

VLA/VLBA Interference Memo No. 29

Memorandum

Subject: ATF Shielding Improvements
Date: August 22, 2002
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In July 2002, tests were conducted in the shielded chamber at the VLA site that suggested that ALMA owned laptop and desktop computers emitted L and P-band RFI at levels (around -110dBW) that were above the detrimental levels (-220dBW) stated in the EVLA Hardware RFI Plan (draft) and the ITU harmful levels, after space loss (60dB) and some assumed shielding (10dB). These findings prompted a shielding survey of the ALMA trailer, in which the computers were to be used. This evaluation found that the trailer provided only about 10dB of shielding, and the space loss to the nearest antenna was found to be $\sim 60\text{dB}$. This meant that the emission levels at the nearest antenna would be -185dBW . Therefore, the shielding of the trailer needed to be improved.

An examination was conducted to determine the best methods for screening the trailer and, with the aid of Bill Brundage, a plan to improve the trailer's shielding was forged. The first improvement made to the trailer to improve shielding was covering the windows of the trailer with metal mesh screening that was electrically bonded to the metal exterior of the trailer. With only this improvement, the shielding of the trailer was tested and found to be around 30dB. This drops the emission levels at the nearest antenna to -200dBW , which is close to acceptable levels of emission.

Further measures to improve the shielding of the trailer are scheduled and include: installation of RFI gaskets on the doors of the trailer, screening of the plastic conduits on the East end of the trailer, and screening the vent pipe on the top of the trailer. These measures are not expected to have such a dramatic effect on the overall shielding of the trailer, and subsequently, one or more of the improvements may be omitted to save time and money.

In addition to the trailer, the weather tower at the ATF has a 1GHz laptop computer installed in the Hoffman box at the base of the tower. The laptop was also tested in the shielded chamber and found to radiate at the same levels ($\sim -110\text{dBW}$) as other similar computers, like those found in the ALMA trailer. The space loss from the tower to the nearest antenna is about the same as that from the trailer ($\sim 60\text{dB}$). An initial survey of the tower showed very little shielding from the Hoffman box, as it had a door with a large glass window installed at the time. Several improvements for the tower were suggested including: installation of a solid metal door on the front of the box, installation of RFI gaskets on the metal door, extension of the existing conduit into the Hoffman box, running all cables through this conduit into the box, covering all holes in the box with metal plates or metal mesh screens, and filtering AC power into the box. As of August 21, 2002, the metal door has been installed and the conduit has been extended with all

cables run inside the conduit into the box. Some holes for ventilation have been covered with metal mesh. The shielding of the box was tested after the installation of the metal door, before any other improvements. This test showed approximately 20dB of shielding at P and L- band for the box. With 20dB of shielding and 60dB of space loss, an additional 30dB of shielding is required to reduce the emissions from the laptop to below the detrimental levels. Once other improvements are complete, the shielding will again be measured, the effectiveness of each shielding method will be evaluated, and further improvements will be researched.

It may also be worth noting that, in general, most commercially available computers, Ethernet switching devices, and Ethernet hubs are expected to have emissions at 4,P, and L-bands with around -110dBW of radiated power. Also, all areas at the ATF have roughly 60dB of space loss to the nearest antenna. This means that all equipment of this type should be shielded as much as possible to prevent disruptions to observations in these bands because the power seen at the nearest antenna from this type of equipment if left unshielded is approximately 50dB over the detrimental levels.