

# National Bureau of Standards Certificate

## Standard Reference Material 2010 Didymium Glass Filter for Checking the Wavelength Scale of Spectrophotometers

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### Serial Number:

This SRM is intended for use in calibrating the wavelength scale in the visible wavelength region of scanning spectrophotometers having nominal bandwidths in the range 1.5 to 10.5 nm. Depending upon the bandwidth of the spectrophotometer, anywhere from 14 to 24 wavelength corrections can be determined from 400 to 760 nm. Detailed instructions on the use of this SRM and examples of its use are given in NBS Special Publication 260-66. Each didymium-glass filter is identified by the SRM number and a serial number.

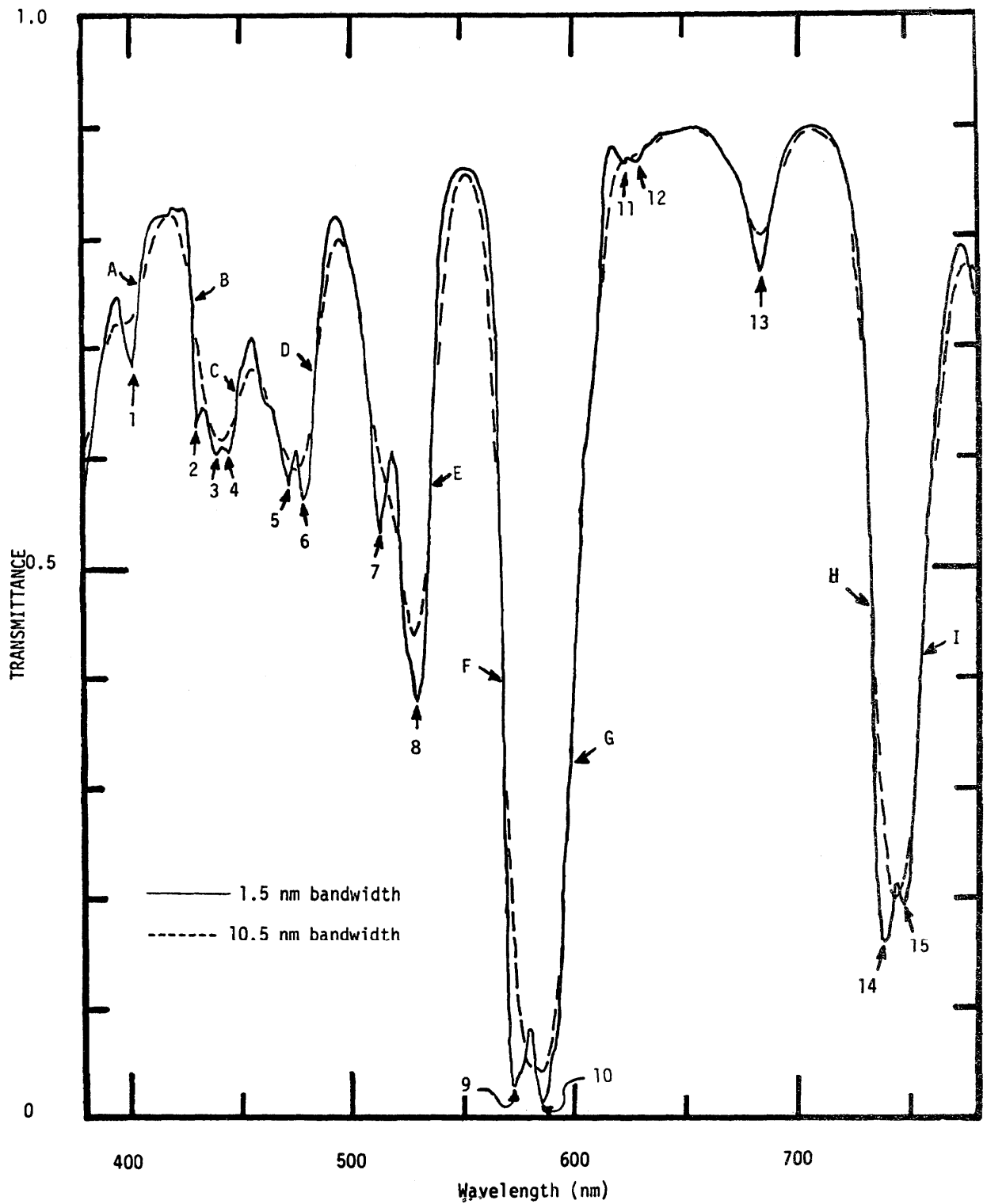
The wavelengths of the transmittance minima as obtained from measurements on two filters representative of the melt are given in Table 1. These values are given for seven equally spaced values of the half-height width of triangular passbands. The minima number is identified in the figure that illustrates the spectral transmittance as a function of wavelength. The wavelength values of nine points of inflection on the spectral transmittance curve as obtained on two filters are given in Table 2. These inflection points are representative of the melt and are also identified in the figure. These inflection points should only be used with the transmittance minima as described in Sections 2.2 and 2.3 in SP 260-66.

The measurements on which these tables are based were made at 25 °C with a high-precision reference spectrophotometer that has a wavelength accuracy of 0.04 nm. Table 3 indicates the estimated random (as obtained from 4 sets of measurements on a single filter) and systematic errors of the transmittance minima given in Table 1. Table 2 also indicates the range of the measured wavelengths of the inflection points. Trial calibrations made on several instruments, using both minima and inflection points, indicate that wavelength corrections made with these SRM's can be accurate to 0.2 nm. The uncertainty of a calibration, however, will depend upon the stability and other characteristics of a particular instrument.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Office of Standard Reference Materials by R. K. Kirby.

The spectral transmittance as a function of wavelength for a filter representative of the melt is given in Table 4. These values are not certified but are provided for use as specified in SP 260-66. *They should not be used to check the photometric scale of a spectrophotometer.*

It is recommended that the filter be handled only by its edges and when not in use it should be stored in the box provided. If cleaning is necessary, wet the filter with water and rub gently with optical lens tissue soaked with a mild soap solution, rinse with distilled water, rinse with isopropyl alcohol, and rinse again with distilled water. Dry after each rinsing by wiping lightly with optical lens tissue.



Spectral transmittance of a typical didymium glass filter. Numbers indicate the principal points of minimum transmittance and letters indicate the principal points of inflection.

**Table 1**  
**Certified Wavelengths (nm) of the Transmittance**  
**Minima for the Indicated Bandwidths**

Bandwidth Minimum No.	1.5 nm	3.0 nm	4.5 nm	6.0 nm	7.5 nm	9.0 nm	10.5 nm
1	402.42	401.81	401.69	401.66	401.42	400.95	
2	431.50	432.48					
3	440.27	440.52	441.84	442.52	442.37	442.08	441.33
4	445.59	445.14					
5	472.72	472.58	472.88				
6	478.89	479.34	479.28	478.31	477.36	476.50	475.65
7	513.45	513.61	513.89	514.31	515.38		
8	529.58	530.02	529.90	529.47	529.27	529.12	528.88
9	572.69	573.27	574.21	575.11	576.59		
10	585.34	585.54	585.77	586.02	585.99	585.35	584.42
11	623.62	624.02					
12	629.53	629.41	628.56	627.03	627.02		
13	684.66	684.68	684.71	684.72	684.71	684.66	684.58
14	739.86	739.96	740.24	740.91	742.01	742.97	743.65
15	748.28	748.10					

**Table 2**  
**Wavelengths and Transmittances at Nine Selected**  
**Points of Inflection**

Point Identification	Wavelength (nm)	Range* (nm)	Transmittance <sup>†</sup>
A	406.44	+08 -06	0.7760
B	429.43	+05 -05	.7359
C	449.49	+06 -06	.6516
D	484.84	+10 -15	.6758
E	536.50	+06 -09	.5805
F	568.15	+08 -04	.4023
G	599.05	+05 -07	.3348
H	733.39	+06 -03	.4719
I	756.45	+01 -02	.4177

\*The range of wavelengths within which the wavelength for the given transmittance will fall for symmetric triangular passbands with half-height bandwidths from 1.5 to 10.5 nm.

<sup>†</sup>These values of transmittance are not certified.

TABLE 4 (cont)

Wave- Length (nm)	T	$\Delta T$ Standard Error	$\Delta T$ System- atic	Wave- Length (nm)	T	$\Delta T$ Standard Error	$\Delta T$ System- atic
500.00	.78689	.000060	.00010	501.50	.77050	.000062	.00010
503.00	.75433	.000047	.00010	504.50	.73899	.000046	.00010
506.00	.72185	.000070	.00010	507.50	.69622	.000054	.00010
509.00	.65070	.000060	.00010	510.50	.58889	.000023	.00010
512.00	.53799	.000044	.00010	513.50	.51737	.000050	.00010
515.00	.53523	.000035	.00010	516.50	.56547	.000033	.00010
518.00	.58503	.000042	.00010	519.50	.59603	.000038	.00010
521.00	.57933	.000049	.00010	522.50	.51464	.000058	.00010
524.00	.43678	.000044	.00010	525.50	.40684	.000029	.00010
527.00	.39690	.000057	.00010	528.50	.36734	.000019	.00010
530.00	.36174	.000012	.00010	531.50	.37185	.000046	.00010
533.00	.38958	.000046	.00010	534.50	.45072	.000037	.00010
536.00	.54457	.000052	.00010	537.50	.63283	.000038	.00010
539.00	.69863	.000066	.00010	540.50	.75111	.000028	.00010
542.00	.79247	.000062	.00010	543.50	.82093	.000050	.00010
545.00	.84006	.000043	.00010	546.50	.85304	.000068	.00010
548.00	.86137	.000073	.00010	549.50	.86532	.000043	.00010
551.00	.86587	.000068	.00010	552.50	.86526	.000035	.00010
554.00	.86482	.000057	.00010	555.50	.86353	.000038	.00010
557.00	.85997	.000035	.00010	558.50	.85316	.000088	.00010
560.00	.84237	.000045	.00010	561.50	.82504	.000060	.00010
563.00	.79728	.000048	.00010	564.50	.75134	.000031	.00010
566.00	.66681	.000052	.00010	567.50	.50244	.000030	.00010
569.00	.25719	.000033	.00010	570.50	.07751	.000011	.00010
572.00	.02604	.000010	.00010	573.50	.02536	.000013	.00010
575.00	.03443	.000011	.00010	576.50	.03857	.000013	.00010
578.00	.05117	.000012	.00010	579.50	.06944	.000014	.00010
581.00	.06863	.000007	.00010	582.50	.03836	.000014	.00010
584.00	.01549	.000007	.00010	585.50	.01027	.000006	.00010
587.00	.01577	.000016	.00010	588.50	.02979	.000022	.00010
590.00	.04702	.000023	.00010	591.50	.05748	.000009	.00010
593.00	.07588	.000013	.00010	594.50	.11929	.000028	.00010
596.00	.19036	.000034	.00010	597.50	.26661	.000020	.00010
599.00	.32378	.000038	.00010	600.50	.38146	.000043	.00010
602.00	.44667	.000041	.00010	603.50	.51047	.000043	.00010
605.00	.56569	.000048	.00010	606.50	.60327	.000074	.00010
608.00	.62507	.000047	.00010	609.50	.64527	.000041	.00010
611.00	.68076	.000072	.00010	612.50	.73522	.000054	.00010
614.00	.79774	.000073	.00010	615.50	.84664	.000067	.00010
617.00	.87427	.000086	.00010	618.50	.88467	.000056	.00010

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TABLE 4 (cont)

Wave- Length (nm)	T	$\Delta T$ Standard Error	$\Delta T$ System- atic	Wave- Length (nm)	T	$\Delta T$ Standard Error	$\Delta T$ System- atic
620.00	.88413	.000042	.00010	621.50	.87711	.000071	.00010
623.00	.87047	.000037	.00010	624.50	.87083	.000060	.00010
626.00	.87359	.000066	.00010	627.50	.87310	.000069	.00010
629.00	.87008	.000069	.00010	630.50	.87085	.000064	.00010
632.00	.87569	.000048	.00010	633.50	.88221	.000043	.00010
635.00	.88828	.000124	.00010	636.50	.89117	.000089	.00010
638.00	.89322	.000035	.00010	639.50	.89543	.000062	.00010
641.00	.89755	.000085	.00010	642.50	.89905	.000051	.00010
644.00	.90014	.000052	.00010	645.50	.90080	.000043	.00010
647.00	.90124	.000041	.00010	648.50	.90112	.000060	.00010
650.00	.90106	.000034	.00010	651.50	.90149	.000079	.00010
653.00	.90218	.000054	.00010	654.50	.90300	.000066	.00010
656.00	.90301	.000082	.00010	657.50	.90256	.000044	.00010
659.00	.90198	.000049	.00010	660.50	.90115	.000091	.00010
662.00	.89951	.000104	.00010	663.50	.89656	.000071	.00010
665.00	.89155	.000045	.00010	666.50	.88540	.000079	.00010
668.00	.87844	.000079	.00010	669.50	.87177	.000085	.00010
671.00	.86691	.000077	.00010	672.50	.86284	.000056	.00010
674.00	.85883	.000035	.00010	675.50	.85369	.000076	.00010
677.00	.84419	.000077	.00010	678.50	.83115	.000053	.00010
680.00	.81611	.000076	.00010	681.50	.79779	.000063	.00010
683.00	.77773	.000111	.00010	684.50	.76323	.000051	.00010
686.00	.77287	.000111	.00010	687.50	.79255	.000057	.00010
689.00	.80954	.000080	.00010	690.50	.82685	.000045	.00010
692.00	.84399	.000066	.00010	693.50	.85936	.000052	.00010
695.00	.87138	.000058	.00010	696.50	.88070	.000036	.00010
698.00	.88764	.000054	.00010	699.50	.89254	.000029	.00010
701.00	.89577	.000056	.00010	702.50	.89798	.000040	.00010
704.00	.89957	.000049	.00010	705.50	.90089	.000060	.00010
707.00	.90166	.000056	.00010	708.50	.90231	.000071	.00010
710.00	.90225	.000066	.00010	711.50	.90168	.000071	.00010
713.00	.90041	.000056	.00010	714.50	.89850	.000060	.00010
716.00	.89593	.000042	.00010	717.50	.89232	.000040	.00010
719.00	.88755	.000075	.00010	720.50	.88137	.000049	.00010
722.00	.87336	.000061	.00010	723.50	.86256	.000086	.00010
725.00	.84758	.000054	.00010	726.50	.82620	.000070	.00010
728.00	.79437	.000071	.00010	729.50	.74399	.000039	.00010
731.00	.66643	.000039	.00010	732.50	.55165	.000033	.00010
734.00	.40413	.000053	.00010	735.50	.26498	.000040	.00010
737.00	.17772	.000064	.00010	738.50	.14784	.000028	.00010

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TABLE 4 (cont)

Wave- Length (nm)	T	$\Delta T$ Standard Error	$\Delta T$ System- atic	Wave- Length (nm)	T	$\Delta T$ Standard Error	$\Delta T$ System- atic
740.00	.14400	.000017	.00010	741.50	.14841	.000015	.00010
743.00	.16928	.000022	.00010	744.50	.19331	.000020	.00010
746.00	.19302	.000027	.00010	747.50	.17683	.000014	.00010
749.00	.17678	.000040	.00010	750.50	.20220	.000026	.00010
752.00	.24335	.000050	.00010	753.50	.29149	.000049	.00010
755.00	.34682	.000095	.00010	756.50	.40869	.000063	.00010
758.00	.47017	.000099	.00010	759.50	.52523	.000164	.00010
761.00	.57256	.000071	.00010	762.50	.61237	.000077	.00010
764.00	.64917	.000089	.00010	765.50	.68412	.000093	.00010
767.00	.71596	.000088	.00010	768.50	.74294	.000080	.00010
770.00	.76342	.000040	.00010	771.50	.77754	.000144	.00010
773.00	.78603	.000082	.00010	774.50	.78934	.000082	.00010
776.00	.78665	.000098	.00010	777.50	.77668	.000050	.00010
779.00	.75800	.000083	.00010	780.50	.73040	.000120	.00010

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