GSB raw voltage recording description and data format

Ver 2.0

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This note provides some basic information about the description of the raw voltage recording mode of the GSB (GMRT Software Back-end) and the format of the data files and associated time stamps.

1. The GSB supports a mode where raw voltage data, acquired at the Nyquist rate of the observing bandwidth by the 16 acquisition nodes, can be passed to 16 recording nodes and recorded to files on disk. At present, this mode works ONLY for the 16 MHz BW mode of the GMRT.

2. For the 16 MHz mode, the GSB data is acquired at @ 33.33333 MSPS and quantized to 4 bits per sample for raw voltage recording.

3. Each observation results in 60 binary files containing the raw voltage data : 30 antennae each with 2 polarizations. During the observation, each data file “grows” at the rate of ~ 56 GB/hour. Each recording node writes 4 raw data files.

4. Data format : Each sample is a 4-bit 2's complement number; 2 samples are packed into a byte with the least significant 4 bits corresponding to the sample that is earlier in time, while the most significant 4 bits correspond to the sample that is later in time.

5. For the recorded voltage signals, the edge of the RF band is (LO1+/-LO4) MHz, and the exact bandwidth of the signals is 16.66666 MHz.

6. For the default set-up, the files are names and sampler associations are as follows :

raw_voltage1*.node0* : Sampler-0
raw_voltage2*.node0* : Sampler-1
raw_voltage3*.node0* : Sampler-2
raw_voltage4*.node0* : Sampler-3
raw_voltage1*.node1* : Sampler-4
.....
raw_voltage2*.node7* : Sampler-29
raw_voltage1*.node8* : Sampler-32
.....
raw_voltage2*.node15* : Sampler-61

7. For the default set-up, the sampler to antenna mapping is as follows :

SMP000 = C00 – 130 POL
SMP001 = C01 – 130 POL
SMP002 = C02 - 130 POL
SMP003 = C03 - 130 POL
SMP004 = C04 - 130 POL
SMP005 = C05 - 130 POL
SMP006 = C06 - 130 POL
SMP007 = C08 - 130 POL
SMP008 = C09 - 130 POL
SMP009 = C10 - 130 POL
SMP010 = C11 - 130 POL
SMP011 = C12 - 130 POL
SMP012 = C13 - 130 POL
SMP013 = C14 - 130 POL
SMP014 = W01 - 130 POL
SMP015 = W02 - 130 POL
SMP016 = W03 - 130 POL
SMP017 = W04 - 130 POL
SMP018 = W05 - 130 POL
SMP019 = W06 - 130 POL
SMP020 = E02 - 130 POL
SMP021 = E03 - 130 POL
SMP022 = E04 - 130 POL
SMP023 = E05 - 130 POL
SMP024 = E06 - 130 POL
SMP025 = S01 - 130 POL
SMP026 = S02 - 130 POL
SMP027 = S03 - 130 POL
SMP028 = S04 - 130 POL
SMP029 = S06 - 130 POL
…….

For the remaining 30 samplers (SMP032 to SMP061), the sequence is identical to the above, except that 130 POL is replaced by 175 POL of the same antenna. Note that *SMP030, SMP031, SMP062, SMP063* correspond to the extra inputs of the GSB and are not used in the default configuration.

8. Finally, in the current, default set-up, the mapping to the actual, physical node in GSB is as follows (note : GSB nodes used are 33 thru 46 and 49,50) :

Node33 : C00(R), C01(R), C02(R), C03(R)
Node34 : C04(R), C05(R), C06(R), C08(R)
Node35 : C09(R), C10(R), C11(R), C12(R)
Node36 : C13(R), C14(R), W01(R), W02(R)
Node37 : W03(R), W04(R), W05(R), W06(R)
Node38 : E02(R), E03(R), E04(R), E05(R)
Node39 : E06(R), S01(R), S02(R), S03(R)

Node49 : S04(R), S06(R)
Node40 : C00(L), C01(L), C02(L), C03(L)
Node41 : C04(L), C05(L), C06(L), C08(L)
Node42 : C09(L), C10(L), C11(L), C12(L)
Node43 : C13(L), C14(L), W01(L), W02(L)
Node44 : W03(L), W04(L), W05(L), W06(L)
Node45 : E02(L), E03(L), E04(L), E05(L)
Node46 : E06(L), S01(L), S02(L), S03(L)
Node50 : S04(L), S06(L)

9. There is a ascii timestamp file “timestamp_voltage.<src-name>.node*.scan*” associated with each node, with entries at every ~ 251 ms (which is equal to 4 MB data buffer for each raw voltage stream) and the timestamp is for the sample at the beginning of the buffer. The format of the timestamp entries is as follows :

yyyy mm dd hh mm ss fractional_sec

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