C-Band Feed
Design and Prototype Tests

S. Srikanth
NRAO/Charlottesville
# EVLA Receiver Bands

<table>
<thead>
<tr>
<th>Band</th>
<th>Freq. (GHz)</th>
<th>Bandwidth Ratio</th>
<th>Feed Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>1-2</td>
<td>2:1</td>
<td>Compact Horn</td>
</tr>
<tr>
<td>S</td>
<td>2-4</td>
<td>2:1</td>
<td>Compact Horn</td>
</tr>
<tr>
<td>C</td>
<td>4-8</td>
<td>2:1</td>
<td>Compact Horn</td>
</tr>
<tr>
<td>X</td>
<td>8-12</td>
<td>1.5:1</td>
<td>Linear Taper Horn</td>
</tr>
<tr>
<td>Ku</td>
<td>12-18</td>
<td>1.5:1</td>
<td>Linear Taper Horn</td>
</tr>
<tr>
<td>K</td>
<td>18-26</td>
<td>1.44:1</td>
<td>Linear Taper Horn</td>
</tr>
<tr>
<td>Ka</td>
<td>26-40</td>
<td>1.53:1</td>
<td>Linear Taper Horn</td>
</tr>
<tr>
<td>Q</td>
<td>40-52</td>
<td>1.3:1</td>
<td>Linear Taper Horn</td>
</tr>
</tbody>
</table>

Note: All horns are corrugated horns.
C-Band Feed Details

Aperture ID  = 22.118 (11.2 λ)
Aperture OD = 24.25
Length      = 66 (33.5λ)
Input Dia.  = 1.875
Θ input    = 8°
Θ max       = 12°

(all dimensions = inches)

Corrugations
Total       = 132
Ring-loaded = 7
Pitch       = 0.563
Flange width = 0.090
Corrug. width = 0.473
No. per λ   = 3.5
C-Band Prototype Work in Progress

S. Srikanth EVLA Feed CDR
February 17, 2005
MIT Lincoln Laboratory
Compact Range

- Range: 400 MHz – 100 GHz
- Chamber: 66’ L x 44’ W x 38’ H
  - 36” pyramids – feed to reflector
  - 36” – 44” wedge – feed to back wall
  - 36” – 44” pyramids – back wall
- Temperature: 68° - 72° F
- Reflector: Rolled–edge;
  - Aperture – 24’ x 24’
  - Parabolic Section – 10’ x 10’;
  - rms < 0.0015”
  - Focal length – 24’
- Quiet Zone: 12’ x 12’ x 12’; 19’ center
- Isolated concrete slab

Frequency coverage: 400 MHz - 100 GHz
Quiet zone size: 12 ft.
Max target weight: 2,000 lb

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Test Adapters

- 3.95 to 5.85 GHz
  Need: 1.875 dia. to WR–187 (1.872 x 0.872)
  Built: 1.875 dia. to WR–187 stepped transition; 12 sections; 11” long; S_{11} < - 20dB

- 5.85 to 8.20 GHz
  Need: 1.875 dia. to WR–137 (1.37 x 0.622)
  Available: 1.75 dia. to WR–187
  Built: (a) 1.875 dia. to 1.75 linear transition
  (b) WR–187 to WR–137 stepped transition; 9 sections; 5” long
Theory & Measured
4.0 GHz

EVLA C-band; 4.0 GHz; E pln.

EVLA C-band; 4.0 GHz; H pln.

EVLA C-band; 4.0 GHz; E pln.

Angle (degrees)

Amplitude (dB)

Theory
Meas.
Theory & Measured
6.0 GHz

EVLA C-band; 6.0 GHz; H pln.

EVLA C-band; 6.0 GHz; E pln.

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Theory & Measured
8.0 GHz

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Co- & X-Polarized Field Patterns - Measured

EVLAC-band; 45-mln.; 6 GHz

EVLAC-Band; 45-mln.; 7.4 GHz

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Co- & X-Polarized Field Patterns - Measured

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Measured E- & H- Plane Patterns - 6.0 GHz

-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120

Angle (degrees)

-120 -90 -60 -30 0 30 60 90 120

Amplitude (dB)

H pln. E pln.
Computed Return Loss

EVLA C-band; Return loss (computed)

S11 (dB)

Frequency (GHz)

Theory

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EVLA Feed CDR

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Return Loss of C-Band S/N 2 While Installed on Antenna 14
Feed As Installed
On the Antenna

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EVLA Feed CDR
February 17, 2005
## C-Band Feed Summary

<table>
<thead>
<tr>
<th>Freq. (GHz)</th>
<th>H</th>
<th>E</th>
<th>X-pol</th>
<th>PC</th>
</tr>
</thead>
<tbody>
<tr>
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<td>-11.8</td>
<td>-31.5</td>
<td></td>
</tr>
<tr>
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<td>-12.4</td>
<td>-11.8</td>
<td>-32.2</td>
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<td>42.6</td>
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<tr>
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<td>-11.9</td>
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<td>8.0</td>
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