Cassini / Huygens Program

Archive Plan

for Science Data

PD 699-068

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Archive Plan for Science Data, 699-068

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Change Record for 699-068

Revision No.	Date	Changes	Sections Affected
Draft 1	7/15/98	First version for review	All
Draft 2	8/1/98	Minor updates, Appendix A -- added definition of processing Appendix C -- added Archive schedule	All
Draft 3	9/16/98	New organization -- Updated signature page, replaced references to SO and DOI with the new "Instrument Operations Team", replaced references to MSO and Science Office with "Science Operations Office" Section 2, item 2 -- states that Cassini provides volumes to PDS CN who in turn provides copies to the relevant PDS DNs. It should be noted that this is still listed as a TBD Incorporated PDS comments	All
Draft 4	10/5/98	Section 2, item 5 Added cruise archive policy & included in delivery of cruise science in Archive schedule OTLs and MSOCs listed as archive contacts for each instrument	All
Preliminary	4/1/99	Changed document title Revised signature page Changed instances of "Cassini Project" to "Cassini Program" Updated applicable document listing	All
Preliminary V1	12/27/99	Updated Signature page Major changes to Roles and Responsibility section 2.0 Some changes to policy section 3.0 Review and comment on To be Supplied list Formatting changes	All
Preliminary V2	4/1/00	Incorporated updates throughout the document as requested by reviewers. Incorporated Huygens data in the plan. Updated distribution list. Updated archive policies.	All
Initial Release, Version 0	4/25/00	Clarified PDS CN and PDS DN roles and responsibilities throughout document. Updated table 1.5.2 data product levels to reflect CODMAC and PDS definitions. (see unresolved list) Clarified the project intent to archive level 1A and level 1B data products in section 6.	All

Revision No.	Date	Changes	Sections Affected
		Reorganized data set tables in appendices. Added new issues to unresolved issues list. Added High-Level Catalog documents to schedule.	
Initial Release, Version 1	8/3/00	Higher level product archive.	6.4

Table of Contents

1. Introduction

1.1 Purpose

The purpose of this document is to describe the Cassini / Huygens science data archive system which includes policy, roles and responsibilities,a description of science and supplementary data products or datasets, metadata, documentation, software, archive schedule, and methods for archive transfer to the NASA Planetary Data System (PDS).

1.2 Scope

This document is applicable to all science and supplementary data resulting from the Cassini Program orbiter and Huygens investigations. Separate agreements to be established through the Cassini Program Science Group (PSG) and Huygens Science Working Team (HSWT) will address data sharing and release policies. This document is subordinate to the Cassini Program Data Management Plan and Science Management Plan.

1.3 Applicable Documents

The Archive Plan for Science Data (APSD) is responsive to the following documents found on-line in the Master Controlled Document Library at http://cel.jpl.nasa.gov/cedr/home/mcdl.html

a) Cassini Operations System Functional Requirements Document, 699-500-3-GS/R

b) Cassini Program Science Management Plan (SMP), PD 699-006, July 1999.

c) Cassini Program Data Management Plan (PDMP), PD 699-061, Rev.B, April 1999.

d) Cassini/Planetary Data System Interface Requirements Document (MSO - PDS IRD), PD 699-108, Rev. B, 14 April 1998.

The following additional documents are referred to in the APSD. PDS documentation is available on-line from the PDS Website at http://pds.jpl.nasa.gov/ .

a) Planetary Data System Data Preparation Workbook (PDS DPW), Version 3.1, 17 February 1995, JPL D-7669, part 1.

b) Planetary Data System Data System Standards Reference, Version 3.3 1 June 1999, JPL D-7669, part 2.

c) Planetary Science Data Dictionary Document, Revision D, 15 March 1996, JPL D-7116. (For the most current information, use the on-line data dictionary provided on the PDS web page.

1.4 Document Change Control

The APSD is under change control once all parties sign it. All the parties on the signature page must approve each revision.

1.5 Terms and Definitions

1.5.1 Archive Terms Defined

For this document the following terms are defined.

Active archive - archive data set available at PDS Discipline Node during ongoing peer review.

Archive - a preservation of data for future use. Mission archives occur during the term of the mission, long-term archives are maintained at the PDS.

Archive medium - a physical device for storing data such as CD, DVD, tape, etc.. For PDS archives, the medium must be acceptable to PDS as described in the PDS standards reference.

Data product - data resulting from a scientific observation. Examples of data products include planetary images, spectrum tables, and time series tables. A data product is a component of a data set.

Data set - a labeled grouping of data products, metadata, documentation and software.

Metadata - a label or file that describes science data products.

Volume - one or several in a series of archive media containing data sets.

PDS - Planetary Data System. The primary organization within NASA responsible for the archive of planetary science data obtained from NASA sponsored missions. The PDS consists of a Central Node located at JPL and several Discipline Nodes located around the country.

MIFT - Mission Interface Team. Members include project, and PDS node personnel. The central node data engineer assigned to the project leads the team. The team plans the archive and develops the archive design. Regular meetings during production are used to coordinate peer review, and resolve issues.

1.5.2 Data Product Levels

The Cassini Program uses NASA levels for describing data products. The definition of each NASA level with examples and the CODMAC equivalent is in the below table. CODMAC to Nasa level mapping is described in chapter 6 of the PDS standards reference.

NASA Levels	Product Description	Cassini Examples	CODMAC Equivalent	CODMAC Description
Raw	Telemetry data stream as received at the ground station, with science and engineering data embedded.	Digital Original Data Records, Intermediate Data Records	Level 1 - Raw Data	Telemetry data with data embedded.
Level 0	Instrument science data (e.g., raw voltages, counts) at full resolution, time ordered, with duplicates and transmission errors removed.	Instrument, Science, & Engineering Packets, Radio Science Subsystem (RSS) Archival Tracking Data File (ATDF)	Level 2 - Edited Data	Corrected for telemetry errors and split or decommutated into a data set for a given instrument. Sometimes called Experimental Data Record. Data are also tagged with time and location of acquisition.
Level 1A	Level 0 data that have been located in space and may have been **reversibly** 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). No resampling.	Multimission Image Processing System (MIPS) Unprocessed Data Record (UDR) (DN placed in image frame format), Radio Science Subsystem (RSS) Orbit Data File	Level 3 - Calibrated	Edited data that are still in units produced by instrument, but that have been corrected so that values are expressed in or are proportional to some physical unit such as radiance. No resampling, so edited data can be reconstructed.
Level 1B	**Irreversibly** transformed (e.g., resampled, remapped, calibrated) values of the instrument measurements (e.g., radiances magnetic field strength).	MIPS Experiment Data Record (EDR) (calibrated DN in image frame format)	Level 4 - Resampled data	Data that have been resampled in the time or space domains in such a way that the original edited data cannot be reconstructed. Could be calibrated in addition to being resampled.
Higher levels	Geophysical parameters mapped into uniform space time grids.	Mosaics, contrast stretching, false color, movies, gravity fields, magnetic fields, reports and graphics.	Level 5 - Derived data	Derived results, as maps, reports, graphics, etc. NASA Levels 2 through 5.

2. Roles and Responsibilities

2.1 Project Scientist

Provide a forum, led by a member of the PSG, for program internal peer review of PI and TL proposed data sets to be archived in the PDS.

2.2 Principal Investigators (PIs), Team Leaders (TLs)

a) Generate, validate the science content and format, and archive reduced science data products, metadata, documentation, and algorithms and software used to generate data products. Metadata includes Instrument, Dataset, Reference, and Personnel high-level catalog templates, ancillary data, and data product labels.

b) Provide L1A and L1B data sets, with Radio Science producing L0 data sets to the project for PDS archiving. (The list of these data sets can be found in appendix A and B.)

c) Work directly with assigned PDS discipline nodes to define data set content and format. Discipline nodes have expertise in archiving specific types of data and will help define keywords and standard values for keywords in metadata such as a data set description file and data product label files.

d) Participate in Mission Interface Team (MIFT) meetings.

e) Report archive status to Instrument Operations (IO) monthly.

All of the above responsibilities, excluding the science validation of products, can be delegated to Operations Team Leads (OTLs).

2.3 Interdisciplinary Scientists (IDSs)

Archive any significant new science data products and associated metadata and supplementary products created from the investigation. These will likely be higher level products and few in numbers. IDSs will inform IO of archive plans.

2.4 Instrument Operations (IO)

a) Coordinate archive data set production schedule and Archive Plan for Science Data (699-068)

b) Receive archive submissions from instruments and coordinate peer review with PDS.

c) Act as agent between PDS, Project and PI and TL when necessary to resolve PDS format and delivery issues.

d) Participate in Mission Interface Team (MIFT) meetings.

e) Report archive status to program monthly.

f) Generate and validate selected SPICE data products as specified in appendix C.

g) Produce Instrument Host and Mission templates and provide to PDS.

2.5 Mission Support and Services Office (MSSO)

a) Provide catalog system for archive data sets. (System should be capable of generating reports.)

b) Perform project internal data set format validation prior to PDS peer review using PDS provided tools. Report status to IO.

c) Produce SPICE archive data sets volumes. The list of these data sets can be found in appendix C.

d) Work directly with NAIF PDS node to define SPICE archive volumes format.

e) Report SPICE archive data set volume production status to IO.

2.6 Spacecraft Operations (SCO)

Generate and validate selected SPICE data products as specified in appendix C.

2.7 Planetary Data System (PDS)

Central Node (CN):

a) Coordinate with the Cassini program to define and produce the archive and ensure they are compatible with PDS standards.

b) Maintain a database of all PDS holdings, which will be updated after Cassini archive volumes have completed the peer review process.

c) Distribute archive volumes to the NASA-supported science community, as funding permits.

d) Provide archive volume validation tools, consultation, and review of validation reports.

e) Provide training materials and instruction to archive volume producers.

f) Participate in peer review of archive volumes.

g) Lead Mission Interface Team (MIFT) meetings to discuss archive and PDS issues.

h) Provide copies of archive volumes to the NSSDC.

Discipline Nodes (DN):

a) Work with archive producers assigned to them to define archive format and content.

b) Provide peer review of archive volumes.

c) Maintain active archives of released Cassini products for access by the science community.

d) Provide archive volume validation tools.

e) Participate in Mission Interface Team (MIFT) meetings.

2.8 National Space Science Data Center (NSSDC)

Maintain a “deep archive” of the data for long-term preservation. The NSSDC will also be responsible for filling large delivery orders to the science community, and when requested by the relevant PDS node, making data available to foreign investigators, educators, and the general public.

2.9 Cassini PDS Archive Locations

The following is a list of PDS Discipline Node managers and contacts.

PDS Node	Contact
Central Node JPL	Valerie Henderson valerie.henderson@jpl.nasa.gov
Atmospheres Node Archive Manager Atmospheres Node Manager New Mexico State University in Las Cruces	Lyle Huber Lhuber@NMSU.edu Reta Beebe rbeebe@nmsu.edu
Geosciences Node Earth and Planetary Remote Sensing Laboratory at Washington University in St. Louis, Missouri	Ray Arvidson arvidson@wunder.wustl.edu
Imaging Node USGS Subnode JPL Subnode	 Eric Eliason eeliason@sirius.wr.usgs.gov Sue LaVoie Susan.K.LaVoie@jpl.nasa.gov
Planetary Plasma Interactions (PPI) Institute of Geophysics and Planetary Physics (IGPP) at the University of California, Los Angeles (UCLA).	Ray Walker rwalker@igpp.ucla.edu
Rings Node Ames Research Center	Mark Showalter showalter@ringside.arc.nasa.gov
Small Bodies Node University of Maryland	Mike A'Hearn ma@astro.umd.edu
Navigation and Ancillary Information Facility (NAIF) JPL	Charles Acton Charles.H.Acton@jpl.nasa.gov
Radio Science Subnode Stanford University	Dick Simpson rsimpson@magellan.stanford.edu

2.10 Cassini Principal Investigators and Team Leaders (PIs/TLs) Archive Contact

Instrument	PI or TL	Instrument Team Archive Representative
CAPS Cassini Plasma Spectrometer	David Young, PI	Judy Furman jfurman@swri.edu
CDA Cosmic Dust Analyzer	Eberhard Grun, PI	Sascha Kempf Sascha.Kempf@mpi-hd.mpg.de
CIRS Composite Infrared Spectrometer	Virgil Kunde, PI	Matt Elliott Matthew.H.Elliott@gsfc.nasa.gov Paul Romani Paul.N.Romani@gsfc.nasa.gov
INMS Ion and Neutral Mass Spectrometer	Hunter Waite, TL	Dana Burket dana@swri.edu
ISS Imaging Science Subsystem	Carolyn Porco, TL	Daniel “Buck” Janes janes@lpl.arizona.edu
MAG Magnetometer	David Southwood, PI	Steve Kellock S.Kellock@ic.ac.uk
MIMI Magnetospheric Imaging Instrument	Tom Krimigis, PI	Don Mitchell Don.Mitchell@jhuapl.edu
RADAR	Charles Elachi, TL	William K. Johnson Williamt.K.Johnson@jpl.nasa.gov
RPWS Radio and Plasma Wave Spectrometer	Don Gurnett, PI	Bill Kurth wsk@space.physics.uiowa.edu
RSS Radio Science Subsystem	Arv Kliore, TL	Randy Herrera Randy.Herrera@jpl.nasa.gov
UVIS Ultraviolet Imaging Spectrograph	Larry Esposito, PI	David Judd David.Judd@lasp.colorado.edu
VIMS Visual and Infrared Mapping Spectrometer	Robert Brown, TL	Rick McCloskey rickm@lpl.arizona.edu

2.11 Huygens Principal Investigator Archive Contacts

Instrument	PI	Team Archive Representative
HASI Huygens Atmospheric Structure Instrument	Marcello Fulchignoni Dept de Recherche Spatiale (DESPA), Observatoire de Paris-Meudon, France	Jean-Pierre Lebreton jlebreton@estec.esa.nl
GCMS Gas Chromatograph and Mass Spectrometer	Hasso B. Niemann Lab for Atmospheres, NASA / Goddard Space Flight Ctr, Balitimore USA	Jean-Pierre Lebreton jlebreton@estec.esa.nl
ACP Aerosol Collector and Pyrolyser	Guy M. Israel Service d'Aeronomie du CNRS, Verrieres-le-Buisson, France	Jean-Pierre Lebreton jlebreton@estec.esa.nl
DISR Descent Imager and Spectral Radiometer	Martin G. Tomasko Dept of Planetary Sciences, Lunar & Planetary Lab, Univ of Arizona, Tuscon USA	Jean-Pierre Lebreton jlebreton@estec.esa.nl
DWE Doppler Wind Experiment	Michael K. Bird Radioastronomisches Inst, Univ Bonn, Germany	Jean-Pierre Lebreton jlebreton@estec.esa.nl
SSP Surface Science Package	John Charles Zarnecki Unit for Space Sciences, Univ of Kent at Canterbury, UK	Jean-Pierre Lebreton jlebreton@estec.esa.nl

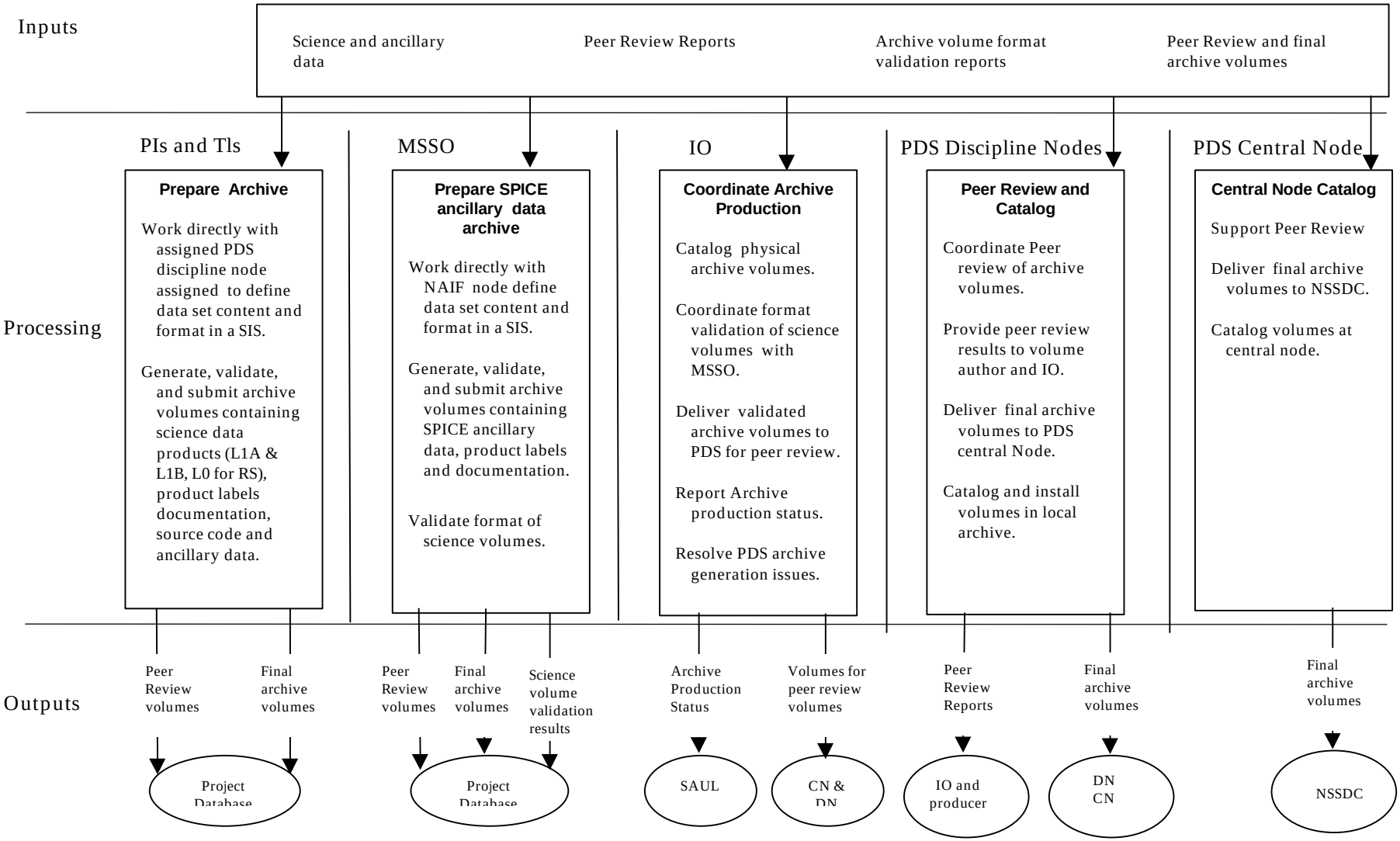
2.12 Cassini MSSO SPICE Archive Contact

Dataset	Team	Archive Representative
SPICE	Greg Chin	TBD

2.13 PDS Discipline Nodes responsible for archiving Cassini data

Instrument	Primary Node	Other Nodes
CAPS	PPI	N / A
CDA	Small Bodies	Rings, PPI
CIRS	Atmospheres	Rings
INMS	PPI	Atmospheres
ISS	Imaging	Rings, Geosciences, Atmospheres
MAG	PPI	N / A
MIMI	PPI	Atmospheres
RADAR	Geosciences	Rings
RPWS	PPI	N / A
RSS	Radio Science subnode	All
UVIS	Atmospheres	Rings
VIMS	Imaging	Rings, Atmospheres
Ancillary data, primarily SPICE	NAIF	
Huygens	Atmospheres	N / A

3. Archive Data Flow Diagram



4. Archive Policies

The PDS standards version that was in place when the production of a volume set began will be used for all subsequent volumes in that set.

Archive datasets will be provided to PDS by the Project submitting two copies on CD-WO, (or other appropriate medium, possibly DVD), to the PDS Discipline Nodes (DNs). The PDS DNs will provide a timely peer review of products. After successful peer review PDS DN will provide with a copy of the final archive volume. CN will send one copy of the archive to the NSSDC for deep archive, thus ensuring availability of the data to the research community over the long term.

The Cassini program internal science data sharing policies will be developed by the PSG. There is no intention for the program to provide PIs, TLs, or IDSs CD-ROM volumes or electronic access to archived data outside of the PDS during the mission.

The Cassini validation period and delivery schedule to PDS is in accordance with SMP, Section 5.

Science Data products for all investigations generated during the cruise phase of the mission shall be delivered to the PDS no later than SOI+1 year. To meet this date, the development of the archive data structures in the form of detailed SISs are required by the project for submission to PDS at SOI-2 years. This will allow enough time to accommodate possible changes in processing software due to PDS non-compliant formats.

Ancillary data, such as SPICE files, that are used in the processing of archive products may be included on archive volumes. However, a complete, independent SPICE archive will be produced by the project.

Although not required, higher level products developed by PIs, TLs, and IDSs may be archived into the PDS, if resources are available to do so. The Cassini Program recognizes those higher level products, described in section 6, are valuable and should be preserved, however funding restrictions may preclude the complete archiving of these products.

The Cassini Program will provide a regular forum for discussing archive progress and issues with the PDS, PIs, and TLs.

5. PDS High-Level Catalog Templates

Documents created from PDS high-level catalog templates will accompany archive data sets. Included are: Mission, Instrument host, Instrument, Dataset, Reference, and Personnel documents, which are defined in JPL D-7669, Planetary Data System Standards Reference. IO will provide a draft version of the Mission and Instrument Host documents to PDS at SOI-1 year. Instrument, Dataset, Reference, and Personnel documents will be provided by archive producers. Updates to these documents will be provided at least every two years if new information is available and final versions 2 months prior to end of mission.

6. Science Data Archive Products

6.1 Documentation

Documents that are relevant to understanding the archive such as the Software Interface Specifications (SISs), which define the format and content of data files are negotiated with PDS well before data products are generated. Instrument status reports will be included on archive volumes delivered to PDS. It may also be appropriate to archive high-level project documents like the Navigation Plan with the PDS.

6.2 Level 0 Data

Level 0 data for Radio Science will be archived with the PDS.

The Cassini program has a requirement to store Level 0 telemetry data (including engineering and housekeeping packets as well as science packets),in the form of Raw telemetry frames, through End-of-Mission + 1 year, which is done by MSSO. There is no commitment to archive this Level 0 telemetry data to the PDS.

6.3 Level 1 Science Data Products

The Cassini Program is committed to archiving level 1A and level 1B products for all possible instruments. However, for some Radio Science experiments level 1 data are not available and in this case level 0 will be archived. Radio Science level 0 products do not always process into level 1. See table 1.5.2 for a description of level1A and lB data products. A detailed list is provided in Appendix A.

For the VIMS, ISS, and RADAR Facility Instruments, IO generates Level 1A products (and also Level 1B for Radar). These products are produced by IO according to TL-approved Software Interface Specifications (SISs) and Operational Interface Agreements (OIAs). TLs are encouraged to negotiate with IO to use PDS formats for these products. If non-PDS formats are used, the TL will be required to reformat to PDS standards for archive. Whatever format is negotiated, IO-produced products are

delivered to the TL for validation and archive volume generation. These volumes are submitted to the IO archive coordinator for submission to the PDS.

6.4 Higher Level Science Data Products

PIs, TLs, and Interdisciplinary Scientists (IDSs) generate higher-level science products.

Although not contractually required, it is expected that higher level data products developed by PIs, TLs, and IDSs in the course of doing their da ta analysis will be archived into the PDS. The Cassini Program recognizes that higher level products are valuable and should be preserved; therefore, a joint effort between the Cassini Program and PDS will be made to facilitate the generation of such produ cts in PDS compliant formats, thereby minimizing any additional effort that might occur in accomplishing this objective.

~~Although not required, higher level products developed by PIs, TLs, and IDSs may be archived into the PDS, if resources are available t o do so. The Cassini Program recognizes that higher level products are valuable and should be preserved however funding restrictions may preclude the complete archiving of these products.~~

6.5 Public Release Data Products

Public Release products will be generated during the Cassini mission in accordance with documented Cassini/JPL/NASA policies and procedures for public information and press releases. The JPL Photolab will maintain press release products with copies distributed to the Regional Planetary Image Facility (RPIFs). The JPL Public Affairs Office will also maintain press released products.

6.6 Ancillary or Supplementary Data Products

6.6.1 SPICE Products and NAIF Toolkit

The Mission Services and Support Office (MSSO) is responsible for generating the archive of SPICE datasets. Final versions of SPICE (SPK, PCK, IK, CK, EK, SCLK, and LSK) files will be archived on CD-WO discs (or other appropriate medium, possibly DVD) in IEEE binary format with accompanying documentation and NAIF Toolkit software. Since the latest version of the NAIF Toolkit is always backward compatible, the latest version of the toolkit will be included on archive volumes. The toolkit will be archived for all Cassini supported operating systems.

6.6.2 Uplink Data Products

The Mission Services and Support Office (MSSO) is responsible for the life-of mission storage of Cassini Uplink products. Selected uplink products will be archived in PDS in the SPICE Ekernel format. If the SPICE Ekernel is not available for any reason,

uplink products will be archived in their place on CD-WO discs with appropriate SIS documentation, and will not be in PDS format.

Appendix A: Science and Ancillary Data Sets to be Archived with PDS by Instrument Teams

Instrument	Science Data Product	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Discipline Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
CAPS	Full calibrated data		1B	Yes	PPI	CAPS	CAPS PI		
CAPS	Averaged survey data		H	Yes	PPI	CAPS	CAPS PI		Higher level product
CAPS	Metadata			Yes	PPI	CAPS	CAPS PI		
CDA	??		1A & 1B	Yes	Small Bodies	CDA	CDA PI		No input from instrument rep.
CDA	Metadata			Yes	Small Bodies	CDA	CDA PI		
CDA	Calibration files			Yes	Small Bodies	CDA	CDA PI		
CIRS	Raw interferograms		1A	Yes	Atmospheres	CIRS	CIRS PI		
CIRS	Calibrated Spectra		1B	Yes	Atmospheres	CIRS	CIRS PI		
CIRS	Map products		H	Yes	Atmospheres	CIRS	CIRS PI		Higher Level product
CIRS	Metadata			Yes	Atmospheres	CIRS	CIRS PI		
CIRS	Calibration files			Yes	Atmospheres	CIRS	CIRS PI		
CIRS	Software for end-user to derive target footprints from C-kernels			Yes	Atmospheres	CIRS	CIRS PI	N / A	Under consideration

Instrument	Science Data Product	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Discipline Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
Huygens	TBS								
INMS	Spectra		1B	Yes	PPI	INMS	INMS PI		this product is committed according to INMS Implementation Plan
INMS	Metadata			Yes	PPI	INMS	INMS PI		
INMS	Calibration files			Yes	PPI	INMS	INMS PI		
ISS	UDR images		1A	Yes	Imaging	IO / ISS	ISS TL		generated by IO, delivered by ISS team
ISS	EDR images		1B	Yes	Imaging	ISS	ISS TL		
ISS	Cartographic data products		H	Yes	Imaging	ISS	ISS TL		Higher Level product
ISS	Metadata			Yes	Imaging	ISS	ISS TL		
ISS	Calibration files			Yes	Imaging	IO, ISS	ISS TL		
MAG	L1A data (duplicates removed, gaps filled, idiosyncrasies of onboard data processing unit fixed, data separated into files by type)		1A	Yes	PPI	MAG	MAG PI		
MAG	software to convert L1A to L1B		Ancillary	Yes	PPI	MAG	MAG PI	N/A	

Instrument	Science Data Product	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Discipline Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
MAG	Metadata		Ancillary	Yes	PPI	MAG	MAG PI		
MAG	Calibration files		Ancillary	Yes	PPI	MAG	MAG PI		
MIMI	Survey File		1B	Yes	PPI	MIMI	MIMI PI		
MIMI	Snapshots		1B	Yes	PPI	MIMI	MIMI PI		
MIMI	Full data record		1B	Yes	PPI	MIMI	MIMI PI		
MIMI	Averaged data record		H	Yes	PPI	MIMI	MIMI PI		Higher Level product
MIMI	Metadata		MIMI		PPI	MIMI	MIMI PI		
MIMI	Calibration files		MIMI		PPI	MIMI	MIMI PI		
RADAR	Decoded data (reversible, i.e. DN < -> EU)		1A	Yes	Geosciences	IO / Radar	Radar TL		product produced by IO (according to TL-approved SIS), delivered to Radar TL who in turn archives to PDS
RADAR	Image calibrated records (SAR strips)		1B	Yes	Geosciences	IO / Radar	Radar TL		product produced by IO (according to TL-approved SIS), delivered to Radar TL who in turn archives to PDS

Instrument	Science Data Product	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Discipline Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
RADAR	Altimeter calibrated records		H	Yes	Geosciences	Cassini Radar Science Team (CRST)	Radar TL		Higher Level product
RADAR	Scatterometer calibrated records		H	Yes	Geosciences	CRST	Radar TL		Higher Level product
RADAR	Radiometer calibrated records		H	Yes	Geosciences	CRST	Radar TL		Higher Level product
RADAR	SAR Image Mosaics, etc.		H	Yes	Geosciences	CRST	Radar TL		Higher Level product
RADAR	Detailed science applications; topographic studies, etc.		H	Yes	Geosciences	CRST	Radar TL		Higher Level product
RADAR	Metadata		Radar	Yes	Geosciences		Radar		
RADAR	Calibration files		IO, Radar	Yes	Geosciences		Radar		
RPWS	Low rate browse set		H	Yes	PPI	RPWS	RPWS PI		Higher Level product
RPWS	Low rate full resolution calibrated set		1B	Yes	PPI	RPWS	RPWS PI		
RPWS	Wideband browse set		H	Yes	PPI	RPWS	RPWS PI		Higher Level product

Instrument	Science Data Product	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Discipline Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
RPWS	Wideband full resolution uncalibrated set		1A	Yes	PPI	RPWS	RPWS PI		
RPWS	Special Data Sets		H	Yes	PPI	RPWS	RPWS PI		Higher Level product
RPWS	Metadata		RPWS	Yes	PPI		RPWS		
RPWS	Wideband full resolution calibration files		RPWS	Yes	PPI		RPWS		
UVIS	Spectra		1B	Yes	Rings Atmospheres	UVIS	UVIS PI		
UVIS	Image at one wavelength		1B	Yes	Rings Atmospheres	UVIS	UVIS PI		
UVIS	Spatial and spectral cubes		H	Yes	Rings Atmospheres	UVIS	UVIS PI		Higher Level product
UVIS	Stellar brightness time history		H	Yes	Rings	UVIS	UVIS PI		Higher Level product
UVIS	Metadata		UVIS	Yes	Rings Atmospheres		UVIS		
UVIS	Calibration files		UVIS	Yes	Rings Atmospheres		UVIS		

Instrument	Science Data Product	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Discipline Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
VIMS	MIPS UDR		1A	Yes	Imaging	IO / MIPS	VIMS TL		product produced by IO (according to TL-approved SIS), delivered to VIMS TL who in turn archives to PDS
VIMS	Metadata		VIMS	Yes	Imaging		VIMS		
VIMS	Calibration files		IO, VIMS	Yes	Imaging		VIMS		
VIMS	software to convert L1A to L1B		IO, VIMS	Yes	Imaging		VIMS	N / A	

Appendix B: Radio Science and Ancillary Data Products to be Archived with PDS

Data Product	Experiment	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
Open-loop radio science data (ODS) *digitized wave*	GWE OM EI SWS		Raw	Yes	RS Subnode	IO / RS *	RST Lead		* produced by DSN, IO makes product available to RST. PDS labels generated by RST
Closed-loop Tracking data (ATDF) *Doppler and range*	GWE OM EI GM SWS		0	Yes	RS Subnode	Radiometric Data Conditioning Team (RMDCT)	RST Lead		PDS labels generated by RST
Orbit Data File (ODF) *Doppler and range*	GM EI		1A	Yes	RS Subnode	RMDCT	RST Lead		PDS labels generated by RST
Radio Science Team Products (Calibrated, Resampled, & Derived datasets)	??		H	Yes	?	Radio Science Team (RST)	RST Lead		Higher Level product
UTPM - Universal Timing & Polar Motion Files	OM GM EI		Level 0 Ancillary	Yes	RS Subnode	IO, TSAC (?)	RST		
MCF - Media Calibration File	OM GM EI		Level 0 Ancillary	Yes	RS Subnode	IO, TSAC (?)	RST		
AMCF - Advanced Media Calibration File - Earth	OM GM EI		Level 0 Ancillary	Yes	RS Subnode	IO, TSAC (?)	RST		

Data Product	Experiment	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
RW - Raw Weather	OM GM EI		Level 0 Ancillary	Yes	RS Subnode	IO, TSAC (?)	RST		
EOP - Orientation Parameters File	OM GM EI		Level 0, Level 1 Ancillary	Yes	RS Subnode	IO, TSAC (?)	RST		
SPKernel	OM		Level 1 Ancillary	Yes	RS Subnode	IO	RST		
CKernel	OM		Level 1 Ancillary	Yes	RS Subnode	IO	RST		
Reports	OM GM EI GWE SWS		Level 1 Ancillary	Yes	RS Subnode	IO	RST		are “operations logs & reports” part of the EK (Experimenter’s Notebook component)?
RFS/RFIS engineering telemetry	??		Level 1 Ancillary	Yes	RS Subnode	IO	RST		
Ultrastable oscillator calibration data/reports	??		Level H Ancillary	Yes	RS Subnode	IO	RST		
High Gain Antenna (HGA) Pattern	HGAC		Level H Ancillary	Yes	RS Subnode	IO	RST		

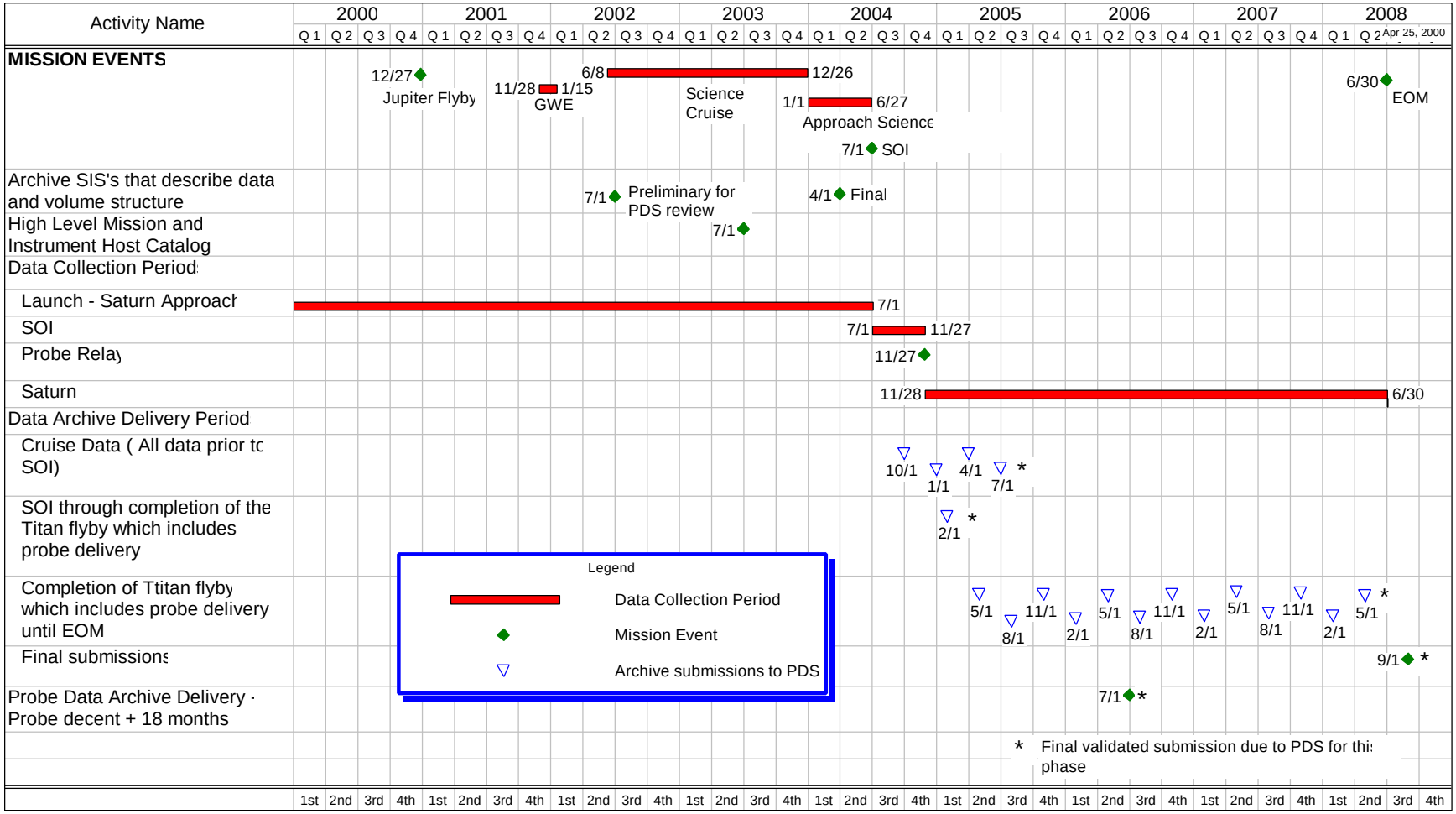
Data Product	Experiment	SIS ID	NASA Level	PDS Format IMG, etc..	PDS Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	Estimated Data Set Size	COMMENTS
High Gain Antenna (HGA) Boresight Alignment	HGAC		Level H Ancillary	Yes	RS Subnode	IO	RST		The HGA Boresight Alignment is part of the Frames kernel produced by IO and archived by MSSO.

GWE - Gravitational Wave Experiment
GM - Gravity Field and Mass Determination Measurements
OM - Occulation Measurements
EI - Ephemeris Improvement
SWS - Solar Wind Scintillation
HGAC - High Gain Antenna Calibration

Appendix C: Ancillary Data Sets to be Archived with PDS by Cassini Project

Supplementary Data Product	PDS Node	Produces data products	Creates archive and supplies to IO for delivery to PDS	PDS Format
SPICE Spacecraft and Target Ephemeris Kernel (SPK)	NAIF	SCO	MSSO	Yes
SPICE Planetary Constants Kernel (PCK)	NAIF	SCO	MSSO	Yes
SPICE Pointing Kernel (CK)	NAIF	SCO	MSSO	Yes
SPICE Spacecraft Clock Kernel (SCLK)	NAIF	SCO	MSSO	Yes
SPICE Leapseconds Kernel (LSK)	NAIF	SCO	MSSO	Yes
SPICE Instrument Kernel (IK)	NAIF	IO (from inputs from instrument teams)	MSSO	Yes
SPICE Frames Kernel (FK)	NAIF	IO (from inputs from instrument teams and spacecraft office)	MSSO	Yes
SPICE Event Kernel (EK) : ESP (Science Plan) ESQ (Sequence Component) ENS (Experimenter's Notebook)	NAIF	IO (from inputs from instrument teams)	MSSO	Yes

Appendix D. Archive Schedule



Appendix E: Acronyms

APSD	Archive Plan for Science Data (formerly known as the Archive Policy and Data Transfer Plan, APDTP)
CAPS	Cassini Plasma Spectrometer
CDA	Cosmic Dust Analyzer
CDS	Command and Data Subsystem
CIRS	Composite Infrared Spectrometer
CK	SPICE spacecraft orientation data
Co-I	Co-Investigator
COS	Cassini Operations System
DN	Data Number
DN	Discipline Node
DSN	Deep Space Network
ECR	Engineering Change Request
EDR	Experiment Data Record
EEIS	End-to-End Information System
EK	SPICE events information
ESA	European Space Agency
EU	Engineering Unit
FDD	Functional Design Document
FI	Facility Instrument
FK	Frames Kernel
FRD	Functional Requirements Document
GWE	Gravity Wave Experiement
HK	Housekeeping
HSWT	Huygens Science Working Team
ID	Identifier
IDR	Intermediate Data Record
IDS	Interdisciplinary Scientist
IK	SPICE instrument Kernel
IO	Instrument Operations Team
IRD	Interface Requirements Document
INMS	Ion and Neutral Mass Spectrometer
ISS	Imaging Science Subsystem
JPL	Jet Propulsion Laboratory
LSK	SPICE leapseconds data
MAG	Magnetometer
MIFT	Mission Interface Team
MIMI	Magnetospheric Imaging Instrument
MIPS	Multimission Image Processing System
MO&DA	Mission Operations and Data Analysis
MOU	Memorandum of Understanding
MP	Mission Plan
MSSO	Mission Science and Support Operations

MSOC	Mission and Science Office Coordinator
NAIF	Navigation and Ancillary Information Facility
NASA	National Aeronautics and Space Administration
NSSDC	National Space Science Data Center
OSSA	Office of Space Science and Applications
OTL	Operations Team Leader
PCK	SPICE target (planet, etc.) size, shape and orientation
PDMP	Project Data Management Plan
PDS	Planetary Data System
PI	Principal Investigator
PPRD	Program Policies & Requirements Document
RPIF	Regional Planetary Image Facility
RPWS	Radio and Plasma Wave Spectrometer
PSG	Program Science Group
RST	Radio Science Team
RSS	Radio Science Subsystem
SAUL	Science and Uplink Office
S/C	Spacecraft
S/W	Software
SCLK	SPICE spacecraft clock coefficients
SFDU	Standard Formatted Data Unit
SIS	Software Interface Specification
SMP	Science Management Plan
SOI	Saturn Orbit Insertion
SPICE	Spacecraft, Planet, Instrument, C-matrix, Events
SPK	SPICE Spacecraft and target (planet, etc.) ephemeris
TL	Team Leader
TM	Team Member
UDR	Unprocessed Data Record
UVIS	Ultraviolet Imaging Spectrograph
VIMS	Visual and Infrared Mapping Spectrometer

Appendix F: To be Resolved List

Unresolved Items	Comments	Due Date
1. A commitment is needed from all teams to archive 1A and 1B products		
2. A MSSO PDS rep needs to be identified.	Section 2	
3. Should the SPICE data archive generation be allocated to another team?	It is currently allocated to MSSO. A team with more SPICE experience and expertise may be a better match.	
4. Should Geosciences be listed as an "other node" for receipt of CIRS data?	(PDS node for surface data to icy satellites-down to the surface of Titan, or just real close.) Section 5.2	
5. Is there a formal interface between Cassini & Regional Planetary Imaging Facilities (RPIFs)?		
6. SIS ID, data set formats and size is needed.	Appendix A	
7. Clarify arrangement between CDA instrument and PDS Small Bodies Node (Dust Subnode). How is data delivered, what format, what is PDS responsibility?	Appendix A	
8. include SIS ID, data formats and structure, volume id / set names, etc. in Appendix A	Appendix A	
9. Incorporate details on Huygens archive products and representatives.	Section 2.11	
10. Will products that are press released or used in journal articles be archived? For example ISS and Radar Movies or videos.	Section 4	
11. CIRS surface and rings data need to be included (John Pearl is lead CO-I @ GSFC for surfaces, Linda Spilker for rings)	Appendix A	
12. Will the Cassini PSG develop a data release and sharing policy?	Section 4	
13. Do we need a formal agreement with PAO to maintain press released products?	6.5	
14. What other project documentation needs to be sent with data to the PDS?	Appendix C.	
15. The SPICE archive is too vague. What has been done for other mission archives?	6.6.1	
16. Should it be required that all ancillary data used in preparation of an archive be sent to PDS?	4.	

Unresolved Items	Comments	Due Date
17. For CN to distribute archive volumes, distribution lists and artwork is required.	2.	
18. NASA data level nomenclature is not well defined for planetary missions. The table was updated based on inputs from several people. Reference: NASA NMI 8030 or "Issues and Recommendations Associated with Distributed Computation and Data Management System for the Space Sciences", pages 31-32, produced by the Committee on Data Management and Computation (CODMAC)	1.5.2	
19. TMOD's network simplification plan will cause ODFs and ATDFs to go away. What is the timeframe? After SOI?	Appendix B	
20. Does appendix A represent a list of products committed to be archived to PDS by PIs and TLs?		
21. What does the IO-agent do? Who makes final decisions if an agreement is not reached?	Section 2.4 and 4.	
22. Appendix A does not mention the VIMS stellar occultation mode. Data obtained in this mode should go to Rings or possibly Atmospheres.		
23. "Level 1A data even with documentation and software are going to be much harder to sue than processed data. My experience has been that when PPI have archived only level 1A data, documentation and software, the data are much less useful than cases where the investigators have provided processed data as well as level 1A data." - Ray Walker		

Resolved Items	Comments
1. policy concerning Cassini "validation period"	Defined in SMP, also see section 4.
2. Does Instrument Operations Team generate the program-wide catalog templates? Should there be a commitment to update catalog templates more frequently than every two years as written here?	See Section 2.4
3. Will sequence products be archived by PDS NAIF node, or is E-kernel sufficient?	See section 6.6
4. Add information about process for retaining control of archive production & validation	See dataflow diagram in section 3.
5. Question: which nodes will archive ISS data other than the PDS Image node?	Section 2.13
6. What is NSSDCs role? Does NSSDC "fill large delivery orders to the science community"?	See section 2.8
7. Higher level products identified for archive in Appendix A -- is this consistent with PDMP archive policy? (I.e. are these the products generated for program requested publications? if not, who is supplier?)	See section 4.
8. identify PDS node that will archive each of the ancillary products	See appendix A.
9. include Validation periods in Archive Schedule	Validation period is from the time data is acquired until the due date in Appendix C
10. include process/flow diagram showing archive from Teams of the Science Operations Office to PDS nodes	See section 3 dataflow diagram.
11. Is it true that MSSO or instrument team sends archive volumes to PDS CN, or do they get sent to DNs? Are templates sent direct to DN or to CN? Who forwards the volumes to NSSDC?	IO sends volumes to PDS DN. See data flow in section 2 and roles and responsibilities in section 2.
12. What is archive medium? CD-WO, DVDs, other?	See section 1.5.1.
13. policy concerning science data taken during cruise	see section 4. Also resolved in SMP.
14. do Level 0 records (i.e. science and housekeeping packets) get archived after life of mission? what is the requirement? where is this archive maintained (PDS, NSSDC, JPL organization?)	No requirement. see section 4. (Transfer frames are archived during the life of the mission, not packets)
15. Data set supplier needs to be identified for each dataset .	See appendix A.
16. what needs to get archived to JPL archives? only documentation as described in section 4.1?	Covered in a separate document.

Distribution List

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