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## **Pit Lid Antenna Radiation Patterns and Assembly (Used with Model 520R and 520F)**

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**March 26, 2006**

**Sensus Metering Systems**

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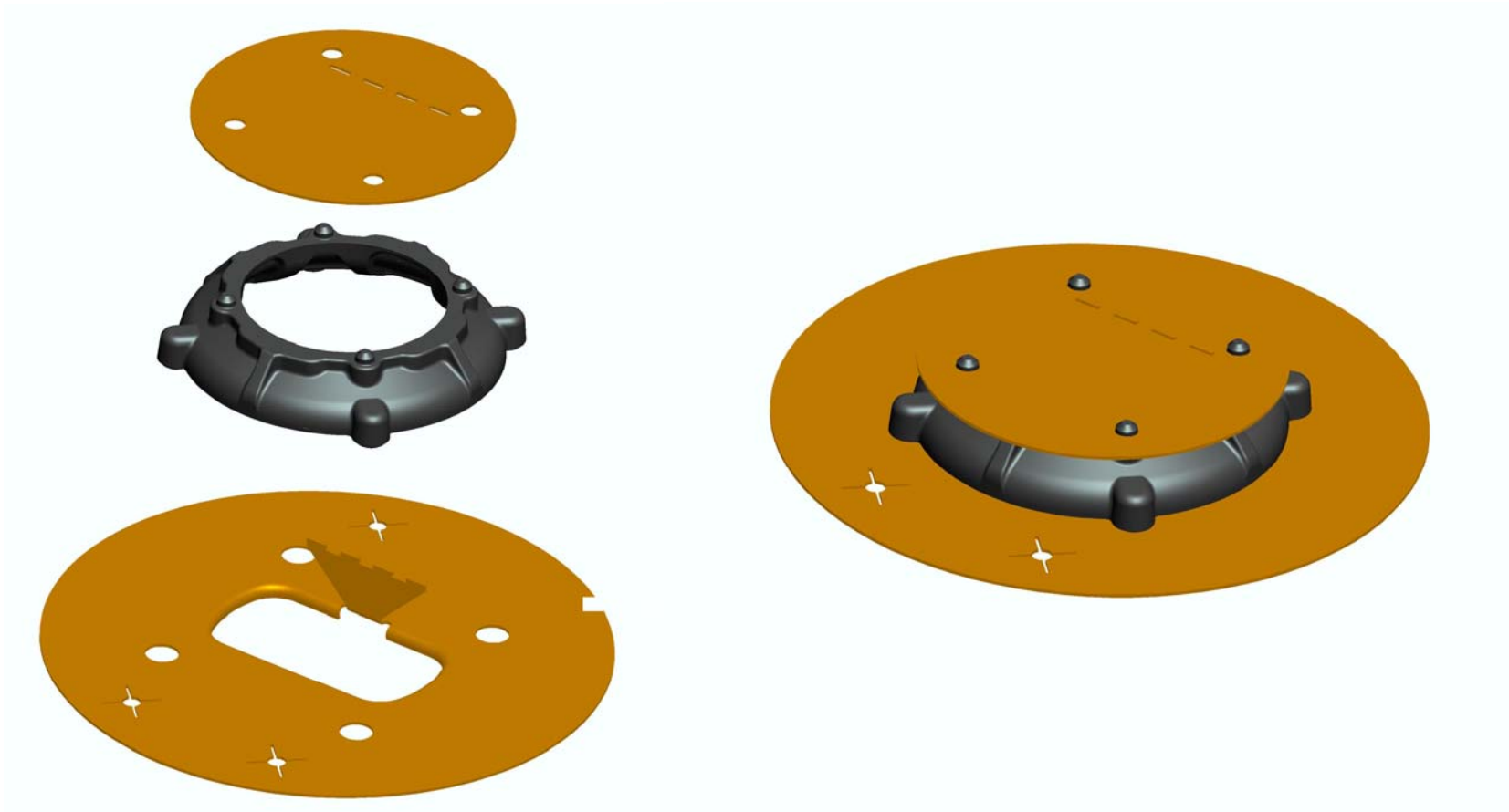


Figure 1 Antenna Assembly, Exploded

Figure 2 Antenna Assembly

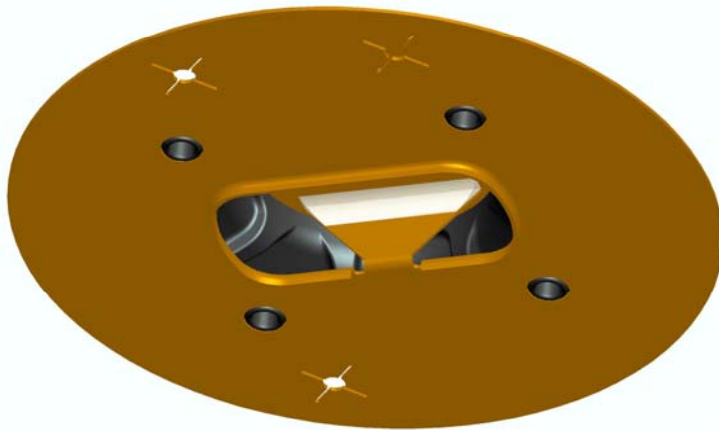


Figure 3 Antenna Assembly, Bottom View  
Showing Alignment Bosses, Retaining  
Clips, and Solder Connection

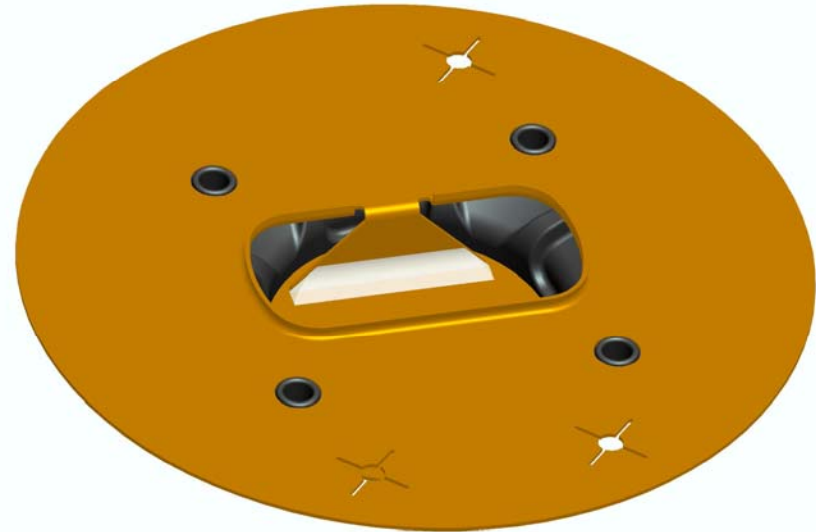


Figure 4 Antenna Assembly, Rotated  
Bottom View Showing Alignment Bosses,  
Retaining Clips, and Solder Connection

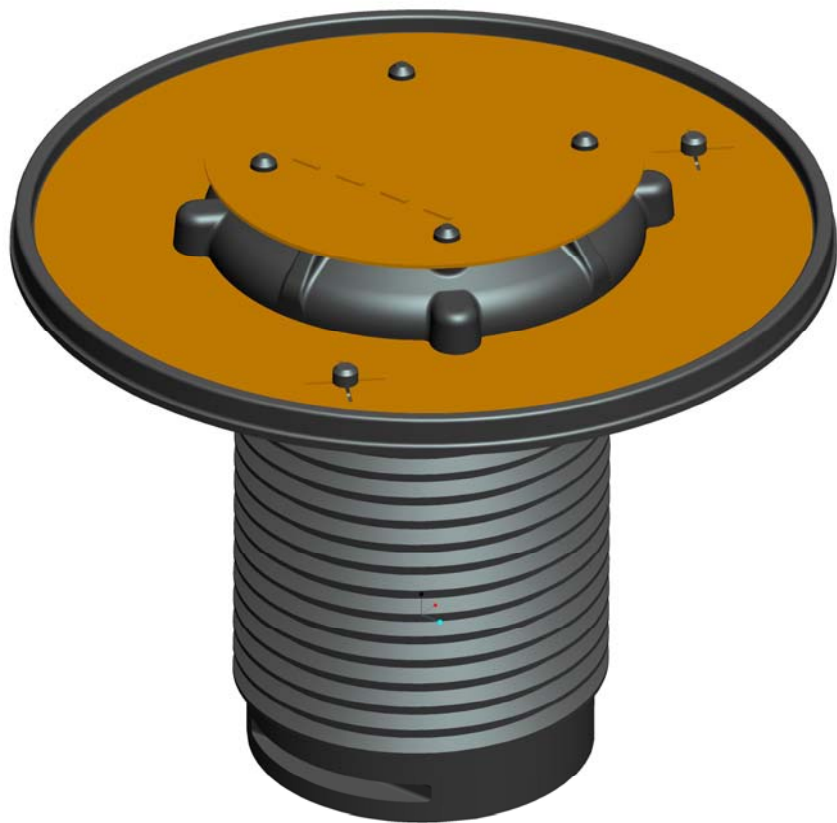


Figure 5 Antenna Lower Housing  
Assembly with Antenna Assembly  
Fastened



Figure 6 Antenna Housing Assembly

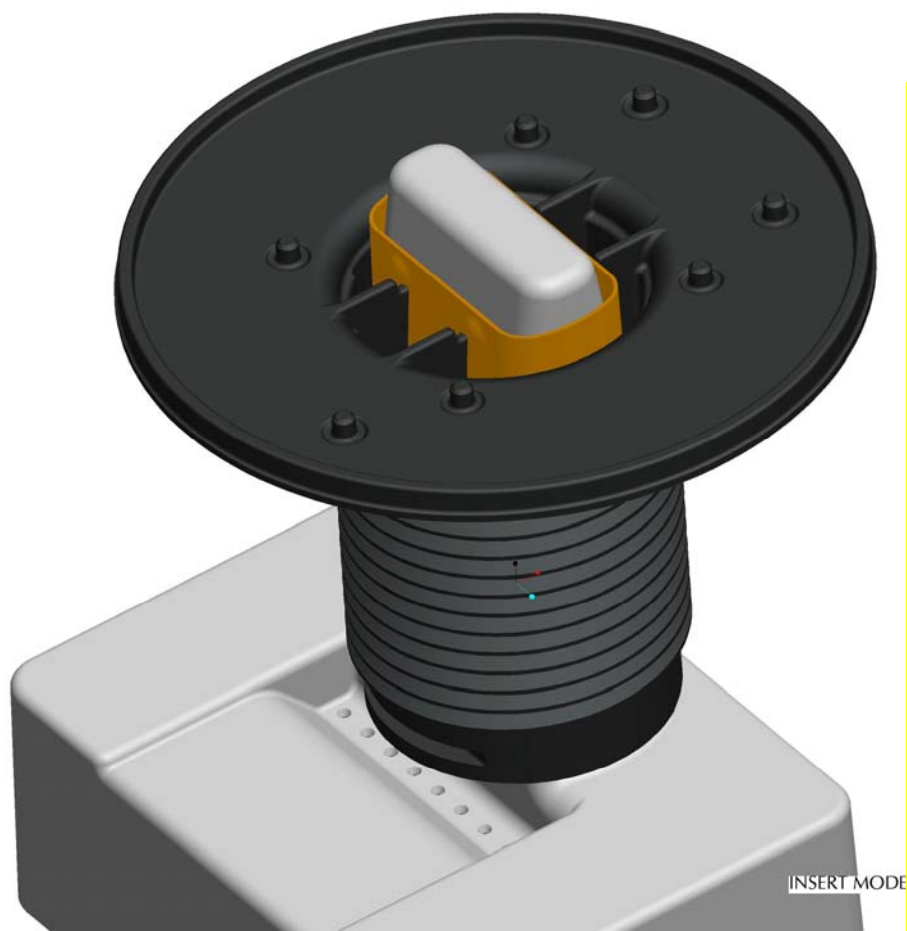


Figure 7 Antenna Lower Housing  
Positioned on Transmitter Assembly



Figure 8 Mechanical Connection  
Between the Antenna Ground Plane and  
Transmitter Isolation Sleeve

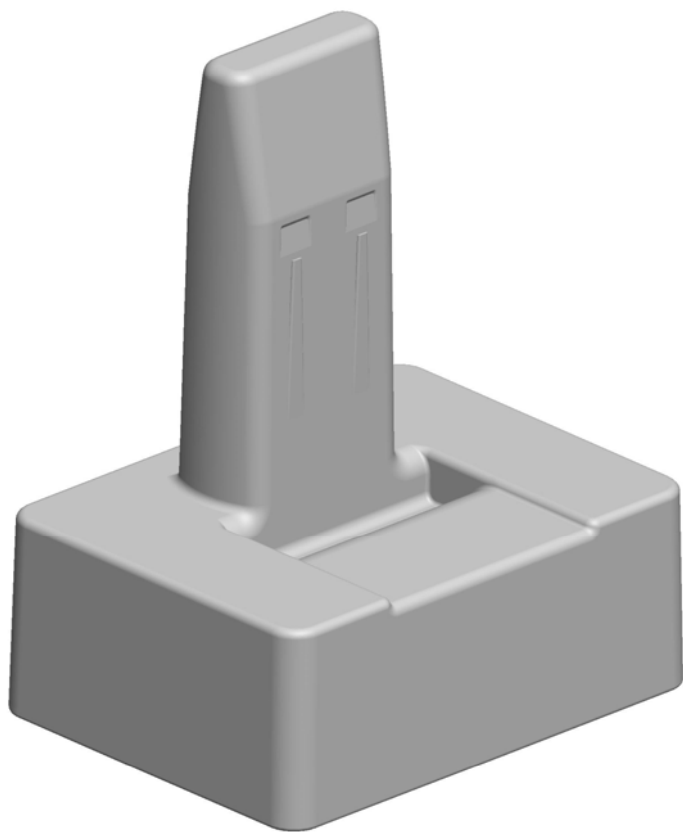


Figure 9 Proposed HDPE Modification for Controlling the Position of the Transmitter Isolation Sleeve

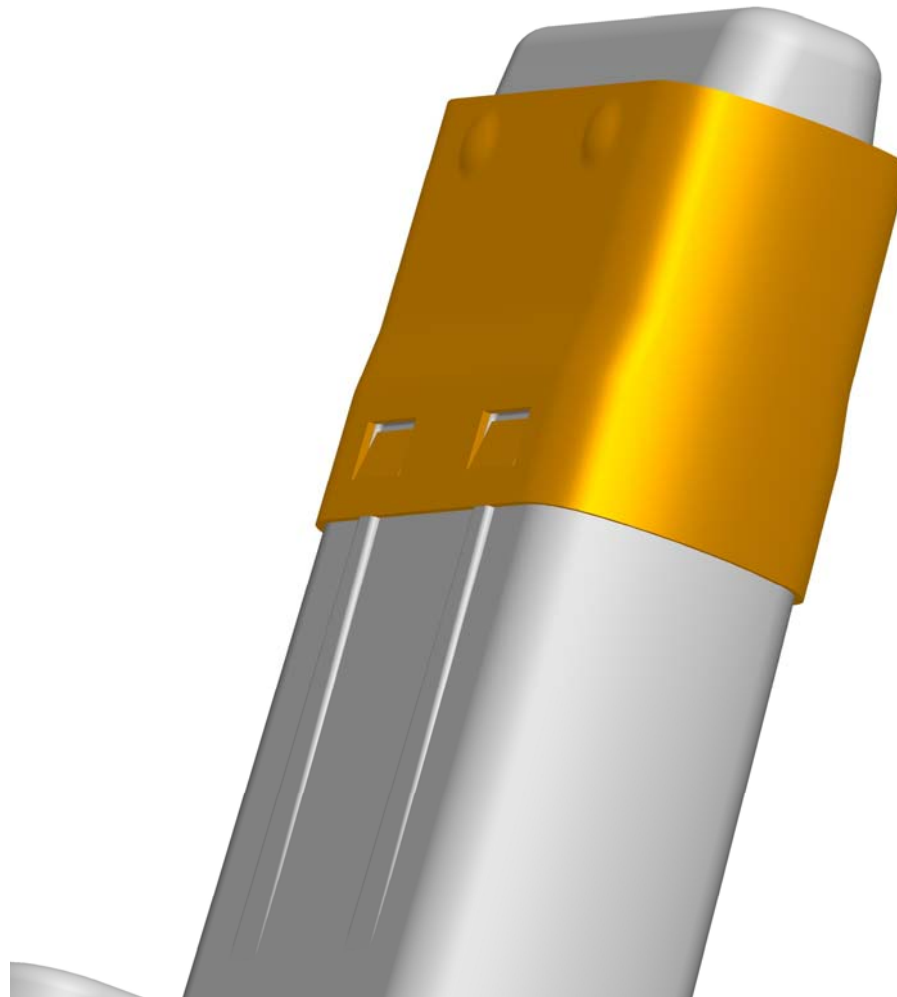


Figure 10 Transmitter Isolation Sleeve Positioned on HDPE with Proposed Modifications



Figure 11 Antenna Housing Assembly  
with EMABOND Ring



Figure 12 Antenna Housing Assembly  
Rotated with EMABOND Ring

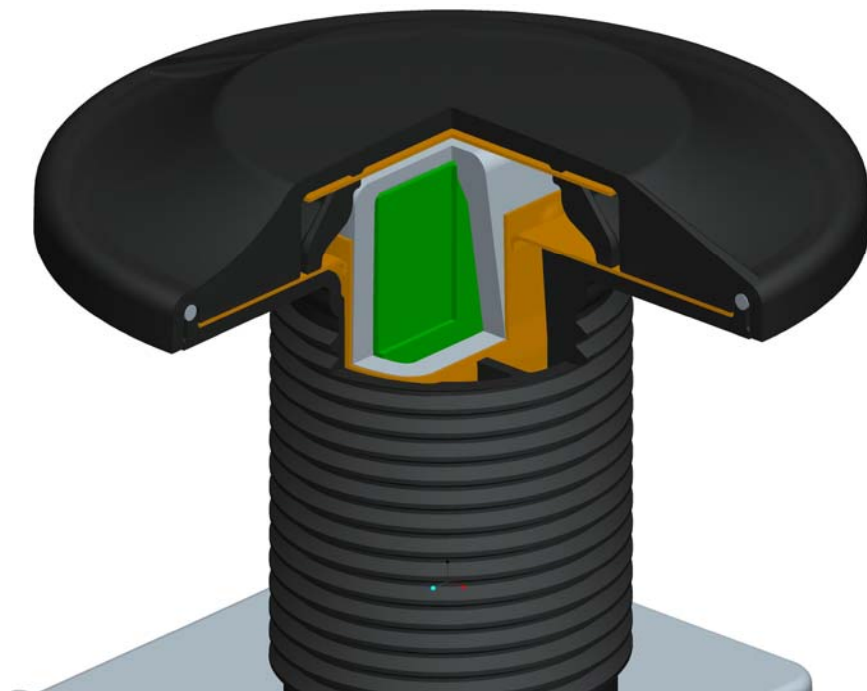


Figure 13 Antenna Housing Assembly  
Section View



Figure 14 Antenna Housing Assembly  
Mounted to Transmitter Housing  
Assembly



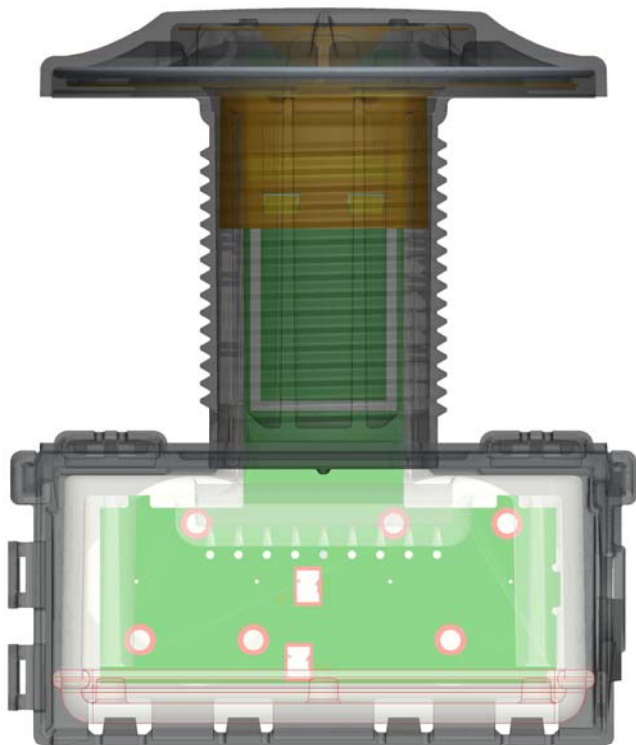


Figure 15 Antenna Housing Assembly  
Semi-Transparent, Front

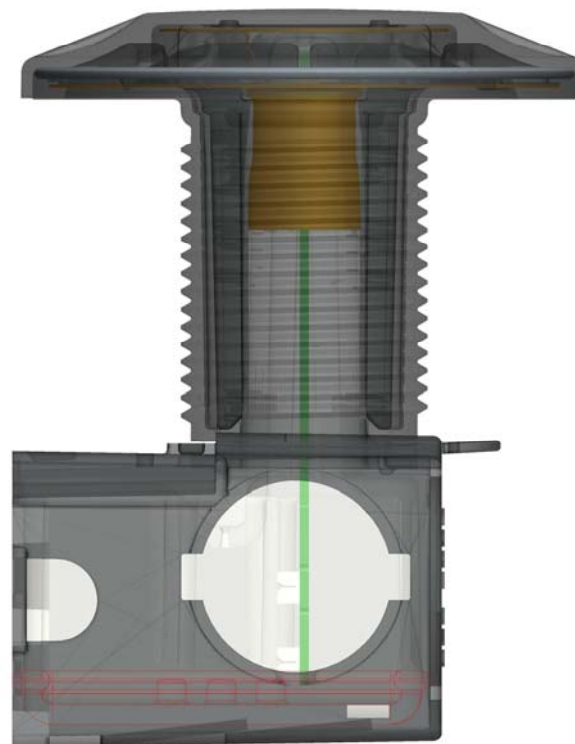


Figure 16 Antenna Housing Assembly  
Semi-Transparent, Side

## Repeatability Data

**Circular Antenna, 3.6 in brass ground plane, 2.04 inch upper plate, nickle plate  
SLA Sleeve with 80/1000 in. copper tape added to bottom and 4 solder bumps around top**

Metal pit with Metal lid

The Circular Antenna was placed into the sealed pit in the anechoic @ 3 meters from the calibrated dipole.

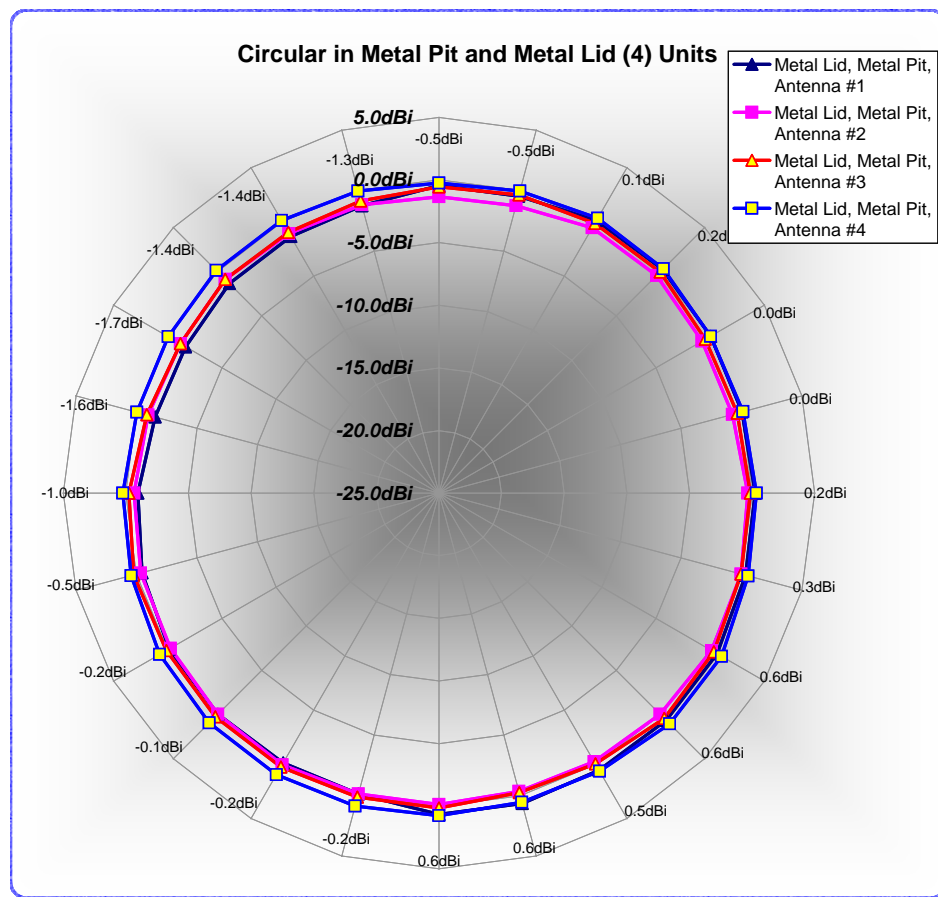
An RF generator provides a +10 dBm sine wave to the antenna

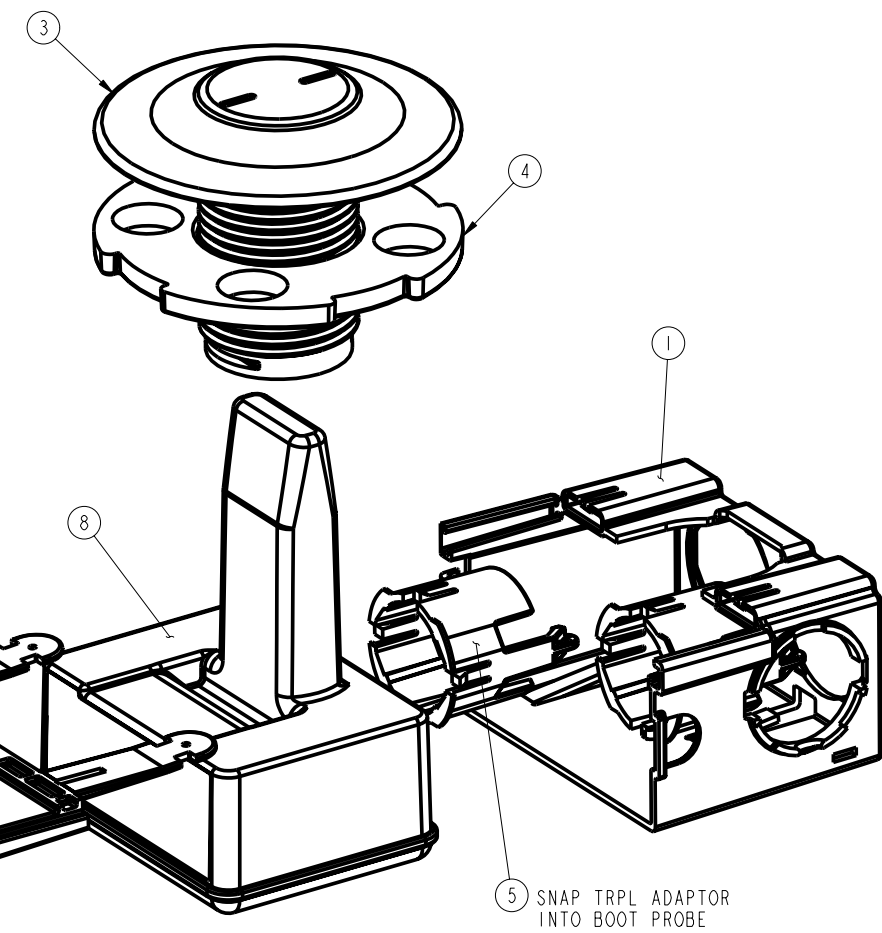
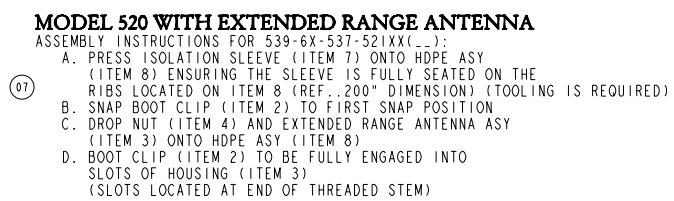
Peak envelop power out was captured at 15 degree intervals using an Agilent Model 4402 spectrum analyzer.

The angle of elevation of the dipole was 10 degrees.

Tx power	10dBm	Distance between plates = 0.38 inch
Date	15-Jun-05	3.6 inch ground plane
Frequency	915MHz	2.04 inch top plate
Distance	3.00m	Modified 1.0 inch nickle plated SLA sleeve around HDPE
Cable loss	3.12dB	80/1000 inch above top of ground plane.
Path loss	41.21dB	0.07 inch ground plane extender
RX antenna gain	2.00dB	The band flares out and makes contact with the rectangular ground plane extender.
System loss	-42.33dB	At 0 degrees, shorting bar in back
Zo	50.0ohm	

Angle	Metal Lid, Metal Pit, Antenna #1		Metal Lid, Metal Pit, Antenna #2		Metal Lid, Metal Pit, Antenna #3		Metal Lid, Metal Pit, Antenna #4	
	SA reading	Gain	SA reading	Gain	SA reading	Gain	SA reading	Gain
0deg	-34.8dBm	-0.5dBi	-35.7dBm	-1.4dBi	-34.9dBm	-0.6dBi	-34.6dBm	-0.3dBi
15deg	-34.8dBm	-0.5dBi	-35.6dBm	-1.3dBi	-34.7dBm	-0.4dBi	-34.4dBm	-0.1dBi
30deg	-34.2dBm	0.1dBi	-34.9dBm	-0.6dBi	-34.5dBm	-0.2dBi	-34.0dBm	0.3dBi
45deg	-34.1dBm	0.2dBi	-34.8dBm	-0.5dBi	-34.4dBm	-0.1dBi	-34.0dBm	0.3dBi
60deg	-34.3dBm	0.0dBi	-35.1dBm	-0.8dBi	-34.8dBm	-0.5dBi	-34.3dBm	0.0dBi
75deg	-34.3dBm	0.0dBi	-35.1dBm	-0.8dBi	-34.7dBm	-0.4dBi	-34.2dBm	0.1dBi
90deg	-34.1dBm	0.2dBi	-34.7dBm	-0.4dBi	-34.5dBm	-0.2dBi	-34.0dBm	0.3dBi
105deg	-34.0dBm	0.3dBi	-34.4dBm	-0.1dBi	-34.4dBm	-0.1dBi	-33.8dBm	0.5dBi
120deg	-33.7dBm	0.6dBi	-34.2dBm	0.1dBi	-34.0dBm	0.3dBi	-33.3dBm	1.0dBi
135deg	-33.7dBm	0.6dBi	-34.4dBm	-0.1dBi	-33.9dBm	0.4dBi	-33.3dBm	1.0dBi
150deg	-33.8dBm	0.5dBi	-34.6dBm	-0.3dBi	-34.4dBm	-0.1dBi	-33.7dBm	0.6dBi
165deg	-33.7dBm	0.6dBi	-34.7dBm	-0.4dBi	-34.6dBm	-0.3dBi	-33.8dBm	0.5dBi
180deg	-33.7dBm	0.6dBi	-34.5dBm	-0.2dBi	-34.2dBm	0.1dBi	-33.6dBm	0.7dBi
195deg	-34.5dBm	-0.2dBi	-34.5dBm	-0.2dBi	-34.2dBm	0.1dBi	-33.5dBm	0.8dBi
210deg	-34.5dBm	-0.2dBi	-34.3dBm	0.0dBi	-34.1dBm	0.2dBi	-33.4dBm	0.9dBi
225deg	-34.4dBm	-0.1dBi	-34.4dBm	-0.1dBi	-34.1dBm	0.2dBi	-33.4dBm	0.9dBi
240deg	-34.5dBm	-0.2dBi	-34.6dBm	-0.3dBi	-34.2dBm	0.1dBi	-33.6dBm	0.7dBi
255deg	-34.8dBm	-0.5dBi	-34.7dBm	-0.4dBi	-34.1dBm	0.2dBi	-33.9dBm	0.4dBi
270deg	-35.3dBm	-1.0dBi	-35.0dBm	-0.7dBi	-34.6dBm	-0.3dBi	-34.1dBm	0.2dBi
285deg	-35.9dBm	-1.6dBi	-35.3dBm	-1.0dBi	-35.2dBm	-0.9dBi	-34.4dBm	-0.1dBi
300deg	-36.0dBm	-1.7dBi	-35.5dBm	-1.2dBi	-35.5dBm	-1.2dBi	-34.4dBm	-0.1dBi
315deg	-35.7dBm	-1.4dBi	-35.2dBm	-0.9dBi	-35.2dBm	-0.9dBi	-34.2dBm	0.1dBi
330deg	-35.7dBm	-1.4dBi	-35.4dBm	-1.1dBi	-35.3dBm	-1.0dBi	-34.2dBm	0.1dBi
345deg	-35.6dBm	-1.3dBi	-35.5dBm	-1.2dBi	-35.2dBm	-0.9dBi	-34.4dBm	-0.1dBi
Average	-0.25dBi		-0.55dBi		-0.24dBi		0.40dBi	
Peak	0.63dBi		0.13dBi		0.43dBi		1.03dBi	





ASSEMBLY INSTRUCTIONS FOR 539-6X-537-520XX( \_ ):

- A. SNAP BOOT CLIP (ITEM 2)  
TO FIRST SNAP POSITION
- B. DROP NUT (ITEM 4) AND PIT HOUSING (ITEM 3)  
ONTO HDPE ASY. (ITEM 8)
- C. BOOT CLIP (ITEM 2) TO BE FULLY ENGAGED INTO  
SLOTS OF HOUSING (ITEM 3)  
(SLOTS LOCATED AT END OF THREADED STEM)

[illegible]