ezRA - Easy Radio Astronomy - ezPlot

The ezPlot program is a data Plotter, which reads one or more condensed data .ezb files, and creates many plot image files to study.

.ezb Data File Column Numbering

That human-readable .ezb condensed data output file has a few header lines, followed by one long line for each recorded data sample. Each long line has 20 ragged columns of numbers, separated by one space character.

The "coordinate" columns 0 through 9 are unrelated to the radio of the sample:
    TimeUtcMjd,   RAH,   DecDeg,   GLatDeg,   GLonDeg,   VLSR,   Count,   Spare1,   Spare2

Spare1 and Spare2 are experimentally redefined as Azimuth and Elevation.

The remaining 11 "signal" columns document the processing of the radio samples. The last 10 "signal" columns are 5 signal pairs of the signal sample's average value, followed by its signal sample's maximum value. The 2 unprocessed (maybe filtered) signals are in columns 10 through 13:
    AntAvg,   AntMax,   RefAvg,   RefMax
The 3 processed signals are in columns 14 through 19:
    AntBAvg,   AntBMax,   AntRBAvg,   AntRBMax,   AntXTVTAvg,   AntXTVTMax
Throughout ezRA, these 10 signals use this order, and are conveniently numbered using 0 through 9. Each of the 5 signals use its own color for plot traces.

And then there is column 9 with the unusual processed signal, AntXTVTCmDop, which tracks the center-of-mass of the Doppler shift of the AntXTVT signal.

ezPlot Plot File List

Each ezPlot plot image filename starts with "ezPlot", followed by a 3-digit number, followed by a description, followed by ".png" . One of the first plot filenames is "ezPlot010raH.png".

The ezPlot plot files are organized into groups. The groupings allows the -ezPlotPlotRangeL arguments to speed execution by creating only the related plots that are wanted.

The ezPlotNNx plot files are 2-dimensional plots of values related to samples, where NN is generally the input condensed data .ezb file 0-19 column number (plotting value by sample number). The ezPlotStudy*.txt file records which samples have the maximum, minimum, and greatest change values, for each of 10 signals.

ezPlot000timeUtcMjdSorted.png	- sorted UTC MJD time of sample (fractional days)
ezPlot001timeUtcMjdUnsorted.png	- unsorted UTC MJD time of sample (fractional days)
ezPlot002timeUtcMjd24hours.png	- unsorted UTC MJD fraction of day time of sample
ezPlot003timeUtcMjdBetween.png	- time between unsorted samples (seconds)
ezPlot010raH.png	- unsorted Right Ascension of sample (hours)
ezPlot020decDeg.png	- unsorted Declination of sample (degrees)
ezPlot030gLatDeg.png	- unsorted Galactic Latitude of sample (degrees)
ezPlot040gLonDeg.png	- unsorted Galactic Longitude of sample (degrees)
ezPlot050vLSR.png	- unsorted VLSR of sample (km/sec)
ezPlot070azDeg.png	- unsorted Azimuth value of sample (degrees)
ezPlot080elDeg.png	- unsorted Elevation value of sample (degrees)
ezPlot100ant.png	- unsorted Ant spectrum average values
ezPlot110antMax.png	- unsorted Ant spectrum maximum values
ezPlot120ref.png	- unsorted Ref spectrum average values
ezPlot130refMax.png	- unsorted Ref spectrum maximum values
ezPlot140antB.png	- unsorted AntB spectrum average values
ezPlot150antBMax.png	- unsorted AntB spectrum maximum values
ezPlot160antRB.png	- unsorted AntRB spectrum average values
ezPlot170antRBMax.png	- unsorted AntRB spectrum maximum values
ezPlot180antXTVT.png	- unsorted AntXTVT spectrum average values
ezPlot190antXTVTMax.png	- unsorted AntXTVT spectrum maximum values
ezPlot191sigProg.png	- summary of the unsorted ezPlot001-ezPlot190 plots
ezPlotStudy*.txt	- text max, min, fastest-changing values by sample for 10 signals

The ezPlot2N0 plot files are 2-dimensional plots where N is the 0-9 signal
(plotting signal value by Right Ascension (hours)).

ezPlot200raAnt.png	- unsorted Ant spectrum average values by RA
ezPlot210raAntMax.png	- unsorted Ant spectrum maximum values by RA
ezPlot220raRef.png	- unsorted Ref spectrum average values by RA
ezPlot230raRefMax.png	- unsorted Ref spectrum maximum values by RA
ezPlot240raAntB.png	- unsorted AntB spectrum average by values RA
ezPlot250raAntBMax.png	- unsorted AntB spectrum maximum values by RA
ezPlot260raAntRB.png	- unsorted AntRB spectrum average values by RA
ezPlot270raAntRBMax.png	- unsorted AntRB spectrum maximum values by RA
ezPlot280raAntXTVT.png	- unsorted AntXTVT spectrum average values by RA
ezPlot290raAntXTVTMax.png	- unsorted AntXTVT spectrum maximum values by RA

The ezPlot3N0 plot files are 2-dimensional plots where N is the 0-9 signal
(plotting value by fraction of UTC day (hours)).

ezPlot300utcAnt.png	- unsorted Ant spectrum avg by fraction of UTC day
ezPlot310utcAntMax.png	- unsorted Ant spectrum max by fraction of UTC day
ezPlot320utcRef.png	- unsorted Ref spectrum avg by fraction of UTC day
ezPlot330utcRefMax.png	- unsorted Ref spectrum max by fraction of UTC day
ezPlot340utcAntB.png	- unsorted AntB spectrum avg by fraction of UTC day
ezPlot350utcAntBMax.png	- unsorted AntB spectrum max by fraction of UTC day
ezPlot360utcAntRB.png	- unsorted AntRB spectrum avg by fraction of UTC day
ezPlot370utcAntRBMax.png	- unsorted AntRB spectrum max by fraction of UTC day
ezPlot380utcAntXTVT.png	- unsorted AntXTVT spectrum avg by fraction of UTC day
ezPlot390utcAntXTVTMax.png	- unsorted AntXTVT spectrum max by fraction of UTC day

The ezPlot4N0 plot files are 2-dimensional plots where N is the 0-9 signal
(plotting value by fraction of Sidereal day (hours)).
    https://en.wikipedia.org/wiki/Sidereal_time

    ezPlot400sidAnt.png   - unsorted Ant spectrum average by fraction of Sidereal day
    ezPlot410sidAntMax.png   - unsorted Ant spectrum maximum by fraction of Sidereal day

    ezPlot420sidRef.png   - unsorted Ref spectrum average by fraction of Sidereal day
    ezPlot430sidRefMax.png   - unsorted Ref spectrum maximum by fraction of Sidereal day

    ezPlot440sidAntB.png   - unsorted AntB spectrum average by fraction of Sidereal day
    ezPlot450sidAntBMax.png   - unsorted AntB spectrum maximum by fraction of Sidereal day

    ezPlot460sidAntRB.png   - unsorted AntRB spectrum average by fraction of Sidereal day
    ezPlot470sidAntRBMax.png   - unsorted AntRB spectrum maximum by fraction of Sidereal day

    ezPlot480sidAntXTVT.png   - unsorted AntXTVT spectrum average by fraction of Sidereal day
    ezPlot490sidAntXTVTMax.png - unsorted AntXTVT spectrum max by fraction of Sidereal day

The ezPlot5N0 plot files are 2-dimensional increasing-sorted plots where N is the 0-9 signal
(plotting by increasing value).

    ezPlot500sortedAnt.png   - increasing-sorted Ant spectrum average values
    ezPlot510sortedAntMax.png   - increasing-sorted Ant spectrum maximum values

    ezPlot520sortedRef.png   - increasing-sorted Ref spectrum average values
    ezPlot530sortedRefMax.png   - increasing-sorted Ref spectrum maximum values

    ezPlot540sortedAntB.png   - increasing-sorted AntB spectrum average values
    ezPlot550sortedAntBMax.png   - increasing-sorted AntB spectrum maximum values

    ezPlot560sortedAntRB.png   - increasing-sorted AntRB spectrum average values
    ezPlot570sortedAntRBMax.png   - increasing-sorted AntRB spectrum maximum values

    ezPlot580sortedAntXTVT.png   - increasing-sorted AntXTVT spectrum average values
    ezPlot590sortedAntXTVTMax.png   - increasing-sorted AntXTVT spectrum maximum values

The ezPlot6N0 plot files are 2-dimensional histogram plots where N is the 0-9 signal (plotting quantity by increasing value).
    https://en.wikipedia.org/wiki/Histogram

    ezPlot600histAnt.png   - Ant spectrum average values histogram
    ezPlot610histAntMax.png   - Ant spectrum maximum values histogram

    ezPlot620histRef.png   - Ref spectrum average values histogram
    ezPlot630histRefMax.png   - Ref spectrum maximum values histogram

    ezPlot640histAntB.png   - AntB spectrum average values histogram
    ezPlot650histAntBMax.png   - AntB spectrum maximum values histogram

    ezPlot660histAntRB.png   - AntRB spectrum average values histogram
    ezPlot670histAntRBMax.png   - AntRB spectrum maximum values histogram

    ezPlot680histAntXTVT.png   - AntXTVT spectrum average values histogram
    ezPlot690histAntXTVTMax.png   - AntXTVT spectrum maximum values histogram
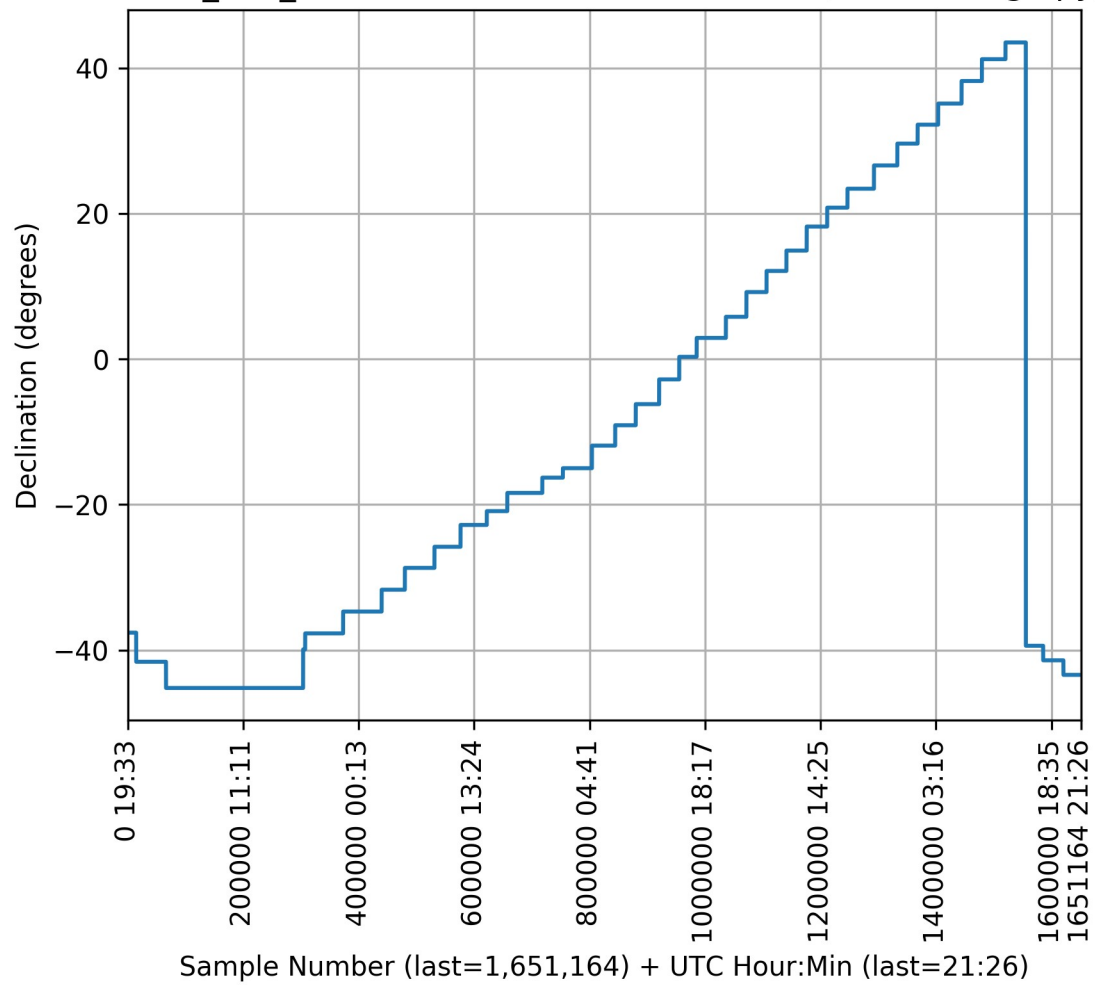
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Blah, blah, blah …

2022_131_00.rad.sdre   LTO16H   (sdrePlot08g5.py)

2022_131_00.rad.sdre   LTO16H   (sdrePlot08g5.py)

Signal Computation Progression
from Ant to AntCBT

Ant

AntB

Cal

AntCBT

0 19:33
200000 11:11
400000 00:13
600000 13:24
800000 04:41
1000000 18:17
1200000 14:25
1400000 03:16
1600000 18:35
1651164 21:26

Sample Number (last=1,651,164) + UTC Hour:Min (last=21:26)