

Apollo 15 Orbital Mass Spectrometer Data Output Scans Collection: Microfilm Scans

Collection Overview

This collection contains microfilm scans of formatted outputs of the full set of data acquired by the Apollo 15 Orbital Mass Spectrometer (OMS) from lunar orbit during 30 July to 7 August 1971. The mass ranges covered are 12-28 and 28-67 atomic mass units (amu). The scans are provided as multipage PDF/A files. Please note there is concern that much of the data are dominated by contamination from spacecraft and instrument outgassing (Hoffman, et al. 1972).

All the images in the six PDF/A files, a15_oms_mp*.pdf, are high-resolution, 400 dots-per-inch scans of formatted outputs of data that were imaged on five rolls of 16-millimeter microfilm. The microfilms are held at the NASA Space Science Data Coordinated Archive (NSSDCA) as data set PSPA-00322.

This collection includes copies of these public publications:

- "Chapter 19. Lunar Orbital Mass Spectrometer Experiment", from the Apollo 15 Preliminary Science Report, which describes the instrument and science goals and provides an early analysis of returned data, and
- "Chapter 29. Lunar Orbital Mass Spectrometer (NASA Experiment S-165)", from the Apollo Scientific Experiments Data Handbook, which provides the basic information necessary to decode the data in formatted outputs such as the description of the fields and the parsing technique of that data set.

Description of the OMS Formatted Data Outputs

The Orbital Mass Spectrometer Experiment on Apollo 15 consisted of a dual collector, single-focusing, sector-field spectrometer mounted at the end of a retractable boom that measured 7.3 meters when fully extended deployed from the Scientific Instrument Module on the Service Module. The two collectors simultaneously scanned two mass ranges, 12 to 28 amu (low-mass channel) and 28 to 67 amu (high-mass channel). This flight neutral mass spectrometer was designed to measure gas concentrations to study the sources, sinks, and transport mechanisms of the lunar ambient atmosphere from orbit. Pre-flight absolute calibration was performed at the Langley Research Center Molecular Beam Facility.

The original data set on 16-mm microfilm was supplied by the principal investigator, Dr. John H. Hoffman, and researcher C. Peters in late 1972. The microfilm records are formatted outputs of the data on magnetic tape. The format presents sequential pairs of mass spectra data tables (low- and high-mass channels) along with background, housekeeping, and calibration data as shown in Figures 1 and 2. Each sequential pair spans about one minute and two seconds. The next section of this document explain the contents of the low- and high-mass tables in more detail.

In addition, there are tabulated summaries of peak amplitudes from 12 to 67 amu at steps of 1 amu (Figure 3), trajectory data (Figure 4), and housekeeping measurements (Figure 5) as a function of ground elapsed time (GET). Each summary chart covers several hours of experiment operation. These tabulated summaries are printed after the corresponding set of sequential pairs of mass spectra output. The headings of these tables are explained in the Apollo Scientific Experiments Data Handbook, pages 29-7 to 29-11 and 29-16 to 29-18.

GET	TIME	APOLLO 15	24 OCTOBER 1972				DATA	C	FLAG	00000000	PBKG	BKG	N				
139	44 49	HIGH MASS	AO	-505.05	A1	34049.05	80	-56.91	B1	17189.58	DATA	C	SYMC	11000011	231	259	10
1	32	20	64	61	0	813	22	8	24	6	24	1	155	664			
2	40	22	95	25	3	1117	14	28	22	20	37	37	543	348			
3	140	34	223	17	31	1101	50	20	46	8	49	1231	256	256			
4	228	30	231	9	19	669	150	24	-7	8	21	1791	272	272			
5	172	30	143	33	47	293	206	40	34	28	29	3647	242	242			
6	56	16	71	15	43	89	254	28	18	-4	25	7359	256	256			
7	12	20	19	17	35	24	234	12	58	19	25	7679	250	250			
8	14	13	19	45	27	48	158	16	42	11	13	4031	260	260			
9	16	0	31	-4	9	24	82	44	46	27	29	679	244	244			
10	28	21	19	21	35	28	34	28	10	15	17	183	276	276			
11	60	21	19	33	11	40	10	16	50	11	33	59	268	268			
12	56	21	59	93	35	76	4	36	17	3	37	47	276	276			
13	35	53	267	101	22	132	4	28	29	23	41	19	250	250			
14	31	37	523	93	34	216	14	20	25	51	121	11	268	268			
15	27	25	603	73	18	420	10	28	25	11	273	31	256	256			
16	9	19	371	41	38	780	2	88	21	7	289	55	1872	1872			
17	9	13	147	25	18	1500	42	212	5	19	145	14	1872	1872			
18	55	19	39	8	70	3340	22	271	17	27	57	26	1856	1856			
19	63	15	27	24	106	5964	18	255	33	7	53	34	1856	1856			
20	95	1	27	16	162	7244	34	215	9	-16	33	34	1840	1840			
21	71	37	13	32	134	6348	18	139	25	0	33	10	1872	1872			
22	31	29	27	36	66	3692	70	79	21	3	25	38	1888	1888			
23	39	45	27	8	42	1260	205	31	33	43	1048320	30	1856	1856			
24	55	29	42	16	30	348	481	31	17	35	1048320	30	1856	1856			
25	21	19	46	28	30	88	713	23	-12	7	36	58	1872	1872			
26	13	9	78	60	6	52	745	11	-2	79	28	86	1872	1872			
27	39	29	70	84	30	68	617	47	9	183	28	254	1888	1888			
28	27	21	54	36	30	40	385	27	-4	290	12	534	1856	1856			
29	71	25	-1	32	30	11	153	39	21	626	60	542	1872	1872			
30	7	40	14	8	18	39	49	11	37	1346	20	270	1856	1856			
31	13	64	26	8	34	27	49	39	21	1234	48	90	1856	1856			
32	31	168	22	40	26	27	25	23	29	394	108	10	1856	1856			
33	43	168	30	12	42	59	33	11	29	86	296	22	1856	1856			
34	27	132	22	14	58	147	5	5	12	26	848	46	1856	1856			
35	26	68	18	4	93	467	29	31	36	14	1360	22	1856	1856			
36	82	56	38	20	121	795	9	7	20	22	1104	38	1856	1856			
37	50	20	90	20	97	971	29	35	24	10	472	30	1856	1856			
38	66	36	110	24	69	859	0	59	4	18	100	18	1856	1856			
39	20	28	82	36	29	555	25	35	12	26	28	21	1856	1856			
40	22	64	42	59	17	235	25	30	8	30	72	17	1856	1856			
41	34	196	38	35	25	99	37	46	-3	6	32	40	1856	1856			
42	26	580	-9	51	1	31	1	46	0	22	40	40	1856	1856			
43	18	684	18	19	13	35	25	38	8	-3	36	20	1856	1856			
44	26	468	26	13	41	19	45	10	0	30	20	20	1856	1856			
45	22	156	-3	7	21	31	72	10	8	70	23	23	1856	1856			
46	30	56	11	15	45	3	128	42	4	198	47	47	1856	1856			
47	46	20	-8	35	49	15	160	26	16	322	31	31	1856	1856			
48	12	10	17	3	29	19	176	14	36	282	59	59	1856	1856			
49	6	2	33	23	113	23	136	18	8	98	31	31	1856	1856			
50	-1	32	53	9	357	15	80	-1	4	25	75	75	1856	1856			
67	216 61	21*56	224 52	49 48	12*45	1113 42	242 39	250 37	32*33	36 30	273 28	7999	548*				
66	47 60	38*55	590 51	85 47	137 44	7216 41	737 38	24*36	5*32	1383 29	1338 27	548*					
65	63 59	24*54	59 50	71 46	94 43	956 40	159	35	24*31	304							
64	9*58	153 53	93 49	28*				34	28								
63	65*57	672															
62	11*																

Figure 2 - High-mass channel data of the sequential pair starting at GET 139:44:49. This sample is page 2609 of a15_oms_mp20067.pdf

		APOLLO 15 PEAK SUMMARY																								L	H
GET	TIME	SUN	HR	C	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26								
-139	44	49	14.0	0	962	97	543	847	11883	48280	46084	671	1378	0	115	0	24	67	256	8	259						
-139	45	51	11.2	0	1005	109	586	947	12653	48308	46211	732	1470	0	117	0	20	73	272	7	271						
-139	46	53	8.4	0	1061	124	628	1113	13561	48522	45152	797	1621	0	132	0	23	77	289	7	243						
-139	47	55	5.6	0	1112	136	686	1318	14522	48917	44217	815	1725	0	128	0	17	85	306	6	199						
-139	48	57	2.8	0	1172	140	772	1557	15491	48902	45526	962	1889	0	152	0	21	95	328	5	164						
-139	49	59	.0	0	1233	168	842	1863	16380	48971	45402	1064	2061	0	153	1	27	99	372	6	161						
-139	51	1	-2.9	0	1294	182	910	2213	17270	48305	44517	1131	2169	0	158	0	22	102	393	4	65						
-139	52	3	-5.7	0	1363	209	1002	2608	18216	48254	45263	1252	2329	8	176	0	27	107	438	3	25						
-139	53	5	-8.4	0	1409	225	1082	2996	18901	46657	44665	1336	2472	0	193	0	27	124	482	4	20						
-139	54	7	-11.5	0	1474	239	1151	3262	19481	47092	44765	1397	2592	0	190	0	28	131	522	5	17						
-139	55	8	-14.5	0	1504	264	1196	3487	19862	47638*	44110*	1483	2687	4	199	0	33	139	572	5	16						
-139	56	10	-17.5	0	1520	256	1199	3571	20099	47135	43894	1467	2771	0	201	0	30	138	588	4	15						
-139	57	12	-20.5	0	1556	279	1231	3614	20353	46988	43278	1492	2764	0	191	0	38	143	596	4	13						
-139	58	14	-23.5	0	1558	280	1239	3632	20453	47557	43702	1486	2789	0	203	0	41	153	620	4	13						
-139	59	16	-26.6	0	1580	273	1225	3573	20404	46806	43242	1494	2801	0	201	0	38	154	624	4	13						
-140	0	18	-29.7	0	1566	276	1195	3377	20328	47094	43970	1470	2801	8	195	0	35	154	618	3	11						
-140	1	20	-32.9	0	1525	268	1168	3200	20143	46520	43946	1408	2759	2	191	0	46	156	619	3	13						
-140	2	22	-36.1	0	1552	268	1128	3029	1986	47047	44215	1389	2667	0	188	0	37	153	593	3	12						
-140	3	24	-39.3	0	1511	254	1107	2763	19531	47197	43605	1332	2568	0	167	0	40	143	589	3	10						
-140	4	26	-42.6	0	1491	248	1046	2573	19060	46967	44362	1283	2493	5	174	0	41	141	573	4	9						
-140	5	28	-45.9	0	1466	238	995	2400	18817	47210	43803	1255	2491	0	173	0	39	143	548	3	10						
-140	6	30	-49.2	0	1435	218	956	2171	18223	46846	43935	1186	2348	4	180	0	41	142	523	3	9						
-140	7	32	-52.6	0	1379	215	917	2026	17808	47544	43840	1179	2306	0	171	0	34	135	516	3	8						
-140	8	34	-56.0	0	1322	202	886	1854	17220	48116	44184	1082	2166	0	172	0	41	141	505	3	8						
-140	9	36	-59.4	0	1322	206	855	1704	16638	48321	44186	2085	2150	2	158	0	41	131	508	3	6						
-140	10	38	-62.9	0	1302	191	818	1617	16249	50106	43212	1000	2042	0	121*	0*	40	135	496	3	5						
-140	11	40	-66.4	0	1254	190	781	1553	15737	49507	42484	946	1921	0	154	0	33	119	465	3	5						
-140	12	42	-69.9	0	1256	180	747	1475	15369	49978	42897	925	1836	0	151	0	37	128	453	3	7						
-140	13	44	-73.4	0	1205	175	735	1385	14916	47892	42810	880	1771	0	144	0	39	121	459	3	6						
-140	14	45	-76.9	0	1199	166	700	1327	14492	48497	42997	848	1724	1	139	0	35	110	440	4	5						
-140	15	47	-80.4	0	1170	178	688	1267	14163	47877	43348	834	1650	0	139	0	36	113	432	4	5						
-140	16	49	-83.9	0	1125	174	660	1218	13820	48199	43442	799	1604	0	134	0	27	111	419	5	8						
-140	17	51	-87.4	0	1111	164	655	1190	13059	47295	43213	785	1571	0	130	0	31	112	398	6	8						
-140	18	53	-90.9	0	1127	159	637	1166	13233	47636	42990	763	1521	0	130	0	30	114	397	8	11						
-140	19	55	-94.3	0	1109	153	637	1123	12930	47716	43132	754	1490	0	124	1	31	119	409	9	11						
-140	20	57	-97.7	0	1106	151	620	1099	12736	47436	43444	718	1445	0	122	0	30	109	389	15	20						
-140	21	59	-101.2	0	1095	151	613	1048	12586	47516	43239	719	1423	0	128	1	38	112	396	25	40						
-140	23	1	-104.5	0	1106	150	616	1049	12407	47874	43170	707	1376	0	123	0	37	104	388	46	129						
-140	24	3	-107.9	0	1060	137	616	1029	12277	47284	43763	686	1376	0	125	0	31	109	386	2	2						
-140	25	5	-111.2	0	1053	140	598	964	12007	46769	43038	685	1333	0	114	0	30	100	363	2	1						
-140	26	7	-114.6	0	1027	129	585	945	11677	46537	42186	653	1285	0	110	0	28	99	354	1	1						
-140	27	9	-117.7	0	1002	135	553	881	11386	46289	43510	657	1260	0	115	0	29	87	337	1	1						
-140	28	11	-120.9	0	988	126	537	853	11199	46735	42517	630	1236	0	106	0	28	97	330	1	1						
-140	29	13	-124.1	0	982	131	529	832	10877	46313	43256	611	1211	0	105	0	29	90	327	2	0						
-140	30	15	-127.2	0	967	123	518	804	10604	45823	43342	583	1144	0	108	0	25	86	306	1	1						
-140	31	17	-130.3	0	959	121	510	777	10435	45759	43362	582	1165	0	109	0	31	83	309	1	0						
-140	32	19	-133.4	0	927	118	503	749	10215	45388	43525	561	1115	0	107	0	29	81	300	1	1						
-140	33	21	-136.4	0	919	117	485	715	9995	45329	43613	543	1075	0	105	1	23	81	296	2	0						
-140	34	23	-139.4	0	929	114	460	703	9820	44824	43623	527	1064	0	99	0	28	82	286	1	1						
-140	35	24	-142.4	0	917	111	460	663	9597	44467	43555	528	1031	0	101	0	28	81	272	1	1						
-140	36	26	-145.3	0	900	107	452	655	9424	44182	43791	517	1007	0	96	0	22	81	272	1	1						

		APOLLO 15 PEAK SUMMARY																								L	H
GET	TIME	SUN	HR	C	55	56	57	58	59	60	61	62	63	64	65	66	67										
-139	44	49	14.0	0	590	224	672	153	24*	38*	21*	62	65*	9*	63	8	259										
-139	45	51	11.2	0	581	229	729	208	56*	42	44	23*	58	41*	85	37	213	7	271								
-139	46	53	8.4	0	587	236	708	204	59																		

APOLLO 15 TRAJECTORY SUMMARY													
GET TIME	REV	SUN HR	LONG	LAT	RADIUS	VELOCITY	ALTIITUDE	SS LONG	SS LAT	SUN A	SUN B	VEL ALPHA	VEL BETA
139 44 49	32.29	14.00	76.50	.59	1857.15	1.6193	122.17	62.51	.21	96.24	226.31	173.90	216.19
139 45 51	32.30	11.22	73.71	1.94	1856.85	1.6195	121.88	62.50	.21	93.11	226.53	173.91	219.38
139 46 53	32.30	8.42	70.91	3.28	1856.52	1.6198	121.55	62.49	.21	89.93	226.84	173.86	222.61
139 47 55	32.31	5.62	68.10	4.62	1856.16	1.6201	121.18	62.48	.21	86.96	227.15	173.92	224.02
139 48 57	32.32	2.81	65.28	5.95	1855.76	1.6205	120.78	62.47	.21	84.04	227.48	174.18	224.86
139 49 59	32.33	-.02	62.45	7.27	1855.33	1.6209	120.35	62.47	.21	81.08	227.20	174.32	225.70
139 51 1	32.33	-2.86	59.59	8.57	1854.86	1.6213	119.89	62.46	.21	78.07	227.80	174.41	226.46
139 52 3	32.34	-5.73	56.72	9.85	1854.37	1.6217	119.39	62.45	.21	75.03	228.26	174.47	226.12
139 53 5	32.35	-8.62	53.82	11.10	1853.84	1.6222	118.87	62.44	.21	71.96	228.45	174.49	224.83
139 54 7	32.36	-11.54	50.90	12.33	1853.29	1.6227	118.32	62.43	.21	68.86	228.10	174.49	223.04
139 55 8	32.37	-14.48	47.94	13.53	1852.72	1.6232	117.74	62.42	.21	65.70	227.86	174.43	221.99
139 56 10	32.38	-17.46	44.96	14.69	1852.12	1.6237	117.14	62.41	.21	62.46	227.68	174.29	221.99
139 57 12	32.38	-20.46	41.94	15.81	1851.49	1.6243	116.52	62.40	.21	59.18	227.59	174.09	222.90
139 58 14	32.39	-23.51	38.89	16.90	1850.85	1.6249	115.87	62.40	.21	55.85	227.64	173.86	222.07
139 59 16	32.40	-26.59	35.80	17.94	1850.19	1.6255	115.21	62.39	.21	52.53	227.86	173.62	221.35
140 0 18	32.41	-29.71	32.67	18.93	1849.51	1.6261	114.53	62.38	.21	49.35	228.30	173.51	217.78
140 1 20	32.42	-32.87	29.50	19.87	1848.82	1.6267	113.84	62.37	.21	46.39	228.85	173.61	216.20
140 2 22	32.43	-36.06	26.30	20.75	1848.11	1.6273	113.13	62.36	.21	43.52	229.31	173.85	216.74
140 3 24	32.44	-39.30	23.05	21.57	1847.39	1.6280	112.42	62.35	.21	40.59	229.97	174.01	217.15
140 4 26	32.45	-42.57	19.77	22.34	1846.67	1.6286	111.69	62.34	.21	37.61	230.87	174.12	217.54
140 5 28	32.45	-45.88	16.45	23.03	1845.93	1.6293	110.96	62.33	.21	34.61	231.96	174.21	218.12
140 6 30	32.46	-49.23	13.10	23.66	1845.20	1.6300	110.22	62.33	.21	31.60	233.29	174.27	218.76
140 7 32	32.47	-52.60	9.74	24.21	1844.46	1.6306	109.48	62.32	.21	28.55	234.91	174.28	219.34
140 8 34	32.48	-56.01	6.30	24.69	1843.72	1.6313	108.74	62.31	.21	25.46	236.96	174.23	219.84
140 9 36	32.49	-59.45	2.85	25.10	1842.98	1.6319	108.00	62.30	.21	22.37	239.44	174.14	220.18
140 10 38	32.50	-62.91	-.62	25.42	1842.24	1.6326	107.27	62.29	.21	19.30	242.90	174.02	220.18
140 11 40	32.51	-66.38	-4.10	25.66	1841.52	1.6332	106.54	62.28	.21	16.26	246.82	173.83	219.09
140 12 42	32.52	-69.88	-7.60	25.82	1840.80	1.6339	105.82	62.27	.21	13.30	252.67	173.58	218.16
140 13 44	32.53	-73.38	-11.11	25.90	1840.09	1.6345	105.11	62.26	.21	10.54	261.54	173.37	218.12
140 14 45	32.54	-76.88	-14.63	25.89	1839.39	1.6351	104.42	62.26	.21	8.40	273.93	173.52	218.54
140 15 47	32.55	-80.39	-18.14	25.80	1838.71	1.6357	103.74	62.25	.21	7.02	292.59	173.78	219.87
140 16 49	32.56	-83.89	-21.65	25.62	1838.05	1.6362	103.08	62.24	.21	6.48	316.79	173.97	218.12
140 17 51	32.57	-87.38	-25.15	25.37	1837.41	1.6368	102.43	62.23	.21	7.55	339.67	174.12	219.25
140 18 53	32.58	-90.86	-28.64	25.03	1836.79	1.6373	101.81	62.22	.21	9.36	356.28	174.22	219.93
140 19 55	32.59	-94.31	-32.10	24.60	1836.19	1.6379	101.21	62.21	.21	11.75	38.40	174.29	220.47
140 20 57	32.60	-97.75	-35.54	24.10	1835.61	1.6384	100.64	62.20	.21	14.46	13.86	174.31	220.87
140 21 59	32.61	-101.17	-38.93	23.53	1835.07	1.6388	100.09	62.19	.21	17.35	18.59	174.29	221.21
140 23 1	32.62	-104.53	-42.35	22.88	1834.55	1.6393	99.57	62.19	.21	21.11	17.22	174.22	221.75
140 24 3	32.63	-107.88	-45.70	22.15	1834.06	1.6397	99.09	62.18	.21	23.49	24.85	174.10	222.30
140 25 5	32.64	-111.19	-49.02	21.36	1833.61	1.6401	98.63	62.17	.21	26.70	27.05	173.94	222.67
140 26 7	32.65	-114.46	-52.30	20.51	1833.19	1.6404	98.21	62.16	.21	29.98	28.86	173.73	222.81
140 27 9	32.65	-117.70	-55.55	19.59	1832.80	1.6408	97.83	62.15	.21	33.24	30.27	173.59	222.10
140 28 11	32.66	-120.90	-58.76	18.62	1832.45	1.6411	97.48	62.14	.21	36.36	31.14	173.62	219.53
140 29 13	32.67	-124.07	-61.93	17.59	1832.14	1.6414	97.16	62.13	.21	39.54	31.33	173.58	216.32
140 30 15	32.68	-127.20	-65.07	16.51	1831.86	1.6416	96.89	62.12	.21	42.65	31.18	173.59	213.75
140 31 17	32.69	-130.29	-68.18	15.39	1831.63	1.6418	96.65	62.12	.21	45.50	31.37	173.84	213.83
140 32 19	32.70	-133.36	-71.25	14.22	1831.43	1.6420	96.46	62.11	.21	48.49	31.53	173.97	213.78
140 33 21	32.71	-136.39	-74.29	13.01	1831.28	1.6421	96.30	62.10	.21	51.53	31.65	174.06	213.64
140 34 23	32.71	-139.39	-77.30	11.77	1831.16	1.6422	96.19	62.09	.21	54.63	31.75	174.07	213.52
140 35 24	32.72	-142.36	-80.28	10.50	1831.09	1.6423	96.11	62.08	.21	57.79	31.89	174.04	213.65
140 36 26	32.73	-145.32	-83.24	9.20	1831.05	1.6424	96.08	62.07	.21	60.94	32.09	174.02	214.20

Figure 4 – Summary of trajectory data covering 139:44:49 to GET 140:37:28. This sample is page 2813 of a15_oms_mp20067.pdf.

APOLLO 15 HOUSEKEEPING SUMMARY																
GET TIME	+12	+ 5	-12	-15	EMISSION	FIL 1	FIL 2	LN HV	HM HV	S HV	ETEMP	STEMP	M LO/HI	D HI/LO	I	
139 44 49	3.92	2.45	2.94	4.67	2.75	.14	2.33	3.08	3.10	2.59	2.75	1.59	.02	2.59	1.51	
139 45 51	3.92	2.45	2.96	4.67	2.84	.14	3.12	3.06	3.10	1.96	2.75	1.59	.02	2.59	1.51	
139 46 53	3.90	2.49	2.94	4.67	2.75	.14	3.12	3.08	3.10	2.04	2.75	1.61	.02	2.61	1.53	
139 47 55	3.90	2.47	2.94	4.67	2.80	.12	3.10	3.08	3.12	2.16	2.76	1.59	.02	2.59	1.53	
139 48 57	3.90	2.45	2.94	4.67	2.86	.12	3.12	3.08	3.12	2.24	2.78	1.63	.02	2.59	1.51	
139 49 59	3.90	2.47	2.94	4.67	2.75	.12	3.12	3.08	3.12	2.31	2.76	1.65	.02	2.61	1.51	
139 51 1	3.90	2.47	2.94	4.67	2.76	.14	3.16	3.08	3.12	2.41	2.76	1.69	.02	2.61	1.51	
139 52 3	3.88	2.45	2.94	4.67	2.59	.16	3.12	3.08	3.12	2.41	2.78	1.67	.02	2.61	1.55	
139 53 5	3.90	2.47	2.94	4.67	2.71	.14	3.12	3.08	3.12	2.59	2.78	1.69	.02	2.61	1.55	
139 54 7	3.90	2.47	2.94	4.67	2.76	.12	3.12	3.08	3.10	1.96	2.80	1.71	.02	2.59	1.49	
139 55 8	3.90	2.45	2.94	4.67	2.80	.14	3.12	3.08	3.10	2.75	2.06	2.78	1.69	.02	2.59	1.55
139 56 10	3.92	2.47	2.94	4.67	2.82	.14	3.14	3.08	3.10	2.16	2.80	1.69	.02	2.59	1.53	
139 57 12	3.90	2.47	2.94	4.67	2.78	.12	3.12	3.08	3.12	2.22	2.80	1.71	.02	2.61	1.57	
139 58 14	3.90	2.47	2.94	4.67	2.78	.14	3.12	3.10	3.12	2.33	2.82	1.73	.02	2.59	1.53	
139 59 16	3.94	2.45	2.96	4.65	2.80	.14	3.14	3.08	3.10	2.82	1.73	1.73	.02	2.57	1.57	
140 0 18	3.90	2.45	2.96	4.67	2.80	.14	3.10	3.08	3.12	2.49	2.80	1.75	.02	2.59	1.55	
140 1 20	3.92	2.45	2.94	4.67	2.78	.14	3.14	3.08	3.12	2.59	2.82	1.75	.02	2.59	1.57	
140 2 22	3.90	2.45	2.94	4.65	2.82	.14	3.14	3.08	3.14	1.96	2.82	1.76	.02	2.61	1.55	
140 3 24	3.90	2.47	2.94	4.67	2.76	.14	3.12	3.08	3.12	2.04	2.84	1.78	.02	2.59	1.55	
140 4 26	3.90	2.47	2.94	4.67	2.76	.16	3.12	3.08	3.12	2.14	2.86	1.75	.02	2.59	1.55	
140 5 28	3.90	2.47	2.94	4.67	2.75	.14	3.14	3.08	3.12	2.24	2.86	1.76	.02	2.57	1.57	
140 6 30	3.92	2.47	2.92	4.67	2.80	.14	3.10	3.08	3.10	2.33	2.88	1.76	.04	2.59	1.59	
140 7 32	3.92	2.47	2.94	4.67	2.75	.14	3.14	3.08	3.10	2.41	2.86	1.76	.04	2.59	1.59	
140 8 34	3.92	2.47	2.96	4.67	2.84	.14	3.12	3.08	3.12	2.49	2.88	1.76	.02	2.61	1.61	
140 9 36	3.90	2.47	2.94	4.67	2.80	.12	3.12	3.08	3.12	2.59	2.88	1.78	.02	2.59	1.59	
140 10 38	3.90	2.45	2.94	4.67	2.71	.14	3.14	3.08	3.14	1.96	2.88	1.76	.02	2.59	1.59	
140 11 40	3.90	2.47	2.94	4.67	2.80	.14	3.14	3.08	3.12	2.06	2.90	1.78	.02	2.57	1.57	
140 12 42	3.90	2.45	2.96	4.67	2.73	.14	3.14	3.08	3.12	2.14						

Explanation of the Low- and High-Mass Data Tables, Conversion Coefficients, and Calibration

The first two lines of the high-mass table shown in Figure 2 give the GET (ground elapsed time), Apollo mission number, high or low mass designation, observation date, high mass coefficients, data synchronization flags, starting background count, ending background count, and number of data points used to calculate the background data. More details on these can be found in Chapter 29 of the Apollo Scientific Experiments Data Handbook. The first two lines of the low-mass table shown in Figure 1 are slightly different. It gives the GET and Apollo mission, but the coefficients identified as low-mass are actually the high mass coefficients. These are followed by other numbers, described in more detail in Chapter 29 of the Apollo Scientific Experiments Data Handbook.

For both the high- and low-mass case, starting with the third row, the data are organized in columns. The first column simply gives the row numbers. The second column gives the counts from voltage steps 1 to 50. Column 3 gives steps from 51-100, column 4 steps 101-150, etc., until column 13, which gives the readings from steps 551-590, the last measurement in the sequence.

The 590 steps cycle through the potential voltage, step 1 at 620 V to step 590 at 1560 V. Step 1 is the count for the highest mass measured (approx. 68 amu for the high-mass and 28 amu for the low-mass). Step 590 is the count for the lowest mass measured in each range (28 amu for high-mass, 16 amu for low-mass). Step number can be converted to the mass being measured for the high-mass case using the coefficients in the second row and the conversion equation:

and

$$\text{step\#} = A0 + A1/\text{mass (for steps 1-400)}$$

$$\text{step\#} = B0 + B1/\text{mass (for steps 401-590)}$$

For example, in the case given in Figure 2, the mass at step 300 would be: $300 = -505.05 + 34049.05/\text{mass}$, or $\text{mass} = 42.29$, so in this case the count of 15 measured at step 300 would apply to mass 42.29.

Unfortunately, an equation and coefficients are not given for the low-mass case. Assuming the low-mass conversion equation has the same form, and identifying known peaks in the data from the literature (Apollo 15 and 16 Preliminary Science Reports) we can roughly estimate the coefficients for the low-mass case as $A0 = -512$, $A1 = 14,616$, $B0 = -65$, and $B1 = 7440$. This would give for step 300 in Figure 1, equivalent to our example above:

$$300 = -512 + 14616/\text{mass}, \text{ or } \text{mass} = 18$$

The final column has background, calibration, and housekeeping numbers, see Yeager et al. (1973) for more details.

Data Quality

Please note there is concern that much of the data is dominated by contamination from spacecraft and instrument outgassing. See Hoffman, et al. (1972) for more details.

In the file a15_oms_mp20067.pdf, the formatted data outputs begin on page 99 and continue through page 1737, then begin again on page 1908 and continue through the last page, 3112. Pages 1738 through 1907 are remnant reports imbedded within this PDF file. Page 1738 has no header, but is part of a "REPORT D05291" that displays at the top of the next page 1739. This report which ends on page 1860 appears to be an inventory of electronic components and is a relic from the microfilm. Multiple similar reports and fragments follow, such as "REPORT D05297", "REPORT D05296", and "REPORT D05298", on pages 186 through 1907. The name "C. Peters" appears on page 1908 signaling that the FORTRAN code has begun for the next set of Apollo 15 OMS data. Although these remnants contribute nothing to the scientific value of the data, they were included in the PDF file

because the intent of this digitization effort was scan and archive the entire contents of the source microfilm reels.

Some frames on the microfilm were blurry which causes the corresponding pages in the PDF/A files to appear to be scans that were out of focus, which is not the case.

References

Apollo 15 Preliminary Science Report, NASA SP-289, published by NASA, Washington, D.C., 1972. (Available from the NASA Technical Reports Server (NTRS), <https://ntrs.nasa.gov/>)

Apollo Scientific Experiments Data Handbook, NASA Technical Memorandum X-58131, JSC-09166, published by NASA Johnson Space Center, Houston, Texas, August 1974 (revised April 1976). (Available from the NTRS, <https://ntrs.nasa.gov/>)

Hoffman, J. H., Lunar orbital mass spectrometer, International Journal of Mass Spectrometry and Ion Physics, Volume 8, Issue 4, pp. 403-416, 1972. (doi:10.1016/0020-7381(72)83026-2)

Hoffman, J. H., R. R. Hodges, Jr., and D. E. Evans, Lunar orbital mass spectrometer experiment, Lunar and Planetary Science Conference Proceedings, Volume 3, pp. 2205-2216, 1972. (Available from the NTRS, <https://ntrs.nasa.gov/>) Published Abstract: One of the Orbital Science experiments on Apollo 15 was a mass spectrometer designed to measure the composition and distribution of the lunar atmosphere. It operated for nearly 90 hours, producing spectra of an unexpectedly complex nature, indicating that many complex gas molecules exist in the vicinity of the spacecraft. The most plausible explanation is that there was continual vaporization of frozen or liquid drops of water, fuel, or other matter that had been ejected from the spacecraft with small relative velocity so that these particles remained in nearby orbits. The search for naturally occurring gases in these spectra involves a statistical analysis of the data which has not been completed to date. A theoretical prediction regarding the possibilities of detecting lunar volcanism from orbit is included.

Yeager, P. R., A. Smith, J. J. Jackson, and J. H. Hoffman, Absolute Calibration of Apollo Lunar Orbital Mass Spectrometer, Journal of Vacuum Science and Technology, Volume 10, pp. 348-354, 1973. (doi:10.1116/1.1317064) Published Abstract: Recent experiments were conducted in Langley Research Center's molecular beam system to perform an absolute calibration of the lunar orbital mass spectrometer which was flown on the Apollo 15 and 16 missions. Tests were performed with several models of the instrument using two test gases, argon and neon, in the 1 ntorr to .1 picotorr range. Sensitivity to argon at spacecraft orbital velocity was .00028 A/torr enabling partial pressures in the .01-picotorr range to be measured at the spacecraft altitude. Neon sensitivity was nearly a factor of 5 less. Test data support the feasibility of using the lunar orbital mass spectrometer as a tool to gather information about the lunar atmosphere.

Related Data Sets

The NSSDCA holds two data sets related to this collection: PSPA-00612 contains the original, high-resolution, 400 dots per inch, TIFF files (scans) of the formatted data outputs on microfilm; PSPA-00379 contains the full set of Apollo 15 Orbital Mass Spectrometer data on magnetic tape supplied by the principal investigator and used to generate the formatted outputs.

A similar orbital mass spectrometer was flown on Apollo 16. A set of scans of formatted data outputs from that experiment are archived in the NASA PDS as collection ID `urn:nasa:pds:a16oms:document_data_output_scans`.

Acknowledgements

This digitization (scanning) effort was performed by the NSSDCA and supported by NASA Lunar Advanced Science and Exploration Research (LASER) grant NNH11ZDA001N.

The NSSDCA provided this collection description.