This file contains detailed information about the ISM/Phobos data files included in the ISM data base.

Data are grouped by processing levels in separated directories; sub-directories correspond to different targets (Mars, Phobos, other, ground calibrations). The various processing levels are: original telemetry files (in the directory /RAW_DATA), edited data files (decompressed and corrected from telemetry errors, in the directory /EDT_DATA), fully calibrated data (in directory /CAL_DATA). Examples of scientific results are available in the directory /DRV_DATA, namely an altimetry data base and a short summary of published results.

All telemetry files transmitted by the instrument are stored in the directory /RAW_DATA, and are documented in SESSIONS.ASC. These files often include several independent observation sessions acquired in a short time (one main session, one or two calibration sessions, possible extra-sessions). Each edited data file corresponds to one session, and therefore to a single instrumental mode (all spectra within a file are comparable, except in a few instances during calibrations). Only sessions containing information were extracted from telemetry files; measurements in even and odd channels are written in separated files.

Data were calibrated whenever possible (main 11 Mars image cubes and one Phobos image cube). Mars image cubes are written in two versions, with and without atmospheric correction applied.

Other useful data files include coordinate files for the main 11 Mars sessions and the Phobos image cube (in directory /GEOMETRY) and derived products (in the directory /DRV_DATA). Topographic reference files from Mariner 9 and from Tom Duxbury's digital model of Phobos are also contained in /GEOMETRY. All the software used to write the edited and calibrated data files is included in the directory /SOFTWARE, and is described in the file SOFTINFO.TXT.

RAW_DATA

Flight

Contains the 20 original telemetry files. Their format is described in DOCISM.PDF, a short description is given in SESSIONS.ASC. Labels are contained in the file RAW_DATA.LBL. Important information is extracted from these files by Convert.for on Vax VMS systems; their whole contents can be accessed using the program Fiche.for, also running under VMS (this software uses non-standard Digital fortran functions).

NOVTEST.DAT
JANTEST.DAT
MARS0102.DAT
MARS0502.DAT
MARS0802.DAT
MARS1102.DAT
MARS1402.DAT
MARS2102.DAT
MARS2202.DAT
MARS2702.DAT
PHOB2702.DAT
MARS2802.DAT

MARS0103.DAT
MARS0703.DAT
MARS1203.DAT
MARS1303.DAT
MARS1403.DAT
MARS2103.DAT
MARS2603.DAT
PHOB2503.DAT

EDT_DATA

These data are extracted from the original telemetry files and are decompressed by Convert.for (works only under VMS). Odd and even channels are written in separated output files. Telemetry errors are corrected. In window mode, the first mirror step is discarded. These files may be read and plotted under IDL by ISM_raw.pro. They should be considered as the primary raw data files.

Mars

Main 11 sessions in window mode on Mars, for 3-axis stabilized orbits. Labels are contained in files XXX_EDT.LBL, where xxx is the root of the session name (in upper case in the following list).

PAVeven.edt and PAVodd.edt
From Mars0802.dat, 11:05:21,875 to 11:12:08,750.
Gain = 1.
Integration time = 0,125 s
First mirror position = 12
Tdet -71,2°C
Window 296 x 8.
Calibrated spectra = 2365
Data are acquired at high temperature, so a special correction is required.

BIBeven.edt and BIBodd.edt
From Mars1102.dat, 16:51:43,375 to 16:58:00,375.
Gain = 2.
Integration time = 0,5 s
First mirror position = 233
Tdet -70,4°C
Window 274 x 8.
Calibrated spectra = 2189
Data are acquired at high temperature, so a special correction is required.

ARAeven.edt and ARAodd.edt
From Mars2102.dat, 10:23:03,750 to 10:44:58,250.
Gain = 2.
Integration time = 0,5 s
First mirror position = 228
Tdet -72.2°C
Window 98 x 25.
Calibrated spectra = 2432
Data are acquired at high temperature, so a special correction is required.

DAEeven.edt and DAEodd.edt

From Mars2702.dat, 02:41:42,875 to 03:08:51,125.
Gain = 2.
Integration time = 0,5 s
First mirror position = 26
Tdet -75,8°C
Window 121 x 25.
Calibrated spectra = 3013
This observation was performed on February 26th, UT.

SYReven.edt and SYRodd.edt

From Mars0103.dat, 10:45:28,375 to 11:12:36,875.
Gain = 2.
Integration time = 0,5 s
First mirror position = 222
Tdet -76,5°C
Window 121 x 25.
Calibrated spectra = 3005

VMCeven.edt and VMCodd.edt

From Mars0703.dat, 03:00:47,750 to 03:27:53,000.
Gain = 1.
Integration time = 0,5 s
First mirror position = 2
Tdet -77,0°C
Window 121 x 25.
Calibrated spectra = 3008
This observation was actually performed on March 6th, UT.

AUReven.edt and AURodd.edt

From Mars1203.dat, 03:23:42,750 to 03:50:47,500.
Gain = 2.
Integration time = 0,5 s
First mirror position = 2
Tdet -76,2°C
Window 121 x 25.
Calibrated spectra = 3007

OLYeven.edt and OLYodd.edt

From Mars1303.dat, 11:55:25,875 to 12:15:54,375.
Gain = 2.
Integration time = 0,5 s
First mirror position = 156
Tdet -77.2°C
Window 91 x 25.
Calibrated spectra = 2275

GOReven.edt and GORodd.edt

From Mars1403.dat, 11:50:24,375 to 12:17:25,625.
Gain = 2.
Integration time = 0,5 s
First mirror position = 210
Tdet -77,4°C
Window 120 x 25.
Calibrated spectra = 3000

ASCeven.edt and ASCodd.edt

From Mars2103.dat, 12:20:36,750 to 12:47:38,0.
Gain = 3.
Integration time = 0,5 s
First mirror position = 162
Tdet -77,0°C
Window 120 x 25.
Calibrated spectra = 2999

Several channels are saturated or non-linear in the brightest half of the image cube; this effect is not corrected in the present files (see DOCISM.PDF for details).

HEBeven.edt and HEBodd.edt

From Mars2603.dat, 15:03:59,875 to 15:30:52,250.
Gain = 2.
Integration time = 0,5 s
First mirror position = 198
Tdet -77,2°C
Window 120 x 25.
Calibrated spectra = 2983

Phobos

Contains the main 2 sessions on Phobos. Labels are contained in files PHT_EDT.LBL, PHO_EDT.LBL and PHO_RES.LBL respectively. The two sessions were acquired 30 minutes apart. Circular orbit synchronized on Phobos, the spacecraft is depointed to follow Phobos. See the file DOCISM.PDF for detailed information about viewing geometry.

PhTeven.edt and PhTodd.edt

From Phob2503.dat, 15:49:28,875 to 15:58:39,125
Default mode.
Gain = 2.
First 39 spectra with integration time = 1 s and 1/8 s alternated every 7.5 s (see DOCISM.PDF). Last 259 spectra are acquired with constant integration time = 1 s (from 15:54:21,0).
Constant mirror position = 0
Tdet -77,4°C
Window 298 x 1.

298 spectra of the external hemisphere of Phobos, with Mars in the background. Data are contaminated by Martian reflected/stray light and cannot be calibrated.

PHOeven.edt and PHOodd.edt

From Phob2503.dat, 16:11:51,625 to 16:17:15,500 (Main session)
Mars window mode 0, 26 samples/line.
Gain = 3.
Integration time = 0,5 s
Starting mirror position = 240 (values are 240, 241... 255, 0, 1... 9)
Tdet -76.7°C
Window 24 x 25.

View of the northern external trailing hemisphere of Phobos, with dark sky on the background.

PHOeven.res and PHOodd.res

Main session in Phob2503.dat

Similar to the former, with spatial convolution applied by the program CorPho.for to minimize registration discrepancies (see DOCISM.PDF).

Other

Other 18 sessions with meaningful signal. Labels are contained in files SPIN_EDT.LBL (one session acquired in spinning orbit), CRU_EDT.LBL (cruise tests), LIM_EDT.LBL (short observations at the limb of Mars) and PHM_EDT.LBL (short observations of Phobos). Only non-calibrated versions of these sessions are included, although some data could be calibrated.

SPINeven.edt and SPINodd.edt

Main session in Mars2202.dat, 02:28:03,625 to 02:55:07,375
Mars window mode 0, 26 samples/line.
Gain = 2
Integration time = 0,5 s
Starting mirror position = 228 ; step = 1
Tdet -72,3°C
Window 121 x 25.

3025 spectra acquired on Mars and on the sky, with two limb crossings (at 2:35 and 2:48). The observed area is unknown (spacecraft's spinning axis and rotation speed are unknown), but the instrument would have observed the Elysium area if stabilized. This session could be calibrated, with no correction for misregistration effect, and applying the second level temperature correction similar to that in Arabia (see DOCISM.PDF).

Cru1even.edt and Cru1odd.edt

From Jantest.dat, 16:53:31,0 to 16:53:32,0
Mars flyby mode 0, 7 samples/line.
Gain = 1
Integration time = 0,125 s
Starting mirror position = 254 ; step = 1
Tdet -72°C
Window 9 x 1.

9 spectra acquired during a technical cruise test. Acquisition begins earlier but previous spectra contain no information ; the first two spectra of this set are null also. Spectra are written in sequence, as if there was one line of 9 samples. The signal measured is probably the Sun's reflection on the spacecraft tank.

Cru2even.edt and Cru2odd.edt

From Jantest.dat, 16:53:36,0 to 17:00:07,5.
Mars global mode 3, 50 samples/line.
Gain = 1
Integration time = 1 s
Starting mirror position = 156 ; step = 4
Tdet -72°C
Window 7 x 49.

343 spectra in window mode, the last ones are zeros. The signal measured is probably the Sun's reflection on a tank. This session is performed as part of a technical cruise test.

lim1even.edt and lim1odd.edt

From Mars1102.dat, 16:41:12,750 to 16:41:42,125.
Before-science session.
Mars window mode 0, 9 samples/line.
Gain = 1, then 2.
Integration time = 1/8 s
Starting mirror position = 233 ; step = 1
Tdet -70,4°C
Window 21 x 8.

168 spectra close to the limb of Mars (maybe on the disk?) during an elliptical orbit, near pericenter. The mirror is moving southward. Beware of gain change: gain = 2 from 16:41:41,375 (last 8 spectra).

lim2even.edt and lim2odd.edt

From Mars2202.dat, 02:09:3,25 to 02:09:12,25.
First dark sky calibration.
Gain = 1.
Integration time = 1 s
Constant mirror position = 0
Tdet -72,3°C
Window 10 x 1.

10 spectra at the limb of Mars. The spacecraft is spinning, data are acquired at high temperature (a correction similar to that in Arabia should be applied).

lim3even.edt and lim3odd.edt

From Mars2702.dat, 2:29:02,375 to 2:29:11,375.
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Constant mirror position = 0
Tdet -75,8°C
Window 10 x 1.

10 spectra at the limb of Mars.

lim4even.edt and lim4odd.edt

From Mars2702.dat, 2:30:26,5 to 2:30:35,5.
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Constant mirror position = 0
Tdet -75,8°C
Window 10 x 1.

10 spectra at the limb of Mars (sequel of the previous file).

lim5even.edt and lim5odd.edt

From Mars0103.dat, 10:32:48,25 to 10:32:57,25.
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Constant mirror position = 0
Tdet -76,5°C
Window 10 x 1.

10 spectra at the limb of Mars.

lim6even.edt and lim6odd.edt

From Mars0103.dat, 10:34:21,375
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Tdet -76,5°C
Window 1 x 1.
Only 1 spectrum, the others were not transmitted (sequel of the previous file).

lim7even.edt and lim7odd.edt

From Mars1303.dat, 12:17:37,5 to 12:17:46,0.
After-science session.
Mars window mode 0, 26 samples/line.
Gain = 2.
Integration time = 0,5 s
Starting mirror position = 156 ; step = 1
Tdet -77,2°C
Window 18 x 1.
18 spectra at the limb of Mars, acquired while the mirror is moving southward.

lim8even.edt and lim8odd.edt

From Mars1403.dat, 12:22:24,875 to 12:22:35,875.
After-science session.
Mars window mode 0, 26 samples/line.
Gain = 2.
Integration time = 0,5 s
Starting mirror position = 210 ; step = 1
Tdet -77,4°C
Window 23 x 1.
23 spectra at the limb of Mars, acquired while the mirror is moving southward.

lim9even.edt and lim9odd.edt

From Mars2103.dat, 13:02:37,375 to 13:02:49,375.
After-science session
Mars window mode 0, 26 samples/line.
Gain = 3.
Integration time = 0,5 s
Starting mirror position = 162 ; step = 1
Tdet -77,0°C
Window 24 x 1.
24 spectra at the limb of Mars acquired while the mirror is moving southward.

Ph1even.edt and Ph1odd.edt

From Phob2702.dat, 19:47:19,25 to 19:47:28,25.
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Constant mirror position = 0
Tdet -77,4°C
Window 10 x 1.
10 spectra on Phobos. Signal increases with time: entry limb, or stray light?

Ph2even.edt and Ph2odd.edt

From Phob2702.dat, 19:48:43,375 to 19:48:52,375.
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Constant mirror position = 0
Tdet -77,4°C
Window 10 x 1.

10 spectra on Phobos. This is the sequel of the previous file; signal magnitude is stable.

Ph3even.edt and Ph3odd.edt

From Phob2503.dat, 15:47:54,625 to 15:48:03,625.
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Constant mirror position = 0
Tdet -77,4°C
Window 10 x 1.

10 spectra on Phobos. This session and the following are in the continuity of the Phobos track. The signal is probably contaminated by Mars reflected light.

Ph4even.edt and Ph4odd.edt

From Phob2503.dat, 15:49:18,75 to 15:49:27,75
First dark sky calibration.
Gain = 2.
Integration time = 1 s
Constant mirror position = 0
Tdet -77,4°C
Window 10 x 1.

10 spectra on Phobos. This session and the previous one are in the continuity of the Phobos track. The signal is probably contaminated by Mars reflected light.

Ph5even.edt and Ph5odd.edt

From Phob2503.dat, 16:00:02,125 to 16:00:11,125.
First dark sky calibration.
Gain = 1.
Integration time = 1 s
Constant mirror position = 0
Tdet -77,4°C
Window 10 x 1.

10 spectra on Phobos. This session and the following are in the continuity of the Phobos track, but the gain is different. The signal is probably contaminated by Mars reflected light.

Ph6even.edt and Ph6odd.edt

From Phob2503.dat, 16:01:26,125 to 16:01:35,125
Second dark sky calibration.
Gain = 1.
Integration time = 1 s
Constant mirror position = 0
Tdet -77,4°C
Window 10 x 1.

10 spectra on Phobos. This session and the previous one are in the continuity of the Phobos track, but the gain is different. The signal is probably contaminated by Mars reflected light.

Calib

This directory contains 30 flight calibrations sessions (all of them, except those from the Phobos session on March 27th). The calibration sessions are entirely extracted (observations of the dark sky and internal source; see details in DOCISM.PDF). They include some of the limb observations extracted separately in directory /EDT_DATA/OTHER. Labels are contained in the file CAL_EDT.LBL. The format of these files is slightly different: calibration step index and gain are recorded instead of mirror position, which remains constant (always 0). These sessions are not calibrated.

Ca1even.edt to Ca30even.edt and Ca1odd.edt to Ca30odd.edt

References to these files are contained in CAL_EDT.LBL and INDEX.TAB.

Ground

Contains selected data from ground calibrations in pre-processed ascii files.

Bidim.dat

Gain = 1
Constant mirror position = 0
Focal plane temperature = -60°C
Set of 14 x 9 averaged spectra with dark current removed.

The instrument lies on a moving platform and looks at a Glowbar (a black body at about 1400 K with non-uniform temperature, i. e. with a spatial structure). The instrument mirror remains in rest position, but the movement of the platform is used to scan the source laterally (azimuth) and vertically (elevation) so as to acquire an image of the Glowbar. The IDL routine litbidim.pro reconstitutes and plots images of the source in each spectral channel. The shift between images in odd and even channels is due to detectors implementation in the focal plane and is close to 23. The shift between images in channels of identical parity is a measure of channels misregistration, and was used to check and refine correction coefficients in Decal2.dat (see DOCISM.PDF). Spectra are averages of several observations with dark current subtracted.

CNChaud.spe and CNFroid.spe

Gain = 1
Constant mirror position = 0
Tdet -65°C

Observations of an extended black body at different temperatures (121.5°C and 113°C respectively). Spectra are averaged spectra and dark current is subtracted. The ratio of these two spectra permits to estimate the transfer function in the high wavelength range

(no detectable signal is emitted below 1.7 µm). The output signal in the short wavelength range is due to spectral orders overlap only, and actually corresponds to photons with 2 x the nominal wavelength. This ratio was also used to refine the transfer function of first grating order in the short wavelength range. These files can be plotted using IDL routine Affspe.pro.

CAL_DATA

These data are calibrated from edited data files by Etalonne.for (Mars image cubes) or EtalPho.for (Phobos image cube). A spatial convolution is applied to register spectral channels; under certain conditions missing pixels are interpolated, but spatial resolution is not degraded. Odd and even channels are written in separated output files, using the same format as edited data files. Values are scaled to fit 16-bits integers limits (coded value = reflectance * 32767 / 0.5). This scaling preserves signal to noise. Spectra can be extracted by the program Extrait.for or under IDL by ISM_plot.pro. All sessions can be mapped by ISM_map.pro (Mars and Phobos in Mercator projection) and ISM_pho.pro (Phobos image in "satellite" projection).

Mars

Two versions of the 11 sessions acquired from 3-axis stabilized orbits on Mars are written, with and without atmospheric correction applied. The atmospheric correction is performed automatically (spectra are not selected in any manner), and is known to produce artefacts outside a narrow elevation range. Labels are contained in files XXX_CAL.LBL and XXX_ATM.LBL respectively, where xxx is the root of the sessions name. Calibration is optimized for even channels only. Limitations to this procedure are detailled in DOCISM.PDF.

Asceven.ca0

This file contains the output of the calibration process for even channels in the Ascraeus image cube. Some channels are saturated however; interpolated values are given in Asceven.cal and Asceven.atm for even channels only. Uncorrected values for the atmospheric correction file can be retrieved from Etalonne.for (see DOCISM.PDF).

Eleven couples of files xxxeven.cal and xxxodd.cal

These files must be considered the primary data for surface and atmosphere analysis. Calibration is optimized for even channels only (see DOCISM.PDF).

Eleven couples of files xxxeven.atm and xxxodd.atm

Same as above with a rough atmospheric correction applied.

Phobos

Only the main image cube (Phobos with sky in the background) is calibrated. The whole window is processed and registered, including pixels in dark sky and at the limb. Calibration is optimized for even channels only.

Phoeven.cal and Phoodd.cal

These files must be considered as the primary data for Phobos analysis.

DRV_DATA

This directory contains additional data resulting from scientific processing of the whole data set.

Topo

Contains 10 altimetry files from the observed areas. Data for the nine medium resolution image cubes can be plotted with IDL routine Litalt.pro, that contains all information about these files. Values of pressure, secante, and surface elevation are interpolated on a regular grid, with a step of 0.3° both in latitude and longitude. High resolution data from the Pavonis image cube are available only in the volcano's caldera, and may be plotted with Litpav.pro. Reference to this work can be found in Bibring *et al.*, *Planet Space Sci.* 1991 (the model was refined with respect to the version published there, and is fully described in Rosenqvist, 1991, Ph.D. thesis).

ARAalt.dat
DAEalt.dat
SYRalt.dat
VMCalt.dat
AURalt.dat
OLYalt.dat
GORalt.dat
ASCalt.dat
HEBalt.dat
PAValt.dat

The other high-resolution session (Biblis) was not processed.

HTML

Contains a set of HTML pages describing the data base and some results from the ISM experiment
(updated version are available at the IAS Planetary Data Centre site at http://www.ias.fr/cdp/index.html).

Includes :

ISM_MAP.gif

A sinusoidal map representing the 11 medium-resolution sessions. The parameter represented is the depth of the 1.44 µm-CO_2 band with correction for varying geometry, so it is a measure of surface elevation (does not use the altimetric data base in /DRV_DATA/TOPO). Accuracy of the projection is better than one pixel. All the information needed for this computation is included in the data base. 256-colours gif file.

Pav.gif

Block diagram of the caldera of Pavonis Mons from the high resolution session. This figure is plotted by LitPav.pro, and uses the altimetry data base. Elevation is retrieved from the best fit of the 2.0 µm band by a line-by line model. See Bibring *et al.*, *Planet Space Sci.* 1991. 256-colours gif file.

Phobalb.gif

Image projection of the Phobos image cube. The parameter plotted is the radiance factor at 0.95 μm (no photometric correction applied). Data in the dark sky are filtered out. 256-colours gif version adapted from the PostScript output from PhoTrace.for.