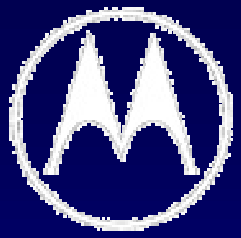

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Modeling of a Half wave Monopole Antenna on a portable radio

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Plantation

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Why Antenna Modeling?

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Predict the antenna characteristics

- radiation pattern
- impedance

Opportunity for improvement

- find the best matching
- re-tuning the antenna
- effect of placement of surrounding mechanical parts, e.g. shields, speaker, chassis length,etc.

Summary

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Modeled the whip antenna on both ground plane and chassis.

Accurate S11 prediction was obtained.

Challenges

- Geometry information on drawing incomplete.
- Material property information not readily available.
- minimum information obtained from vendor.
- Information obtained by breaking down samples.

New Radio, new Antenna

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New Antenna for New Band

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- Old Frequency 806 - 870 MHz
- New Frequencies 765 - 870 MHz
- Center frequency 815 MHz.

Proposed sample longer than original

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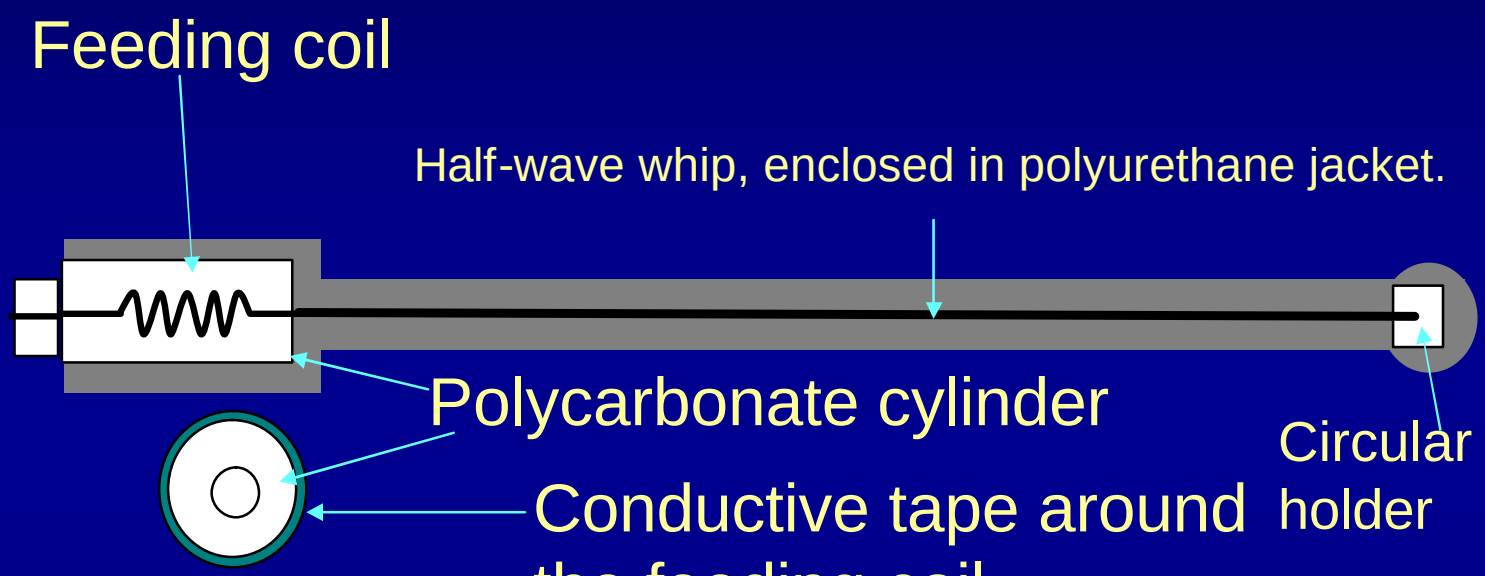
Original length=170 mm

Reducing the center frequency

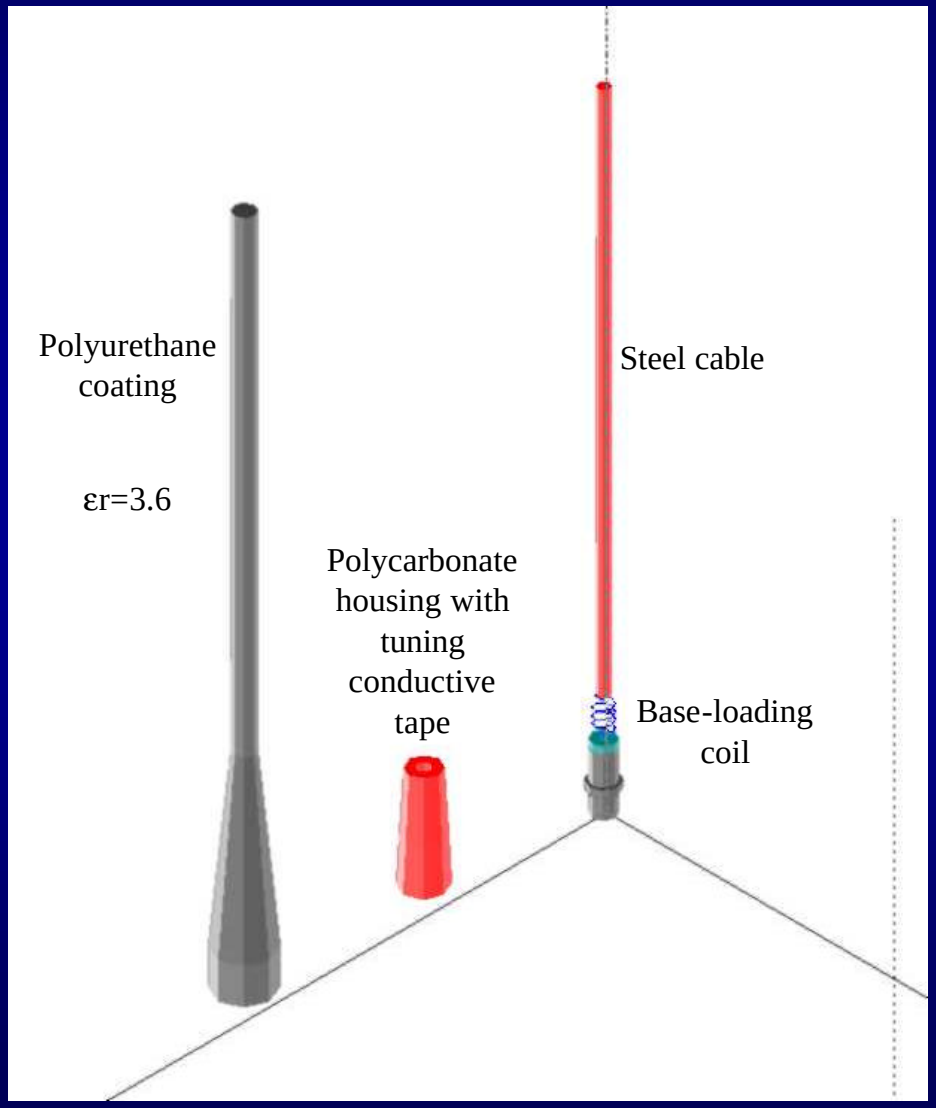
Adding length = new tooling = $$$$$ + Cycle Time

Proposed length= 180 mm

Antenna Design



antenna model



First Stage

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Model the existing antenna sample on ground plane to establish correlation.

Model on ground plane

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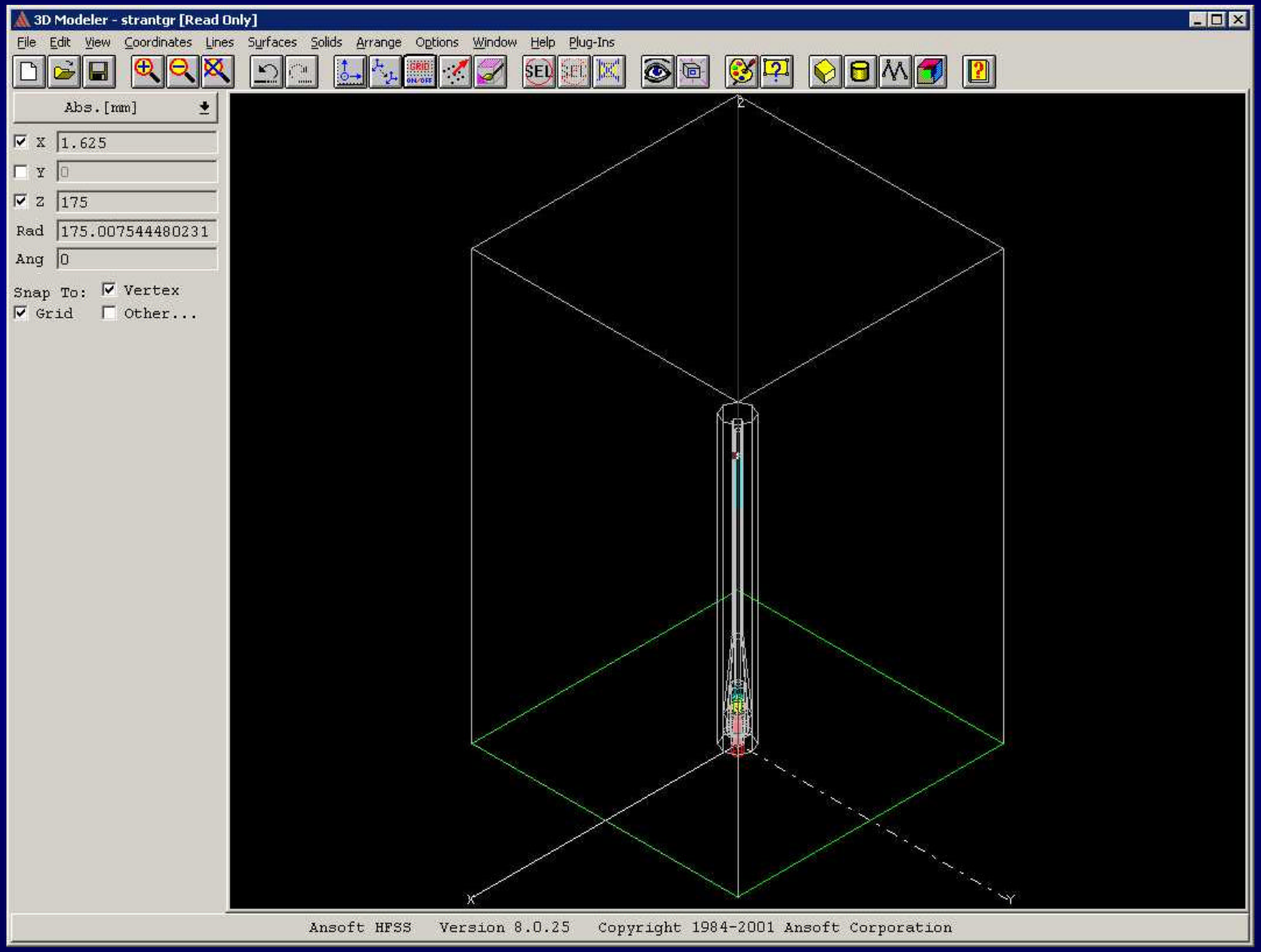

Dummy Cylinders to enhance meshing

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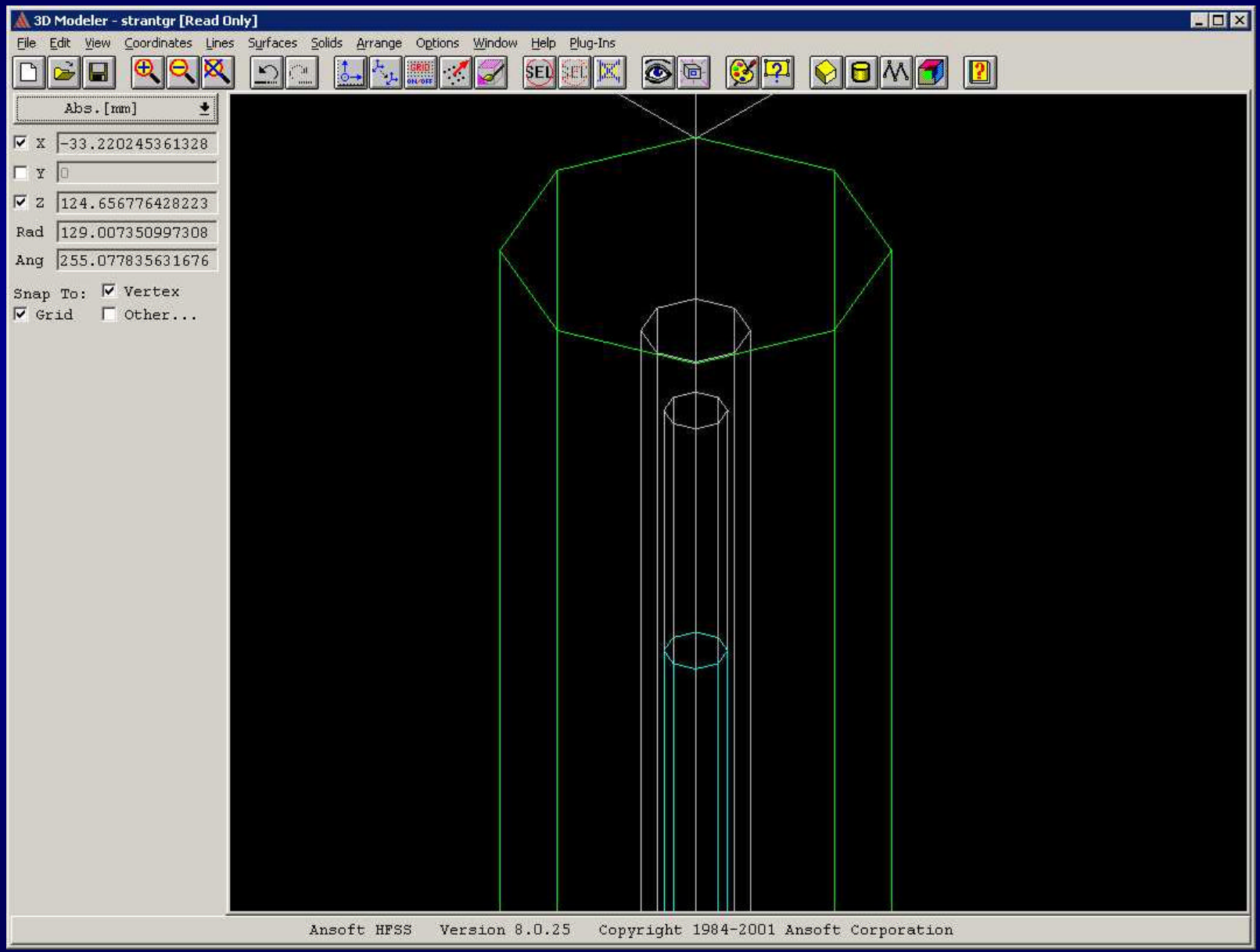

Feeding Structure - port and cap

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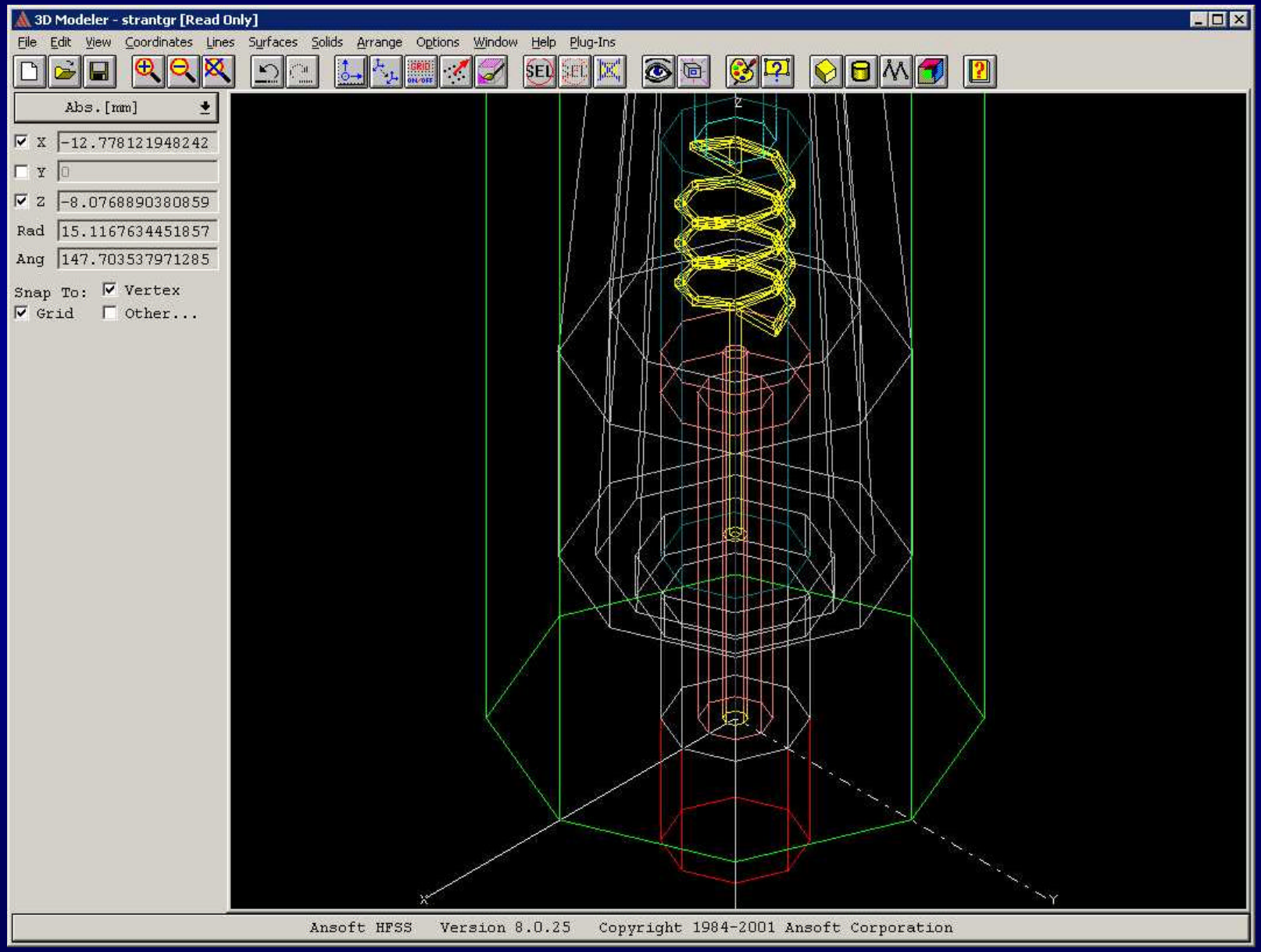

Matching conductive tape

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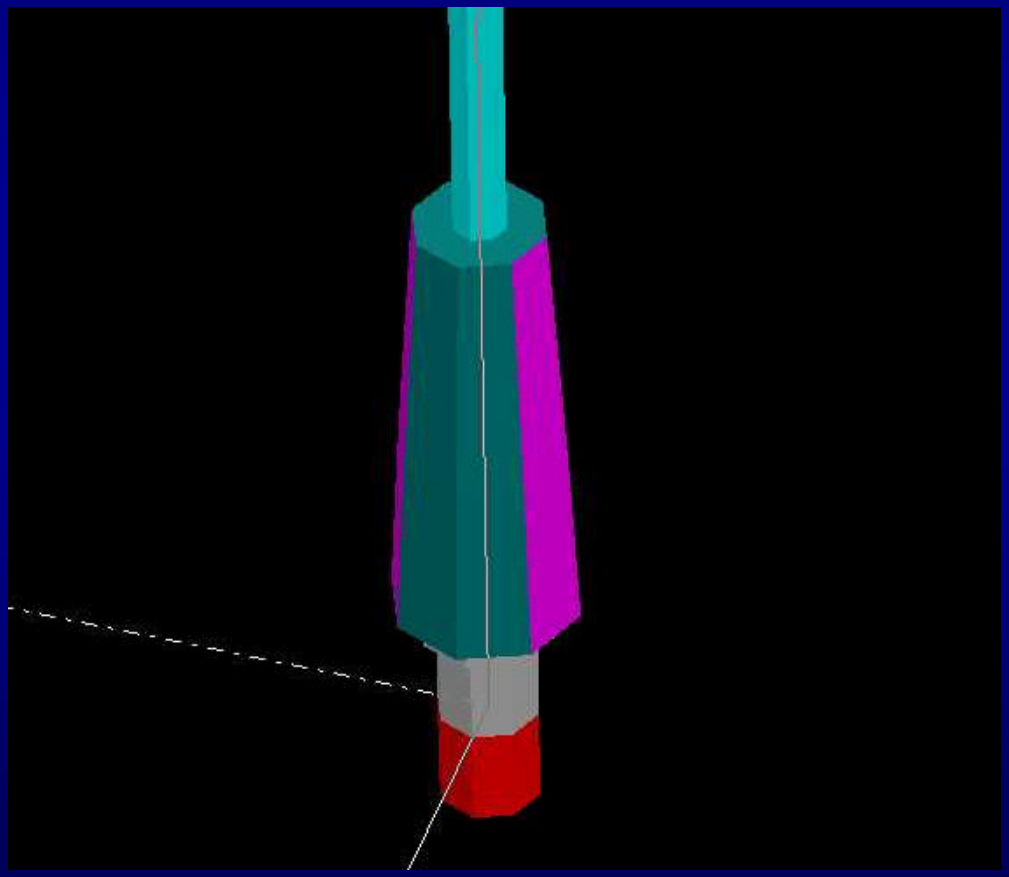
Modeled by PEC boundary condition

on the polycarbonate cylinder.



Impedance on ground plane(S11)

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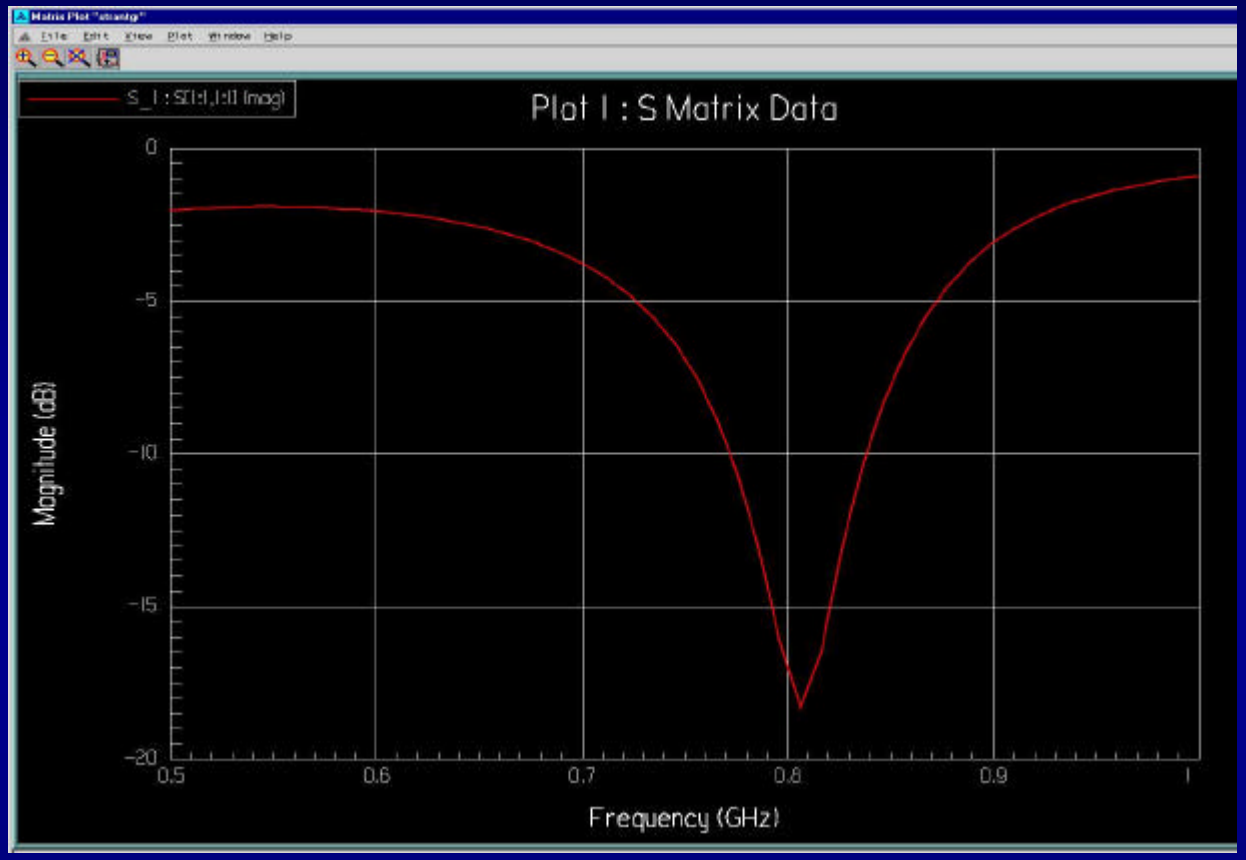

Ground plane	Measured	Simulated
Center frequency	805.2	806.1
Lower S11@-10dB	770.7	772.1
Higher S11@-10dB	841.8	838.4

Stage 2

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Model the antenna on the radio chassis.

Radio model

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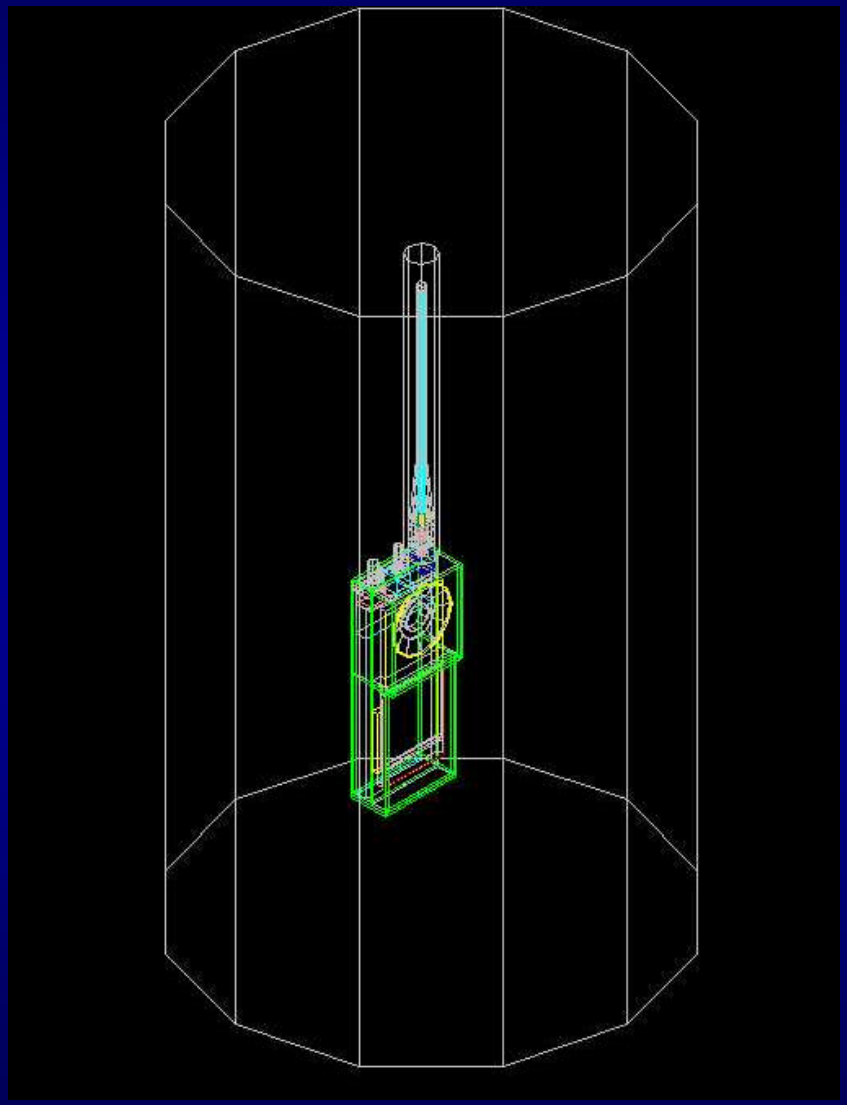

Full model

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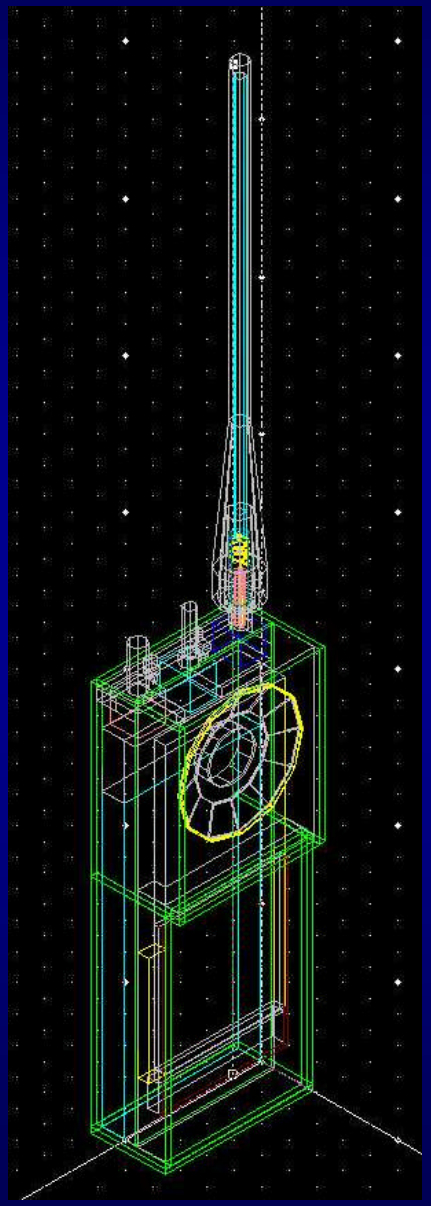

Radio chassis S11

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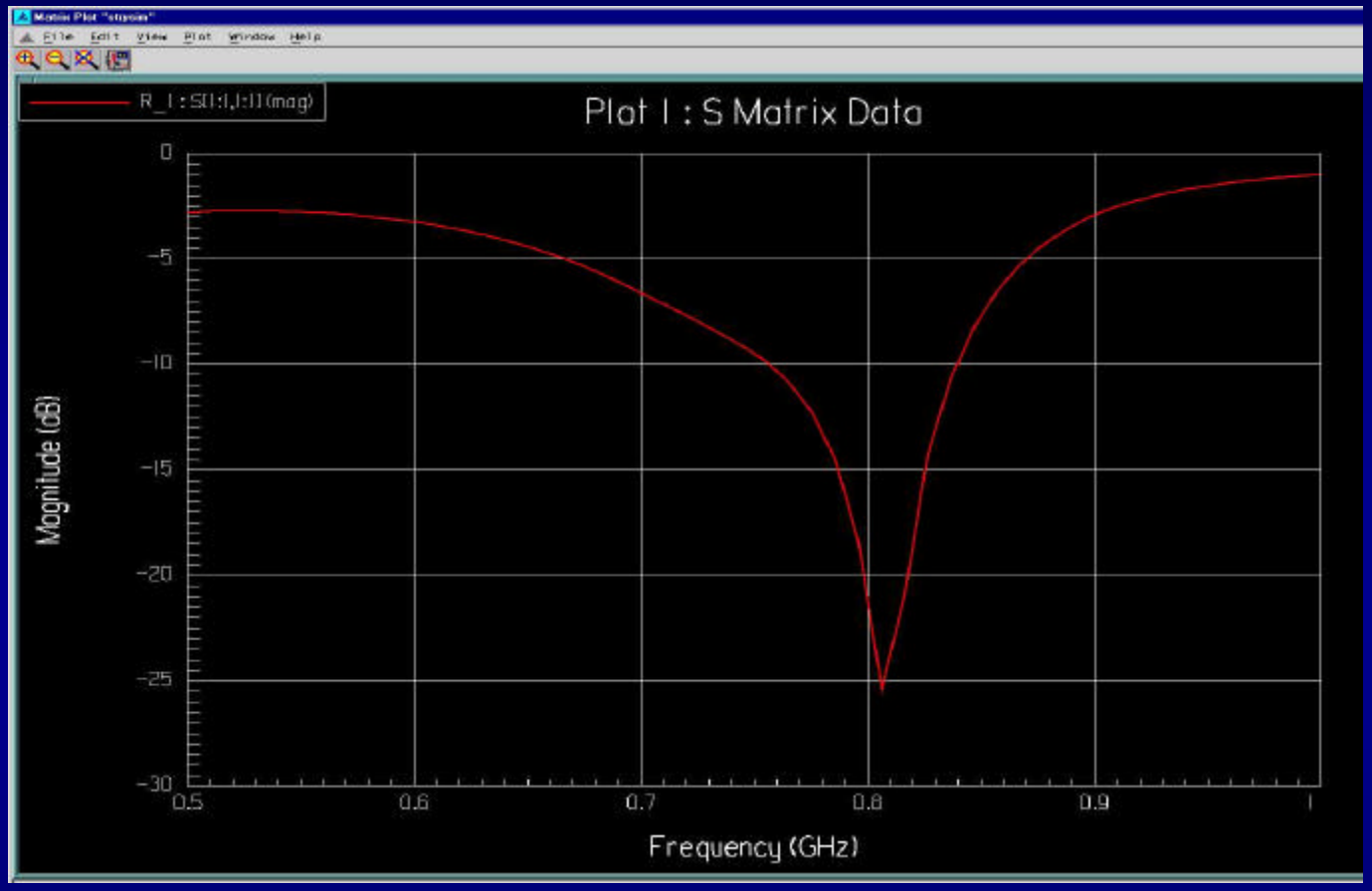

Chassis	Measured	Simulated
Center frequency	813.6	816.3
Lower S11@-10dB	760	775.5
Higher S11@-10dB	852.2	845

Measured S11 on Chassis

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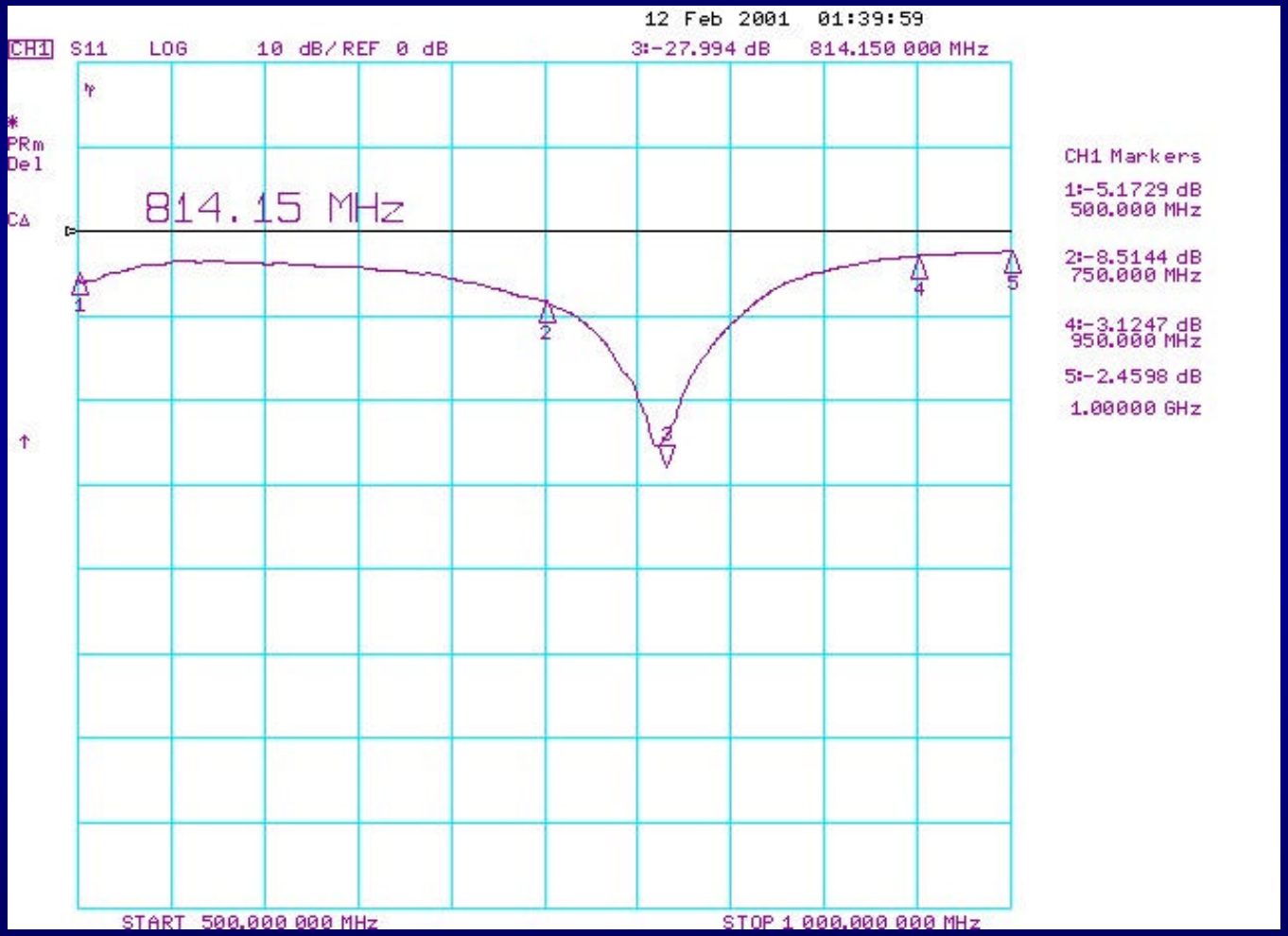

Feeding, knobs and switches

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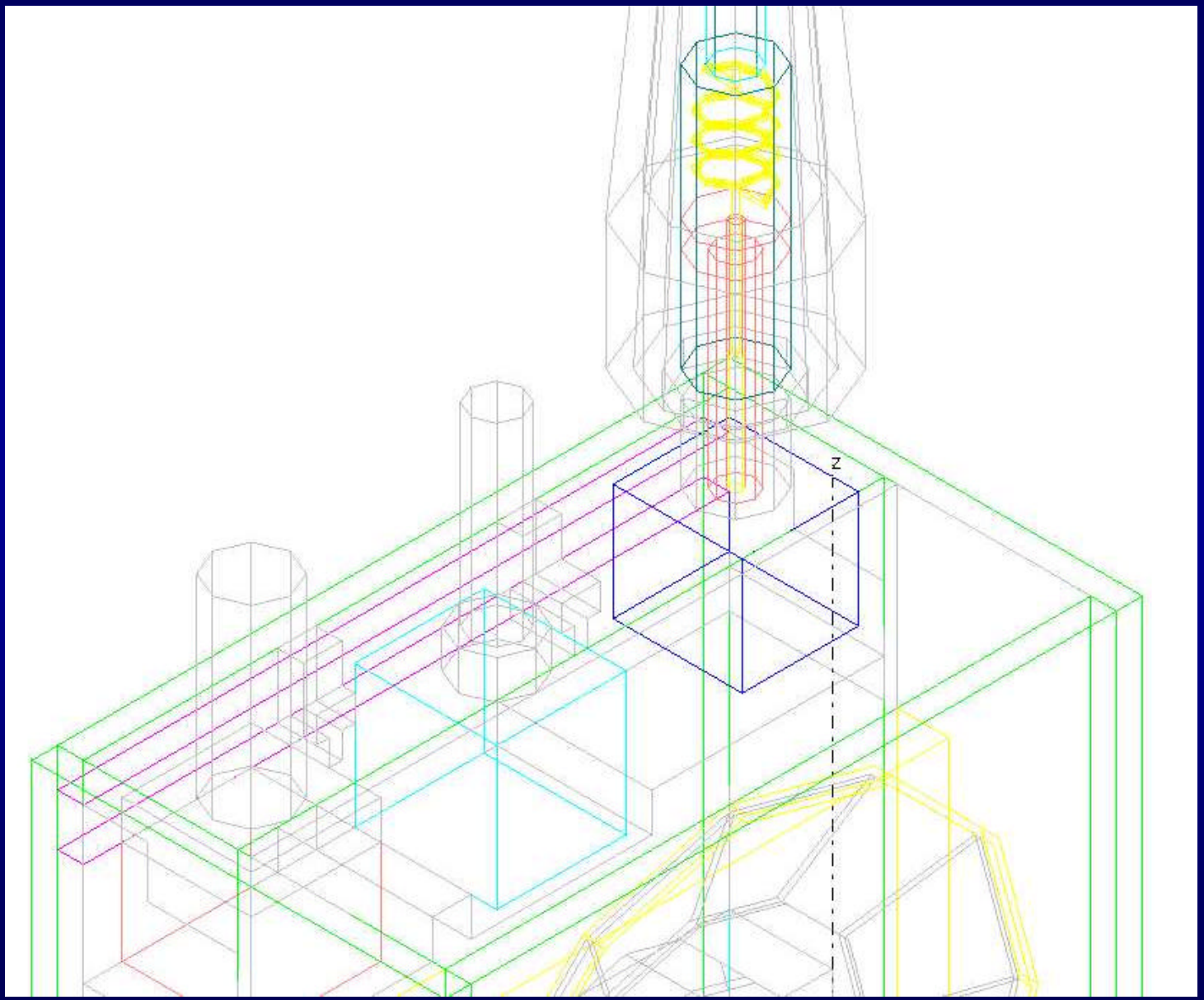

Radiation patterns

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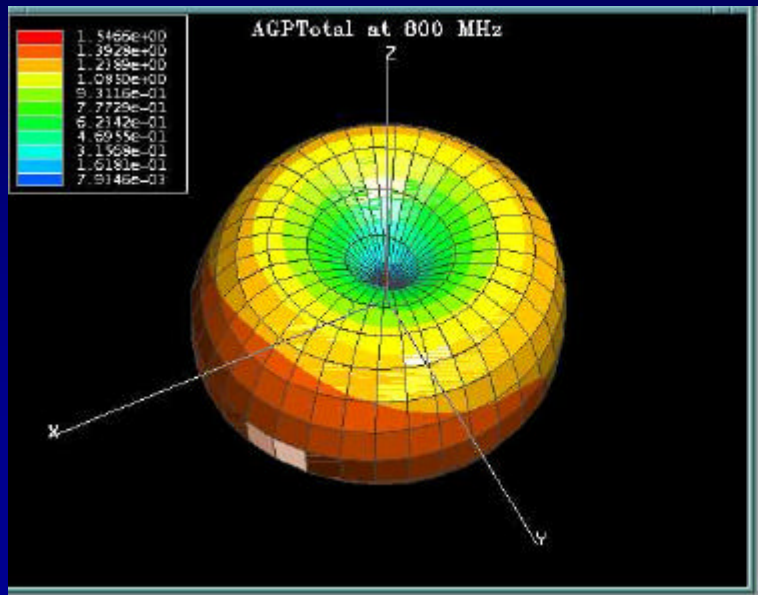

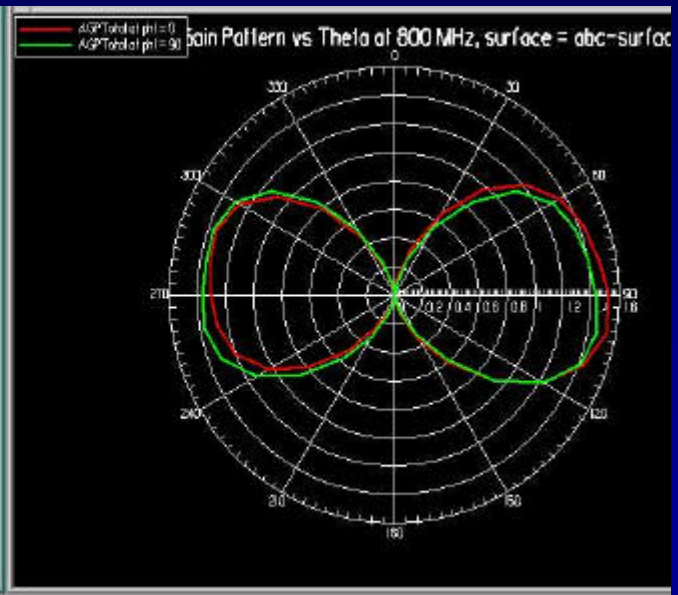

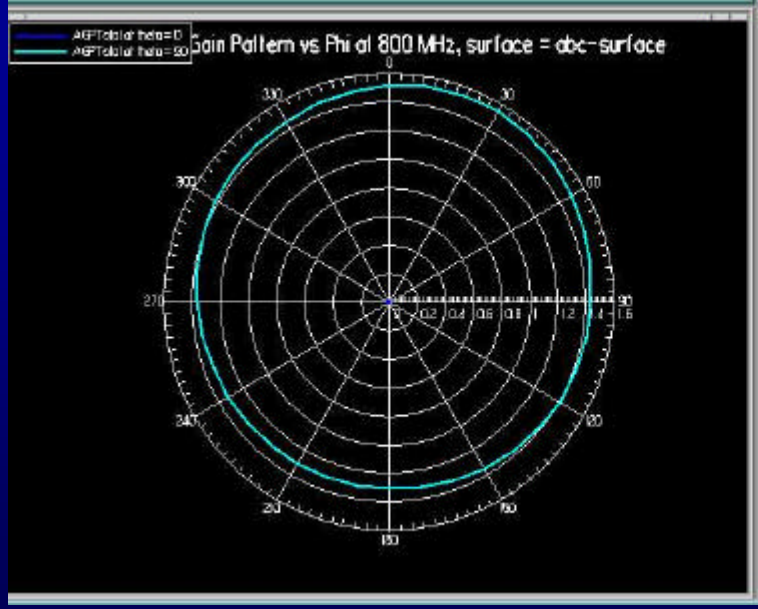

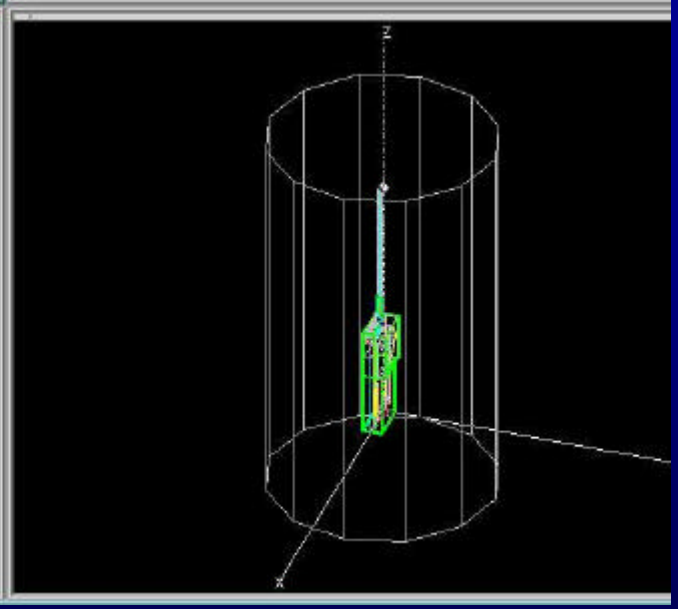

Stage 3

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Use the original length of 170 mm, conduct parametric sweep varying the width of the conductive tape.

Varying the width of the conductive tape.

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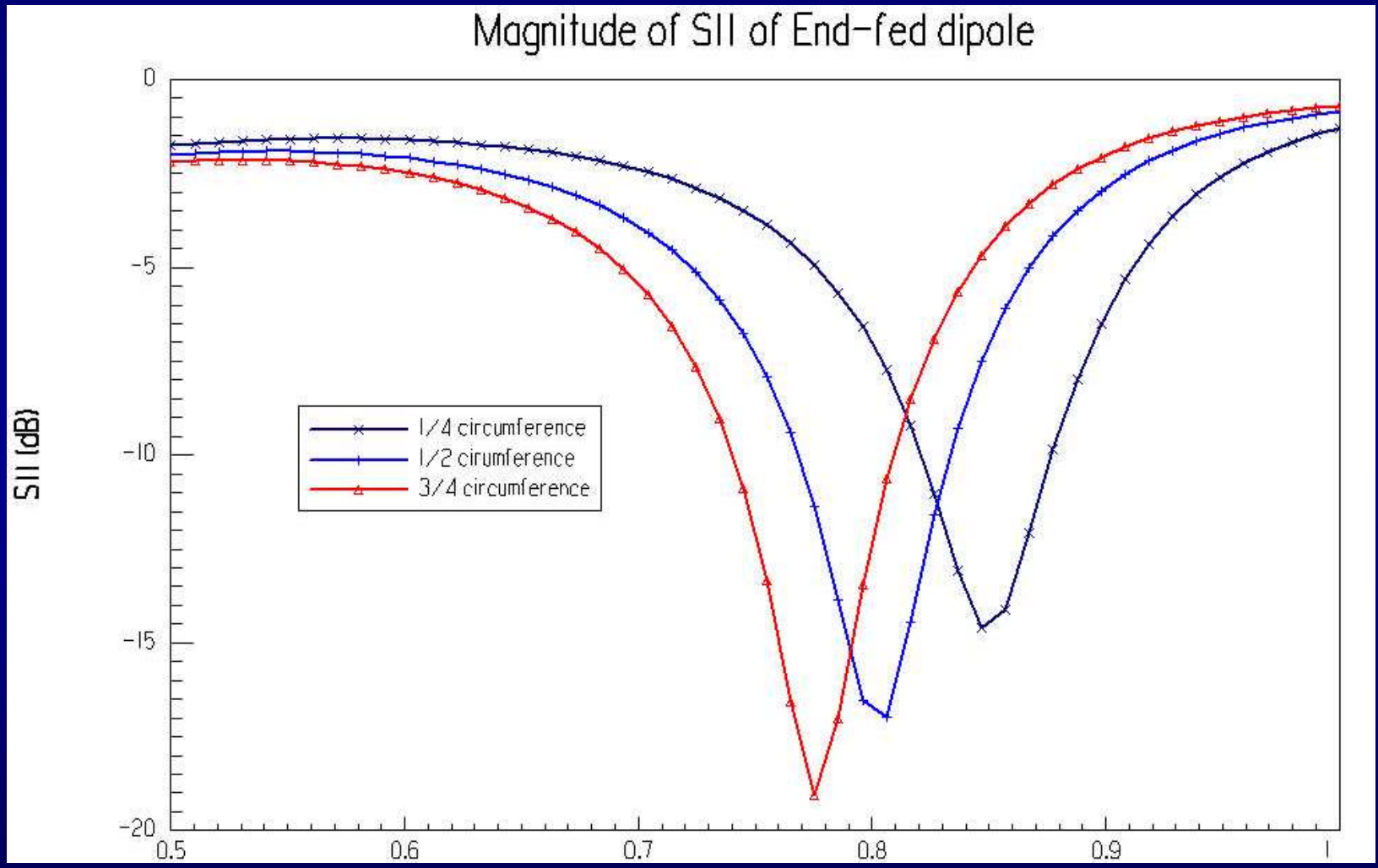
Antenna at original length of 170 mm.



Final, production version

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Final products - XTS2500 Radios

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Benefit

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- Complete understanding of the antenna.
- Track changes, and possible drift in performance.
- Check for impact of future changes of radio mechanics and metal part placement.