The Hat Creek Radio Observatory

GReX Electromagnetic interference measurements

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This document summarizes the testing of the GReX electronics EM interferences at the Hat Creek Radio Observatory (HCRO) on April 3rd, 2024.

1 Measurement setup

The GRex unit is place in the screened room and it's Electromagnetic emissions are recorded by a spectrum analyzer connected to an omnidirectional antenna through a signal amplifier. A schematic of the setup is shown in figure 1, a list of the components used in table 1 and a picture inside the screened room in figure 2. A list of settings for the spectrum analyser is shown in table 3.

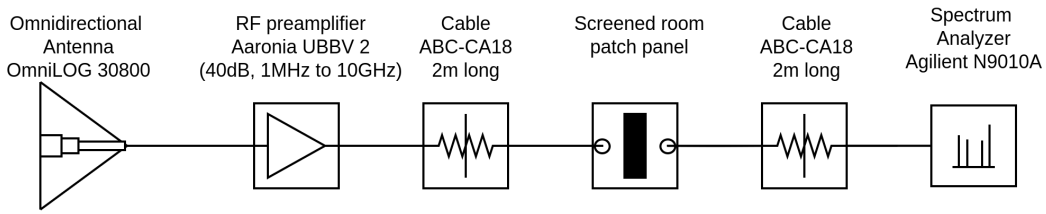

Figure 1: GReX EMI measurement setup schematics.

Figure 2: Test setup in the HCRO screened room.

Description	Designation
Omnidirectional antenna	OmniLOG 30800
RF preamplifier	Aaronia UBBV 2
Female-Female SMA cable 2m	ABC-CA18-SMSM-2.OM
Female-Female SMA cable 5m	ABC-CA18-SMSM-5.OM
Spectrum analyzer	Agilent N9010A

Table 1: Measurement setup components list.

Description	Setting
Start Frequency	300 MHz
Stop Frequency	6 GHz
Number of points	1001
Sweep time	656.175767597013
RBW	100
VBW	1000
Attenuation	0
Trace type	Maxhold
Detector	Peak

Table 2: Specrum analyzer settings list.

2 Results

The baseline spectrum is shown in figure 3. The emission peaks are due to the EMI emitted by the spectrum analyzer itself, eventhough it is set outside the screened room. However, as the comparison spectrum plot shows, this contribution is negligible compared to the GReX measurements recorded. Figure 5 shows the spectrum for the GReX enclosure open is shown in figure 4. The spectrum when the GReX enclosure is closed. Finally, figure 6 shows the effect of adding absorbers inside the enclosure. A list of the highest interference peaks, defined as peak > 30 dBm abouve their surrounding background, is presented in table X.

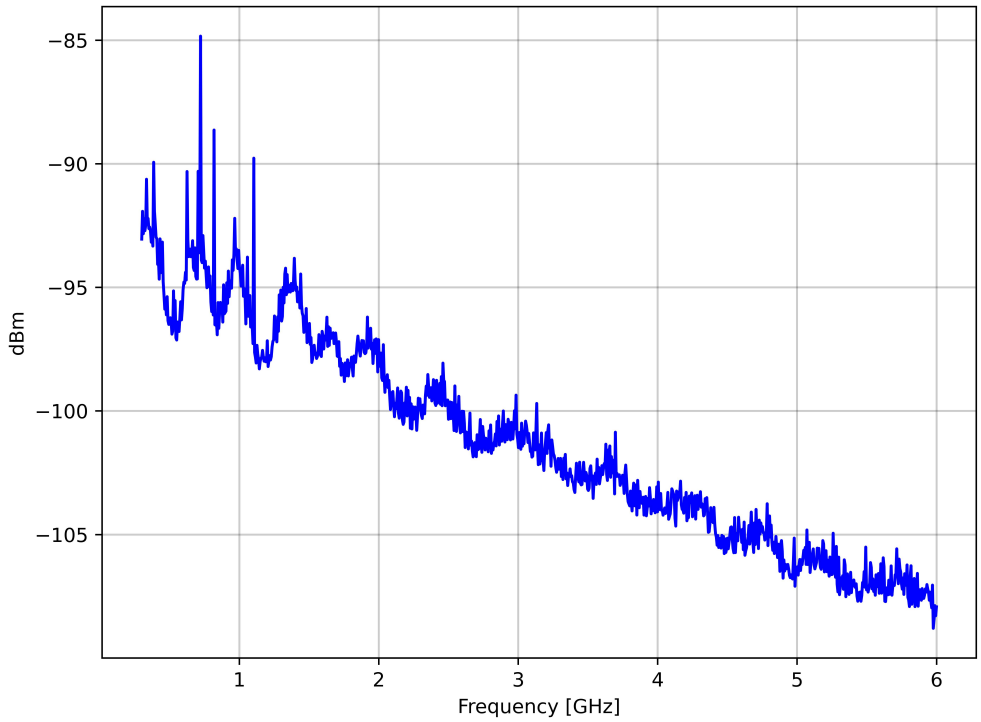

Figure 3: Baseline.

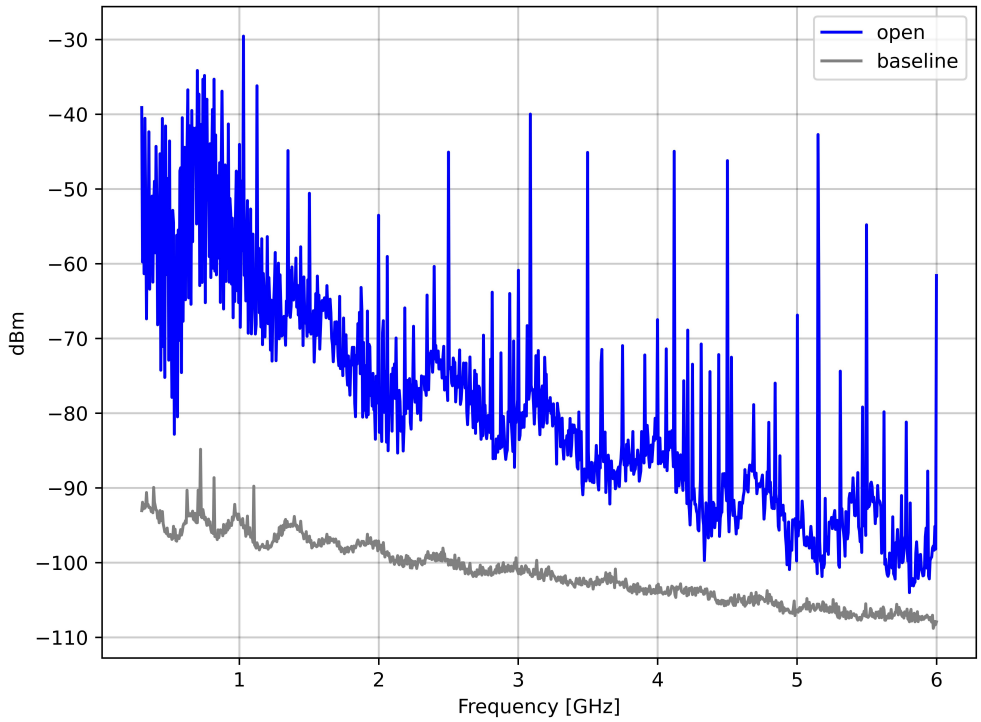

Figure 4: GReX enclosure open compared to baseline.

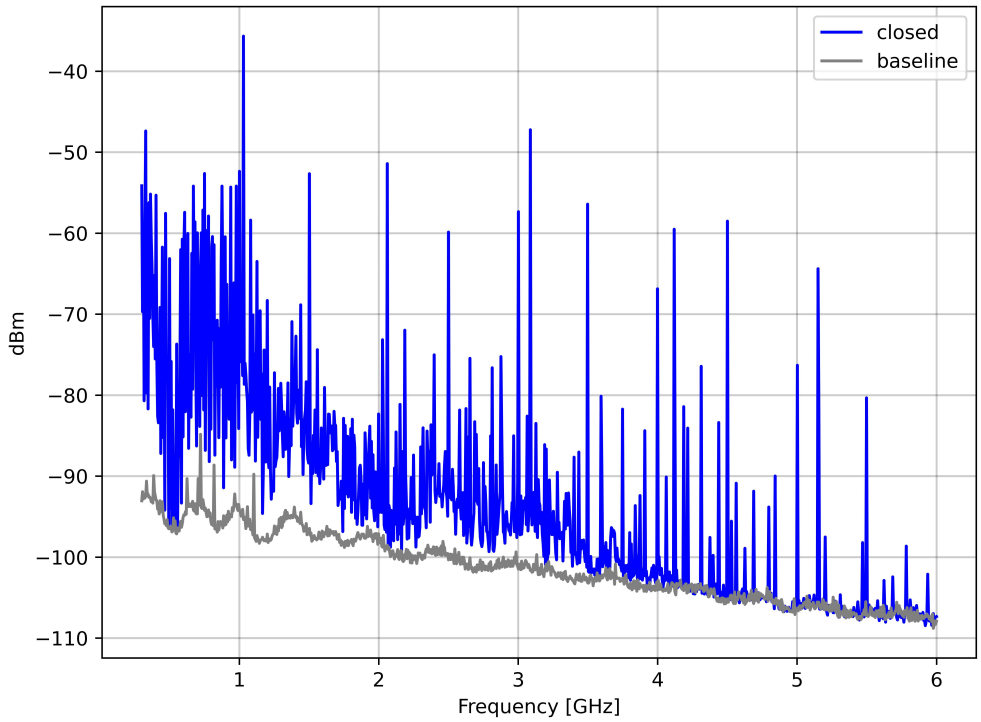

Figure 5: GReX enclosure closed compared to baseline.

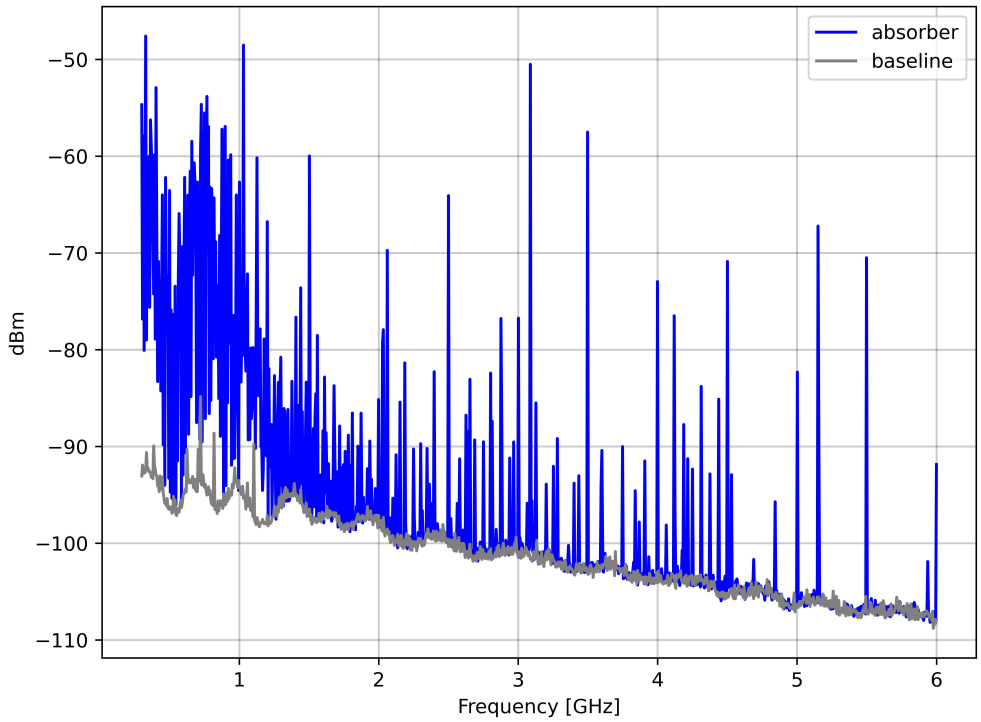

Figure 6: GReX enclosure closed and compared to baseline.

Measurement	Frequency [GHz]	Amplitude [dBm]
closed	0.4995	-63.143009
closed	1.0296	-35.672183
closed	1.5027	-52.661033
closed	2.0613	-51.418850
closed	2.5002	-59.862832
closed	3.0018	-57.345924
closed	3.0873	-47.234282
closed	3.4977	-56.419926
closed	3.9993	-66.870435
closed	4.5009	-58.519204

Table 3: List of main emission peaks **verify peaks and condition**.