

Limitations and workaround for complex sampled data

The current vex 1.5 standard can transfer only limited information about the nature of a complex sampled signal, so both the v2d and vex file must be modified to correctly characterize the signal in some cases. Notably, this means that the sampling rate given in the vex file under the \$FREQ heading must always be double the bandwidth, even for complex sampled antennas.

To correctly represent a complex sampled signal, the sampling rate specified in the vex file must therefore be given as double the sampling rate of the complex data. This means the sampling rate is wrong by a factor of 2, but this is compensated by the number of samples in the FFT also being adjusted by a factor of 2.

```
$FREQ;
*
def 2400.00MHz1x4MHz;
* mode = 1 stations =T1:T2
sample_rate =      128.0 Ms/sec;
chan_def = :   200.00 MHz   :   U   :   64.00 MHz   :   &CH01   :   &BBC01
:   &NoCal ;   *Rcp
enddef;
```

Stations T1 and T2 are complex sampled at a sampling rate of 64 Ms/sec, but they are defined at 128 Ms/sec in the vex file for the workaround described above. To tell vex2difx that the data is complex sampled, the v2d file must also be modified to reflect that the sampling is complex:

```
ANTENNA T1 {
sampling = COMPLEX
      .
      .
}
ANTENNA T2 {
sampling = COMPLEX
      .
      .
}
```

An alternate way of telling vex2difx that the data is complex sampled for VDIF files specifically shows up in the \$TRACKS section of the vex file:

```
$TRACKS;
def VDIF.1Ch2bit;
  track_frame_format = VDIFC/32032/2;
      .
      .
enddef;
```

In the above example, VDIFC signifies that the VDIF data is complex and in “Single Sideband” mode. For complex VDIF data in “Double Sideband” mode, VDIFD is needed. 32032 denotes the frame size, and 2 denotes the bit depth. Note that for a vex file with station schedules in real Mark5B format, there is a perl script “addVDIF.pl” that comes with DiFX which changes the setup to VDIF and includes

a complex option along with settings for frame size and bit depth that result in the track_frame_format line given above.

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