DEUTERIUM ARRAY MEMO #042

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS 01886

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Telephone: 978-692-4764
Fax: 781-981-0590

To: Deuterium Array Group

From: R.B. Phillips and M.A. Poirier

Subject: Some tests of shielding applied to the Westford radome base

Monday 24 November Mike Poirier and I measured the strength of a signal at 325.0 MHz, generated inside the Lincoln Lab instrumentation room under the Westford radome, before and after some *ad hoc* shielding made from deuterium array ground screen rolls. Yagis were used to send and receive. The signal was generated at +10 dBm indicated strength with the radiating yagi on the opposite side of the concrete radome base wall. Measurements were made using a Hewlett-Packard E4401B spectrum analyzer.

Test one placed the outside measuring yagi 2 meters from the wall, at a horizontal height that gave maximum power (Figure 1). A segment of shielding roll was then temporarily mounted to the wall surface. Other influences except for the shielding mesh were repeated[1] in both measurements to minimize scatterers or absorbers. The shielding extended a bit less than a full wavelength (3.03 ft or 92 cm) above and below the inside test source, and a little over two wavelengths to the left and right of it. Figure 2 shows the *ad hoc* shielded signal at 2 meters distance. The shielding reduced the signal by about 14 dB.

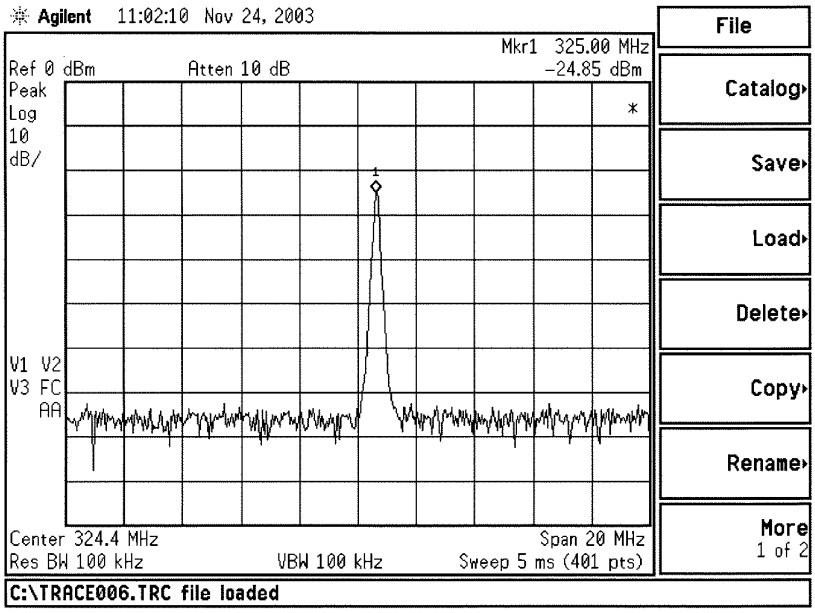

Figure 1: Signal at 325 MHz from test generator radiating through yagi inside the lab area, measured at distance of 2 meters.

[1] Human helpers stood in the same places, and ladders and other tools set in the same locations in both cases.

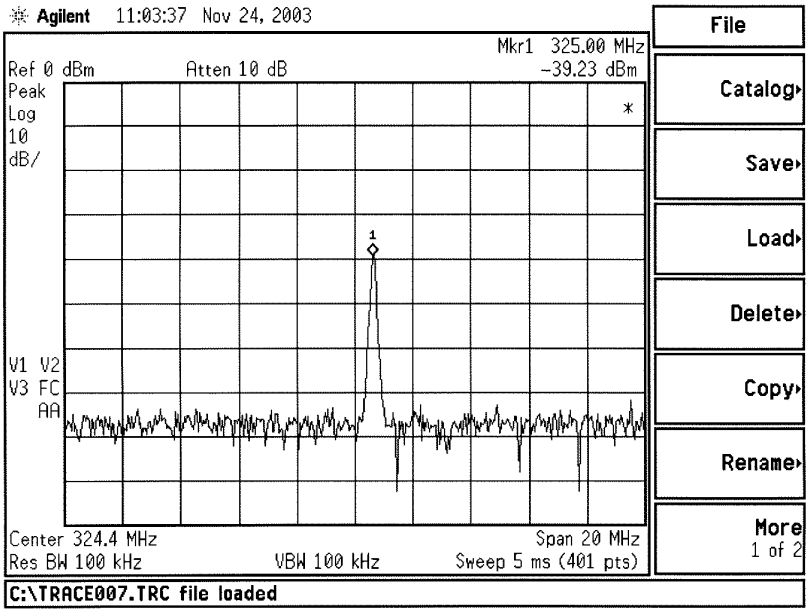

Figure 2: Signal after applying *ad hoc* shielding arrangement to the radome base wall. Measured reduction is approximately 14 dB.

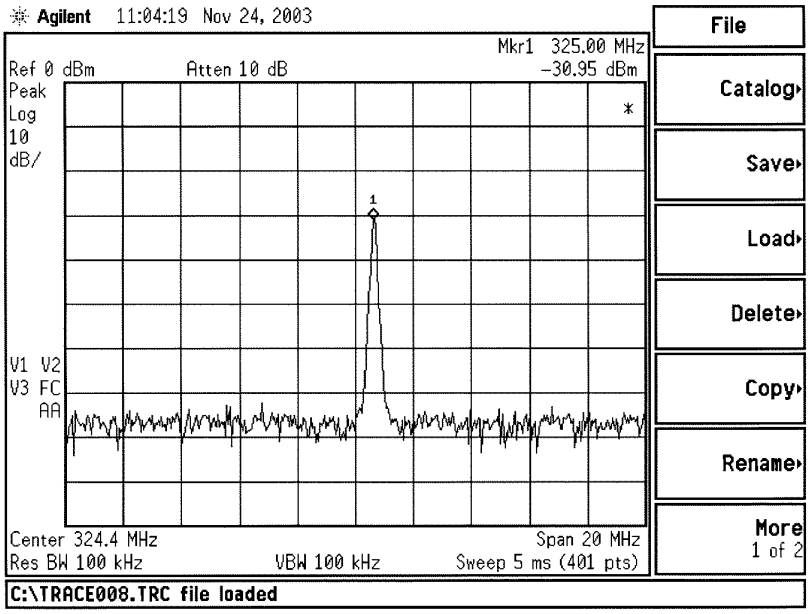

Figure 3: Test signal as seen from across the access road, no shielding.

Test two repeated the before and after shielding measurements from 8 meters, with the measuring equipment moved across the access road. The unshielded signal was 6 dB weaker than at 2 meters, possibly indicating some scattering or near-field effects are at work in this geometry (Figure 3).

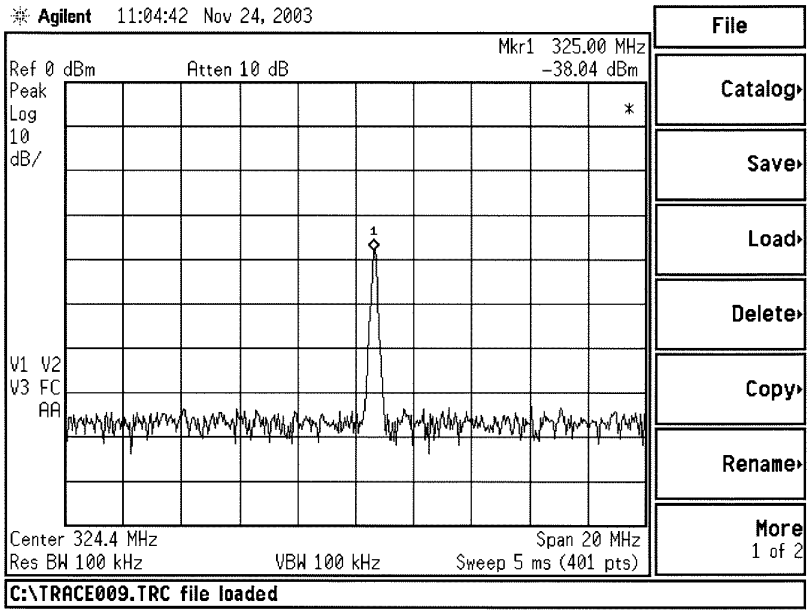

Figure 4: Test signal as seen from across road, with shielding; reduction is 7dB.

The mesh shielding was erected again, and the signal in Figure 4 recorded. The test signal strength dropped by 7 dB compared to the unshielded case. The smaller reduction may result from significant power being diffracted around the edges of the 2λ by 4λ mask.

The *ad hoc* shielding reduced this artificial RFI signal from inside the Lincoln area by 7 to 14 dB, or factors of 5 to 25. If the shielding was extended well beyond the 2λ by 4λ dimensions used, the reduction seen in test two would probably improve because diffractive paths would be blocked.

Recommendations

Apply screening made of surplus Deuterium Array ground plane material to the radome base now, extending the mesh beyond the shielding applied previously to the roof of the Lincoln Lab instrumentation room. Overlap sections of mesh, and connect them electrically. The effort to apply the mesh to the exterior of the radome base will require 3 persons to handle and affix the shielding material, and should require 3 to 6 person-days.

Acknowledgements

Special thanks to Dave Fields for assisting MAP and RBP in the *ad hoc* shielding placement and measurement.