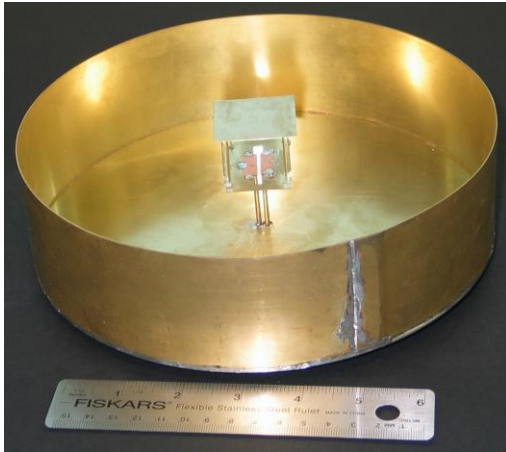


# Novel Broadband and Multi-band Antennas for Satellite and Wireless Applications

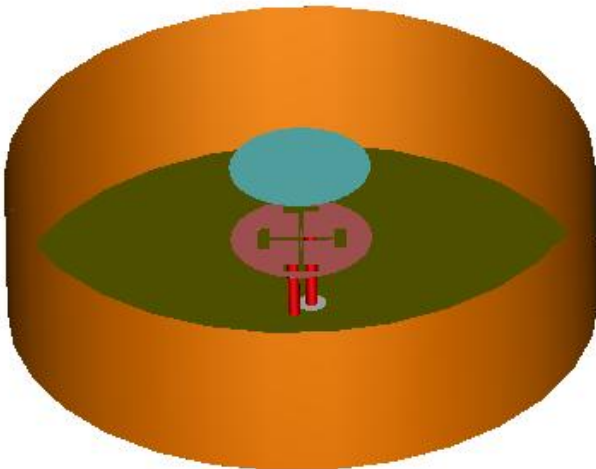
The objective of our research is to develop novel antenna structures for broadband and/or multi-band satellite and wireless applications (such as 3G, 4G, WiFi, WiMax, and DVB-H). Here we demonstrate a number of antennas which have been developed in our group for recent years, including: (1) A broadband short backfire antenna excited by an unbalance-fed H-shaped slot; (2) A simply fed broadband short backfire antenna; (3) A single-fed circularly polarized short backfire antenna; (4) Two broadband circularly polarized loop antennas; (5) A broadband cavity-backed slot/strip antenna; (6) A compact broadband antennas for GPS, DCS-1800, IMT-2000, and WLAN applications; (7) A low-profile planar antenna for DVB-H (8) a quad-band switchable antenna and (9) a quad band expanded array.

## Broadband Short Backfire Antenna Excited by an Unbalance-fed H-Shaped Slot



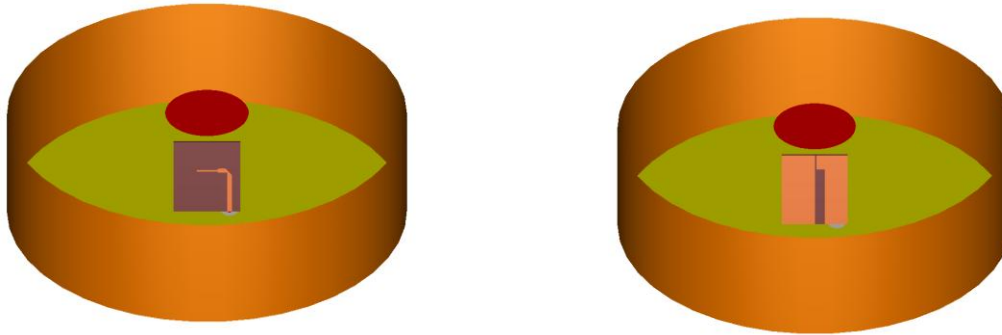
This antenna achieves a bandwidth of ~20% with a gain of ~15 dBi, which can find applications for wireless and satellite communications.

## Single-Fed Circularly Polarized Short Backfire Antenna



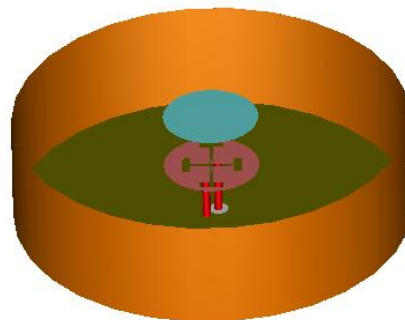
This antenna achieves circularly polarized radiation with a single feed. The antenna has a perfect impedance matching ( $VSWR < 1.2$ ) and a gain of ~15 dBi, which may find applications in wireless and satellite communications.

## Simply Fed Broadband Short Backfire Antenna



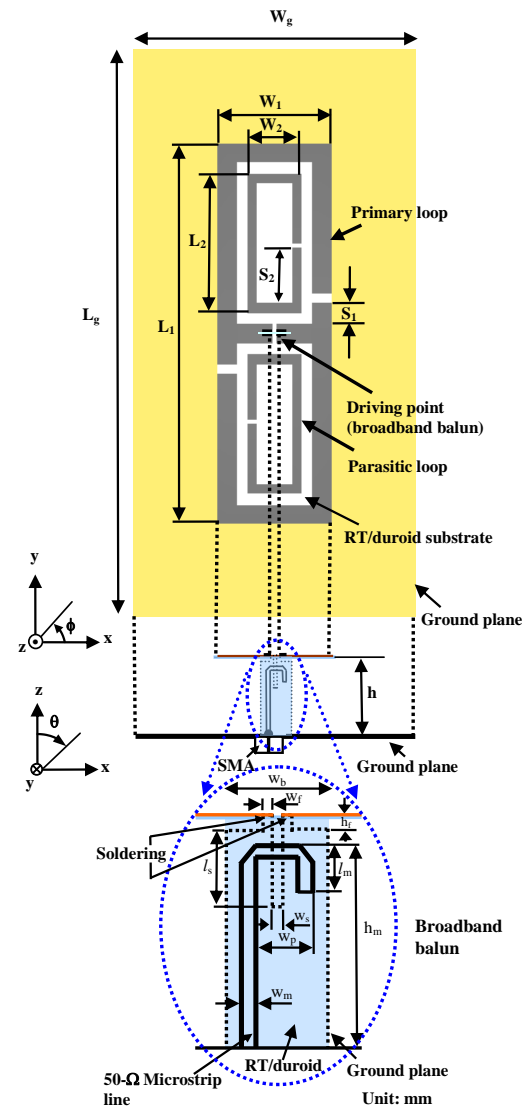
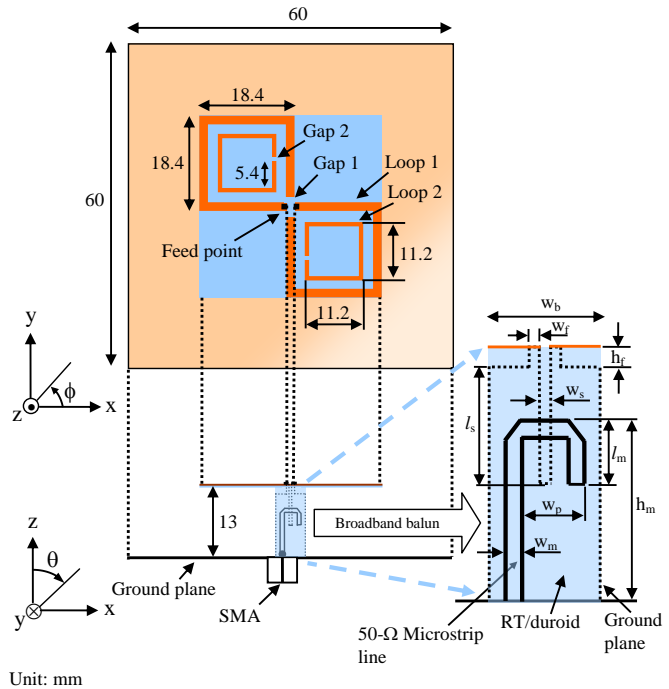
This antenna has a simple feeding structure. The antenna achieves a bandwidth of  $\sim 14\%$  with a gain of  $\sim 15$  dBi, which may find applications for WiMax and satellite communications.

## Single-Fed Circularly Polarized Short Backfire Antenna



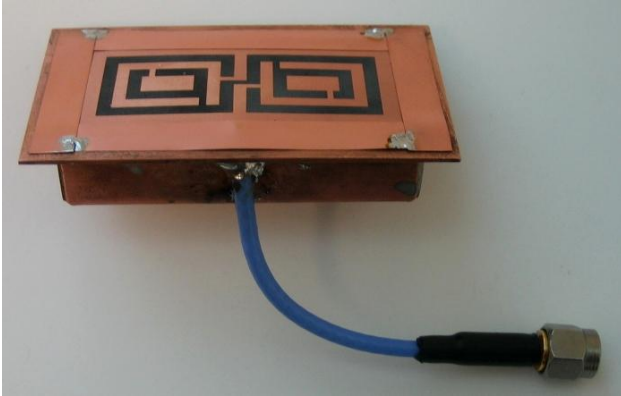
This antenna achieves circularly polarized radiation with a single feed. The antenna has a perfect impedance matching ( $VSWR < 1.2$ ) and a gain of  $\sim 15$  dBi, which may find applications in wireless and satellite communications.

# Broadband Circularly Polarized Loop Antennas



These antennas achieve broadband circularly polarized radiation. The antennas have a bandwidth of wider than ~30% with good impedance matching and a gain of ~10 dBi, which may find applications in base stations and satellite communications.

## Broadband Cavity-Backed Slot/Strip Antenna



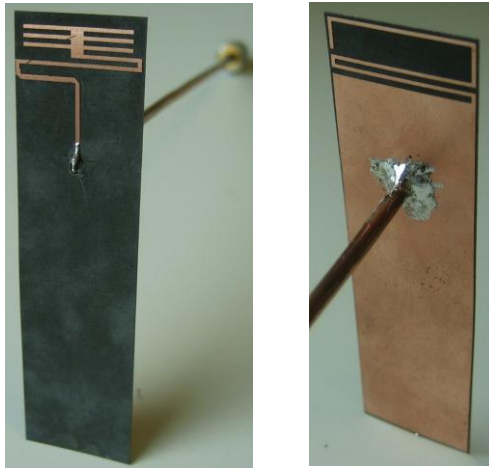
This antenna achieves broadband circularly polarized radiation with a coplanar feed. The antenna has a bandwidth of ~20% and a gain of ~9 dBi, which may find applications in airborne/high-speed vehicles and satellite communications.

## Compact Broadband Antennas for GPS, DCS-1800, IMT-2000, and WLAN Applications



This is a broadband planar antenna, which achieves a bandwidth of ~50%. The antenna has a height of 7.2 mm, which may find applications for wireless handsets.

## Compact Broadband Antennas for GPS, DCS-1800, IMT-2000, and WLAN Applications



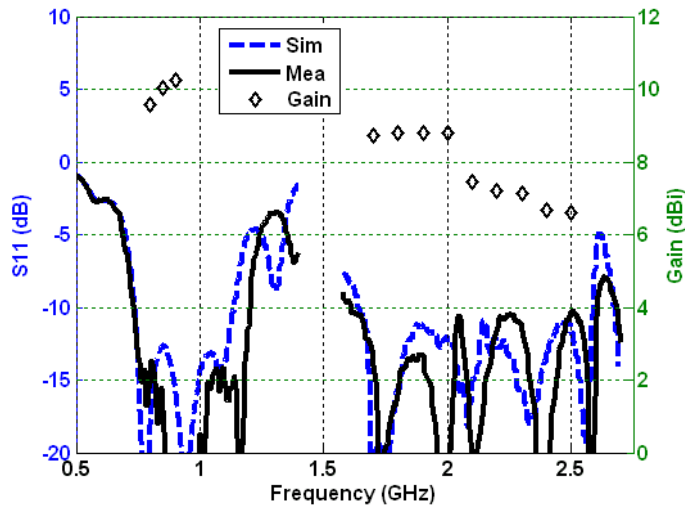
## Low-Profile Planar Antennas for DVB-H Applications



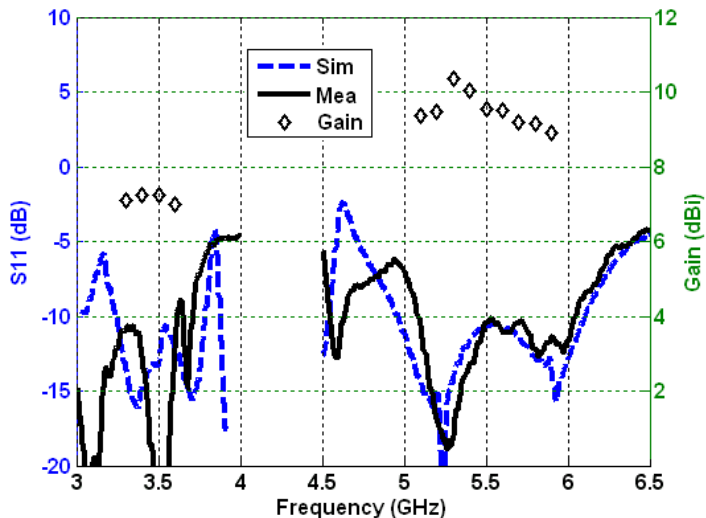
This is a broadband planar antenna, which achieves a bandwidth of ~50%. The antenna has a height of 7.2 mm, which may find applications for wireless handsets.

This is a low-profile broadband planar antenna for DVB-H handhelds. The antenna achieves a gain 3-dB higher than the specification.

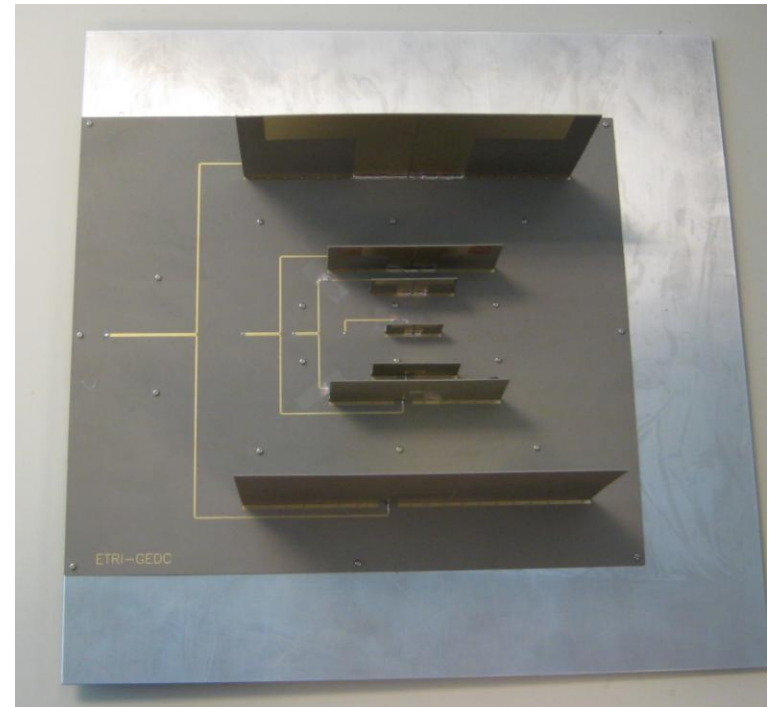
# Quad Band Switchable Antenna



Simulated and measured return loss with measured gain of the quad-band antenna element in B1 and B2.

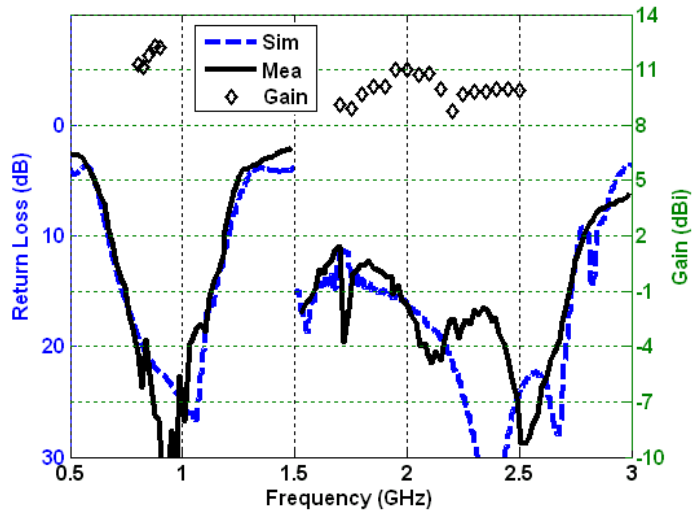


Simulated and measured return loss with measured gain of the quad-band antenna element in B3 and B4.

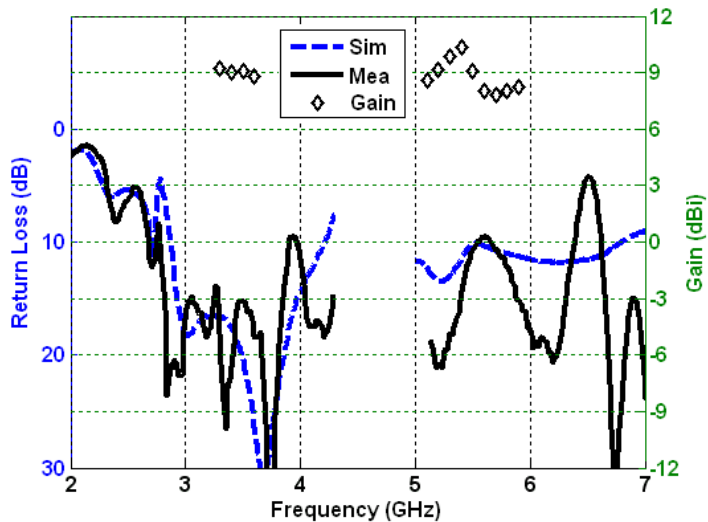
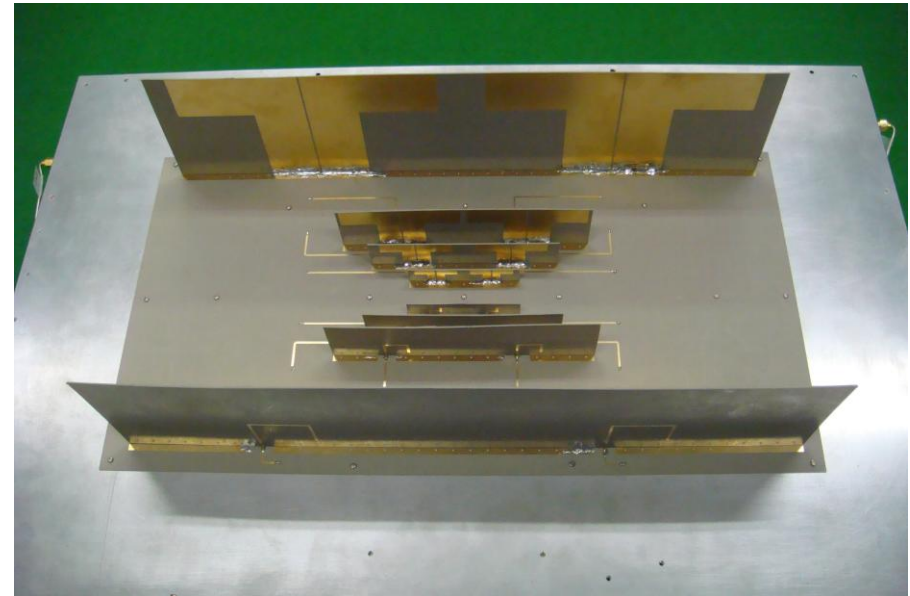


The switchable quad band antenna element covers existing standards under B1 (800-900 MHz), B2 (1.7-2.5GHz), B3 (3.3-3.6GHz), and B4 (5.1-5.9 GHz). It achieves a >10dB return loss and a broadside gain of 7-9dBi making it suitable for a base stations building block.

# Quad Band Expanded Array



Measured and simulated return loss with measured gain of the quad-band antenna array in B3 and B4.

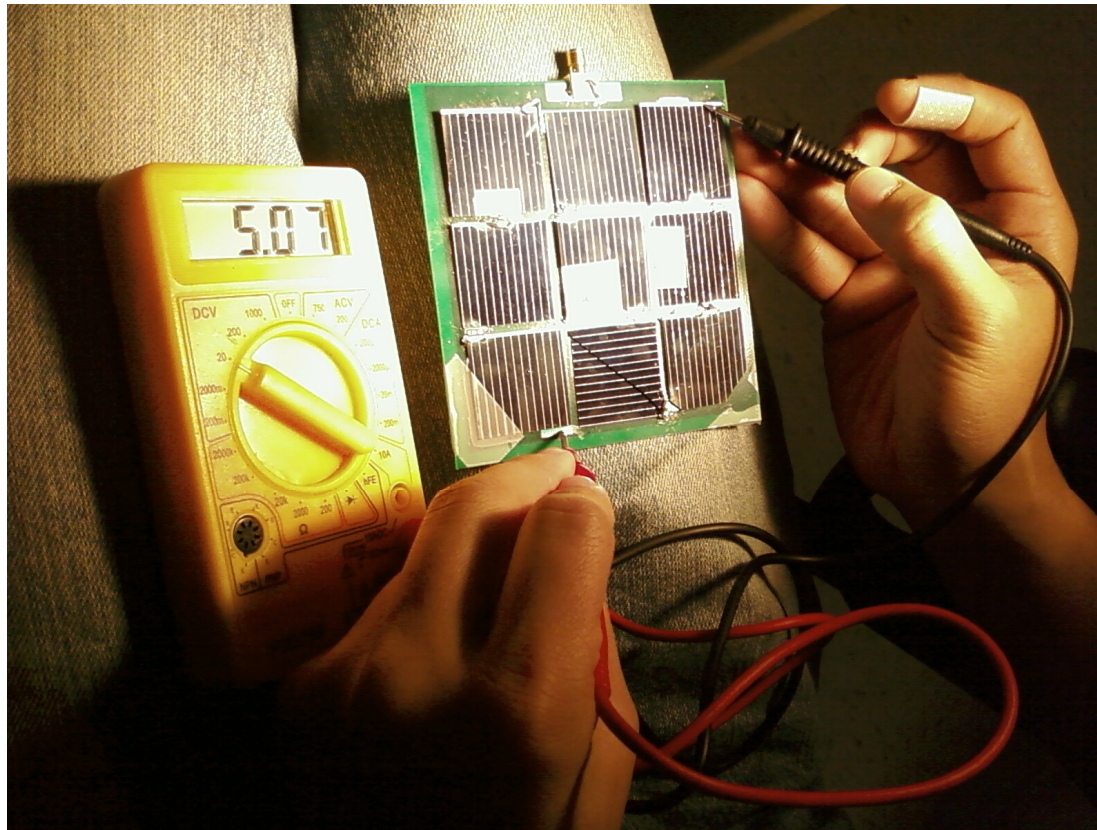


Measured and simulated return loss with measured gain of the quad-band antenna array in B3 and B4.

The quad band array covers the same frequency and shows good impedance bandwidth while achieving 9-11dBi of gain. This allows further array implementation and beam tilting mechanism for base station operation.

# OmniSolant

- The omnidirectional solar antenna integrates a planar antenna with compact solar cell circuitry. This eliminates the use of vertically positioned monopole antenna. Based on the size of the solar cell, this topology can support power harvesting and communication required for Wireless Sensor Nodes and WiFi.



- This is the measured antenna radiation at 2.4GHz.

