Cassini Radio Science Operations Archive

Data Descriptions

Documents

- Cassini RSS User's Guide - *Asmar, Sami et. al.*
- Appendix to the Cassini RSS User's Guide - *Asmar, Sami, et. al.*
- Cassini Operations Archive User's Guide - *Buccino, Dustin, et. al.*
- Calibration System for Cassini Radio Science Experiments - *de Negueruela Aleman, Cristina*

Navigate

The page contains a description of most of the data types that are contained in this archive. Click on a type to jump to it.

A. PDS Archive
B. Briefing Messages
C. Timeline
D. Experiment Figure
E. Elevation Plots
F. Spacecraft Telemetry Plots (TLM Plots)
G. Experiment Notes
H. Operator Logs
I. Experiment Movie
J. RSS/DSN Meeting Material
K. RSR Power Plots
L. RSR Execution Logs
M. DSN Discrepancy Reports
N. ACE Log
O. Network Monitor & Control Log (NMC Log)
P. Reconstructed C-Kernel Plots
Q. DSN Key File (DKF)
R. Monopulse Data
S. Ops Report
T. SFOS
U. Mission Services Activity Report

A brief description of each file type is shown below.

A. PDS Archive

Format	Internet link
Producer	Cassini RSS IO Team
Date Created	Approximately 3 months after activity
Description	A link to the PDS data set on the Atmospheres node which contains the primary and ancillary data for the experiment or activity
Typical use	This link provides a convenient way to access the data.

B. Briefing Messages

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	(Per producer preference)
Average Size	300 kB
Producer	DSN Network Operations Project Engineer (NOPE) DSN Network Operations Analyst (NOA)
Date Created	Nominally 3-5 days prior to activity

Description	Briefing messages are prepared by the DSN Network Operations Project Engineer (NOPE) with information about the upcoming activity. It includes an overview, any special requirements, support products that must be generated, and special instructions for DSN personnel to follow during the activity. Typically, one briefing message is produced for each activity or set of activities.
Typical use	Take note of any special instructions given to the station, such as directives or workarounds, and equipment status or issues with the station or complex being used during the activity.

C. Timeline

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	`<activity>_Timeline_Table_<version>.pdf`
Average Size	100 kB
Producer	Cassini RSS IO Team
Source	DKF / SPASS / PEF
Date Created	Finalized 3-5 days before activity
Description	The detailed experiment timeline is prepared by the RSS Ops team in collaboration with the science team. It provides times and instructions for RSS and DSN operators to follow during an activity. The events in this timeline may supersede the DKF.
Typical use	The timeline will include information on when and where the signal will be acquired and in what mode, and when data are to be collected. It also may include estimates of signal strength, what medium the signal is propagating through (rings, atmosphere, bistatic reflection, free-space).

D. Experiment Figure

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	`<activity>_Timeline_Figure_<version>.pdf`
Average Size	100 kB
Producer	Cassini RSS Team
Date Created	Finalized 3-5 days before activity
Description	The experiment figure contains a graphical depiction of the spacecraft's position as viewed by Earth during certain experiments (specifically, Titan Occultations, Saturn Occultations, and Titan Bistatic). It also shows graphically a basic version of the timeline. It is created by the Cassini RSS scientists and RSS team.
Typical use	The figure shows the geometry of the experiment, including an overview of DSN coverage and estimates of when the signal will begin propagating through various mediums, such as rings, atmosphere, or bistatic reflection.

E. Elevation Plots

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/PLT/ELV/`
Naming Convention	`<date>ELang_<activity>_<version>.pdf`
Average Size	100 kB
Producer	Cassini RSS IO Team
Source	Computed from SPICE SP-Kernels
Date Created	Finalized 3-5 days before activity
Description	The elevation plots are created by the RSS team in planning and preparation of the upcoming experiment. They show the elevation profiles of the DSN stations used during the experiment.

Typical use	Elevation plots show coherency gaps (when two complexes are below the minimum safe transmit elevation) and the estimated elevation angle as a function of time. At lower elevation angles, expect more variance in the signal properties, such as amplitude.

F. Spacecraft Telemetry Plots (TLM Plots)

Format	Adobe PDF or Microsoft Excel
Archive Location	`data/YYYY_DDD/AAA/PLT/TLM/`
Naming Convention	`<activity>_TLM.pdf`
Average Size	200 kB
Producer	Cassini RSS IO Team
Source	Spacecraft engineering telemetry stream
Date Created	3-5 days after activity
Description	Spacecraft RFS engineering telemetry provides a time history of the received power, static phase error, and coherency lock status of the spacecraft's deep-space transponder. This information is queried and plotted by the RSS ops team.
Typical use	These plots were produced in response to the failure in the USO in 2012 when experiments typically conducted in non-coherent (one-way) mode now needed to be conducted coherently (two-way/three-way). Because the uplink signal would decrease in power as it propagated through the rings or atmosphere, the spacecraft might drop lock and go non-coherent. These plots provide the spacecraft coherency lock status, and received power as a function of time to determine when to process coherent or non-coherent data. Additionally, the static phase error provides ???.

G. Experiment Notes

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	`<activity>OpsNotes.pdf`
Average Size	500 kB
Producer	Cassini RSS IO Team
Source	Hand-written notes during experiment
Date Created	During experiment in real-time
Description	Experiment notes are collected by the RSS IO team during experiments.
Typical use	Experiment notes are useful to determine if any anomalous circumstances occurred during the experiment, as well as sample values of SNT, monopulse, and signal power levels. Any communication between the Operations team and the DSN is included.

H. Operator Logs

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/LOG/OPS/`
Naming Convention	`SSSAAAAYYYYDDD_HHMM_OperationsLog_DSS.pdf`
Average Size	300 kB
Producer	Cassini RSS IO Team
Source	Hand-written operator log OR digital operator log (after 2014)
Date Created	During experiment in real-time
Description	Operator logs are filled out by the RSS Ops team during an activity. They contain the configuration of the RSR and DSN along with any notes taken.

Typical use	Use operator logs to determine the configuration of the open-loop receivers, as well as notes on station weather and equipment status. Notes similar to Experiment Notes may be present.

I. Experiment Movie

Format	Quicktime Movie (.mov) or Windows Media Movie (.wmv)
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	`<activity>.mov` or `<activity>.wmv`
Average Size	80 MB
Producer	Cassini RSS IO Team
Source	Screenshots of real-time open-loop receiver displays
Date Created	During experiment in real-time
Description	A movie of the RSR displays is recorded by the RSS team during an experiment and contains a FFT display (typically 16-kHz bandwidth) and signal-to-noise time history. These are created for Saturn Occultations, Titan Occultations, and Titan Bistatic experiments.
Typical use	Watch the movie for a quick look at the signal in the frequency domain and SNR time history.

J. RSS/DSN Meeting Material

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	`Intro_<activity>_DSNMeet.pdf`
Average Size	300 kB
Producer	Cassini RSS Team
Date Created	Approximately 1 week prior to experiment
Description	Before each experiment (prime gravity, special activities, occultations, and bistatic experiments), a meeting is conducted between the RSS team and the DSN. This meeting material is typically a presentation with a description of the experiment, action items, and work allocations for the experiment.
Typical use	Review the meeting material for any problems that were anticipated or solved before the experiment.

K. RSR Power Plots

Format	PNG Image
Archive Location	`data/YYYY_DDD/AAA/PLT/RSR/`
Naming Convention	`YYYY_DDD_DSSNNB_RSRXY.png`
Average Size	20 kB
Producer	Cassini RSS IO Team
Source	RSR Execution Logs
Date Created	At end-of-pass (EOT) time
Description	The post-pass power plots are graphs of the signal-to-noise ratio as a function of time of the track collected by the RSR. They are derived from the RSR execution logs using software developed by the RSS Ops team. One plot is produced per band per RSR used.
Typical use	View the signal power time history for a quick visual check if the signal behaved as expected. For regular passes (ORT, MONCAL, AUXPIM, etc), does the signal maintain a constant power level? For experiments such as occultations, does the signal power decrease at the expected time?

L. RSR Execution Logs

Format	Plain-text
Archive Location	`data/YYYY_DDD/AAA/LOG/RXL/`
Naming Convention	`rXYlogCASYY0DDDB.NN` or `RSRXY_log.DDD-HHMMSS`
Average Size	3 MB
Producer	Cassini RSS IO Team
Source	RSR, VSR or WVSR software
Date Created	During experiment in real-time
Description	The RSR execution log (often referred to as simply the "log file") is a text file of the operations of the RSR. It contains a time history of health and status updates, such as residual frequency and signal-to-noise ratio, along with events, user commands, and anomalies and warnings.
Typical use	Review the log file to determine what commands were issued, the RSR configuration settings, and review residual frequencies or signal power as recorded by the RSR in real-time. Commonly issued commands that may be of relevance are: · *att auto*: set the attenuator (this command causes a phase change in the signal) · *way*: change the tracking mode · *fro* or *sfro*: offset the frequency tuning predicts

File Format	This is a plain-text formatted file. Each log entry is delimited by a new line, carriage return.
	
	If the receiver is an RSR or VSR, each entry in the log is formatted as follows:
	`YY/DDD HH:MM:SS> {log entry}`
	
	If the receiver is a WVSR, each line is a different log entry. For the WVSR, both Side A and Side B are recorded in the same log. To distinguish entries between Side A and Side B, look for the keyword dsp1 (Side A) or dsp2 (Side B) in the log entry. Each entry in the log is formatted as follows:
	`YY/DDD HH:MM:SS {processor} {log entry}`

M. DSN Discrepancy Reports

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/DR/`
Naming Convention	`CNNNNNN.pdf`
Average Size	200 kB
Producer	Deep Space Network
Date Created	Before (pre-pass), during (real-time), or after (post-pass) the activity
Description	When the DSN encounters anomalies or problems during a pass, a Discrepancy Report (DR) is created by the DSN operator to document what happened and what action, if any, was taken to remedy the problem.
Typical use	Read the DR to determine if any data should be discarded or modified due to equipment malfunction or failure.

N. ACE Log

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/LOG/ACE/`
Naming Convention	`acelog_YYYY_DDD_HHMM_DDD_HHMM.pdf`
Average Size	100 kB
Producer	Cassini Real-time Operations (RTO) staff

Date Created	During experiment in real-time
Description	The Cassini ACE is the real-time operations person who represents the project during DSN passes and is responsible for ensuring telemetry is successfully downlinked and commands uplinked. The ACE communicates between project personnel and the DSN operators. The ACE records his actions in the ACE log.
Typical use	The ACE log contains a time history of commands sent to the spacecraft, downlink configuration and monitoring data, communications with the DSN, telemetry status and bit rate changes, and more. Use this to determine a time history of events for the experiment.

O. Network Monitor & Control Log (NMC Log)

Format	Plain text
Archive Location	`data/YYYY_DDD/AAA/LOG/NMC/`
Naming Convention	`<spacecraft_id><2 digit year><pass number>-<time tag>`
Average Size	1 MB
Producer	DSN Network Monitor and Control Console
Date Created	During pass in real-time
Description	The NMC logs contain a time history of the automated commands, manual commands, and status updates of the DSN systems. One log is recorded per station per pass.
Typical use	Manual and automatic directives, such as pointing model, monopulse enable/disable, and station health, are recorded in this file, as well as intermittent estimates of station health, such as signal-to-noise ratio, system noise temperature, pointing angles, monopulse, and more.
File Format	The NMC log is a plain-text file with each entry in the log delimited by a new line, carriage return feed pair. Each column is fixed-width, with the exception of the log entry, which is the rest of the line. The first column is the log entry number, the second column is the current UTC time (HH:MM:SS), the third column is the two-digit code for the entry, the fourth column is the receiver or subsystem, the fourth column is the operator, the fifth column is an ID of the type of log entry, and the final characters in the line are the log entry.

P. Reconstructed C-Kernel Plots

Format	Microsoft Excel spreadsheet and chart
Archive Location	`data/YYYY_DDD/AAA/PLT/CK/`
Naming Convention	`<activity>.xls(x)`
Average Size	1 MB
Producer	Cassini RSS-IO Team
Date Created	Upon release of reconstructed C-Kernel, approximately 2 weeks after activity
Description	The Cassini AACS team produces a reconstructed C-Kernel which describes where the spacecraft was pointing during an experiment. The RSS Ops team produces a plot of the error between the desired pointing of the HGA and the actual pointing achieved. These are produced only when the spacecraft requires specialized pointing: Saturn and Titan Occultations (limb tracking) and Titan Bistatic experiments (specular reflection tracking).
Typical use	This file can help quantify how good the pointing was for a particular experiment and any corrections that may need to be applied to the data.

Q. DSN Key File (DKF)

Format	Plain text
Archive Location	`data/SEQ/SSS/`
Naming Convention	`z0SS0v.dkf`
Average Size	500 kB
Producer	Cassini Science Planning and Sequencing Team
Date Created	During sequence implementation, 1-3 months prior to activity

Description	The DSN Key File (DKF) is produced by the Cassini project during the sequence implementation phase for the DSN to follow during tracking and science passes. It provides a timeline for events such as mode switches (1-way, 2-way, 3-way), beginning of track, and end of track.
Typical use	The file can be searched for telemetry bit rate changes, mode switches, and DSN coverage for the spacecraft.
File Format	The DSN key file is a plain text file with new line, carriage return feed pairs. There is an 11 line SFDU header describing the file at the top. Each line of the DKF begins with one of the following: · * - Indicates a comment line · ! - Indicates the start of a new entry · @ - Indicates a continuation of an entry Each entry is formatted as follows. `[spacecraft id} {dss ID} {entry number} {UTC DOY} {UTC time} {type} {dss} {entry} [{comments}]`

R. Monopulse Data

Format	Plain text
Archive Location	`data/YYYY_DDD/AAA/158/`
Naming Convention	`SSS_YYYY_DDD_dssNN.txt`
Average Size	700 kB
Producer	Cassini RSS-IO Team
Source	Monitor data telemetry stream
Date Created	1-7 days after experiment
Description	Monopulse is a Ka-band subsystem at the DSN to provide pointing corrections to the 34-m BWG antennas. Monitoring data is collected by the project which is then queried by the RSS Ops team which produces the monopulse data file. The azimuth and elevation corrections in this file tell how much the antenna needed to be corrected by. Utilization of monopulse requires Ka-band to be in lock on the closed-loop receiver.
Typical use	The data contained in the monopulse corrections can be used to determine how well the antenna was pointed using the blind pointing model. Small corrections indicate good pointing and large corrections indicate bad pointing. Small corrections are due to thermal variations in the antenna structure. Large corrections can sometimes be associated with high wind speed or a bad pointing model.
File Format	Monopulse data is a plain-text file with new line, carriage return feed pairs. The first line in the file is the header that describes the format of the columns. The columns are delimited by spaces (sometimes multiple). The first column is the timestamp in UTC, the second column is the Azimuth angle, the third column is the Elevation angle, the fourth column is the measured Azimuth error, the fifth column is the measured Elevation error, the sixth column is the accumulated Azimuth correction and the seventh column is the accumulated Elevation correction. The actual applied monopulse offsets are the last two columns (Azimuth Correction and Elevation Correction).

S. Ops Report

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	`YYYY_DDD_OpsReport.pdf`
Average Size	50 kB
Producer	Cassini RSS-IO Team
Source	Operator notes and operator logs
Date Created	During or directly after experiment
Description	The ops report is a status summary of the experiment produced during or immediately following the experiment based on notes from the operations team during the experiment. It provides an overview of the experiment including what happened and any anomalous circumstances.
Typical use	Read the report for a summary of the experiment.

T. SFOS

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/` or `data/SEQ/SSS/`
Naming Convention	`SS_z0SS0v_sfos(_activity).pdf`
Average Size	100 kB
Producer	Cassini Science Planning and Sequencing Team
Source	Spacecraft sequence products (DKF, PEF, …)
Date Created	During sequence implementation, 1-3 months prior to activity
Description	The SFOS is produced by the Cassini project and is a timeline of events on the spacecraft and DSN ground stations. It shows each main activity, DSN view periods, downlink passes, command passes, maneuver time slots, and spacecraft ops status (transmitter power, antenna use, ranging, DDOR tones, light-time, and bit rate changes).
Typical use	This file provides a timeline for the spacecraft. Look for Radio Science specific passes (begin with RSS), downlink passes, telemetry bit rates, potential occultations, and any other activities that may impact radio science.

U. Mission Services Activity Report

Format	Adobe PDF
Archive Location	`data/YYYY_DDD/AAA/`
Naming Convention	`NOPE_YYYY_DOY_DDD_ACTIVIES_REPORT_DSS-NN.pdf`
Average Size	50 kB
Producer	DSN Network Operations Analyst or Network Operations Project Engineer
Date Created	Directly following experiment
Description	Contains a post-pass summary of the experiment written by the NOPE or NOA and explains the DSN's role in the experiment.
Typical use	Read the report for a summary of the DSN performance during the experiment as well as a time history of key events. The report may contain information on corrective actions.