

● **IRPA/INIRC Guidelines**



**PROPOSED CHANGE TO THE IRPA 1985 GUIDELINES ON LIMITS
 OF EXPOSURE TO ULTRAVIOLET RADIATION**
 International Non-ionizing Radiation Committee
 of the
 International Radiation Protection Association

BACKGROUND FOR CHANGE

(1) No change is proposed relative to the IRPA EL for actinic UVR (<315 nm).

(2) For UV-A wavelengths between 315 nm and 370 nm, there exists an insufficient safety factor in the guide-

line ELs for 8-h exposures. The current limit provides an equal spectral weighting between 315 and 400 nm, a maximum 1000-s exposure of 1 J cm^{-2} (10^4 J m^{-2}) and a maximum irradiance of 1 mW cm^{-2} for longer periods which leads to radiant exposures increasing with time. More recent studies of skin and ocular injury action spec-

Table 1. Ultraviolet radiation exposure limits and spectral weighting function. IRPA/INIRC 1988 Revision.

Wavelength ^a (nm)	EL (J m^{-2})	EL (mJ cm^{-2})	Relative Spectral Effectiveness S_λ	Wavelength ^a (nm)	EL (J m^{-2})	EL (mJ cm^{-2})	Relative Spectral Effectiveness S_λ
180	2,500	250	0.012	310	2,000	200	0.015
190	1,600	160	0.019	313 ^b	5,000	500	0.006
200	1,000	100	0.030	315	1.0×10^4	1.0×10^3	0.003
205	590	59	0.051	316	1.3×10^4	1.3×10^3	0.0024
210	400	40	0.075	317	1.5×10^4	1.5×10^3	0.0020
215	320	32	0.095	318	1.9×10^4	1.9×10^3	0.0016
220	250	25	0.120	319	2.5×10^4	2.5×10^3	0.0012
225	200	20	0.150	320	2.9×10^4	2.9×10^3	0.0010
230	160	16	0.190	322	4.5×10^4	4.5×10^3	0.00067
235	130	13	0.240	323	5.6×10^4	5.6×10^3	0.00054
240	100	20	0.300	325	6.0×10^4	6.0×10^3	0.00050
245	83	8.3	0.360	328	6.8×10^4	6.8×10^3	0.00044
250	70	7.0	0.430	330	7.3×10^4	7.3×10^3	0.00041
254 ^b	60	6.0	0.500	333	8.1×10^4	8.1×10^3	0.00037
255	58	5.8	0.520	335	8.8×10^4	8.8×10^3	0.00034
260	46	4.6	0.650	340	1.1×10^5	1.1×10^4	0.00028
265	37	3.7	0.810	345	1.3×10^5	1.3×10^4	0.00024
270	30	3.0	1.000	350	1.5×10^5	1.5×10^4	0.00020
275	31	3.1	0.960	355	1.9×10^5	1.9×10^4	0.00016
280 ^b	34	3.4	0.880	360	2.3×10^5	2.3×10^4	0.00013
285	39	3.9	0.770	365 ^b	2.7×10^5	2.7×10^4	0.00011
290	47	4.7	0.640	370	3.2×10^5	3.2×10^4	0.000093
295	56	5.6	0.540	375	3.9×10^5	3.9×10^4	0.000077
297 ^b	65	6.5	0.460	380	4.7×10^5	4.7×10^4	0.000064
300	100	10	0.300	385	5.7×10^5	5.7×10^4	0.000053
303 ^b	250	25	0.190	390	6.8×10^5	6.8×10^4	0.000044
305	500	50	0.060	395	8.3×10^5	8.3×10^4	0.000036
308	1,200	120	0.026	400	1.0×10^6	1.0×10^5	0.000030

^a Wavelengths chosen are representative; other values should be interpolated at intermediate wavelengths.

^b Emission lines of a mercury discharge spectrum.

tra in the UV-A provide sufficient data to update the current ELs.

(3) The practical impact of the proposed change will be minimal. Measurements of most broad-band lamps and of welding arcs would not be affected in terms of the effective irradiance. Only a few "black-light" sources would be affected. A closer agreement will exist with other recently established international reference action spectra for erythema. The revised EL is shown in Table 1. The following revised wording replaces the top three paragraphs in the current guidelines given in the right column of page 333:

EXPOSURE LIMITS

The EL for both general and occupational exposure to UVR incident upon the skin or eye where irradiance values are known and the exposure duration is controlled are as follows:

For the near-ultraviolet UV-A spectral region (315–400 nm), the total radiant exposure incident upon the unprotected eye should not exceed

1.0 J cm^{-2} (10 kJ m^{-2}) within an 8-h period and the total 8-h radiant exposure incident upon the unprotected skin should not exceed the values given in Table 1. Values for the relative spectral effectiveness, S_{λ} , are given up to 400 nm to expand the action spectrum into the UV-A for determining the EL for skin exposure.

For the actinic UV spectral region (UV-C and UV-B from 180–315 nm), the radiant exposure incident upon the unprotected skin or eye within an 8-h period should not exceed the values given in Table 1.

For determination of the effective irradiance of a broadband source weighted against the peak of the spectral effectiveness curve (270 nm), the weighting formula described in the current text (paragraph 4) still applies.

Two of the scientific references to support this update were actually referenced in the original guidelines (Bauer et al. 1982; Parrish et al. 1982); however, two later ones should be added (Urbach and Gange 1986; McKinlay and Diffey 1987).

REFERENCES

- Bauer, H.; Caldwell, M. M.; Tevini, M.; Worrest, B. Biological effects of UV-B radiation. Proceedings of a workshop held in Munich-Neuherberg 25–27 May 1982. Available from: Gesellschaft für Strahlen- und Umweltforschung, Josephspitalstr. 15, D-8000 Munich 2, Federal Republic of Germany: BPT-Report 5/82; 1982.
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- Parrish, J. A.; Jaenicke, K. F.; Anderson, R. R. Erythema and melanogenesis action spectra of normal human skin. *Photochem. Photobiol.* 36(2):187–191; 1982.
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