

VLBA ACQUISITION MEMO #164

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To: VLBA Data Acquisition Group
From: Alan E.E. Rogers
Subject: Dynamic range of IFD square law detector bias subtraction

The dynamic range of the square law detector in the IFD and BBC can be extended with software bias subtraction. Without bias subtraction the typical output and square law error due to the bias is as follows:

Power <u>dBm</u>	Output Freq. <u>KHz</u>	<u>Count</u>	Output <u>Voltage</u>	Error <u>%</u>
-16	200	65536	4	0.3
-22	50	16200	1	1
-32	5	1800	0.11	10
-42	1	360	0.02	55

At -42 dBm the error can be reduced to 1.6% per °C by subtracting the bias which is present for zero signal input. In this case the error results from the thermal drift of the op. amp. of $0.6 \mu\text{V}/^\circ\text{C}$ referred to its input. With a bias subtraction in the station computer software the nominal level of the IF distribution detector could be reduced from -22 dBm to -26 dBm. In this case satisfactory operation could be maintained (error less than 5%) with receiver output that ranges + or -10 dB from nominal. Further, this could be achieved with a single constant bias correction for each detector (for a range of 10°C) maintained in a table accessed by serial number.