Definition of Keywords and Its Organization in HDF5

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1. Introduction

Here is the definition of keywords and how they are organized in hdf5 file.

To ensure compatibility for other programing languages, Python-specific objects, like list, dict and tuple, are excluded.

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2. File Name

startdatetime_enddatetime.hdf5

startdatetime is a date time string when the file is created;

enddatetime is a date time string when the file is closed;

The date time string contains year, month, day, hour, minute and second.

Example:

20160229093022_20160229124807.hdf5

Notice:

The start and end date time is not accurate, use 'obstime' attribute in the hdf5 file.

3. Data type

String is ASCII character.

Integer is 32bits, signed.

Float is 32 bits.

Complex is 64 bits – A two-element compound with field firstly 32 bits real part and then 32 bits imaginary part.

4. Attribute for Data File

Keywords are stored as data file's attributes.

The keywords are all lower case.

Keywords:

Type A: Common

Keyword	Data Type	Annotation	Example
nickname	String	Any nick name for the data file.	"Keyword Example Data"
comment	String	Comment.	"Here is comment."
observer	String	observer's name.	"Someone"
history	String	history of the data file.	"No history."
keywordver	String	keyword's version.	"0.0", "0.1", "1.2"

Type B: Site

Keyword	Data Type	Annotation	Example
sitename	String	Name of the observation site	"Hongliuxia Observatory"
sitelat	Float	Unit: degree; Site's latitude.	44.17639
sitelon	Float	Unit: degree; Site's longitude.	91.7413861
siteelev	Float	Unit: meter; Site's elevation above sea level.	1500.0
timezone	String	Beijing Time, 8 hours ahead of GMT	"UTC+08h"
epoch	String	Epoch	2000.0

Type C: Antenna

Keyword	Data Type	Annotation	Example

telescope	String	Tianlai telescope type and generation; Use Roman number for generation.	"Tianlai-Dish-I", "Tianlai-Dish-II", "Tianlai-Cylinder-I"
dishdiam	Float	Diameter of dish; For cylinder: -1.0	6.0
nants	Int	Number of antennas.	16, 3
npols	Int	Polarization of each feed.	2
nfeeds	Int	Number of feeds	32, 192
cylen	Float	Length of cylinder; For dish: -1.0	50.0
cywid	Float	Width of cylinder; For dish: -1.0	50.0

Type D: Receiver

Keyword	Data Type	Annotation	Example
recvver	String	Version of receivers (the analog devices).	"0.0"
lofreq	Float	Unit: MHz; Local Oscillator frequency.	935.0

Type E: Correlator

Keyword	Data Type	Annotation	Example
corrver	String	Version of correlator.	"0.0"
samplingbits	Int	ADC sampling bits.	8
corrmode	Int	Correlation mode.	1
inttime	Float	Integration time.	1.0
obstime	String	The middle date and time when the first visibility data block is observed; Format: "yyyy/mm/dd HH:MM:SS.FFFFFF"; Note: the time corresponds to when the visibility data is firstly received from the correlator, instead of when the source's signal is received by feeds or digitalized by ADC.	"2016/02/29 09:30:22.639220"
sec1970	Float	Seconds since epoch 1970 Jan. 1st ; Equals "obstime".	1456709422. 639220
nfreq	Int	Number of frequency points.	512
freqstart	Float	Unit: MHz; The lowest frequency in the bandpass.	685.0
freqstep	Float	Unit: MHz; Frequency step of the bandpass.	0.244140625

5. Array and Its Attribute

Use Array to store mass data and regular data.

Arrays:

Keyword	Data Type	Dimname	Attribute	Annotation
vis	Complex	Time, Frequency, Baseline	dimname	Visibility data
feedno	Int	Feed No.		Starting from 1.
channo	Int	Feed No., (Channel No. of XPol, Channel No. of YPol)	dimname badchn	Starting from 1. For Dish: X=> Horizontal, Y=> Orthogonal.

				For Cylinder: X => East-West Y => North-South badchn: bad channels, Array of data type integer.
blorder	Int	Baselines, Baseline Name		Example: [[2, 8], [1, 17], [42, 43], [42, 55], …]
feedpos	Float	Feed No., (X, Y, Z) coordinate	dimname unit	Feeds' positions in right hand Cartesian Coordinate with X-Y plane being the horizontal plane, and X axis pointing to the east. Unit: meter Origin:
antpointing	Float	Source No., Feed No., (Az, Alt, AzErr, AltErr)	dimname unit	Antenna pointing and its error; For cylinder: (0, 90, x, x.) Unit: degree
pointingtime	Float	Source No., (starttime, endtime)	dimname unit	Start pointing time and end pointing time expressed in seconds since epoch 1970; Unit: second
polerr	Float	Feed No., (XPolErr, YPolErr)	dimname unit	Unit: degree
nspos	Float	NoiseSource No., (X, Y, Z) coordinate	dimname unit	Noise Source Position; XYZ origin is the same as feedpos; Unit: meters
noisesource	Float	NoiseSource No., (Start, Stop, Cycle)	dimname unit	Start: Start time; Stop: Stop time; Cycle: Source On Cycle; Unit: second
transitsource	Float	Sources, (time, SourceRA, SourceDec, SourceAz, SourceAlt)	dimname unit srcname	Unit: (second, degree, degree, degree, degree) srcname: Source's name
weather	Float	Weather Data, (Sec1970, RoomTemperature, RoomHumidity, Temperature, Dewpoint, Humidity, Precipitation, WindDirection, WindSpeed, Pressure)	dimname unit	Unit: (second, Celcius, %, Celcius, Celcius, %, millimeter, degree (0 to 360; 0 for North, 90 for East), m/s, Pa)