

# Printed Antennas for Space Applications and Base Stations



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## Aims

- ✓ Base station antennas with reconfigurable beams for GSM1800-UMTS, WLL-3.5 GHz and LMDS 10.5 GHz.
- ✓ Advanced circuit development to control and combine RF signals
- ✓ To study and demonstrate reflectarray concepts for beam reconfiguration.
- ✓ Development of contoured beam reflectarrays for DBS space antennas
- ✓ Design, manufacture and test multi-beam reflectarrays for LMDS central station antennas at 26 GHz

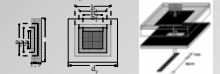
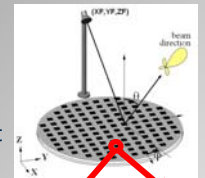
## Team:

- ✓ 2 Full professors
- ✓ 1 Associate Professor
- ✓ 3 Phd students

## Antenna configurations:

### Reflectarray:

- Array of patches printed on a grounded substrate
- The phase of reflected field is controlled with the patch or line dimensions at each element
- Two types of elements are considered:
  - Stacked patches of varying size
  - Patches with aperture-coupled lines

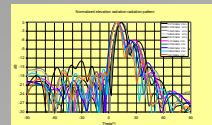
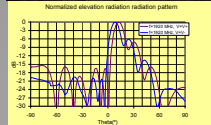
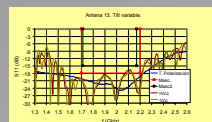


### Lineal array components:

- Radiating elements:
  - Slot coupled stacked patches
  - Wideband  $\approx 25\%$
  - Low cost, low losses
- Wideband feeding network
- Butler Matrix
- Dual polarization radiating element
  - Phase sifters
  - Multiplexer

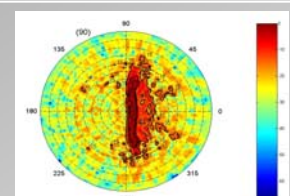


## Results

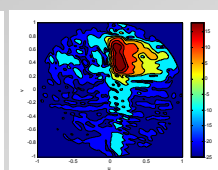
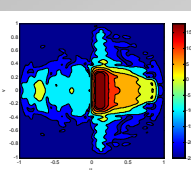
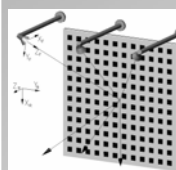


Frequency: 1700 MHz-2200MHz. 2 switchable tilt positions with  $\pm V_{cc}$ . Shaped elevation pattern.

### Two tilt positions antenna

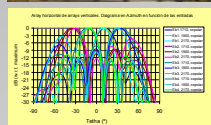
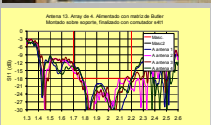


Frequency: 24-26 GHz  
Sector beam:  $90^\circ$  in azimuth and cosec<sup>2</sup> in elevation



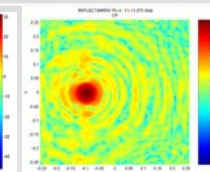
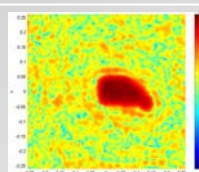
3 sector beams:  $30^\circ$  in azimuth and cosec<sup>2</sup> in elevation

### LMDS Base Station Antenna



Frequency: 1700 MHz-2200MHz.  
4 simultaneous beams or switchable beam.  
Shaped elevation pattern with two tilt positions.

### Multibeam base station antenna



Demonstrator

H polarization

V Polarization

Different coverage for each polarization  
Frequency: 11.45-12.75 GHz      Polarization: dual linear

### 1-m breadboard for DBS antenna