Design, Modeling and Evaluation of a 2.4GHz FHSS Comm System for NarcisSat

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http://ssdl.stanford.edu/NarcisSat
Microhard MHX-2400
Antenna Simulation

AGPZ (dB) at 2450 MHz

AGPTotal (dB) at 2440 MHz

AGP (dB) at 2450 MHz

AGP (dB) at 2440 MHz
Patch Antenna Models

Antenna Gain Pattern (dBi) vs Theta at 2450 MHz, surface = faces3

AGPTotal (dB) at 2500 MHz
Stabilization

- Permanent Magnets
- Hysteresis Rods
- Patch Antenna

MKE2400
Hysteresis Model

Hysteresis curve
Simulation model 1
Simulation model 2

$B_{Hyst}$
$B_s$
$B_r$
$H_c$
$H_{\tau}$
Ground Station

20 Meter Dish operated by SRI

Characteristics

- Solid state motion control
- Pointing accuracy = 0.1 degree
- Gain @ 2.4 GHz = 51 dBi
Designed, simulated, fabricated and tuned a 2.4GHz choked circular wavelength feed horn

- perpendicular feed probes
- gives circular and linear polarized capabilities
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$I H_B = H_B + \omega \times H_B = T_{MAGNET} + T_{HYST} + T_{EX}$
Initial attitude: $135^\circ$ between magnets and Earth’s field

Initial rate: $1 \text{ rad/s}$ tumbling about magnet cross-axis

Stabilization Simulation Results

Passive Magnetic Attitude Stabilization - Magnet Angle to Earth’s Field

- Field-Nadir angle
- System resolution
- Magnet-Nadir angle
- Magnet-Field angle
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