

CORM 2008

Troy, NY
10 Jun 2008



CORM Transmittance Intercomparison

Pre-Test Plan

Samples: Filters are deep-dyed polyester designed for theatrical lighting to hold their color when mounted in close proximity to high intensity spot lights. Samples should remain stable under the very low level of illumination in a spectrophotometer. Samples of each color are cut from single cast or extruded sheet and mounted in 35mm slide frames.

There are 13 specimens which include a range of colors similar to the BCRA ceramic tiles (red, orange, yellow, green, cyan, blue, purple) plus a series of neutrals. The neutrals range from clear (undyed film) to a near-black (OD is about 3)

Measurement: UV-VIS range (300nm to 800nm). Multiple readings on different days (as was done for the CORM OP-1 reflectance intercomparison). Uncertainty can be reported if determined. No derived values are to be reported.

CORM Transmittance Intercomparison

CORM OP-1

Inter-Comparisons of Reflectance & Transmittance

Experimental Protocol

Round-Robin on Regular Transmittance and Spectrocolorimetry

Standards to be characterized: 13 deep-dyed polycarbonate sheets supplied by the Roscolux Corporation. The selected films are #00-Clear, #10-Med. Yellow, #21-Golden Amber, #25-Orange Red, #39-Exotic Sangria, #358-Rose Indigo, #359-Medium Violet, #370-Italian Blue, #389-Chroma Green, #3402-ND 0.3, #3403-ND 0.6, #3404-ND 0.9, #3415-ND 0.15. These materials are designed as filters for stage lighting and are thus designed to be as stable as possible under conditions of high heat and high irradiance. The sheets have been cut into small rectangles and mounted inside of black, 35mm slide frames. The slides are inserted into an archival quality, plastic slide sheet. The clear aperture of the film is 35mm x 23mm. There is an alpha-numeric label on each slide frame (A – M) and a serial number on each storage sleeve. The storage sheet is placed inside of a large ZIP-lock bag for shipping. This is to prevent the possibility of jet fuel fumes from depositing on the slides during air freight shipping.

The experiment will be conducted in a parallel fashion. OSRAM Sylvania will send the slides out to the participant via next-day air who will set up his equipment and read the slides five times on separate days and then return the slides to OSRAM, again via next day air.

The slides must be allowed to come to equilibrium with room temperature before attempting any readings. You will need to record the temperature inside the sample compartment of your spectrometer. As much as possible we try to collect the readings at 23 ± 1 C. That is about 72 - 75 F which should be reasonable except during the hottest part of the summer or the coldest part of the winter. If this temperature range will be a problem please let us know before taking the readings.

CORM Transmittance Intercomparison

CORM OP-1

Inter-Comparisons of Reflectance & Transmittance

Experimental Protocol

Round-Robin on Regular Transmittance and Spectrocolorimetry (continued)

The slides are to be read with the label facing the incident light flux. Many UV-VIS spectrometers have clips for holding filters so these will keep the slides securely in place during the readings. The digital thermometer should be kept in the sample compartment so that the temperature readings of the exact temperature can be recorded before and after the scan.

The slides are not to be cleaned. If there appears to be a blemish on the surface that cannot be removed with an optics brush or air puff then note it on your data report and included a copy of the note in the package in which slides are to be returned to OSRAM. Set your instrument up to scan from 800nm to 300nm at a 5nm interval with a 5nm bandwidth. Store all data as ASCII or in an EXCEL spreadsheet and email back to Danny Rich at Danny.Rich@na.sunchem.com.

CORM Transmittance Intercomparison

Significant Dates and Numbers

Oct 2006 First samples sent to test laboratories

Nov 2006 Last samples sent to test laboratories

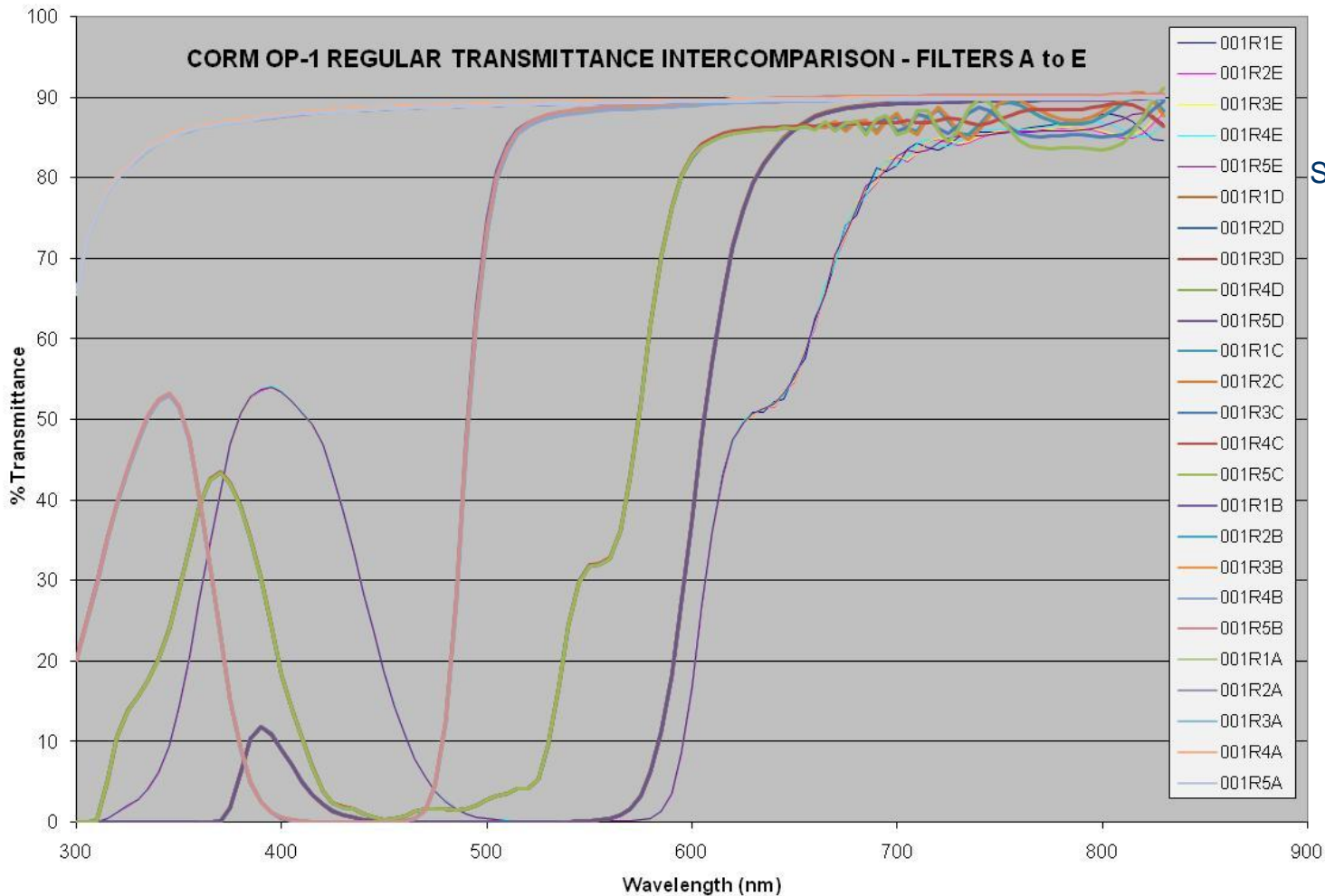
Sep 2007 last set of data received

23 laboratories indicated desire to participate

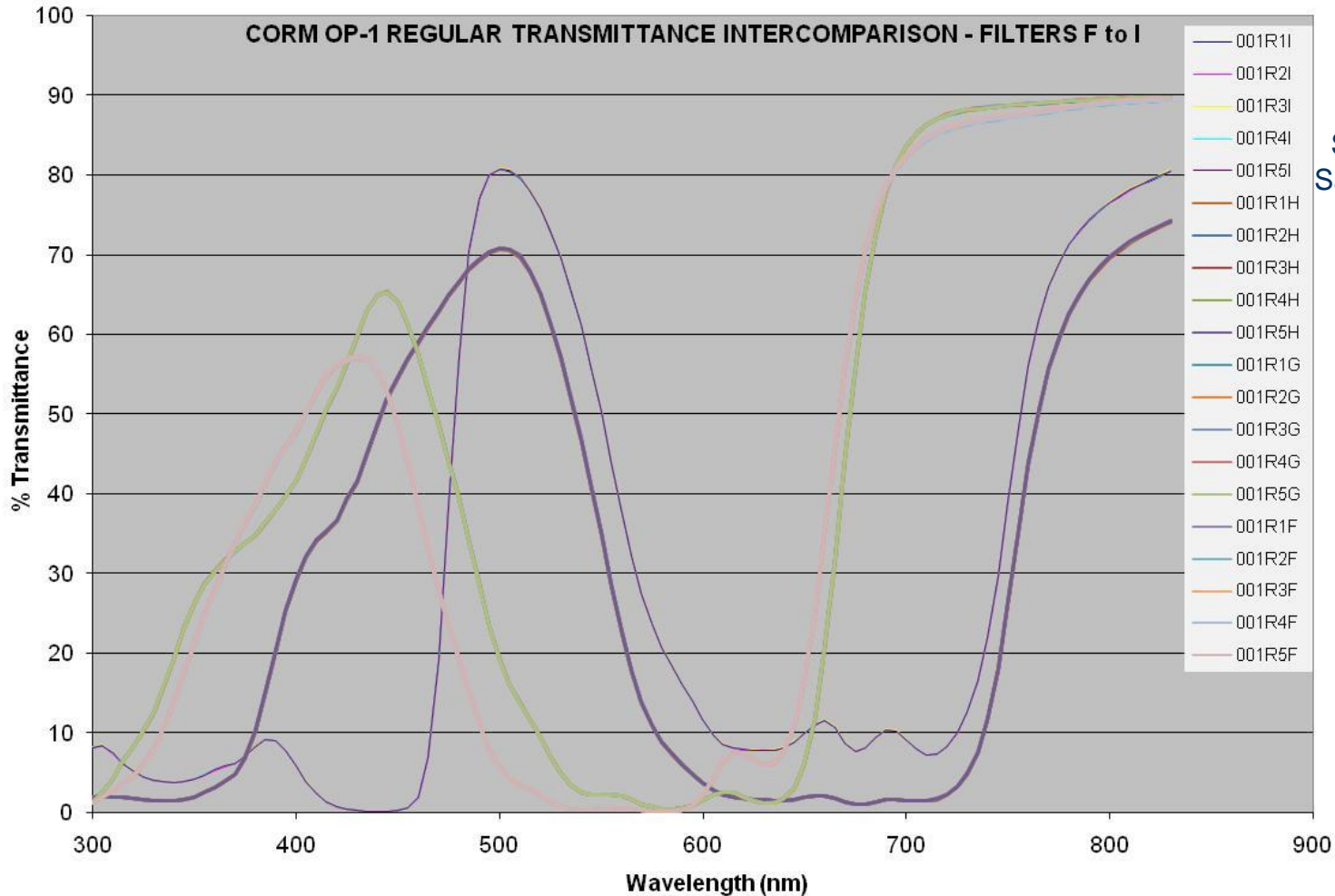
19 laboratories supplied data

4 laboratories still to supply data

CORM Transmittance Intercomparison

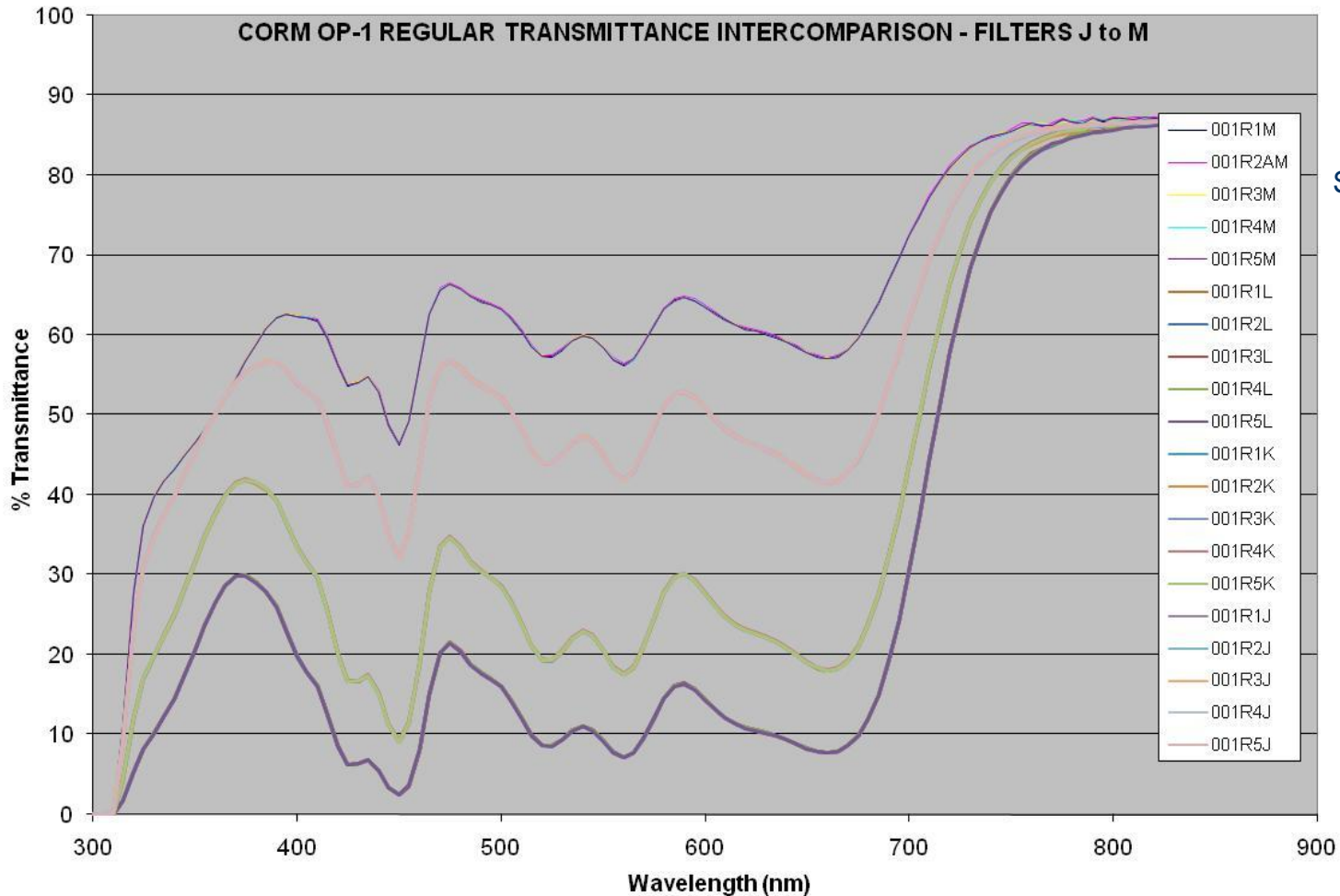


CORM Transmittance Intercomparison

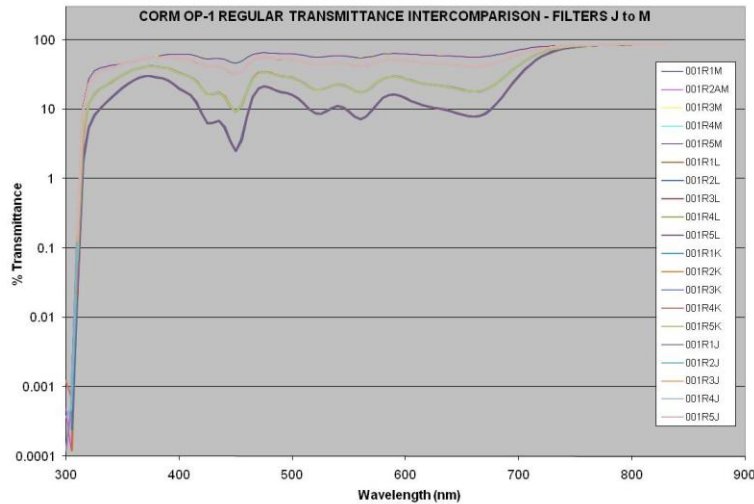
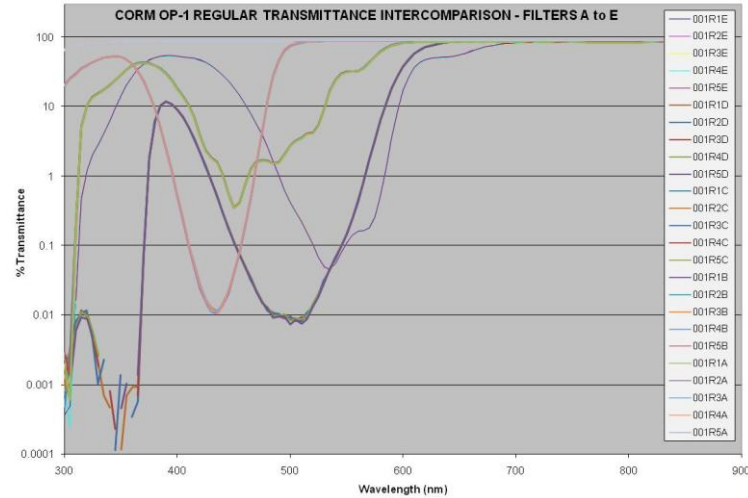


Single Laboratory Single Sample Set Reproducibility

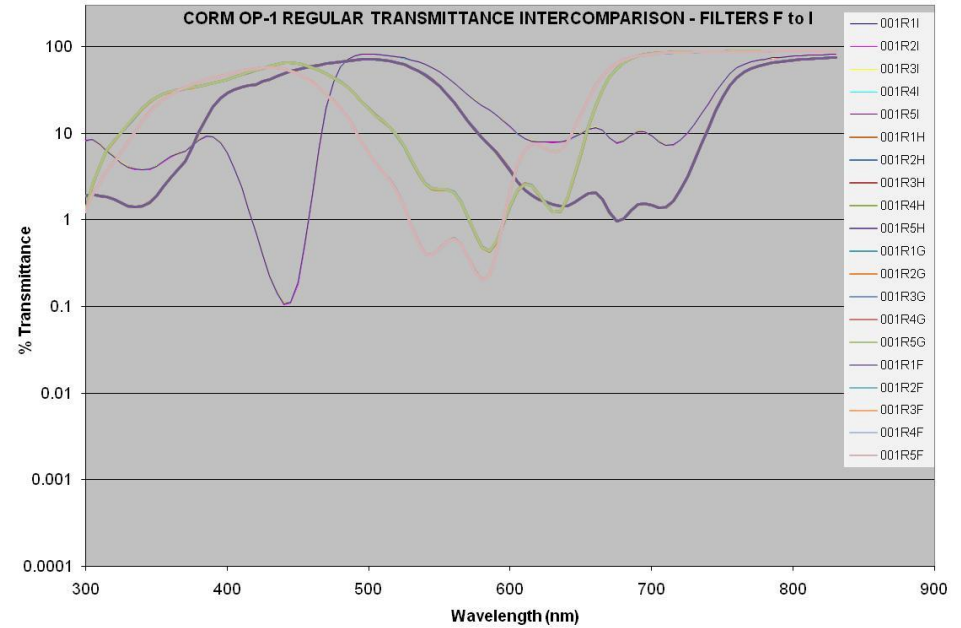
CORM Transmittance Intercomparison



CORM Transmittance Intercomparison



Single Laboratory Single Sample Set Reproducibility



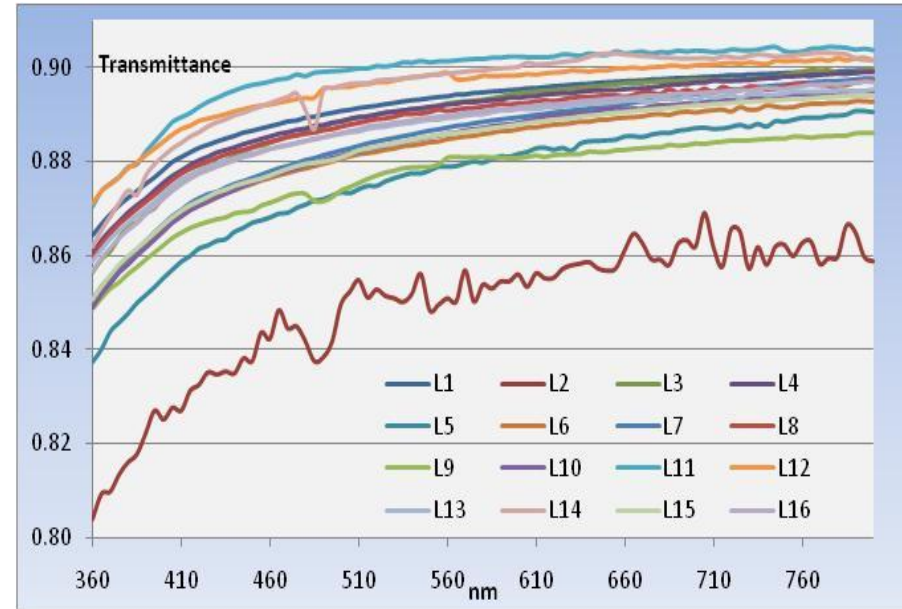
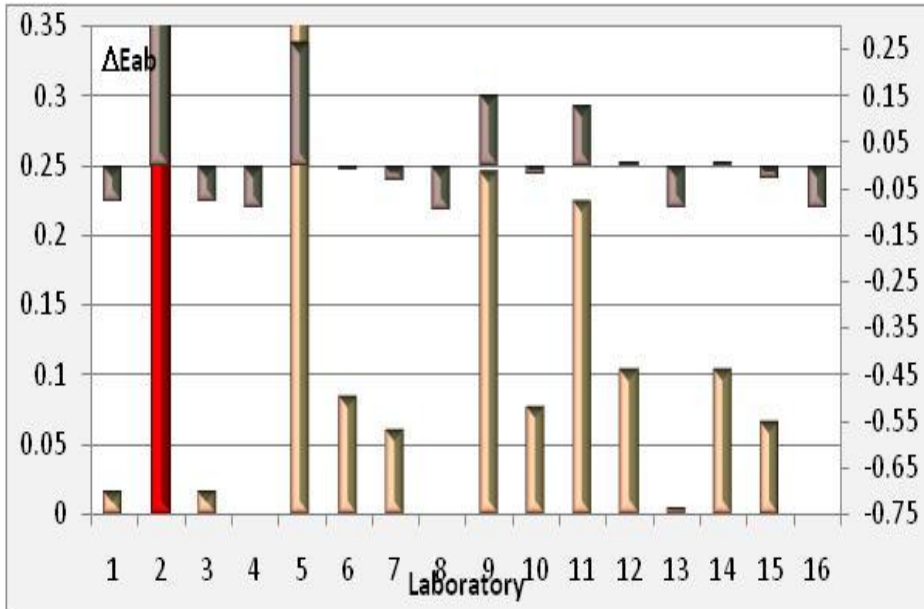
CORM Transmittance Intercomparison

Comparison of a Single Laboratory, Single Sample Set Measurement with Two Instruments

Filter	Instrument	x	y	Y	L	a*	b*
A	CARY 500	0.3136	0.3300	89.18	95.65	-0.017	0.514
	PE 900	0.3136	0.3300	89.22	95.67	-0.011	0.501
B	CARY 500	0.4298	0.5203	83.28	93.14	-21.5	104.4
	PE 900	0.4284	0.5192	83.47	93.22	-21.7	103.1
F	CARY 500	0.1961	0.0632	3.78	22.92	81.1	-81.1
	PE 900	0.1987	0.0635	3.76	22.87	81.7	-80.5
J	CARY 500	0.3174	0.3370	47.67	74.61	-1.2	3.09
	PE 900	0.3175	0.3373	47.19	74.81	-1.2	3.16

CORM Transmittance Intercomparison

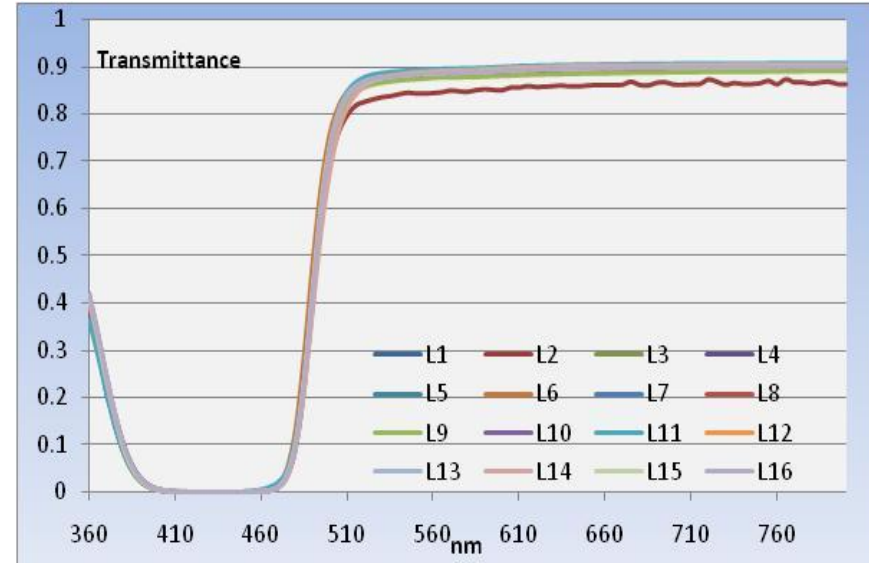
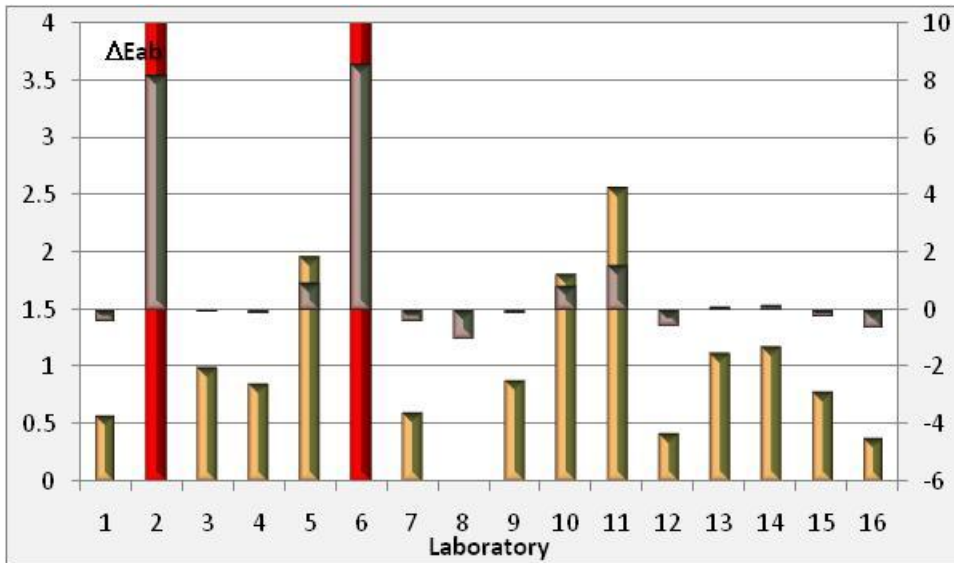
Sample Name	A															
Laboratory No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
x	0.3136	0.3142	0.3138	0.3136	0.3142	0.3138	0.3140	0.3136	0.3138	0.3140	0.3133	0.3134	0.3136	0.3136	0.3139	0.3137
y	0.3299	0.3308	0.3302	0.3300	0.3305	0.3302	0.3303	0.3300	0.3302	0.3303	0.3297	0.3299	0.3300	0.3300	0.3302	0.3301
Y	89.3551	85.1906	89.1783	89.1767	87.8117	88.4162	88.6651	89.0548	87.9066	88.5490	90.1227	89.7724	88.9002	89.8279	88.5314	88.9459
L*	95.73	93.97	95.65	95.65	95.08	95.34	95.44	95.60	95.12	95.39	96.05	95.90	95.54	95.93	95.38	95.56
a*	-0.015	-0.092	-0.023	-0.017	0.014	0.002	0.000	-0.023	-0.038	0.020	-0.053	-0.095	-0.001	-0.021	0.001	-0.014
b*	0.479	0.884	0.631	0.514	0.806	0.621	0.695	0.511	0.625	0.685	0.352	0.419	0.496	0.519	0.642	0.549



ΔE_{ab}	0.016798	2.826632	0.016837	0.002634	0.360632	0.084043	0.060616	0	0.245237	0.076881	0.223621	0.1031	0.004917	0.103757	0.065498	0.003534
Dev	-0.07441	2.735425	-0.07437	-0.08857	0.269425	-0.00716	-0.03059	-0.09121	0.15403	-0.01433	0.132414	0.011893	-0.08629	0.01255	-0.02571	-0.08767

CORM Transmittance Intercomparison

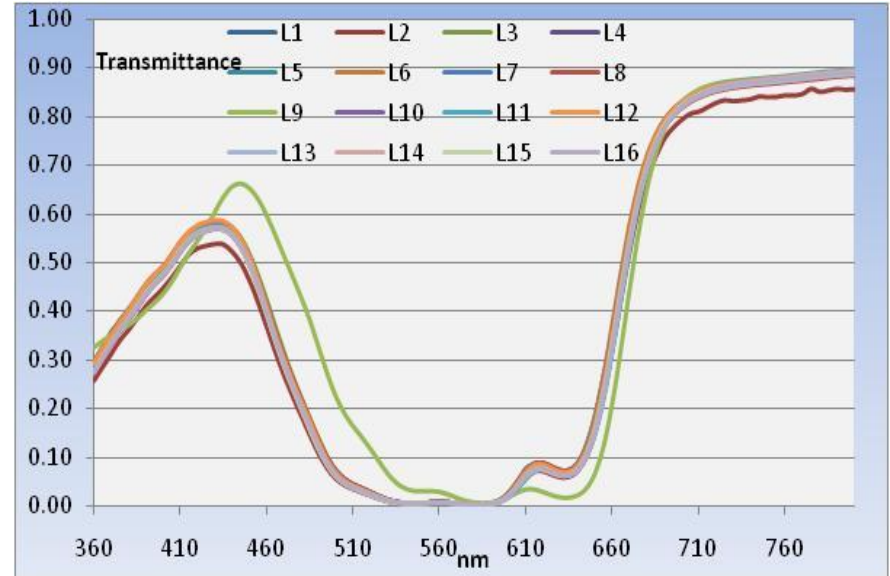
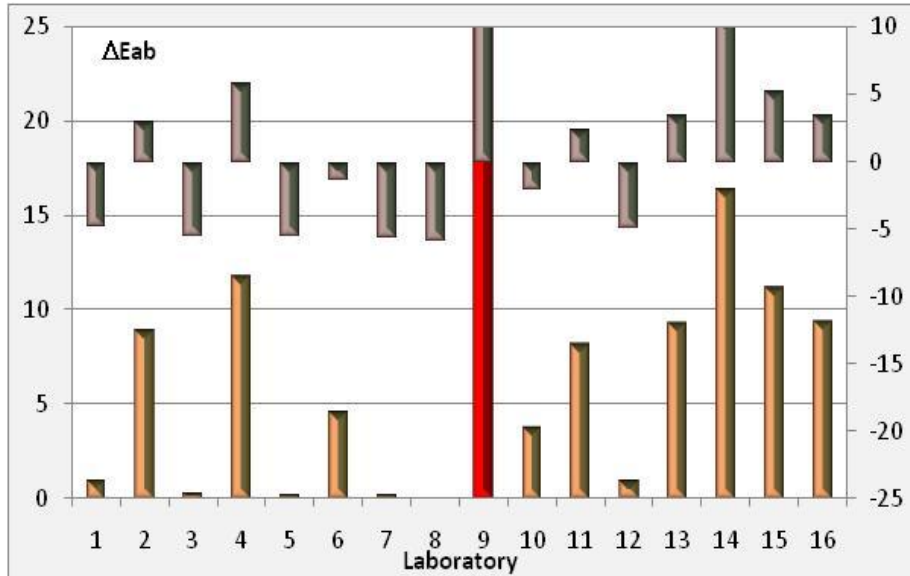
Sample Name	B															
Laboratory No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
x	0.4303	0.4300	0.4304	0.4298	0.4294	0.4271	0.4301	0.4309	0.4302	0.4294	0.4292	0.4299	0.4295	0.4327	0.4297	0.4300
y	0.5202	0.5198	0.5197	0.5203	0.5202	0.5189	0.5204	0.5211	0.5207	0.5200	0.5193	0.5206	0.5204	0.5204	0.5205	0.5207
Y	83.1394	79.6471	83.1382	83.2793	82.8826	83.8428	83.1511	82.8637	82.1883	83.3200	84.1353	83.6027	83.3418	83.1154	83.3785	83.3259
L*	93.08	91.53	93.07	93.14	92.96	93.38	93.08	92.95	92.66	93.15	93.51	93.28	93.16	93.06	93.18	93.16
a*	-21.298	-20.951	-21.108	-21.476	-21.558	-22.067	-21.417	-21.295	-21.401	-21.556	-21.497	-21.562	-21.638	-20.513	-21.572	-21.554
b*	104.585	102.697	104.367	104.450	103.966	102.379	104.585	105.343	104.452	104.034	103.851	104.839	104.360	106.092	104.531	104.811



ΔE_{ab}	0.588248	9.160441	1.000881	0.862965	1.965808	9.562627	0.605239	0	0.892371	1.819687	2.5738	0.429023	1.127433	1.184836	0.786	0.39132
Dev	-0.42801	8.144183	-0.01538	-0.15329	0.94955	8.546369	-0.41102	-1.01626	-0.12389	0.803429	1.557543	-0.58724	0.111175	0.168579	-0.23026	-0.62494

CORM Transmittance Intercomparison

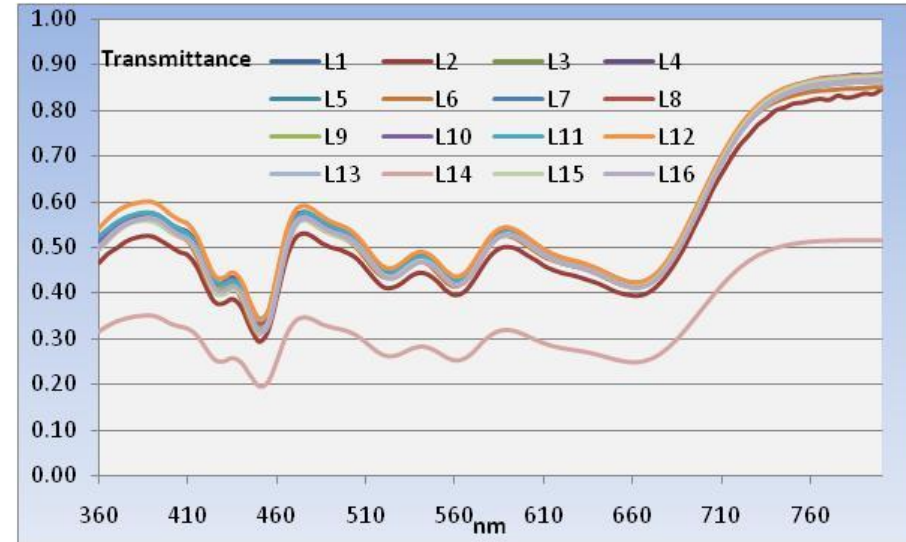
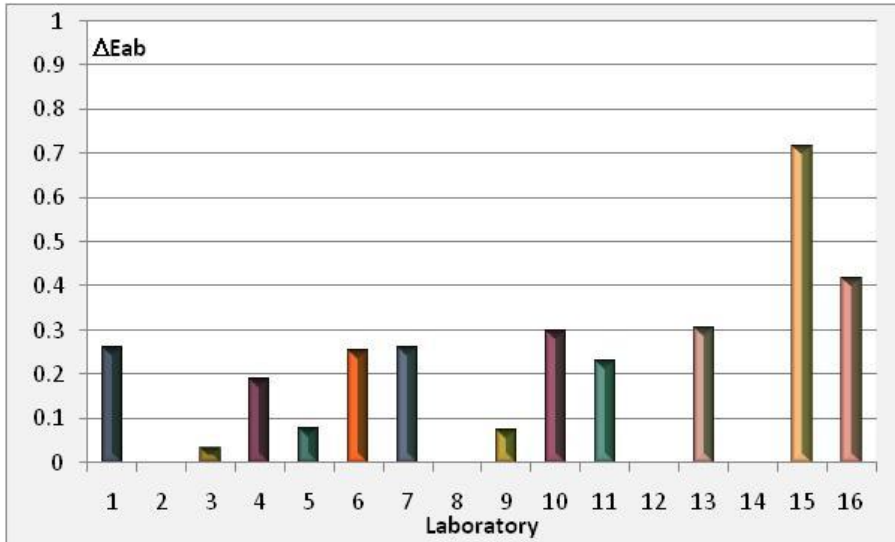
Sample Name	F															
Laboratory No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
x	0.1994	0.1978	0.1982	0.1961	0.2006	0.2021	0.1999	0.1991	0.1659	0.1985	0.1954	0.1992	0.1966	0.1964	0.1966	0.1960
y	0.0683	0.0633	0.0694	0.0632	0.0691	0.0674	0.0689	0.0690	0.0961	0.0664	0.0637	0.0682	0.0638	0.0627	0.0636	0.0638
Y	4.2902	3.5478	4.4159	3.7783	4.3005	4.1216	4.3217	4.3083	7.8114	4.0864	3.8288	4.2707	3.8260	3.7487	3.8105	3.8390
L*	24.61	22.12	25.00	22.92	24.64	24.07	24.71	24.67	33.59	23.96	23.10	24.55	23.09	22.82	23.03	23.13
a*	79.426	79.971	78.314	81.085	78.993	80.545	78.996	78.495	46.997	80.148	80.462	79.360	80.828	81.709	81.096	80.745
b*	-80.086	-79.167	-80.051	-81.075	-79.406	-79.524	-79.717	-79.634	-78.465	-80.393	-81.037	-80.057	-80.840	-81.272	-80.972	-81.046



ΔE_{ab}	1.073685	8.89818	0.319627	11.81737	0.301299	4.571763	0.260317	0	1073.042	3.814119	8.298986	0.941022	9.387713	16.41113	11.21542	9.409604
Dev	-4.70766	3.116831	-5.46172	6.036024	-5.48005	-1.20959	-5.52103	-5.78135	1067.261	-1.96723	2.517637	-4.84033	3.606364	10.62978	5.43407	3.628255

CORM Transmittance Intercomparison

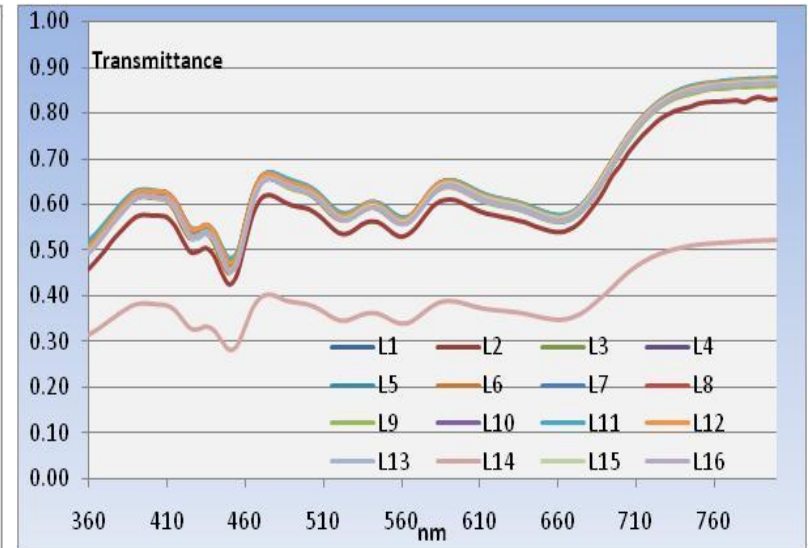
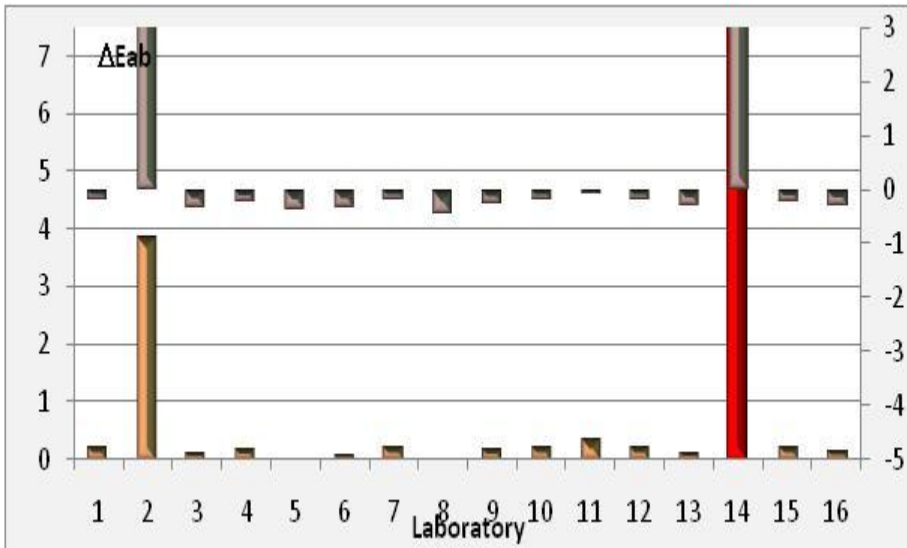
Sample Name	J															
Laboratory No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
x	0.3174	0.3200	0.3178	0.3174	0.3176	0.3185	0.3173	0.3178	0.3172	0.3175	0.3172	0.3159	0.3183	0.3169	0.3196	0.3191
y	0.3370	0.3399	0.3380	0.3370	0.3379	0.3383	0.3368	0.3380	0.3374	0.3369	0.3370	0.3361	0.3391	0.3362	0.3398	0.3390
Y	47.8278	44.3615	47.6862	47.6668	46.9855	46.7354	47.6541	47.4058	47.4570	47.8450	47.8491	48.7735	46.8546	28.2742	46.8594	46.7406
L*	74.72	72.47	74.63	74.61	74.18	74.02	74.61	74.45	74.48	74.73	74.73	75.31	74.10	60.14	74.10	74.02
a*	-1.160	-1.207	-1.394	-1.202	-1.433	-1.204	-1.166	-1.413	-1.414	-1.126	-1.292	-1.471	-1.603	-0.908	-1.339	-1.259
b*	3.075	4.235	3.432	3.089	3.350	3.593	3.012	3.431	3.157	3.060	3.062	2.619	3.811	2.330	4.198	3.893



ΔE_{ab}	0.261839	4.606983	0.032044	0.188731	0.078758	0.253171	0.260873	0	0.075961	0.297339	0.229237	1.403699	0.3048	206.3261	0.715767	0.418354
Dev	-13.7946	-9.44946	-14.0244	-13.8677	-13.9777	-13.8033	-13.7956	-14.0564	-13.9805	-13.7591	-13.8272	-12.6527	-13.7516	192.2696	-13.3407	-13.6381

CORM Transmittance Intercomparison

Sample Name	M															
Laboratory No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
x	0.3187	0.3206	0.3192	0.3187	0.3189	0.3198	0.3186	0.3191	0.3185	0.3185	0.3185	0.3187	0.3192	0.3186	0.3201	0.3197
y	0.3366	0.3389	0.3375	0.3366	0.3373	0.3379	0.3365	0.3375	0.3369	0.3364	0.3367	0.3366	0.3381	0.3364	0.3384	0.3381
Y	60.4299	56.5759	60.5531	60.3654	59.5078	59.6713	60.2930	59.9348	59.3933	60.1691	60.8720	60.4299	59.5273	36.3343	59.7106	59.4507
L*	82.07	79.94	82.14	82.04	81.57	81.66	82.00	81.80	81.51	81.93	82.31	82.07	81.58	66.77	81.68	81.54
a*	-0.507	-0.621	-0.703	-0.542	-0.745	-0.590	-0.515	-0.714	-0.785	-0.562	-0.685	-0.507	-0.910	-0.408	-0.677	-0.713
b*	3.401	4.358	3.759	3.422	3.642	3.991	3.354	3.751	3.455	3.311	3.425	3.401	3.951	2.808	4.202	4.029



ΔE_{ab}	0.237644	3.845021	0.112512	0.192534	0.066981	0.093548	0.235075	0	0.179937	0.233221	0.364264	0.237644	0.127629	226.8283	0.2201	0.147047
Dev	-0.1819	3.425477	-0.30703	-0.22701	-0.35256	-0.326	-0.18447	-0.41954	-0.23961	-0.18632	-0.05528	-0.1819	-0.29192	226.4088	-0.19944	-0.2725

Future Action

➔ Planned Completion of Data Reduction

- Evaluate specific filters for wavelength error
- Complete compilation of color parameters
- Complete comparison of color parameters
- Evaluate 300 nm to 360 nm region
- Integrate sample variation from Sun Chemical data on all sample sets
- Make samples available for additional testing

Source: Blind text

Acknowledgements

Jean Evans for OSI data presented in this talk

**Thank you for your
attention.**

