REMOTE MCB OPERATION OF THE VLBA TAPE DRIVES

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OVERVIEW

In this document the remote[1] control of the VLBA tape drives for the Green Bank Earth Station (GBES) is described. In order to consolidate operations at the Green Bank site the VLBA tapes drives were moved from the control room at the GBES antenna to the Jansky Operations Center (JOC) approximately 400 meters away.

In order to control the VLBA tape drives and formatter in the JOC while the station computer remained with the GBES antenna, a method of remotely controlling the monitor and control bus (MCB) connection with the tape drives and formatter was needed. This remoting of the MCB was designed and implemented by Dan Pedtke, the OVLBI engineer.

REMOTE MCB USING FIBER OPTICS

It was decided that we would not use a remote computer connected to an MCB bus to control the VLBA tape drives. This would have required software development to have the station computer talk with the remote computer. Instead, the simpler hardware solution of remoting the MCB connection over a fiber optics cable was chosen.

The remoting of the MCB connection using the fiber optics cable is simple, converting the RS-422 differential balanced signal of the MCB to a fiber signal. The trick here is at the CPU end, where several MCB remotes share the bus with the fiber interface. The fiber interface needs to grab the shared bus for the time it is receiving MCB data, then tri-state it immediately when the data is done so that another local MCB remote can grab the bus. The schematics of the remoting of the MCB connection are shown in Figure 1.

How does the fiber interface know when to grab and release the bus? A tristate-able RS422 driver was used with a timer such that when the signal coming over the fiber changes from an idle state, the bus is driven. When the fiber signal sits idle for at most 11 bit times (191 microseconds), then the timer times out and the driver releases the bus. It turns out that 11 bit times is a long enough time to keep the driver active thru a complete transmission regardless of the data content (worst case is a string of zeros), but short enough so that the bus is released before the time that another remote can be expected to drive the bus.

Also, the bus driver and timer are fast enough that they drive the bus before less than 10% of the first bit time has passed, barely shortening the length of the first bit, another risk of such a scheme.

The other end of the MCB fiber interface is straightforward, consisting of an RS-422 to logic converter and the fiber-optic components, connected straight through, with bus continuously

[1]Here we define remote as being non-local to the station computer such that a cable cannot be used to connect the monitor and control bus (MCB) to the tape drives.

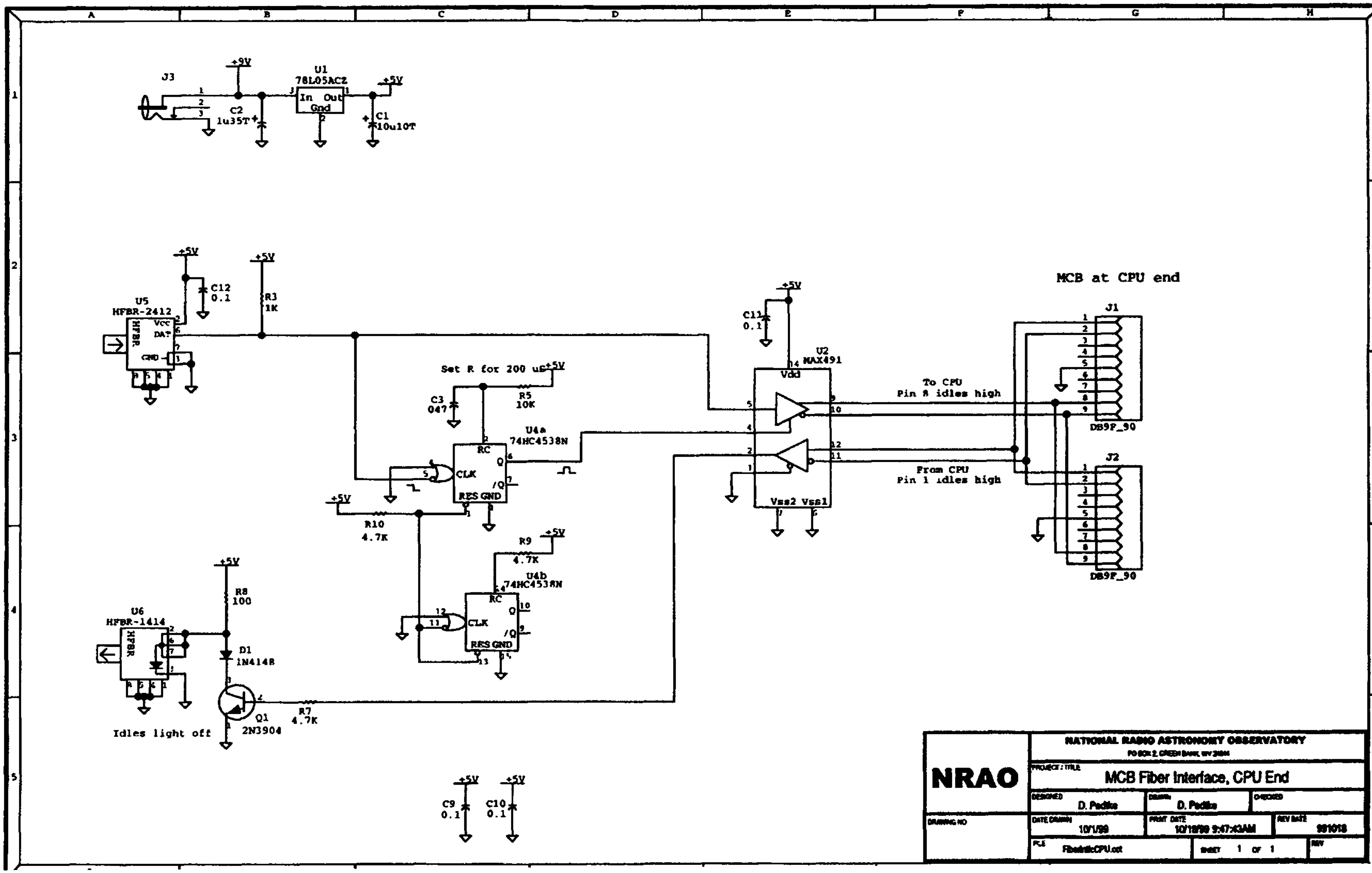
J3
+9V
U1
78L05ACZ
In Out
Gnd
+5V
C2
1u35T
C1
10u10T
+5V
C12
0.1
U5
HFBR-2412
Vcc
DAT
GND
R3
1K
Set R for 200 us
+5V
C3
047
R5
10K
U4a
74HC4538N
RC
CLK
Q
/Q
RES GND
R10
4.7K
R9
4.7K
U4b
74HC4538N
+5V
C11
0.1
U2
MAX491
Vdd
Vss2 Vss1
To CPU
Pin 8 idles high
From CPU
Pin 1 idles high
MCB at CPU end
J1
DB9F_90
J2
DB9F_90
R8
100
U6
HFBR-1414
D1
1N4148
Q1
2N3904
R7
4.7K
Idles light off
C9
0.1
C10
0.1
NATIONAL RADIO ASTRONOMY OBSERVATORY
NRAO
MCB Fiber Interface, CPU End
D. Pedike
D. Pedike
10/1/99
981018

Fig 1a.

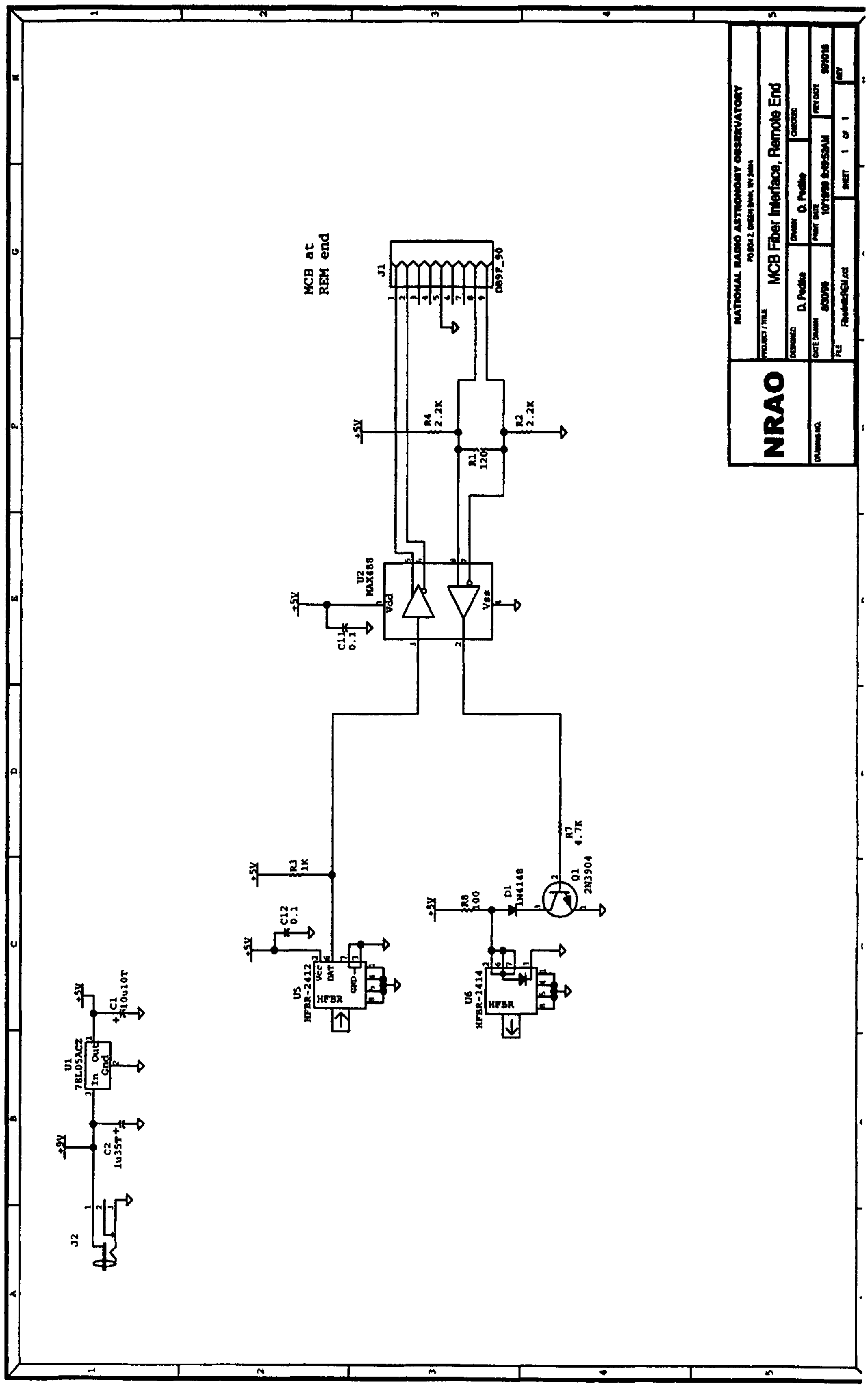

Fig 1b.

Figure 1: Schematics showing the design of the MCB remote fiber connection. In panel a) the CPU end of the MCB to fiber connection is shown. In panel b) the tape drive end of the connection is shown.

driven.

TESTING THE VLBA DRIVES OVER THE REMOTE MCB

In oder to test the VLBA drives once they had been moved to the JOC (see Figure 2), the GBES decoder was put into a mode in which it produced a known pattern of data and furthermore had known autocorrelation spectra for each channel (see Figure 3). The VLBA screens package was then used (actually the SPAN window) to capture 8 Mbyte segments of data. These data streams were then used (again using the SPAN window) to produce autocorrelation spectra (see Figure 4). These autocorrelation spectra were found to agree with the known spectra shown in Figure 3.

The decoder was then put into a mode in which the autocorrelation spectra would contain a single spike in the middle of the bandpass. A VLBA tape was then used to record this data. The tape was then sent to the VLBA correlator in Socorro were the autocorrelation spectra shown in Figure 5 were produced. This demonstrates that the remote operation of the VLBA tape drives is working properly.

Figure 2: The VLBA tape drives and formatter in the Jansky Operations Center tape room. The formatter is in the rack to the right of the tape drives and consists of the "silver" modules with the yellow post-it note on them.

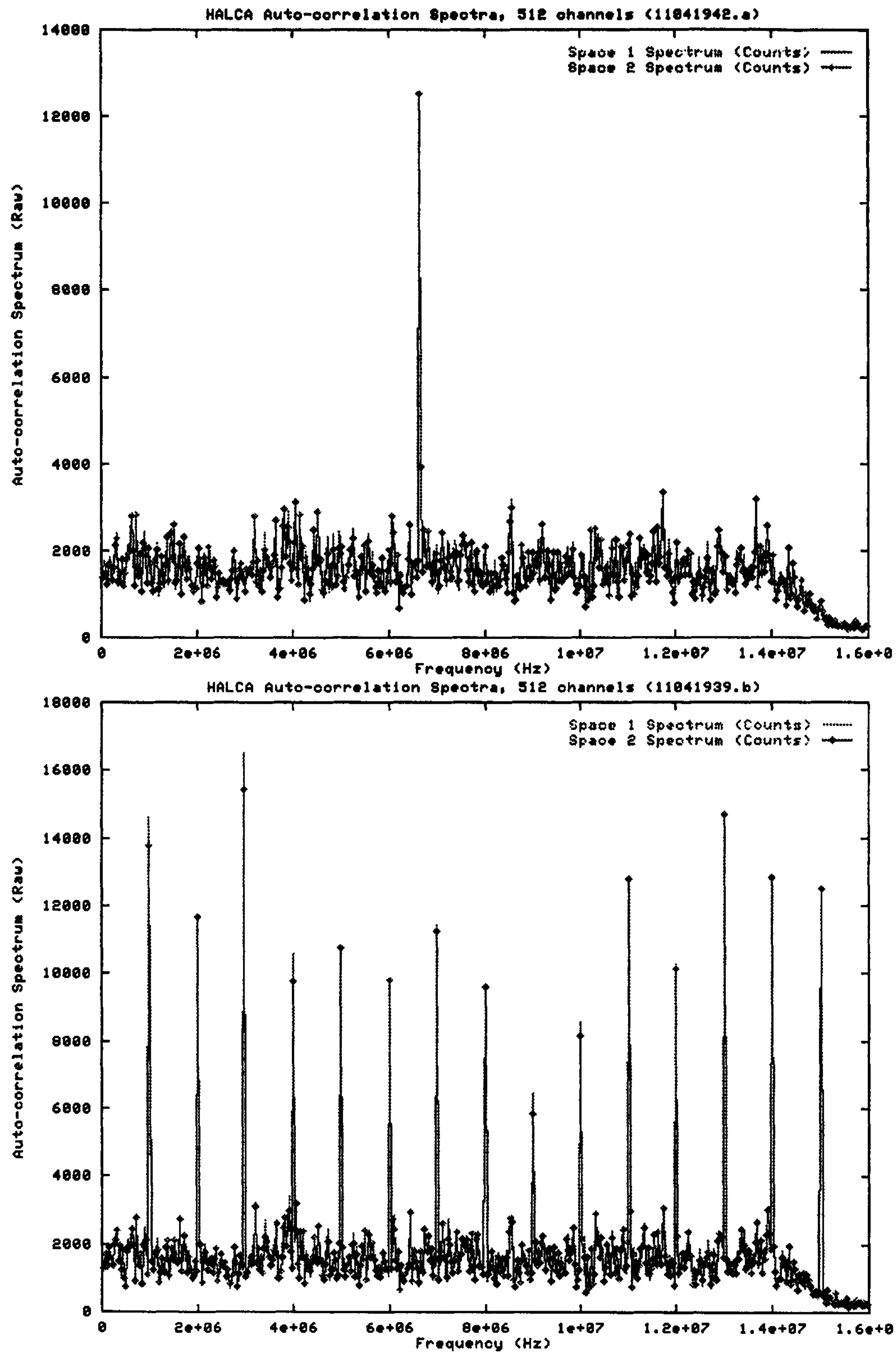

Figure 3: This figure shows the autocorrelation spectra that were to be expected from the output Decoder data. The channel A spectrum is the upper plot and the channel B spectrum is the lower plot.

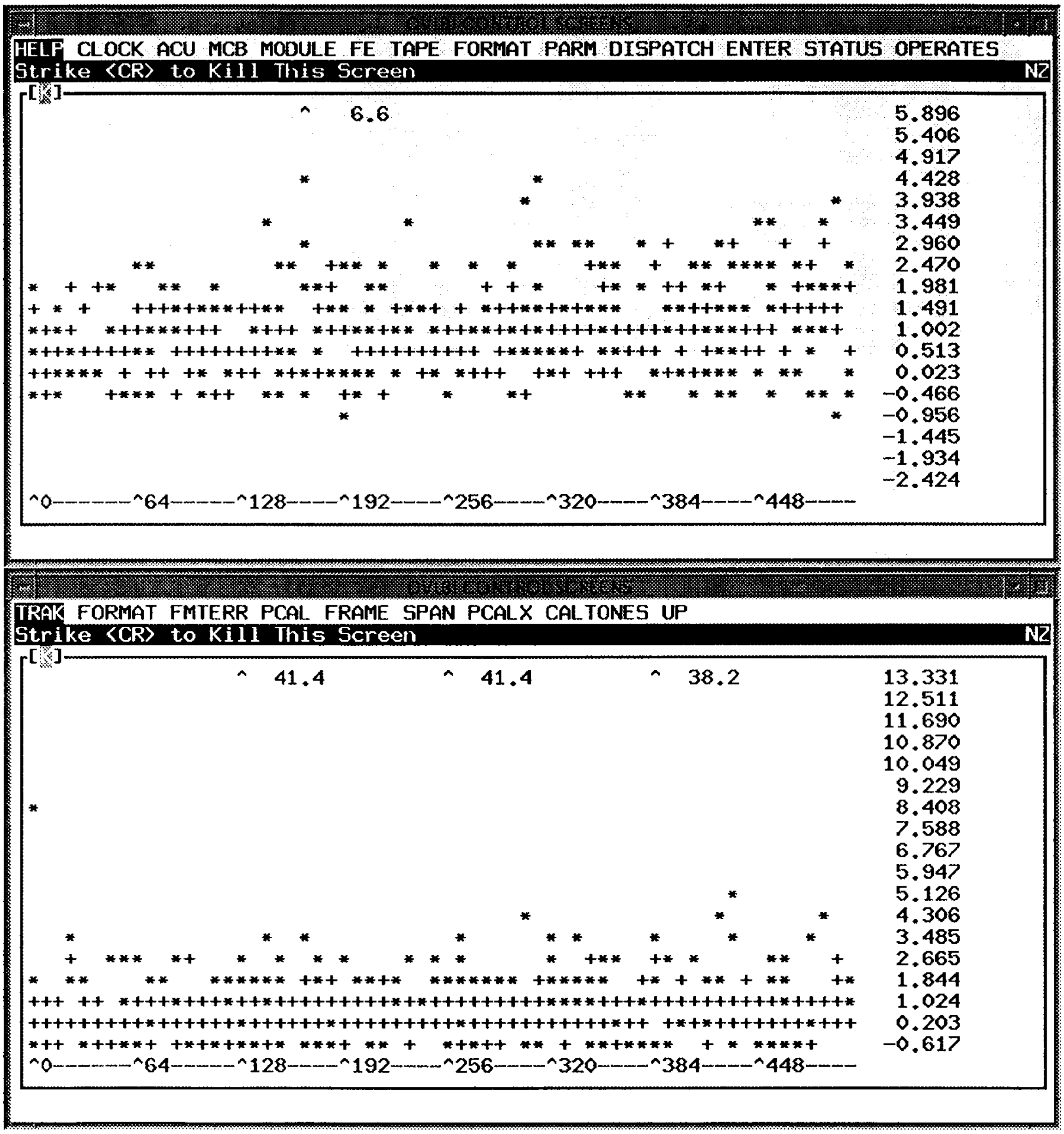

Figure 4: This figure shows the autocorrelation spectra that were measured from the data captured in the VLBA formatter. The channel A spectrum is the upper plot and the channel B spectrum is the lower plot. This data is consistent with the known spectra shown in Figure 3. Note: only a portion of the full autocorrelation spectra are shown in this figure.

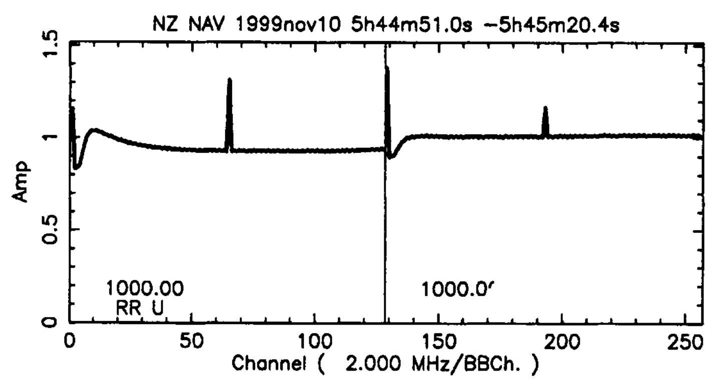

Figure 5: The autocorrelation spectra produced by the VLBA correlator for the test tape written with a spike in the middle of the bandpass.