Phoenix Project

Software Interface Specification

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Mars Atmospheric Opacity Software Interface Specification (SIS)

FINAL

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.

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CHANGE LOG

DATE	SECTIONS CHANGED	REASON FOR CHANGE	REVISION
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TBD ITEMS

SECTION	DESCRIPTION
Appendix A	Finish definition of header object.

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ACRONYMS

ASCII	American Standard Code for Information Interchange
CODMAC	Committee on Data Management and Computation
EDR	Experiment Data Record
ISO	International Standards Organization
JPL	Jet Propulsion Laboratory
NASA	National Aeronautics and Space Administration
ODL	Object Description Language
PDS	Planetary Data System
RDR	Reduced Data Record
ROME	Remote Object Manager Extended
SIS	Software Interface Specification
SSI	Surface Stereo Imager
TBD	To Be Determined

1. INTRODUCTION

1.1 Purpose and Scope

The purpose of this data product SIS is to provide users of the Phoenix Mars atmospheric opacity data product with a detailed description of the product and a description of how it was generated, including data sources and destinations. The product is an ASCII table of Mars atmospheric opacity values as derived from Phoenix Surface Stereo Imager (SSI) solar filter observations of the Sun. This SIS is intended to provide enough information to enable users to read and understand the data product. The users for whom this SIS is intended are the scientists who will analyze the data, including those associated with the Phoenix Project and those in the general planetary science community.

1.2 Contents

This data product SIS describes how the Mars atmospheric opacity data product is generated, formatted, labeled, and uniquely identified. The document discusses standards used in generating the product and software that may be used to access the product. The data product structure and organization is described in sufficient detail to enable a user to read the product. Finally, an example of a data product and the PDS label is provided, along with definitions for the label keywords.

1.3 Applicable Documents and Constraints

This Data Product SIS is responsive to the following Phoenix documents:

1. Mars Exploration Program Data Management Plan, R. E. Arvidson, S. Slavney, and S. Nelson, Rev. 3, March 20, 2002.
2. Phoenix Project Archive Generation, Validation and Transfer Plan, R. E. Arvidson, JPL D-29392, February 28, 2008.
3. Phoenix SIS - Camera Experiment Data Record (EDR) and Reduced Data Record (RDR) Data Products, D. Alexander, R. Deen, P. Zamani, JPL D-33231, March 24, 2008.

This SIS is also consistent with the following Planetary Data System documents:

4. Planetary Data System Data Preparation Workbook, Version 3.1, JPL D-7669, Part 1, February 1, 1995.
5. Planetary Data System Data Standards Reference, Version 3.5, JPL D-7669, Part 2, October, 15, 2002
6. Planetary Science Data Dictionary Document, JPL D-7116, August 28, 2002.

The reader is referred to the following documents for additional information:

7. Smith, P. H., and M. Lemmon, Opacity of the Martian atmosphere measured by the Imager for Mars Pathfinder, *J. Geophys. Res, 104,* 8975-8995, 1999.

1.4 Relationships with Other Interfaces

Changes to the SSI EDR and/or RDR data products and the SIS that describes these products [3] could affect the Mars atmospheric opacity data product and/or this SIS. In addition, changes to the processing tools used to generate the Mars atmospheric opacity data product could affect both the data product and this SIS.

2. DATA PRODUCT CHARACTERISTICS AND ENVIRONMENT

2.1 Data Product Overview

A Mars atmospheric opacity data product consists of two files, an ASCII formatted detached PDS label file and an ASCII formatted data file. The data file contains values of the Mars atmospheric opacity or optical depth derived from Phoenix SSI images of the Sun acquired with solar filters. The effective wavelengths of these filters are 451, 671, 887 and 991 nm. Solar filters designed to measure water vapor at 935 nm are not included. Each data file contains an ASCII table of the derived atmospheric opacity for a given rover and Pancam solar filter. Each table contains columns with the source image identifier, the time of image acquisition, the Mars season (L_s), Sun-Mars distance, solar elevation, observed solar flux, opacity, and uncertainty.

2.2 Data Processing

2.2.1 Data Processing Level

This SIS used the Committee On Data Management And Computation (CODMAC) data level numbering system to describe the processing level of the Mars atmospheric opacity data products. These data products are considered CODMAC "Level 5" or "Derived Data" (equivalent to NASA Level 2). The Mars atmospheric opacity data products are generated from analysis of Phoenix SSI images. Refer to Table 1 for a summary of the CODMAC and NASA data processing levels.

Table 1. Processing Levels for Science Data Sets

NASA	CODMAC	Description
Packet data	Raw - Level 1	Telemetry data stream as received at the ground station, with science and engineering data embedded.
Level-0	Edited - Level 2	Instrument science data (e.g., raw voltages, counts) at full resolution, time ordered, with duplicates and transmission errors removed.
Level 1-A	Calibrated - Level 3	Level 0 data that have been located in space and may have been transformed (e.g., calibrated, rearranged) in a reversible manner and packaged with needed ancillary and auxiliary data (e.g., radiances with the calibration equations applied).
Level 1-B	Resampled - Level 4	Irreversibly transformed (e.g., resampled, remapped, calibrated) values of the instrument measurements (e.g., radiances, magnetic field strength).

NASA	CODMAC	Description
Level 1-C	Derived - Level 5	Level 1A or 1B data that have been resampled and mapped onto uniform space-time grids. The data are calibrated (i.e., radiometrically corrected) and may have additional corrections applied (e.g., terrain correction).
Level 2	Derived - Level 5	Geophysical parameters, generally derived from Level 1 data, and located in space and time commensurate with instrument location, pointing, and sampling.
Level 3	Derived - Level 5	Geophysical parameters mapped onto uniform space-time grids.

2.2.2 Data Product Generation

The Mars atmospheric opacity data products are produced by the SSI instrument team using processing procedures and software developed by Mark Lemmon, Texas A&M Univ.

An opacity data product is generated after each sol in which opacity data is acquired. The generation is done in four steps. First, the input parameters are set up. A list of SSI data products to be processed is read and associated values are determined for L_s, the distance of Mars from the Sun, the sol that the data were acquired, and the actual elevation angle of the Sun. It is likely that standard tools such as the NAIF toolkit will be used for these computations. For each SSI data product, the airmass is computed by integration through a spherically symmetric atmosphere with a scale height equivalent to the gas scale height of the Martian atmosphere.

Second, the solar flux is extracted from each calibrated SSI data product. To do this, the background is determined within an annulus at a fixed radius from the center of the Sun in the image. That background is subtracted, as failure to do so would lead to a significant departure from Beers' Law at high airmasses. After background subtraction, the solar flux is integrated over the image. The presence of a few missing pixels (e.g., a Phobos transit or a missing packet that only partly overlaps the Sun) can be accommodated by the integration algorithm. The presence of a large number of missing pixels or any saturated pixels will result in the rejection of an image (returning a flux and opacity of "–1.000").

Third, a relative calibration is derived. Data from the afternoon of all sols during which more than 1 image was acquired are considered, together with instrumental uncertainties. The published calibration (Lemmon et al., in prep.) is considered as a single datum with associated uncertainty. The instrument response is varied, and a single best-fit opacity is derived for each afternoon using Beers' Law (I_observed = I_0 exp(-τ η), where η = airmass). A best-fitting responsivity is chosen by minimizing the reduced X^2 of the fit.

Fourth, the relative calibration is used to derive opacities. All images are considered, and Beers' Law is applied to every pair of I_observed and airmass. The relative calibration method ensures that (1) substantial calibration uncertainty is not propagated into uncertainty in opacity once sufficient surface data are obtained, and (2) that the processing transfers smoothly from using the laboratory calibration when the first datasets are obtained to using the relative calibration when enough surface data exist.

2.2.3 Data Flow

The Mars atmospheric opacity data products are generated from SSI solar filter images. These images are read from ROME in each sol's ssi_edr area. The most recent version of the appropriate opacity data product is also obtained from ROME. Once a new version of an opacity data product is generated, it is transferred back to ROME for access by other Phoenix science and operations team members. Updates to the Mars atmospheric opacity data products will be made whenever new SSI solar images are acquired. After a science validation period, the Mars atmospheric opacity data products are transferred to the PDS for final validation and archiving in accordance with the Phoenix archive plan [2].

The opacity data products will be updated as new SSI solar filter images are acquired. Thus, the size of an individual Mars atmospheric opacity data product will increase over the course of the Phoenix mission. The final version of each data product will include opacity determinations covering the complete mission.

2.2.4 Labeling and Identification

Each Mars atmospheric opacity data product is identified by a unique filename, along with a unique product_id keyword in the associated PDS label. The product filename adheres to the ISO-9660 level II filename convention of 27.3 (maximum of 27 characters followed by a 3 character extension), which is compliant with PDS standards [5]. The product_id found in the PDS label is equal to the filename without the extension.

The file naming scheme for the Mars atmospheric opacity data products is formed by:

PHX_TAU<filter>_<sol>_<date><version>.TAB

where:

PHX	=	(3 alpha characters) Always PHX for the Phoenix mission.
TAU	=	(3 alpha characters) Always TAU for atmospheric opacity data
filter	=	(3 integers) Effective wavelength of SSI solar filter. Valid values are "451", "887", and "991" for left eye and "671" for right eye.
sol	=	(3 integers) Sol number of last data entry.
date	=	(8 integers) Product creation date with format yyyymmdd for year, month, and date.
version	=	(1 alpha character). Product version identifier. Value of "A" for first version of given product creation date. Value increments for each new version within a given day.
TAB	=	(3 alpha characters) Always TAB to indicate a PDS ASCII table structure.

An example filename using this scheme would be: PHX_TAU451_027_20080222A.TAB.

Standards Used in Generating Data Products

2.2.1 PDS Standards

The Mars atmospheric opacity data product complies with Planetary Data System standards for file formats and labels, as specified in the PDS Standards Reference [5] and the Planetary Science Data Dictionary Document [6].

2.2.2 Time Standards

The PDS label for a Mars atmospheric opacity data product uses keywords containing time values, such as start time and stop time. Each time value standard is defined according to the keyword definition. See Appendix B.

2.2.3 Data Storage Conventions

The Mars atmospheric opacity data product and detached PDS label files are stored as ASCII text. Each line or record in the files is terminated with a two-character sequence of carriage return (<CR>, ASCII 13) and line feed (<LF>, ASCII 10) to comply with PDS standards [5]. This line terminator sequence will allow the data files and labels to be easily read on most computers, which recognize either the carriage return, the line feed, or the <CR>/<LF> sequence as an ASCII record terminator.

2.3 Data Validation

Validation of Mars atmospheric opacity data product labels includes checking for correct PDS syntax, for accepted standard values of keywords, and for internal consistency of label items.

The SSI team will periodically check the relative calibration for internal consistency and will determine if a different internal calibration is better suited to the data obtained. Opacity derivations will be compared to independent but indirect estimates of opacity from other sources, such as the shadow intensity.

3. DETAILED DATA PRODUCT SPECIFICATIONS

3.1 Data Product Structure and Organization

Each Mars atmospheric opacity data product is structured as two files; a detached PDS label file and a separate data file. Both components are stored as ASCII text. Data within the opacity data file is organized by time with the most recent measurement being appended to the end of the file.

3.2 Data Format Description

Each Mars atmospheric opacity data product consists of two parts. The first part of the data file contains header information, which includes parameter values used in the opacity computations and column names for the data rows. The second part of the file, starting at line 10 consists of a PDS table object [5]. The table has eight columns and a variable number of rows. There is one row for each opacity measurement. The number of rows in a data product will increase as new measurements of atmospheric opacity are made. Each row is 88 bytes long including the carriage return and line feed characters. All columns are fixed-width as described in the PDS label and are also delimited with commas. Text columns are surrounded by double-quotes and are left-justified. Numeric columns are right-justified. Table 2 contains the column definitions for the opacity data product.

Table 2. Mars Atmospheric Opacity Column Definitions

COLUMN NUMBER	NAME	DATA TYPE	DESCRIPTION
1	Pancam Product_id	Text	The product_id of the SSI solar filter image used for a given opacity determination.
2	Solar Longitude	Real	Martian season in degrees past northern spring equinox.
3	Solar Distance	Real	Mars-Sun distance in AU at time of observation.
4	Local Time	Real	Observation time in sols past the local midnight preceding landing. The local solar time is given by multiplying the fractional component by 24 hours. Sol number is obtained by rounding up the local time value. For example, noon on Sol 2 is given as local time of 1.5.
5	Solar elevation	Real	Solar elevation relative to the local horizon.
6	Solar Flux	Real	Observed solar flux after subtracting background in units of $W/m^2/nm$. Computed using Pancam calibration parameters. A value of -1.0 indicates an image that resulted in a non-measurement of opacity (e.g., due to missing packet and/or data saturation).
7	Opacity Value	Real	Measured atmospheric opacity using the current best relative calibration. A value of -1.0 indicates an image that resulted in a non-measurement of opacity (e.g., due to missing packet and/or data saturation).
8	Relative Opacity Error	Real	Relative error in the opacity measurement. A value -1.0 indicates an image that resulted in a non-measurement of opacity (e.g., due to missing packet and/or data saturation).

3.3 PDS Label Description

Each Mars atmospheric opacity data product has a detached PDS label, which is stored as ASCII text. The PDS label is object-oriented with keywords for product identification, along with the data object definition. The data object definition within the label contains descriptive information needed to interpret or process the data.

PDS labels are written in Object Description Language (ODL) [5]. PDS label statements have the form of "keyword = value". Each label statement is terminated with a carriage return character (ASCII 13) and a line feed character (ASCII 10) sequence to allow the label to be read by many operating systems. Pointer statements with the following format are used to indicate the location of data objects in the data product:

^object = location

where the carat character (^, also called a pointer) is followed by the name of the specific data object. For detached PDS labels, location is the name of the file that contains data object and optionally the starting record number of the data object within the file or byte offset from the start of the file.

Appendix A lists an example PDS label for a Mars atmospheric opacity data product, along with a sample data file.

4. APPLICABLE SOFTWARE

4.1 Utility Programs

The ASCII format of the Mars atmospheric opacity data product means that the data can be displayed using a text editor. In addition, the use of the PDS table structure for this data product means the data can be readily imported into spreadsheet and plotting programs.

4.2 Applicable PDS Software Tools

PDS-labeled tables can be viewed with the program NASAView, developed by the PDS. NASAView is available in versions that run on SUN/SOLARIS, Windows, and LINUX operating systems. NASAView can be obtained from the PDS web site http://pdsproto.jpl.nasa.gov/Distribution/license.html. There is no charge for NASAView.

APPENDIX A - SAMPLE MARS ATMOSPHERIC OPACITY LABEL AND DATA FILE

PDS Label

```
PDS_VERSION_ID                = PDS3

/* FILE DATA ELEMENTS */
RECORD_TYPE                   = STREAM
FILE_RECORDS                  = 21
^HEADER                       = ("PHX_TAU451_027_20080222A.TAB", 1)
^TABLE                        = ("PHX_TAU451_027_20080222A.TAB", 10)

/* IDENTIFICATION DATA ELEMENTS */
DATA_SET_ID                   = "PHX-M-SSI-5-ATMOS-OPACITY-V1.0"
PRODUCT_ID                    = "PHX_TAU451_027_20080222A"
PRODUCT_TYPE                  = "OPACITY"
INSTRUMENT_HOST_ID            = "EM"
INSTRUMENT_HOST_NAME          = "PHOENIX LANDER"
FILTER_NAME                   = SSI_L3_451NM
INSTRUMENT_ID                 = SSI_LEFT
MISSION_NAME                  = "PHOENIX"
TARGET_NAME                   = SUN
PRODUCT_CREATION_TIME         = 2008-2-22T02:09:53
START_TIME                    = 2008-06-15T10:34:02
STOP_TIME                     = 2008-06-21T11:48:13

OBJECT                        = HEADER
  BYTES                       = UNK
  RECORDS                     = 9
  HEADER_TYPE                 = SPREADSHEET
  INTERCHANGE_FORMAT          = ASCII
  DESCRIPTION                 = "The header contains key parameter values
                                 used in the opacity computations, along
                                 with column headings for the table object."
END_OBJECT                    = HEADER

OBJECT                        = TABLE
  INTERCHANGE_FORMAT          = ASCII
  ROWS                        = 12
  ROW_BYTES                   = 88
  COLUMNS                     = 8
  DESCRIPTION                 = "Tables containing the opacity
                                 determinations for a given rover and
                                 solar filter.  Columns in the table
                                 are fixed-width and separated by
                                 commas.  The start byte and bytes
                                 keywords of the column definitions do
                                 not include quotes or commas in the table."

  OBJECT                      = COLUMN
    COLUMN_NUMBER             = 1
    NAME                      = SSI_PRODUCT_ID
    DATA_TYPE                 = CHARACTER
    START_BYTE                = 2
```

```
    BYTES                     = 27
    DESCRIPTION               = "The product_id of the SSI solar
                                 filter image used for a given opacity
                                 determination."
  END_OBJECT                  = COLUMN

  OBJECT                      = COLUMN
    COLUMN_NUMBER             = 2
    NAME                      = SOLAR_LONGITUDE
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 31
    BYTES                     = 6
    DESCRIPTION               = "Martian season in degrees past
                                 northern spring equinox."
  END_OBJECT                  = COLUMN

  OBJECT                      = COLUMN
    COLUMN_NUMBER             = 3
    NAME                      = SOLAR_DISTANCE
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 38
    BYTES                     = 6
    DESCRIPTION               = "Mars-Sun distance in AU at time of
                                 observation."
  END_OBJECT                  = COLUMN

  OBJECT                      = COLUMN
    COLUMN_NUMBER             = 4
    NAME                      = LOCAL_TIME
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 45
    BYTES                     = 8
    DESCRIPTION               = "Observation time in sols past the local
                                 Midnight preceding landing. The local
                                 solar time is given by multiplying the
                                 fractional component by 24 hours.
                                 Sol number is obtained by rounding down
                                 the local_time value. For example, noon
                                 on Sol 2 is given as local_time of 2.5."
  END_OBJECT                  = COLUMN

  OBJECT                      = COLUMN
    COLUMN_NUMBER             = 5
    NAME                      = ELEVATION
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 54
    BYTES                     = 7
    DESCRIPTION               = "Solar elevation relative to the local
                                   horizon."
  END_OBJECT                  = COLUMN

  OBJECT                      = COLUMN
    COLUMN_NUMBER             = 6
    NAME                      = SOLAR_FLUX
    DATA_TYPE                 = ASCII_REAL
    START_BYTE                = 62
    BYTES                     = 8
```

```
    DESCRIPTION                = "Observed solar flux in DN ms-1
                                  after subtracting
                                  background light. Computed using
                                  Pancam calibration parameters.
                                  A value of -1.0 indicates an image
                                  that resulted in a non-measurement
                                  opacity (e.g., due to missing packet
                                  and/or data saturation)."
  END_OBJECT                   = COLUMN

  OBJECT                       = COLUMN
    COLUMN_NUMBER              = 7
    NAME                       = ATMOSPHERIC_OPACITY
    DATA_TYPE                  = ASCII_REAL
    START_BYTE                 = 71
    BYTES                      = 7
    DESCRIPTION                = "Measured atmospheric opacity using
                                  the current best relative calibration.
                                  A value of -1.0 indicates an image
                                  that resulted in a non-measurement
                                  opacity (e.g., due to missing packet
                                  and/or data saturation)."
  END_OBJECT                   = COLUMN

  OBJECT                       = COLUMN
    COLUMN_NUMBER              = 8
    NAME                       = OPACITY_ERROR
    DATA_TYPE                  = ASCII_REAL
    START_BYTE                 = 79
    BYTES                      = 8
    DESCRIPTION                = "Relative error in the opacity
                                  measurement.
                                  A value of -1.0 indicates an image
                                  that resulted in a non-measurement
                                  opacity (e.g., due to missing packet
                                  and/or data saturation)."
  END_OBJECT                   = COLUMN

END_OBJECT                     = TABLE
END
```

Sample Data File

The sample data file listed below consists of two parts. The first nine lines contains header information with parameter values used in the opacity computations. The header also includes the column names for the data rows. The second part of the file, starting at line 10 contains the opacity determinations.

```
Phoenix opacity measurements for SSI 447-nm solar filter images.
Flux_1AU = 100.000 DN ms-1 in the current best fit.
Abs_Err = 0.0300000 (absolute error in tau derivation at AM=1).
The date of the current best fit is 2008-Feb-22 02:09:53 UTC.
N_ENTRIES = 12
```

Comments or questions to Mark Lemmon, lemmon@tamu.edu.

Product_ID,	L_s,	R_au,	Sol,	Elev,	Flux,	TAU,	Rel_err
"ST020ESF897993317_00234L3M1",	85.7,	1.660,	20.598,	41.820,	100.000,	0.500,	0.020
"ST021ESF898077676_100A3L3M1",	86.1,	1.660,	21.548,	45.475,	100.000,	0.500,	0.020
"ST021ESF898083614_100E3L3M1",	86.1,	1.660,	21.615,	40.129,	100.000,	0.500,	0.020
"ST022ESF898131187_10103L3M1",	86.4,	1.660,	22.151,	11.602,	100.000,	0.500,	0.020
"ST022ESF898157014_10163L3M1",	86.5,	1.660,	22.442,	44.959,	100.000,	0.500,	0.020
"ST022ESF898172594_101D3L3M1",	86.6,	1.660,	22.618,	39.889,	100.000,	0.500,	0.020
"ST023ESF898245721_10203L3M1",	87.0,	1.659,	23.441,	44.931,	100.000,	0.500,	0.020
"ST023ESF898256498_10233L3M1",	87.0,	1.659,	23.563,	44.653,	100.000,	0.500,	0.020
"ST023ESF898263217_10263L3M1",	87.1,	1.659,	23.639,	37.583,	100.000,	0.500,	0.020
"ST024ESF898331910_102A3L3M1",	87.4,	1.659,	24.412,	42.805,	100.000,	0.500,	0.020
"ST025ESF898423654_10343L3M1",	87.9,	1.659,	25.446,	45.216,	100.000,	0.500,	0.020
"ST026ESF898516163_103E3L3M1",	88.3,	1.658,	26.488,	46.712,	100.000,	0.500,	0.020

APPENDIX B – LABEL KEYWORD DEFINITIONS

Note see the Planetary Science Data Dictionary [6] for the definitions of keywords within the header and table objects.

Keyword Name	Definition	Type	Units	Valid Values
DATA_SET_ID	A unique alphanumeric identifier for a data set or a data product. The DATA_SET_ID value for a given data set or product is constructed according to flight project naming conventions. In most cases the DATA_SET_ID is an abbreviation of the DATA_SET_NAME. Note: In the PDS, the values for both DATA_SET_ID and DATA_SET_NAME are constructed according to standards outlined in the Standards Reference.	string(40)		“PHX-M-SSI-5-ATMOS-OPACITY-V1.0”
FILE_RECORDS	Indicates the number of physical file records, including both label records and data records. Note: In the PDS the use of FILE_RECORDS along with other file-related data elements is fully described in the Standards Reference.	integer		
FILTER_NAME	Provides the commonly-used name of the instrument filter through which an image or measurement was acquired or which is associated with a given instrument mode	string array		"SSI_L3_451NM " "SSI_L4_991NM " “SSI_L5_887NM” “SSI_R3_671NM”
INSTRUMENT_HOST_ID	Provides a unique identifier for the host where an instrument is located.	string(6)		“EM”, “PHX”
INSTRUMENT_HOST_NAME	Provides the full name of the host on which an instrument is based.	string array		“PHOENIX LANDER”
INSTRUMENT_ID	Provides an abbreviated name or acronym which identifies an instrument. Note: INSTRUMENT_ID is not a unique identifier for a given instrument.	string(12)		"SSI_LEFT" "SSI_RIGHT"
MISSION_NAME	Identifies a major planetary mission or project. A given planetary mission may be associated with one or more spacecraft.	string array		“PHOENIX”

Keyword Name	Definition	Type	Units	Valid Values
PDS_VERSION_ID	Represents the version number of the PDS standards documents that is valid when a data product label is created. Values for the PDS_version_id are formed by appending the integer for the latest version number to the letters 'PDS'. Examples: PDS3, PDS4.	string(6)		"PDS3"
PRODUCT_CREATION_TIME	Defines the UTC system format time when a product was created. Formation rule: YYYY-MM-DDThh:mm:ss[.fff]	string		
PRODUCT_ID	Represents a permanent, unique identifier assigned to a data product by its producer. See also: source_product_id. Note: In the PDS, the value assigned to product_id must be unique within its data set. Additional note: The product_id can describe the lowest-level data object that has a PDS label.	string(40)		Filename less the extension
PRODUCT_TYPE	Identifies the type or category of a data product within a data set.	string(8)		"OPACITY"
RECORD_TYPE	Indicates the record format of a file. Note: In the PDS, when record_type is used in a detached label file it always describes its corresponding detached data file, not the label file itself. The use of record_type along with other file-related data elements is fully described in the PDS Standards Reference.	string(20)		"FIXED_LENGTH"
START_TIME	Provides the date and time of the beginning of an event or observation (whether it be a spacecraft, ground-based, or system event) in UTC system format. Formation rule: YYYY-MM-DDThh:mm:ss[.fff]"	string		
STOP_TIME	Provides the date and time of the beginning of an event or observation (whether it be a spacecraft, ground-based, or system event) in UTC system format. Formation rule: YYYY-MM-DDThh:mm:ss[.fff]"	string		
^TABLE	This is a pointer to the table object. See the PDS Standards Reference for more information on pointer usage.	string		
^TABLE_HEADER	This is a pointer to the table_header object. See the PDS Standards Reference for more information on pointer usage.	string		

Keyword Name	Definition	Type	Units	Valid Values
TARGET_NAME	Identifies a target. The target may be a planet, satellite, ring, region, feature, asteroid or comet.	string(30)		"SUN"