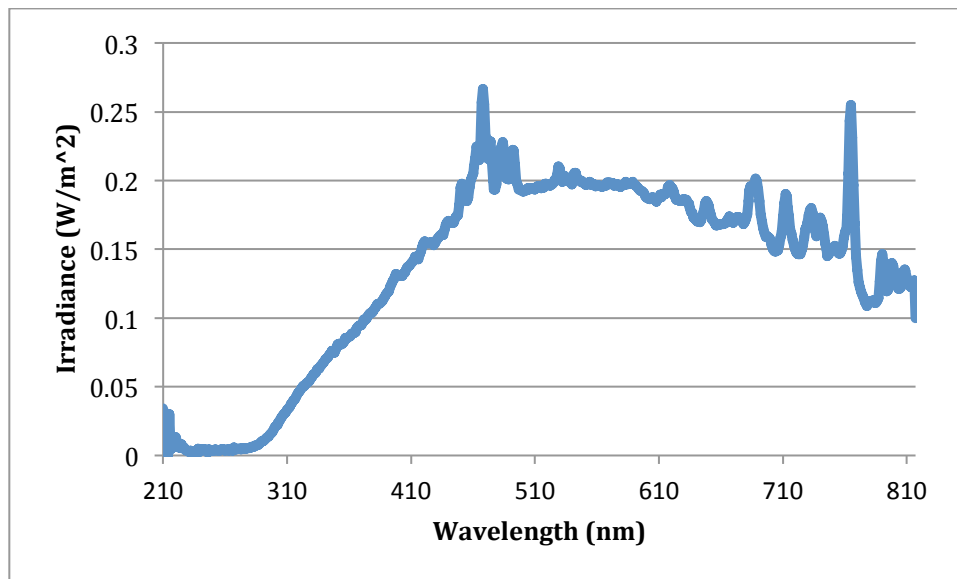


# Technical Report

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## Spectral and Color Characteristics of Broncolor Pulso F4 Strobe with UVE Protection Dome

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Simulating camera signals requires spectral data for the camera's sensitivities, the taking illuminant, and the object's reflectance factor. Strobes are difficult to measure because the spectroradiometer and strobe must be synchronized, particularly for auto-ranging spectroradiometers. The Studio for Scientific Imaging and Archiving of Cultural Heritage has access to both a Minolta CS-2000 and PhotoResearch PR655 spectroradiometer. Neither is capable of measuring a strobe source without auxiliary hardware and software for synchronization.

The author contacted Broncolor through Capture Integration and obtained 1nm spectral irradiance data from 210 – 817nm for a Pulso F4 with a UVE protection dome in place, plotted in Figure 1.

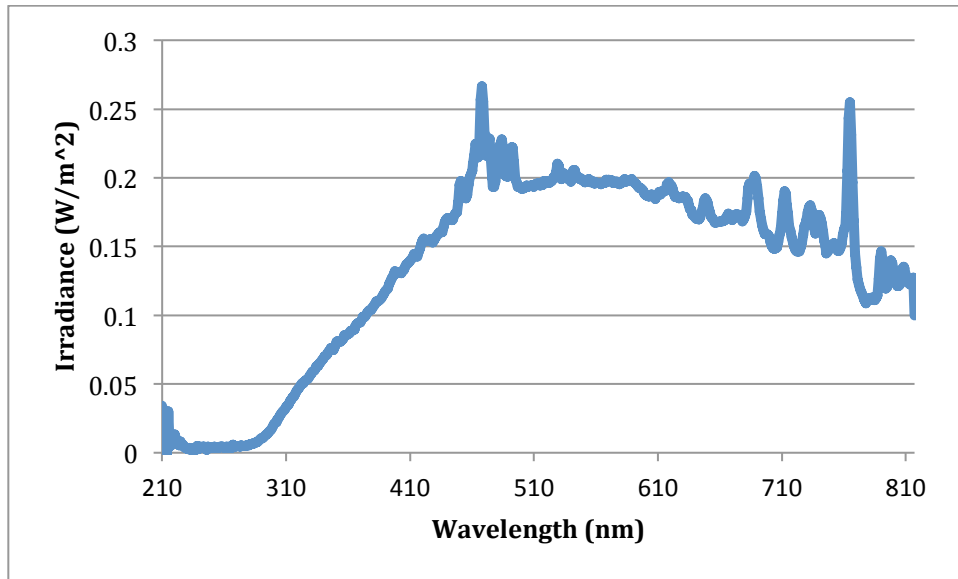


Figure 1. Spectral irradiance of a Broncolor Pulso F4 with UVE protection dome.

The spectroradiometer was assumed to have a 1nm triangular bandpass. The data were convolved to a 10nm triangular bandpass between 380 and 780nm, a common data range for CIE calculations and camera spectral sensitivity measurements, the results plotted in Figure 2 and tabulated in Table I.

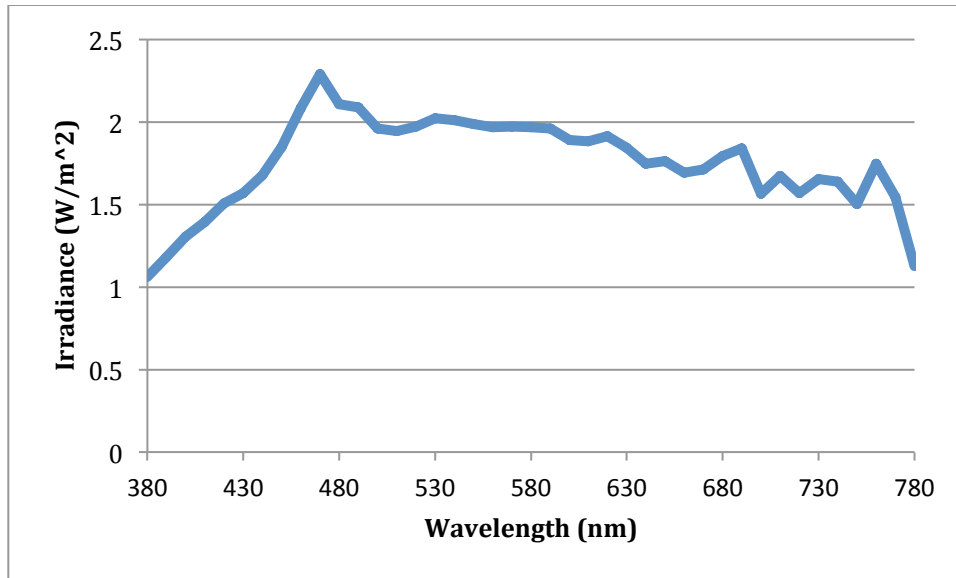


Figure 2. Spectral irradiance of a Broncolor Pulso F4 with UVE protection dome convolved to a 10nm bandpass.

The CIE daylight eigenvectors were sampled every 10 nm<sup>1</sup> and the correlated color temperature (CCT) determined that minimized chromaticity error between the Pulso strobe and the daylight distribution. The resulting CCT was 5659K. A second optimization minimized spectral error, known as distribution temperature. The resulting CCT was 5692K. Quite often, Xenon strobes are assumed to produce light equivalent to D55 (5500K). The spectra are plotted in Figure 3. CIE daylight is a crude approximation to actual data.

If spectral data for the actual strobe are available, they should be used. When such data are unavailable, the common practice of using D55 is a reasonable practice.

<sup>1</sup> Published in G. Wyszecki and W.S. Stiles, Color Science Concepts and Methods, Quantitative Data and Formulae, 2<sup>nd</sup> edition, Table V(3.3.4), p. 762, John Wiley, New York, 1982.

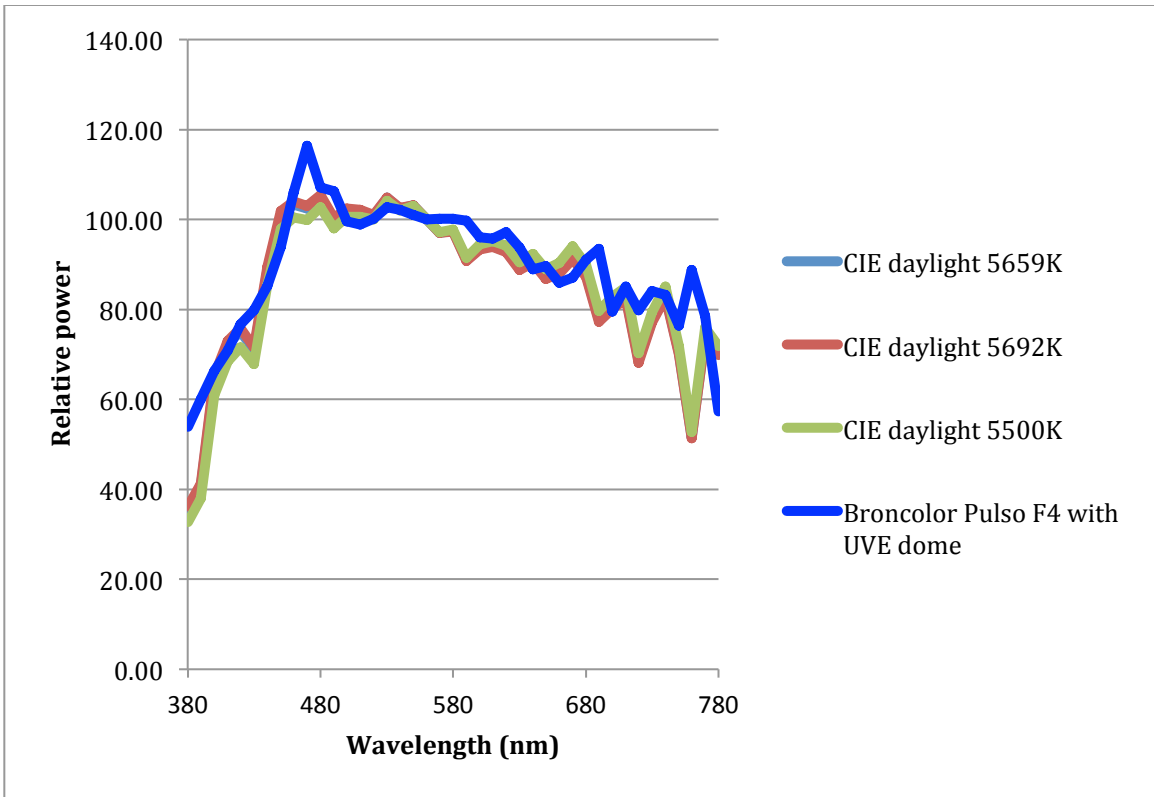


Figure 3. Comparisons between the measured Broncolor Pulso F4 and various CIE daylight spectral power distributions.

*Table I. Spectral power distributions of each listed illuminant or source.*

Wavelength (nm)	CIE daylight 5659K	CIE daylight 5741K	CIE daylight 5500K	Broncolor Pulso F4 with UVE dome
380	35.58	36.17	32.74	53.93
390	40.70	41.26	38.04	60.01
400	64.51	65.26	60.89	66.36
410	72.27	73.05	68.49	70.90
420	75.13	75.88	71.52	76.69
430	70.99	71.63	67.86	79.76
440	88.82	89.49	85.55	85.21
450	101.18	101.84	97.94	93.88
460	103.38	103.98	100.41	106.05
470	102.43	102.96	99.87	116.41
480	104.97	105.44	102.70	107.20
490	99.88	100.26	98.05	106.23
500	102.14	102.45	100.65	99.63
510	101.90	102.15	100.67	98.87
520	100.81	100.98	99.97	100.19
530	104.81	104.94	104.20	102.80
540	102.49	102.58	102.10	102.16
550	103.15	103.19	102.96	101.10
560	100.00	100.00	100.00	100.00
570	97.07	97.03	97.22	100.22
580	97.41	97.34	97.75	100.11
590	90.90	90.79	91.44	99.73
600	93.57	93.40	94.44	96.05
610	94.07	93.86	95.16	95.72
620	92.97	92.72	94.24	97.26
630	89.08	88.80	90.47	93.80
640	90.66	90.32	92.36	88.91
650	87.12	86.78	88.89	89.58
660	88.33	87.93	90.36	86.02
670	91.66	91.19	93.99	87.11
680	87.64	87.18	90.00	91.10
690	77.72	77.33	79.71	93.48
700	80.62	80.18	82.88	79.51
710	82.79	82.38	84.88	85.07
720	68.55	68.21	70.27	79.78
730	77.46	77.09	79.34	84.06
740	83.06	82.67	85.03	83.30
750	70.26	69.94	71.91	76.39
760	51.55	51.30	52.82	88.79
770	74.14	73.79	75.96	78.58
780	70.17	69.84	71.85	57.36