Why Should We Care for the 400nm UV Upper Limit and the Effectiveness of the Resistance to Radiance Test on the Standard?

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Should sunglasses certification be mandatory?

What could harm consumer?

- Any power/prism added to the lenses?
- Flammable?
- How long does it last?
- UV protected?

FLAMMABLE?

- 400 out of 400 polycarbonate sunglasses tested as required by ISO12312-1:2015 did not ignite or continue to glow after withdrawal of the test rod;

The flammability test procedure consists in a hot steel rod (6mm diameter; 300mm ±3mm long) at 650 ^{o}C ± 20 ^{o}C pressed against the sunglasses surfaces with a force equals to the weight of the steel rod for a period of 5 seconds and then remove it. The sample should not ignite or continue to glow after withdrawal of the test rod. (ISO 12311:2013)

UV PROTECTED?

- 390 out of 400 sunglasses (polycarbonate, XYLEX and CR39) spectroscopically tested were 380nm UV protected;
- 89% were 400nm UV protected
- 10 sunglasses failed;

Why have they failed?

Bin Shyh Enterprise Co., Ltd.
886-6-2394266 / 886-6-2394246

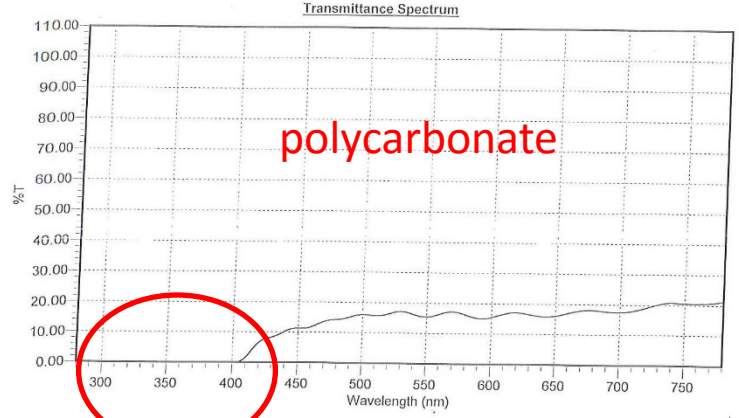
Sunglasses Certification Report

Standard: EN ISO 12312-1:2013

Sample Name: B20 with 5ML Pink Mirror
Company: UTH-115-1(15120901)
Material: Polycarbonate Lens
Size: 82mmx70mm/6C/1.8mm Dec

Item	Value	Requirement	Result
Filter Category	3		
Luminous Transmittance Tv	16.09%	8% - 18%	PASS
Incandescent Lights			
Q, Red	1.01	>= 0.80	PASS
Q, Yellow	1.00	>= 0.60	PASS
Q, Green	1.00	>= 0.60	PASS
Q, Blue	0.94	>= 0.60	PASS
LED Signal Lights			
Q, Red	1.01	>= 0.80	PASS
Q, Yellow	0.96	>= 0.60	PASS
Q, Green	0.98	>= 0.60	PASS
Q, Blue	0.83	>= 0.60	PASS
Tmin (475 - 650nm)	14.03%	>= 3.22% (0.2Tv)	PASS
Tsuva (315 - 380nm)	0.01%	<= 8.05% (0.5Tv)	PASS
Tsuvb (280 - 315nm)	0.01%	<= 1.0%	PASS
Tsuv (280 - 380nm)	0.01%		
Tsb (380 - 500nm)	10.51%		

Transmittance Spectrum



Spectrum Data:

nm	%T	nm	%T	nm	%T	nm	%T	nm	%T	nm	%T	nm	%T	nm	%T
280	0.000	290	0.000	300	0.000	310	0.011	320	0.011	330	0.012	340	0.012	350	0.000
360	0.000	370	0.000	380	0.000	390	0.023	400	0.019	410	1.552	420	6.566	430	8.274
440	10.224	450	11.191	460	11.742	470	13.571	480	14.217	490	15.136	500	16.010	510	15.691
520	16.337	530	17.193	540	16.200	550	15.453	560	16.415	570	17.210	580	16.231	590	15.074
600	15.422	610	16.652	620	17.106	630	16.467	640	15.864	650	16.121	660	17.102	670	17.976
680	18.044	690	17.642	700	17.485	710	17.987	720	19.072	730	20.237	740	20.834	750	20.534
760	20.552	770	20.744	780	21.350										

13:55:37 Wednesday, January 06, 2016 Page 1/1

Why have they failed?

CARL ZEISS VISION

Carl Zeiss Vision Sunlens

Via S. e P. Mazzucchelli, 17 21043 Castiglione Olona (Varese), Italy

OPTICAL TRANSMITTANCE PROPERTIES | TECHNICAL DATA SHEET | In pursuance of EU Directive 89/686/EE | Section 2

COLOUR CODE : **Cr39 7078 Gradient Grey**

EN 1836:2005+A1:2007
European Standard
section 4.1 and 6.2

Filter Type

- [ ] Solid Tint
- [ ] Polarizing
- [ ]
- [X] Gradient Tint
- [ ] Photochromic
- [ ]

Transmittance Claims

- [ ] Solar Infra-red Transmittance
- [X] Solar UVA Transmittance
- [ ] Solar Blue-light Transmittance
- [X] Solar UVB Transmittance
- [X] Solar UV Transmittance
- [ ]

General Transmittance Requirements

Filter Category	3	- Dark tint	
		-	
Photochromic Ratio >= 1.25	N.R.		
Polarizing Ratio > 4:1	N.R.		
Degree of Polarization	N.R.		
Polarizing Ratio > 8:1	N.R.		
	CENTER	TOP	BOTTOM
Luminous Transmittance - D65 (380-780nm)	16,6%	11,0%	34,3%
Max Solar UVA Trans (315-380nm)	PASS	PASS	PASS
Max Spectral Trans (315-350nm)	PASS	PASS	PASS
Max Spectral Trans (280-315nm)	PASS	PASS	PASS

Requirements for road use and driving
section 4.1.3.2

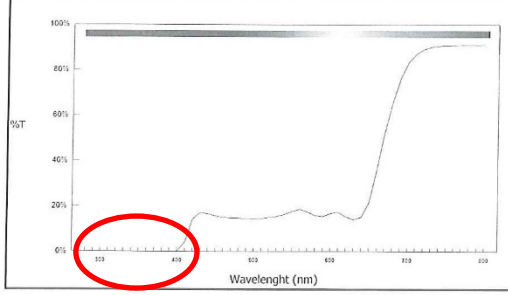
	CENTER	TOP	BOTTOM
Spectral Transmittance (500-650nm)	PASS	PASS	PASS
Q Red	PASS	PASS	PASS
Q Yellow	PASS	PASS	PASS
Q Green	PASS	PASS	PASS
Q Blue	PASS	PASS	PASS

Claimed Transmittance Properties
section 6.2.1.2

Infrared Transmittance	N.R.			
Blue Light Transmittance (380-500nm)	N.R.			
UV Transmittance (280-380nm)	< 0,01 %			
UVA Transmittance (315-380nm)	< 0,01 %			
UVB Transmittance (280-315nm)	< 0,01 %			

CR39

OK



TRANSMISSION VALUES (CENTER)

280	0,0	290	0,0	300	0,0
310	0,0	320	0,0	330	0,0
340	0,0	350	0,0	360	0,0
370	0,0	380	0,0	390	0,0
400	0,1	410	4,0	420	14,2
430	17,1	440	16,6	450	15,7
460	15,0	470	14,7	480	14,7
490	14,4	500	14,2	510	14,5
520	15,0	530	15,5	540	16,3
550	17,6	560	18,6	570	17,5
580	15,9	590	15,4	600	16,8
610	17,4	620	15,3	630	14,1
640	15,1	650	21,7	660	36,6
670	52,8	680	65,9	690	76,5
700	83,5	710	87,2	720	89,3
730	90,2	740	90,7	750	90,9
760	91,0	770	91,1	780	91,1

Hot Buttered

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Why have they failed?

886-6-2394266 / 886-6-2394246

Sunglasses Certification Report

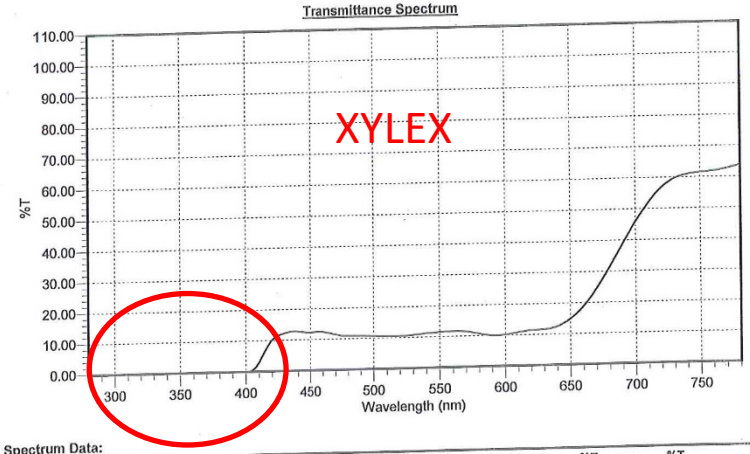
Standard: EN ISO 12312-1:2013

ORIGINAL CERT. 影印無效 FAX NO. 886-6-2394246 SPECTROPHOTOMETER TEST CERT.

Company: UTH-100(14082701)
Material: PRX II (Xylex) lens+VLC
Size: 82mmx70mm/6C/1.8mm Dec R&L
Color: Smoke S309

Item	Value	Requirement	Result
Filter Category	3		
Luminous Transmittance Tv	11.15%	8% - 18%	PASS
Incandescent Lights			
Q, Red	1.14	>= 0.80	PASS
Q, Yellow	1.03	>= 0.60	PASS
Q, Green	0.99	>= 0.60	PASS
Q, Blue	1.05	>= 0.60	PASS
LED Signal Lights			
Q, Red	1.07	>= 0.80	PASS
Q, Yellow	0.92	>= 0.60	PASS
Q, Green	0.96	>= 0.60	PASS
Q, Blue	1.03	>= 0.60	PASS
Tmin (475 - 650nm)	9.93%	>= 2.23% (0.2Tv)	PASS
Tsuva (315 - 380nm)	0.00%	<= 5.57% (0.5Tv)	PASS
Tsuvb (280 - 315nm)	0.00%	<= 1.0%	PASS
Tsuv (280 - 380nm)	0.00%		
Tsb (380 - 500nm)	11.24%		

Transmittance Spectrum



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360	0.000	370	0.000	380	0.000	390	0.027	400	0.022	410	2.927	420	10.048	430	12.302
440	12.636	450	12.301	460	12.341	470	11.445	480	10.896	490	10.809	500	10.634	510	10.527
520	10.489	530	10.748	540	11.182	550	11.463	560	11.634	570	11.442	580	10.641	590	9.967
600	10.164	610	10.844	620	11.394	630	11.624	640	12.502	650	14.886	660	18.927	670	24.602
680	31.514	690	38.902	700	45.935	710	52.046	720	56.773	730	59.669	740	60.964	750	61.516
760	61.902	770	62.672	780	63.703										

Hot Buttered
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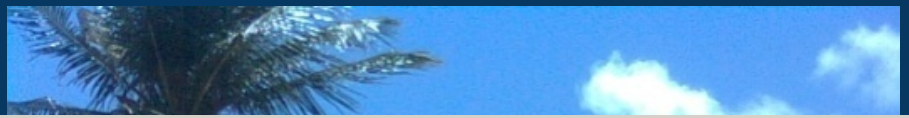
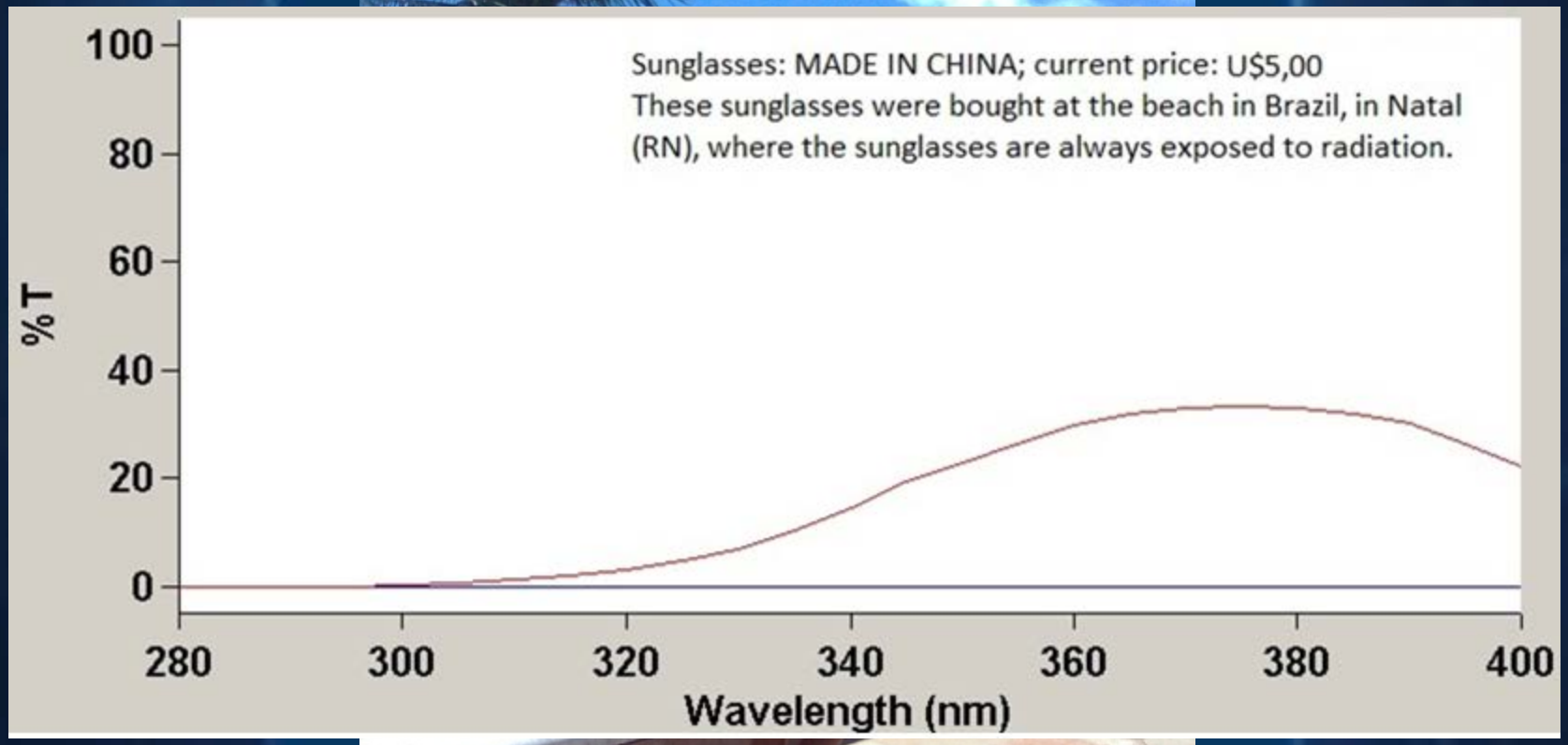
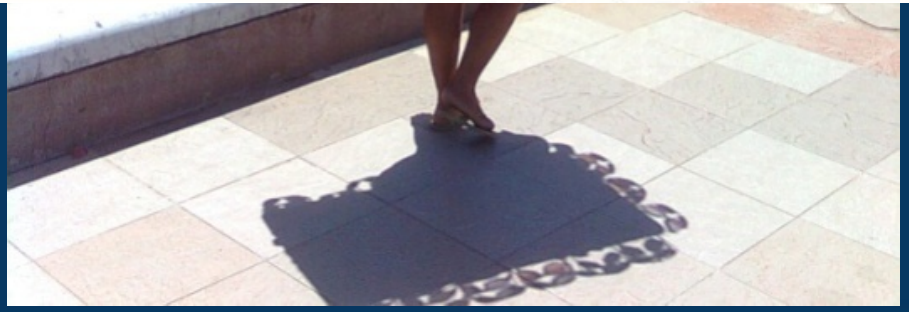
UV PROTECTION TEST FAILED







380nm or 400nm for UVA upper limit?

How long UV protection should last?

380nm or 400nm for UVA upper limit?

400nm

Australian AS/NZS 1067:2003

Brazilian: NBR15111:2013

380nm

Brazilian: NBR ISO12312-1:2015

American - ANSI Z80.3-2015

European - BS EN1836: 2005

ICNIRP TG : 2005 the task group was composed of David Sliney, Danielle Aron-Rosa, Francois DeLori, Franz Fankhauser, Robert Landry, Martin Mainster, John Marshall, Bernard Rassow, Bruce Stuck, Stephen Trokel, Teresa Motz West, and Michael Wolffe

Ultraviolet radiant exposure in the spectral region 180 to 400 nm incident upon the unprotected eye(s) should not exceed 30 J m^{-2} effective spectrally weighted,

INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION

ICNIRP TG STATEMENT

ADJUSTMENT OF GUIDELINES FOR EXPOSURE OF THE EYE TO OPTICAL RADIATION FROM OCULAR INSTRUMENTS

PUBLISHED IN: APPLIED OPTICS 44(11):2162-2176; 2005

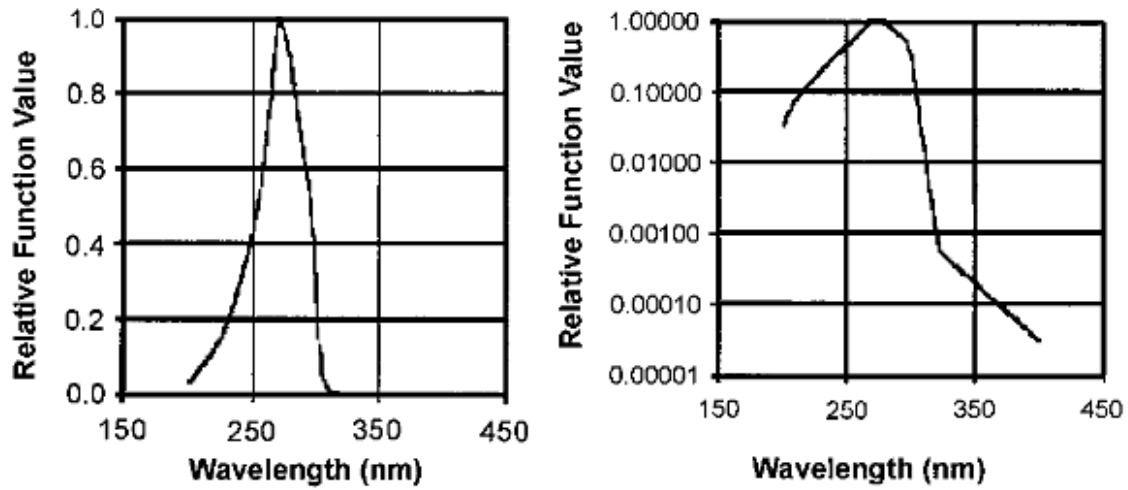


Fig. 3. ICNIRP UV hazard function $S(\lambda)$ describes approximately the relative spectral risk for photokeratitis and is also an envelope of the action spectra for cataract and erythema of the skin. The left panel shows $S(\lambda)$ as a linear plot, and the right panel shows $S(\lambda)$ as a semilogarithmic plot to illustrate the contribution of longer UV wavelengths.

380nm or 400nm for UVA upper limit?

Ultraviolet radiant exposure in the spectral region 180 to 400 nm incident upon the unprotected eye(s) should not exceed 30 J m^{-2} effective spectrally weighted, and the total (unweighted) ultraviolet radiant exposure in the spectral region 315 to 400 nm should not exceed 10^4 J m^{-2}

ICNIRP
INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION

UV PROTECTION IN BRAZIL
280nm – 380nm or 400nm?

doi:10.1093/rpd/ncu274
Radiation Protection Dosimetry (2015), Vol. 164, No. 3, pp. 435–443
Advance Access publication 8 September 2014

CONTRIBUTION TO THE RADIATION PROTECTION FOR SUNGLASSES STANDARDS

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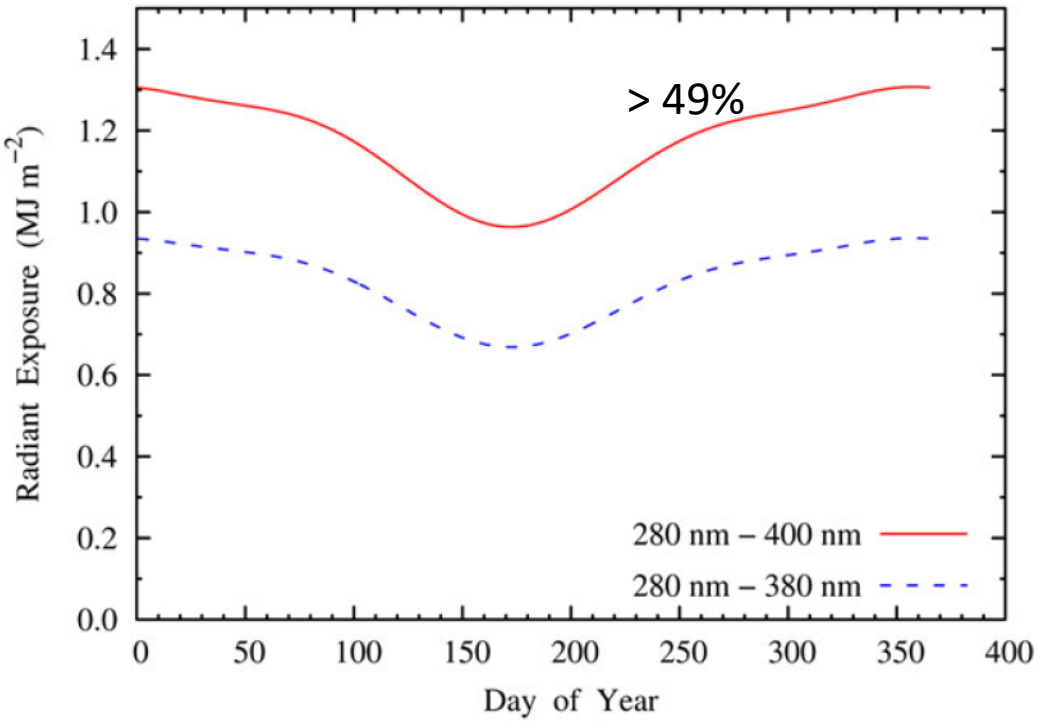

Figure 2. Global radiant exposure expected for São Carlos (SP) city for each clear sky day of the year. The 380- and 400-nm profiles refer to the entire daylight radiant exposure for São Carlos (SP) calculated for UV ranges of 280–380 nm and 280–400 nm, respectively.

Brazil is a continental-sized country, with latitudes ranging from +3^0 N to -33^0 S

UV PROTECTION IN BRAZIL 280nm – 380nm or 400nm?

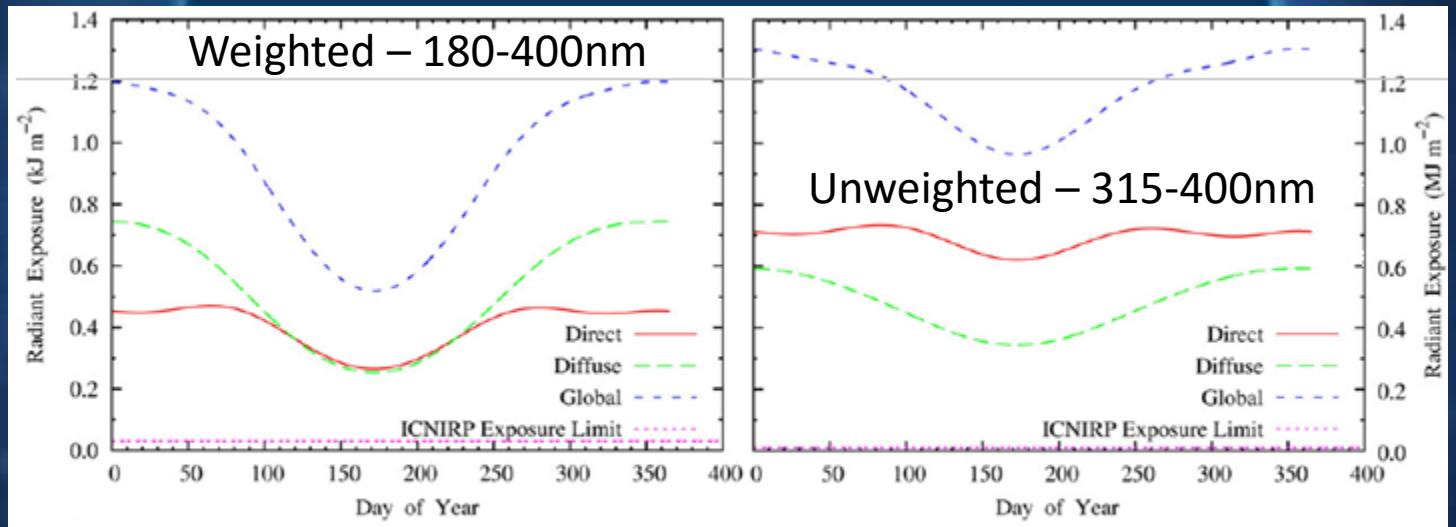

Figure 4. Calculated daily radiant exposure for São Carlos, Brazil, that reaches the unprotected eye: (a) weighted solar irradiance in the spectral region of 180–400 nm and (b) unweighted solar irradiance in the spectral region of 315–400 nm. The calculations presented in both graphs considerably exceed the ICNIRP safe limits recommendation, which is represented in both graphs by horizontal lines.

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Why Should We Care for the 400nm UV Upper Limit?

- requirements defined by ICNIRP should be considered for inclusion in sunglasses standards worldwide

- It should be taken into account that the UV indexes in Brazil as a whole are higher than the UV indexes in Europe. Therefore, the geographic optimisation of the Brazilian standard should be considered.

1

What is the Effectiveness of the Resistance to Radiance Test on the Standard?

Solar Simulator

450 W Xenon arc lamp (OFR)

cutoff filter (clear white crown glass B 270; 4 mm thick)

50 hours at a distance of 300 mm radiant exposure delivered by the lamp to the lenses is 84.0 $MJ \cdot m^{-2}$

2

Sun exposure Equivalence to Solar simulator

What is the Effectiveness of the Resistance to Radiance Test on the Standard?

450 W Xenon arc lamp (OFR)
cutoff filter (clear white crown glass B 270; 4 mm thick) for 50 hours at a distance of 300 mm from the lamp

SOLAR SIMULATOR = 1 SUN

Is it enough?

2

What is the Effectiveness of the Resistance to Radiance Test on the Standard?

On Line Survey

- most are residents of the state of São Paulo (southeast of Brazil), followed by the state of Paraíba (northeast of Brazil);
- 59.4% are male and 40.6% female;
- 41.4% have completed some level of higher education;
- 69.8% wear sunglasses all year round;
- 80.5% wear sunglasses for ½ hour to 2 hours daily;
- 49.6% sunglasses average price of US$ 50 – 150;
- 52.6% buy new sunglasses every 2-4 years.

2

www.sel.eesc.usp.br/lio

What is the Effectiveness of the Resistance to Radiance Test on the Standard?

Is it enough?

50 hours for a user who wears 1 hour a day, guarantees a 50 days use of sunglasses

2

What is the Effectiveness of the Resistance to Radiance Test on the Standard?

Assumption

Sunglasses should be required to last at least 2 years (730 days)

2

Suggestion for Sunglasses Protection

- Use 400nm as upper UVA limit
- Requirements defined by ICNIRP should be considered for inclusion in sunglasses standards worldwide
- Resistance to Irradiation test should be performed, however it should be able to simulate at least 24 months of sun exposure

THANK YOU!

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