

## Spurious signals at MV3

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### 1. Introduction

Spurious signals have been seen in the spectrum of the X-band broadband system at MV3, but only in IF0. The spectrum is described in this note.

### 2. The spectrum

There are spurious signals in the IF0 channel at MV3. The spectrum is shown in the figures. If there are similar signals in IF1, they are sufficiently weak that they do not show up in a fourfit plot.

By switching the IF0 and IF1 inputs after the Dewar, it is clear that the signal arises after the Dewar, implicating the fiber, UDC, or DBE (assuming the Mk5B+ is not responsible).

The data are from the second Nyquist Zone so are lower sideband. The spectral lines are listed below. I have read the frequencies and amplitudes off of the fourfit plots and include the RF frequency, the frequency relative to the local oscillator frequency (IF freq), and the frequency relative to the sample frequency.

From these data it appears that the spectrum is symmetric about 768 MHz in the A2D input, or about 256 MHz in the second 512 MHz Nyquist Zone.

Note that there is no information in every other 32 MHz interval (where the red marks are) since only half of the channels in each IF are recorded.

Notice the triplets at  $-100 \pm 0.5$ ,  $-156 \pm 0.5$ ,  $-356 \pm 0.5$ , and  $-412 \pm 0.5$ . These correspond to 924, 868, 668, and 612 MHz relative to the IF frequency, which is the zero-frequency of the AtoD input. The actual value of the 0.5 MHz offset is uncertain due to the low resolution of the fourfit plot.

While the power in the signals is not enough to affect the VLBI data, many of the signals are on multiples of 4 MHz, so the choice of phase cal frequencies is restricted.

Any ideas for the source(s) of the spurious signals?

### Table

RF freq	IF freq	PFB freq	amp
8612.0	532.0	-492.0	0.5
8616.0	536.0	-488.0	4.0
8620.0	540.0	-484.0	1.0
8624.0	544.0	-480.0	1.0
8628.0	548.0	-476.0	1.0
8635.5	555.5	-468.5	1.0
8636.0	556.0	-468.0	10.0
8676.0	596.0	-428.0	2.0

8680.0	600.0	-424.0	4.0
8691.5	611.5	-412.5	2.0
8692.0	612.0	-412.0	3.0
8692.5	612.5	-411.5	6.0
8747.5	667.5	-356.5	6.0
8748.0	668.0	-356.0	6.0
8748.5	668.5	-355.5	3.0
8760.0	680.0	-344.0	6.0
8764.0	684.0	-340.0	3.0
8804.0	724.0	-300.0	8.0
8804.5	724.5	-299.5	1.0
8812.0	732.0	-292.0	1.0
8816.0	736.0	-288.0	1.0
8820.0	740.0	-284.0	1.0
8824.0	744.0	-280.0	2.0
8868.0	788.0	-236.0	0.5
8872.0	792.0	-232.0	2.0
8876.0	796.0	-228.0	1.0
8880.0	800.0	-224.0	1.0
8884.0	804.0	-220.0	1.0
8891.5	811.5	-212.5	1.0
8892.0	812.0	-212.0	8.0
8932.0	852.0	-172.0	2.0
8936.0	856.0	-168.0	3.0
8947.5	867.5	-156.5	2.0
8948.0	868.0	-156.0	2.0
8948.5	868.5	-155.5	6.0
9003.5	923.5	-100.5	6.0
9004.0	924.0	-100.0	4.0
9004.5	924.5	-99.5	3.0
9016.0	936.0	-88.0	5.0
9020.0	940.0	-84.0	2.0
9060.0	980.0	-44.0	8.0
9060.5	980.5	-43.5	1.0
9068.0	988.0	-36.0	1.0
9072.0	992.0	-32.0	1.0
9076.0	996.0	-28.0	1.0
9079.5	999.5	-24.5	0.5
9080.0	1000.0	-24.0	2.0

**Figures**

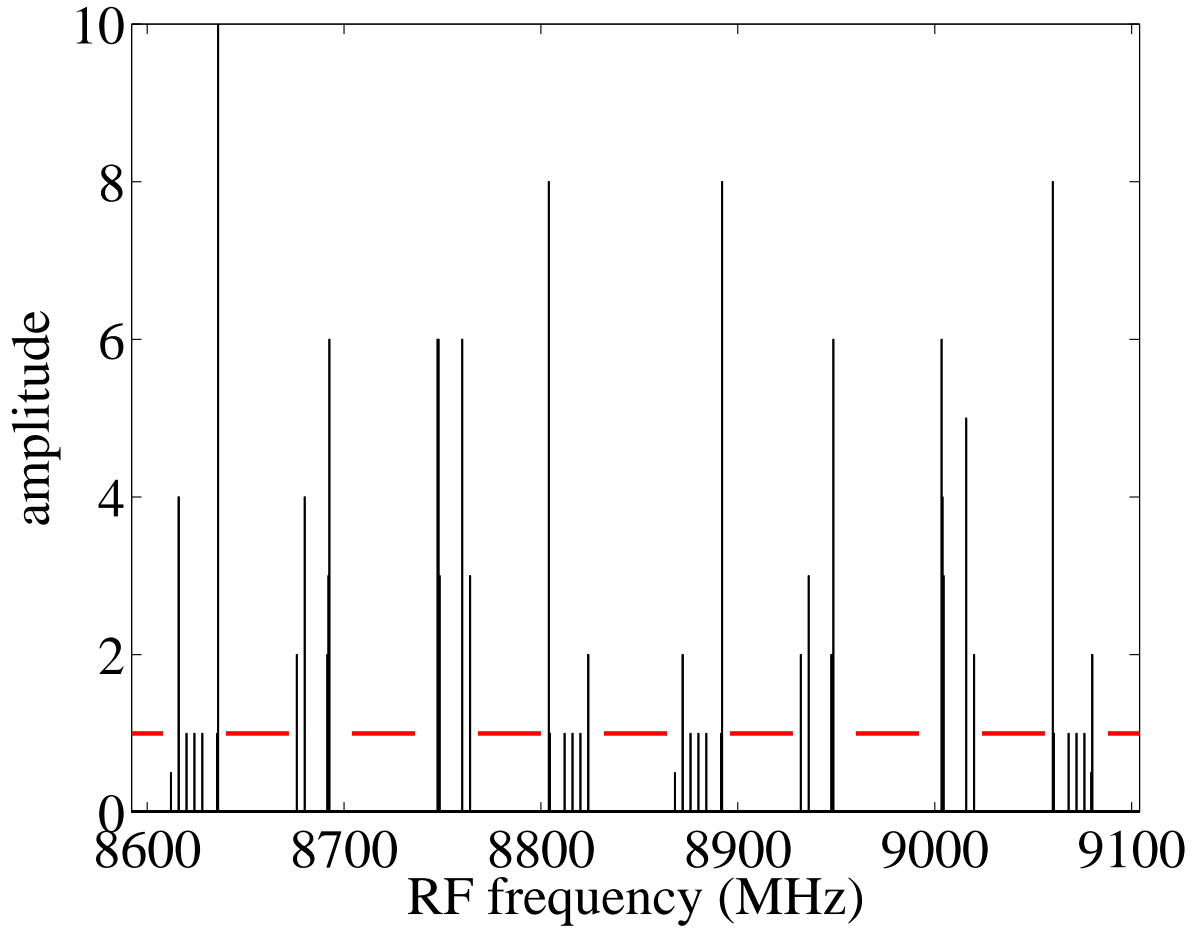


Figure 1. Spectrum of spurious signals at MV3 in IF0 showing RF frequencies. The 32 MHz channels indicated in red were not recorded.

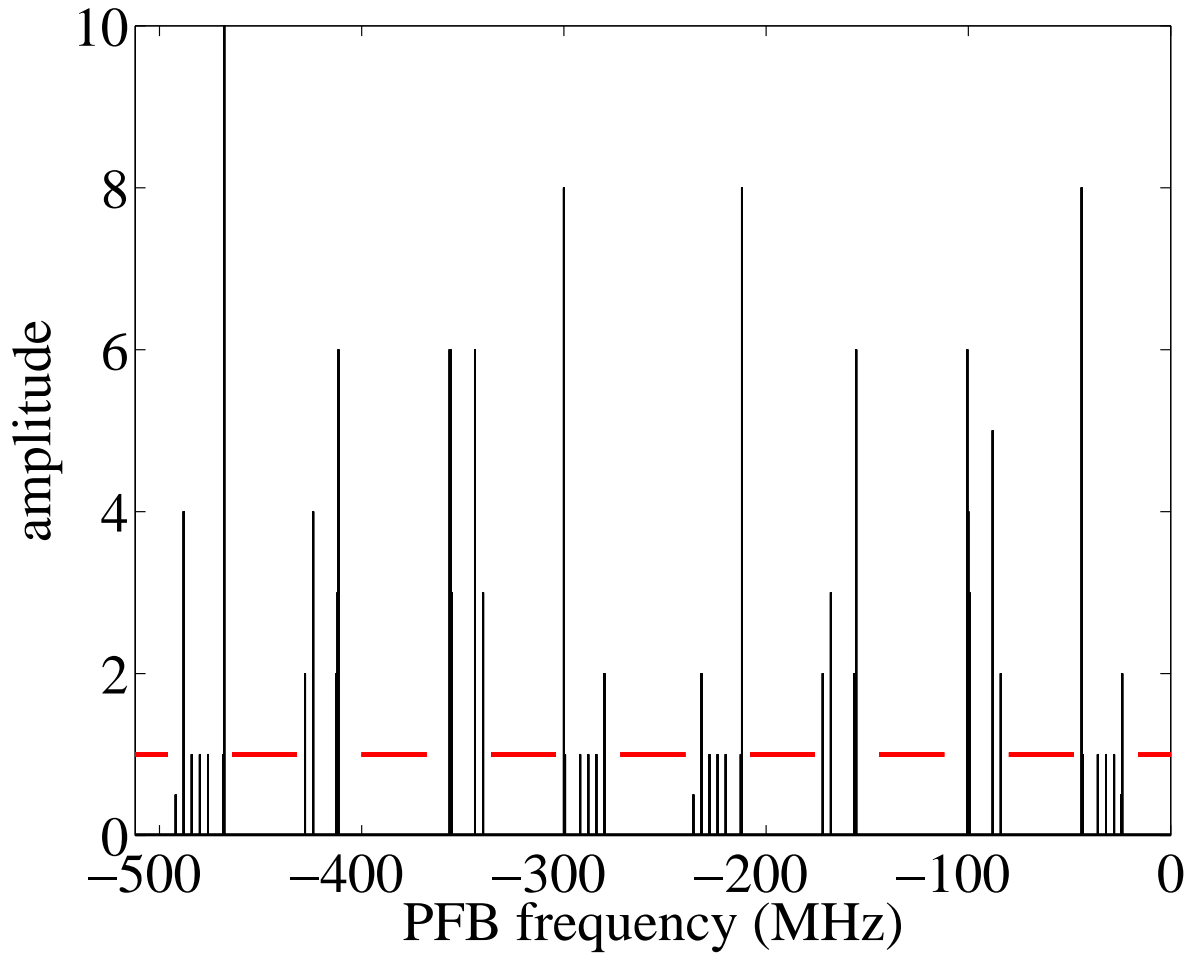


Figure 2. Spectrum of spurious signals at MV3 in IF0 showing frequencies relative to the sampling frequency (1024 MHz) of the DBE. The input data are in the second Nyquist Zone (512-1024 MHz) in the input to the A2D converter.

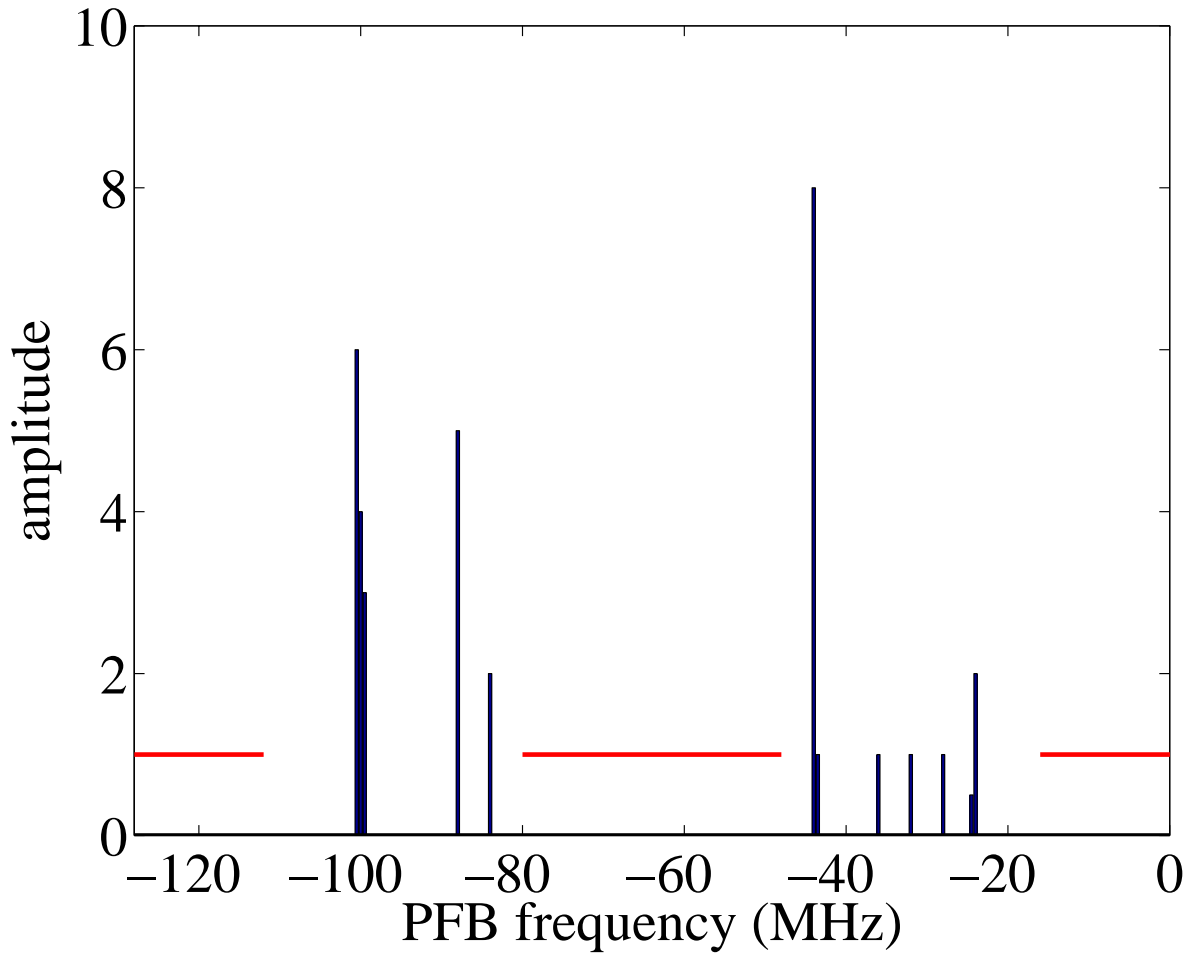


Figure 3. Spectrum of spurious signals at MV3 in IF0 showing frequencies relative to the sampling frequency (1024 MHz) of the DBE. Only the lowest 128 MHz is shown. The input data are in the second Nyquist Zone (512-1024 MHz) in the input to the A2D converter.

