Antennas for the Next Radio Occultation Mission

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Early POD Antenna Testing



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Early Antenna Testing

D&M Flat Ground Plane



Shown with permission from Nick's Mom

Early Antenna Testing D&M Flat Ground Plane



Time (hrs)

Early Antenna Testing D&M Flat Groundplane

JPL



(hrs)

Early Antenna Testing Choke Ring with/without D&M



Early Antenna Testing 2 & 3-ring Choke Ring



Rooftop POD Antenna Testing

2-ring vs 3-ring choke



POD Antenna Testing



COSMIC-1 Occultation Antenna Pattern



COSMIC-1 Occultation Antenna Testing



COSMIC-1 Occ antenna vs CHAMP Occ Antenna



SNR Issues



SNR Issues



Some Occultation Antennas

GRAS GPS (MetOp)



ROSA (SAC-D)





Lower Troposphere Performance in Tropics





Not all profiles retrieved to the surface (worse for low SNR)





Key Design Criteria

- Wide-band, High Performance (SNR over the region of interest)
- Low Weight
- Reproducible with minimal fine-tuning
- Low cost, but "Flight"
- Must fit. I 0cm x 40cm x 60cm



ff_2D_GainRHCP Helix Antenna ADKv1 when 25.00 xdb10Beamwidth(3) Curve Info max dB(GainRHCP) L1 : LastAdaptive Freq='1.575GHz' Phi='0deg' 63.7375 15.4565 Name Х - dB(GainRHCP)_1 m1 0.0000 14.0593 L2 : LastAdaptive Freq='1.227GHz' Phi='0deg' 14.0593 59.9607 0.0000 15.4565 m2 m2 171 - dB(GainRHCP)_2 dB(GainRHCP)_2 L1 : LastAdaptive Freq='1.575GHz' Phi='90deg' 17.1111 15.4565 12.50 dB(GainRHCP)_3 L2 : LastAdaptive Freq='1.227GHz' Phi='90deg' 21.5746 14.0593 -0.00 -12.50 5 -25.00 -37.50 -50.00 2.5 turns Rect Helix 4-element array -62.50-200.00 -150.00 -100.00 -50.00 0.00 50.00 100.00 150.00 200.00 Theta [deg]

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Test Hardware Occultation Antenna Testing



Occultation Antenna Testing

3x4 Steerable Helix Array SNRv; Elevation Cut

3x4 Steerable Helix Array SNRv (Combined)

Helix Array Config for Azimuth Cut

3x4 Steerable Helix Array

Array_Test_Helix_rot15deg PRN17 09/10/2011

Digital Beam-forming over Azimuth Range

1x4 Steerable Helix Array Phased for Limb

Summary

- 2-ring choke ring with D&M element for POD
- Materials selection for prototype, flight tested
- Passively steered towards limb from vertical to allow un-tilted mount to spacecraft
- I2 element design complete and prototype fab complete
- Working on more compact and 15 element designs as options