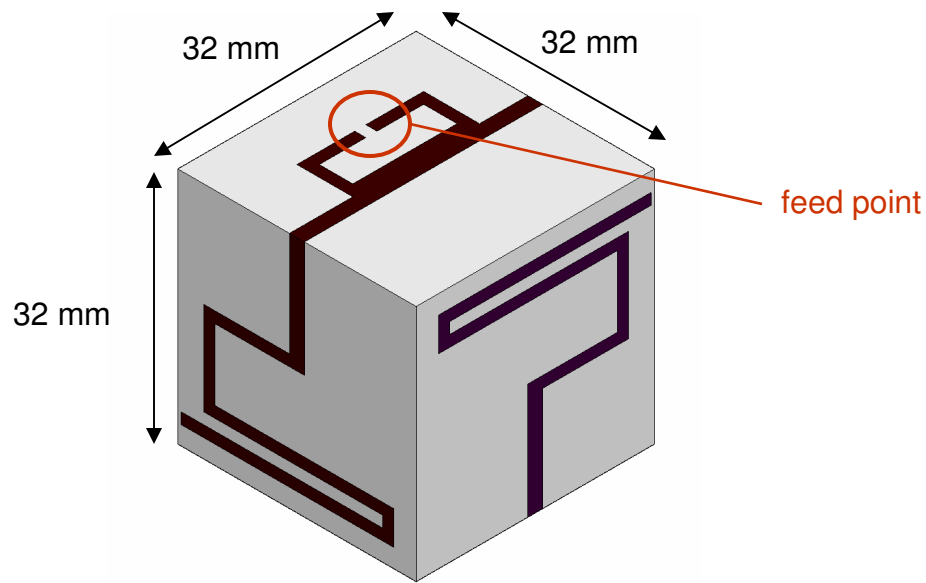
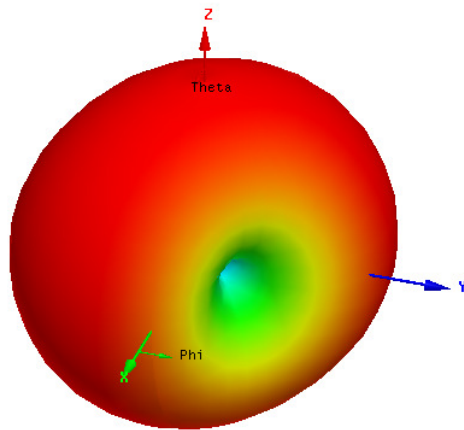


“Magic Cube” Antennas

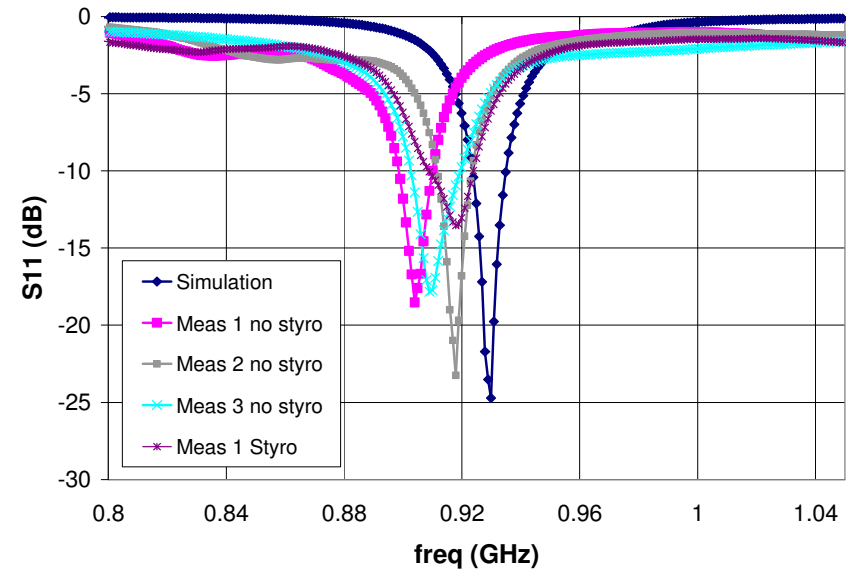
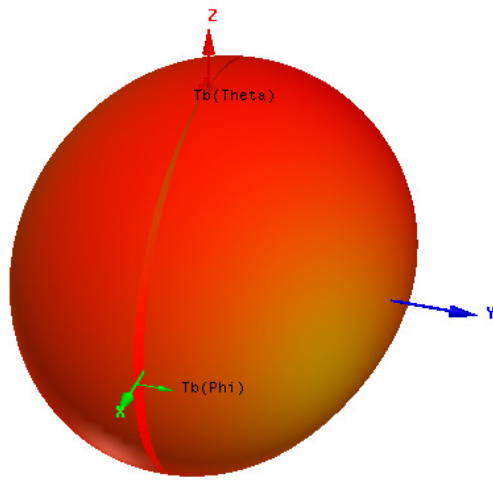
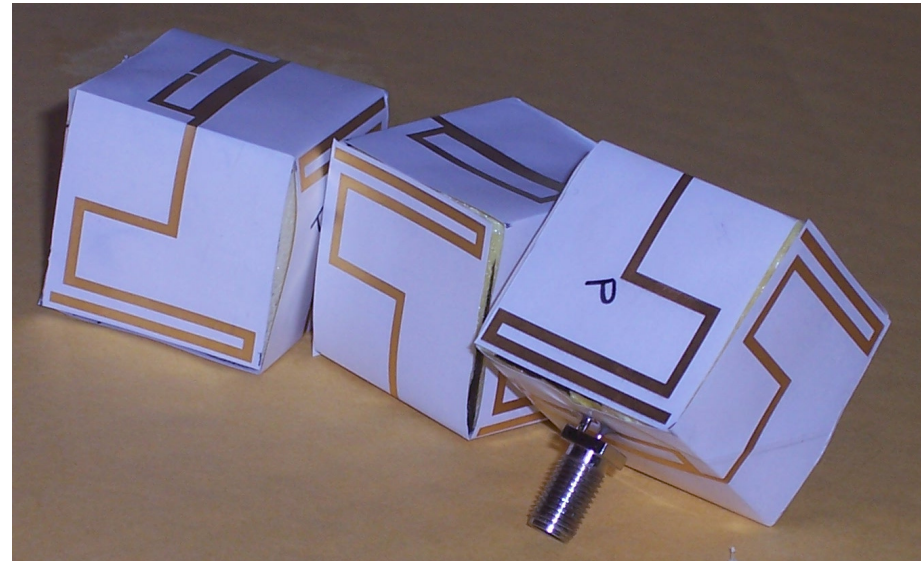


- Thin LCP material for cube
- Low-cost: printed and then folded into three-dimensional shape
- Easily re-designable for any chip input impedance to achieve conjugate impedance matching
- Used for RFID and Wireless Sensor Node (WSN) technology
- Omnidirectional Radiation pattern
- Uses all six sides in antenna design



Fabricated Antenna

- Meander line structure on the cube with inductive couple allows for miniaturization of the length of each side and conjugate matching
- Planar designs can be manipulated to have similar characteristics without a directionally-specific orientation
- In certain meander line structures, dual-band performance is achieved



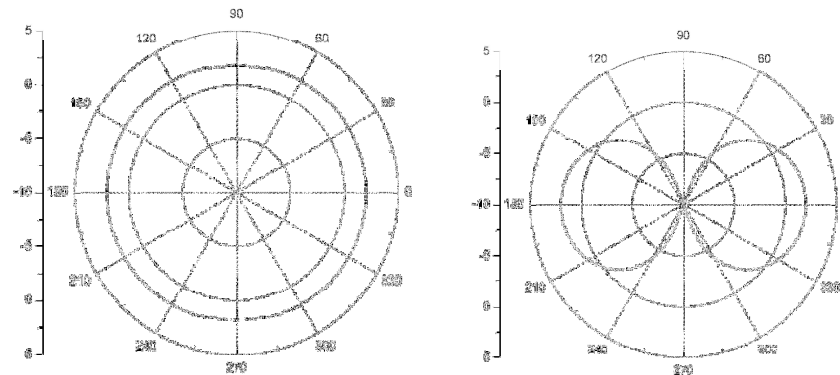
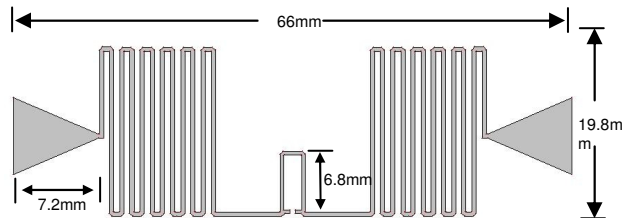
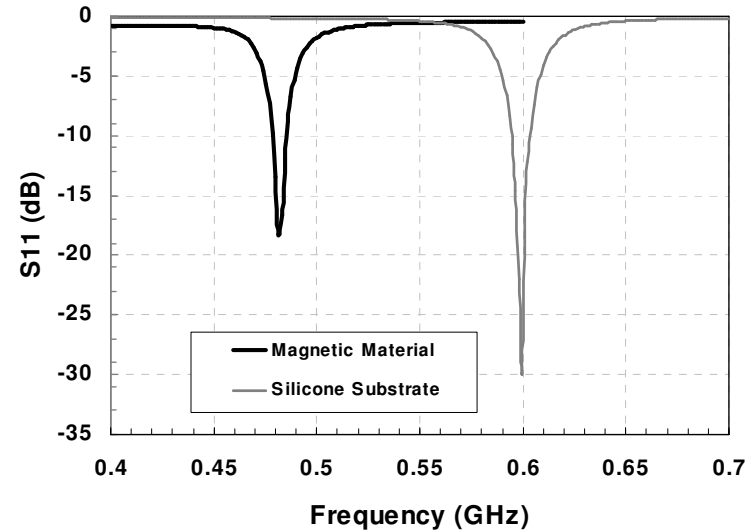
New Flexible Magnetic Composite Material

	<i>mean</i>	<i>Lower CI</i>	<i>Upper CI</i>
ϵ_r	7.142	7.083	7.201
μ_r	2.463	2.457	2.468
$\tan\delta_e$	0.0017	0.0005	0.0028
$\tan\delta_m$	0.0391	0.0358	0.0424

- Magnetic composite
 - fabricated from 40 vol% BaCo ferrite powder in Dow Corning Sylgard 184 silicone
 - produced with a mixer at 240 rpm and 110°C for 30 minutes
- 95% CI (Confidence Interval) for mean of ϵ_r , μ_r , $\tan\delta_e$ and $\tan\delta_m$ based on 5 measurements
- h (substrate thickness) = 1.3 mm

RFID tag on magnetic composite

- Antenna designed for UHF RFID band = 480 MHz
- Miniaturization concept proven by comparing the resonant frequency of the pure silicone design vs. composite
- Silicone $f_{res} = 6$ GHz
- Composite $f_{res} = 480$ MHz
- Miniaturization factor = 1.25
- For structures with ground plane even further miniaturization



Conformal performance

- Antenna bent for conformal performance analysis
 - Foam cylinder 54 mm in diameter
 - Slight downshift in frequency of 6 MHz
- Medical monitoring and pharma applications

