SRN NDA Routine Sun EDR CDF Dataset Specification v1.7

Authors

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Version History

Date	Version	Change record	Authors
2017-10-06	0.1	First draft, adapted from SRN NDA Routine Jupiter EDR CDF Dataset Specification v1.3	L. Lamy
2018-02-12	0.2	Updated keywords, added noise generator details	L. Lamy B. Cecconi
2018-04-05	0.3	Updated keywords, fixed typos, added missing UCD values, fixed affiliations.	B. Cecconi
2019-04-02	0.4	Jupiter and Sun datasets definitions aligned Added author	B. Cecconi
2019-04-29	1.0	Initial release of NDA Routine Sun CDF Dataset	B. Cecconi
2019-07-01	1.6	Same versioning as Routine Jupiter dataset	B. Cecconi A. Loh
2020-09-09	1.7	Added addition VESPA_* keywords with unit values Added spase_DatasetResourceID	B. Cecconi A. Loh
2021-01-08	1.7	Added citation and DOI	B. Cecconi

Table of Contents

Introduction

The Nançay Decameter Array (NDA) at the Station de Radioastronomie de Nançay (SRN) is a phased array of 144 « Teepee » helicoidal antenna, composed of two sub-arrays of 72 antenna each, sensitive to Right Handed (RH) and Left Handed (LH) circular polarization, respectively [A,B,C]. The « Routine » digital receiver is connected to this array and is observing the Sun in the decametric range, mainly from 10 to 80 MHz (although the ranges 10-70 MHz and 20-70 MHz have also been used instead), since September 1990, recording alternatively a spectrum on a single polarization, every 0.5 sec. For each spectral sweep, the LH array is sampled first, followed by the RH array. The receiver is sampling 401 spectral steps in 350 ms. The spectral step is thus 175 kHz (for the 10-80 MHz setup) and the temporal sampling step is about 0.87 ms. The internal clock of the receiver cannot provide a better timing accuracy than 10 µs. The spectral bandwidth for each measurement is 30 kHz (– 3 dB filter bandwidth).

This dataset provides EDR (experiment data record) uncalibrated data. The first 400 samples of each sweep are recorded (the 401st sample is lost). The number of spectral sweep is N in the following documentation. The Epoch variable contains the LH sweep start times. LH and RH spectral sweeps are provided in separate variables. In order to reconstruct the observation time of each spectral step for each polarization (with a 10ms accuracy), two additional variables are provided:

- `Sweep_time_offset_ramp`: a series of 400 offset times (in seconds), to be added to the sweep start time in order to recover the actual time of measurement for each sample of a sweep;
- `RR_sweep_time_offset`: a series of N offset times (in seconds), to be added to each Epoch time in order to get the actual start time of each RH sweep.

The unit of LH and RH spectra are provided in dB. The sample values are proportional to the power in dB[V^2/Hz] measured at the input of the receiver. Value 256 corresponds to 80 dB[V^2/Hz]. It is straightforward to convert RH and LH spectra into dB[V^2/Hz] with a 0.3125 multiplying factor.

Calibration sweeps, regularly acquired every hour from the starting observing time are also included in the data. They can be identified with the Status variable:

- Status value = 17 at time of mode switch, before calibration mode. This Status code appears also when switching between attenuation values during the calibration sequences.
- Status value = 0 at the end of the calibration sequence.

In practice, the calibration sweeps are executed as follows. The signal summed up over each bloc of 8 antennas is replaced by the signal of a reference noise diode with delivers a fixed power of 42 dB ENR (or -72 dBm/MHz). This signal is then attenuated by 30 dB, 20 dB, 10 dB and 0 dB and measured over 10 s long exposures for each attenuation factor. The 30 dB attenuation factor approximately corresponds to the mean sky level.

The data are distributed in CDF (Common Data Format). A CDF file is structured with a header section containing the global attributes, and a data section containing the variables and the associated variable attributes [1]. A series of links and documents introducing to CDF is available at NASA PDS/PPI node (Planetary Plasma Interactions node of NASA Planetary Data System) [2].

The selected CDF specifications are compliant with archive quality CDF as defined by ISTP (International Solar Terrestrial Program) [3] and PDS4 (NASA Planetary Data System version 4) [4]. They also contain the required metadata to be compliant with the EPNcore data model, used by the VESPA project for its data distribution protocol EPN-TAP [5].

Metadata description

The global attributes are organized in 4 sections: the ISTP section, the PDS section, the VESPA section and the NDA section. The following items provide the list of global attributes, by section, with their default values and definition.

ISTP section

TITLE

Definition	This attribute is an NSSDC standard global attribute, which is a title for the data set
Value	`SRN NDA Routine Sun EDR Dataset`

Project

Definition	This attribute identifies the name of the project and indicates ownership.

Value	`SRN>Station de Radioastronomie de Nancay`
	`OBSPM>Observatoire de Paris`
	`PADC>Paris Astronomical Data Centre`

Discipline

Definition	This attribute describes both the science discipline and subdiscipline. More than one entry is allowed.
Value	`Solar Physics>Waves`

Data_type

Definition	This attribute identifies the data type of the CDF data set. Both a long name and a short name are given.
Value	`EDR>Experiment Data Record`

Descriptor

Definition	This attribute identifies the name of the instrument or sensor that collected the data
CDF Type	CDF_CHAR
Value	`routine_sun>Routine receiver with Sun pointing`

Data_version

Definition	This attribute identifies the version of a particular CDF data file. This is string containing a number (0 padded, on 2 digits), incremented every time the file is updated.
CDF Type	CDF_CHAR

Value (Updated by script)

Instrument_type

Definition This attribute is used to facilitate making choices of instrument type through CDAWeb. More than one entry is allowed.
CDF Type CDF_CHAR
Value `Radio Telescope`

Logical_file_id

Definition This attribute stores the name of the CDF file using the naming convention.
CDF Type CDF_CHAR
Value (Updated by script)

Logical_source

Definition This attribute carries source_name, data_type, and descriptor information.
CDF Type CDF_CHAR
Value `srn_nda_routine_sun_edr`

Logical_source_description

Definition This attribute writes out the full words associated with the encrypted Logical_source .
CDF Type CDF_CHAR
Value `Solar Observations from the Routine receiver of the Nancay Decameter Array at the Station de Radioastronomie de Nancay`

File_naming_convention

Definition This attributes give the file naming convention.
CDF Type CDF_CHAR
Value `source_descriptor_type_yyyymmddhhmm_yyyymmddhhmm_ver`

Mission_group

Definition This attribute has a single value and is used to facilitate making choices of source.
CDF Type CDF_CHAR
Value `SRN>Station de Radioastronomie de Nancay`

PI_name

Definition This attribute value should include first initial and last name.
CDF Type CDF_CHAR
Value `L. Lamy`

PI_affiliation

Definition This attribute value should include a recognizable abbreviation.

CDF Type CDF_CHAR

Value `LESIA>LESIA, Observatoire de Paris, PSL Research University, CNRS, Sorbonne Universites, Universite de Paris, 92195 Meudon, France`

`SRN>Station de Radioastronomie de Nancay, Observatoire de Paris, PSL Research University, CNRS, Universite d'Orleans, 18330 Nancay, France`

Source_name

Definition This attribute identifies the mission or investigation that contains the sensors.

CDF Type CDF_CHAR

Value `SRN_NDA>Nancay Decameter Array`

TEXT

Definition This attribute is an NSSDC standard global attribute, which is a text description of the experiment whose data is included in the CDF. A reference to a journal article(s) or to a World Wide Web page describing the experiment is essential, and constitutes the minimum requirement. A written description of the data set is also desirable. This attribute can have as many entries as necessary to contain the desired information.

CDF Type CDF_CHAR

Value The Nancay Decameter Array (NDA) at the Station de Radioastronomie de Nançay (SRN) is a phased array of 144 « Teepee » helicoidal antenna, composed of two sub-arrays of 72 antenna each, sensitive to Right Handed (RH) and Left Handed (LH) circular polarization, respectively. The « Routine » digital receiver is connected to this array and is observing Jupiter in the decametric range (10 to 40 MHz) since September 1990, recording alternatively a spectrum on a single polarization, every 0.5 sec. (more details at: `http://www.obs-nancay.fr/reseau-decametrique/`)

Generated_by

Definition This attribute allows for the generating data center/group to be identified.

CDF Type CDF_CHAR

Value `LESIA>Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique`
`SRN>Station de Radioastronomie de Nancay`

Generation_date

Definition Date stamps the creation of the file using the syntax yyyymmdd

CDF Type CDF_CHAR
Value (Updated by script)

LINK_TEXT

Definition This attribute stores text describing on-line data available at PI or CoI web sites.
CDF Type CDF_CHAR
Value `The NDA Routine Sun data are available at`

LINK_TITLE

Definition This attribute stores the title of the web site holding on-line data available at PI or CoI web sites.
CDF Type CDF_CHAR
Value `Station de Radioastronomie de Nancay`

HTTP_LINK

Definition This attribute stores the URL for the PI or CoI web site holding on-line data.
CDF Type CDF_CHAR
Value `http://www.obs-nancay.fr`

MODS

Definition This attribute is an NSSDC standard global attribute which is used to denote the history of modifications made to the CDF data set.
CDF Type CDF_CHAR
Value (Updated by script)

Parents

Definition This attribute lists the parent CDF(S) for files of derived and merged data sets.
CDF Type CDF_CHAR
Value (Updated by script)
Note This is the name of the corresponding raw RT1 file.

Rules_of_use

Definition Text containing information on, e.g., citability and PI access restrictions. This may point to a World Wide Web page specifying the rules of use.
CDF Type CDF_CHAR
Value SRN/NDA observations in open access can be freely used for scientific purposes. Their acquisition, processing and distribution is ensured by the SRN/NDA team, which can be contacted for any questions and/or collaborative purposes.
Contact email: contact.nda@obs-nancay.fr

We kindly request the authors of any communications and publications using these data to let us know about them, include minimal citation to the reference below and appropriate acknowledgements whenever needed.

References:
A. Lecacheux, The Nançay Decameter Array: A Useful Step Towards Giant, New Generation Radio Telescopes for Long Wavelength Radio Astronomy, in Radio Astronomy at Long Wavelengths, eds. R. G. Stone, K. W. Weiler, M. L. Goldstein, & J.-L. Bougeret, AGU Geophys. Monogr. Ser., 119, 321, 2000.

Acknowledgements: see the acknowledgement field.

Skeleton_version

Definition	This attribute contains the version number of this dataset description file.
CDF Type	CDF_CHAR
Value	(Updated by script)

Software_version

Definition	This attribute contains the software version number.
CDF Type	CDF_CHAR
Value	(Updated by script)

Software_language

Definition	This is a text attribute containing the software language used for the processing.
CDF Type	CDF_CHAR
Value	`python3`

Time_resolution

Definition	Specifies time resolution of the file
CDF Type	CDF_CHAR
Value	`1 second`

Acknowledgement

Definition	Text string at PI disposal allowing for information on expected acknowledgment if data is citable.
CDF Type	CDF_CHAR
Value	The authors acknowledge the Station de Radioastronomie de Nancay of the Observatoire de Paris (USR 704-CNRS, supported by Universite d'Orleans, OSUC, and Region Centre in France) for

providing access to NDA observations accessible online at http://www.obs-nancay.fr

Spase_DatasetResourceID

Definition SPASE Dataset resource ID
CDF Type CDF_CHAR
Value `spase://GBO/NumericalData/SRN/NDA/RoutineSun/PT1S`

Validate

Definition Details to be specified. This attribute is written by software for automatic validation of features such as the structure of the CDF file on a simple pass/fail criterion.
CDF Type CDF_CHAR
Note (Updated by script)

PDS section

PDS_Observation_start_time

Definition Observation Start Time in ISO format
CDF Type CDF_CHAR
Value (Updated by script)

PDS_Observation_stop_time

Definition Observation Stop Time in ISO format
CDF Type CDF_CHAR
Value (Updated by script)

PDS_Observation_target

Definition Observation Target Name
CDF Type CDF_CHAR
Value `Sun`

PDS_Observation_type

Definition Observation Type
CDF Type CDF_CHAR
Value `Radio`

VESPA section

VESPA_dataproduct_type

Definition Organization of the data product, from enumerated list
CDF Type CDF_CHAR
Value `DS>Dynamic Spectrum`

VESPA_target_class

Definition Type of target, from enumerated list

CDF Type CDF_CHAR
Value `star`

VESPA_target_region

Definition Type of region of interest (possible from UAT: http://astrothesaurus.org)
CDF Type CDF_CHAR
Value `Solar Wind`
`Heliosphere`

VESPA_feature_name

Definition Secondary name (can be standard name of region of interest)
CDF Type CDF_CHAR
Value `Solar type II`
`Solar type III`

VESPA_instrument_host_name

Definition Observatory or Space Mission name
CDF Type CDF_CHAR
Value `SRN>Station de Radioastronomie de Nancay`

VESPA_instrument _name

Definition Instrument or Telescope Name
CDF Type CDF_CHAR
Value `NDA>Nancay Decameter Array`

VESPA_receiver_name

Definition Receiver or Channel name
CDF Type CDF_CHAR
Value `RoutineSun>Routine Sun`

VESPA_time_sampling_step

Definition Time sampling step (in seconds)
CDF Type CDF_CHAR
Value `1.0`

VESPA_time_sampling_step_unit

Definition Unit of time sampling step
CDF Type CDF_ CHAR
Value `s`

VESPA_time_exp

Definition Time exposure (in milliseconds)
CDF Type CDF_CHAR
Value `0.875`

VESPA_time_exp_unit

Definition Unit of sample integration time
CDF Type CDF_ CHAR
Value `ms`

VESPA_spectral_range_min

Definition Min spectral range (frequency in MHz)
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_spectral_range_max

Definition Max spectral range (frequency in MHz)
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_spectral_range_unit

Definition Unit of spectral range
CDF Type CDF_ CHAR
Value `MHz`

VESPA_spectral_sampling_step

Definition Spectral sampling step (frequency in kHz)
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_spectral_sampling_step_unit

Definition Unit of spectral sampling step (frequency)
CDF Type CDF_CHAR
Value `kHz`

VESPA_spectral_resolution

Definition Spectral observation bandwidth (frequency in kHz)
CDF Type CDF_CHAR
Value `30`

VESPA_spectral_resolution_unit

Definition Spectral observation bandwidth (frequency)
CDF Type CDF_CHAR
Value `kHz`

VESPA_measurement_type

Definition A physical characterization of the data, using UCDs (Unified Content Descriptor) as defined by IVOA
CDF Type CDF_CHAR
Value `phys.flux.density;em.radio;phys.polarization`

VESPA_access_format

Defintion File format type, using MIME Types.
CDF Type CDF_CHAR
Value `application/x-cdf`

VESPA_bib_reference

Defintion Bibliographic reference for the dataset, preferably an ADS bibref or a DOI.
CDF Type CDF_CHAR
Value `2000GMS...119..321L`

VESPA_target_distance

Definition Distance to target (in km)
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_target_distance_unit

Definition Unit of distance to target
CDF Type CDF_CHAR
Value `km`

VESPA_subobserver_longitude_min

Definition Minimum Carrington longitude
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_subobserver_longitude_max

Definition Maximum Carrington longitude
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_subobserver_longitude_unit

Definition Unit of Carrington longitude
CDF Type CDF_CHAR
Value `deg`

VESPA_subobserver_latitude_min

Definition Minimum solar latitude
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_subobserver_latitude_max

Definition Maximum solar latitude
CDF Type CDF_CHAR
Value (Updated by script)

VESPA_subobserver_latitude_unit

Definition	Unit of Jovian latitude
CDF Type	CDF_CHAR
Value	deg

VESPA_carrington_rotation

Defintion	Carrington rotation number at meridian_time
CDF Type	CDF_CHAR
Unit	N/A
Value	(Updated by script)

NDA section

NDA_geographic_longitude

Defintion	Longitude of SRN/NDA on Earth
CDF Type	CDF_CHAR
Unit	degrees
Value	47.380510

NDA_geographic_latitude

Defintion	Latitude of SRN/NDA on Earth
CDF Type	CDF_CHAR
Unit	degrees
Value	2.193226

NDA_geographic_altitude

Defintion	Altitude of the SRN on Earth
CDF Type	CDF_CHAR
Unit	meters
Value	135

NDA_rf_filter_selected

Defintion	Value of the selected RF filter
CDF Type	CDF_CHAR
Unit	N/A
Value	(Updated by script)

NDA_rf_filter_time_change

Defintion	Date of the change of RF filter
CDF Type	CDF_CHAR
Unit	ISO formatted time (UTC)
Value	(Updated by script)

NDA_power_resolution

Defintion	Power resolution (dB per division)
CDF Type	CDF_CHAR

Unit	dB/div
Value	(Updated by script)

NDA_meridian_time

Defintion	Date of Sun passing meridian
CDF Type	CDF_CHAR
Unit	ISO formatted time (UTC)
Value	(Updated by script)

NDA_reference_level

Defintion	Reference level (dBm)
CDF Type	CDF_REAL4
Unit	dBm
Value	(Updated by script)

NDA_sweep_duration

Defintion	Duration of spectral sweep
CDF Type	CDF_REAL4
Unit	s
Value	0.35

NDA_header_version

Defintion	Version of the header specification of RT1 file
CDF Type	CDF_BYTE
Unit	N/A
Value	(Updated by script)

Data Description

There are seven data variables in each file. Each variable is described below.

Time axis

Name	`Epoch`
CDF Type	CDF_TIME_TT2000
UCD	time.epoch
Unit	nanoseconds after Jan. 1st 2000
Description	UTC time of each spectra.
Dimensions	N

Frequency axis

Name	`Frequency`
CDF Type	CDF_REAL4
UCD	em.freq
Unit	MHz

Description	Central frequency of each step of the spectral sweep.
Dimensions	400

RH Spectrogram

Name	`RR`
CDF Type	CDF_UINT1
UCD	phys.flux.density;phys.polarization.circular
Unit	dB
Description	Spectrogram measured on the RH-polarized set of antennas.
Dimensions	N x 400

LH Spectrogram

Name	`LL`
CDF Type	CDF_UINT1
UCD	phys.flux.density;phys.polarization.circular
Unit	dB
Description	Spectrogram measured on the LH-polarized set of antennas.
Dimensions	N x 400

Status flag

Name	`STATUS`
CDF Type	CDF_BYTE
UCD	meta.flag
Unit	N/A
Description	Instrument mode value at end of RH and LH sweeps.
Dimensions	N x 2

Sweep Time Offset Ramp

Name	`SWEEP_TIME_OFFSET_RAMP`
CDF Type	CDF_REAL4
UCD	time.duration
Unit	second
Description	Time Offset to be added to the sweep start time to recover the actual time of measurement of each sweep sample.
Dimensions	400

RH Sweep Time Offset

Name	`RR_SWEEP_TIME_OFFSET`
CDF Type	CDF_REAL4
UCD	time.duration
Unit	second
Description	Time Offset to be added to the Epoch time to recover the actual start time of the RH sweep.
Dimensions	N

References

[A] A. Boischot et al., A new high-gain broadband steerable array to study jovian decametric emission, Icarus, 43, 399-407, 1980.
[B] A. Lecacheux, The Nançay Decameter Array: A Useful Step Towards Giant, New Generation Radio Telescopes for Long Wavelength Radio Astronomy, in Radio Astronomy at Long Wavelengths, eds. R. G. Stone, K. W. Weiler, M. L. Goldstein, & J.-L. Bougeret, AGU Geophys. Monogr. Ser., 119, 321, 2000.
[C] **L. Lamy**, P. Zarka, B. Cecconi, L. Klein, S. Masson, L. Denis and A. Coffre, 1977-2017 : 40 years of decametric observations of Jupiter and the Sun with the Nançay decameter array, *in Planetary Radio Emissions VIII,* edited by G. Fischer et al., Austrian Academy of Sciences press, Seggauberg, 2016. arXiv:1709.03821

[1] http://cdf.gsfc.nasa.gov
[2] http://ppi.pds.nasa.gov/doc/
[3] http://spdf.gsfc.nasa.gov/istp_guide/istp_guide.html
[4] http://ppi.pds.nasa.gov/doc/cdf/PDS4-Archiving-of-CDF-Files-v3.pdf
[5] https://voparis-confluence.obspm.fr/display/VES/EPNcore+v2

Appendix

RT1 file header versions

The raw data files (RT1 files) header specification changed six times since the start of operations on Sept. 18th, 1990. The header section of the RT1 files consists in a stream of 405 bytes. The header information is written in ASCII characters. In all versions, we find the following information: minimum and maximum observed frequencies, spectral resolution, temporal resolution and intensity scale description. Starting in version 2, the "meridian time" is specified. It is the time when the Sun crosses the local meridian. Starting in version 5, the RF filter set up and changes are provided. In the last and current version, the meridian crossing date (in addition to the meridian time), the start of observation date and the end of observation time are specified. The specifications of each version are described below.

Header format version 1

- In use for RT1 files from 1990-09-18 to 1990-11-26
- Used header length: 16 bytes (out of 405 bytes)
- Header structure
    - Dummy — 1 byte (= 0x15)
    - Frequency min. (MHz) — 2 ASCII characters
    - Frequency max. (MHz) — 2 ASCII characters
    - Freq. resolution (kHz) — 3 ASCII characters
    - Reference Level (dBm) — 3 ASCII characters
    - Sweep Time (ms) — 3 ASCII characters

- Power Scale (dB/div) 2 ASCII characters
- Example:

`∅1040030-1035010∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅`

Header format version 2

- In use for RT1 files from 1990-11-27 to 1994-02-23
- Used header length: 20 bytes (out of 405 bytes)
- Header structure
  - Dummy 1 byte (= 0x15)
  - Frequency min (MHz) 2 ASCII characters
  - Frequency max (MHz) 2 ASCII characters
  - F_resolution (kHz) 3 ASCII characters
  - Reference Level (dBm) 3 ASCII characters
  - Sweep Time (ms) 3 ASCII characters
  - Power Scale (dB/div) 2 ASCII characters
  - Meridian Time (hour) 2 ASCII characters
  - Meridian Time (min) 2 ASCII characters
- Example:

`∅1040030-10350100432∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅`

Header format version 3

- In use for RT1 files from 1994-02-24 to 1999-01-18
- Used header length: 22 bytes (out of 405 bytes)
- Header structure
  - Dummy 1 byte (0x15)
  - Frequency min (MHz) 2 ASCII characters
  - Frequency max (MHz) 2 ASCII characters
  - F_resolution (kHz) 3 ASCII characters
  - Reference Level (dBm) 3 ASCII characters
  - Dummy 2 bytes (0x20 0x20)
  - Sweep Time (ms) 3 ASCII characters
  - Power Scale (dB/div) 2 ASCII characters
  - Meridian Time (hour) 2 ASCII characters
  - Meridian Time (min) 2 ASCII characters
- Example:

`∅0540030-20  350102254∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅`

Header format version 4

- In use for RT1 files from 1999-01-19 to 2000-10-31
- Used header length: 22 bytes (out of 405 bytes)
- Header structure
  - Dummy 1 byte (0x78)
  - Frequency min (MHz) 2 ASCII characters

- Frequency max (MHz) 2 ASCII characters
- F_resolution (kHz) 3 ASCII characters
- Reference Level (dBm) 3 ASCII characters
- Sweep Time (ms) 5 ASCII characters
- Power Scale (dB/div) 2 ASCII characters
- Meridian Time (hour) 2 ASCII characters
- Meridian Time (min) 2 ASCII characters

- Example:

```
x1040030-2000350101541∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅
```

Header format version 5

- In use for RT1 files from 2000-11-01 to 2009-09-20
- Used header length: 40 bytes (out of 405 bytes)
- Header structure
  - Dummy 1 byte (0x78)
  - Frequency min (MHz) 2 ASCII characters
  - Frequency max (MHz) 2 ASCII characters
  - F_resolution (kHz) 3 ASCII characters
  - Reference Level (dBm) 3 ASCII characters
  - Sweep Time (ms) 5 ASCII characters
  - Power Scale (dB/div) 2 ASCII characters
  - Meridian Time (hour) 2 ASCII characters
  - Meridian Time (min) 2 ASCII characters
  - 1st RF Filter 1 ASCII character
  - 1st RF Filter time (hh:mm) 5 ASCII characters
  - 2nd RF Filter 1 ASCII character
  - 2nd RF Filter time (hh:mm) 5 ASCII characters
  - 3rd RF Filter 1 ASCII character
  - 3rd RF Filter time (hh:mm) 5 ASCII characters
- Example:

```
x1040030-2000350100141221:41123:45204:45∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅∅
```

Header format version 6

- In use for RT1 files from 2009-09-22 to now
- Used header length: 64 bytes (out of 405 bytes)
- Header structure
  - Dummy 1 byte (0x78)
  - Frequency min (MHz) 2 ASCII characters
  - Frequency max (MHz) 2 ASCII characters
  - F_resolution (kHz) 3 ASCII characters
  - Reference Level (dBm) 3 ASCII characters
  - Sweep Time (ms) 5 ASCII characters
  - Power Scale (dB/div) 2 ASCII characters
  - Meridian Time (hour) 2 ASCII characters

- Meridian Time (min) 2 ASCII characters
- 1st RF Filter 1 ASCII character
- 1st RF Filter time (hh:mm) 5 ASCII characters
- 2nd RF Filter 1 ASCII character
- 2nd RF Filter time (hh:mm) 5 ASCII characters
- 3rd RF Filter 1 ASCII character
- 3rd RF Filter time (hh:mm) 5 ASCII characters
- Dummy 1 byte (0x20)
- Meridian date (dd/mo/yr) 8 ASCII characters
- Dummy 1 byte (0x20)
- Obs. start date (dd/mo/yr) 8 ASCII characters
- Dummy 1 byte (0x20)
- Obs. stop time (hh:mm) 5 ASCII characters

- Example:

```
x1040030-2000350102106217:06000:00000:00 22/09/09 22/09/09 01:06ØØØØØ
```