National Institute of Standards & Technology

Report of Investigation

Reference Material 8785

Air Particulate Matter on Filter Media

This Reference Material (RM) 8785 is intended primarily for use in the evaluation of analytical methods used to characterize the carbon composition of atmospheric fine-particulate matter (PM) for national air quality monitoring programs. This RM consists of only the fine fraction (nominally < 2.5 μm aerodynamic diameter) of SRM 1649a *Urban Dust* resuspended in air and filtered onto quartz-fiber filter. RM 8785 also provides the atmospheric chemistry and ocean-sciences community with a means to inter-compare methods and laboratories for the measurement of elemental (black) carbon. RM 8785 has value-assignments for total carbon, elemental carbon and organic carbon measured according to two thermal-optical methods: the NIOSH and IMPROVE protocols [1,2].

A unit of RM 8785 consists of three loaded filters, each uniquely identified by its APM identification number (e.g., APM 1257), its production characteristics, i.e., batch and chamber-column-row (e.g., 12959-30 and IV-D-5, respectively) and its mass of fine SRM 1649a on the filter (e.g., 1948 μg). For the most part, filters contained in each unit were randomly selected from the population of 2231 filters (Table 1; see Appendix); however, if all three filters selected per unit had a loading nominally less than (or greater than) the 50th percentile, then the next available filter in the greater than (or less than) 50th percentile was substituted for one of the three original filters. Therefore, the expectation is that each unit represents at least one filter from the lower 50th percentile and one filter from the upper 50th percentile; however, this distribution cannot be guaranteed due to uncertainties in the packaging process. A filter (process) blank is available as RM 8786.

Expiration of Value Assignment: RM 8785 is valid indefinitely, within the measurement uncertainty specified, provided the RM is handled and stored in accordance with instructions given in this Report of Investigation (see "Instructions for Handling, and Storage"). Periodic validation of this RM is not required. This report is nullified if the RM is damaged, contaminated, or otherwise modified.

Maintenance of RM: NIST will monitor this RM over the period of its validity. If substantive technical changes occur that affect the value assignment before the expiration of this report, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Reference Values: A NIST Reference value is a non-certified value that are the best estimates of the true values; however, the values do not meet NIST criteria for certification and are provided with associated uncertainties that may reflect only measurement precision and may not include all sources of uncertainty. The measurand is total carbon as determined by the indicated methods listed in Table 2. Metrological traceability is to the SI derived units for mass fraction (expressed as grams per gram). Values were obtained through an inter –methods and – laboratory comparison involving two thermal optical analysis (TOA) methods and three laboratories, one of which was NIST.

Information Values: A NIST information value is considered to be a value that will be of interest and use to the RM user, but insufficient information is available to assess adequately the uncertainty associated with the value or only a limited number of analyses were performed. RM 8785 information concentration values for elemental carbon and organic carbon, expressed as a mass fraction, are reported in Table 3. Values were obtained during the course of the total carbon measurements noted above for the intercomparison. Since elemental and organic carbon concentration values are method-defined parameters and possibly differ statistically across instruments, only information values can be assigned. Information values cannot be used to establish metrological traceability

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All phases of the project that include filter selection, gravimetric analysis, resuspension and collection, inter-laboratory and-methods comparison, and data analysis were coordinated by G.A. Klouda of the NIST Materials Measurement Science Division.

Production of RM 8785 was under the leadership of H.J. Parish and E.L. Watson of SRI International (Menlo Park, CA) with technical assistance given by K. Irwin. Gravimetric analysis and thermal-optical reflectance analysis of filters were under the leadership of J.C. Chow of Desert Research Institute (Reno, NV) with technical assistance by D. Crow, A. Chen and S. Kohl. R.A. Cary of Sunset Laboratory Inc. provided thermal-optical transmission analysis and expertise. G.A. Klouda of NIST provided the NIST thermal-optical transmission analysis. J.J. Filliben and G.A. Klouda collaborated on the experimental design for production and intercomparison of RM 8785, including the statistical analysis of the data. The following individuals were instrumental in assisting in the research and development of a 'prototype' filter material to RM 8785: D.B. Klinedinst, K.K. Takagi and M.E. Knab of NIST; R.B Kellogg, G. Norris and J. Weinstein of the U.S. Environmental Protection Agency; and J. Stone of URG Corporation. Throughout the course of this project, J.M. Conny and L.A. Currie contributed much of their expertise to advancing the research and development of RM 8785. Funding was in part provided by the U.S. Environmental Protection Agency under Interagency Agreement DW 13939042-01-0 and the National Institute of Standards and Technology, Standards Reference Material Program.

Support aspects involved in the issuance of this RM were coordinated through the NIST Office of Reference Materials.

PREPARATION AND ANALYSIS[(1)]

SRM 1649a – Feedstock for RM 8785: Although SRM 1649a *Urban Dust* was collected in Washington, DC during 1976-77, today it remains a valuable material for inter-comparison of methods and laboratories. The advantages of this feedstock was its immediate availability, its proven stability over time, and its known carbon composition. Through inter-laboratory and methods comparisons, SRM 1649a has been certified for total carbon and has been assigned values for select trace-carbon species and carbon-isotopes [3–9]. RM 8785, only the fine fraction of SRM 1649a, is expected to have a similar, but not identical, chemical composition as the complete SRM 1649a material.

Resuspension and Collection of SRM 1649a on Quartz-Fiber Filter: The NIST RM 8785 Air Particulate Matter on Filter was produced at SRI International by resuspending SRM 1649a in air and by collecting the aerosol on 320 quartz-fiber filters in each of 7 batches for a total of 2240 filters [10–12]. SRI's dust generation and collection system incorporates the following components to generate an aerosol:

- Dust feeder – delivers a continuous stream of aerosol material
- Sonic velocity disperser – breaks up agglomerates and dilutes the aerosol
- Settling tower – removes large particles that survive the sonic airflow
- Sampling collection chambers – houses 320 filter packs to simultaneously collect the aerosol on 320 filters under matched flow (2 L min^{-1}) conditions.

Figure 1a is a photograph of the SRI system. Figure 1b is an operational flow diagram of the generation and collection system. Figure 1c is a schematic of the sampling collection chamber [13]. Each filter is housed in a URG Corp.® filter pack, specially designed to pass only particles nominally less than 2.5 μm aerodynamic diameter, and has a set of characteristics that provides a unique identification: filter identification number, mass loading, batch, chamber, and position.

The mass of urban dust on each filter was determined gravimetrically before and after the resuspension and collection process [14]. Prior to gravimetric analysis, quartz-fiber filters were conditioned in an average temperature of 21.5 °C within 1.5 °C and a relative-humidity of 35 % within 5 % (absolute) controlled clean room for a minimum of 24 hours. Each filter was visually examined for pinholes and creases as part of filter acceptance testing. Gravimetric analyses were conducted on a Mettler Toledo MT5® microbalance with a sensitivity of 1 μg. The filters were hand-carried from Desert Research Institute's (DRI) facility (Reno, NV) to SRI International prior to and after resuspension sampling to minimize particle losses during transit.

[(1)]Certain commercial equipment, instruments, or materials are identified in this certificate to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Process blanks were prepared for possible chemical analyses and weighing controls were obtained to estimate potential bias in the gravimetric measurement. Quartz-fiber filters are friable, and although they were carefully emplaced and removed from the filter holder, some material may have been lost from some filters. Filters also adsorb organic vapors that can increase their mass.

Gravimetric Results: The distribution of PM-mass loadings with respect to chamber position, chamber and batch appears quite variable. After nine outliers with negative loadings and appearing damaged were removed, there remained 2231 filters (see Appendix). The average mass, the standard deviation and the standard uncertainty of the mean [15] were 1.064 mg, 0.414 mg and 0.009 mg, respectively. This corresponds to a relative standard deviation of 38.9 % and a relative standard uncertainty of the mean of 0.9 %. We note that the median of the 2231 filters was 1.022 mg with a standard uncertainty (via bootstrapping) of the median of 0.009 mg (0.9 %). Also, note that there is little difference between the mean (1.064 mg) and the median (1.022 mg); for simplicity we have chosen the mean for the final reported value. See Figure 2 for a histogram and summary statistics.

RM 8785 INTER –LABORATORY AND –METHOD COMPARISON

Objective: The objective of the intercomparison was to obtain value assignments [16,17] and uncertainties [15] for total carbon (TC), elemental carbon (EC) and organic carbon (OC) content (in $g \bullet g^{-1}$ dust) and the EC/TC ratio of RM 8785 filters using two specific thermal-optical analysis (TOA) methods: the "STN-NIOSH" and the "IMPROVE." The STN-NIOSH is the NIOSH (National Institute of Occupational Safety and Health) Method 5040 [1,18], with a slightly modified temperature profile for the Environmental Protection Agency (EPA) PM 2.5 Chemical Speciation Trends Network [19], applied to an *original* thermal-optical transmission (TOT) instrument and to the *new version* of the TOT instrument; analyses performed by NIST and Sunset Laboratory Inc. (SLI), respectively. The IMPROVE (Interagency Monitoring of Protected Visual Environments) Method [2,20] was applied to the DRI/OGC (*original*) thermal-optical reflectance (TOR) instrument and a DRI Model 2001® (*new version*) of the TOR instrument; both analyses performed by the Desert Research Institute (DRI). The IMPROVE protocol has been previously compared to the NIOSH protocol by measuring $PM_{2.5}$ in ambient and source samples using DRI's thermal-optical reflectance (transmission) instrument [21]. Also, a more recent study has focused on optimizing TOA instruments for measuring atmospheric elemental carbon by studying the response surface of a TOT instrument [22].

Experimental Design and Filter Selection [23-25]: In order to intercompare methods and laboratories, the RM 8785 filter population was divided into eight mass intervals, considering that the relative standard uncertainty of mass loading was 39 %. The mass intervals were defined by the ordering of all 2231 filters from the least loaded filter to the heaviest loaded over the entire mass range, nominally 0.09 mg to 2.9 mg per filter, divided by eight (octile). The octiles are listed in Table 1 with their summary statistics: number of filters (n), minimum, maximum, median, range, average, standard deviation of the data, and relative standard deviation; each octile contains 279 filters, except for the eighth octile with 278. From each octile, two filters were randomly selected for each laboratory. An additional filter was randomly selected from each of the eight octiles for *round-robin* distribution, one punch per filter sent to each of the four laboratories. The filter selection represented a balanced design with replication and *round-robin* sampling. For this design, 72 filters (*i.e.*, 8 octiles x 2 replicates x 4 instruments + 8 round-robin filters) were consumed for value-assignment.

Note: Originally, four laboratories were identified for the intercomparison, two TOR labs and two TOT labs. Later, one TOR laboratory was replaced by DRI using the *new version* TOR instrument. During the interlaboratory study, samples of RM 8785 were identified as "SRM 2784". SRM 2784 is the SRM number reserved for this material, once certification of an analyte is obtained.

Table 1. RM 8785 Mass Interval (Octile) Summary

Interval (Octile)	n	Minimum (μg)	Maximum (μg)	Median (μg)	Range (μg)	Average (μg)	Std. Dev. (μg)[a]	RSD, %
1	279	92	626	555	534	526	104	[20]
2	279	626	741	687	115	684	34	[5]
3	279	742	873	809	131	809	38	[5]
4	279	873	1022	943	149	945	44	[5]
5	279	1022	1139	1081	117	1081	33	[3]
6	279	1139	1279	1207	140	1208	42	[3]
7	279	1279	1554	1372	275	1391	82	[6]
8	278	1554	2855	1848	1301	1875	216	[12]

[a] Standard deviation of the data [15]. Number in brackets is the relative standard deviation in percent.

Reference Solutions: Each laboratory received two Reference Solutions and HPLC Water (blank) contained in 4.5 mL Certan® capillary bottles: a urea solution of 0.203 $\mu gC \bullet \mu L^{-1}$ and a sucrose solution of 4.078 $\mu gC \bullet \mu L^{-1}$. Microliter water-type syringes were used to transfer solution volumes from the Certan® vial onto an unused pre-treated (900 °C) quartz filter punch of an area specified by the method. These so called control-filter punches were defined as follows:

- C1 was 5 μL of 0.203 $\mu gC \bullet \mu L^{-1}$ urea
- C2 was 5 μL of 4.078 $\mu gC \bullet \mu L^{-1}$ sucrose
- C3 was 25 μL of 0.203 $\mu gC \bullet \mu L^{-1}$ urea
- C4 was 20 μL of 4.078 $\mu gC \bullet \mu L^{-1}$ sucrose
- C5 was HPLC water blank used to prepare the solutions

For the IMPROVE method, C4 was defined as 10 μL of 4.078 $\mu gC \bullet \mu L^{-1}$ sucrose since 20 μL saturated the detector. Control-filters were prepared the day of the analysis and provided a means to evaluate the calibration of each instrument on a daily basis over the range of carbon concentrations expected.

Laboratories, Methods and Thermal-Optical Analyses: A set of RM 8785 filters was analyzed by DRI for total carbon, elemental carbon and organic carbon using the DRI/OGC TOR instrument and applying the IMPROVE protocol [2,20]. A second set of RM 8785 filters, originally targeted for analysis by a second laboratory also having a DRI/OGC TOR instrument, was also sent to DRI and analyzed using and the DRI Model 2001® thermal/optical analyzer that differs somewhat from the DRI/OGC design [21]. Both sets of measurements were performed at DRI and are designated as follows: DRI = DRI/OGC TOR and DRI2 = DRI Model 2001® TOR.

A third set of RM 8785 filters was analyzed by SLI for total carbon, elemental carbon and organic carbon using the *new version* TOT instrument and applying STN-NIOSH Method. A fourth set of RM 8785 filters was retained by NIST and analyzed using an original TOT instrument and also applying the STN-NIOSH Method. TOT laboratories are designated as follows: NIST = *original* TOT and SLI = *new version* TOT.

Each laboratory was instructed to measure each filter in triplicate according to a strict measurement protocol [23,24]; except for the eight round-robin filters of which only one punch per filter was analyzed by each laboratory-method. If there appeared to be an outlier among the triplicate measurements, laboratories were instructed to analyze a fourth aliquant. The total number of carbon measurements across all laboratories-methods amounted to 232.

Reference Values: Total carbon concentrations were reported by the laboratories in units of $\mu g \bullet cm^{-2}$. A value assignment was determined for each method. The total carbon concentration ($\mu g \bullet cm^{-2}$), adjusted for laboratory bias, was regressed against its corresponding mass of fine particulate SRM 1649a for all measurements obtained from each method [25]. Reference values and expanded uncertainties (*U*) for each method are reported as gram of total carbon per gram of fine-particulate SRM 1649a deposited on the filter (Table 2). The total carbon *reference value* for all four laboratory-methods combined is 0.229 ± 0.050 $g \bullet g^{-1}$ (*U*, n = 4); no correction for blank total carbon.

Table 2. NIST RM 8785 Reference Value and Expanded Uncertainty for Total Carbon [a]

Method	Total Carbon[b] ($g \bullet g^{-1}$)	U [c] ($g \bullet g^{-1}$) k = 2
IMPROVE	0.223	0.057
STN-NIOSH	0.236	0.030

[a] Total carbon mass fraction based on a total deposit area of 8.55 cm^2; not corrected for blank total carbon.
[b] Reference value, mass fraction
[c] The expanded uncertainty is $U = 2u$, where u is the standard deviation of the coefficient. The quantity U serves as a basis for computing 95% confidence limits for the true parameter value. The unweighted standard deviation (u) of the mean of these two values was computed and $U = 2u$ was reported in the Table 2.

Information Values: Carbon concentrations were reported by the laboratories in units of $\mu g \bullet cm^{-2}$. The elemental and organic carbon concentrations ($\mu g \bullet cm^{-2}$) adjusted for laboratory bias, were each regressed against their corresponding mass of fine particulate SRM 1649a for all measurements obtained from each method [25]. Information values and expanded uncertainties (U) for each method are reported as gram of carbon per gram of fine-particulate SRM 1649a deposited on the filter (Table 3).

Table 3. NIST RM 8785 Information Value and Expanded Uncertainty for Elemental Carbon, Organic Carbon and the Elemental/Total Carbon Ratio [a]

Method	Elemental Carbon [b] ($g \bullet g^{-1}$)	$\underline{U}$ [c] $(g \bullet g^{-1})$ k = 2	Organic Carbon [b] ($g \bullet g^{-1}$)	U [c] $(g \bullet g^{-1})$ k = 2	$\frac{EC}{TC}$ [b]	U [c] k = 2
IMPROVE	0.111	0.035	0.112	0.022	0.490	0.050
STN-NIOSH	0.067	0.008	0.169	0.024	0.279	0.023

[a] Carbon Mass fractions, based on a total deposit area of 8.55 cm^2; not corrected for blank carbon.
[b] Information value, EC and OC are mass fractions; EC/TC ratio. The reported value of EC/TC in Table 3 for each method is the average obtained from the two corresponding instruments.
[c] The expanded uncertainty is $U = 2u$, where u is the standard deviation of the coefficient. The quantity U serves as a basis for computing 95 % confidence limits for the true parameter value. The unweighted standard deviation (u) of the mean of these two values was computed and $U = 2u$ was reported in the Table 3.

NOTICE AND WARNING TO USERS

Storage: Until use, it is recommended that RM 8785 be stored in its original container at less than 20 ºC.

Handling: This material is naturally occurring urban atmospheric particulate matter and may contain constituents of unknown toxicities; therefore, caution and care should be exercised during its handling and use.

Stability: For information regarding the stability of RM 8785, refer to the Certificate of Analysis for SRM 1649a *Urban Dust* [3].

INFORMATION FOR USE

Because very limited quantities of RM 8785 exist, users are strongly advised to collect their own reference sample of atmospheric particulate matter in a large enough quantity for routine quality control (QC) and to compare this QC reference sample with RM 8785.

Figure 1a. SRI Dust Generation and Collection System

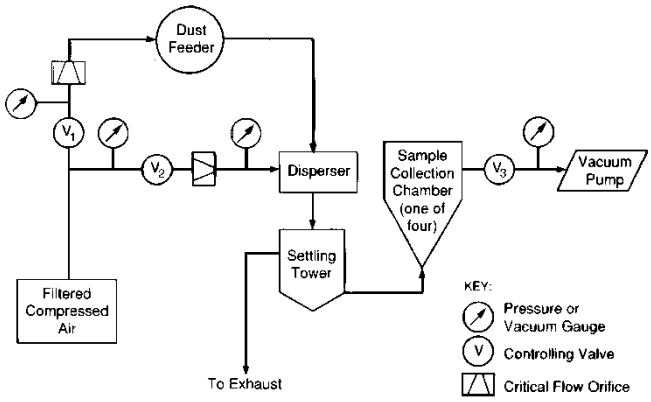


Figure 1b. Operational Flow Diagram of the Dust Generation and Collection System

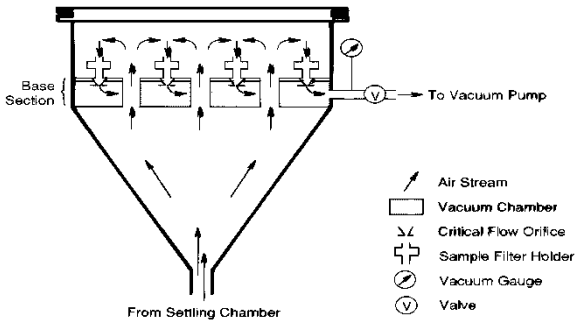
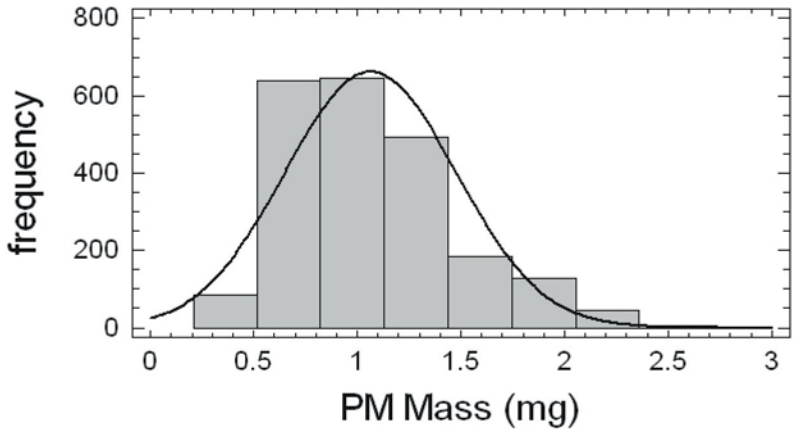


Figure 1c. Schematic of the Sampling Collection Chamber



n =	2231 filters
mean =	1.064 mg
standard deviation =	0.414 mg
standard uncertainty of mean =	0.009 mg (0.9%
median =	1.022 mg
standard uncertainty of median =	0.009 (0.9 %)

Figure 2. Histogram of Gravimetric PM Mass for RM 8785 Filters

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Users of this RM should ensure that the Report of Investigation in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at https://www.nist.gov/srm.

APPENDIX

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM0001	817	APM0055	1826	APM0109	688	APM0163	1543
APM0002	1900	APM0056	2437	APM0110	1372	APM0164	983
APM0003	1723	APM0057	2077	APM0111	318	APM0165	1252
APM0004	2204	APM0058	1717	APM0112	1129	APM0166	1227
APM0005	2045	APM0059	1301	APM0113	1036	APM0167	1057
APM0006	1093	APM0060	1550	APM0114	798	APM0168	703
APM0007	1764	APM0062	1005	APM0115	631	APM0169	802
APM0008	1309	APM0063	710	APM0117	656	APM0170	701
APM0009	669	APM0064	717	APM0118	672	APM0171	591
APM0010	1163	APM0065	1057	APM0119	788	APM0172	958
APM0011	1048	APM0066	1169	APM0120	586	APM0173	622
APM0013	968	APM0067	636	APM0121	646	APM0174	1513
APM0014	965	APM0068	1340	APM0122	1000	APM0175	611
APM0015	651	APM0069	1088	APM0123	777	APM0176	1385
APM0016	1022	APM0070	984	APM0124	733	APM0177	775
APM0017	837	APM0071	788	APM0125	959	APM0178	852
APM0018	1183	APM0072	804	APM0126	943	APM0179	938
APM0019	611	APM0073	805	APM0127	1128	APM0180	835
APM0020	649	APM0074	793	APM0128	1182	APM0181	699
APM0021	626	APM0075	886	APM0129	834	APM0182	1211
APM0022	868	APM0076	1490	APM0130	792	APM0183	1974
APM0023	1313	APM0077	1294	APM0131	729	APM0184	1236
APM0025	1157	APM0078	1114	APM0133	1019	APM0185	1553
APM0026	1172	APM0079	869	APM0134	1740	APM0186	332
APM0027	1092	APM0080	740	APM0135	1059	APM0187	1152
APM0028	1128	APM0081	999	APM0136	1239	APM0188	1752
APM0029	742	APM0083	1296	APM0137	1079	APM0189	1022
APM0030	802	APM0084	1168	APM0138	827	APM0191	797
APM0031	642	APM0085	1275	APM0139	978	APM0192	652
APM0033	1334	APM0086	614	APM0141	1098	APM0193	950
APM0034	1335	APM0087	1499	APM0142	867	APM0194	745
APM0035	1018	APM0088	1276	APM0143	622	APM0195	814
APM0036	1038	APM0089	1082	APM0144	858	APM0196	633
APM0037	1355	APM0090	1402	APM0145	677	APM0197	784
APM0038	1072	APM0091	1537	APM0146	857	APM0198	537
APM0039	988	APM0092	1061	APM0147	924	APM0199	1025
APM0041	762	APM0093	1030	APM0149	1511	APM0200	1299
APM0042	656	APM0094	836	APM0150	1023	APM0201	1669
APM0043	835	APM0095	814	APM0151	1688	APM0202	1472
APM0044	620	APM0096	1021	APM0152	1078	APM0203	1732
APM0045	982	APM0097	927	APM0153	1029	APM0204	2084
APM0046	943	APM0099	1417	APM0154	1511	APM0205	1375
APM0047	703	APM0100	1634	APM0155	1731	APM0206	2163
APM0048	1050	APM0101	1979	APM0156	2006	APM0207	1785
APM0049	1789	APM0102	2237	APM0157	2262	APM0208	537
APM0050	1086	APM0103	1982	APM0158	2002	APM0209	1378
APM0051	1750	APM0104	2045	APM0159	853	APM0210	1145
APM0052	1239	APM0105	1740	APM0160	1056	APM0211	677
APM0053	1523	APM0106	1673	APM0161	1069	APM0212	628
APM0054	2855	APM0107	2198	APM0162	626	APM0213	757

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM0214	936	APM0268	815	APM0322	782	APM0374	1042
APM0215	548	APM0269	537	APM0323	763	APM0375	808
APM0217	215	APM0270	348	APM0324	1501	APM0376	871
APM0218	1279	APM0271	948	APM0325	423	APM0377	1150
APM0219	668	APM0272	851	APM0326	1264	APM0378	702
APM0220	883	APM0273	739	APM0327	1141	APM0379	754
APM0221	800	APM0275	1207	APM0328	1288	APM0380	517
APM0222	830	APM0276	974	APM0329	803	APM0381	706
APM0223	834	APM0277	1135	APM0330	887	APM0382	1151
APM0224	600	APM0278	1356	APM0331	841	APM0383	1479
APM0225	1080	APM0279	623	APM0333	1165	APM0384	1056
APM0226	887	APM0280	887	APM0334	1922	APM0385	1080
APM0227	896	APM0281	745	APM0335	1030	APM0386	1218
APM0228	1435	APM0283	1344	APM0336	965	APM0387	968
APM0229	799	APM0284	1146	APM0337	1493	APM0388	1070
APM0230	727	APM0285	1283	APM0338	1016	APM0389	1229
APM0231	608	APM0286	1326	APM0339	948	APM0391	866
APM0233	1308	APM0287	1280	APM0340	1130	APM0392	656
APM0234	1396	APM0288	1280	APM0341	1238	APM0393	877
APM0235	1373	APM0289	1357	APM0342	696	APM0394	808
APM0236	1547	APM0290	1241	APM0343	823	APM0395	913
APM0237	1172	APM0291	1145	APM0344	1037	APM0396	586
APM0238	1244	APM0292	1099	APM0345	480	APM0397	826
APM0239	1267	APM0293	727	APM0346	721	APM0399	1391
APM0240	935	APM0294	874	APM0347	548	APM0400	1196
APM0241	679	APM0295	597	APM0348	696	APM0401	1571
APM0242	755	APM0296	614	APM0349	820	APM0402	1821
APM0243	944	APM0297	1073	APM0350	1063	APM0403	1660
APM0244	700	APM0298	1270	APM0351	1425	APM0404	844
APM0245	705	APM0299	1059	APM0352	1695	APM0405	1685
APM0246	605	APM0300	1345	APM0353	1782	APM0406	1944
APM0247	884	APM0301	561	APM0354	1579	APM0407	2076
APM0248	939	APM0302	1797	APM0355	1951	APM0408	1603
APM0249	1710	APM0303	1340	APM0356	1715	APM0409	1071
APM0250	1042	APM0304	1466	APM0357	2106	APM0410	983
APM0251	2471	APM0305	2120	APM0359	928	APM0411	608
APM0252	1410	APM0306	1338	APM0360	611	APM0412	675
APM0253	1920	APM0307	1837	APM0361	943	APM0413	1298
APM0254	1672	APM0309	1192	APM0362	1233	APM0414	924
APM0255	2042	APM0310	625	APM0363	1209	APM0415	1027
APM0256	1921	APM0311	756	APM0364	857	APM0417	628
APM0257	2258	APM0312	1315	APM0365	482	APM0418	965
APM0259	1258	APM0313	1105	APM0366	960	APM0419	1024
APM0260	1040	APM0314	1152	APM0367	599	APM0420	810
APM0261	964	APM0315	1180	APM0368	878	APM0421	828
APM0262	1131	APM0317	865	APM0369	728	APM0422	642
APM0263	911	APM0318	630	APM0370	759	APM0423	647
APM0264	1263	APM0319	752	APM0371	674	APM0424	1201
APM0265	1060	APM0320	549	APM0372	866	APM0425	1012
APM0267	1318	APM0321	597	APM0373	689	APM0426	1080

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM0427	755	APM0481	801	APM0534	1042	APM0587	948
APM0428	882	APM0482	843	APM0535	1550	APM0588	1351
APM0429	684	APM0483	1871	APM0536	1165	APM0589	984
APM0430	380	APM0484	1312	APM0537	886	APM0590	957
APM0431	691	APM0485	251	APM0538	1132	APM0591	1277
APM0433	1614	APM0486	1153	APM0539	1425	APM0592	721
APM0434	930	APM0487	1175	APM0541	594	APM0593	725
APM0435	1193	APM0488	1118	APM0542	1119	APM0594	843
APM0436	330	APM0489	1070	APM0543	1338	APM0595	712
APM0437	811	APM0491	667	APM0544	714	APM0596	775
APM0438	1171	APM0492	756	APM0545	655	APM0597	697
APM0439	1097	APM0493	656	APM0546	517	APM0598	1105
APM0441	948	APM0494	741	APM0547	1221	APM0599	1287
APM0442	756	APM0495	692	APM0549	551	APM0601	1836
APM0443	1156	APM0496	596	APM0550	927	APM0602	1389
APM0444	750	APM0497	642	APM0551	1150	APM0603	1609
APM0445	636	APM0499	1106	APM0552	2051	APM0604	1756
APM0446	817	APM0500	1777	APM0553	1228	APM0605	1981
APM0447	888	APM0501	854	APM0554	2013	APM0606	1959
APM0448	1150	APM0502	2045	APM0555	2030	APM0607	2098
APM0449	1484	APM0503	1332	APM0556	2274	APM0608	1361
APM0450	1676	APM0504	1649	APM0557	2079	APM0609	743
APM0451	1501	APM0505	2249	APM0558	2292	APM0610	1340
APM0452	1864	APM0506	1706	APM0559	1491	APM0612	986
APM0453	1732	APM0507	1705	APM0560	1405	APM0613	873
APM0454	1779	APM0509	817	APM0562	597	APM0614	1062
APM0455	1971	APM0510	681	APM0563	1211	APM0615	1273
APM0456	2447	APM0511	1034	APM0564	816	APM0616	592
APM0457	1650	APM0512	880	APM0565	874	APM0617	511
APM0459	1290	APM0513	930	APM0566	1176	APM0618	688
APM0460	1336	APM0514	1016	APM0567	1060	APM0619	844
APM0461	592	APM0515	862	APM0568	1048	APM0620	1037
APM0462	975	APM0516	1156	APM0569	555	APM0621	758
APM0463	1163	APM0517	1091	APM0570	708	APM0622	700
APM0464	951	APM0518	585	APM0571	909	APM0623	872
APM0465	1149	APM0519	938	APM0572	953	APM0625	1265
APM0466	1103	APM0520	1279	APM0573	191	APM0626	1323
APM0467	1147	APM0521	596	APM0574	2000	APM0627	838
APM0468	1128	APM0522	757	APM0575	667	APM0628	1424
APM0469	901	APM0523	886	APM0576	1001	APM0629	758
APM0470	929	APM0524	1282	APM0577	794	APM0630	993
APM0471	673	APM0525	1220	APM0578	1484	APM0631	624
APM0472	886	APM0526	1108	APM0579	546	APM0632	782
APM0473	688	APM0527	1139	APM0580	723	APM0633	1253
APM0475	735	APM0528	1625	APM0581	509	APM0634	1103
APM0476	1452	APM0529	707	APM0582	641	APM0635	1230
APM0477	1304	APM0530	880	APM0583	1182	APM0636	1564
APM0478	1247	APM0531	722	APM0584	1308	APM0637	1214
APM0479	373	APM0532	649	APM0585	1513	APM0638	1134
APM0480	792	APM0533	1215	APM0586	1330	APM0639	1299

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM0640	840	APM0695	572	APM0749	899	APM0802	2282
APM0641	708	APM0696	700	APM0750	1453	APM0803	2083
APM0642	611	APM0697	543	APM0751	1928	APM0804	363
APM0643	864	APM0698	733	APM0752	1495	APM0805	1767
APM0644	800	APM0699	941	APM0753	1968	APM0806	870
APM0645	860	APM0700	1053	APM0754	1951	APM0807	1997
APM0646	605	APM0701	1435	APM0755	586	APM0808	1215
APM0647	895	APM0702	2056	APM0756	1868	APM0809	1199
APM0648	704	APM0703	2063	APM0757	1674	APM0811	700
APM0649	894	APM0704	1638	APM0758	1193	APM0812	1151
APM0650	1174	APM0705	1623	APM0759	1490	APM0813	1425
APM0651	1708	APM0706	1956	APM0760	836	APM0814	1246
APM0652	2026	APM0707	1878	APM0761	598	APM0815	972
APM0653	1434	APM0709	1053	APM0762	507	APM0816	992
APM0654	1278	APM0710	1686	APM0763	878	APM0817	1457
APM0655	1328	APM0711	1247	APM0764	1323	APM0818	638
APM0656	1196	APM0712	1169	APM0765	888	APM0819	734
APM0657	1446	APM0713	868	APM0767	957	APM0820	874
APM0659	1233	APM0714	974	APM0768	1013	APM0821	841
APM0660	1231	APM0715	1170	APM0769	782	APM0822	745
APM0662	859	APM0717	427	APM0770	721	APM0823	768
APM0663	865	APM0718	1012	APM0771	930	APM0825	1178
APM0664	901	APM0719	630	APM0772	784	APM0826	1193
APM0665	1176	APM0720	913	APM0773	681	APM0826	1344
APM0667	885	APM0721	631	APM0775	1009	APM0827	1110
APM0668	784	APM0722	1069	APM0776	1015	APM0828	728
APM0669	1169	APM0723	1018	APM0777	1203	APM0829	738
APM0670	698	APM0725	916	APM0778	776	APM0830	659
APM0671	784	APM0726	1129	APM0779	811	APM0831	878
APM0672	672	APM0727	1012	APM0780	668	APM0833	907
APM0673	606	APM0728	883	APM0781	1257	APM0834	1266
APM0674	966	APM0729	606	APM0782	748	APM0835	1098
APM0675	796	APM0730	683	APM0783	1174	APM0836	1056
APM0676	1194	APM0731	774	APM0784	1310	APM0837	1411
APM0677	1229	APM0732	1309	APM0785	939	APM0838	1212
APM0678	920	APM0733	1232	APM0786	1101	APM0839	1140
APM0679	576	APM0734	1359	APM0787	1051	APM0840	1059
APM0680	536	APM0735	1205	APM0788	1051	APM0841	1253
APM0683	1060	APM0736	1260	APM0789	1304	APM0842	1034
APM0684	1612	APM0737	1067	APM0790	1258	APM0843	809
APM0685	1487	APM0738	1097	APM0791	792	APM0844	731
APM0686	1141	APM0739	1231	APM0792	899	APM0845	972
APM0687	1880	APM0741	1015	APM0793	884	APM0846	481
APM0688	1332	APM0742	1067	APM0794	694	APM0847	661
APM0689	1044	APM0743	694	APM0795	613	APM0849	1115
APM0690	1144	APM0744	655	APM0796	481	APM0850	1301
APM0691	901	APM0745	677	APM0797	1025	APM0851	1788
APM0692	824	APM0746	568	APM0799	1676	APM0852	1902
APM0693	912	APM0747	795	APM0800	1299	APM0853	1833
APM0694	1138	APM0748	1361	APM0801	1204	APM0854	813

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM0855	1120	APM0909	1236	APM0964	895	APM1020	523
APM0856	2141	APM0910	1273	APM0965	861	APM1021	691
APM0857	1533	APM0911	901	APM0966	622	APM1022	631
APM0859	535	APM0912	724	APM0967	698	APM1023	707
APM0860	518	APM0913	1298	APM0968	1092	APM1025	1098
APM0861	1373	APM0914	1087	APM0969	697	APM1026	1352
APM0862	1104	APM0915	695	APM0970	699	APM1027	1214
APM0863	1272	APM0917	696	APM0971	770	APM1028	703
APM0864	1085	APM0918	704	APM0972	198	APM1029	691
APM0865	615	APM0919	579	APM0973	736	APM1030	754
APM0866	1327	APM0920	848	APM0974	602	APM1031	746
APM0867	1273	APM0921	901	APM0975	1330	APM1032	1084
APM0868	863	APM0922	460	APM0976	1103	APM1033	1073
APM0869	714	APM0923	847	APM0977	1144	APM1034	1206
APM0870	502	APM0925	515	APM0978	864	APM1035	1239
APM0871	183	APM0926	1278	APM0979	636	APM1036	1328
APM0872	544	APM0927	814	APM0980	614	APM1037	2001
APM0873	743	APM0928	1416	APM0981	780	APM1038	1583
APM0874	1093	APM0929	747	APM0983	1270	APM1039	1151
APM0875	788	APM0930	763	APM0984	1096	APM1040	1145
APM0877	1111	APM0931	657	APM0985	1411	APM1041	925
APM0878	1132	APM0932	913	APM0986	1493	APM1042	1003
APM0879	708	APM0933	1312	APM0987	1171	APM1043	711
APM0880	617	APM0934	1120	APM0988	1399	APM1044	701
APM0881	681	APM0935	1062	APM0989	948	APM1045	655
APM0882	1515	APM0936	965	APM0991	640	APM1046	639
APM0883	1078	APM0937	1584	APM0992	909	APM1047	902
APM0884	1350	APM0938	927	APM0993	631	APM1048	521
APM0885	2045	APM0939	1070	APM0994	1008	APM1049	1191
APM0886	1084	APM0941	635	APM0995	517	APM1050	1391
APM0887	1102	APM0942	626	APM0996	504	APM1051	1242
APM0888	1220	APM0943	706	APM0997	803	APM1052	1665
APM0889	1096	APM0944	679	APM0999	930	APM1053	1134
APM0890	1108	APM0945	539	APM1001	1927	APM1054	1670
APM0891	556	APM0946	631	APM1002	1427	APM1055	1649
APM0892	761	APM0947	716	APM1003	462	APM1056	2229
APM0893	680	APM0949	1098	APM1004	1423	APM1057	2140
APM0894	639	APM0950	752	APM1005	1828	APM1059	1206
APM0895	763	APM0951	1348	APM1006	2157	APM1060	1056
APM0896	882	APM0952	1113	APM1007	2020	APM1061	1339
APM0897	926	APM0953	2021	APM1009	791	APM1062	916
APM0899	1350	APM0954	1191	APM1010	525	APM1063	1080
APM0900	338	APM0955	1921	APM1011	626	APM1064	1060
APM0901	1263	APM0956	1774	APM1012	1272	APM1065	1039
APM0902	1486	APM0957	1921	APM1013	948	APM1066	1076
APM0903	1676	APM0958	1279	APM1014	720	APM1067	1299
APM0904	1068	APM0959	1326	APM1015	1087	APM1068	1251
APM0905	1839	APM0960	864	APM1017	1255	APM1069	612
APM0906	885	APM0962	545	APM1018	839	APM1070	899
APM0907	1595	APM0963	1365	APM1019	1257	APM1071	535

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM1072	836	APM1124	656	APM1177	1168	APM1232	1299
APM1073	878	APM1125	1312	APM1178	734	APM1233	1520
APM1075	869	APM1126	846	APM1179	695	APM1234	1194
APM1076	1230	APM1127	1384	APM1180	806	APM1235	1660
APM1077	1107	APM1128	1027	APM1181	934	APM1236	1173
APM1078	645	APM1129	865	APM1183	1253	APM1237	1133
APM1079	615	APM1130	774	APM1184	1213	APM1238	1936
APM1080	910	APM1131	804	APM1185	1223	APM1239	1148
APM1081	858	APM1132	526	APM1186	1150	APM1241	918
APM1082	1182	APM1133	1281	APM1187	1022	APM1242	865
APM1083	1128	APM1134	1127	APM1188	1081	APM1243	726
APM1084	1209	APM1135	1266	APM1189	1263	APM1244	729
APM1085	1162	APM1136	314	APM1191	687	APM1245	914
APM1086	1147	APM1137	1430	APM1192	487	APM1246	696
APM1087	1144	APM1138	1278	APM1193	880	APM1247	1098
APM1088	1291	APM1139	1484	APM1194	810	APM1248	1084
APM1089	1086	APM1140	1068	APM1195	919	APM1249	956
APM1090	1228	APM1141	928	APM1196	1244	APM1250	1275
APM1091	751	APM1142	1049	APM1197	833	APM1251	1432
APM1092	547	APM1143	864	APM1198	699	APM1252	1228
APM1093	778	APM1144	739	APM1199	1018	APM1253	1532
APM1094	812	APM1145	512	APM1201	1912	APM1254	1292
APM1095	1004	APM1146	607	APM1202	2058	APM1255	1284
APM1096	1078	APM1147	491	APM1203	1722	APM1256	1607
APM1097	741	APM1149	686	APM1204	2061	APM1257	1948
APM1098	490	APM1150	1302	APM1205	962	APM1258	1764
APM1099	1322	APM1151	2055	APM1206	1733	APM1259	734
APM1100	682	APM1152	1892	APM1207	2047	APM1260	1185
APM1101	2074	APM1153	784	APM1208	474	APM1261	1234
APM1102	2031	APM1154	1268	APM1209	623	APM1262	1218
APM1103	1645	APM1155	2126	APM1210	692	APM1263	638
APM1104	1813	APM1156	1840	APM1211	583	APM1264	1239
APM1105	1861	APM1157	1482	APM1212	935	APM1265	953
APM1106	1039	APM1159	688	APM1213	873	APM1267	817
APM1107	1971	APM1160	1338	APM1214	1028	APM1268	1138
APM1109	954	APM1161	503	APM1215	1053	APM1269	848
APM1110	1062	APM1162	1103	APM1217	1297	APM1270	838
APM1111	1231	APM1163	837	APM1218	656	APM1271	680
APM1112	1310	APM1164	823	APM1219	630	APM1272	910
APM1113	1229	APM1165	1024	APM1220	833	APM1273	623
APM1114	1115	APM1167	1013	APM1221	745	APM1274	1310
APM1115	617	APM1168	523	APM1222	1110	APM1275	781
APM1116	1136	APM1169	805	APM1223	814	APM1276	905
APM1117	534	APM1170	750	APM1225	1088	APM1277	816
APM1118	1299	APM1171	1250	APM1226	951	APM1278	1588
APM1119	877	APM1172	699	APM1227	1048	APM1279	575
APM1120	647	APM1173	740	APM1228	822	APM1280	814
APM1121	655	APM1174	1401	APM1229	911	APM1281	294
APM1122	1222	APM1175	721	APM1230	502	APM1283	1622
APM1123	921	APM1176	1135	APM1231	632	APM1284	1458

APPENDIX (continued)

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM1285	1486	APM1338	1067	APM1390	1216	APM1444	776
APM1286	1095	APM1339	1340	APM1391	1324	APM1445	567
APM1287	1236	APM1340	1320	APM1392	659	APM1446	695
APM1288	1135	APM1341	764	APM1393	768	APM1447	838
APM1289	1145	APM1342	610	APM1394	544	APM1448	725
APM1290	1065	APM1343	899	APM1395	510	APM1449	1046
APM1291	1050	APM1344	819	APM1396	483	APM1450	1281
APM1292	585	APM1345	663	APM1397	645	APM1451	1435
APM1293	1243	APM1346	977	APM1399	883	APM1452	1946
APM1294	555	APM1347	981	APM1400	967	APM1453	1469
APM1295	555	APM1348	678	APM1401	1382	APM1454	1340
APM1296	947	APM1349	1057	APM1402	1277	APM1455	1550
APM1297	615	APM1350	1439	APM1403	2041	APM1456	1346
APM1298	601	APM1351	2530	APM1404	1492	APM1457	1682
APM1299	963	APM1352	1981	APM1405	891	APM1459	958
APM1300	1428	APM1353	1082	APM1406	2336	APM1460	951
APM1301	1856	APM1354	670	APM1407	931	APM1461	741
APM1302	542	APM1355	1715	APM1408	966	APM1462	589
APM1303	1755	APM1356	2000	APM1409	705	APM1463	809
APM1304	1204	APM1357	1767	APM1410	508	APM1464	592
APM1305	1104	APM1359	932	APM1411	453	APM1465	844
APM1306	1352	APM1360	1564	APM1412	586	APM1467	1117
APM1307	1841	APM1361	707	APM1413	802	APM1468	1266
APM1309	1455	APM1362	771	APM1414	1199	APM1469	852
APM1310	1457	APM1363	1074	APM1415	1184	APM1470	572
APM1311	560	APM1364	897	APM1416	1554	APM1471	1040
APM1312	541	APM1365	814	APM1417	757	APM1472	511
APM1313	1130	APM1366	856	APM1418	1037	APM1473	560
APM1314	1085	APM1367	611	APM1419	563	APM1474	871
APM1315	1194	APM1368	1091	APM1420	965	APM1475	662
APM1317	706	APM1369	841	APM1421	578	APM1476	1180
APM1318	964	APM1370	834	APM1422	578	APM1477	1391
APM1319	786	APM1371	821	APM1423	348	APM1478	1426
APM1320	548	APM1372	612	APM1425	651	APM1479	727
APM1321	696	APM1373	606	APM1426	1299	APM1480	601
APM1322	664	APM1374	713	APM1427	917	APM1481	662
APM1323	1282	APM1375	1278	APM1428	730	APM1482	660
APM1324	935	APM1376	1009	APM1429	646	APM1483	1552
APM1325	1252	APM1377	982	APM1430	659	APM1484	1109
APM1326	1221	APM1378	827	APM1431	395	APM1485	1644
APM1327	704	APM1379	759	APM1433	2008	APM1486	1130
APM1328	280	APM1380	692	APM1434	1071	APM1487	1095
APM1329	777	APM1381	585	APM1435	1197	APM1488	1453
APM1330	660	APM1383	839	APM1436	1019	APM1489	1042
APM1331	546	APM1384	1453	APM1437	984	APM1490	1082
APM1333	985	APM1385	1123	APM1438	1519	APM1491	886
APM1334	1248	APM1386	746	APM1439	1112	APM1492	512
APM1335	779	APM1387	1131	APM1441	644	APM1493	590
APM1336	1271	APM1388	1420	APM1442	775	APM1494	756
APM1337	909	APM1389	1800	APM1443	1060	APM1495	511

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM1496	862	APM1551	1663	APM1605	1721	APM1659	1181
APM1497	344	APM1552	1690	APM1606	2194	APM1660	1065
APM1499	1148	APM1553	1825	APM1607	1916	APM1661	704
APM1500	922	APM1554	1819	APM1608	1181	APM1662	850
APM1501	1359	APM1555	1926	APM1609	994	APM1663	895
APM1502	1478	APM1556	1292	APM1610	1026	APM1664	854
APM1503	1352	APM1557	2090	APM1611	1043	APM1665	1093
APM1504	1505	APM1559	792	APM1612	580	APM1666	828
APM1505	1605	APM1560	591	APM1613	1307	APM1667	92
APM1506	1741	APM1561	1051	APM1614	1007	APM1668	502
APM1507	2053	APM1562	1095	APM1615	727	APM1669	573
APM1508	912	APM1563	1013	APM1617	1405	APM1670	659
APM1509	836	APM1564	1147	APM1618	665	APM1671	626
APM1510	1269	APM1565	1198	APM1619	952	APM1672	537
APM1512	641	APM1566	974	APM1620	774	APM1673	613
APM1513	1158	APM1567	1069	APM1621	620	APM1675	524
APM1514	952	APM1568	1105	APM1622	1028	APM1676	1105
APM1515	935	APM1569	524	APM1623	663	APM1677	306
APM1516	981	APM1570	1048	APM1625	803	APM1678	854
APM1517	715	APM1571	857	APM1626	1024	APM1679	611
APM1518	836	APM1572	797	APM1627	1280	APM1680	515
APM1519	552	APM1573	862	APM1628	1124	APM1681	672
APM1520	626	APM1575	775	APM1629	643	APM1682	1241
APM1521	653	APM1576	1155	APM1630	728	APM1683	1123
APM1522	726	APM1577	1234	APM1631	547	APM1684	1034
APM1523	577	APM1578	711	APM1632	589	APM1685	1273
APM1524	1551	APM1579	763	APM1633	1032	APM1686	1120
APM1525	986	APM1580	562	APM1634	873	APM1687	931
APM1526	777	APM1581	687	APM1635	1016	APM1688	1538
APM1527	1091	APM1582	1028	APM1636	1463	APM1689	1839
APM1528	1278	APM1583	1158	APM1637	1064	APM1690	759
APM1529	585	APM1584	615	APM1638	1088	APM1691	800
APM1530	615	APM1585	972	APM1639	1115	APM1692	501
APM1531	604	APM1586	1029	APM1640	1028	APM1693	614
APM1533	1200	APM1587	1107	APM1641	943	APM1694	589
APM1534	1013	APM1588	1013	APM1642	725	APM1695	419
APM1535	946	APM1589	930	APM1643	525	APM1696	403
APM1536	1516	APM1591	746	APM1644	513	APM1697	489
APM1537	1007	APM1592	900	APM1645	538	APM1699	1158
APM1538	879	APM1593	1272	APM1646	455	APM1700	706
APM1539	1042	APM1594	827	APM1647	638	APM1701	1666
APM1541	768	APM1595	460	APM1649	1637	APM1702	2008
APM1542	651	APM1596	847	APM1650	1081	APM1703	2003
APM1543	668	APM1597	739	APM1651	1901	APM1704	1365
APM1544	734	APM1598	498	APM1652	1744	APM1705	1283
APM1545	669	APM1599	1446	APM1653	602	APM1706	1331
APM1546	500	APM1601	1452	APM1654	1650	APM1707	1593
APM1547	584	APM1602	1704	APM1655	1882	APM1708	891
APM1549	832	APM1603	1504	APM1656	1343	APM1709	664
APM1550	900	APM1604	1967	APM1657	2177	APM1710	862

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM1711	1011	APM1767	1307	APM1821	891	APM1873	922
APM1712	632	APM1768	540	APM1822	911	APM1875	1252
APM1713	996	APM1769	929	APM1823	936	APM1876	1221
APM1714	923	APM1770	645	APM1825	892	APM1877	1306
APM1715	1138	APM1771	639	APM1826	908	APM1878	1099
APM1717	1009	APM1772	715	APM1827	1149	APM1879	624
APM1718	711	APM1773	793	APM1828	584	APM1880	556
APM1719	652	APM1775	655	APM1829	1041	APM1881	604
APM1720	573	APM1776	616	APM1830	550	APM1883	1193
APM1721	577	APM1777	1078	APM1831	641	APM1884	1506
APM1722	342	APM1778	626	APM1833	1112	APM1885	1303
APM1723	732	APM1779	630	APM1834	2017	APM1886	976
APM1725	617	APM1780	621	APM1835	1627	APM1887	969
APM1726	1213	APM1781	726	APM1836	936	APM1888	994
APM1727	792	APM1782	692	APM1837	1105	APM1889	1825
APM1728	976	APM1783	1196	APM1838	869	APM1891	660
APM1729	595	APM1784	1109	APM1839	1323	APM1892	842
APM1730	595	APM1785	1893	APM1840	1073	APM1893	931
APM1731	498	APM1786	1379	APM1841	722	APM1894	739
APM1733	1658	APM1787	1432	APM1842	734	APM1895	786
APM1734	1147	APM1788	345	APM1843	706	APM1896	612
APM1735	972	APM1789	1661	APM1844	694	APM1897	615
APM1736	225	APM1790	1272	APM1845	720	APM1899	1712
APM1737	909	APM1791	933	APM1846	661	APM1900	943
APM1738	1078	APM1792	812	APM1847	701	APM1901	1546
APM1739	984	APM1793	517	APM1848	595	APM1902	607
APM1741	679	APM1794	583	APM1849	1445	APM1903	513
APM1742	801	APM1795	627	APM1850	1140	APM1904	1908
APM1743	539	APM1796	534	APM1851	1792	APM1905	2207
APM1744	784	APM1797	530	APM1852	2101	APM1906	2143
APM1745	593	APM1798	1458	APM1853	1800	APM1907	2284
APM1746	553	APM1799	1041	APM1854	1873	APM1908	2356
APM1747	1103	APM1801	717	APM1855	1696	APM1909	814
APM1749	1474	APM1802	1871	APM1856	1920	APM1910	937
APM1750	1022	APM1803	2148	APM1857	2568	APM1911	1051
APM1751	1323	APM1804	1291	APM1858	1586	APM1912	450
APM1752	1459	APM1805	1846	APM1859	879	APM1913	477
APM1753	1629	APM1806	1678	APM1860	610	APM1914	535
APM1754	1516	APM1807	1578	APM1861	614	APM1915	1235
APM1755	2001	APM1809	855	APM1862	1363	APM1917	613
APM1756	1964	APM1810	987	APM1863	1126	APM1918	805
APM1757	1932	APM1811	1052	APM1864	621	APM1919	756
APM1758	337	APM1812	605	APM1865	646	APM1920	739
APM1759	587	APM1813	476	APM1866	1134	APM1921	716
APM1760	627	APM1814	854	APM1867	528	APM1922	677
APM1761	940	APM1815	1104	APM1868	507	APM1923	115
APM1762	810	APM1817	1130	APM1869	594	APM1925	838
APM1763	1195	APM1818	1283	APM1870	806	APM1926	617
APM1764	865	APM1819	677	APM1871	559	APM1927	875
APM1765	658	APM1820	503	APM1872	515	APM1928	1323

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM1929	819	APM1981	727	APM2034	1260	APM2084	1007
APM1930	623	APM1983	1265	APM2035	1558	APM2085	1082
APM1931	771	APM1984	873	APM2036	1227	APM2086	1173
APM1932	600	APM1985	1077	APM2037	1121	APM2087	1117
APM1933	1893	APM1986	1151	APM2038	1162	APM2088	1251
APM1934	1937	APM1987	1204	APM2039	1271	APM2089	1103
APM1935	1254	APM1988	1160	APM2040	1057	APM2091	729
APM1936	1245	APM1989	1060	APM2041	833	APM2092	701
APM1937	1065	APM1990	1186	APM2042	790	APM2093	810
APM1938	1240	APM1991	735	APM2043	874	APM2094	889
APM1939	1306	APM1992	1039	APM2044	638	APM2095	582
APM1941	590	APM1993	807	APM2045	614	APM2096	1013
APM1942	660	APM1994	774	APM2046	643	APM2097	670
APM1943	1155	APM1995	1044	APM2047	679	APM2099	1208
APM1944	608	APM1996	604	APM2048	682	APM2100	400
APM1945	673	APM1997	717	APM2049	1361	APM2101	559
APM1946	637	APM1999	1129	APM2050	1048	APM2102	1484
APM1947	873	APM2001	1304	APM2051	1597	APM2103	1850
APM1948	1186	APM2002	1180	APM2052	1173	APM2104	1230
APM1949	1111	APM2003	1666	APM2053	400	APM2105	2350
APM1950	1294	APM2004	1349	APM2054	1793	APM2106	1121
APM1951	2041	APM2005	1946	APM2055	1614	APM2107	2052
APM1952	1719	APM2006	1537	APM2056	1822	APM2109	988
APM1953	1381	APM2007	2077	APM2057	1687	APM2110	1223
APM1954	1970	APM2008	1863	APM2058	1939	APM2111	1054
APM1955	1624	APM2009	1172	APM2059	596	APM2112	761
APM1956	2237	APM2010	895	APM2060	633	APM2113	1099
APM1957	2085	APM2011	1187	APM2061	1186	APM2114	1173
APM1958	1973	APM2012	715	APM2062	1299	APM2115	1040
APM1959	935	APM2013	1249	APM2063	1155	APM2117	996
APM1960	593	APM2014	1438	APM2064	1057	APM2118	1224
APM1961	466	APM2015	1121	APM2065	1013	APM2119	193
APM1962	1233	APM2016	1181	APM2066	1420	APM2120	793
APM1963	1274	APM2017	1343	APM2067	977	APM2121	891
APM1964	1081	APM2018	920	APM2068	828	APM2122	836
APM1965	852	APM2019	1284	APM2069	1074	APM2123	709
APM1966	1455	APM2020	890	APM2070	1046	APM2124	1142
APM1967	708	APM2021	1031	APM2071	764	APM2125	763
APM1968	1346	APM2022	841	APM2072	689	APM2126	1131
APM1969	706	APM2023	595	APM2073	923	APM2127	1191
APM1970	775	APM2024	1634	APM2074	489	APM2128	733
APM1971	1102	APM2025	1202	APM2075	1258	APM2129	673
APM1972	762	APM2026	1167	APM2076	1416	APM2130	808
APM1973	886	APM2027	1113	APM2077	1345	APM2131	712
APM1975	797	APM2028	796	APM2078	854	APM2133	1787
APM1976	1275	APM2029	792	APM2079	634	APM2134	1307
APM1977	1257	APM2030	397	APM2080	657	APM2135	1000
APM1978	1342	APM2031	815	APM2081	681	APM2136	757
APM1979	374	APM2032	1212	APM2082	673	APM2137	1002
APM1980	762	APM2033	1153	APM2083	1106	APM2138	1014

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)	Filter ID	Mass (μg)
APM2139	996	APM2192	1071	APM2247	1174	APM2305	760
APM2141	919	APM2193	809	APM2249	1658	APM2306	1000
APM2142	1066	APM2194	611	APM2250	1423	APM2307	1299
APM2143	655	APM2195	645	APM2251	1652	APM2308	1671
APM2144	696	APM2196	850	APM2252	1200	APM2309	1171
APM2145	617	APM2197	765	APM2253	1707	APM2310	1420
APM2146	511	APM2198	1133	APM2254	1024	APM2311	949
APM2147	629	APM2199	1204	APM2255	1134	APM2313	1181
APM2149	819	APM2201	502	APM2257	1529	APM2314	1477
APM2150	1433	APM2202	1449	APM2258	1873	APM2315	1249
APM2151	1489	APM2203	1628	APM2259	1132	APM2316	1525
APM2152	1921	APM2204	1622	APM2260	1538	APM2317	1084
APM2153	1330	APM2205	854	APM2261	1057	APM2318	876
APM2154	1706	APM2206	1163	APM2262	1074	APM2319	744
APM2155	1956	APM2207	1710	APM2263	987	APM2320	1730
APM2156	2226	APM2209	1763	APM2265	1504	APM2321	1130
APM2157	1972	APM2210	1349	APM2266	1235	APM2322	974
APM2158	1579	APM2211	1003	APM2267	1003	APM2323	1308
APM2159	1060	APM2212	1912	APM2268	1158	APM2324	571
APM2160	1102	APM2213	1349	APM2269	1088	APM2325	1234
APM2161	544	APM2214	711	APM2270	1361	APM2326	772
APM2162	1213	APM2215	1490	APM2271	1028	APM2327	1055
APM2163	1125	APM2217	1123	APM2273	1019	APM2329	1099
APM2164	1085	APM2218	1371	APM2274	1496	APM2330	1545
APM2165	1019	APM2219	1344	APM2275	905	APM2331	1210
APM2167	1376	APM2220	1642	APM2276	1246	APM2332	1220
APM2168	818	APM2221	1147	APM2277	1355	APM2333	900
APM2169	968	APM2222	277	APM2278	895	APM2334	1329
APM2170	790	APM2223	1175	APM2279	311	APM2335	1275
APM2171	310	APM2224	1168	APM2281	1355	APM2336	964
APM2172	795	APM2225	1395	APM2282	1022	APM2337	1480
APM2173	951	APM2226	1897	APM2283	1554	APM2338	1313
APM2174	776	APM2227	1166	APM2284	1421	APM2339	838
APM2175	1171	APM2228	1288	APM2285	842	APM2340	436
APM2176	856	APM2229	994	APM2286	1095	APM2341	683
APM2177	1052	APM2230	1530	APM2287	986	APM2342	498
APM2178	753	APM2231	1100	APM2289	954	APM2343	701
APM2179	1090	APM2233	912	APM2290	633	APM2345	1111
APM2180	755	APM2234	1732	APM2291	1979	APM2346	1018
APM2181	611	APM2235	1087	APM2292	1149	APM2347	1192
APM2182	1462	APM2236	1474	APM2293	807	APM2348	1207
APM2183	1260	APM2237	1277	APM2294	1383	APM2349	1166
APM2184	1252	APM2238	1740	APM2295	1115	APM2350	834
APM2185	1213	APM2239	1123	APM2297	1330	APM2351	196
APM2186	1190	APM2241	690	APM2298	1397	APM2353	1692
APM2187	476	APM2242	1500	APM2299	1139	APM2354	1250
APM2188	1249	APM2243	1156	APM2300	1422	APM2355	1381
APM2189	1284	APM2244	1818	APM2301	634	APM2356	1698
APM2190	325	APM2245	341	APM2302	1144	APM2357	597
APM2191	867	APM2246	573	APM2303	1072	APM2358	1351

Filter Identification and Gravimetrically Determined Mass of the Fine Fraction of SRM 1649a on Filter

Filter ID	Mass (μg)
APM2359	577
APM2361	1347
APM2362	1372
APM2363	1033
APM2364	1068
APM2365	967
APM2366	677
APM2367	1063
APM2368	1304
APM2369	1199
APM2370	963
APM2371	1203
APM2372	1120
APM2373	1028
APM2374	950
APM2375	1344
APM2376	1000
APM2377	1657
APM2378	1835
APM2379	1025
APM2380	1270
APM2381	724
APM2382	702
APM2383	1191
APM2385	1285
APM2386	1429
APM2387	1098
APM2388	1201
APM2389	965
APM2390	829
APM2391	1512