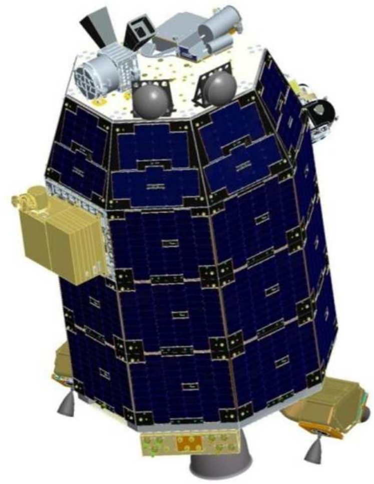

Lunar Atmosphere and Dust Environment Explorer

(LADEE)

(NMS PDS Software Interface Specification)

Mehdi Benna

(07/18/2014)

Ames Research Center
Moffett Field, California

National Aeronautics and Space Administration

This document is approved in accordance with LADEE Configuration Management Plan, C04.LADEE.CM, paragraph 3.6.1.1 Document Release Routing Approval Process.

Page three of this document contains the approved routed release of this document.

Approval Signatures

Mehdi Benna 08/13/2014

Dr. Mehdi Benna Date
Instrument Scientist, NMS

Paul Mahaffy
Digitally signed by Paul Mahaffy
DN: cn=Paul Mahaffy, o=NASA Goddard, ou=Code 699, email=Paul.R.Mahaffy@nasa.gov, c=US
Date: 2014.08.15 12:03:41 -05'00'

Dr. Paul Mahaffy Date
Principal Investigator, NMS

Digitally signed by Gregory T Delory
Date: 2014.08.15 13:06:26 -07'00' 08/15/2014

Dr. Greg Delory Date
LADEE Deputy Project Scientist

Reta Beebe
Digitally signed by Reta Beebe
DN: cn=Reta Beebe, o, ou, email=rbeebe@nmsu.edu, c=US
Date: 2014.08.18 09:08:03 -06'00'

Dr. Reta Beebe Date
PDS Atmospheres Node Manager

THOMAS MORGAN
Digitally signed by THOMAS MORGAN
DN: c=US, o=U.S. Government, ou=NASA, ou=People, cn=THOMAS MORGAN, 0.9.2342.19200300.100.1.1=thmorgan
Date: 2014.08.20 15:35:23 -04'00'

Dr. Tom Morgan Date
Project Manager, PDS

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Rev 1.0	First Release	Mehdi Benna	04/24/2013
Rev 1.1	Update of section 3.2.1	Mehdi Benna	04/30/2013
Rev 1.2	Minor edits (DAWG review)	Mehdi Benna	05/03/2013
Rev 1.3	Added file naming convention in 4.4	Mehdi Benna	05/14/2013
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Rev 1.7	Added Table for flight TIDs	Mehdi Benna	05/22/2014
Rev 1.8	Post PDS review updates	Mehdi Benna	07/18/2014

CONFIGURATION MANAGEMENT PLAN

This document is an LADEE Project Configuration Management (CM)-controlled document. Changes to this document require prior approval of the LADEE Project Manager. Proposed changes shall be submitted to the LADEE CM office along with supportive material justifying the proposed change. Changes to this document will be made by complete revision.

Questions or comments concerning this document should be addressed to:

LADEE Project Control Manager
Mail Stop 240-5
Ames Research Center
Moffett Field, California 94035

ACRONYMS

ATM	Planetary Atmospheres Node
C&DH	Command and Data Handling
DAC	Digital to Analogue Converter
DAWG	Data and Archives Working Group
DMAP	Data Management and Archive Plan
EOM	End of (LADEE) Mission
GSFC	Goddard Space Flight Center
ICD	Interface Control Document
I&T	Integration and Testing
INMS	Ion and Neutral Gas Mass Spectrometer
LADEE	Lunar Atmosphere and Dust Environment Explorer
LLCD	Lunar Laser Communication Demonstrator
NMS	Neutral Mass Spectrometer
NGIMS	Neutral Gas and Ion Mass Spectrometer
OLAF	Online Archive Facility
PDS	Planetary Data System
RF	Radio Frequency
SIS	Software Interface Specification
SQL	Structured Query Language
SOC	Science Operation Center
TBD	To Be Determined

1. INTRODUCTION

1.1 Purpose and Scope

This document describes the format and the content of the Neutral Mass Spectrometer (NMS) products as archived in the Planetary Atmospheres Discipline Node (ATM) of the Planetary Data System (PDS). The data products stored in PDS are a subset of the holdings of the NMS team database at NASA's Goddard Space Flight Center (GSFC).

This SIS is intended to provide enough information to enable users to read and understand the NMS data products as stored in PDS. The users for whom this SIS is intended are software developers of the programs used in generating the NMS products and scientists who will analyze the data, including those associated with the LADEE mission and those in the general lunar science community.

1.2 Contents

NMS is an instrument on the LADEE spacecraft designed to analyze the composition of the lunar exosphere (neutrals and ions) during the mission. This Data Product SIS describes how the NMS instrument acquires its data and how the data are processed.

1.3 Applicable Documents and Constraints

1. Planetary Data System Standards Reference, JPL D-7669 part 2, version 4.0.6, October 8, 2012.
2. Planetary Data System Archive Preparation Guide, JPL D-31224, version 1.4, April 1, 2010.
3. LADEE Project Data Management and Archive Plan, version 2.2, May, 2011.
4. LADEE NMS PDS Interface Control Document, version 1.3 June 24, 2013.
5. LADEE NMS Reference Document, version 1.0, March 01, 2014.

1.4 Relationships with Other Interfaces

The NMS data products are stored on multiple data servers of GSFC. The master copy stored in an SQL (Structured Query Language) relational database for rapid instrument

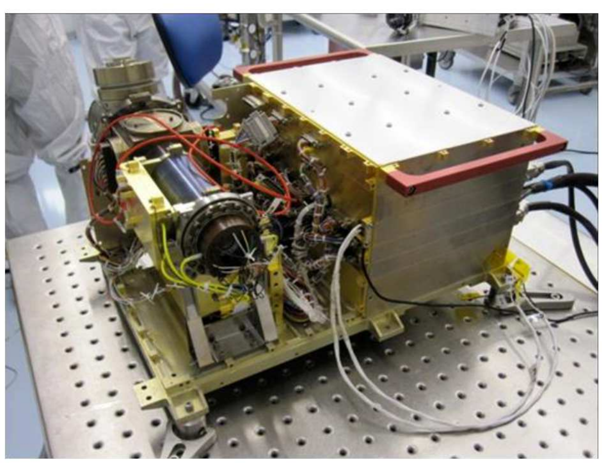

Figure 1: The LADEE NMS Instrument during Integration and Testing (I&T).

team access will be used by the NMS science team to retrieve and process data for delivery to PDS as described by the LADEE NMS PDS Interface Control Document.

2. MANAGEMENT AND OVERSIGHT

Data will be produced by the NMS science team for submission to PDS. Data delivered to PDS will be managed and verified according to the LADEE NMS PDS Interface Control Document and the PDS Standards Reference.

3. DATA PRODUCT CHARACTERISTICS AND ENVIRONMENT

3.1 Instrument Overview

The LADEE Neutral Mass Spectrometer (NMS) is a high sensitivity quadrupole mass spectrometer with a mass range of 2 to 150 Dalton and unit mass resolution (Figure 1). The sensor of the NMS instrument is the upgraded engineering unit of the Neutral Gas and Ion Mass Spectrometer (NGIMS) developed for the CONTOUR mission [1]. This mass spectrometer is similar to the CASSINI Ion and Neutral Mass Spectrometer (INMS) designed and developed at GSFC [2].The LADEE NMS instrument was modified from the heritage CONTOUR NGIMS instrument to increase the instrument sensitivity, field of view and overall operational flexibility.

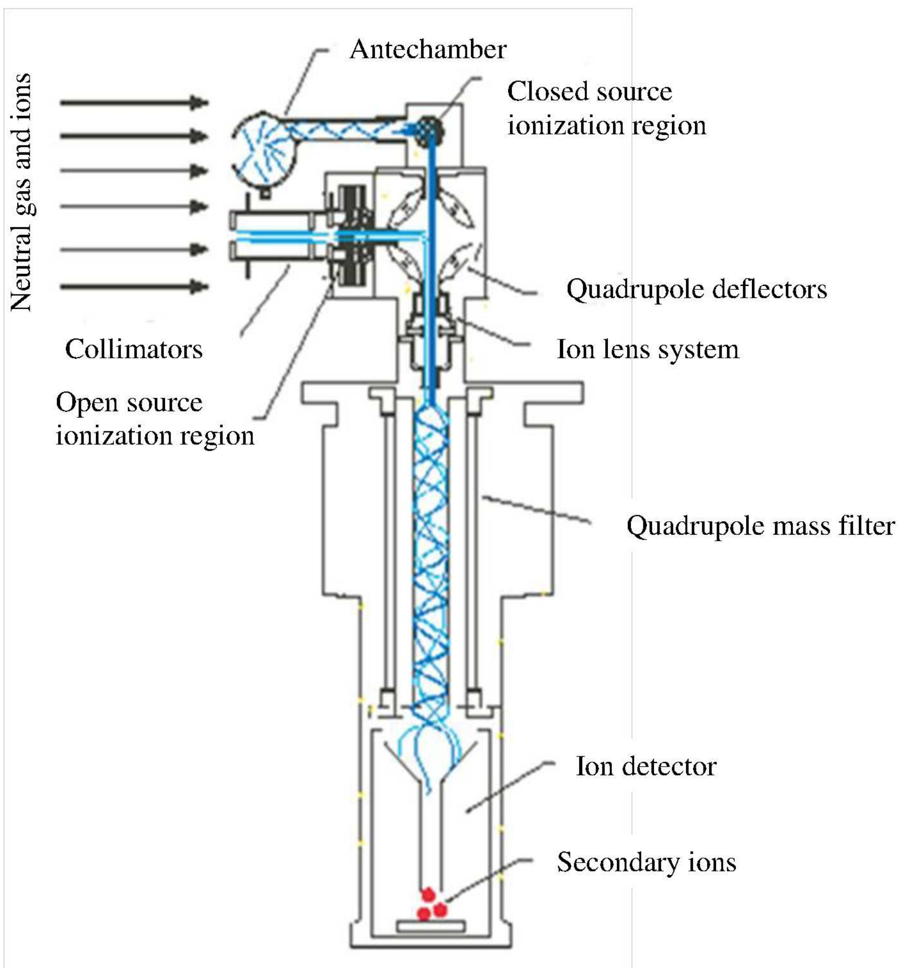

Figure 2: Schematics illustrating the principal components of the NMS sensor.

The NMS sensor consists of:
- two separate ion sources for sampling ambient neutrals and ions,
- four ion collimators
- four hot-filament electron guns,
- an electrostatic quadrupole switching lens that selects between the sources,
- various focusing lenses,
- a quadrupole mass analyzer, and
- two secondary electron multiplier (SEM) detectors.

The instrument control is provided by the Command and Data Handling (C&DH) unit, according to the instructions given to a user defined script. The C&DH and all the related electronics boards are packaged together. A sketch of the key NMS components is shown in Figure 2, and the primary instrument parameters are listed in Table – 1. Detailed information about the instrument is provided in the LADEE NMS Reference Document.

3.1.1 Gas sampling system

The NMS instrument uses two separate gas sampling systems (also referred to as ion sources), a closed source and an open source in order to optimize interpretation of the neutral species (Figure 3).

In the closed source mode, the ram pressure of the inflowing gas creates a density enhancement in the source antechamber, allowing the sampled species to be measured with relatively high precision and sensitivity. This mode will be used to measure species, such as He and Ar, which do not react with the antechamber surfaces.

Table – 1: Key NMS parameters

NMS Instrument Parameters	
Neutral gas sampling systems	1. Closed source (non wall reactive species) 2. Open source (wall reactive species)
Ion sampling system	Thermal and suprathermal positive ions
Source switching system	Electrostatic quadrupole deflector
Field of view	1. Closed source: 2 π steradians 2. Open source 10° cone half angle
Neutral mode ionization sources	Electron impact ionization with redundant filaments 1. Closed source: 200 µA and 70eV 2. Open source: 200 µA and 70eV
Mass analyzer	Quadrupole mass filter; 0.508 cm field radius, 15 cm rod length; Radio frequencies: 1.43 and 3.10 MHz
Mass range	2 – 150 Daltons and a unit mass resolution
Scan modes	1. Survey: scan mass range in 0.1 Datons steps 2. Adaptive mode: select mass values
Crosstalk	10^{-6} for adjacent masses
Detector system	Two secondary electron multiplier detectors operating in pulse counting mode (detector noise <1 count per min) Dynamic range ~ 10^8
Data rate	Integration period from 27 ms to 250 ms with a 3 ms setup time per period.

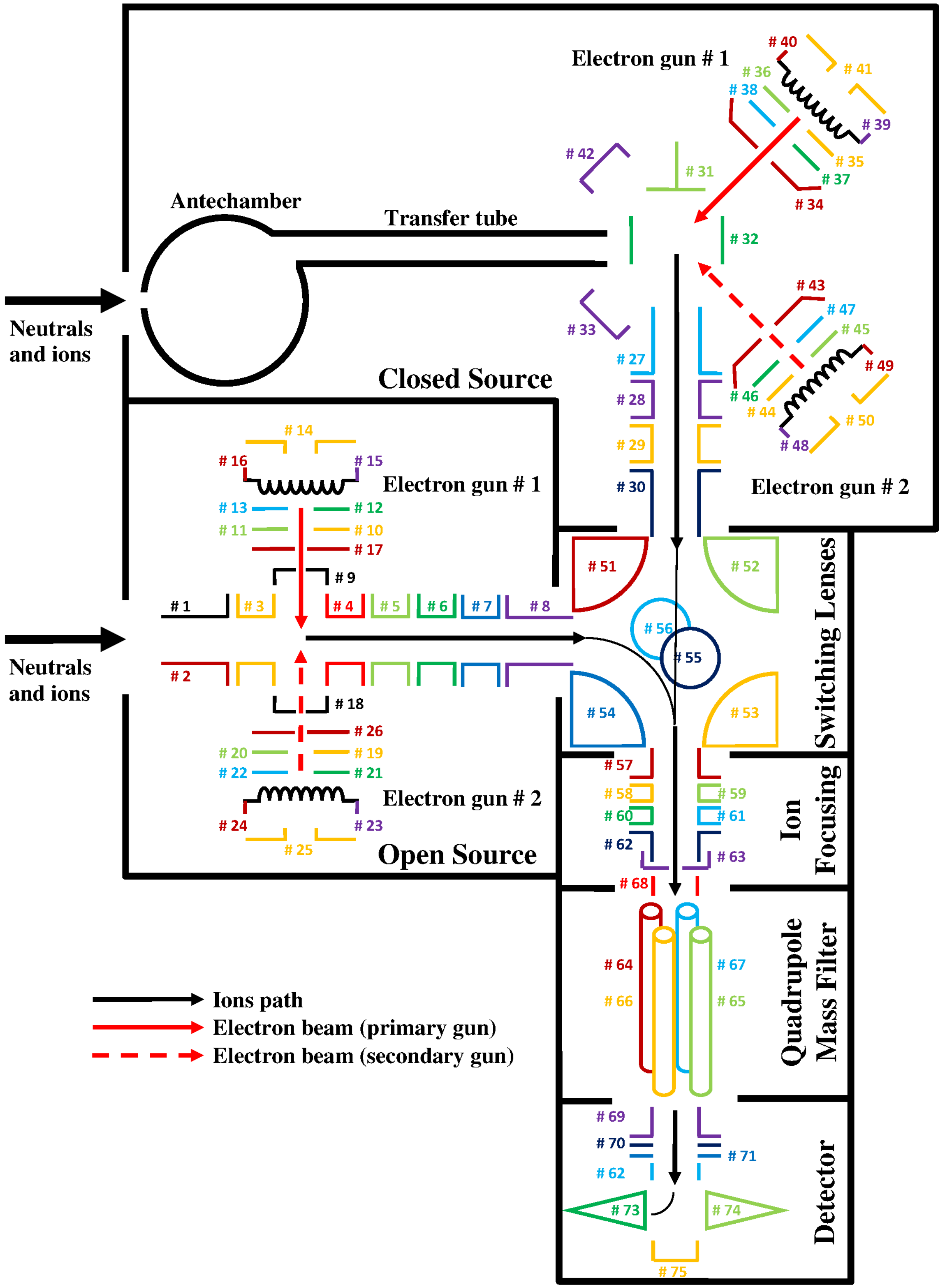

Figure 3: Schematics of NMS electrostatic elements. Table 3 provides the related nomenclature.

The open source has the advantage that it can measure reactive neutral radicals, such as atomic oxygen, and ions. In this mode, the ambient neutral gas density is sampled directly with no stagnation enhancement and no collisions with the surfaces of the instrument. For open source ion measurements, the NMS angular response can be increased beyond the geometric view cone by adjusting the voltages on the ion collimator lenses. For neutral sampling in the open source mode, the ion collimator lenses and the repeller lens remove incoming ions and electrons, which could cause spurious ionization of neutral species, and allow only neutrals to pass into the ionization region.

3.1.2 Ion Optics

In both closed and open source modes, impacting electrons emitted from the hot-filament electron guns ionize the sampled neutrals. Electrostatic lenses are used to focus the ambient ions and those created from ambient neutrals by electron impact into the quadrupole switching lens (Mahaffy and Lai, 1990), an electrostatic device that steers ions from either the closed or open source through a system of focusing lenses into a dual radio frequency (RF) quadrupole mass analyzer.

3.1.3 Mass Analyzer

The mass analyzer selectively filters the ions according to their mass-to-charge ratio using a set of 4 hyperbolic rods excited with a RF wave form.

Two opposing potentials of the form $U_{DC} + U_{AC}\cos(2\pi f t)$ drive each pair of rods (Figure 4). Ions with the appropriate ratio of mass to charge achieve stable trajectories while the rest of the ions diverge and end up impacting the rods.

During a mass scan the absolute values of U_{DC} and U_{AC} are increased while the ratio U_{DC}/U_{AC} is kept constant. The DC and AC potentials are calculated for the given target mass as:

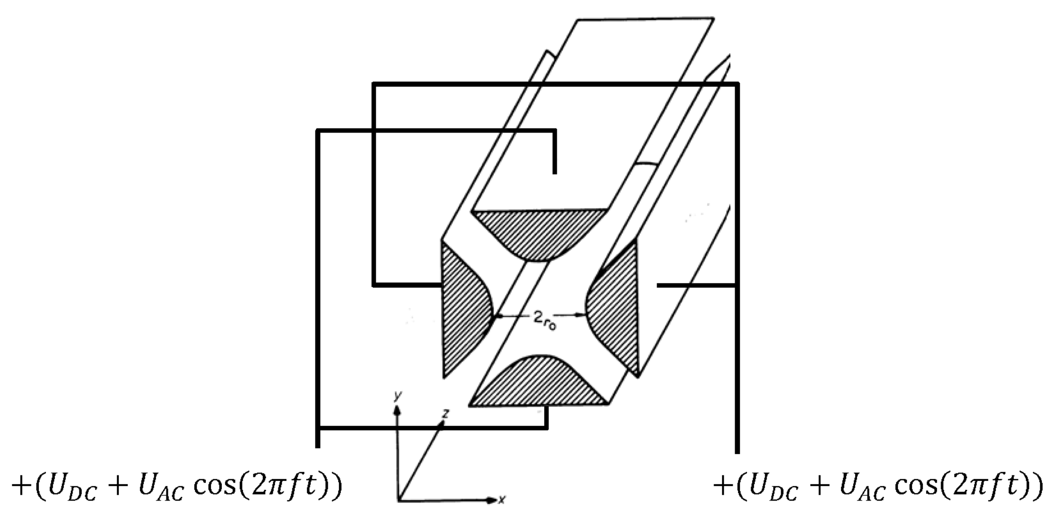

Figure 4: Quadrupole mass filter and driving RF potentials.

$$U_{DC} = \frac{m\, r_0^2\, \pi^2\, f^2\, a}{2\, e}$$

$$U_{AC} = \frac{m\, r_0^2\, \pi^2\, f^2\, q}{e}$$

Where m is the mass of the targeted ion, r_0 is the hyperbolic rods radius, f the RF frequency, and e the electron charge. $a \approx 0.23699$ and $q \approx 0.7060$ are constants that drive the mass resolution of the analyzer.

In order to cover the mass range of 2 to 150 Da while keeping the voltages relatively low, the RF frequency is switched from $f_1 = 1.43\, MHz$ to $f_2 = 3.10\, MHz$ at mass $m = 21\, Da$.

When the NMS is operating in the open source mode, a quadrupole bias voltage U_{QB} is added to the DC voltage applied to the RF mass analyzer rods to slow down incoming ions and increase their residence time in the analyzer's RF field.

3.1.4 Detectors

Ions exiting the quadrupole mass filter are directed toward one of the two redundant secondary electron multipliers for detection. During nominal operations only one detector is used at a given time. The multipliers are associated electrodes electronically biased such that most of the ions are deflected into one of the detectors. Charge pulses at the anode of the multiplier are amplified and counted. The detection threshold is determined by the background noise in the multiplier (approximately one count per minute). The upper count rate of each detector system is about 10 MHz, limited by the product of the multiplier pulse width and gain bandwidth of the pulse amplifier of the counting system. There is a non-linear response that occurs in the range of 1–10 MHz and needs to be accounted for.

3.1.5 Instrument Accommodation on the LADEE spacecraft

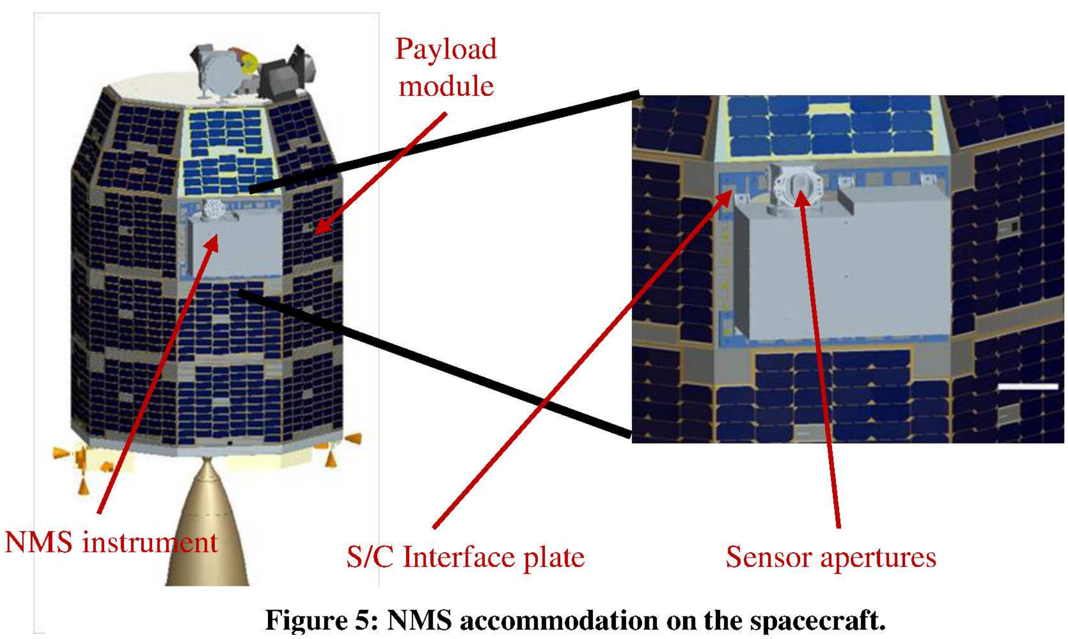

Figure 5: NMS accommodation on the spacecraft.

The NMS instrument is mounted on the Payload Module (Figure 5) on the opposite panel from the Lunar Laser Communication Demonstrator (LLCD). The outward normal to both the open and closed source INMS apertures lies in the spacecraft -X direction. The instrument apertures are directed toward the nominal spacecraft motion direction with a clear field of view of any spacecraft structure in order to avoid any induced contamination (from spacecraft structure or thrusters firing).

3.1.6 Instrument Calibration

NMS was designed, built and tested at the Planetary Environment Laboratory (Code 699) of NASA's Goddard Space Flight Center (GSFC). During I&T, the NMS instrument was mounted on a vacuum chamber in order to characterize its sensitivity for a set of gases and gas mixes in static pressure. Ion calibration was also conducted using an ion beam set up. However, no calibration data were obtained with a neutral beam. Detailed descriptions of the calibration procedure and calibration results are provided in the current version of the NMS calibration report included in the NMS bundle.

3.2 Data Products

This document uses the LADEE data definitions for all products. These data have been reviewed and accepted by PDS to comply with PDS4 standards. NMS will deliver both raw and calibrated data to PDS as defined in the LADEE definitions table, Table – 2, and delineated in Table – 3.

3.2.1 NMS Product Definitions

All NMS products delivered to the PDS are in "spreadsheet" format with comma-delimited columns or as ASCII text files. These products are described in Table – 3. Deliveries will be made to PDS in accordance with the schedule defined in the LADEE NMS PDS Interface Control Document.

3.2.2 Data Product Detailed Description and Format

Data generated by the NMS instrument will be organized in products according to their processing state and will adhere to the nomenclature of product definition set by the LADEE project (Table – 2).

The NMS pipeline processes the Packet Data (binary files as generated by the instrument) to generate the Raw, and Calibrated products that will be archived at the PDS (Table – 3).

The Packet Data will be separated by telemetry channel (Housekeeping, Science and Instrument Log) and converted to ASCII to generate the Raw Housekeeping, the Raw Science and the Message Log. These data will be checked for anomalies and will be time-stamped. The Housekeeping units will be expressed in engineering units (Volts and Digital Numbers) when applicable.

Then, the Raw Science will be corrected for detector response (dead time correction) and the Raw Housekeeping will be converted to scientific units (physical unit corresponding to the measurement being made: for example deg C for Temp, A for current or emission, and V for voltage monitor circuits) when applicable.

Table – 2: LADEE Data Processing Levels

Product	Product Description	Relevant to NMS
Packet Data	Telemetry data stream as received at the ground station, with science and engineering data embedded.	X
Raw	Original data from an instrument. If compression, reformatting, packetization or other translation has been applied to facilitate data transmission or storage, those processes will be reversed so that the archived data are in a PDS approved archive format.	X
Reduced	Data that have been processed beyond the raw stage but which are not yet entirely independent of the instrument.	
Calibrated	Data converted to physical units entirely independent of the instrument.	X
Derived	Results that have been distilled from one or more calibrated data products (for example, maps, gravity or magnetic fields, or ring particle size distributions). Supplementary data, such as calibration tables or tables of viewing geometry, used to interpret observational data should also be classified as derived data if not easily matched to one of the other three categories	

These data will be checked for anomalies and the time-stamp will be corrected for any offset between the instrument and spacecraft clocks. This process will yield Calibrated Housekeeping and Calibrated Science ASCII files. Unlike other instruments of the LADEE mission, the NMS instrument does not generate or use data at the reduced level.

Table – 3: Data Definitions for NMS.

Product Name	Description	Estimated Size (B = Bytes)	Type	File label
Calibration Housekeeping	Instrument housekeeping packets	6000 KB	Raw ground calibration	gnd_hk
Calibration Science	Instrument science packets	600 KB	Raw ground calibration	gnd _sci
Calibration Message Log	Instrument message log	10 KB	Raw ground calibration	gnd _msg
Calibration Markers	Instrument markers	10 KB	Raw ground calibration	gnd _mkr
Raw Housekeeping	Instrument housekeeping packets	6000 KB	Raw flight	raw_hk
Raw Science	Instrument science packets	600 KB	Raw flight	raw_sci
Raw Message Log	Instrument message log	10 KB	Raw flight	raw_msg
Raw Markers	Instrument markers	10 KB	Raw flight	raw_mkr
Calibrated Housekeeping	Instrument housekeeping packets	6000 KB	Calibrated flight	cal_hk
Calibrated Science	Instrument science packets	600 KB	Calibrated flight	cal_sci
Calibrated Message Log	Instrument message log	10 KB	Calibrated flight	cal_msg
Calibrated Markers	Instrument markers	10 KB	Calibrated flight	cal_mkr

Section 8 provides detailed information about the formats and content descriptions of the archived data products.

3.2.3 Data Products Generation

All data products and associated documentation will be generated by the NMS team. The PDS Planetary Atmospheres Discipline Node will assist in the definition and development of first delivery products and their associated PDS documentation, which will act as templates for subsequent updates. When new products are developed by the NMS team, PDS Planetary Atmospheres Discipline Node will likewise assist in the definition and development of those products and their associated PDS documentation in preparation for their initial delivery.

3.2.4 Data Validation

Data content validation will be performed by the NMS science team prior to delivery to PDS. Data structure and format will be performed by the NMS science team and the PDS data review team as described in Section 4.3.

4. ARCHIVE VOLUMES

4.1 Generation

The NMS Data Product Archive Collection and its updates are produced by the NMS Instrument Team in cooperation with the Planetary Atmospheres Discipline Node (ATM) of PDS. The Archive Collection will include data acquired during calibration, commissioning, and science phases.

The Planetary Atmospheres Discipline Node and NMS will collaborate to design the PDS documentation files associated with the initial data delivery by the NMS team. All data formats are based on the Planetary Data System standards as documented in the PDS Standards Reference.

4.2 Data Transfer

The NMS team will submit data to PDS as a tarred-gzipped bundle via ftp to the Atmospheres Node. Details will be worked out through further testing between NMS and ATM.

4.3 Review and Revision

The Planetary Atmospheres Discipline Node is responsible for organizing the Peer Review of the NMS data sets, according to PDS policy. The Peer Review Committee will include a small number of scientists, selected by ATM and from outside the NMS Team, who have an interest in the anticipated data products. The Peer Review committee will also include NMS Team members and PDS representatives.

For NMS there will be a pre-launch review approximately 6 months from start of operations. This review will contain sample data and documentation in the format of the final archived data set. This sample data will be produced by the flight instrument pre-launch and will differ in the final data set only in specific values and size. Data format and archive method will be the equivalent.

After the start of operations, when generation of products has begun, each individual product will be validated to see that it conforms to the design specified in the SIS..

4.4 Data Volume Architecture

The complete set of LADEE NMS data will be archived in PDS in a single bundle in the PDS4 standard. In the outline below, each .csv, .txt, and .pdf file is assumed to have an

.xml label file with the same filename base, which is not mentioned in the outline. Labels for other types of files are mentioned explicitly.

With the exception of the sample bundle provided by the NMS team to the PDS for the purpose of review and validation, all data files are named following the convention:

nms_ [file_label]_[tid]_[yyyy][mm][dd]_[hh][mm][ss].[ext]

The product's *[file_label]* parameter reflects the type of data contained in the according to the nomenclature shown in Table – 3. The *[tid]* parameter is a 5-digit integer that uniquely identifies the executed script associated with the product. The time tag parameters *[yyyy]*, *[mm]*, *[dd]*, *[hh]*, *[mm]* and *[ss]* are respectively the numerical value of year, month, day, hours, minutes and seconds UTC when the data started to be collected by the instrument. The file extension *[ext]* captures the file type (pdf, csv, txt, tab, xml, etc.). As an example the file nms_cal_hk__36467_20140128_002112.csv is a csv file containing calibrated housekeeping data that were collected in orbit by the NMS instrument starting from 00:21:12 UTC on Jan 28th 2014 under the activity identifier 36467. Each data set (TID) that was acquired during the calibration or flight portion of the mission can be directly linked to a unique script that was executed on the instrument. The list of scripts that were executed during the mission is given in Appendix 8.5. The full list of TIDs acquired by the instrument and available in this archive is provided in in Appendix 8.6.

Root Level of NMS Bundle
Bundle label, including inventory for the bundle (bundle_ladee_nms.xml)
Bundle table of contents (readme.txt)

Context Collection – contains mission, spacecraft, instrument, and other context objects. These context objects refer to the full descriptions in the document collection.

/context
    Inventory of context collection (collection_nms_context_inventory.tab)
    Inventory of context object (collection_nms_context.xml)

Ground Calibration Data Collection – contains all the raw data products and their labels that were acquired during LADEE NMS pre-launch integration and testing. This data is used to define the calibration constants for flight data.

/calibration (contains all the ground calibration products organized by years and months)

    Inventory of the data collection (collection_nms_calibration_inventory.csv)
    Raw calibration housekeeping data tables (file_name.csv)
    Raw calibration science data tables (file_name.csv)
    Raw calibration message logs (file_name.txt)
    Raw calibration marker files (file_name.txt)

Data Raw Collection – contains the raw data products and their labels that were acquired during flight.

/data_raw (contains all the flight raw products organized by years and months)

Inventory of the raw data collection (collection_nms_data_raw_inventory.csv)
Raw housekeeping data tables (file_name.csv)
Raw science data tables (file_name.csv)
Raw message logs (file_name.txt)
Raw marker files (file_name.txt)

Data Calibrated Collection – contains the calibrated data products and their labels that were acquired during flight.

/data_calibrated (contains all the flight calibrated products organized by years and months)

Inventory of the calibrated data collection (collection_nms_data_calibrated_inventory.csv)
Calibrated housekeeping data tables (file_name.csv)
Calibrated science data tables (file_name.csv)
Calibrated message logs (file_name.txt)
Calibrated marker files (file_name.txt)

Document Collection – contains documents relevant to the bundle

/document

Inventory of the document collection (collection_nms_document_inventory.csv)
NMS instrument reference document (nms_ref_document.pdf)
LADEE NMS SIS (nms_pds_sis.pdf)
NMS flight TID list (nms_flight_tids.pdf)

Schema Collection – contains the schemas used in the bundle

/xml_schema

Inventory of the schema collection (collection_nms_xml_schema_inventory.tab)

5. ARCHIVE RELEASE SCHEDULE

Figure 6 shows the delivery schedule in reference to the mission timeline. Three months from EOM, the final dataset with liens resolved will be delivered.

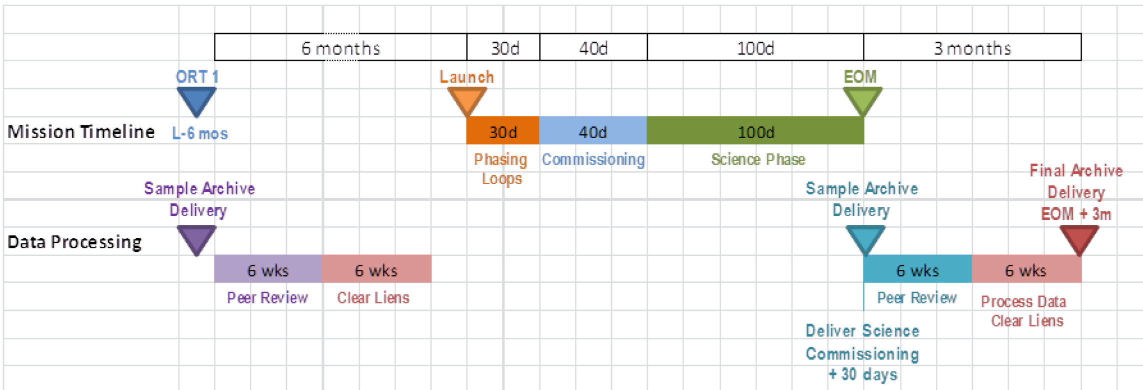

Figure 6: Data processing timeline against mission events and milestones.

6. COGNIZANT PERSONS

Table – 4: Cognizant Persons for NMS PDS Data

NMS Team		
Principal Investigator, **Dr. Paul Mahaffy**	Planetary Environment Laboratory NASA Goddard Space Flight Center Code 699 8800 Greenbelt road Greenbelt, MD 20771	301 614-6379 Paul.mahaffy@nasa.gov
NMS Scientist **Dr. Mehdi Benna**	Planetary Environment Laboratory NASA Goddard Space Flight Center Code 699 8800 Greenbelt road Greenbelt, MD 20771	301 614-6392 mehdi.benna@nasa.gov
NMS Scientist **Dr. Richard Hodges**		301 614-6392 hodges@lasp.colorado.edu
NMS Calibration Engineer **Mr. Eric Raeen**	Planetary Environment Laboratory NASA Goddard Space Flight Center Code 699 8800 Greenbelt road Greenbelt, MD 20771	301 614-6363 eric.raeen@nasa.gov
NMS Archive Engineer **Mr. Eric Lyness**	Planetary Environment Laboratory NASA Goddard Space Flight Center Code 699 8800 Greenbelt road Greenbelt, MD 20771	301 614-6090 Eric.Lyness@nasa.gov
PDS Planetary Atmospheres Data Node		
PDS Atmospheres Node Manager **Dr. Reta Beebe**	Astronomy Department New Mexico State University P.O. Box 30001, MSC 4500 Las Cruces, NM 88003	575 646-1938 rbeebe@nmsu.edu
PDS Atmospheres Archive Manage **Mr. Lyle Huber**	Astronomy Department New Mexico State University P.O. Box 30001, MSC 4500 Las Cruces, NM 88003	575 646-1862 lhuber@nmsu.edu

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[2] Waite, J. H.; Lewis, W. S.; Kasprzak, W. T.; Anicich, V. G.; Block, B. P.; Cravens, T. E.; Fletcher, G. G.; Ip, W.-H.; Luhmann, J. G.; McNutt, R. L.; Niemann, H. B.; Parejko, J. K.; Richards, J. E.; Thorpe, R. L.; Walter, E. M.; Yelle, R. V. (2004), The Cassini Ion and Neutral Mass Spectrometer (INMS) Investigation, Space Science Reviews, Volume 114, Issue 1-4, pp. 113-231.

8. APPENDICES

8.1 NMS Electrodes Designation

Table A-1: NMS Electrode list and designation (see Figure 3)

Lens #	Designation	Abbreviation	Min Potential (V)	Max Potential (V)
Open Source (OS) Sub Assembly				
1	OS Collimator (a) (Split)	OS_COLa	-150	150
2	OS Collimator (b) (Split)	OS_COLb	-150	150
3	OS Lens 1	OS_OL1	-10	10
4	OS Lens 2	OS_OL2	-10	10
5	OS Lens 3	OS_OL3	-150	150
6	OS Lens 4	OS_OL4	-300	0
7	OS Lens 5	OS_OL5	-900	100
8	OS Nozzle	OS_OL6	-900	100
9	OS Electron Restrictor 1	OS_RES1	-150	150
10	OS Electron Deflector 1 (c)	OS_EF1c	-100	0
11	OS Electron Deflector 1 (d)	OS_EF1d	-100	0
12	OS Electron Focus 1 (a)	OS_EF1a	-100	0
13	OS Electron Focus 1 (b)	OS_EF1b	-100	0
14	OS Filament Shield 1	OS_FS1	-100	0
15	OS Filament 1-P	OS_FIL1-P	-70	-70
16	OS Filament 1-M	OS_FIL1-M	-70	-70
17	OS Electron Accelerator 1	OS_EA1	-100	200
18	OS Electron Restrictor 2	OS_RES2	-150	150
19	OS Electron Deflector 2 (c)	OS_EF2c	-100	0
20	OS Electron Deflector 2 (d)	OS_EF2d	-100	0
21	OS Electron Focus 2 (a)	OS_EF2a	-100	0
22	OS Electron Focus 2 (b)	OS_EF2b	-100	0
23	OS Filament Shield 2	OS_FS2	-100	0
24	OS Filament 2-P	OS_FIL2-P	-70	-70
25	OS Filament 2-M	OS_FIL2-M	-70	-70
26	OS Electron Accelerator 2	OS_EA2	-100	200
Closed Source (CS) Sub Assembly				
27	CS Ion Accelerator	CS_IA	-10	10
28	CS Ion Focus a	CS_IFa	-300	0
29	CS Ion Focus b	CS_IFb	-300	0
30	CS Nozzle	CS_NZ	-300	0
31	CS Repeller	CS_RP	-10	10
32	CS Repeller Shield	CS_RS	-10	10
33	CS Anode 1	CS_AN1	0	300
34	CS Electron Accelerator 1	CS_EA1	0	300
35	CS Electron Focus 1 (a)	CS_EF1a	-100	0
36	CS Electron Focus 1 (b)	CS_EF1b	-100	0
37	CS Electron Deflector 1 (c)	CS_EF1c	-100	0
38	CS Electron Deflector 1 (d)	CS_EF1d	-100	0
39	CS Filament 1-P	CS_FIL1-P	-70	-70
40	CS Filament 1-M	CS_FIL1-M	-70	-70
41	CS Filament Shield 1	CS_FS1	-100	0
42	CS Anode 2	CS_AN2	0	300
43	CS Electron Accelerator 2	CS_EA2	0	300
44	CS Electron Focus 2 (a)	CS_EF2a	-100	0
45	CS Electron Focus 2 (b)	CS_EF2b	-100	0
46	CS Electron Deflector 2 (c)	CS_EF2c	-100	0
47	CS Electron Deflector 2 (d)	CS_EF2d	-100	0

48	CS Filament 2-P	CS_FIL2-P	-70	-70
49	CS Filament 2-M	CS_FIL2-M	-70	-70
50	CS Filament Shield 2	CS_FS2	-100	0
Switching Lens (SL) Sub Assembly				
51	Sl Quad Lens Top Front	SL_TF	-200	100
52	SL Quad Lens Top Back	SL_TB	-900	100
53	SL Quad Lens Bottom Back	SL_BB	-200	100
54	Sl Quad Lens Bottom Front	SL_BF	-900	100
55	SL End Lens 1	SL_EL1	-100	900
56	SL End Lens 2	SL_EL2	-100	900
Ion Analyzer (IA) Sub Assembly				
57	IA Lens 1	IA_L1	-900	0
58	IA Lens 2	IA_L2	-900	0
59	IA Lens 4 (a) (Split)	IA_L4a	-300	0
60	IA Lens 4 (b) (Split)	IA_L4b	-300	0
61	IA Lens 5 (a) (Split)	IA_L5a	-900	0
62	IA Lens 5 (b) (Split)	IA_L5b	-900	0
63	IA Lens 6	IA_L6	-900	0
Quadrupole (QD) Sub Assembly				
64	Rod 1	QD_R1	RF	RF
65	Rod 2	QD_R2	RF	RF
66	Rod 3	QD_R3	RF	RF
67	Rod 4	QD_R4	RF	RF
68	Beam Shaping Lens	QD_BS	-150	150
Multiplier (MT) Sub Assembly				
69	Einzel Lens	MT_EZ	-200	100
70	Mask 1	MT_MA1	-200	100
71	Mask 2	MT_MA2	-200	100
72	Window	MT_WD	-200	100
73	Multiplier Neg 1	MT_MU1	-3500	0
74	Multiplier Neg 2	MT_MU2	-3500	0
75	Faraday Cup	MT_FC	-150	150

8.2 NMS DAC ID designation:

This table provides the ID number of all Digital to Analog Converters (DAC) that can be displayed in the science data tables under DAC_ID (Table A-5 and A-7).

Table A-2: NMS Electrode list and designation (see Figure 3)

DAC Designation	DAC ID
16	OS_FIL1_VCTL
17	OS_FIL1_ECTL
18	OS_FS1_VCTL
19	OS_FIL2_VCTL
20	OS_FIL2_ECTL
21	OS_FS2_VCTL
22	CS_FIL1_VCTL
23	CS_FIL1_ECTL
24	CS_FS1_VCTL
25	CS_FIL2_VCTL
26	CS_FIL2_ECTL

27	CS_FS2_VCTL
28	DT1_VCTL
29	DT2_VCTL
30	QB_VCTL
32	FIL_ON_CTRL
34	ROD_AC
36	ROD_DC
37	RF_FREQ
47	FIL_SEL
48	BA_FIL_VCTL
49	CS_NZ_VCTL
50	MT_MU1_VCTL
51	MT_MU2_VCTL
52	CS_EA1_VCTL
53	CS_AN1_VCTL
54	CS_EA2_VCTL
55	CS_AN2_VCTL
56	QD_BS_VCTL
57	MT_EZ_VCTL
58	MT_MA1_VCTL
59	MT_MA2_VCTL
60	MT_WD_VCTL
61	MT_FC_VCTL
62	OS_EA1_VCTL
63	OS_RES1_VCTL
64	OS_EA2_VCTL
65	OS_RES2_VCTL
66	OS_OL1_VCTL
67	OS_OL2_VCTL
68	OS_COLA_VCTL
69	OS_COLB_VCTL
70	CS_IA_VCTL
71	CS_RP_VCTL
72	CS_RS_VCTL
76	IA_L1_VCTL
77	IA_L2_VCTL
78	IA_L4A_VCTL
79	IA_L4B_VCTL
80	IA_L5_VCTL
81	IA_L6_VCTL
82	OS_EF1A_VCTL
83	OS_EF1B_VCTL
84	OS_EF1C_VCTL
85	OS_EF1D_VCTL
86	OS_EF2A_VCTL
87	OS_EF2B_VCTL
88	OS_EF2C_VCTL
89	OS_EF2D_VCTL
90	CS_EF1A_VCTL
91	CS_EF1B_VCTL
92	CS_EF1C_VCTL
93	CS_EF1D_VCTL
94	CS_EF2A_VCTL
95	CS_EF2B_VCTL
96	CS_EF2C_VCTL
97	CS_EF2D_VCTL
100	OS_OL4_VCTL
101	CS_IFA_VCTL
102	CS_IFB_VCTL

103	SL_TB_VCTL
104	SL_BB_VCTL
105	SL_BF_VCTL
106	SL_EL_VCTL
107	OS_OL3_VCTL
108	SL_TF_VCTL
109	OS_OL5_VCTL
110	OS_OL6_VCTL

8.3 NMS TUNING ID Designation:

In raw and science tables, tuning is designated as a single digital number from 0 to 6.

Table A-3: NMS Tuning designations

Tuning ID	Tuning
0	Undefined
1	Open Source Neutral Thermal
2	Open Source Neutral Beaming
3	Open Source Ion
4	Closed Source Neutral
5	Background, Closed Source Tuning, Open source switching
6	Background, Open Source Tuning, Closed source switching

8.4 NMS Data Product Column Descriptions

The data user is highly encouraged to consult the most up-to-date version of the NMS reference document (included in the NMS bundle) for detailed description of the instrument calibration procedure and of the best use for the telemetry channels.

8.4.1 Raw housekeeping data table

This table contains the raw housekeeping packets values generated while the instrument is on (during ground calibration or flight). The entries marked in green are the housekeeping channels of most relevance to the data calibration process. The rest of the housekeeping channels are most generally used to access the health of the instrument and the integrity of the NMS data.

Table A-4: Definition of the raw housekeeping data table

#	Name	Format	Units	Range	Description
1	TIME.	Real	s	N/A	SCLK timestamp of any corresponding observed value.
2	MKID	Integer	N/A	N/A	Marker ID of the current data point. Markers are tag numbers given to related set of measurements.
3	CDH:+13A_VMON	Real	V	0 – 5	Engineering value of +13A_VMON at TIME.
4	CDH:+13V_MON	Real	V	0 – 5	Engineering value of +13V_MON at TIME.
5	CDH:+15RF_VMON	Real	V	0 – 5	Engineering value of +15RF_VMON at TIME.
6	CDH:+160_VMON	Real	V	0 – 5	Engineering value of +160_VMON at TIME.
7	CDH:+5D_VMON	Real	V	0 – 5	Engineering value of +5D_VMON at TIME.

8	CDH:+5VREF_DAC	Real	V	0 – 5	Engineering value of +5VREF_DAC at TIME.
9	CDH:+80RF_VMON	Real	V	0 – 5	Engineering value of +80RF_VMON at TIME.
10	CDH:-13A_VMON	Real	V	0 – 5	Engineering value of -13A_VMON at TIME.
11	CDH:-13V_MON	Real	V	0 – 5	Engineering value of -13V_MON at TIME.
12	CDH:-15RF_VMON	Real	V	0 – 5	Engineering value of -15RF_VMON at TIME.
13	CDH:-160_VMON	Real	V	0 – 5	Engineering value of -160_VMON at TIME.
14	CDH:-5.7VREF	Real	V	0 – 5	Engineering value of -5.7VREF at TIME.
15	CDH:-5VREF_DAC	Real	V	0 – 5	Engineering value of -5VREF_DAC at TIME.
16	CDH:3.3V_IMON	Real	V	0 – 5	Engineering value of 3.3V_IMON at TIME.
17	CDH:5V_IMON	Real	V	0 – 5	Engineering value of 5V_IMON at TIME.
18	CDH:AGC_TMP	Real	V	0 – 5	Engineering value of AGC_TMP at TIME. This value captures the temperature of the RF AGC board.
19	CDH:ARM1_MON	Real	V	0 – 5	Engineering value of ARM1_MON at TIME.
20	CDH:ARM2_MON	Real	V	0 – 5	Engineering value of ARM2_MON at TIME.
21	CDH:BA_FIL_EMIS	Real	V	0 – 5	Engineering value of BA_FIL_EMIS at TIME.
22	CDH:BA_FIL_IMON	Real	V	0 – 5	Engineering value of BA_FIL_IMON at TIME.
23	CDH:BA_FIL_VMON	Real	V	0 – 5	Engineering value of BA_FIL_VMON at TIME.
24	CDH:BA_GRID_IMON	Real	V	0 – 5	Engineering value of BA_GRID_IMON at TIME.
25	CDH:BA_PRES	Real	V	0 – 5	Engineering value of BA_PRES at TIME.
26	CDH:CDH_+5VREF	Real	V	0 – 5	Engineering value of CDH_+5VREF at TIME.
27	CDH:CDH_-5VREF	Real	V	0 – 5	Engineering value of CDH_-5VREF at TIME.
28	CDH:CDH_2.5VMON	Real	V	0 – 5	Engineering value of CDH_2.5VMON at TIME.
29	CDH:CDH_3.3VMON	Real	V	0 – 5	Engineering value of CDH_3.3VMON at TIME.
30	CDH:CDH_TMP	Real	V	0 – 5	Engineering value of CDH_TMP at TIME. This value captures the temperature of the CDH board.
31	CDH:CS_+13A_MON	Real	V	0 – 5	Engineering value of CS_+13A_MON at TIME.
32	CDH:CS_+5REF_MON	Real	V	0 – 5	Engineering value of CS_+5REF_MON at TIME.
33	CDH:CS_-5REF_MON	Real	V	0 – 5	Engineering value of CS_-5REF_MON at TIME.
34	CDH:CS_AN1_MON	Real	V	0 – 5	Engineering value of CS_AN1_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_AN1 electrode.
35	CDH:CS_AN2_MON	Real	V	0 – 5	Engineering value of CS_AN2_MON at TIME. This value captures the drive circuit input to control the

					voltage on the CS_AN2 electrode.
36	CDH:CS_EA1_MON	Real	V	0 – 5	Engineering value of CS_EA1_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EA1 electrode.
37	CDH:CS_EA2_MON	Real	V	0 – 5	Engineering value of CS_EA2_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EA2 electrode.
38	CDH:CS_EF1A_MON	Real	V	0 – 5	Engineering value of CS_EF1A_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1A electrode.
39	CDH:CS_EF1B_MON	Real	V	0 – 5	Engineering value of CS_EF1B_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1B electrode.
40	CDH:CS_EF1C_MON	Real	V	0 – 5	Engineering value of CS_EF1C_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1C electrode.
41	CDH:CS_EF1D_MON	Real	V	0 – 5	Engineering value of CS_EF1D_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1D electrode.
42	CDH:CS_EF2A_MON	Real	V	0 – 5	Engineering value of CS_EF2A_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF2A electrode.
43	CDH:CS_EF2B_MON	Real	V	0 – 5	Engineering value of CS_EF2B_MON at TIME. This value captures the drive circuit input to 0 – 5 control the voltage on the CS_ EF2B electrode.
44	CDH:CS_EF2C_MON	Real	V	0 – 5	Engineering value of CS_EF2C_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_EF2C electrode.
45	CDH:CS_EF2D_MON	Real	V	0 – 5	Engineering value of CS_EF2D_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_EF2D electrode.
46	CDH:CS_FIL1_IMON	Real	V	0 – 5	Engineering value of CS_FIL1_IMON at TIME. This value captures CS_FIL1 current.
47	CDH:CS_FIL1_VMON	Real	V	0 – 5	Engineering value of CS_FIL1_VMON at TIME. This value captures CS_FIL1 voltage.
48	CDH:CS_FIL2_IMON	Real	V	0 – 5	Engineering value of CS_FIL2_IMON at TIME. This value captures CS_FIL2 current.
49	CDH:CS_FIL2_VMON	Real	V	0 – 5	Engineering value of CS_FIL2_VMON at TIME. This value captures CS_FIL2 voltage.

50	CDH:CS_FIL_EMON	Real	V	0 – 5	Engineering value of CS_FIL_EMON at TIME. This value captures the emission value on the active CS filament.
51	CDH:CS_FIL_SEL_ST	Real	N/A	N/A	Engineering value of CS_FIL_SEL_ST at TIME.
52	CDH:CS_FS1_MON	Real	V	0 – 5	Engineering value of CS_FS1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_FS1 electrode.
53	CDH:CS_FS2_MON	Real	V	0 – 5	Engineering value of CS_FS2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_FS2 electrode.
54	CDH:CS_GND_REF	Real	V	0 – 5	Engineering value of CS_GND_REF at TIME.
55	CDH:CS_IA_MON	Real	V	0 – 5	Engineering value of CS_IA_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_IA electrode.
56	CDH:CS_IFA_MON	Real	V	0 – 5	Engineering value of CS_IFA_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_IFA electrode.
57	CDH:CS_IFB_MON	Real	V	0 – 5	Engineering value of CS_IFB_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_IFB electrode.
58	CDH:CS_NZ_MON	Real	V	0 – 5	Engineering value of CS_NZ_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_NZ electrode.
59	CDH:CS_RP_MON	Real	V	0 – 5	Engineering value of CS_RP_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_RP electrode.
60	CDH:CS_RS_MON	Real	V	0 – 5	Engineering value of CS_RS_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_RS electrode.
61	CDH:CS_SPARE	Real	N/A	N/A	Unused channel.
62	CDH:CS_TMP	Real	V	0 – 5	Engineering value of CS_TMP at TIME. This value captures the temperature of the CS board.
63	CDH:CS_TRAP_MON	Real	V	0 – 5	Engineering value of CS_TRAP_MON at TIME.
64	CDH:CTL_+13VMON	Real	V	0 – 5	Engineering value of CTL_+13VMON at TIME.
65	CDH:CTL_+2.5VMON	Real	V	0 – 5	Engineering value of CTL_+2.5VMON at TIME.
66	CDH:CTL_+3.3VMON	Real	V	0 – 5	Engineering value of CTL_+3.3VMON at TIME.
67	CDH:CTL_+4VMON	Real	V	0 – 5	Engineering value of CTL_+4VMON at TIME.
68	CDH:CTL_+5VMON	Real	V	0 – 5	Engineering value of CTL_+5VMON at TIME.
69	CDH:CTL_+5VREF	Real	V	0 – 5	Engineering value of CTL_+5VREF at TIME.
70	CDH:CTL_+6VMON	Real	V	0 – 5	Engineering value of CTL_+6VMON at TIME.
71	CDH:CTL_-13VMON	Real	V	0 – 5	Engineering value of CTL_-

					13VMON at TIME.
72	CDH:CTL_-5VREF	Real	V	0 – 5	Engineering value of CTL_-5VREF at TIME.
73	CDH:CTL_SPARE	Real	N/A	N/A	Unused channel.
74	CDH:CTL_TMP	Real	V	0 – 5	Engineering value of CTL_TMP at TIME. This value captures the temperature of the CTL board.
75	CDH:DET_TMP	Real	V	0 – 5	Engineering value of DET_TMP at TIME. This value captures the temperature of the DET board.
76	CDH:EM1_IMON	Real	V	0 – 5	Engineering value of EM1_IMON at TIME. This value captures the current drawn by Multiplier 1.
77	CDH:EM2_IMON	Real	V	0 – 5	Engineering value of EM2_IMON at TIME. This value captures the current drawn by Multiplier 2.
78	CDH:EXT_THERM1	Real	V	0 – 5	Engineering value of EXT_THERM1 at TIME.
79	CDH:EXT_THERM2	Real	V	0 – 5	Engineering value of EXT_THERM2 at TIME.
80	CDH:EXT_THERM3	Real	V	0 – 5	Engineering value of EXT_THERM3 at TIME.
81	CDH:FLASH_VMON	Real	V	0 – 5	Engineering value of FLASH_VMON at TIME.
82	CDH:IA_L1_MON	Real	V	0 – 5	Engineering value of IA_L1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L1 electrode.
83	CDH:IA_L2_MON	Real	V	0 – 5	Engineering value of IA_L2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L2 electrode.
84	CDH:IA_L4A_MON	Real	V	0 – 5	Engineering value of IA_L4A_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L4A electrode.
85	CDH:IA_L4B_MON	Real	V	0 – 5	Engineering value of IA_L4B_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L4B electrode.
86	CDH:IA_L5_MON	Real	V	0 – 5	Engineering value of IA_L5_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L5 electrode.
87	CDH:IA_L6_MON	Real	V	0 – 5	Engineering value of IA_L6_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L6 electrode.
88	CDH:IF_+5REF_MON	Real	V	0 – 5	Engineering value of IF_+5REF_MON at TIME.
89	CDH:IF_-5REF_MON	Real	V	0 – 5	Engineering value of IF_-5REF_MON at TIME.
90	CDH:IF_GND_REF	Real	V	0 – 5	Engineering value of IF_GND_REF at TIME.
91	CDH:IF_TMP	Real	V	0 – 5	Engineering value of IF_TMP at TIME. This value captures the temperature of the IF board.
92	CDH:MT_EZ_MON	Real	V	0 – 5	Engineering value of MT_EZ_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_EZ electrode.

93	CDH:MT_FC_MON	Real	V	0 – 5	Engineering value of MT_FC_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_FC electrode.
94	CDH:MT_MA1_MON	Real	V	0 – 5	Engineering value of MT_MA1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_MA1 electrode.
95	CDH:MT_MA2_MON	Real	V	0 – 5	Engineering value of MT_MA2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_MA2 electrode.
96	CDH:MT_WD_MON	Real	V	0 – 5	Engineering value of MT_WD_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_WD electrode.
97	CDH:MULTANA1	Real	V	0 – 5	Engineering value of MULTANA1 at TIME.
98	CDH:MULTANA2	Real	V	0 – 5	Engineering value of MULTANA2 at TIME.
99	CDH:OS_+13A_MON	Real	V	0 – 5	Engineering value of OS_+13A_MON at TIME.
100	CDH:OS_+5REF_MON	Real	V	0 – 5	Engineering value of OS_+5REF_MON at TIME.
101	CDH:OS_-5REF_MON	Real	V	0 – 5	Engineering value of OS_-5REF_MON at TIME.
102	CDH:OS_COLA_MON	Real	V	0 – 5	Engineering value of OS_COLA_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_COLA electrode.
103	CDH:OS_COLB_MON	Real	V	0 – 5	Engineering value of OS_COLB_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_COLB electrode.
104	CDH:OS_EA1_MON	Real	V	0 – 5	Engineering value of OS_EA1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EA1 electrode.
105	CDH:OS_EA2_MON	Real	V	0 – 5	Engineering value of OS_EA2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EA2 electrode.
106	CDH:OS_EF1A_MON	Real	V	0 – 5	Engineering value of OS_EF1A_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1A electrode.
107	CDH:OS_EF1B_MON	Real	V	0 – 5	Engineering value of OS_EF1B_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1B electrode.
108	CDH:OS_EF1C_MON	Real	V	0 – 5	Engineering value of OS_EF1C_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1C electrode.

109	CDH:OS_EF1D_MON	Real	V	0 – 5	Engineering value of OS_EF1D_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1D electrode.
110	CDH:OS_EF2A_MON	Real	V	0 – 5	Engineering value of OS_EF2A_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2A electrode.
111	CDH:OS_EF2B_MON	Real	V	0 – 5	Engineering value of OS_EF2B_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2B electrode.
112	CDH:OS_EF2C_MON	Real	V	0 – 5	Engineering value of OS_EF2C_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2C electrode.
113	CDH:OS_EF2D_MON	Real	V	0 – 5	Engineering value of OS_EF2D_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2D electrode.
114	CDH:OS_FIL1_IMON	Real	V	0 – 5	Engineering value of OS_FIL1_IMON at TIME. This value captures OS_FIL1 current.
115	CDH:OS_FIL1_VMON	Real	V	0 – 5	Engineering value of OS_FIL1_VMON at TIME. This value captures OS_FIL1 voltage.
116	CDH:OS_FIL2_IMON	Real	V	0 – 5	Engineering value of OS_FIL2_IMON at TIME. This value captures OS_FIL2 current.
117	CDH:OS_FIL2_VMON	Real	V	0 – 5	Engineering value of OS_FIL2_VMON at TIME. This value captures OS_FIL2 voltage.
118	CDH:OS_FIL_EMON	Real	V	0 – 5	Engineering value of OS_FIL_EMON at TIME. This value captures the emission value on the active OS filament.
119	CDH:OS_FIL_SEL_ST	Real	N/A	N/A	Engineering value of OS_FIL_SEL_ST at TIME.
120	CDH:OS_FS1_MON	Real	V	0 – 5	Engineering value of OS_FS1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_FS1 electrode.
121	CDH:OS_FS2_MON	Real	V	0 – 5	Engineering value of OS_FS2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_FS2 electrode.
122	CDH:OS_GND_REF	Real	V	0 – 5	Engineering value of OS_GND_REF at TIME.
123	CDH:OS_OL1_MON	Real	V	0 – 5	Engineering value of OS_OL1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL1 electrode.
124	CDH:OS_OL2_MON	Real	V	0 – 5	Engineering value of OS_OL2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL2 electrode.

125	CDH:OS_OL3_MON	Real	V	0 – 5	Engineering value of OS_OL3_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL3 electrode.
126	CDH:OS_OL4_MON	Real	V	0 – 5	Engineering value of OS_OL4_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL4 electrode.
127	CDH:OS_OL5_MON	Real	V	0 – 5	Engineering value of OS_OL5_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL5 electrode.
128	CDH:OS_OL6_MON	Real	V	0 – 5	Engineering value of OS_OL6_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL6 electrode.
129	CDH:OS_RES1_MON	Real	V	0 – 5	Engineering value of OS_RES1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_RES1 electrode.
130	CDH:OS_RES2_MON	Real	V	0 – 5	Engineering value of OS_RES2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_RES2 electrode.
131	CDH:OS_SPARE	Real	N/A	N/A	Unused channel.
132	CDH:OS_TMP	Real	V	0 – 5	Engineering value of OS_TMP at TIME. This value captures the temperature of the OS board.
133	CDH:OS_TRAP_MON	Real	V	0 – 5	Engineering value of OS_TRAP_MON at TIME.
134	CDH:PS_IMON	Real	V	0 – 5	Engineering value of PS_IMON at TIME.
135	CDH:PS_IMON_2	Real	V	0 – 5	Engineering value of PS_IMON_2 at TIME.
136	CDH:PS_TMP	Real	V	0 – 5	Engineering value of PS_TMP at TIME. This value captures the temperature of the PS board.
137	CDH:PYRO1_MON	Real	V	0 – 5	Engineering value of PYRO1_MON at TIME.
138	CDH:PYRO2_MON	Real	V	0 – 5	Engineering value of PYRO2_MON at TIME.
139	CDH:PulseCounter	Real	CTS	N/A	Engineering value of PulseCounter at TIME. This value captures the number of counts detected with active multiplier during the duration of the integration period.
140	CDH:QD_BS_MON	Real	V	0 – 5	Engineering value of QD_BS_MON at TIME. This value captures the drive circuit input needed to control the voltage on the QD_BS electrode.
141	CDH:RF_AGC_MON	Real	V	0 – 5	Engineering value of RF_AGC_MON at TIME.
142	CDH:RF_Cntr	Real	N/A	N/A	Engineering value of RF_Cntr at TIME. This value captures the current RF frequency.
143	CDH:RF_TMP	Real	V	0 – 5	Engineering value of RF_TMP at TIM. This value captures the temperature of the RF board.
144	CDH:SL_BB_MON	Real	V	0 – 5	Engineering value of SL_BB_MON

					at TIME. This value captures the drive circuit input needed to control the voltage on the SL_BB electrode.
145	CDH:SL_BF_MON	Real	V	0 – 5	Engineering value of SL_BF_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_BF electrode.
146	CDH:SL_EL_MON	Real	V	0 – 5	Engineering value of SL_EL_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_EL electrode.
147	CDH:SL_TB_MON	Real	V	0 – 5	Engineering value of SL_TB_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_TB electrode.
148	CDH:SL_TF_MON	Real	V	0 – 5	Engineering value of SL_TF_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_TF electrode.
149	CDH:SPARE_0	Real	N/A	N/A	Unused channel.
150	CDH:SPARE_1	Real	N/A	N/A	Unused channel.
151	CDH:SPARE_2	Real	N/A	N/A	Unused channel.
152	CDH:SPARE_3	Real	N/A	N/A	Unused channel.
153	CDH:SPARE_4	Real	N/A	N/A	Unused channel.
154	CDH:SPARE_5	Real	N/A	N/A	Unused channel.
155	CDH:SPARE_6	Real	N/A	N/A	Unused channel.
156	CDH:THERM_COM	Real	N/A	N/A	Engineering value of THERM_COM at TIME.
157	FSW:ALARM_LEVEL	Real	N/A	N/A	Engineering value of ALARM_LEVEL at TIME.
158	FSW:ALARM_STAT	Real	N/A	N/A	Engineering value of ALARM_STAT at TIME.
159	FSW:BAD_CMD_ERR	Real	N/A	N/A	Engineering value of BAD_CMD_ERR at TIME.
160	FSW:BAD_CMD_OP	Real	N/A	N/A	Engineering value of BAD_CMD_OP at TIME.
161	FSW:CODE_CSUM	Real	N/A	N/A	Engineering value of CODE_CSUM at TIME.
162	FSW:DWELL_MON_ADDR	Real	N/A	N/A	Engineering value of DWELL_MON_ADDR at TIME.
163	FSW:DWELL_MON_VAL	Real	N/A	N/A	Engineering value of DWELL_MON_VAL at TIME.
164	FSW:FSW_VER	Real	N/A	N/A	Engineering value of FSW_VER at TIME.
165	FSW:INST_MODE	Real	N/A	N/A	Engineering value of INST_MODE at TIME.
166	FSW:LARGEST_FREE_BLOCK	Real	N/A	N/A	Engineering value of LARGEST_FREE_BLOCK at TIME.
167	FSW:LAST_CMD	Real	N/A	N/A	Engineering value of LAST_CMD at TIME.
168	FSW:LAST_FILE_ID	Real	N/A	N/A	Engineering value of LAST_FILE_ID at TIME.
169	FSW:LAST_MARKER	Real	N/A	N/A	Engineering value of LAST_MARKER at TIME.
170	FSW:LAST_RESET	Real	N/A	N/A	Engineering value of LAST_RESET at TIME.
171	FSW:LIB_CSUM	Real	N/A	N/A	Engineering value of LIB_CSUM at TIME.
172	FSW:LIB_VER	Real	N/A	N/A	Engineering value of LIB_VER at TIME.
173	FSW:LOAD_TYPE	Real	N/A	N/A	Engineering value of LOAD_TYPE

					at TIME.
174	FSW:MEM_ALLOC	Real	N/A	N/A	Engineering value of MEM_ALLOC at TIME.
175	FSW:MEM_FREE	Real	N/A	N/A	Engineering value of MEM_FREE at TIME.
176	FSW:N_ALARMS	Real	N/A	N/A	Engineering value of N_ALARMS at TIME.
177	FSW:N_ALARM_ACTIVE	Real	N/A	N/A	Engineering value of N_ALARM_ACTIVE at TIME.
178	FSW:N_ALARM_ENAB	Real	N/A	N/A	Engineering value of N_ALARM_ENAB at TIME.
179	FSW:N_ALLOCS	Real	N/A	N/A	Engineering value of N_ALLOCS at TIME.
180	FSW:N_CMDS	Real	N/A	N/A	Engineering value of N_CMDS at TIME.
181	FSW:N_CMD_ERRS	Real	N/A	N/A	Engineering value of N_CMD_ERRS at TIME.
182	FSW:N_FREES	Real	N/A	N/A	Engineering value of N_FREES at TIME.
183	FSW:PKT_REV	Real	N/A	N/A	Engineering value of PKT_REV at TIME.
184	FSW:POWER_STAT	Real	N/A	N/A	Engineering value of POWER_STAT at TIME.
185	FSW:SCRIPT_CSUM	Real	N/A	N/A	Engineering value of SCRIPT_CSUM at TIME.
186	FSW:SCRIPT_ID	Real	N/A	N/A	Engineering value of SCRIPT_ID at TIME.
187	FSW:SCRIPT_MODE	Real	N/A	N/A	Engineering value of SCRIPT_MODE at TIME.
188	FSW:SCRIPT_VER	Real	N/A	N/A	Engineering value of SCRIPT_VER at TIME.
189	FSW:SIDE_A	Real	N/A	N/A	Engineering value of SIDE_A at TIME.
190	FSW:TELEM_MODE	Real	N/A	N/A	Engineering value of TELEM_MODE at TIME.
191	FSW:ZONE_ALERT	Real	N/A	N/A	Engineering value of ZONE_ALERT at TIME.
192	QMS:ADC_STATUS	Integer	N/A	N/A	Engineering value of ADC_STATUS at TIME.
193	QMS:AMUX1	Integer	N/A	N/A	Engineering value of AMUX1 at TIME.
194	QMS:AMUX2	Integer	N/A	N/A	Engineering value of AMUX2 at TIME.
195	QMS:AMUX_ADDR1	Integer	N/A	N/A	Engineering value of AMUX_ADDR1 at TIME.
196	QMS:AMUX_ADDR2	Integer	N/A	N/A	Engineering value of AMUX_ADDR2 at TIME.
197	QMS:AMUX_ADDR3	Integer	N/A	N/A	Engineering value of AMUX_ADDR3 at TIME.
198	QMS:AMUX_ADDR4	Integer	N/A	N/A	Engineering value of AMUX_ADDR4 at TIME.
199	QMS:BA_FIL_VCTL	Real	N/A	N/A	Engineering value of BA_FIL_VCTL at TIME.
200	QMS:COUNT1	Integer	N/A	NA	Engineering value of COUNT1 at TIME. This value captures the number of counts detected with multiplier 1 during the duration of the integration period.
201	QMS:COUNT2	Integer	N/A	NA	Engineering value of COUNT2 at TIME. This value captures the number of counts detected with

					multiplier 2 during the duration of the integration period.
202	QMS:CS_AN1_VCTL	Real	N/A	0 – 256	Engineering value of CS_AN1_VCTL at TIME. This value captures the DAC setting for the CS_AN1 electrode.
203	QMS:CS_AN2_VCTL	Real	N/A	0 – 256	Engineering value of CS_AN2_VCTL at TIME. This value captures the DAC setting for the CS_AN2 electrode.
204	QMS:CS_EA1_VCTL	Real	N/A	0 – 256	Engineering value of CS_EA1_VCTL at TIME. This value captures the DAC setting for the CS_EA1 electrode.
205	QMS:CS_EA2_VCTL	Real	N/A	0 – 256	Engineering value of CS_EA2_VCTL at TIME. This value captures the DAC setting for the CS_EA2 electrode.
206	QMS:CS_EF1A_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF1A_VCTL at TIME. This value captures the DAC setting for the CS_EF1A electrode.
207	QMS:CS_EF1B_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF1B_VCTL at TIME. This value captures the DAC setting for the CS_EF1B electrode.
208	QMS:CS_EF1C_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF1C_VCTL at TIME. This value captures the DAC setting for the CS_EF1C electrode.
209	QMS:CS_EF1D_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF1D_VCTL at TIME. This value captures the DAC setting for the CS_EF1D electrode.
210	QMS:CS_EF2A_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF2A_VCTL at TIME. This value captures the DAC setting for the CS_EF2A electrode.
211	QMS:CS_EF2B_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF2B_VCTL at TIME. This value captures the DAC setting for the CS_EF2B electrode.
212	QMS:CS_EF2C_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF2C_VCTL at TIME. This value captures the DAC setting for the CS_EF2C electrode.
213	QMS:CS_EF2D_VCTL	Real	N/A	0 – 4096	Engineering value of CS_EF2D_VCTL at TIME. This value captures the DAC setting for the CS_EF2D electrode.
214	QMS:CS_FIL1_ECTL	Real	N/A	0 – 256	Engineering value of CS_FIL1_ECTL at TIME. This value captures the DAC setting for the CS_FIL1 electrode.
215	QMS:CS_FIL1_VCTL	Real	N/A	0 – 256	Engineering value of CS_FIL1_VCTL at TIME. This value captures the DAC setting for the CS_FIL1 electrode.
216	QMS:CS_FIL2_ECTL	Real	N/A	0 – 256	Engineering value of CS_FIL2_ECTL at TIME. This value captures the DAC setting for the

					CS_FIL2 electrode.
217	QMS:CS_FIL2_VCTL	Real	N/A	0 – 256	Engineering value of CS_FIL2_VCTL at TIME. This value captures the DAC setting for the CS_FIL2 electrode.
218	QMS:CS_FS1_VCTL	Real	N/A	0 – 256	Engineering value of CS_FS1_VCTL at TIME. This value captures the DAC setting for the CS_FS1 electrode.
219	QMS:CS_FS2_VCTL	Real	N/A	0 – 256	Engineering value of CS_FS2_VCTL at TIME. This value captures the DAC setting for the CS_FS2 electrode.
220	QMS:CS_IA_VCTL	Real	N/A	0 – 256	Engineering value of CS_IA_VCTL at TIME. This value captures the DAC setting for the CS_IA electrode.
221	QMS:CS_IFA_VCTL	Real	N/A	0 – 4096	Engineering value of CS_IFA_VCTL at TIME. This value captures the DAC setting for the CS_IFA electrode.
222	QMS:CS_IFB_VCTL	Real	N/A	0 – 4096	Engineering value of CS_IFB_VCTL at TIME. This value captures the DAC setting for the CS_IFB electrode.
223	QMS:CS_NZ_VCTL	Real	N/A	0 – 256	Engineering value of CS_NZ_VCTL at TIME. This value captures the DAC setting for the CS_NZ electrode.
224	QMS:CS_RP_VCTL	Real	N/A	0 – 256	Engineering value of CS_RP_VCTL at TIME. This value captures the DAC setting for the CS_RP electrode.
225	QMS:CS_RS_VCTL	Real	N/A	0 – 256	Engineering value of CS_RS_VCTL at TIME. This value captures the DAC setting for the CS_RS electrode.
226	QMS:CTL_DIGITAL_STATUS	Integer	N/A	N/A	Engineering value of CTL_DIGITAL_STATUS at TIME.
227	QMS:CTL_ERROR_COUNT	Integer	N/A	N/A	Engineering value of CTL_ERROR_COUNT at TIME.
228	QMS:CTL_PACKET_COUNT	Integer	N/A	N/A	Engineering value of CTL_PACKET_COUNT at TIME.
229	QMS:CTL_SYNC_CODE	Integer	N/A	N/A	Engineering value of CTL_SYNC_CODE at TIME.
230	QMS:DAC12BSPARE1	Real	N/A	N/A	Unused channel.
231	QMS:DAC12BSPARE2	Real	N/A	N/A	Unused channel.
232	QMS:DAC12BSPARE3	Real	N/A	N/A	Unused channel.
233	QMS:DAC12USPARE1	Real	N/A	N/A	Unused channel.
234	QMS:DAC12USPARE2	Real	N/A	N/A	Unused channel.
235	QMS:DAC16BSPARE1	Real	N/A	N/A	Unused channel.
236	QMS:DAC16BSPARE2	Real	N/A	N/A	Unused channel.
237	QMS:DAC8B_SPARE1	Real	N/A	N/A	Unused channel.
238	QMS:DAC8B_SPARE2	Real	N/A	N/A	Unused channel.
239	QMS:DAC8B_SPARE3	Real	N/A	N/A	Unused channel.
240	QMS:DAC_SPARE	Real	N/A	N/A	Unused channel.
241	QMS:DT1_VCTL	Real	N/A	0 – 256	Engineering value of DT1_VCTL at TIME. This value captures the DAC setting for the DET1 discriminator.
242	QMS:DT2_VCTL	Real	N/A	0 – 256	Engineering value of DT2_VCTL at TIME. This value captures the DAC setting for the DET1 discriminator.

243	QMS:FIL_ON_CTRL	Real	N/A	N/A	Engineering value of FIL_ON_CTRL at TIME.
244	QMS:FIL_SELECT	Integer	N/A	N/A	Engineering value of FIL_SELECT at TIME.
245	QMS:IA_L1_VCTL	Real	N/A	0 – 4096	Engineering value of IA_L1_VCTL at TIME. This value captures the DAC setting for the IA_L1 electrode.
246	QMS:IA_L2_VCTL	Real	N/A	0 – 4096	Engineering value of IA_L2_VCTL at TIME. This value captures the DAC setting for the IA_L2 electrode.
247	QMS:IA_L4A_VCTL	Real	N/A	0 – 4096	Engineering value of IA_L4A_VCTL at TIME. This value captures the DAC setting for the IA_L4A electrode.
248	QMS:IA_L4B_VCTL	Real	N/A	0 – 4096	Engineering value of IA_L4B_VCTL at TIME. This value captures the DAC setting for the IA_L4B electrode.
249	QMS:IA_L5_VCTL	Real	N/A	0 – 4096	Engineering value of IA_L5_VCTL at TIME. This value captures the DAC setting for the IA_L5 electrode.
250	QMS:IA_L6_VCTL	Real	N/A	0 – 4096	Engineering value of IA_L6_VCTL at TIME. This value captures the DAC setting for the IA_L6 electrode.
251	QMS:IP_COUNT	Real	Seconds	N/A	Engineering value of IP_COUNT at TIME. This value captures the current integration period (IP) duration.
252	QMS:IP_SETUP	Real	Seconds	N/A	Engineering value of IP_SETUP at TIME. This value captures the current settling period duration.
253	QMS:MT_EZ_VCTL	Real	N/A	0 – 256	Engineering value of MT_EZ_VCTL at TIME. This value captures the DAC setting for the MT_EZ electrode.
254	QMS:MT_FC_VCTL	Real	N/A	0 – 256	Engineering value of MT_FC_VCTL at TIME. This value captures the DAC setting for the MT_FC electrode.
255	QMS:MT_MA1_VCTL	Real	N/A	0 – 256	Engineering value of MT_MA1_VCTL at TIME. This value captures the DAC setting for the MT_MA1 electrode.
256	QMS:MT_MA2_VCTL	Real	N/A	0 – 256	Engineering value of MT_MA2_VCTL at TIME. This value captures the DAC setting for the MT_MA2 electrode.
257	QMS:MT_MU1_VCTL	Real	N/A	0 – 256	Engineering value of MT_MU1_VCTL at TIME. This value captures the DAC setting for the MT_MU1 electrode.
258	QMS:MT_MU2_VCTL	Real	N/A	0 – 256	Engineering value of MT_MU2_VCTL at TIME. This value captures the DAC setting for the MT_MU2 electrode.
259	QMS:MT_WD_VCTL	Real	N/A	0 – 256	Engineering value of MT_WD_VCTL at TIME. This value captures the DAC setting for the MT_WD electrode.
260	QMS:OS_COLA_VCTL	Real	N/A	0 – 256	Engineering value of OS_COLA_VCTL at TIME. This

					value captures the DAC setting for the OS_COLA electrode.
261	QMS:OS_COLB_VCTL	Real	N/A	0 – 256	Engineering value of OS_COLB_VCTL at TIME. This value captures the DAC setting for the OS_COLB electrode.
262	QMS:OS_EA1_VCTL	Real	N/A	0 – 256	Engineering value of OS_EA1_VCTL at TIME. This value captures the DAC setting for the OS_EA1 electrode.
263	QMS:OS_EA2_VCTL	Real	N/A	0 – 256	Engineering value of OS_EA2_VCTL at TIME. This value captures the DAC setting for the OS_EA2 electrode.
264	QMS:OS_EF1A_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF1A_VCTL at TIME. This value captures the DAC setting for the OS_EF1A electrode.
265	QMS:OS_EF1B_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF1B_VCTL at TIME. This value captures the DAC setting for the OS_EF1B electrode.
266	QMS:OS_EF1C_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF1C_VCTL at TIME. This value captures the DAC setting for the OS_EF1C electrode.
267	QMS:OS_EF1D_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF1D_VCTL at TIME. This value captures the DAC setting for the OS_EF1D electrode.
268	QMS:OS_EF2A_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF2A_VCTL at TIME. This value captures the DAC setting for the OS_EF2A electrode.
269	QMS:OS_EF2B_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF2B_VCTL at TIME. This value captures the DAC setting for the OS_EF2B electrode.
270	QMS:OS_EF2C_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF2C_VCTL at TIME. This value captures the DAC setting for the OS_EF2C electrode.
271	QMS:OS_EF2D_VCTL	Real	N/A	0 – 4096	Engineering value of OS_EF2D_VCTL at TIME. This value captures the DAC setting for the OS_EF2D electrode.
272	QMS:OS_FIL1_ECTL	Real	N/A	0 – 256	Engineering value of OS_FIL1_ECTL at TIME. This value captures the DAC setting for the OS_FIL1 emission control.
273	QMS:OS_FIL1_VCTL	Real	N/A	0 – 256	Engineering value of OS_FIL1_VCTL at TIME. This value captures the DAC setting for the OS_FIL1 electrode.
274	QMS:OS_FIL2_ECTL	Real	N/A	0 – 256	Engineering value of OS_FIL2_ECTL at TIME. This value captures the DAC setting for the OS_FIL2 emission control.
275	QMS:OS_FIL2_VCTL	Real	N/A	0 – 256	Engineering value of OS_FIL2_VCTL at TIME. This value captures the DAC setting for the

					OS_FIL2 electrode.
276	QMS:OS_FS1_VCTL	Real	N/A	0 – 256	Engineering value of OS_FS1_VCTL at TIME. This value captures the DAC setting for the OS_FS1 electrode.
277	QMS:OS_FS2_VCTL	Real	N/A	0 – 256	Engineering value of OS_FS2_VCTL at TIME. This value captures the DAC setting for the OS_FS2 electrode.
278	QMS:OS_OL1_VCTL	Real	N/A	0 – 256	Engineering value of OS_OL1_VCTL at TIME. This value captures the DAC setting for the OS_OL1 electrode.
279	QMS:OS_OL2_VCTL	Real	N/A	0 – 256	Engineering value of OS_OL2_VCTL at TIME. This value captures the DAC setting for the OS_OL2 electrode.
280	QMS:OS_OL3_VCTL	Real	N/A	0 – 4096	Engineering value of OS_OL3_VCTL at TIME. This value captures the DAC setting for the OS_OL3 electrode.
281	QMS:OS_OL4_VCTL	Real	N/A	0 – 4096	Engineering value of OS_OL4_VCTL at TIME. This value captures the DAC setting for the OS_OL4 electrode.
282	QMS:OS_OL5_VCTL	Real	N/A	0 – 4096	Engineering value of OS_OL5_VCTL at TIME. This value captures the DAC setting for the OS_OL5 electrode.
283	QMS:OS_OL6_VCTL	Real	N/A	0 – 4096	Engineering value of OS_OL6_VCTL at TIME. This value captures the DAC setting for the OS_OL6 electrode.
284	QMS:OS_RES1_VCTL	Real	N/A	0 – 256	Engineering value of OS_RES1_VCTL at TIME. This value captures the DAC setting for the OS_RES1 electrode.
285	QMS:OS_RES2_VCTL	Real	N/A	0 – 256	Engineering value of OS_RES2_VCTL at TIME. This value captures the DAC setting for the OS_RES2 electrode.
286	QMS:QB_VCTL	Real	V	0 – 256	Engineering value of QB_VCTL at TIME.
287	QMS:QD_BS_VCTL	Real	N/A	0 – 256	Engineering value of QD_BS_VCTL at TIME. This value captures the DAC setting for the QD_BS electrode.
288	QMS:RF_FREQ	Real	MHz	N/A	Engineering value of RF_FREQ at TIME.
289	QMS:RF_FREQ_SET	Integer	N/A	N/A	Engineering value of RF_FREQ_SET at TIME.
290	QMS:RODAC_CTRL	Real	N/A	0 – 65536	Engineering value of RODAC_CTRL at TIME. This value captures the DAC setting for the RF AC amplitude.
291	QMS:RODDC_CTL	Real	N/A	0 – 65536	Engineering value of RODDC_CTL at TIME. This value captures the DAC setting for the RF DC amplitude.
292	QMS:SERIAL_NUM	Integer	N/A	N/A	Engineering value of SERIAL_NUM at TIME.

293	QMS:SERIAL_NUM_SET	Integer	N/A	N/A	Engineering value of SERIAL_NUM_SET at TIME.
294	QMS:SL_BB_VCTL	Real	N/A	0 – 4096	Engineering value of SL_BB_VCTL at TIME. This value captures the DAC setting for the SL_BB electrode.
295	QMS:SL_BF_VCTL	Real	N/A	0 – 4096	Engineering value of SL_BF_VCTL at TIME. This value captures the DAC setting for the SL_BF electrode.
296	QMS:SL_EL_VCTL	Real	N/A	0 – 4096	Engineering value of SL_EL_VCTL at TIME. This value captures the DAC setting for the SL_EL electrode.
297	QMS:SL_TB_VCTL	Real	N/A	0 – 4096	Engineering value of SL_TB_VCTL at TIME. This value captures the DAC setting for the SL_TB electrode.
298	QMS:SL_TF_VCTL	Real	N/A	0 – 4096	Engineering value of SL_TF_VCTL at TIME. This value captures the DAC setting for the SL_TF electrode.
299	QMS:SYNC_CODE	Integer	N/A	N/A	Engineering value of SYNC_CODE at TIME.
300	QMS:WAIT	Integer	N/A	N/A	Engineering value of WAIT at TIME.
301	TM:TMMarker	Real	N/A	N/A	Engineering value of TMMarker at TIME. This value captures the Marker ID of the current data point. Markers are tag numbers given to related set of measurements.
302	TM:TMMarkerText	Text	N/A	N/A	Engineering value of TMMarkerText at TIME. This value captures the current Marker description.
303	TM:TMSync	Real	N/A	N/A	Engineering value of TMSync at TIME.
304	TM:TMSystemID	Real	N/A	N/A	Engineering value of TMSystemID at TIME.
305	TM:TMTick	Real	N/A	N/A	Engineering value of TMTick at TIME.

8.4.2 Raw science data table

This table contains the raw science packets values generated while the instrument is in a science telemetry mode (during ground calibration of flight).

Table A-5: Definition of the raw science data table

#	Name	Format	Units	Range	Description
1	TIME.	Real	s	N/A	SCLK timestamp of any corresponding observed value.
2	MKID	Integer	N/A	N/A	Marker ID of the current data point. Markers are tag numbers given to related set of measurements.
3	IP	Real	s	N/A	Engineering value of IP at TIME. This value captures the current integration period (IP) duration.
4	TUNING	Integer	N/A	N/A	Engineering value of TUNING at TIME. This value captures the current focusing scheme of the sensor (See Table A-3)
5	MASS	Real	M/Z	0 – 150	Engineering value of MASS at TIME. This value captures the current measured mass value.
6	COUNTS	Real	Hz	N/A	Engineering value of COUNTS at

					TIME. This value captures the number of counts detected with the active multiplier during the duration of the integration period.
7	DAC_ID	Integer	N/A	N/A	Engineering value of DAC_ID at TIME. This value captures the ID of DAC used during electrode voltage scan (See Table A-2).
8	DAC_SETTING	Real	N/A	N/A	Engineering value of DAC_SETTING at TIME. This value captures the voltage setting of the DAC_ID electrode during its voltage scan.

8.4.3 Raw message log

The message log is an ASCII file that contains the messages generated by the C&DH as it executes the script. These messages are time tagged (in seconds) to allow the data user to correlate the data to the tasks executed by the instrument.

8.4.4 Raw marker file

The marker file is an ASCII file that contains the markers generated by the C&DH as it executes the script. These markers are time tagged (in seconds) to allow the data user to correlate the data to the tasks executed by the instrument.

8.4.5 Calibrated housekeeping table

This table contains the calibrated housekeeping packets values generated while the instrument is on. The entries marked in green are the housekeeping channels of most relevance to the data calibration process. The rest of the housekeeping channels are most generally used to access the health of the instrument and the integrity of the NMS data.

Table A-6: Definition of the calibrated housekeeping table

#	Name	Format	Units	Range	Description
1	TIME.	Real	s	N/A	SCLK timestamp of any corresponding observed value.
2	MKID	Integer	N/A	N/A	Marker ID of the current data point. Markers are tag numbers given to related set of measurements.
3	CDH:+13A_VMON	Real	V	N/A	Scientific value of +13A_VMON at TIME.
4	CDH:+13V_MON	Real	V	N/A	Scientific value of +13V_MON at TIME.
5	CDH:+15RF_VMON	Real	V	N/A	Scientific value of +15RF_VMON at TIME.
6	CDH:+160_VMON	Real	V	N/A	Scientific value of +160_VMON at TIME.
7	CDH:+5D_VMON	Real	V	N/A	Scientific value of +5D_VMON at TIME.
8	CDH:+5VREF_DAC	Real	V	N/A	Scientific value of +5VREF_DAC at TIME.
9	CDH:+80RF_VMON	Real	V	N/A	Scientific value of +80RF_VMON at TIME.
10	CDH:-13A_VMON	Real	V	N/A	Scientific value of -13A_VMON at TIME.
11	CDH:-13V_MON	Real	V	N/A	Scientific value of -13V_MON at TIME.

12	CDH:-15RF_VMON	Real	V	N/A	Scientific value of -15RF_VMON at TIME.
13	CDH:-160_VMON	Real	V	N/A	Scientific value of -160_VMON at TIME.
14	CDH:-5.7VREF	Real	V	N/A	Scientific value of -5.7VREF at TIME.
15	CDH:-5VREF_DAC	Real	V	N/A	Scientific value of -5VREF_DAC at TIME.
16	CDH:3.3V_IMON	Real	A	N/A	Scientific value of 3.3V_IMON at TIME.
17	CDH:5V_IMON	Real	A	N/A	Scientific value of 5V_IMON at TIME.
18	CDH:AGC_TMP	Real	°C	N/A	Scientific value of AGC_TMP at TIME. This value captures the temperature of the RF AGC board.
19	CDH:ARM1_MON	Real	V	N/A	Scientific value of ARM1_MON at TIME.
20	CDH:ARM2_MON	Real	V	N/A	Scientific value of ARM2_MON at TIME.
21	CDH:BA_FIL_EMIS	Real	V	N/A	Scientific value of BA_FIL_EMIS at TIME.
22	CDH:BA_FIL_IMON	Real	V	N/A	Scientific value of BA_FIL_IMON at TIME.
23	CDH:BA_FIL_VMON	Real	V	N/A	Scientific value of BA_FIL_VMON at TIME.
24	CDH:BA_GRID_IMON	Real	V	N/A	Scientific value of BA_GRID_IMON at TIME.
25	CDH:BA_PRES	Real	V	N/A	Scientific value of BA_PRES at TIME.
26	CDH:CDH_+5VREF	Real	V	N/A	Scientific value of CDH_+5VREF at TIME.
27	CDH:CDH_-5VREF	Real	V	N/A	Scientific value of CDH_-5VREF at TIME.
28	CDH:CDH_2.5VMON	Real	V	N/A	Scientific value of CDH_2.5VMON at TIME.
29	CDH:CDH_3.3VMON	Real	V	N/A	Scientific value of CDH_3.3VMON at TIME.
30	CDH:CDH_TMP	Real	°C	N/A	Scientific value of CDH_TMP at TIME. This value captures the temperature of the CDH board.
31	CDH:CS_+13A_MON	Real	V	N/A	Scientific value of CS_+13A_MON at TIME.
32	CDH:CS_+5REF_MON	Real	V	N/A	Scientific value of CS_+5REF_MON at TIME.
33	CDH:CS_-5REF_MON	Real	V	N/A	Scientific value of CS_-5REF_MON at TIME.
34	CDH:CS_AN1_MON	Real	V	N/A	Scientific value of CS_AN1_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_AN1 electrode.
35	CDH:CS_AN2_MON	Real	V	N/A	Scientific value of CS_AN2_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_AN2 electrode.
36	CDH:CS_EA1_MON	Real	V	N/A	Scientific value of CS_EA1_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EA1 electrode.
37	CDH:CS_EA2_MON	Real	V	N/A	Scientific value of CS_EA2_MON at TIME. This value captures the drive circuit input to control the voltage on

					the CS_EA2 electrode.
38	CDH:CS_EF1A_MON	Real	V	N/A	Scientific value of CS_EF1A_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1A electrode.
39	CDH:CS_EF1B_MON	Real	V	N/A	Scientific value of CS_EF1B_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1B electrode.
40	CDH:CS_EF1C_MON	Real	V	N/A	Scientific value of CS_EF1C_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1C electrode.
41	CDH:CS_EF1D_MON	Real	V	N/A	Scientific value of CS_EF1D_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF1D electrode.
42	CDH:CS_EF2A_MON	Real	V	N/A	Scientific value of CS_EF2A_MON at TIME. This value captures the drive circuit input to control the voltage on the CS_EF2A electrode.
43	CDH:CS_EF2B_MON	Real	V	N/A	Scientific value of CS_EF2B_MON at TIME. This value captures the drive circuit input to N/A control the voltage on the CS_ EF2B electrode.
44	CDH:CS_EF2C_MON	Real	V	N/A	Scientific value of CS_EF2C_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_EF2C electrode.
45	CDH:CS_EF2D_MON	Real	V	N/A	Scientific value of CS_EF2D_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_EF2D electrode.
46	CDH:CS_FIL1_IMON	Real	V	N/A	Scientific value of CS_FIL1_IMON at TIME. This value captures CS_FIL1 current.
47	CDH:CS_FIL1_VMON	Real	V	N/A	Scientific value of CS_FIL1_VMON at TIME. This value captures CS_FIL1 voltage.
48	CDH:CS_FIL2_IMON	Real	V	N/A	Scientific value of CS_FIL2_IMON at TIME. This value captures CS_FIL2 current.
49	CDH:CS_FIL2_VMON	Real	V	N/A	Scientific value of CS_FIL2_VMON at TIME. This value captures CS_FIL2 voltage.
50	CDH:CS_FIL_EMON	Real	V	N/A	Scientific value of CS_FIL_EMON at TIME. This value captures the emission value on the active CS filament.
51	CDH:CS_FIL_SEL_ST	Real	N/A	N/A	Scientific value of CS_FIL_SEL_ST at TIME.
52	CDH:CS_FS1_MON	Real	V	N/A	Scientific value of CS_FS1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_FS1 electrode.
53	CDH:CS_FS2_MON	Real	V	N/A	Scientific value of CS_FS2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_FS2 electrode.

54	CDH:CS_GND_REF	Real	V	N/A	Scientific value of CS_GND_REF at TIME.
55	CDH:CS_IA_MON	Real	V	N/A	Scientific value of CS_IA_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_IA electrode.
56	CDH:CS_IFA_MON	Real	V	N/A	Scientific value of CS_IFA_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_IFA electrode.
57	CDH:CS_IFB_MON	Real	V	N/A	Scientific value of CS_IFB_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_IFB electrode.
58	CDH:CS_NZ_MON	Real	V	N/A	Scientific value of CS_NZ_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_NZ electrode.
59	CDH:CS_RP_MON	Real	V	N/A	Scientific value of CS_RP_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_RP electrode.
60	CDH:CS_RS_MON	Real	V	N/A	Scientific value of CS_RS_MON at TIME. This value captures the drive circuit input needed to control the voltage on the CS_RS electrode.
61	CDH:CS_SPARE	Real	N/A	N/A	Unused channel.
62	CDH:CS_TMP	Real	°C	N/A	Scientific value of CS_TMP at TIME. This value captures the temperature of the CS board.
63	CDH:CS_TRAP_MON	Real	V	N/A	Scientific value of CS_TRAP_MON at TIME.
64	CDH:CTL_+13VMON	Real	V	N/A	Scientific value of CTL_+13VMON at TIME.
65	CDH:CTL_+2.5VMON	Real	V	N/A	Scientific value of CTL_+2.5VMON at TIME.
66	CDH:CTL_+3.3VMON	Real	V	N/A	Scientific value of CTL_+3.3VMON at TIME.
67	CDH:CTL_+4VMON	Real	V	N/A	Scientific value of CTL_+4VMON at TIME.
68	CDH:CTL_+5VMON	Real	V	N/A	Scientific value of CTL_+5VMON at TIME.
69	CDH:CTL_+5VREF	Real	V	N/A	Scientific value of CTL_+5VREF at TIME.
70	CDH:CTL_+6VMON	Real	V	N/A	Scientific value of CTL_+6VMON at TIME.
71	CDH:CTL_-13VMON	Real	V	N/A	Scientific value of CTL_-13VMON at TIME.
72	CDH:CTL_-5VREF	Real	V	N/A	Scientific value of CTL_-5VREF at TIME.
73	CDH:CTL_SPARE	Real	N/A	N/A	Unused channel.
74	CDH:CTL_TMP	Real	°C	N/A	Scientific value of CTL_TMP at TIME. This value captures the temperature of the CTL board.
75	CDH:DET_TMP	Real	°C	N/A	Scientific value of DET_TMP at TIME. This value captures the temperature of the DET board.
76	CDH:EM1_IMON	Real	A	N/A	Scientific value of EM1_IMON at TIME. This value captures the current drawn by Multiplier 1.
77	CDH:EM2_IMON	Real	A	N/A	Scientific value of EM2_IMON at

					TIME. This value captures the current drawn by Multiplier 2.
78	CDH:EXT_THERM1	Real	°C	N/A	Scientific value of EXT_THERM1 at TIME.
79	CDH:EXT_THERM2	Real	°C	N/A	Scientific value of EXT_THERM2 at TIME.
80	CDH:EXT_THERM3	Real	°C	N/A	Scientific value of EXT_THERM3 at TIME.
81	CDH:FLASH_VMON	Real	V	N/A	Scientific value of FLASH_VMON at TIME.
82	CDH:IA_L1_MON	Real	V	N/A	Scientific value of IA_L1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L1 electrode.
83	CDH:IA_L2_MON	Real	V	N/A	Scientific value of IA_L2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L2 electrode.
84	CDH:IA_L4A_MON	Real	V	N/A	Scientific value of IA_L4A_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L4A electrode.
85	CDH:IA_L4B_MON	Real	V	N/A	Scientific value of IA_L4B_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L4B electrode.
86	CDH:IA_L5_MON	Real	V	N/A	Scientific value of IA_L5_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L5 electrode.
87	CDH:IA_L6_MON	Real	V	N/A	Scientific value of IA_L6_MON at TIME. This value captures the drive circuit input needed to control the voltage on the IA_L6 electrode.
88	CDH:IF_+5REF_MON	Real	V	N/A	Scientific value of IF_+5REF_MON at TIME.
89	CDH:IF_-5REF_MON	Real	V	N/A	Scientific value of IF_-5REF_MON at TIME.
90	CDH:IF_GND_REF	Real	V	N/A	Scientific value of IF_GND_REF at TIME.
91	CDH:IF_TMP	Real	°C	N/A	Scientific value of IF_TMP at TIME. This value captures the temperature of the IF board.
92	CDH:MT_EZ_MON	Real	V	N/A	Scientific value of MT_EZ_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_EZ electrode.
93	CDH:MT_FC_MON	Real	V	N/A	Scientific value of MT_FC_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_FC electrode.
94	CDH:MT_MA1_MON	Real	V	N/A	Scientific value of MT_MA1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_MA1 electrode.
95	CDH:MT_MA2_MON	Real	V	N/A	Scientific value of MT_MA2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_MA2 electrode.

96	CDH:MT_WD_MON	Real	V	N/A	Scientific value of MT_WD_MON at TIME. This value captures the drive circuit input needed to control the voltage on the MT_WD electrode.
97	CDH:MULTANA1	Real	V	N/A	Scientific value of MULTANA1 at TIME.
98	CDH:MULTANA2	Real	V	N/A	Scientific value of MULTANA2 at TIME.
99	CDH:OS_+13A_MON	Real	V	N/A	Scientific value of OS_+13A_MON at TIME.
100	CDH:OS_+5REF_MON	Real	V	N/A	Scientific value of OS_+5REF_MON at TIME.
101	CDH:OS_-5REF_MON	Real	V	N/A	Scientific value of OS_-5REF_MON at TIME.
102	CDH:OS_COLA_MON	Real	V	N/A	Scientific value of OS_COLA_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_COLA electrode.
103	CDH:OS_COLB_MON	Real	V	N/A	Scientific value of OS_COLB_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_COLB electrode.
104	CDH:OS_EA1_MON	Real	V	N/A	Scientific value of OS_EA1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EA1 electrode.
105	CDH:OS_EA2_MON	Real	V	N/A	Scientific value of OS_EA2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EA2 electrode.
106	CDH:OS_EF1A_MON	Real	V	N/A	Scientific value of OS_EF1A_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1A electrode.
107	CDH:OS_EF1B_MON	Real	V	N/A	Scientific value of OS_EF1B_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1B electrode.
108	CDH:OS_EF1C_MON	Real	V	N/A	Scientific value of OS_EF1C_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1C electrode.
109	CDH:OS_EF1D_MON	Real	V	N/A	Scientific value of OS_EF1D_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF1D electrode.
110	CDH:OS_EF2A_MON	Real	V	N/A	Scientific value of OS_EF2A_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2A electrode.
111	CDH:OS_EF2B_MON	Real	V	N/A	Scientific value of OS_EF2B_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2B

					electrode.
112	CDH:OS_EF2C_MON	Real	V	N/A	Scientific value of OS_EF2C_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2C electrode.
113	CDH:OS_EF2D_MON	Real	V	N/A	Scientific value of OS_EF2D_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_EF2D electrode.
114	CDH:OS_FIL1_IMON	Real	A	N/A	Scientific value of OS_FIL1_IMON at TIME. This value captures OS_FIL1 current.
115	CDH:OS_FIL1_VMON	Real	V	N/A	Scientific value of OS_FIL1_VMON at TIME. This value captures OS_FIL1 voltage.
116	CDH:OS_FIL2_IMON	Real	A	N/A	Scientific value of OS_FIL2_IMON at TIME. This value captures OS_FIL2 current.
117	CDH:OS_FIL2_VMON	Real	V	N/A	Scientific value of OS_FIL2_VMON at TIME. This value captures OS_FIL2 voltage.
118	CDH:OS_FIL_EMON	Real	A	N/A	Scientific value of OS_FIL_EMON at TIME. This value captures the emission value on the active OS filament.
119	CDH:OS_FIL_SEL_ST	Real	N/A	N/A	Scientific value of OS_FIL_SEL_ST at TIME.
120	CDH:OS_FS1_MON	Real	V	N/A	Scientific value of OS_FS1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_FS1 electrode.
121	CDH:OS_FS2_MON	Real	V	N/A	Scientific value of OS_FS2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_FS2 electrode.
122	CDH:OS_GND_REF	Real	V	N/A	Scientific value of OS_GND_REF at TIME.
123	CDH:OS_OL1_MON	Real	V	N/A	Scientific value of OS_OL1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL1 electrode.
124	CDH:OS_OL2_MON	Real	V	N/A	Scientific value of OS_OL2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL2 electrode.
125	CDH:OS_OL3_MON	Real	V	N/A	Scientific value of OS_OL3_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL3 electrode.
126	CDH:OS_OL4_MON	Real	V	N/A	Scientific value of OS_OL4_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL4 electrode.
127	CDH:OS_OL5_MON	Real	V	N/A	Scientific value of OS_OL5_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_OL5 electrode.
128	CDH:OS_OL6_MON	Real	V	N/A	Scientific value of OS_OL6_MON at TIME. This value captures the drive

					circuit input needed to control the voltage on the OS_OL6 electrode.
129	CDH:OS_RES1_MON	Real	V	N/A	Scientific value of OS_RES1_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_RES1 electrode.
130	CDH:OS_RES2_MON	Real	V	N/A	Scientific value of OS_RES2_MON at TIME. This value captures the drive circuit input needed to control the voltage on the OS_RES2 electrode.
131	CDH:OS_SPARE	Real	N/A	N/A	Unused channel.
132	CDH:OS_TMP	Real	°C	N/A	Scientific value of OS_TMP at TIME. This value captures the temperature of the OS board.
133	CDH:OS_TRAP_MON	Real	V	N/A	Scientific value of OS_TRAP_MON at TIME.
134	CDH:PS_IMON	Real	A	N/A	Scientific value of PS_IMON at TIME.
135	CDH:PS_IMON_2	Real	A	N/A	Scientific value of PS_IMON_2 at TIME.
136	CDH:PS_TMP	Real	°C	N/A	Scientific value of PS_TMP at TIME. This value captures the temperature of the PS board.
137	CDH:PYRO1_MON	Real	V	N/A	Scientific value of PYRO1_MON at TIME.
138	CDH:PYRO2_MON	Real	V	N/A	Scientific value of PYRO2_MON at TIME.
139	CDH:PulseCounter	Real	Hz	N/A	Scientific value of PulseCounter at TIME. This value captures the number of counts detected with active multiplier during the duration of the integration period.
140	CDH:QD_BS_MON	Real	V	N/A	Scientific value of QD_BS_MON at TIME. This value captures the drive circuit input needed to control the voltage on the QD_BS electrode.
141	CDH:RF_AGC_MON	Real	V	N/A	Scientific value of RF_AGC_MON at TIME.
142	CDH:RF_Cntr	Real	KHz	N/A	Scientific value of RF_Cntr at TIME. This value captures the current RF frequency.
143	CDH:RF_TMP	Real	°C	N/A	Scientific value of RF_TMP at TIM. This value captures the temperature of the RF board.
144	CDH:SL_BB_MON	Real	V	N/A	Scientific value of SL_BB_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_BB electrode.
145	CDH:SL_BF_MON	Real	V	N/A	Scientific value of SL_BF_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_BF electrode.
146	CDH:SL_EL_MON	Real	V	N/A	Scientific value of SL_EL_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_EL electrode.
147	CDH:SL_TB_MON	Real	V	N/A	Scientific value of SL_TB_MON at TIME. This value captures the drive circuit input needed to control the

					voltage on the SL_TB electrode.
148	CDH:SL_TF_MON	Real	V	N/A	Scientific value of SL_TF_MON at TIME. This value captures the drive circuit input needed to control the voltage on the SL_TF electrode.
149	CDH:SPARE_0	Real	N/A	N/A	Unused channel.
150	CDH:SPARE_1	Real	N/A	N/A	Unused channel.
151	CDH:SPARE_2	Real	N/A	N/A	Unused channel.
152	CDH:SPARE_3	Real	N/A	N/A	Unused channel.
153	CDH:SPARE_4	Real	N/A	N/A	Unused channel.
154	CDH:SPARE_5	Real	N/A	N/A	Unused channel.
155	CDH:SPARE_6	Real	N/A	N/A	Unused channel.
156	CDH:THERM_COM	Real	N/A	N/A	Scientific value of THERM_COM at TIME.
157	FSW:ALARM_LEVEL	Real	N/A	N/A	Scientific value of ALARM_LEVEL at TIME.
158	FSW:ALARM_STAT	Real	N/A	N/A	Scientific value of ALARM_STAT at TIME.
159	FSW:BAD_CMD_ERR	Real	N/A	N/A	Scientific value of BAD_CMD_ERR at TIME.
160	FSW:BAD_CMD_OP	Real	N/A	N/A	Scientific value of BAD_CMD_OP at TIME.
161	FSW:CODE_CSUM	Real	N/A	N/A	Scientific value of CODE_CSUM at TIME.
162	FSW:DWELL_MON_ADDR	Real	N/A	N/A	Scientific value of DWELL_MON_ADDR at TIME.
163	FSW:DWELL_MON_VAL	Real	N/A	N/A	Scientific value of DWELL_MON_VAL at TIME.
164	FSW:FSW_VER	Real	N/A	N/A	Scientific value of FSW_VER at TIME.
165	FSW:INST_MODE	Real	N/A	N/A	Scientific value of INST_MODE at TIME.
166	FSW:LARGEST_FREE_BLOCK	Real	N/A	N/A	Scientific value of LARGEST_FREE_BLOCK at TIME.
167	FSW:LAST_CMD	Real	N/A	N/A	Scientific value of LAST_CMD at TIME.
168	FSW:LAST_FILE_ID	Real	N/A	N/A	Scientific value of LAST_FILE_ID at TIME.
169	FSW:LAST_MARKER	Real	N/A	N/A	Scientific value of LAST_MARKER at TIME.
170	FSW:LAST_RESET	Real	N/A	N/A	Scientific value of LAST_RESET at TIME.
171	FSW:LIB_CSUM	Real	N/A	N/A	Scientific value of LIB_CSUM at TIME.
172	FSW:LIB_VER	Real	N/A	N/A	Scientific value of LIB_VER at TIME.
173	FSW:LOAD_TYPE	Real	N/A	N/A	Scientific value of LOAD_TYPE at TIME.
174	FSW:MEM_ALLOC	Real	N/A	N/A	Scientific value of MEM_ALLOC at TIME.
175	FSW:MEM_FREE	Real	N/A	N/A	Scientific value of MEM_FREE at TIME.
176	FSW:N_ALARMS	Real	N/A	N/A	Scientific value of N_ALARMS at TIME.
177	FSW:N_ALARM_ACTIVE	Real	N/A	N/A	Scientific value of N_ALARM_ACTIVE at TIME.
178	FSW:N_ALARM_ENAB	Real	N/A	N/A	Scientific value of N_ALARM_ENAB at TIME.
179	FSW:N_ALLOCS	Real	N/A	N/A	Scientific value of N_ALLOCS at

					TIME.
180	FSW:N_CMDS	Real	N/A	N/A	Scientific value of N_CMDS at TIME.
181	FSW:N_CMD_ERRS	Real	N/A	N/A	Scientific value of N_CMD_ERRS at TIME.
182	FSW:N_FREES	Real	N/A	N/A	Scientific value of N_FREES at TIME.
183	FSW:PKT_REV	Real	N/A	N/A	Scientific value of PKT_REV at TIME.
184	FSW:POWER_STAT	Real	N/A	N/A	Scientific value of POWER_STAT at TIME.
185	FSW:SCRIPT_CSUM	Real	N/A	N/A	Scientific value of SCRIPT_CSUM at TIME.
186	FSW:SCRIPT_ID	Real	N/A	N/A	Scientific value of SCRIPT_ID at TIME.
187	FSW:SCRIPT_MODE	Real	N/A	N/A	Scientific value of SCRIPT_MODE at TIME.
188	FSW:SCRIPT_VER	Real	N/A	N/A	Scientific value of SCRIPT_VER at TIME.
189	FSW:SIDE_A	Real	N/A	N/A	Scientific value of SIDE_A at TIME.
190	FSW:TELEM_MODE	Real	N/A	N/A	Scientific value of TELEM_MODE at TIME.
191	FSW:ZONE_ALERT	Real	N/A	N/A	Scientific value of ZONE_ALERT at TIME.
192	QMS:ADC_STATUS	Integer	N/A	N/A	Scientific value of ADC_STATUS at TIME.
193	QMS:AMUX1	Integer	N/A	N/A	Scientific value of AMUX1 at TIME.
194	QMS:AMUX2	Integer	N/A	N/A	Scientific value of AMUX2 at TIME.
195	QMS:AMUX_ADDR1	Integer	N/A	N/A	Scientific value of AMUX_ADDR1 at TIME.
196	QMS:AMUX_ADDR2	Integer	N/A	N/A	Scientific value of AMUX_ADDR2 at TIME.
197	QMS:AMUX_ADDR3	Integer	N/A	N/A	Scientific value of AMUX_ADDR3 at TIME.
198	QMS:AMUX_ADDR4	Integer	N/A	N/A	Scientific value of AMUX_ADDR4 at TIME.
199	QMS:BA_FIL_VCTL	Real	N/A	N/A	Scientific value of BA_FIL_VCTL at TIME.
200	QMS:COUNT1	Integer	N/A	NA	Scientific value of COUNT1 at TIME. This value captures the number of counts detected with multiplier 1 during the duration of the integration period.
201	QMS:COUNT2	Integer	N/A	NA	Scientific value of COUNT2 at TIME. This value captures the number of counts detected with multiplier 2 during the duration of the integration period.
202	QMS:CS_AN1_VCTL	Real	V	N/A	Scientific value of CS_AN1_VCTL at TIME. This value captures the DAC setting for the CS_AN1 electrode.
203	QMS:CS_AN2_VCTL	Real	V	N/A	Scientific value of CS_AN2_VCTL at TIME. This value captures the DAC setting for the CS_AN2 electrode.
204	QMS:CS_EA1_VCTL	Real	V	N/A	Scientific value of CS_EA1_VCTL at TIME. This value captures the DAC setting for the CS_EA1 electrode.
205	QMS:CS_EA2_VCTL	Real	V	N/A	Scientific value of CS_EA2_VCTL at TIME. This value captures the DAC

					setting for the CS_EA2 electrode.
206	QMS:CS_EF1A_VCTL	Real	V	N/A	Scientific value of CS_EF1A_VCTL at TIME. This value captures the DAC setting for the CS_EF1A electrode.
207	QMS:CS_EF1B_VCTL	Real	V	N/A	Scientific value of CS_EF1B_VCTL at TIME. This value captures the DAC setting for the CS_EF1B electrode.
208	QMS:CS_EF1C_VCTL	Real	V	N/A	Scientific value of CS_EF1C_VCTL at TIME. This value captures the DAC setting for the CS_EF1C electrode.
209	QMS:CS_EF1D_VCTL	Real	V	N/A	Scientific value of CS_EF1D_VCTL at TIME. This value captures the DAC setting for the CS_EF1D electrode.
210	QMS:CS_EF2A_VCTL	Real	V	N/A	Scientific value of CS_EF2A_VCTL at TIME. This value captures the DAC setting for the CS_EF2A electrode.
211	QMS:CS_EF2B_VCTL	Real	V	N/A	Scientific value of CS_EF2B_VCTL at TIME. This value captures the DAC setting for the CS_EF2B electrode.
212	QMS:CS_EF2C_VCTL	Real	V	N/A	Scientific value of CS_EF2C_VCTL at TIME. This value captures the DAC setting for the CS_EF2C electrode.
213	QMS:CS_EF2D_VCTL	Real	V	N/A	Scientific value of CS_EF2D_VCTL at TIME. This value captures the DAC setting for the CS_EF2D electrode.
214	QMS:CS_FIL1_ECTL	Real	A	N/A	Scientific value of CS_FIL1_ECTL at TIME. This value captures the DAC setting for the CS_FIL1 electrode.
215	QMS:CS_FIL1_VCTL	Real	V	N/A	Scientific value of CS_FIL1_VCTL at TIME. This value captures the DAC setting for the CS_FIL1 electrode.
216	QMS:CS_FIL2_ECTL	Real	A	N/A	Scientific value of CS_FIL2_ECTL at TIME. This value captures the DAC setting for the CS_FIL2 electrode.
217	QMS:CS_FIL2_VCTL	Real	V	N/A	Scientific value of CS_FIL2_VCTL at TIME. This value captures the DAC setting for the CS_FIL2 electrode.
218	QMS:CS_FS1_VCTL	Real	V	N/A	Scientific value of CS_FS1_VCTL at TIME. This value captures the DAC setting for the CS_FS1 electrode.
219	QMS:CS_FS2_VCTL	Real	V	N/A	Scientific value of CS_FS2_VCTL at TIME. This value captures the DAC setting for the CS_FS2 electrode.
220	QMS:CS_IA_VCTL	Real	V	N/A	Scientific value of CS_IA_VCTL at TIME. This value captures the DAC setting for the CS_IA electrode.
221	QMS:CS_IFA_VCTL	Real	V	N/A	Scientific value of CS_IFA_VCTL at TIME. This value captures the DAC setting for the CS_IFA electrode.

222	QMS:CS_IFB_VCTL	Real	V	N/A	Scientific value of CS_IFB_VCTL at TIME. This value captures the DAC setting for the CS_IFB electrode.
223	QMS:CS_NZ_VCTL	Real	V	N/A	Scientific value of CS_NZ_VCTL at TIME. This value captures the DAC setting for the CS_NZ electrode.
224	QMS:CS_RP_VCTL	Real	V	N/A	Scientific value of CS_RP_VCTL at TIME. This value captures the DAC setting for the CS_RP electrode.
225	QMS:CS_RS_VCTL	Real	V	N/A	Scientific value of CS_RS_VCTL at TIME. This value captures the DAC setting for the CS_RS electrode.
226	QMS:CTL_DIGITAL_STATUS	Integer	N/A	N/A	Scientific value of CTL_DIGITAL_STATUS at TIME.
227	QMS:CTL_ERROR_COUNT	Integer	N/A	N/A	Scientific value of CTL_ERROR_COUNT at TIME.
228	QMS:CTL_PACKET_COUNT	Integer	N/A	N/A	Scientific value of CTL_PACKET_COUNT at TIME.
229	QMS:CTL_SYNC_CODE	Integer	N/A	N/A	Scientific value of CTL_SYNC_CODE at TIME.
230	QMS:DAC12BSPARE1	Real	N/A	N/A	Unused channel.
231	QMS:DAC12BSPARE2	Real	N/A	N/A	Unused channel.
232	QMS:DAC12BSPARE3	Real	N/A	N/A	Unused channel.
233	QMS:DAC12USPARE1	Real	N/A	N/A	Unused channel.
234	QMS:DAC12USPARE2	Real	N/A	N/A	Unused channel.
235	QMS:DAC16BSPARE1	Real	N/A	N/A	Unused channel.
236	QMS:DAC16BSPARE2	Real	N/A	N/A	Unused channel.
237	QMS:DAC8B_SPARE1	Real	N/A	N/A	Unused channel.
238	QMS:DAC8B_SPARE2	Real	N/A	N/A	Unused channel.
239	QMS:DAC8B_SPARE3	Real	N/A	N/A	Unused channel.
240	QMS:DAC_SPARE	Real	N/A	N/A	Unused channel.
241	QMS:DT1_VCTL	Real	N/A	N/A	Scientific value of DT1_VCTL at TIME. This value captures the DAC setting for the DET1 discriminator.
242	QMS:DT2_VCTL	Real	N/A	N/A	Scientific value of DT2_VCTL at TIME. This value captures the DAC setting for the DET1 discriminator.
243	QMS:FIL_ON_CTRL	Real	N/A	N/A	Scientific value of FIL_ON_CTRL at TIME.
244	QMS:FIL_SELECT	Integer	N/A	N/A	Scientific value of FIL_SELECT at TIME.
245	QMS:IA_L1_VCTL	Real	V	N/A	Scientific value of IA_L1_VCTL at TIME. This value captures the DAC setting for the IA_L1 electrode.
246	QMS:IA_L2_VCTL	Real	V	N/A	Scientific value of IA_L2_VCTL at TIME. This value captures the DAC setting for the IA_L2 electrode.
247	QMS:IA_L4A_VCTL	Real	V	N/A	Scientific value of IA_L4A_VCTL at TIME. This value captures the DAC setting for the IA_L4A electrode.
248	QMS:IA_L4B_VCTL	Real	V	N/A	Scientific value of IA_L4B_VCTL at TIME. This value captures the DAC setting for the IA_L4B electrode.
249	QMS:IA_L5_VCTL	Real	V	N/A	Scientific value of IA_L5_VCTL at TIME. This value captures the DAC setting for the IA_L5 electrode.
250	QMS:IA_L6_VCTL	Real	V	N/A	Scientific value of IA_L6_VCTL at TIME. This value captures the DAC setting for the IA_L6 electrode.
251	QMS:IP_COUNT	Real	Seconds	N/A	Scientific value of IP_COUNT at TIME. This value captures the

					current integration period (IP) duration.
252	QMS:IP_SETUP	Real	Seconds	N/A	Scientific value of IP_SETUP at TIME. This value captures the current settling period duration.
253	QMS:MT_EZ_VCTL	Real	V	N/A	Scientific value of MT_EZ_VCTL at TIME. This value captures the DAC setting for the MT_EZ electrode.
254	QMS:MT_FC_VCTL	Real	V	N/A	Scientific value of MT_FC_VCTL at TIME. This value captures the DAC setting for the MT_FC electrode.
255	QMS:MT_MA1_VCTL	Real	V	N/A	Scientific value of MT_MA1_VCTL at TIME. This value captures the DAC setting for the MT_MA1 electrode.
256	QMS:MT_MA2_VCTL	Real	V	N/A	Scientific value of MT_MA2_VCTL at TIME. This value captures the DAC setting for the MT_MA2 electrode.
257	QMS:MT_MU1_VCTL	Real	V	N/A	Scientific value of MT_MU1_VCTL at TIME. This value captures the DAC setting for the MT_MU1 electrode.
258	QMS:MT_MU2_VCTL	Real	V	N/A	Scientific value of MT_MU2_VCTL at TIME. This value captures the DAC setting for the MT_MU2 electrode.
259	QMS:MT_WD_VCTL	Real	V	N/A	Scientific value of MT_WD_VCTL at TIME. This value captures the DAC setting for the MT_WD electrode.
260	QMS:OS_COLA_VCTL	Real	V	N/A	Scientific value of OS_COLA_VCTL at TIME. This value captures the DAC setting for the OS_COLA electrode.
261	QMS:OS_COLB_VCTL	Real	V	N/A	Scientific value of OS_COLB_VCTL at TIME. This value captures the DAC setting for the OS_COLB electrode.
262	QMS:OS_EA1_VCTL	Real	V	N/A	Scientific value of OS_EA1_VCTL at TIME. This value captures the DAC setting for the OS_EA1 electrode.
263	QMS:OS_EA2_VCTL	Real	V	N/A	Scientific value of OS_EA2_VCTL at TIME. This value captures the DAC setting for the OS_EA2 electrode.
264	QMS:OS_EF1A_VCTL	Real	V	N/A	Scientific value of OS_EF1A_VCTL at TIME. This value captures the DAC setting for the OS_EF1A electrode.
265	QMS:OS_EF1B_VCTL	Real	V	N/A	Scientific value of OS_EF1B_VCTL at TIME. This value captures the DAC setting for the OS_EF1B electrode.
266	QMS:OS_EF1C_VCTL	Real	V	N/A	Scientific value of OS_EF1C_VCTL at TIME. This value captures the DAC setting for the OS_EF1C electrode.
267	QMS:OS_EF1D_VCTL	Real	V	N/A	Scientific value of OS_EF1D_VCTL at TIME. This value captures the

					DAC setting for the OS_EF1D electrode.
268	QMS:OS_EF2A_VCTL	Real	V	N/A	Scientific value of OS_EF2A_VCTL at TIME. This value captures the DAC setting for the OS_EF2A electrode.
269	QMS:OS_EF2B_VCTL	Real	V	N/A	Scientific value of OS_EF2B_VCTL at TIME. This value captures the DAC setting for the OS_EF2B electrode.
270	QMS:OS_EF2C_VCTL	Real	V	N/A	Scientific value of OS_EF2C_VCTL at TIME. This value captures the DAC setting for the OS_EF2C electrode.
271	QMS:OS_EF2D_VCTL	Real	V	N/A	Scientific value of OS_EF2D_VCTL at TIME. This value captures the DAC setting for the OS_EF2D electrode.
272	QMS:OS_FIL1_ECTL	Real	A	N/A	Scientific value of OS_FIL1_ECTL at TIME. This value captures the DAC setting for the OS_FIL1 emission control.
273	QMS:OS_FIL1_VCTL	Real	V	N/A	Scientific value of OS_FIL1_VCTL at TIME. This value captures the DAC setting for the OS_FIL1 electrode.
274	QMS:OS_FIL2_ECTL	Real	A	N/A	Scientific value of OS_FIL2_ECTL at TIME. This value captures the DAC setting for the OS_FIL2 emission control.
275	QMS:OS_FIL2_VCTL	Real	V	N/A	Scientific value of OS_FIL2_VCTL at TIME. This value captures the DAC setting for the OS_FIL2 electrode.
276	QMS:OS_FS1_VCTL	Real	V	N/A	Scientific value of OS_FS1_VCTL at TIME. This value captures the DAC setting for the OS_FS1 electrode.
277	QMS:OS_FS2_VCTL	Real	V	N/A	Scientific value of OS_FS2_VCTL at TIME. This value captures the DAC setting for the OS_FS2 electrode.
278	QMS:OS_OL1_VCTL	Real	V	N/A	Scientific value of OS_OL1_VCTL at TIME. This value captures the DAC setting for the OS_OL1 electrode.
279	QMS:OS_OL2_VCTL	Real	V	N/A	Scientific value of OS_OL2_VCTL at TIME. This value captures the DAC setting for the OS_OL2 electrode.
280	QMS:OS_OL3_VCTL	Real	V	N/A	Scientific value of OS_OL3_VCTL at TIME. This value captures the DAC setting for the OS_OL3 electrode.
281	QMS:OS_OL4_VCTL	Real	V	N/A	Scientific value of OS_OL4_VCTL at TIME. This value captures the DAC setting for the OS_OL4 electrode.
282	QMS:OS_OL5_VCTL	Real	V	N/A	Scientific value of OS_OL5_VCTL at TIME. This value captures the DAC setting for the OS_OL5 electrode.
283	QMS:OS_OL6_VCTL	Real	V	N/A	Scientific value of OS_OL6_VCTL

					at TIME. This value captures the DAC setting for the OS_OL6 electrode.
284	QMS:OS_RES1_VCTL	Real	V	N/A	Scientific value of OS_RES1_VCTL at TIME. This value captures the DAC setting for the OS_RES1 electrode.
285	QMS:OS_RES2_VCTL	Real	V	N/A	Scientific value of OS_RES2_VCTL at TIME. This value captures the DAC setting for the OS_RES2 electrode.
286	QMS:QB_VCTL	Real	V	N/A	Scientific value of QB_VCTL at TIME.
287	QMS:QD_BS_VCTL	Real	V	N/A	Scientific value of QD_BS_VCTL at TIME. This value captures the DAC setting for the QD_BS electrode.
288	QMS:RF_FREQ	Real	MHz	N/A	Scientific value of RF_FREQ at TIME.
289	QMS:RF_FREQ_SET	Integer	N/A	N/A	Scientific value of RF_FREQ_SET at TIME.
290	QMS:RODAC_CTRL	Real	V	N/A	Scientific value of RODAC_CTRL at TIME. This value captures the DAC setting for the RF AC amplitude.
291	QMS:RODDC_CTL	Real	V	N/A	Scientific value of RODDC_CTL at TIME. This value captures the DAC setting for the RF DC amplitude.
292	QMS:SERIAL_NUM	Integer	N/A	N/A	Scientific value of SERIAL_NUM at TIME.
293	QMS:SERIAL_NUM_SET	Integer	N/A	N/A	Scientific value of SERIAL_NUM_SET at TIME.
294	QMS:SL_BB_VCTL	Real	V	N/A	Scientific value of SL_BB_VCTL at TIME. This value captures the DAC setting for the SL_BB electrode.
295	QMS:SL_BF_VCTL	Real	V	N/A	Scientific value of SL_BF_VCTL at TIME. This value captures the DAC setting for the SL_BF electrode.
296	QMS:SL_EL_VCTL	Real	V	N/A	Scientific value of SL_EL_VCTL at TIME. This value captures the DAC setting for the SL_EL electrode.
297	QMS:SL_TB_VCTL	Real	V	N/A	Scientific value of SL_TB_VCTL at TIME. This value captures the DAC setting for the SL_TB electrode.
298	QMS:SL_TF_VCTL	Real	V	N/A	Scientific value of SL_TF_VCTL at TIME. This value captures the DAC setting for the SL_TF electrode.
299	QMS:SYNC_CODE	Integer	N/A	N/A	Scientific value of SYNC_CODE at TIME.
300	QMS:WAIT	Integer	N/A	N/A	Scientific value of WAIT at TIME.
301	TM:TMMarker	Real	N/A	N/A	Scientific value of TMMarker at TIME. This value captures the Marker ID of the current data point. Markers are tag numbers given to related set of measurements.
302	TM:TMMarkerText	Text	N/A	N/A	Scientific value of TMMarkerText at TIME. This value captures the current Marker description.
303	TM:TMSync	Real	N/A	N/A	Scientific value of TMSync at TIME.
304	TM:TMSystemID	Real	N/A	N/A	Scientific value of TMSystemID at TIME.
305	TM:TMTick	Real	Seconds	N/A	Scientific value of TMTick at TIME.

8.4.6 Calibrated science data table

This table contains the calibrated science packets values generated while the instrument is in a science telemetry mode.

Table A-7: Definition of the calibrated science data table

#	Name	Format	Units	Range	Description
1	TIME.	Real	s	N/A	SCLK timestamp of any corresponding observed value.
2	MKID	Integer	N/A	N/A	Marker ID of the current data point. Markers are tag numbers given to related set of measurements.
3	IP	Real	s	N/A	Scientific value of IP at TIME. This value captures the current integration period (IP) duration.
4	TUNING	Integer	N/A	N/A	Engineering value of TUNING at TIME. This value captures the current focusing scheme of the sensor (See Table A-3).
5	MASS	Real	M/Z	0 – 150	Scientific value of MASS at TIME. This value captures the current measured mass value.
6	COUNTS_PER_SECOND	Real	Hz	N/A	Scientific value of COUNTS_PER_SECOND at TIME. This value captures the number of counts per second detected with the active multiplier during the duration of the integration period.
7	DAC_ID	Integer	N/A	N/A	Engineering value of DAC_ID at TIME. This value captures the ID of DAC used during electrode voltage scan (See Table A-2).
8	DAC_SETTING	Real	N/A	N/A	Scientific value of DAC_SETTING at TIME. This value captures the voltage setting of the DAC_ID electrode during its voltage scan.

8.4.7 Time-corrected message log

The time-corrected message log is an ASCII file identical to the raw message log but with time-corrected stamps (in seconds).

8.4.8 Time-correlated marker file

The time-correlated marker file is an ASCII file identical to the raw marker file but with time-corrected stamps (in seconds).

8.5 NMS Script list:

During calibration, integration and testing and flight portions of the LADEE mission, the NMS instrument executed a series of scripts. The message log of the script execution provides an addition method of verifying the script name and version for each TID.
The list of scripts executed by NMS are given in the following table:

Table A-8: Description of the scripts executed by the NMS instrument

Script Name	Description
gse_startup.bas	Script to perform initial single gas calibration. The script is parameterized during each run according the calibration gas used.

cal_script.bas	Script to perform single and mixed gas calibration. The script is parameterized during each run according the calibration gas used.
baseline.bas	Engineering comprehensive performance test (CPT). Performs Hi and Low emission full range scans on FIL1/EM1 and FIL2/EM2. Perfoms lens scans and PHDs.
sci_main.bas	Script engine used to execute all flight activities. This script loads and execute one of the configuration files listed below.
STS_orbit_Baseline	Flight functional configuration file to trend the detectors and instrument background. Performs 1.5 - 69.5 amu fractional scans on CS, OSNT and OSNB, PHD (24 and 44 amu) on EM1 and EM2, OS_OL1 lens scans.
STS_exo_L1_10x7x10_v01	Configuration file to measure He and Ar-40 using CS. Performs fractional scans of 4 and 40 amu. Unit scans of 36, 37, 38, 39, 41, and 42 amu.
STS_exo_L2_2x5x10_v03	Configuration file to measure He Ne, Ar-36 and Ar-40 using CS. Performs fractional scans of 4, 20, 36 and 40 amu. Unit scans of 18, 19, 21, 22, 35, 37, 38, 39, 41, and 42 amu.
STS_exo_L2_2x5x10_v04	Configuration file to measure He Ne, Ar-36, Ar-40 and H_2O using CS. Performs fractional scans of 4, 17, 18, 20, 36 and 40 amu. Unit scans of 19, 21, 22, 35, 37, 38, 39, 41, and 42 amu.
STS_exo_L3A_3x5x10_v01	Configuration file to measure H_2, He, CH_4, OH, H_2O, CO, Ar, and CO_2 and general survey using CSN. Performs fractional scans of 2, 4, 12, 15-18, 20, 28, 32, 40, and 44. Unit scans of 2-53 amu.
STS_exo_L3B_3x5x10_v01	Configuration file to measure H_2, He, CH_4, OH, H_2O, CO, Ar, and CO_2 and general survey using OSNB. Performs fractional scans of 2, 4, 12, 15-18, 20, 28, 32, 40, and 44. Unit scans of 2-53 amu.
STS_ion_I1_1x3x10_v03	Configuration file to measure ions (OSION mode). Performs fractional scans of 2, 4, 12, 14, 16, 17, 18, 20, 23, 24, 25, 28, 30, 32, 36, 39, 40, 44, 48, and 49 amu.
STS_ion_I1_1x3x10_v04	Configuration file to measure ions, and perform energy scans (OSION mode). Performs fractional scans of 2, 4, 12, 14, 16, 17, 18, 20, 23, 24, 25, 28, 30, 32, 36, 39, 40, 44, 48, and 49 amu, Energy scan on mass 18 amu.
STS_omm_L1_1x31x2_v03	Configuration file to measure He and Ar mass peak shapes during orbital maintenance maneuvers using CS. Perform a 31 points peak top scans of 4 and 40 amu. Unit scans of 39 and 41 amu.
STS_omm_L1_1x61x2_v03	Configuration file to measure He and Ar mass peak shapes during orbital maintenance maneuvers using CS. Perform a 61 points peak top scans of 4 and 40 amu. Unit scans of 39 and 41 amu.
STS_tlt_R1_1x3x10_v03	Configuration file to measure sputtered species, and general survey using OSNB. Perform fractional scans of 2, 4, 12-18, 23-41, 44 and 48 amu. Unit scans of 49-90 amu.
STS_bkg_LHA_1x11x10_v01	Configuration file to make a general survey (full mass range) using CS. Perform fractional scans of 1.5-90.5 amu.
STS_bkg_LHB_1x11x10_v01	Configuration file to execute a general survey (full mass range) using OSNB. Perform fractional scans of 1.5-90.5 amu.
STS_pro_L3_1x1x10_v01	Configuration file to execute a special survey for Cheng-E 3 landing (includes He and Ar for cadence) using CS. Performs Unit scans on 2, 4, 12, 14, 16, 17, 18, 19, 28, 30, 32, 40, 44, 45, 46, 62, 63, and 92 amu.
STS_baseline_cap_eject_v02	Configuration file to acquire scans prior and post break-off assembly ejection.
STS_baseline_peaktopstructure_v02	Configuration file to test peak top scanning.
STS_baseline_recal_Ar_v03	Configuration file to acquire Ar data prior to break-off assembly ejection.
STS_baseline_recal_He_v04	Configuration file to acquire He data prior to break-off assembly ejection.

8.6 NMS TID List:

The list of TID that are relevant to instrument calibration and that provide trending of instrument performance are listed in the Table A-9. The data returned from these activities are archived in their raw form in the \calibration collection.
TIDs acquired after launch are listed in TID_Flight_List.pdf in the \document collection and are archived in the \data_raw and \data_calibrated collections.

Table A-9: List of TID collected prior to LADEE launch

Date	TID	Ops	Temperature	Script
FM Calibration on Chamber				
28-Oct-11	10160	Argon Calibration	Ambient	gse-startup.bas
28-Oct-11	10161	Argon Calibration	Ambient	gse-startup.bas
31-Oct-11	10169	Helium Calibration	Ambient	gse-startup.bas
31-Oct-11	10170	Helium Calibration	Ambient	gse-startup.bas
1-Nov-11	10175	Krypton Calibration	Ambient	cal_script.bas
1-Nov-11	10176	Krypton Calibration	Ambient	cal_script.bas
3-Nov-11	10180	Neon Calibration	Ambient	gse-startup.bas
3-Nov-11	10182	Neon Calibration	Ambient	gse-startup.bas
FM Calibration on Vacuum Chamber				
20-Dec-11	10278	Argon Calibration	Ambient	cal_script.bas
21-Dec-11	10281	Argon Calibration	Ambient	cal_script.bas
21-Dec-11	10282	Blank Calibration	Ambient	cal_script.bas
21-Dec-11	10283	Argon Calibration	Ambient	cal_script.bas
22-Dec-11	10286	CPT	Ambient	baseline.bas
22-Dec-11	10289	SAM Mix Calibration	Ambient	cal_script.bas
22-Dec-11	10290	Blank Calibration	Ambient	cal_script.bas
23-Dec-11	10292	SAM Mix Calibration	Ambient	cal_script.bas
23-Dec-11	10293	SAM Mix Calibration	Ambient	cal_script.bas
23-Dec-11	10294	Blank Calibration	Ambient	cal_script.bas
23-Dec-11	10295	SAM Mix Calibration	Ambient	cal_script.bas
23-Dec-11	10296	Blank Calibration	Ambient	cal_script.bas
28-Dec-11	10298	Argon Calibration	Ambient	cal_script.bas
28-Dec-11	10299	Blank Calibration	Ambient	cal_script.bas
28-Dec-11	10301	Argon Calibration	Ambient	cal_script.bas
29-Dec-11	10305	Background	Ambient	cal_script.bas
29-Dec-11	10306	Background	Ambient	cal_script.bas
29-Dec-11	10307	Heluim Calibration	Ambient	cal_script.bas
29-Dec-11	10308	Heluim Calibration	Ambient	cal_script.bas
29-Dec-11	10309	Blank Calibration	Ambient	cal_script.bas
29-Dec-11	10310	Heluim Calibration	Ambient	cal_script.bas
29-Dec-11	10311	Blank Calibration	Ambient	cal_script.bas
23-Dec-11	10314	CPT	Ambient	baseline.bas
29-Dec-11	10315	LADEE Mix Calibration	Ambient	cal_script.bas
30-Dec-11	10317	Heluim Calibration	Ambient	cal_script.bas
30-Dec-11	10319	LADEE Mix Calibration	Ambient	cal_script.bas
30-Dec-11	10321	Post Pinch-off	Ambient	cal_script.bas
Environmental Testing				

17-Aug-12	10754	CPT	Ambient	Baseline.bas
18-Aug-12	10757	CPT	50	Baseline.bas
19-Aug-12	10763	CPT	-30	Baseline.bas
20-Aug-12	10766	CPT	50	Baseline.bas
21-Aug-12	10783	CPT	-30	Baseline.bas
21-Aug-12	10788	CPT	50	Baseline.bas
22-Aug-12	10800	CPT	-30	Baseline.bas
23-Aug-12	10802	CPT	50	Baseline.bas
24-Aug-12	10806	CPT	-30	Baseline.bas
25-Aug-12	10815	CPT	50	Baseline.bas
26-Aug-12	10822	CPT	-30	Baseline.bas
26-Aug-12	10827	CPT	50	Baseline.bas
27-Aug-12	10831	CPT	-30	Baseline.bas
28-Aug-12	10839	CPT	50	Baseline.bas
28-Aug-12	10845	CPT	-30	Baseline.bas
29-Aug-12	10855	CPT	50	Baseline.bas
30-Aug-12	10868	CPT	-30	Baseline.bas
4-Sep-12	10879	CPT	Ambient	Baseline.bas
7-Sep-12	10887	CPT	Ambient	Baseline.bas
Post-Environmental Testing				
21-Sep-13	10906	CPT	Ambient	Baseline.bas
4-Oct-12	10934	CPT	Ambient	Baseline.bas
Spacecraft Integration and Testing				
17-Dec-12	10989	CPT	Ambient	Baseline.bas
16-Jan-13	10993	CPT	Ambient	Baseline.bas
Assembly, Test, and Launch Operations				
25-Mar-13	11060	CPT	Hot	Baseline.bas
4-Apr-13	11094	CPT	-30	Baseline.bas
8-May-13	12025	CPT	Ambiant	Baseline.bas
17-May-13	12036	CPT	Ambiant	Baseline.bas