

NATIONAL RADIO ASTRONOMY OBSERVATORY
GREEN BANK, WEST VIRGINIA

ELECTRONICS DIVISION TECHNICAL NOTE NO. 128

Title: 300-1000 MHz RECEIVER FEEDS

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300-1000 MHz RECEIVER FEEDS

We have designed and constructed five cavity backed dipole feeds covering most of the spectrum from 300 to 1000 MHz. They were designed to work with our 300 foot and 140 foot antennas which have an F/D of 0.428. The feeds are designated 300-350, 350-410, 450-500, 500-700 and 700-1000 MHz. Feed pattern measurements in both the E and H planes were made. The edge illumination of 12 to 15 dB down was the design goal. The taper efficiency and spillover temperatures were calculated from the feed patterns using R. Fisher's program described in EDIR 174.

A summary of the feed characteristics follows:

300-350 MHz Feed-----

Frequency (MHz)	280	300	320	340	360
E-Plane Edge(dB)	-12.5	-11	-13	-14.5	-16
H-Plane Edge(dB)	-14.5	-12	-12	-13.5	-13
Return Loss (dB)	-24	-22	-24	-21	-16
Taper Efficiency	.83	.83	.79	.76	.73
Spillover Temp(K)	21	24	14.7	11	7.2

350-410 MHz Feed-----

Frequency (MHz)	310	330	350	370	390	410
E-Plane Edge(dB)-9.5	-11	-12.3	-13	-14	-14	-16
H-Plane Edge(dB)-12.8	-10.8	-12.3	-13.3	-13.5	-13.5	-15
Return Loss (dB)-13	-23	-17	-20	-32	-32	-16
Taper Efficiency		.79				.74
Spillover Temp(Kelvin)		16				9

450-500 MHz Feed-----

Frequency (Mhz)	420	440	460	480	500
E-Plane Edge(dB)	-9.9	-11.5	-11.7	-12.9	-14.7
H-Plane Edge(dB)	-11.3	-11.9	-12.3	-13.5	-14.4
Return Loss (dB)	-22	-23	-22	-24	-23
Taper Efficiency	.82	.80	.79	.77	.74
Spillover Temp(K)	20.2	15.3	13.2	11.9	8.7

500-700 MHz Feed-----

Frequency (MHz)	500	600	700
E-Plane Edge(dB)	-15.5	-16	-18
H-Plane Edge(db)	-13.8	-16.3	-19.5
Return Loss (dB)	-15	-21	-12
Taper Efficiency	.764	.723	.652
Spillover Temperature(K)	13.7	7.6	3.0

700 - 1000 MHz Feed-----

Frequency (Mhz)	650	700	800	900	1000
E-Plane Edge(dB)	-13.8	-14	-15	-16.4	-17.5
H-Plane Edge(dB)	-14.3	-15.4	-16	-16.5	-18.5
Return Loss (dB)	-10	-16	-17	-16	-10
Taper Efficiency	.79	.77	.77	.76	.68
Spillover Temp(K)	17.2	13.9	10.5	9.2	4.9

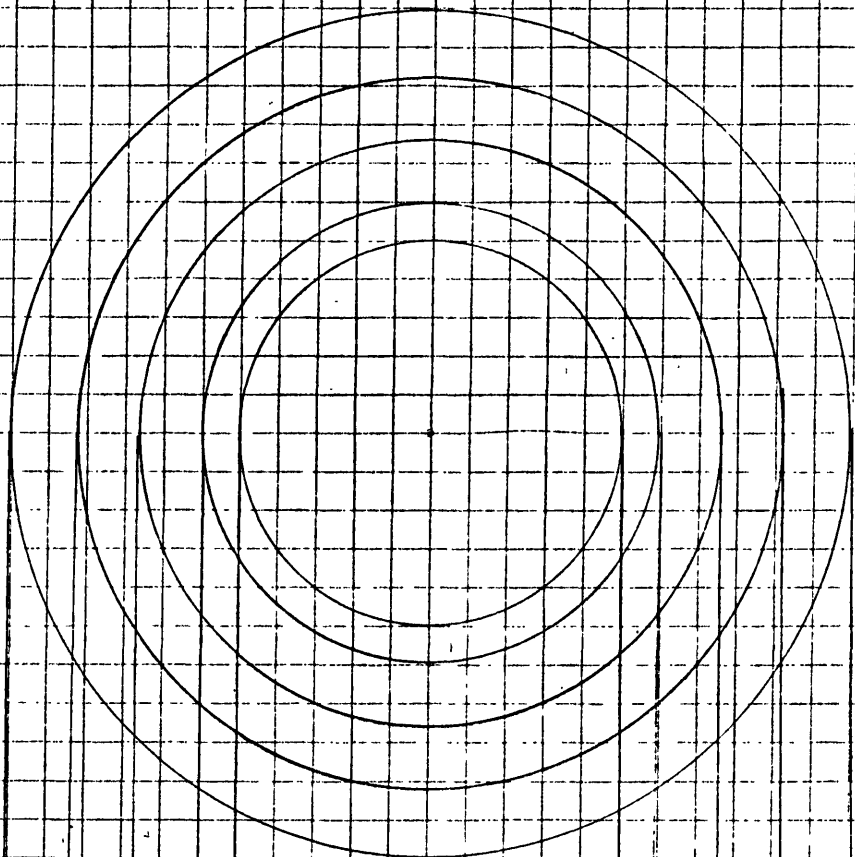
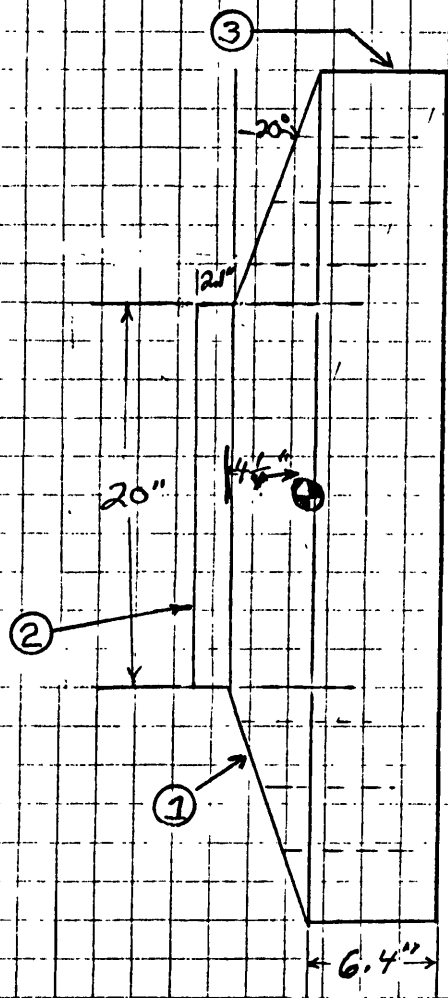
The 300-350, 350-410 and 450-500 MHz feeds are cavity backed dipole feeds. The physical dimensions are tabulated below:

Feed	300-350 MHz	350-410 MHz	450-500 MHz
Dipole Length	21.6 inches	18.7 inches	14.0 inches
Dipole Height from Cavity Back	4.9 inches	4.3 inches	3.7 inches
Top Matching Element	13.25 inch disc	11.5 inch disc	8.5 inch disc
Bottom Matching Element	10.4 inch cross	9 inch cross	6.75 inch cross
Diameter of Cavity	38.5 inches	33.4 inches	28.5 inches
Depth of Cavity	14.7 inches	12.75 inches	10.9 inches

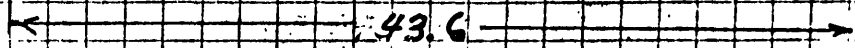
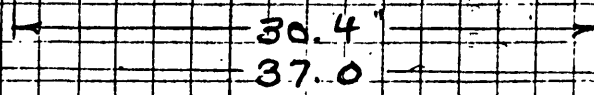
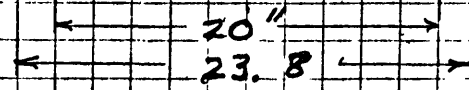
The 500-700 MHz and 700-1000 MHz feeds have the quarter wavelength deep concentric rings mounted on a cone around the main cavity. As shown above these two feeds have a narrower pattern than the lower frequency units which does reduce the spillover. This feed design provides acceptable illumination of the reflector over a wider frequency band than the single cavity backed dipole feed. The dimensions are:

Feed	500-700 MHz	700-1000 MHz
Dipole Length	10.1 inches	7.2 inches
Dipole Height from Cavity Back	5.5 inches	3.0 inches
Diameter of Cavity	20 inches	14 inches
Depth of Cavity	8.6 inches	6 inches
Outside Ring Diameter	43.6 inches	40 inches
Number of Rings/Spacing	3/3.3 inches	5/2.3 inches
Ring Depth	6.4 inches	4.5 inches
Cone Angle	70 degrees	70 degrees

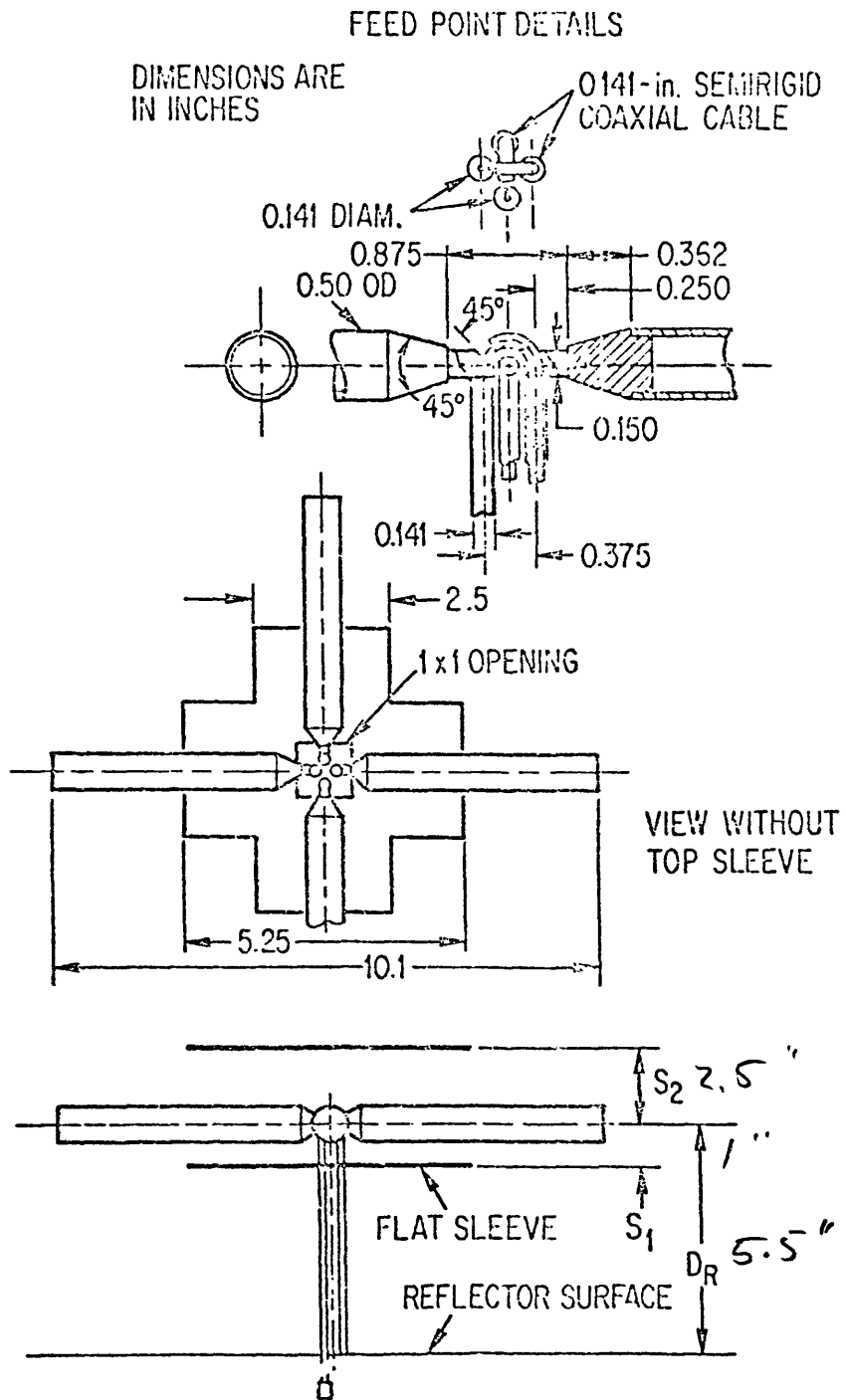
The attached sketches show construction details for the 500 to 700 MHz feed.



500-700 MHz FEED ASSEMBLY



4/23/79 J. Coe



Dual Flat-Sleeve Dipole Model

500-700 MHz Feed