EVLA Feed CDR

Outdoor Antenna Test Range (OATR)

The OATR:

Purpose

To support the EVLA Project by providing:

- A mechanism to monitor the feed horn manufacturing process by using:
  - VSWR measurements: All new feeds will be tested! **(100% Sampling)**
  - Radiation patterns: Statistical Sampling = 5 or 6 units from each frequency band + the first feed fabricated with new or modified manufacturing process.

    (~20% Sampling)
- A **long-term** troubleshooting tool!
- Future design testing platform.

The OATR:

Why a local facility?

Antenna Range Costs Comparison				
Shipping/Testing Costs @ External Testing Facility (Estimate)	Total Projected Costs for antenna range with brand new equipment:	Total Material and Equipment costs for building test range (to date):	Funds required to complete project:	New Mexico Tech contributions to completing the project:
$93,000	$148,510	$13,629	$4,100	$6,840

The OATR:

Progress *(Highlights)*

Overall Completion: **51%**

Requirements: **60%**

Location: **30%**

22ft Baseline Separation	**Simulating the distance between the sub-reflector and the feed circle.**
14ft Elevated Platforms	**To reduce potential multi-path reflection energy.**
0.05deg Angular Resolution	**Based on the optical encoder resolution with the systematic backlash of the positioner.**
1700lb Vertical Load Capacity	**Using double density polystyrene foam tower.**

Tunable Frequency Range: **45MHz – 26.5GHz**	**HP8510B (Rx)** **HP8340A (Tx)**
Actual Coverage: **1 – 18GHz**	**Standard Gain Horn coverage**
Sensitivity: **-70dBm**	**Estimate only!** **Based on acquired radiation pattern data.**
Amplitude Repeatability: **~ 1.5dB**	**Refinement still in progress!**

The OATR:

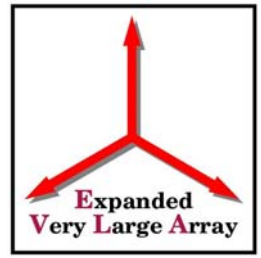
Capabilities *(Generalized)*

- Amplitude and Phase measurements.
- Time-Gating with pico-second resolution.
- Gain normalization.
- Phase Center measurements.
- Axial ratio / Polarization measurements.

The OATR:

The Site!

The OATR:
Proof of Concept Setup



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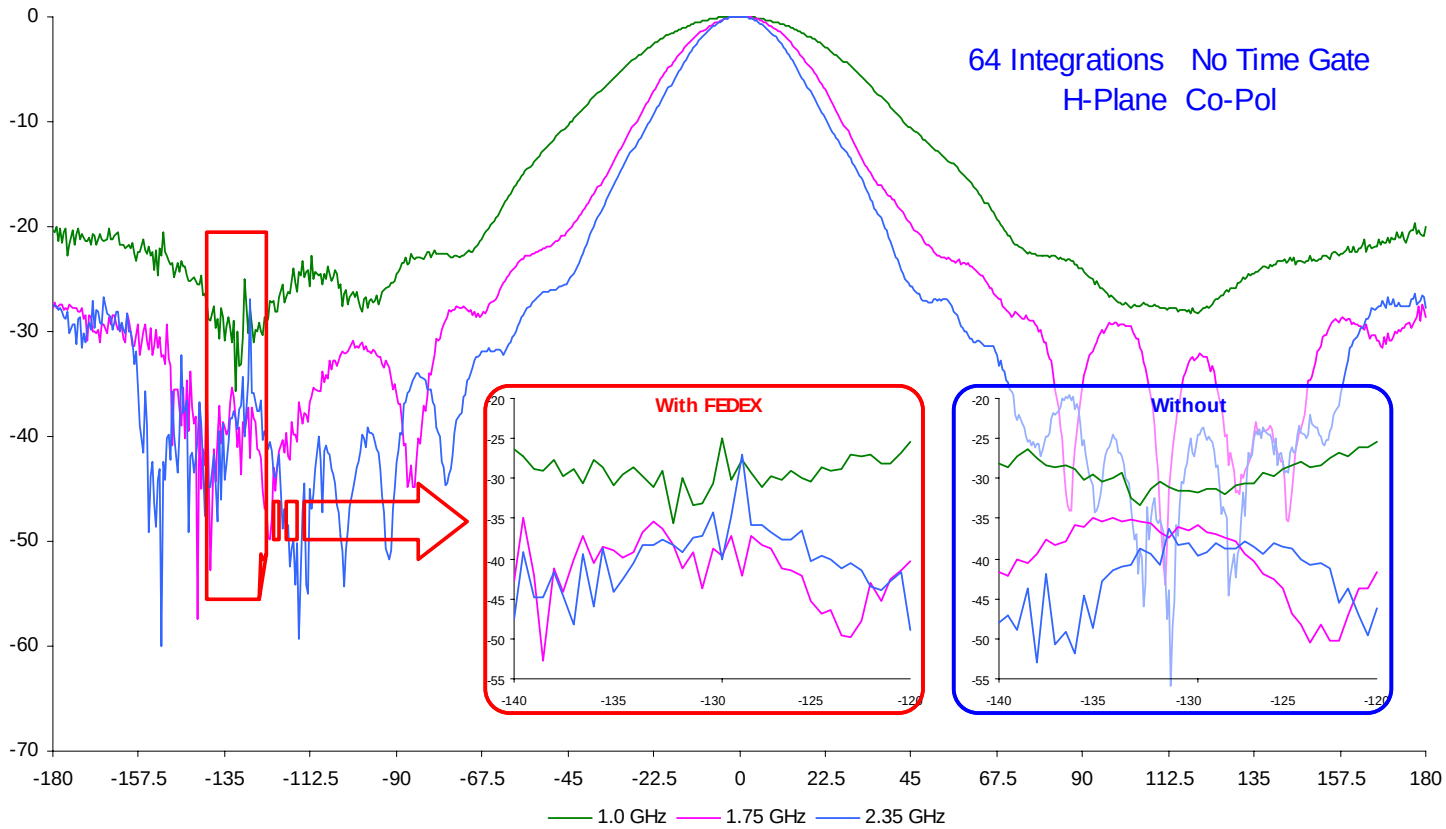
The OATR:

Progress *(Detailed)*

Established Requirements and Progress				
Requirement	**Minimum Requirement**	**Goals**	**Status**	**Notes / Comments**
System Automation	Manual	Computer	**Complete**	Computer Controlled
Tunable Frequency	1 to 8 GHz	1 to 12 GHz min.	**Exceeded**	45MHz to 26 GHz Possible
Receiver Type	Scalar (amp)	Vector (amp &	**Complete**	Vector (HP8510B)
Amplitude Accuracy	< 1 dB	< 1 dB	In Progress	Initial results <2dBm with response calibration. Testing in progress.
Phase Accuracy	n/a	TBD	In Progress	Will be identified after permanent location established
Sensitivity (1 KHz	< 60 dBm	< 60 dBm	In Progress	Testing in progress.
Source Output	< +10 dBm	< +10 dBm	**Complete**	Stable output at various levels
Nominal Tx	~ 40 deg.	~ 40 deg.	In Progress	New Standar Gain Horns require further evaluation.
Nominal Tx Gain	>12 dBi	>12 dBi	**Complete**	11.5 to 23 dBi typical for Gain Horns.
Range Type	Elevated (10 ft)	Elevated (22 ft.)	In Progress	Elevated (14ft)
Range Length (R)	22 ft (fixed)	Up to 200 ft	**Complete**	Established 22ft Separation
Clutter Free Range	> (3*R)^2 sq. ft	> (3*R)^2 sq. ft	In Progress	Location depenant item.
AUT Vertical Load	1000 lbs.	1000 lbs.	**Exceeded**	>1100lbs achieved with High Density Foam Column Tower.
AUT Moment	1000 ft. lbs.	1000 ft. lbs.	**Complete**	1000lbs
Angular Accuracy	< 0.1 deg.	< 0.1 deg.	**Complete**	0.05 deg with systematic backlash included.

The OATR:
Reflections



The OATR:
Boresight (Electrical)