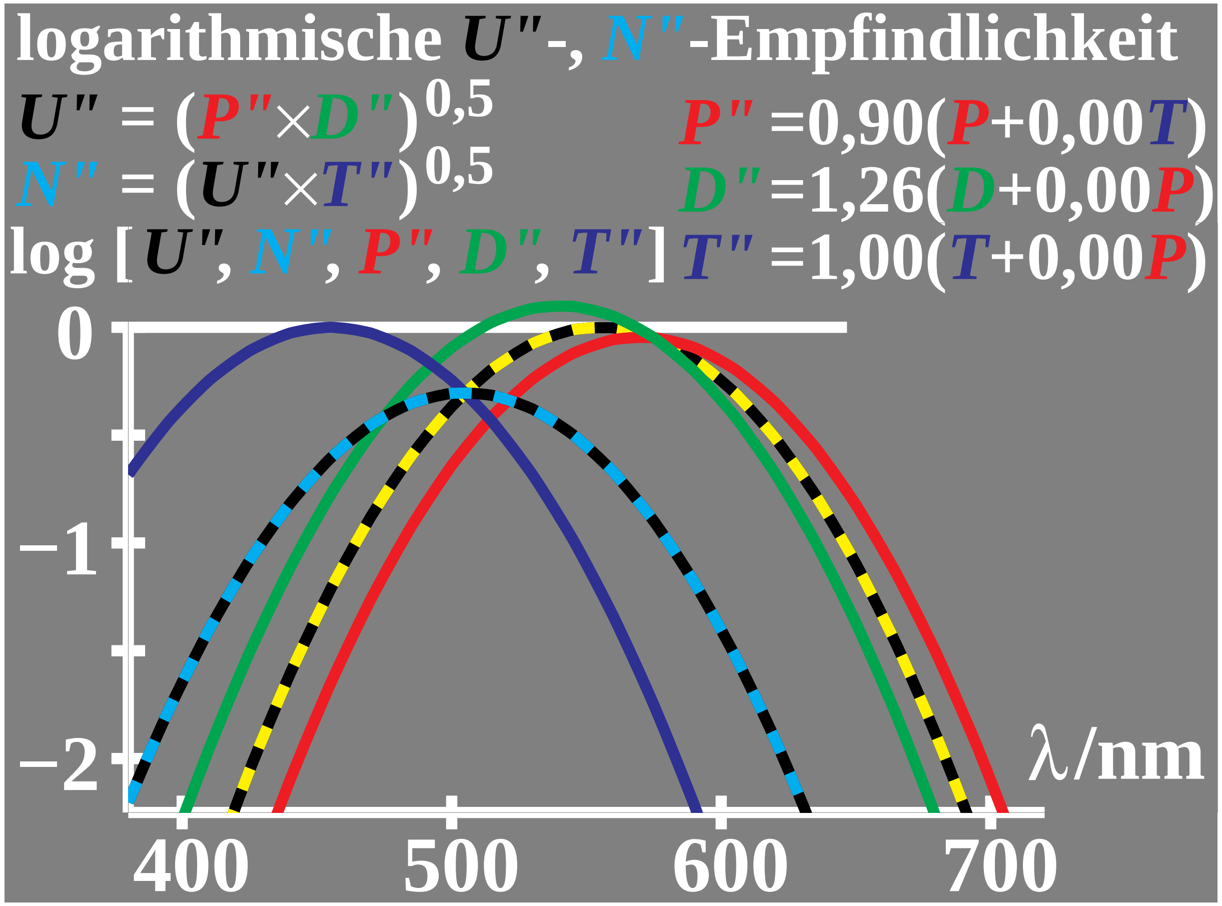

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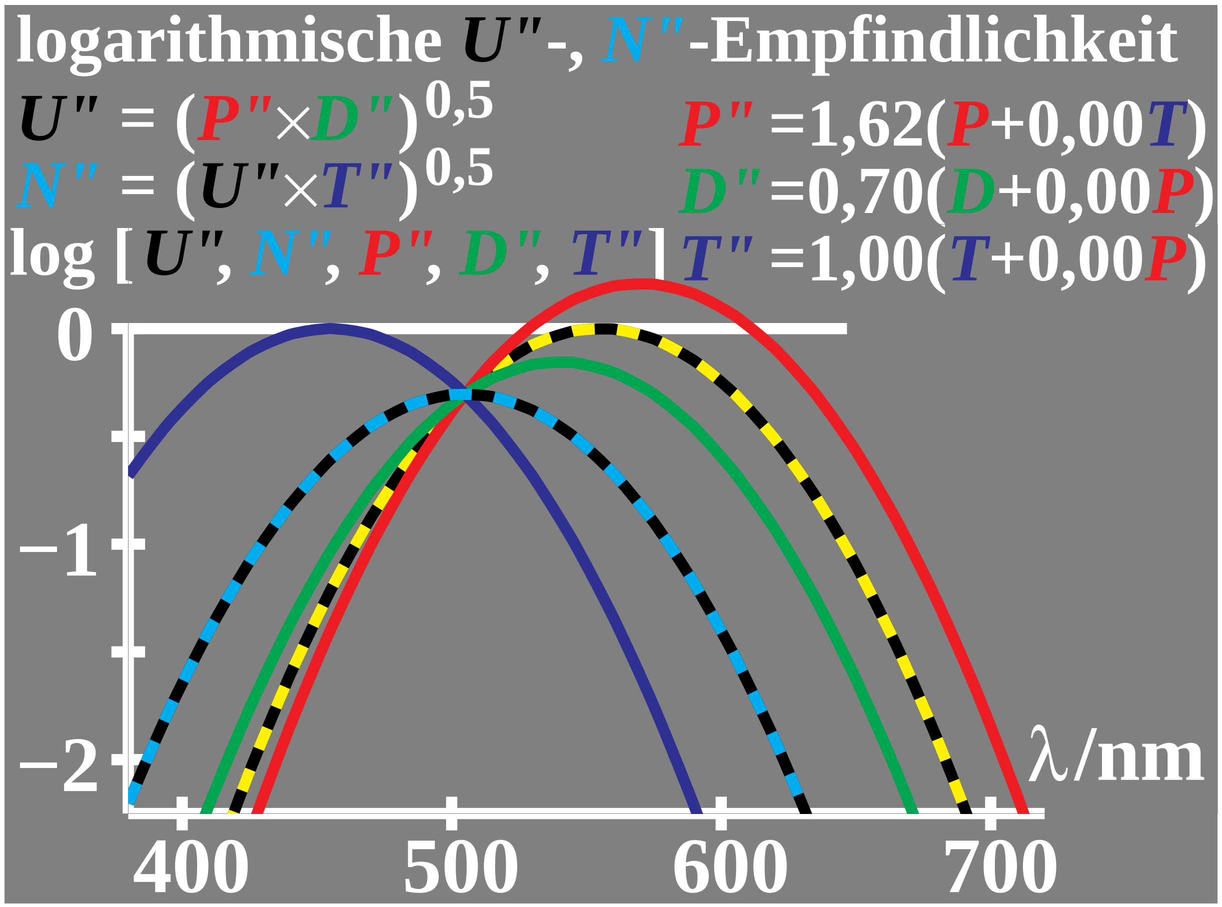

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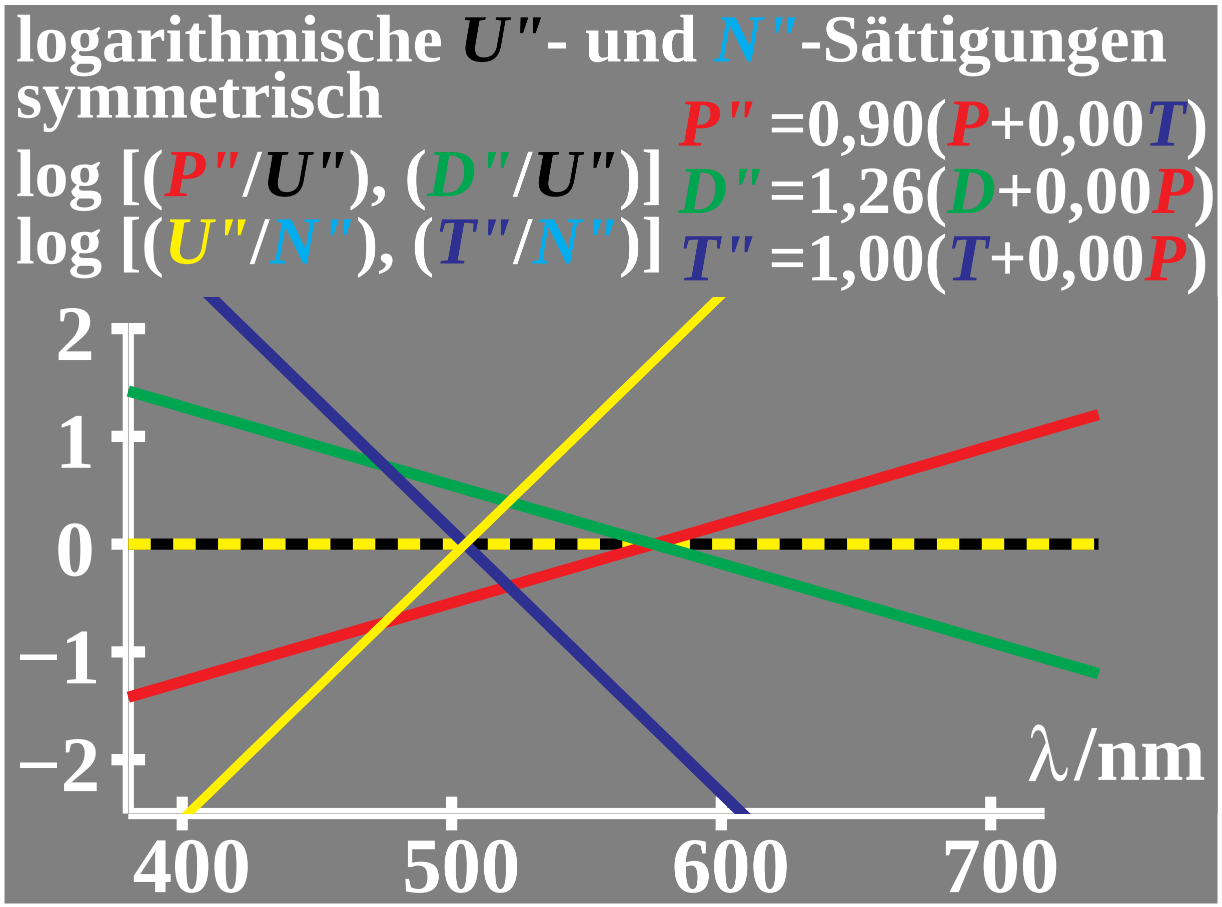

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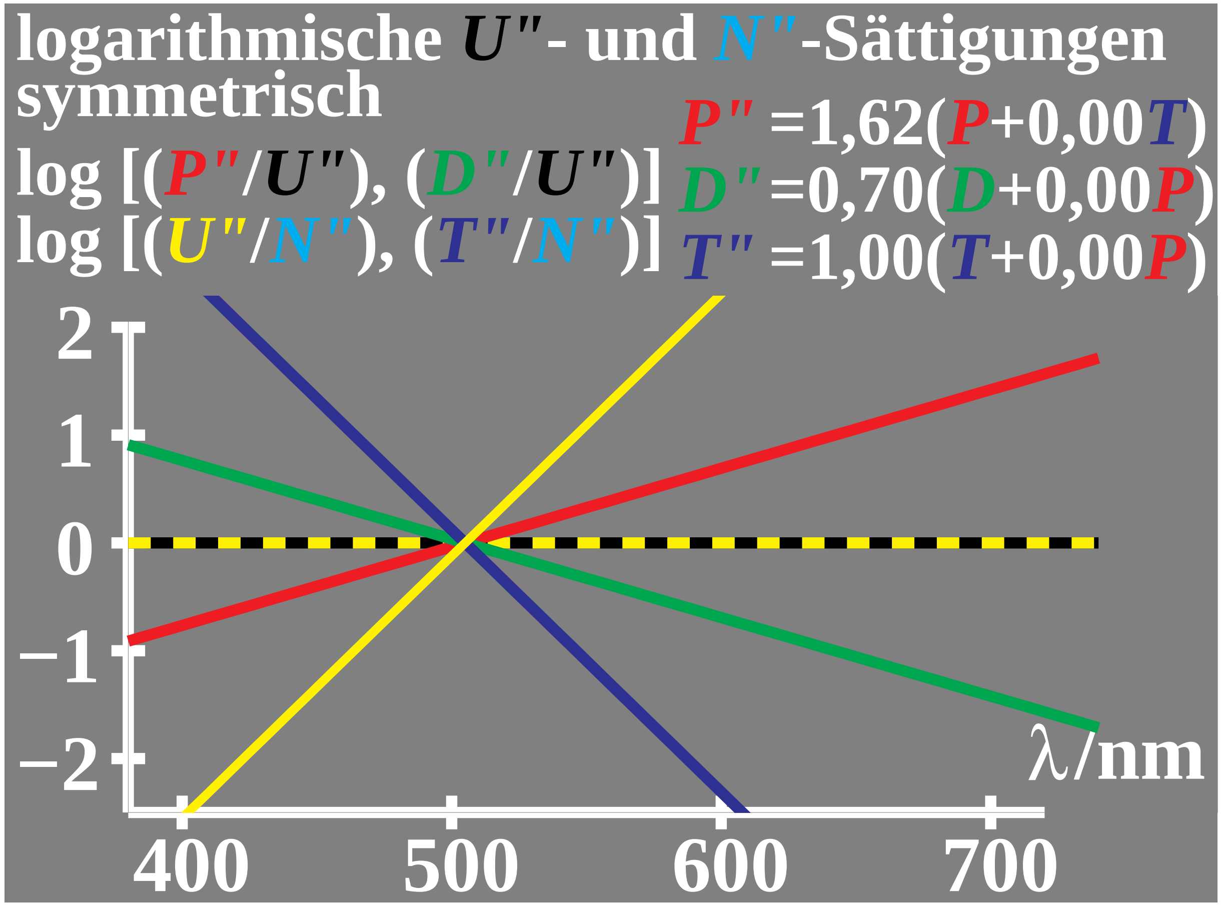

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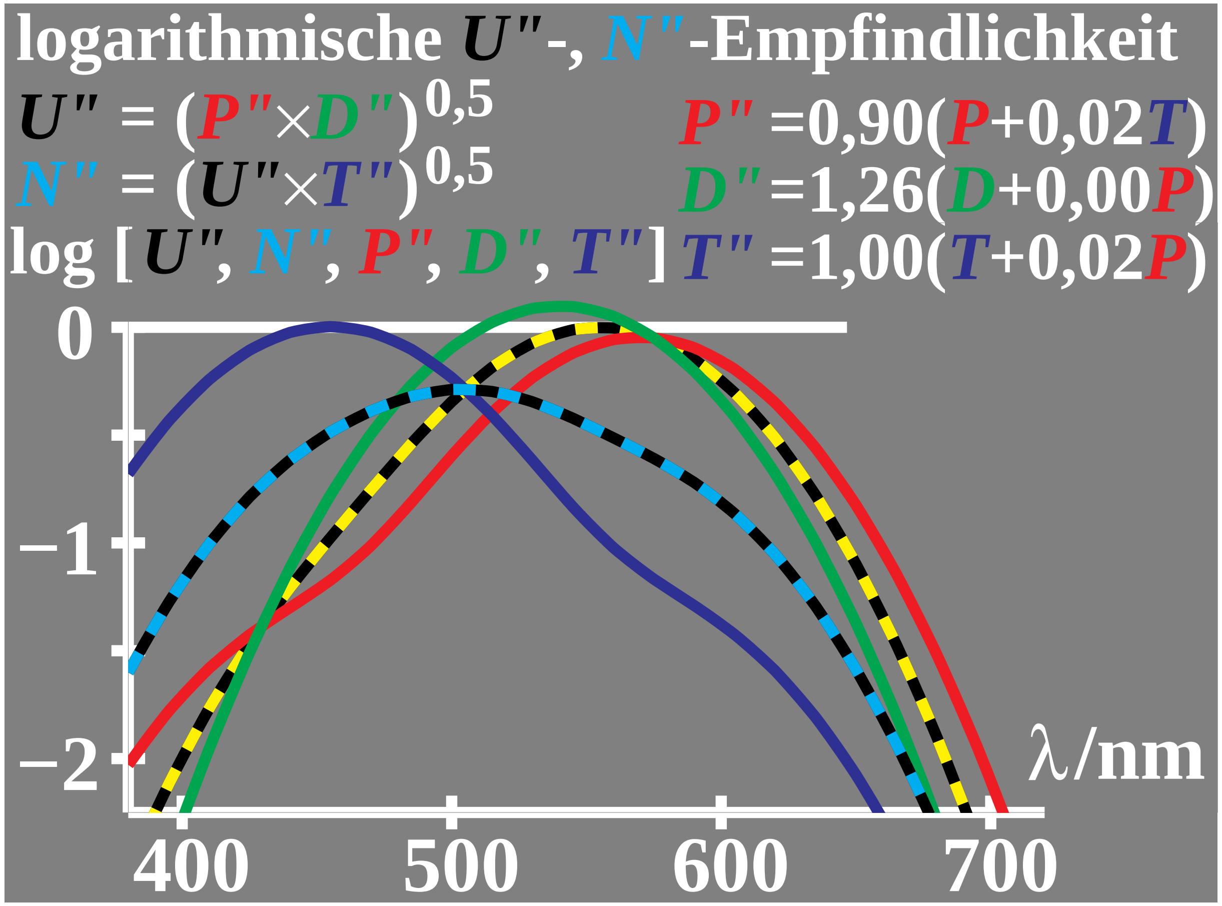

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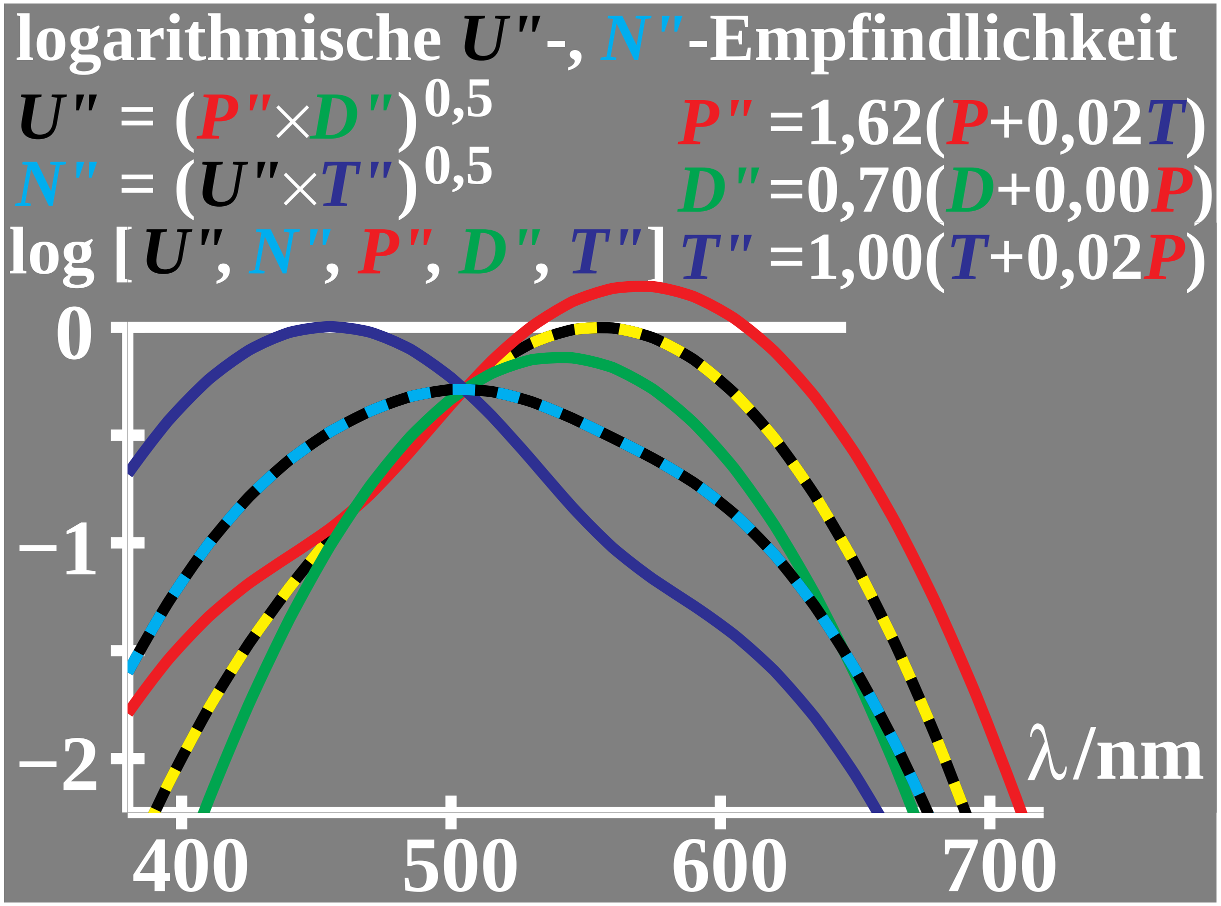

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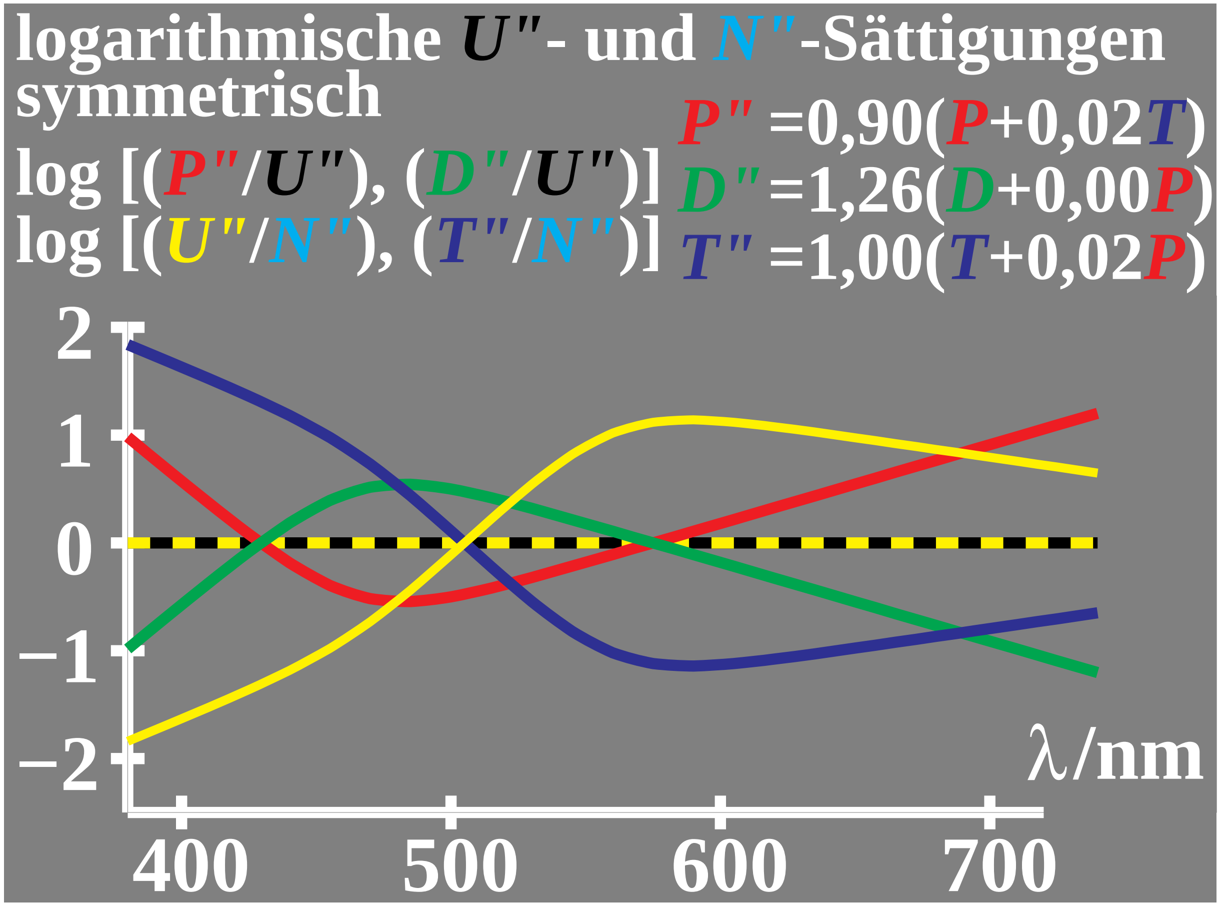

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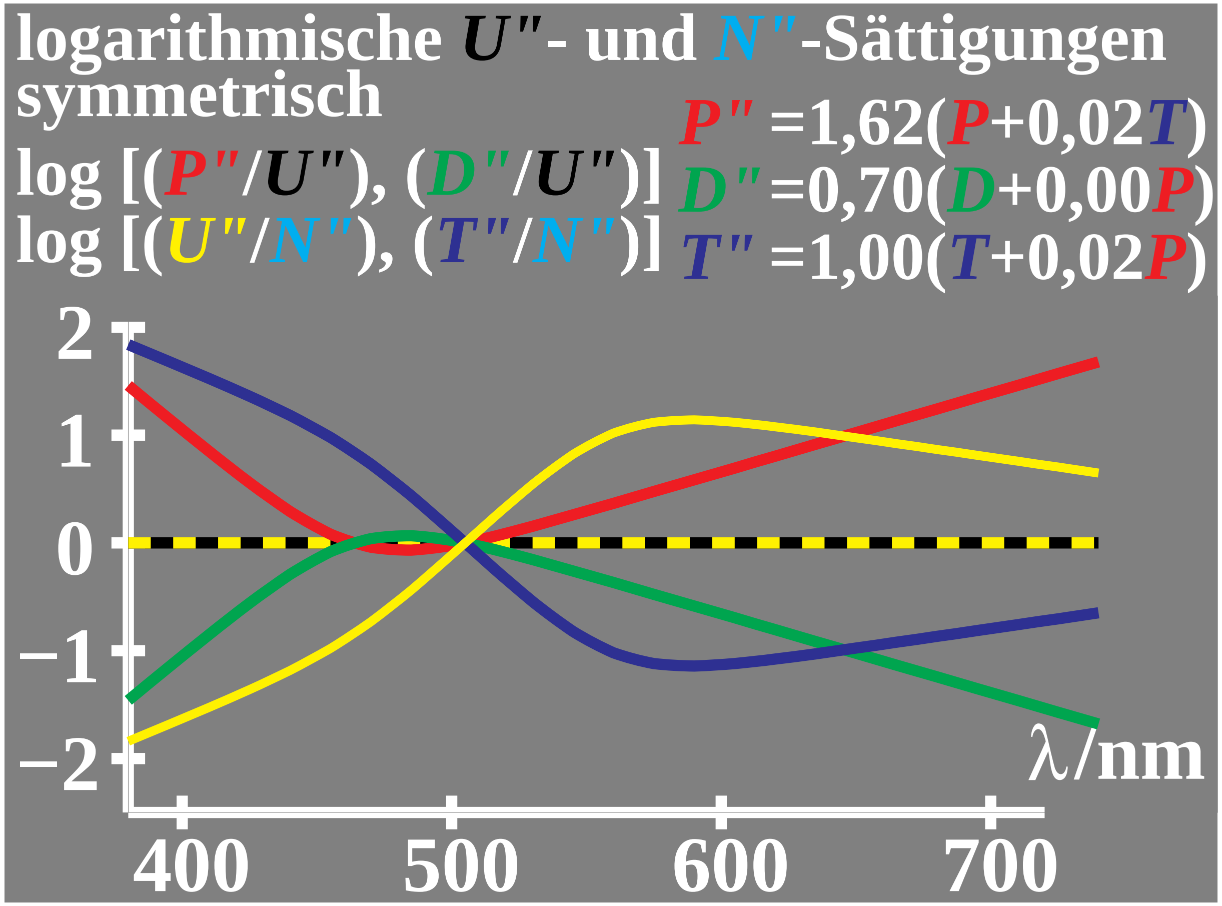

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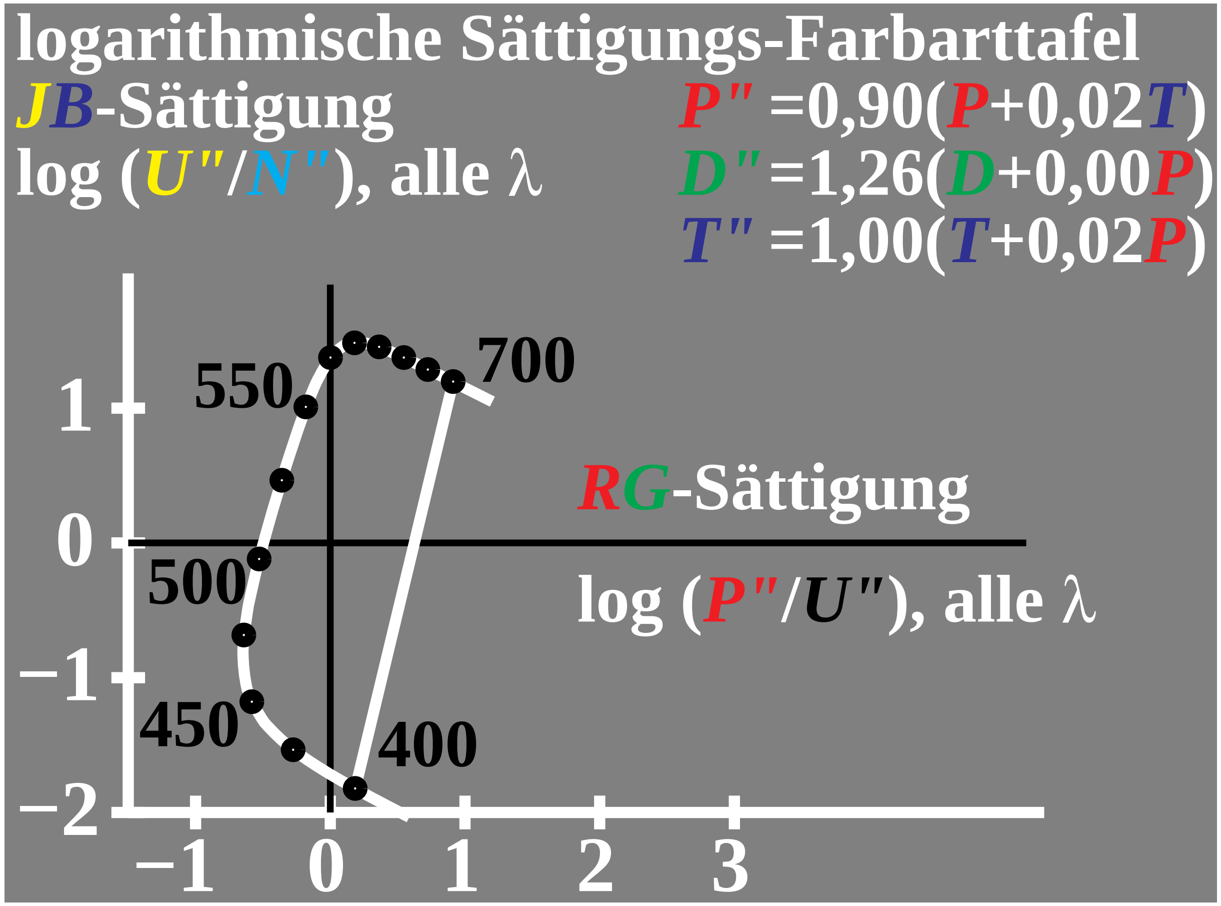

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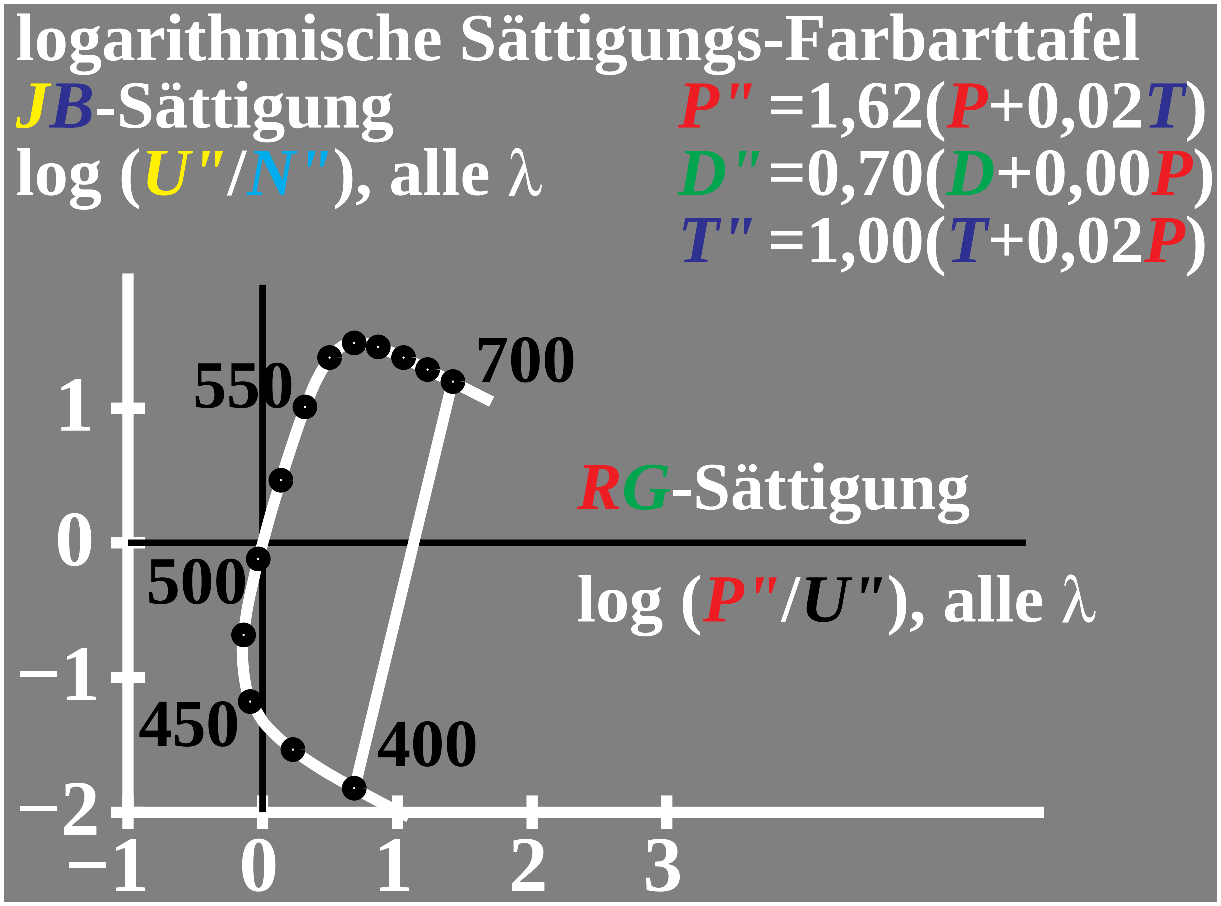

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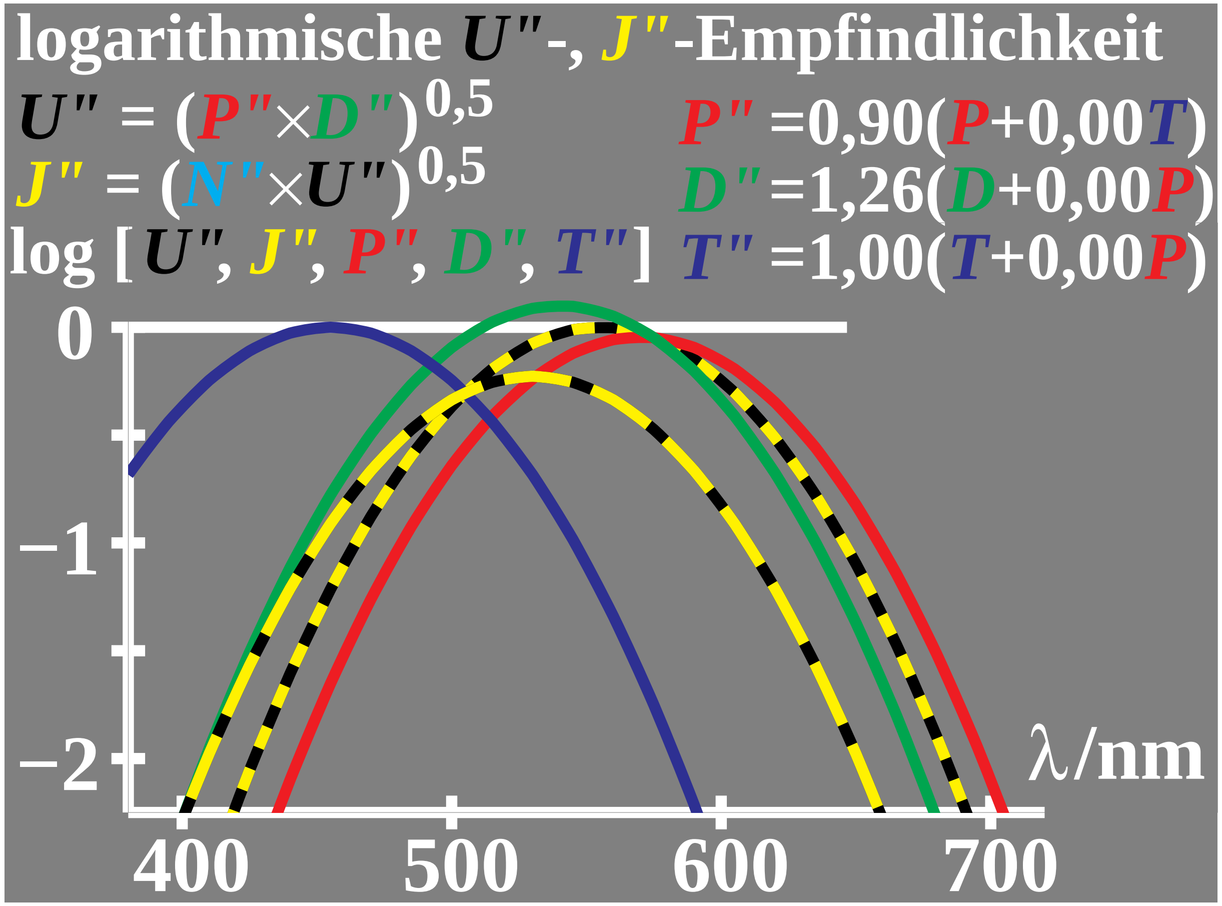

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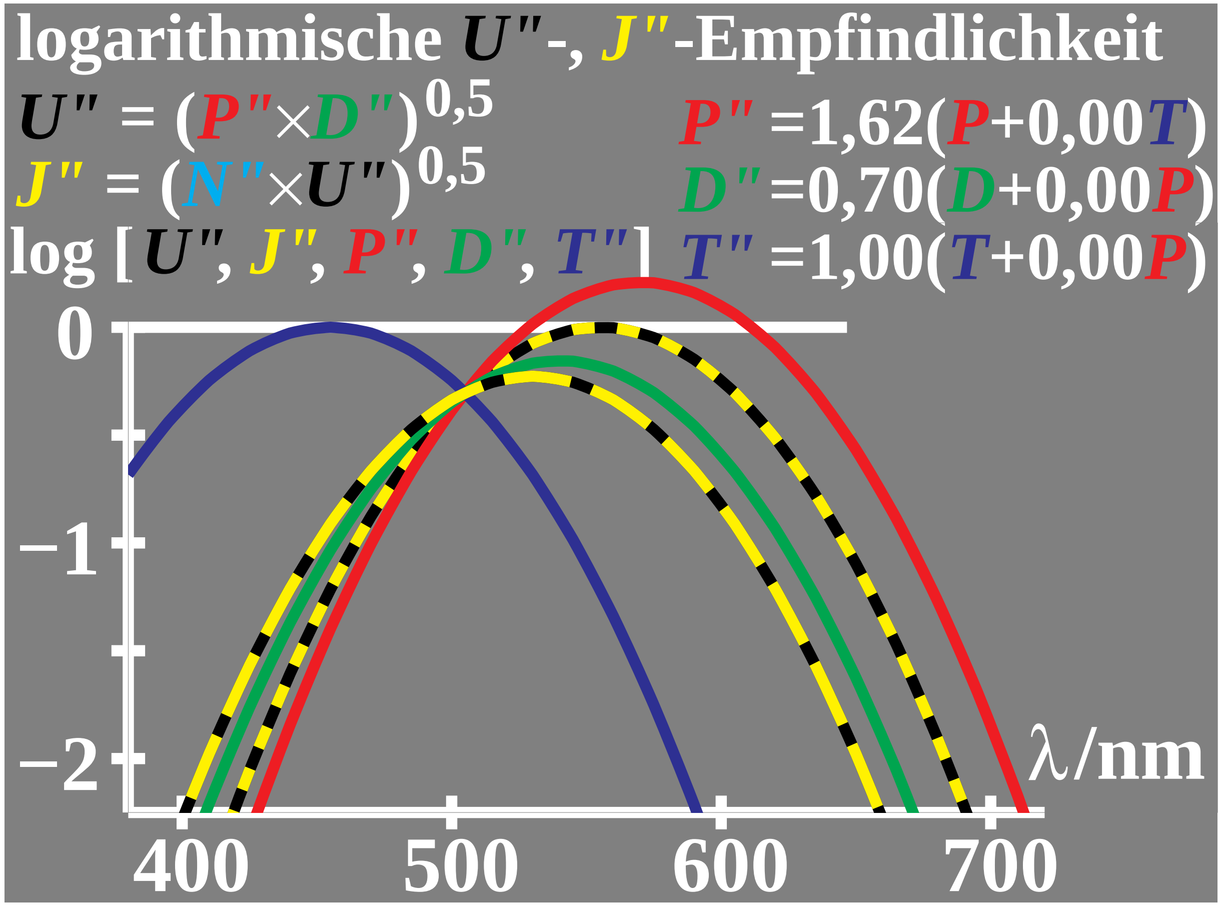

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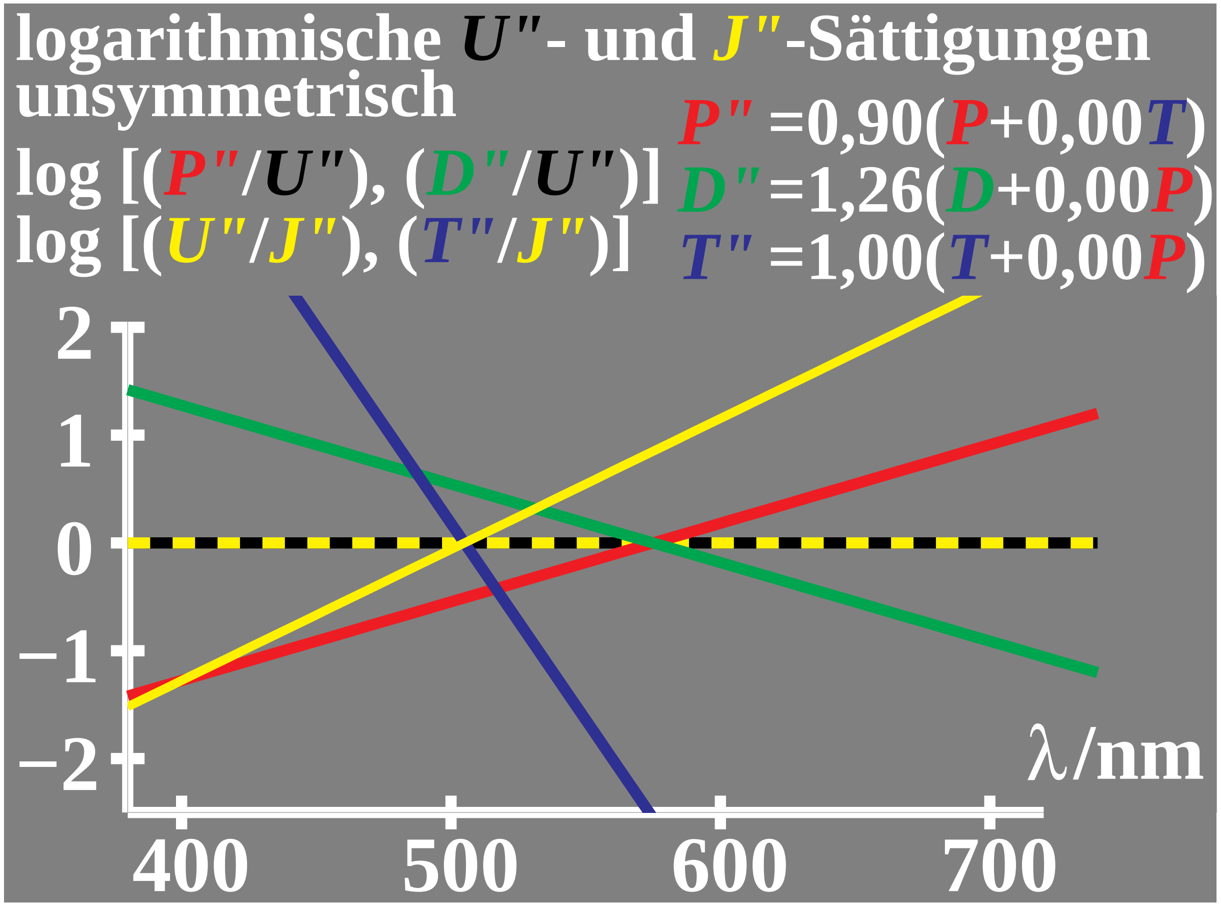

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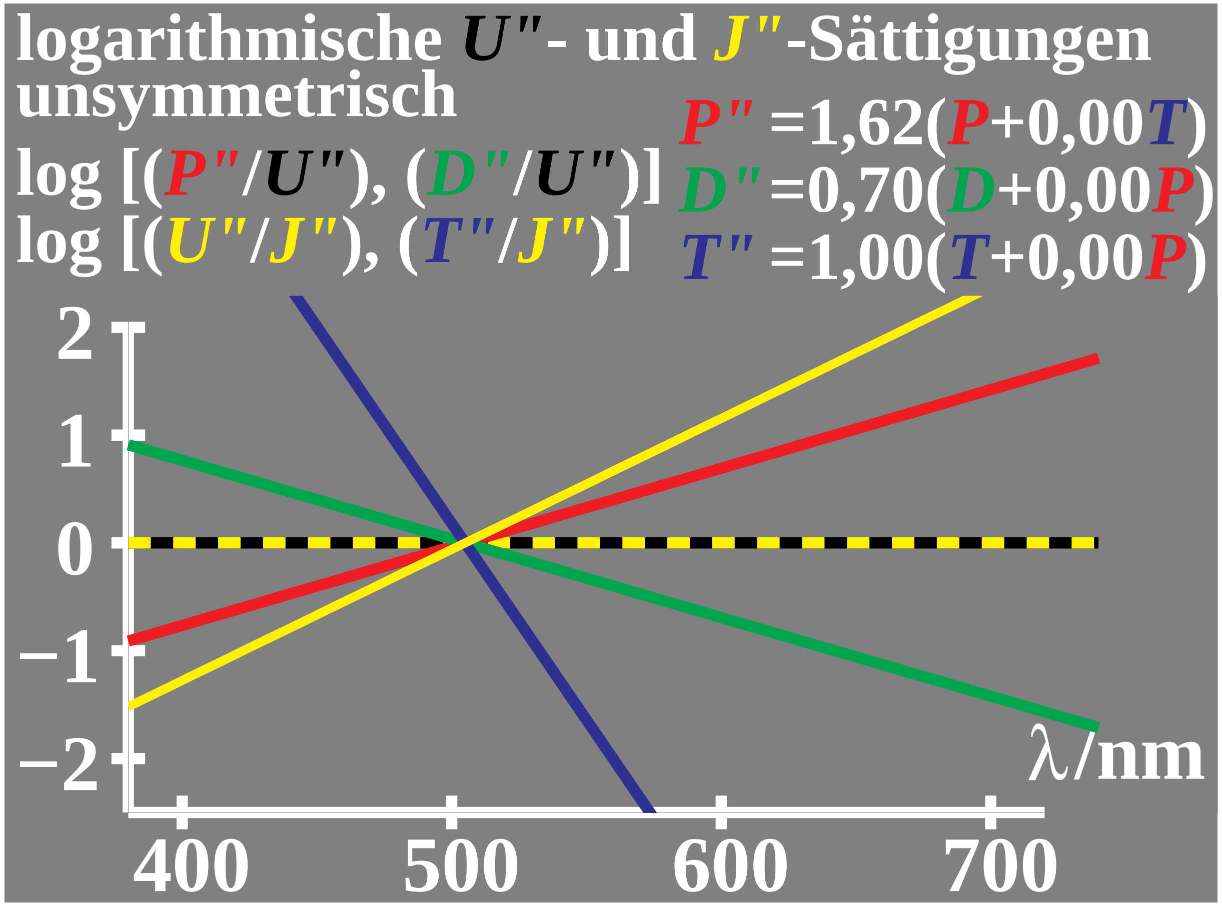

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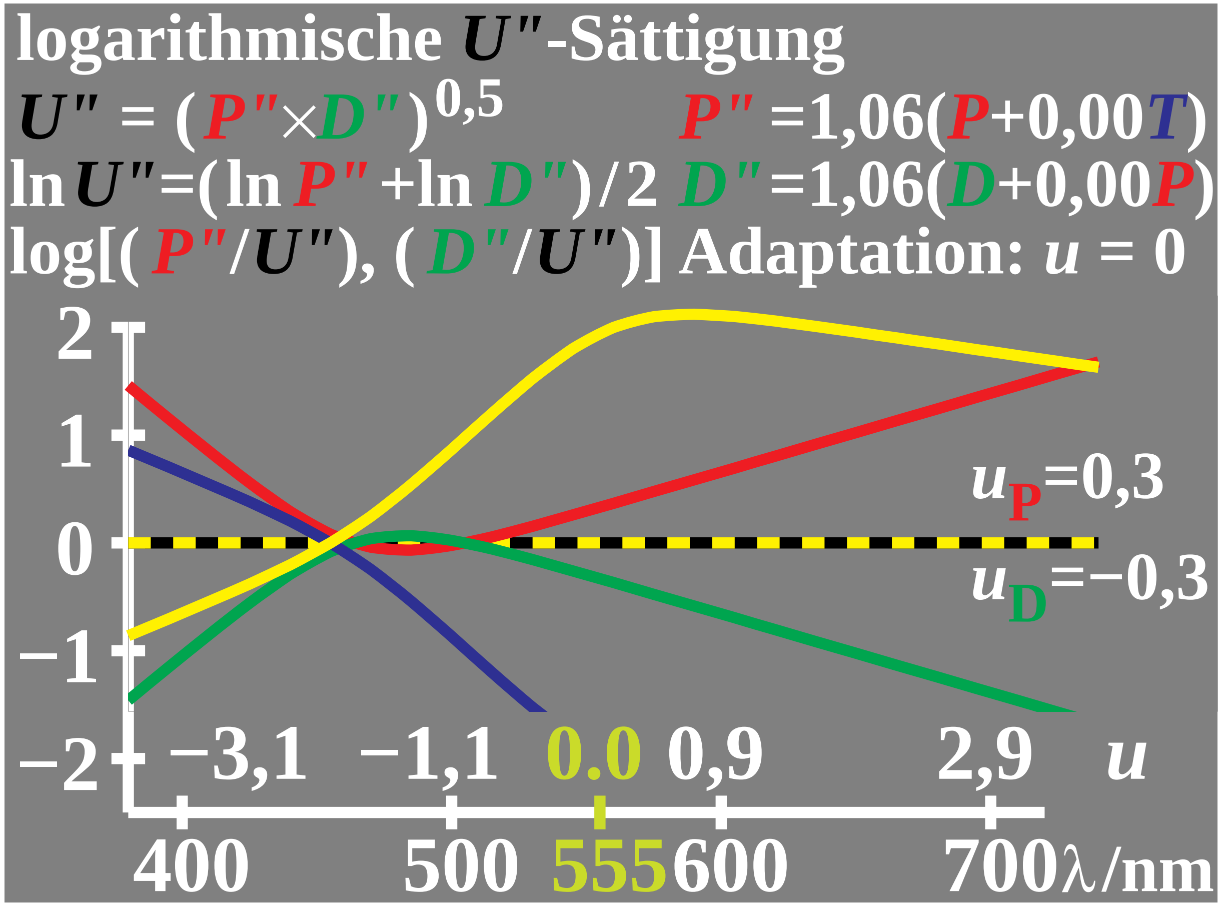

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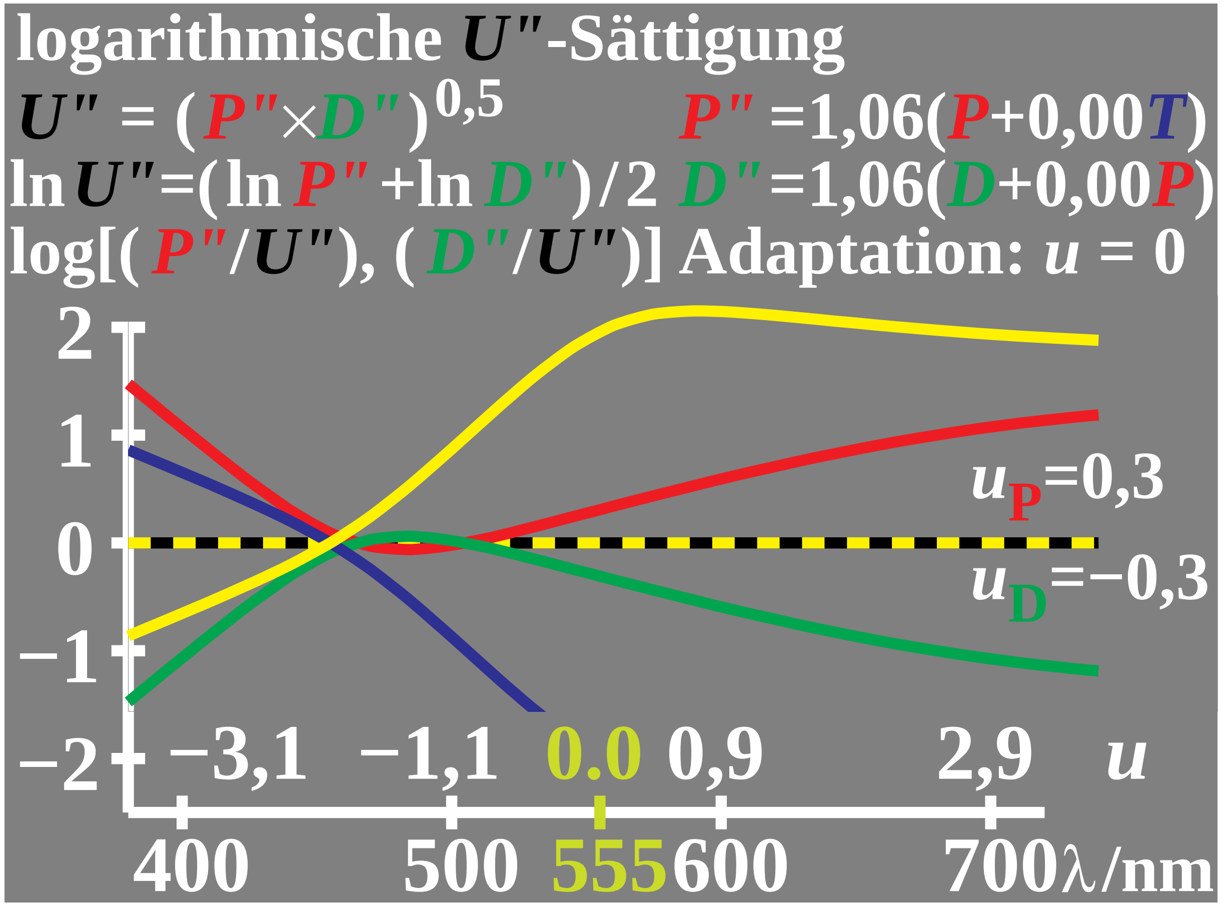

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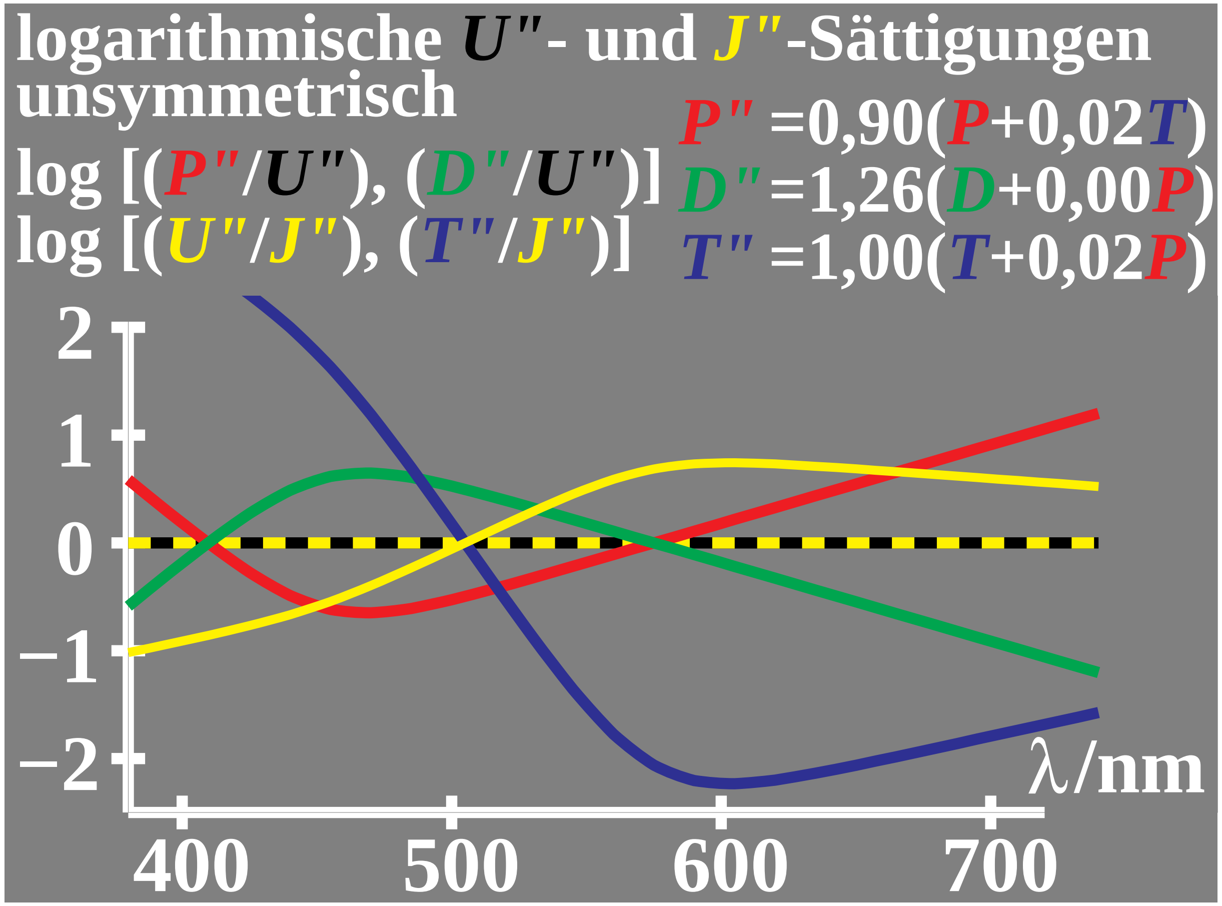

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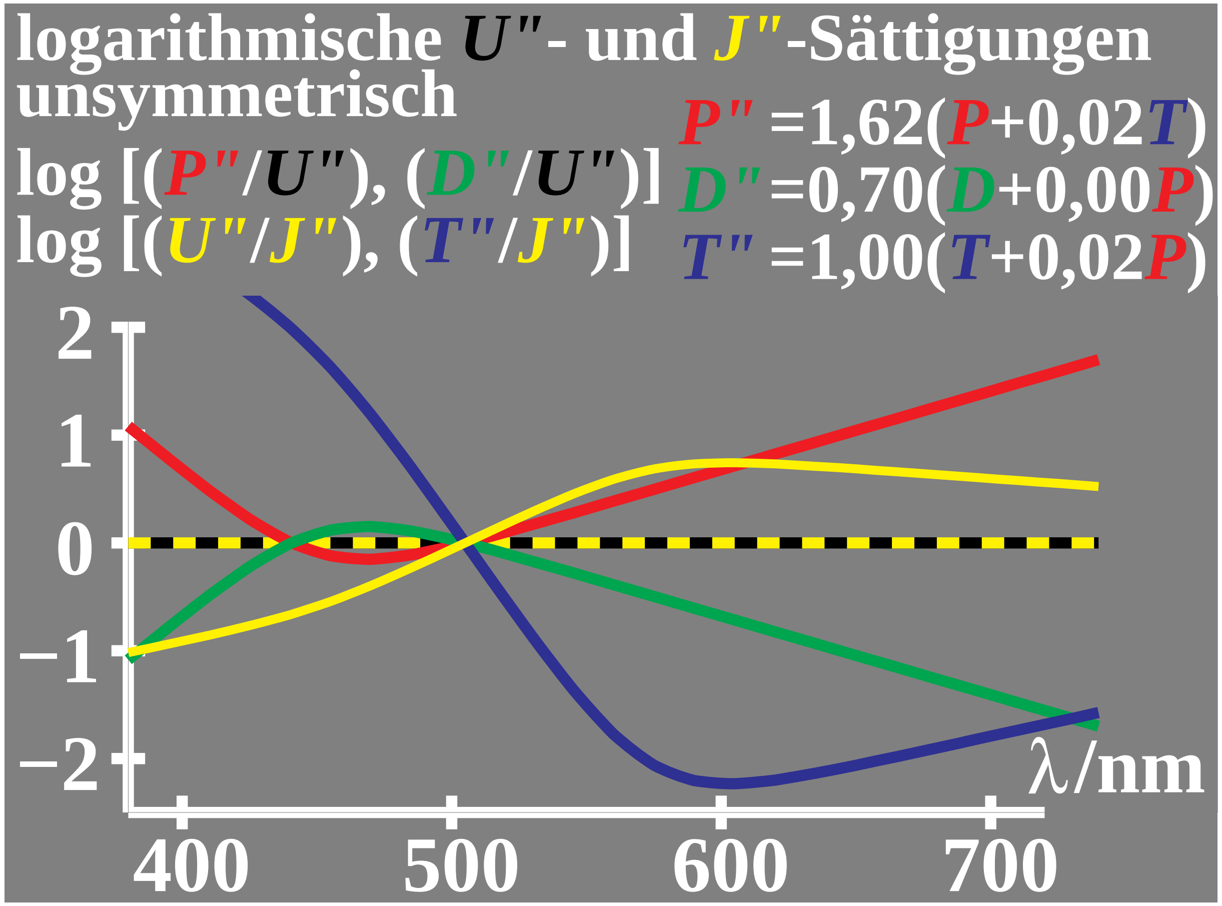

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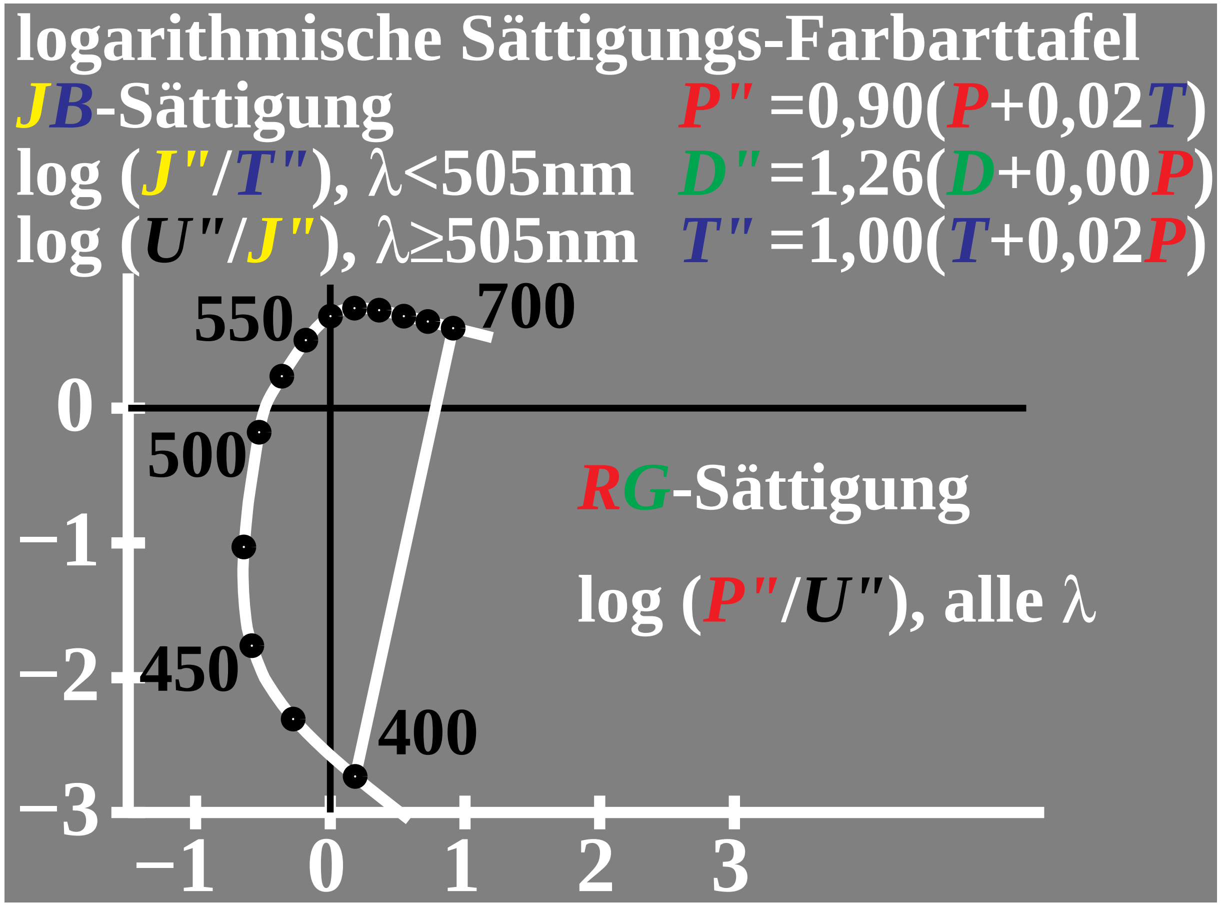

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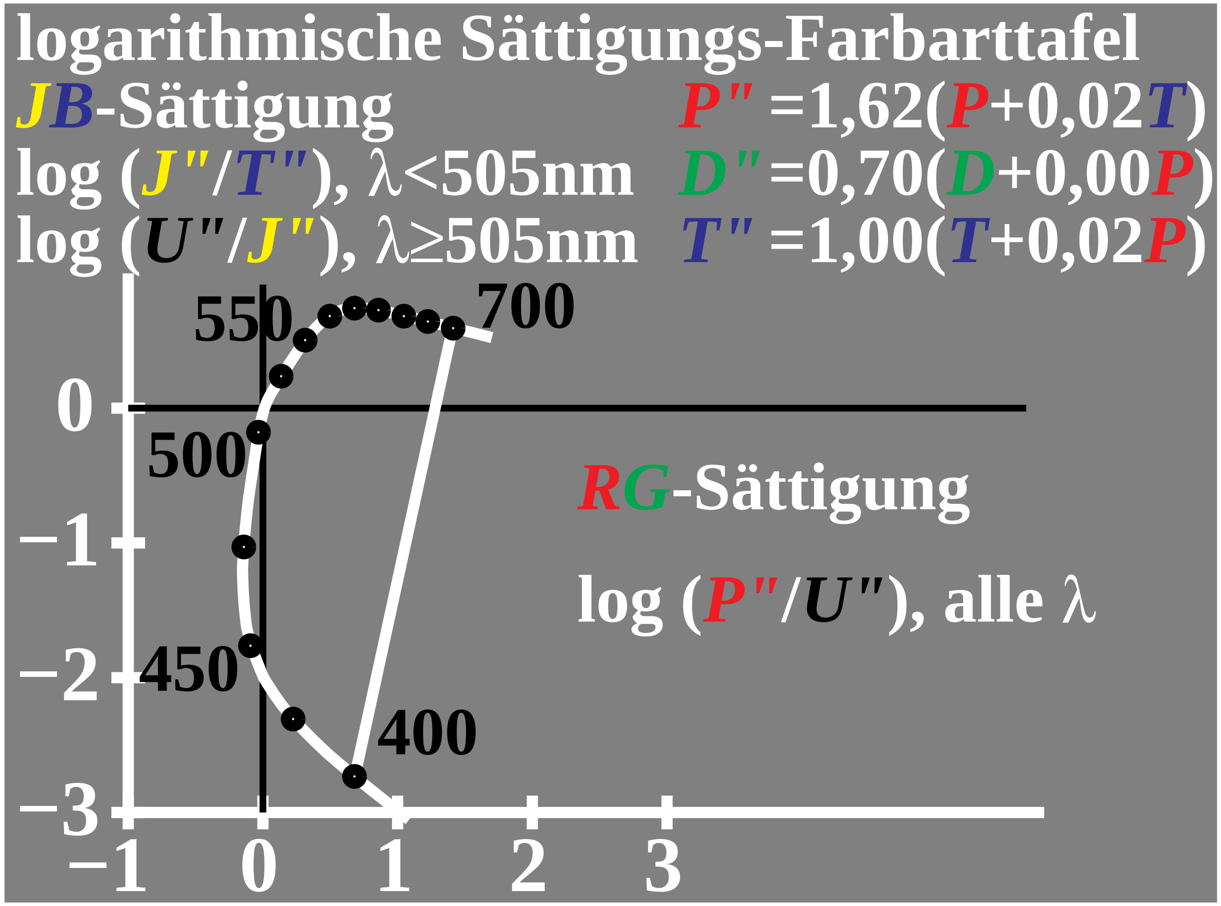

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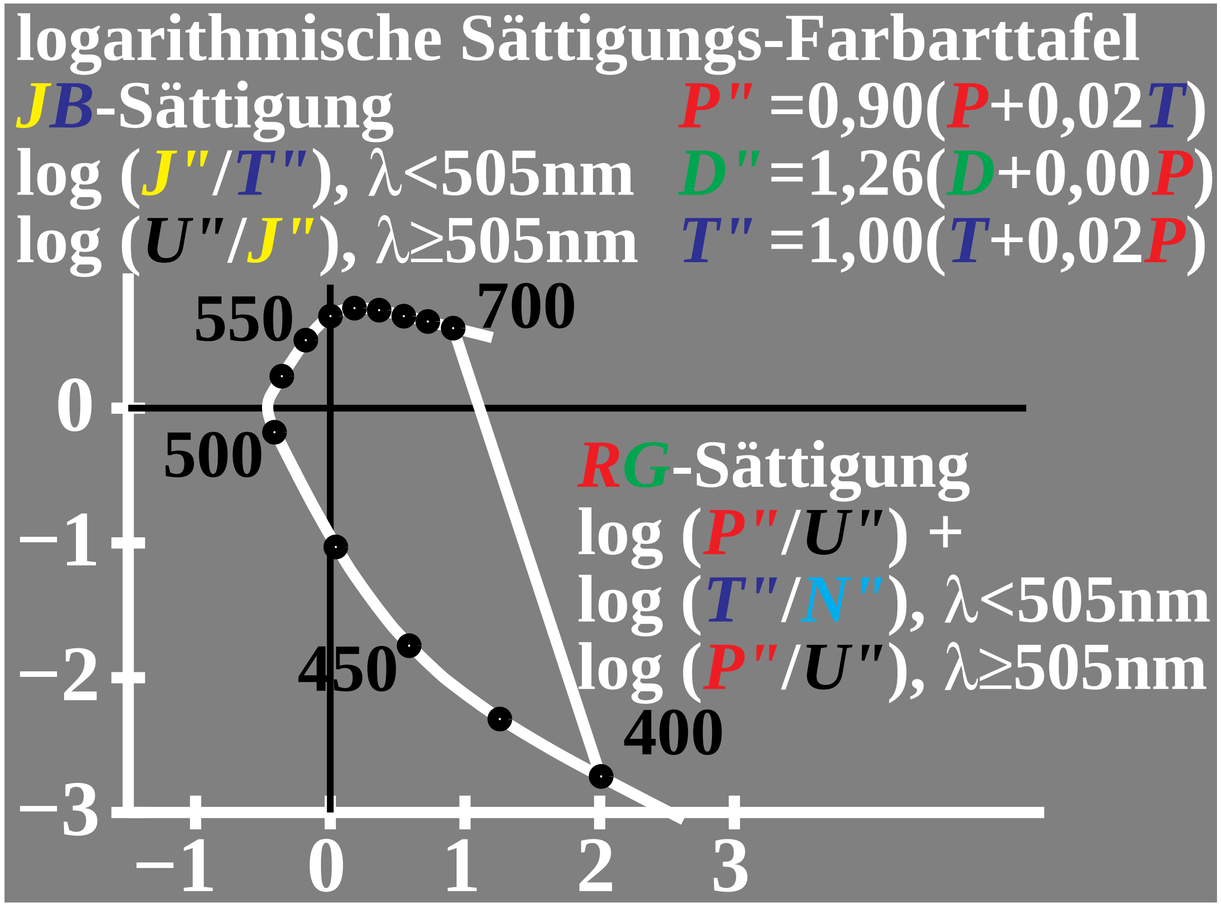

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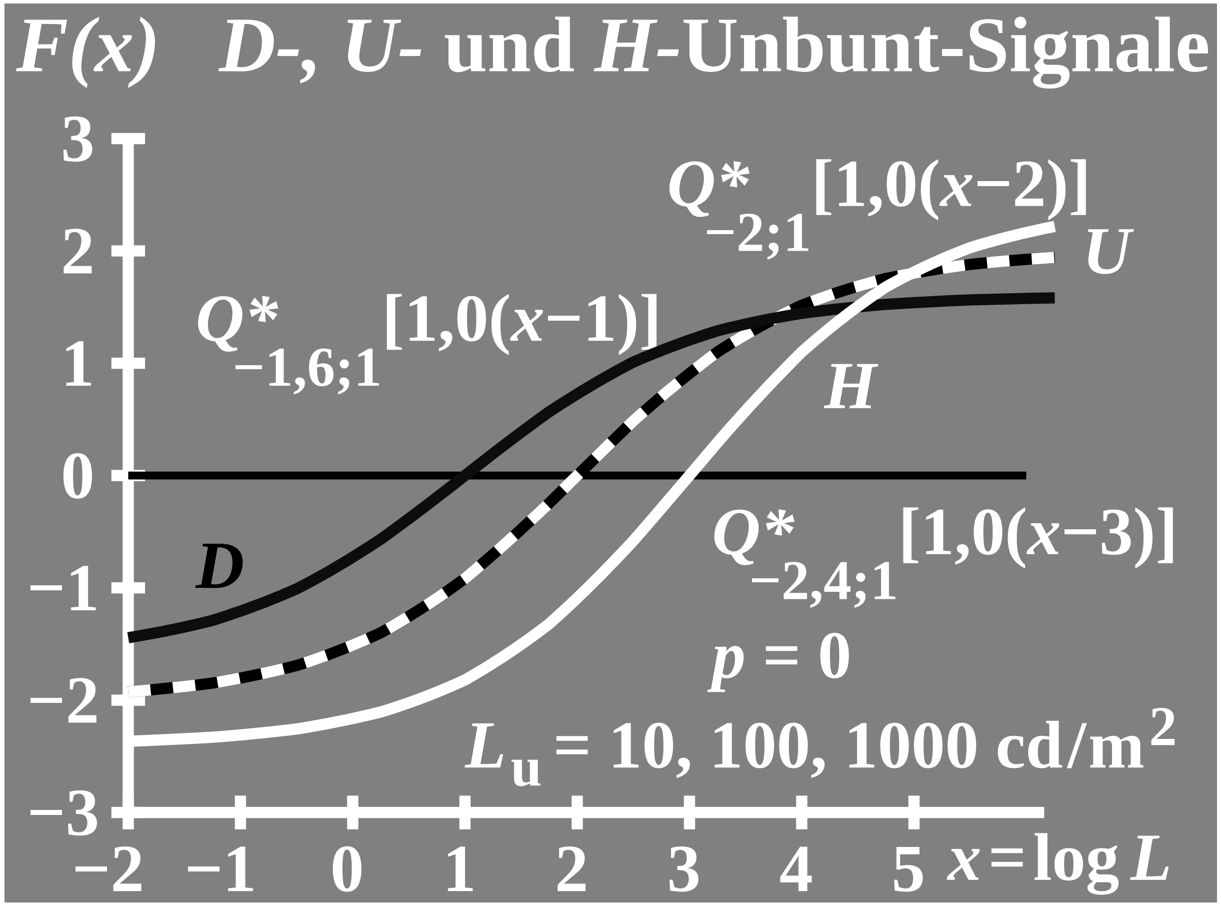

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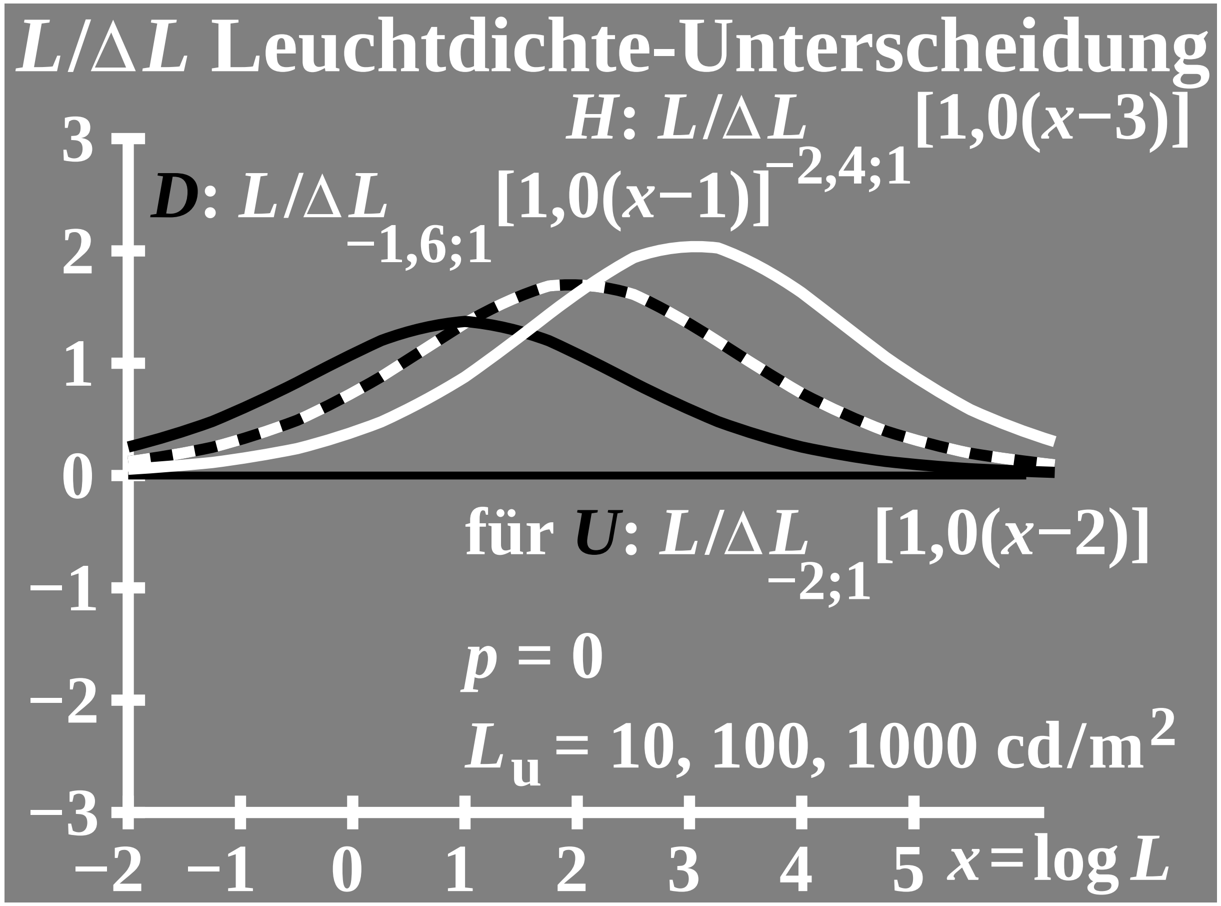

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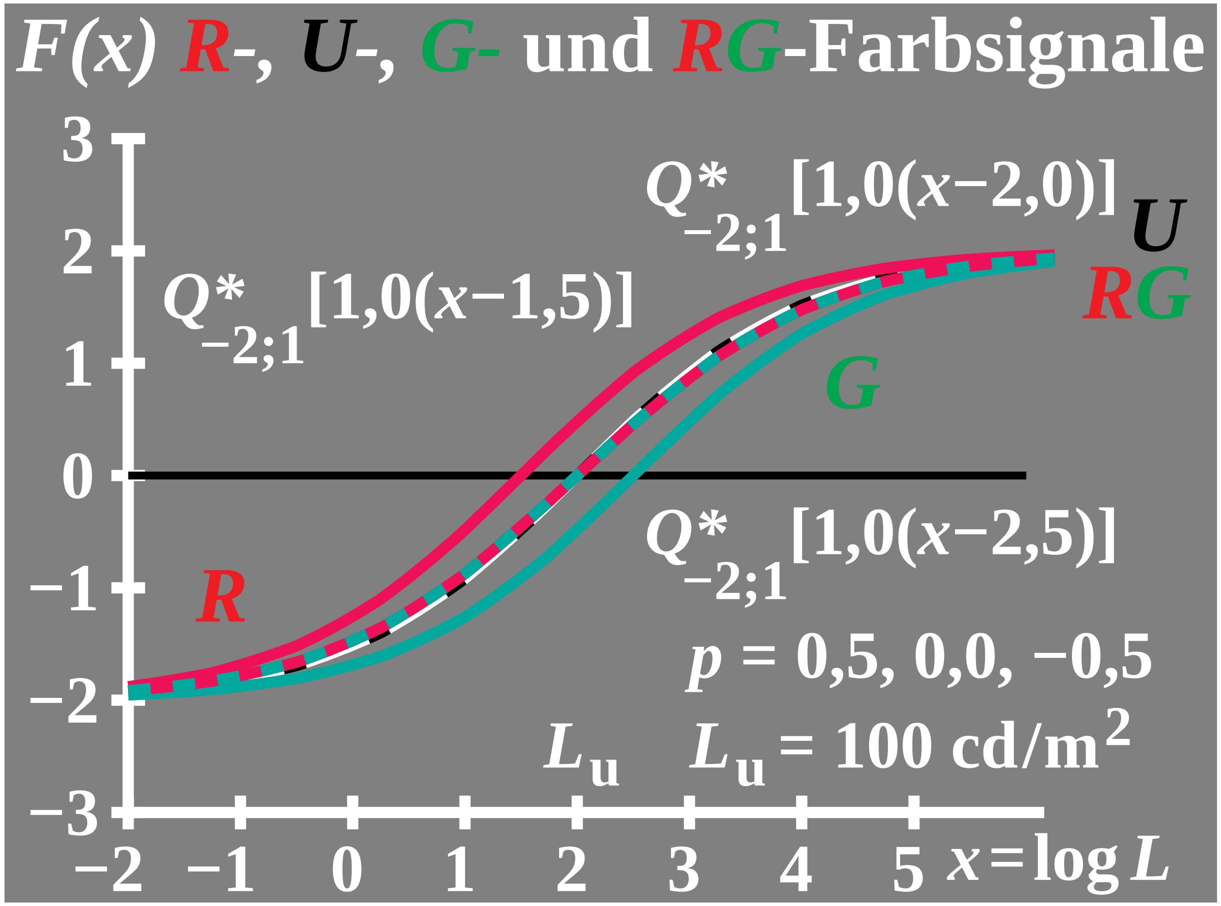

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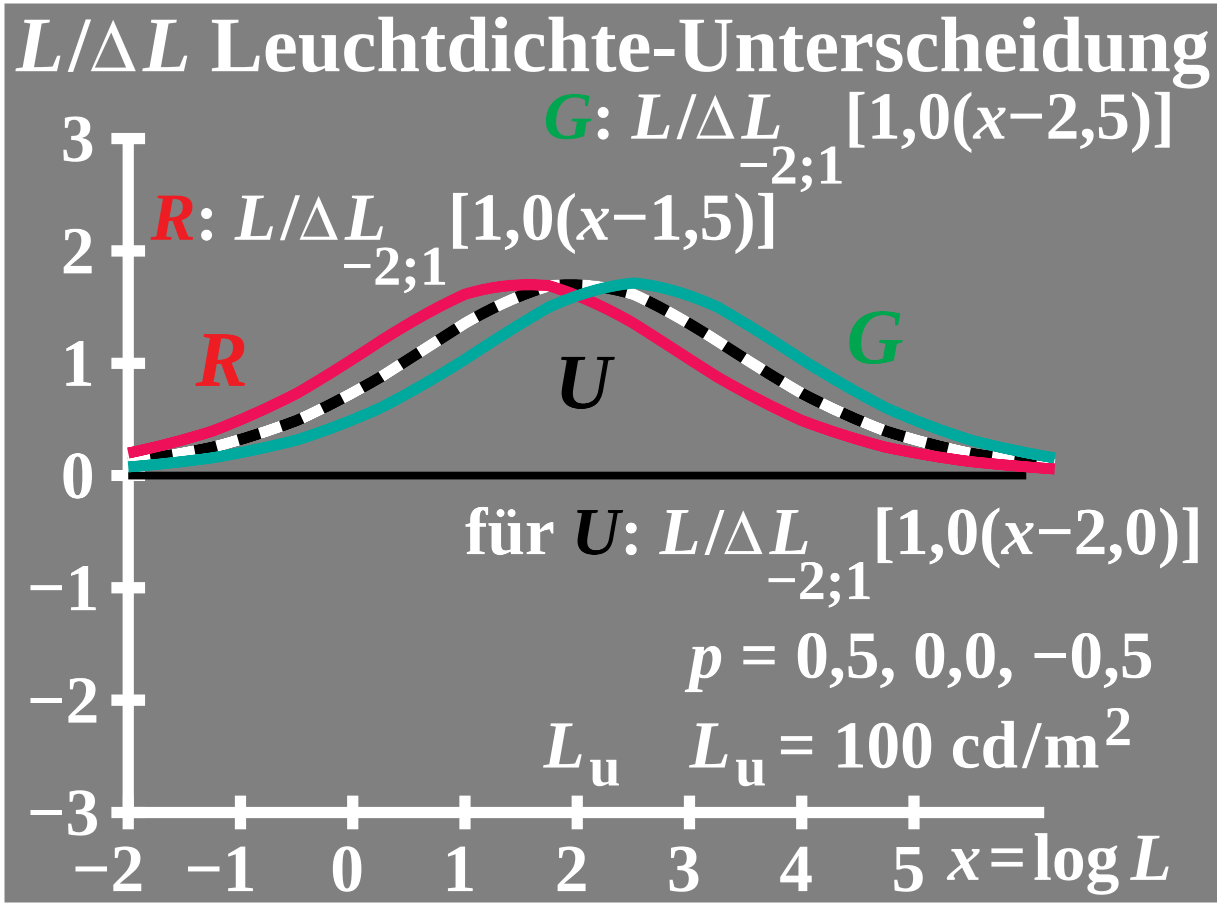

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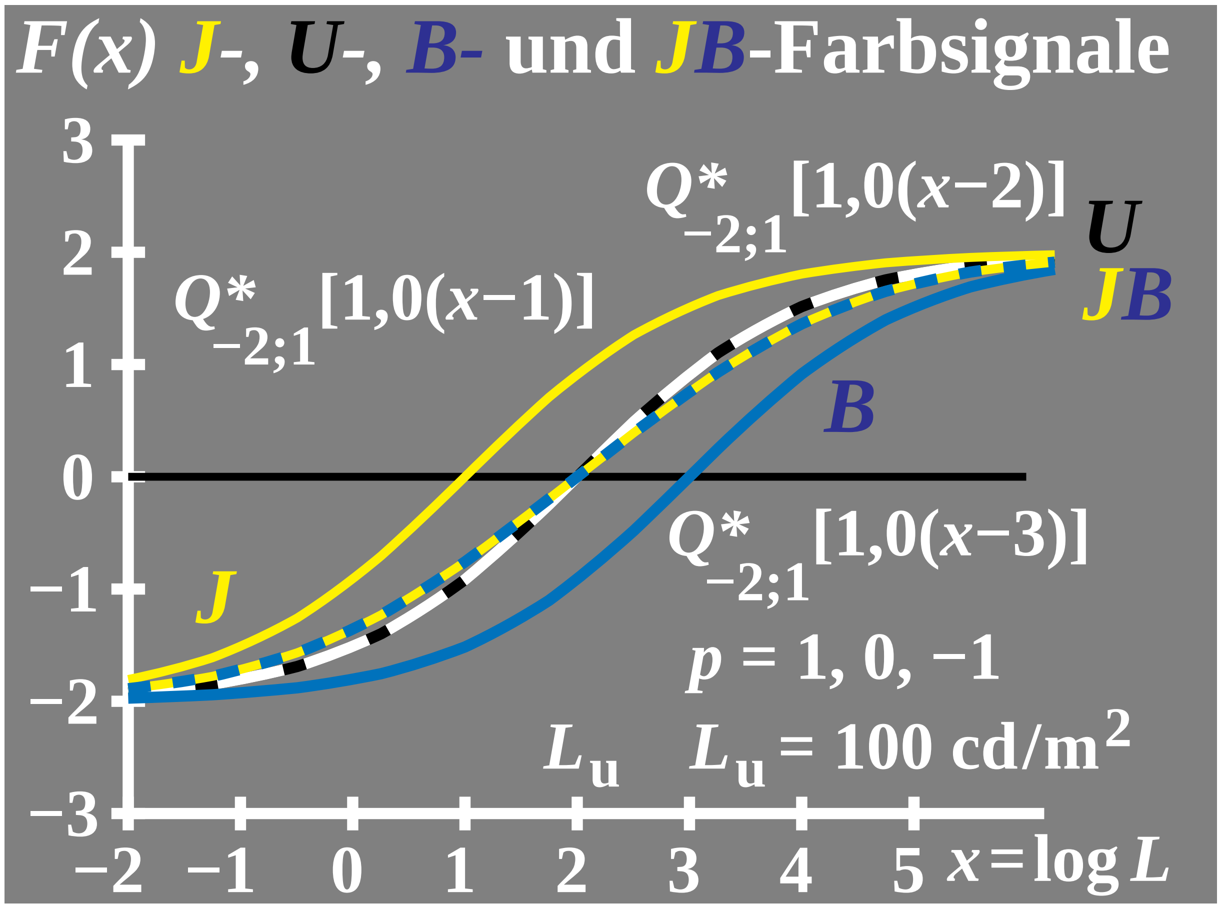

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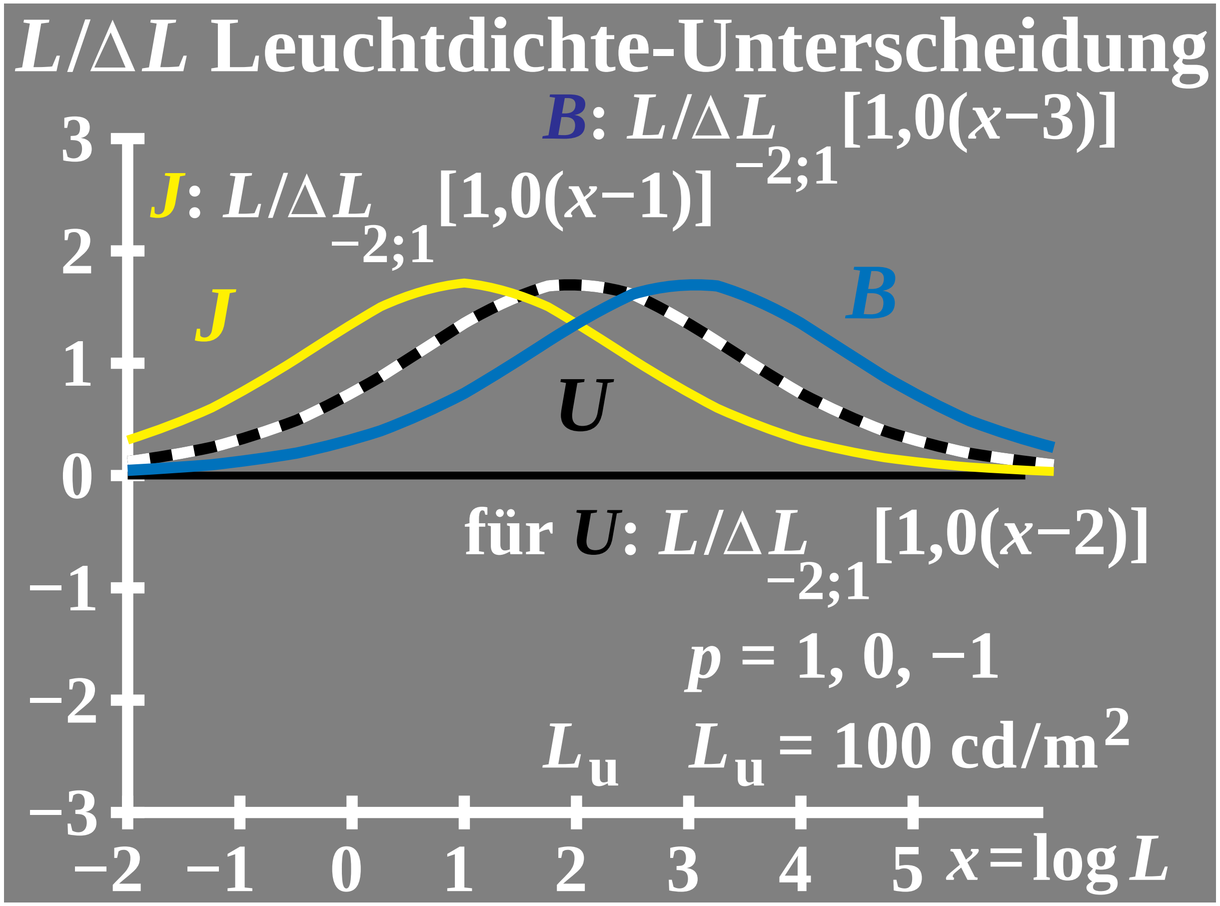

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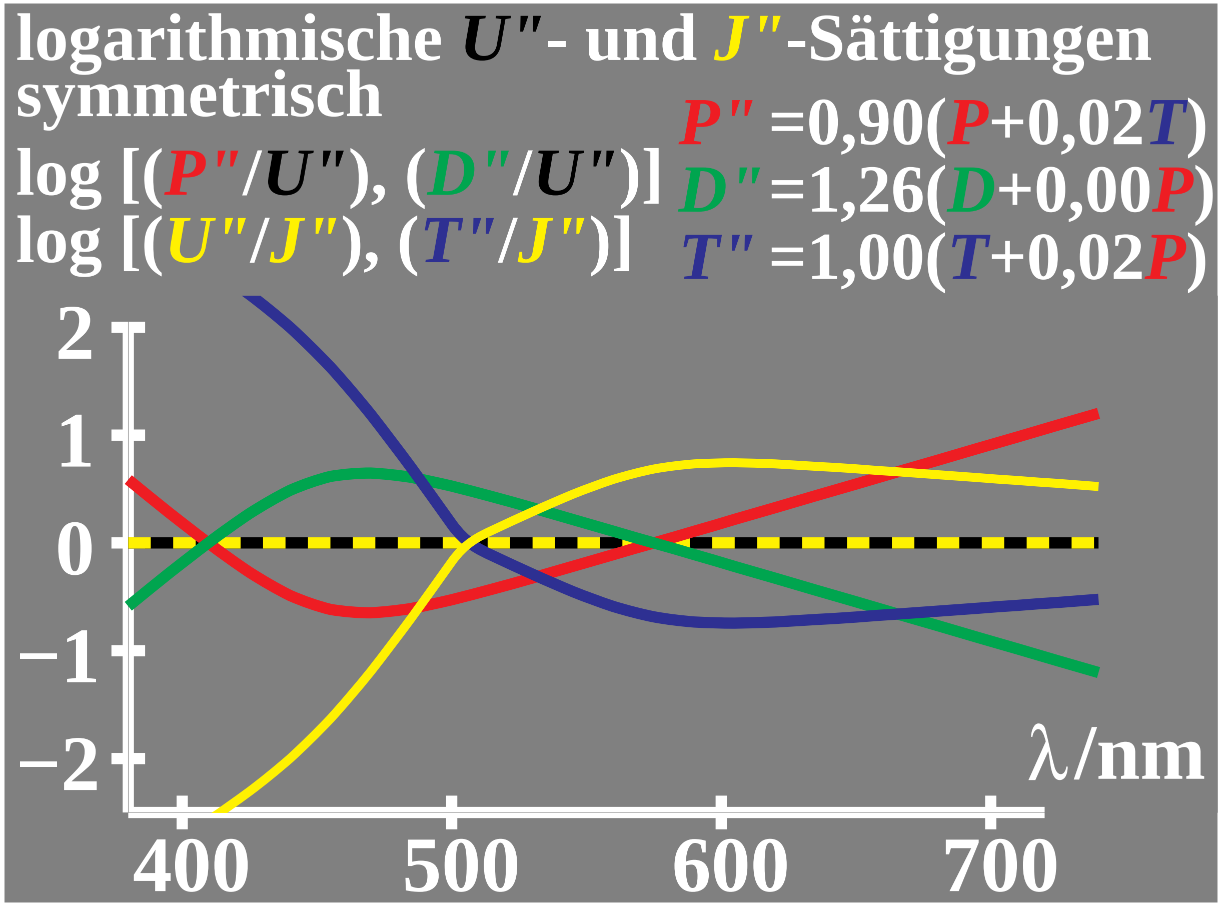

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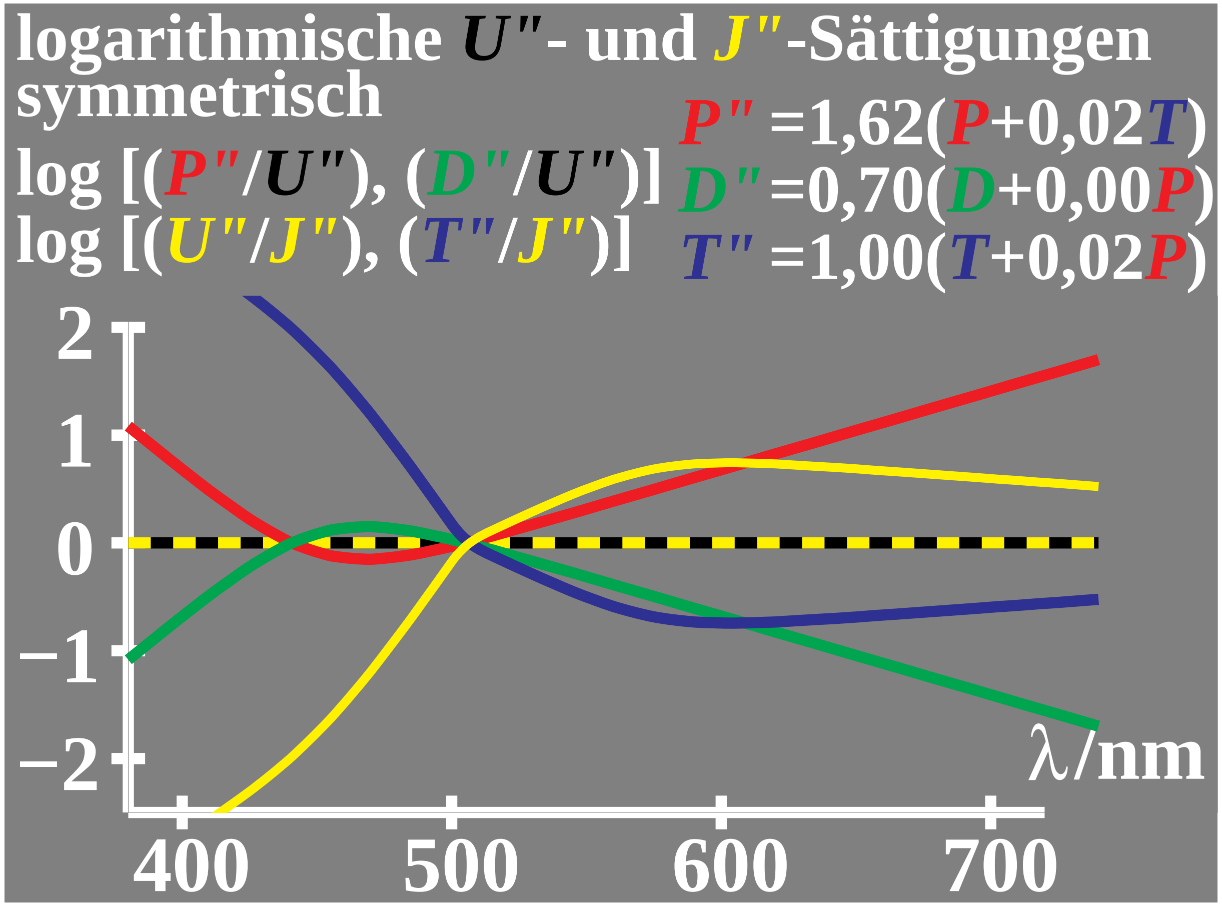
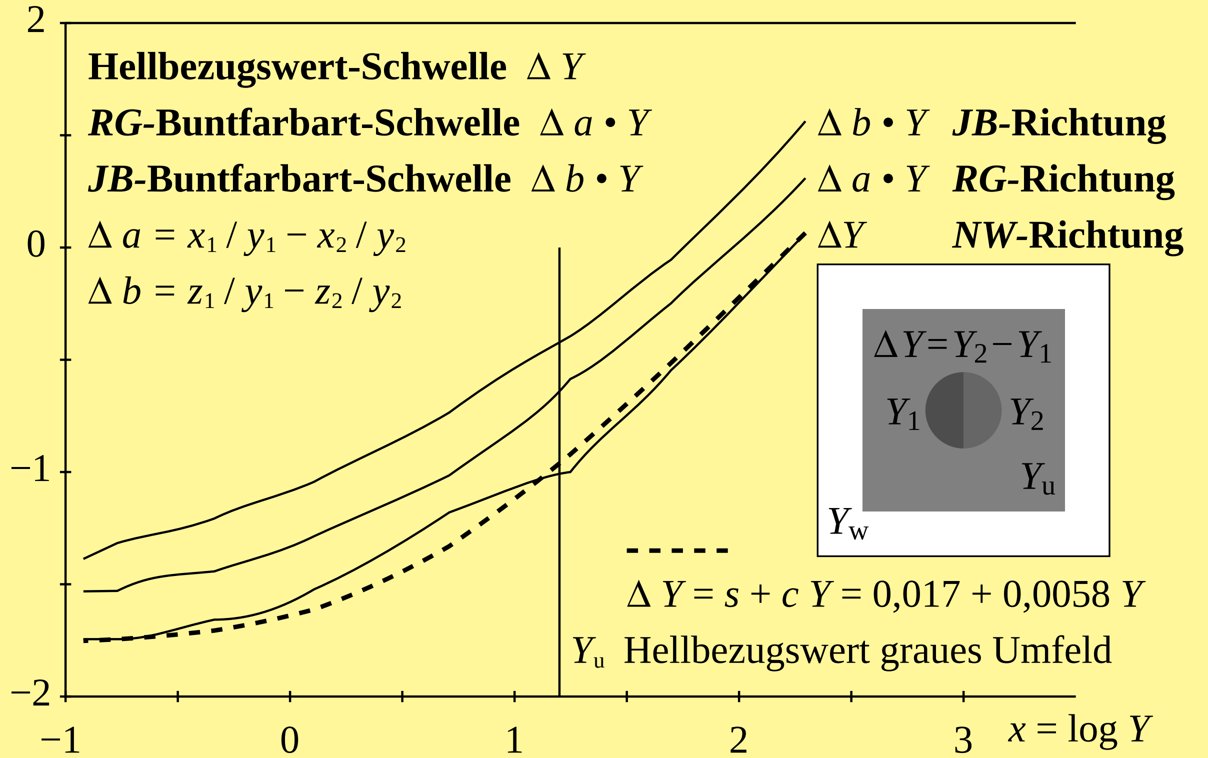


G9461_8f.eps, G0320_3f.eps, G4_69_2f.eps, Bild 4_69_2

NW*-Unbunt- sowie *RG*- und *JB*-Bunt-Schwellen als Funktion von *Y

Experimente und Daten: BAM-Forschungsbericht Nr. 115 (1985), S. 72 ff.



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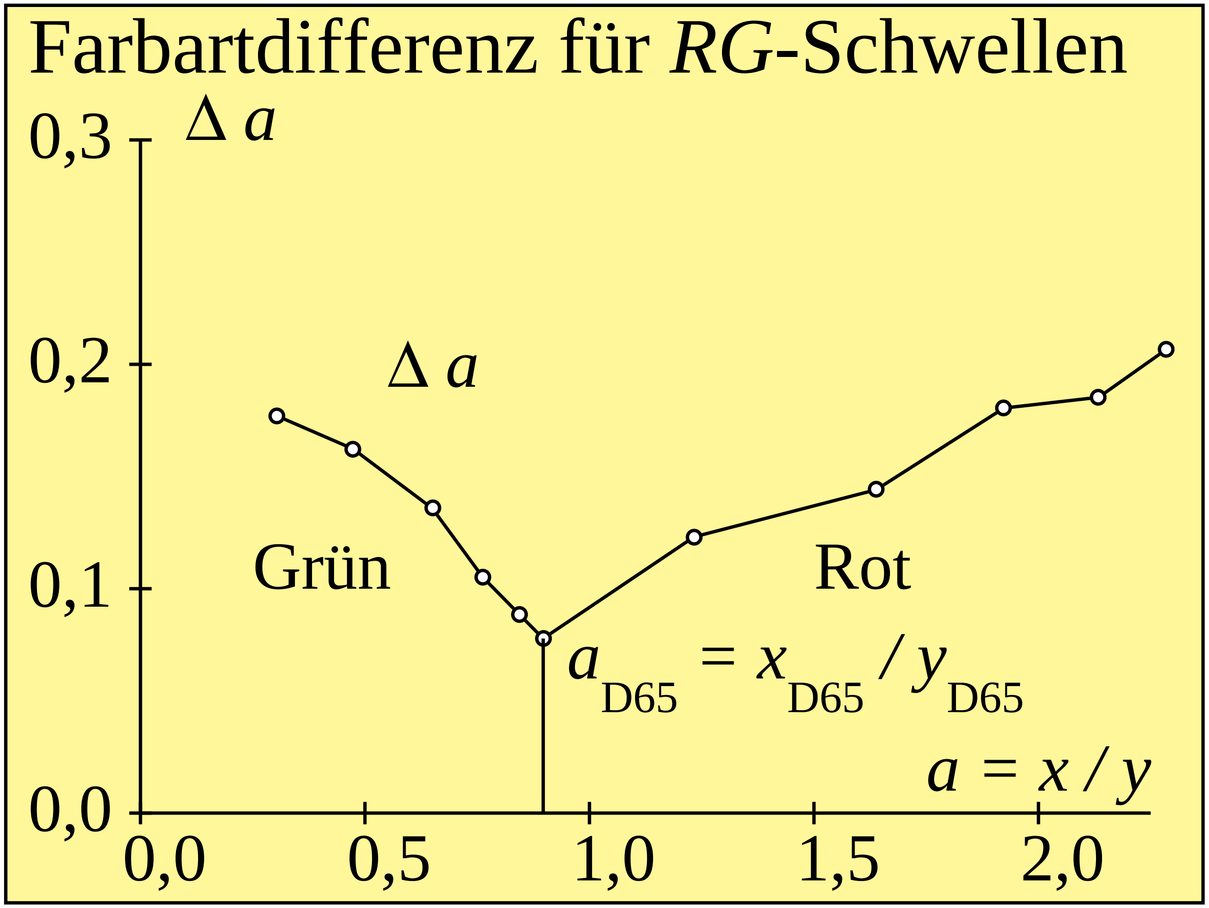

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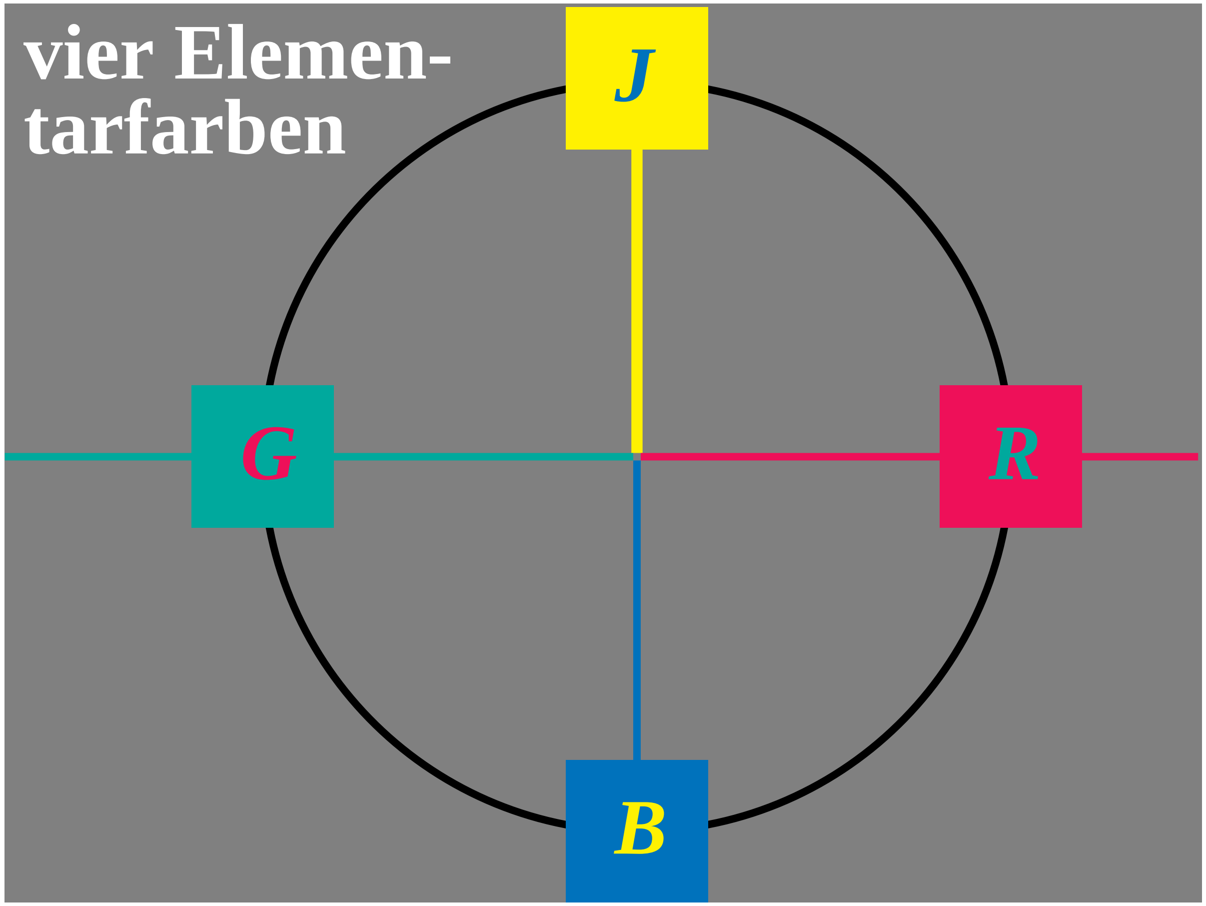

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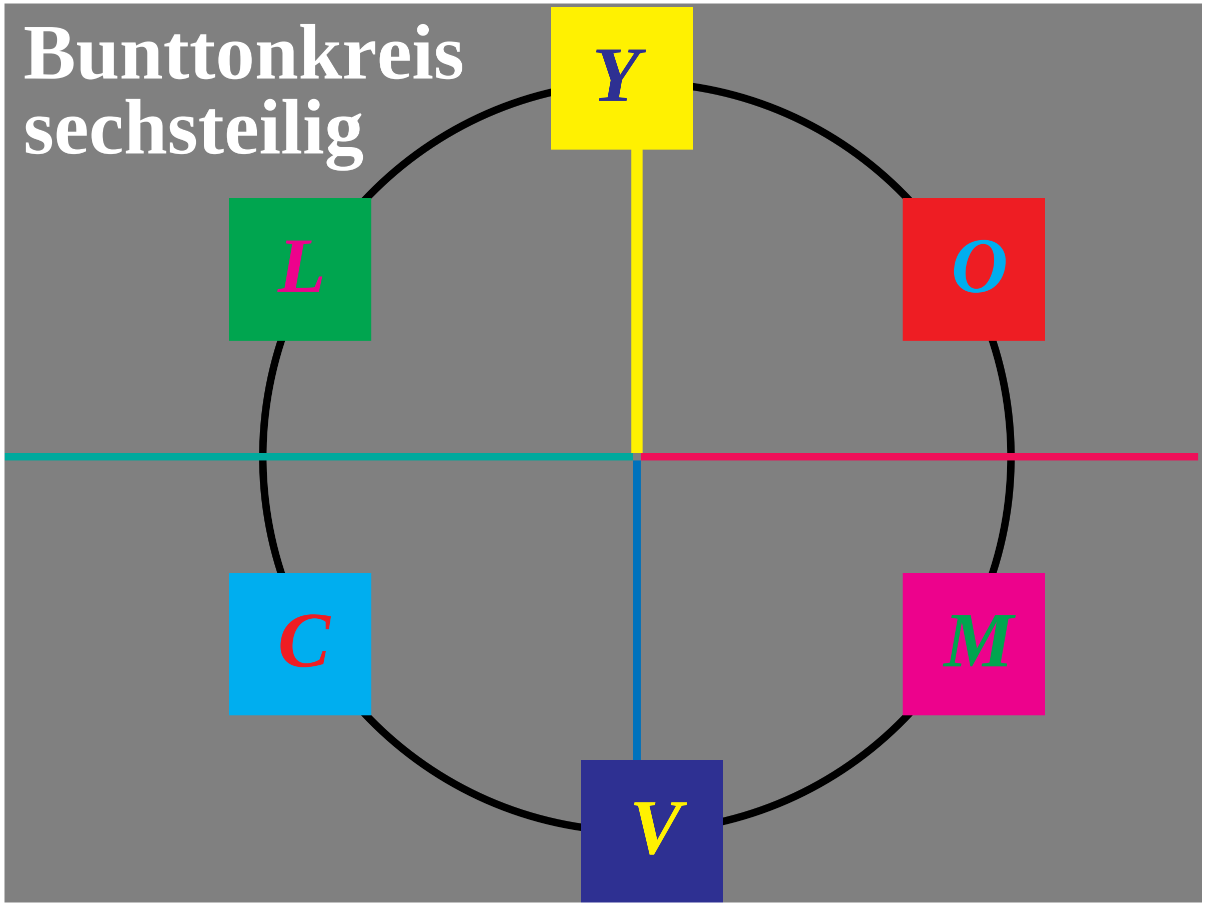

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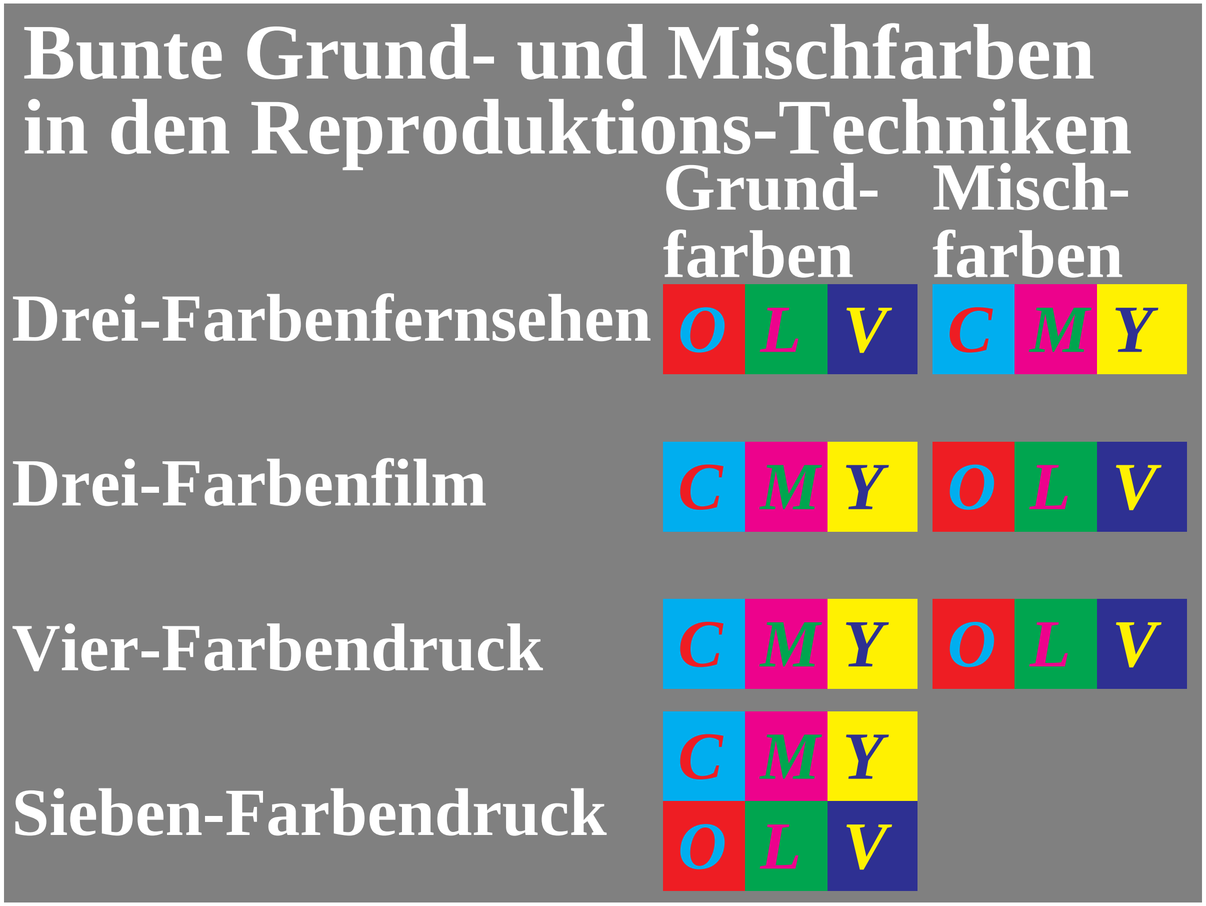

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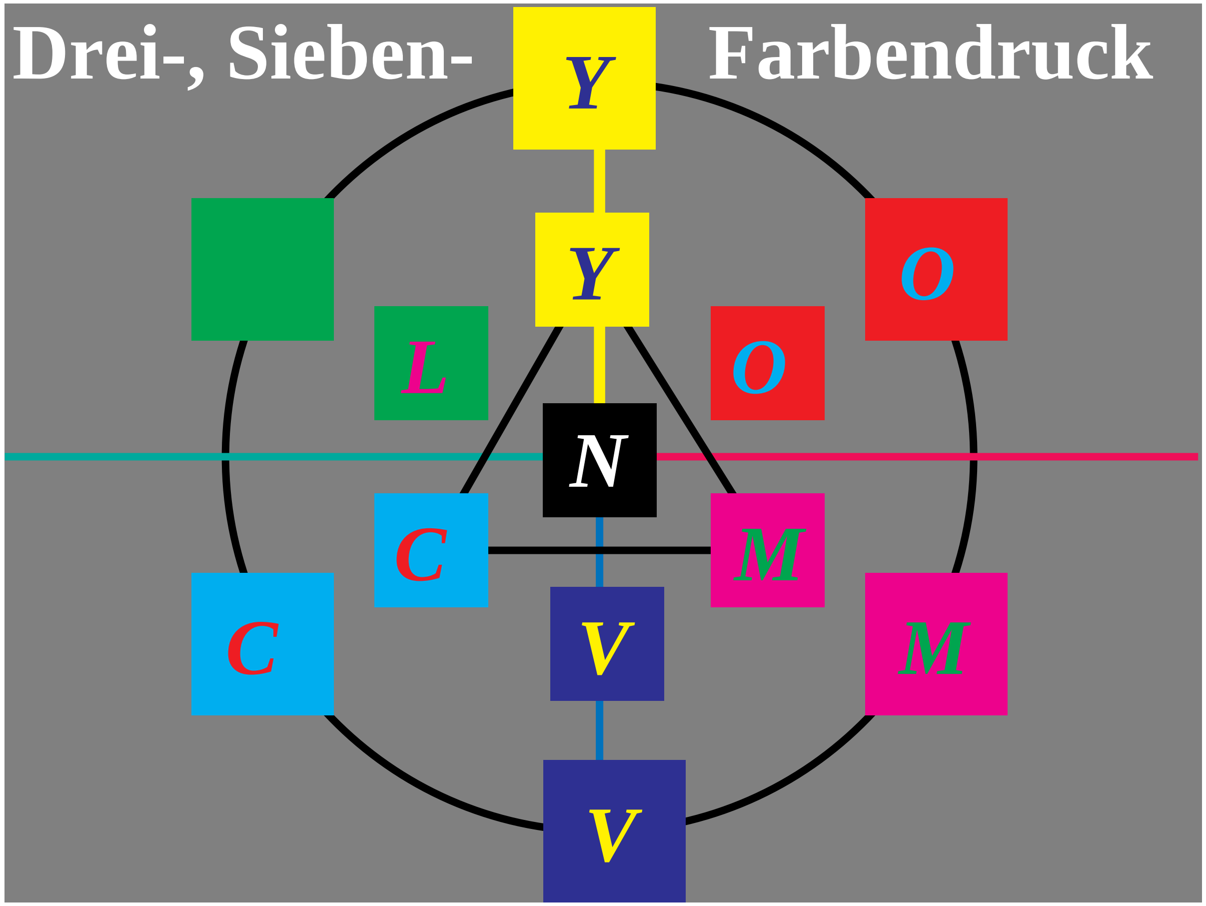

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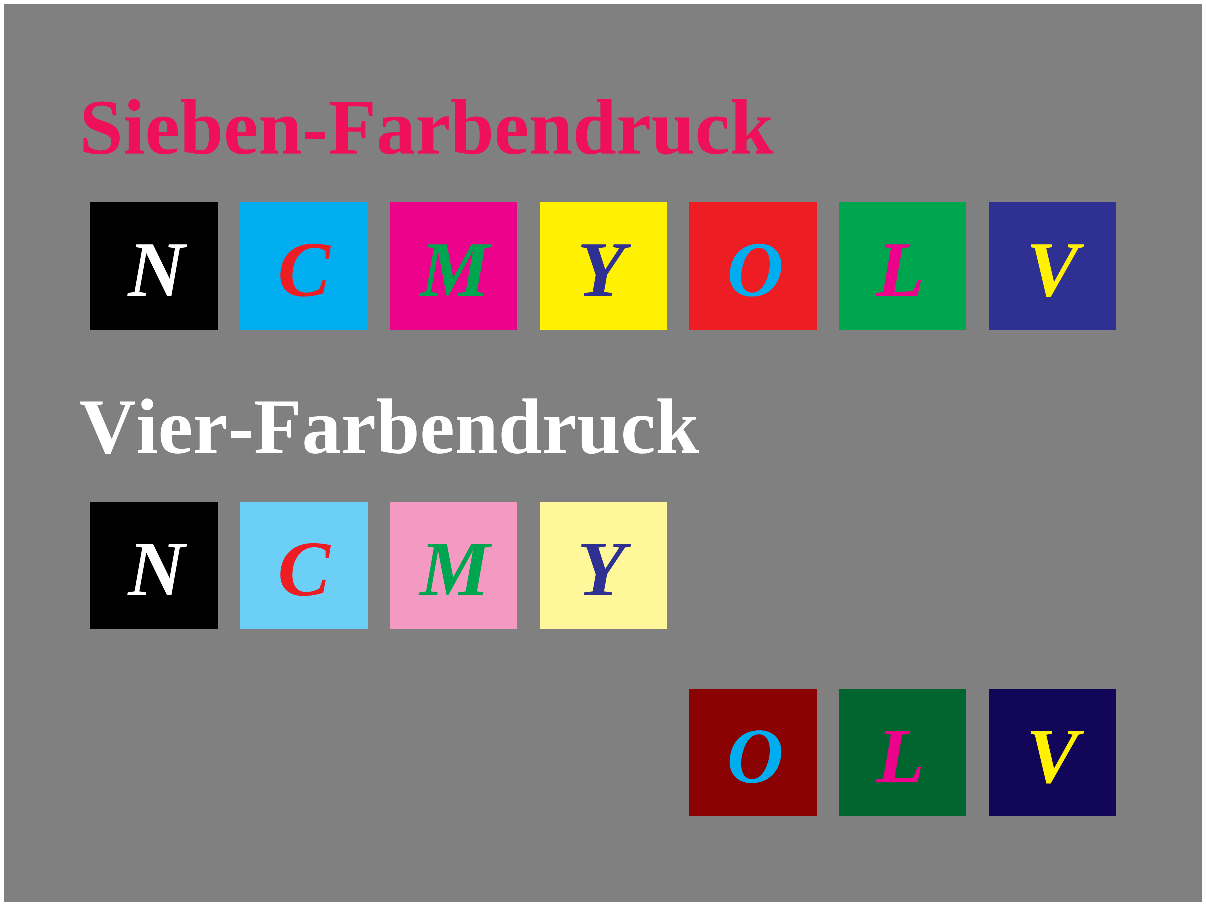

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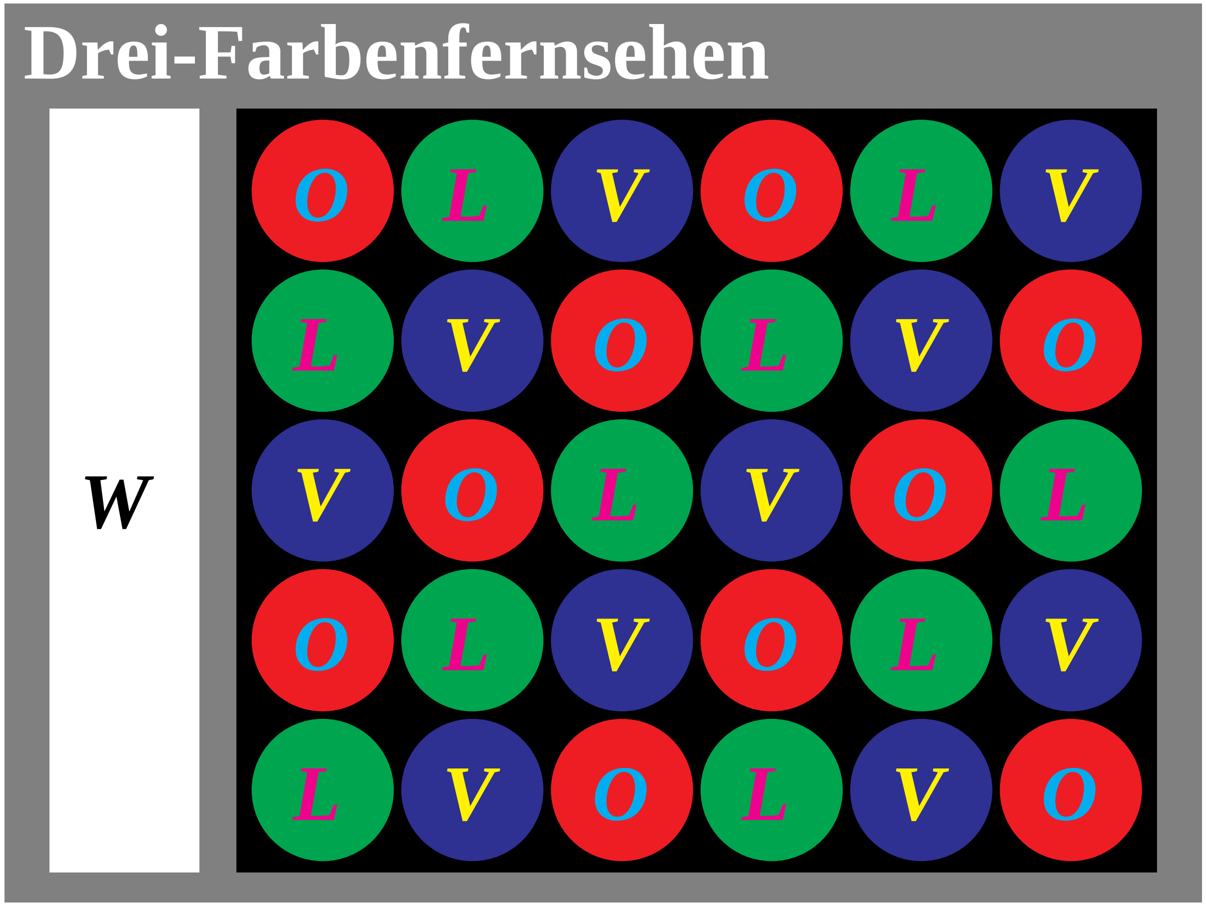

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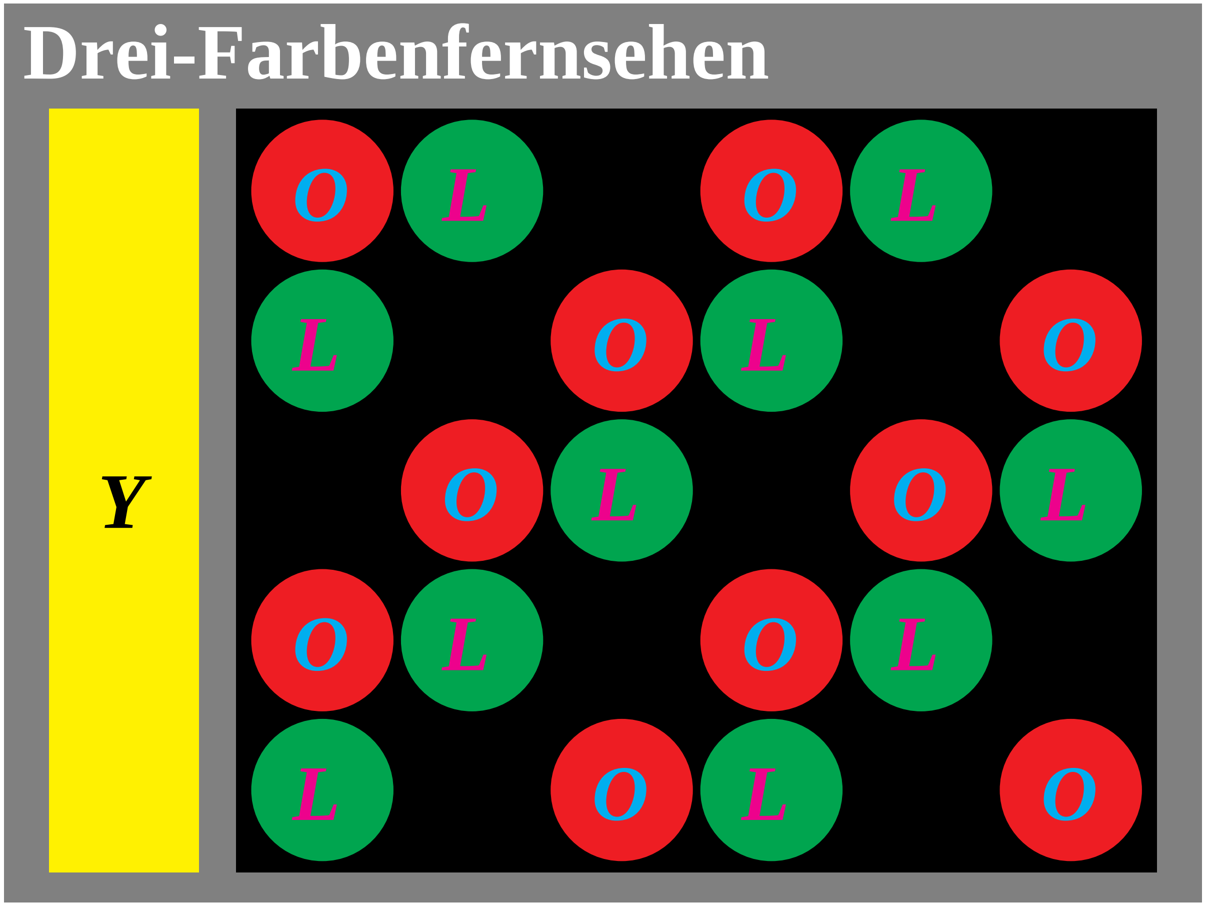

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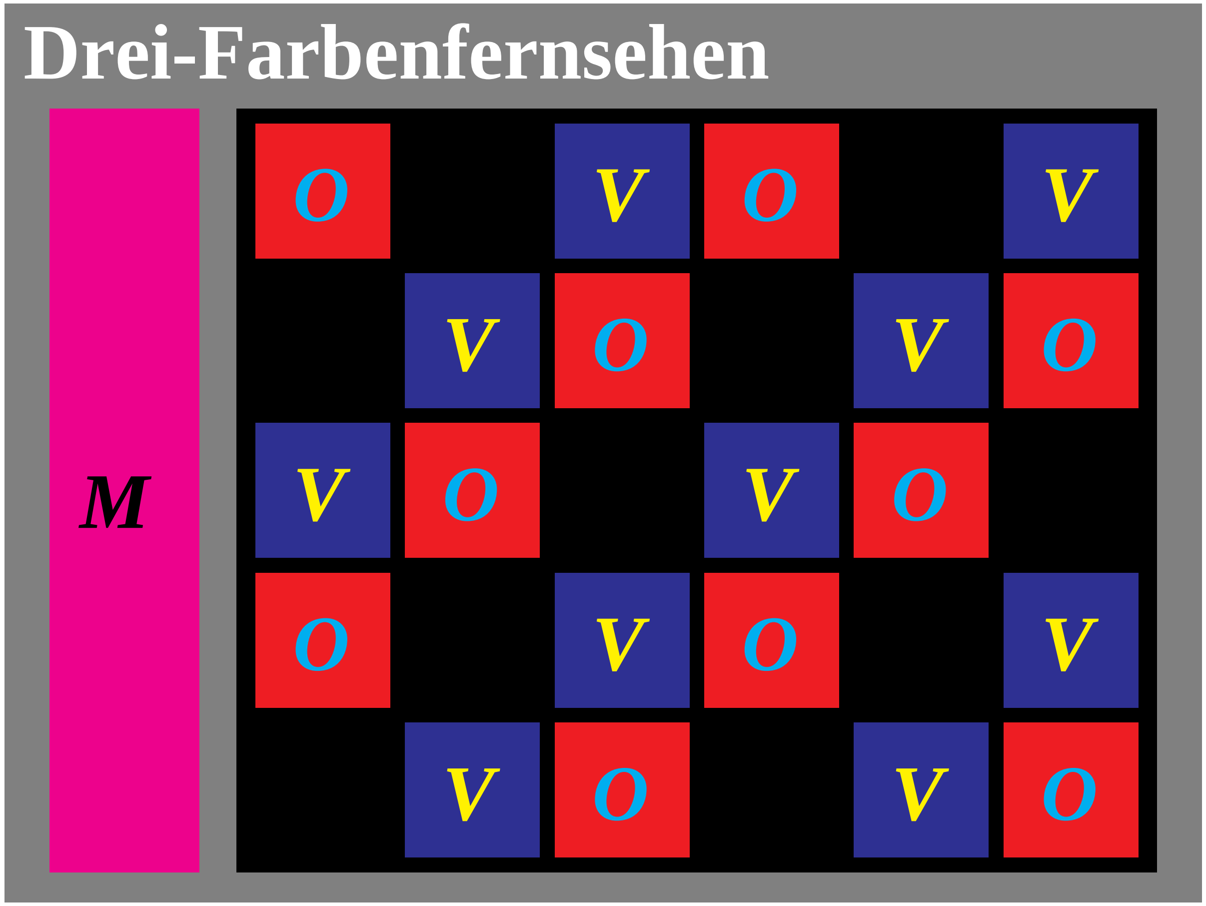

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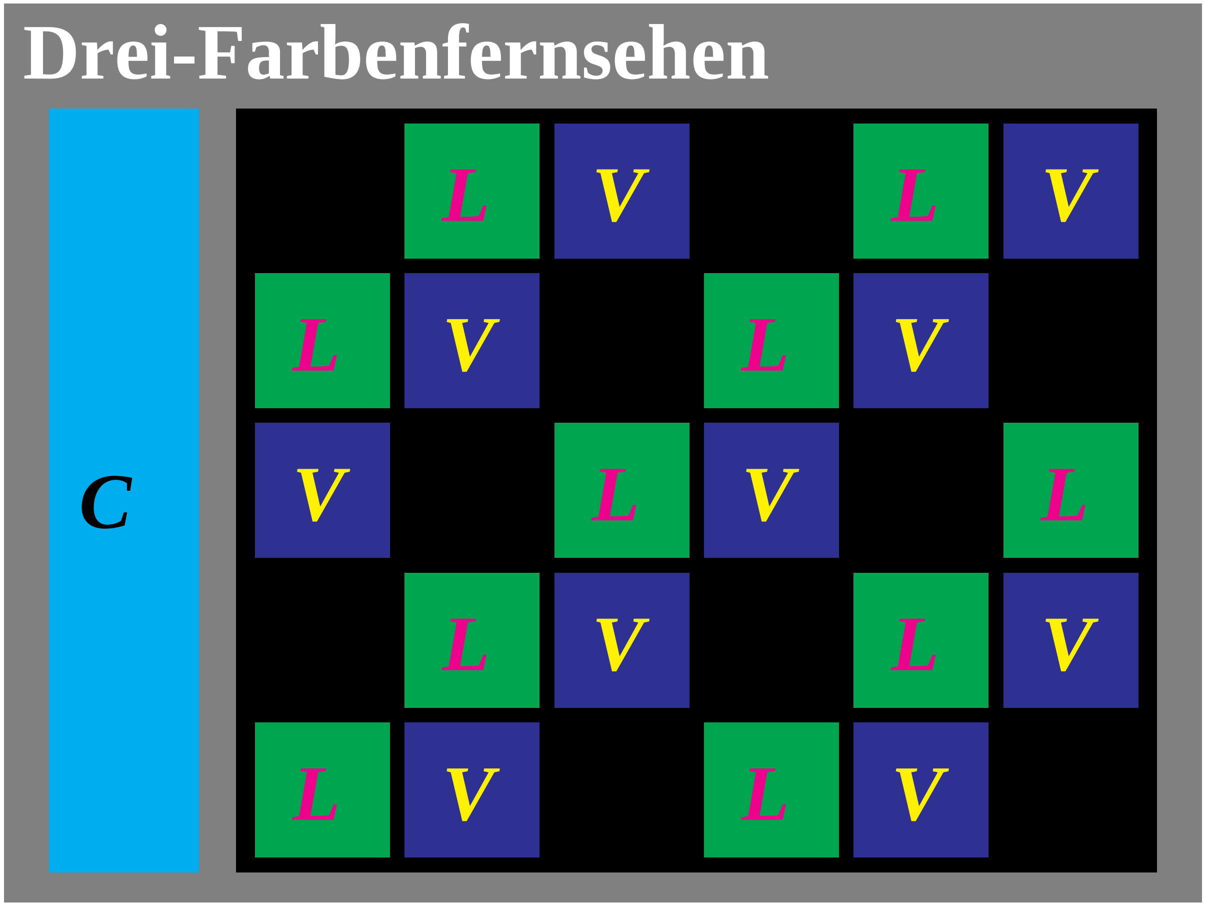

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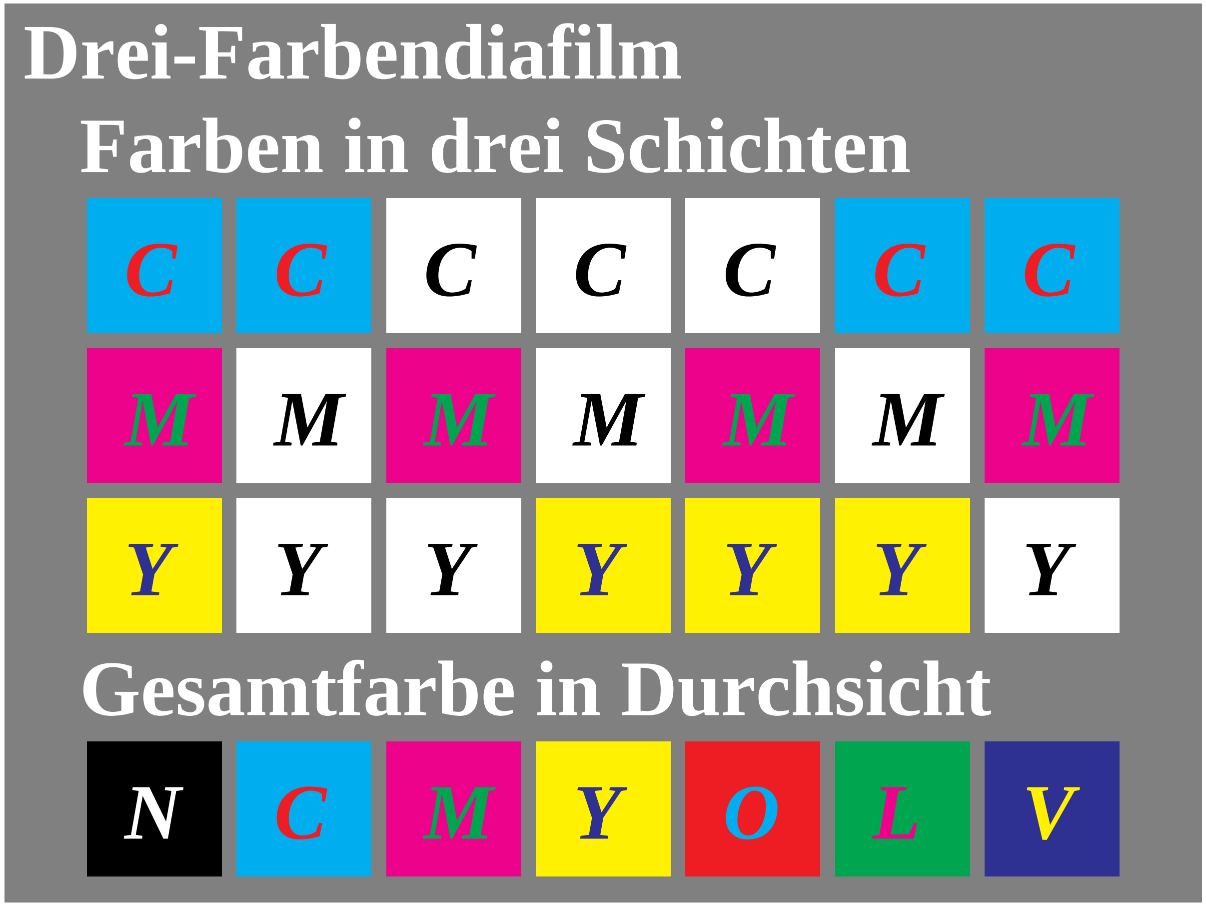

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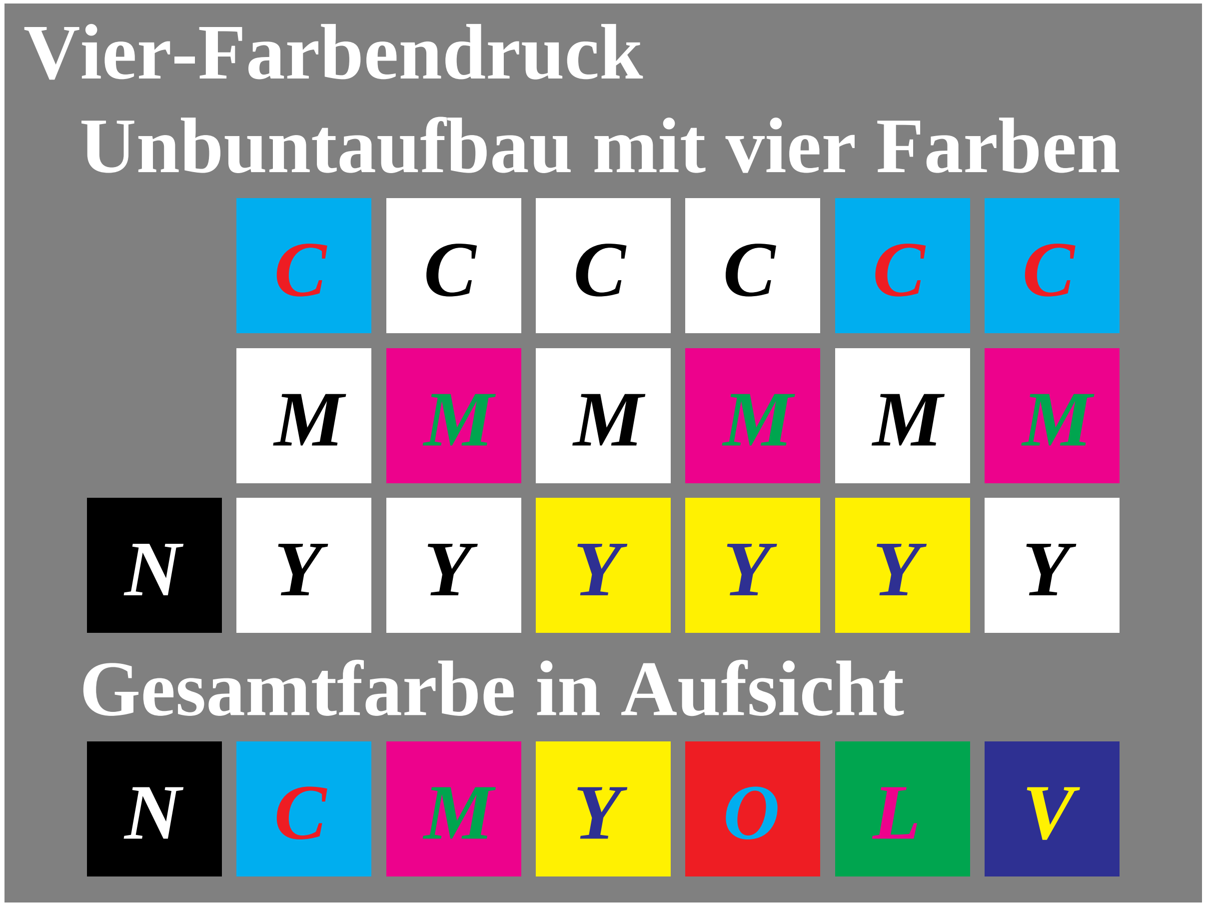

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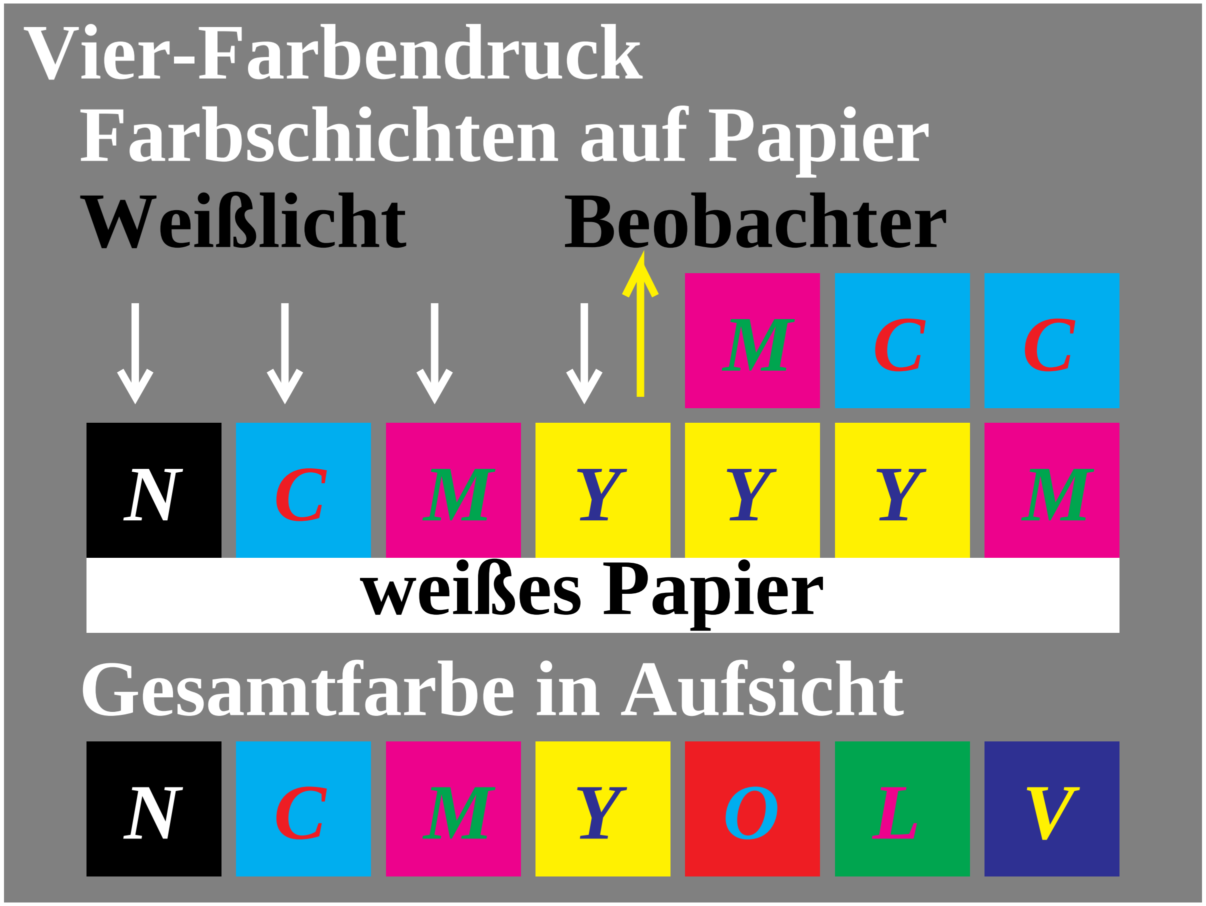

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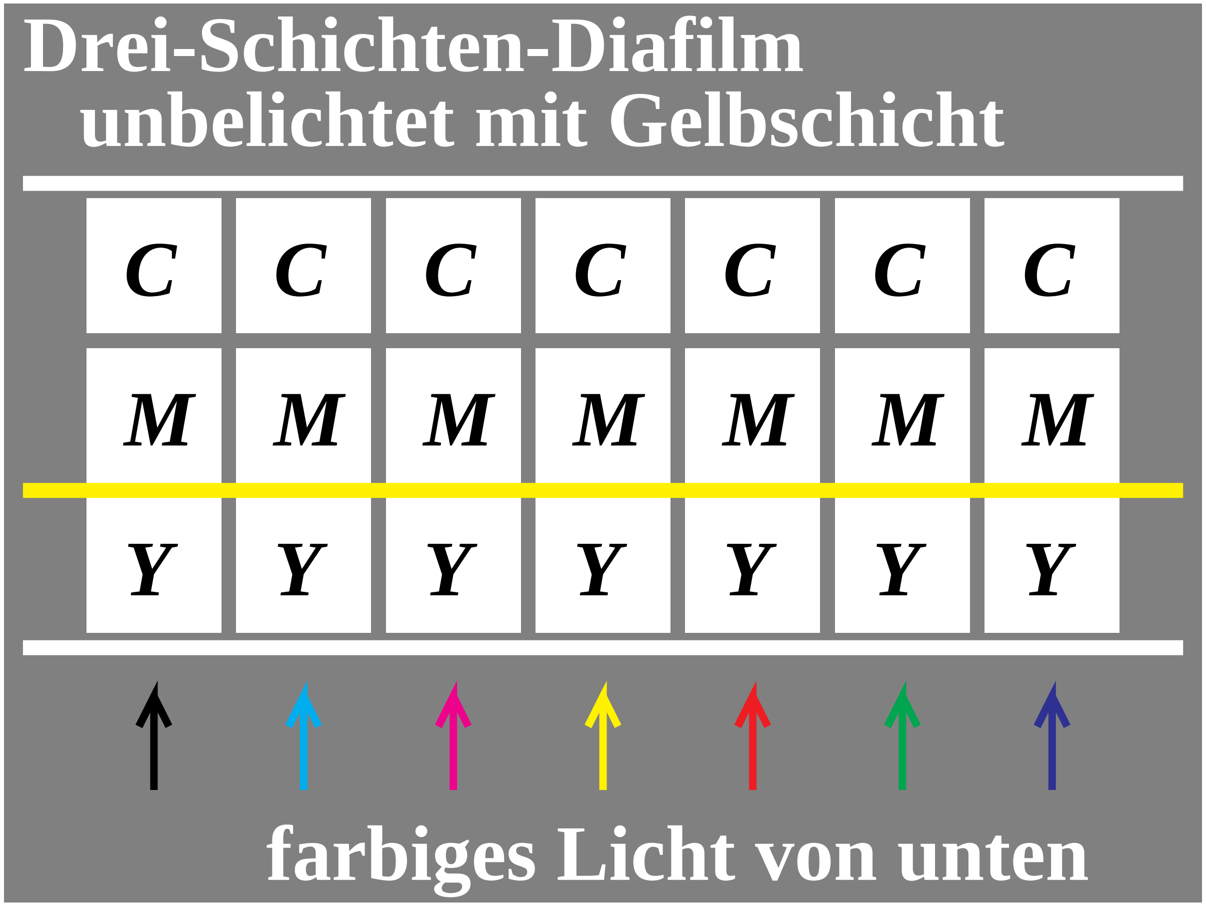

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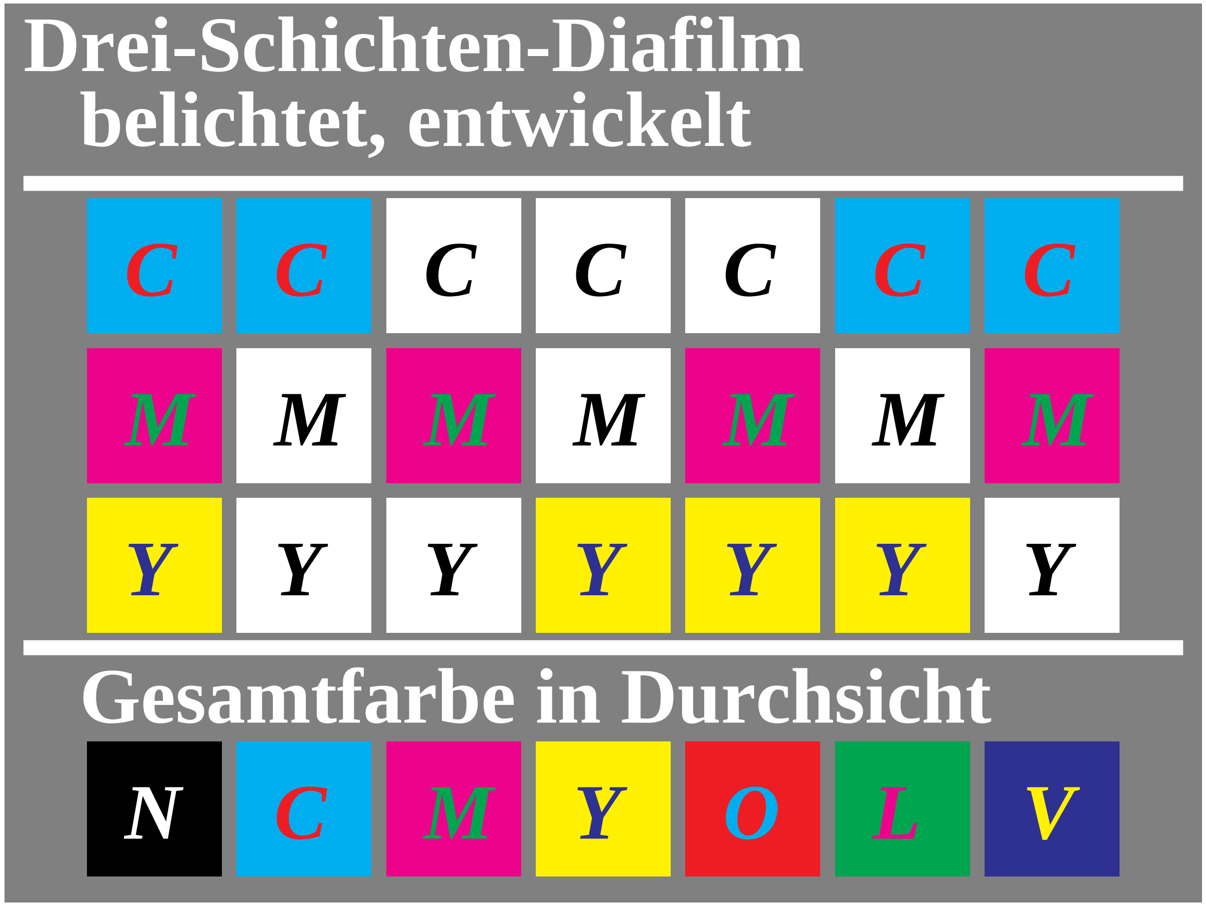

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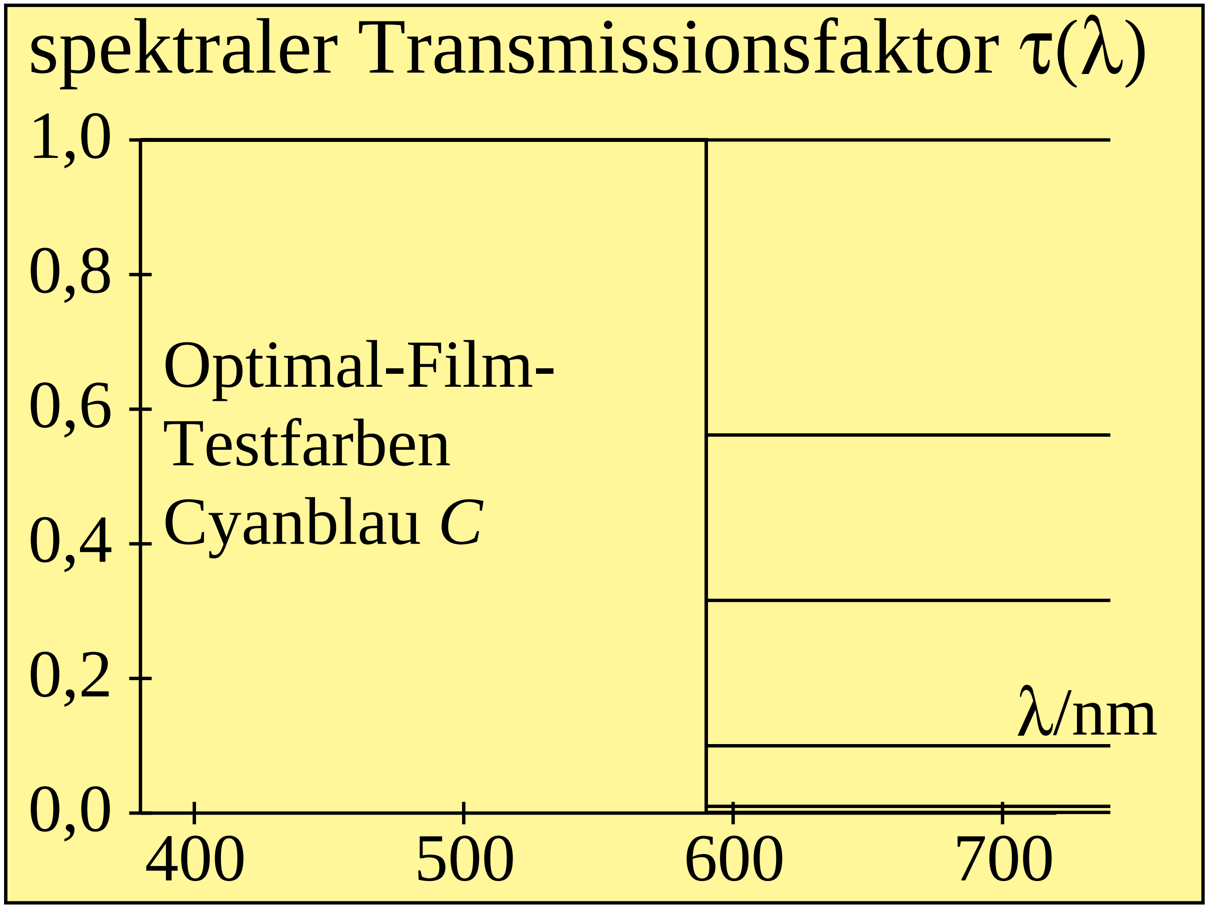

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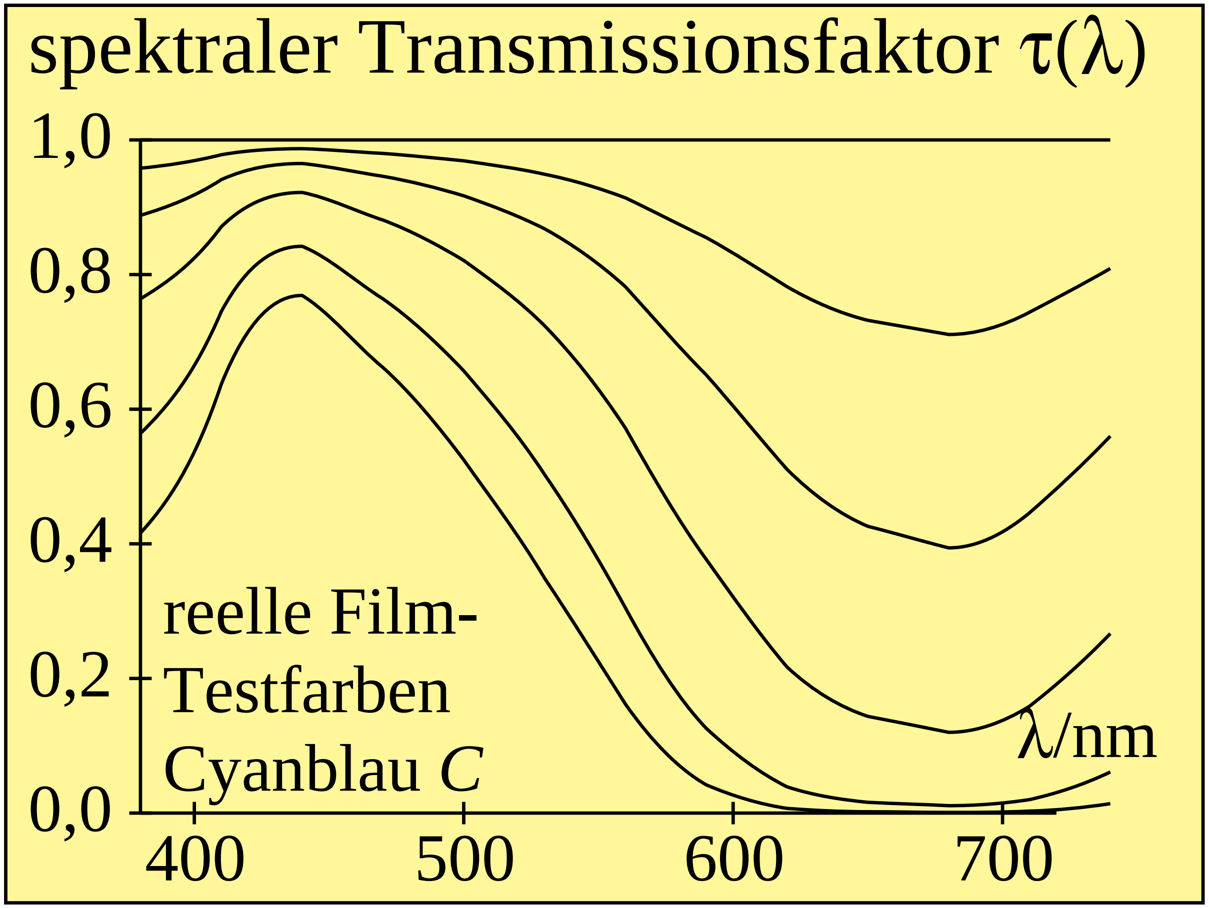

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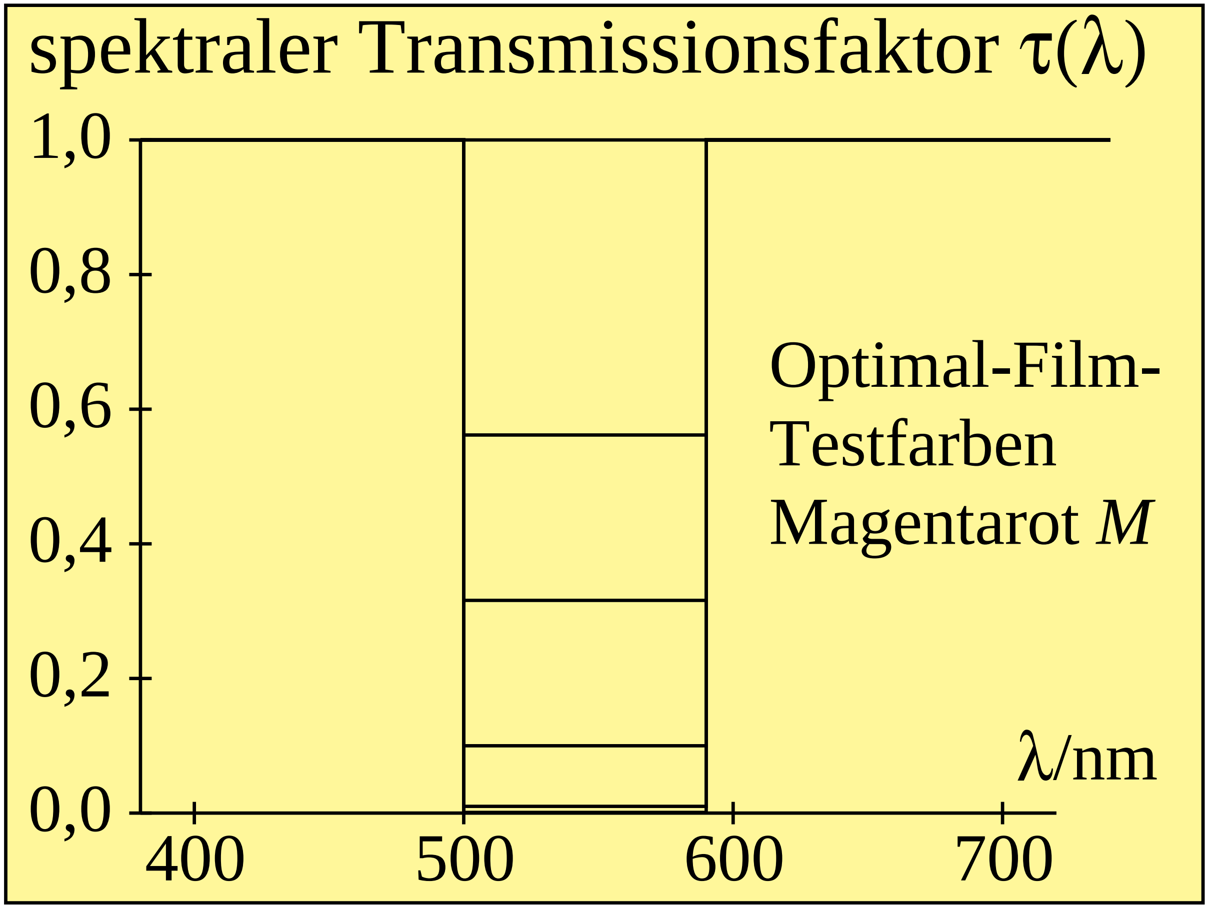

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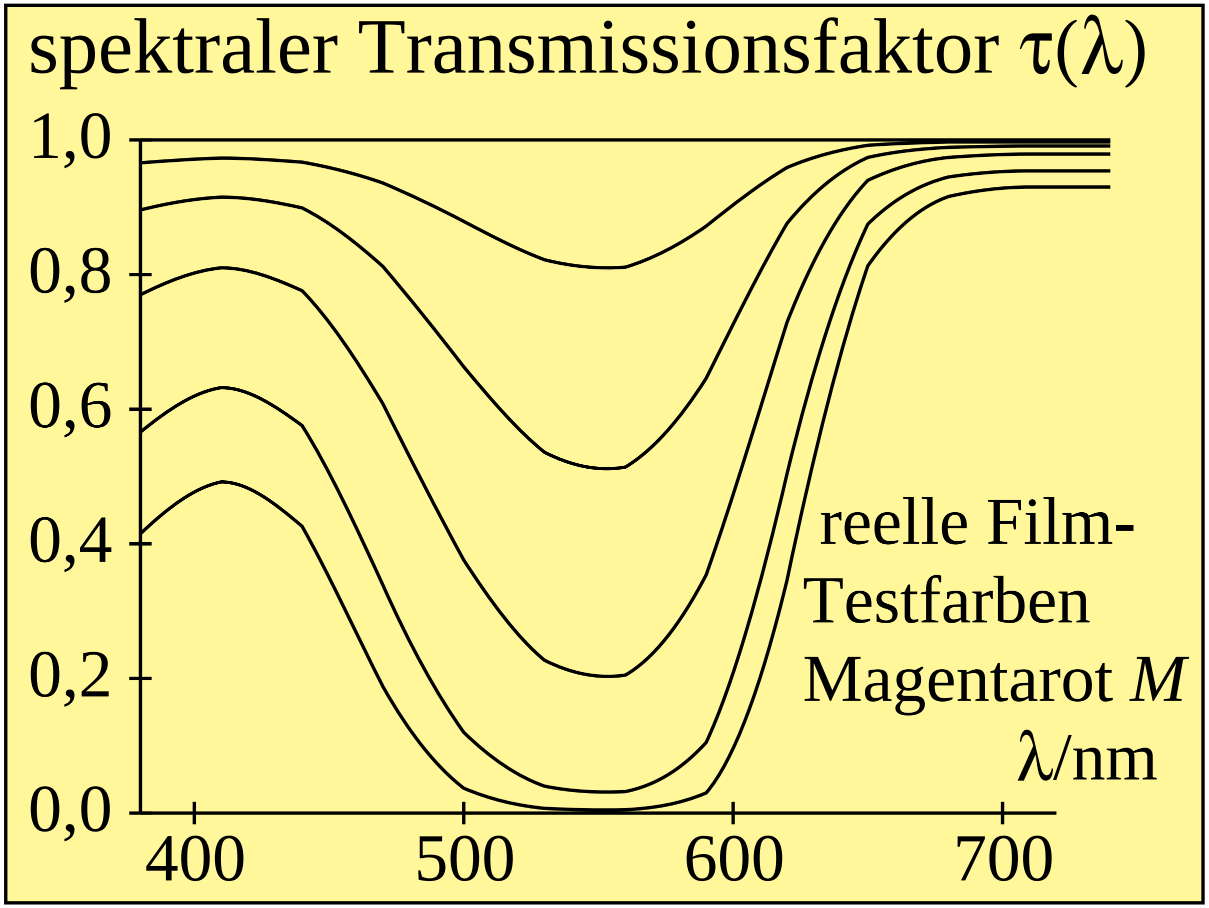

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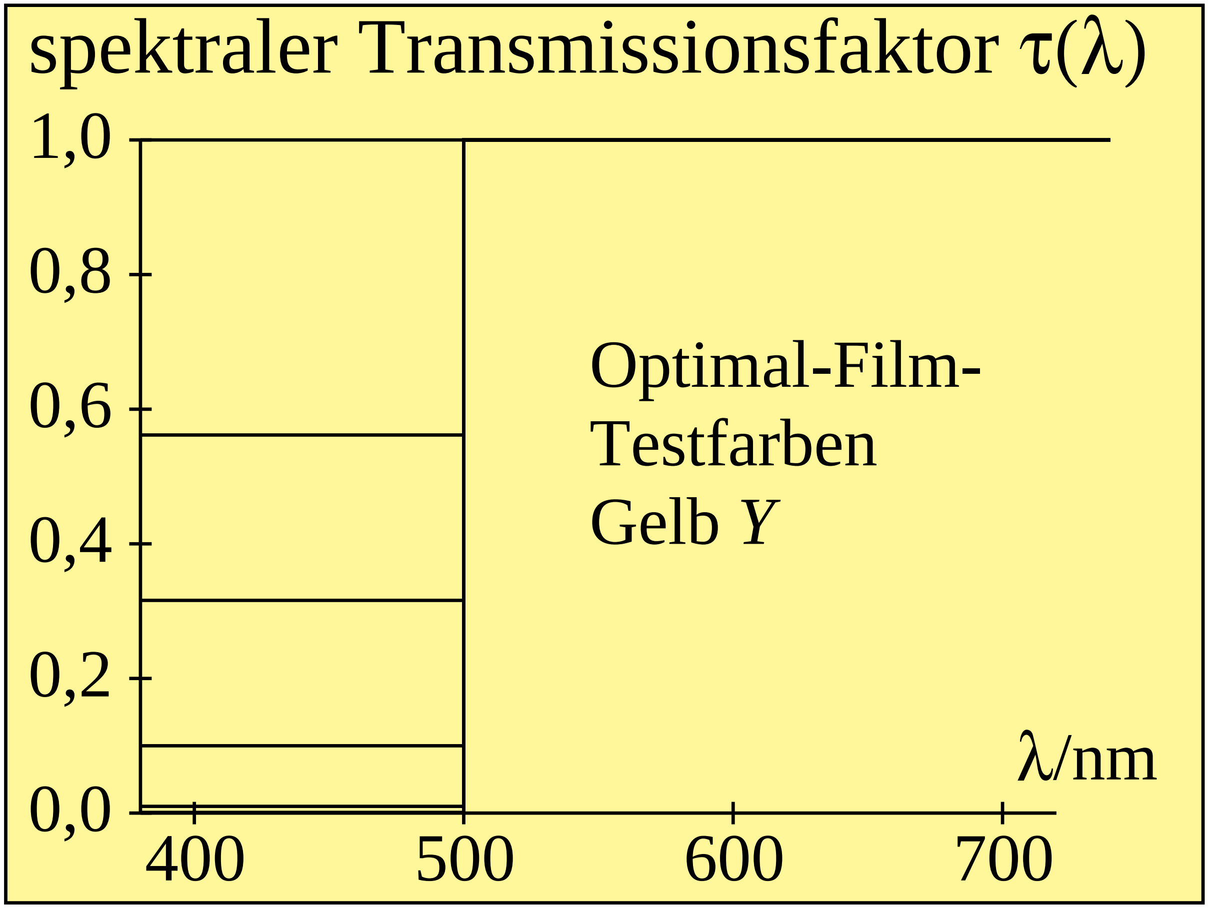

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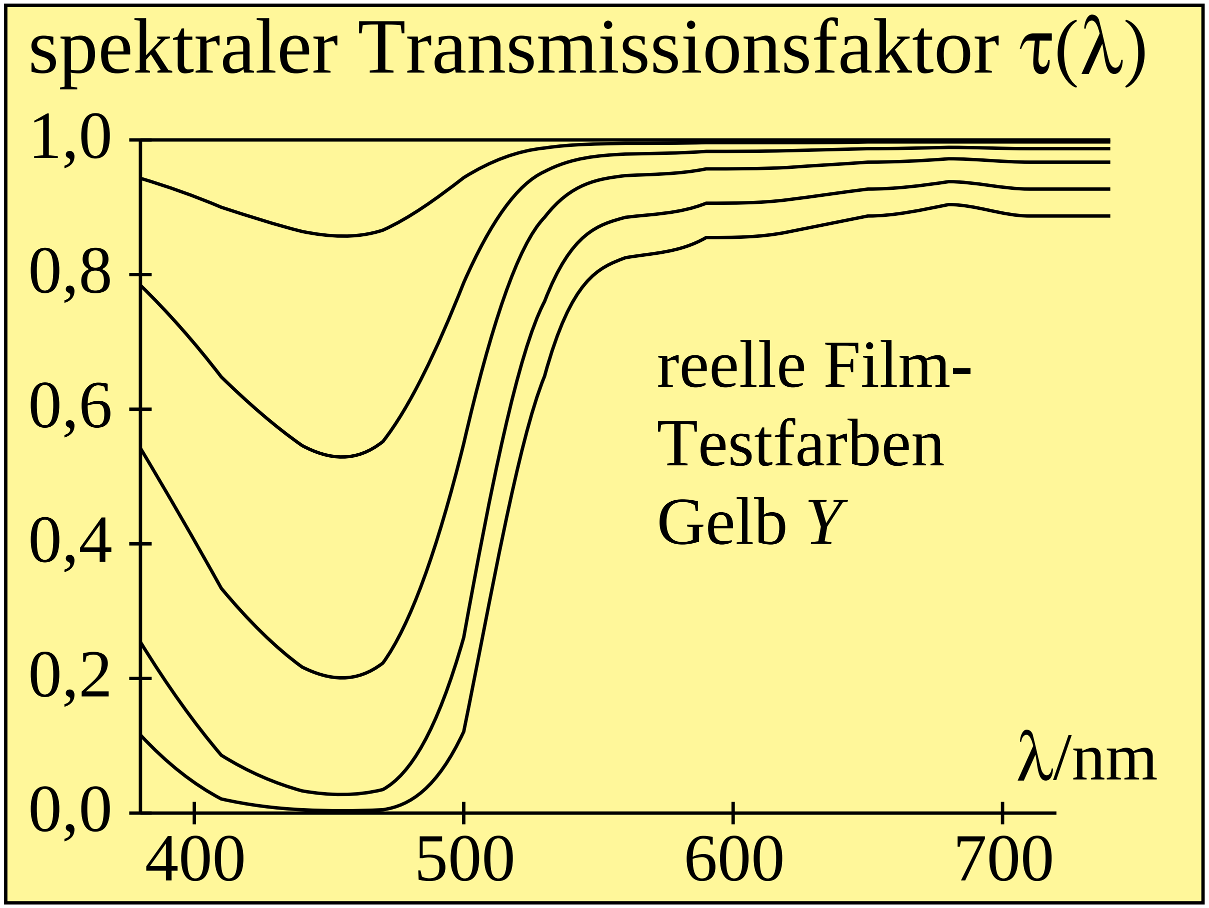

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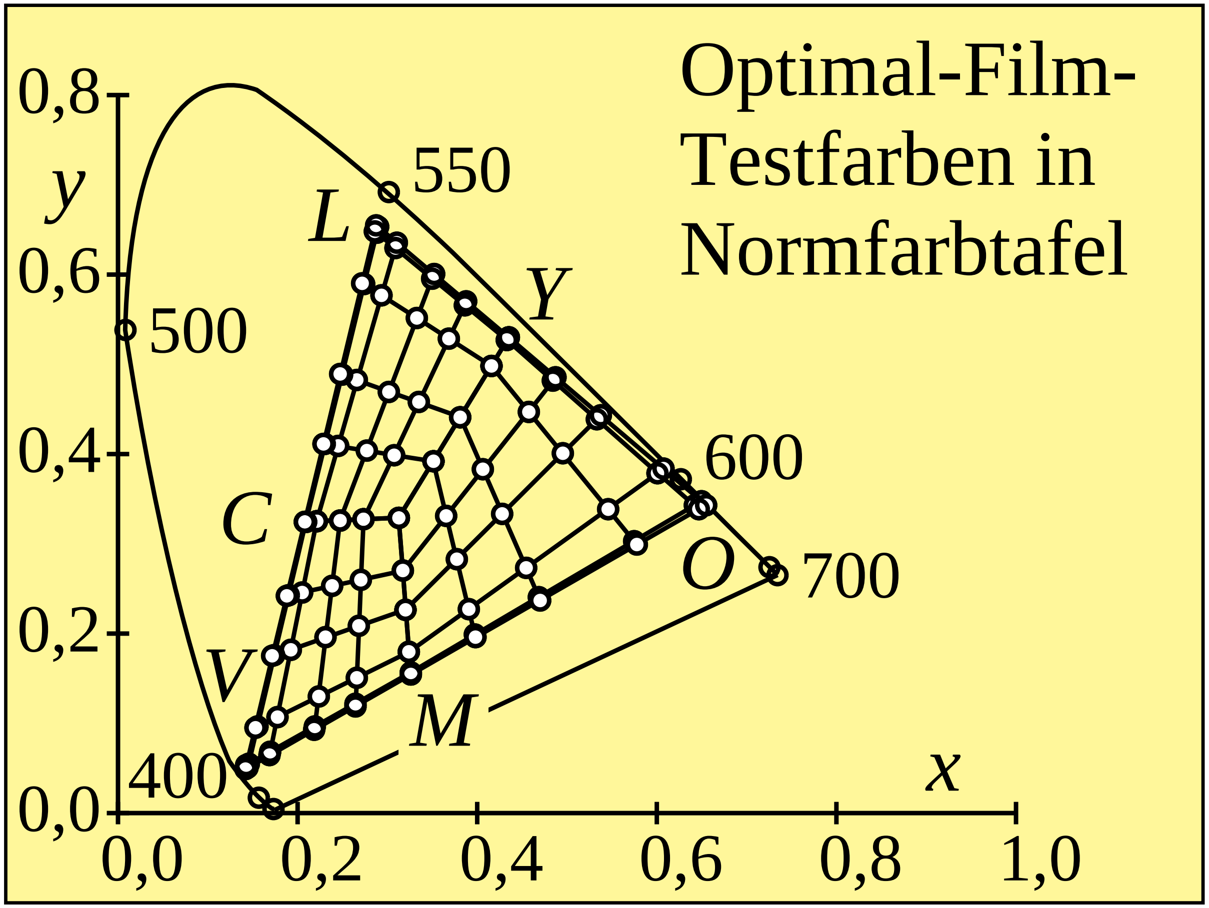

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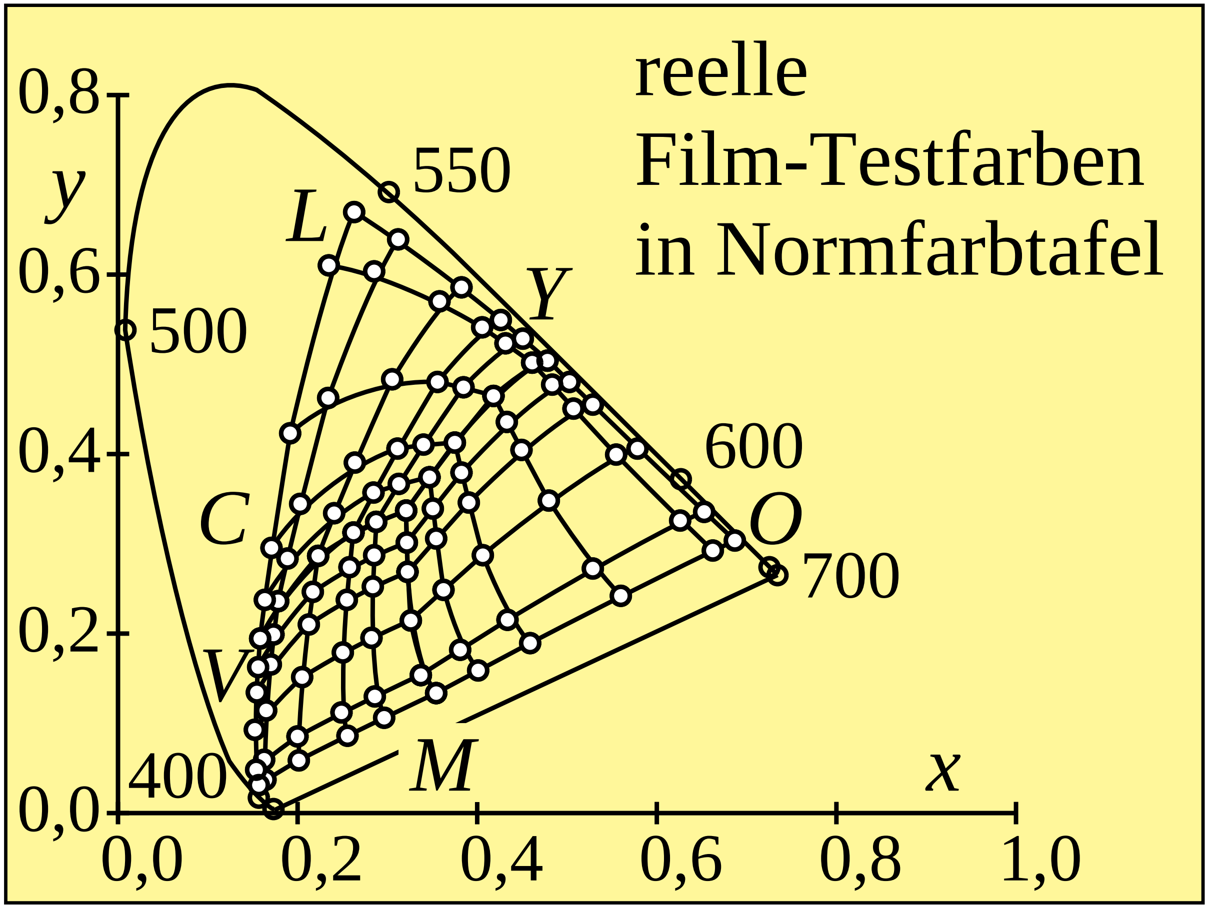

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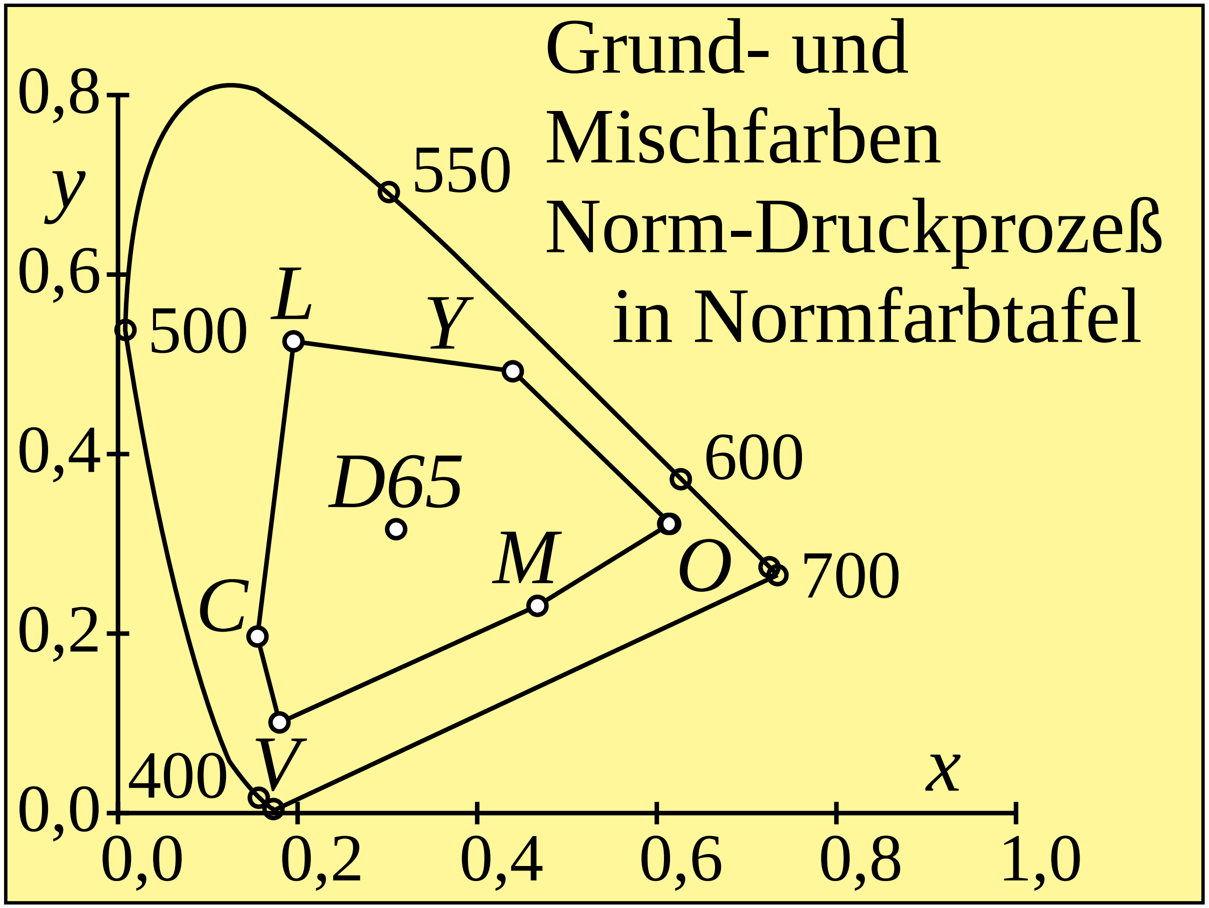

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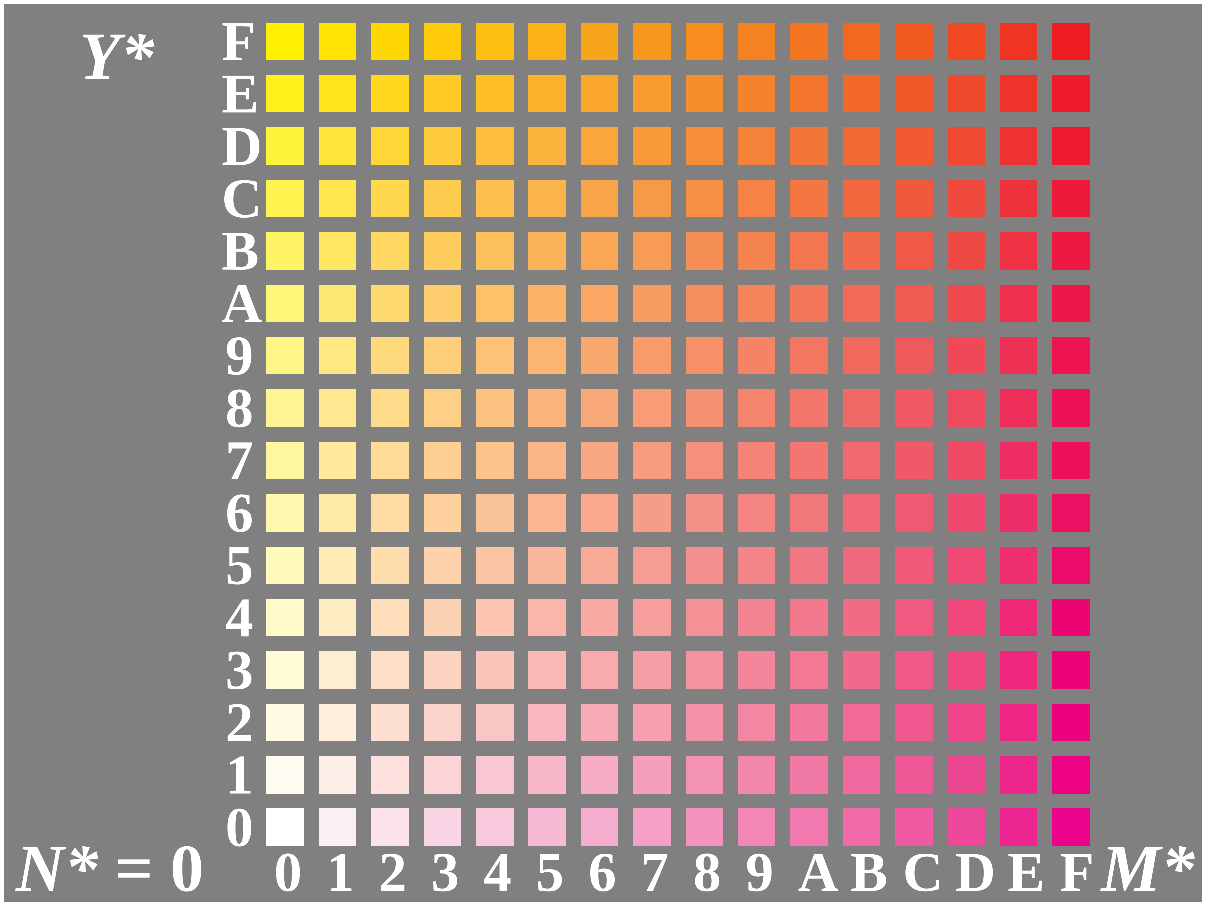

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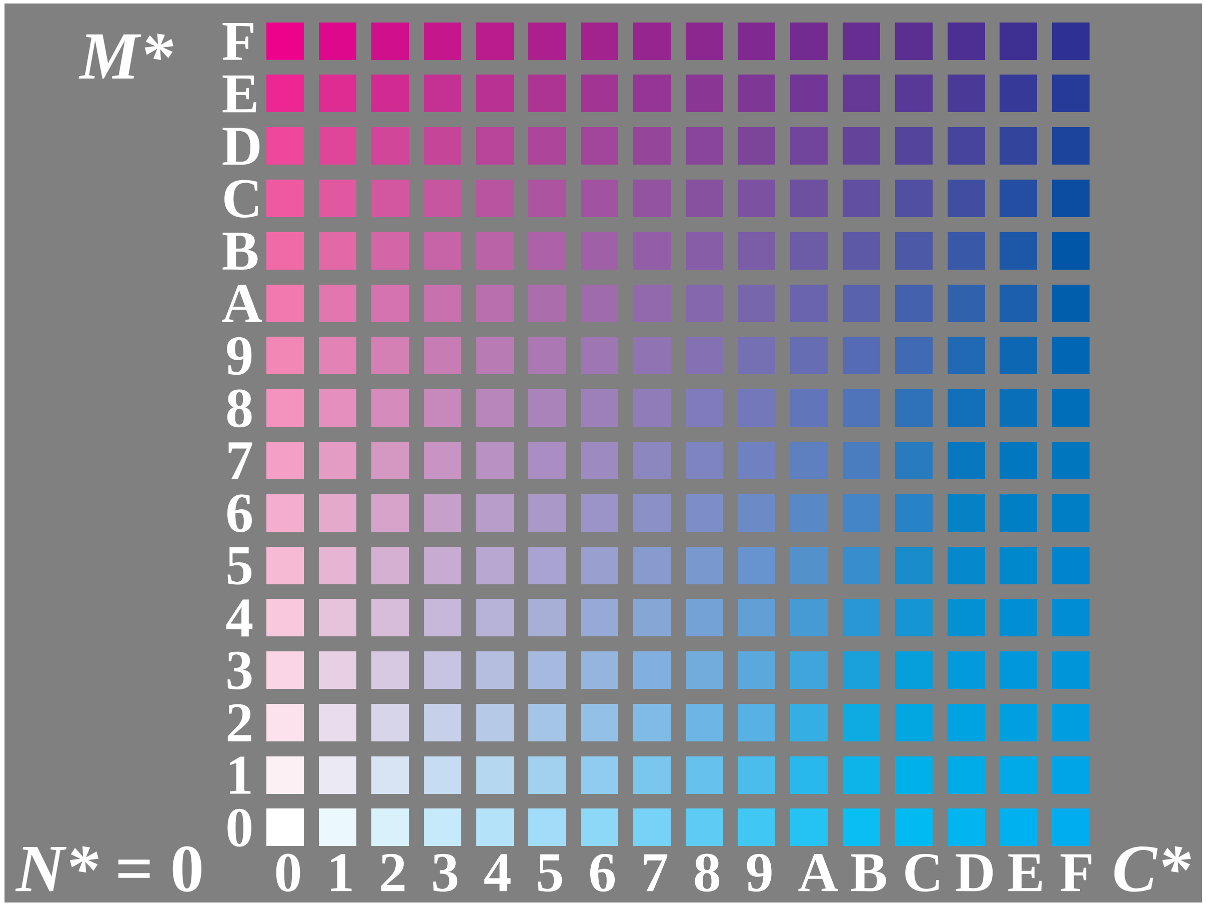

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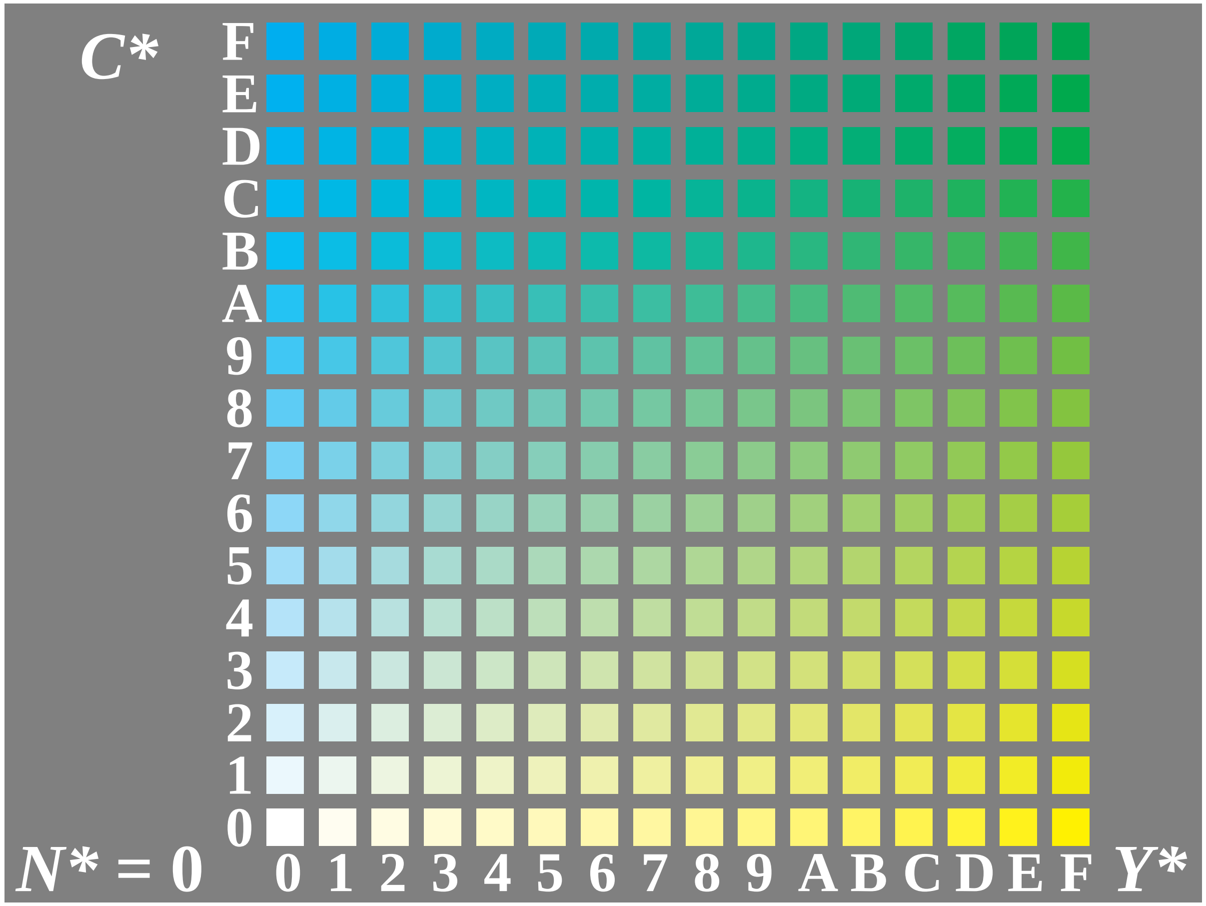

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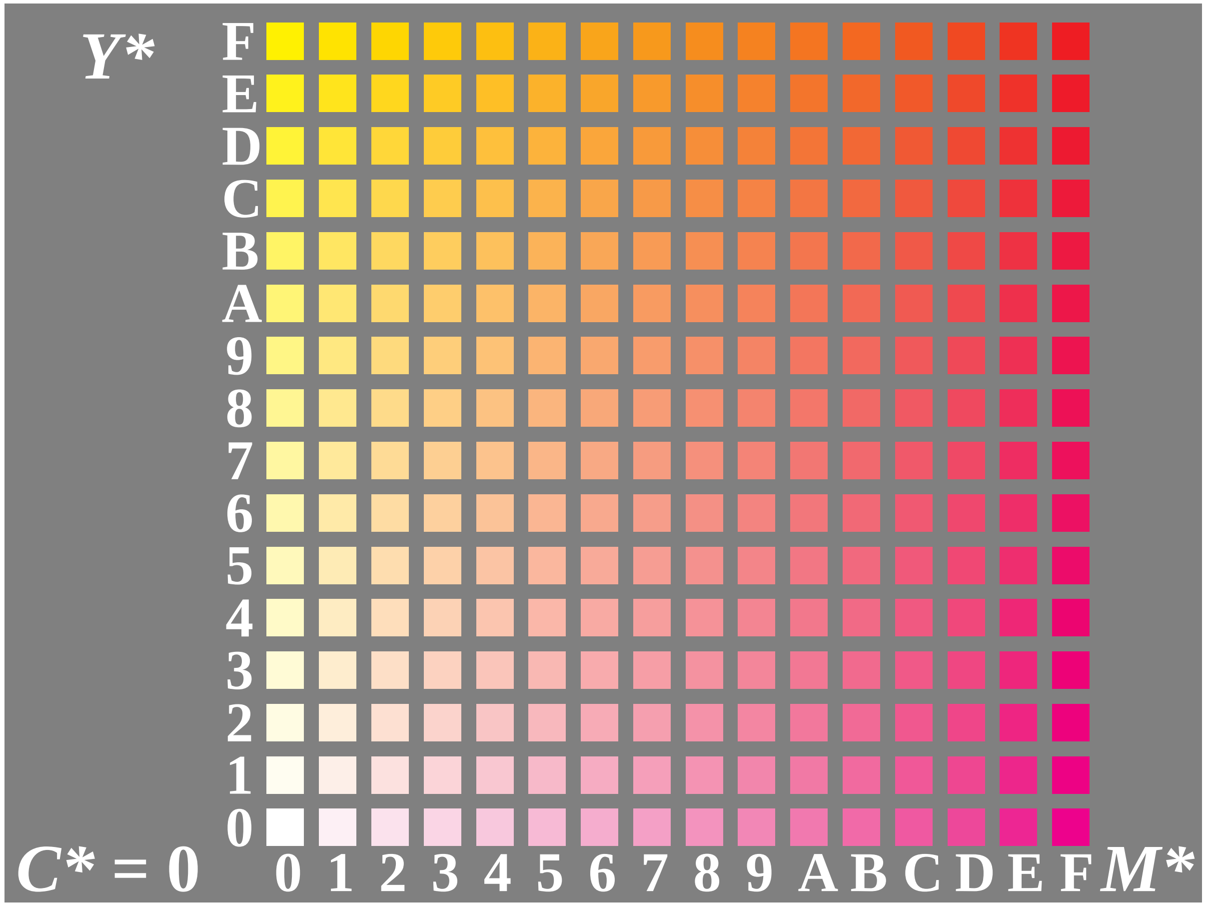

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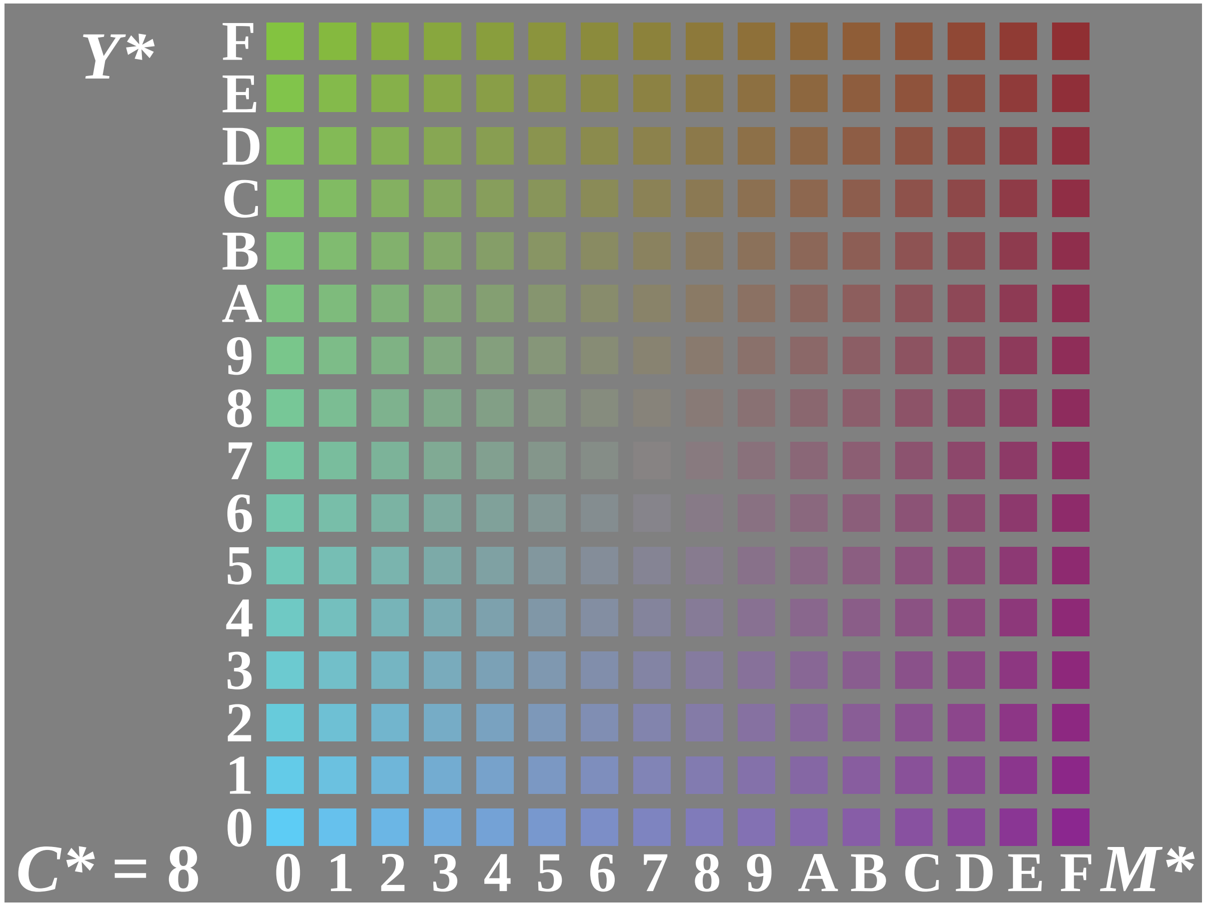

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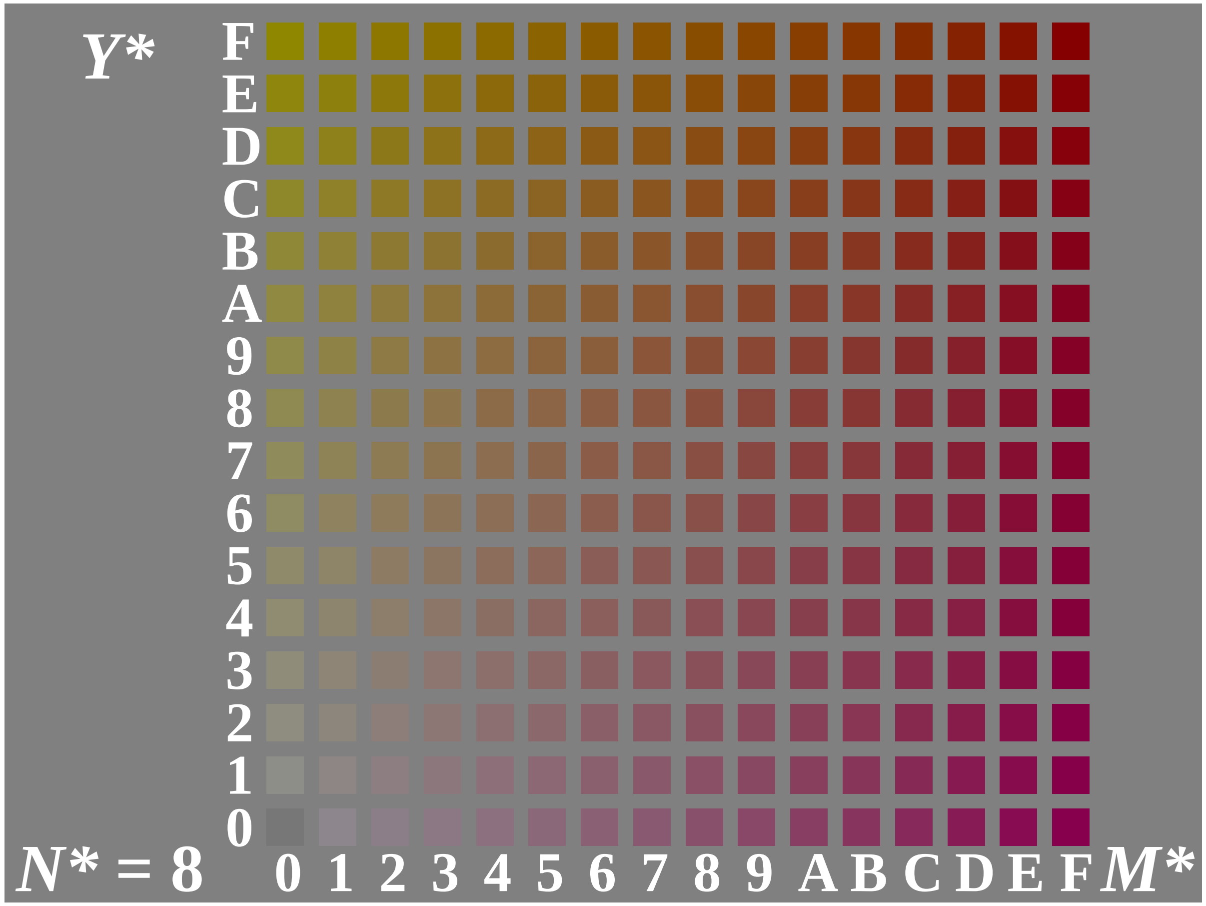

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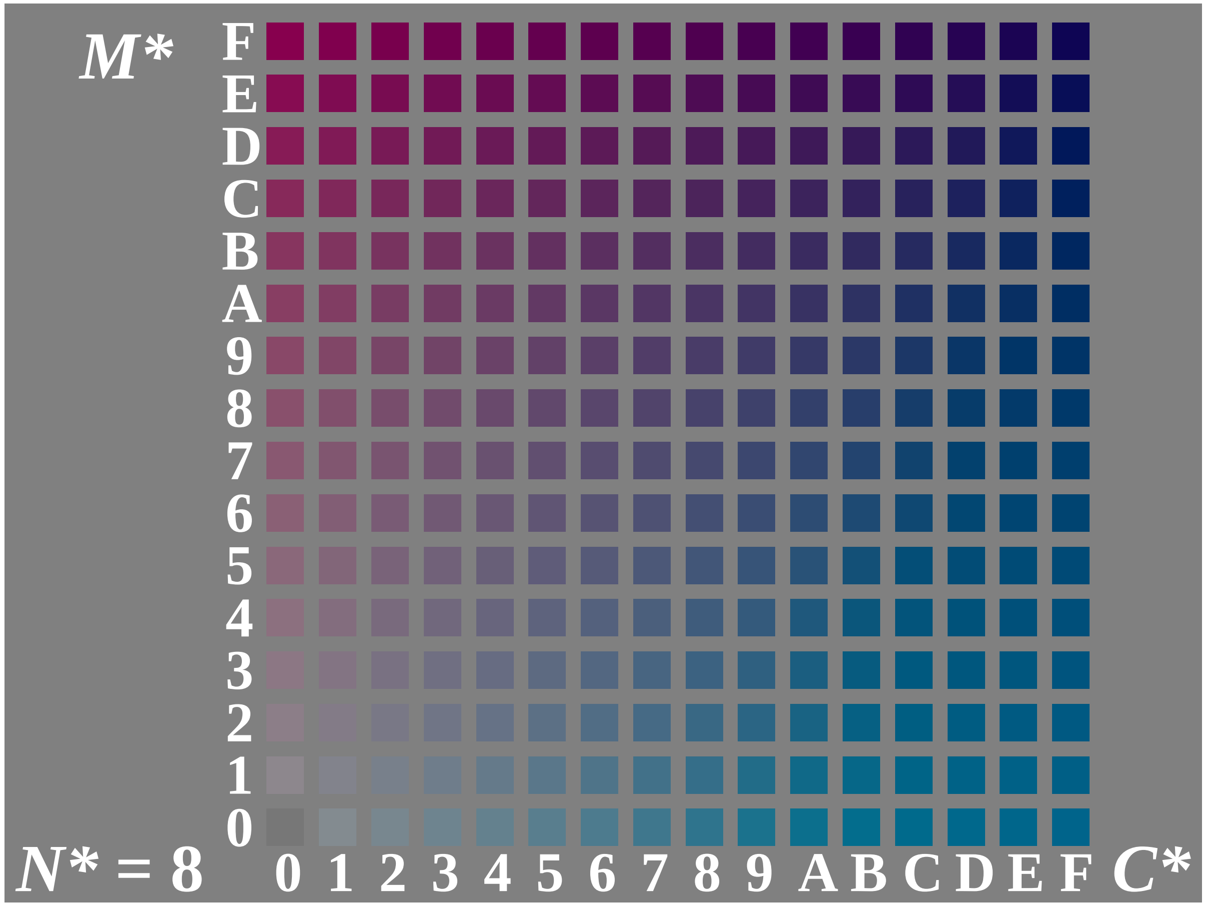

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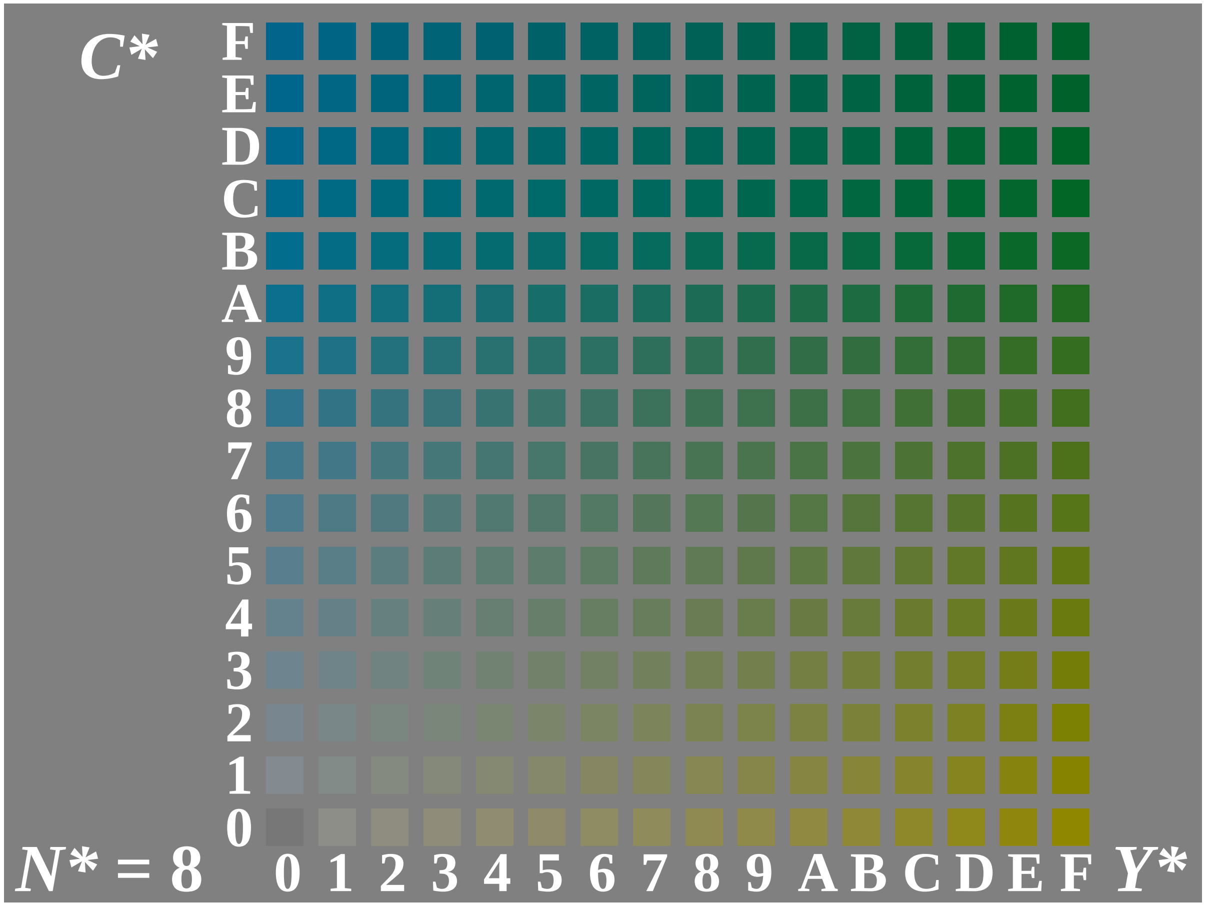


G8435_1f.eps, G0331_3f.eps, G5_22_3f.eps, Bild 5_22_3

Farbheit	Farbnummer			Hellbezugswert
O L* V**	*n*	*h**	*d*	*Y* (Y_W = 81 Druck)
15,15,15	7	FFF*	4095	81·(81/81)
13,13,13	−	DDD*	3549	81·(64/81)
11,11,11	−	BBB*	3003	81·(49/81)
9, 9, 9	−	999*	2457	81·(36/81)
7, 7, 7	8	777*	1911	81·(25/81)
5, 5, 5	−	555*	1365	81·(16/81)
3, 3, 3	−	333*	819	81·(9/81)
1, 1, 1	−	111*	273	81·(4/81)
0, 0, 0	0	000*	0	81·(2/81)

G8590_1f.eps, G0331_4f.eps, G5_23_1f.eps, Bild 5_23_1

Farbheit	**Farbnummer**			**Hellbezugswert**
O* L* V*	***n***	***h****	***d***	**Y (Y_L = 16 Druck)**
0,15, 0	**2**	**0F0***	**240**	**16·(81/81)**
0,13, 0	**−**	**0D0***	**208**	**16·(64/81)**
0,11, 0	**−**	**0B0***	**176**	**16·(49/81)**
0, 9, 0	**−**	**090***	**144**	**16·(36/81)**
0, 7, 0	**10**	**070***	**112**	**16·(25/81)**
0, 5, 0	**−**	**050***	**80**	**16·(16/81)**
0, 3, 0	**−**	**030***	**48**	**16·(9/81)**
0, 1, 0	**−**	**010***	**16**	**16·(4/81)**
0, 0, 0	**0**	**000***	**0**	**81·(2/81)**

G8590_8f.eps, G0331_5f.eps, G5_23_2f.eps, Bild 5_23_2

Farbheit	**Farbnummer**			**Hellbezugswert**
O* L* V*	***n***	***h****	***d***	***Y*** **(Y_Y = 76 Druck)**
15,15, 0	3	FF0*	4080	76·(81/81)
13,13, 0	−	DD0*	3536	76·(64/81)
11,11, 0	−	BB0*	2992	76·(49/81)
9, 9, 0	−	990*	2448	76·(36/81)
7, 7, 0	11	770*	1904	76·(25/81)
5, 5, 0	−	550*	1360	76·(16/81)
3, 3, 0	−	330*	816	76·(9/81)
1, 1, 0	−	110*	272	76·(4/81)
0, 0, 0	0	000*	0	81·(2/81)

G8590_5f.eps, G0331_6f.eps, G5_24_1f.eps, Bild 5_24_1

Farbheit	Farbnummer			Hellbezugswert
O L* V**	*n*	*h**	*d*	*Y* (Y_M = 17 Druck)
15, 0,15	5	F0F*	3855	17·(81/81)
13, 0,13	−	D0D*	3341	17·(64/81)
11, 0,11	−	B0B*	2827	17·(49/81)
9, 0, 9	−	909*	2313	17·(36/81)
7, 0, 7	13	707*	1799	17·(25/81)
5, 0, 5	−	505*	1285	17·(16/81)
3, 0, 3	−	303*	771	17·(9/81)
1, 0, 1	−	101*	257	17·(4/81)
0, 0, 0	0	000*	0	81·(2/81)

G8590_6f.eps, G0331_7f.eps, G5_24_2f.eps, Bild 5_24_2

Farbheit	Farbnummer			Hellbezugswert
O L* V**	*n*	*h**	*d*	Y (Y_C = 21 Druck)
0,15,15	6	0FF*	255	21·(81/81)
0,13,13	−	0DD*	221	21·(64/81)
0,11,11	−	0BB*	187	21·(49/81)
0, 9, 9	−	099*	153	21·(36/81)
0, 7, 7	14	077*	119	21·(25/81)
0, 5, 5	−	055*	85	21·(16/81)
0, 3, 3	−	033*	51	21·(9/81)
0, 1, 1	−	011*	17	21·(4/81)
0, 0, 0	0	000*	0	81·(2/81)

G8590_7f.eps, G0331_8f.eps, G5_24_3f.eps, Bild 5_24_3

Farbheit *O* L* V**	Farbnummer *n*	*h**	*d*	Hellbezugswert *Y* (Y_Y = 76 Druck)
15,15,15	7	FFF*	4095	76+5·(81/81)
15,15,13	−	FFD*	4093	76+5·(64/81)
15,15,11	−	FFB*	4091	76+5·(49/81)
15,15, 9	−	FF9*	4089	76+5·(36/81)
15,15, 7	−	FF7*	4087	76+5·(25/81)
15,15, 5	−	FF5*	4085	76+5·(16/81)
15,15, 3	−	FF3*	4083	76+5·(9/81)
15,15, 1	−	FF1*	4081	76+5·(4/81)
15,15, 0	3	FF0*	4080	76+5·(0/81)

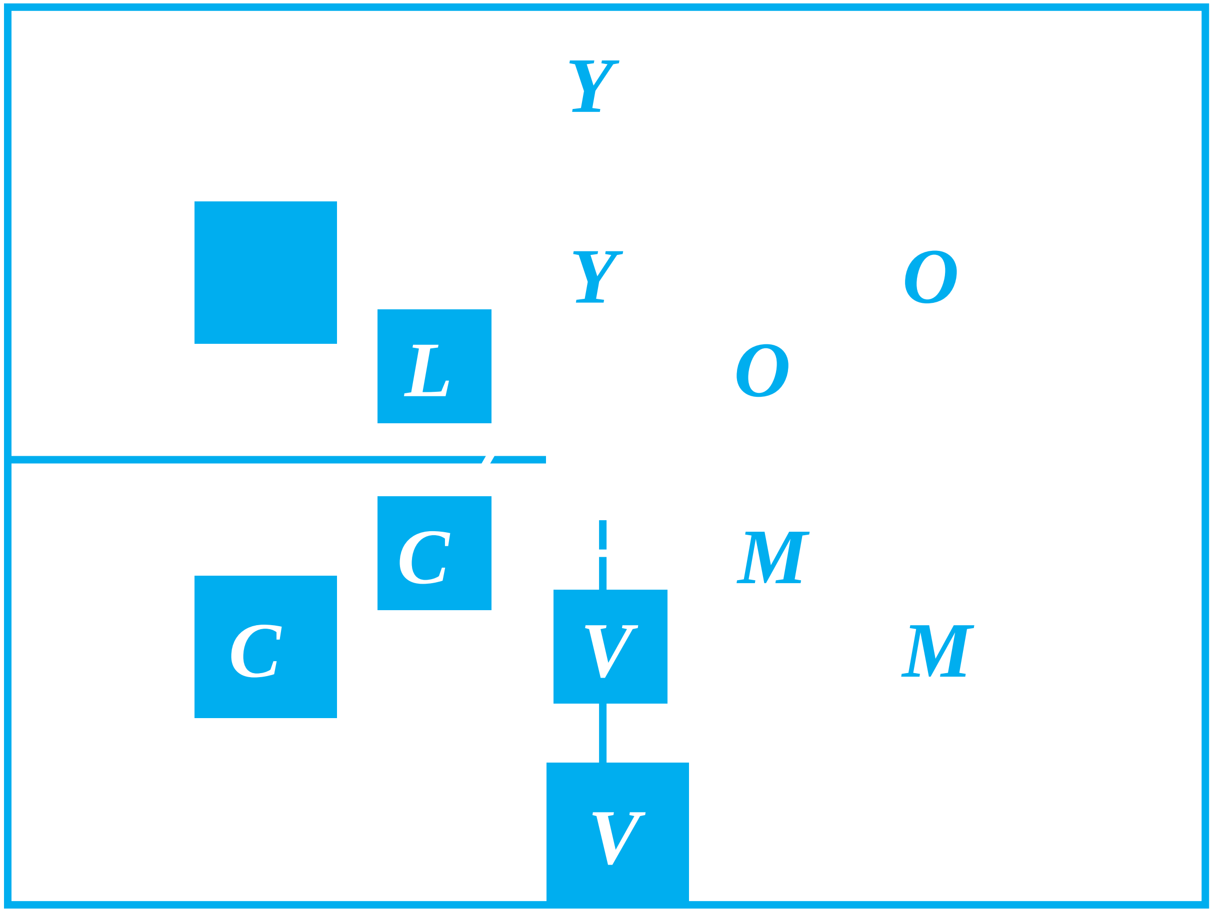
G8590_2f.eps, G0340_1f.eps, G5_25_1f.eps, Bild 5_25_1

Farbheit	Farbnummer			Hellbezugswert
O L* V**	*n*	*h**	*d*	*Y* (Y_M = 17 Druck)
15,15,15	7	FFF*	4095	17+64·(81/81)
15,13,15	−	FDF*	4063	17+64·(64/81)
15,11,15	−	FBF*	4031	17+64·(49/81)
15, 9,15	−	F9F*	3999	17+64·(36/81)
15, 7,15	−	F7F*	3967	17+64·(25/81)
15, 5,15	−	F5F*	3935	17+64·(16/81)
15, 3,15	−	F3F*	3903	17+64·(9/81)
15, 1,15	−	F1F*	3871	17+64·(4/81)
15, 0,15	5	F0F*	3855	17+64·(0/81)

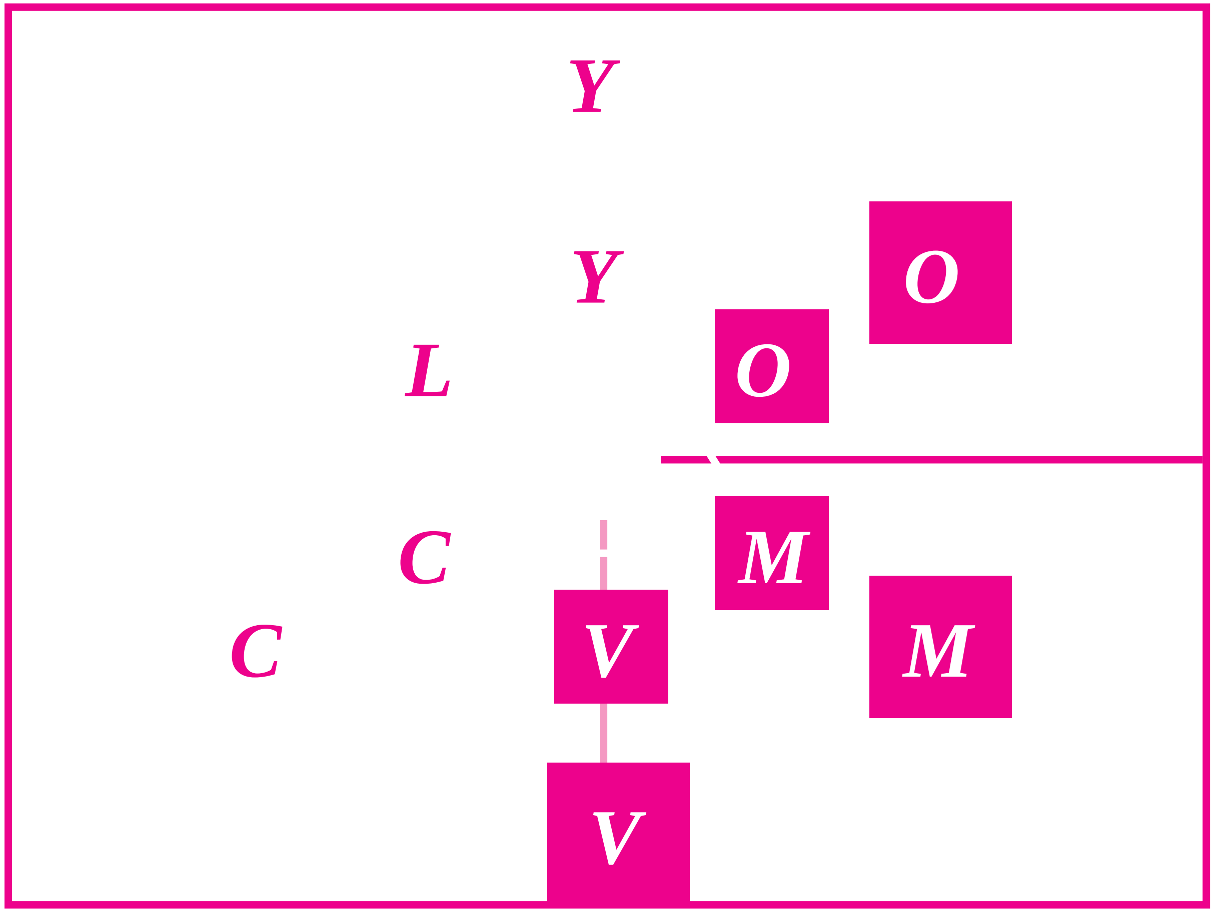
G8590_3f.eps, G0340_2f.eps, G5_25_2f.eps, Bild 5_25_2

Farbheit	Farbnummer			Hellbezugswert
O L* V**	*n*	*h**	*d*	*Y* (Y_C = 21 Druck)
15,15,15	7	FFF*	4095	21+60·(81/81)
13,15,15	−	DFF*	3583	21+60·(64/81)
11,15,15	−	BFF*	3071	21+60·(49/81)
9,15,15	−	9FF*	2559	21+60·(36/81)
7,15,15	−	7FF*	2047	21+60·(25/81)
5,15,15	−	5FF*	1535	21+60·(16/81)
3,15,15	−	3FF*	1023	21+60·(9/81)
1,15,15	−	1FF*	511	21+60·(4/81)
0,15,15	6	0FF*	255	21+60·(0/81)

G8590_4f.eps, G0340_3f.eps, G5_25_3f.eps, Bild 5_25_3

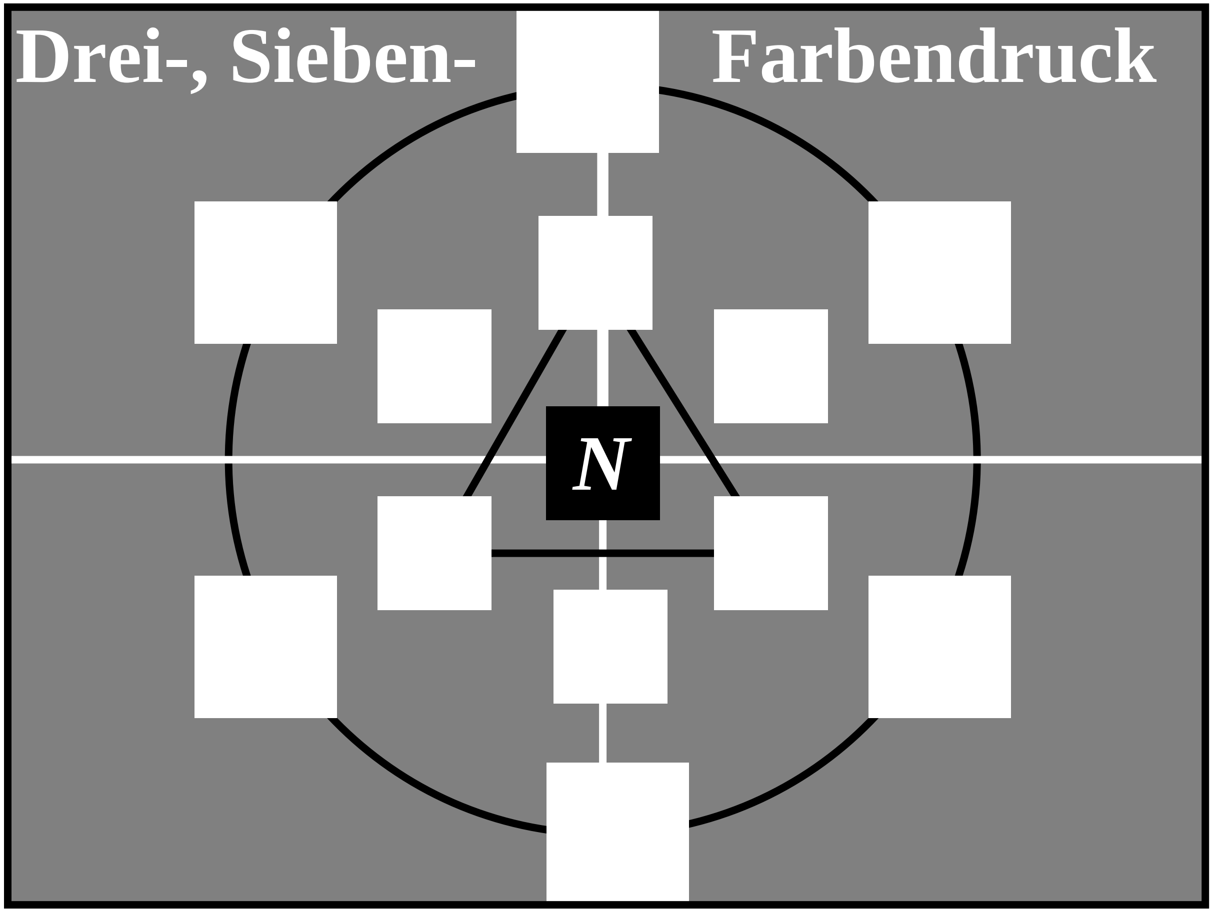


G9491_4f.eps, G0340_4f.eps, G5_26_1f.eps, Bild 5_26_1



G9491_5f.eps, G0340_5f.eps, G5_26_2f.eps, Bild 5_26_2

G9491_6f.eps, G0340_6f.eps, G5_26_3f.eps, Bild 5_26_3



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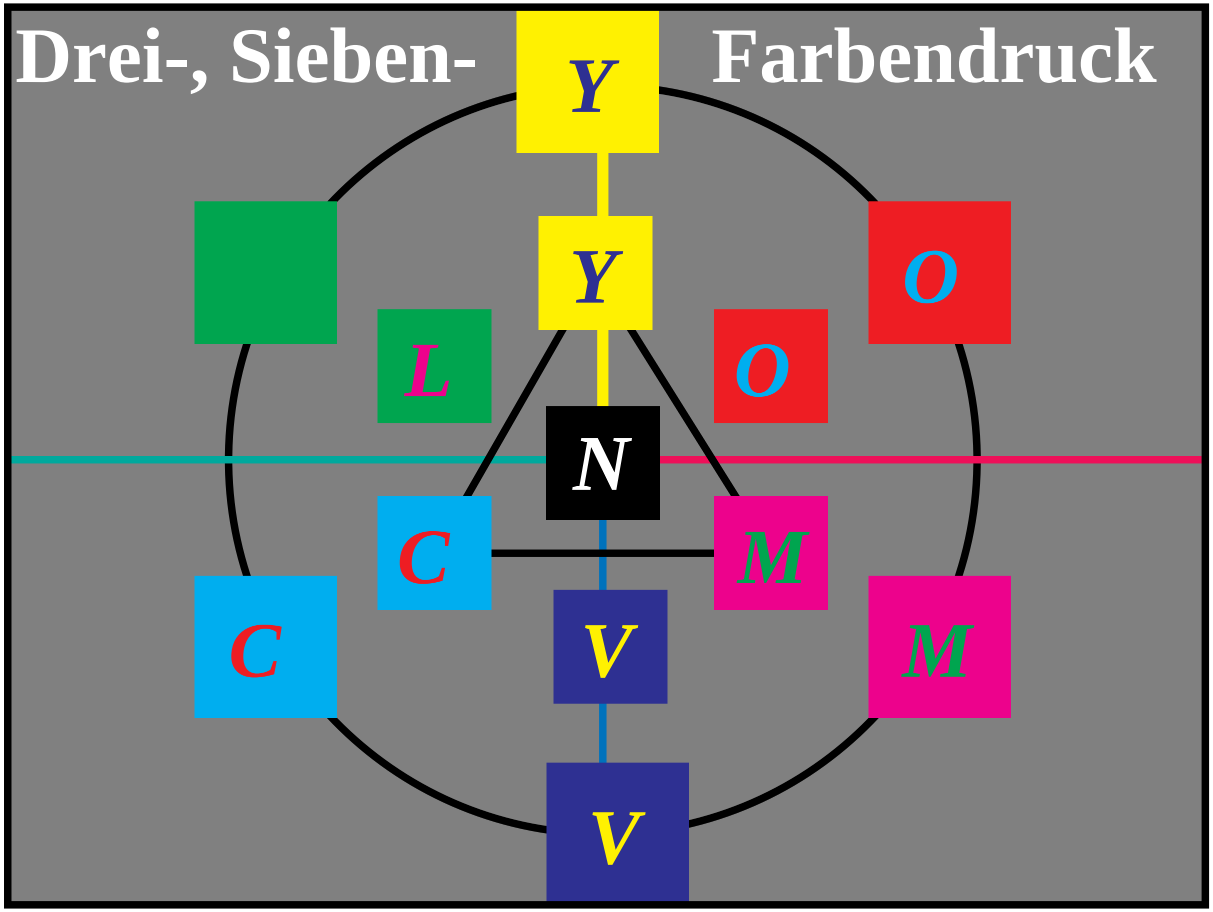

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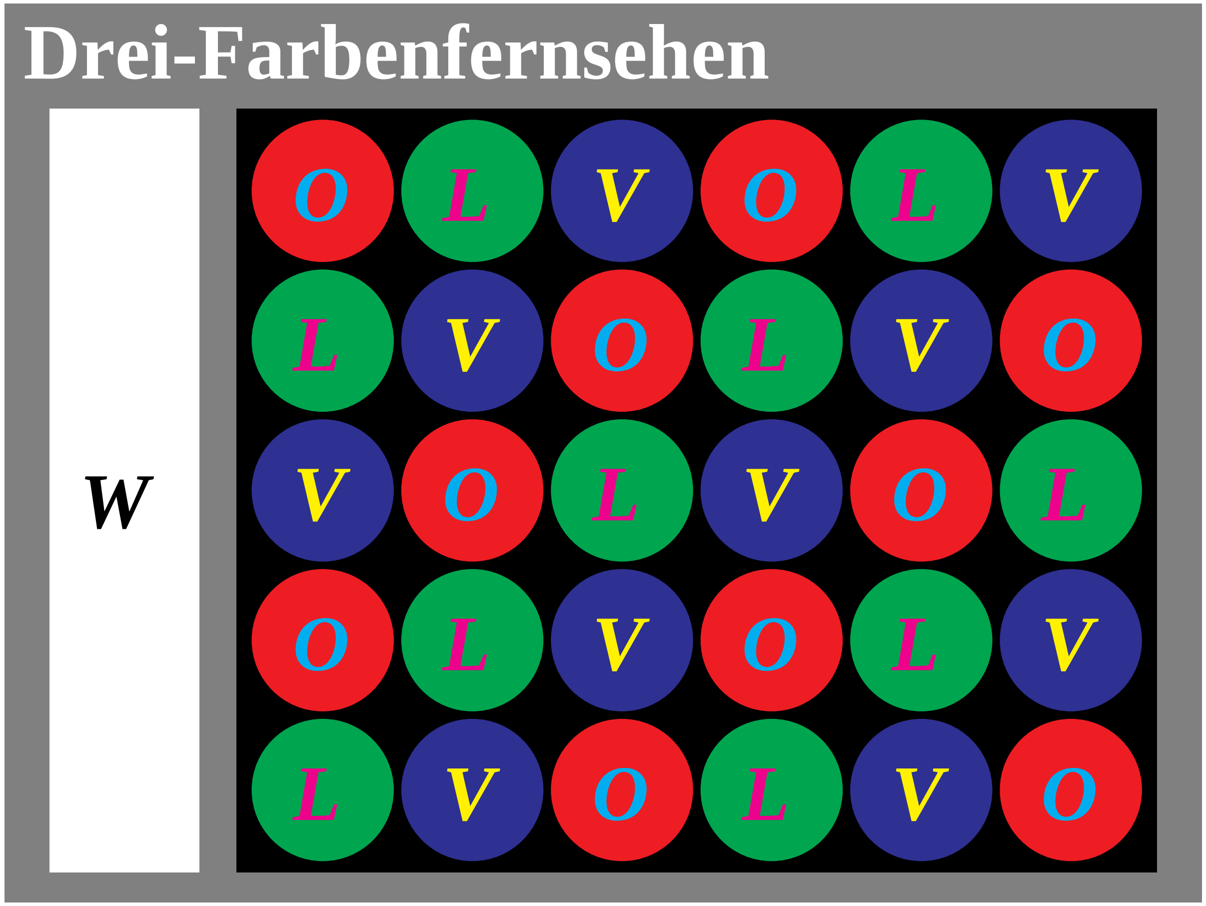

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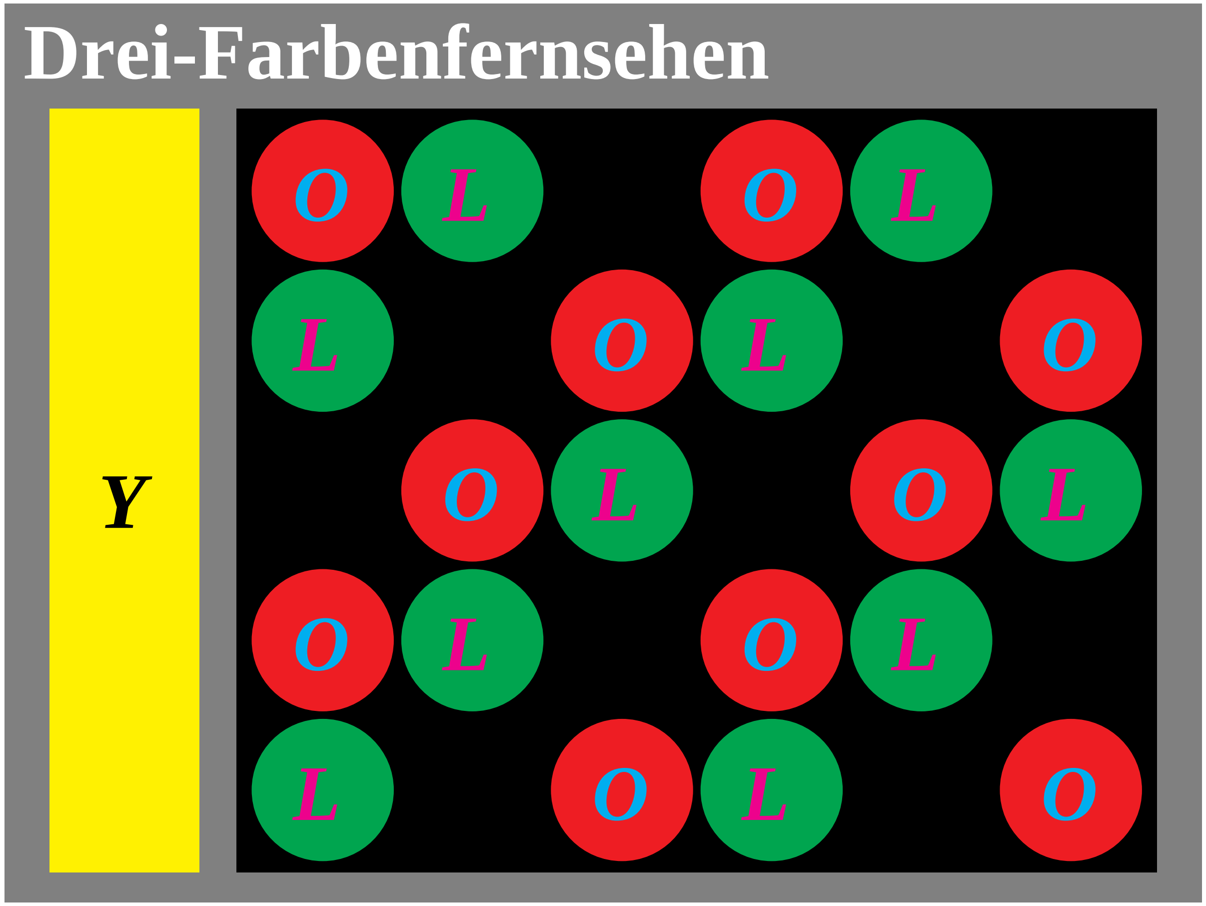
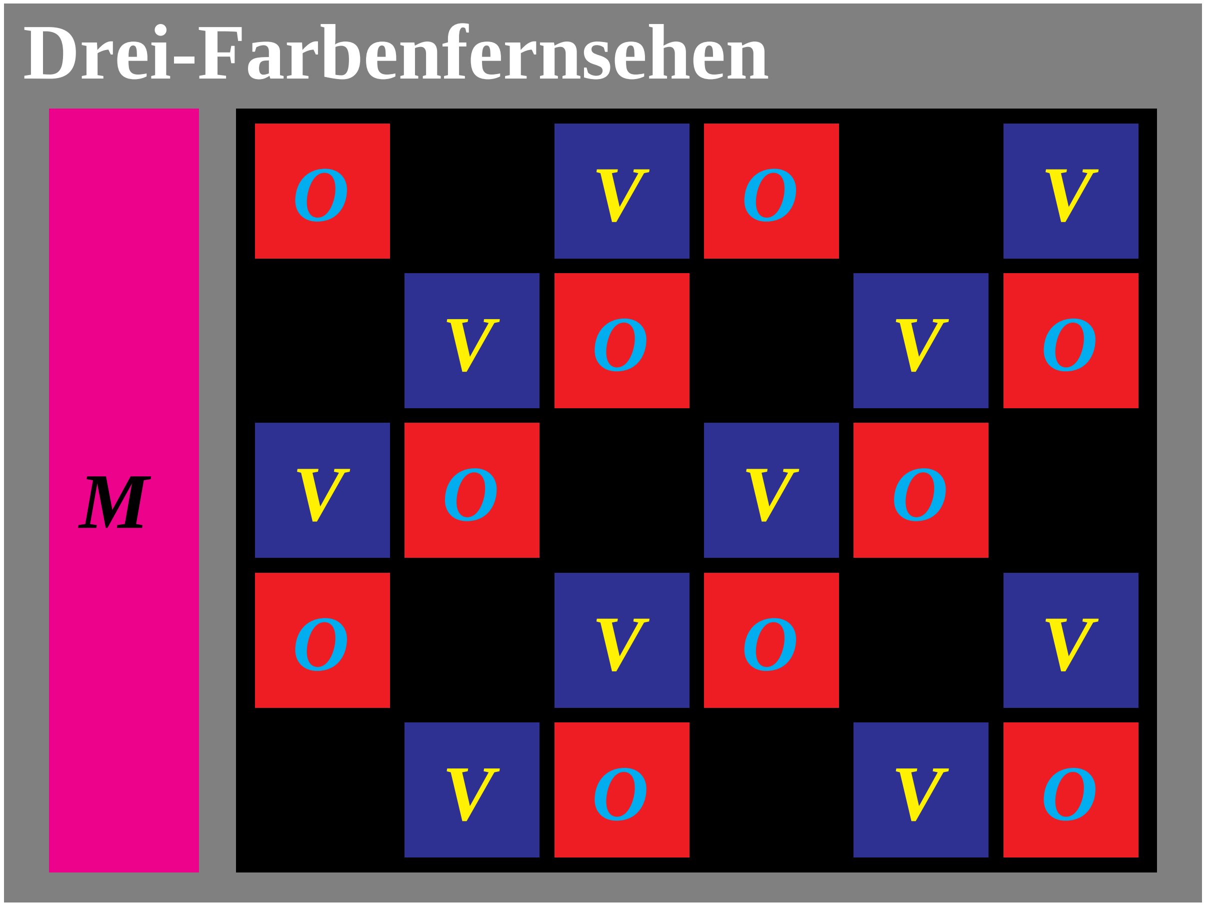
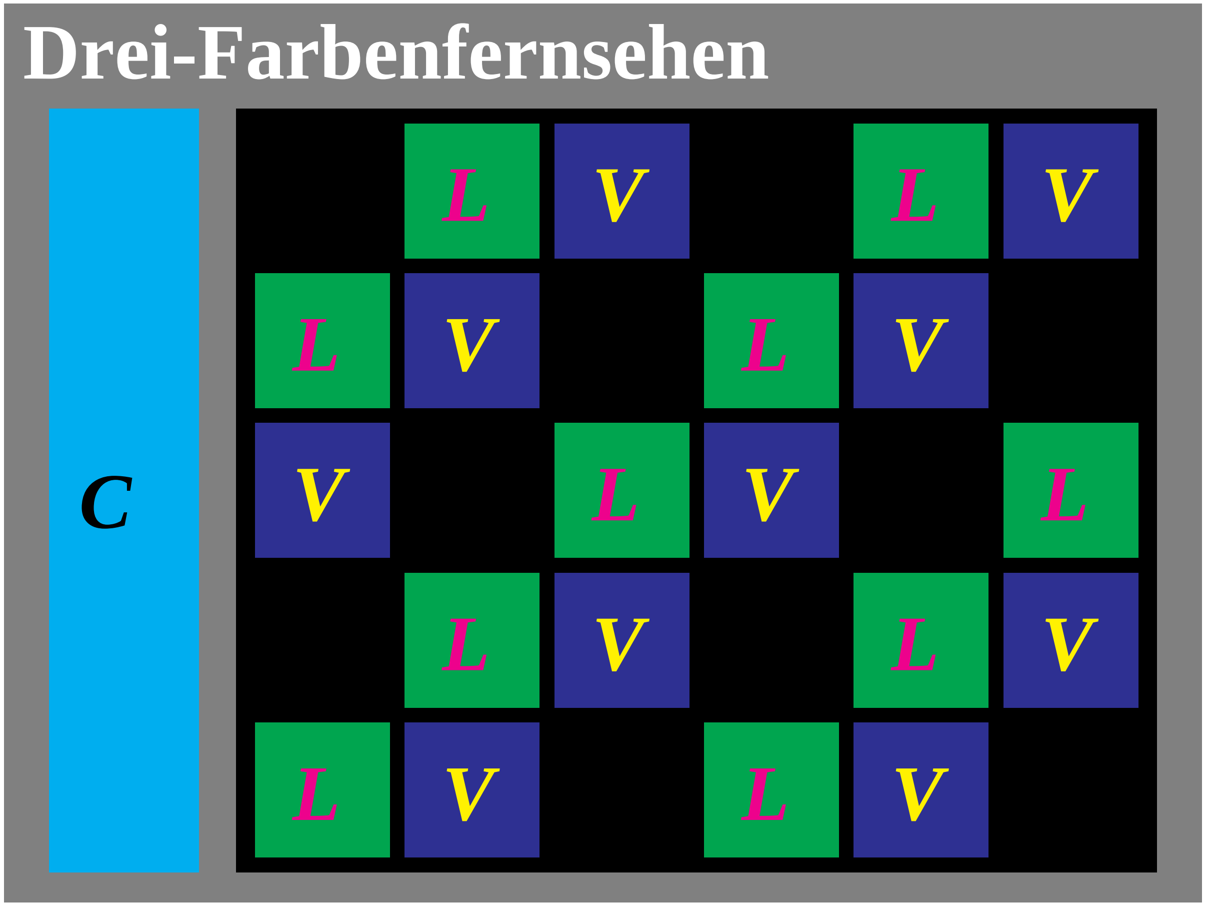


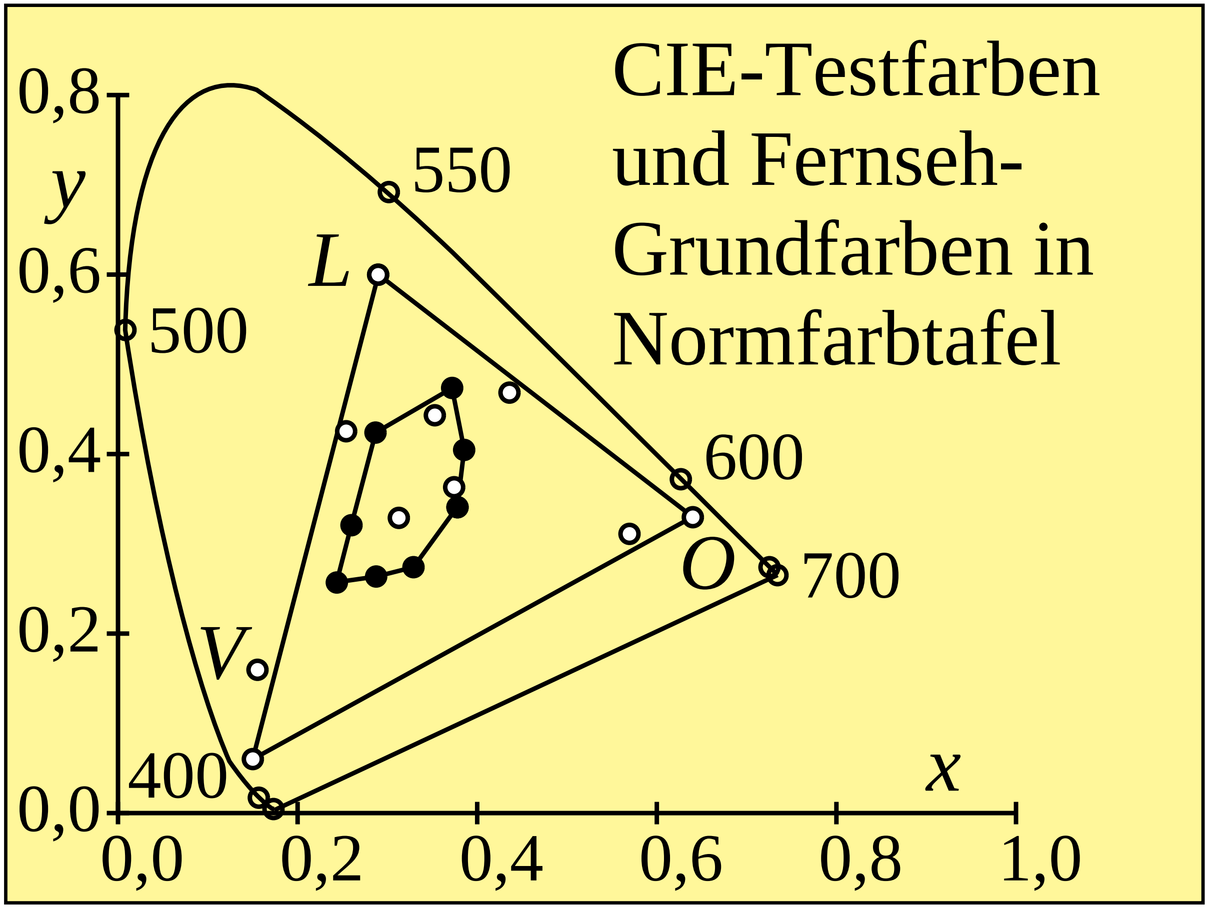
G8671_6f.eps, G0341_2f.eps, G5_27_2f.eps, Bild 5_27_2



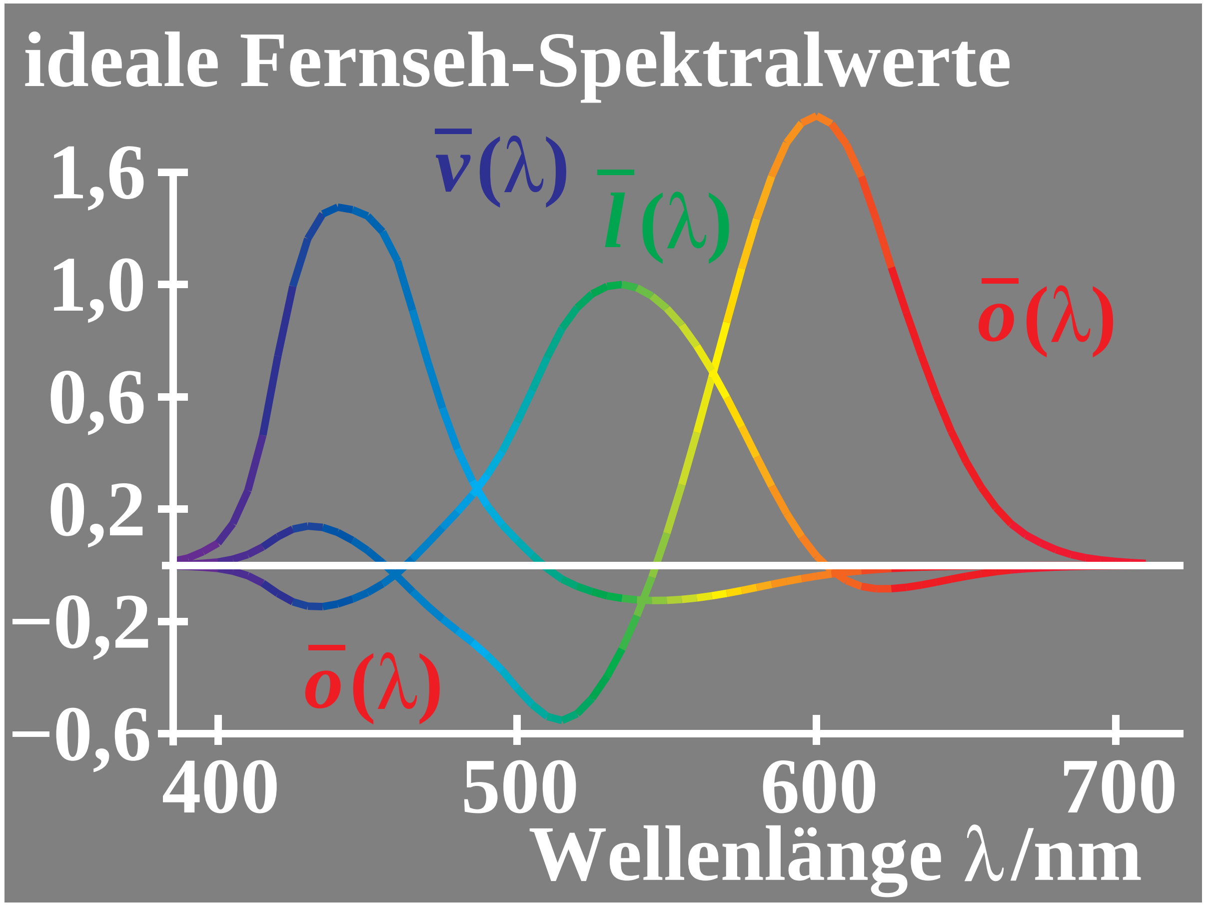
G8671_7f.eps, G0341_3f.eps, G5_27_3f.eps, Bild 5_27_3



G8671_8f.eps, G0341_4f.eps, G5_27_4f.eps, Bild 5_27_4



G8331_3f.eps, G0341_5f.eps, G5_28f.eps, Bild 5_28



G8540_7f.eps, G0341_6f.eps, G5_29f.eps, Bild 5_29

Farbheit	Farbnummer			Digitalbezugswert
O L* V**	*n*	*h**	*d*	*D* (Y_W = 100 Video)
15,15,15	7	FFF*	4095	100·(81/81)·2,55
13,13,13	−	DDD*	3549	100·(64/81)·2,55
11,11,11	−	BBB*	3003	100·(49/81)·2,55
9, 9, 9	−	999*	2457	100·(36/81)·2,55
7, 7, 7	8	777*	1911	100·(25/81)·2,55
5, 5, 5	−	555*	1365	100·(16/81)·2,55
3, 3, 3	−	333*	819	100·(9/81)·2,55
1, 1, 1	−	111*	273	100·(4/81)·2,55
0, 0, 0	0	000*	0	100·(2/81)·2,55

G9091_1f.eps, G0341_7f.eps, G5_30_1f.eps, Bild 5_30_1

Farbheit	Farbnummer			Digitalbezugswert
O L* V**	*n*	*h**	*d*	*D* (Y_L = 71 Video)
0,15, 0	2	0F0*	240	71·(81/81)·2,55
0,13, 0	−	0D0*	208	71·(64/81)·2,55
0,11, 0	−	0B0*	176	71·(49/81)·2,55
0, 9, 0	−	090*	144	71·(36/81)·2,55
0, 7, 0	10	070*	112	71·(25/81)·2,55
0, 5, 0	−	050*	80	71·(71/81)·2,55
0, 3, 0	−	030*	48	71·(9/81)·2,55
0, 1, 0	−	010*	16	71·(4/81)·2,55
0, 0, 0	0	000*	0	81·(2/81)·2,55

G9091_8f.eps, G0341_8f.eps, G5_30_2f.eps, Bild 5_30_2

Farbheit	**Farbnummer**			**Digitalbezugswert**
O* L* V*	***n***	***h****	***d***	***D*** **(Y_Y = 93 Video)**
15,15, 0	**3**	**FF0***	**4080**	**93·(81/81)·2,55**
13,13, 0	**−**	**DD0***	**3536**	**93·(64/81)·2,55**
11,11, 0	**−**	**BB0***	**2992**	**93·(49/81)·2,55**
9, 9, 0	**−**	**990***	**2448**	**93·(36/81)·2,55**
7, 7, 0	**11**	**770***	**1904**	**93·(25/81)·2,55**
5, 5, 0	**−**	**550***	**1360**	**93·(16/81)·2,55**
3, 3, 0	**−**	**330***	**816**	**93·(9/81)·2,55**
1, 1, 0	**−**	**110***	**272**	**93·(4/81)·2,55**
0, 0, 0	**0**	**000***	**0**	**81·(2/81)·2,55**

G9091_5f.eps, G0350_1f.eps, G5_31_1f.eps, Bild 5_31_1

Farbheit	**Farbnummer**			**Digitalbezugswert**
O* L* V*	***n***	***h****	***d***	***D*** **(Y_M = 29 Video)**
15, 0,15	5	F0F*	3855	29·(81/81)·2,55
13, 0,13	−	D0D*	3341	29·(64/81)·2,55
11, 0,11	−	B0B*	2827	29·(49/81)·2,55
9, 0, 9	−	909*	2313	29·(36/81)·2,55
7, 0, 7	13	707*	2999	29·(25/81)·2,55
5, 0, 5	−	505*	1285	29·(16/81)·2,55
3, 0, 3	−	303*	771	29·(9/81)·2,55
1, 0, 1	−	101*	257	29·(4/81)·2,55
0, 0, 0	0	000*	0	81·(2/81)·2,55

G9091_6f.eps, G0350_2f.eps, G5_31_2f.eps, Bild 5_31_2

Farbheit	Farbnummer			Digitalbezugswert
$O^*\ L^*\ V^*$	n	h^*	d	D (Y_C = 78 Video)
0,15,15	6	0FF*	255	78·(81/81)·2,55
0,13,13	−	0DD*	221	78·(64/81)·2,55
0,11,11	−	0BB*	187	78·(49/81)·2,55
0, 9, 9	−	099*	153	78·(36/81)·2,55
0, 7, 7	14	077*	119	78·(25/81)·2,55
0, 5, 5	−	055*	85	78·(16/81)·2,55
0, 3, 3	−	033*	51	78·(9/81)·2,55
0, 1, 1	−	011*	17	78·(4/81)·2,55
0, 0, 0	0	000*	0	81·(2/81)·2,55

G9091_7f.eps, G0350_3f.eps, G5_31_3f.eps, Bild 5_31_3

Farbheit	**Farbnummer**			**Digitalbezugswert**
O* L* V*	***n***	***h****	***d***	***D* (Y_Y = 93 Video)**
15,15,15	**7**	**FFF***	**4095**	**[93+7·(81/81)]·2,55**
15,15,13	**−**	**FFD***	**4093**	**[93+7·(64/81)]·2,55**
15,15,11	**−**	**FFB***	**4091**	**[93+7·(49/81)]·2,55**
15,15, 9	**−**	**FF9***	**4089**	**[93+7·(36/81)]·2,55**
15,15, 7	**−**	**FF7***	**4087**	**[93+7·(25/81)]·2,55**
15,15, 5	**−**	**FF5***	**4085**	**[93+7·(16/81)]·2,55**
15,15, 3	**−**	**FF3***	**4083**	**[93+7·(9/81)]·2,55**
15,15, 1	**−**	**FF1***	**4081**	**[93+7·(4/81)]·2,55**
15,15, 0	**3**	**FF0***	**4080**	**[93+7·(0/81)]·2,55**

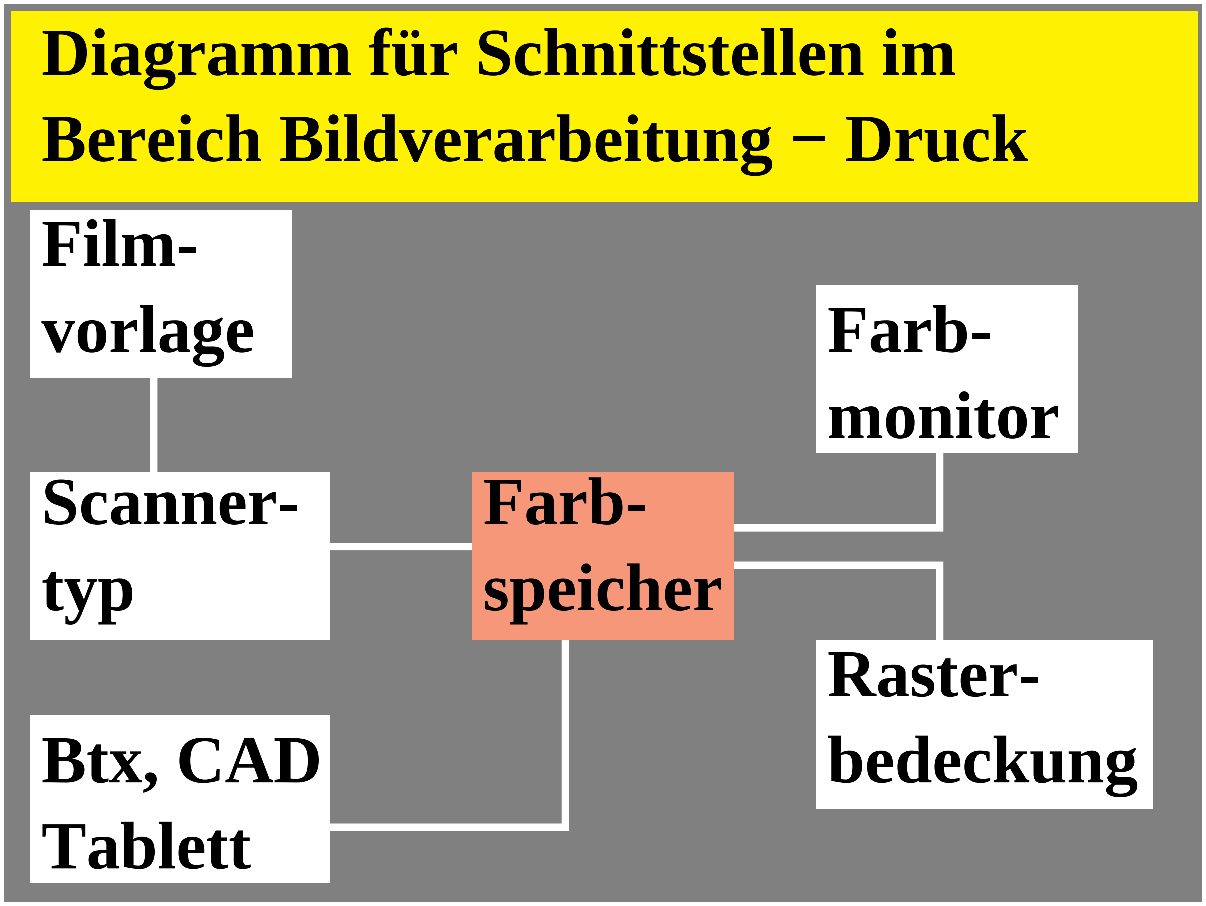
G9091_2f.eps, G0350_4f.eps, G5_32_1f.eps, Bild 5_32_1

Farbheit *O* L* V**	Farbnummer *n*	*h**	*d*	Digitalbezugswert *D* (Y_M = 29 Video)
15,15,15	7	FFF*	4095	[29+71·(81/81)]·2,55
15,13,15	−	FDF*	4063	[29+71·(64/81)]·2,55
15,11,15	−	FBF*	4031	[29+71·(49/81)]·2,55
15, 9,15	−	F9F*	3999	[29+71·(36/81)]·2,55
15, 7,15	−	F7F*	3967	[29+71·(25/81)]·2,55
15, 5,15	−	F5F*	3935	[29+71·(16/81)]·2,55
15, 3,15	−	F3F*	3903	[29+71·(9/81)]·2,55
15, 1,15	−	F1F*	3871	[29+71·(4/81)]·2,55
15, 0,15	5	F0F*	3855	[29+71·(0/81)]·2,55

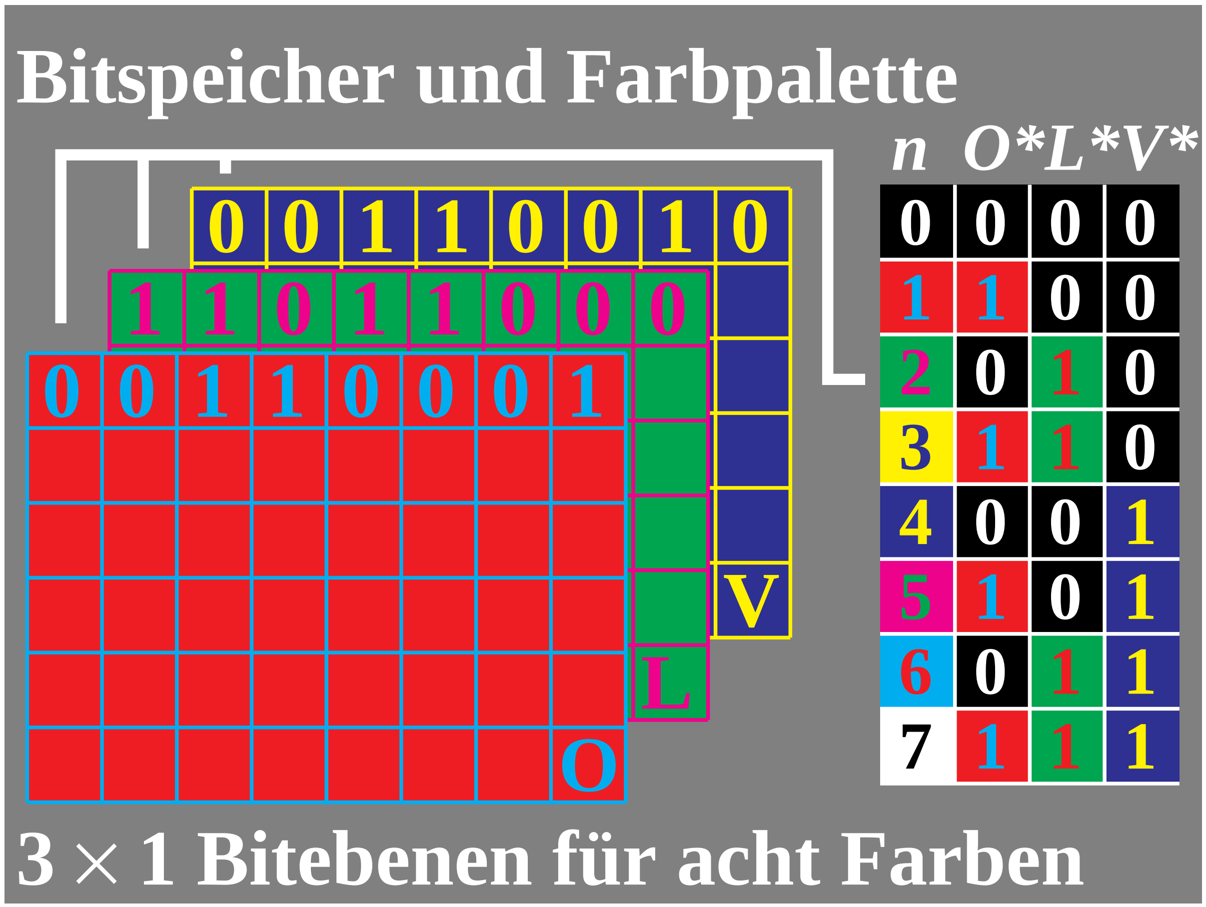
G9091_3f.eps, G0350_5f.eps, G5_32_2f.eps, Bild 5_32_2

Farbheit	Farbnummer			Digitalbezugswert
O L* V**	*n*	*h**	*d*	*D* (Y_C = 78 Video)
15,15,15	7	FFF*	4095	[78+22·(81/81)]·2,55
13,15,15	–	DFF*	3583	[78+22·(64/81)]·2,55
11,15,15	–	BFF*	3071	[78+22·(49/81)]·2,55
9,15,15	–	9FF*	2559	[78+22·(36/81)]·2,55
7,15,15	–	7FF*	2047	[78+22·(25/81)]·2,55
5,15,15	–	5FF*	1535	[78+22·(16/81)]·2,55
3,15,15	–	3FF*	1023	[78+22·(9/81)]·2,55
1,15,15	–	1FF*	511	[78+22·(4/81)]·2,55
0,15,15	6	0FF*	255	[78+22·(0/81)]·2,55

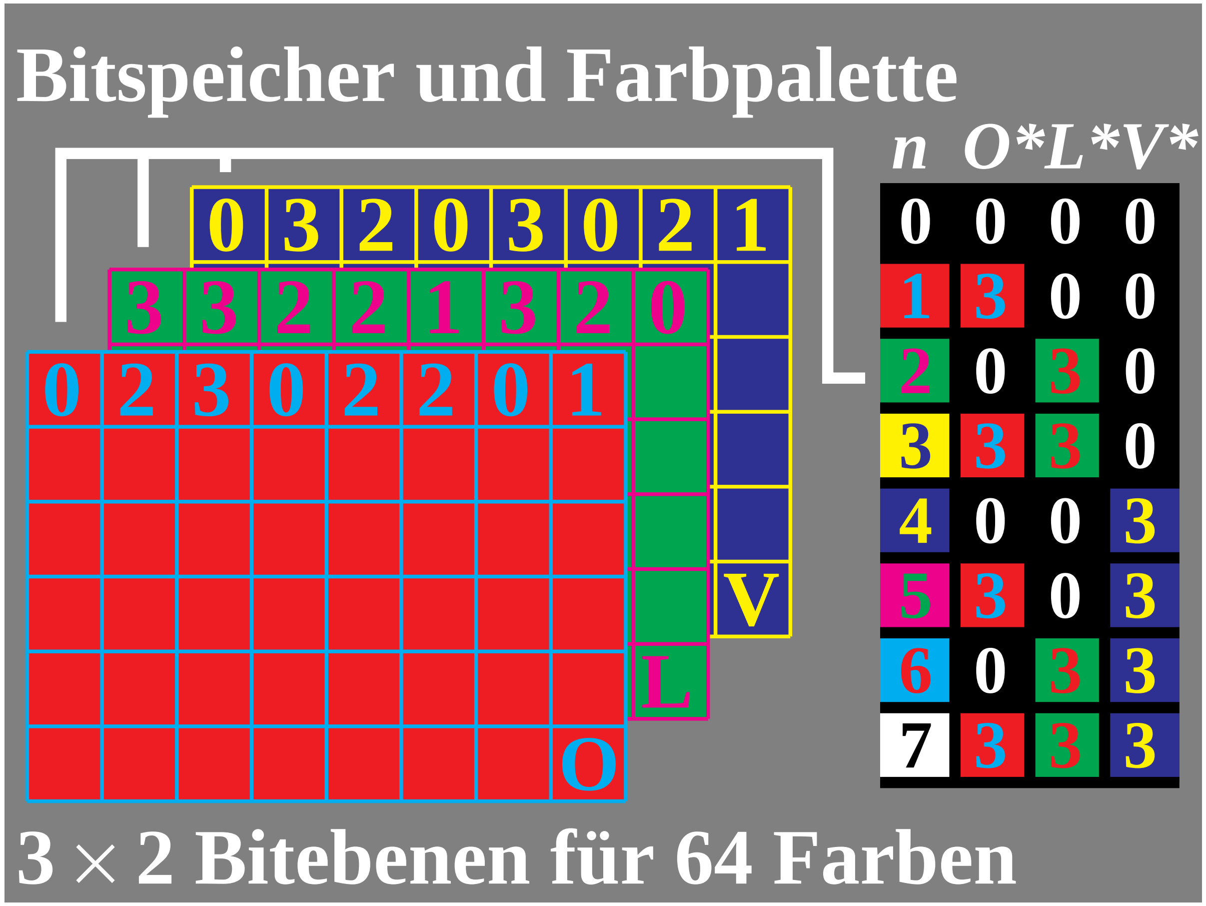
G9091_4f.eps, G0350_6f.eps, G5_32_3f.eps, Bild 5_32_3



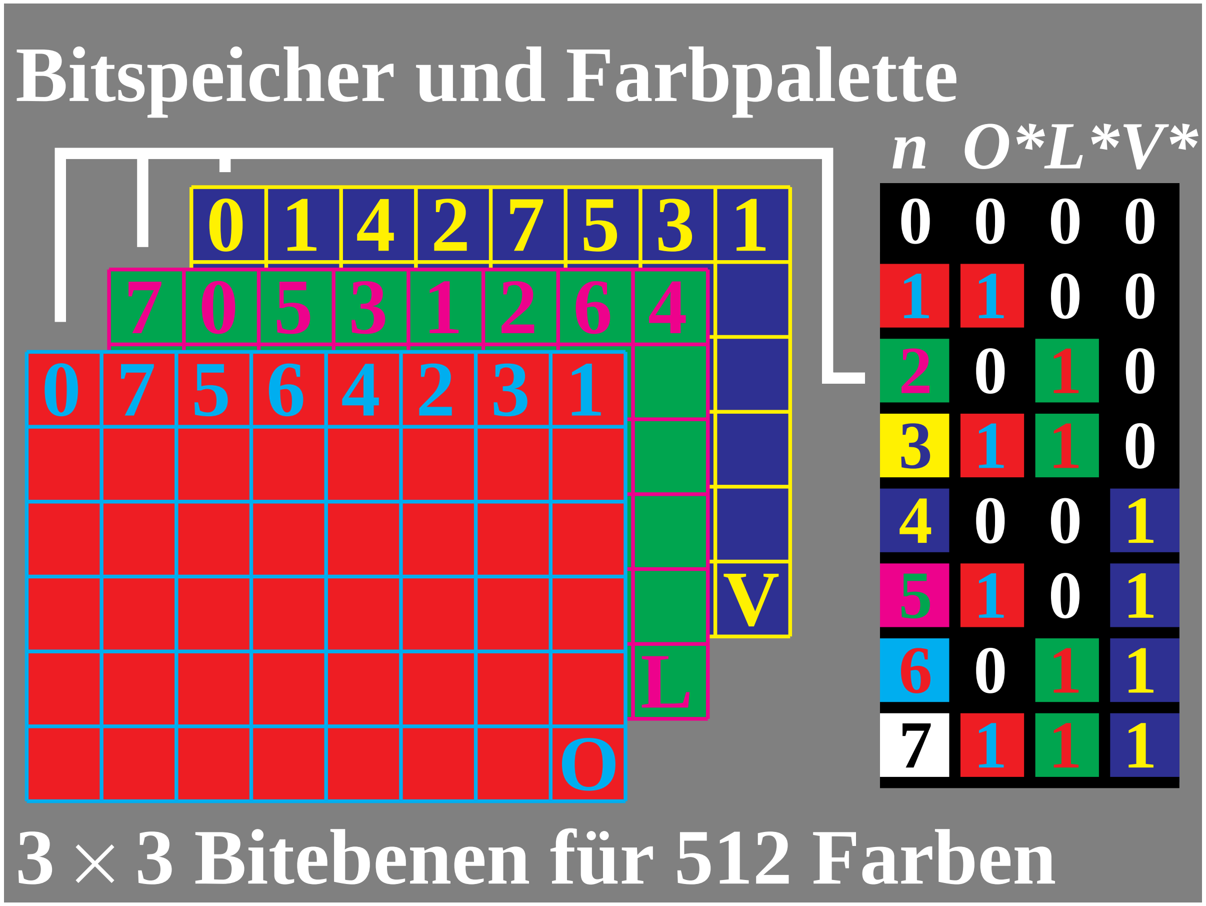
G8690_1f.eps, G0350_7f.eps, G6_01f.eps, Bild 6_1



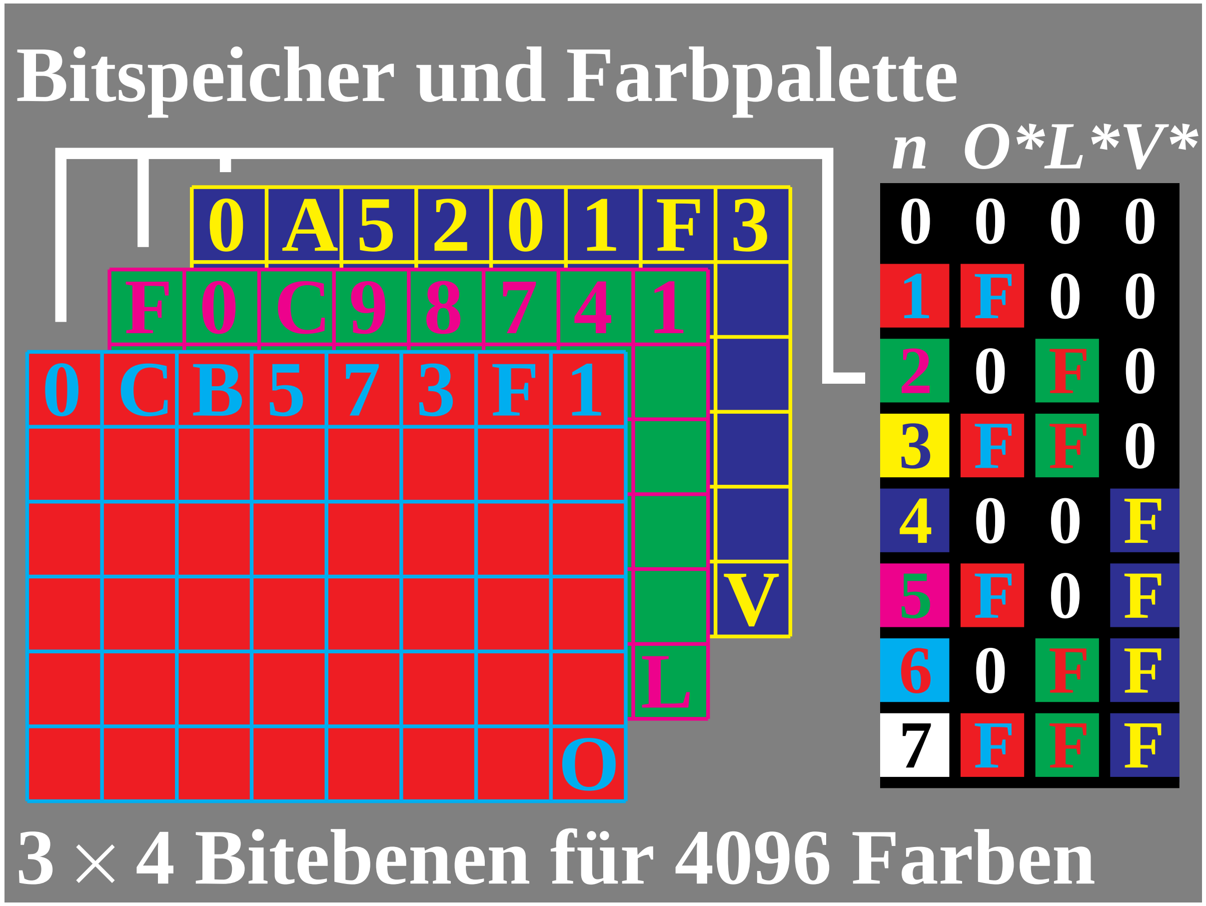
G8660_1f.eps, G0350_8f.eps, G6_02f.eps, Bild 6_2



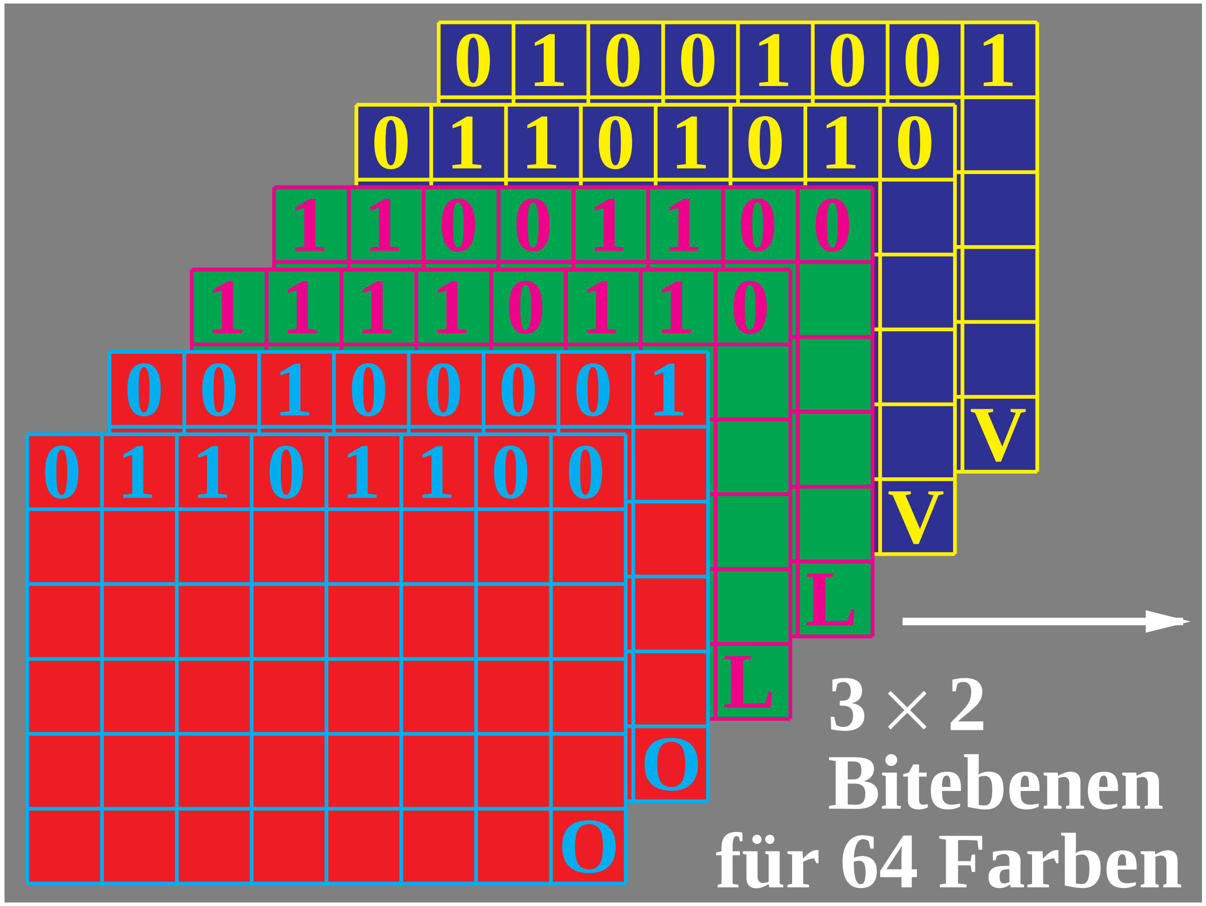
G8660_2f.eps, G0351_1f.eps, G6_03f.eps, Bild 6_3



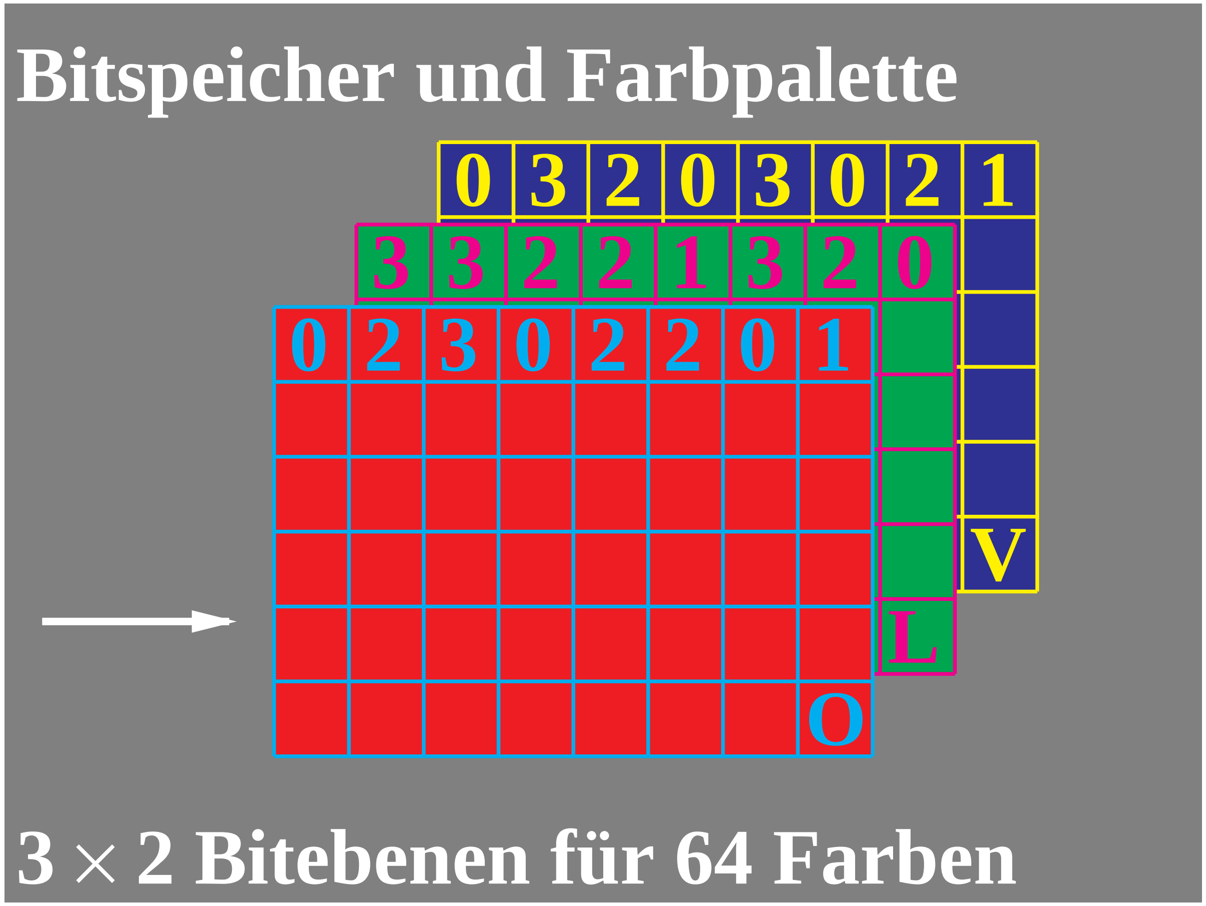
G8660_3f.eps, G0351_2f.eps, G6_04f.eps, Bild 6_4



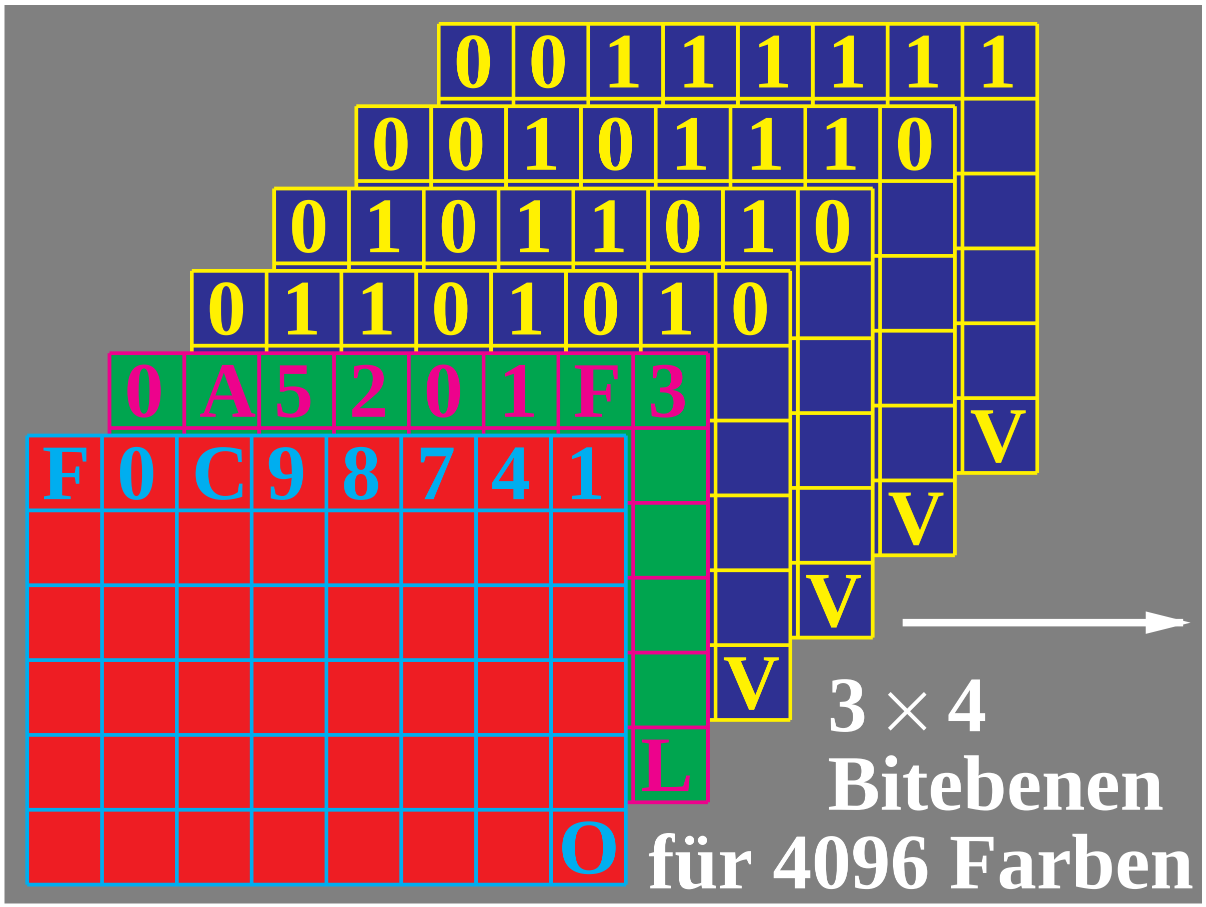
G8660_4f.eps, G0351_3f.eps, G6_05f.eps, Bild 6_5



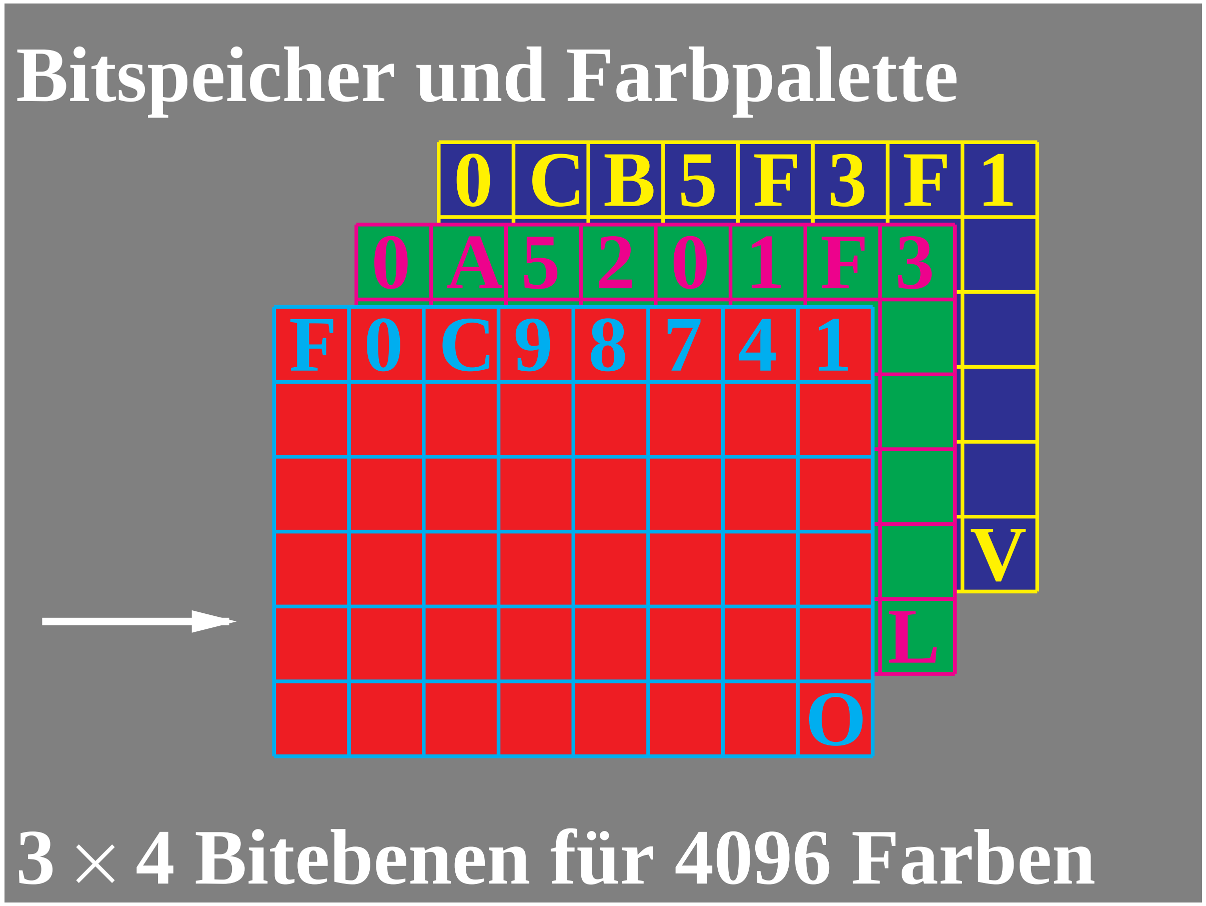
G8660_5f.eps, G0351_4f.eps, G6_06_1f.eps, Bild 6_6_1



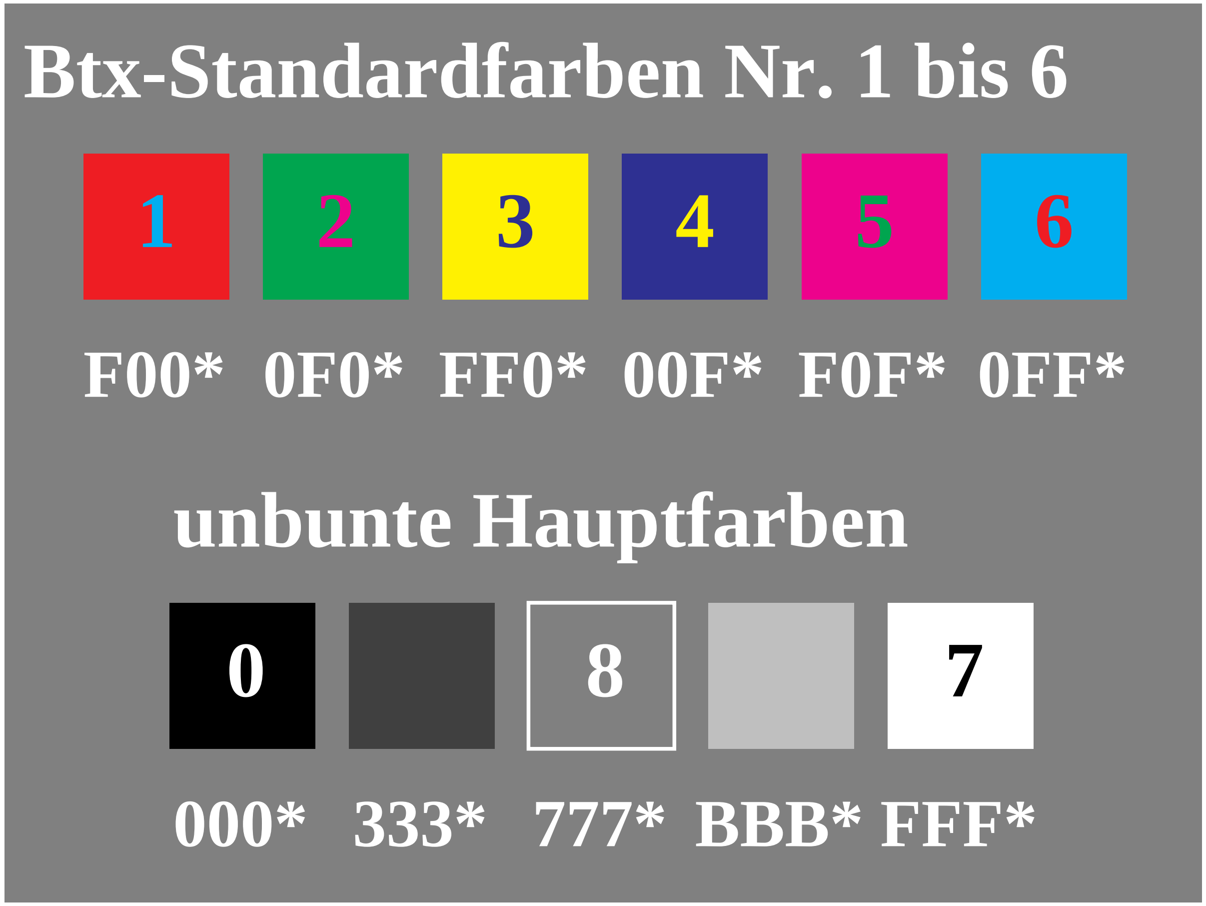
G8660_6f.eps, G0351_5f.eps, G6_06_2f.eps, Bild 6_6_2



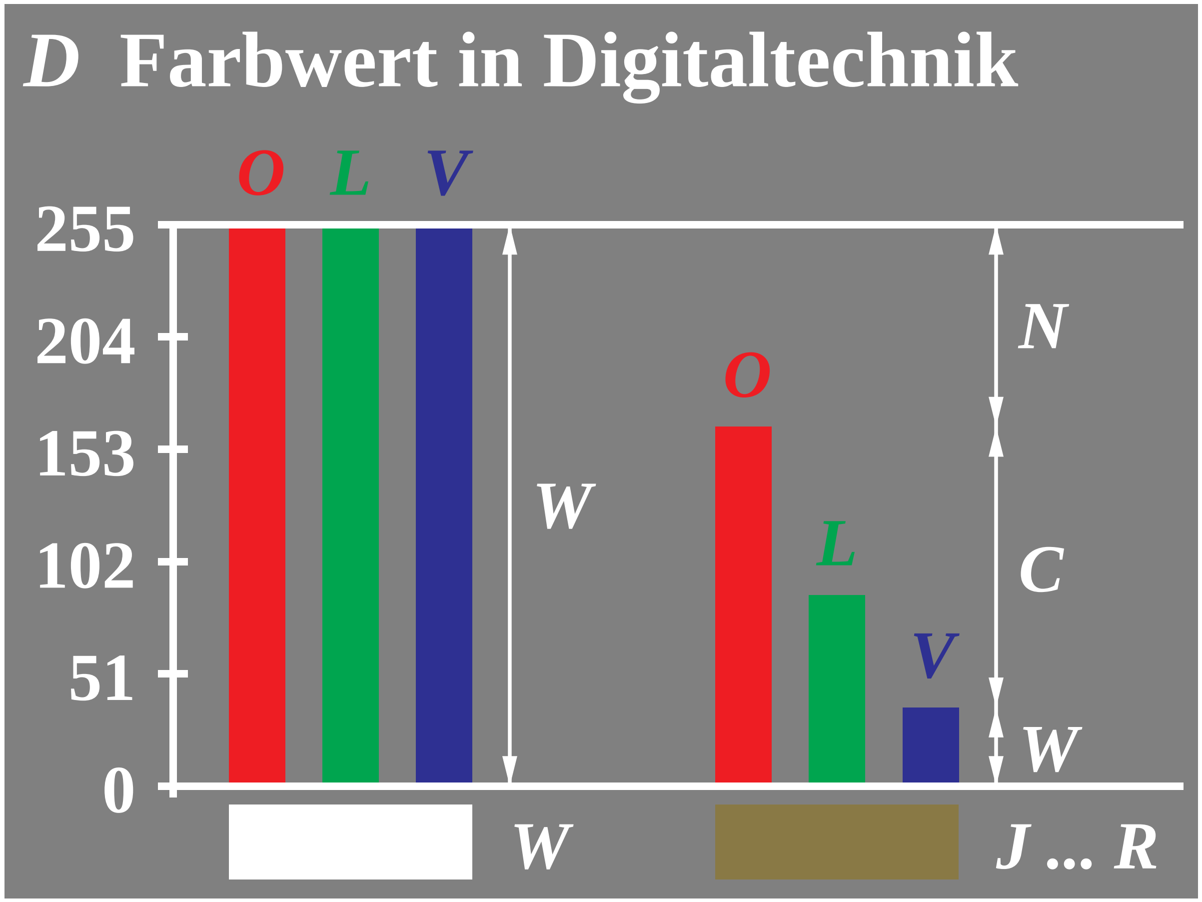
G8660_7f.eps, G0351_6f.eps, G6_07_1f.eps, Bild 6_7_1



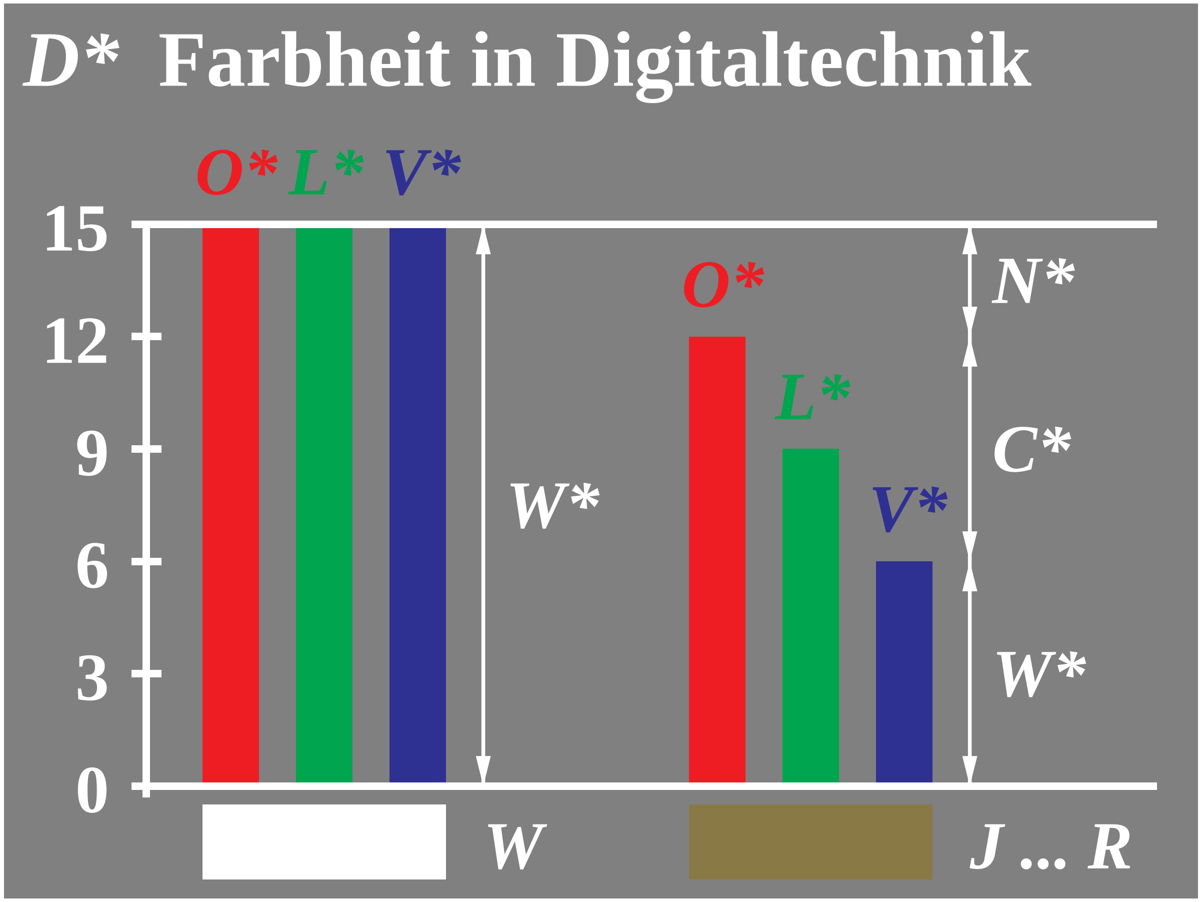
G8660_8f.eps, G0351_7f.eps, G6_07_2f.eps, Bild 6_7_2



G8711_4f.eps, G0351_8f.eps, G6_08f.eps, Bild 6_8



G8550_6f.eps, G0360_1f.eps, G6_09f.eps, Bild 6_9



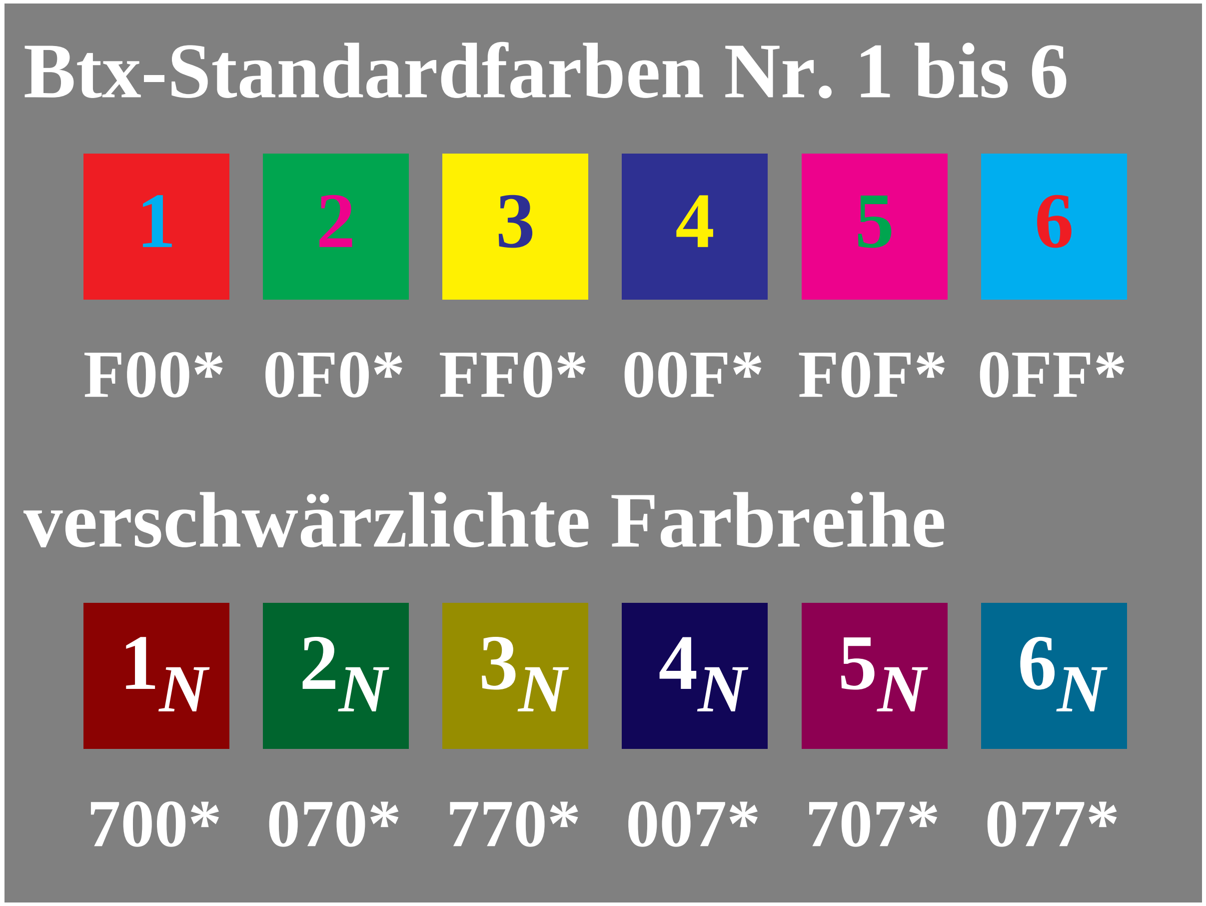
G8550_8f.eps, G0360_2f.eps, G6_10f.eps, Bild 6_10

Farbheit *O* L* V**	Farbnummer *n*	*h**	*d*	Digitalbezugswert *D* (Y_Y = 93 Video)
15,15,15	7	FFF*	4095	[93+7·(81/81)]·2,55
15,15,13	−	FFD*	4093	[93+7·(64/81)]·2,55
15,15,11	−	FFB*	4091	[93+7·(49/81)]·2,55
15,15, 9	−	FF9*	4089	[93+7·(36/81)]·2,55
15,15, 7	−	FF7*	4087	[93+7·(25/81)]·2,55
15,15, 5	−	FF5*	4085	[93+7·(16/81)]·2,55
15,15, 3	−	FF3*	4083	[93+7·(9/81)]·2,55
15,15, 1	−	FF1*	4081	[93+7·(4/81)]·2,55
15,15, 0	3	FF0*	4080	[93+7·(0/81)]·2,55

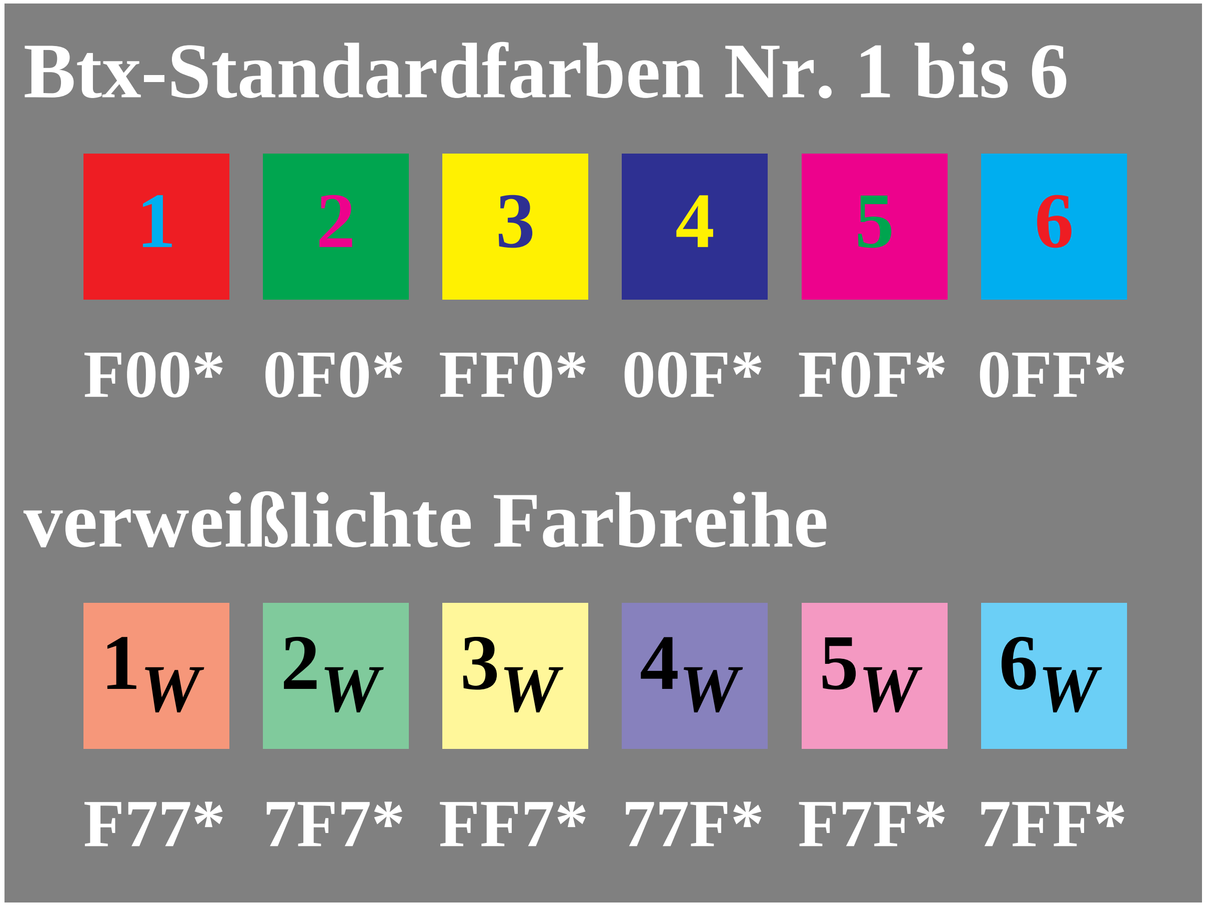
G9091_2f.eps, G0360_3f.eps, G6_11_1f.eps, Bild 6_11_1

Farbheit	Farbnummer			Digitalbezugswert
O L* V**	*n*	*h**	*d*	*D* (Y_M = 29 Video)
15,15,15	7	FFF*	4095	[29+71·(81/81)]·2,55
15,13,15	−	FDF*	4063	[29+71·(64/81)]·2,55
15,11,15	−	FBF*	4031	[29+71·(49/81)]·2,55
15, 9,15	−	F9F*	3999	[29+71·(36/81)]·2,55
15, 7,15	−	F7F*	3967	[29+71·(25/81)]·2,55
15, 5,15	−	F5F*	3935	[29+71·(16/81)]·2,55
15, 3,15	−	F3F*	3903	[29+71·(9/81)]·2,55
15, 1,15	−	F1F*	3871	[29+71·(4/81)]·2,55
15, 0,15	5	F0F*	3855	[29+71·(0/81)]·2,55

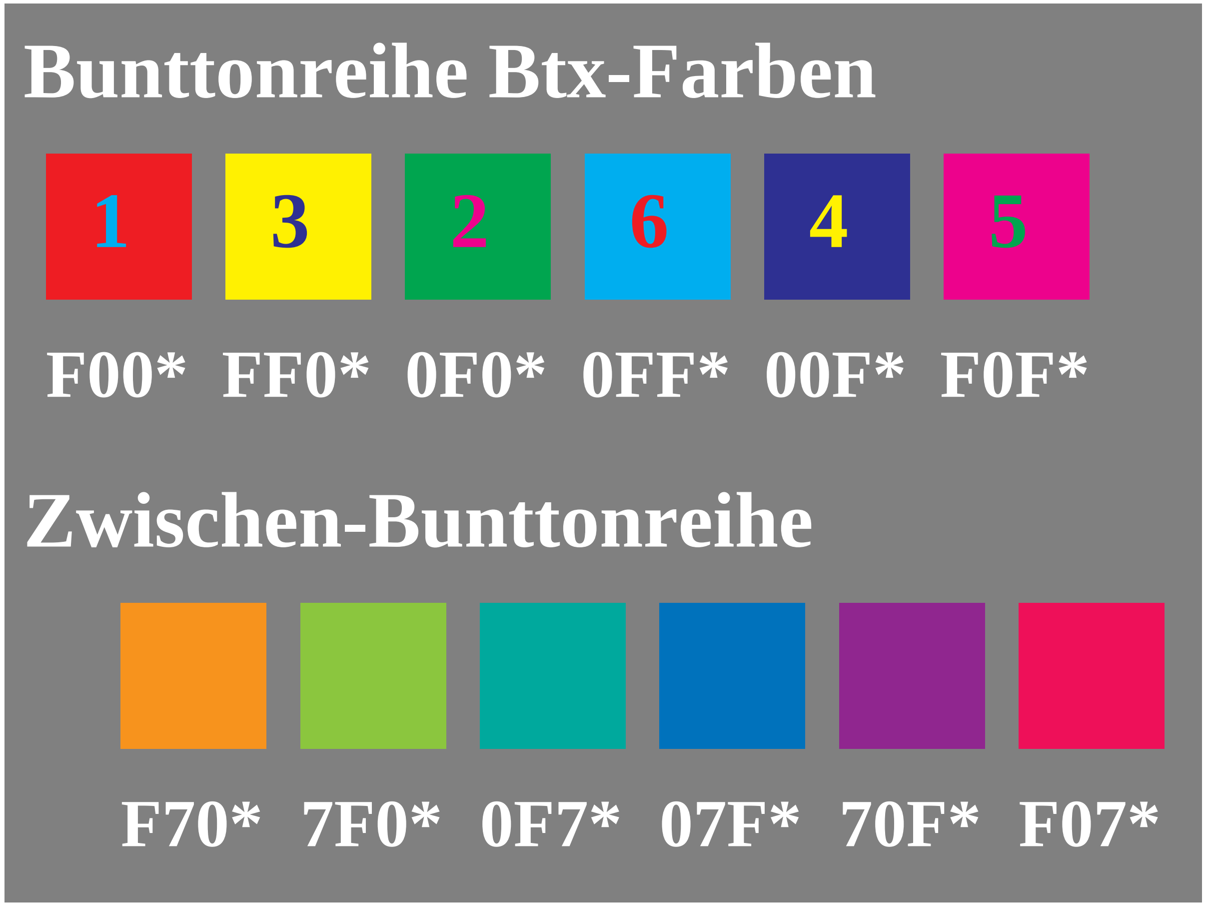
G9091_3f.eps, G0360_4f.eps, G6_11_2f.eps, Bild 6_11_2



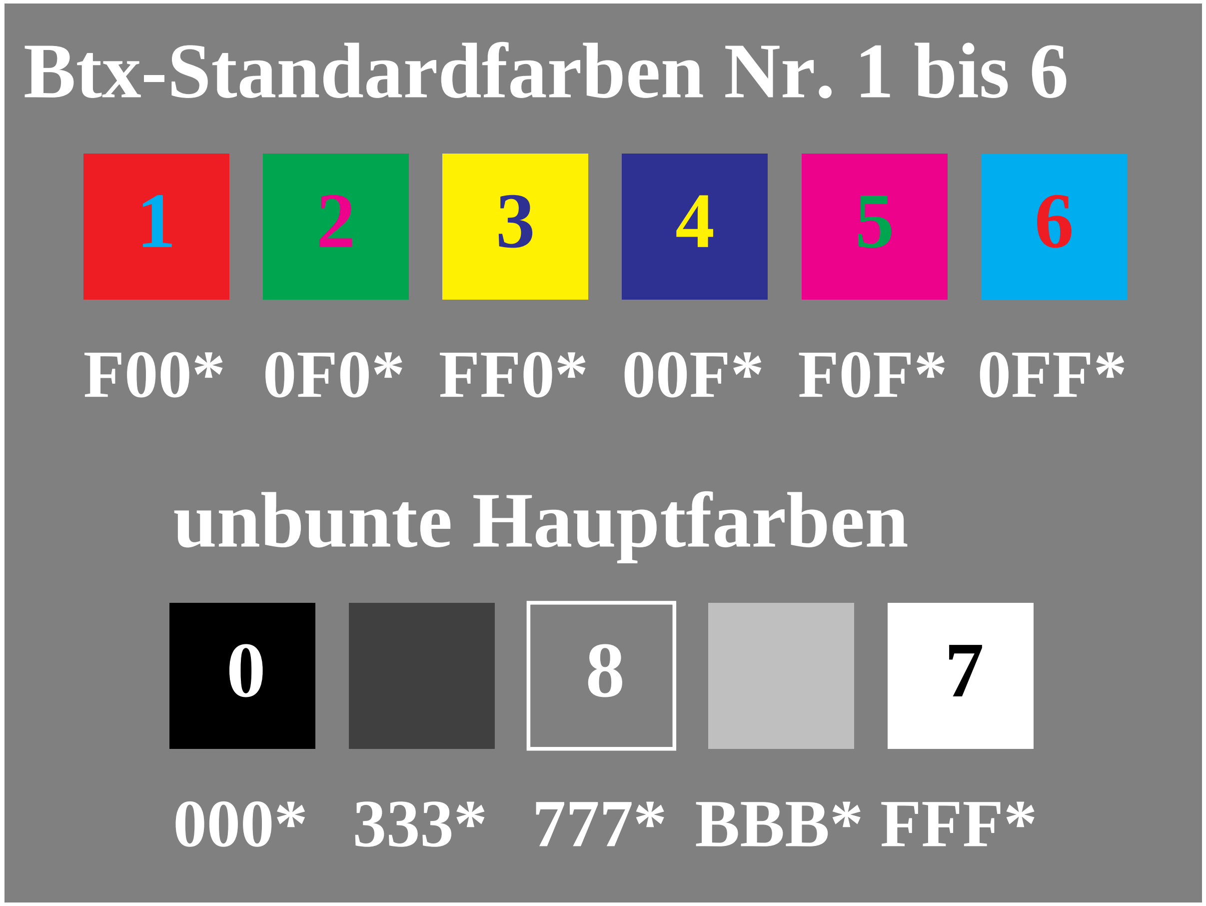
G8711_1f.eps, G0360_5f.eps, G6_12_1f.eps, Bild 6_12_1



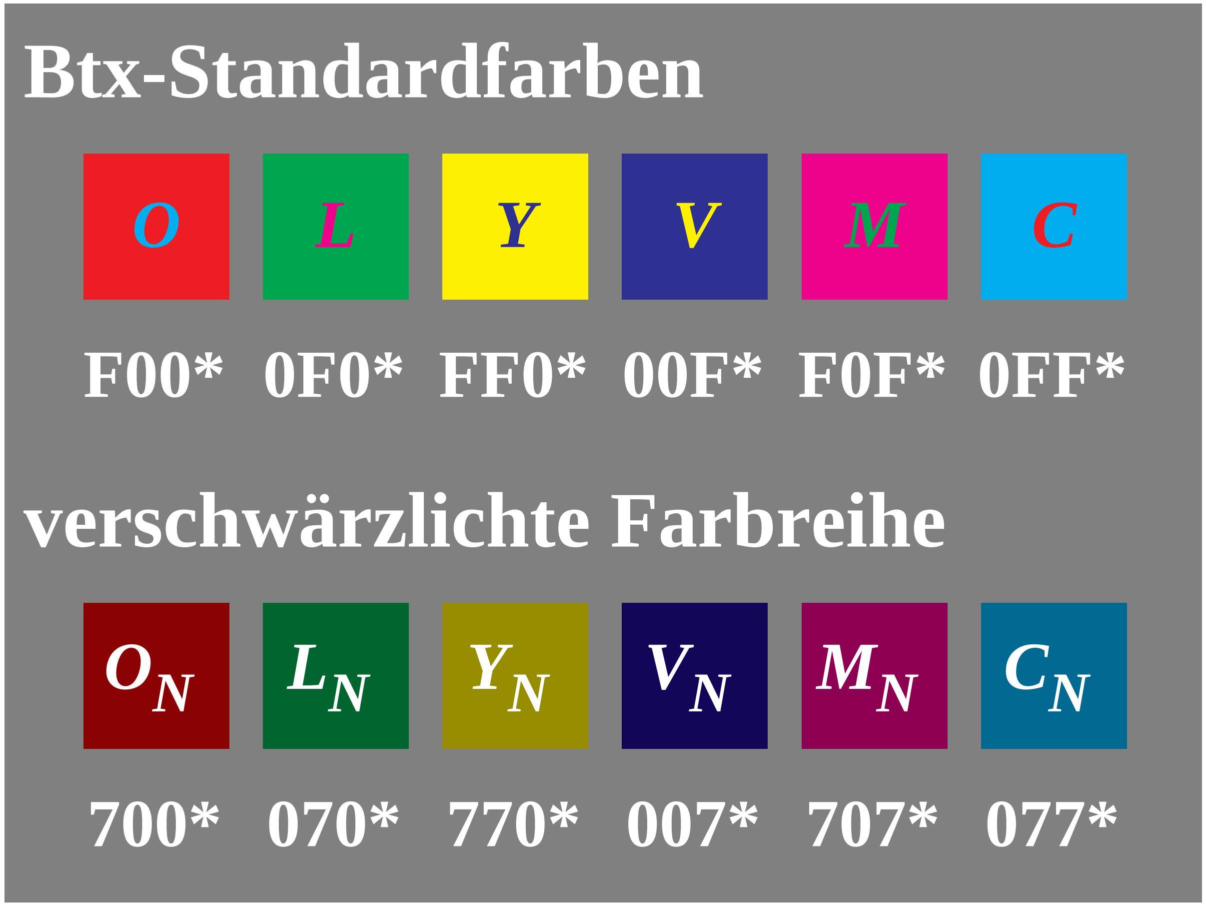
G8711_2f.eps, G0360_6f.eps, G6_12_2f.eps, Bild 6_12_2



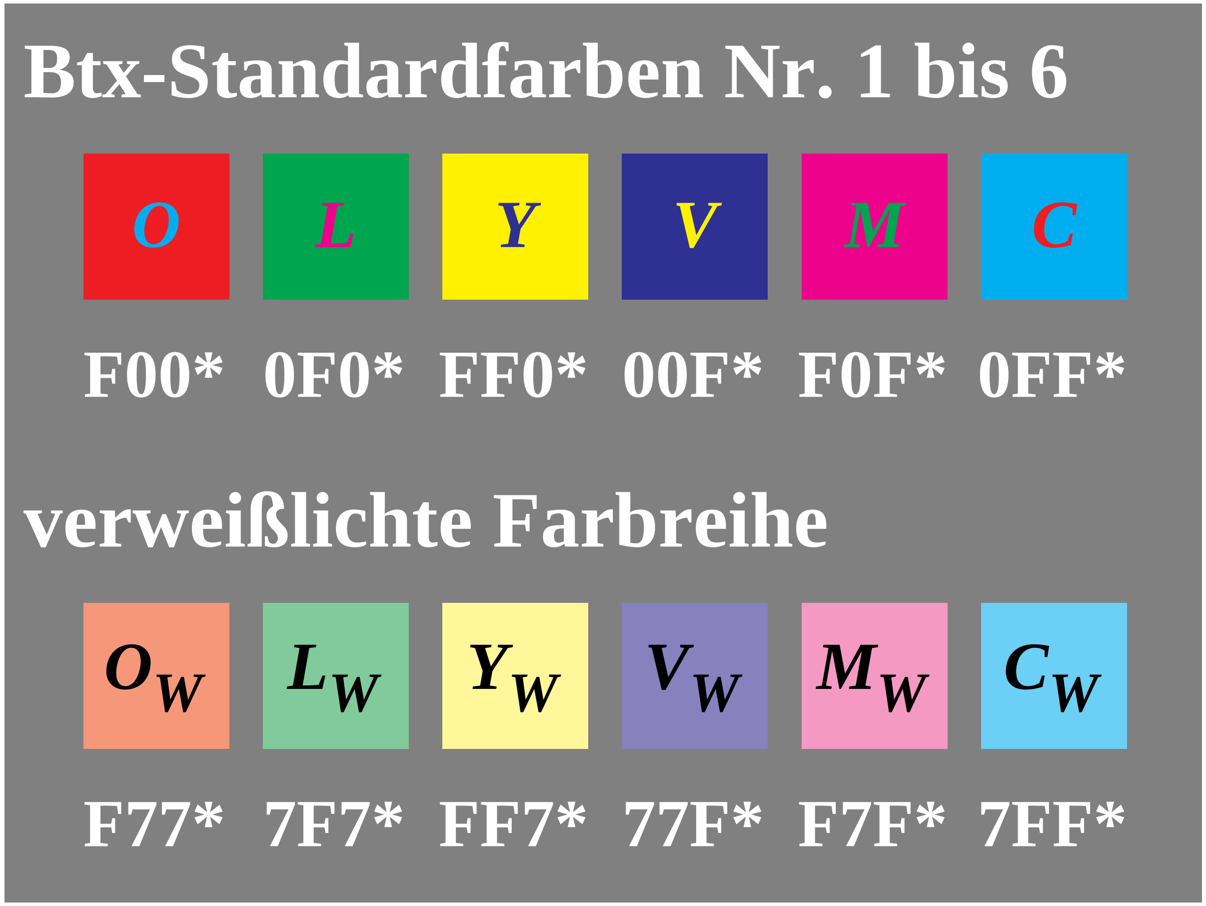
G8711_3f.eps, G0360_7f.eps, G6_12_3f.eps, Bild 6_12_3



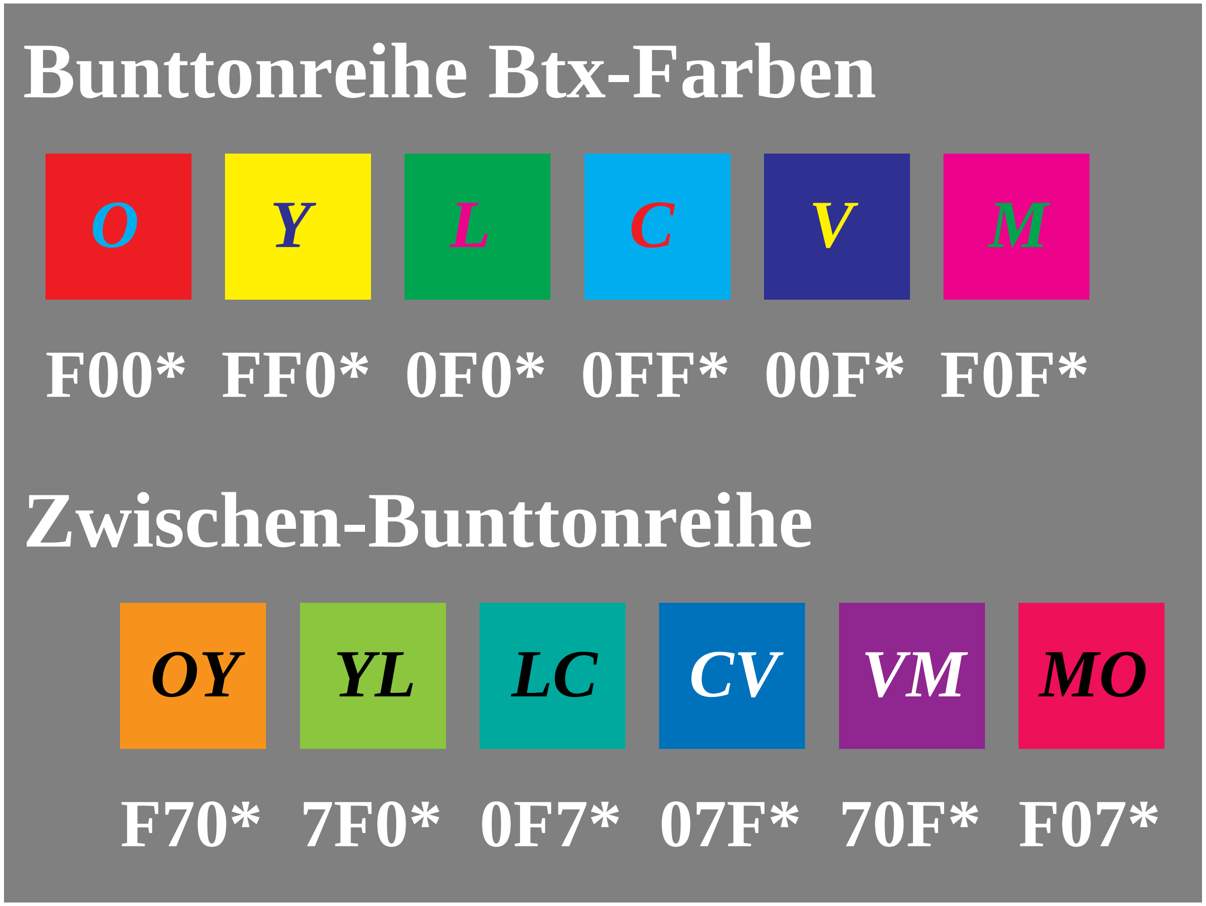
G8711_4f.eps, G0360_8f.eps, G6_12_4f.eps, Bild 6_12_4



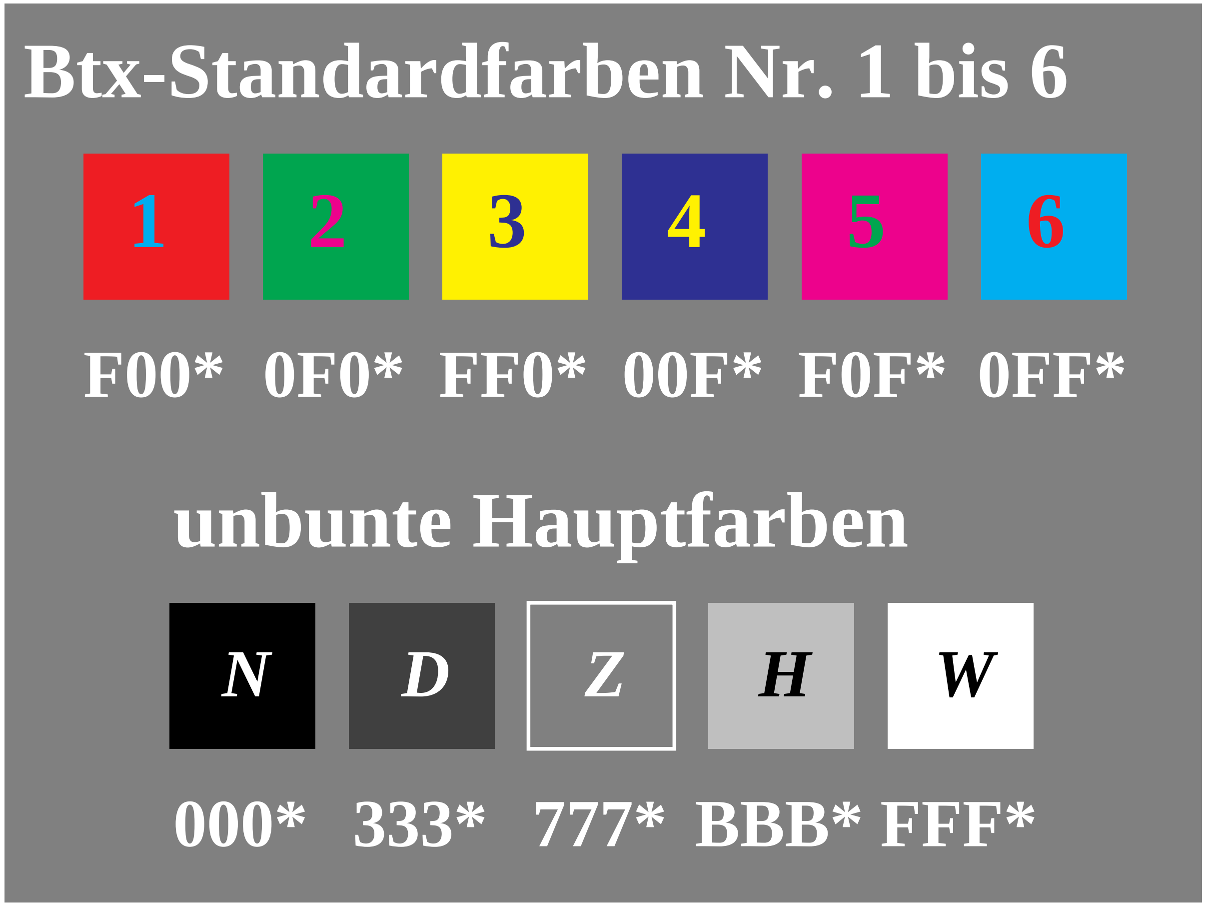
G8711_5f.eps, G0361_1f.eps, G6_13_1f.eps, Bild 6_13_1



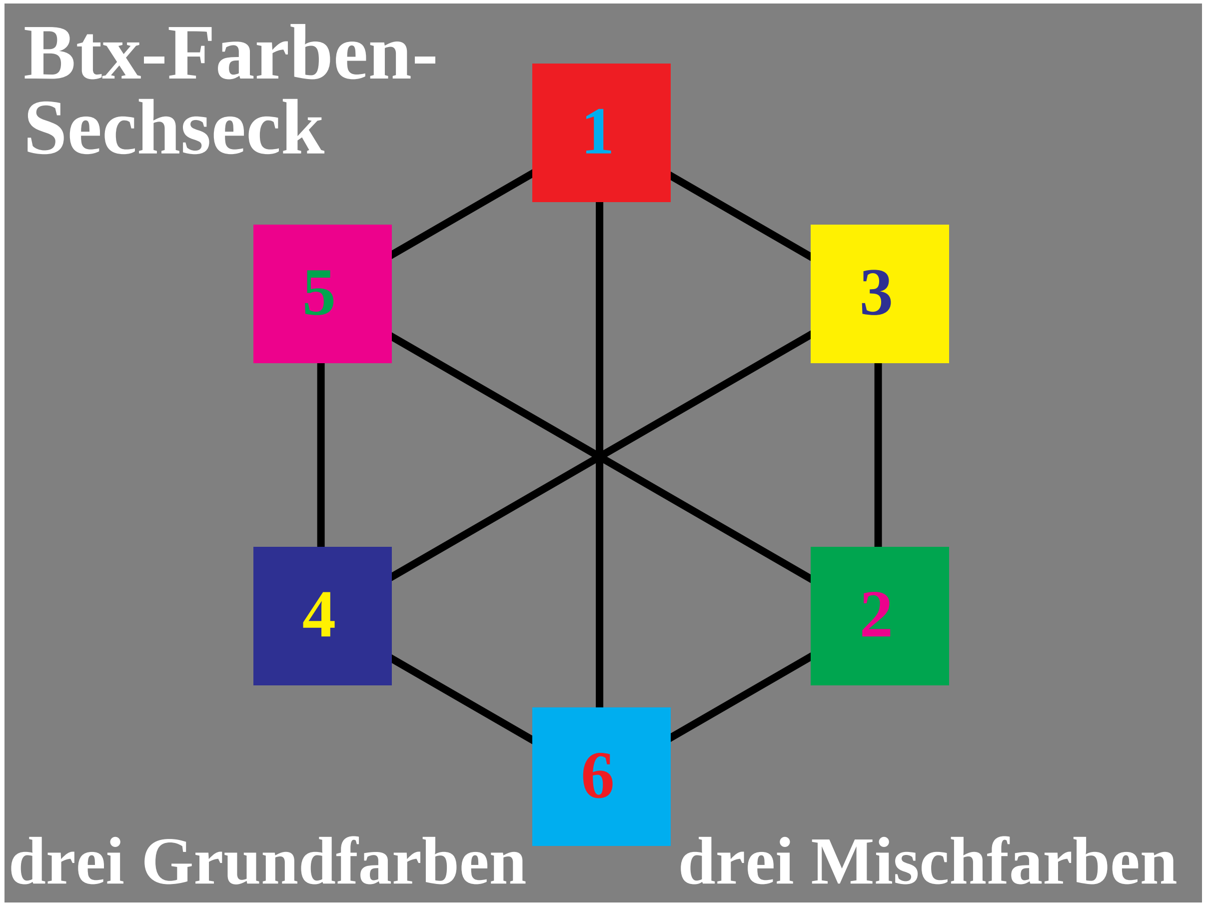
G8711_6f.eps, G0361_2f.eps, G6_13_2f.eps, Bild 6_13_2



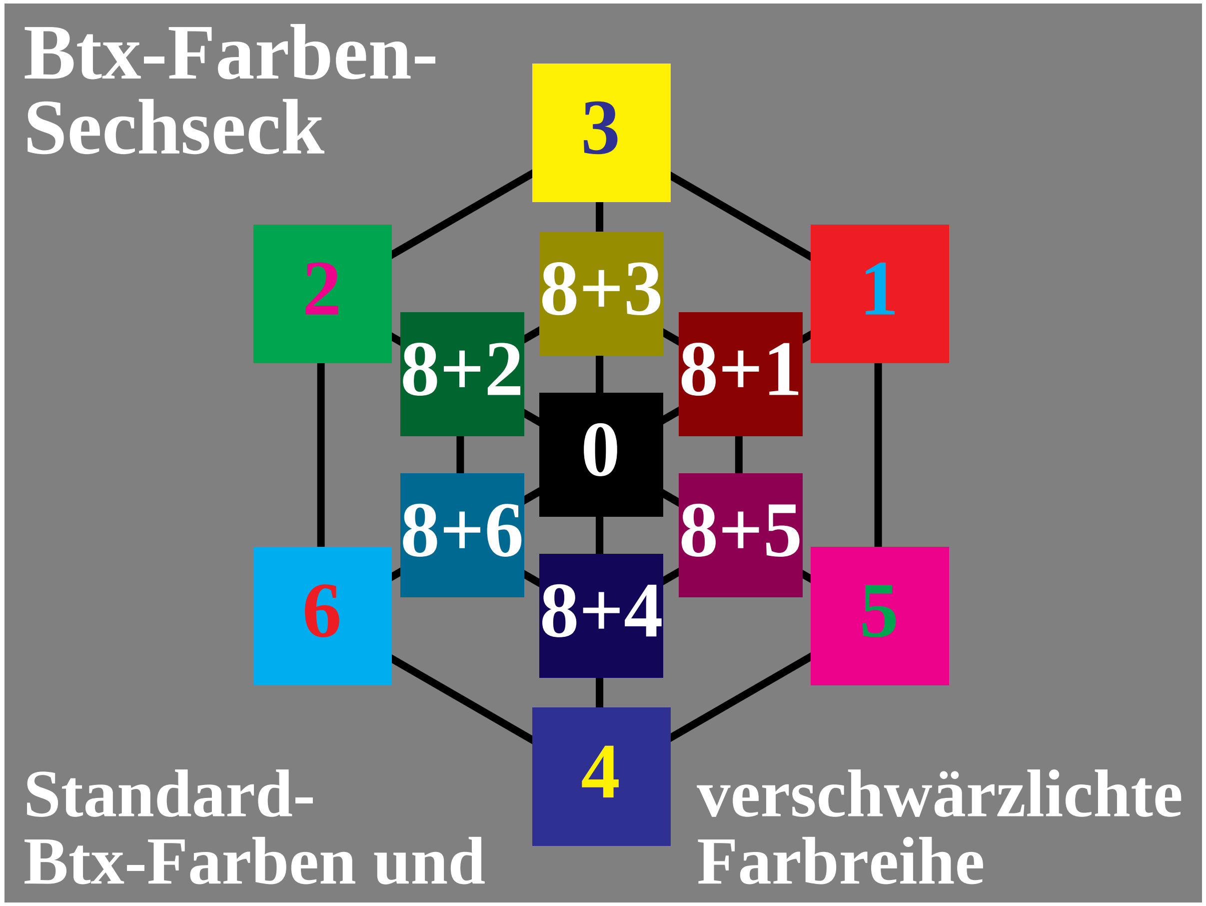
G8711_7f.eps, G0361_3f.eps, G6_13_3f.eps, Bild 6_13_3



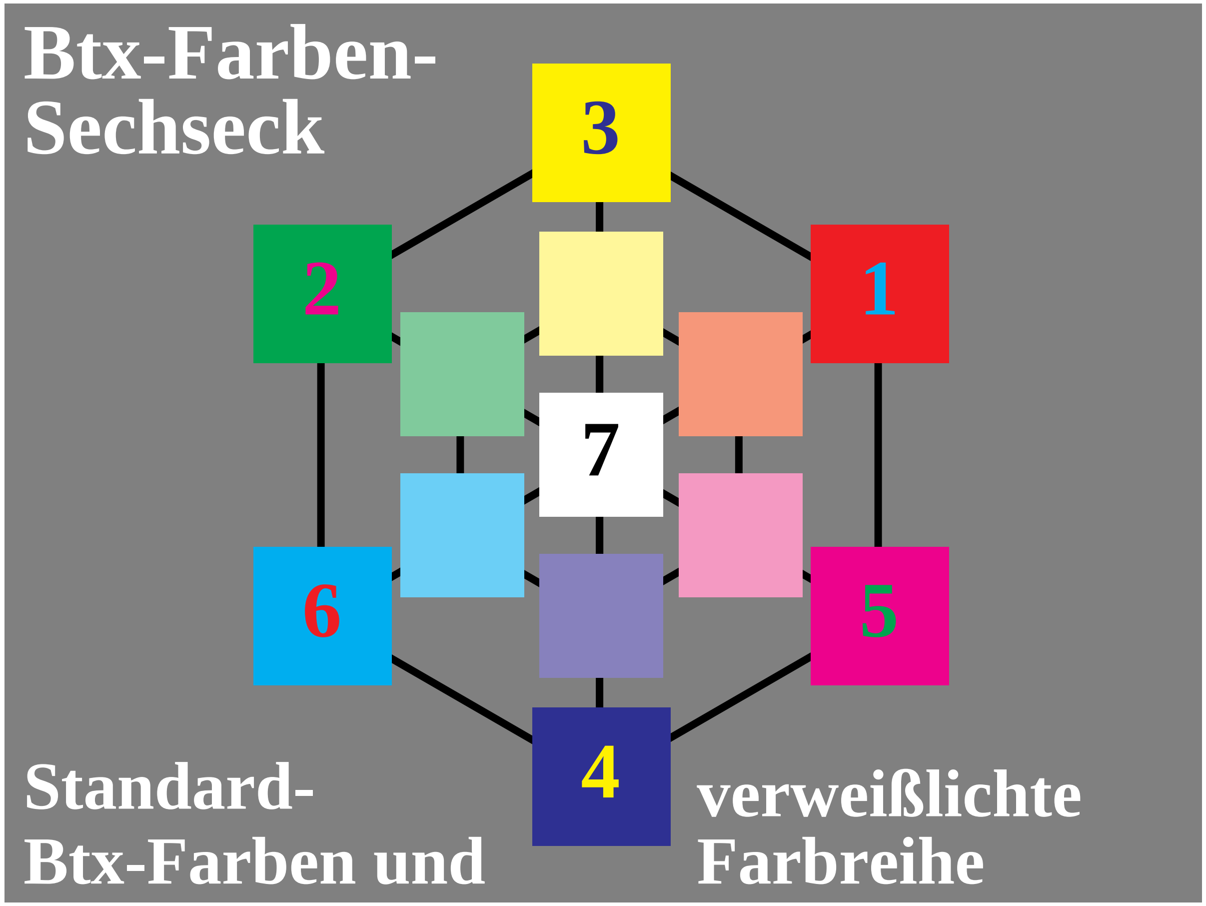
G8711_8f.eps, G0361_4f.eps, G6_13_4f.eps, Bild 6_13_4



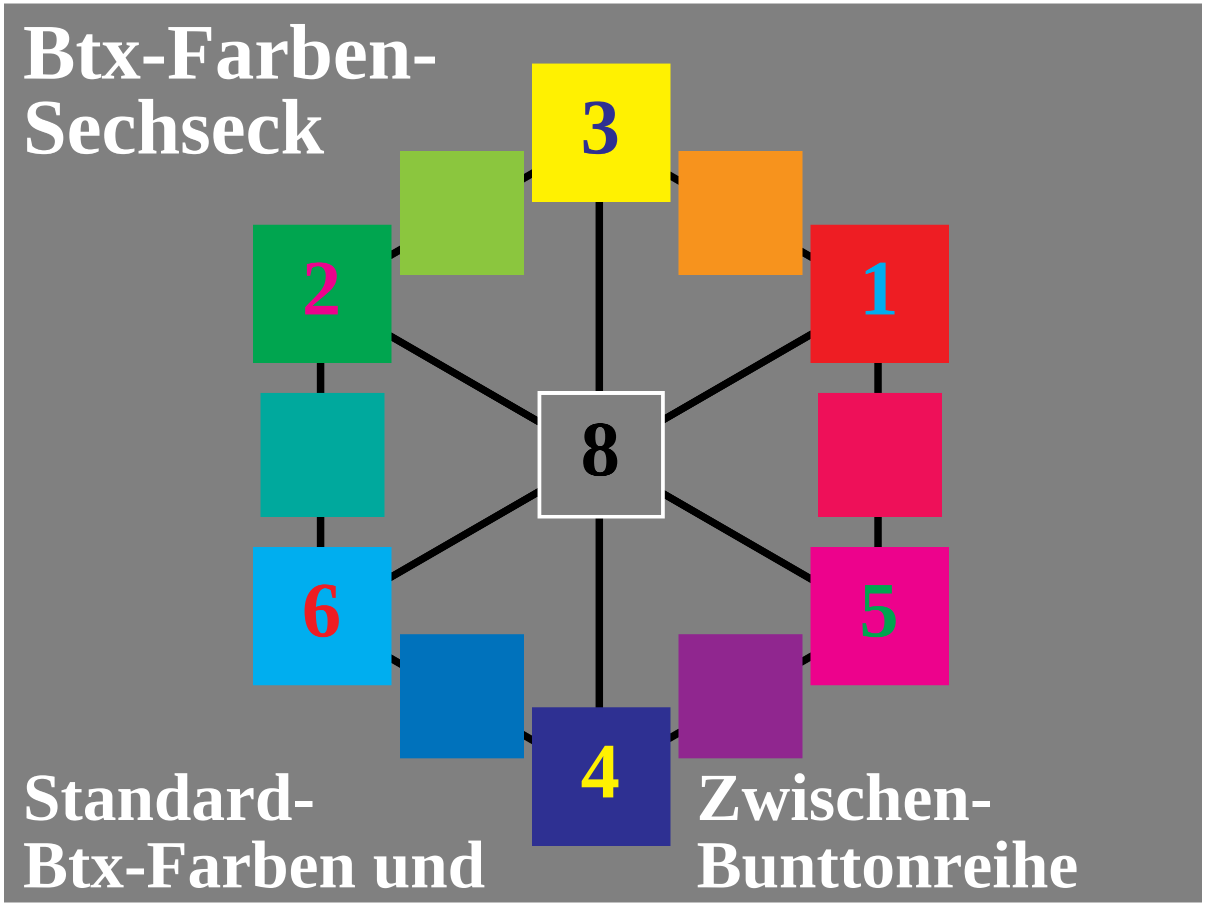
G8710_1f.eps, G0361_5f.eps, G6_14_1f.eps, Bild 6_14_1



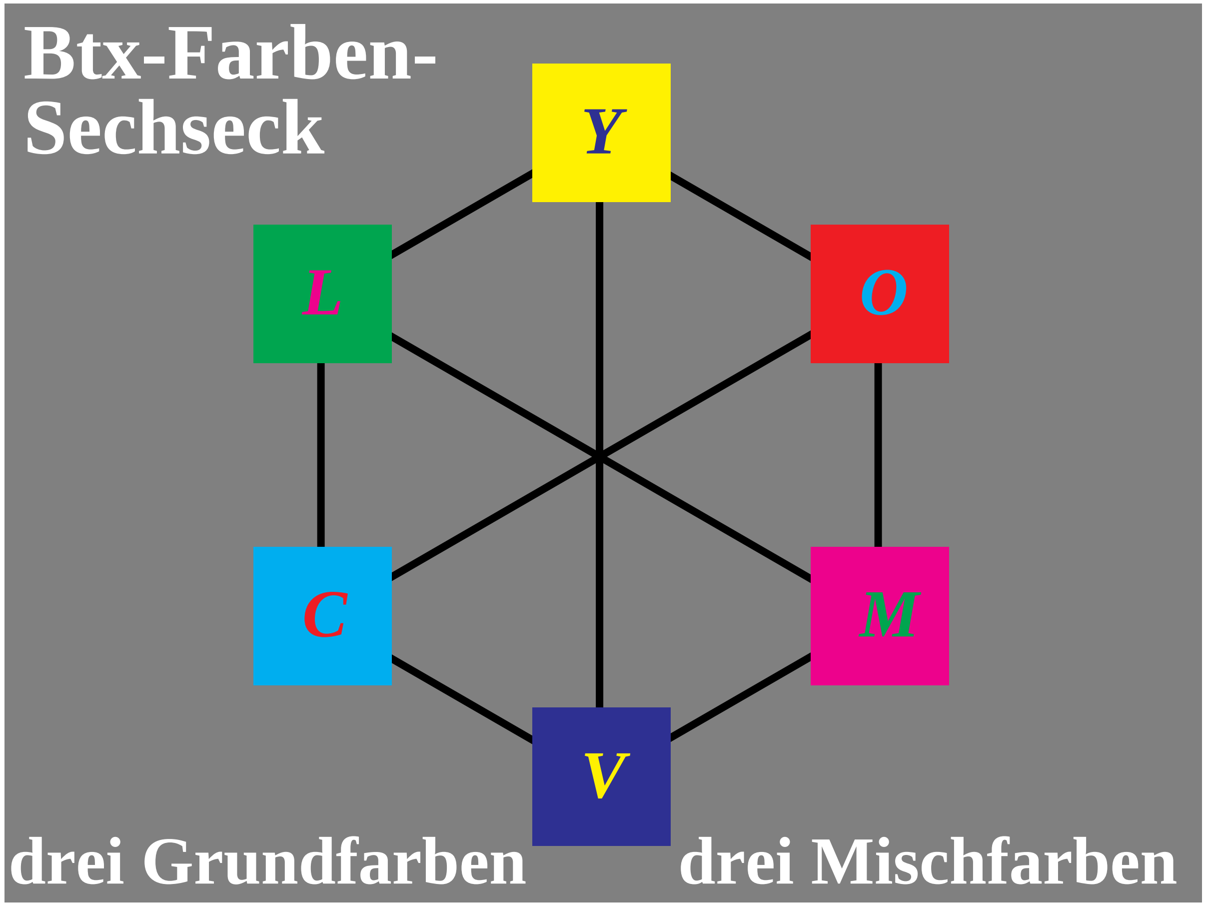
G8710_2f.eps, G0361_6f.eps, G6_14_2f.eps, Bild 6_14_2



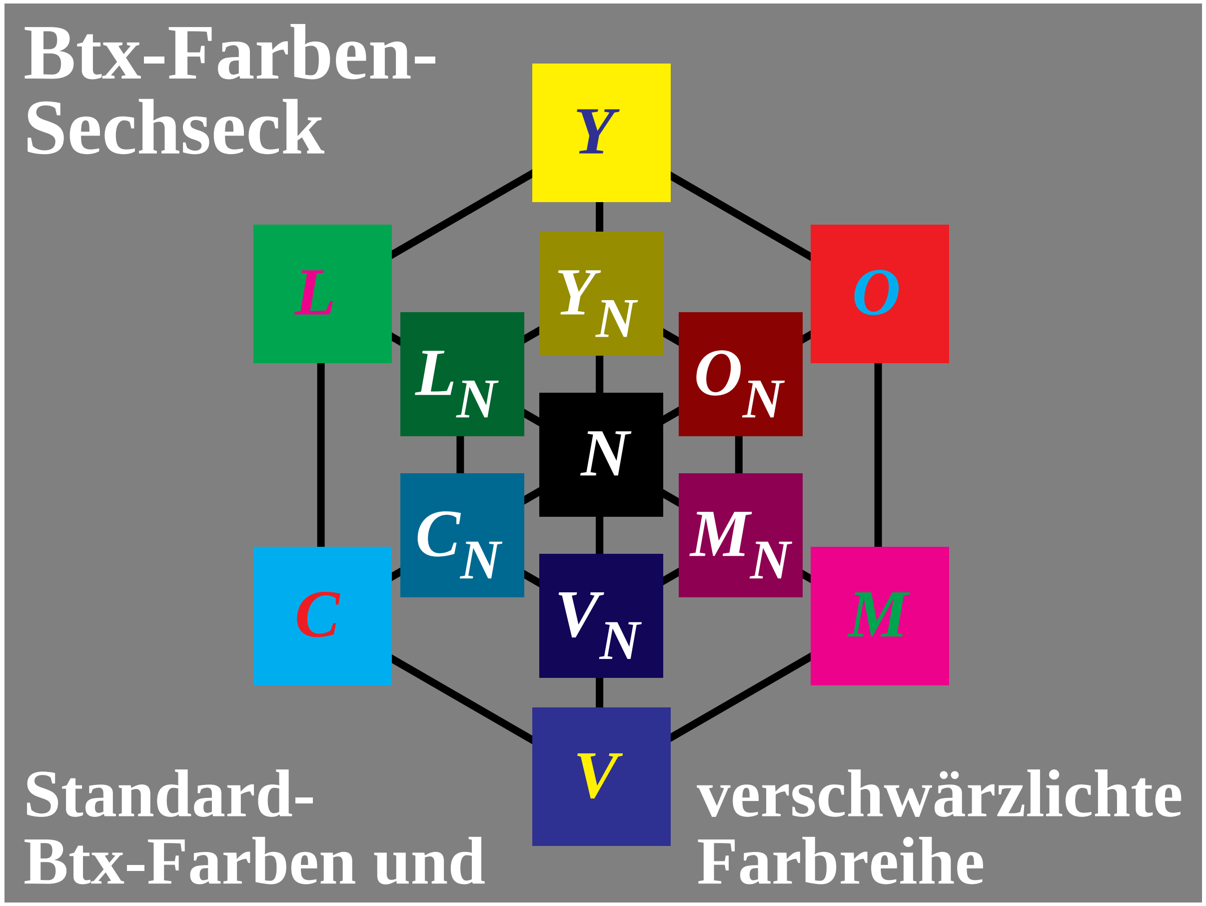
G8710_3f.eps, G0361_7f.eps, G6_14_3f.eps, Bild 6_14_3



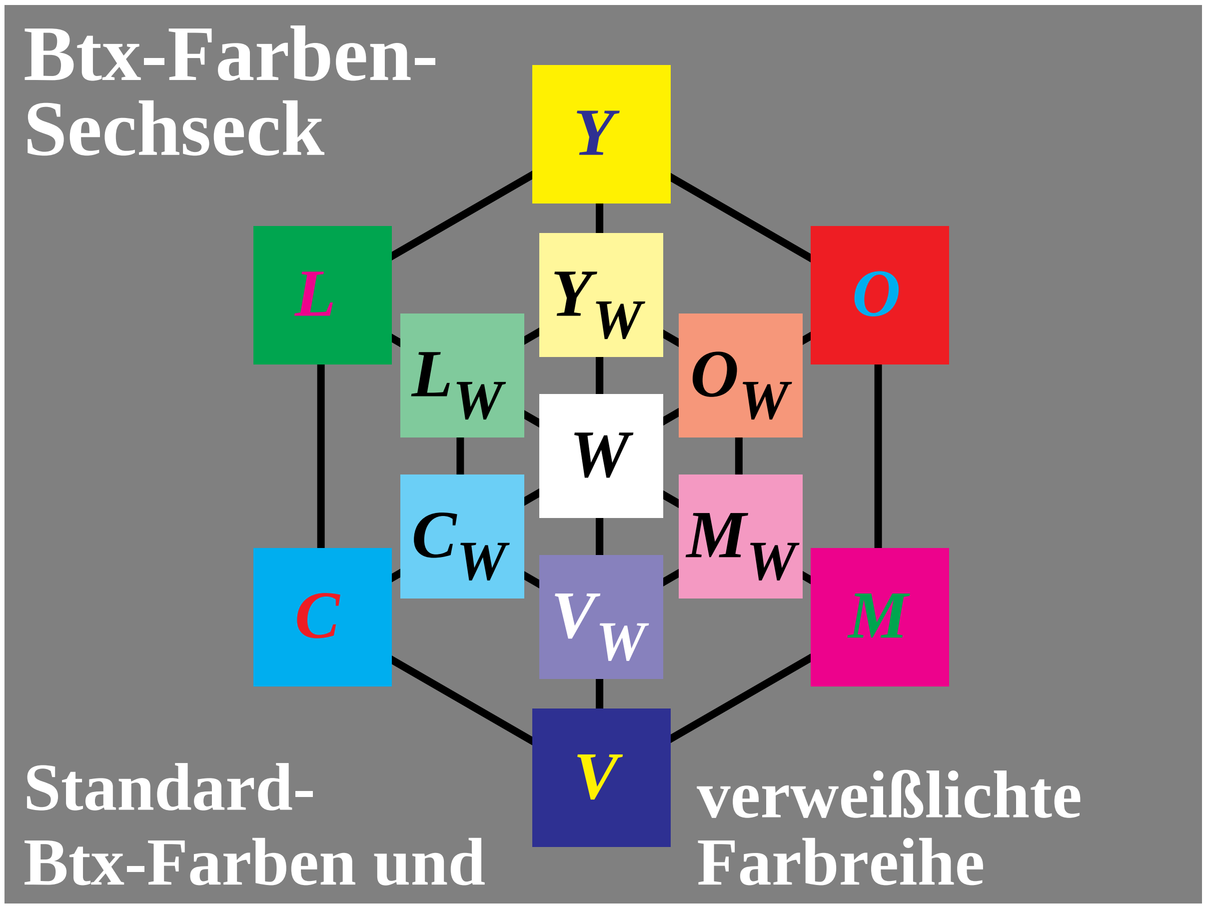
G8710_4f.eps, G0361_8f.eps, G6_14_4f.eps, Bild 6_14_4



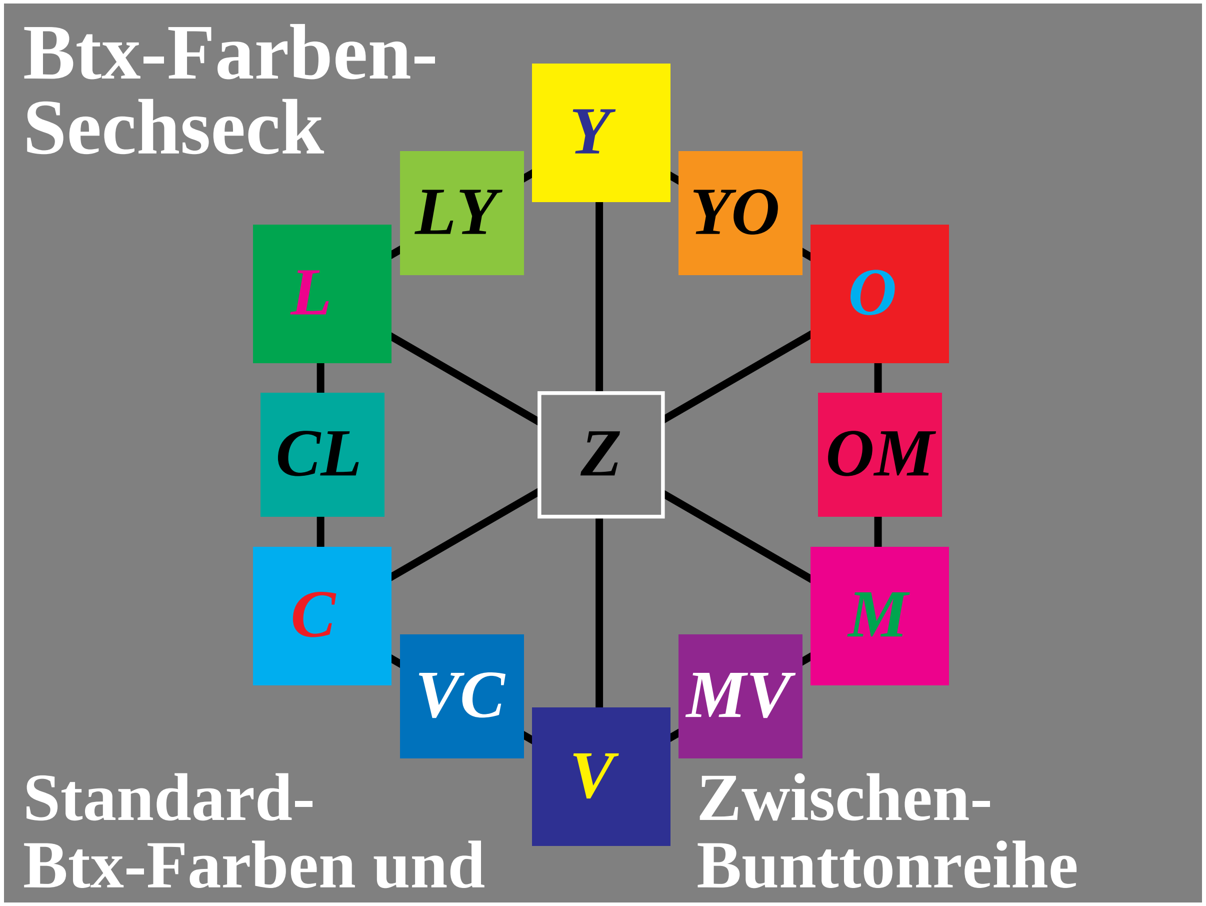
G8710_5f.eps, G0370_1f.eps, G6_15_1f.eps, Bild 6_15_1



G8710_6f.eps, G0370_2f.eps, G6_15_2f.eps, Bild 6_15_2



G8710_7f.eps, G0370_3f.eps, G6_15_3f.eps, Bild 6_15_3



G8710_8f.eps, G0370_4f.eps, G6_15_4f.eps, Bild 6_15_4

G8490_1f.eps, G0370_5f.eps, G6_16f.eps, Bild 6_16

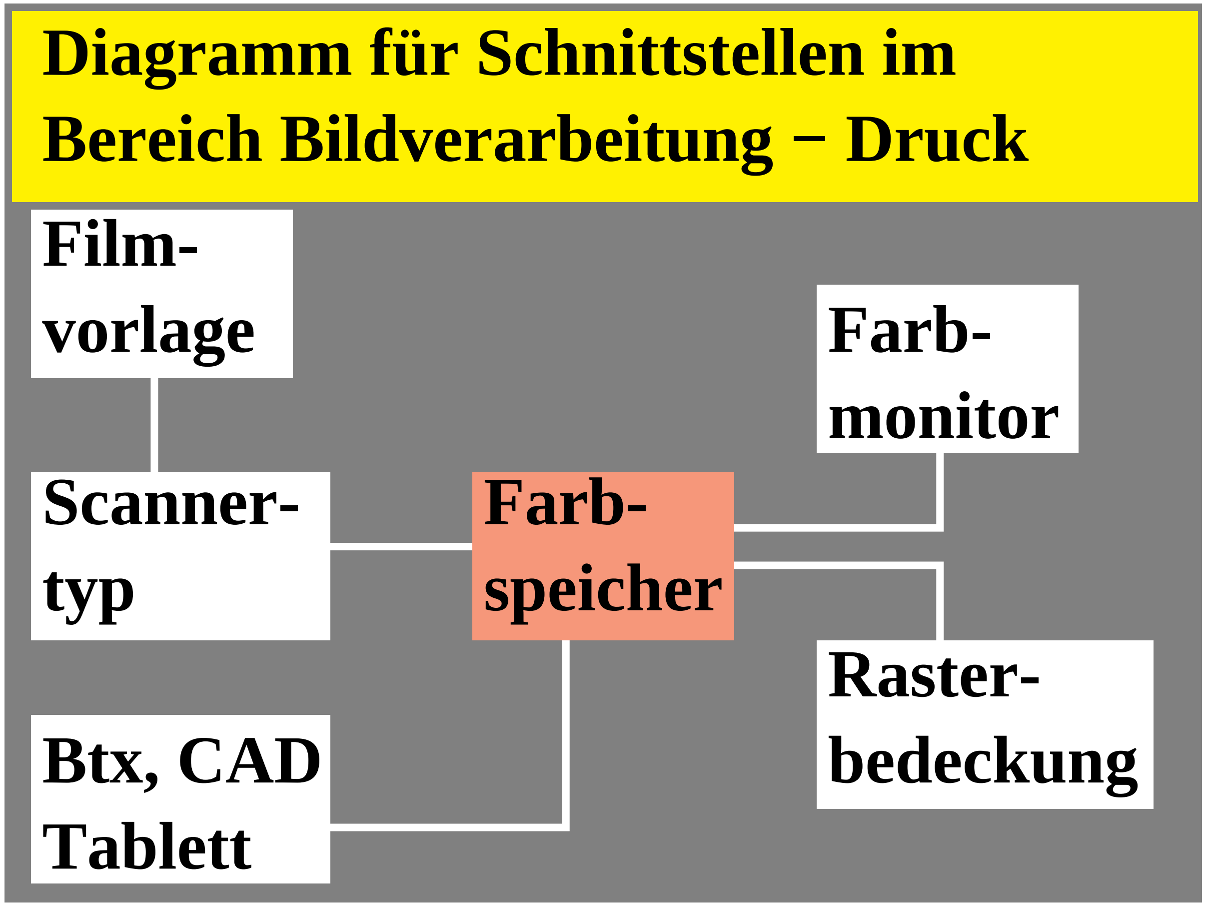
G8490_2f.eps, G0370_6f.eps, G6_17f.eps, Bild 6_17

Programm Änderung
BAM-Leitseite

```
1 rem BAM-Btx-Leitseite
2 rem Bildänderung
3 send *65100#
4 print at(5,3) "Koll.Farbgraphik"
5 print at(5,14) "19.2.86,15h,BAM"
6 stop
```

G8212_4f.eps, G0370_7f.eps, G6_18f.eps, Bild 6_18

G8490_3f.eps, G0370_8f.eps, G6_19f.eps, Bild 6_19



G8690_1f.eps, G0371_1f.eps, G6_20f.eps, Bild 6_20

Von der Filmvorlage zur Druck-Reproduktion, Einflußparameter:

Filmmaterial: ***Agfa, Fuji, Kodak***

Belichtung: −6GRAD, 0GRAD, +6GRAD

Aufnahmelichtart: 3200K, 5500K, 7700K

Scannertyp: Breitband, Laser, ...

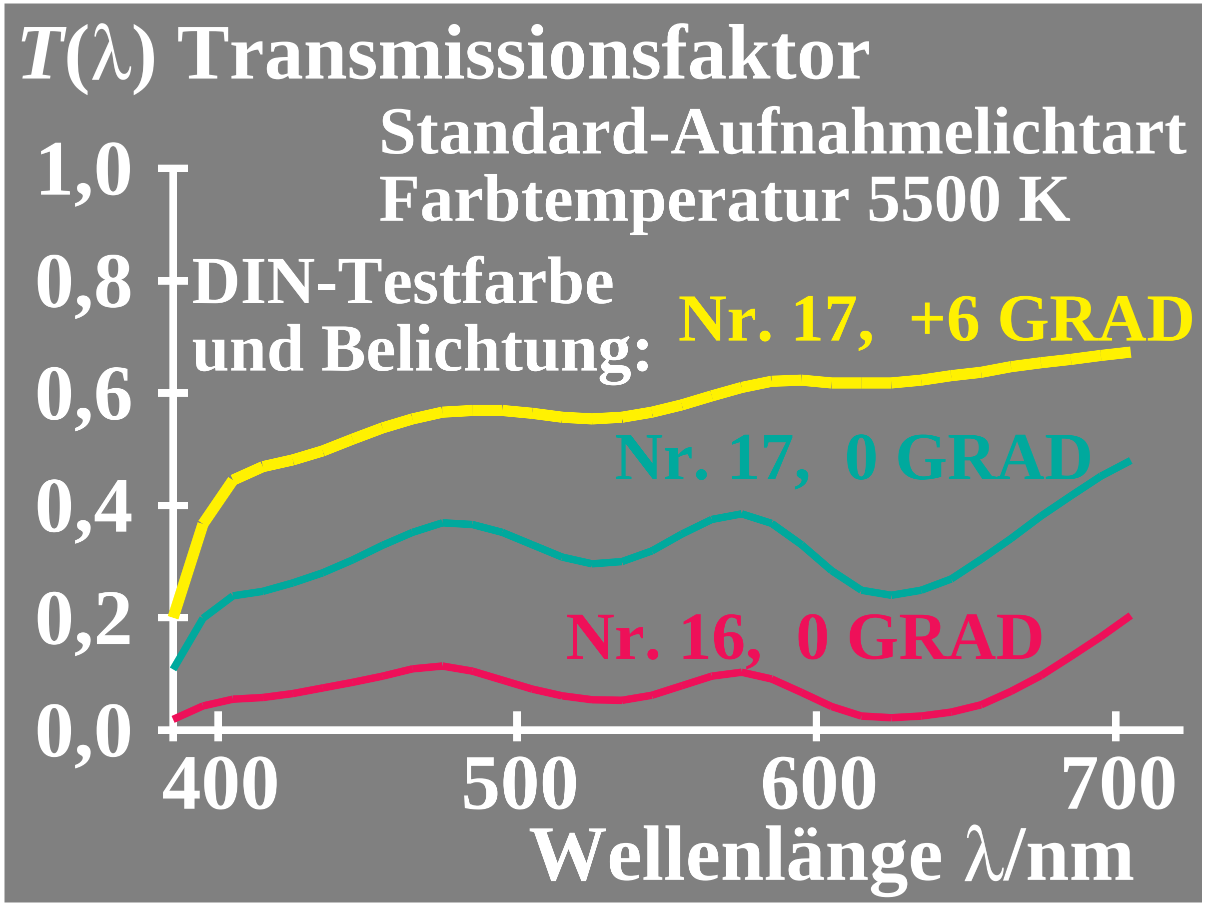
Scannerjustierung: leeres Bildfenster, Filmschleier, DIN-Testfarbe Nr. 16 / 17

Kennlinientransformation: quadratisch

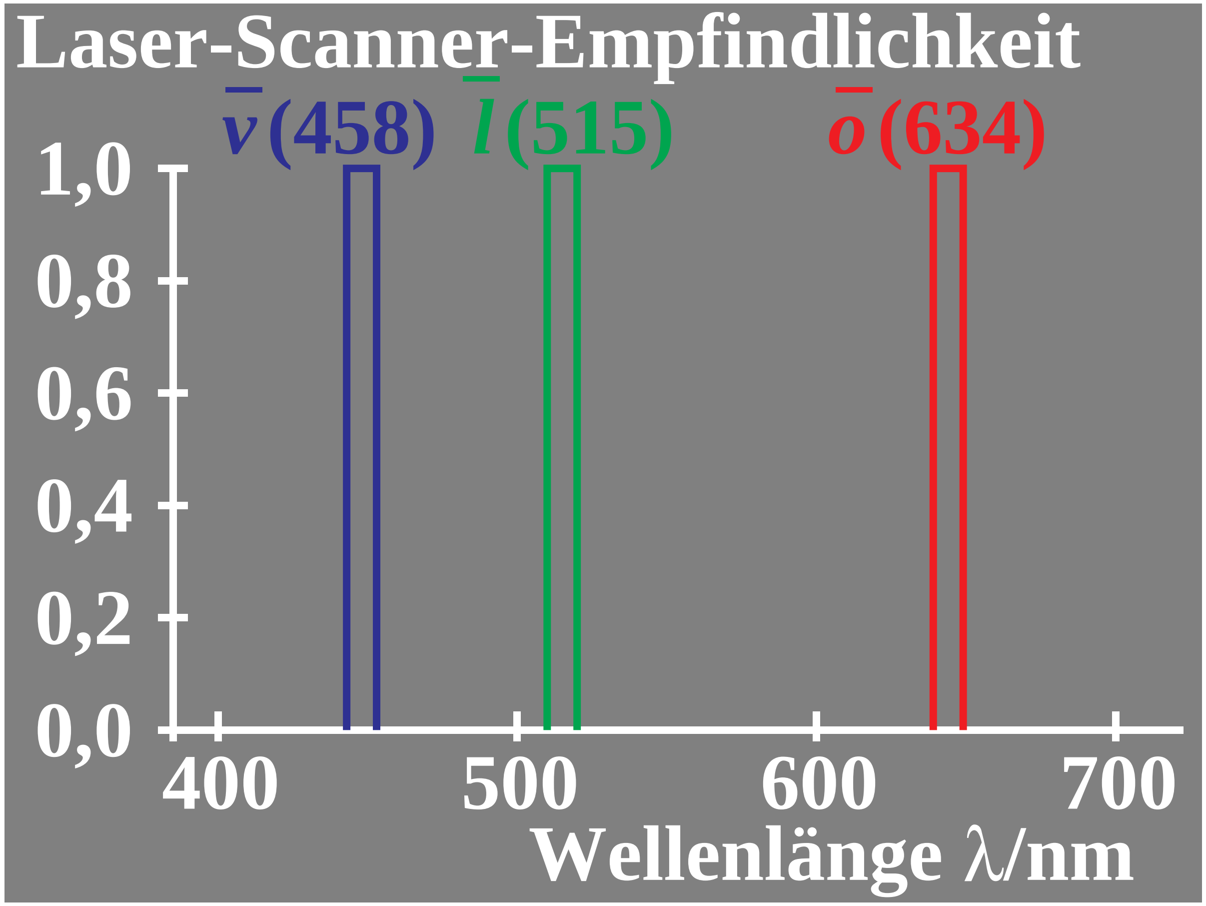
Reproduktionsmodell: Rasterverbreiter.

Druckfarben: Euroskala, ...

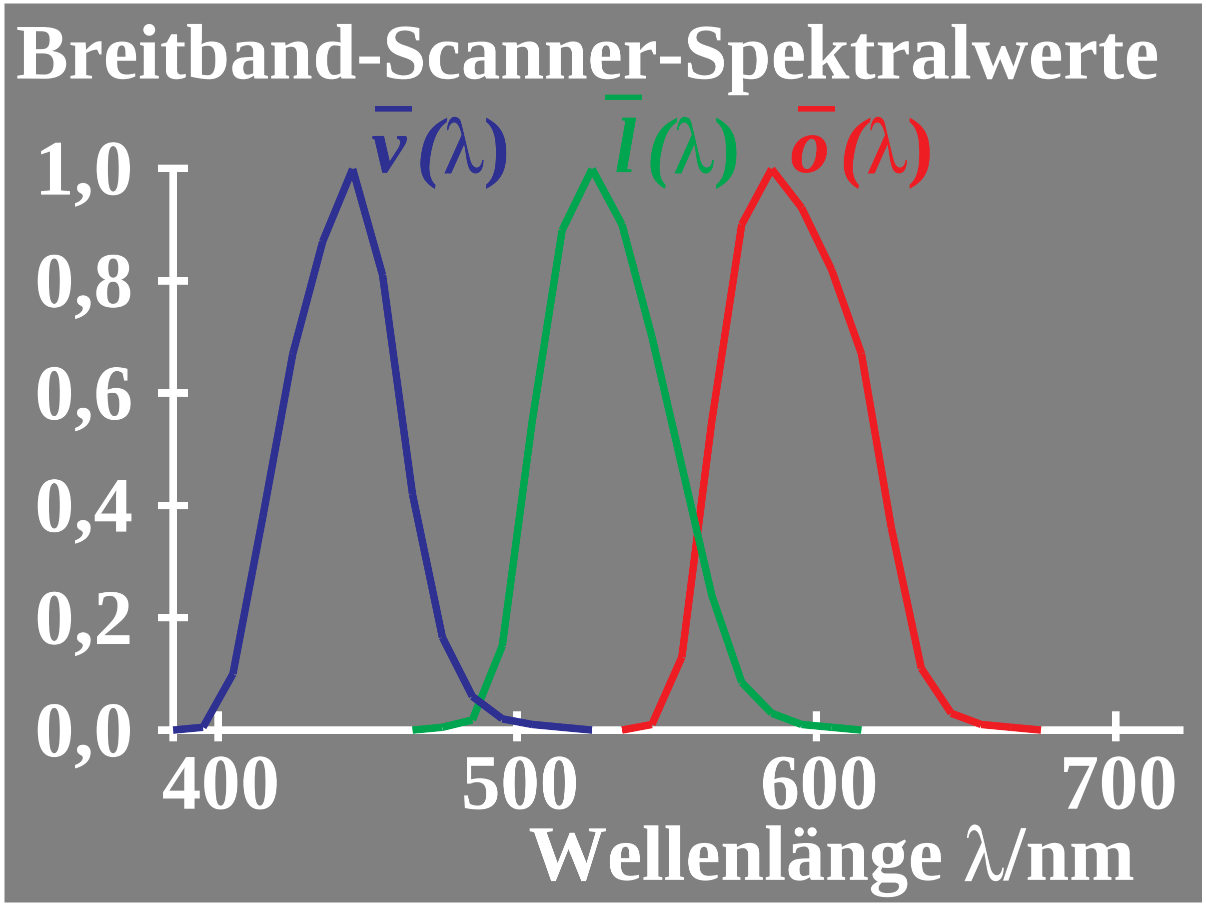
G8690_2f.eps, G0371_2f.eps, G6_21f.eps, Bild 6_21



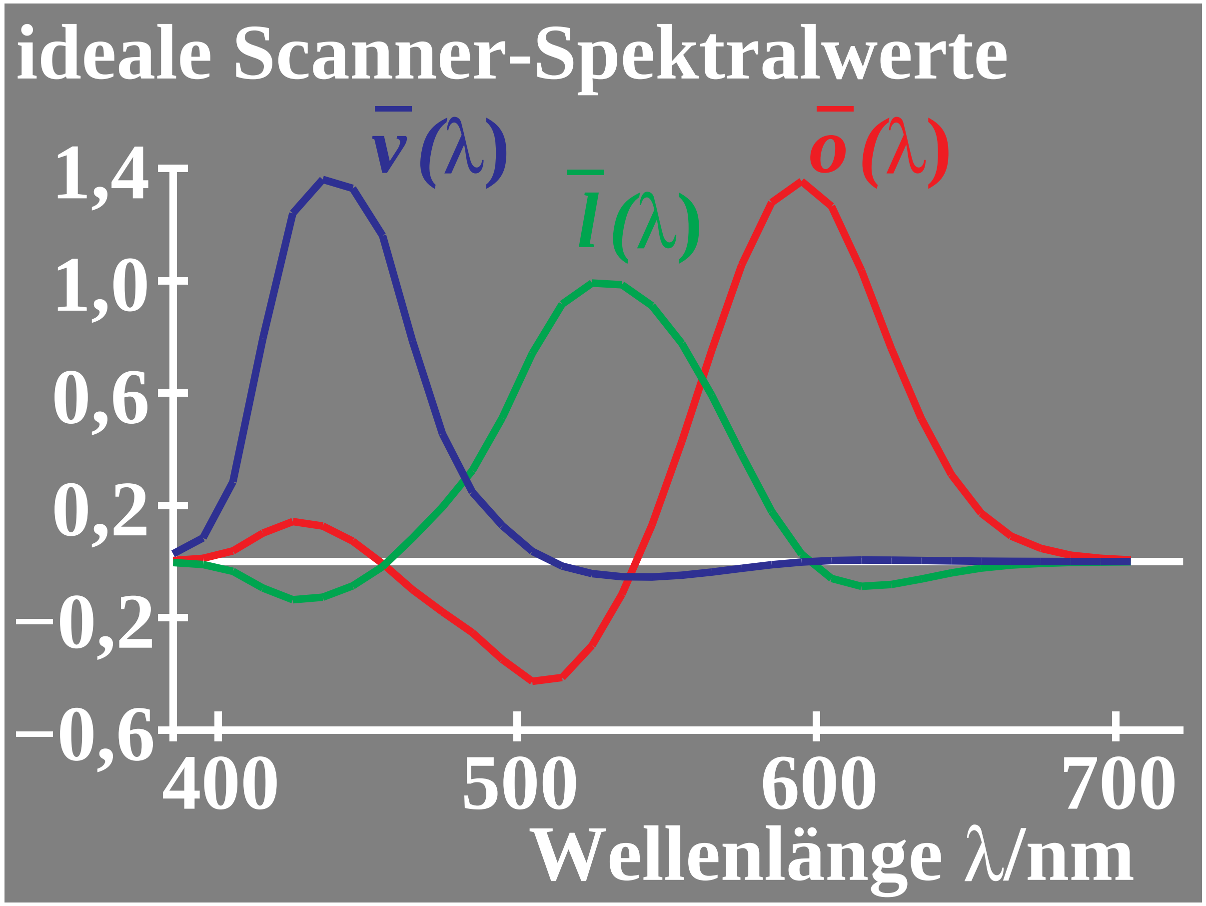
G8680_3f.eps, G0371_3f.eps, G6_22f.eps, Bild 6_22



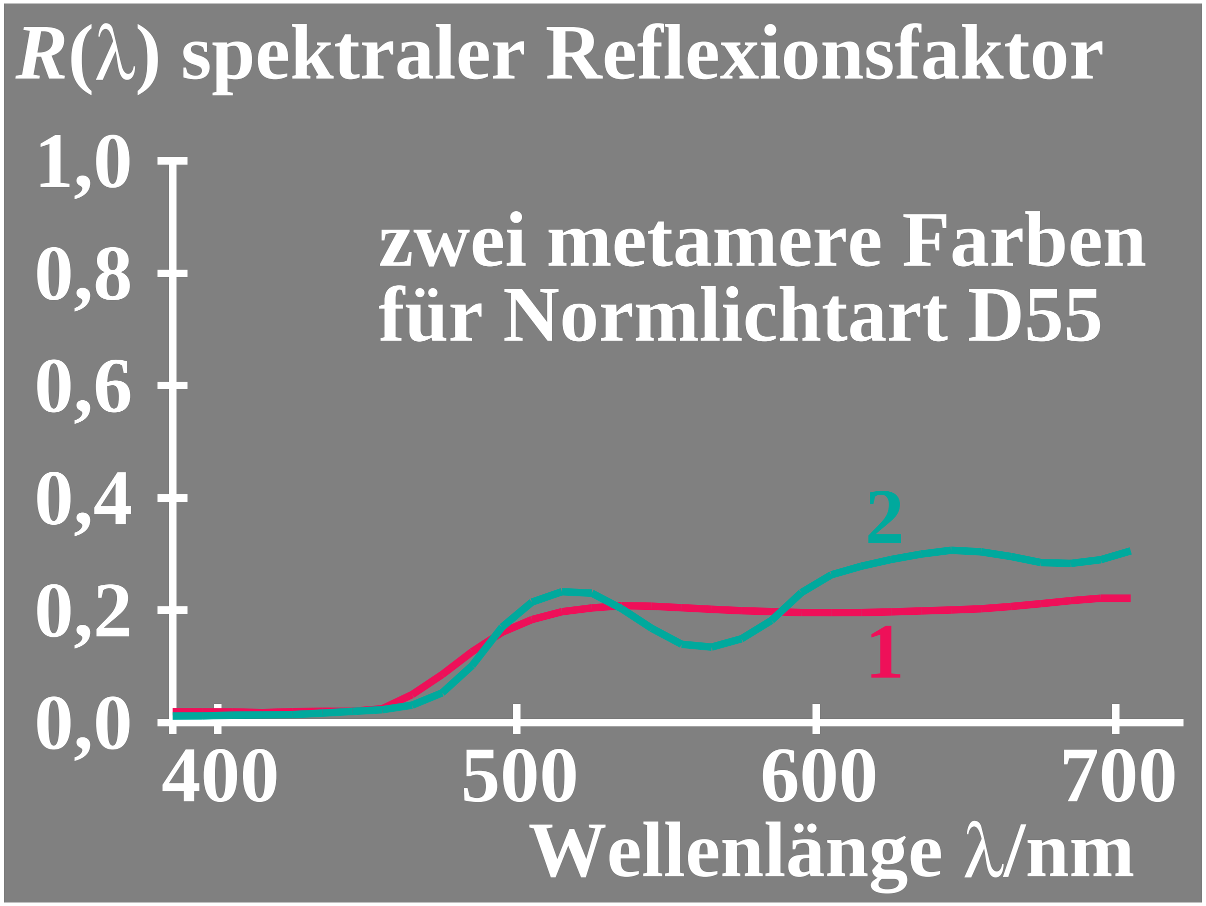
G8680_4f.eps, G0371_4f.eps, G6_23f.eps, Bild 6_23



G8680_5f.eps, G0371_5f.eps, G6_24f.eps, Bild 6_24



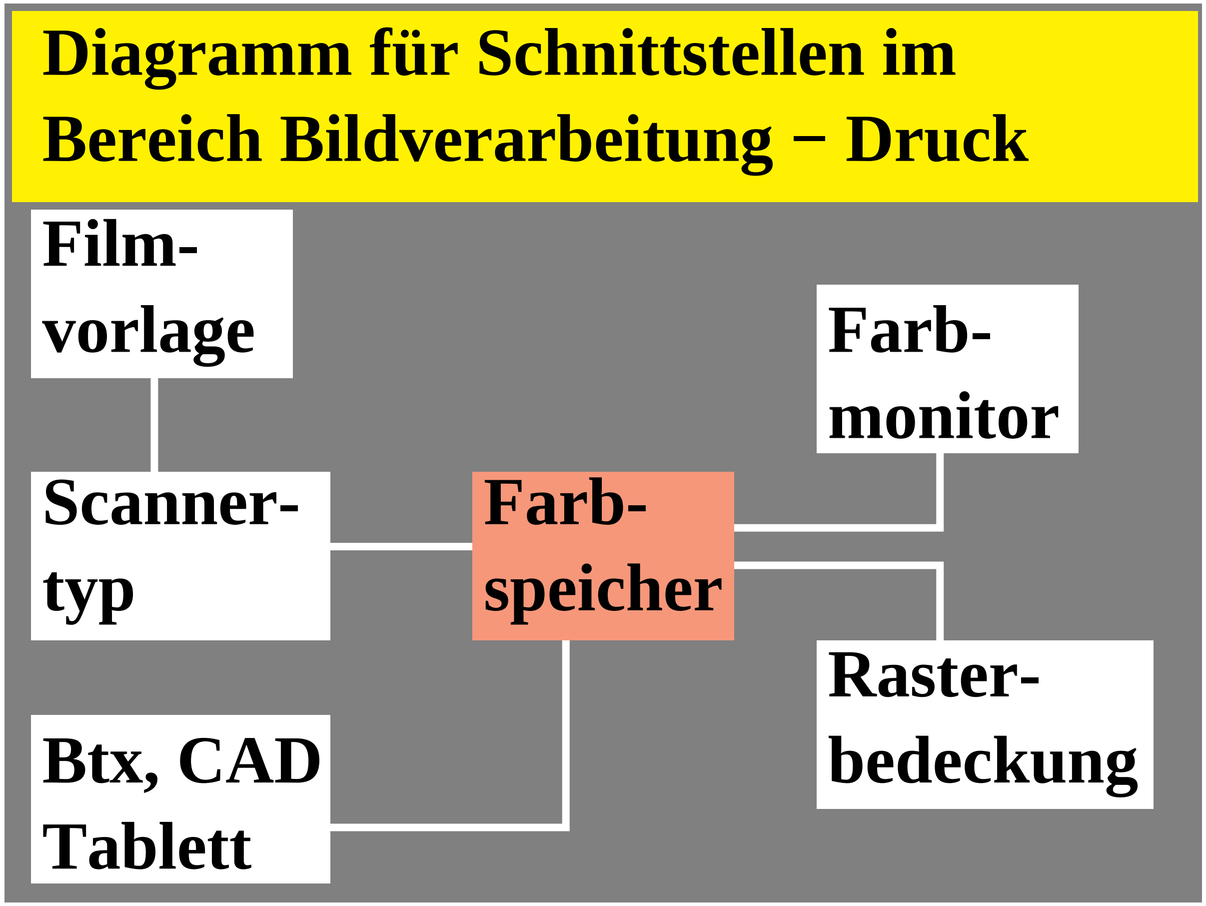
G8680_6f.eps, G0371_6f.eps, G6_25f.eps, Bild 6_25



G8680_7f.eps, G0371_7f.eps, G6_26f.eps, Bild 6_26

Farbwiedergabe-Index R_i der metameren BAM-Scanner-Testfarbe			
Scanner	**TF 1**	**Farbwieder-gabe-Index**	**Farbab-stand**
Breitband	**1**	**82**	**3**
	2	**84**	
Laser	**1**	**63**	**10**
	2	**69**	
idealer	**1**	**100**	**0**
	2	**100**	
D55, Farbjustierung leeres Bildfenster			

G8690_3f.eps, G0371_8f.eps, G6_27f.eps, Bild 6_27



G8690_1f.eps, G0380_1f.eps, G6_28f.eps, Bild 6_28

Empfindungs−Stufungsfunktionen

Helligkeit L^* und Hellbezugswert Y

Adaptation auf Umgebung Weiß:

$$L^* = 100\ (Y\ /\ 100\ )^{1/2,0}$$

Adaptation auf Umgebung Grau:

$$L^* = 100\ (Y\ /\ 100\ )^{1/2,4}$$

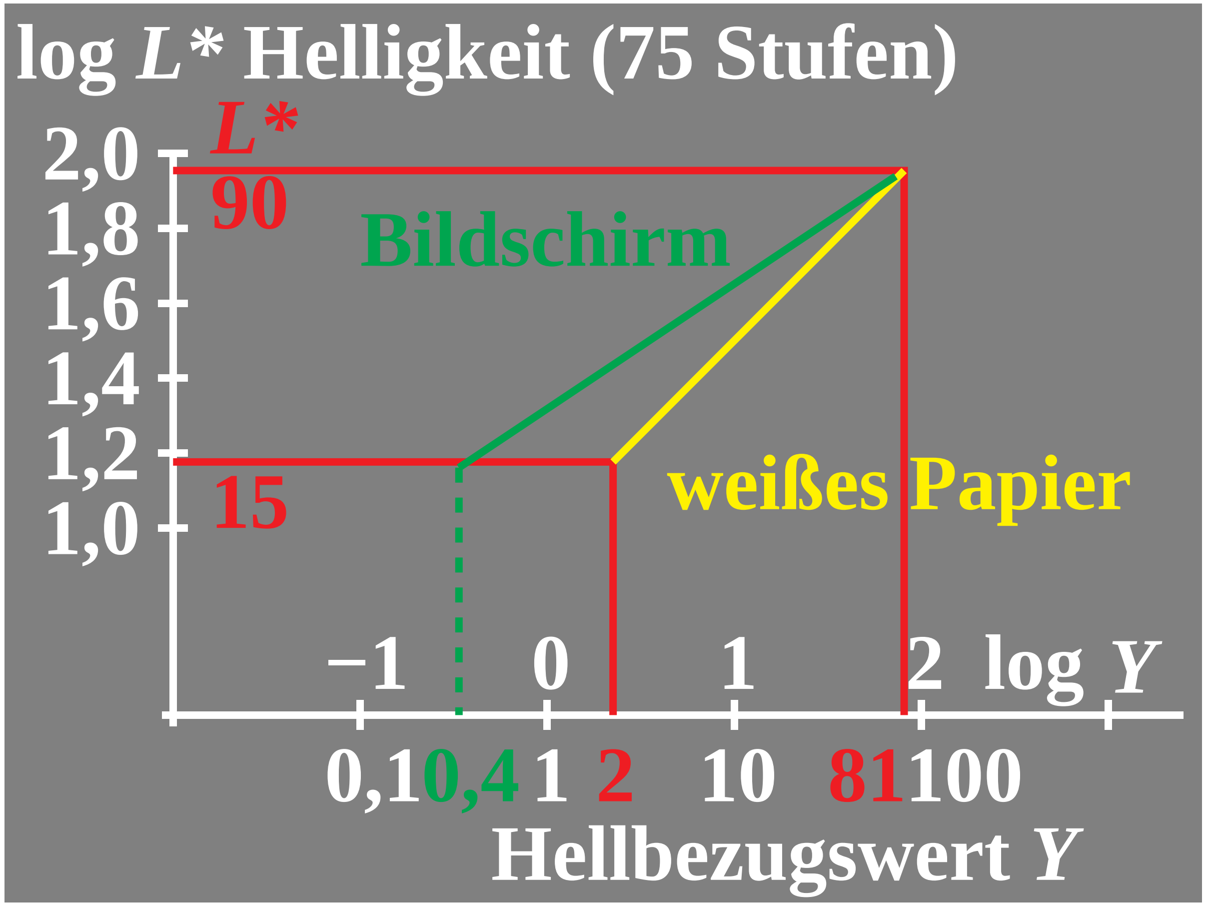
Beschreibung durch CIELAB 1976:

$$L^* = 116\ (Y\ /\ 100\ )^{1/3,0} - 16$$

Adaptation auf Umgebung Schwarz:

$$L^* = 100\ (Y\ /\ 100\ )^{1/3,0}$$

G8691_1f.eps, G0380_2f.eps, G6_29f.eps, Bild 6_29



G8691_2f.eps, G0380_3f.eps, G6_30f.eps, Bild 6_30

Farbheit		Hellbezugswert Y			
N^*	L^*	$Y = (L^*/10)^2$		$Y = (L^*/10)^3 / 9$	
0	90	81	Y_{max}	81,0	Y_{normiert}
2	80	64		56,9	$(=Y_{\mathrm{Papier}})$
4	70	49		38,1	
6	60	36		24,0	
8	50	25		13,9	
10	40	16		7,1	
12	30	9		3,0	
14	20	4		0,9	
15	15	2,25	Y_{min}	0,4	

G8691_3f.eps, G0380_4f.eps, G6_31f.eps, Bild 6_31

Linear-Scan-Bereich *Y*	Helligkeits-Bereich *L**	Farbheit *L**	*h**	Farb-Nr. *d*
76,6 ... 85,5	87,5 ... 92,4	90	FFF	4095
60,1 ... 68,1	77,5 ... 82,4	80	DDD	3549
45,6 ... 52,5	67,5 ... 72,4	70	BBB	3003
33,1 ... 39,0	57,5 ... 62,4	60	999	2457
22,6 ... 27,5	47,5 ... 52,4	50	777	1911
14,1 ... 18,0	37,5 ... 42,4	40	555	1365
7,6 ... 10,5	27,5 ... 32,4	30	333	819
3,1 ... 5,0	17,5 ... 22,4	20	111	273
1,6 ... 3,0	12,5 ... 17,4	15	000	0

G8691_4f.eps, G0380_5f.eps, G6_32f.eps, Bild 6_32

Farbheit O^* L^* V^*	Schwarzheit N^*	Hellbezugswert Y	Bedeckung b
15,15,15	0	81 Y_{max}	0,00
13,13,13	2	64	0,22
11,11,11	4	49	0,41
9, 9, 9	6	36	0,57
7, 7, 7	8	25	0,71
5, 5, 5	10	16	0,83
3, 3, 3	12	9	0,91
1, 1, 1	14	4	0,98
0, 0, 0	15	2,25 Y_{min}	1,00

G8681_5f.eps, G0380_6f.eps, G6_33f.eps, Bild 6_33

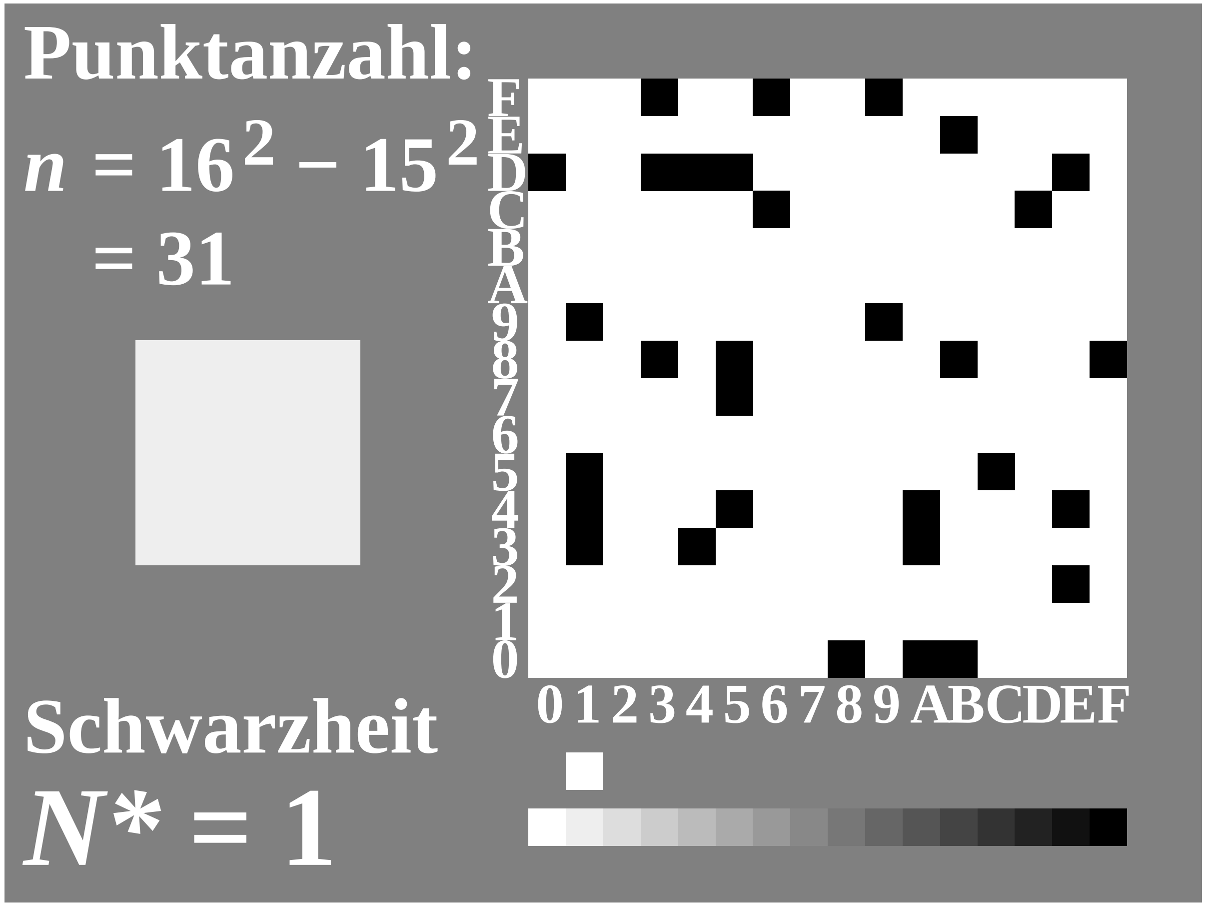
Farbheit $O^*\ L^*\ V^*$	Gelbheit Y^*	Hellbezugswert Y	Bedeckung b
15,15,15	0	81 Y_{max}	0,00
15,15,13	2		0,22
15,15,11	4		0,41
15,15, 9	6		0,57
15,15, 7	8		0,71
15,15, 5	10		0,83
15,15, 3	12		0,91
15,15, 1	14		0,98
15,15, 0	15	76 Y_{min}	1,00

G8691_6f.eps, G0380_7f.eps, G6_34f.eps, Bild 6_34

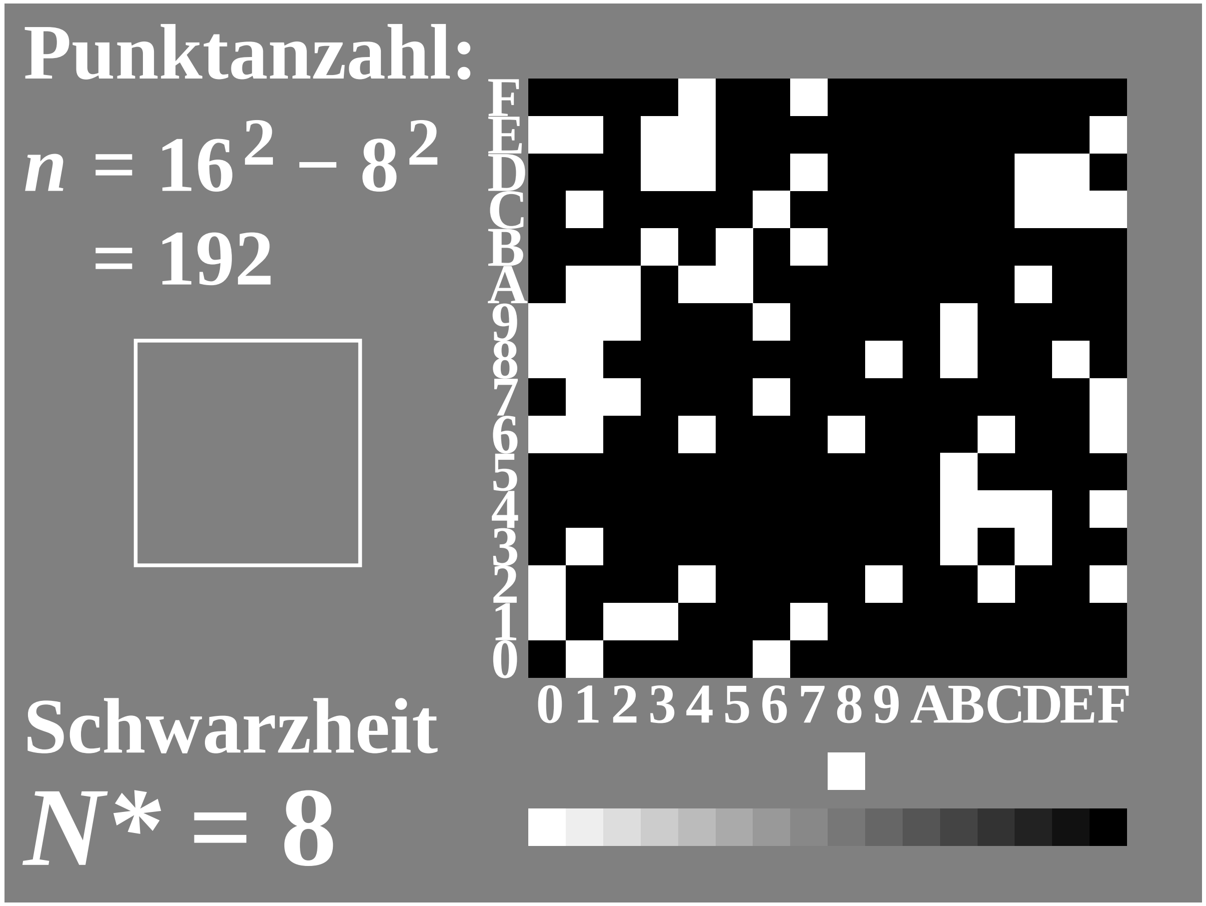
Schnittstellen im Bereich:
Farbfilmvorlage − Farbscanner −
Farbspeicher − Rasterflächendeckung

1. **Farbscanner mit Farbmessung**
   Empfindlichkeiten = Spektralwerte
2. **Minimum 12-Bit Farbbildspeicher**
   erzeugt kubische Bildschirm- und
   quadratische Rasterflächen-Kennlinie
3. **Minimum 8-Bit Auflösung für**
   lineare lichtelektrische Empfänger

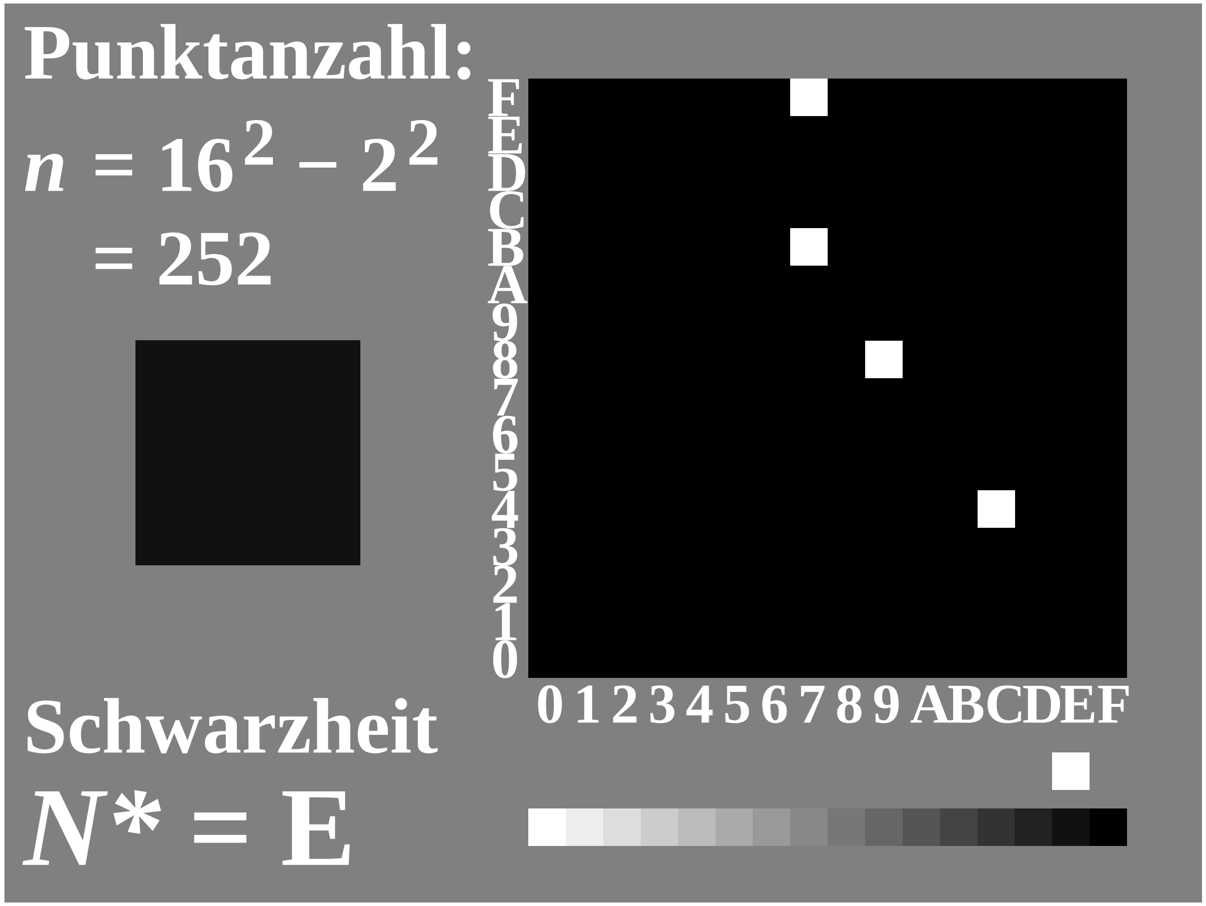
G8690_4f.eps, G0380_8f.eps, G6_35f.eps, Bild 6_35



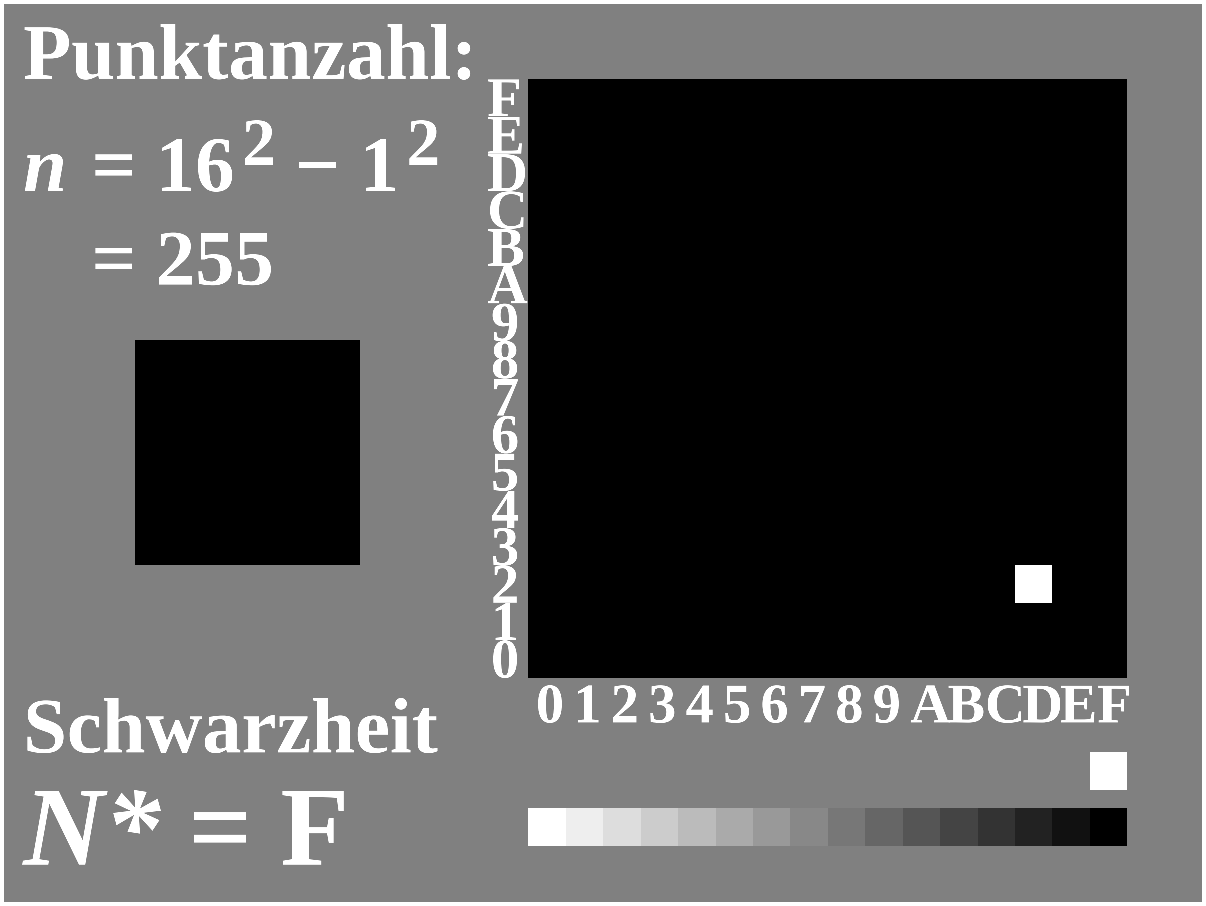
G8990_2f.eps, G0381_1f.eps, G6_36_1f.eps, Bild 6_36_1



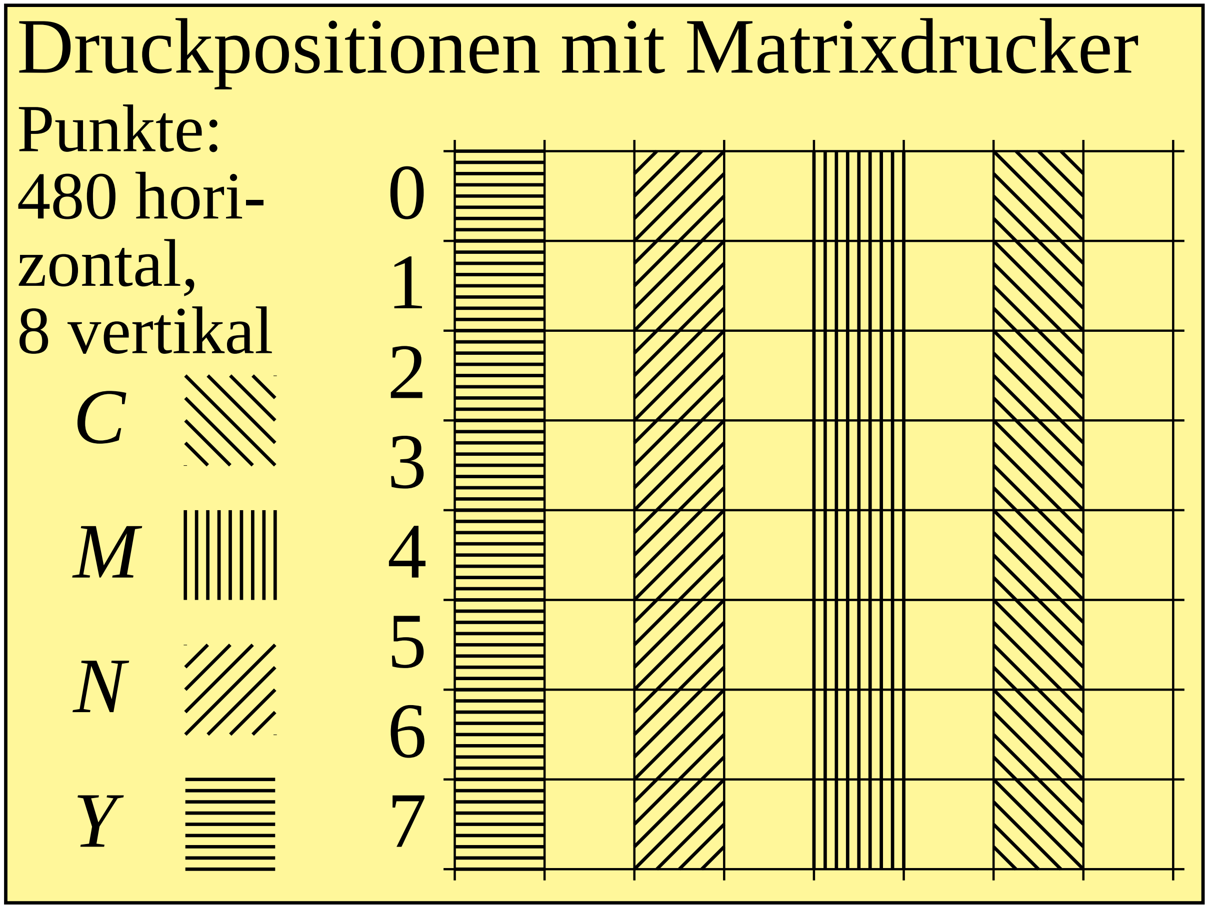
G8991_1f.eps, G0381_2f.eps, G6_36_2f.eps, Bild 6_36_2



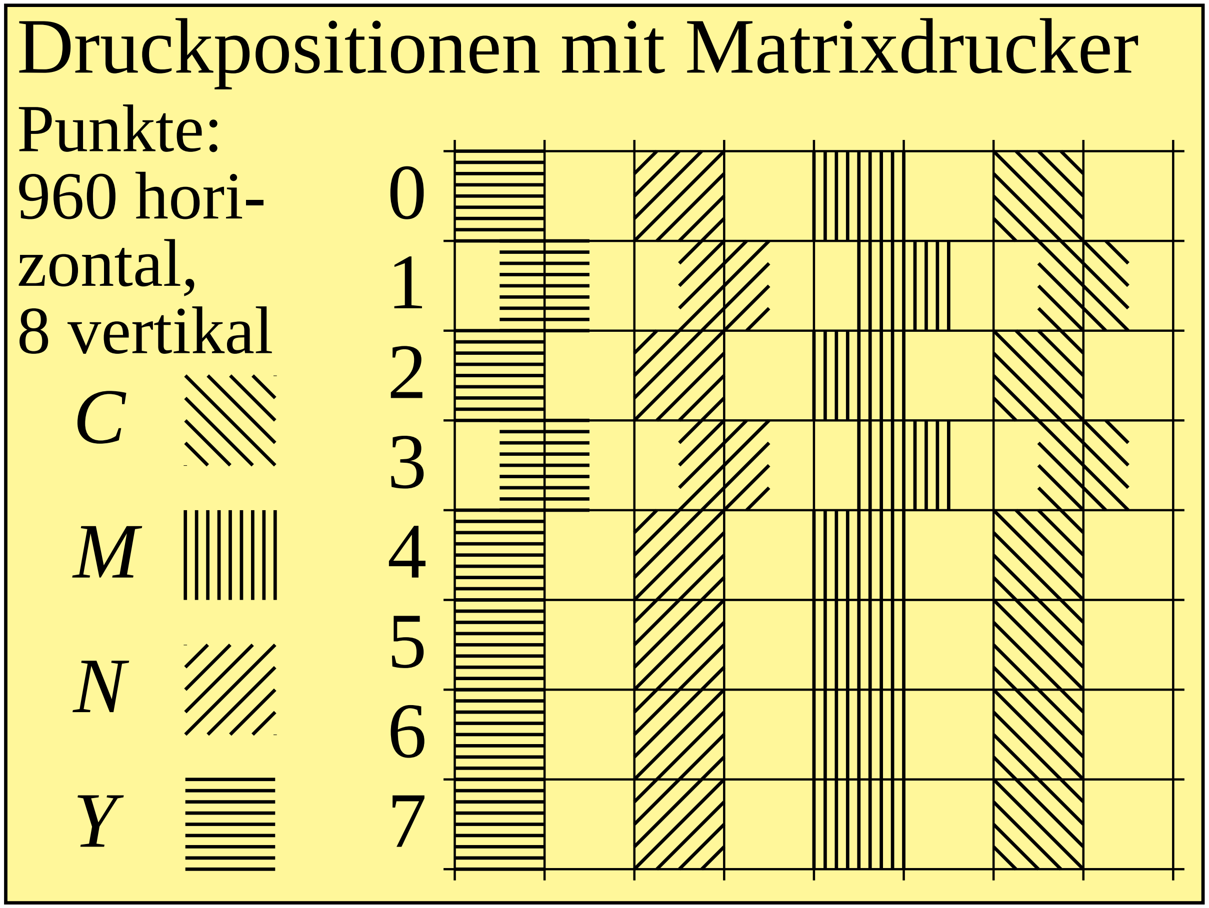
G8991_7f.eps, G0381_3f.eps, G6_36_3f.eps, Bild 6_36_3



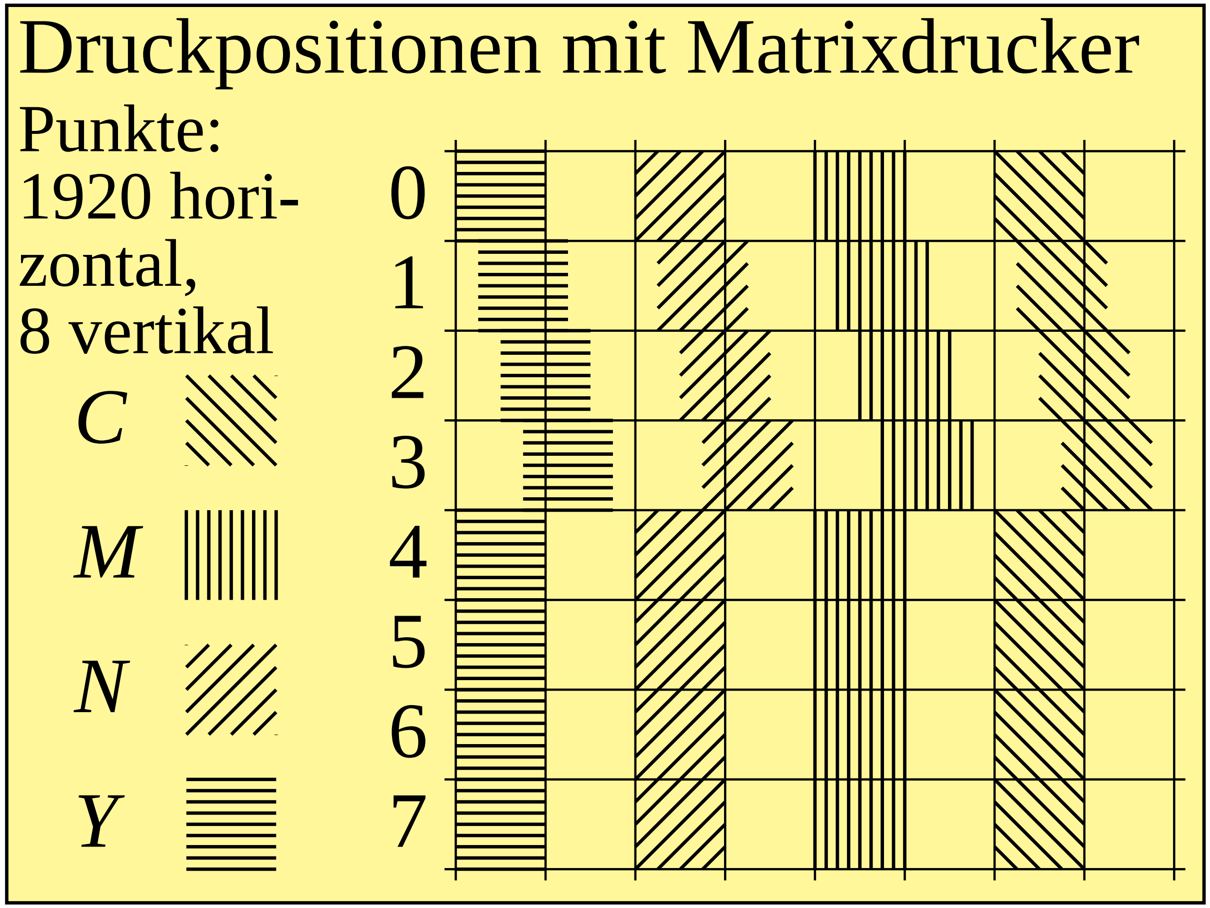
G8991_8f.eps, G0381_4f.eps, G6_36_4f.eps, Bild 6_36_4



G8340_3f.eps, G0381_5f.eps, G7_01f.eps, Bild 7_1



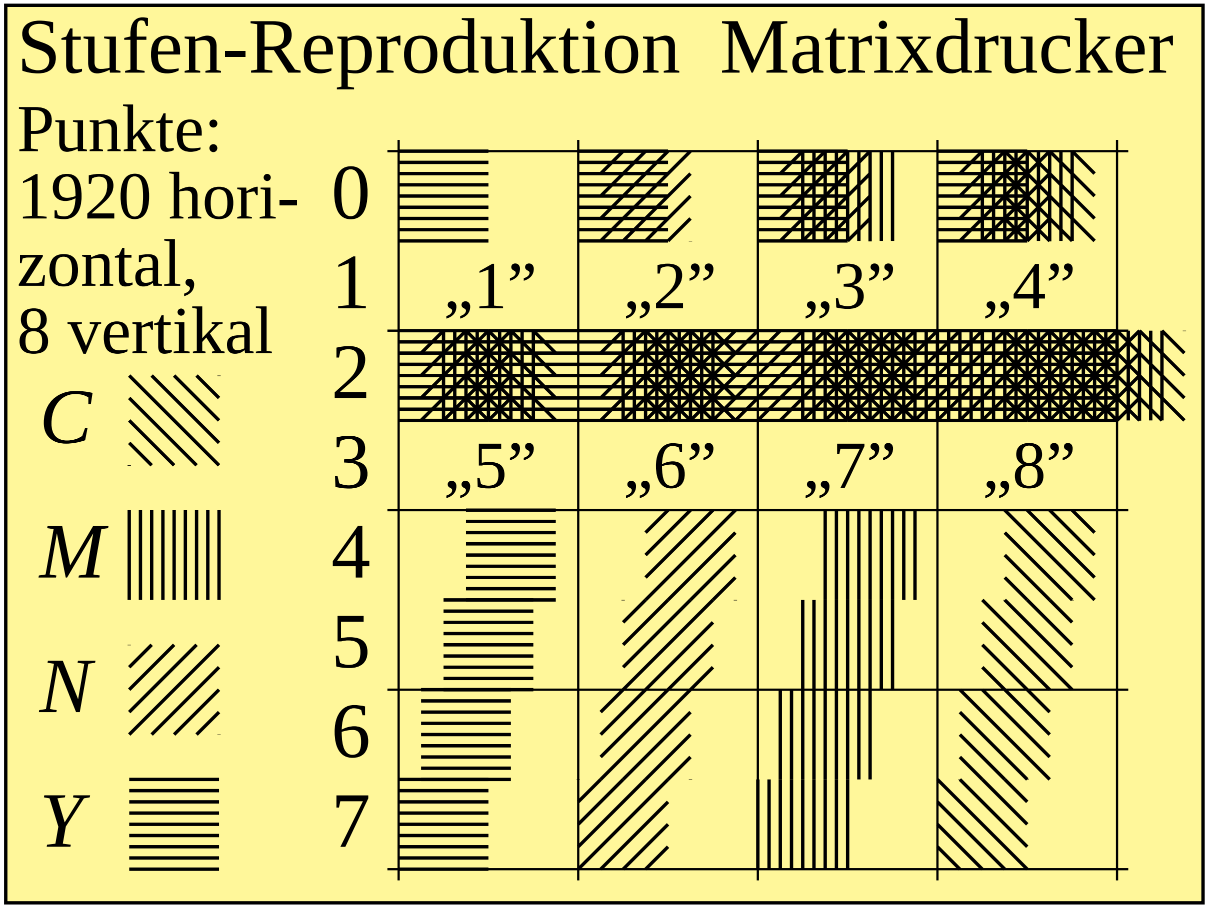
G8340_4f.eps, G0381_6f.eps, G7_02_1f.eps, Bild 7_2_1



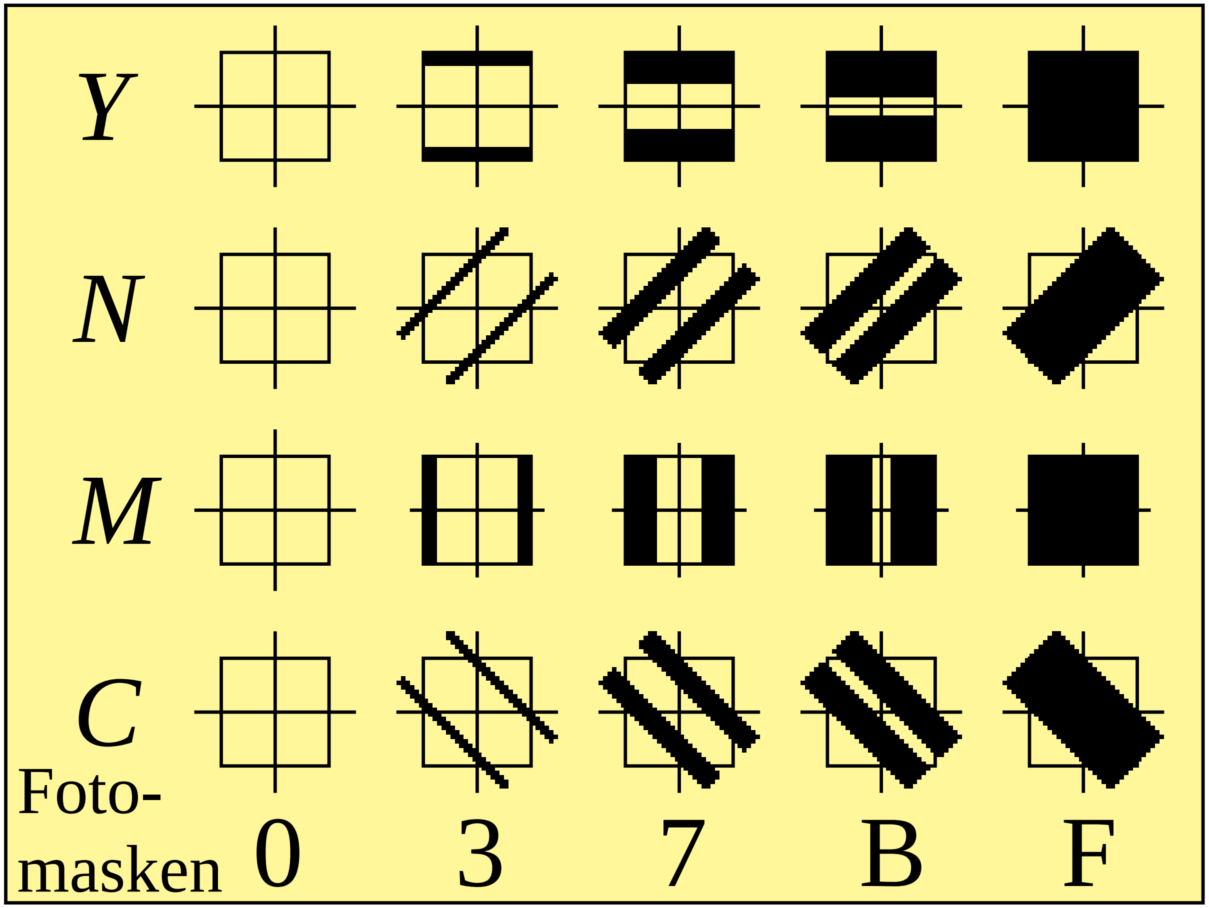
G8340_5f.eps, G0381_7f.eps, G7_02_2f.eps, Bild 7_2_2

Farbheit $O^*\ L^*\ V^*$	Schwarz-heit N^*	Hellbezugs-wert Y	Bedek-kung b
15,15,15	0	81 Y_{max}	0,00
13,13,13	2	64	0,22
11,11,11	4	49	0,41
9, 9, 9	6	36	0,57
7, 7, 7	8	25	0,71
5, 5, 5	10	16	0,83
3, 3, 3	12	9	0,91
1, 1, 1	14	4	0,98
0, 0, 0	15	2,25 Y_{min}	1,00

G8691_5f.eps, G0381_8f.eps, G7_03f.eps, Bild 7_3

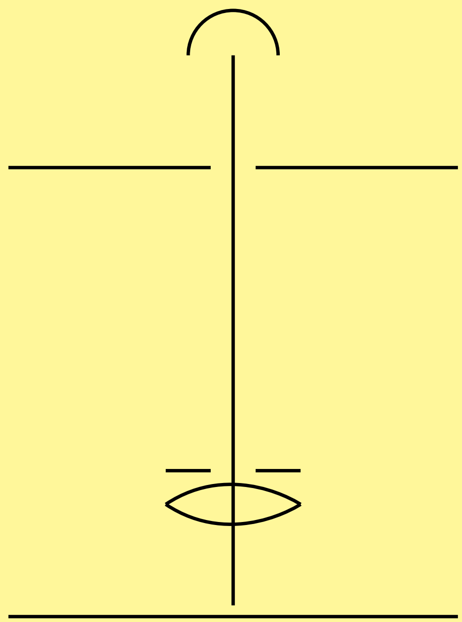


G8340_6f.eps, G0391_2f.eps, G7_04f.eps, Bild 7_4

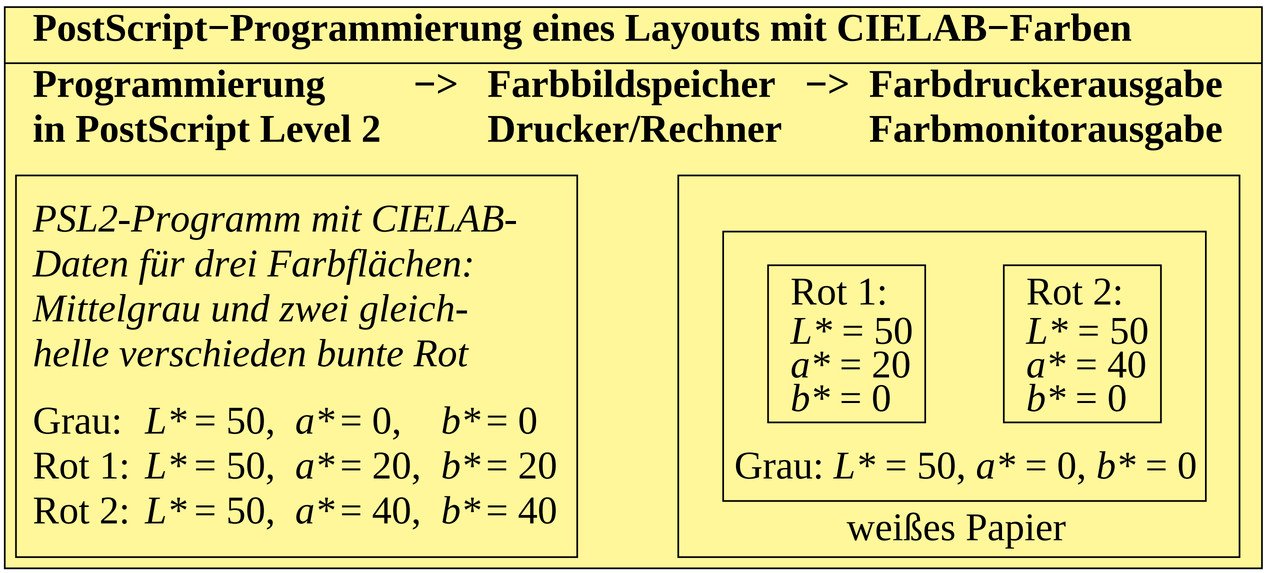


G8340_2f.eps, G0391_3f.eps, G7_05f.eps, Bild 7_5

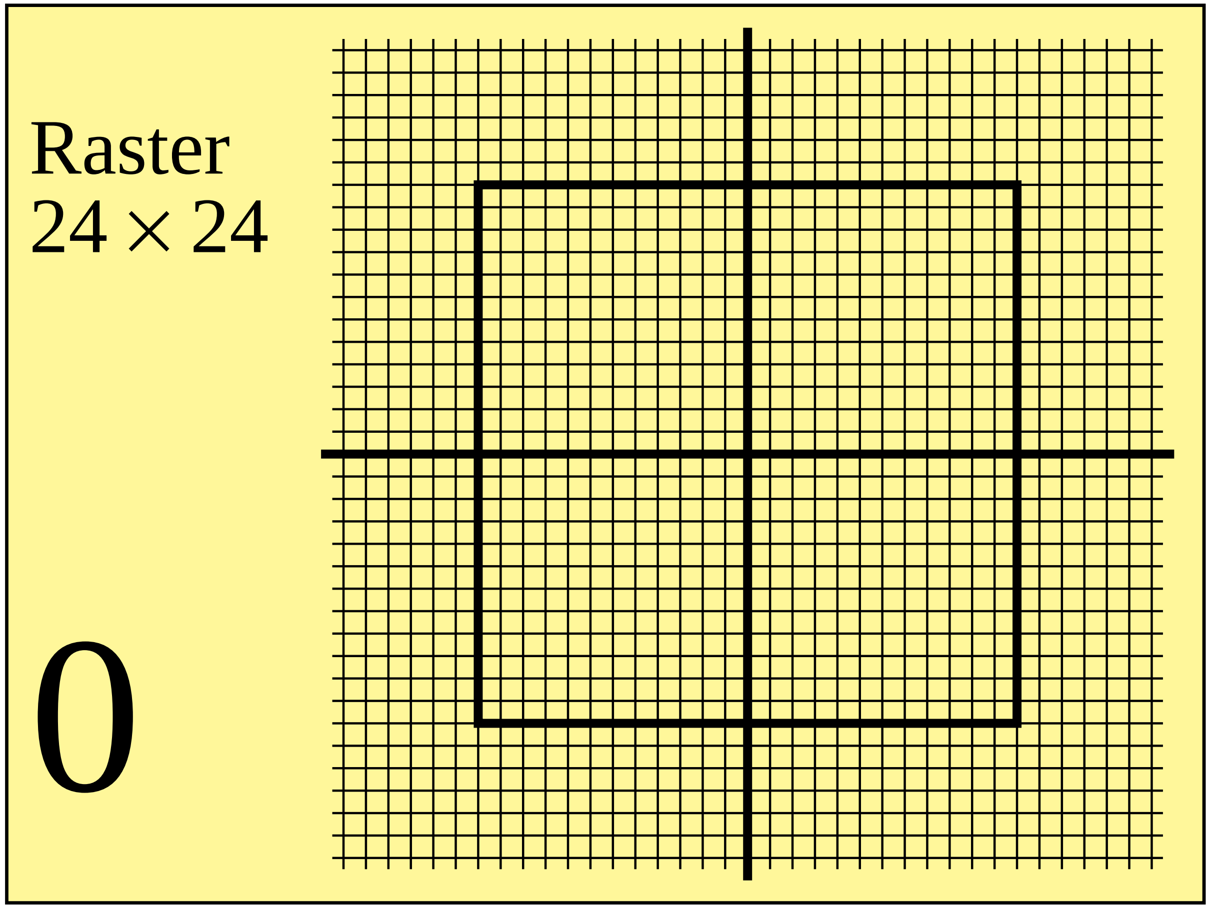
optischer Aufbau: Filmbelichter



G8321_7f.eps, G0391_4f.eps, G7_06f.eps, Bild 7_6



G7330_3f.eps, G0391_7f.eps, G8_01f.eps, Bild 8_1 2x1,5 D−>F



G8321_8f.eps, G0410_1f.eps, G8_02f.eps, Bild 8_2

PSL1-Programmcode: Raster 24×24 mit Linien horizontal, vertikal und Text

```
%!PS-Adobe-3.0 B8321-8n.eps 20.10.94
%%BoundingBox: 72 90 226 206
/FS {findfont exch scalefont setfont} bind def
/MM {72 25.4 div mul} def     %Umrechnung Inch -> mm
%%EndProlog

%Nullpunkt Bounding-Box
 72 90 translate

% Einheiten in 0,01 mm und Rahmen 5,4cm x 4,0cm
0.01 MM 1.5 mul 0.01 MM 1.5 mul scale
15 setlinewidth
 0 0  moveto 5400 0 rlineto 0 4000 rlineto
            -5400 0 rlineto closepath stroke

%Text und Zeichnen
 10 setlinewidth 350 /Times-Roman FS
 100 3250 moveto (Raster) show
 100 2900 moveto (24x24) show
 1000 /Times-Roman FS 100 500 moveto (0) show

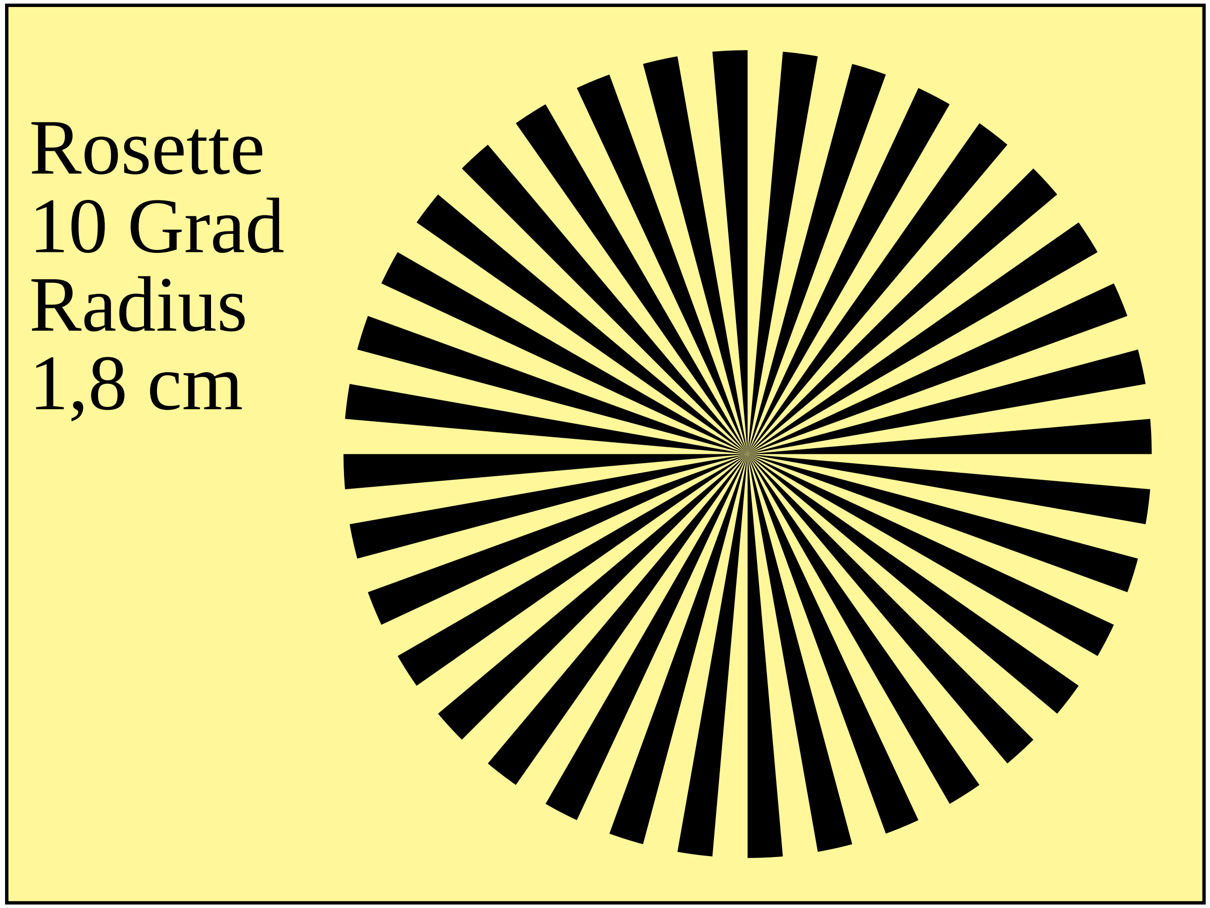
% neuer Rastermittelpunkt und Nullpunkt
  3300 2000 translate

% 36 Linien horizontal und vertikal
 -1800 100 1800 {dup -1850 moveto 1850 lineto} for stroke
 -1800 100 1800 {dup -1850 exch moveto 1850 exch lineto}
                for stroke

% fetteres Quadrat und Nullkreuz
    40 setlinewidth
 -1200 -1200 moveto 2400    0 rlineto    0 2400 rlineto
                   -2400    0 rlineto closepath stroke
 -1900     0 moveto 3800    0 rlineto stroke
     0 -1900 moveto    0 3800 rlineto stroke

showpage
```

G8323_8f.eps, G0410_7f.eps, G8_03f.eps, Bild 8_3 2x3



G8260_5f.eps, G0410_2f.eps, G8_04f.eps, Bild 8_4

PSL1-Teilprogrammcode: Text und Zeichnen Rosette (Siemensstern)

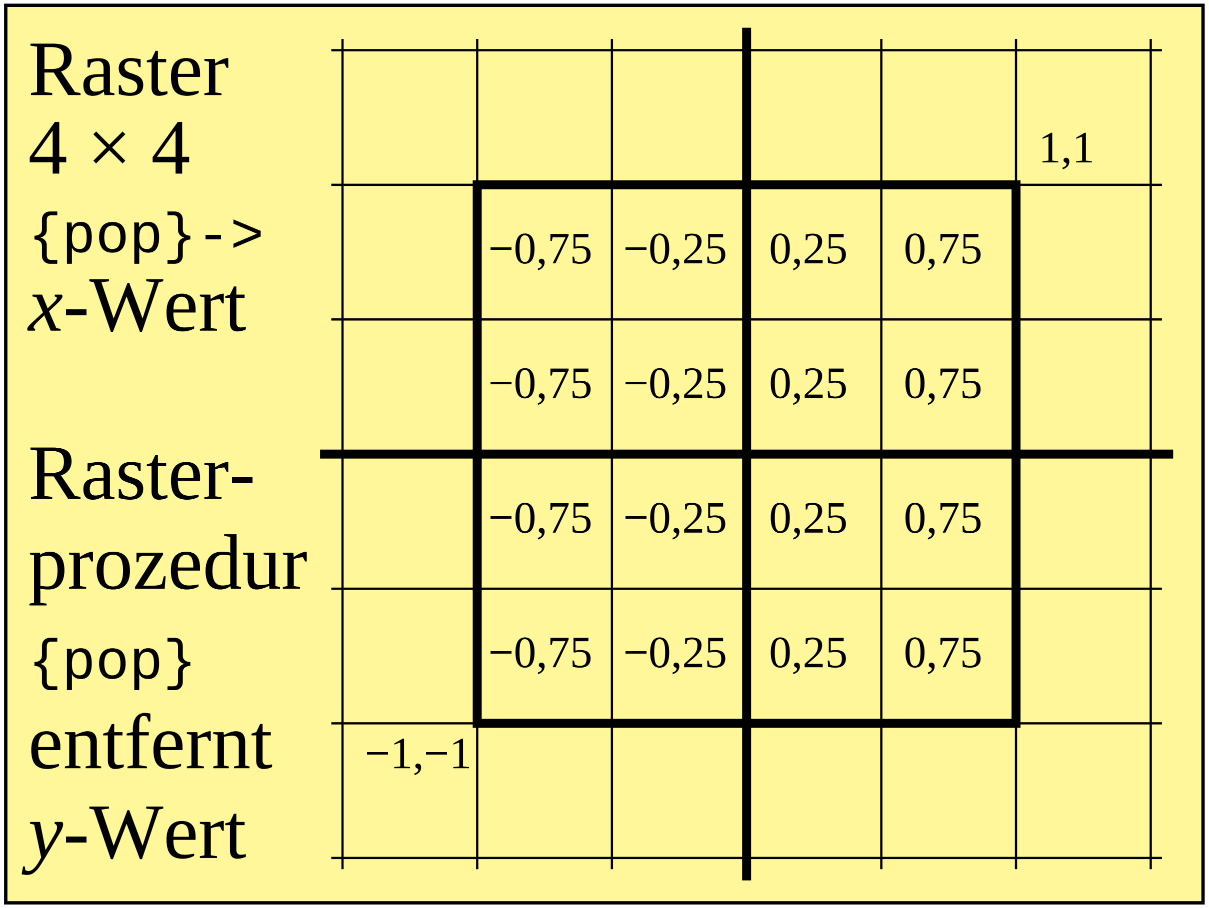
```
    10 setlinewidth
   350 /Times-Roman FS
   100 3250 moveto (Rosette) show
   100 2900 moveto (10 Grad) show
   100 2550 moveto (Radius) show
   100 2200 moveto (1,8 cm) show

 %neuer Rastermittelpunkt und Nullpunkt
   3300 2000 translate

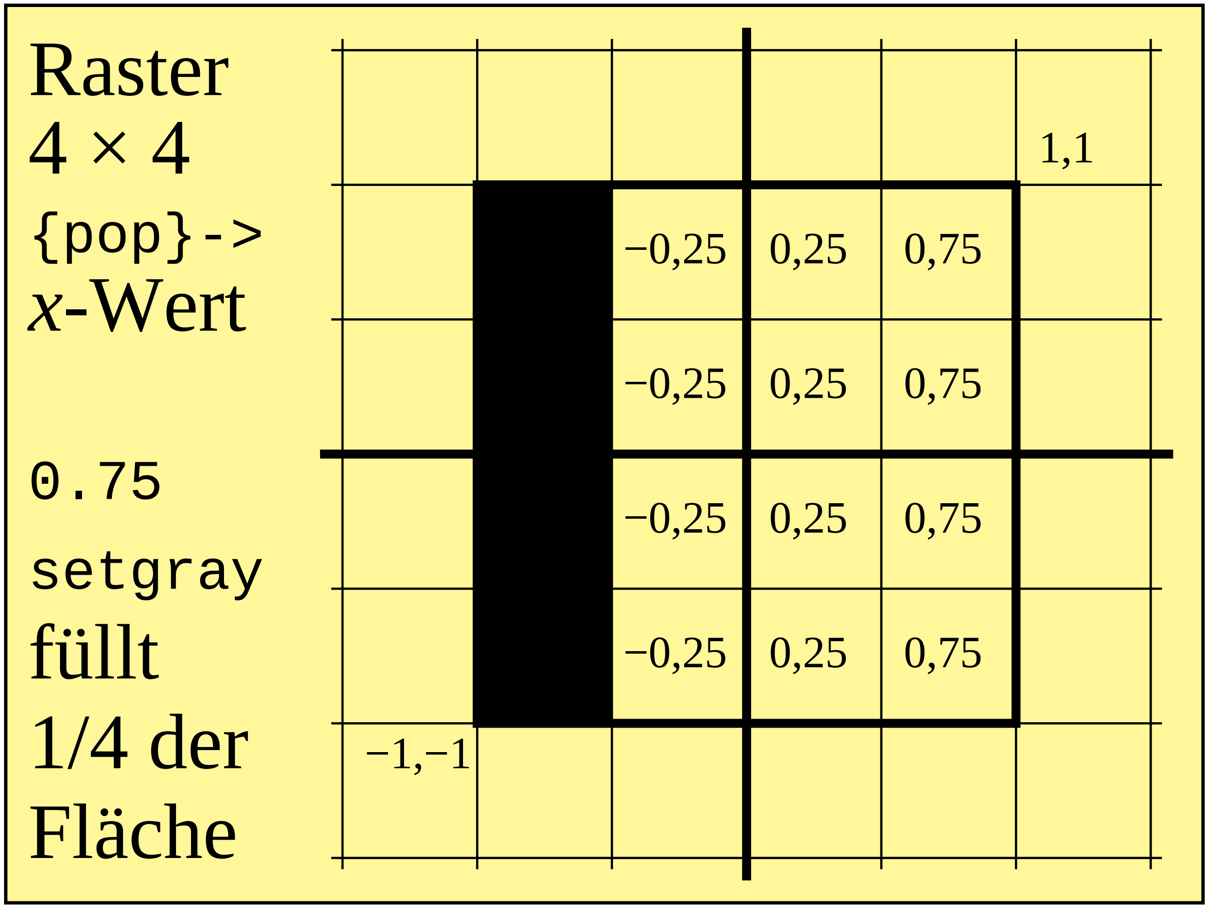
 %Zeichnen der Rosette, Radius 1,8 cm
  0.0 setgray
  0 10 350 {newpath 0 0 moveto 0 0 1800
  4 -1 roll dup 5 add  arc closepath fill} for

 showpage
```

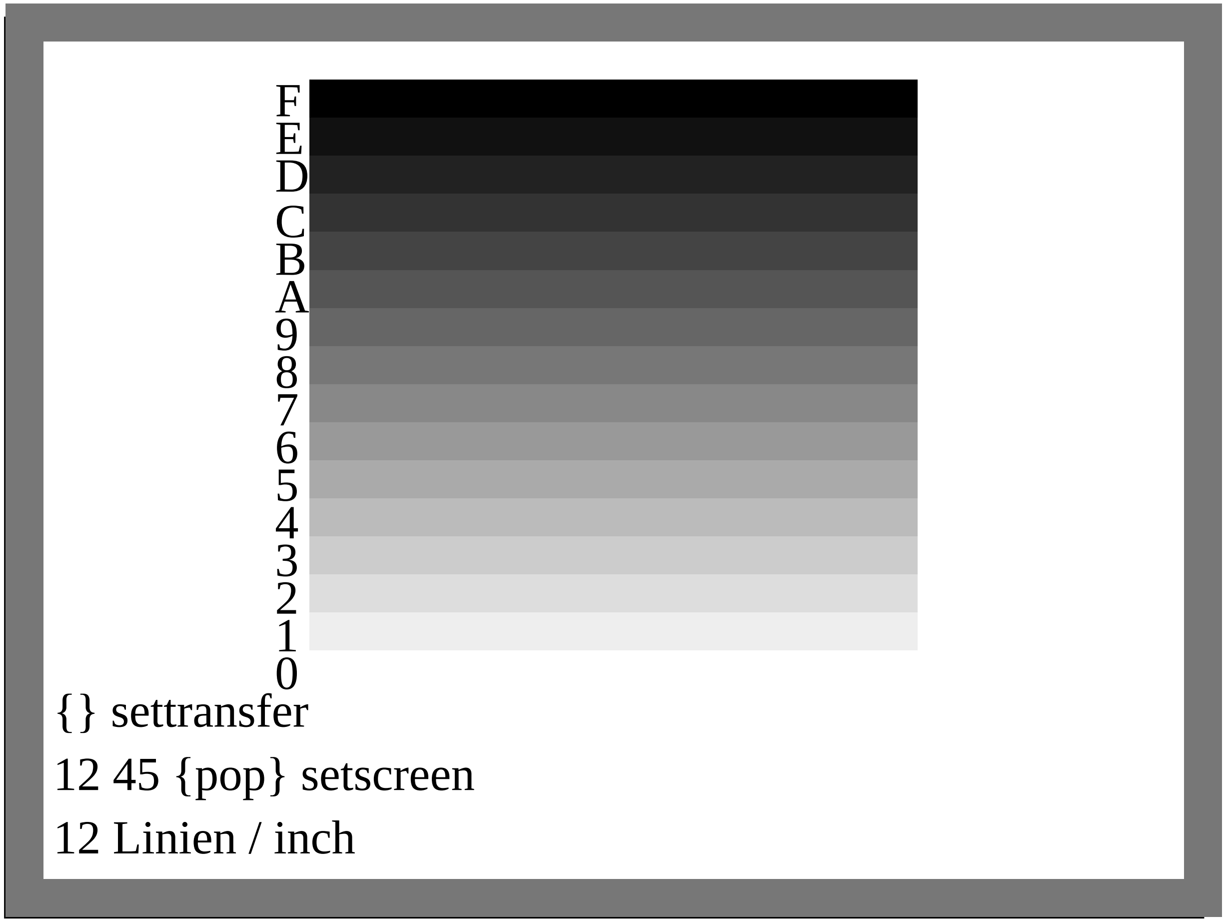
G8262_5f.eps, G0411_3f.eps, G8_05f.eps, Bild 8_5 2x2



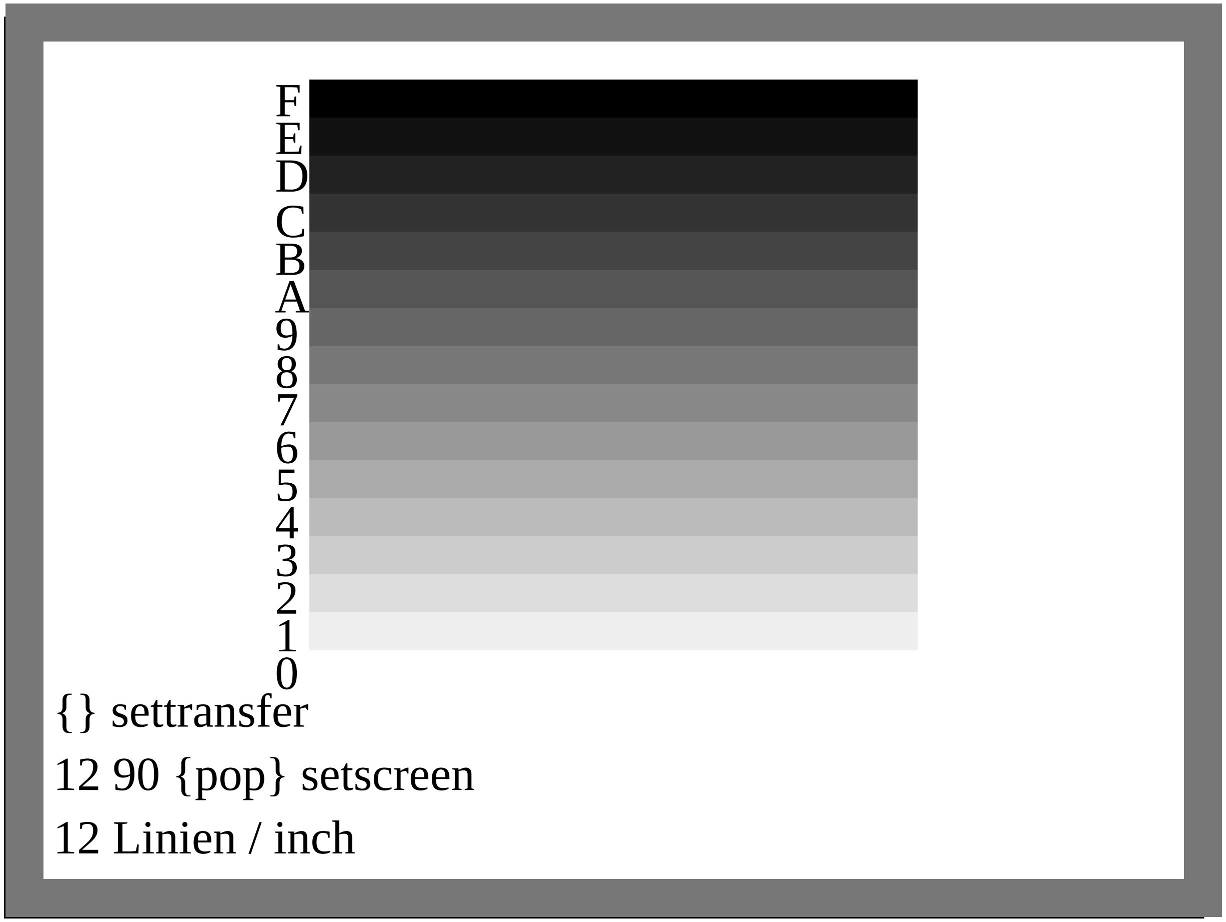
G8340_7f.eps, G0411_5f.eps, G8_06_1f.eps, Bild 8_6_1



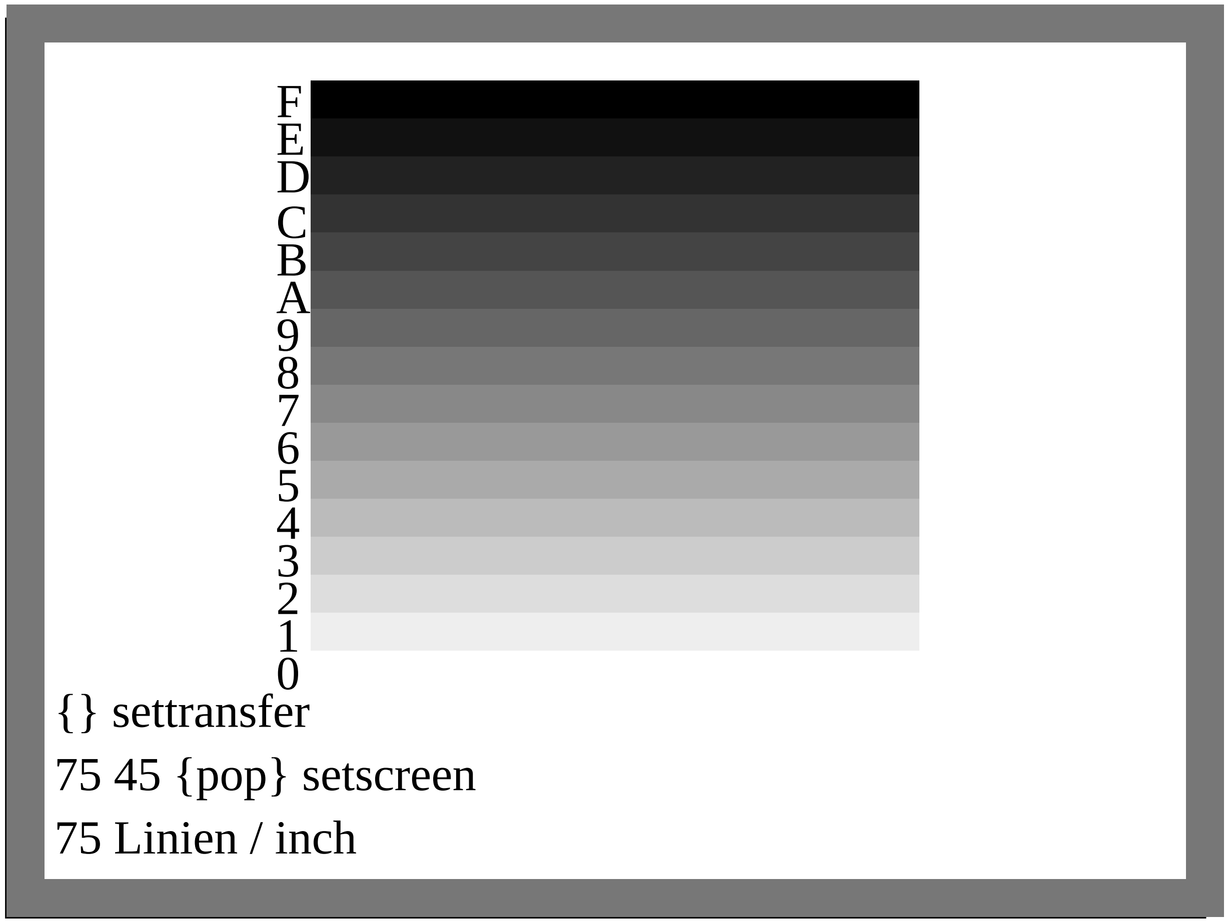
G8340_8f.eps, G0411_6f.eps, G8_06_2f.eps, Bild 8_6_2



G8250_1f.eps, G0411_7f.eps, G8_07_1f.eps, Bild 8_7_1 *PDF



G8250_2f.eps, G0411_8f.eps, G8_07_2f.eps, Bild 8_7_2 *PDF



G8251_1f.eps, G0420_1f.eps, G8_07_3f.eps, Bild 8_7_3 *PDF

PSL1-Programmcode: Bildmatrix 32×24 zur Erzeugung von 16 Graustufen

```
%!PS-Adobe-3.0 B8250-1n.eps      20.10.94
%%BoundingBox: 72 90 226 206
/FS {findfont exch scalefont setfont} bind def
/MM {72 25.4 div mul} def
/proz1 {pop} bind def
/proz2 {} bind def
%%EndProlog
gsave

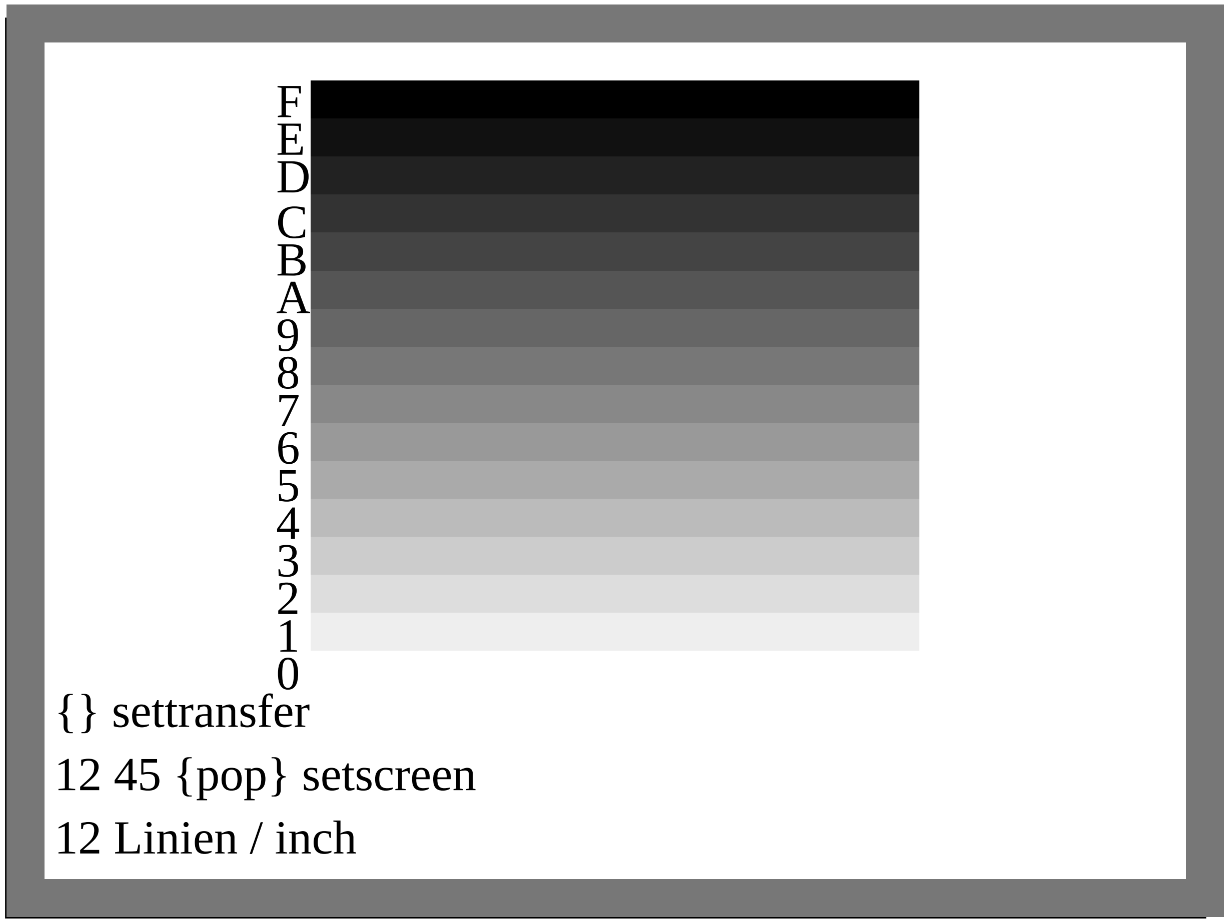
 {proz2 } settransfer
 12 45 {proz1} setscreen
 72 90 translate
 32 3600 div 72 mul 240 mul 4 mul
 24 3600 div 72 mul 240 mul 4 mul scale

/DatenString 16 string def %Bild 32x24 von unten nach oben
 32 24 4 [32 0 0 -24 0 24]
{currentfile DatenString readhexstring pop} image
77777777777777777777777777777777
7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7
7FFFFFFF0000000000000000FFFFFFF7
7FFFFFFF1111111111111111FFFFFFF7
7FFFFFFF2222222222222222FFFFFFF7
7FFFFFFF3333333333333333FFFFFFF7
7FFFFFFF4444444444444444FFFFFFF7
7FFFFFFF5555555555555555FFFFFFF7
7FFFFFFF6666666666666666FFFFFFF7
7FFFFFFF7777777777777777FFFFFFF7
7FFFFFFF8888888888888888FFFFFFF7
7FFFFFFF9999999999999999FFFFFFF7
7FFFFFFFAAAAAAAAAAAAAAAAFFFFFFF7
7FFFFFFFBBBBBBBBBBBBBBBBFFFFFFF7
7FFFFFFFCCCCCCCCCCCCCCCCFFFFFFF7
7FFFFFFFDDDDDDDDDDDDDDDDFFFFFFF7
7FFFFFFFEEEEEEEEEEEEEEEEFFFFFFF7
7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7
7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7
7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7
7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7
7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7
7FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7
77777777777777777777777777777777
grestore

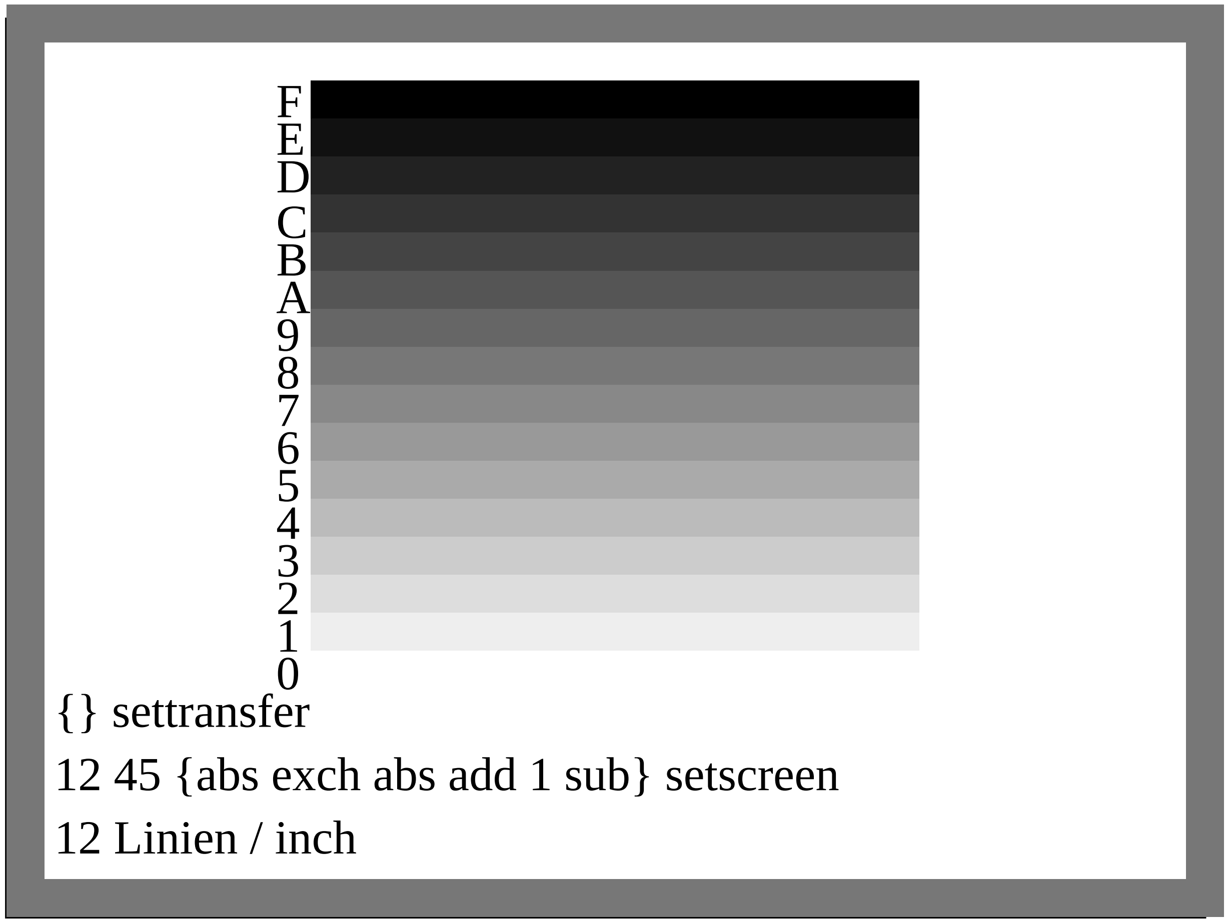
 72 90 translate
 6 /Times-Roman FS
 6 24 moveto ({} settransfer) show
 6 16 moveto (12 45 {pop} setscreen) show
 6  8 moveto (12 Linien / inch) show

34 28.75 moveto (0) show
%! hier weiterer text 0, 1, ..., F, nicht protokolliert
34 101.0 moveto (F) show
showpage
```

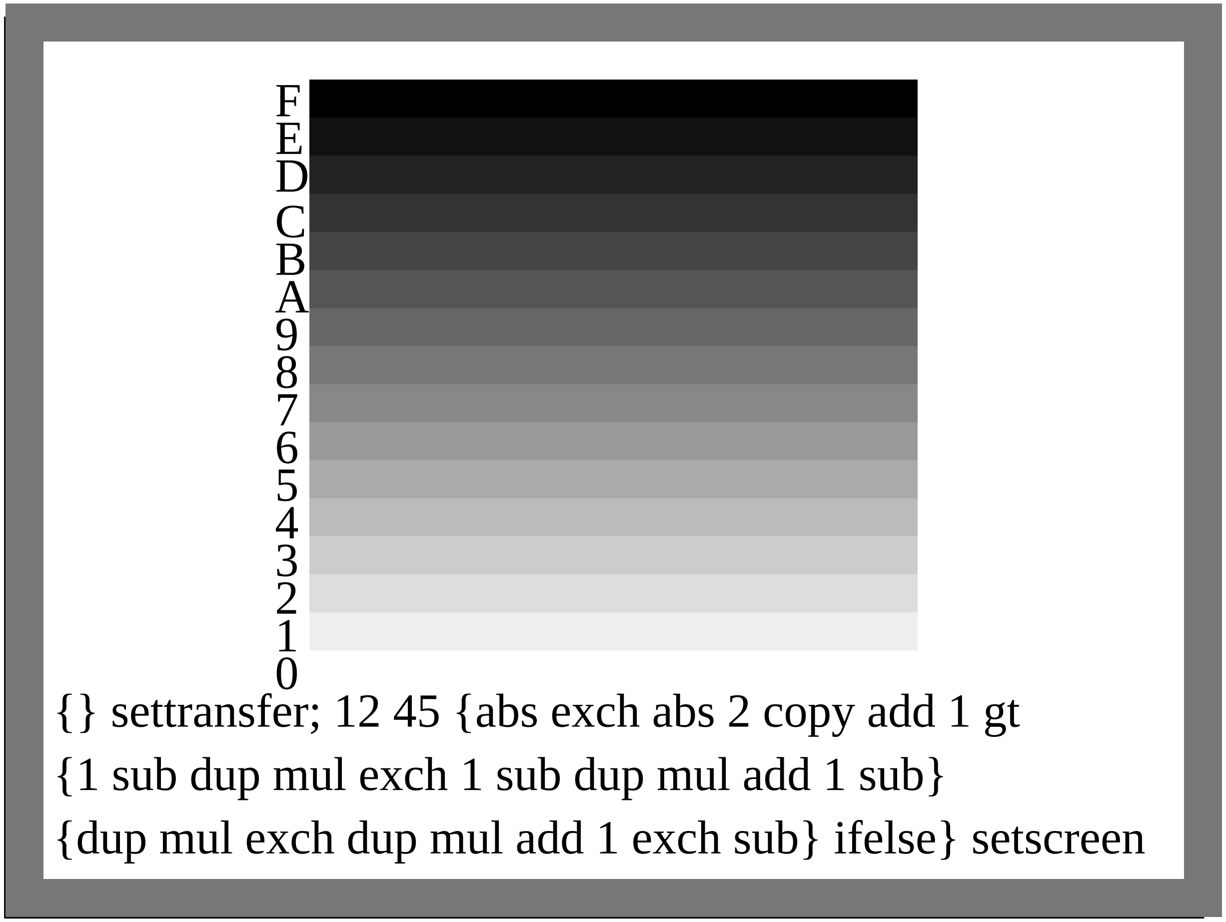
G8252_1f.eps, G0421_7f.eps, G8_08f.eps, Bild 8_8 2x4



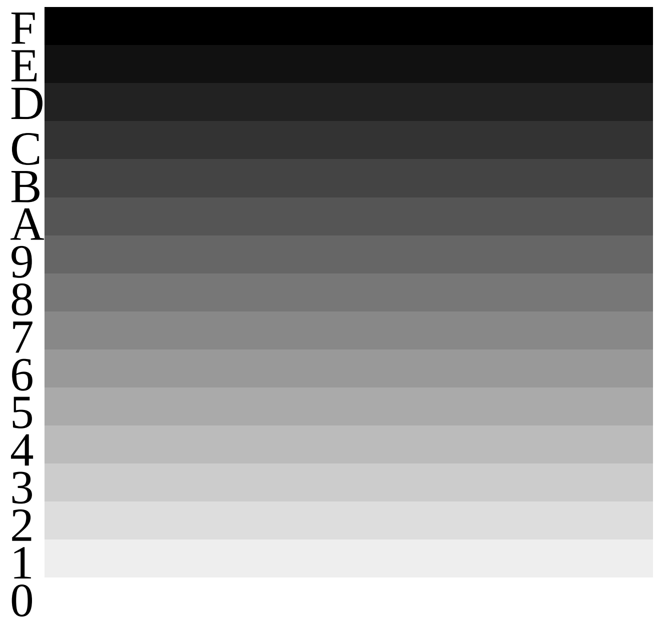
G8250_1f.eps, G0420_2f.eps, G8_09_1f.eps, Bild 8_9_1 *PDF



G8250_3f.eps, G0420_3f.eps, G8_09_2f.eps, Bild 8_9_2 *PDF



G8250_4f.eps, G0420_4f.eps, G8_09_3f.eps, Bild 8_9_3 *PDF

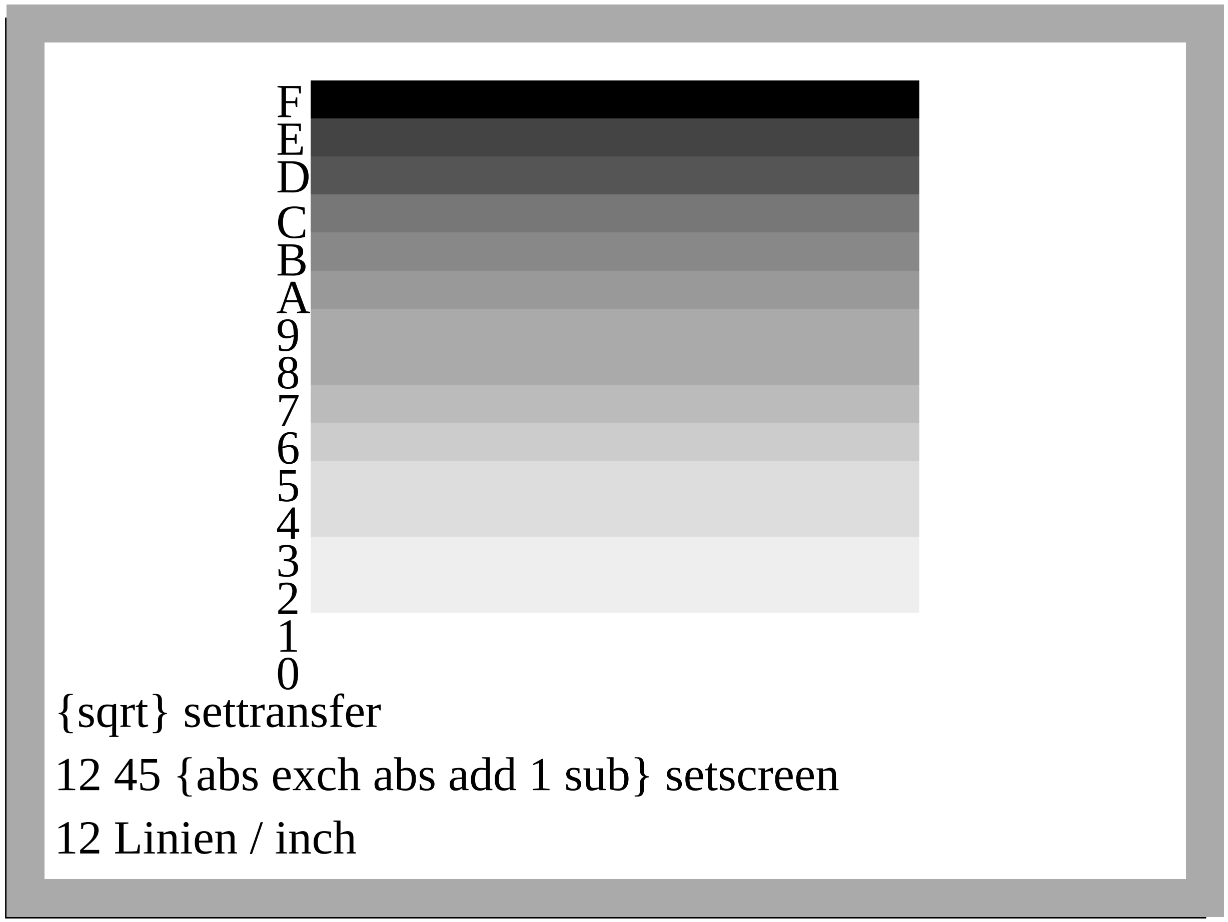


{} settransfer

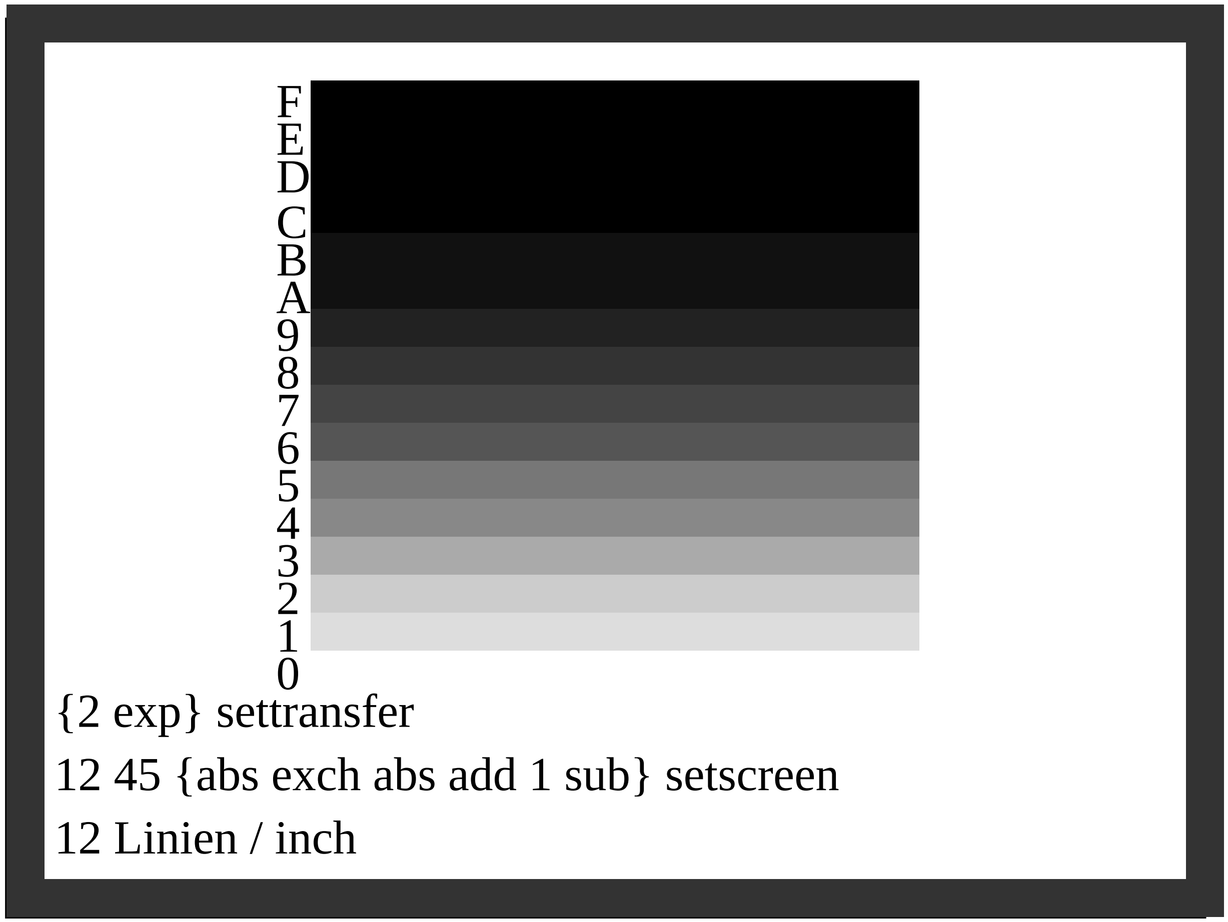
12 45 {abs exch abs add 1 sub} setscreen

12 Linien / inch

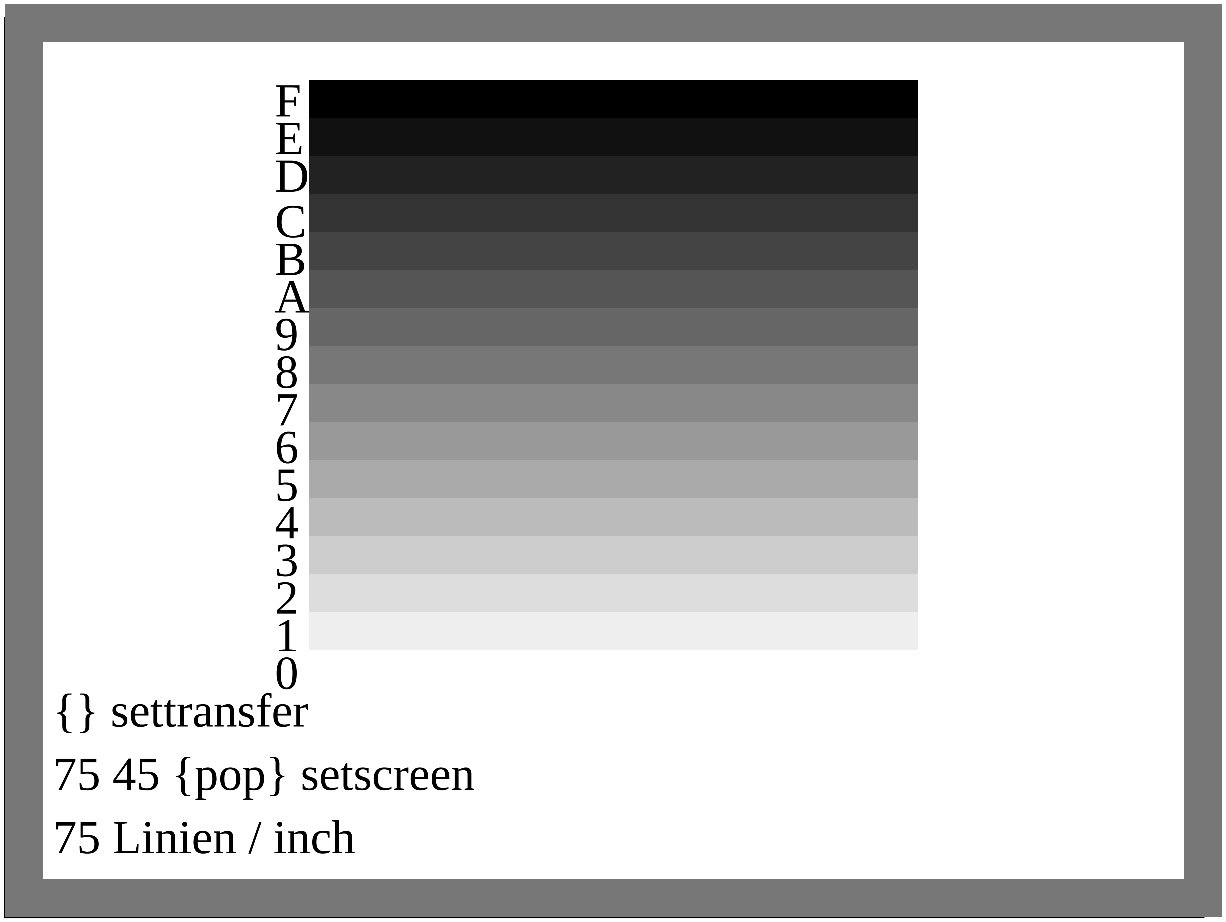
G8250_3f.eps, G0420_5f.eps, G8_10_1f.eps, Bild 8_10_1 *PDF



G8250_7f.eps, G0420_6f.eps, G8_10_2f.eps, Bild 8_10_2 *PDF



G8260_1f.eps, G0430_1f.eps, G8_10_3f.eps, Bild 8_10_3 *PDF



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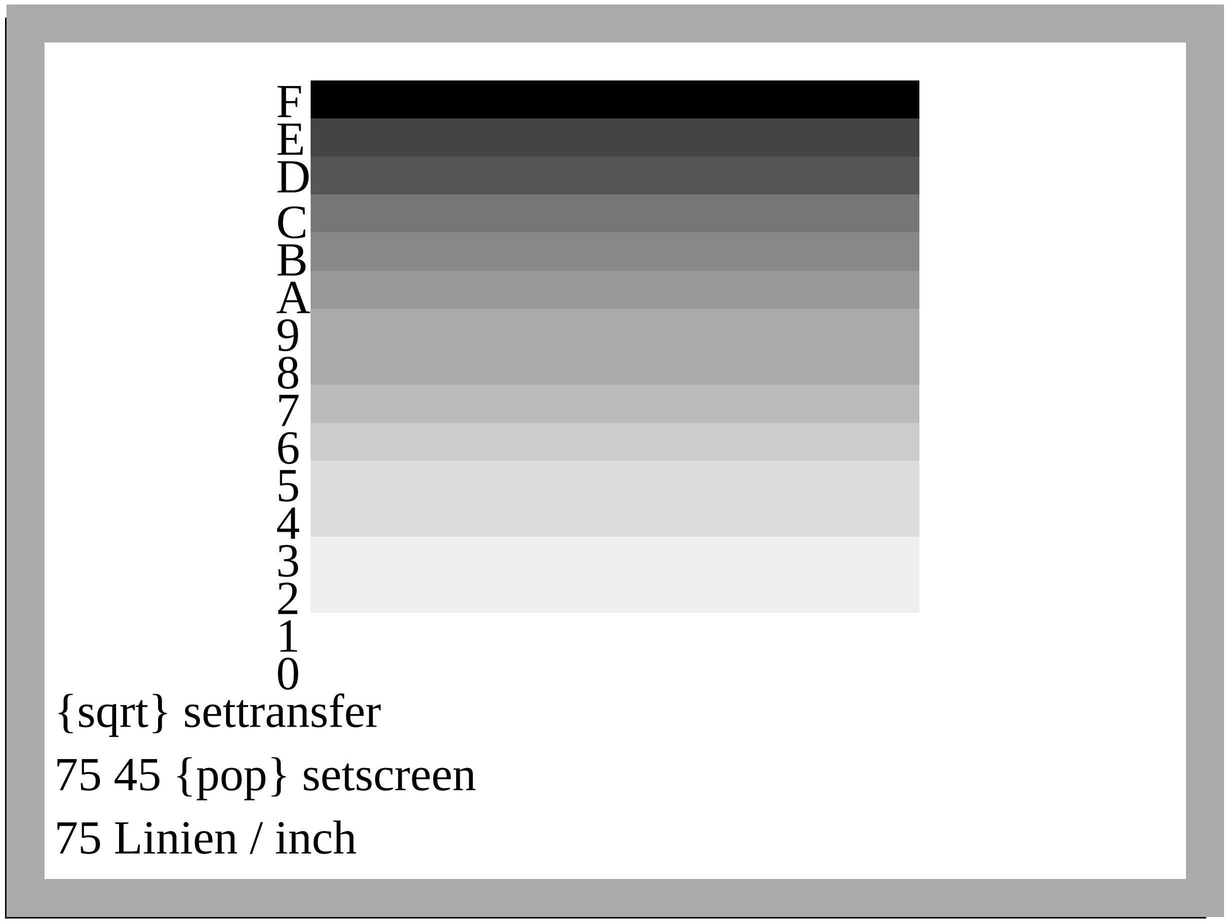

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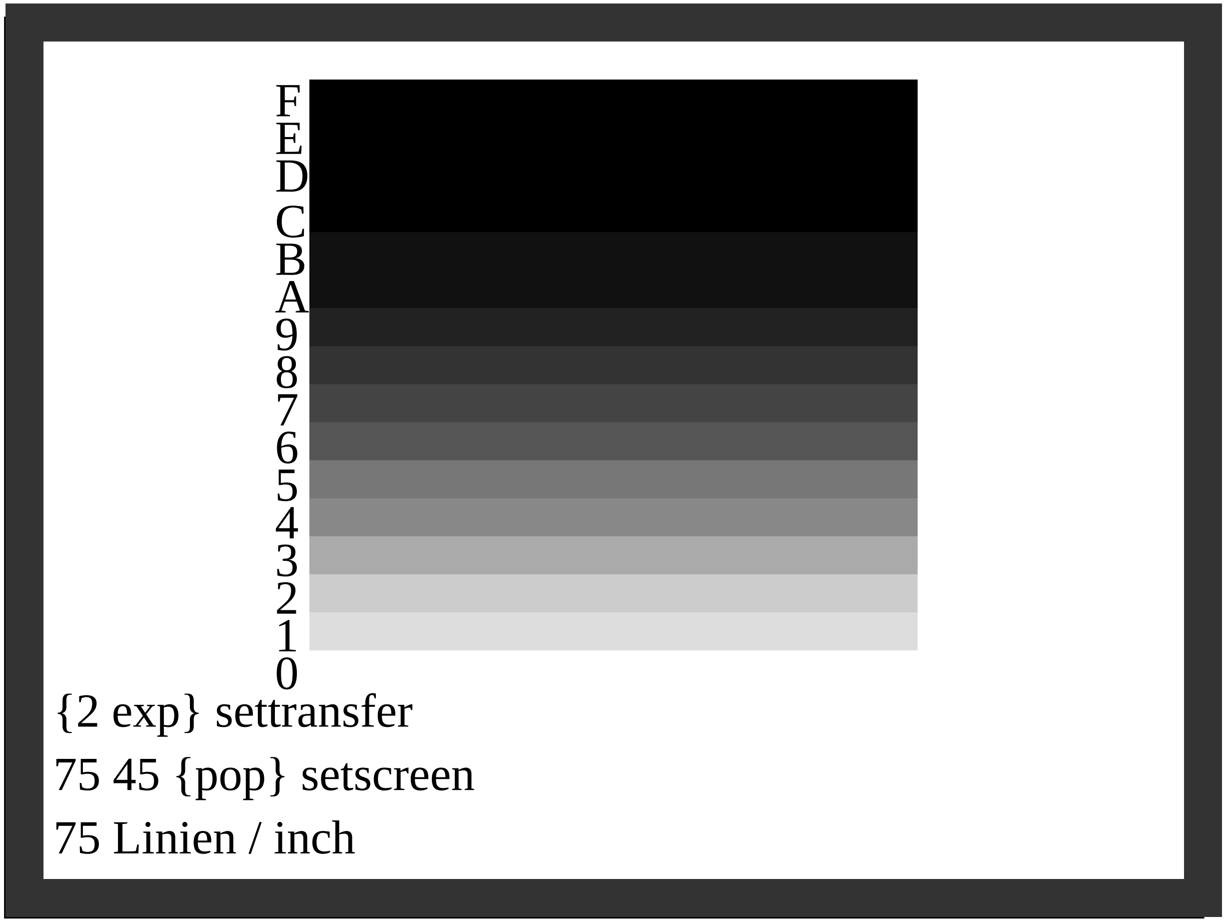

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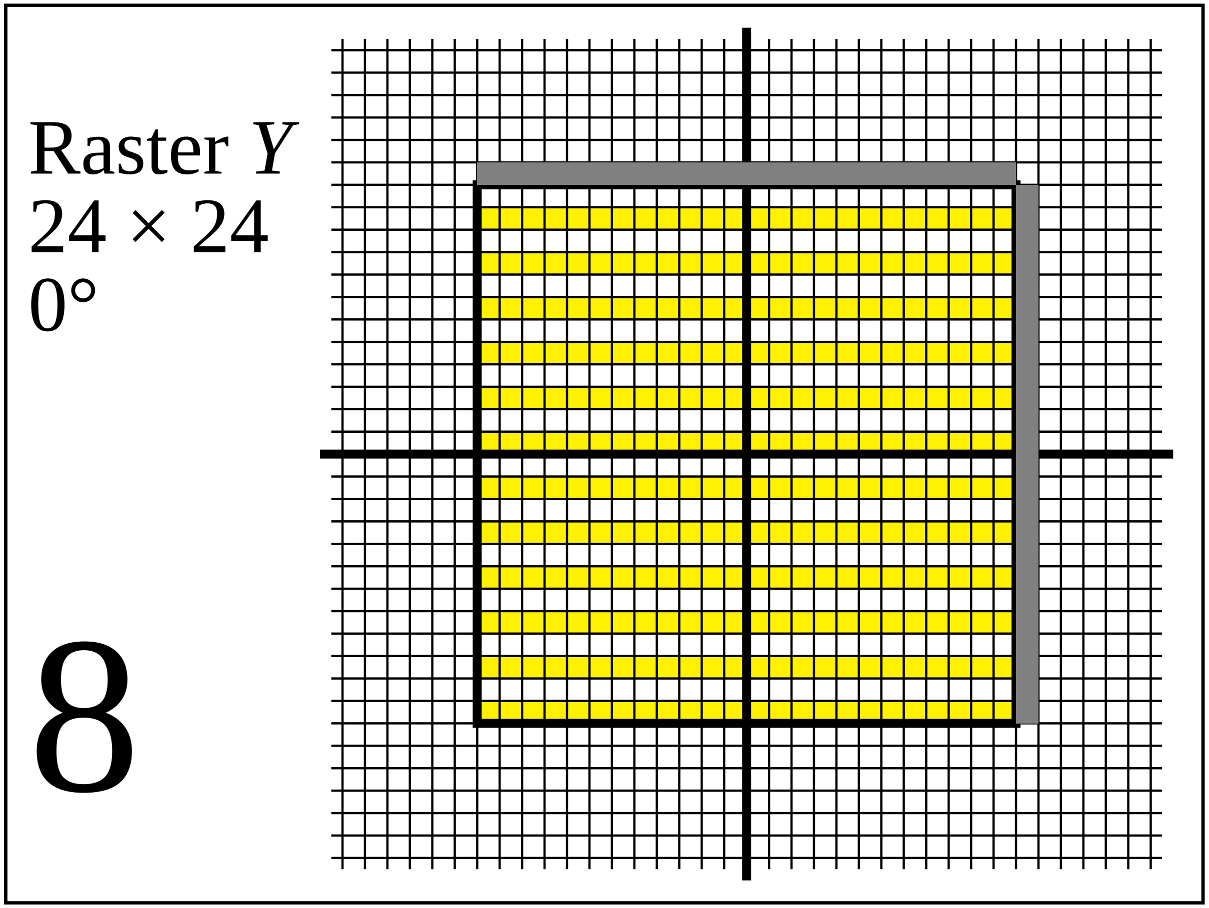

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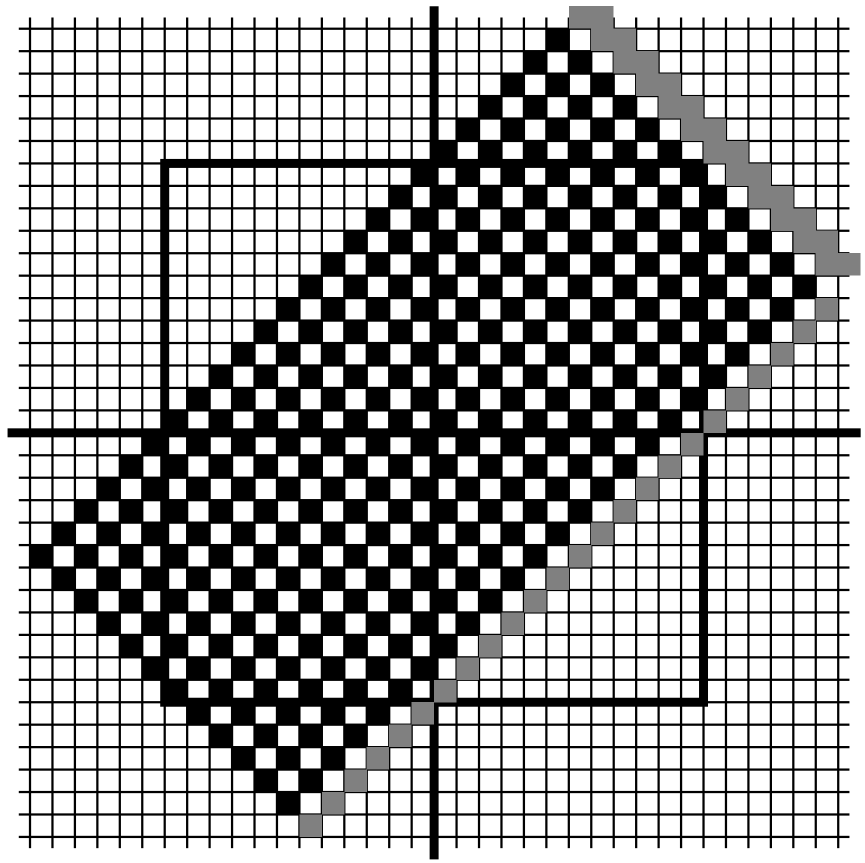
45°

8



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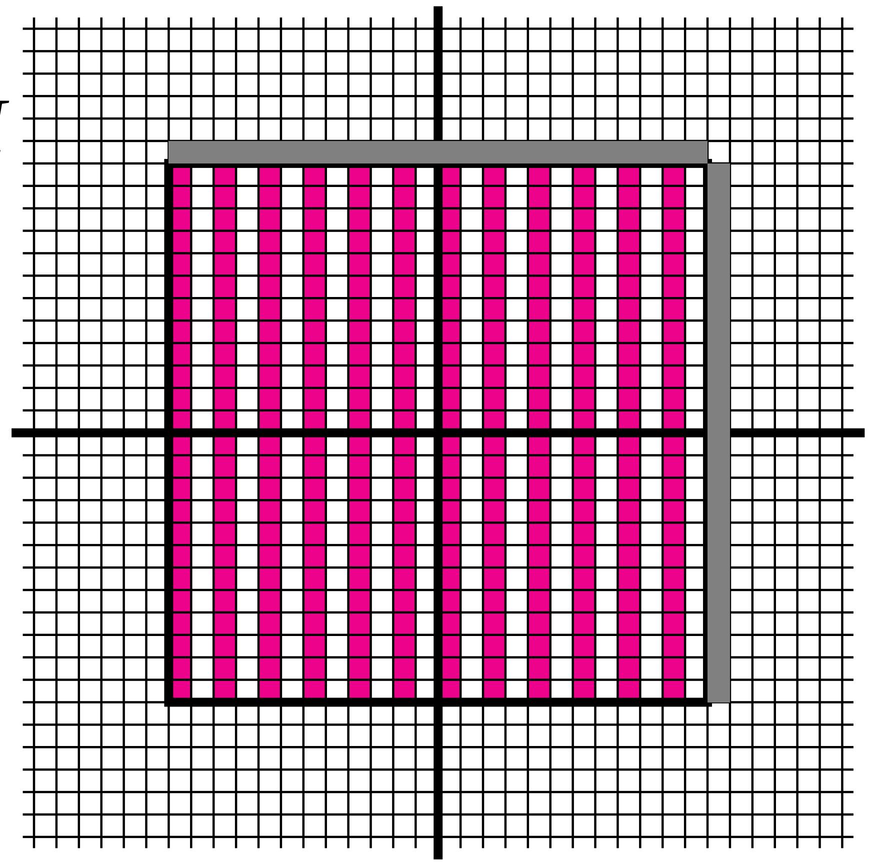

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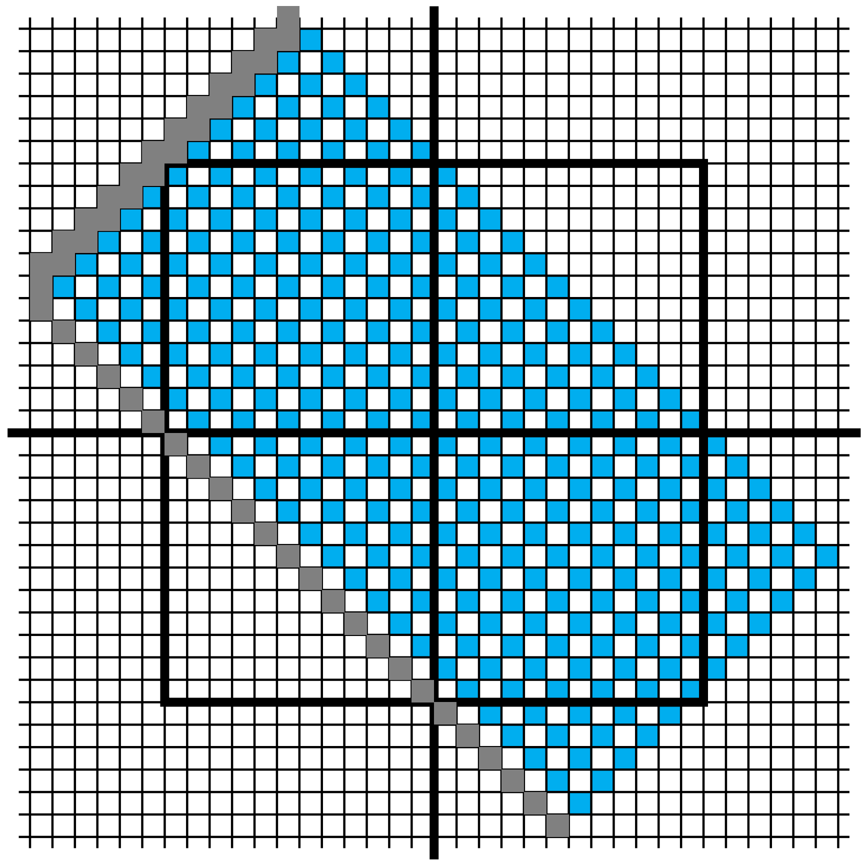
8



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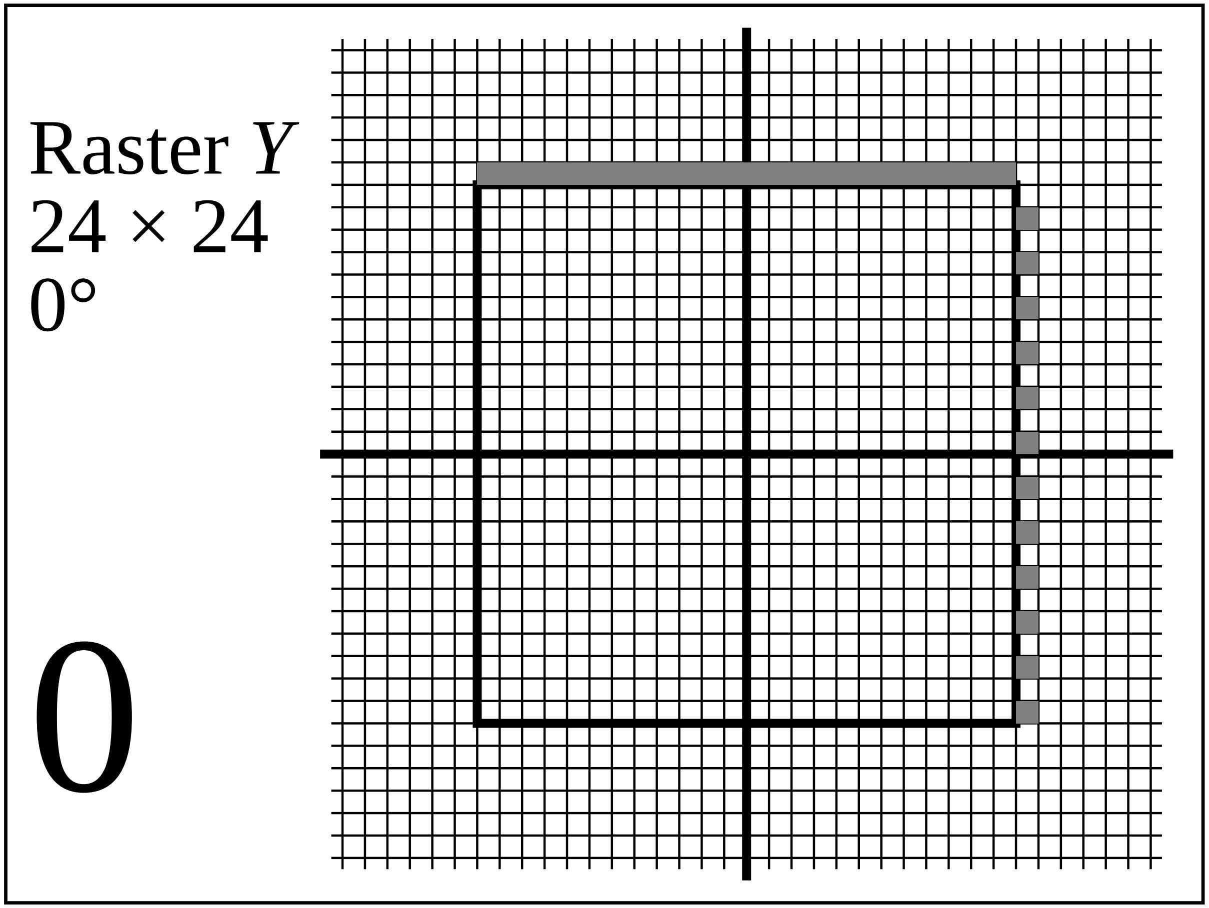

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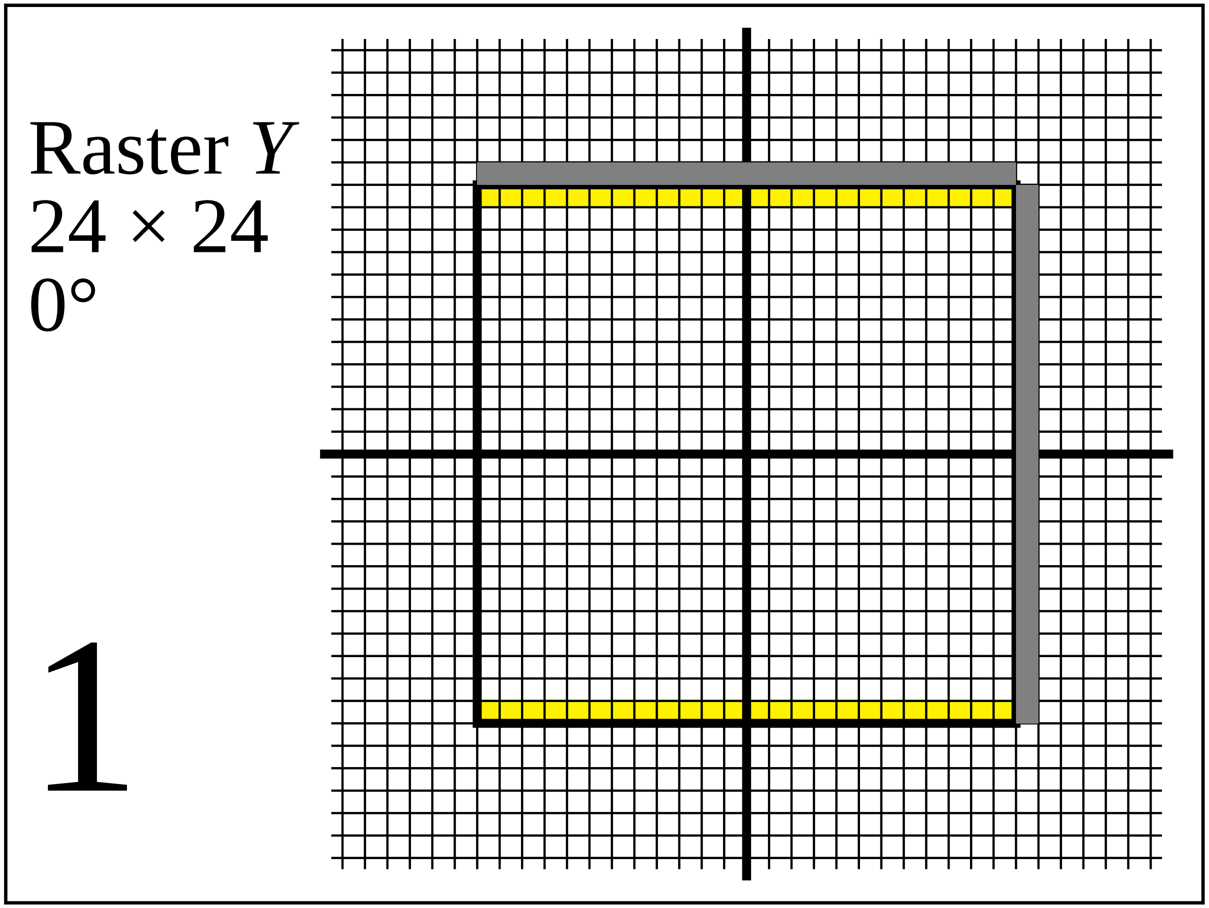

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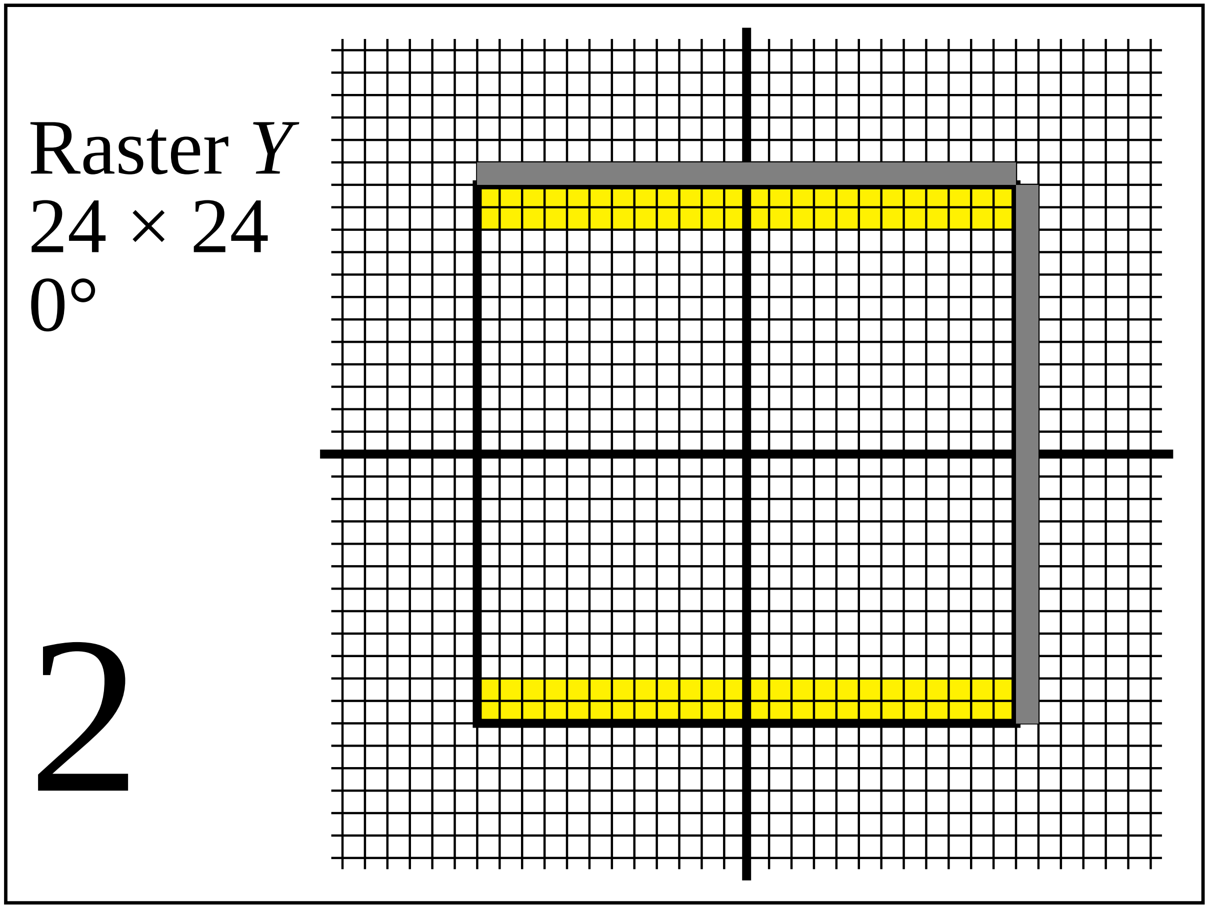

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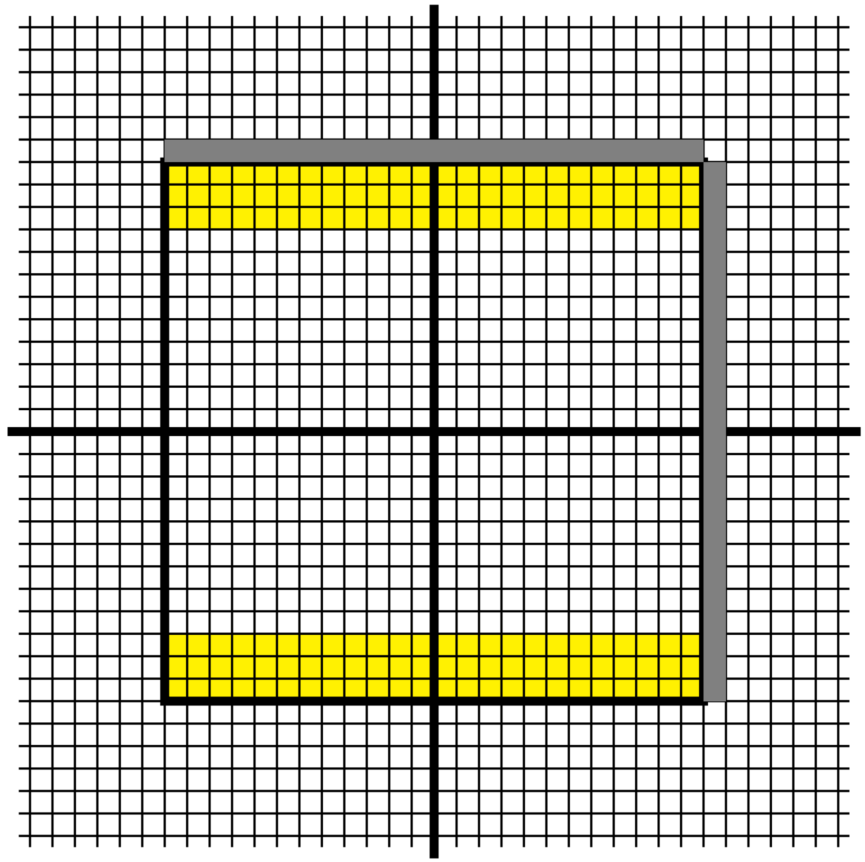

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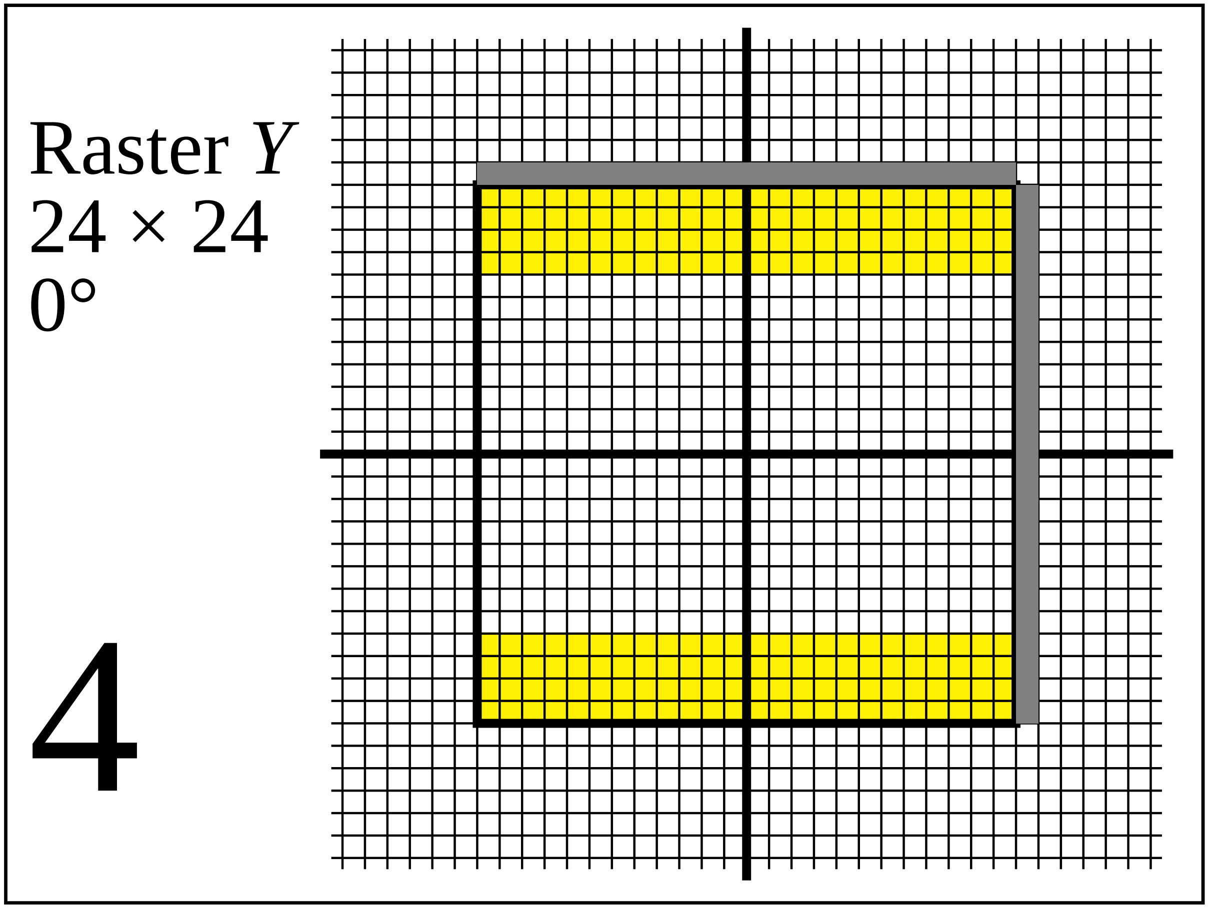

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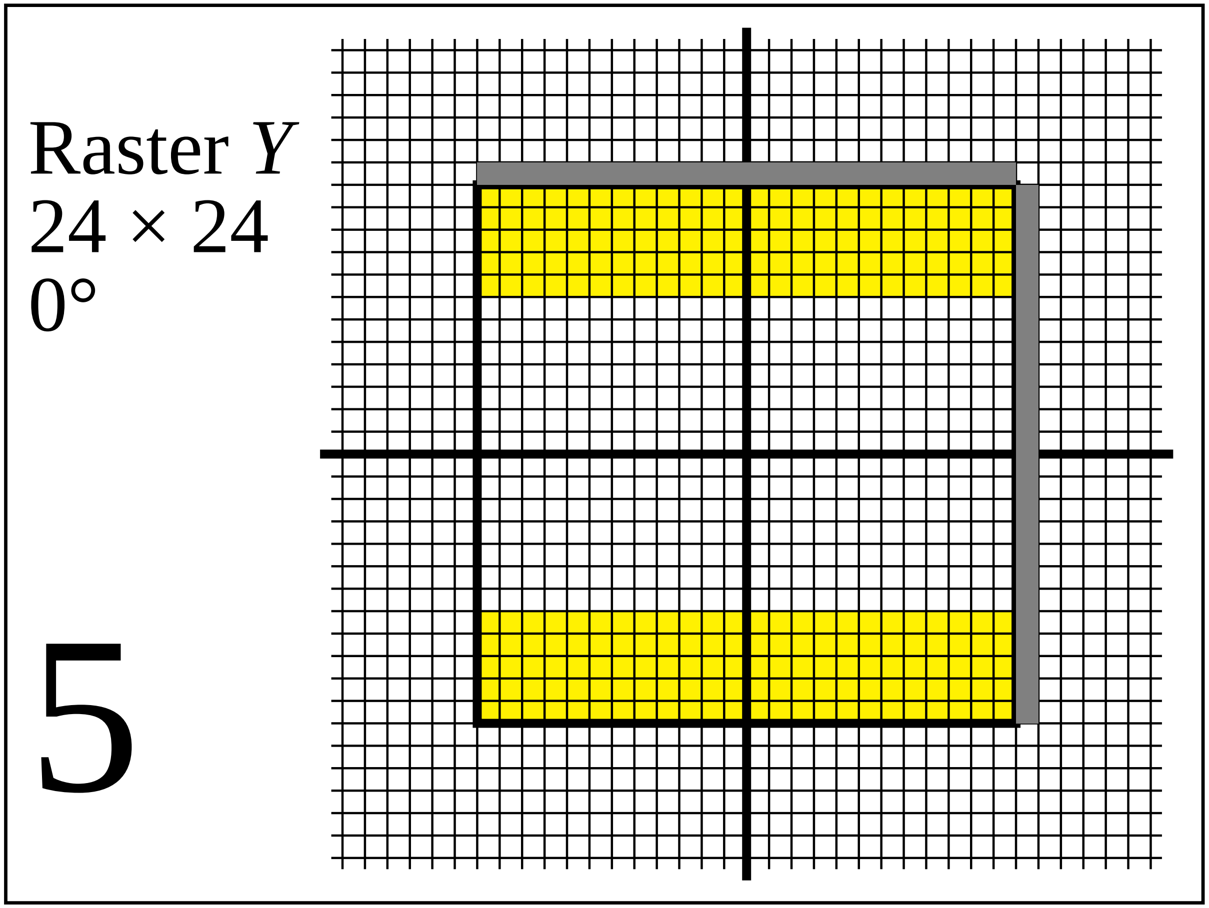

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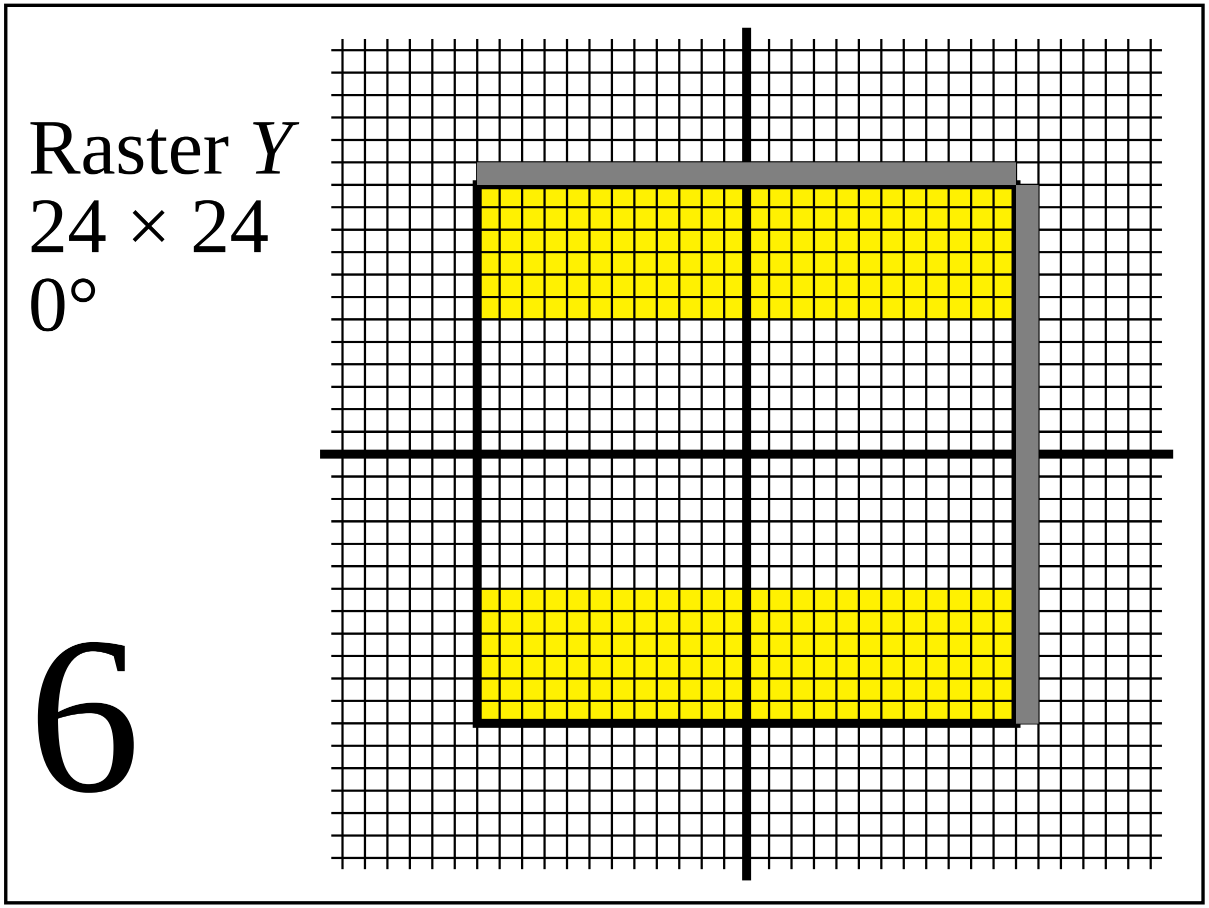

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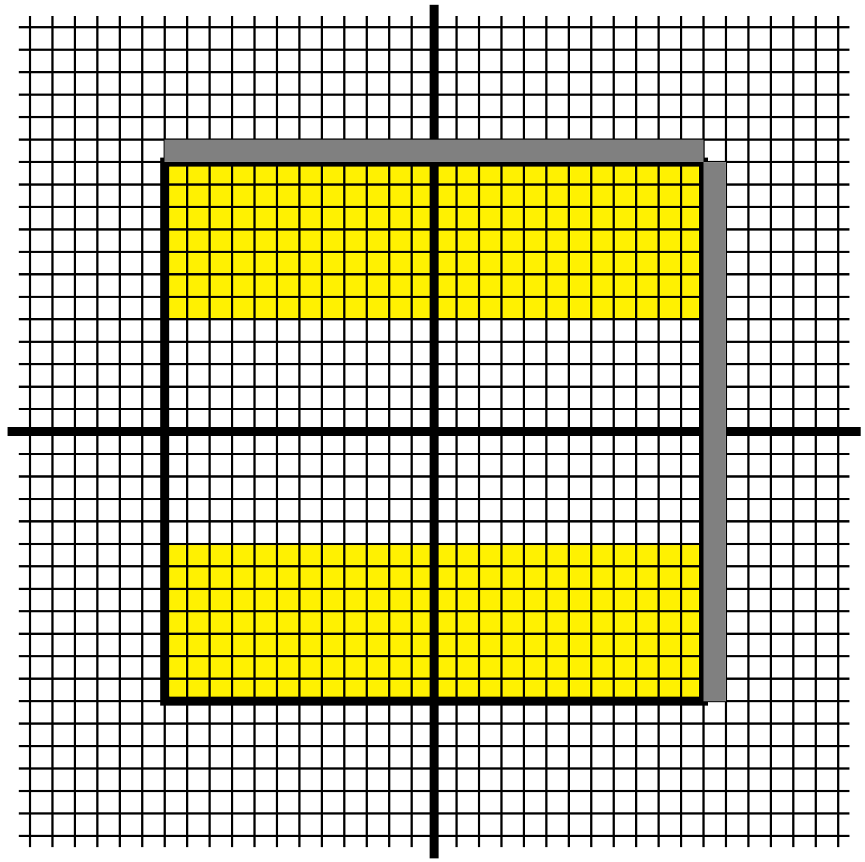
7



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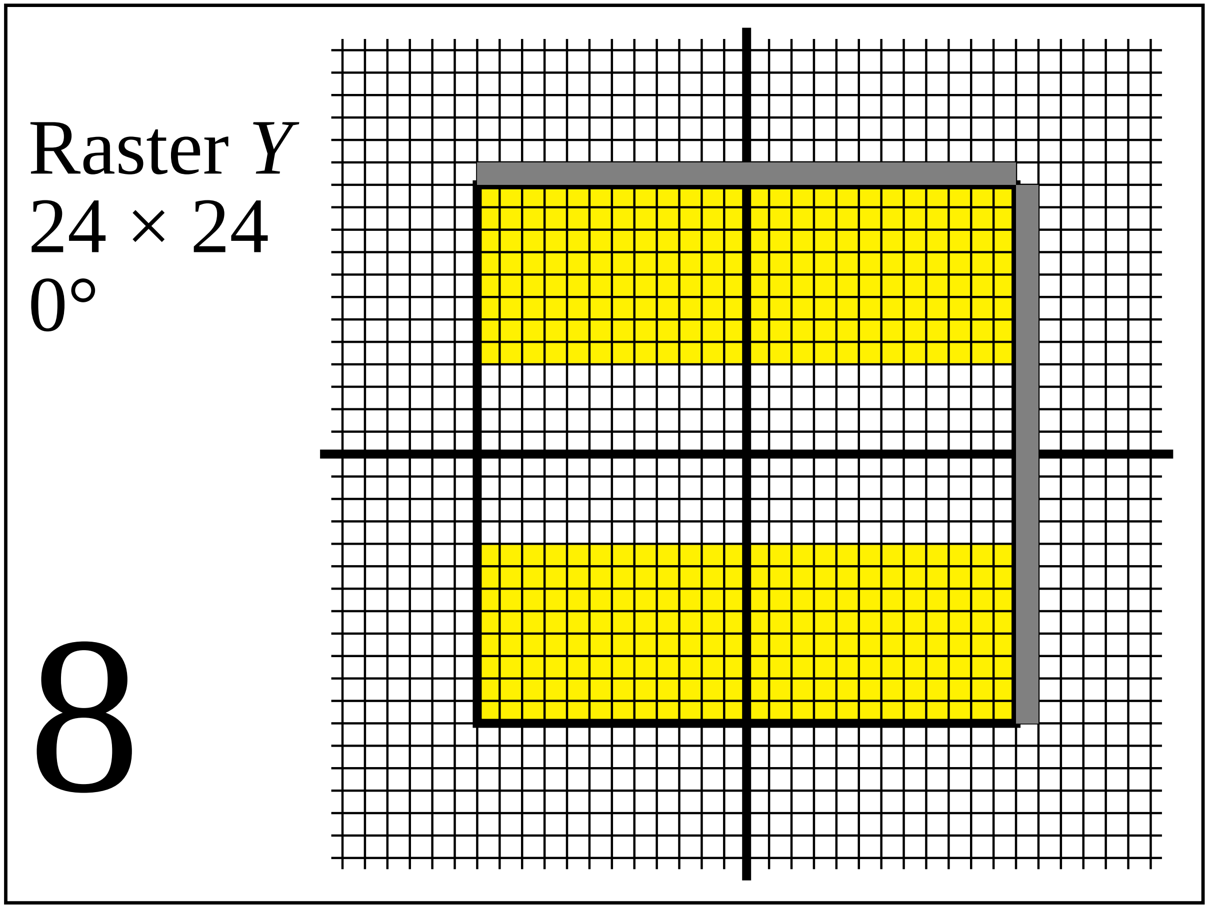

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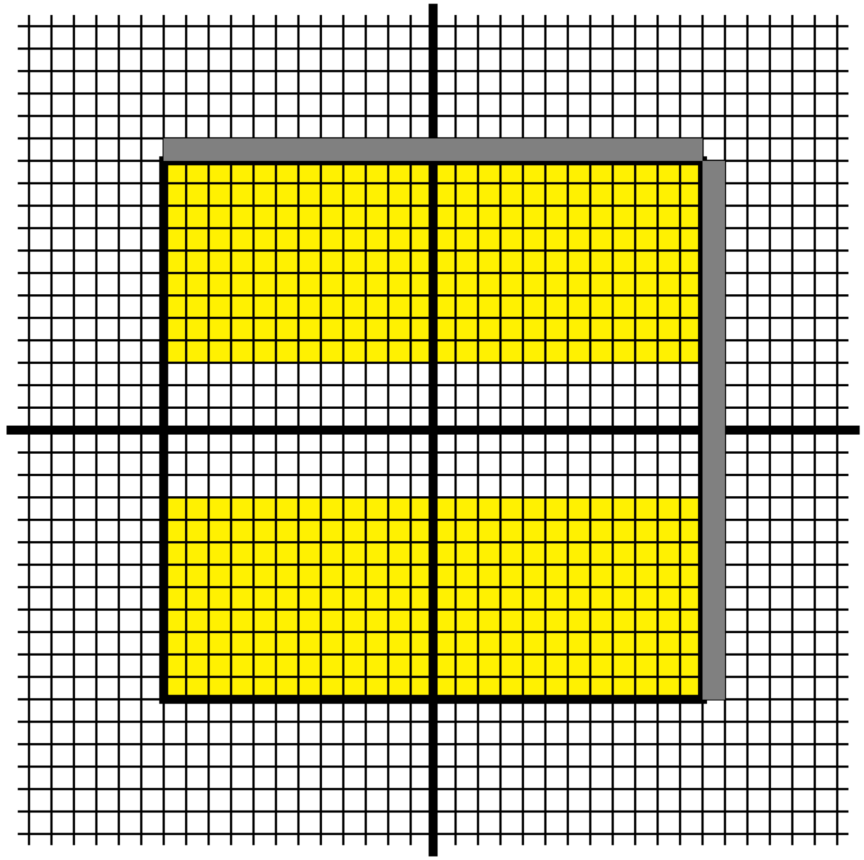
9



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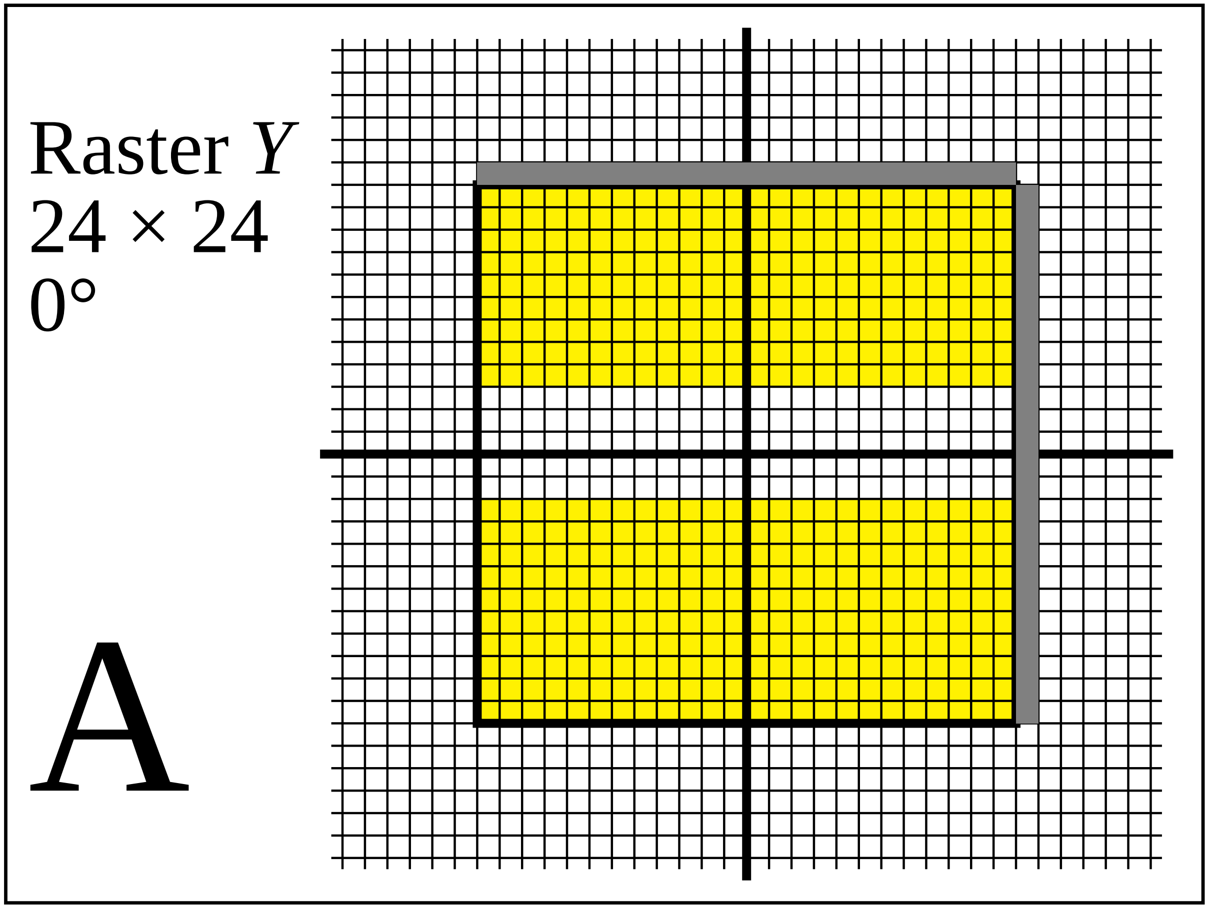

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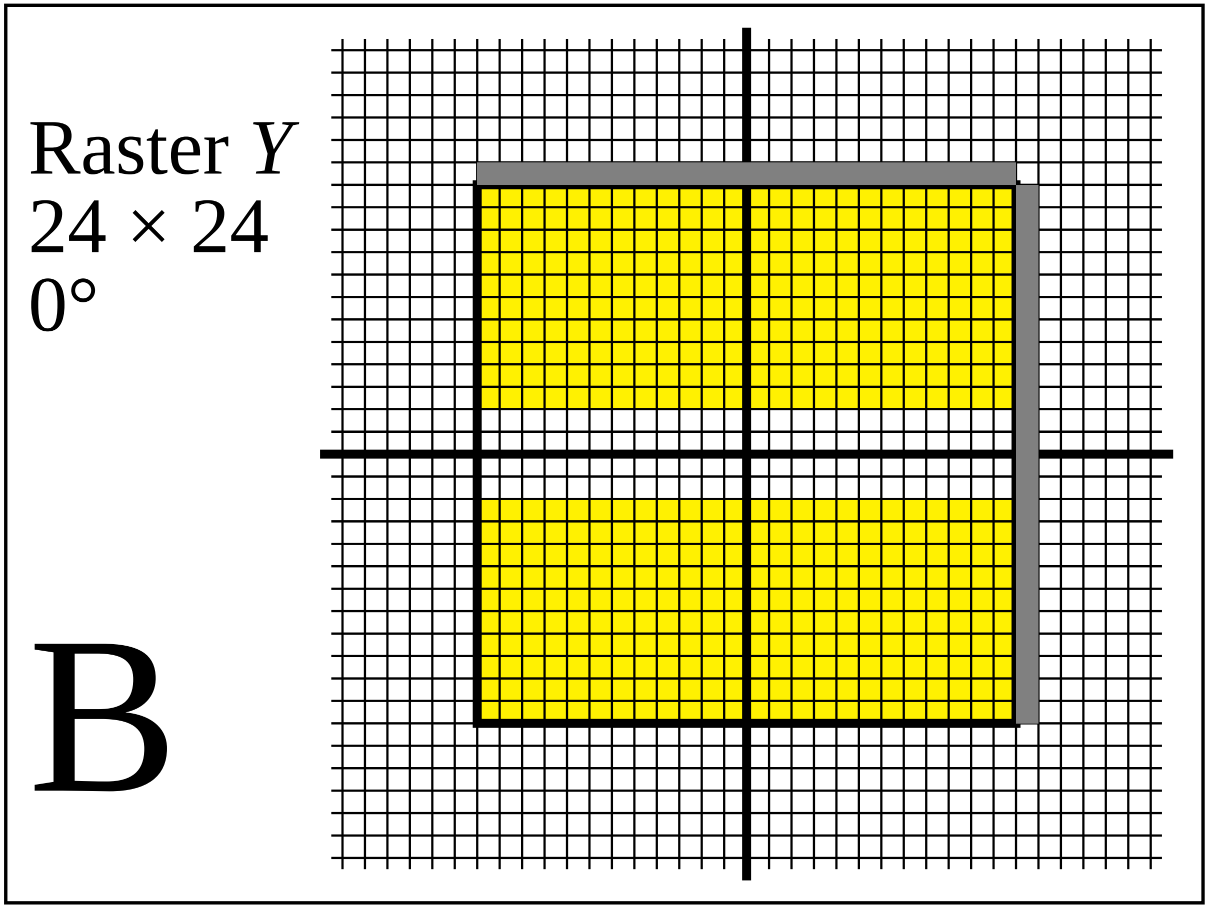

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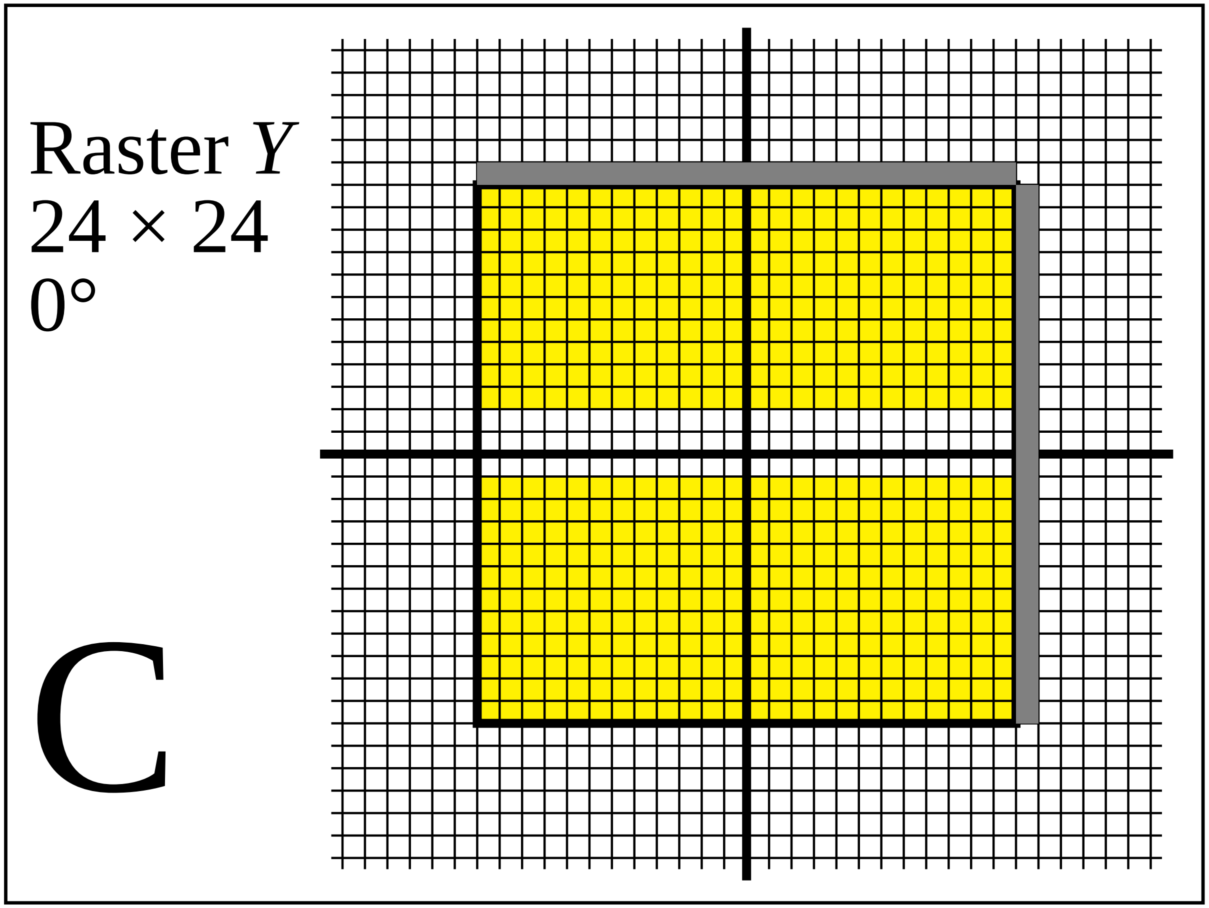

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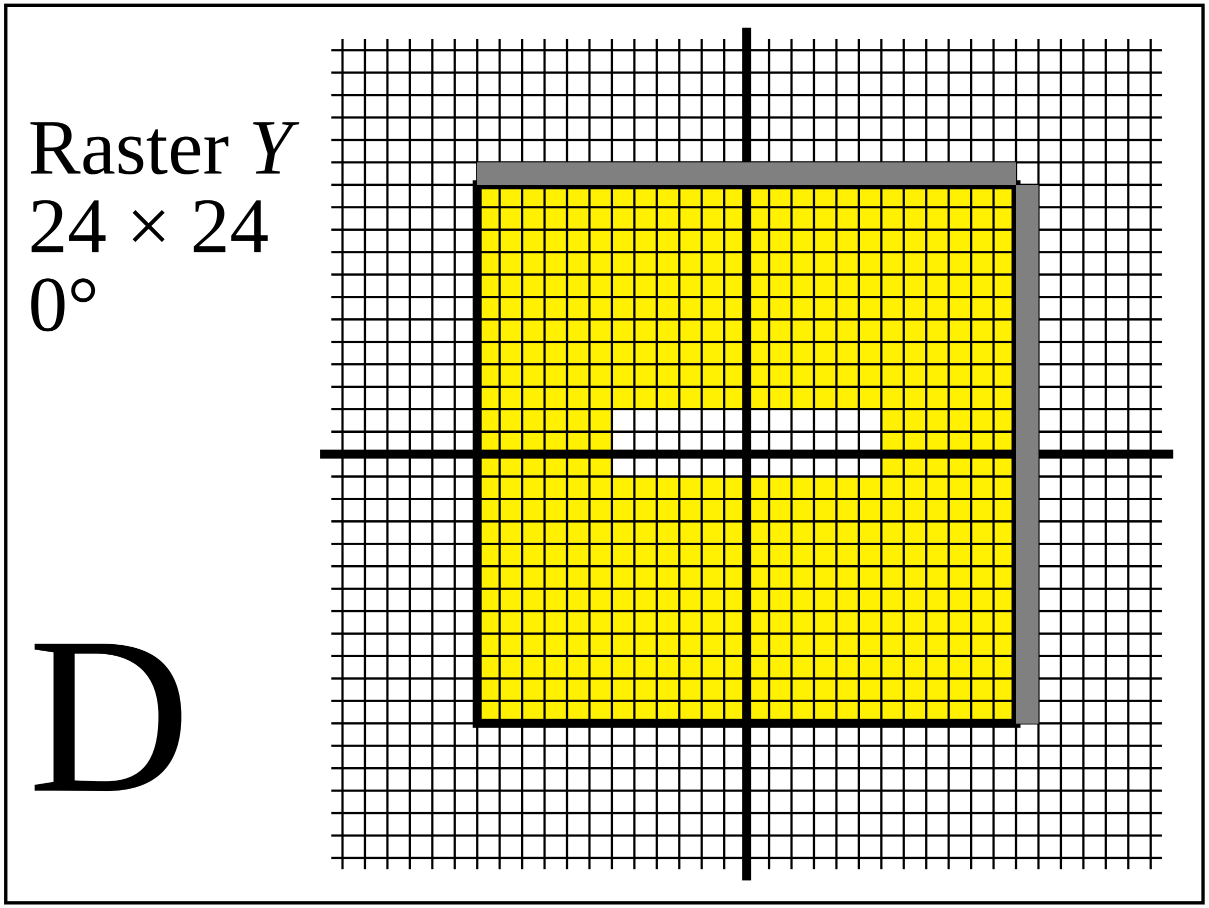

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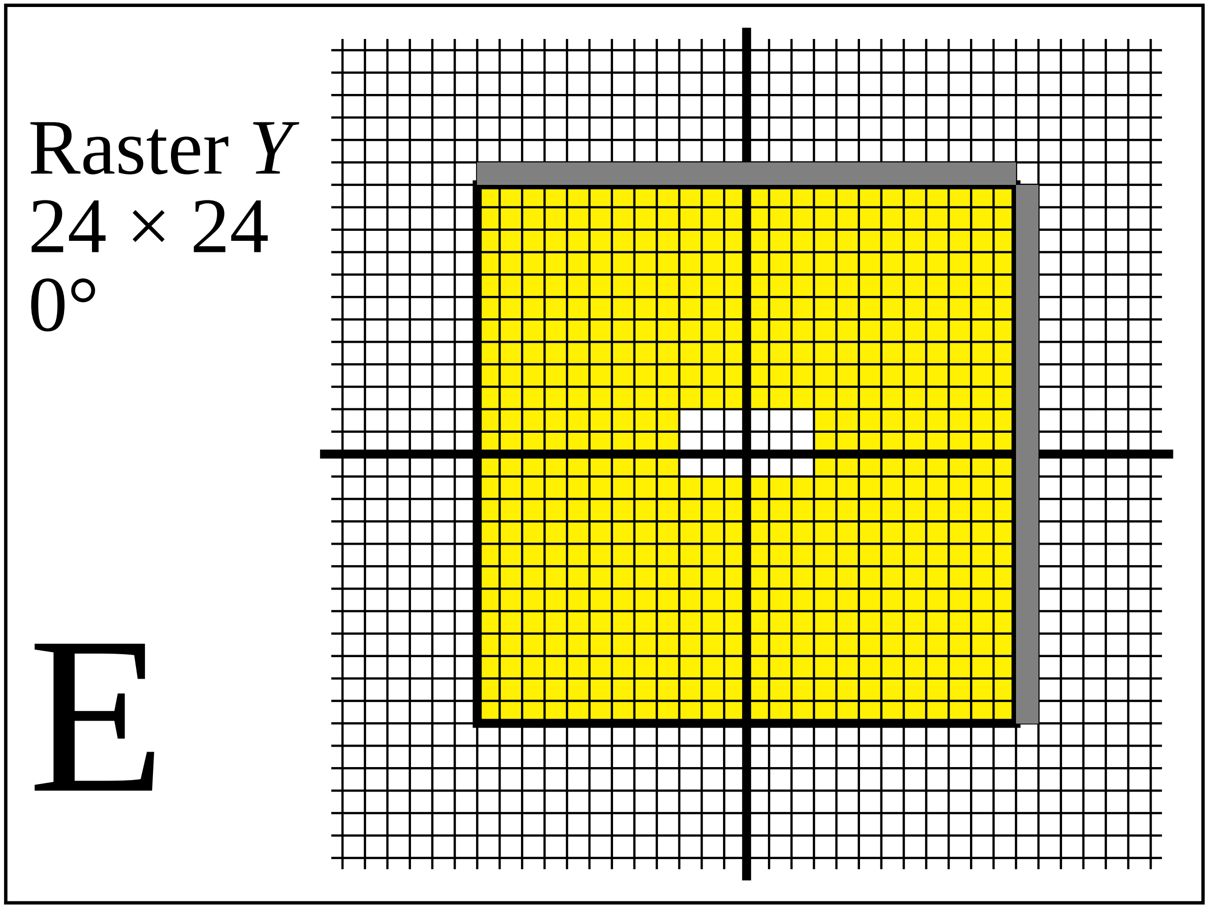

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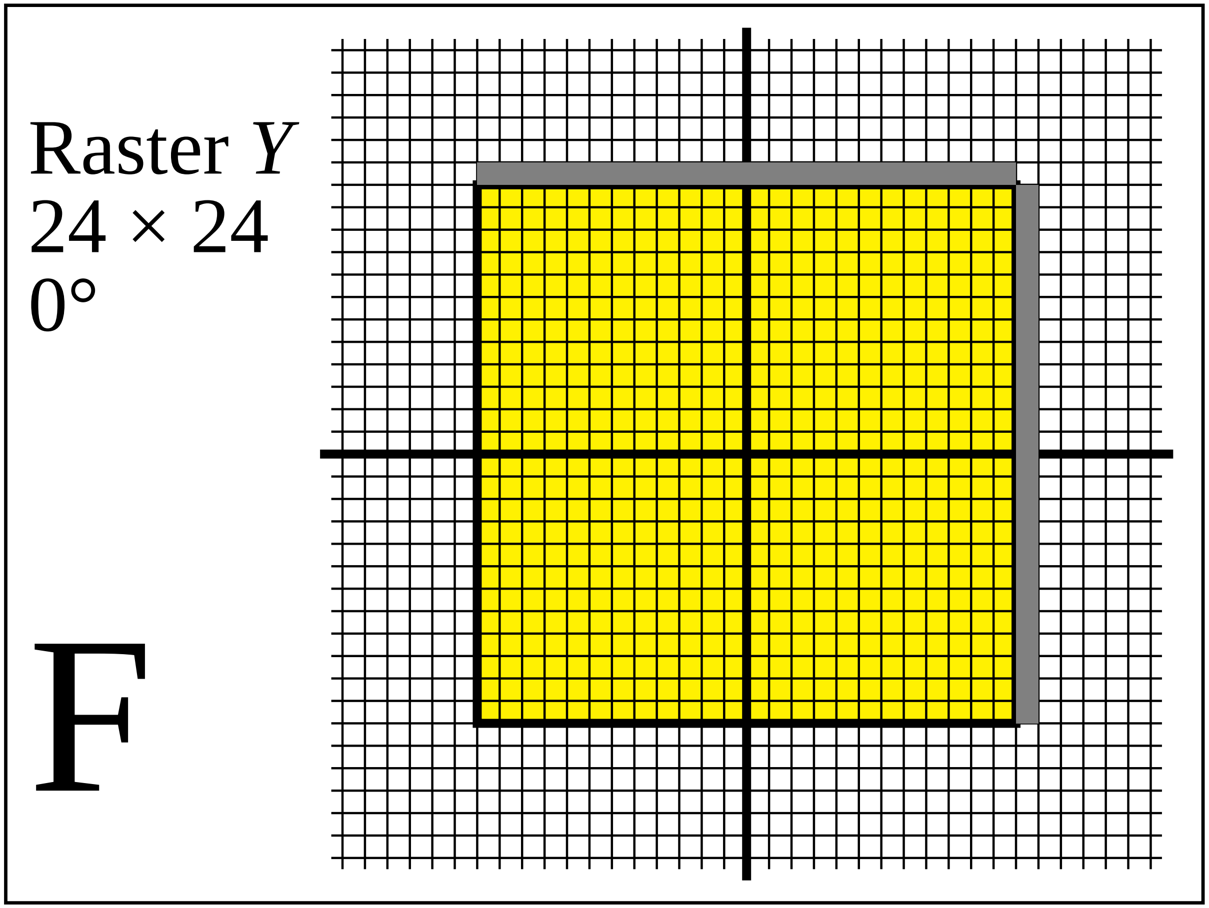

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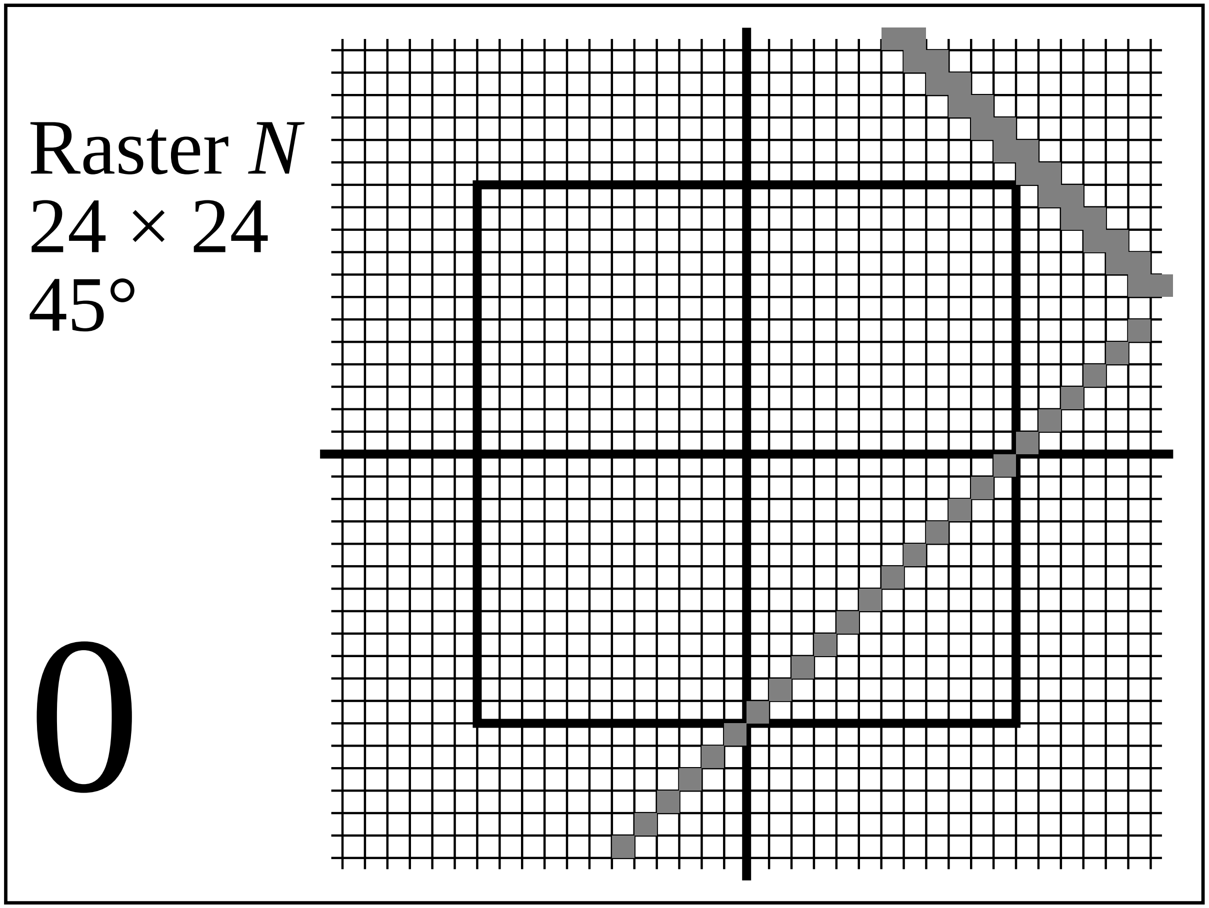

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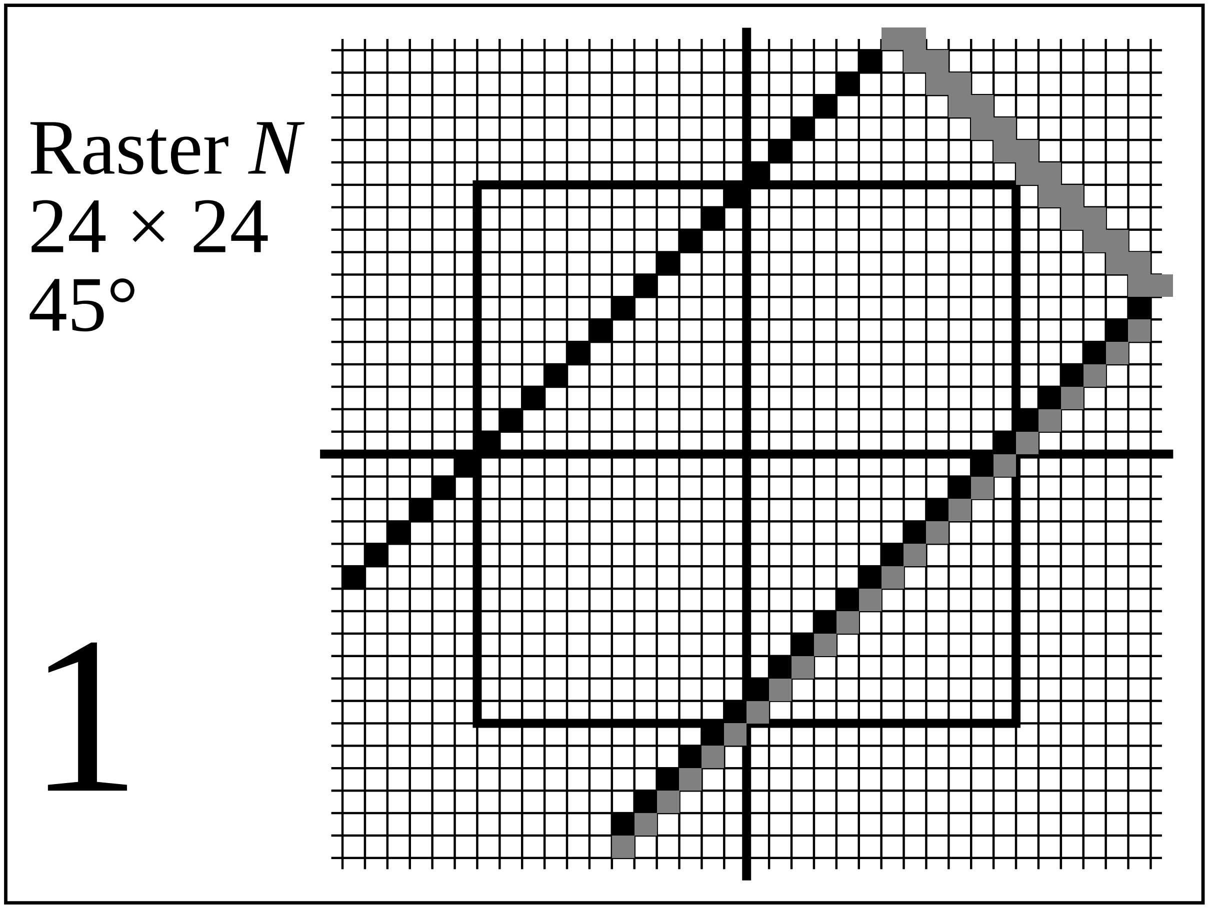

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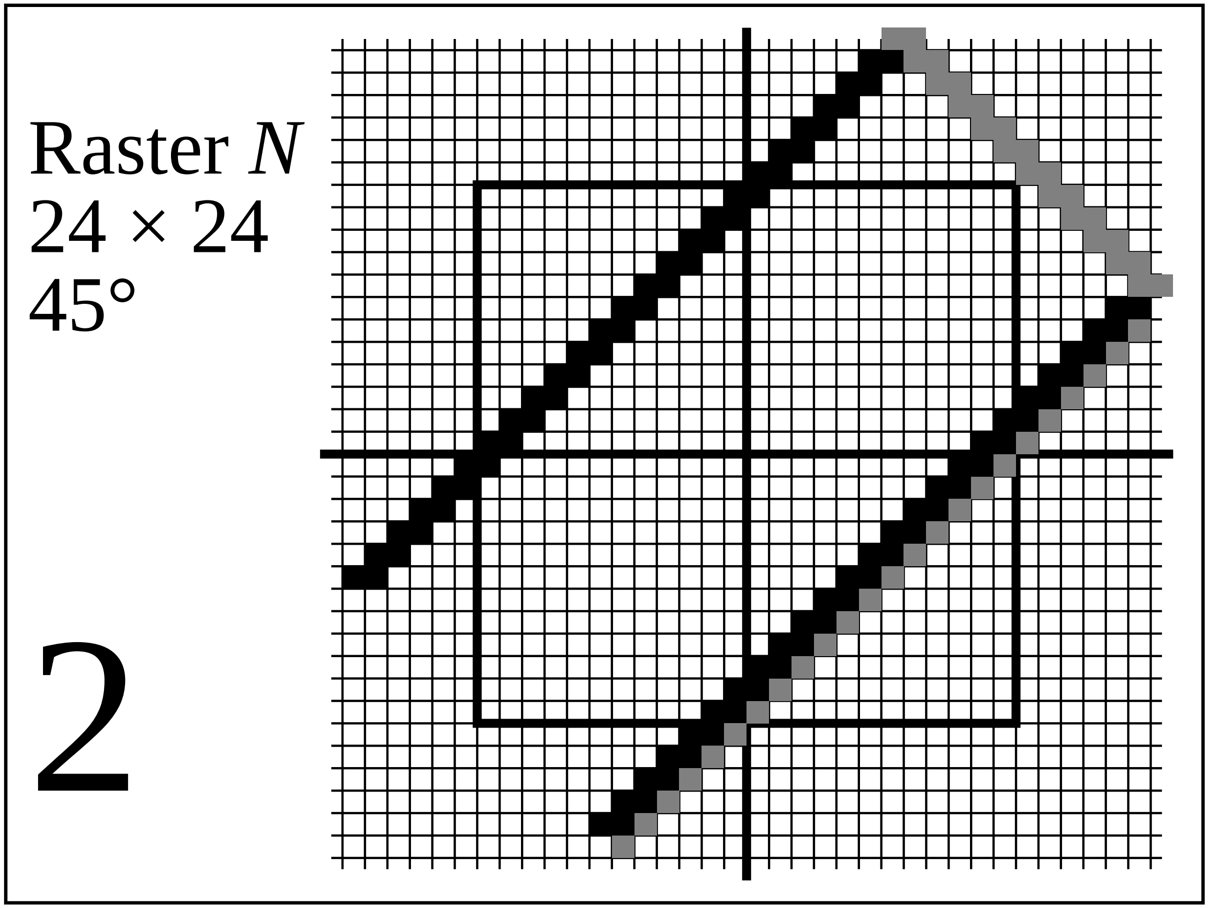

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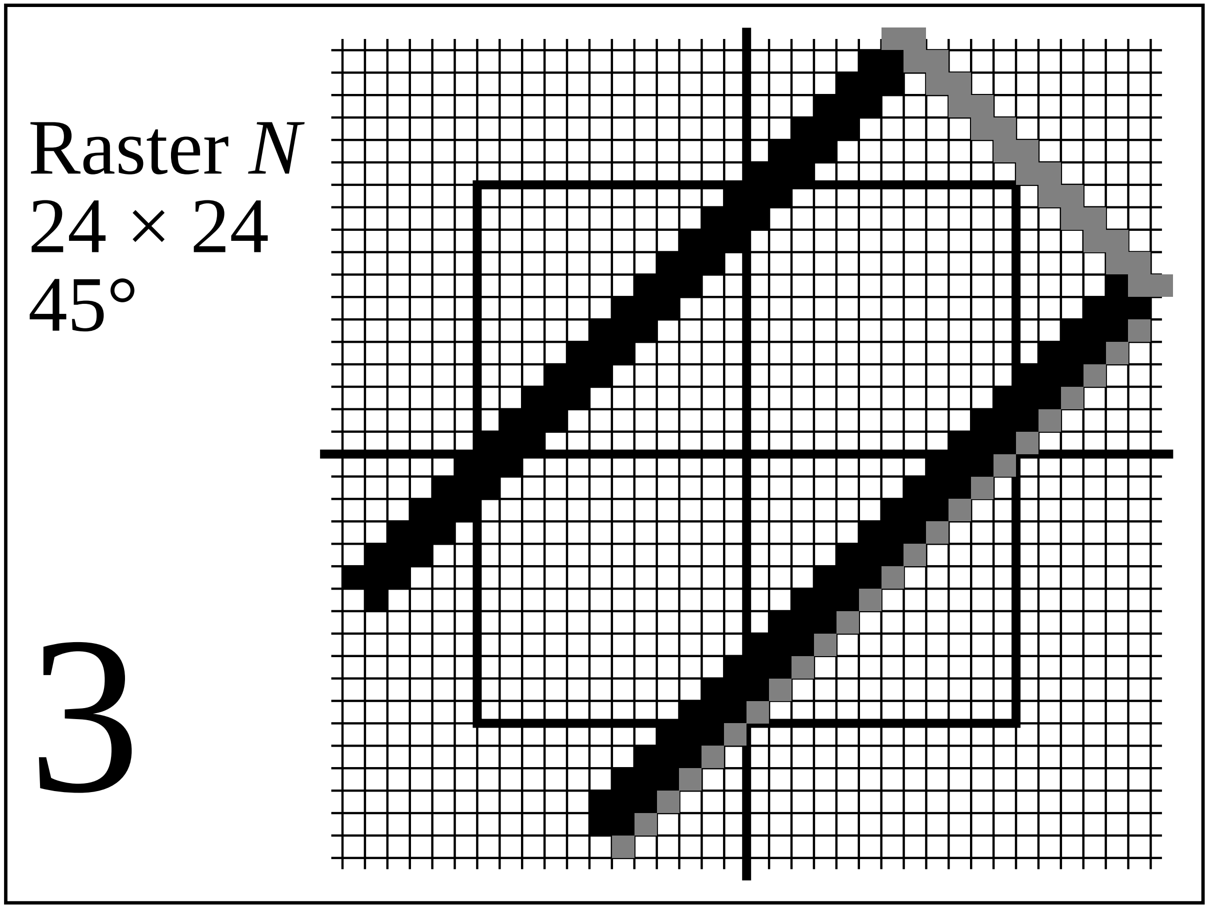

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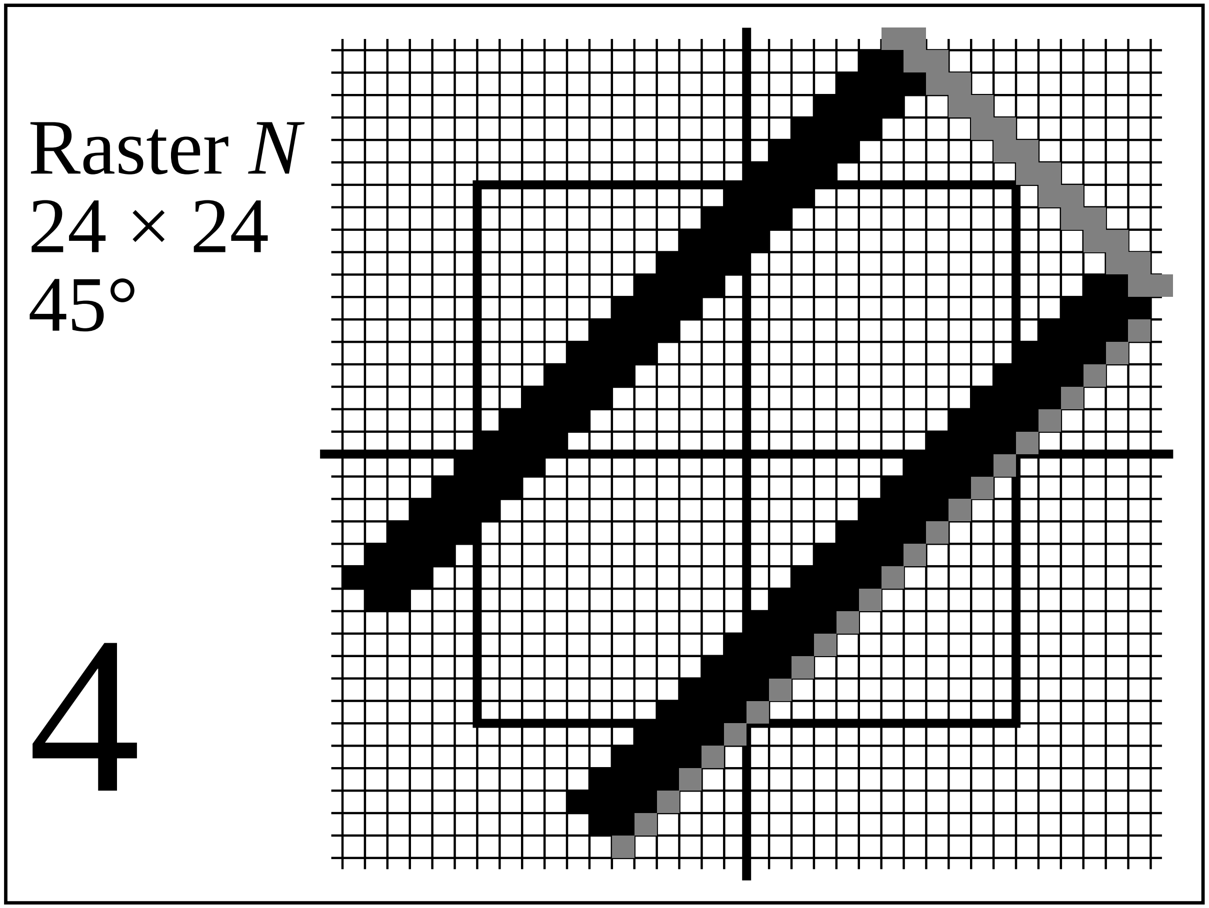

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Raster N
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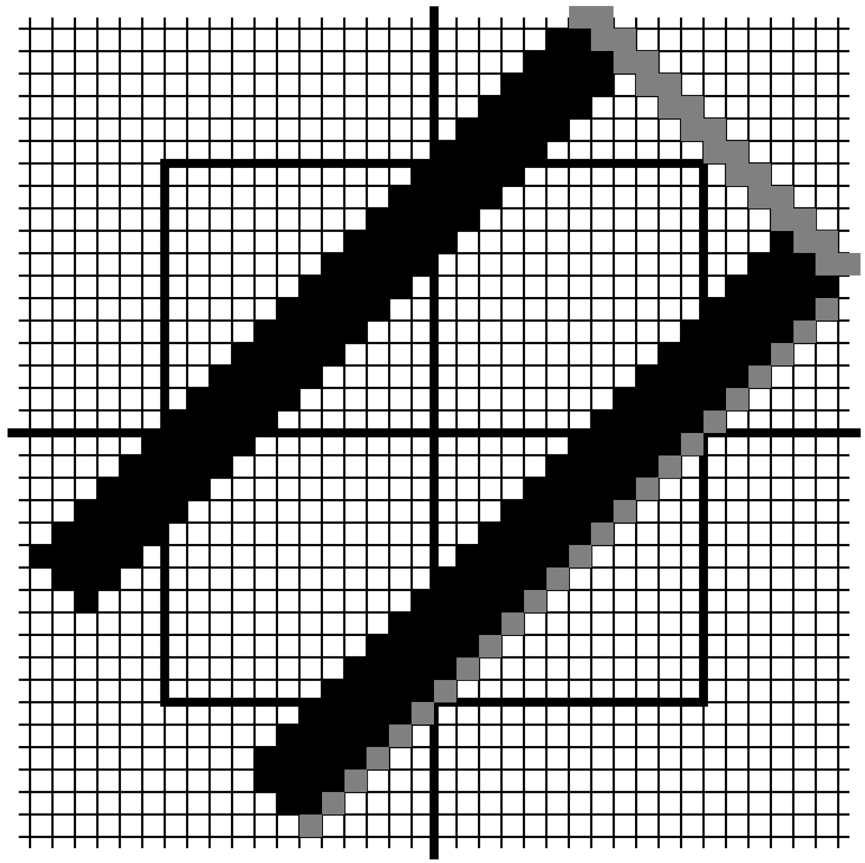

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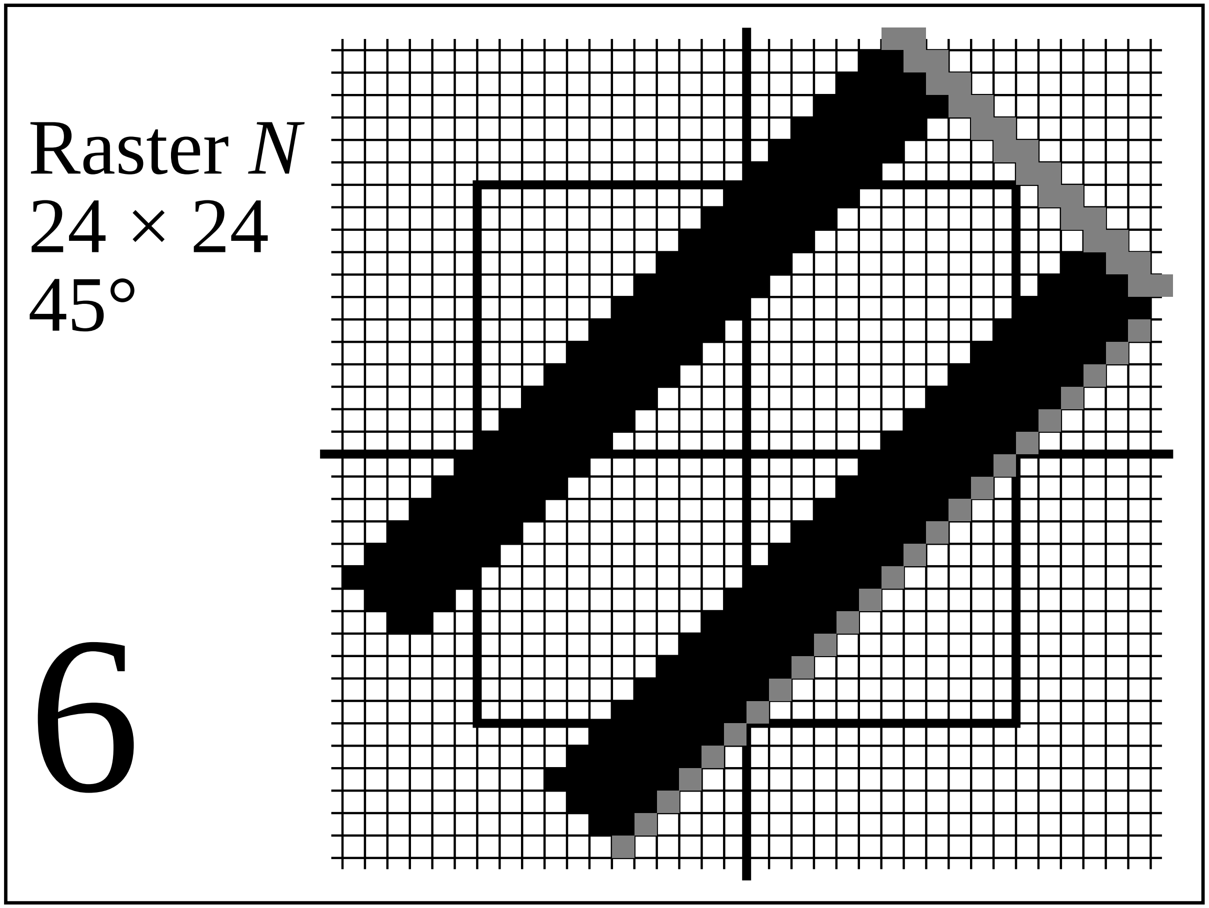

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Raster *N*
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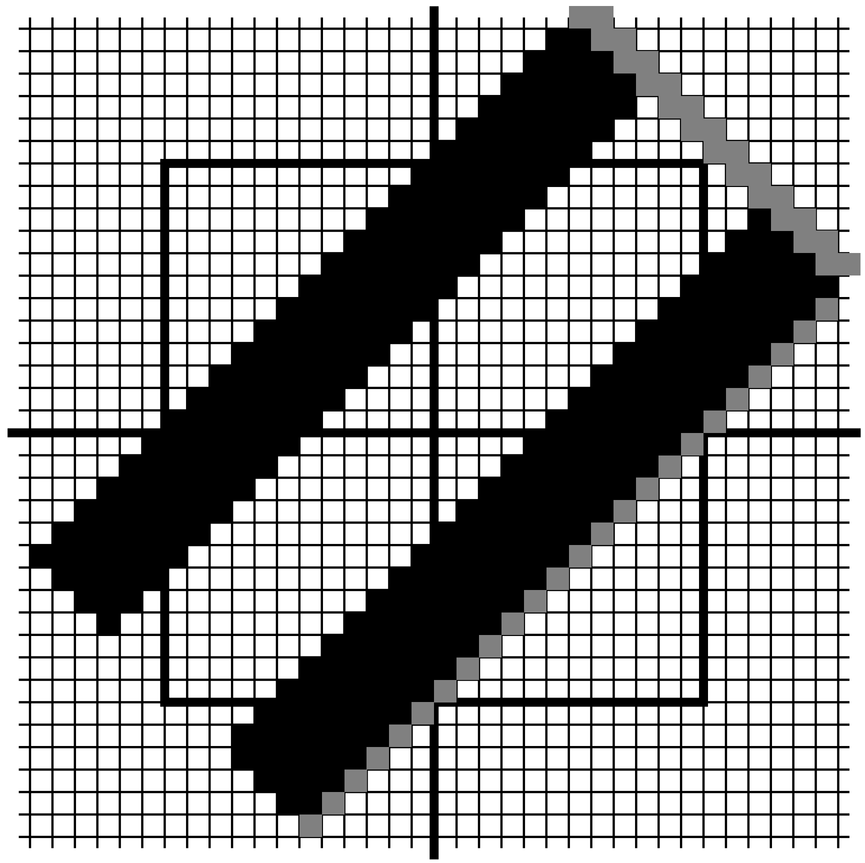

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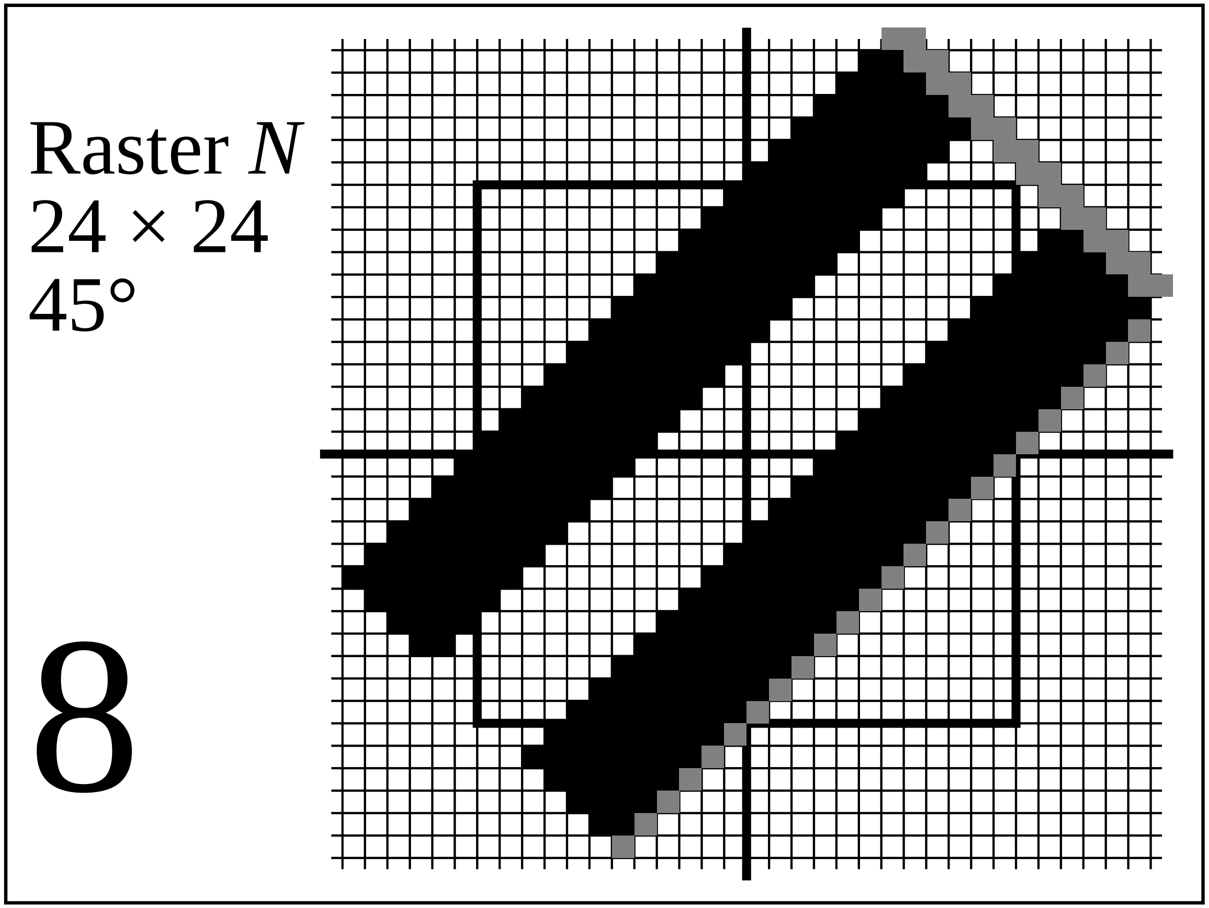

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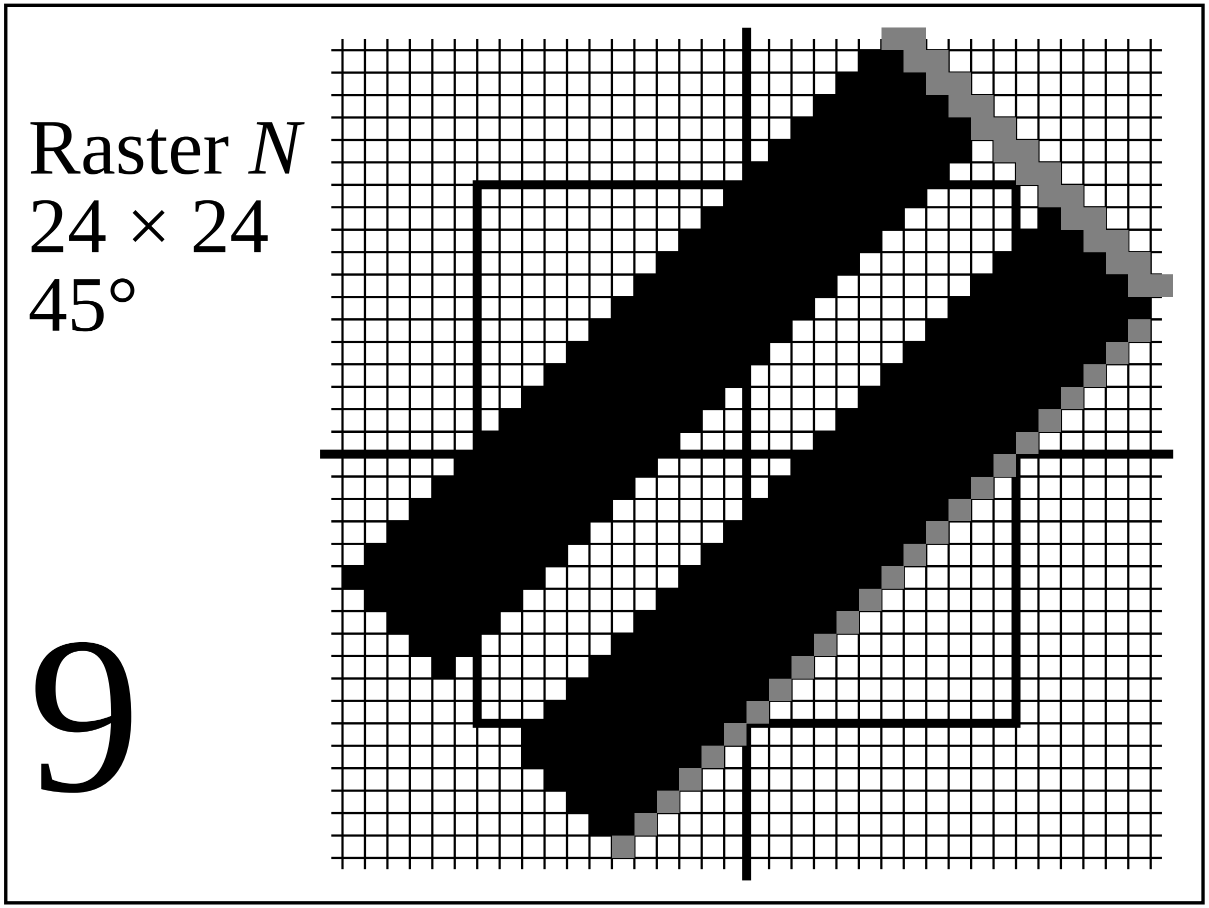

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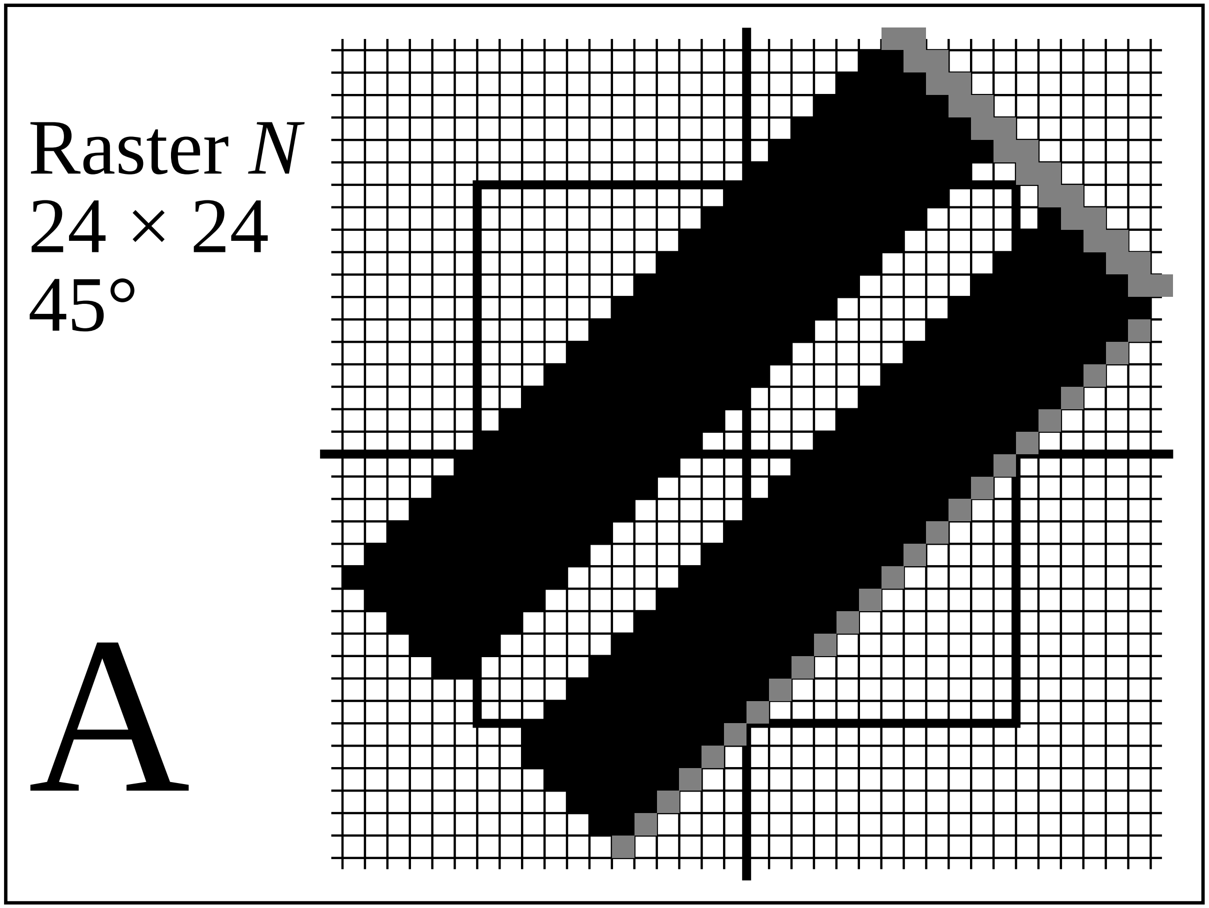

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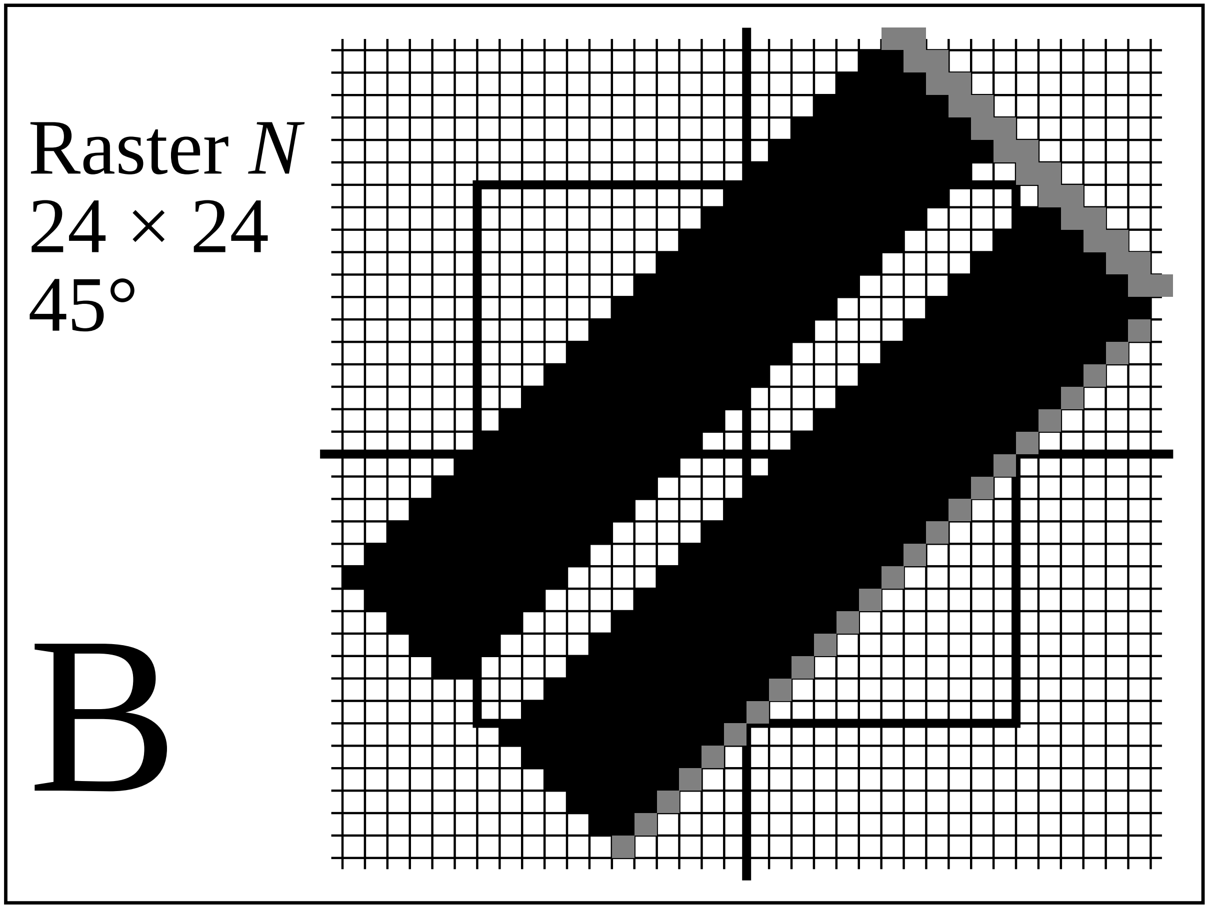

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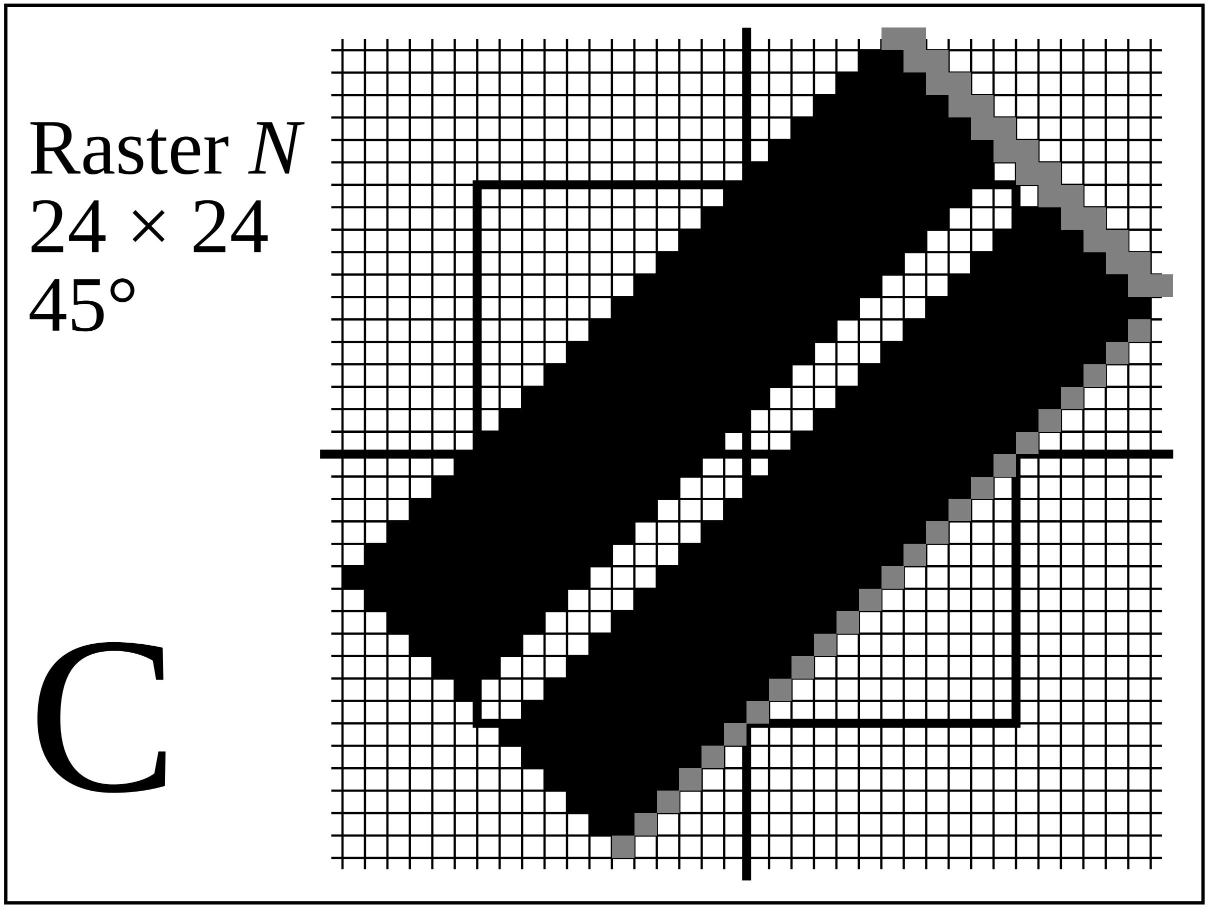

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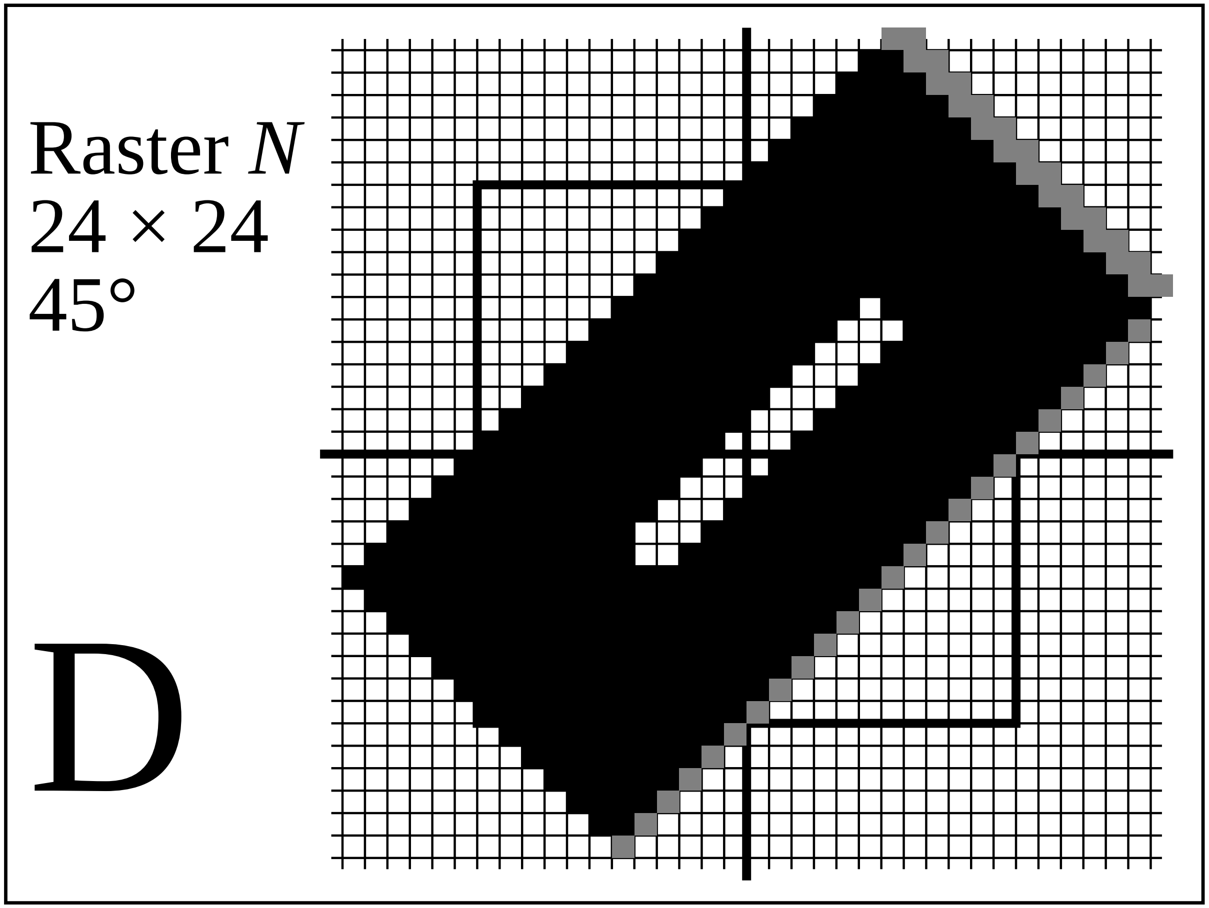

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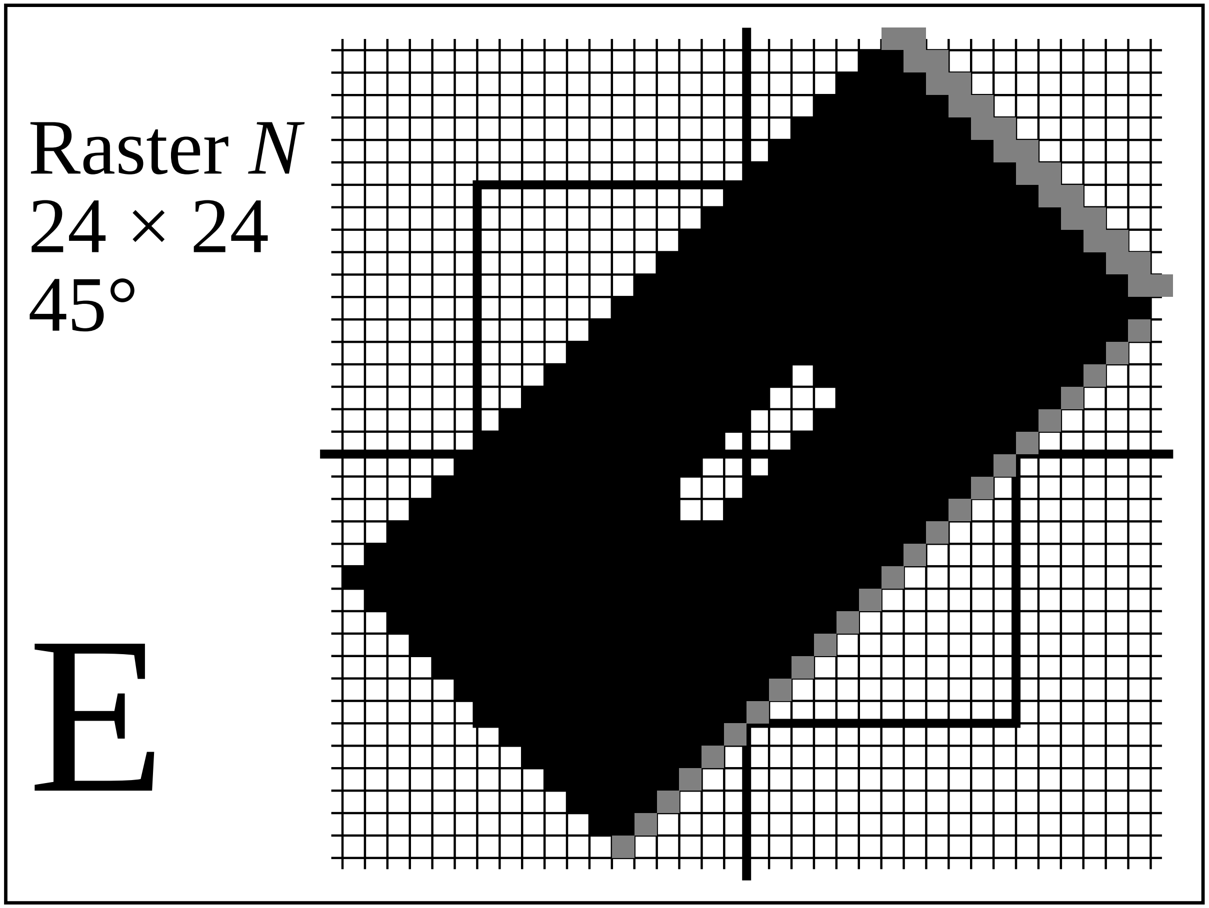

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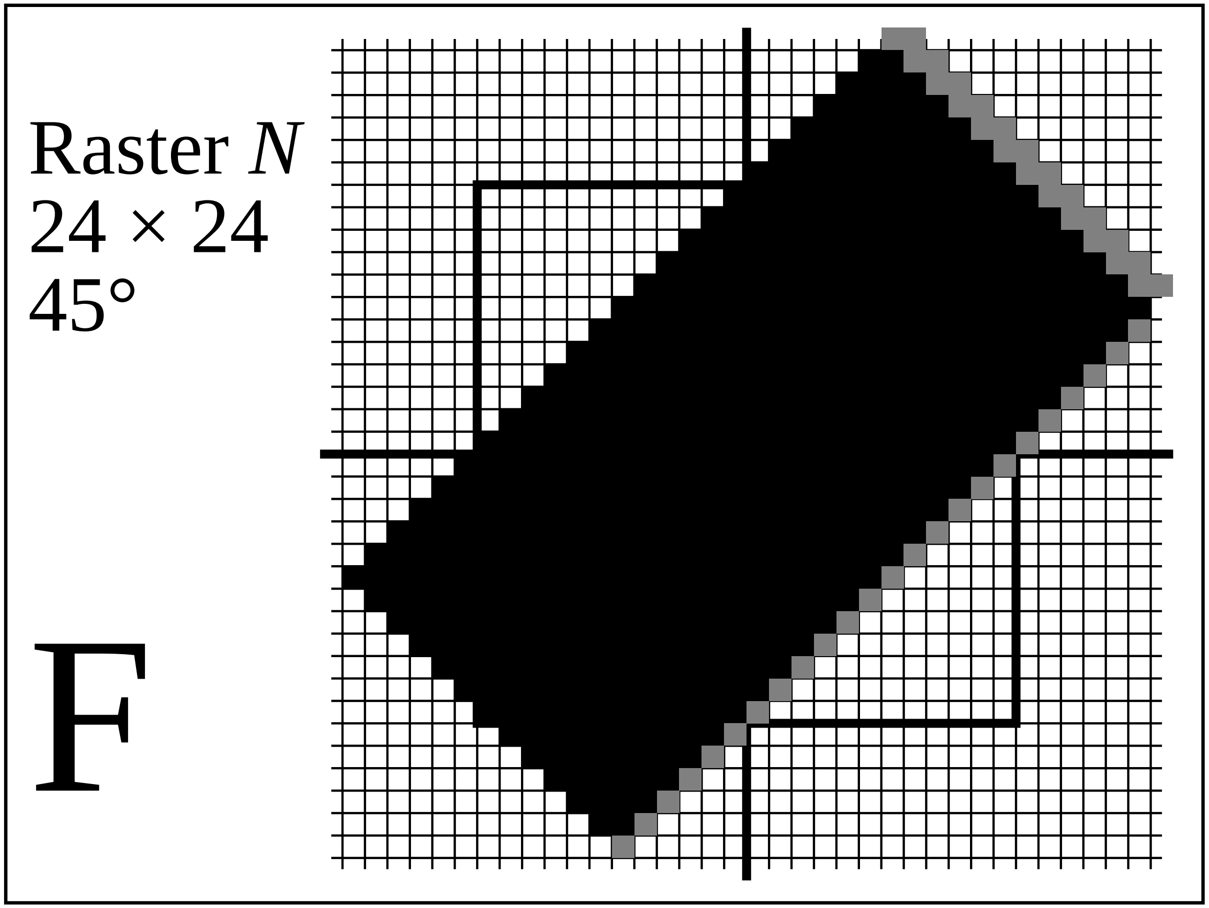

G8361_8f.eps, G0450_8f.eps, G8_16_8f.eps, Bild 8_16_8

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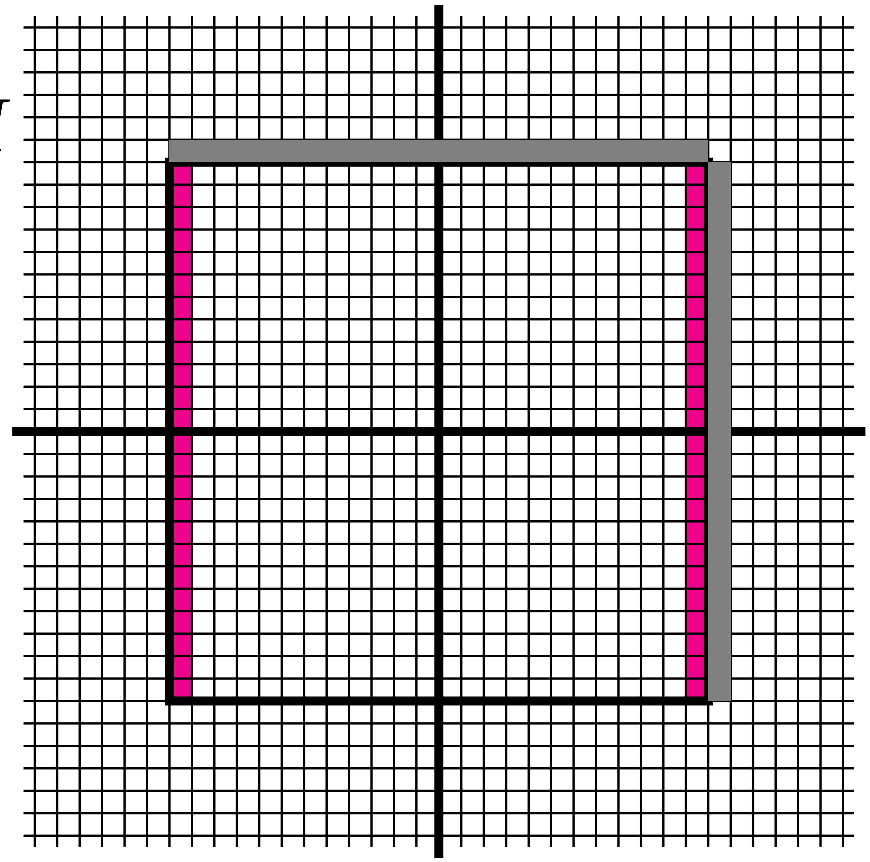

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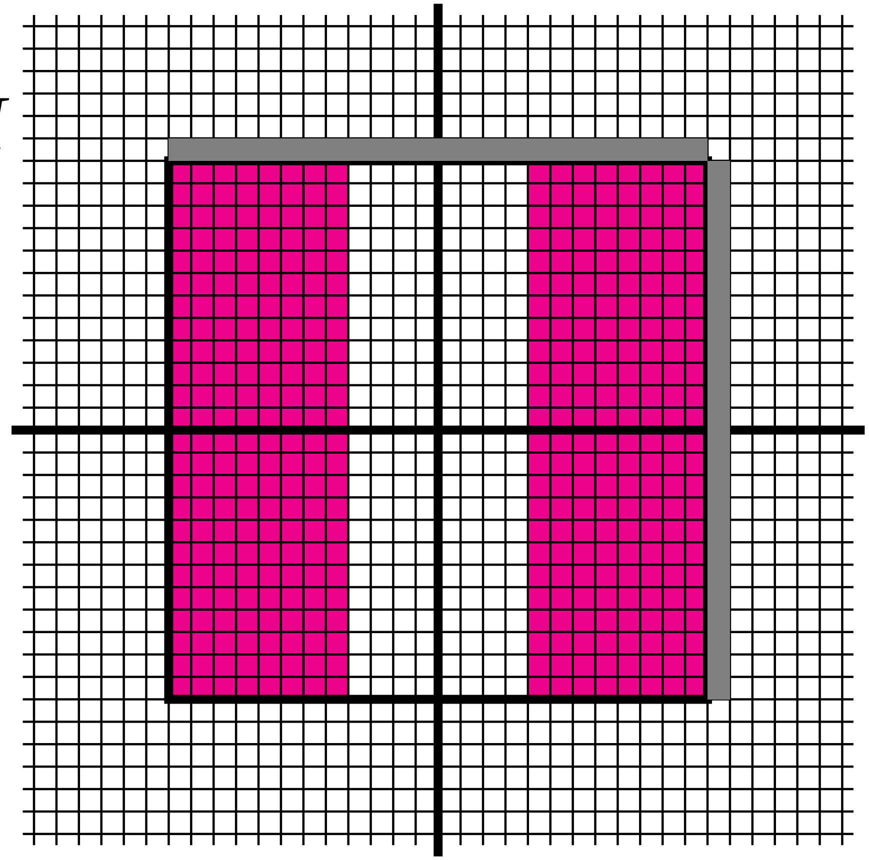

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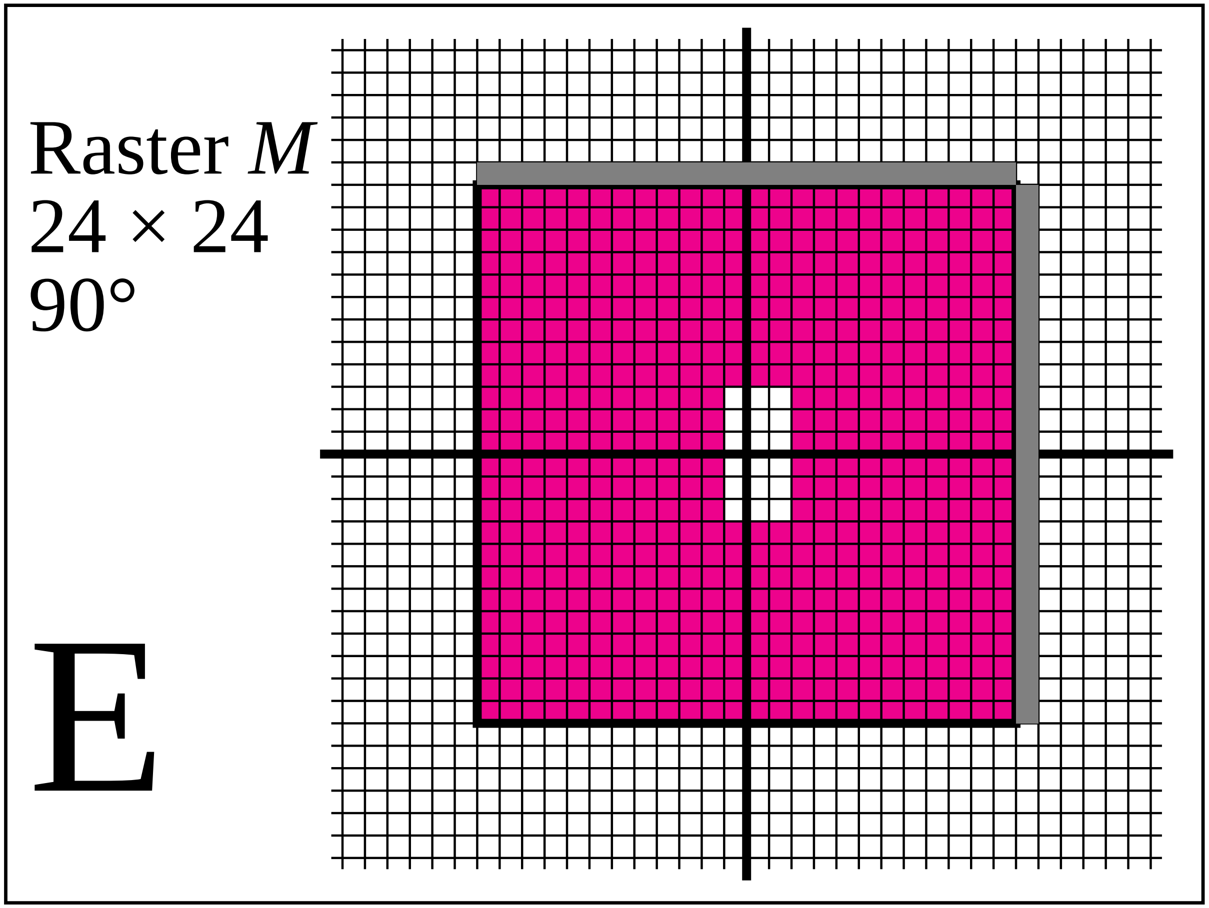

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Raster *C*
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135°

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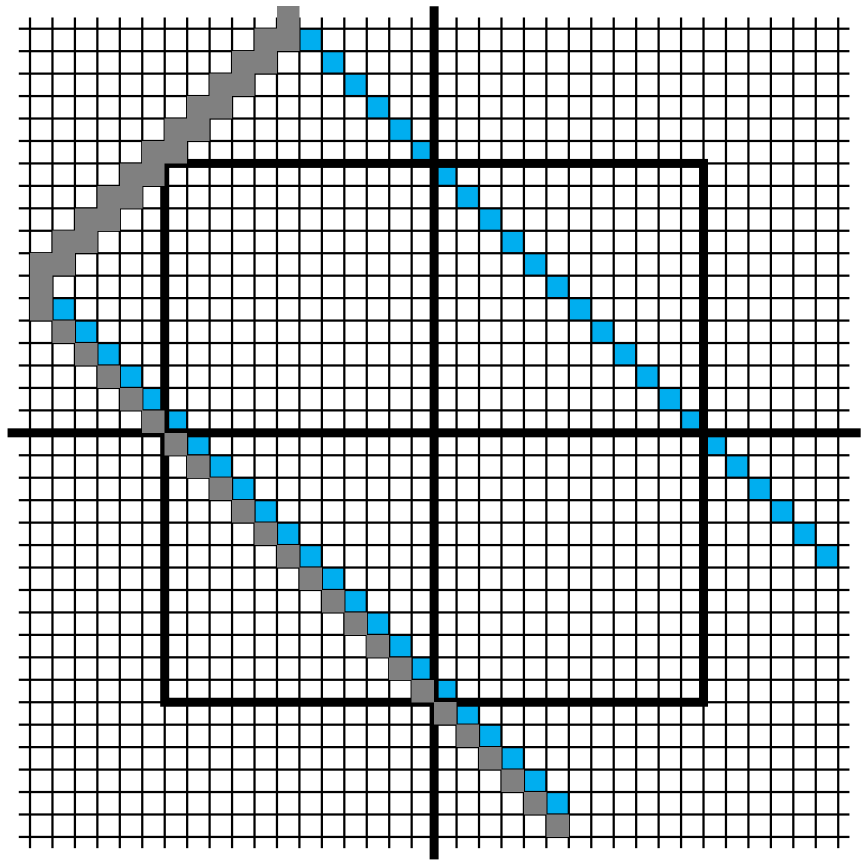

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Raster *C*
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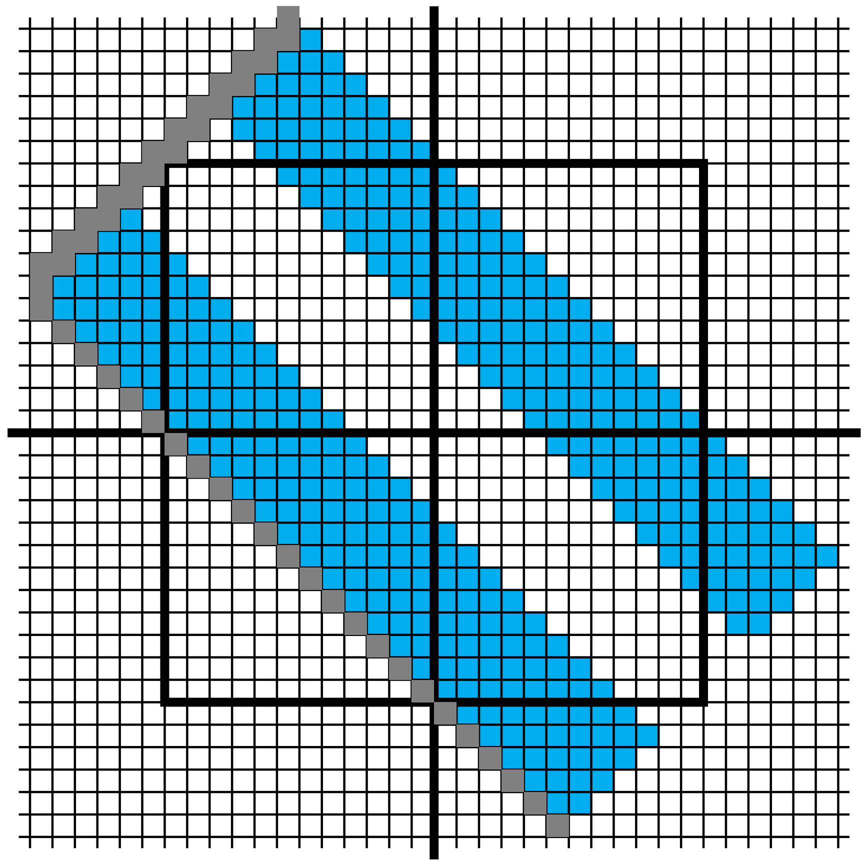
135°

8



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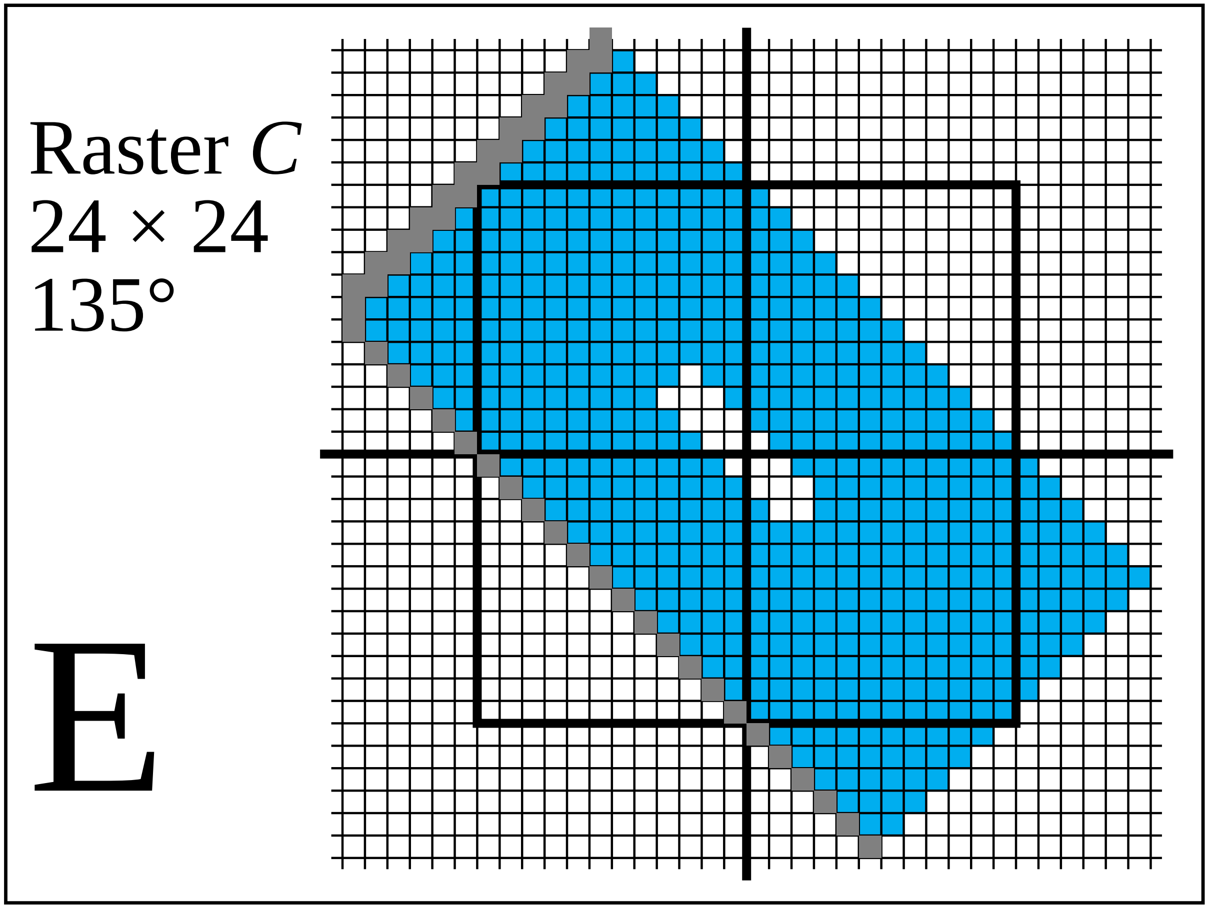

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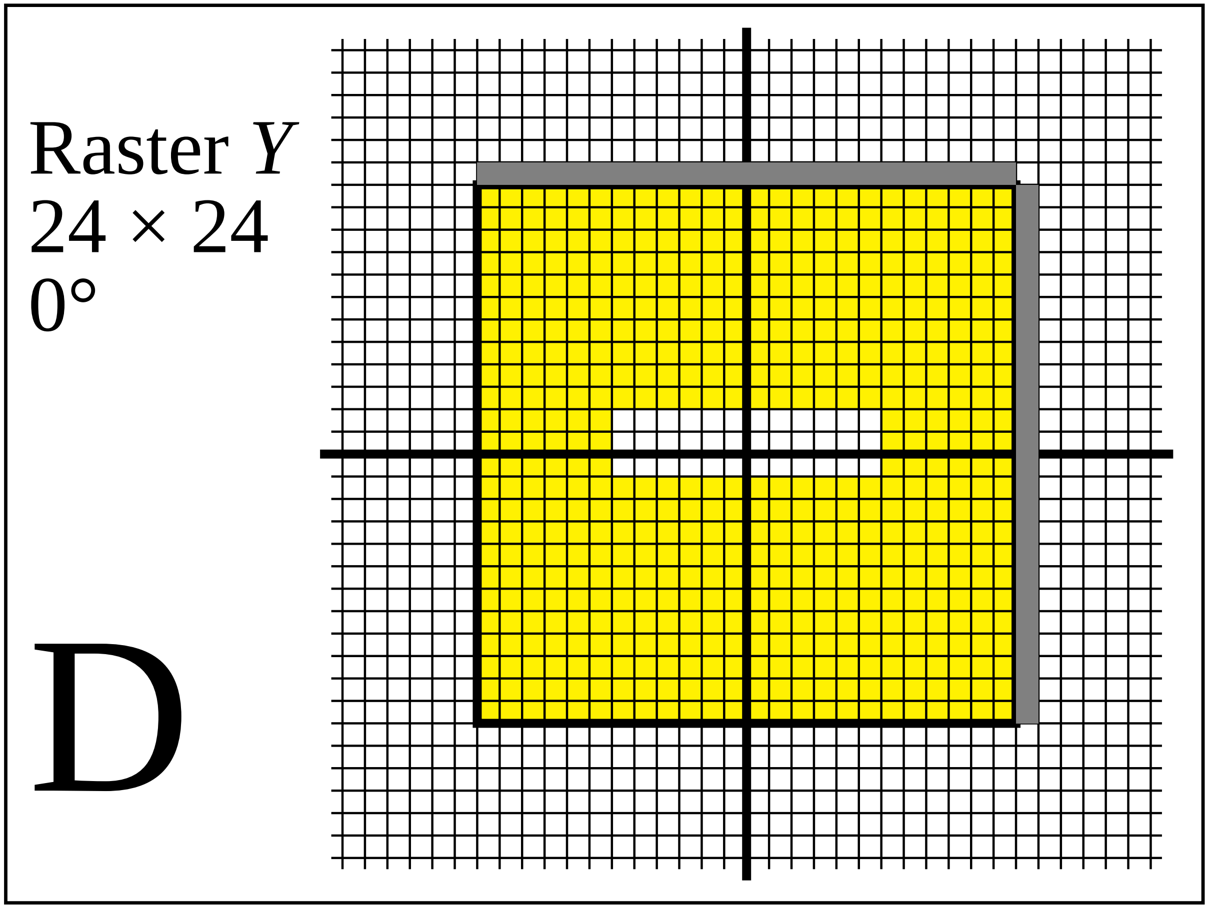

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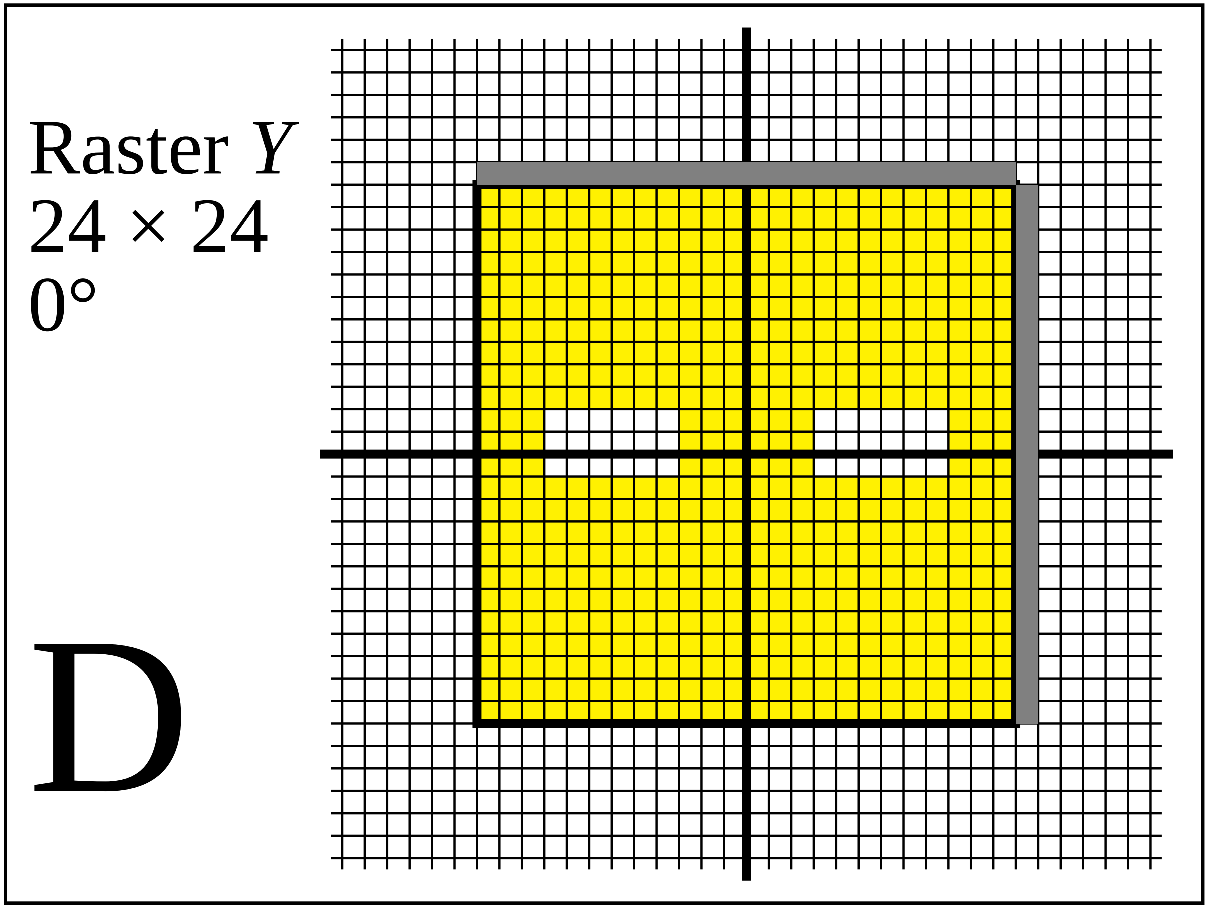

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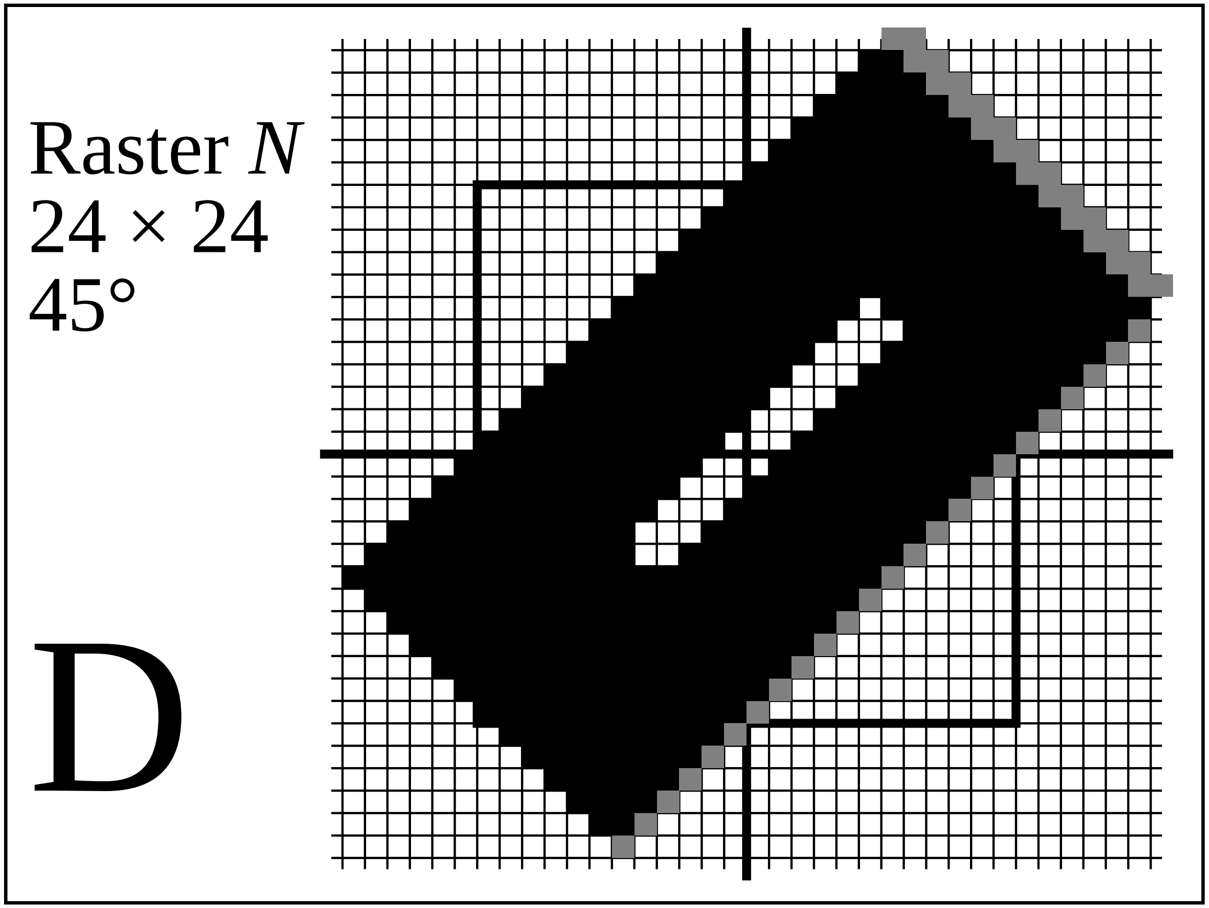

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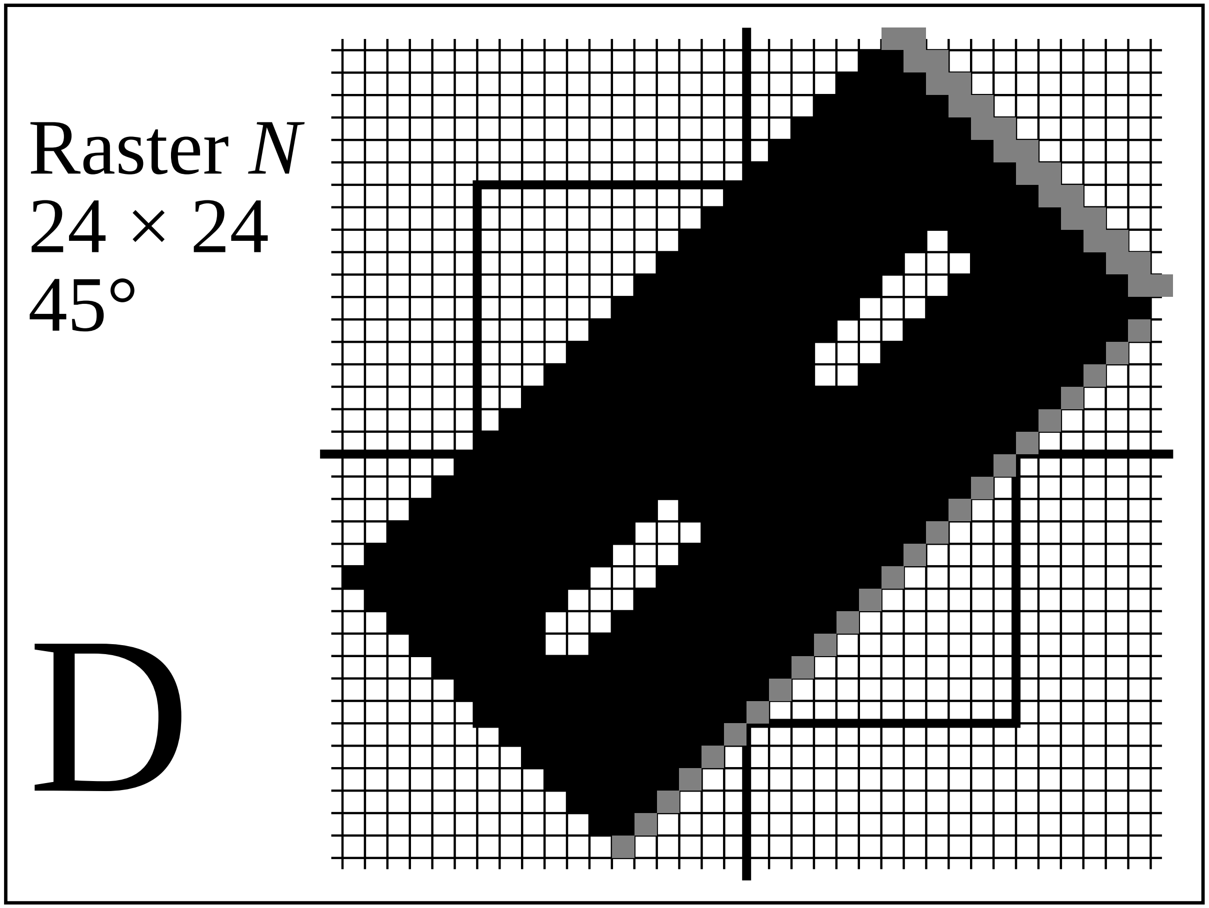

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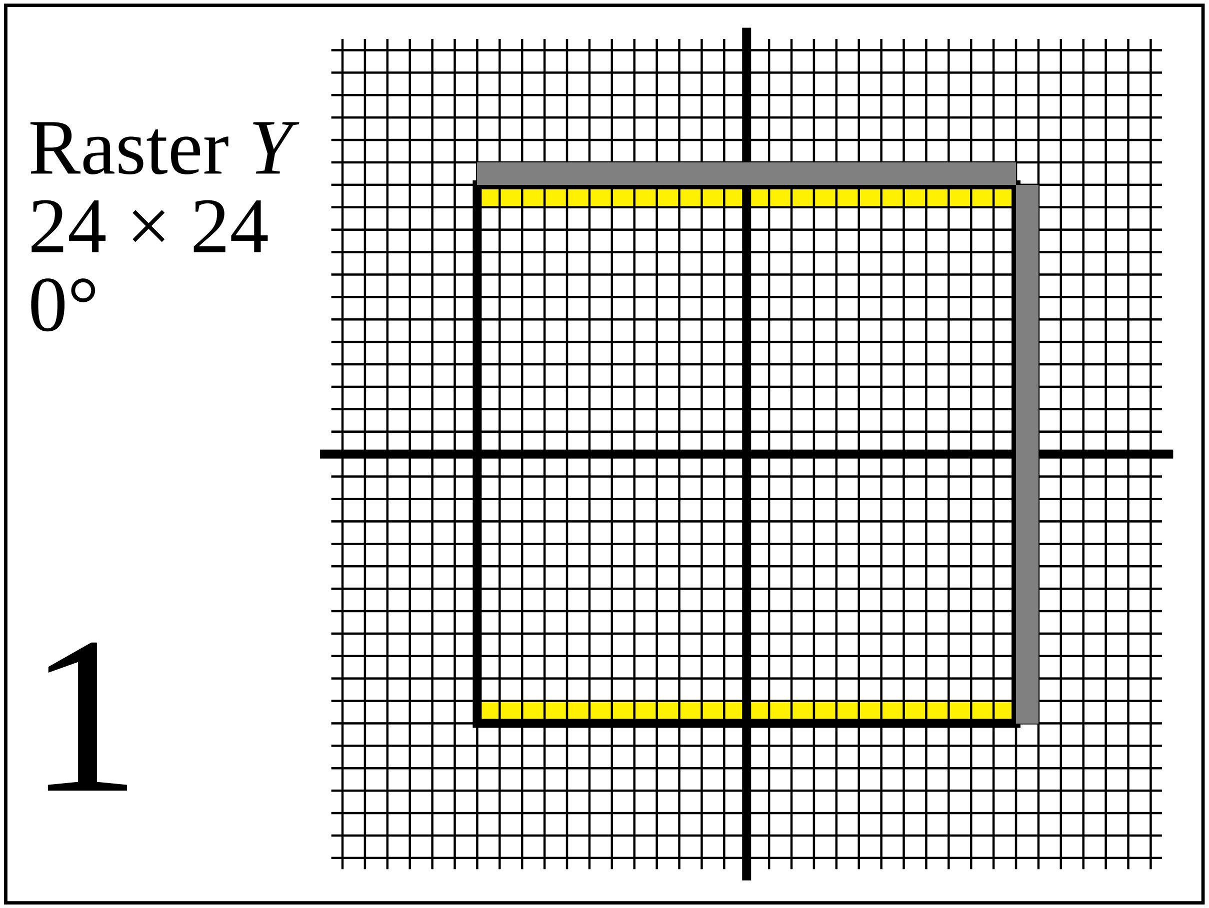

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Raster *Y*
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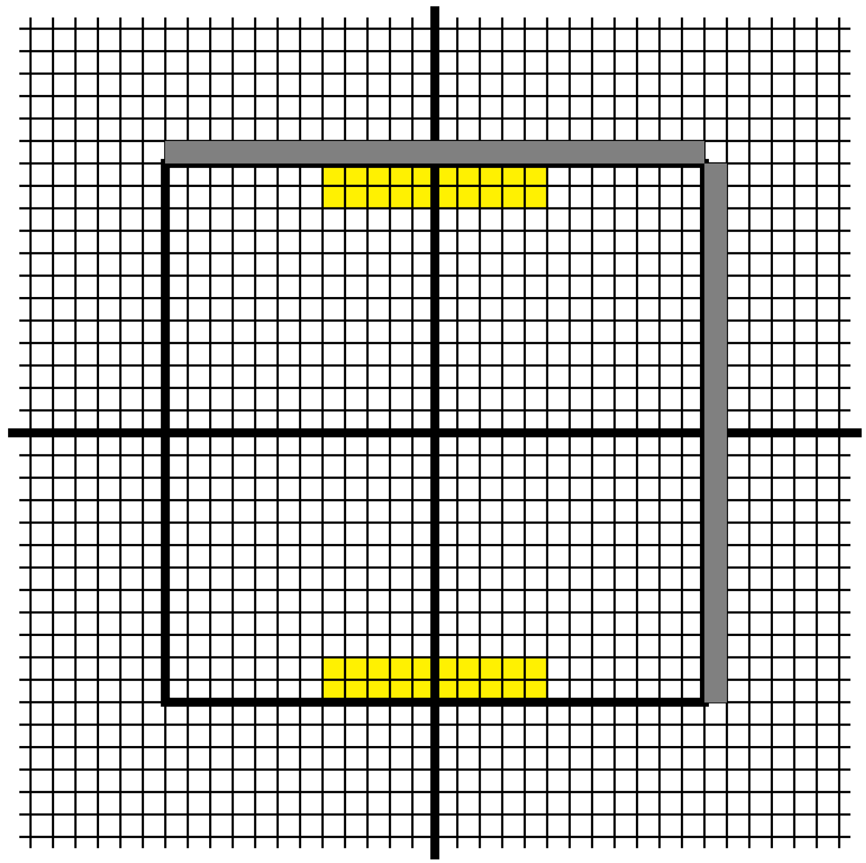

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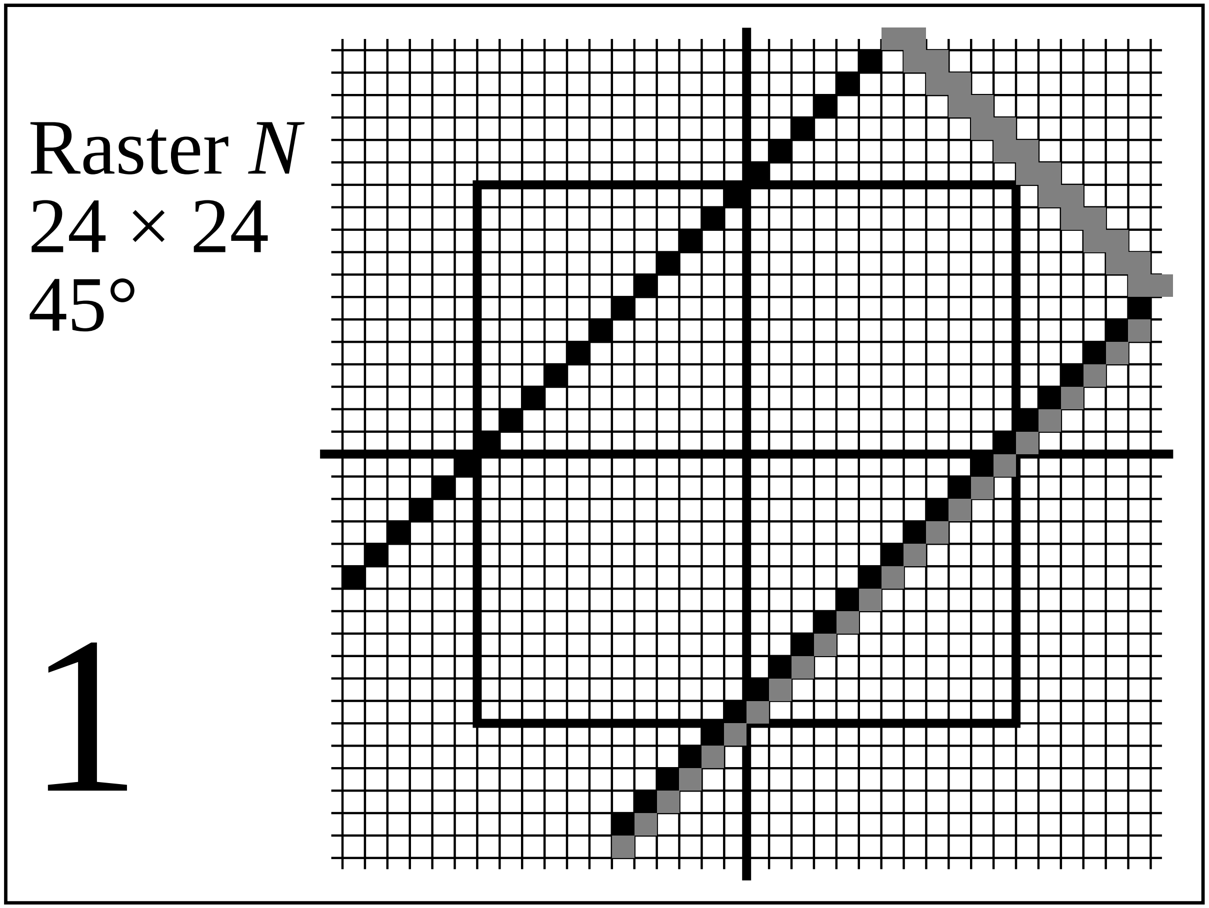

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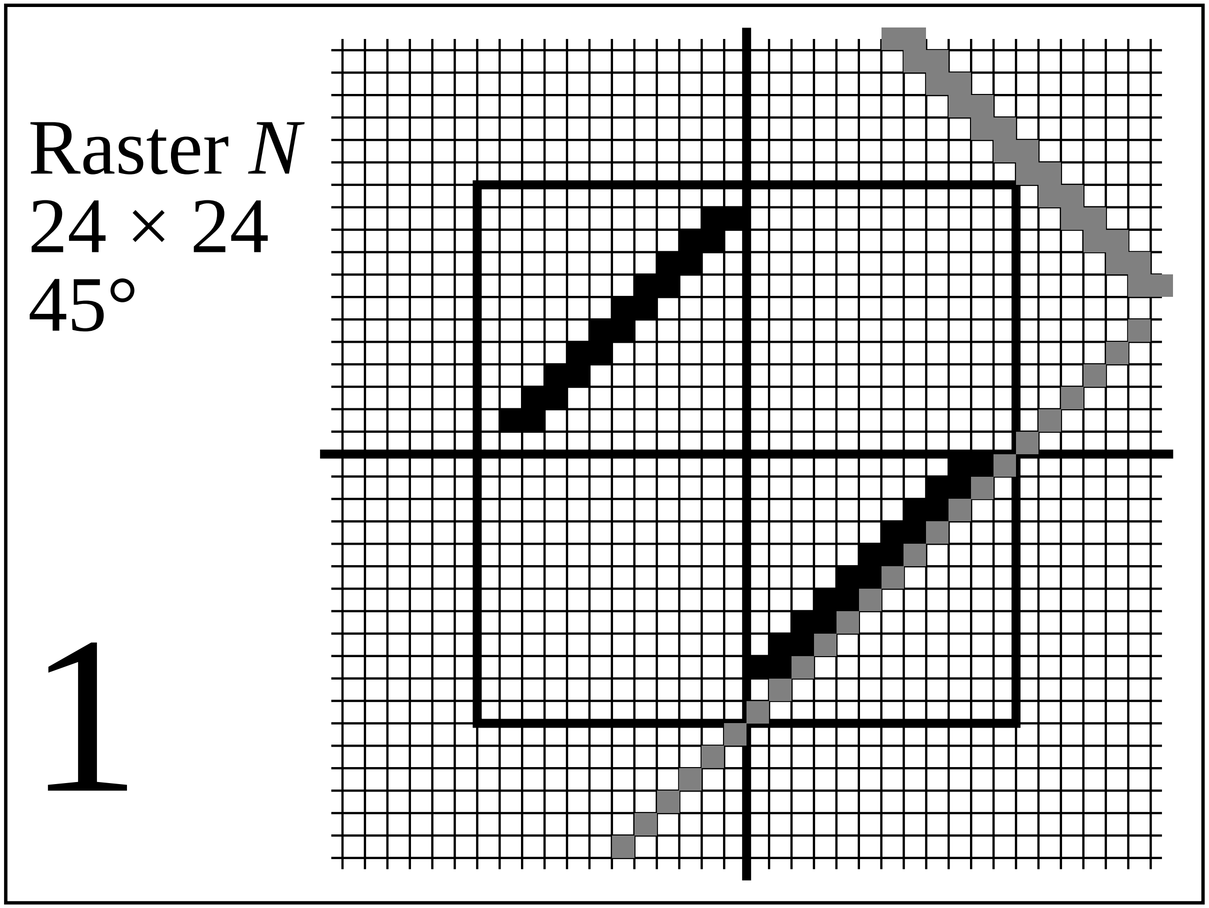

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PSL1-Programmcode: Horizontale Rechteck-Grafikelemente

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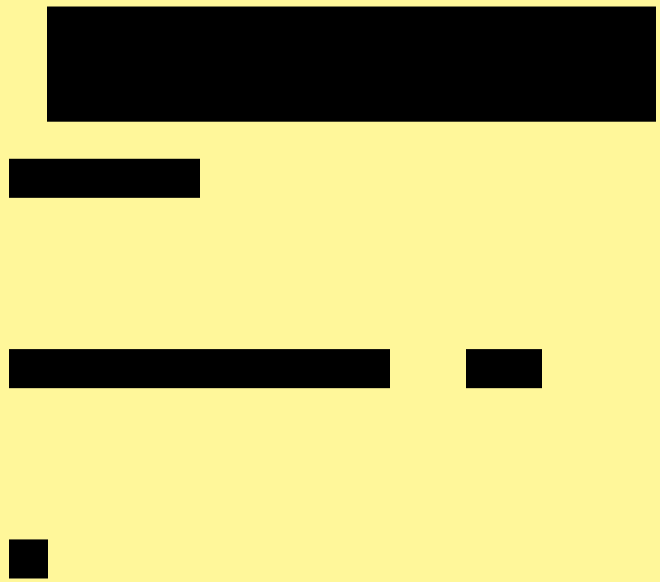
%%BoundingBox: 72 90 226 206
%  Transformation Benutzer- -> Geraetekoordinaten
/Mt  { %  x  y    snaptopixel    sx  sy
 transform
 .25 sub round .25 add exch
 .25 sub round .25 add exch
 itransform moveto} bind def
/HQR { % Zeichnen Basis-Rechteck horizontal (x0 y0 w h)
       4 -2 roll Mt  %(x0,y0) untere linke Ecke Rechteck
       dtransform round exch round exch idtransform
       % Transform. Benutzer- -> Geraetekoordinaten
       dup 0 exch rlineto  %(0,h)  nach oben links
       exch 0 rlineto      %(w,0)  nach oben rechts
       neg 0 exch rlineto  %(0,-h) nach unten rechts
       closepath fill} bind def
/HQRr {HQR /x0 r x0 add def} bind def %r-Quadrat & x0-Transl.
/t { % x y -> x0 y0  Start Zeile, Spalte, Diagonale
     /y0 exch def /x0 exch def} bind def
/O { %voll gefuelltes Basis-Rechteck mit w=r h=1
     /r exch def %Wiederholungsfaktor r
     x0 y0 r 1 HQRr} bind def              %r-fach Quadrat
/@ {/r exch def /x0 r x0 add def} bind def %nur x0-Transl.

72 90 translate 0.0 setlinewidth
72 300 div 20 mul 4 mul dup scale

1 8 t 1 O   1 13 t 10 O 2 @ 2 O   1 18 t 5 O
20 1 22 { 2 exch t 16 O} for

showpage
```

G8262_6f.eps, G0461_5f.eps, G8_21f.eps, Bild 8_21 2x3



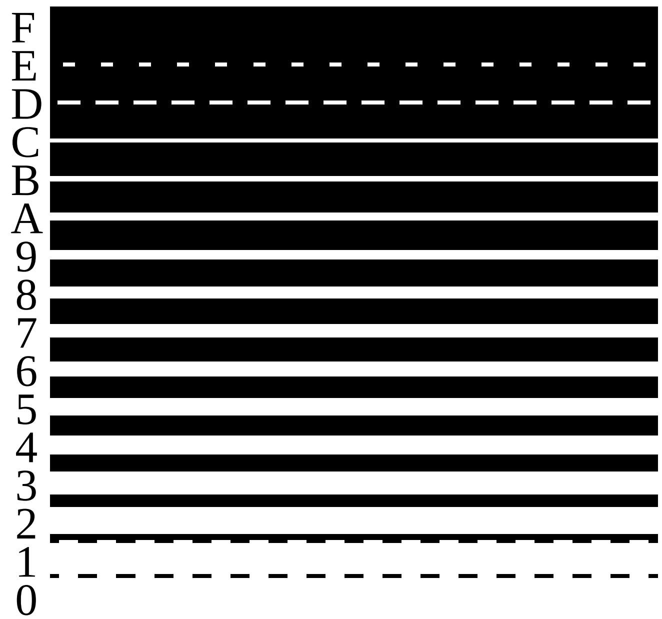
```
72 300 div 20 mul 4 mul dup scale
1 8 t 1 O   1 13 t 10 O 2 @ 2 O   1 18 t 5 O
20 1 22 { 2 exch t 16 O} for
```

G8260_6f.eps, G0461_7f.eps, G8_22f.eps, Bild 8_22

PSL1-Programmcode: Horizontale Rechteck-Grafikelemente (16 Graustufen)

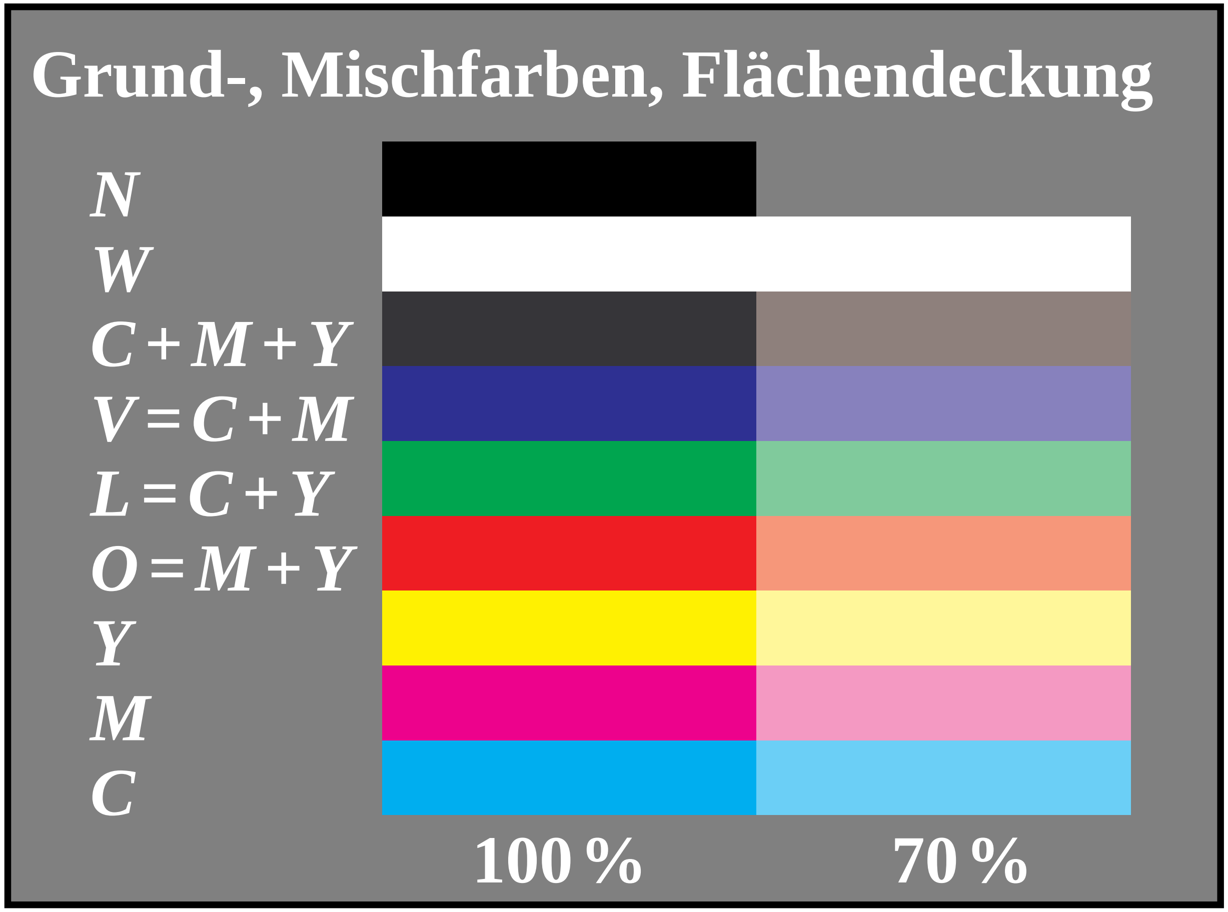
```
%!PS-Adobe-3.0 B8260-7n.eps             20.10.94
%%BoundingBox: 72 90 226 206
% Definitionen /Mt /HQR /HQRr, vgl. PSL1-Code B8262-6n.eps
/HQR1 {HQR /x0 1 x0 add def} bind def %Rechteck & x0-Transl.
%horizontale (HO) Raster, horizontales moveto
/HOIn {%Basis-Rechteck (w=r 1); Innenfeld weiss (w=r 0<h<1)
       /r exch def    %Wiederholungsfaktor r
       x0 y0 r 1 HQR  %Schwarzes Rechteck (w=r h=1)
       1.0 setgray
       x0 y0 xyh add r h HQRr  %Rechteck weiss (w=r 0<h<1)
       0.0 setgray } bind def
/HORa {%Basis-Quadrat (w=r 1); Innenfeld weiss (w=r 0<h<1)
       /r exch def    %Wiederholungsfaktor r
       x0 y0 r 1 HQR  %Schwarzes Rechteck (w=r h=1)
       1.0 setgray
       x0 y0 xyh add r h HQR       %Rechteck weiss (r 0<h<1)
       r {x0 xyw add y0 w 1 HQR1} repeat %Quer-Rechteck
       0.0 setgray } bind def
/HOMi {%Basis-Rechteck (w=r 1); Innenfeld weiss (0<w,h<1)
       /r exch def    %Wiederholungsfaktor r
       x0 y0 r 1 HQR  %Schwarzes Randrechteck
       1.0 setgray
       r {x0 xyw add y0 xyh add w h HQR1} repeat %Quadrat
       0.0 setgray } bind def
/xyw{1 w sub 0.5 mul}bind def /xyh{1 h sub 0.5 mul}bind def
/O { /r exch def x0 y0 r 1 HQRr} bind def   %r-fach Quadrat
/N {/h 0.10 def /w 0.30 def HOMi} bind def
/M {/h 0.10 def /w 0.60 def HOMi} bind def
/L {/h 0.10 def HOIn} bind def
/K {/h 0.15 def HOIn} bind def
/J {/h 0.20 def HOIn} bind def
/I {/h 0.25 def HOIn} bind def
/H {/h 0.30 def HOIn} bind def
/G {/h 0.35 def HOIn} bind def
/F {/h 0.40 def HOIn} bind def
/E {/h 0.45 def HOIn} bind def
/D {/h 0.50 def HOIn} bind def
/C {/h 0.60 def HOIn} bind def
/B {/h 0.70 def HOIn} bind def
/A {/h 0.80 def /w 0.50 def HORa} bind def
/@ {/x0 exch x0 add def} bind def %reine x0-Translation
/t {/y0 exch def /x0 exch def} bind def  %Start x0, y0
1 1 scale 72 90 translate 0.0 setlinewidth %kleinste Linie
72 300 div 20 mul 4 mul dup scale
 0 0 t 32 H
 1 1 6 {0 exch t 1 H 30 @ 1 H} for
 0 7 t 1 H 7 @ 16 A 7 @ 1 H
 0 8 t 1 H 7 @ 16 B 7 @ 1 H
 % .....
 0 20 t 1 H 7 @ 16 N 7 @ 1 H
 0 21 t 1 H 7 @ 16 O 7 @ 1 H
 0 22 t 1 H 30 @ 1 H
 0 23 t 32 H
showpage
```

G8262_7f.eps, G0470_7f.eps, G8_23f.eps, Bild 8_23 2x4

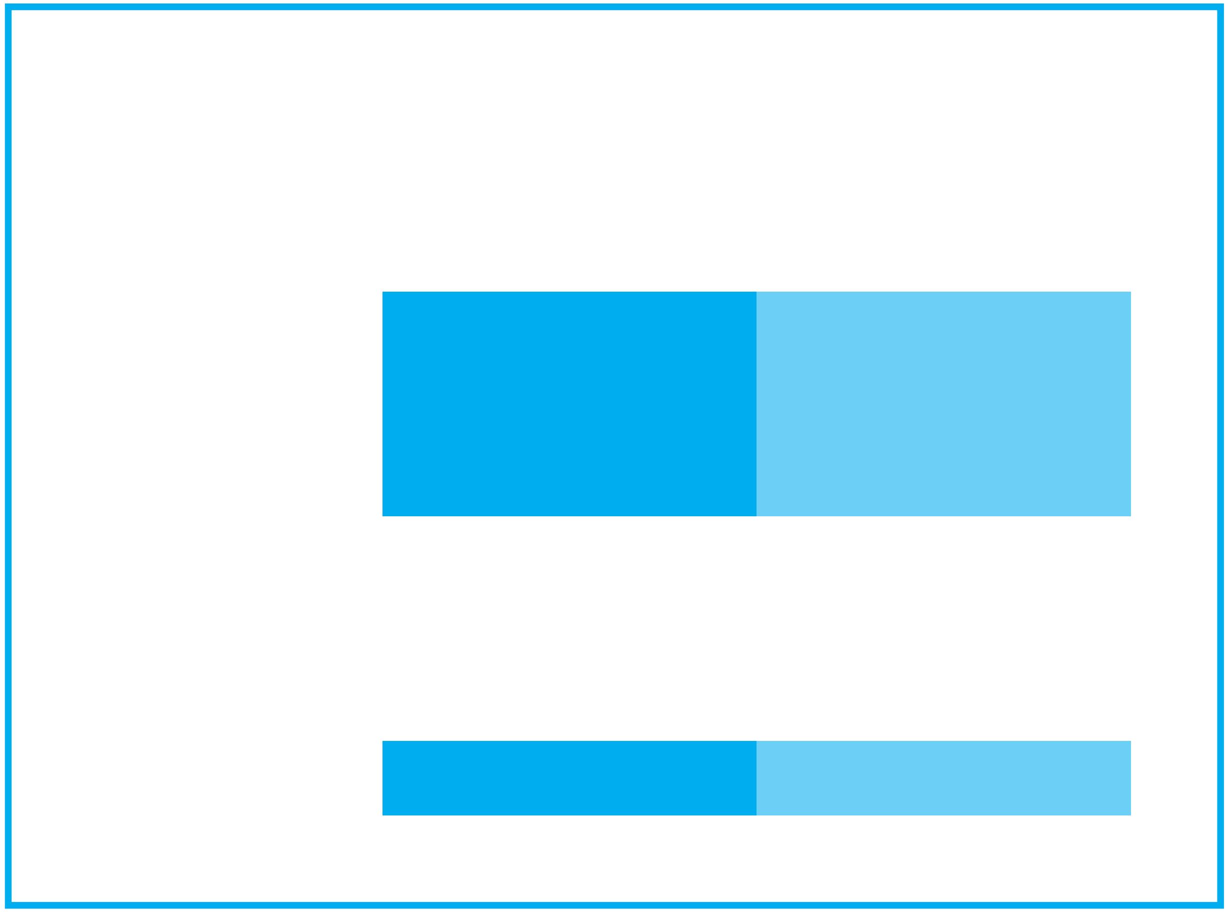


0 0 translate 0 0 t 32 H 1 1 6 {0 exch t 1 H 30 @ 1 H} for
0 7 t 1 H 7 @ 16 A 7 @ 1 H
0 8 t 1 H 7 @ 16 B 7 @ 1 H ... 0 23 t 32 H

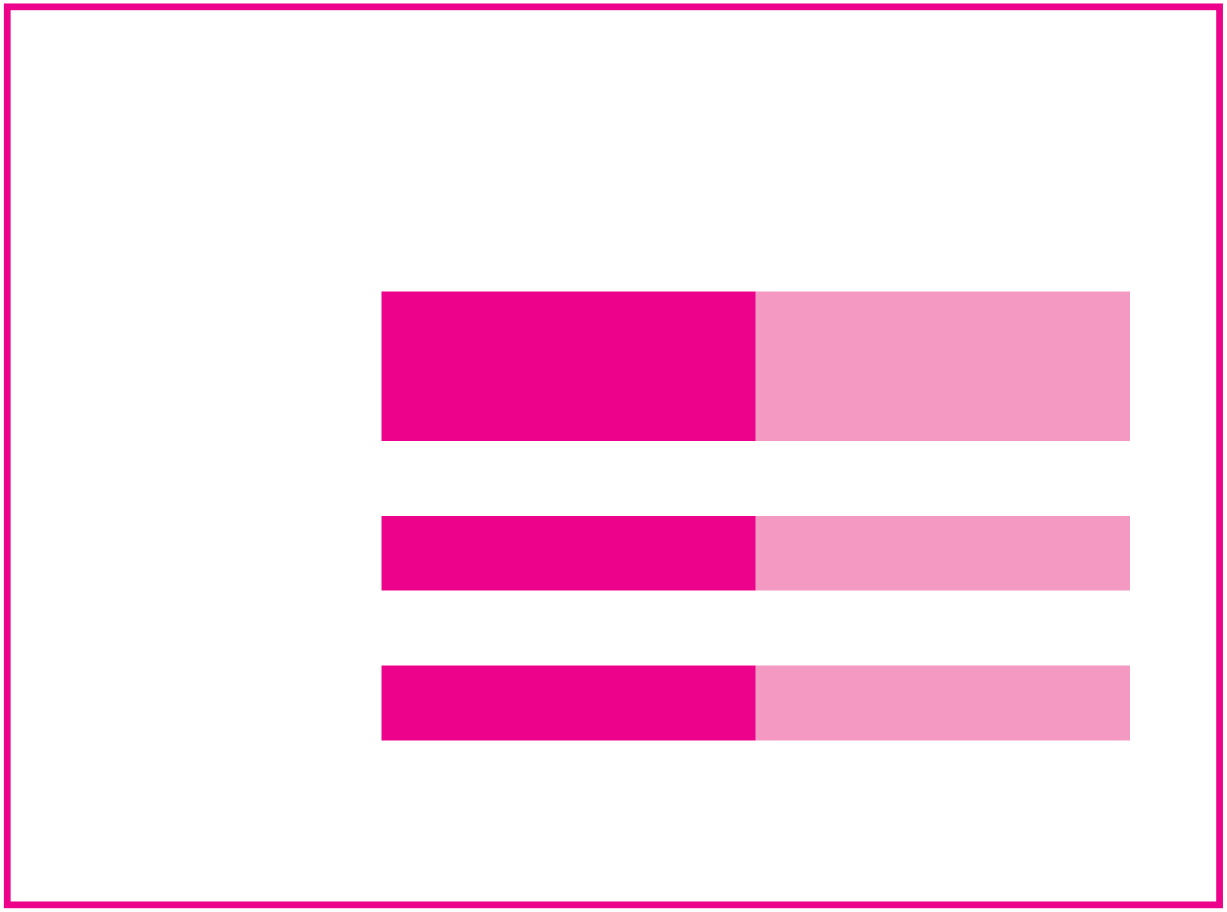
G8260_7f.eps, G0471_1f.eps, G8_24f.eps, Bild 8_24



G9481_8f.eps, G0471_2f.eps, G8_25f.eps, Bild 8_25

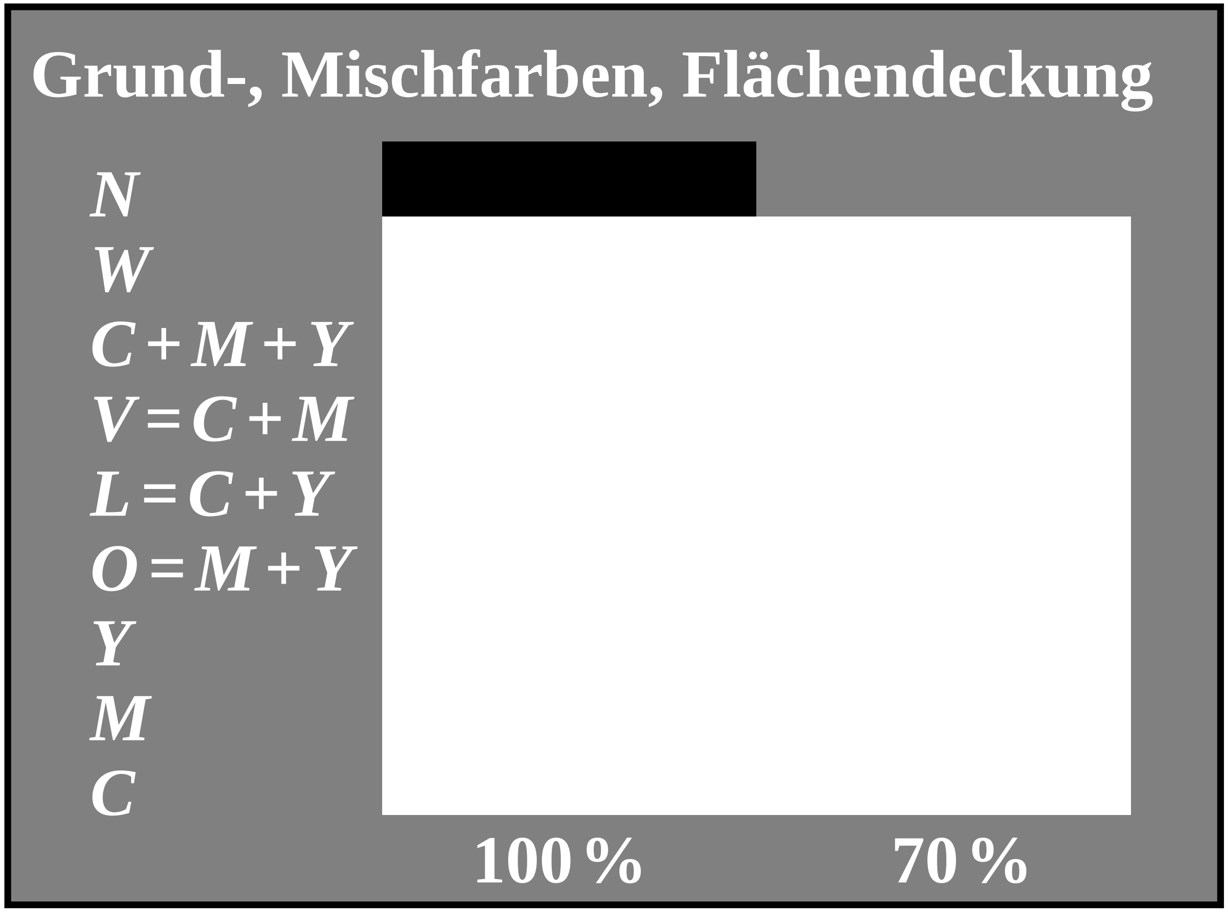


G9481_4f.eps, G0471_3f.eps, G8_26_1f.eps, Bild 8_26_1



G9481_5f.eps, G0471_4f.eps, G8_26_2f.eps, Bild 8_26_2

G9481_6f.eps, G0471_5f.eps, G8_26_3f.eps, Bild 8_26_3



G9481_7f.eps, G0471_6f.eps, G8_26_4f.eps, Bild 8_26_4

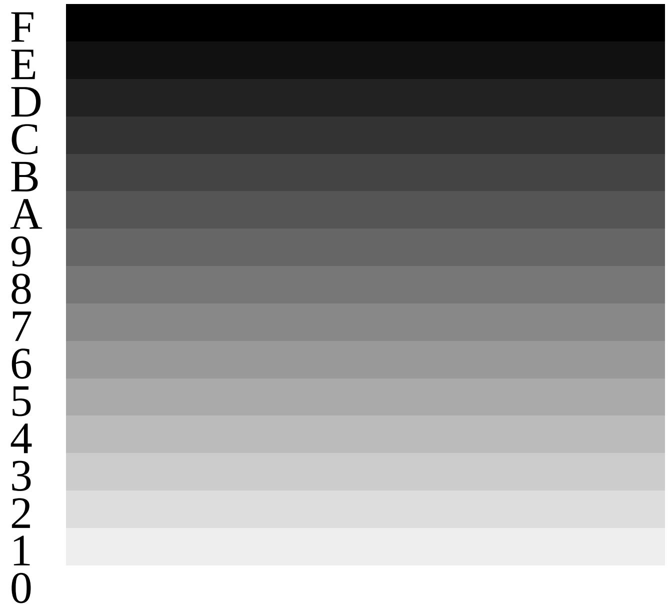
PSL1-Programmcode: Farbbild und -auszüge mit vier Grundfarben CMYN

```
%!PS-Adobe-3.0 d2:[rr.p9f]B7251-7n.eps/B9481-8N.eps   12.2.96
%%BoundingBox: 72 90 226 204
/Times-Roman findfont dup length dict  begin
{1 index /FID ne {def} {pop pop} ifelse }forall
/Encoding ISOLatin1Encoding def currentdict end
/Times-ISOL1 exch definefont pop
/FS {findfont exch scalefont setfont} bind def
/MM {72 25.4 div mul} def /str {8 string } bind def
%%EndProlog

72 90 translate 0.01 MM 1.05 mul 0.01 MM 1.05 mul scale
/ausz 2 def           %Farbauszug 0=C, 1=M, 2=Y, 3=N, 4=F
/recfi {/heigth exch def /width exch def /ys exch def /xs exch def
        xs ys moveto width 0 rlineto
         0 heigth rlineto width neg 0 rlineto closepath
 ausz 0 eq { pop pop pop 1 exch sub setgray          %C
            060 135 {pop} setscreen fill } if
 ausz 1 eq { pop pop 1 exch sub setgray pop          %M
            060 090 {pop} setscreen fill } if
 ausz 2 eq { pop 1 exch sub setgray pop pop          %Y
            060 000 {pop} setscreen fill } if
 ausz 3 eq { 1 exch sub setgray pop pop pop          %N
            060 045 {pop} setscreen fill } if
 ausz 4 eq { setcmykcolor
            060 135 {pop} 060 090 {pop} 060 000 {pop} %F
            060 045 {pop} setcolorscreen fill} if} bind def
 ausz 3 ge {0.0 0.0 0.0 0.5 0 0 5400 4000 recfi}
           {0.0 setgray 0 0 moveto 5400 0 rlineto 0 4000
            rlineto -5400 0 rlineto closepath stroke} ifelse
 ausz 3 ge {1.0 setgray 300 /Times-ISOL1 FS 100 3600 moveto
 (Grund›, Mischfarben, Flächendeckung) show } if
/xyw {4000 12 div} bind def /xw {5 xyw mul} bind def
/x01 {5 xyw mul} bind def /y0 {1.2 xyw mul} bind def
/x02 {10 xyw mul} bind def
/colors1           %CMYN der Farbstreifen von unten nach oben
[{1.0 0.0 0.0 0.0} {0.0 1.0 0.0 0.0} {0.0 0.0 1.0 0.0}
 {0.0 1.0 1.0 0.0} {1.0 0.0 1.0 0.0} {1.0 1.0 0.0 0.0}
 {1.0 1.0 1.0 0.0} {0.0 0.0 0.0 0.0} {0.0 0.0 0.0 1.0}] bind def
/colors2
[{0.5 0.0 0.0 0.0} {0.0 0.5 0.0 0.0} {0.0 0.0 0.5 0.0}
 {0.0 0.5 0.5 0.0} {0.5 0.0 0.5 0.0} {0.5 0.5 0.0 0.0}
 {0.5 0.5 0.5 0.0} {0.0 0.0 0.0 0.0} {0.0 0.0 0.0 0.5}] bind def
0 1 8 {/i exch def colors1 i get exec
       x01 i xyw mul y0 add xw xyw recfi} for
0 1 8 {/i exch def colors2 i get exec
       x02 i xyw mul y0 add xw xyw recfi} for
ausz 3 ge {1.0 setgray 300 /Times-Italic FS
/N8 (C     M     Y     O=M+Y L=C+Y V=C+M C+M+Y W     N     ) def
0 1 8  {/nr exch def nr xyw mul y0 add x01 1300 sub exch
moveto 40 0 N8 nr 6 mul 6 getinterval ashow}for 300 /Times-Roman FS
x01 400 add  y0 300 sub moveto (100) show 30 0 rmoveto (%) show
x02 600 add  y0 300 sub moveto (70) show 30 0 rmoveto (%) show} if

showpage
```

G7253_7f.eps, G0480_7f.eps, G8_27f.eps, Bild 8_27 2x4

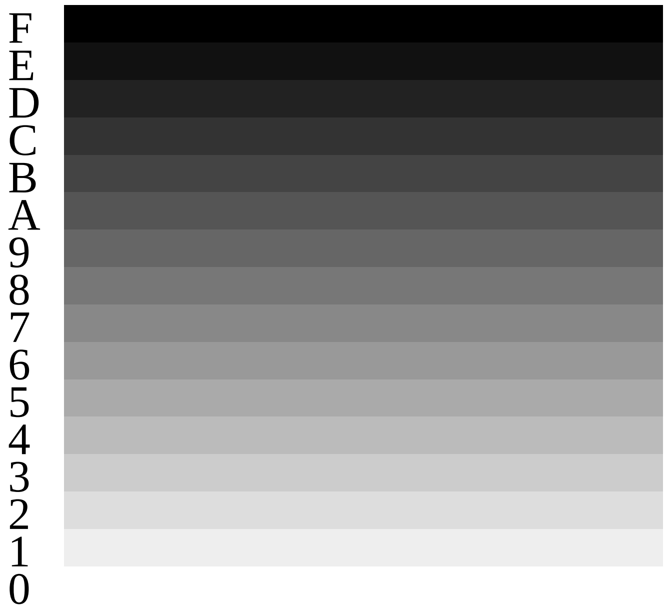


% <</HalftoneType 3 /Width 24 /Height 24 /Thresholds

%Mitte 7 × 5 "10", 13 × 5 "20", 24 × 5 "30", usw.

% >> sethalftone; ohne Rasterzellen-Schwellendaten mit "%"

G7210_7f.eps, G0481_1f.eps, G8_28_1f.eps, Bild 8_28_1 *PDF



<</HalftoneType 3 /Width 24 /Height 24 /Thresholds

%Mitte 7 × 5 "10", 13 × 5 "20", 24 × 5 "30", usw.

>> sethalftone %<<, >> siehe PSL2−Handbuch, Seite 361

G7211_7f.eps, G0481_2f.eps, G8_28_2f.eps, Bild 8_28_2 *PDF

PSL2-Programmcode: Rasterzellen-Schwellendaten (24 × 24, 8 bit, horizontal)

```
%!PS-Adobe-3.0 B7211-7n.eps mit h24n721.for, 20.10.94
%%BoundingBox: 72 90 226 204
/FS {findfont exch scalefont setfont} bind def
/MM {72 25.4 div mul} def /str {8 string } bind def
/languagelevel where {pop languagelevel} {1} ifelse
2 eq {[/HalftoneType 3 /Width 24 /Height 24 /Thresholds
<F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0
 E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0
 D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0
 C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
 B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0
 A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0
 909090909090909090909090909090909090909090909090
 808080808080808080808080808080808080808080808080
 606060606060606060606060606060606060606060606060
 404040404040404040404040404040404040404040404040
 303030303020202010101010101010202020303030303030
 303030303020202010101010101010202020303030303030
 303030303020202010101010101010202020303030303030
 303030303020202010101010101010202020303030303030
 303030303020202010101010101010202020303030303030
 505050505050505050505050505050505050505050505050
 707070707070707070707070707070707070707070707070
 909090909090909090909090909090909090909090909090
 A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0A0
 B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0B0
 C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0C0
 D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0
 E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0
 F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0F0>
 counttomark 2 idiv dup dict begin {def} repeat
 pop currentdict end sethalftone} if %Def.Dictionary
%%EndProlog

72 90 translate 0.01  MM dup scale 15 setlinewidth
0 0  moveto 5400 0 rlineto 0 4000 rlineto
           -5400 0 rlineto closepath stroke
/xyw {4000 24 div} bind def /xw {16 xyw mul} bind def
/x0 {8 xyw mul} bind def /y0 {5 xyw mul} bind def
0 1 15 {dup 0.0666 mul 1 exch sub setgray
        xyw mul y0 add x0 exch moveto
        xw 0 rlineto 0 xyw rlineto
        xw neg 0 rlineto closepath fill} for
200 /Times-ISOL1 FS 0 setgray /D16str (0123456789ABCDEF) def
0 1 15 {/nr exch def nr xyw mul y0 add x0 250 sub exch
        moveto D16str nr 1 getinterval show} for

 xyw 3.5 xyw mul moveto
(<</HalftoneType 3 /Width 24 /Height 24 /Thresholds) show
 xyw 2.0 xyw mul moveto
(%Mitte 7 × 5 "10", 13 × 5 "20", 24 × 5 "30", usw.) show
 xyw 0.5 xyw mul moveto
(>> sethalftone %<<, >> siehe PSL2-Handbuch, Seite 361) show
showpage
```

G7213_7f.eps, G0490_7f.eps, G8_29f.eps, Bild 8_29 2x4

PC-Betriebssysteme für Intel 486 Produkt-Name und Grafik-Software			
Hersteller	NeXT	Microsoft	IBM
Produkt-Name	NeXT-step V.3.3	Windows NT V.3.1	OS/2 V.2.1
Umfang	300 MByte	100 MByte	40 MByte
Speicher	16 MByte	12 MByte	8 MByte
Grafik-Software	Display-PostScript	Graphic G.I.(GDI)	Presentat. M.(PM)

G7110_1f.eps, G0481_3f.eps, G8_30_1f.eps, Bild 8_30_1

Hersteller, Hardware, Betriebssystem und Adobe-PostScript			
Hersteller	Hardware	Betriebs-System	Post-Script
Digital	VAX,AXP	OSF/1	Level 2
IBM	RISC 6000	AIX	Level 2
Sun	SPARC	Solaris	Level 2
Adobe	SPARC	X-Window	Level 2
NeXT	Intel, Motorola	Mach	Level 2

G7110_2f.eps, G0481_4f.eps, G8_30_2f.eps, Bild 8_30_2

Farbheit und -wert in CIEBased*ABC*		
Farbheit ABC^*	Farbwert ABC	Farbraum Bsp. Geräte-Koordinaten
	XYZ	CIE 1931 XYZ lineares Farbmeßgerät
Lab^*		CIELAB 1976 $L^*a^*b^*$ CIELAB-Farbmeßgerät
	OLV RGB	linearer Farbraum OLV linearer Scanner, Belichter
OLV^* RGB^*		Btx-Farbraum OLV^* nichtlinearer Raum RGB^* quadrat./logarithm.Scanner

G7110_3f.eps, G0481_5f.eps, G8_31_1f.eps, Bild 8_31_1

CIEBased*ABC* − geräte(un)abhängig

CIELAB −> PostScript −> Geräte-

Koordinaten intern Koordinaten

PostScript Level 2

Farbmonitor

$$\begin{pmatrix} A^* = L^* \\ B^* = a^* \\ C^* = b^* \end{pmatrix} \longrightarrow \begin{pmatrix} X \\ Y \\ Z \end{pmatrix} \begin{array}{l} \nearrow \begin{pmatrix} R^* \\ G^* \\ B^* \end{pmatrix} \\ \searrow \begin{pmatrix} C^* \\ M^* \\ Y^* \end{pmatrix} \end{array}$$

Farbdrucker

G7110_4f.eps, G0481_6f.eps, G8_31_2f.eps, Bild 8_31_2

CIEBased*ABC*-Farbraum in PSL2

Farbwiedergabe $XYZ_{\mathrm{soll}} - XYZ_{\mathrm{ist}}$

PSL2-Programm		Software				Ausgabe		Meß-Gerät
X_{soll}		L	−>	L^*	−>	L		X_{ist}
Y_{soll}	−>	M	−>	M^*	−>	M	−>	Y_{ist}
Z_{soll}		N	−>	N^*	−>	N		Z_{ist}

Matrix1	Decode1	Decode2	Matrix2
3×3	{0.5 exp}	{2.0 exp}	3×3

G7111_5f.eps, G0481_7f.eps, G8_32_1f.eps, Bild 8_32_1

CIEBased*ABC* − Optimierung der Farbwiedergabe $XYZ_{soll} - XYZ_{eopt}$

PSL2-Programm Monitor Messung

$$
\begin{array}{llllllll}
X_{soll} & & L & \rightarrow & L^* & \rightarrow & L & & X_{ist} \\
Y_{soll} & \rightarrow & M & \rightarrow & M^* & \rightarrow & M & \rightarrow & Y_{ist} \\
Z_{soll} & & N & \rightarrow & N^* & \rightarrow & N & & Z_{ist}
\end{array}
$$

$$
\begin{array}{lll}
X_{sollk} = X_{soll} + (X_{soll} - X_{ist}) & & X_{eopt} \\
Y_{sollk} = Y_{soll} + (Y_{soll} - Y_{ist}) & \rightarrow & Y_{eopt} \\
Z_{sollk} = Z_{soll} + (Z_{soll} - Z_{ist}) & & Z_{eopt}
\end{array}
$$

G7120_5f.eps, G0481_8f.eps, G8_32_2f.eps, Bild 8_32_2

Digitale Bildverarbeitung
mit *Adobe PostScript Level 2*
CIEBased*ABC*-Farbraum

Die *ABC*-Farbdaten stellen eine Zonen-Theorie des Farbensehens mit zwei nichtlinearen Stufen dar:

1. nichtlineare trichromatische Stufe
2. nichtlineare Gegenfarbenstufe

G7110_5f.eps, G0491_1f.eps, G8_33_1f.eps, Bild 8_33_1

CIEBased*ABC*-Farbraum in PSL2

Transformation *ABC** –> *XYZ*

drei Farbheiten –> Normfarbwerte

$$\begin{pmatrix} L^* \\ M^* \\ N^* \end{pmatrix} = \begin{pmatrix} 3 \times 3 \\ \mathrm{Matrix}ABC \end{pmatrix} \times \begin{pmatrix} D(A^*) \\ D(B^*) \\ D(C^*) \end{pmatrix}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 3 \times 3 \\ \mathrm{Matrix}LMN \end{pmatrix} \times \begin{pmatrix} D(L^*) \\ D(M^*) \\ D(N^*) \end{pmatrix}$$

G7110_6f.eps, G0491_2f.eps, G8_33_2f.eps, Bild 8_33_2

CIE 1931 *XYZ*-Farbraum in PSL2

[/CIEBased*ABC*<<   %Dict PostScript Level 2

/Matrix*ABC* [1 0 0 0 1 0 0 0 1] %default
/Decode*ABC* [{} {} {}] %default, Leerfunkion
/Range*ABC* [0 0.9505 0 1 0 1.0890] %D65

/Matrix*LMN* [1 0 0 0 1 0 0 0 1] %default
/Decode*LMN* [{} {} {}] %default, Leerfunkion
/Range*LMN* [0 0.9505 0 1 0 1.0890] %D65

/WhitePoint [0.9505 1 1.0890] %D65
/BlackPoint [0 0 0] % default

>>]setcolorspace

G7110_7f.eps, G0491_3f.eps, G8_33_3f.eps, Bild 8_33_3

CIEBased*ABC*-Farbraum in PSL2
*LMN** / *OLV** / *RGB** −> *XYZ*
EBU-Bildschirm-Phosphore, D65

$$L = \mathrm{Decode}L^* = \{2.2\ \mathrm{exp}\}$$
$$M = \mathrm{Decode}M^* = \{2.2\ \mathrm{exp}\}$$
$$N = \mathrm{Decode}N^* = \{2.2\ \mathrm{exp}\}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0{,}4303 & 0{,}3416 & 0{,}1782 \\ 0{,}2219 & 0{,}7068 & 0{,}0713 \\ 0{,}0202 & 0{,}1296 & 0{,}9387 \end{pmatrix} \times \begin{pmatrix} L \\ M \\ N \end{pmatrix}$$

G7111_1f.eps, G0491_4f.eps, G8_34_1f.eps, Bild 8_34_1

EBU-*RGB**-Farbraum in PSL2

```
[/CIEBasedABC<<   %Dict PostScript Level 2
   /MatrixABC [1 0 0 0 1 0 0 0 1]  %default
   /DecodeABC [{} {} {}] %default, Leerfunkion
   /RangeABC [ 0 0.9505 0 1 0 1.0890] %D65
   /MatrixLMN [0.4303 0.2219 0.0202 0.3416
               0.6720 0.1412 0.1845 0.0833 0.9227]
   /DecodeLMN [{2.2 exp} {2.2 exp} {2.2 exp}]
   /RangeLMN [ 0 0.9505 0 1 0 1.0890] %D65
   /WhitePoint [0.9505 1 1.0890] %D65
   /BlackPoint [0 0 0] % default
>>]setcolorspace
```

G7111_2f.eps, G0491_5f.eps, G8_34_2f.eps, Bild 8_34_2

CIEBased*ABC*-Farbraum in PSL2

*LMN** / *OLV** / *RGB** −> *XYZ*

NTSC-Bildschirm-Phosphore, D65

$$L = \mathrm{Decode}L^* = \{1.8 \text{ exp}\}$$
$$M = \mathrm{Decode}M^* = \{1.8 \text{ exp}\}$$
$$N = \mathrm{Decode}N^* = \{1.8 \text{ exp}\}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0{,}4497 & 0{,}3163 & 0{,}1845 \\ 0{,}2446 & 0{,}6720 & 0{,}0833 \\ 0{,}0252 & 0{,}1412 & 0{,}9227 \end{pmatrix} \times \begin{pmatrix} L \\ M \\ N \end{pmatrix}$$

G7111_3f.eps, G0491_6f.eps, G8_34_3f.eps, Bild 8_34_3

CIELAB 1976 $L^*a^*b^*$-Farbraum
Definition und Umkehrung

$$L^* = 116\,(Y/Y_n)^{1/3} - 16$$

$$a^* = 500\,[\,(X/X_n)^{1/3} - (Y/Y_n)^{1/3}\,]$$

$$b^* = 200\,[\,(Y/Y_n)^{1/3} - (Z/Z_n)^{1/3}\,]$$

$$X = X_n\,[\,(L^* + 16)/116 + a^*/500\,]^3$$

$$Y = Y_n\,[\,(L^* + 16)/116\,]^3$$

$$Z = Z_n\,[\,(L^* + 16)/116 - b^*/200\,]^3$$

G7111_7f.eps, G0491_7f.eps, G8_35_1f.eps, Bild 8_35_1

CIELAB 1976 $L^*a^*b^*$-Farbraum und CIEBased*ABC*-Transformation

$$X = X_n \, [\, (L^* + 16) / 116 + a^*/500 \,]^3$$
$$Y = Y_n \, [\, (L^* + 16) / 116 \,]^3$$
$$Z = Z_n \, [\, (L^* + 16) / 116 - b^*/200 \,]^3$$

A = DecodeL^* = {16 add 116 div}

B = Decodea^* = {500 div}

C = Decodeb^* = {200 div}

G7111_8f.eps, G0491_8f.eps, G8_35_2f.eps, Bild 8_35_2

CIEBased*ABC*-Farbraum in PSL2
Transformation *ABC** −> *XYZ*
CIELAB Teil 1: *ABC** −> *LMN**

$$A \;=\; \mathrm{Decode}A* = \{16 \text{ add } 116 \text{ div}\}$$
$$B \;=\; \mathrm{Decode}B* = \{500 \text{ div}\}$$
$$C \;=\; \mathrm{Decode}C* = \{200 \text{ div}\}$$

$$\begin{pmatrix} L* \\ M* \\ N* \end{pmatrix} = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & -1 \end{pmatrix} \times \begin{pmatrix} A \\ B \\ C \end{pmatrix}$$

G7120_1f.eps, G0510_1f.eps, G8_36_1f.eps, Bild 8_36_1

CIEBased*ABC*-Farbraum in PSL2
Transformation *ABC** −> *XYZ*
CIELAB Teil 2: *LMN** −> *XYZ*

$$L = \mathrm{Decode}L^* = \{3\ \mathrm{exp}\}$$
$$M = \mathrm{Decode}M^* = \{3\ \mathrm{exp}\}$$
$$N = \mathrm{Decode}N^* = \{3\ \mathrm{exp}\}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \times \begin{pmatrix} X_{\mathrm{n}} & L \\ Y_{\mathrm{n}} & M \\ Z_{\mathrm{n}} & N \end{pmatrix}$$

G7120_3f.eps, G0510_2f.eps, G8_36_2f.eps, Bild 8_36_2

CIELAB *L*a*b**-Farbraum in PSL2

```
[/CIEBasedABC<<   %Dict PostScript Level 2
   /MatrixABC [1 0 0 0 1 0 0 0 1]  %default
   /DecodeABC [{16 add 116 div} bind
       {500 div} bind  {200 div} bind ]
   /RangeABC [0 100 −128 127 −128 127] %Lab*
   /MatrixLMN [0.9505 0 0 0 1 0 0 0 1.0890]
   /DecodeLMN [{3 exp} {3 exp} {3 exp}]
   /RangeLMN [ 0 0.9505 0 1 0 1.0890] %D65
   /WhitePoint [0.9505 1 1.0890] %D65
   /BlackPoint [0 0 0] % default
>>]setcolorspace
```

G7120_4f.eps, G0510_3f.eps, G8_36_3f.eps, Bild 8_36_3

CIEBased*ABC* − Optimierung der Farbwiedergabe $Lab^*_{soll} - Lab^*_{eopt}$

PSL2-Programm			Ausgabe		Messung	
L^*_{soll}		L	$\to L^* \to$	L		L^*_{ist}
a^*_{soll}	$\to$	M	$\to M^* \to$	M	$\to$	a^*_{ist}
b^*_{soll}		N	$\to N^* \to$	N		b^*_{ist}

$$
\begin{aligned}
L^*_{sollk} &= L^*_{soll} + (L^*_{soll} - L^*_{ist}) && L^*_{eopt} \\
a^*_{sollk} &= a^*_{soll} + (a^*_{soll} - a^*_{ist}) \to{} && a^*_{eopt} \\
b^*_{sollk} &= b^*_{soll} + (b^*_{soll} - b^*_{ist}) && b^*_{eopt}
\end{aligned}
$$

G7120_7f.eps, G0510_4f.eps, G8_37_1f.eps, Bild 8_37_1

Ausgleichsrechnung für Farbwiedergabe $Lab^*_{i,\mathrm{soll}} - Lab^*_{i,\mathrm{gopt}} = \mathrm{Min.}$

Farbheit-Differenzen $\Delta(Lab^*)$ für CIE-Testfarben $i = 1, 2, ..., 17$

$$\Delta L^*_i = L^*_{i,\mathrm{soll}} - L^*_{i,\mathrm{gopt}}$$
$$\Delta a^*_i = a^*_{i,\mathrm{soll}} - a^*_{i,\mathrm{gopt}}$$
$$\Delta b^*_i = b^*_{i,\mathrm{soll}} - b^*_{i,\mathrm{gopt}}$$

$$\sum_{i=1,17} [(\Delta L^*_i)^2 + (\Delta a^*_i)^2 + (\Delta b^*_i)^2]^{1/2} = \mathrm{Min.}$$

G7121_2f.eps, G0510_5f.eps, G8_37_2f.eps, Bild 8_37_2

Ausgleichsrechnung für Farbwiedergabe $Lab^*_{i,\mathrm{soll}} - Lab^*_{i,\mathrm{gopt}} = \mathrm{Min.}$

Farbheit-Differenzen $\Delta(Lab^*_i)$ für CIE-Testfarben i = 1 bis 17 −> Min.

$$\begin{pmatrix} L^*_{i,\mathrm{gopt}} \\ a^*_{i,\mathrm{gopt}} \\ b^*_{i,\mathrm{gopt}} \end{pmatrix} = \begin{pmatrix} a_{11} & a_{21} & a_{31} \\ a_{12} & a_{22} & a_{32} \\ a_{13} & a_{23} & a_{33} \end{pmatrix} \times \begin{pmatrix} L^*_{i,\mathrm{soll}} \\ a^*_{i,\mathrm{soll}} \\ b^*_{i,\mathrm{soll}} \end{pmatrix}$$

$$\sum_{i=1,17} [(\Delta L^*_i)^2 + (\Delta a^*_i)^2 + (\Delta b^*_i)^2]^{1/2} = \mathrm{Min.}$$

G7121_4f.eps, G0510_6f.eps, G8_37_3f.eps, Bild 8_37_3

G7221_7f.eps, G0550_1f.eps, G8_38f.eps, Bild 8_38

PSL2-Programmcode: Definition und Reproduktion von 17 CIE-Testfarben

```
%!PS-Adobe-3.0 B7221-7n.eps  20.10.94
%%BoundingBox: 72 90 226 206
/FS {findfont exch scalefont setfont} bind def
/MM {72 25.4 div mul} def
/languagelevel where {pop languagelevel} {1} ifelse
                     /PSL12 exch def
/dictende {counttomark 2 idiv dup dict begin {def}
           repeat pop currentdict end} bind def
%%EndProlog

72 90 translate  0.01  MM  dup  scale  20 setlinewidth

PSL12 2 eq {[ /CIEBasedABC [ %Farbraum und Grenzen fuer D65
 /WhitePoint  [0.9505 1 1.089]       %CIEXYZ fuer D65
 /RangeABC [0 0.9505  0 1  0 1.0885] %CIEXYZ-Grenzen N/W
 /RangeLMN [0 0.9505  0 1  0 1.0885] dictende ]
  setcolorspace } if  %Ende Standard-Definition PSL2-CIEBasedA

PSL12 1 eq                          %Definition alle PSL1-Geraete
 { {/setrgbcolor where              %Abfrage auf PSL1-Farb-Geraet
    {pop setrgbcolor}                           %PSL1-Farb-Geraet
    {pop 0.4 exp setgray pop} ifelse }          %PSL1-SW-Geraet
 /setcolor exch def} if

/colRec {moveto s 0 rlineto 0 s rlineto s neg 0 rlineto %Quadrat
  closepath setcolor} bind def

0.1885 0.1983 0.2157 setcolor %Testfarbe Nr 16 (Mittelgrau)

0 0 moveto 5400 0 rlineto 0 4000 rlineto   %Bildfeld 54mm x 40mm
          -5400 0 rlineto closepath fill

250 /Times-Bold FS   0.7239 0.7615 0.8289 setcolor %Weiss
3200 3300 moveto (17 CIE-Testfarben) show

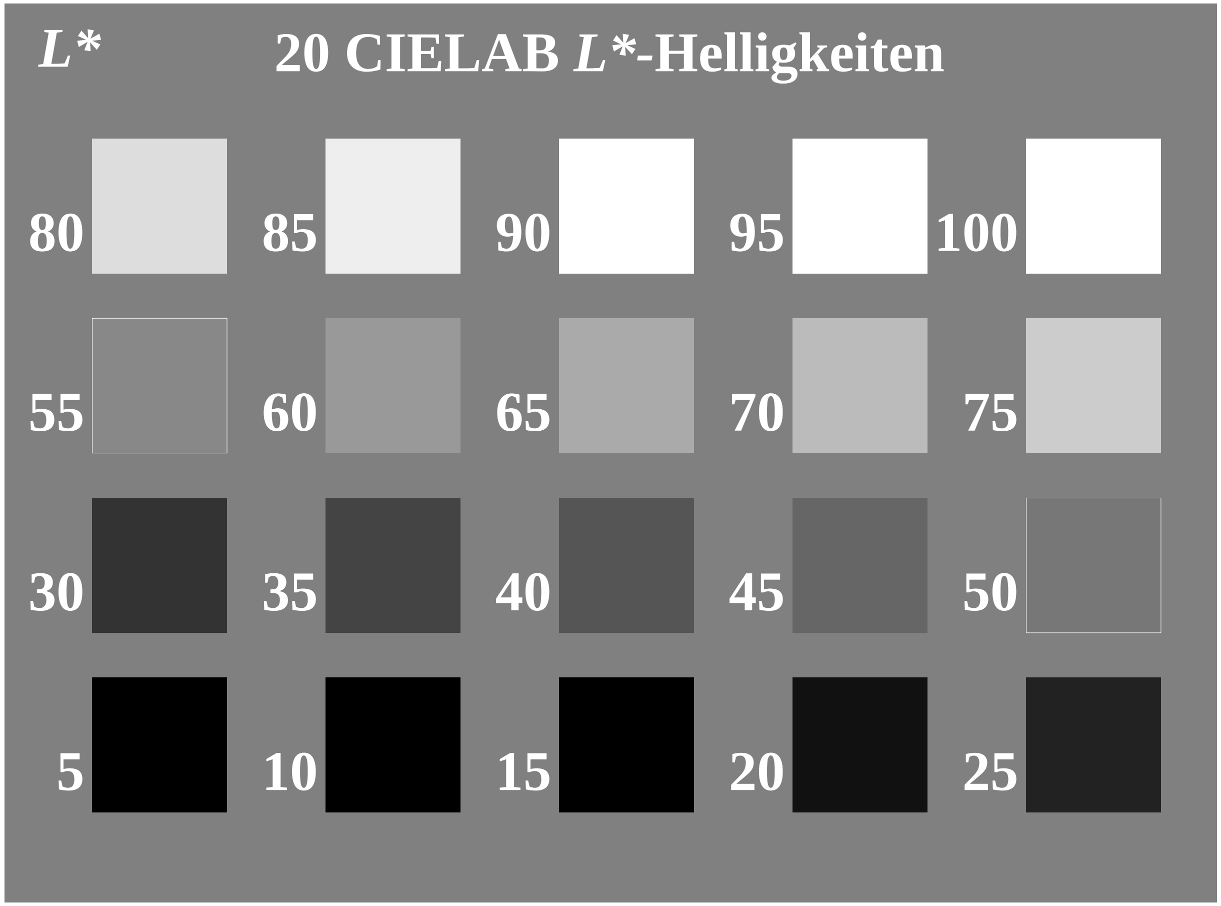
500 500 translate %Nullpunkt untere linke Testfarbe

/s 600 def  /xw 1000 def  /yw 800 def %Quadratseite und Abstaende

%   X      Y      Z    x,y-Position      fuelle Farbrechteck
 0.3298 0.2976 0.2459 0        0        colRec fill %CIE-TF01
 0.2749 0.2890 0.1501 xw 1 mul yw 0 mul colRec fill %CIE-TF02
 0.2393 0.3043 0.0996 xw 2 mul yw 0 mul colRec fill %CIE-TF03
 0.2045 0.2948 0.2127 xw 3 mul yw 0 mul colRec fill %CIE-TF04
 0.2502 0.3087 0.4042 xw 4 mul yw 0 mul colRec fill %CIE-TF05
 0.2826 0.2983 0.5791 0        yw 1 mul colRec fill %CIE-TF06
 0.3333 0.2939 0.5322 xw 1 mul yw 1 mul colRec fill %CIE-TF07
 0.3757 0.3131 0.4544 xw 2 mul yw 1 mul colRec fill %CIE-TF08
 0.2048 0.1120 0.0436 xw 3 mul yw 1 mul colRec fill %CIE-TF09
 0.5487 0.5894 0.1208 xw 4 mul yw 1 mul colRec fill %CIE-TF10
 0.1212 0.2035 0.1533 0        yw 2 mul colRec fill %CIE-TF11
 0.0628 0.0647 0.2773 xw 1 mul yw 2 mul colRec fill %CIE-TF12
 0.5885 0.5709 0.4139 xw 2 mul yw 2 mul colRec fill %CIE-TF13
 0.0935 0.1171 0.0543 xw 3 mul yw 2 mul colRec fill %CIE-TF14
 0.0342 0.0359 0.0394 0        yw 3 mul colRec fill %CIE-TF15 N
 0.1885 0.1983 0.2157 xw 1 mul yw 3 mul colRec fill %CIE-TF16 Z
 0.7239 0.7615 0.8289 xw 2 mul yw 3 mul colRec fill %CIE-TF17 W
 0.7239 0.7615 0.8289 xw 1 mul yw 3 mul colRec stroke  %-TF17 W

1 1 17 {/nr1 exch def          %Quadrate und Texte Nr. 1 bis 17
   nr1 9 gt {/xp 300 def}{/xp 200 def} ifelse
   nr1 14 gt {/nr nr1 1 add def} {/nr nr1 def} ifelse
   nr 1 sub 5 idiv /i exch def
   nr 1 sub 5 mod /j exch def
   j xw mul xp sub i yw mul 20 add moveto
   nr1 4 string cvs show } for
showpage
```

G7223_7f.eps, G0511_7f.eps, G8_39f.eps, Bild 8_39 2x4



G7231_7f.eps, G0550_2f.eps, G8_40f.eps, Bild 8_40

PSL2-Programmcode: Definition und Reproduktion von 20 L^*-Helligkeiten

```
%!PS-Adobe-3.0 B7231-7n.eps  20.10.94
%%BoundingBox: 72 90 226 206
/FS {findfont exch scalefont setfont} bind def
/MM {72 25.4 div mul} def
/languagelevel where {pop languagelevel} {1} ifelse
               /PSL12 exch def
/dictende {counttomark 2 idiv dup dict begin {def}
           repeat pop currentdict end} bind def
%%EndProlog

72 90 translate  0.01  MM  dup  scale  20 setlinewidth

PSL12 2 eq                     %Abfrage PostScript Level 1 oder 2
 {[ /CIEBasedA [               %monochromer L*-Farbraum fuer D65
 /WhitePoint  [1 1 1]          %CIEXYZ fuer Weiss
 /RangeA [0 100]               %CIELAB-L*-Grenzen N/W
 /DecodeA                      %CIE-Transformation L* -> Y
  { 16 add 116 div 3 exp} bind
 dictende ] setcolorspace } if %Standard-PSL2 L* setcolor

PSL12 1 eq                        %Definition PSL1-SW-Geraet
 {/setcolor {0.01 mul 0.4 exp setgray} def } if

/colqua {moveto s 0 rlineto 0 s rlineto s neg 0 rlineto %Quadrat
  closepath} bind def

/s 600 def  /xw 1000 def  /yw 800 def %Quadratseite und Abstaende

50 setcolor     %Graufeld mit L*=50 (mittlere CIELAB-Helligkeit)
0 0 moveto 5400 0 rlineto 0 4000 rlineto   %Bildfeld 54mm x 40mm
          -5400 0 rlineto closepath fill

/TR {250 /Times-Roman FS} bind def   %Times-Roman; Hoehe 2,5mm
/TI {250 /Times-Italic FS} bind def  %Times-Italic

1200 3700 moveto 100 setcolor
TR (20 CIELAB ) show TI (L*-) show TR (Helligkeiten) show

550 400 translate    %Nullpunkt unteres linkes Graufeld

0 1 3 {/i exch def             %Zeilenindex   i=0, 1, 2, 3
0 1 4 {/j exch def             %Spaltenindex  j=0, 1, 2, ..., 5
       /n i 5 mul j add def    %laufende Nummer 0, 1, ..., 19
       /L* n 1 add 5 mul def   %20 L*-Helligkeiten L*=5, ..., 100

       /x0 j xw mul def        %x-Position fuer Quadrat
       /y0 i yw mul def        %y-Position

       L* setcolor             %CIELAB-L*-Helligkeit
       x0 y0 colqua fill       %xy0-Quadrat fuellen

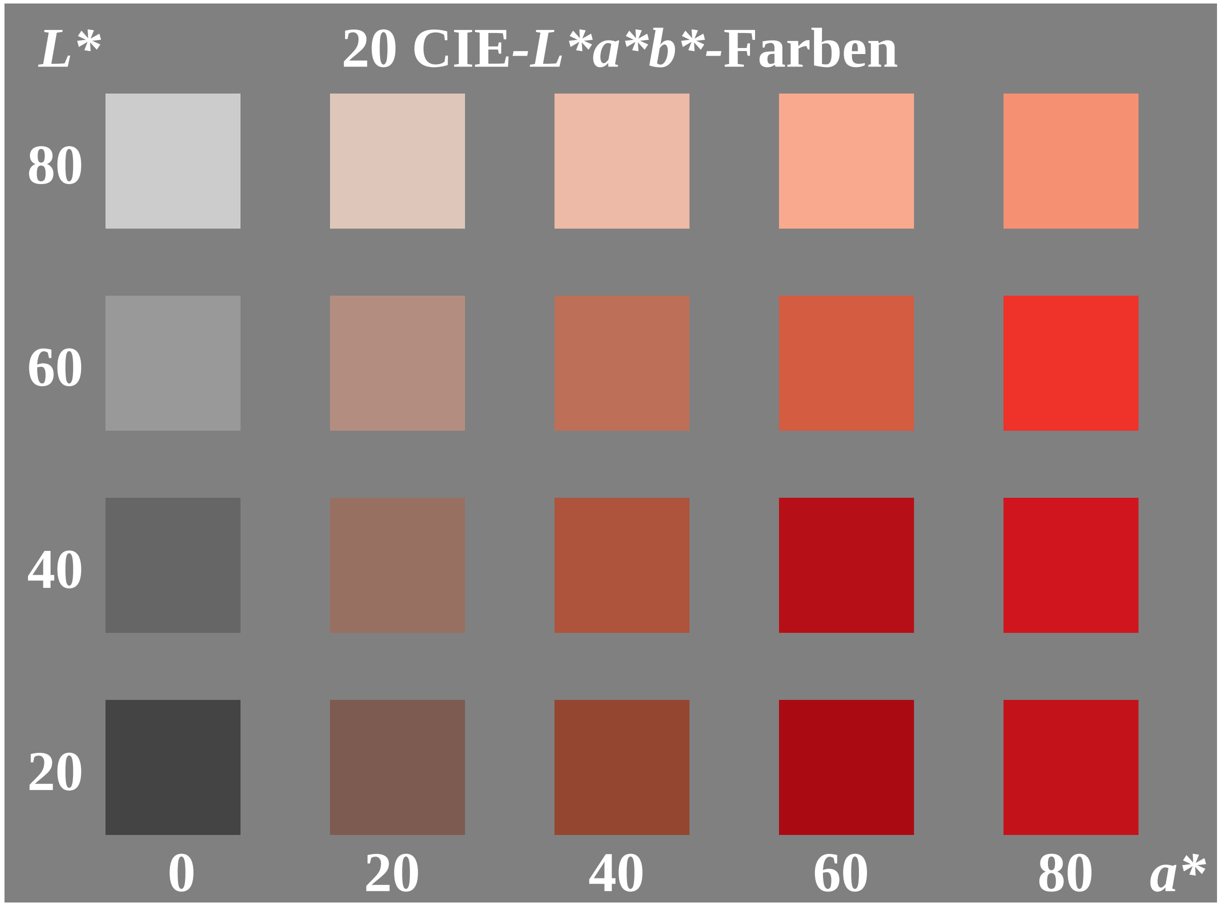
       L* 50 eq {100 setcolor  %Sonderfall Quadratrand
       x0 y0 colqua stroke} if %xy0-Quadrat

       L* 4 string cvs dup stringwidth  %x-, y-Stringlaenge L*
       pop x0 exch sub 20 sub           %x-Position minus xl
       y0 100 add moveto                %y-Text-Position

       100 setcolor show               %Text L* rechtsbuendig W
      } for       %Ende Schleife j
      } for       %Ende Schleife i

showpage
```

G7233_7f.eps, G0520_7f.eps, G8_41f.eps, Bild 8_41 2x4



G7241_7f.eps, G0550_3f.eps, G8_42f.eps, Bild 8_42

PSL2-Programmcode: Definition und Reproduktion von 20 CIE-*L*a**-Farben

```
%!PS-Adobe-3.0 B7241-7n.eps 20.10.94
%%BoundingBox: 72 90 226 206
/FS {findfont exch scalefont setfont} bind def
/MM {72 25.4 div mul} def
/languagelevel where {pop languagelevel} {1} ifelse
           /PSL12 exch def
/dictende {counttomark 2 idiv dup dict begin {def}
           repeat pop currentdict end} bind def
%%EndProlog

72 90 translate  0.01  MM  dup  scale

PSL12 2 eq {[ /CIEBasedABC [    %Farbraum und Grenzen fuer D65
 /WhitePoint  [0.9505 1 1.089]                %CIEXYZ fuer D65
 /RangeABC [0 0.9505  0 1  0 1.0885]       %CIEXYZ-Grenzen N/W
 /RangeLMN [0 0.9505  0 1  0 1.0885] dictende ] setcolorspace} if

PSL12 1 eq                         %Definition alle PSL1-Geraete
 { {/setrgbcolor where             %Abfrage auf PSL1-Farb-Geraet
    {pop setrgbcolor}                           %PSL1-Farb-Geraet
    {pop 0.4 exp setgray pop} ifelse }         %PSL1-SW-Geraet
 /setcolor exch def} if

/LABDEF {/b* exch def /a* exch def /L* exch def} bind def
/X* {L* 16 add 116 div a* 500 div add} bind def
/Y* {L* 16 add 116 div} bind def
/Z* {L* 16 add 116 div b* 200 div sub} bind def
/DecodeXYZ* {dup 6 29 div ge {dup dup mul mul}
            { 4 29 div sub 108 841 div mul} ifelse} bind def
/X {X* DecodeXYZ* 0.9505 mul } bind def
/Y {Y* DecodeXYZ*} bind def
/Z {Z* DecodeXYZ* 1.0890 mul } bind def
/LABXYZ {LABDEF X Y Z} bind def

/s 600 def  /xw 1000 def  /yw 900 def  %Quadratseite und Abstaende

/colqua {moveto s 0 rlineto 0 s rlineto        %Quadrat
            s neg 0 rlineto closepath fill} bind def

50 0 0 LABXYZ setcolor  %Graufeld mit L*=50 (mittlere CIELAB-Helligkeit)
0 0 moveto 5400 0 rlineto 0 4000 rlineto   %Bildfeld 54mm x 40mm
          -5400 0 rlineto closepath fill

/TR {250 /Times-Roman FS} bind def   %Times-Roman; Hoehe 2,5mm
/TI {250 /Times-Italic FS} bind def  %Times-Italic

1200 3720 moveto 100 0 0 LABXYZ setcolor
TR (20 CIE) show TI (-L*a*b*-) show TR (Farben) show
100 3720 moveto TI (L*) show
5100 100 moveto TI (a*) show TR

400 300 translate    %Nullpunkt unteres linkes Farbfeld

0 1 3 {/i exch def        %fuer CIELAB-L*=   20, 40, 60, 80
0 1 4 {/j exch def        %fuer CIELAB-a*=0, 20, 40, 60, 80
       /LS i 1 add 20 mul def
       /aS j 20 mul def
       LS aS 0 LABXYZ setcolor %L*, a*, b*=0 -> XYZ
       j xw mul i yw mul colqua
       100 0 0 LABXYZ setcolor %Schrift W
       LS 4 string cvs dup stringwidth pop /xl exch def
       j xw mul xl sub 050 sub i yw mul 200 add moveto show
       aS 4 string cvs dup stringwidth pop /xl exch def
       j xw mul xl sub 400 add i yw mul 220 sub moveto show
      } for %j
      } for %i
showpage
```

G7243_7f.eps, G0521_7f.eps, G8_43f.eps, Bild 8_43 2x4

PSL2-Programmcode: *Kodak*-Foto-CD EPS-Datei mit 17 CIE-Testfarben

```
%!PS-Adobe-3.0 B7380-7n.eps wrstl:W0419m1.eps
%%Creator: Kodak Photo CD Access Developer Toolkit
%%Pages: 1
%%BoundingBox: 0 0 192 128
%%LanguageLevel: 2
%%EndComments
%%EndProlog
%%Page: 1 1
/picstr 192 string def
gsave
/cols 192 def
/rows 128 def
72 65536 mul 4915200 div dup
cols mul exch rows mul scale
cols rows 8
[cols 0 0 rows neg 0 rows]
{ currentfile picstr readhexstring pop }
false 3
colorimage
000000000000000000000000000000000000000000000000000000000000
%insgesamt 192 x 128 x 2 Hexadezimal-Zeichen (8 Bit) OLV*›Daten
000400000400000400000400000400000300000300000300000300000300
000300000300000300000300000300000300000300000300000300000300
000400000300000300000100000000000000
grestore
showpage
```

G7382_7f.eps, G0530_3f.eps, G8_44f.eps, Bild 8_44 2x2

CIEBased*ABC*-Farbraum in PSL2

*LMN** / *OLV** / *RGB** −> *XYZ*

EBU-Bildschirm-Phosphore, D65

$$L = \mathrm{Decode}L^* = \{2.2\ \mathrm{exp}\}$$
$$M = \mathrm{Decode}M^* = \{2.2\ \mathrm{exp}\}$$
$$N = \mathrm{Decode}N^* = \{2.2\ \mathrm{exp}\}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0{,}4303 & 0{,}3416 & 0{,}1782 \\ 0{,}2219 & 0{,}7068 & 0{,}0713 \\ 0{,}0202 & 0{,}1296 & 0{,}9387 \end{pmatrix} \times \begin{pmatrix} L \\ M \\ N \end{pmatrix}$$

G7111_1f.eps, G0530_5f.eps, G8_45_1f.eps, Bild 8_45_1

CIEBased*ABC*-Farbraum in PSL2

*OLV** −> *OLV* −> *XYZ*

EBU-Bildschirm-Phosphore, D65

$$
\begin{array}{lclcl}
O & = & \mathrm{Decode}O* & = & \{2.2\ \mathrm{exp}\} \\
L & = & \mathrm{Decode}L* & = & \{2.2\ \mathrm{exp}\} \\
V & = & \mathrm{Decode}V* & = & \{2.2\ \mathrm{exp}\}
\end{array}
$$

$$
\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0{,}4303 & 0{,}3416 & 0{,}1782 \\ 0{,}2219 & 0{,}7068 & 0{,}0713 \\ 0{,}0202 & 0{,}1296 & 0{,}9387 \end{pmatrix} \times \begin{pmatrix} O \\ L \\ V \end{pmatrix}
$$

G7370_6f.eps, G0530_6f.eps, G8_45_2f.eps, Bild 8_45_2

PSL2-Programmcode: Farbraum-Transformation Foto-CD-Bild mit 17 CIE-Testfarben

```
%!PS-Adobe-3.0 B7381-7n.eps wrstl:W0419m2.eps
%%Creator: Kodak Photo CD Access Developer Toolkit
%%BoundingBox: 0 0 192 128
%%LanguageLevel: 2
%%EndComments
%%EndProlog
/picstr 192 string def
gsave
/cols 192 def
/rows 128 def
72 65536 mul 4915200 div dup
cols mul exch rows mul scale

[ /CIEBasedABC << %Farbraum und Grenzen fuer D65
   %vgl. Adobe Techn. Note #5122: Matching RGBcolor, S.4
 /WhitePoint  [1.0000 1 1.0000]       %CIEXYZ fuer E
 /DecodeABC [{1.1591 mul 1.634 exp}
       {1.1486 mul 1.616 exp}
       {1.2085 mul 1.502 exp}]
 /MatrixABC [ 0.3546  0.1495 -0.0403
              0.4319  0.7237  0.0972
              0.0399 -0.0405  0.7171]
 /RangeABC [0 1  0 1  0 1]
 /DecodeLMN [{} {} {}]
 /MatrixLMN [1.0000 0.0000 0.0000
             0.0000 1.0000 0.0000
             0.0000 0.0000 1.0000]
 /RangeLMN [0 1  0 1  0 1] >>] setcolorspace

<<
 /ImageType 1
 /Width 192 /Height 128
 /BitsPerComponent 8
 /Decode [0 1 0 1 0 1]
 /ImageMatrix [192 0 0 -128 0 128]
 /DataSource currentfile /ASCIIHexDecode filter
>>
image
000000000000000000000000000000000000000000000000000000000000
%insgesamt 192 x 128 x 2 Hexadezimal-Zeichen (8 Bit) OLV*-Daten
000400000400000400000400000400000300000300000300000300000300
000300000300000300000300000300000300000300000300000300000300
000400000300000300000100000000000000
grestore
showpage
```

G7383_7f.eps, G0531_7f.eps, G8_46f.eps, Bild 8_46 2x3

Foto-CD mit CIE-Testfarben: u = unnormierte Daten

Nr.		O^*_u	L^*_u	V^*_u	$X_{\mathrm{soll},u}$	$Y_{\mathrm{soll},u}$	$Z_{\mathrm{soll},u}$
1		141	109	95	0,3298	0,2976	0,2459
2		128	119	65	0,2749	0,2890	0,1501
3		102	129	45	0,2393	0,3043	0,0996
4		83	130	79	0,2045	0,2948	0,2127
5		82	132	130	0,2502	0,3087	0,4042
6		95	122	158	0,2826	0,2983	0,5791
7		136	115	160	0,3333	0,2939	0,5322
8		187	117	148	0,3757	0,3131	0,4544
9	*R*	173	40	43	0,2048	0,1120	0,0436
10	*J*	190	168	43	0,5487	0,5894	0,1208
11	*G*	55	106	64	0,1212	0,2035	0,1533
12	*B*	9	50	99	0,0628	0,0647	0,2773
13		204	166	124	0,5885	0,5709	0,4139
14		61	78	37	0,0935	0,1171	0,0543
15	*N*	39	42	39	0,0342	0,0359	0,0394
16	*Z*	89	95	88	0,1885	0,1983	0,2157
17	*W*	220	222	211	0,7239	0,7615	0,8289

G7370_1f.eps, G0530_7f.eps, G8_47_1f.eps, Bild 8_47_1 2x2 D−>F

Foto-CD mit CIE-Testfarben: n = normierte Daten							
Nr.		O_n^*	L_n^*	V_n^*	$X_{\mathrm{soll},n}$	$Y_{\mathrm{soll},n}$	$Z_{\mathrm{soll},m}$
1		163	125	114	0,4556	0,3908	0,2967
2		148	136	78	0,3797	0,3795	0,1811
3		118	148	54	0,3306	0,3996	0,1202
4		96	149	95	0,2825	0,3871	0,2566
5		95	151	157	0,3456	0,4054	0,4876
6		110	140	190	0,3904	0,3917	0,6986
7		157	132	193	0,4604	0,3859	0,6421
8		216	134	178	0,5190	0,4112	0,5482
9	*R*	200	45	51	0,2829	0,1471	0,0526
10	*J*	220	192	51	0,7580	0,7740	0,1457
11	*G*	63	121	77	0,1674	0,2672	0,1849
12	*B*	10	57	119	0,0868	0,0850	0,3345
13		236	190	149	0,8130	0,7497	0,4993
14		70	89	44	0,1292	0,1538	0,0655
15	*N*	45	48	47	0,0472	0,0471	0,0475
16	*Z*	103	109	106	0,2604	0,2604	0,2602
17	*W*	255	255	255	1,0000	1,0000	1,0000

G7370_2f.eps, G0530_8f.eps, G8_47_2f.eps, Bild 8_47_2 2x2 D−>F

CIEBased*ABC* − Optimierung der Farbwiedergabe $XYZ_{soll} - XYZ_{opt}$

PSL2-Programm Monitor Messung

$$
\begin{array}{llllllll}
X_{soll} & & L & \to & L^* & \to & L & X_{ist} \\
Y_{soll} & \to & M & \to & M^* & \to & M \to & Y_{ist} \\
Z_{soll} & & N & \to & N^* & \to & N & Z_{ist}
\end{array}
$$

$$
\begin{array}{lll}
X_{sollk} = X_{soll} + (X_{soll} - X_{ist}) & & X_{opt} \\
Y_{sollk} = Y_{soll} + (Y_{soll} - Y_{ist}) & \to & Y_{opt} \\
Z_{sollk} = Z_{soll} + (Z_{soll} - Z_{ist}) & & Z_{opt}
\end{array}
$$

G7371_2f.eps, G0540_1f.eps, G8_48_1f.eps, Bild 8_48_1

Foto-CD mit CIE-Testfarben: u = unnormierte Daten							
Nr.		O^*_u	L^*_u	V^*_u	$X_{\mathrm{sollk},u}$	$Y_{\mathrm{sollk},u}$	$Z_{\mathrm{sollk},u}$
1		141	109	95	0,3587	0,3203	0,2553
2		128	119	65	0,3113	0,3208	0,1577
3		102	129	45	0,2777	0,3538	0,1006
4		83	130	79	0,2383	0,3395	0,2272
5		82	132	130	0,2844	0,3547	0,3920
6		95	122	158	0,3029	0,3269	0,5119
7		136	115	160	0,3506	0,3092	0,4580
8		187	117	148	0,3869	0,3206	0,3899
9	*R*	173	40	43	0,2193	0,1081	0,0547
10	*J*	190	168	43	0,5872	0,6319	0,1315
11	*G*	55	106	64	0,1348	0,2261	0,1644
12	*B*	9	50	99	0,0489	0,0667	0,2548
13		204	166	124	0,6046	0,5837	0,3921
14		61	78	37	0,1312	0,1573	0,0745
15	*N*	39	42	39	0,0482	0,0502	0,0545
16	*Z*	89	95	88	0,2305	0,2413	0,2388
17	*W*	220	222	211	0,7193	0,7615	0,6669

G7370_3f.eps, G0540_2f.eps, G8_48_2f.eps, Bild 8_48_2

Foto-CD mit CIE-Testfarben: n = normierte Daten							
Nr.		O_n^*	L_n^*	V_n^*	$X_{\mathrm{sollk},n}$	$Y_{\mathrm{sollk},n}$	$Z_{\mathrm{sollk},n}$
1		163	125	114	0,4987	0,4206	0,3828
2		148	136	78	0,4328	0,4213	0,2365
3		118	148	54	0,3861	0,4646	0,1508
4		96	149	95	0,3313	0,4458	0,3407
5		95	151	157	0,3954	0,4658	0,5878
6		110	140	190	0,4211	0,4293	0,7676
7		157	132	193	0,4874	0,4060	0,6868
8		216	134	178	0,5379	0,4210	0,5846
9	*R*	200	45	51	0,3049	0,1420	0,0820
10	*J*	220	192	51	0,8163	0,8298	0,1972
11	*G*	63	121	77	0,1874	0,2969	0,2465
12	*B*	10	57	119	0,0680	0,0876	0,3821
13		236	190	149	0,8405	0,7665	0,5879
14		70	89	44	0,1824	0,2066	0,1117
15	*N*	45	48	47	0,0670	0,0659	0,0817
16	*Z*	103	109	106	0,3205	0,3169	0,3581
17	*W*	255	255	255	1,0000	1,0000	1,0000

G7370_4f.eps, G0540_3f.eps, G8_48_3f.eps, Bild 8_48_3

CIEBased*ABC*-Farbraum in PSL2

OLV^*_n −> OLV_n −> $XYZ_{\mathrm{soll},n}$

NEC-Bildschirm und NeXTstep

$$O = \text{Decode}O^* = \{1.16 \text{ mul } 1.63 \text{ exp}\}$$

$$L = \text{Decode}L^* = \{1.15 \text{ mul } 1.62 \text{ exp}\}$$

$$V = \text{Decode}V^* = \{1.21 \text{ mul } 1.51 \text{ exp}\}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0{,}447 & 0{,}545 & 0{,}055 \\ 0{,}191 & 0{,}904 & -0{,}056 \\ -0{,}050 & 0{,}120 & 0{,}952 \end{pmatrix} \times \begin{pmatrix} O \\ L \\ V \end{pmatrix}$$

G7370_7f.eps, G0540_4f.eps, G8_49_1f.eps, Bild 8_49_1

CIEBased*ABC*-Farbraum in PSL2

OLV^*_n –> OLV_n –> $XYZ_{\mathrm{sollk},n}$

NEC-Bildschirm und NeXTstep

$$O = \mathrm{Decode}O^* = \{1.16 \text{ mul } 1.48 \text{ exp}\}$$

$$L = \mathrm{Decode}L^* = \{1.15 \text{ mul } 1.47 \text{ exp}\}$$

$$V = \mathrm{Decode}V^* = \{1.21 \text{ mul } 1.26 \text{ exp}\}$$

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0{,}448 & 0{,}599 & 0{,}002 \\ 0{,}146 & 0{,}999 & -0{,}102 \\ -0{,}071 & 0{,}000 & 0{,}952 \end{pmatrix} \times \begin{pmatrix} O \\ L \\ V \end{pmatrix}$$

G7370_8f.eps, G0540_5f.eps, G8_49_2f.eps, Bild 8_49_2

Farbmaßzahlen der 17 CIE-Testfarben nach DIN 6169 „Farbwiedergabe"

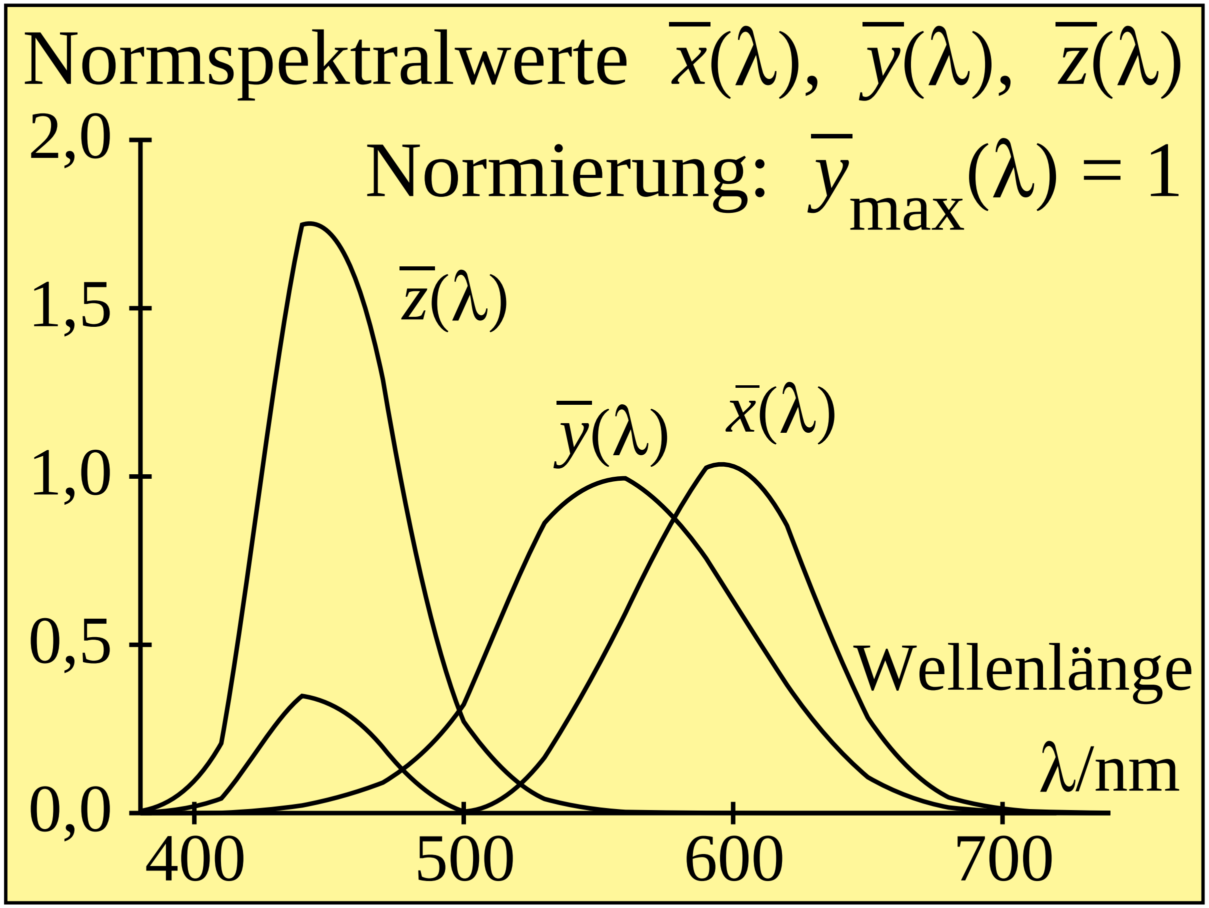
Farb−	CIELAB-Daten			Normfarbwerte und −anteile					
Nr.	***L****	***a****	***b****	***X***	***Y***	***Z***	***x***	***y***	***Y***
01	61,45	17,53	11,74	32,98	29,76	24,59	0,3776	0,3407	29,76
02	60,69	0,08	28,92	27,49	28,90	15,01	0,3850	0,4047	28,90
03	62,02	−20,59	44,41	23,93	30,43	9,96	0,3720	0,4731	30,43
04	61,20	−33,17	17,07	20,45	29,48	21,27	0,2872	0,4140	29,48
05	62,40	−17,48	−8,56	25,02	30,87	40,42	0,2597	0,3205	30,87
06	61,51	−0,37	−28,40	28,26	29,83	57,91	0,2436	0,2571	29,83
07	61,12	20,15	−24,56	33,33	29,39	53,22	0,2874	0,2534	29,39
08	62,77	27,42	−13,64	37,57	31,31	45,44	0,3286	0,2738	31,31
09	39,92	58,74	27,99	20,48	11,20	4,36	0,5682	0,3107	11,20
10	81,26	−2,90	71,56	54,87	58,94	12,08	0,4358	0,4681	58,94
11	52,23	−42,43	13,60	12,12	20,35	15,33	0,2535	0,4257	20,35
12	30,57	1,41	−46,48	6,28	6,47	27,73	0,1551	0,1598	6,47
13	80,23	11,37	21,04	58,85	57,09	41,39	0,3740	0,3628	57,09
14	40,75	−13,81	24,23	9,35	11,71	5,43	0,3529	0,4420	11,71
15	22,27	0,12	−0,17	3,42	3,59	3,94	0,3123	0,3278	3,59
16	51,65	0,00	0,04	18,85	19,83	21,57	0,3128	0,3291	19,83
17	89,93	0,02	0,03	72,39	76,15	82,89	0,3127	0,3290	76,15

G7390_3f.eps, G0541_3f.eps, G8_50f.eps, Bild 8_50 2x2

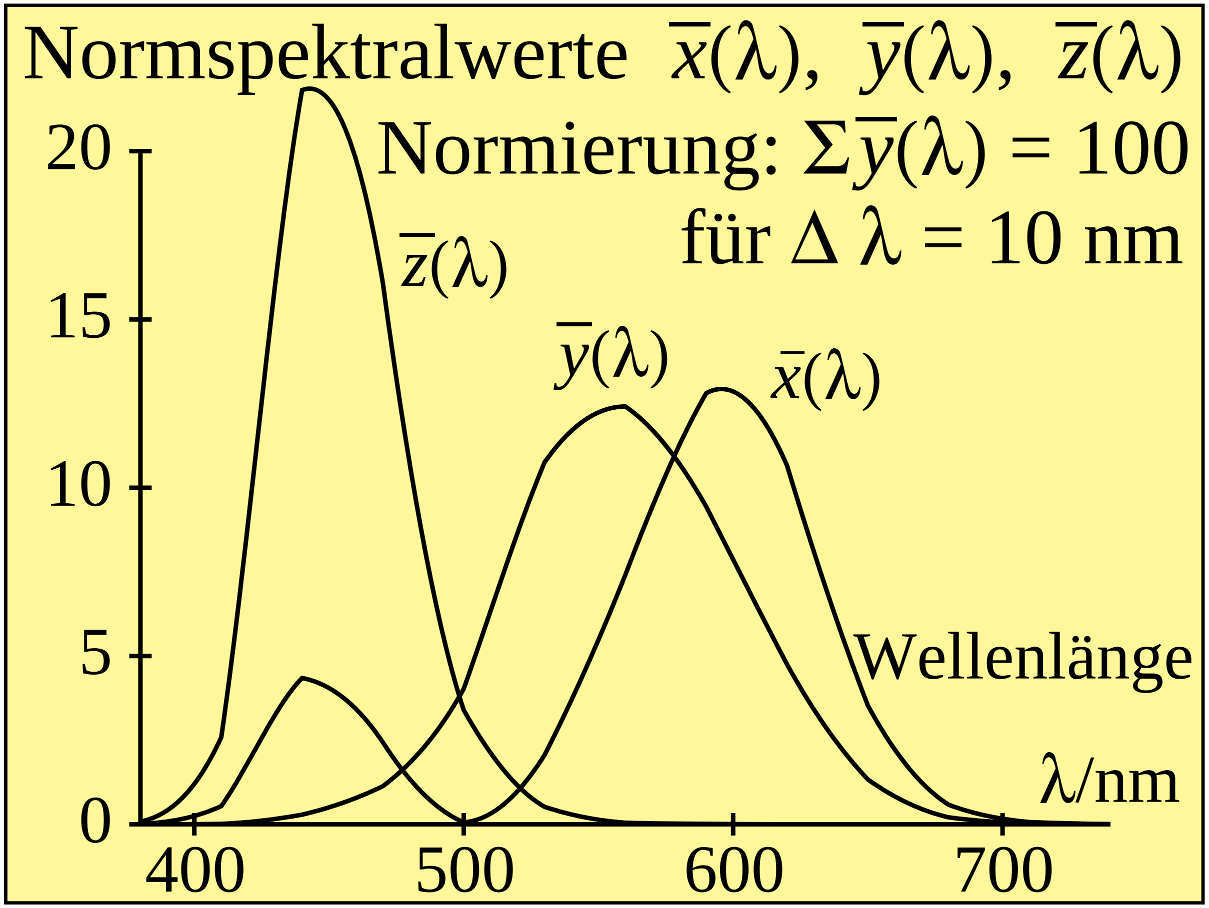
Farbabstand Δ*E Aufsichtfarben −> Lichtfarben mit 3×3-Matrix, γ = 1,7**

Farb-Nr.	Soll-CIELAB Werte *L**	*a**	*b**	Ist-CIELAB Werte *L**	*a**	*b**	Farbabstand CIELAB Δ*E**
01	61,45	17,53	11,74	60,93	18,72	13,81	2,44
02	60,69	0,08	28,92	60,04	1,10	30,46	1,96
03	62,02	−20,59	44,41	61,60	−18,79	43,86	1,91
04	61,20	−33,17	17,07	61,26	−30,55	16,60	2,66
05	62,40	−17,48	−8,56	61,48	−12,40	−14,30	7,72
06	61,51	−0,37	−28,40	60,69	8,18	−38,62	13,35
07	61,12	20,15	−24,56	60,43	24,45	−32,53	9,09
08	62,77	27,42	−13,64	62,57	29,44	−16,63	3,62
09	39,92	58,74	27,99	49,51	51,50	40,79	17,56
10	81,26	−2,90	71,56	82,38	3,16	73,10	6,36
11	52,23	−42,43	13,60	53,30	−33,50	13,23	8,90
12	30,57	1,41	−46,48	35,01	18,53	−50,70	18,20
13	80,23	11,37	21,04	80,55	15,20	25,75	6,08
14	40,75	−13,81	24,23	41,04	−12,20	20,27	4,27
15	22,27	0,12	−0,17	23,43	0,00	−2,50	2,62
16	51,65	0,00	0,04	50,69	0,45	−2,69	2,93
17	89,93	0,02	0,03	89,93	2,83	−3,62	4,60
Farbabstand für alle 17 CIE-Testfarben im Mittel:							6,70

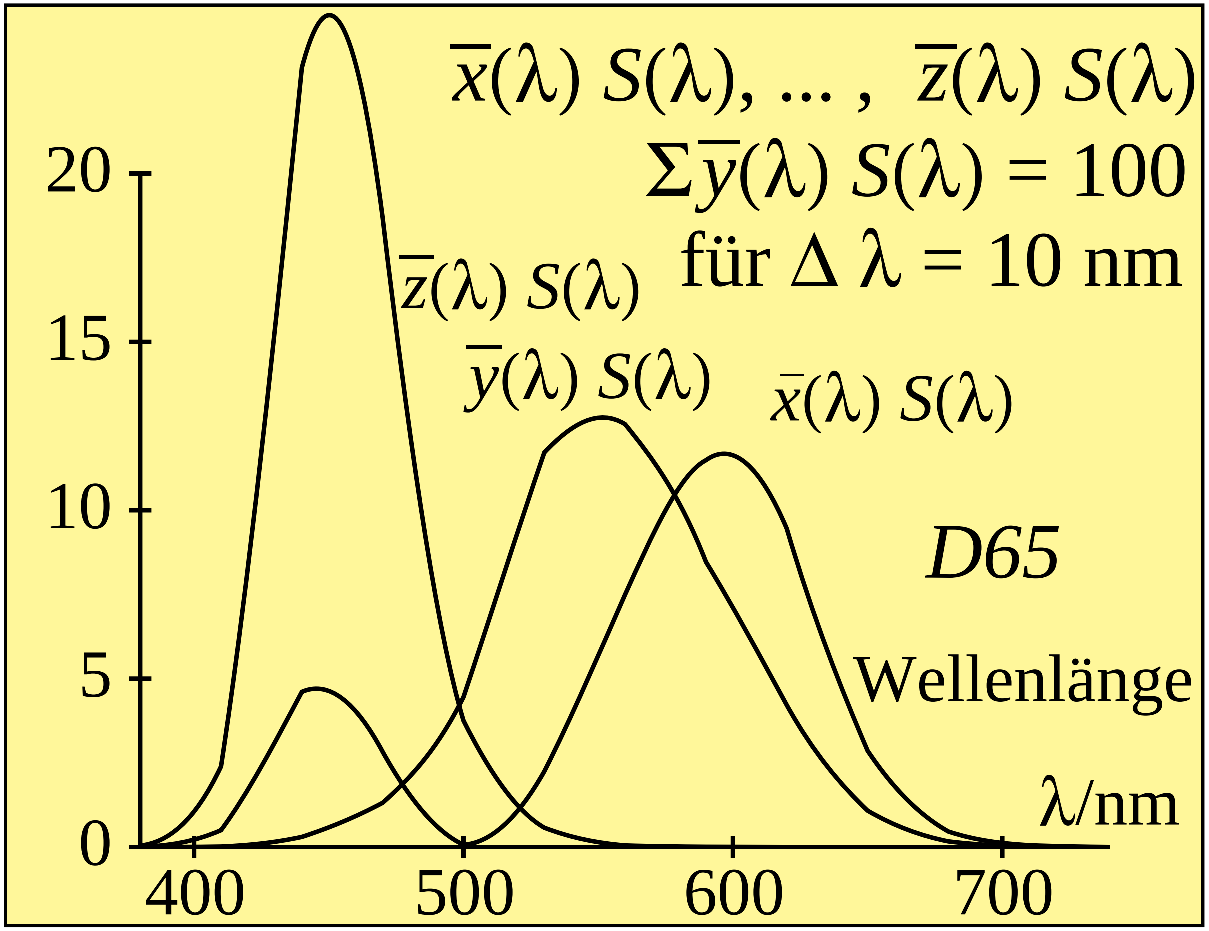
G7390_7f.eps, G0541_7f.eps, G8_51f.eps, Bild 8_51 2x2



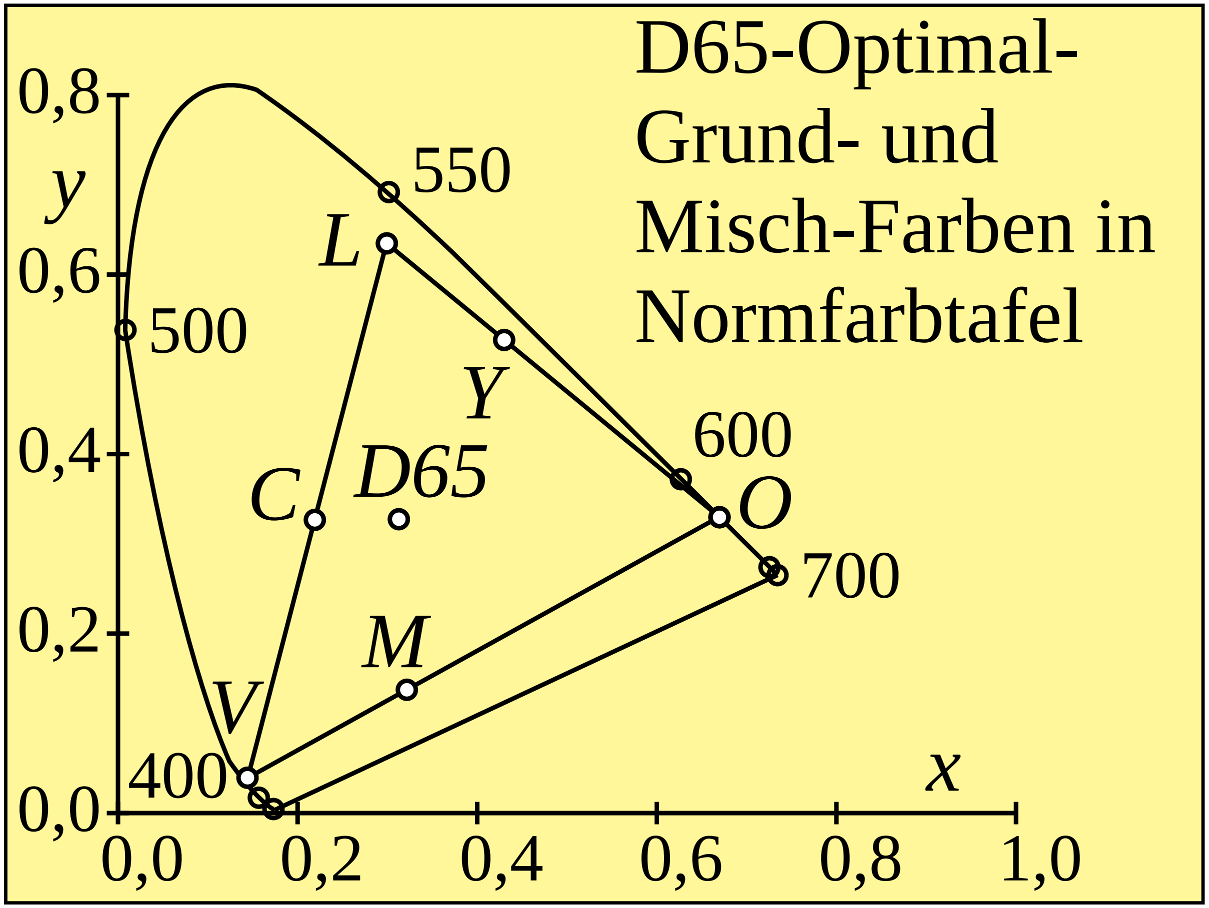
G8310_1f.eps, G0550_4f.eps, G9_1_1f.eps, Bild 10_1_1



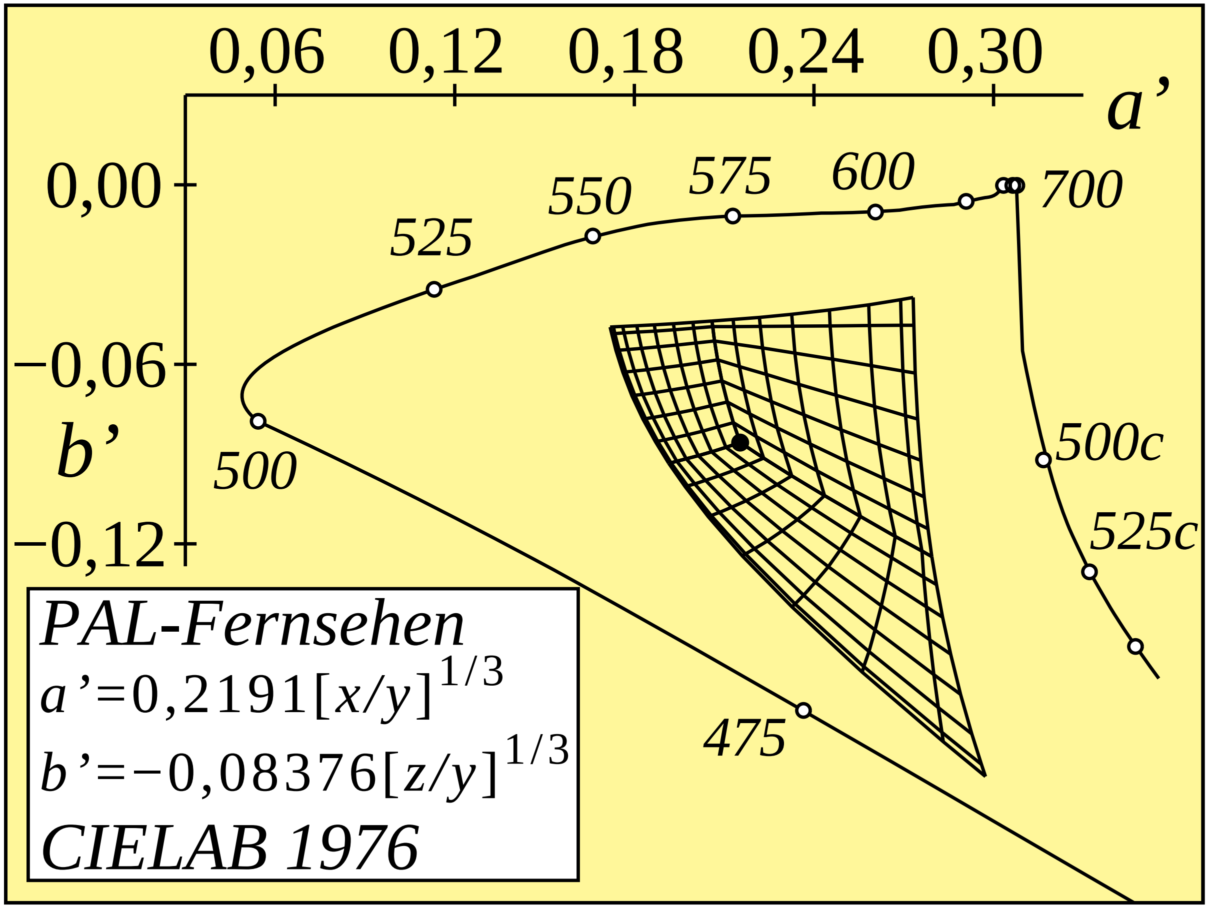
G8321_1f.eps, G0550_5f.eps, G9_1_2f.eps, Bild 10_1_2



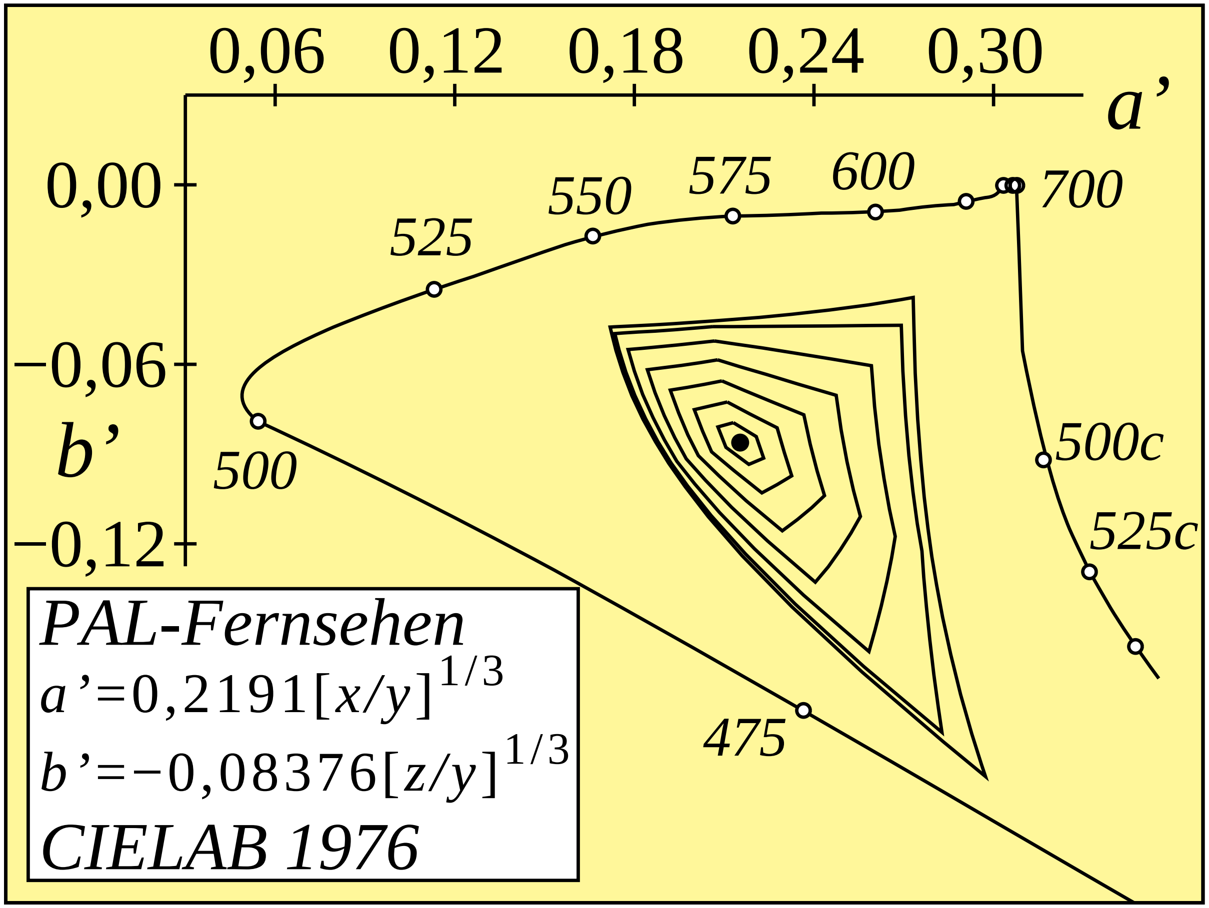
G8321_2f.eps, G0550_6f.eps, G9_1_3f.eps, Bild 10_1_3



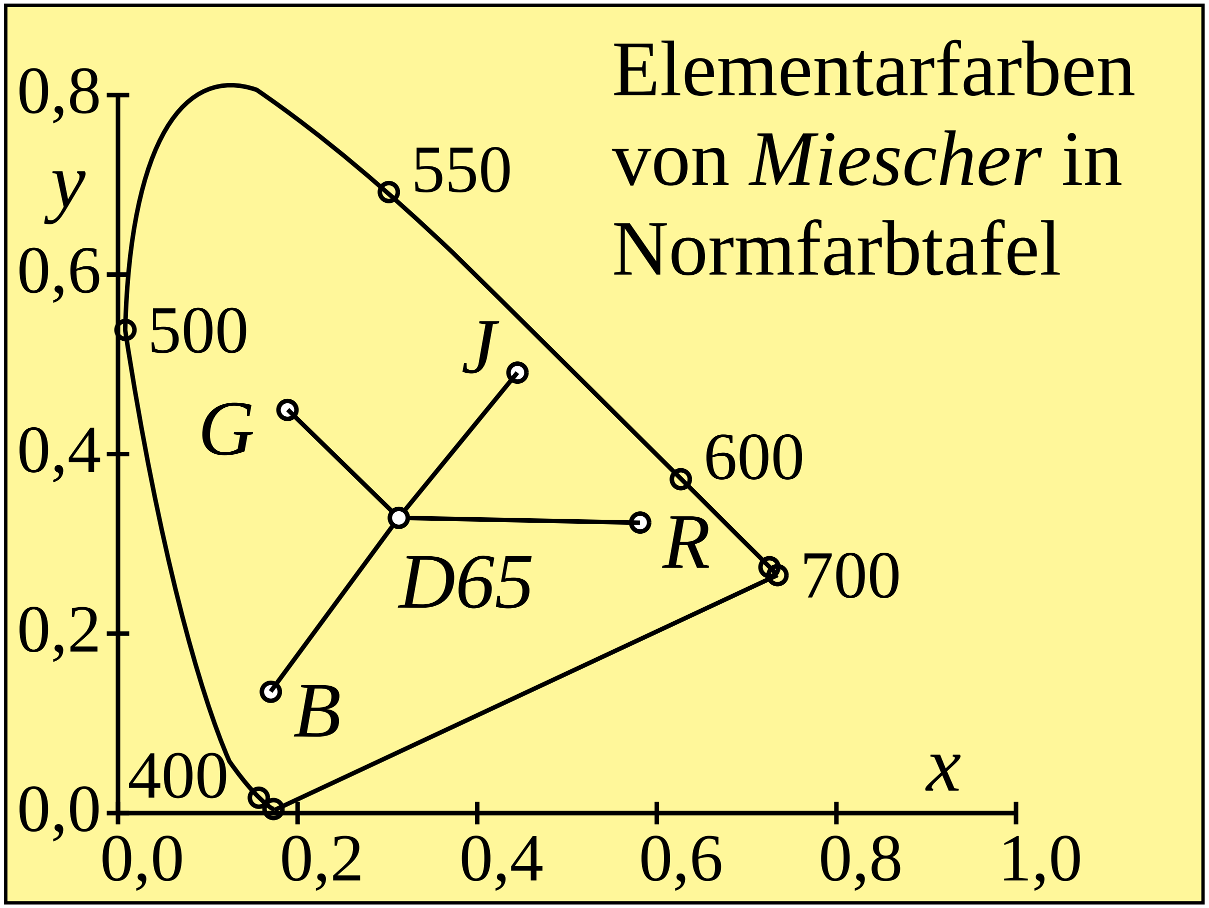
G8331_8f.eps, G0550_7f.eps, G9_2f.eps, Bild 10_2



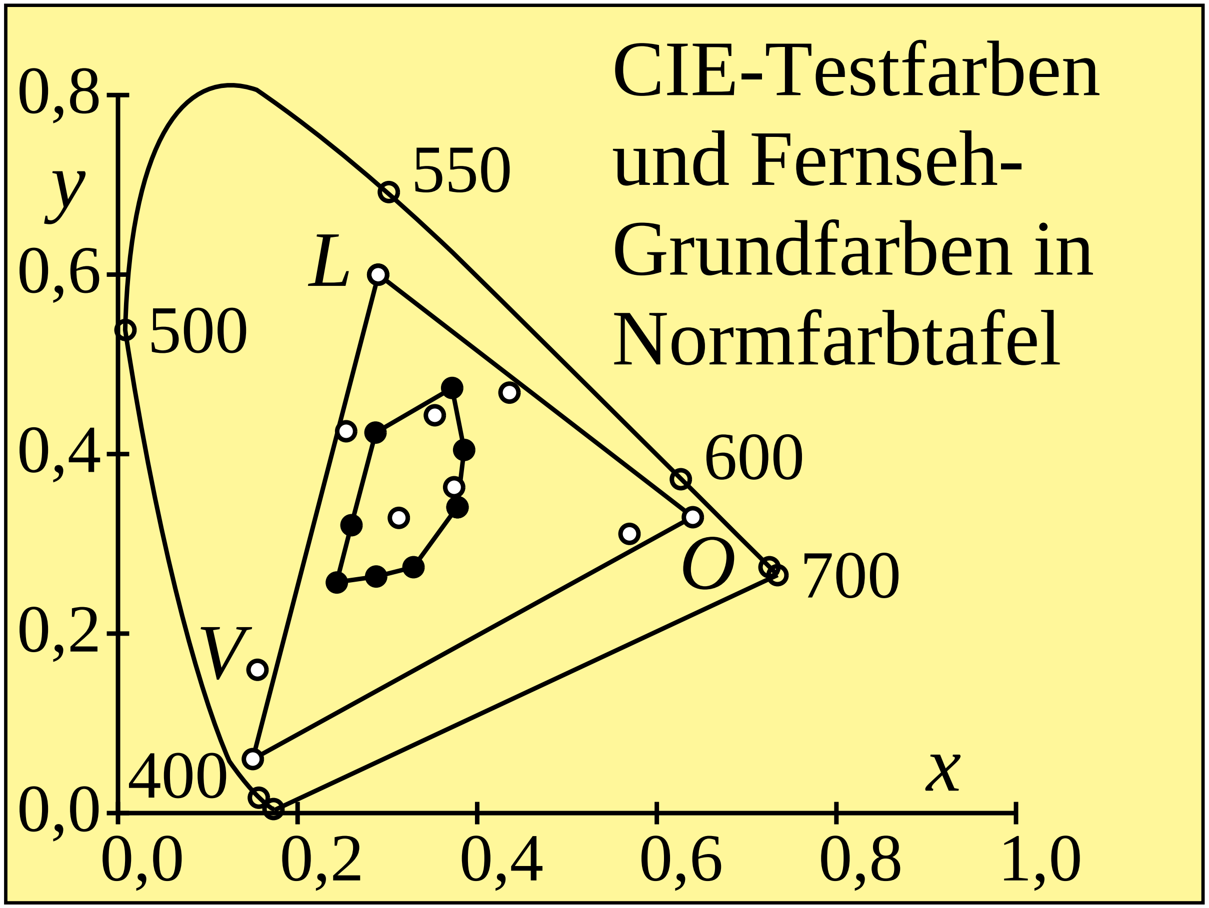
G8240_7f.eps, G0550_8f.eps, G9_3_1f.eps, Bild 10_3_1



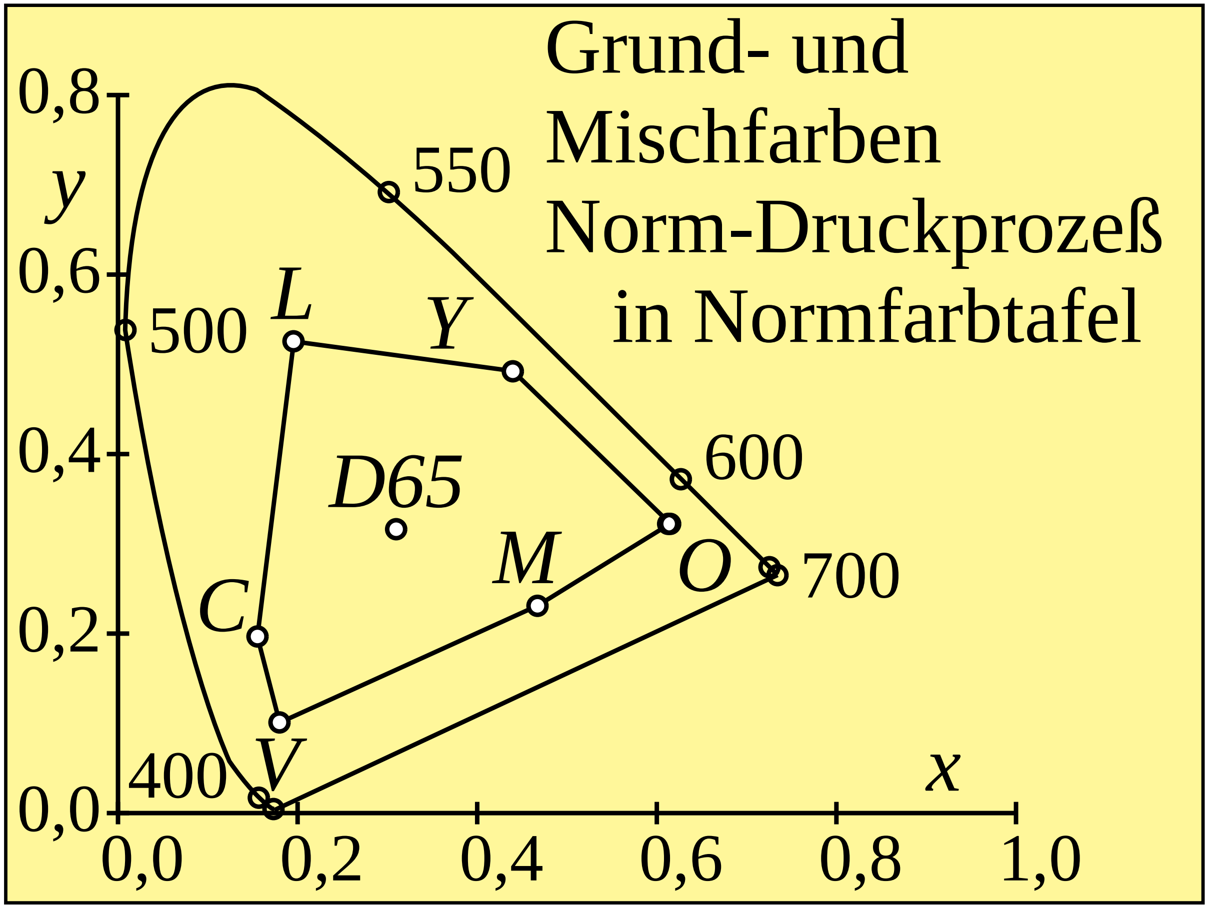
G8240_8f.eps, G0551_1f.eps, G9_3_2f.eps, Bild 10_3_2



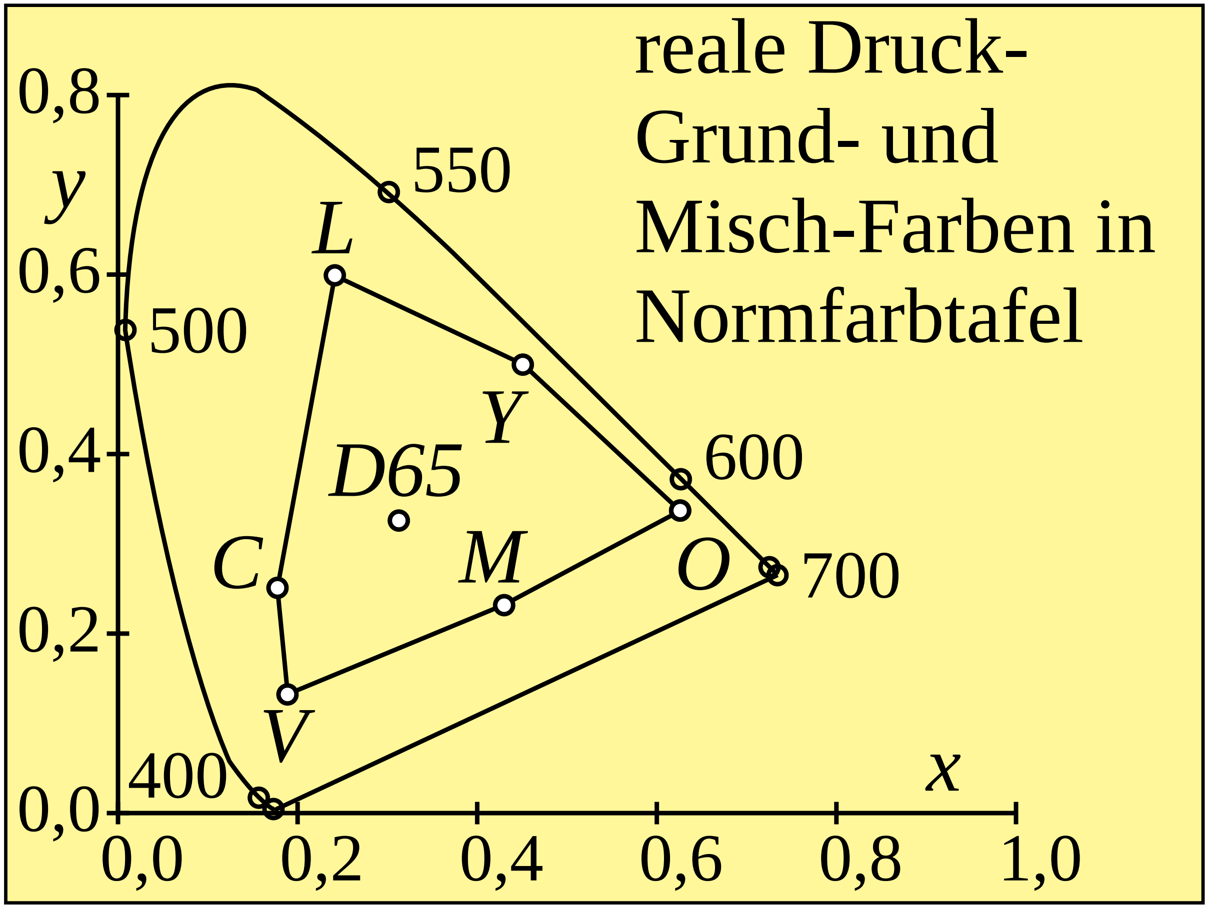
G8331_5f.eps, G0551_2f.eps, G9_4f.eps, Bild 10_4



G8331_3f.eps, G0551_3f.eps, G9_5f.eps, Bild 10_5



G8331_6f.eps, G0551_4f.eps, G9_6f.eps, Bild 10_6



G8331_7f.eps, G0551_5f.eps, G9_7f.eps, Bild 10_7

Farbmischung und Farbmerkmale der niederen und höheren Farbmetrik			
		Art der Farbmischung	
		dichromatisch	**trichromatisch**
Niedere Farb- oder Valenzmetrik:			
Weißwert	*W*	*V*	*V*
Schwarzwert	*N*	100 − *Y*	100 − *O*
Buntwert	*C*	*Y* − *V*	*O* − *V*
Höhere Farb- oder Empfindungmetrik:			
Weißheit	*W**	*V**	*V**
Schwarzheit	*N**	100 − *Y**	100 − *O**
Buntheit	*C**	*Y** − *V**	*O** − *V**

G7330_7f.eps, G0560_3f.eps, GT2_01f.eps, Tabelle 2_1 2x2

Farbschwellen-Formel LABJNDS 1985 (JND = just noticeable difference)

$$\Delta E^{*}_{\mathrm{JND}} = Y_0\,[\,(\Delta\,Y)^2 + (\,a_0\,\Delta\,a''\cdot Y)^2 + (\,b_0\,\Delta\,b''\cdot Y)^2]^{1/2}\,/\,\,(\,s + d\,Y^{\mathrm{e}})$$

$a\;\; = x\,/\,y \qquad a_{\mathrm{n}} = x_{\mathrm{n}}\,/\,y_{\mathrm{n}} \qquad b = -\,0{,}4\;z\,/\,y \qquad b_{\mathrm{n}} = -\,0{,}4\;z_{\mathrm{n}}\,/\,y_{\mathrm{n}}$

$a'' = a_{\mathrm{n}} + (\,a - a_{\mathrm{n}})\,/\,(\,1 + 0{,}5\,\left|a - a_{\mathrm{n}}\right|\,)$

$b'' = b_{\mathrm{n}} + (\,b - b_{\mathrm{n}})\,/\,(\,1 + 0{,}5\,\left|b - b_{\mathrm{n}}\right|\,)$

n = D65 oder A (Umfeld)

$Y\;\; = (\,Y_1 + Y_2\,)\,/\,2 \qquad \Delta\,Y = Y_1 - Y_2 \qquad \Delta\,a'' = a''_1 - a''_2 \qquad \Delta\,b'' = b''_1 - b''_2$

$s = 0{,}0170 \qquad d = 0{,}0058 \qquad e = 1{,}0$

$a_0 = 1{,}0 \qquad b_0 = 1{,}8 \qquad Y_0 = 1{,}5$ *Umfeld D65*

$a_0 = 1{,}0 \qquad b_0 = 1{,}7 \qquad Y_0 = 1{,}0$ *Umfeld A*

G7351_7f.eps, G0560_7f.eps, GT4_01f.eps, Tabelle 4_1 2x2

Grund- und Mischfarben des Normfarbdruck-Prozesses nach DIN 16 539					
Grundfarbe oder Mischfarbe und Bezeichnung	**Normfarbwert-anteile**		**Normfarbwerte**		
	x	***y***	***X***	***Y***	***Z***
drei subtraktive Grundfarben:					
C Cyanblau	0,1553	0,1967	16,92	21,44	70,62
M Magentarot	0,4675	0,2314	33,88	16,77	21,82
Y Gelb	0,4399	0,4925	68,13	76,28	10,48
drei subtraktive Mischfarben:					
O Orangerot	0,6152	0,3226	30,51	16,00	3,08
L Laubgrün	0,1958	0,5256	6,05	16,23	8,06
V Violettblau	0,1807	0,1009	4,86	2,72	19,33
NLC (Weiß)	0,3101	0,3162	98,07	100,00	118,22

G7311_3f.eps, G0561_3f.eps, GT5_01f.eps, Tabelle 5_1 2x2

Grund- und Mischfarben des Normfarbfernseh-Prozesses nach DIN 6169

Grundfarbe oder Mischfarbe und Bezeichnung	**Normfarbwert-anteile**		**Normfarbwerte**		
	x	***y***	***X***	***Y***	***Z***
drei additive Grundfarben:					
O Orangerot	0,6400	0,3300	43,03	22,19	2,02
L Laubgrün	0,2900	0,6000	34,16	70,68	12,96
V Violettblau	0,1415	0,0482	17,82	7,13	93,87
drei additive Mischfarben:					
C Cyanblau	0,2197	0,3288	51,98	77,81	106,83
M Magentarot	0,3270	0,1576	60,85	29,32	95,89
Y Gelb	0,4172	0,5019	77,19	92,87	14,98
D65 (Weiß)	0,3127	0,3291	95,01	100,00	108,85

G7310_7f.eps, G0561_7f.eps, GT5_02f.eps, Tabelle 5_2 2x2

Farbnummern, Farbnamen und Farbcodierungen im CEPT-Standard

CEPT-Nummer	**CEPT-Name**	**CEPT-Farbe**	**Farb-Code *OLV****	**BAM-Nummer**	**BAM Farbe**	**Farbname** *Bemerkungen:*
0	Schwarz	*S*	000*	0	*N*	Schwarz (n = noir)
1	Rot	*R*[1)]	F00*	1	*O*	Orangerot
2	Grün	*G*[1)]	0F0*	2	*L*	Laubgrün
3	Gelb	*O*[2)]	FF0*	3	*Y*	Gelb (= Elementargelb)
4	Blau	*B*[1)]	00F*	4	*V*	Violettblau
5	Magenta	*M*	F0F*	5	*M*[3)]	Magentarot
6	Cyan	*C*	0FF*	6	*C*[3)]	Cyanblau
7	Weiß	*W*	FFF*	7	*W*	Weiß
8	Grau	–	777*	8	*Z*	Zentralgrau (Mittelgrau)
9 –14	Halbtöne	–	–[4)]	9 –14	–[4)]	verschwärzlichte Reihe
15	Hintergrund	–	–	15	*R*	Elementarrot
–	–	–	333*	16	*D*	Dunkelgrau
–	–	–	–[4)]	17 –22	–[4)]	verweißlichte Reihe
–	–	–	–	23	*G*	Elementargrün
–	–	–	BBB*	24	*H*	Hellgrau
–	–	–	–[4)]	25 –30	–[4)]	Zwischenbunttöne
–	–	–	–	31	*B*	Elementarblau

G7331_7f.eps, G0570_7f.eps, GT6_01f.eps, Tabelle 6_1 2x3

Grund-, Mischfarben und Farbnummern eines Farbmatrix-Druckers

Grundfarbe oder Mischfarbe	**Farbe und Farbbezeichnung**	**Einzel- oder Mischfarbe**	**Farbnummer**
Grundfarben im	*N* Schwarz	*N*	0
Farbband enthalten	*M* Magentarot	*M*	1
	C Cyanblau	*C*	2
	Y Gelb	*Y*	4
Mischfarben aus	*O* Orangerot	*Y* + *M*	3
zwei Grundfarben	*L* Laubgrün	*C* + *Y*	5
übereinander	*V* Violettblau	*M* + *C*	6
Mischfarben aus	*N* Schwarz aus	*Y* + *C* + *M*	1 + 2 + 4
drei Grundfarben	drei Buntfarben		nacheinander

G7321_3f.eps, G0571_3f.eps, GT7_01f.eps, Tabelle 7_1 2x2

Basic-Programmcode für Farbstreifen mit Farbmatrix-Drucker

```
110 FOR K=0 TO 6
120 LPRINT CHR$(27);"r";CHR$(K);
130 LPRINT "Farbbandfarbe";K;
140 LPRINT CHR$(&H1B);"L";CHR$(100);CHR$(0);
150 FOR I=0 TO 100
160 LPRINT CHR$(&HFF)
170 NEXT
180 LPRINT CHR$(27);"E";":Bit Image";CHR$(27);F
190 NEXT
200 LPRINT CHR$(27);"r";CHR$(0)
210 END
```

G7321_7f.eps, G0571_7f.eps, GT7_02f.eps, Tabelle 7_2 2x2

Grund- und Mischfarben additiver Spektralfarben für Normlichtart D65

Reflexionsfaktoren $R(\lambda) = 1$ λ_1 ... λ_2 in nm	**Farbe: Kurzbezeichnung:**	**Normfarbwertanteile, D65** *x*	*y*	**Normfarbwerte 2°, D65** *X*	*Y*	*Z*
drei additive Optimal-Grundfarben:						
590 ... 700	*O (J80R)*	0, ...	0, ...	. . , . .	. . , . .	. . , . .
490 ... 590	*L (G10J)*	0, ...	0, ...	. . , . .	. . , . .	. . , . .
370 ... 490	*V (R80B)*	0, ...	0, ...	. . , . .	. . , . .	. . , . .
drei additive Optimal-Mischfarben:						
370 ... 590	*C (B30G)*	0, ...	0, ...	. . , . .	. . , . .	. . , . .
370 ... 490, 590 ... 770	*M (R30B)*	0, ...	0, ...	. . , . .	. . , . .	. . , . .
490 ... 770	*Y (G90J)*	0, ...	0, ...	. . , . .	. . , . .	. . , . .
370 ... 770	*D65 (W)*	0, ...	0, ...	. . . , . .	100,00	. . . , . .

G7340_3f.eps, G0581_3f.eps, GT9_01f.eps, Tabelle 10_1 2x2

Normspektralwerte für den 2°-Beobachter und Normlichtart D65

λ/nm	$\bar{x}(\lambda)S(\lambda)$	$\bar{y}(\lambda)S(\lambda)$	$\bar{z}(\lambda)S(\lambda)$	λ/nm	$\bar{x}(\lambda)S(\lambda)$	$\bar{y}(\lambda)S(\lambda)$	$\bar{z}(\lambda)S(\lambda)$
380	0,0065	0,0002	0,0305				
390	0,0219	0,0006	0,1036				
400	0,1121	0,0031	0,5316	600	9,0463	5,3739	0,0068
410	0,3767	0,0105	1,7958	610	8,5007	4,2648	0,0029
420	1,1879	0,0354	5,7060	620	7,0906	3,1619	0,0016
430	2,3292	0,0952	11,3678	630	5,0637	2,0889	0,0004
440	3,4574	0,2283	17,3426	640	3,5475	1,3861	0,0002
450	3,7222	0,4207	19,6198	650	2,1462	0,8100	0,0000
460	3,2416	0,6688	18,6069	660	1,2515	0,4629	0,0000
470	2,1245	0,9892	13,9998	670	0,6807	0,2492	0,0000
480	1,0489	1,5245	8,9165	680	0,3465	0,1260	0,0000
490	0,3296	2,1415	4,7895	690	0,1497	0,0541	0,0000
500	0,0507	3,3438	2,8158	700	0,0770	0,0278	0,0000
510	0,0949	5,1311	1,6138	710	0,0407	0,0147	0,0000
520	0,6275	7,0411	0,7760	720	0,0169	0,0061	0,0000
530	1,6867	8,7850	0,4297	730	0,0095	0,0034	0,0000
540	2,8689	9,4247	0,2005	740	0,0049	0,0018	0,0000
550	4,2652	9,7921	0,0861	750	0,0020	0,0007	0,0000
560	5,6256	9,4155	0,0369	760	0,0007	0,0003	0,0000
570	6,9448	8,6753	0,0191				
580	8,3066	7,8869	0,0150				
590	8,6143	6,3539	0,0092	Summe:	95,0188	100,0000	108,8244

Normfarbwerte: $X =$ 95,0188 $Y =$ 100,0000 $Z =$ 108,8244

Normfarbwertanteile: $x =$ 0,3127 $y =$ 0,3291 $z =$ 0,3582

G7341_7f.eps, G0580_7f.eps, GT9_02f.eps, Tabelle 10_2 2x3

Normspektralwerte für den 2°-Beobachter und Normlichtart D65				
Wellenlänge	Normspektralwerte, 2°, *D65*, 20 nm			Bemerkungen
λ/nm	$\bar{x}(\lambda)S(\lambda)$	$\bar{y}(\lambda)S(\lambda)$	$\bar{z}(\lambda)S(\lambda)$	$S(\lambda) = S_{D65}(\lambda)$
380	0,0129	0,0004	0,0609	
400	0,2237	0,0062	1,0607	370 nm ... 490 nm
420	2,3701	0,0705	11,3849	Violettblau *V*
440	6,8984	0,4555	34,6028	
460	6,4678	1,3345	37,1255	
480	2,0929	3,0417	17,7907	
500	0,1012	6,6717	5,6183	
520	1,2519	14,0488	1,5483	
540	5,7242	18,8047	0,4001	490 nm ... 590 nm
560	11,2246	18,7863	0,0736	Laubgrün *L*
580	16,5738	15,7363	0,0298	
600	18,0496	10,7224	0,0136	
620	14,1475	6,3087	0,0031	
640	7,0782	2,7656	0,0003	
660	2,4970	0,9237	0,0000	590 nm ... 770 nm
680	0,6914	0,2513	0,0000	Orangerot *O*
700	0,1563	0,0555	0,0000	
720	0,0337	0,0122	0,0000	
740	0,0098	0,0035	0,0000	
760	0,0015	0,0005	0,0000	
				370 nm ... 770 nm
Summe: Weiß	95,6038	100,000	109,7126	Weiß *D65*

G7350_7f.eps, G0590_7f.eps, GT9_03f.eps, Tabelle 10_3 2x3

Grund- und Mischfarben additiver Optimalfarben für Normlichtart D65					
Grundfarbe oder Mischfarbe und Bezeichnung	**Normfarbwert-anteile**		**Normfarbwerte**		
	x	***y***	***X***	***Y***	***Z***
drei additive Optimal-Grundfarben:					
O Orangerot	0,6695	0,3302	42,65	21,04	0,02
L Laubgrün	0,2991	0,6351	34,87	74,04	7,67
V Violettblau	0,1445	0,0393	18,06	4,90	102,02
drei additive Optimal-Mischfarben:					
C Cyanblau	0,2191	0,3268	52,94	78,96	109,70
M Magentarot	0,3218	0,1375	60,73	25,95	102,04
Y Gelb	0,4300	0,5274	77,53	95,09	7,69
D65 (Weiß)	0,3131	0,3275	95,60	100,00	109,71

G7310_3f.eps, G0581_7f.eps, GT9_04f.eps, Tabelle 10_4 2x1,5 D−>F

Elementarfarben Gelb, Rot, Blau und Grün nach *Miescher* für D65					
Grundfarbe oder Mischfarbe und Bezeichnung	**Normfarbwert-anteile**		**Normfarbwerte**		
	x	***y***	***X***	***Y***	***Z***
vier Elementarfarben:					
J Gelb	0,4449	0,4909		77,82	
R Rot	0,5813	0,3236		18,11	
B Blau	0,1701	0,1355		9,35	
G Grün	0,1890	0,4496		20,24	
D65 (Weiß)	0,3127	0,3291	95,01	100,00	108,85

G7320_7f.eps, G0591_3f.eps, GT9_05f.eps, Tabelle 10_5 2x2

Grund- und Mischfarben des Normfarbfernseh-Prozesses nach DIN 6169					
Grundfarbe oder Mischfarbe und Bezeichnung	**Normfarbwert-anteile**		**Normfarbwerte**		
	x	***y***	***X***	***Y***	***Z***
drei additive Grundfarben:					
O Orangerot	0,6400	0,3300	43,03	22,19	2,02
L Laubgrün	0,2900	0,6000	34,16	70,68	12,96
V Violettblau	0,1415	0,0482	17,82	7,13	93,87
drei additive Mischfarben:					
C Cyanblau	0,2197	0,3288	51,98	77,81	106,83
M Magentarot	0,3270	0,1576	60,85	29,32	95,89
Y Gelb	0,4172	0,5019	77,19	92,87	14,98
D65 (Weiß)	0,3127	0,3291	95,01	100,00	108,85

G7310_7f.eps, G0591_7f.eps, GT9_06f.eps, Tabelle 10_6 2x2

Grund- und Mischfarben des Normfarbdruck-Prozesses nach DIN 16 539

Grundfarbe oder Mischfarbe und Bezeichnung	Normfarbwert-anteile		Normfarbwerte		
	x	***y***	***X***	***Y***	***Z***
drei subtraktive Grundfarben:					
C Cyanblau	0,1553	0,1967	16,92	21,44	70,62
M Magentarot	0,4675	0,2314	33,88	16,77	21,82
Y Gelb	0,4399	0,4925	68,13	76,28	10,48
drei subtraktive Mischfarben:					
O Orangerot	0,6152	0,3226	30,51	16,00	3,08
L Laubgrün	0,1958	0,5256	6,05	16,23	8,06
V Violettblau	0,1807	0,1009	4,86	2,72	19,33
NLC (Weiß)	0,3101	0,3162	98,07	100,00	118,22

G7311_3f.eps, G0610_3f.eps, GT9_07f.eps, Tabelle 10_7 2x2

Grund- und Mischfarben eines Test-Offset-Farbdruck-Prozesses					
Grundfarbe oder Mischfarbe und Bezeichnung	**Normfarbwert-anteile**		**Normfarbwerte**		
	x	***y***	***X***	***Y***	***Z***
drei subtraktive Grundfarben:					
C Cyanblau	0,1776	0,2510	20,04	28,32	64,46
M Magentarot	0,4298	0,2320	29,94	16,17	23,56
Y Gelb	0,4512	0,5000	62,08	68,74	6,75
drei subtraktive Mischfarben:					
O Orangerot	0,6261	0,3368	21,57	11,60	1,28
L Laubgrün	0,2416	0,5989	5,82	14,43	3,84
V Violettblau	0,1890	0,1326	4,39	3,08	15,77
D65 (weißes Papier, *D65*)	0,3173	0,3337	77,74	81,79	85,43
N (schwarze Druckfarbe)	0,3130	0,3258	4,12	4,29	4,75

G7311_7f.eps, G0610_7f.eps, GT9_08f.eps, Tabelle 10_8 2x2

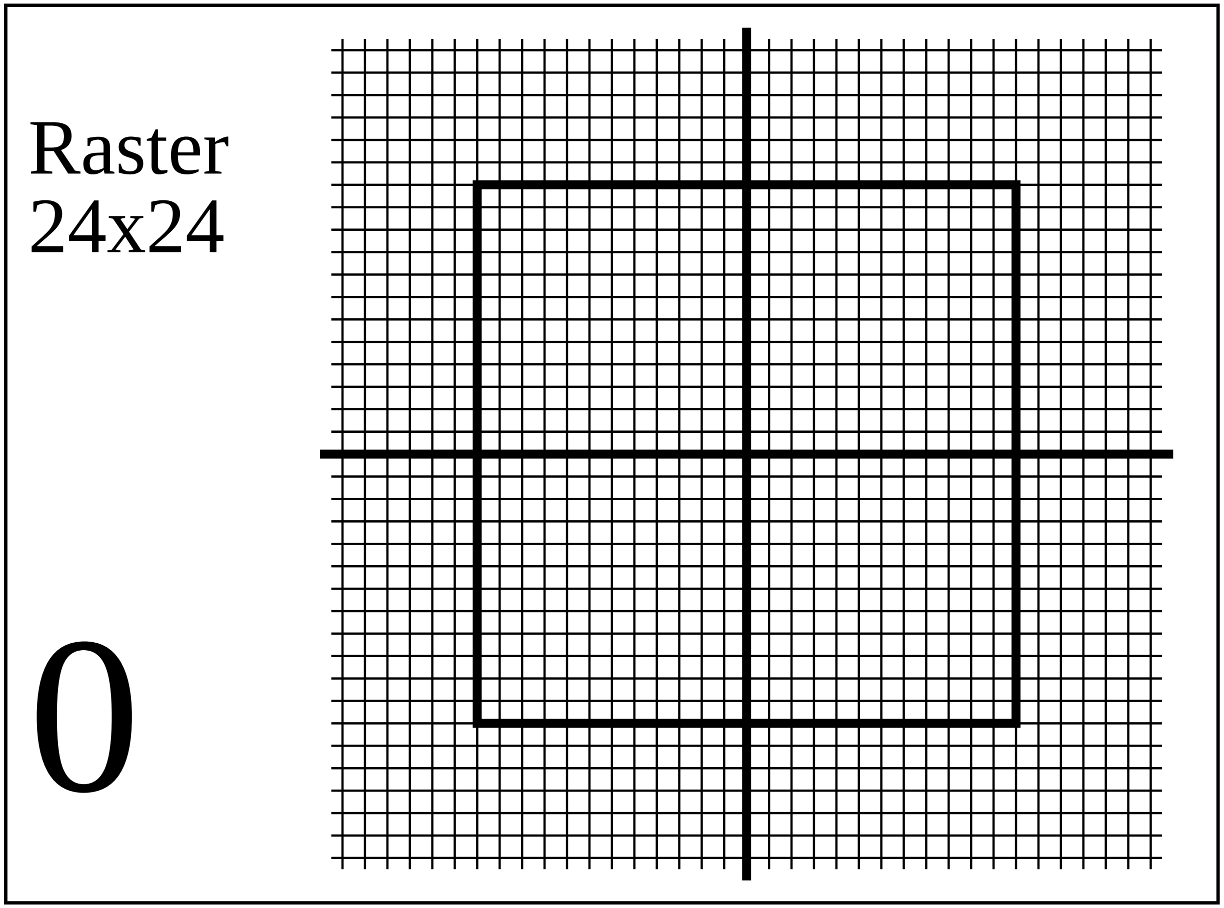
Farbvalenzmetrische Größen (Farbwerte: lineare Koordinaten)		
Farbvalenzmetrische Größen	**Bezeichnung und Zusammenhang mit Normfarbwerten / -anteilen**	**Bemerkungen:**
Hellbezugswert	$Y = y\,(X + Y + Z)$	*Definition in:*
		CIEXYZ 1931
Buntwert	*für lineares Buntwertdiagramm (A, B)*	
Rot−Grün	$A = [\,X / Y - X_n / Y_n\,]\,Y = [\,a - a_n\,]\,Y$	*Definition*
	$= [\,x / y - x_n / y_n\,]\,Y$	*Gegenfarbsystem*
Gelb−Blau	$B = -\,0{,}4[\,Z / Y - Z_n / Y_n\,]\,Y = [\,b - b_n\,]\,Y$	
	$= -\,0{,}4[\,z / y - z_n / y_n\,]\,Y$	*n = D65 (Umfeld)*
radial	$C = [\,A^2 + B^2\,]^{1/2}$	
Sättigungswert	**= Buntwert / Hellbezugswert**	
Rot−Grün	$S_a = A / Y = X / Y - X_n / Y_n$	*Definition*
	$= x / y - x_n / y_n = a - a_n$	*Gegenfarbsystem*
Gelb−Blau	$S_b = B / Y = -\,0{,}4\,[\,Z / Y - Z_n / Y_n\,]$	
	$= -\,0{,}4[\,z / y - z_n / y_n\,] = b - b_n$	
radial	$S_c = C / Y$	
	$= [\,(a - a_n)^2 + (b - b_n)^2\,]^{1/2}$	
Farbartwert	*für lineare Farbtafel (a, b)*	
Rot−Grün	$a = X / Y = x / y$	*Definition*
Gelb−Blau	$b = -\,0{,}4\,[Z / Y\,] = -\,0{,}4\,[z / y\,]$	*Gegenfarbsystem*
radial	$c = [\,(a - a_n)^2 + (b - b_n)^2\,]^{1/2}$	

G7360_7f.eps, G0611_7f.eps, GT9_09f.eps, Tabelle 10_9 2x3

Farbempfindungsgrößen (Farbheiten: Kubikwurzel-Koordinaten)

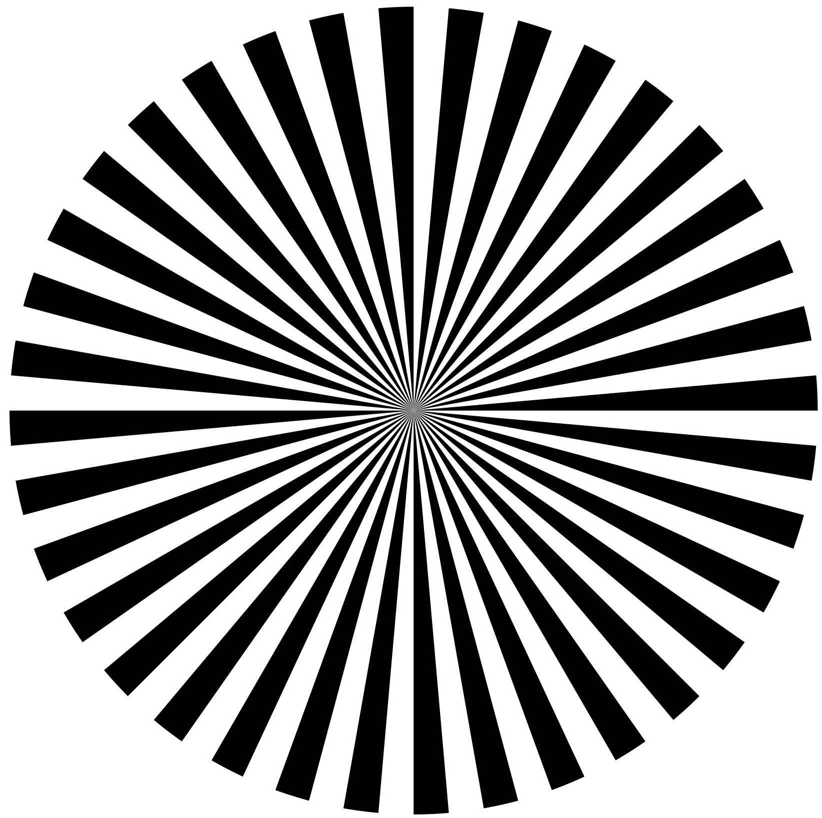
Farbempfin-dungsgrößen	**Bezeichnung und Zusammenhang mit Normfarbwerten / -anteilen**	**Bemerkungen:**
Helligkeit	$L^* = 116\ (Y / 100)^{1/3} - 16$	*Definition 1976 in:*
	Näherung: $L^* = 100\ (Y / 100)^{1/3}$	*CIELUV und CIELAB*
Buntheit	*für nichtlineares Buntheitsdiagramm (a*, b*)*	
Rot−Grün	$a^* = 500\ [\ (X / X_n)^{1/3} - (Y / Y_n)^{1/3}\ ]$	*Definition 1976 in:*
	$= 500\ (a' - a'_n)\ Y^{1/3}$	*CIELAB*
Gelb−Blau	$b^* = 200\ [\ (Y / Y_n)^{1/3} - (Z / Z_n)^{1/3}\ ]$	
	$= 500\ (b' - b'_n)\ Y^{1/3}$	*n = D65 (Umfeld)*
radial	$C^* = [\ a^{*2} + b^{*2}\ ]^{1/2}$	
Sättigung	**= Buntheit / Helligkeit**	
Rot−Grün	$S^*_a = a^* / [\ 100\ (Y / 100)^{1/3}\ ]$	*Definition für:*
	$= 21{,}6\ (a' - a'_n)$	*CIELAB 1976*
Gelb−Blau	$S^*_b = b^* / [\ 100\ (Y / 100)^{1/3}\ ]$	
	$= 21{,}6\ (b' - b'_n)$	
radial	$S^*_c = C^* / [\ 100\ (Y / 100)^{1/3}\ ]$	
	$= 21{,}6\ [\ (a' - a'_n)^2 + (b' - b'_n)^2\ ]^{1/2}$	
Farbart	*für nichtlineare Farbarttafel (a', b')*	
Rot−Grün	$a' = (1 / X_n)^{1/3}\ (x / y)^{1/3}$	*Definition für:*
	$= 0{,}2191\ (x / y)^{1/3}$ für *D65*	*CIELAB 1976*
Gelb−Blau	$b' = -\ 0{,}4\ (1 / Z_n)^{1/3}\ (z / y)^{1/3}$	*Farbarttafel (a', b')*
	$= -\ 0{,}08376\ (z / y)^{1/3}$ für *D65*	*ähnlich (u', v')*
radial	$c' = [\ (a' - a'_n)^2 + (b' - b'_n)^2\ ]^{1/2}$	*von CIELUV 1976*

G7361_7f.eps, G0620_7f.eps, GT9_10f.eps, Tabelle 10_10 2x4

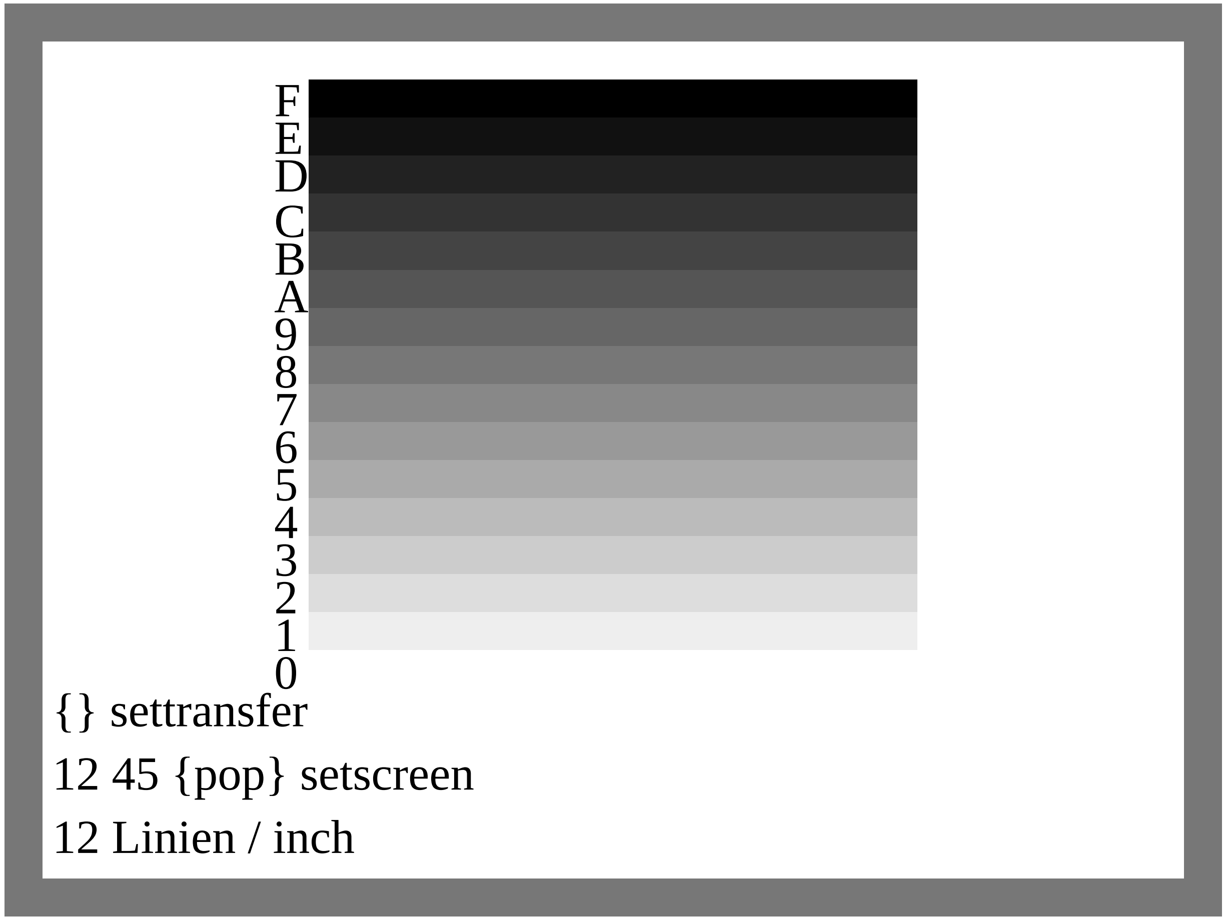


G8325_8f.eps, G0630_1f.eps, GTe01f.eps, Testbild 1

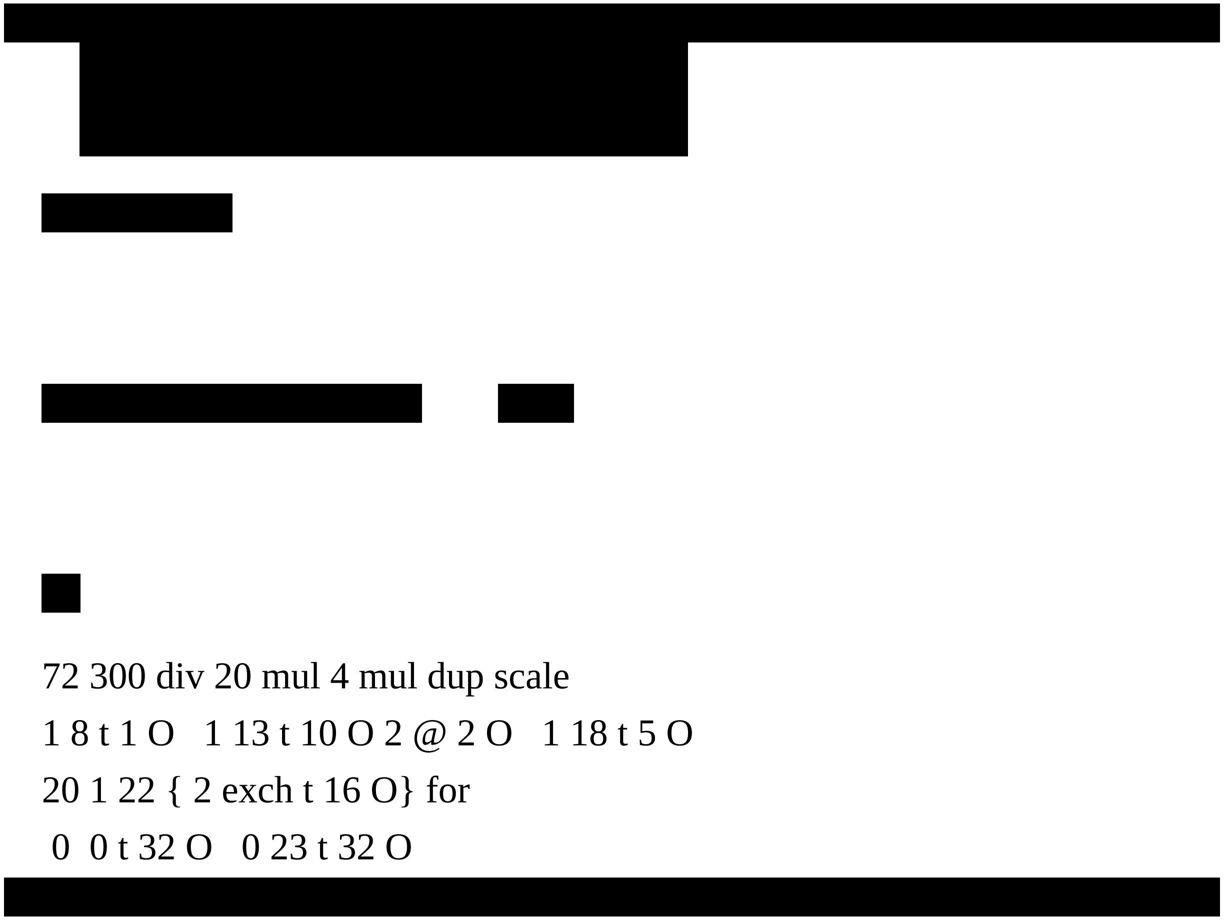
Rosette
10 Grad
Radius
1,8 cm



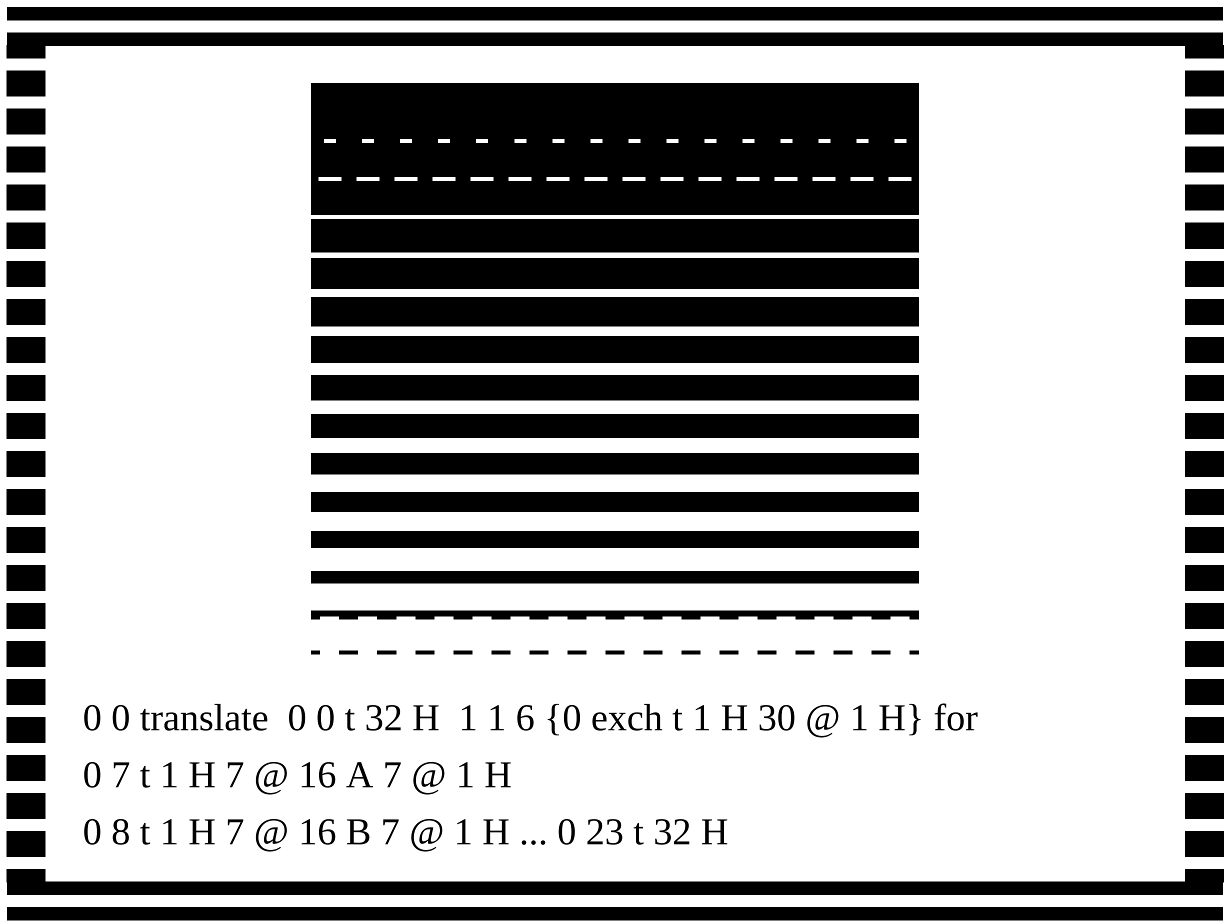
G8264_5f.eps, G0630_2f.eps, GTe02f.eps, Testbild 2



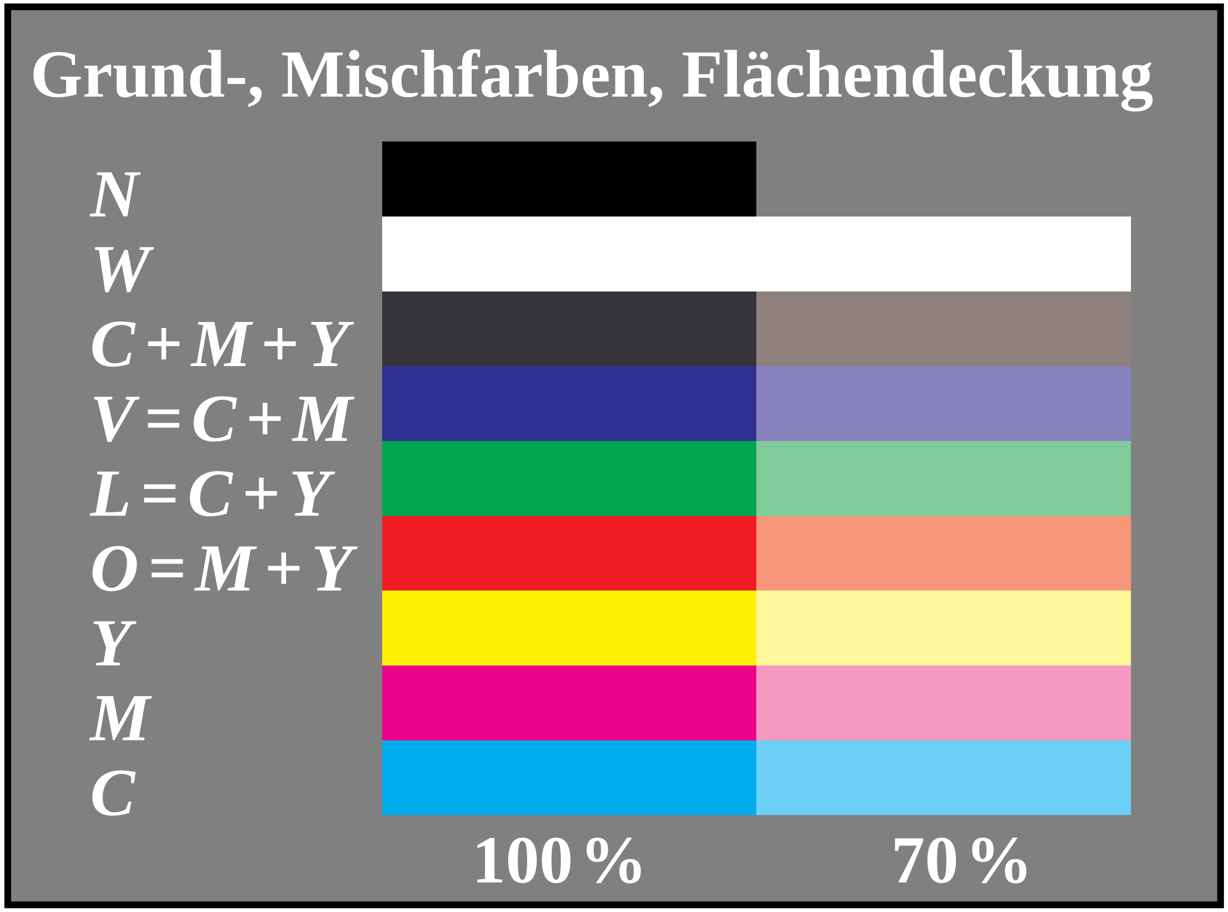
G8254_1f.eps, G0630_3f.eps, GTe03f.eps, Testbild 3 *PDF



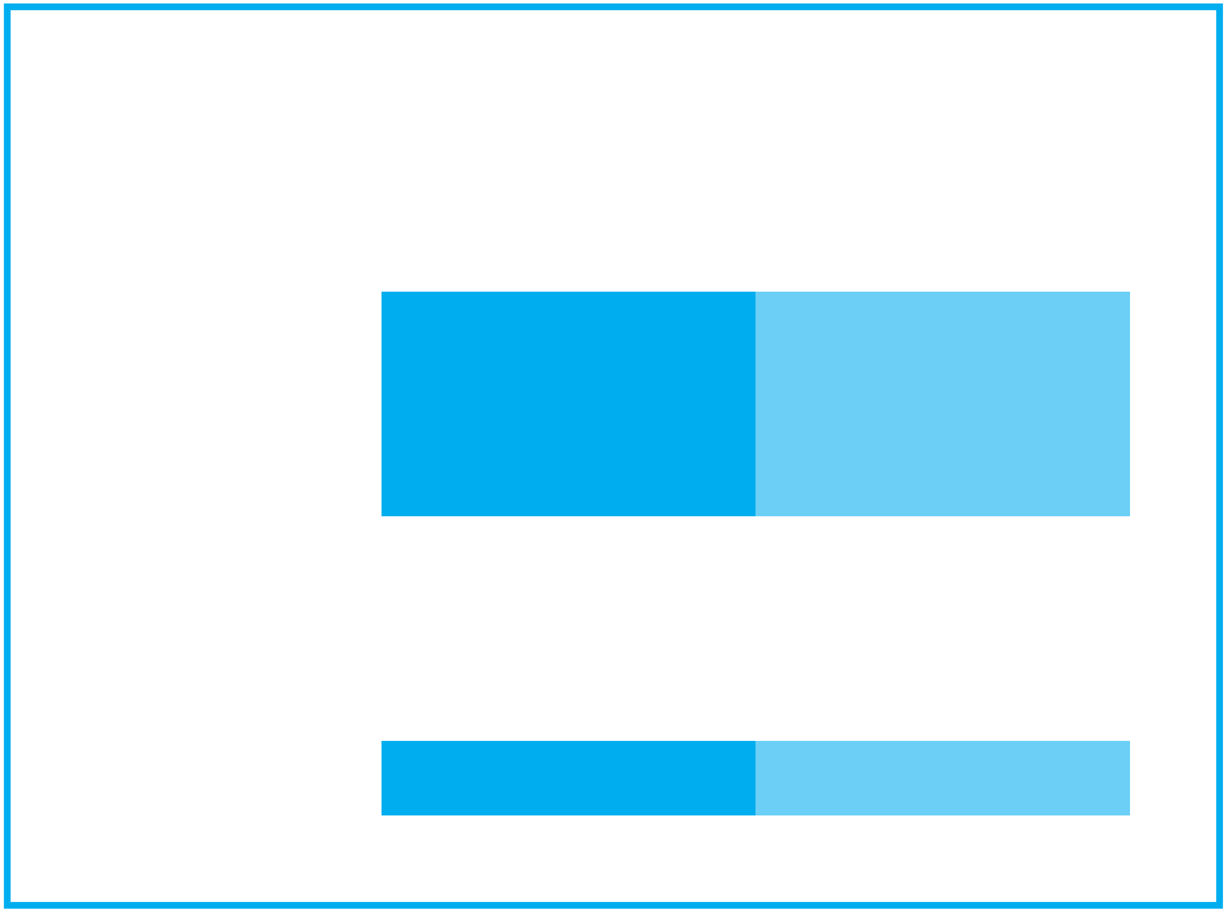
G8264_6f.eps, G0630_4f.eps, GTe04f.eps, Testbild 4



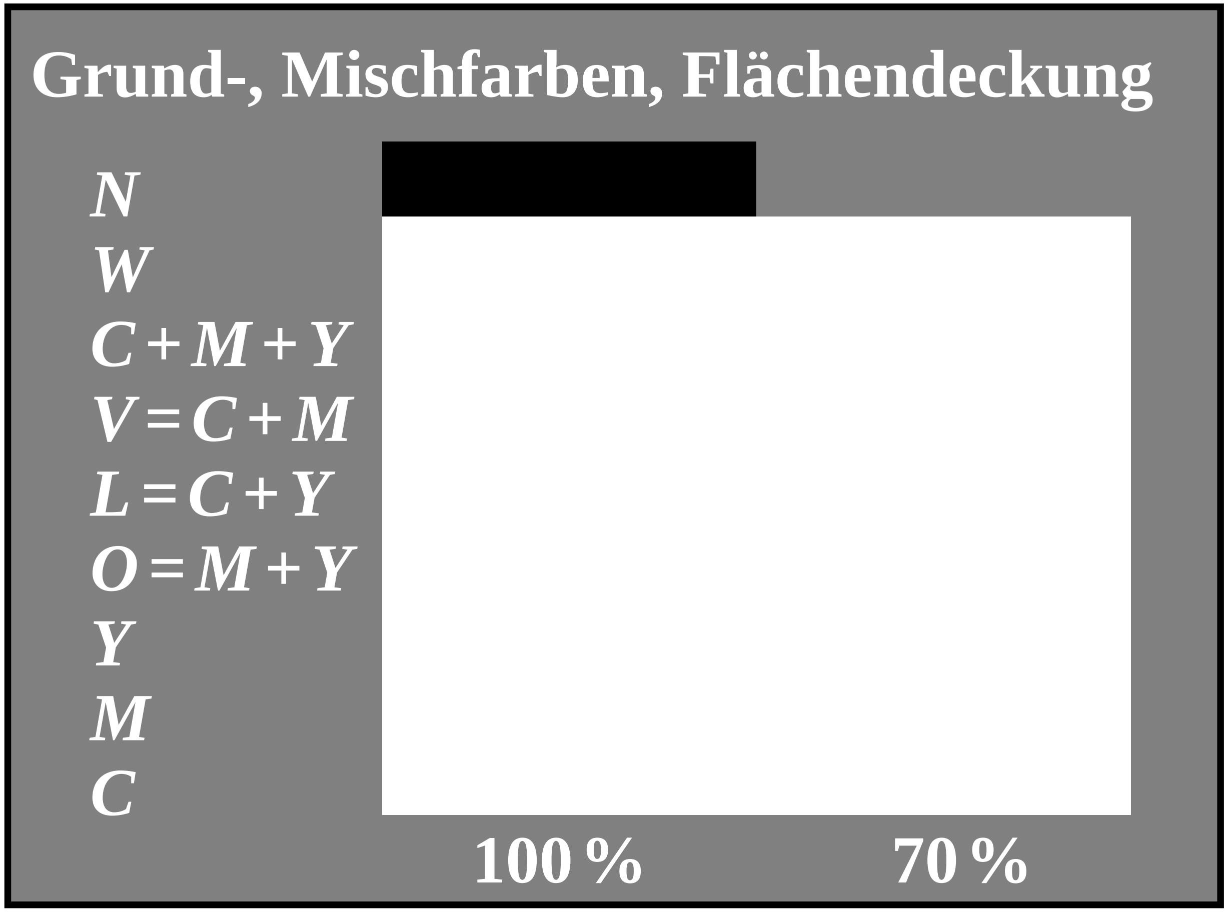
G8264_7f.eps, G0630_5f.eps, GTe05f.eps, Testbild 5



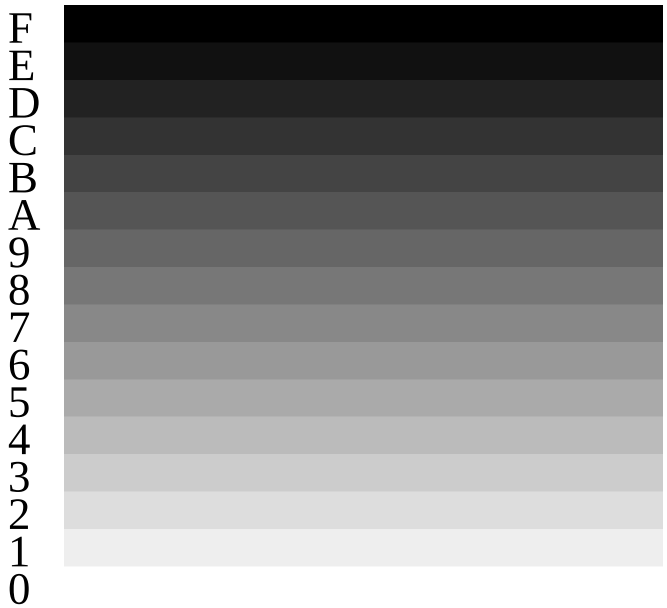
G9485_8f.eps, G0630_6f.eps, GTe06_1f.eps, Testbild 6_1



G9485−4f.eps, G0630_7f.eps, GTe06_2f.eps, Testbild 6_2



G9485_7f.eps, G0630_8f.eps, GTe06_3f.eps, Testbild 6_3



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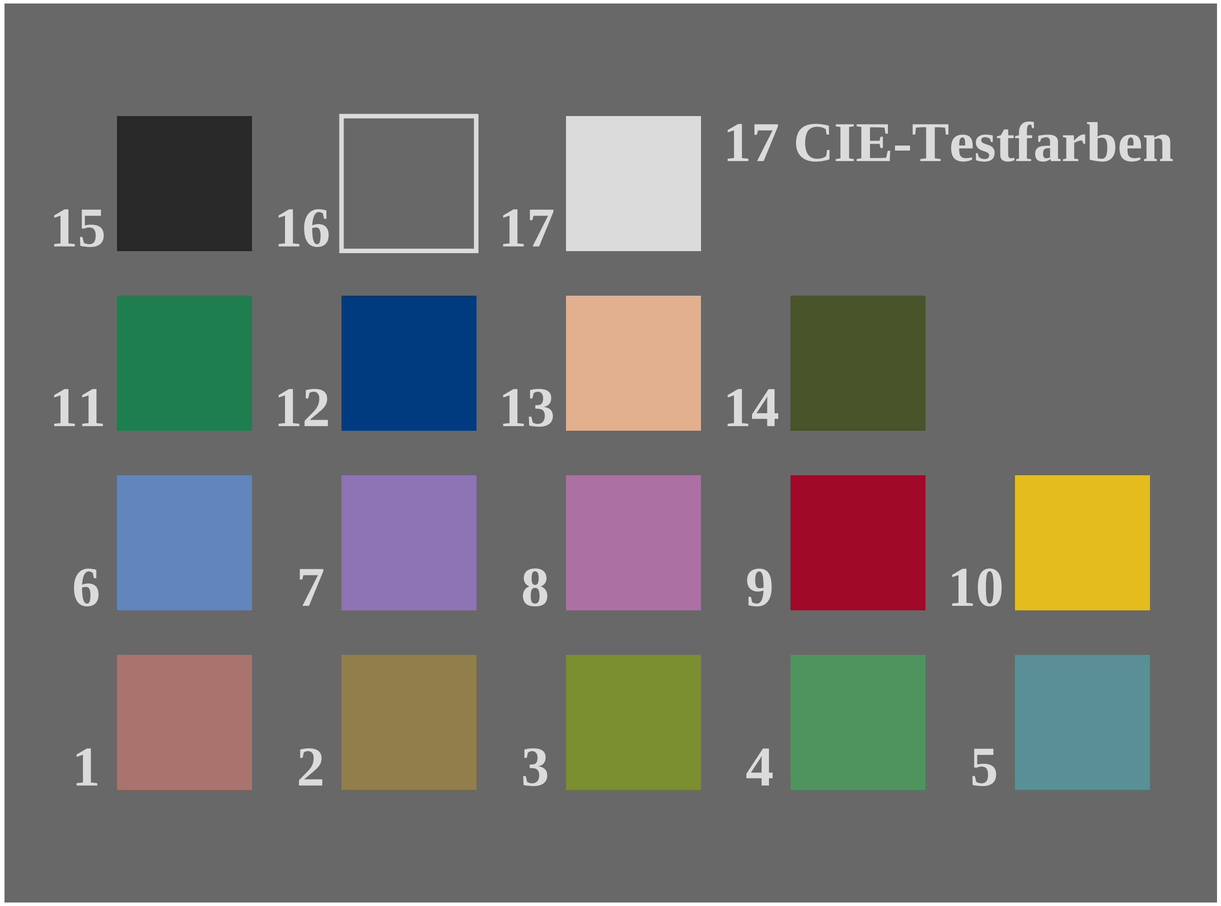
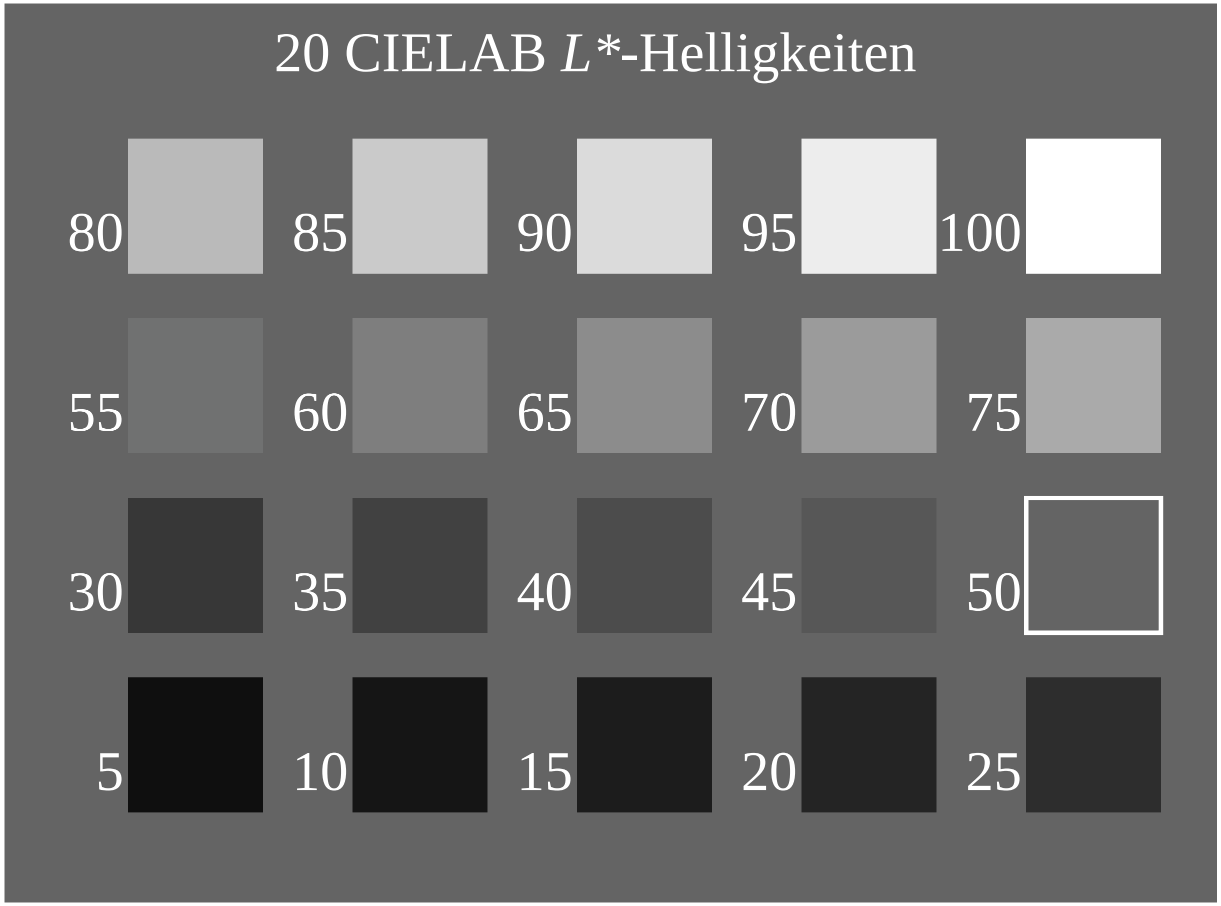
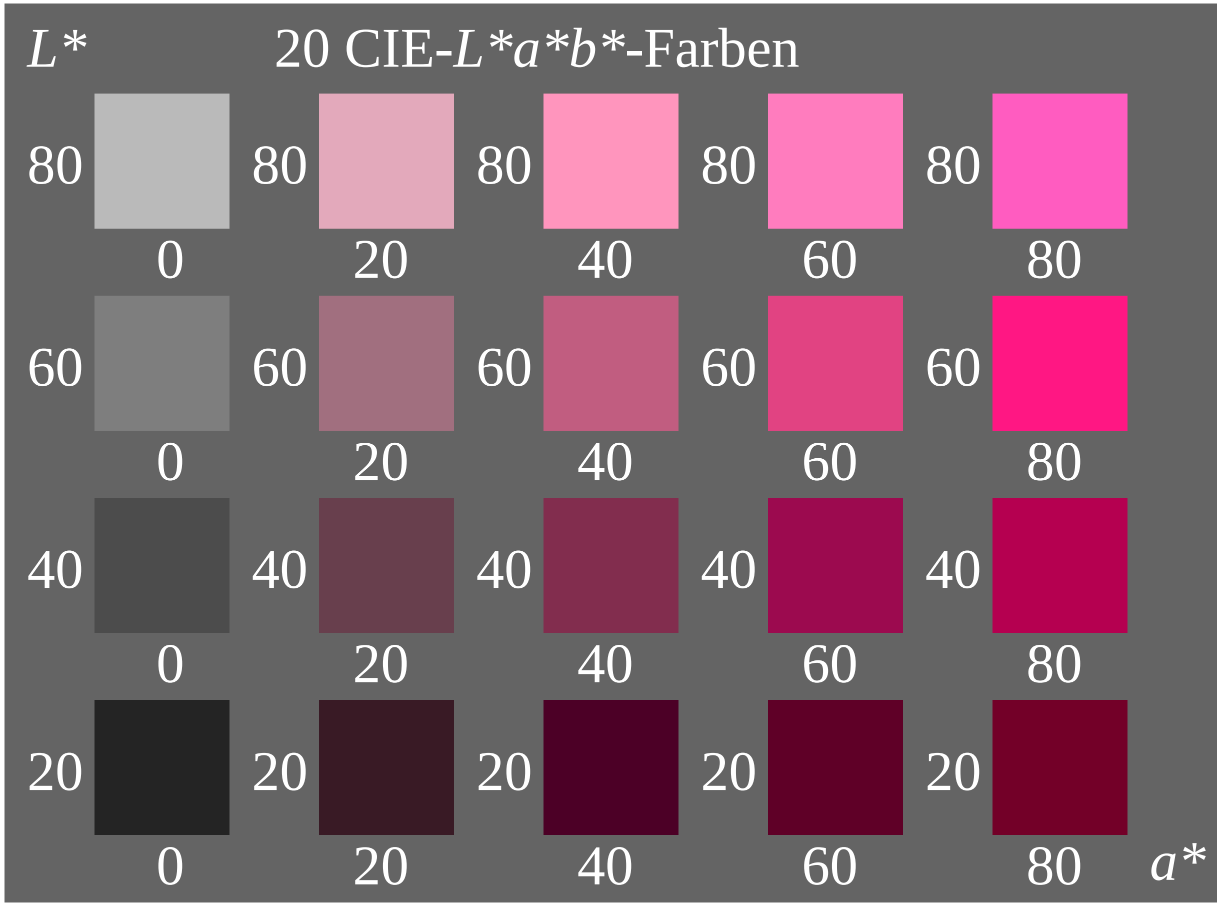
G7215_7f.eps, G0631_1f.eps, GTe07f.eps, Testbild 7 *PDF



G7225_7f.eps, G0631_2f.eps, GTe08f.eps, Testbild 8



G7235_7f.eps, G0631_3f.eps, GTe09f.eps, Testbild 9



G7245_7f.eps, G0631_4f.eps, GTe10f.eps, Testbild 10

G7384_8f.eps, G0631_5f.eps, GTe11f.eps, Testbild 11

G7385_8f.eps, G0631_6f.eps, GTe12f.eps, Testbild 12

G7384_7f.eps, G0631_7f.eps, GTe13f.eps, Testbild 13

G7385_7f.eps, G0631_8f.eps, GTe14f.eps, Testbild 14