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DSN ODF (Orbit Data File) Processing Package: Level 1a to Level 1b Software Design Specifications

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ACRONYMS

| | |
|--------|--|
| A/D | Analog/Digital |
| AGC | Automatic Gain Control |
| AGVTP | Archive Generation, Validation and Transfer Plan |
| AOL | Amplitude Open Loop |
| ATDF | Archival Tracking Data Format |
| CD-ROM | Compact Disk - Read Only Memory |
| CL | Closed-Loop |
| DDS | Data Delivery System |
| DSN | Deep Space Network |
| DVD | Digital Versatile Disk |
| ESA | European Space Agency |
| ESOC | European Space Operation Center |
| ESTEC | European Space Technology Center |
| FOL | Frequency Open Loop |
| G/S | Ground Station |
| HGA | High Gain Antenna |
| IFMS | Intermediate Frequency Modulation System |
| JPL | Jet Propulsion Laboratory |
| LCP | Left Circular Polarization |
| LGA | Low Gain Antenna |
| LOS | Line Of Sight |
| MaRS | Mars Express Radio Science Experiment |
| MGA | Medium Gain Antenna |
| MGS | Mars Global Surveyor |
| NASA | National Aeronautics and Space Administration |
| ODF | DSN Original Data File |
| ODR | Original Data Record |
| OL | Open-Loop |
| ONED | one-way dual-frequency mode |
| ONES | One-way single-frequency mode |
| PDS | Planetary Data System |
| POL | Polarization Open Loop |
| RCP | Right Circular Polarization |
| RSR | Radio Science Receiver |
| RX | Receiver |
| S/C | Spacecraft |

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| | |
|-------|---|
| SIS | Software Interface Specification |
| S-TX | S-Band Transmitter |
| SPICE | Space Planet Instrument C-Matrix Events |
| TBC | To Be Confirmed |
| TBD | To Be Determined |
| TWOD | Two-way dual-frequency mode |
| TWOS | Two-way single-frequency mode |
| USO | Ultra Stable Oszillator |
| X-TX | X-band Transmitter |

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1 INTRODUCTION

1.1 SCOPE

This document specifies the requirements for the development of the DSN Orbit Data File (ODF) processing software, transferring Level 1a ODF data towards Level 1b. The software shall analyze radio Doppler and range tracking data recorded at the DSN ground stations.

1.2 REFERENCED DOCUMENTS

| | Reference Number | Title | Issue Number | Date |
|-----|---------------------|--------------------------------------|--------------|------------|
| [1] | MEX-MRS-IGM-IS-3016 | Radio Science File naming Convention | 6.2 | 29.11.2003 |
| [2] | TRK-2-18 | Orbit Data File Interface | change 3 | 15.06.2000 |
| | | | | |
| | | | | |

1.3 SOFTWARE CONFIGURATION CONTROL

This document addresses the software package

DSN ODF PROC PCK L1A TO L1B Version 1.0

After release, the software is under configuration control which will be documented in this section.

| <u>Version number</u> | <u>Changes/Action</u> | <u>New version</u> | <u>Release date</u> |
|-----------------------|-----------------------|--------------------|---------------------|
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2 SHORT FORMAT DESCRIPTION OF LEVEL 1A DSN ODF TAPES

2.1 BLOCK STRUCTURE

The ODF data are provided in disk files. Each ODF block or physical record consists of 2016 32-bit-words, for a total length of 64512 bits. Each ODF block contains 224 9-word (288 bits = 9 words x 32 bit) logical records. [2]

These logical records are grouped in two records with a group header record (9 words x 32 bit) and a group data record (9 words x 32 bit).

2.2 BLOCK CONTENT

A complete ODF may consist of several blocks or physical records.

A complete ODF may consist of the following records:

- File Label Group – one per ODF; consists of File Label Group Header Record and File Label data Group Record
- Identifier Group – one per ODF; consists of Identifier Group Header Record and identifier Group Data Record
- Orbit Data Group – multiple record groups, time ordered; each record group consists of sequential Orbit Data Group Header Record and Orbit Data Group Data Record
- Ramp groups – optional
- Clock offset groups – optional
- Data summary group – optional
- End-of-File (EOF) group – one per ODF; consists of EOF Group Record only

The description of the block content is given in [2] and attached as Annex A.

3 SPECIFICATIONS FOR LEVEL 1A TO LEVEL 1B PROCESSING

3.1 GENERAL SPECIFICATION

ODF-SPEC-3110: The software shall

- read the binary DSN ODF_FILE,
- process the data according to this specification,
- create ASCII data output files according to this specification and
- create a PDS conform label file Level 1a, for the original ODF_FILE and Level 1b label files for the output files.

ODF-SPEC-3120: The software language is FORTRAN and PERL

3.2 INPUT FILES

3.2.1 Data file types

ODF-SPEC-3210: the following table defines the input file types and the logical file names used in this specification and within the software:

| File Description | Logical name within program |
|-----------------------------------|-----------------------------|
| DSN Orbit data file (ODF); binary | ODF_FILE |
| DSN meteorological file | DSN_MET |

3.2.2 File names

ODF-SPEC-3220: The incoming DSN ODF_FILE (Level 1a) will be renamed. Level 1a file names are defined as (see also [1] section 4.1)

r00ODF0L1A_ODF_yyddhhmm_qq.DAT

The time information in the file name will be the reference time given in ODF_HEADER and is typically the start date of the file. A DSN ODF file contains usually data covering several days and from different ground stations. Therefore, a general apointment to a specific ground station cannot be done and *gg=00*.

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Table 3-1: file name parameter

| Acronym | Description | Examples |
|---------|--|----------|
| r | Spacecraft (Raumsonde) name R = Rosetta M = Mars Express V = Venus Express | M |
| gg | Ground station ID: 00 = independent of ground station, various ground stations or not feasible to appoint to a specific ground station or complex <u>DSN complex 40 Canberra</u> 34 = 34 m BWG 40 = complex 40 43 = 70 m 45 = 34 m HEF <u>DSN complex 10 Goldstone:</u> <u>10 = complex</u> 14 = 70 m 15 = 34 m HEF 24 = 34 m BWG 25 = 34 m BWG 26 = 34 m BWG 27 = 34 m HSBWG <u>DSN complex 60 Madrid:</u> 54 = 34 m BWG 55 = 34 m BWG 60 = complex 63 = 70 m 65 = 34 m HEF | 43 |
| ttt | data source identifier <u>Level 1a and 1b</u> ODF0 = ODF closed loop | ODF0 |
| lll | Data archiving level L1A = Level 1A | L1A |
| sss | data type DSN data files level 1a: ODF original orbit files (closed-loop) | |
| yy | Year | 04 |
| ddd | Day of the year | 153 |
| hhmm | Sample hour , minute (Start time) | 1135 |
| qq | Sequence or version number | 01 |

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| | | |
|-----|-----------------------------------|-----|
| eee | .DAT binary data files (Level 1a) | DAT |
|-----|-----------------------------------|-----|

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ODF-SPEC-3230: A Level 1a label file will be generated according to PDS standards. The level 1a label file name is defined in ODF-SPEC-3220 with the extension *.LBL (see also [1] section 4.2).

r00ODF0L1A_ODF_yyddhhmm_qq.LBL

3.2.3 File formats

ODF-SPEC-3240: ODF_FILE formats are defined in [2] Tables 3-1 to Tables 3-8. A copy of these Tables can be found in Annex 1.

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3.3 LEVEL 1A TO LEVEL 1B PROCESSING SOFTWARE SPECIFICATIONS

ODF-SPEC-3320: the different groups or record types will be identified by the first word (item 1) in the relevant Group Header Record called "Primary Key":

| Group Header Record | Item number | Data word | Numerical value of "Primary Key" | Table Number in [2] (see also Annex 1) |
|---------------------|-------------|-----------|----------------------------------|--|
| File Label | 1 | 1 | 101 | Table 3-1 ° |
| Identifier | 1 | 1 | 107 | Table 3-2a |
| Orbit Data | 1 | 1 | 109 | Table 3-3a |
| Ramp | 1 | 1 | 2030 | Table 3-4a |
| Clock Offsets | 1 | 1 | 2040 | Table 3-5a |
| Data Summary | 1 | 1 | 105 | Table 3-7a |
| EOF | 1 | 1 | -1 | Table 3-8 |

ODF-SPEC-3330: the observables are defined by item 10 in the Orbit Data Group Data Record.

| Identification of observable | Item number | Data word | Numerical value of "Data Type ID" |
|------------------------------|-------------|-----------|-----------------------------------|
| One-way Doppler | 10 | 5 | 11 |
| Two-way Doppler | 10 | 5 | 12 |
| Three-way Doppler | 10 | 5 | 13 |
| NSP Pseudo noise Range | 10 | 5 | 36 |
| DSN sequential Range | 10 | 5 | 37 |
| RE Range | 10 | 5 | 41 |

ODF-SPEC-3335: DSN station ID, uplink/downlink band flag; data validity indicator

These info are defined in the Orbit Data Group Data Record:

| Identification | Item number | Data word | value |
|--------------------|-------------|-----------|--|
| Uplink band | 12 | 5 | 0 = one-way 1 = S-band 2 = X-band 3 = Ka-band |
| Downlink band | 11 | 5 | 0 = one-way 1 = S-band 2 = X-band 3 = Ka-band |
| DSN station ID | 8 | 5 | Station ID number |
| Data validity flag | 14 | 5 | 0 = good data 1 = bad data |

ODF-SPEC-3340: the observables are stored as item 4 and item 5 in Orbit Data Group Data Record and formatted as

| observable | Item numbers | Data words | Format | Units |
|-------------------|--------------|------------|--------|-------------|
| One-way Doppler | 4,5 | 3,4 | S32 | Hz |
| Two-way Doppler | 4,5 | 3,4 | S32 | Hz |
| Three-way Doppler | 4,5 | 3,4 | S32 | Hz |
| Range | 4,5 | 3,4 | S32 | Range units |
| Range | 4,5 | 3,4 | S32 | Range units |
| Range | 4,5 | 3,4 | S32 | nsec |

ODF-DEF-3360: The time tag unit is seconds past zero hours UTC of 1st January 1950.

ODF-DEF-3370: The number of seconds including leap seconds between 1st January 1950 00:00 UTC and 1st January 2003 00:00 UTC is:

| | |
|---|---------------|
| Modified Julian date 1 st January 1950 00:00 UTC | 0 |
| Modified Julian Date 1 st January 2003 00:00 UTC | 19,358 |
| Number of standard days | 19,358 |
| Number of standard seconds | 1,672,531,200 |
| Number of leap seconds between 1972 and 31.12.2003 | 22 |

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| | |
|--|---------------|
| (last leap second was introduced on 31 st Dec 1999) | |
| Total number of seconds | 1,672,531,222 |

ODF-SPEC-3350: the time tag of the observable (record time tag) is stored in item 1 and item 2 of the Orbit Data Group data Record.

| Time tag | Item numbers | Data words | Format | Units |
|--------------------------|--------------|----------------------|--------|-------|
| Time tag integer part | 1 | 1 | I32 | sec |
| Time tag fractional part | 2 | 2 bit1 – bit10 | I10 | msec |

The time tag relative to 1st January 2003 00:00 UTC in seconds is:

$$\begin{aligned}
 \text{time_tag}[\text{sec onds}] &= \text{float}(\text{item1}) + \text{float}(\text{item2}) \cdot 10^{-3} - 1,672,531,222 \\
 \text{item2} &= \text{word2} \cdot \text{AND} \cdot (2^{10} - 1)
 \end{aligned}$$

ODF-SPEC-3355: Leap seconds have to be added to time_tag[seconds] if “Leap Second Alert” will occur after 31st December 2003.

ODF-SPEC-3360: number of days since 1st January 2003 00:00 UTC is :

$$\text{time_tag}[\text{days}] = \frac{\text{time_tag}[\text{sec onds}]}{86,400}$$

| year | Number of days | Cumulative number of days since 01.01.2003 |
|------|----------------|--|
| 2003 | 365 | 365 |
| 2004 | 366 | 731 |
| 2005 | 365 | 1096 |
| 2006 | 365 | 1461 |
| 2007 | 365 | 1826 |
| 2008 | 366 | 2192 |
| 2009 | 365 | 2557 |

ODF-SPEC-3370: *time tag*

is to be transformed into

- ISO format
- Fractions of day of year
- Ephemeris time in seconds since 1st January 2000, 00:00 UTC

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ODF_SPEC_3400: *uplink frequency*

The uplink frequency may be reconstructed from the Ramp Group Data Format.

$$uplink_frequency(t) = start_frequency(t_0) + ramp_rate(t_0) \cdot (t - t_0) \quad (1.1)$$

Where

| Variable | description | Item# | Data word | format |
|-----------------|--|-------|-----------|--------|
| start_frequency | Ramp start frequency, integer GHz | 5 | 5 | I22 |
| | Ramp start frequency, integer part (mod 10 ⁹) | 7 | 6 | I32 |
| | Ramp start frequency, fractional part (10 ⁻⁹) | 8 | 7 | I32 |
| Ramp_rate | Ramp rate, integer part (two's complement) | 3 | 3 | S32 |
| | Ramp rate, fractional part (two's complement, 10 ⁻⁹) | 4 | 4 | S32 |
| t ₀ | Ramp start time, integer part | 1 | 1 | I32 |
| | Ramp start time, fractional part (10 ⁻⁹) | 2 | 2 | I32 |
| t | Time stamp of observable $t \geq t_0$ | | | |

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4 DSN METEOROLOGICAL FILE FOR TROPOSPHERIC CALIBRATION

ODF-SPEC-4010: The original DSN meteorological file DSN_MET will be renamed to **rggDSN0L1A_MET_yyddhhmm_qq.AUX**

The file name format is specified in [1] section 4.1.

ODF-SPEC-4020: The original DSN meteorological file DSN_MET has the following file format:

The file has a header line:

DATE: yymmdd DOY: ddd DSS gg (= ground station complex)

And six columns with meteorological information for every 30 minutes

| column | description | unit |
|--------|----------------------|----------------|
| 1 | time | hhmm |
| 2 | dew p temperature | degree Celsius |
| 3 | temperature | degree Celsius |
| 4 | pressure | mbar |
| 5 | H2O partial pressure | mbar |
| 6 | relative humidity | % |

The format repeats for each day of the year. There is one meteorological file for each DSN complex 10, 40 and 60.

ODF-SPEC-4030: The original DSN meteorological file DSN_MET will be modified to match the file format of the IFMS meteorological file. One output files for each DSN complex will be generated.

5 OUTPUT FILES

5.1 DATA OUTPUT FILE TYPES

ODF-SPEC-5110: the following table defines the output file types and the logical file names used in this specification and within the software:

| File Description | Logical name within program |
|---|--|
| Processed DSN Orbit data file (ODF); ASCII | ODF_DOP_S ODF_DOP_X ODF_RNG_S ODF_RNG_X |
| Uplink frequency reconstruction file | ODF_RAMP |
| Modified DSN meteorological file | DSN_MET_MOD |

5.2 FILE NAMES

ODF-SPEC-5220: The level 1b file name of ODF_DOP-S, ODF_DOP_X, ODF_RNG_S, ODF_RNG_X , ODF_RAMP and ODF_MET_MOD are defined (see also [1] section 4.1) as:

r00tttL1B_sss_yyddhhmm_qq.TAB

The time information in the file name is taken as the reference time. and is typically the start date of the file. A DSN ODF file contains usually data covering several days and from different ground stations. Therefore, a general apointment to a specific ground station cannot be done and gg=00.

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Table 5-1: file name parameter

| Acronym | Description | Examples |
|---------|---|----------|
| r | Spacecraft (Raumsonde) name R = Rosetta M = Mars Express V = Venus Express | M |
| gg | Ground station ID: 00 = independent of ground station, various ground stations or not feasible to appoint to a specific ground station or complex | 43 |
| tttt | data source identifier <u>Level 1a and 1b</u> ODF0 = ODF closed loop DSN0 = DSN ancillary file (meteo file) | ODF0 |
| lll | Data archiving level L1B = Level 1B | L1B |
| sss | data type <u>DSN data files level 1b:</u> DPS S-band Doppler DPX X-band Doppler RNS uncalibrated S-band ranging file RNX uncalibrated X-band ranging file RMP uplink frequency ramp rate file <u>DSN ancillary files level 1b:</u> MET modified DSN meteorological file | DPS |
| yy | Year | 04 |
| ddd | Day of the year | 153 |
| hhmm | Sample hour , minute (Start time) | 1135 |
| qq | Sequence or version number | 00 |
| eee | .TAB ASCII data files | |

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5.3 FILE FORMATS

5.3.1 ODF Doppler and Ranging file formats Level 1b

ODF-SPEC-5350: The file format of ODF_DOP_S, ODF_DOP_X, ODF_RNG_S and ODF_RNG_X are defined in [Fehler! Verweisquelle konnte nicht gefunden werden](#) werden, to

Gelöscht: Table 5-1

[Z:\documents\all_missions\DSN software\MEX-MRS-IGM-DS-3037 I3 R3 ODF L1a to L1b Spec.doc](#), _____ Erstelldatum
[13.03.2005 15:22:00](#)

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respectively.

Gelöscht: Table 5-4

Table 5-2 File format of ODF_DOP_S

| Column | Format | Description | Unit | Resolution |
|--------|--------|---|------|-------------------|
| 1 | | Sample number | | |
| 2 | | Time in ISO format | | |
| 3 | | Time in fractions of day of year | Days | 10 ⁻¹⁰ |
| 4 | | Ephemeris time since 01.01.2000 | Sec | µsec |
| 5 | I2 | Spacecraft ID | | |
| 6 | I2 | DSN station ID | | |
| 7 | I1 | 1 = One-way 2 = two-way | | |
| 8 | I1 | Uplink frequency flag 0 = one-way 1 = S-band 2 = X-band 3 = Ka-band | | |
| 9 | I1 | Downlink frequency flag 1 = S-band 2 = X-band 3 = Ka-band | | |
| 10 | I1 | Data validity indicator 0 = data invalid 1 = data valid | | |
| 11 | | Observed S-band Doppler | Hz | nHz |

Gelöscht: 9

Gelöscht: 5

Gelöscht: 1

Gelöscht: 6

Gelöscht: 7

Gelöscht: 8

Gelöscht: 9

Gelöscht: 0

Gelöscht: µHz

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Table 5-3: File format of ODF_DOP_X

| Column | Format | Description | Unit | Resolution |
|--------|--------|---|------|------------------|
| 1 | | Sample number | | |
| 2 | | Time in ISO format | | |
| 3 | | Time in fractions of day of year | Days | 10 ⁻⁹ |
| 4 | | Ephemeris time since 01.01.2000 | Sec | µsec |
| 5 | i2 | Spacecraft ID | | |
| 6 | i2 | DSN station ID | | |
| 7 | i1 | 1 = One-way 2 = two-way | | |
| 8 | i1 | Uplink frequency flag 0 = one-way 1 = S-band 2 = X-band 3 = Ka-band | | |
| 9 | i1 | Downlink frequency flag 1 = S-band 2 = X-band 3 = Ka-band | | |
| 10 | i1 | Data validity indicator 0 = data invalid 1 = data valid | | |
| 11 | | Observed X-band Doppler | Hz | nHz |

Gelöscht: 5

Gelöscht: 6

Gelöscht: 7

Gelöscht: 8

Gelöscht: 9

Gelöscht: 0

Gelöscht: µHz

Table 5-4: File format of ODF_RNG_S

| Column | Format | Description | Unit | Resolution |
|-----------|-----------|--|------------------------------------|------------------|
| 1 | | Sample number | | |
| 2 | | Time in ISO format | | |
| 3 | | Time in fractions of day of year | Days | 10 ⁻⁹ |
| 4 | | Ephemeris time since 01.01.2000 | Sec | µsec |
| <u>5</u> | <u>I2</u> | <u>Spacecraft ID</u> | | |
| <u>6</u> | <u>I2</u> | <u>DSN station ID</u> | | |
| <u>7</u> | <u>I1</u> | <u>1 = One-way 2 = two-way</u> | | |
| <u>8</u> | <u>I1</u> | <u>Uplink frequency flag 0 = one-way 1 = S-band 2 = X-band 3 = Ka-band</u> | | |
| <u>9</u> | <u>I1</u> | <u>Downlink frequency flag 1 = S-band 2 = X-band 3 = Ka-band</u> | | |
| <u>10</u> | <u>I1</u> | <u>Data validity indicator 0 = data invalid 1 = data valid</u> | | |
| <u>11</u> | <u>I2</u> | <u>Data type (item 10)</u> | | |
| <u>12</u> | | <u>Observed S-band range</u> | <u>Range units or nsec</u> | |
| <u>13</u> | | <u>Item 18 plus item 19</u> | | |
| <u>14</u> | | <u>Item 20</u> | | |
| <u>15</u> | | <u>Item 21</u> | | |
| <u>16</u> | | <u>Item 22</u> | | |

Gelöscht: 5

Gelöscht: 6

Gelöscht: 7

Gelöscht: 8

Gelöscht: 9

Gelöscht: 0

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Table 5-5: File format of ODF_RNG_X

| Column | Format | Description | Unit | Resolution |
|--------|--------|---|---------------------------|------------------|
| 1 | | Sample number | | |
| 2 | | Time in ISO format | | |
| 3 | | Time in fractions of day of year | Days | 10 ⁻⁹ |
| 4 | | Ephemeris time since 01.01.2000 | Sec | µsec |
| 5 | I2 | Spacecraft ID | | |
| 6 | I2 | DSN station ID | | |
| 7 | I1 | 1 = One-way 2 = two-way | | |
| 8 | I1 | Uplink frequency flag 0 = one-way 1 = S-band 2 = X-band 3 = Ka-band | | |
| 9 | I1 | Downlink frequency flag 1 = S-band 2 = X-band 3 = Ka-band | | |
| 10 | I1 | Data validity indicator 0 = data invalid 1 = data valid | | |
| 11 | I2 | Data type (item 10) | | |
| 12 | | Observed X-band range | Range units or nsec | |
| 13 | | Item 18 plus item 19 | | |
| 14 | | Item 20 | | |
| 15 | | Item 21 | | |
| 16 | | Item 22 | | |

Gelöscht: 5

Gelöscht: "

Gelöscht: 6

Gelöscht: 7

Gelöscht: 8

Gelöscht: 9

Gelöscht: 10

Gelöscht: Observed X-band range

Gelöscht: Range units

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5.3.2 ODF Ramp RATE File Format

ODF-SPEC-5360: The file format of ODF_RAMP is defined in [Fehler! Verweisquelle konnte nicht gefunden werden.](#)

Gelöscht: Table 5-5

Table 5-6: file format of ODF_RAMP

| Column | Format | Description | Unit | Resolution |
|--------|--------|---|------|-----------------------|
| 1 | | Sample number | | |
| 2 | | Ramp start time Time in ISO format | | |
| 3 | | Ramp start time Time in fractions of day of year | Days | 10 ⁻¹⁰ |
| 4 | | Ramp start time Ephemeris time since 01.01.2000 | Sec | µsec |
| 5 | | Ramp stop time Time in ISO format | | |
| 6 | | Ramp stop time Time in fractions of day of year | Days | 10 ⁻¹⁰ |
| 7 | | Ramp stop time Ephemeris time since 01.01.2000 | Sec | µsec |
| 8 | | DSN Station ID | | |
| 9 | | Ramp Rate | Hz/s | 10 ⁻⁶ Hz/s |
| 10 | | Ramp Start Frequency | Hz | 10 ⁻⁶ Hz |

Gelöscht: 9

Gelöscht: 9

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5.3.3 DSN modified meteorological file

ODF-SPEC-5370: the output file names are specified as

rggDSN0L1B_MET_yydddhmm_qq.TAB

with *gg* = DSN complex.

ODF-SPEC-5372: The output format is specified in ODF-SPEC-5373.

ODF-SPEC-5373: The file format of ODF_MET_MOD is defined in **Fehler!**
Verweisquelle konnte nicht gefunden werden. Three output files are generated,
 one for each DSN complex.

Gelöscht: Table 5-6

Table 5-7: file format of ODF_MET_MOD

| Column | description | Unit |
|--------|---|------------------|
| 1 | Sample number | |
| 2 | Ground received time as UTC in ISO format | |
| 3 | Ground received time as UTC in fractions of day of year starting with the first day of the year the data was recorded in at 00:00.000 | days |
| 4 | Ground received time as Ephemeris time beginning at 12:00 01.01.2000 UTC | s |
| 5 | Humidity | 0.1 % |
| 6 | Pressure | 0.1 hecto Pascal |
| 7 | Temperature | 0.1 °C |

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5.4 LABEL FILES

ODF-SPEC-5470: Level 1b label files will be generated according to PDS standards.

ODF-SPEC-5480: The level 1b label file name is defined in ODF-SPEC-5220 and 5370 with the extension *.LBL (see also [1] section 4.2).

rggODF0L1B_sss_yyddhhmm_qq.LBL

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6 ANNEX A

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