GBT memo

Real time display of VEGAS data for Observers, Operators and Engineers

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In this report, we propose to enhance the existing online display – the GBT FITS Monitor (GFM) – by taking into consideration the needs of the Versatile GBT Astronomical Spectrometer (VEGAS). The enhanced online display is envisioned as a monitoring tool for the observers and operators and a debugging tool for the engineers. The display is expected to interface with the VEGAS through the data streaming software infrastructure. Thus this report also form a requirement for the data streaming system.

A block diagram of VEGAS is shown in Fig. 1, which is being built by the CICADA collaboration – a collaboration between CASPER and NRAO. The VEGAS is funded by the NSF ATI program and uses the CASPER technology. The specifications and modes of the VEGAS are given in Roshi et al. (2010). VEGAS consists of 8 spectrometer working in parallel as shown in Fig. 1. Each of the 8 spectrometer can be configured in 1 or 8 subband mode (see Roshi et al. 2010).

The current online display, GFM's spectral line mode, is capable of displaying spectra from a maximum of 8 'spectral windows' of the GBT spectrometer. This display format – 2D display of frequency/channel vs power spectral density – can be enhanced to display up to a maximum of 64 'spectral windows' or subbands of VEGAS. The user selection 'button' for this display can be organized into a maximum of 8 banks and 8 subbands depending of the configuration of VEGAS.

In addition to the 2D display, it will be good to have a waterfall plot (3D plot) showing the dynamic spectrum. Fig 2 and 3 show examples of such plots. A crosshair, which can be moved around on the 3D plot, will selects the 2D 'cuts' of the spectrum (bottom panel) and time series of a channel (right panel). At any instance, a single 3D plot as in Fig 2 or eight 3D plots as in Fig 3 can be displayed. If all the 8 spectrometers are configured in single subband mode, then the eight 3D plots can be the data from the 8 banks. On the other hand if the spectrometers are configured in 8 subband mode, then the eight 3D plots can be data from the 8 sub-bands of a banks or data from a selected subset of 8 out of the 64 sub-bands. For mixed configuration (ie some banks in single subband and others in 8 subband mode), the rule for the display can be that the user selects up to a maximum of 8 subbands from all the available subands. The dynamic spectrum can display data for a maximum of 10 mts or so. Once the display is full half of the old data is flushed out and the other half is retained. This will be helpful to check the stability of the system.

A panel, which can be opened by user, can be used to display the VEGAS hardware monitoring parameters discussed in the GBT software MR 3Q211 (Whitehead & Brandt 2011).

All data for the display is expected to be coming through the data streaming system. Thus the design of the data streaming system should take into account of the requirement of the VEGAS real time display.

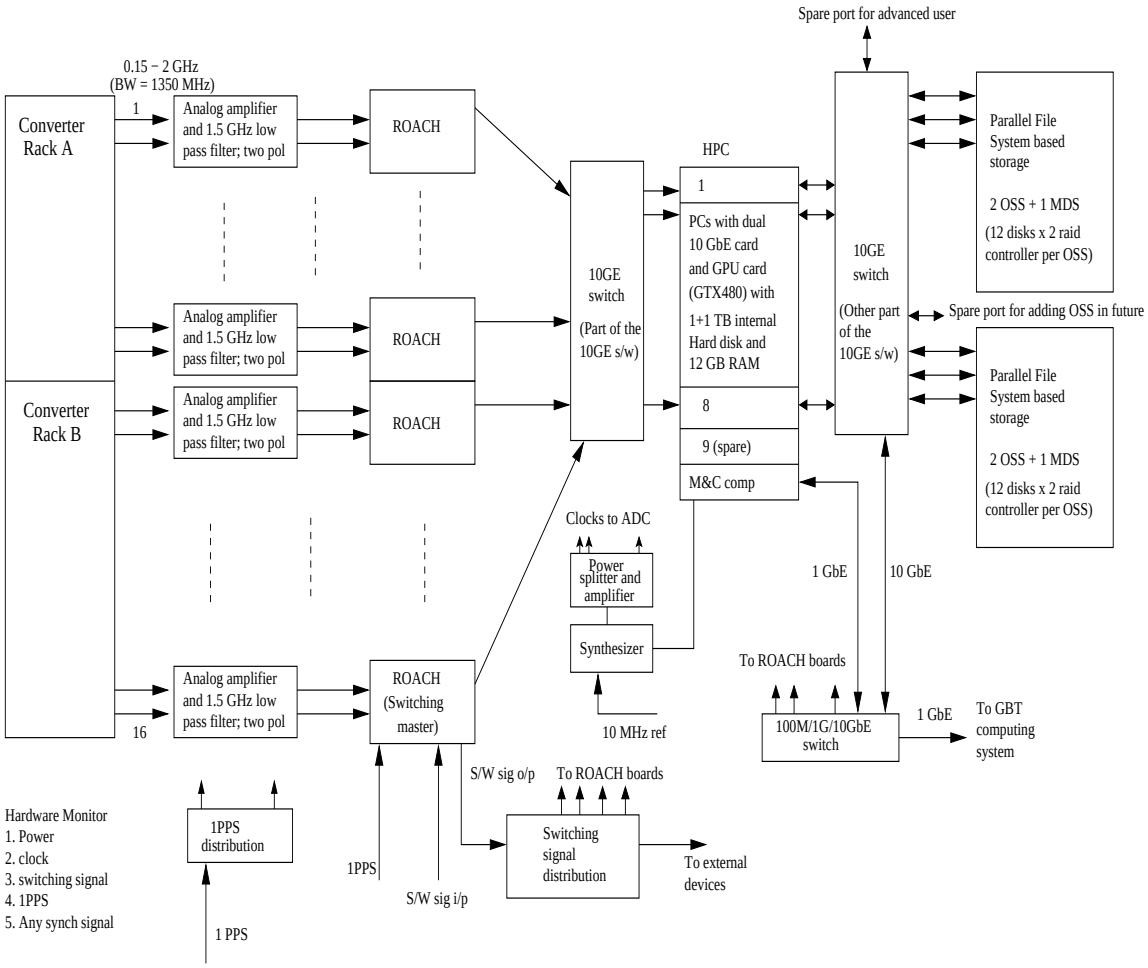

Figure 1: A block diagram of the new GBT spectrometer VEGAS

Reference

Roshi, D. A. et al. 2010, `http://www.gb.nrao.edu/vegas/report/specific.pdf`
Whitehead, M., Brandt, P., 2011, `https://safe.nrao.edu/wiki/bin/view/GB/Software/ProjectRequest3Q211`

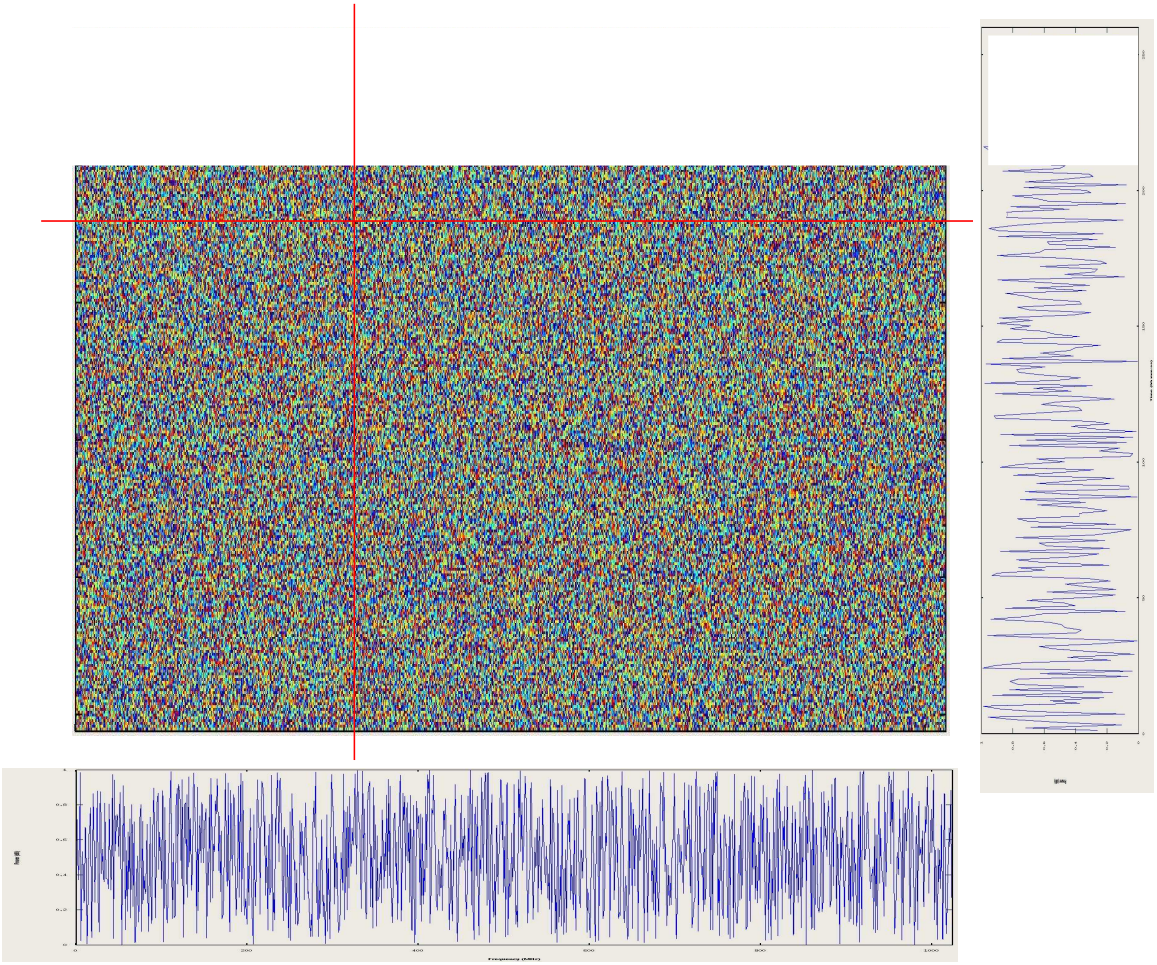

Figure 2: Real time display format for the VEGAS. A single dynamic spectrum is shown as waterfall plot or 3D plot. The x-axis of the 3D plot is frequency or channels, y-axis is time and the color scale is spectral density. The crosshair shown in red can be used to move over the 3D plot to examine the data. The instantaneous position of the crosshair will produce the 2D display of the spectrum on the bottom panel and time series of a channel on the right panel.

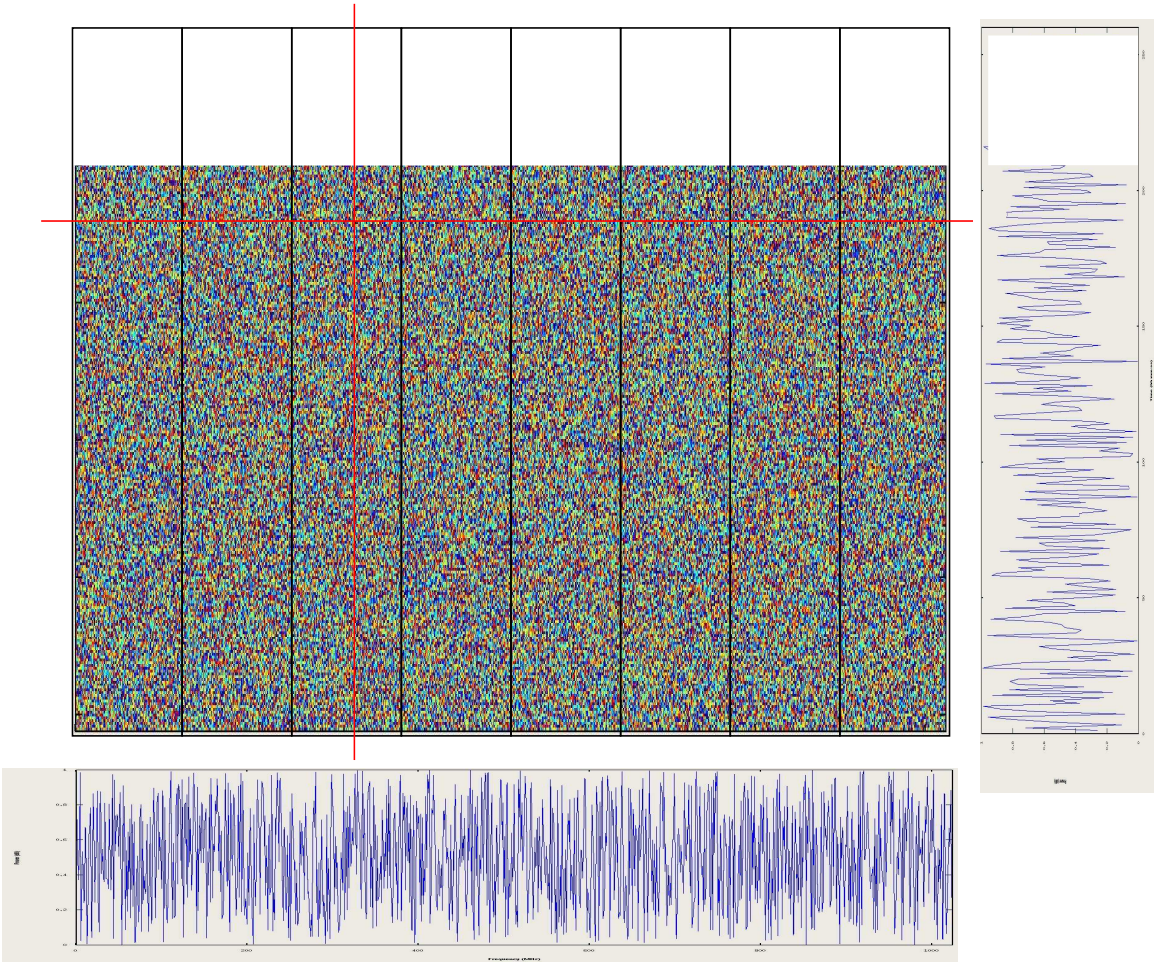

Figure 3: Real time display format for the VEGAS. Eight dynamic spectra are shown as waterfall plot or 3D plot. The x-axis of the 3D plot is frequency or channels, y-axis is time and the color scale is spectral density. The crosshair shown in red can be used to move over the 3D plot to examine the data. The instantaneous position of the crosshair will produce the 2D display of the 8 spectra on the bottom panel and time series of a channel on the right panel.