Red lights, glasses and a classic incandescent bulb under the spectrometer

Summary protocol · Spectral measurement · 21 October 2026 · Protocol **ML-2026-10**

Measurement date	21 October 2026
Performed by	Mitochondriak® Lab, Easy Light s.r.o., Slovakia
Instruments	certified spectrometer OHSP-350UVF (230–900 nm, 1 nm step) and a second certified spectrometer UPRtek CV600 with calibration certificate (380–780 nm, 1 nm step)
Conditions	dark room, no other light source
Distance source – sensor	bulbs E27, E14 and Warm Spectrum 50 cm; GU10 30 cm on the beam axis; night light with sensor 10–15 cm; glasses: white LED at 50 cm
Comparison	ordinary white LED bulb (3,700 K, 50 cm); sunlight outdoors on 21 Oct 2026 at 12:16 (82,212 lx, 5,050 K, OHSP-350UVF)
Units	spectral irradiance in mW/m²/nm, illuminance in lx

Summary

On 21 October 2026, Mitochondriak® Lab measured four Mitochondriak® red lights (bulbs E27, E14, GU10 and the night light with motion sensor), the red glasses and the Warm Spectrum incandescent bulb with two certified spectrometers; for comparison, an ordinary white LED bulb and the midday sun. The red lights peak at 631–656 nm and their blue and green components are practically 0 (below the instrument noise floor). Per 100 lx they send a signal of 0.2–0.9 lx melanopic EDI to the body clock – an ordinary white LED 61 lx, the sun 86 lx. The glasses reduced the melanopic EDI of the white LED by 99.7 %. The incandescent bulb has a continuous spectrum extending into the infrared and is a daytime supplement of long wavelengths. All red lights are practically flicker-free.

Overview of all measurements

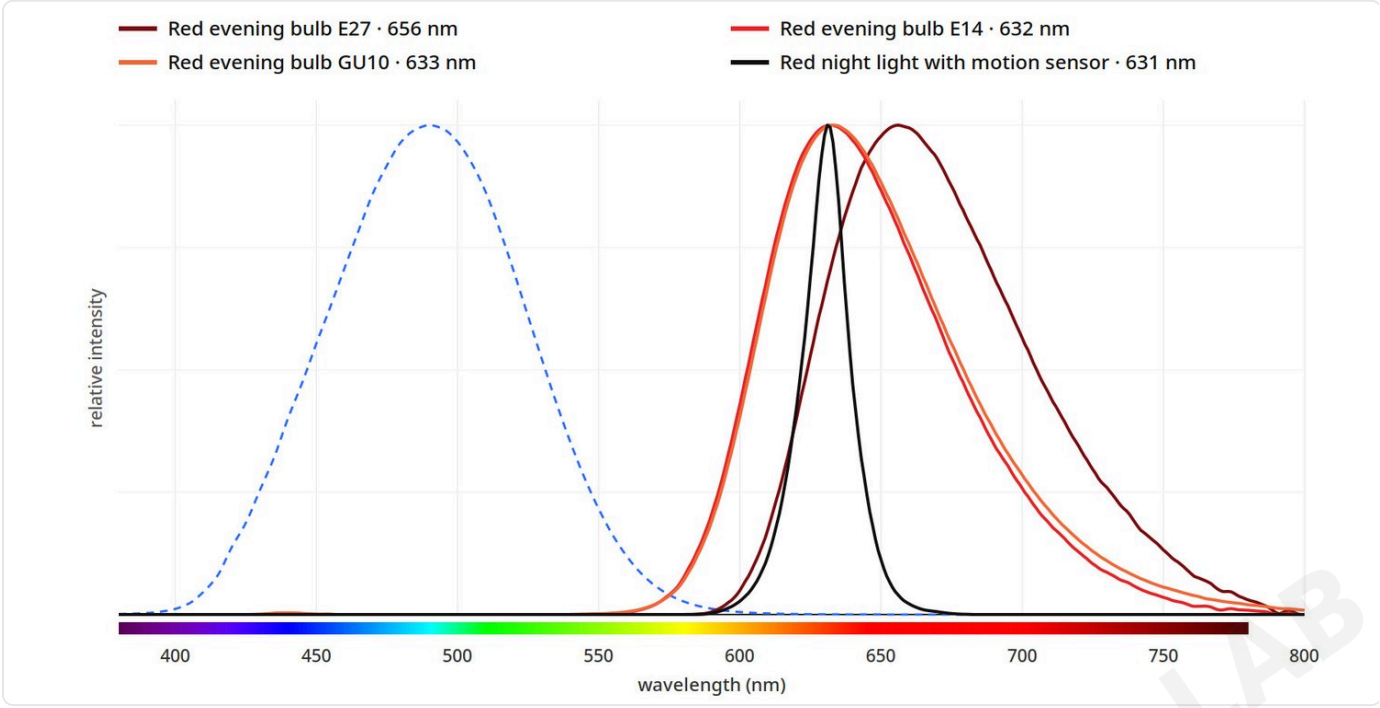
Light source	Distance	Illuminance OHSP / UPRtek (lx)	Peak (nm)	Below 500 nm	Melanopic EDI (lx)	mel-EDI per 100 lx	Flicker index / % flicker
Red evening bulb E27	50 cm	95.6 / 112.8	656	practically 0*	0.22	0.2	0.01 / 3.53 %
Red evening bulb E14	50 cm	300.0 / 243.2	632	practically 0*	2.33	0.8	0.01 / 4.68 %
Red evening bulb GU10	30 cm	2,814 / 3,341	633	practically 0*	24.0	0.9	0.01 / 2.21 %
Red night light with motion sensor	~10 cm	277.3 / 301.5	631	practically 0*	0.69	0.2	0.00 / 1.21 %
White LED through Mitochondriak® glasses	50 cm	210.3 / 212.9	620	practically 0*	2.13	1.0	–
Incandescent bulb Warm Spectrum E27	50 cm	120.3 / 123.5	> 900	1.5 %	31.3	26	0.02 / 8.78 %
Ordinary white LED (3,700 K)	50 cm	1,018 / 1,033	456	19.9 %	618	61	–
Sun, 21 Oct 2026, 12:16	outdoors	82,212 / –	585	25.3 %	70,924	86	–

* below the instrument noise floor

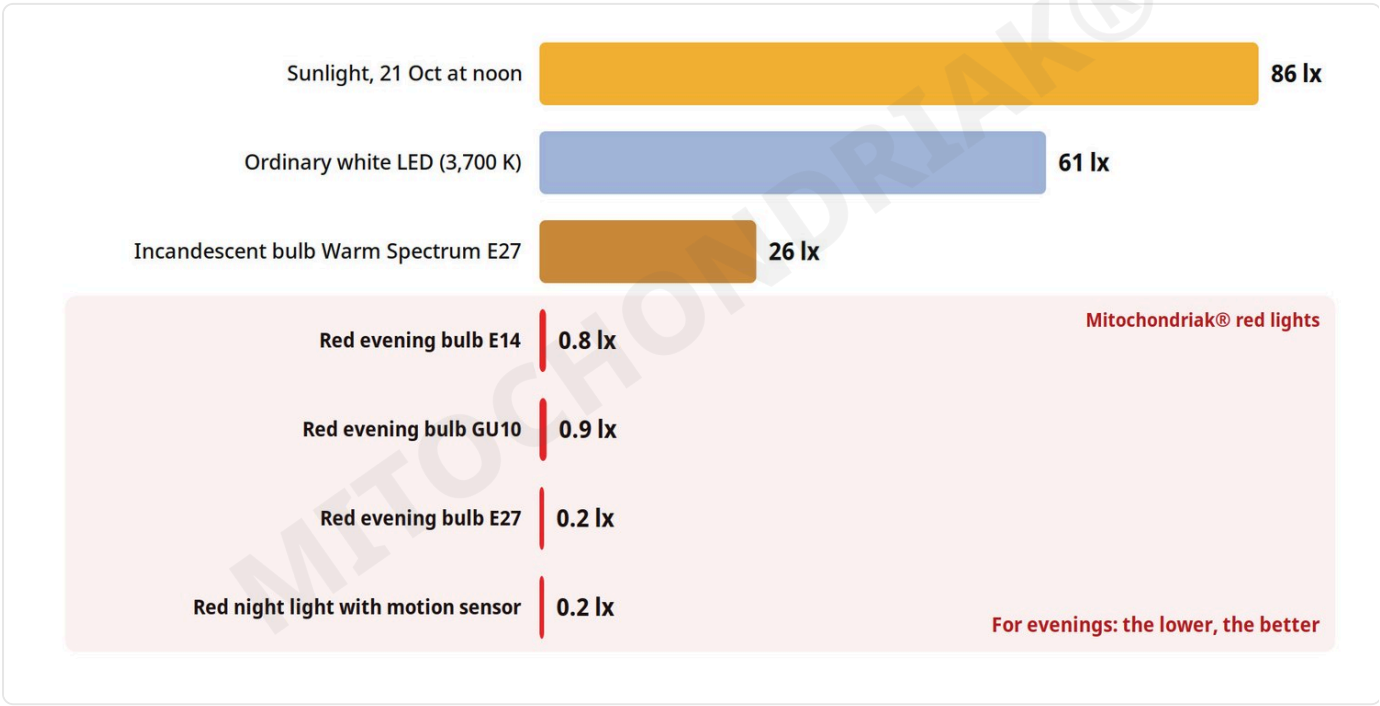
MITOCHONDRIAK® LAB

© 2026 Mitochondriak® · www.mitochondriak.com · citation with attribution permitted

Charts



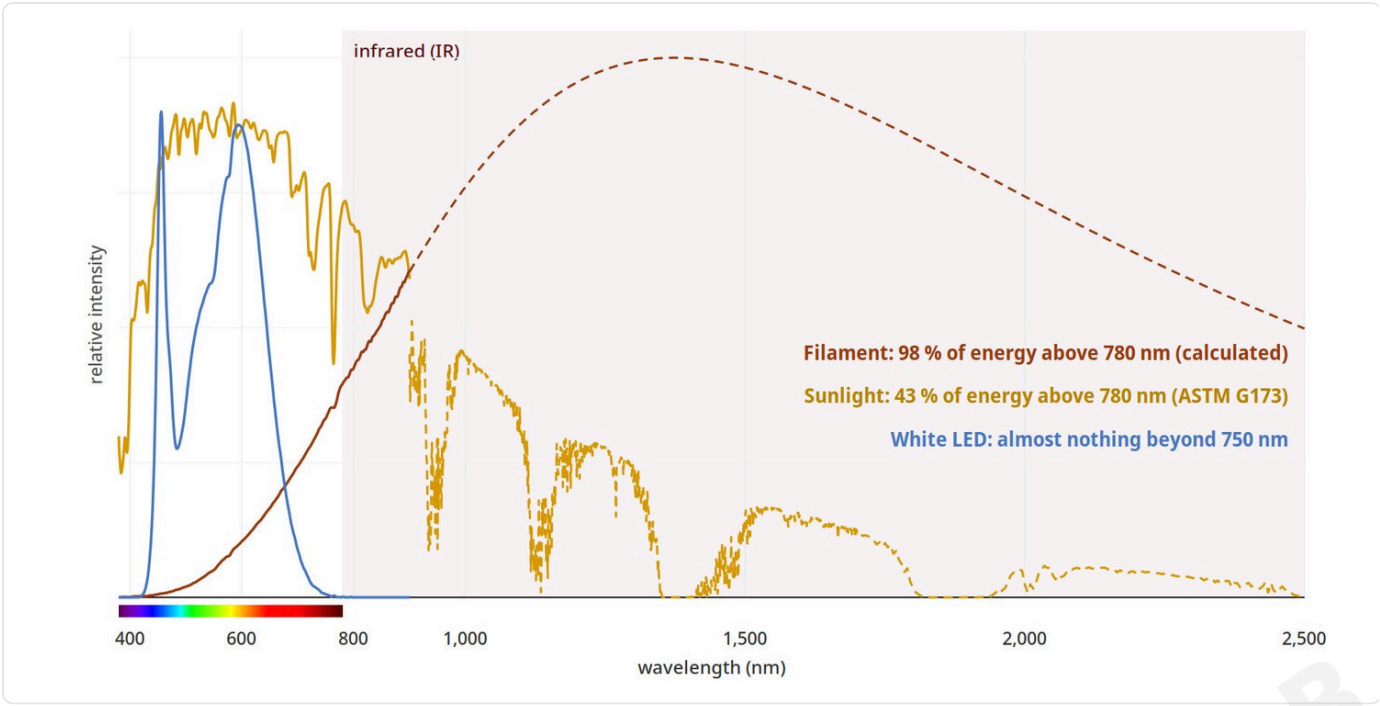
Normalised spectra of Mitochondriak® red lights (OHSP-350UVF). Dashed blue line = melanopsin sensitivity (CIE S 026).



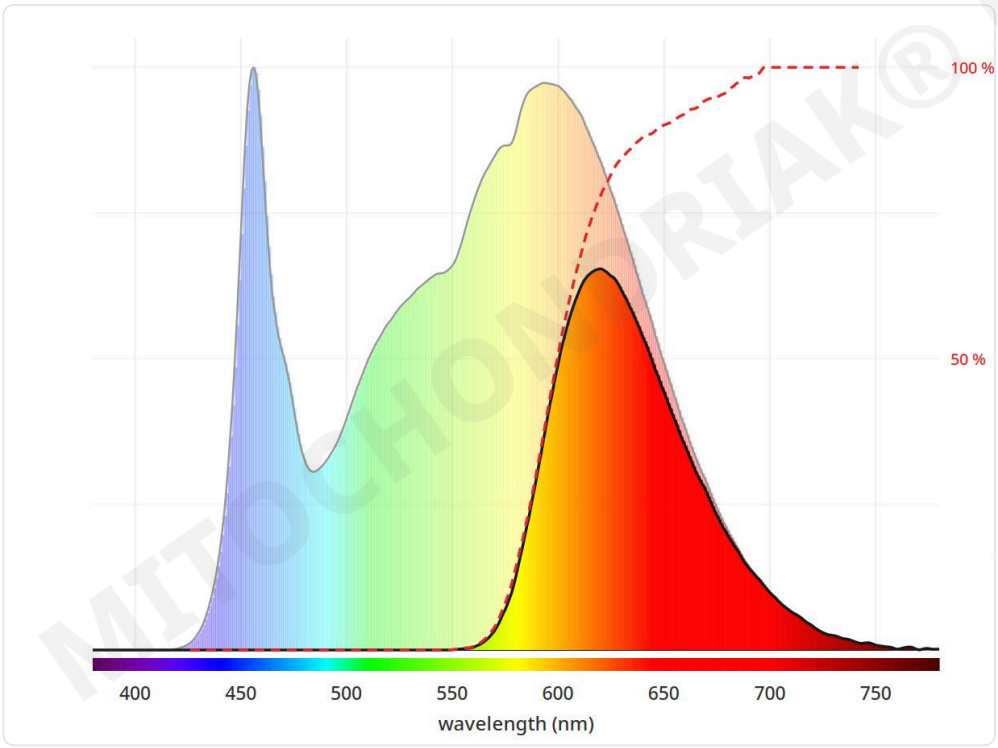
Melanopic EDI per 100 lx of light (CIE S 026, OHSP-350UVF): the same lux, a very different signal to the body clock.

MITOCHONDRIAK® LAB

© 2026 Mitochondriak® · www.mitochondriak.com · citation with attribution permitted



Sunlight, a filament bulb and a white LED. Solid line: measurement 380–900 nm (OHSP-350UVF); dashed: ASTM G173 reference spectrum and calculation by Planck's law (~2,110 K).

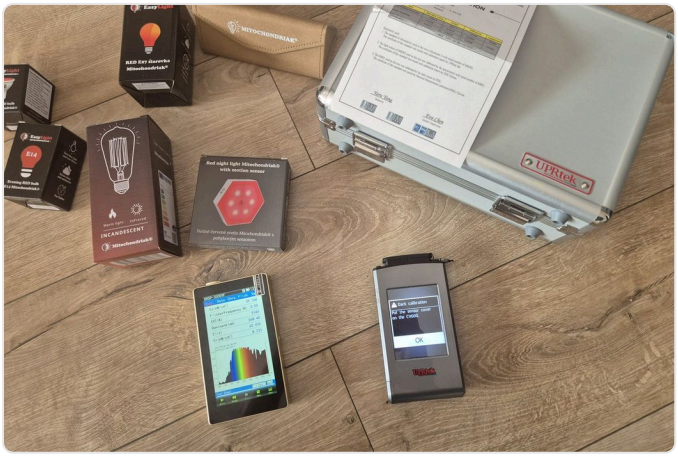


White LED at 50 cm without glasses (grey) and through the glasses (coloured), OHSP-350UVF. Dashed red line = lens transmission.

MITOCHONDRIAK® LAB

© 2026 Mitochondriak® · www.mitochondriak.com · citation with attribution permitted

Measurement setup



All measured lights and both spectrometers, Mitochondriak® Lab, 21 October 2026.

Flicker

Lights powered from 50 Hz AC mains fluctuate slightly at 100 Hz. This is not visible flicker but a small fluctuation of light, described by two quantities: percent flicker and flicker index.

Red bulbs E27, E14 and GU10 and the night light with motion sensor: flicker index 0.00–0.01, percent flicker 1.21–4.68 % (UPRtek CV600); in flicker mode (50 kHz sampling) the OHSP-350UVF showed a flat line with 0.0 % modulation depth for the red bulbs. All red lights are practically flicker-free, below the IEEE 1789 low-risk limit (< 8 % at 100 Hz). Incandescent bulb: flicker index 0.02, 8.78 % at 100 Hz – the thermal inertia of the filament smooths the light.

On repeated measurements, percent flicker varies by tenths of a percent with the tilt of the instrument.

Method

- **Spectra:** certified spectrometer OHSP-350UVF (230–900 nm) and a second certified spectrometer UPRtek CV600 with calibration certificate (380–780 nm), both with a 1 nm step. Output: spectral irradiance E(λ) in mW/m²/nm.
- **Illuminance:** E_v = 683 lm/W · Σ E(λ) · V(λ) · Δλ, where V(λ) is the CIE photopic luminous efficiency function and Δλ = 1 nm. The value calculated from the spectrum matches the instrument reading.
- **Melanopic EDI** (equivalent daylight illuminance) per CIE S 026:2018: E_{mel} = Σ E(λ) · s_{mel}(λ) · Δλ / 1.3262 mW/lm. In plain words: how many lux of daylight would send the same signal to the body clock. Technically: the D65 daylight illuminance with the same response of melanopsin in the retinal ipRGCs. mel-DER = melanopic EDI / illuminance. An international expert consensus (Brown et al., PLoS Biology 2022) recommends at least 250 lx during the day, at most 10 lx in the evening and at most 1 lx during sleep (melanopic EDI).
- **Melanopic values** are calculated from the OHSP-350UVF spectrum (lower noise in the blue range, wider range). The UPRtek CV600 has a noise background of about 0.02 mW/m²/nm in the blue range, which for light without a blue component would add up to a small artificial contribution. Both instruments agree on the shape of the spectrum and the peak position (difference 2–4 nm).
- **Bands:** energy shares below 500 nm (blue), below 550 nm (blue and green), 600–700 nm and above 620 nm are calculated from spectral irradiance in the 380–780 nm range; shares 700–900 nm and 780–900 nm from the 380–900 nm range (OHSP-350UVF). FWHM is the spectral width at half of the peak height; the centroid is the energy-weighted mean wavelength.
- **Flicker:** percent flicker = (max − min) / (max + min) · 100 %; flicker index = area of the light waveform above its mean level / total area per period (IES). UPRtek CV600 in Flicker mode, OHSP-350UVF in Flick mode with 50 kHz sampling.
- **Beyond 900 nm:** we fitted the shape of the measured 450–900 nm spectrum to Planck's law of black-body radiation. The best fit is ~2,110 K (calculated); it gives a peak at ~1,370 nm and ~98 % of the energy above 780 nm. The reference solar spectrum at ground level (ASTM G173, 280–4,000 nm) has ~43 % of its energy above 780 nm. The colour temperature of 1,965–1,986 K describes the colour of the visible light; the Planck temperature describes the shape of the whole spectrum. Type of evidence: measurement 380–900 nm, calculation beyond 900 nm, reference standard for sunlight.
- **Glasses:** the same white LED bulb (3,700 K) at 50 cm, measured once without glasses and once through the lens directly in front of the sensor. Transmission T(λ) = E through glasses(λ) / E without glasses(λ), calculated where the reference light has at least 1 % of its maximum; band transmission = Σ E through glasses / Σ E without glasses. Transmission and melanopic values are calculated from the OHSP-350UVF spectrum (lower noise in the blue range).
- **Illuminance** is measured at one point at the stated distance, not as luminous flux in lumens (which requires an integrating sphere). For directional light it depends on the exact position and orientation of the sensor, so we report the values of both instruments. Values apply to the measured unit; negative noise values are clipped to 0.

MITOCHONDRIAK® LAB

© 2026 Mitochondriak® · www.mitochondriak.com · citation with attribution permitted

Spectral table (5 nm step)

λ (nm)	E27	E14	GU10	Sensor	Warm Spectrum	White LED	LED + glasses	Sun
380	0	0	0	0	0.016	0	0	385.7
385	0	0	0	0	0.013	0	0	298.8
390	0	0	0	0	0.023	0	0	366.2
395	0	0	0	0	0.017	0	0	346.1
400	0	0	0	0	0.010	0	0	549.1
405	0	0	0	0	0.038	0	0	664.8
410	0	0	0	0	0.043	0	0	686.6
415	0	0	0	0	0.039	0	0	751.3
420	0	0	0	0	0.054	0.045	0	748.4
425	0	0	0.000	0	0.049	0.185	0	752.2
430	0	0	0.200	0	0.058	0.574	0	691.8
435	0	0.045	0.620	0	0.080	1.465	0	790.8
440	0	0.058	0.806	0	0.089	3.273	0	845.1
445	0	0.039	0.551	0	0.117	7.103	0	935.6
450	0	0	0.234	0	0.133	13.85	0	1,012
455	0	0.012	0.072	0	0.167	19.28	0	1,027
460	0	0	0	0	0.184	16.74	0	1,064
465	0	0	0	0	0.201	11.77	0	1,064
470	0	0	0	0	0.240	9.830	0	1,061
475	0	0	0	0	0.263	8.036	0	1,118
480	0	0	0	0	0.313	6.359	0	1,147
485	0	0	0	0	0.351	5.942	0	1,110
490	0	0	0	0	0.389	6.264	0	1,096
495	0	0	0	0	0.437	6.835	0	1,135
500	0	0	0	0	0.482	7.715	0	1,124
505	0	0	0	0	0.528	8.737	0	1,113
510	0	0	0	0	0.586	9.637	0	1,140
515	0	0	0	0	0.663	10.34	0	1,118
520	0	0	0	0	0.729	10.91	0	1,072
525	0	0	0	0	0.813	11.40	0	1,133
530	0	0	0	0	0.898	11.75	0	1,146
535	0	0	0	0	0.985	12.11	0	1,156
540	0	0	0.037	0	1.083	12.40	0	1,135
545	0	0	0.221	0	1.159	12.54	0	1,113
550	0	0.014	0.378	0	1.238	12.80	0.008	1,101
555	0	0.052	0.667	0	1.372	13.73	0.041	1,137
560	0	0.094	1.299	0	1.522	14.93	0.094	1,154
565	0	0.237	2.553	0	1.666	15.83	0.279	1,170
570	0	0.489	4.813	0	1.777	16.45	0.652	1,146
575	0	0.972	8.866	0	1.858	16.80	1.357	1,126
580	0.000	1.811	15.99	0	1.963	17.28	2.456	1,118
585	0.015	3.157	28.01	0.008	2.175	18.48	4.069	1,183
590	0.092	4.957	44.13	0.178	2.283	18.78	5.825	1,107
595	0.348	7.403	66.48	0.752	2.406	18.87	7.776	1,107
600	0.838	10.37	93.69	1.859	2.536	18.79	9.546	1,120
605	1.731	13.67	124.9	4.053	2.655	18.41	10.97	1,139
610	2.991	16.85	156.2	8.252	2.791	17.90	11.98	1,139
615	4.738	19.75	185.0	16.13	2.941	17.11	12.53	1,125
620	6.806	21.99	207.5	28.81	3.086	16.28	12.69	1,134
625	9.048	23.43	222.8	47.47	3.254	15.25	12.45	1,117
630	11.20	24.11	230.9	67.25	3.402	14.18	11.97	1,095
635	13.13	24.06	231.8	57.98	3.537	13.06	11.27	1,106
640	14.75	23.41	226.7	32.20	3.715	11.84	10.42	1,117
645	15.97	22.37	217.5	16.81	3.890	10.71	9.514	1,109
650	16.68	20.96	205.1	7.707	4.041	9.546	8.602	1,075
655	17.06	19.42	190.8	3.228	4.236	8.426	7.668	1,057
660	16.97	17.77	175.7	1.484	4.399	7.385	6.801	1,075
665	16.51	16.03	159.7	0.679	4.580	6.392	5.943	1,107
670	15.89	14.42	143.8	0.390	4.815	5.592	5.279	1,112
675	14.94	12.70	128.5	0.144	4.961	4.722	4.480	1,114
680	13.90	11.17	113.9	0.031	5.151	3.991	3.829	1,112
685	12.91	9.762	100.1	0.000	5.341	3.371	3.284	1,073
690	11.78	8.406	87.54	0	5.539	2.783	2.732	958.0
695	10.76	7.339	76.29	0	5.753	2.367	2.343	971.3
700	9.642	6.236	66.22	0	5.940	1.897	1.911	978.8
705	8.566	5.255	57.01	0	6.122	1.517	1.562	988.5
710	7.590	4.428	48.76	0	6.319	1.202	1.280	1,013
715	6.727	3.759	41.58	0	6.542	0.981	1.059	987.4

MITOCHONDRIAK® LAB

© 2026 Mitochondriak® · www.mitochondriak.com · citation with attribution permitted

λ (nm)	E27	E14	GU10	Sensor	Warm Spectrum	White LED	LED + glasses	Sun
720	5.874	3.091	35.40	0	6.760	0.729	0.808	817.9
725	5.060	2.505	29.98	0	6.959	0.523	0.581	807.4
730	4.429	2.084	25.52	0	7.192	0.422	0.483	786.8
735	3.792	1.696	21.56	0	7.437	0.345	0.375	872.1
740	3.201	1.378	18.27	0	7.691	0.253	0.280	920.4
745	2.705	1.074	15.40	0	7.936	0.170	0.235	966.4
750	2.253	0.847	12.99	0	8.113	0.124	0.162	982.9
755	1.844	0.636	11.12	0	8.387	0.083	0.106	990.1
760	1.410	0.426	9.238	0	8.600	0.011	0.027	789.8
765	1.175	0.417	7.537	0	8.592	0.067	0.097	570.2
770	0.843	0.222	6.492	0	8.937	0.002	0.011	793.1
775	0.744	0.274	5.546	0	9.440	0.010	0.049	893.2
780	0.511	0.214	4.590	0	9.671	0.022	0.037	938.2
785	0.349	0.157	4.018	0	9.860	0	0.006	948.3
790	0.062	0.010	3.058	0	9.970	0	0	920.9
795	0.145	0.055	2.643	0	10.29	0.016	0.021	893.4
800	0	0	2.069	0	10.39	0	0	888.7
805	0.000	0.000	1.535	0	10.69	0	0	874.3
810	0	0	1.192	0	10.84	0	0	872.6
815	0	0	0.981	0	11.14	0	0	780.8
820	0	0	0.432	0	11.22	0	0	695.5
825	0	0	0.139	0	11.47	0	0	681.0
830	0	0	0.012	0	11.58	0	0	696.1
835	0	0	0	0	11.84	0	0	712.1
840	0	0	0	0	12.01	0	0	756.9
845	0	0	0	0	12.20	0	0	792.6
850	0	0	0	0	12.47	0	0	814.2
855	0	0	0	0	12.72	0	0	794.7
860	0	0	0	0	12.94	0	0	801.7
865	0	0	0	0	13.11	0	0	807.4
870	0	0	0	0	13.34	0	0	799.2
875	0	0	0	0	13.62	0	0	809.3
880	0	0	0	0	13.76	0	0	812.6
885	0	0	0	0	14.06	0	0	816.2
890	0	0	0	0	14.29	0	0	826.2
895	0	0	0	0	14.54	0	0	815.0
900	0	0	0	0	14.82	0	0	762.0

All columns: OHSP-350UVF, spectral irradiance in mW/m²/nm at the distances listed in the overview on page 1. UPRtek CV600 values are in the product protocols and in the CSV. Sun: OHSP-350UVF, outdoors on 21 Oct 2026 at 12:16; the ultraviolet part of sunlight is outside the scope of this measurement.

Data and citation

Full data at 1 nm (CSV, both instruments):
https://mitochondriak-media.fsn1.your-objectstorage.com/blog/science/lab-2026-10/mitochondriak-lab-2026-10-spectrum-data.csv

Protocols of the individual products:
Red evening bulb E27: https://mitochondriak-media.fsn1.your-objectstorage.com/products/e27-red-bulb/measurements/mitochondriak-e27-red-bulb-measurement-protocol-en.pdf
Red evening bulb E14: https://mitochondriak-media.fsn1.your-objectstorage.com/products/e14-red-bulb/measurements/mitochondriak-e14-red-bulb-measurement-protocol-en.pdf
Red evening bulb GU10: https://mitochondriak-media.fsn1.your-objectstorage.com/products/gu10-red-bulb/measurements/mitochondriak-gu10-red-bulb-measurement-protocol-en.pdf
Red night light with motion sensor: https://mitochondriak-media.fsn1.your-objectstorage.com/products/red-night-light-sensor/measurements/mitochondriak-red-night-light-sensor-measurement-protocol-en.pdf
Mitochondriak® blue light blocking glasses: https://mitochondriak-media.fsn1.your-objectstorage.com/products/blue-light-glasses/measurements/mitochondriak-blue-light-glasses-measurement-protocol-en.pdf
Incandescent bulb Warm Spectrum E27: https://mitochondriak-media.fsn1.your-objectstorage.com/products/warm-spectrum-bulb/measurements/mitochondriak-warm-spectrum-bulb-measurement-protocol-en.pdf

Citation: Mitochondriak® Lab (2026). Red lights, glasses and a classic incandescent bulb under the spectrometer – measurement protocol ML-2026-10, 21 October 2026. www.mitochondriak.com. Citation with attribution permitted.

MITOCHONDRIAK® LAB