ORN NDA JunoN EDR Dataset Specification v1.0

Authors

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Citation

Cecconi, B., L Lamy, P Renaud, A Loh, A Coffre, L Denis. **2022**. *ORN NDA JunoN EDR Dataset Specification.* Version 1.0. PADC/CDN. https://doi.org/10.25935/2Q7F-Q189

Version History

Date	Version	Change record	Authors
2022-09-25	0.1	First draft	B. Cecconi
2022-09-28	1.0	Complete author list and small fixes	B. Cecconi

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Introduction

The Nançay Decameter Array (NDA) at the Observatoire Radioastronomique de Nançay (ORN – Nançay Radio Observatory) 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 « JunoN » digital receiver is connected to this array and is observing Jupiter in the decametric range, mainly from 6 to 56 MHz since 2016, with a high temporal and spectral resolution. The relevant data is selected by an operator, whom decides to keep the high resolution (2.6 ms x 3.05 kHz) or the medium resolution (83.2 ms x 12.2 kHz), based on the science content of the records.

This dataset provides EDR (experiment data record) uncalibrated data. The header section is described below. The records are provided with *ECube* records data format [D].

Header section

This main header section provides the length of the header and the observation mode.

header_length
Definition	Length of the header section (in bytes)
Data Type	unsigned 32 bits integer

stream_10G
Definition	Observation mode : nodata (value=0), spectrum (value=1), or waveform (value=2)
Data Type	unsigned 32 bits integer

Nodata mode header section
If stream_10G=0, the file should be skipped

Spectrum mode header section
The spectrum observation mode (stream_10G=1) is described with the following header keywords.

nb_corr
Definition	Number of correlation items available for each record
Data Type	unsigned 32 bits integer

accum
Definition	Accumulating factor
Data Type	unsigned 32 bits integer

freq_bandwidth
Definition	Extent of the observed spectral domain
Data Type	32 bits floating point
Unit	MHz

freq_sampling

Definition	Sampling frequency
Data Type	32 bits floating point
Unit	MHz

freq_center

Definition	Central frequency of the observed spectral domain
Data Type	32 bits floating point
Unit	MHz

time_resolution

Definition	Temporal resolution
Data Type	32 bits floating point
Unit	ms

nfreq

Definition	Number of steps on the spectral axis
Data Type	unsigned 32 bits integer

frequencies

Definition	Spectral axis
Data Type	32 bits floating point
Length	*nfreq*
Unit	MHz

Waveform mode header section

The spectrum observation mode (stream_10G=2) is described with the following header keywords.

freq_bandwidth

Definition	Extent of the observed spectral domain
Data Type	32 bits floating point
Unit	MHz

freq_sampling

Definition	Sampling frequency
Data Type	32 bits floating point
Unit	MHz

freq_center

Definition	Central frequency of the observed spectral domain
Data Type	32 bits floating point
Unit	MHz

Data section

The data section is using the ECube data record format. For reading the ECube data record, refer to the ECube data format specification [D]. The following sections are providing the *ECube_size* and *magic_word* values, useful for decoding the ECube data record.

Spectrum mode data section

The ECube record size (in bytes) is computed from the spectrum header section as:
- *ECube_size* = 4 * (8 + nb_corr*(nfreq+2))

The Magic word used to identify the type of record in the ECube record format is:
- *Magic_word* = 0x7F800000

Waveform mode data section

The ECube record size (in bytes) is fixed for this mode:
- *ECube_size* = 2048

The Magic word used to identify the type of record in the ECube record format is:
- *Magic_word* = 0xFF800000

References

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[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`

[D] B. Cecconi, C. Viou, A. Coffre. 2022. ECube Data Format Specification. Version 1.0. PADC/CDN. https://doi.org/10.25935/njwh-r040