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To: Deuterium Array Group

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Subject: Output file format

The output files are ASC11. However, the spectral data for each individual element is base 64 encoded using the same scheme as e-mail attachments. Each line of the files starts with

Col	Entry	Desc.
0	YYY:DDD:HH:MM:SS	UT Time
1	Az	beam or element azimuth
2	El	beam or element elevation
3	Integ	integration secs
4	mode	format mode
5	frequency	MHz

The line format modes are:

0	element spectrum in ASCII
10	element spectrum in Base64
1	beam spectrum in ASCII
2	beam power
3	correlation coefficients
4	pulsar period spectrum
5	total power
6	beam map
7	temperature

The line format mode that are present depend on the record options in the d1.cat file (see memo #40).

The columns beyond 5 are mode dependent:

Modes 0 and 10   individual element spectra

Col	entry
6	frequency separation in Hz
7	channel (or element) number
8	scaling factor (normally 1024)
9	start of spectrum

For mode 0 then spectrum is straight ASCII with spaces between entries. i.e. the same format as the RFI monitor. For mode 10 the spectrum is encoded using base64 as follows:

```
For (i=0, i<64; i++){
If(i>='A' && i<='Z')b64[i]=i-'A';
If (i>='a' && i<='z') b64[i]= i-'a'+26;
If (i>='0' && i<='9') b64[i]=i-'0'+52;
If(i—'+') b64[i]=62;
If(i== '/') b64[i] = 63;
}
```

each number is encoded with 3 ASCII symbols followed by the next number encoded in the next 3 symbols.

Mode 1 beam spectrum
   Col entry
   6   frequency separation in Hz
   7   beam number
   8   number of frequencies (normally 1024)
   9   start of spectrum in ASCII with spaces as delimeters.

Mode 2 beam total power
   Col entry
   6   source name
   7   az of beam (deg)
   8   el of beam (deg)
   9   scan angle (deg)
   10   beam total power
   11   b_beamnumber
   12   data maximum
   13   pulse maximum
   14   number of elements

Mode 3 correlation coefficients
   Col entry
   6   baseline
   7   normalized correlation
   8   correlation phase
   9-end   above triplet repeats

Mode 4 pulsar period bin spectrum
   Col entry
   6   beam number
   7   0
   8   power in period averaging bin
   9   number of pulses in first bin
   10-775 above triplet repeats for next 255 bins
   776 source name
   777 computer ID

mode 5   total power for each element
    col   entry
    6-29 total power 24 entries
    30-53 cal phase 24 entries
    54   "USB-errors" keyword
    55-60 usb error count

Mode 6 beam map
    Col entry
    6   start of beam map

Mode 7 temperature data
    col   entry
    6   "mbtem"   keyword
    7   motherboard temperature degC
    8   CPU temperature degC
    9   time difference between CPU clock and count of 1 second ticks since start of the program