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agenda item 11.)

Proposal for collective amendments regarding colour specifications

(Transmitted by the experts from the UK)

INTRODUCTION

Report 51st session of GRE, TRANS/WP.29/GRE/51
"….
1.2.8. COLLECTIVE AMENDMENTS REGARDING COLOUR SPECIFICATIONS
38. Recalling the considerations at its fiftieth session, GRE agreed to insert this agenda item to consider improving colour definitions, expecting for the next session a joint proposal by the United Kingdom and IEC.
…"
Input to this document was received from individual experts from Germany and the Netherlands.

OBJECTIVE

The objective of this informal document is to find a common position on another colour boundaries notation and the way of implementation into the regulations -if accepted- in advance of a formal proposal to amend the relevant regulations.

SCOPE

Active lighting and light signalling regulations were considered, only.
Passive light signalling was not considered here in detail. Those regulations use a notation method giving a table of intersection points (no formulas) and which is very similar to the notation proposed below. Moreover, several tables of co-ordinates for one 'colour' are possible.

SUGGESTED AMENDMENTS TO CURRENT NOTATION

1. Change "≥" and "≤" into "=".
2. Add the spectral locus and the purple line (linear extension across the purple range of colours between the red and the blue extremities of the spectral locus), where necessary.
3. A reference to the CIE publication and CIE system: CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer.
4. Tune text to CIE as far as possible (literally not possible).
5. Add the chromaticity coordinates of the intersection points of the chromaticity boundaries, the spectral locus and the purple line.
6. Change names and sequence of boundaries because of intersection points, clockwise starting top left.

SUGGESTED COLOUR BOUNDARIES NOTATION

R37

3.6.2. The colour of the light emitted shall have chromaticity coordinates (x,y) (CIE Publication 15.2, 1986, Colorimetry, the CIE 1931 standard colorimetric observer), that lie inside the chromaticity areas defined by the following boundaries:

finished filament lamps emitting white light:

W_{12}	green boundary:	y = 0.150 + 0.640 x
W_{23}	yellowish green boundary:	y = 0.440
W_{34}	yellow boundary:	x = 0.500
W_{45}	reddish purple boundary:	y = 0.382
W_{56}	purple boundary:	y = 0.050 + 0.750 x
W_{61}	blue boundary:	x = 0.310

with intersection points:

	x	y
W_1:	0,310	0,348
W_2:	0,453	0,440
W_3:	0,500	0,440
W_4:	0,500	0,382
W_5:	0,443	0,382
W_6:	0,310	0,283

finished filament lamps emitting selective-yellow light:

SY_{12}	green boundary:	y = 1.290 x - 0.100
SY_{23}	the spectral locus	
SY_{34}	red boundary:	y = 0.138 + 0.580 x
SY_{45}	yellowish white boundary:	y = 0.440
SY_{51}	white boundary:	y = 0.940 - x

with intersection points:

	x	y
SY_1:	0,454	0,486
SY_2:	0,480	0,519
SY_3:	0,545	0,454
SY_4:	0,521	0,440
SY_5:	0,500	0,440

finished filament lamps emitting amber light:

A_{12}	green boundary:	y = x - 0.120
A_{23}	the spectral locus	
A_{34}	red boundary:	y = 0.390
A_{41}	white boundary:	y = 0.790 - 0.670 x

with intersection points:

	x	y
A_1:	0,545	0,425
A_2:	0,557	0,442
A_3:	0,609	0,390
A_4:	0,597	0,390

finished filament lamps emitting red light:

R_{12}	yellow boundary:	y = 0.335
R_{23}	the spectral locus	
R_{34}	the purple line	(its linear extension across the purple range of colours between the red and the blue extremities of the spectral locus).
R_{41}	purple boundary:	y = 0.980 – x

with intersection points:

	x	y
R_1:	0,645	0,335
R_2:	0,665	0,335
R_3:	0,735	0,265
R_4:	0,721	0,259

R99

Additionally to relevant colour boundaries above, sheets DxR/4 and DxS/4:
To avoid an unnecessary complication of the sheet, it is suggested to keep the design as it is.
Note:
If notation as suggested above would be used, part of the table on the sheets would look like:

Chromaticity co-ordinates	Objective		x = 0.375	y = 0.375
	Tolerance area 3/	within Boundaries	x = 0.345 x = 0.405	y = 0.150 + 0.640 x y = 0.050 + 0.750 x
		Intersection points x,y of boundaries	x=0,345 x=0,405 x=0,405 x=0,345	y=0,371 y=0,409 y=0,354 y=0,309

IMPLEMENTATION

Examples were given for R37 and R99; texts need to be rephrased for other regulations.

Alternatives

1. Annex to each relevant Regulation.
2. Annex to R48, (R53, R74, R86) installation.
3. Annex to R37 and/or R99.
4. New Regulation concerning general specifications, definitions, colour boundaries, test procedures etc.

Legal and practical consequences should be considered.

Relevant Regulations (to be completed)

	Reg		body/ annex	paragraph	colour of light			
		ACTIVE			white	sel yellow	amber	red
x	5	sealed beam headlamps			x	x		
x	6	direction ind					x	
x	7	stop, pos, markers			x			x
x	19	front fog			x	x		
x	23	reversing			x			
x	31	halogen sealed beam headlamps			x	x		
x	37	filament light sources			x	x	x	x
x	38	rear fog						x
x	50	pos, stop, dir ind			x?		x	x
?	65	special warning lamps						
?	77	parking lamps						x
x	87	DRL						
x	91	side marker					x	x
x	98	gas-discharge headlamps			x	x		
x	99	gas-discharge light sources			x	x		
x	112				x			
x	113					x		
		PASSIVE						
P	3	retrorefl devices					x	x
P	4	ill rear reg plates						
P	27	warning triangles						
P	69	rear marking plates						tables 1,2,3
P	70	rear marking plates heavy and long vehicles					yellow tables 1,2	tables 1,2,3
P	88	retro refl tyres						
P	104	retro refl contour				yellow table 1	yellow table 2	

INFORMATION

re REGULATIONS

Current text including proposed amendments for selective yellow

R37

3.6.2. The colourimetric characteristics of the light emitted, expressed in CIE trichromatic coordinates, shall lie within the following limits:

finished filament lamps emitting white light:

limit towards blue:	$x \geq 0.310$
limit towards yellow:	$x \leq 0.500$
limit towards green:	$y \leq 0.150 + 0.640\ x$
limit towards green:	$y \leq 0.440$
limit towards purple:	$y \geq 0.050 + 0.750\ x$
limit towards red:	$y \geq 0.382$;

finished filament lamps emitting selective-yellow light:

limit towards red	$y \geq 0.138 + 0.580\ x$
limit towards green	$y \leq 1.290\ x - 0.100$
limit towards white:	$y \geq 0.940 - x$ and
	$y \geq 0.440$;

finished filament lamps emitting amber light:

limit towards green:	$y \leq x - 0.120$
limit towards red:	$y \geq 0.390$
limit towards white:	$y \geq 0.790 - 0.670\ x$;

finished filament lamps emitting red light:

limit towards yellow:	$y \leq 0.335$
limit towards purple:	$y \geq 0.980 – x$.

R99

Additionally sheets DxR/4 and DxS/4:

Colour co-ordinates	Objective		x = 0.375	y = 0.375
	Tolerance area 3/		x ≥ 0.345 x ≤ 0.405	y ≤ 0.150 + 0.640 x y ≥ 0.050 + 0.750 x

4.2 Specified chromaticity areas

The colours of light signals shall have chromaticity coordinates (*x, y*) that lie inside the chromaticity areas defined by the boundaries specified in Table 1 and, where applicable, by the spectral locus and its linear extension across the purple range of colours between the red and blue extremities of the spectral locus.

NOTE 1 For convenience in plotting the chromaticity areas, the intersection points of the chromaticity boundaries, spectral locus and purple line are given in Table 2 and the areas are illustrated in Figures 1 to 5.

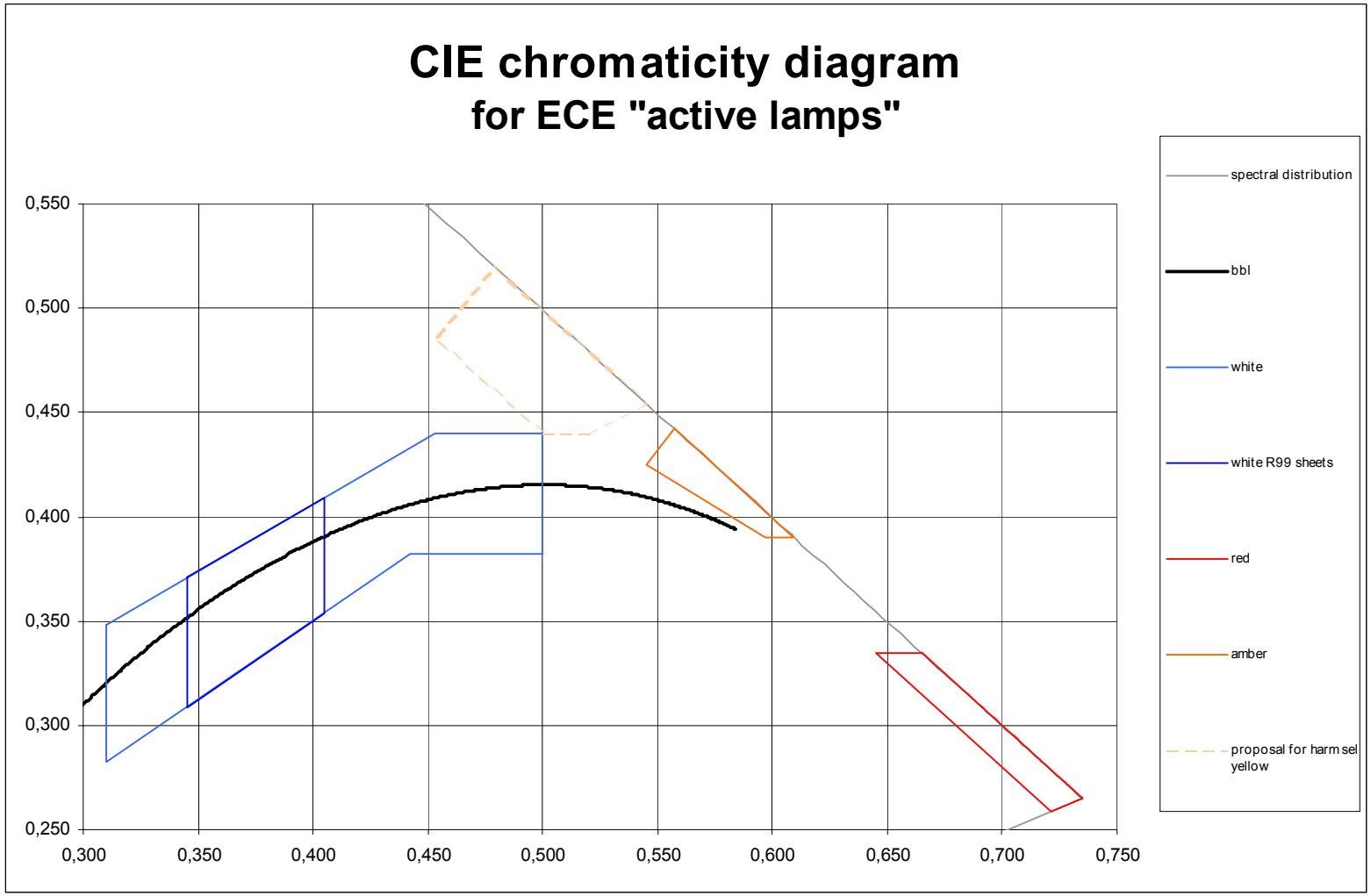
NOTE 2 The chromaticity coordinates for plotting the spectral locus in Figures 1 to 5 are given in ISO/CIE 10527-1991.

Table 1 - Boundaries of the allowed chromaticity areas for the colours of light signals

Colour	Notation	Equation of boundary
RED LIGHT SIGNAL COLOURS **Class A** Yellow boundary Purple boundary	 AB AD	 y = 0,320 y = 0,980 – x
etc		

Table 2 - Coordinates of intersection points of allowed chromaticity area boundaries

Colour	Chromaticity coordinates				
RED LIGHT SIGNAL COLOURS **Class A**		**A**	**B**	**C**	**D**
	x	0,660	0,680	0,735	0,721
	y	0,320	0,320	0,265	0,259
etc					


CIE chromaticity diagram
for ECE "active lamps"
0,550
0,500
0,450
0,400
0,350
0,300
0,250
0,300
0,350
0,400
0,450
0,500
0,550
0,600
0,650
0,700
0,750
spectral distribution
bbl
white
white R99 sheets
red
amber
proposal for harmsel yellow