



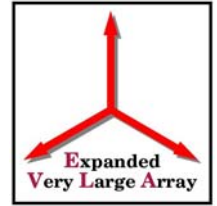
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# RFI Concerns Relating to EVLA Feeds

Dan Mertely



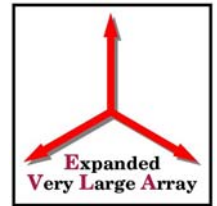
# Why RFI Concerns?



- EVLA RFI Harmful Levels were validated using VLA feeds (EVLA memo #47).
- VLA feeds are machined, not “ring and band” (R&B) assembled.
- EVLA L-band, S-band, and some C-band feeds are R&B assembled.
- R&B assembled feeds have more joints, therefore more opportunities for leakage.



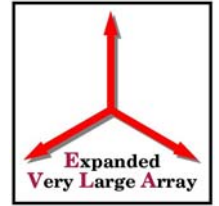
# Why Leakage is a Concern



- RFI entering via the feed body from the vertex room electronics may set vertex room maximum emission levels.
- RFI entering via the feed body above the vertex room contributes to total RFI signal levels.
- Natural radiation entering via the feed body above the vertex room contributes to far-out sidelobe levels, and may affect deep beam pattern.



# Mechanisms of RFI Input



## 1) Aperture:

Main Beam.

Side lobes.

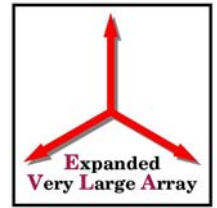
## 2) Feed Horn Body.

## 3) Receiver Cables and Connectors.

## 4) Receiver Dewar Structure.



# Sources of RFI 1



- 1) Antenna internal digital & RF devices.
- 2) Adjacent antenna emissions.
- 3) Site local RFI.

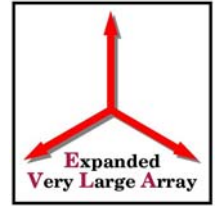
Correlator, IF racks.

PCs, PDAs, LAN equipment, test equipment.

Site Radios (harmonics & spurious).



# Sources of RFI 2



## 4) External RFI:

### In-band:

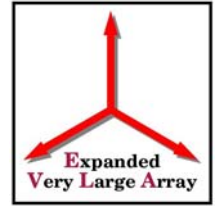
Military, Medical, Satellites,  
Commercial and private aircraft.

### Out-of-band (harmonics & spurious):

TV, Radio (AM & FM), 2-way, utility  
telemetry.



# Feed Assembly Differences:



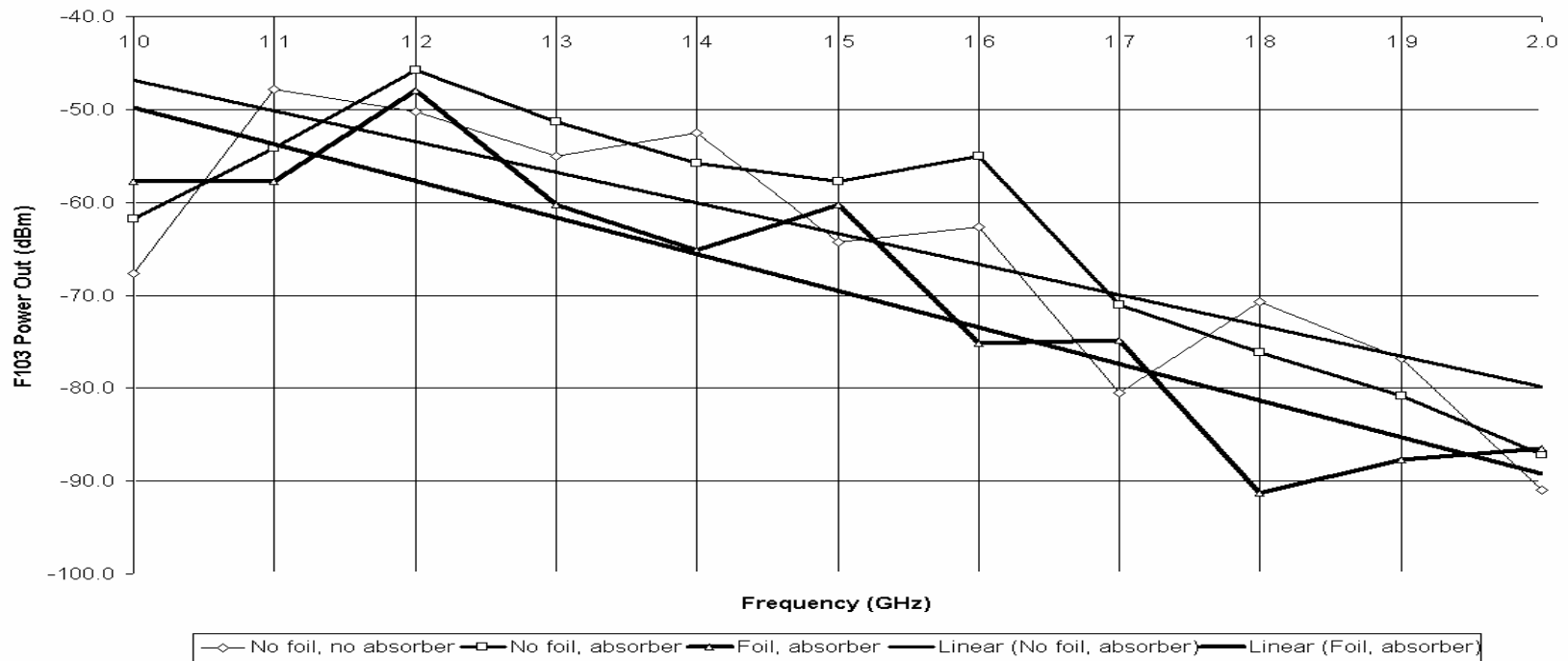
- A13 L-band: R&B Cut, Chromate then Assemble—Leak Tested.
- A14 L-band: R&B Cut then assemble—Leak Tested.
- A13 C-band: R&B Cut, Assemble, then Chromate
- A14 C-band: R&B Cut, then Assemble.
- A16 C-band: Machined feed (No R&B).



# A13 L-Band Leakage Test Results



A13 L-band Raw Loop-back Test Data: RCP

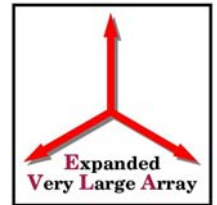


- Trend lines show pre and post “foiling” of FH body in V-room (aperture sealed with absorber).

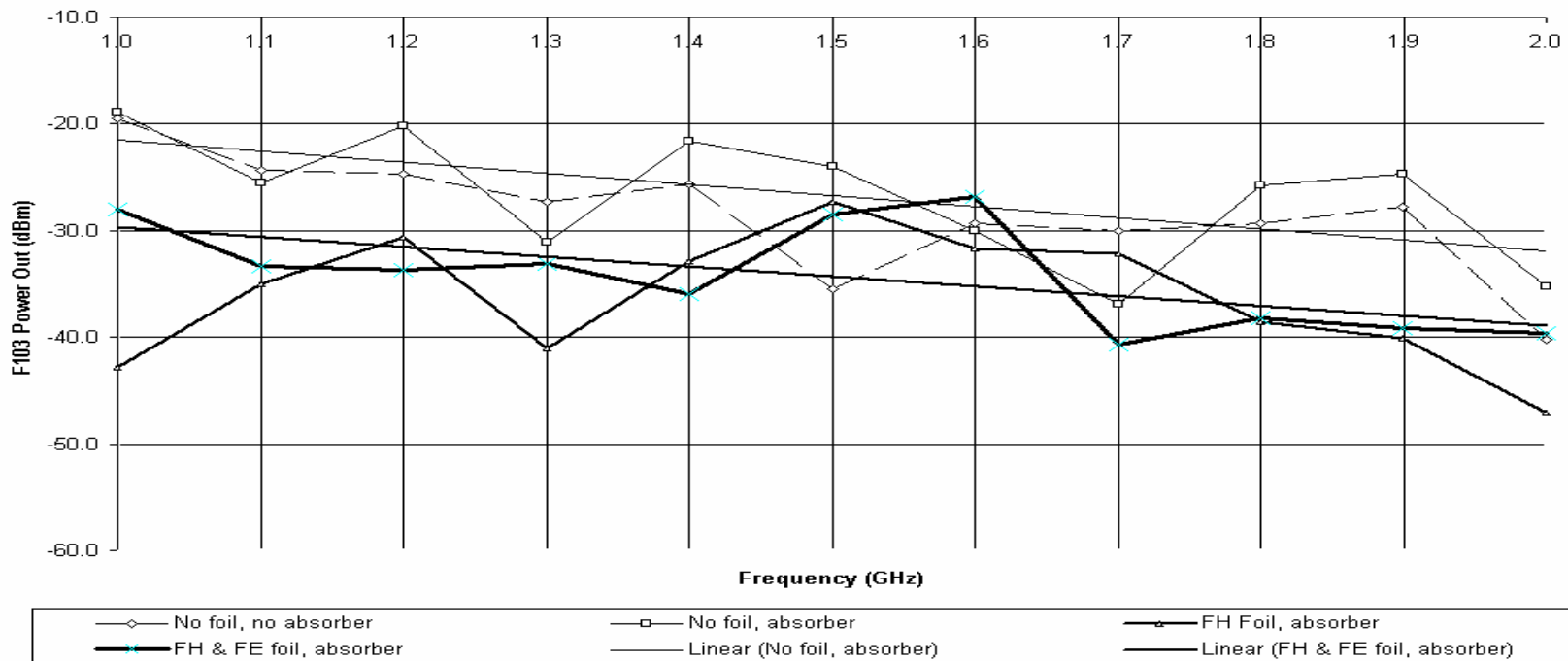




# A14 L-Band Leakage Test Results



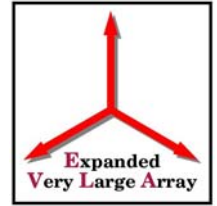
A14 L-band Raw Loop-back Test Data: RCP (average)



- Trend lines show pre and post “foiling” of FH body in V-room (aperture sealed with absorber).



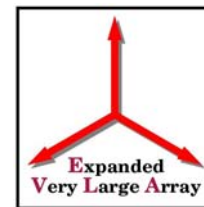
# Conclusions



- 1) Total blocked-aperture path loss from a vertex room source is only around 50 - 60 dB at 1.4 GHz. (assuming 55 dB gain in F103, L-band front end)
- 2) Similar tests should be preformed on machined and assemble-then-chromate feeds.
- 3) Emissions and shielding test recommendations to date were based on VLA, machined feed construction. (EVLA Memo #47)
- 4) Additional sealing of R&B constructed feed horns may be necessary.



# Sealing options



- Assemble R&B ,using conductive paint or RTV. (Labor intensive--expensive)
- Assemble then coated on the inside with conductive paint. (May affect performance)
- Assemble R&B, coat outside with conductive paint, then add lamination. (Lamination adhesion problems?)
- Assemble, laminate, then coat outside with conductive paint. (Resonant chamber effect?)



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# Questions?