Requirements on KFPA/Ku band and GBT IF systems to process the full receiver bandwidth with VEGAS for the Galactic Center Pulsar Search Project

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The Galactic Center Pulsar search project needs wider bandwidth receivers in the frequency range 11 to 22 GHz. A new Ku band and a modified K band receivers with bandwidths 7 and 7.5 GHz respectively are being built for this project. Here we discusses changes needed in the IF system to enable VEGAS to process the full RF bandwidth of these receivers.

A block diagram of the VEGAS is shown in Fig. 1 (see Roshi et al. 2011 for details). It consists of 8 independent spectrometers working in parallel. Each spectrometer can process dual polarized signal with a usable bandwidth of 1.25 GHz. These spectrometers are referred to as BANKS in the data processing software (eg. GBTIDL) and are named A to H with the polarization input ports named as A1, A2, B1, B2 and so on. The spectrometers will be connected to the Converter Rack outputs of the GBT.

K and Ku band connection to IF router

The mapping of K and Ku band receivers to VEGAS Banks is given in Table 1. The receiver bandwidth (ie the maximum front-end bandwidth), IF bandwidth and the maximum bandwidth VEGAS can process with the present IF connectivity are given in Columns 1, 2 and 3 respectively. The new connectivity discussed below will provide the signal routing shown in red, which enables VEGAS to process the full receiver bandwidth.

The new Ku band front end stage is expected to have a maximum bandwidth of 7 GHz. The existing IF stage of Ku band is restricted to 3.5 GHz bandwidth, which needs to be modified. Fig. 2 shows the connections to the IF router to process the 7 GHz bandwidth with VEGAS. The 7.5 GHz K-band outputs for beam 1 and 2 are available through 'Advanced Control switch S2U5'. The connectivity of this receiver to the IF router to process the full bandwidth with VEGAS is also shown in Fig. 2.

Reference

Roshi et al. 2011, `http://www.gb.nrao.edu/vegas/report/overalldoc.pdf`

Revision History

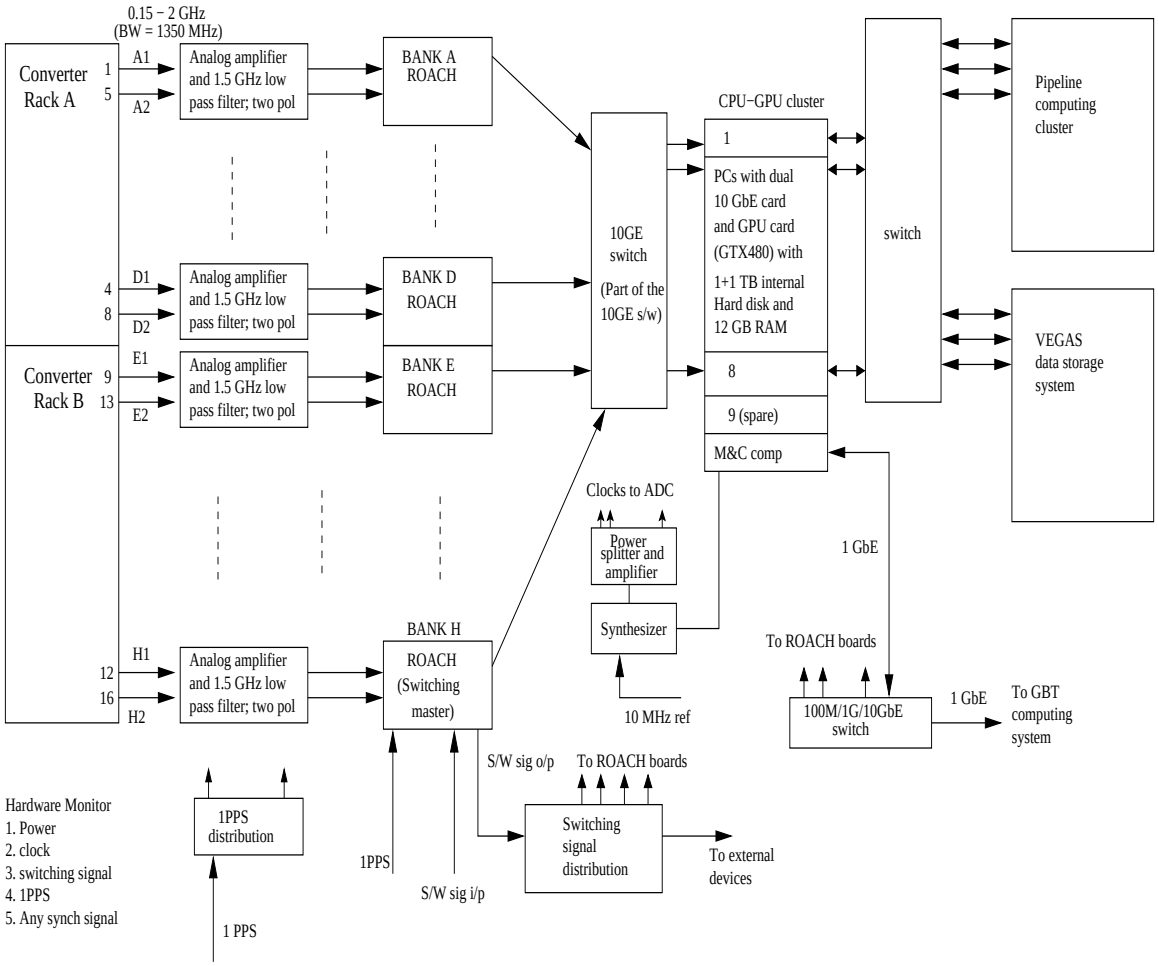
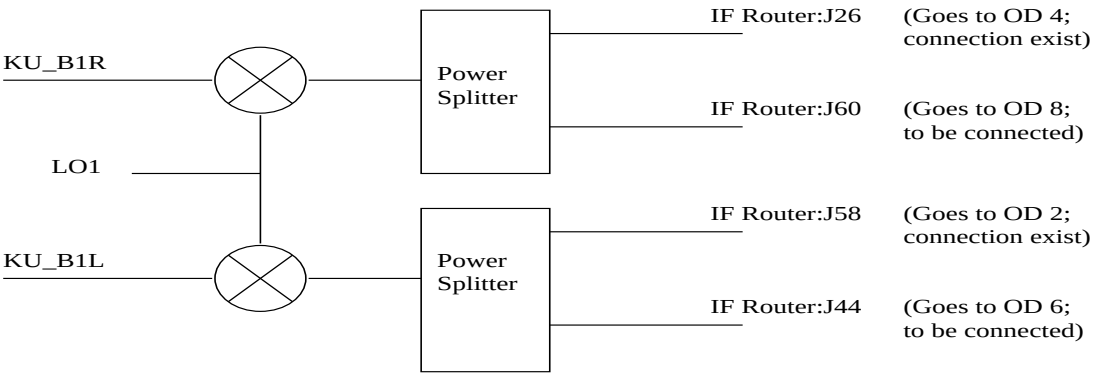
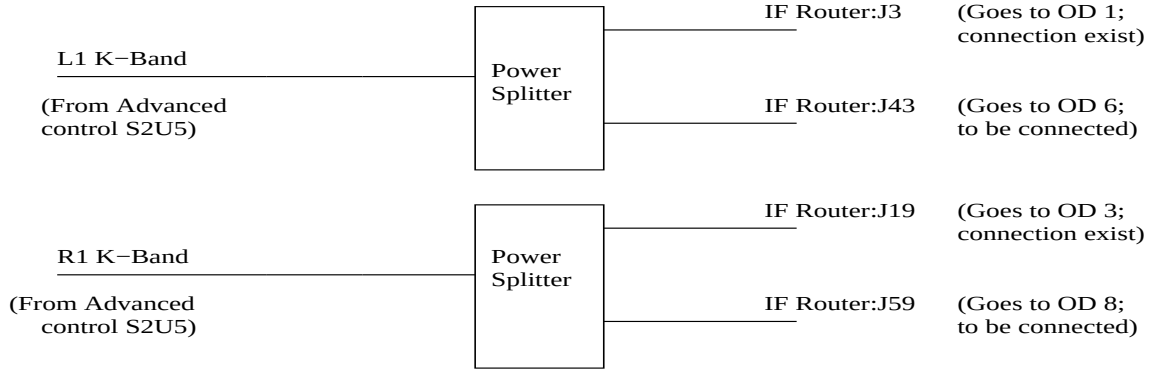


Figure 1: A schematic of the new GBT spectrometer



Ku−Band Receiver connection to the IF router



K−Band Receiver connection to the IF router

Figure 2: K- and Ku-band receiver connection to IF router

Table 1: Receiver, Converter Module and VEGAS Bank Mapping

Receiver	Rec BW	IF BW	Dig BW	Converter Module															
Name	(MHz)	(MHz)	(GHz)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ku_B1R	7000	7000	5/10					A2	B2	C2	D2					E2	F2	G2	H2
Ku_B1L	7000	7000	5/10	A1	B1	C1	D1					E1	F1	G1	H1				
Ku_B2R	7000	7000	5													E2	F2	G2	H2
Ku_B2L	7000	7000	5									E1	F1	G1	H1				
KFPA_R1	7500	7500	5/10					A2	B2	C2	D2					E2	F2	G2	H2
KFPA_L1	7500	7500	5/10	A1	B1	C1	D1					E1	F1	G1	H1				
KFPA_R2	7500	7500	5													E2	F2	G2	H2
KFPA_L2	7500	7500	5									E1	F1	G1	H1				