



Research Consortium in Speckled Computing

Antennas for Specknet

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Introduction

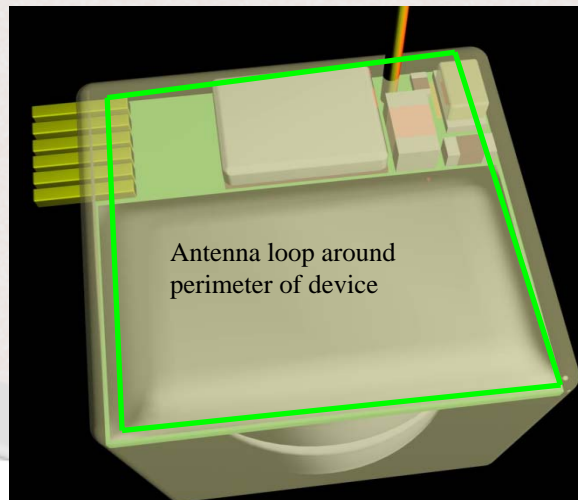
- The loop antenna 8 & 14 GHz
- The patch antenna at 24 GHz (linear and CP)
- Conclusion

Miniaturisation trade offs

- Reduced efficiency (or Gain).
- Shorter range.
- Smaller useful bandwidth.
- Increased sensitivity to external factors.
- Hence more critical tuning.

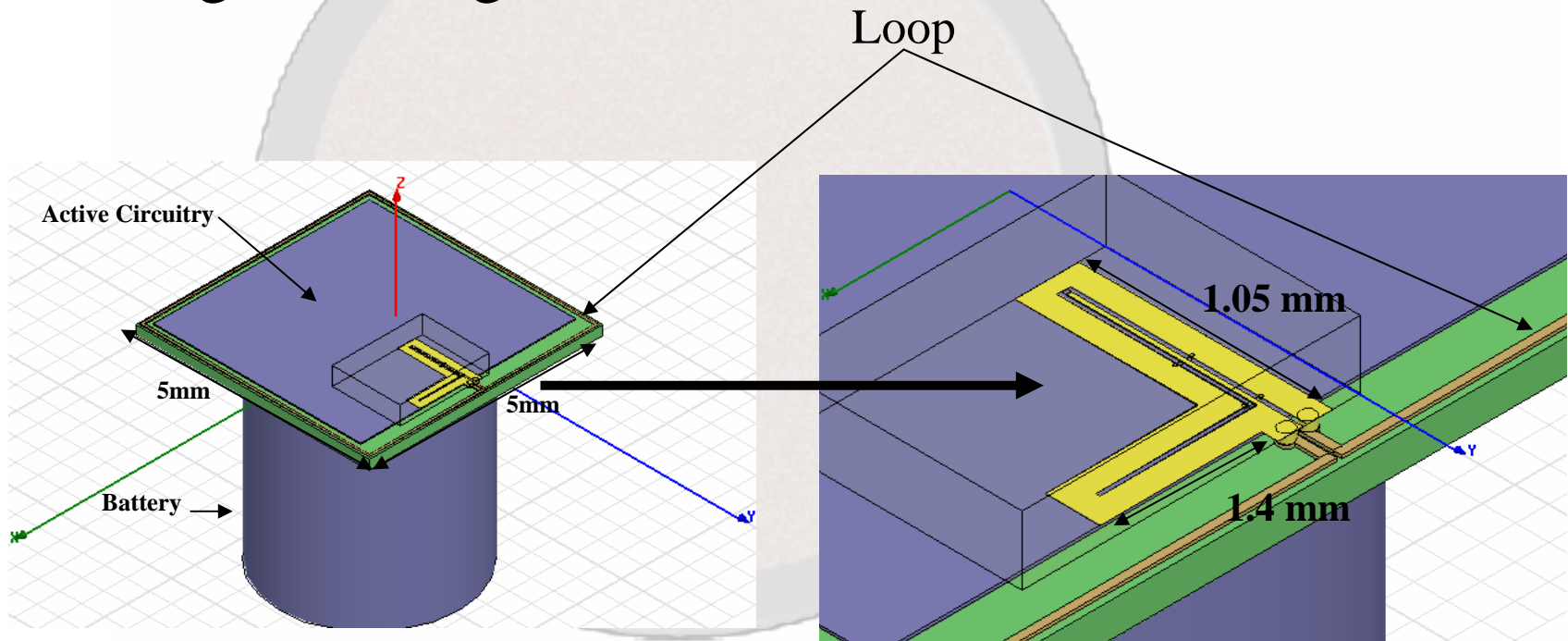
The Loop Antenna

- Simple antenna
- Active devices within antenna footprint
- Designs for 8 GHz and 14 GHz



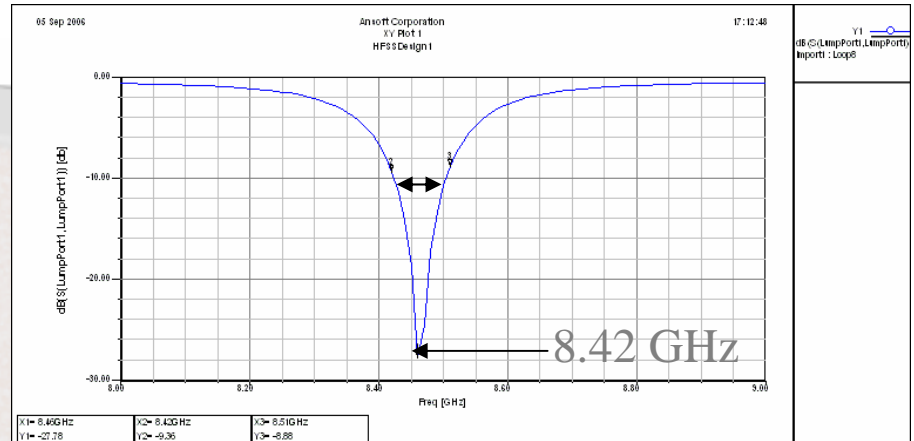
Loop Antenna @ 8 GHz

- Differential feed
- CPW to Slotline transition
– big matching stub

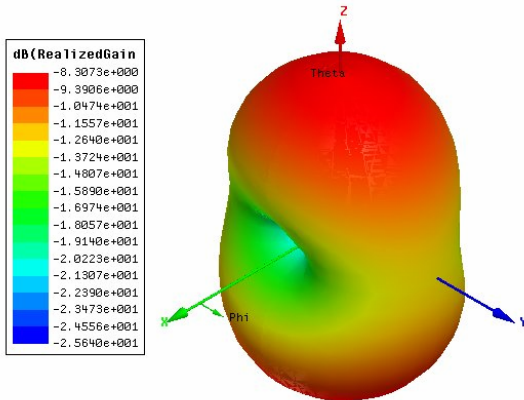


Loop Antenna @ 8 GHz

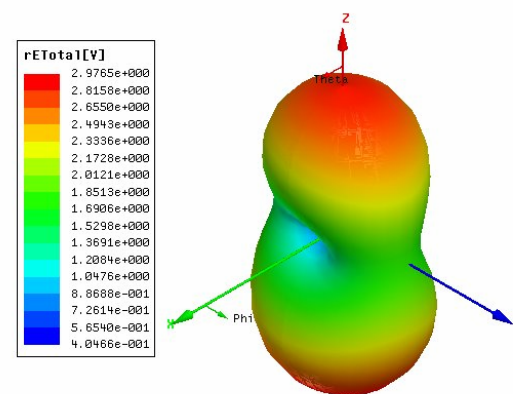
- $RL = -27.78 \text{ dB @ } 8.42 \text{ GHz}$
- $BW = 90 \text{ MHz}$
- Poor Efficiency (4%) due to metallisation (60% without).



Return Loss (dB)



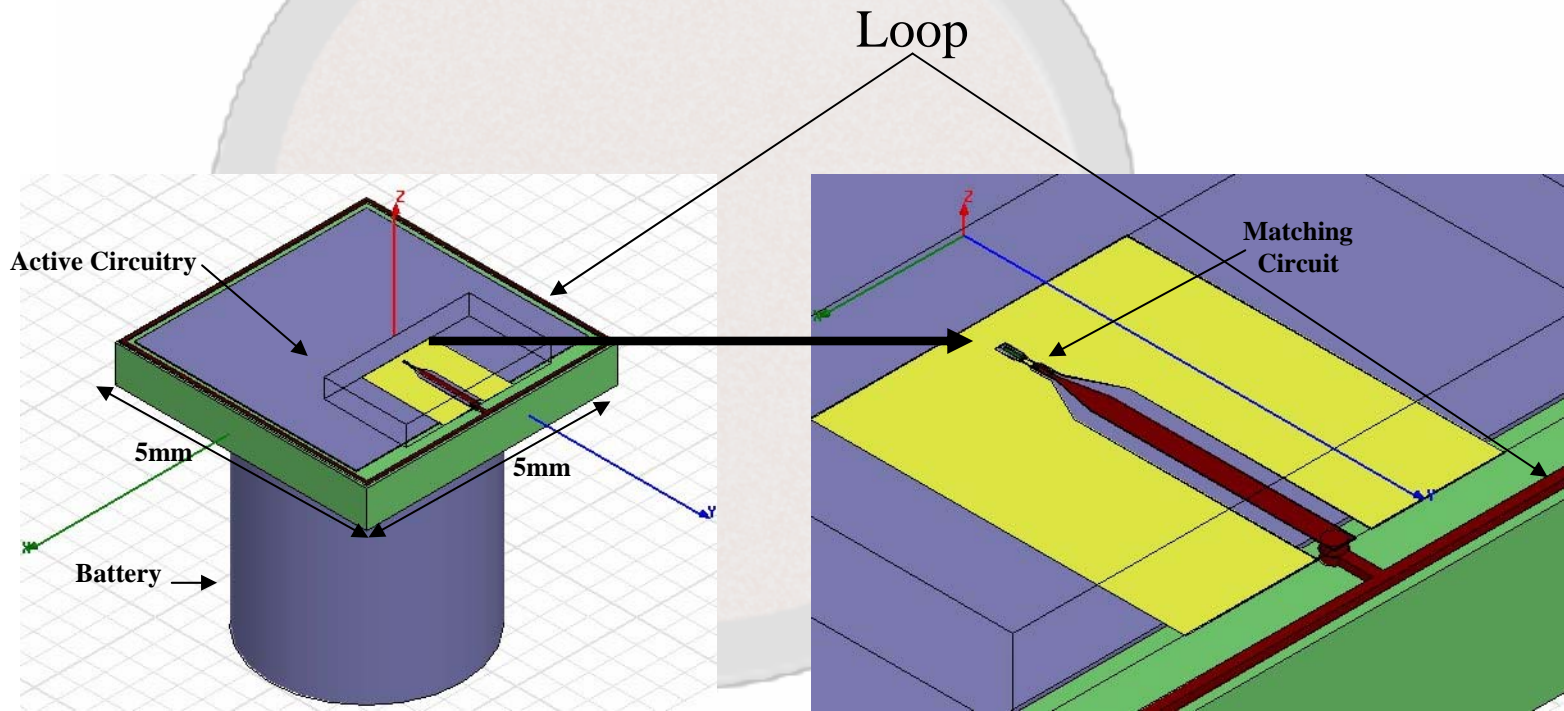
3D Plot of Gain (dB)



3D Plot E-field (dB)

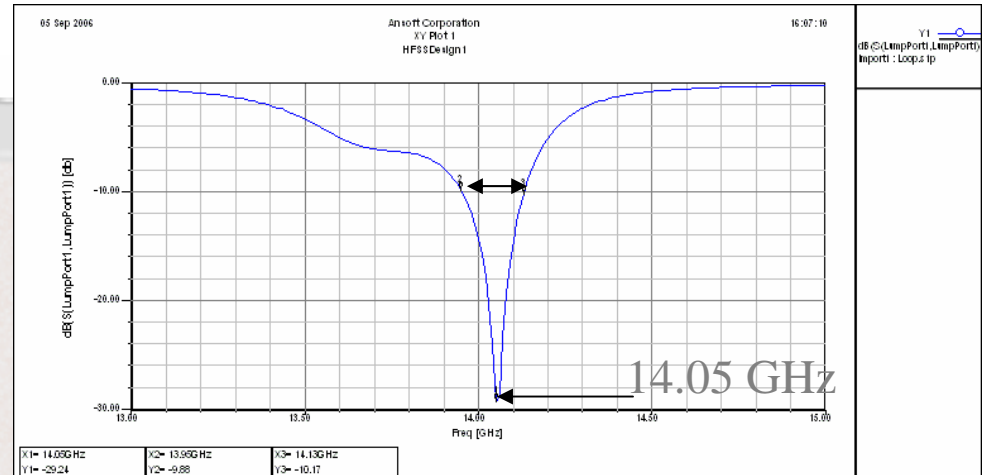
Loop Antenna @ 14 GHz

- Single feed using capacitive coupling to GND
- Matching using discrete components-much smaller size

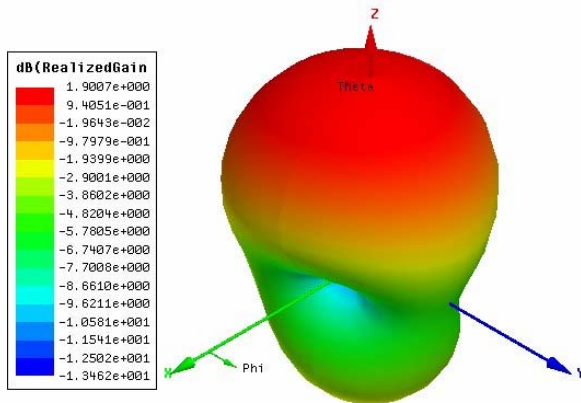


Loop Antenna @ 14 GHz

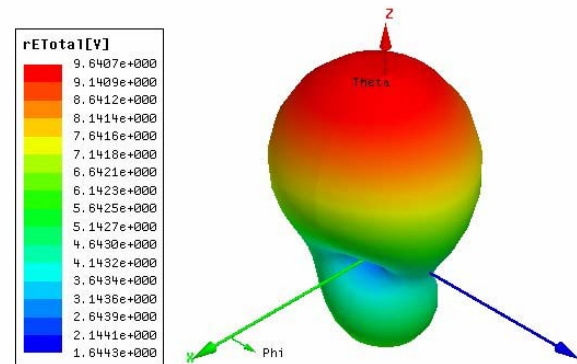
- $RL = -29.24 \text{ dB @ } 14.05 \text{ GHz}$
- $BW = 180 \text{ MHz}$
- $Eff = 46\%$



Return Loss (dB)



3D Plot of Gain (dB)



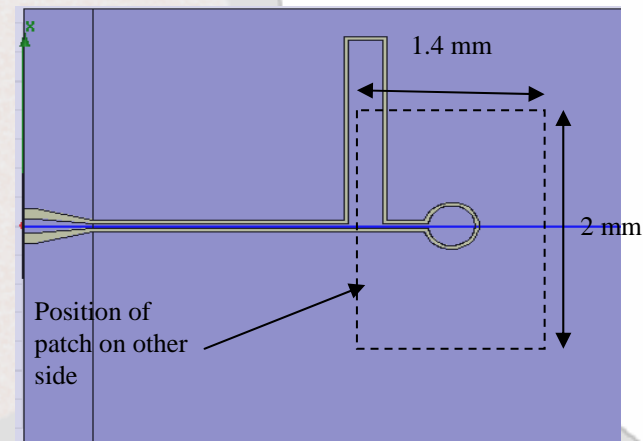
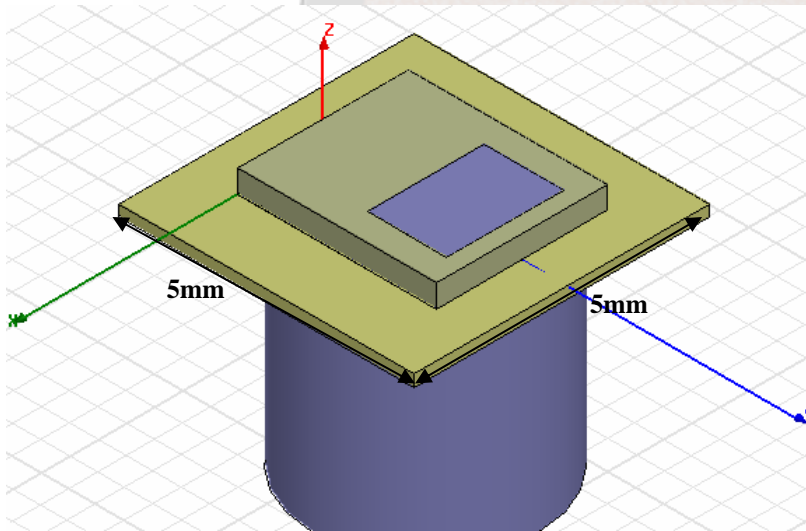
3D Plot E-field (dB)

Patch Antenna

- At 24 GHz dimensions are small (1.4 mm x 2 mm)
- Antenna on other side of active circuitry
- Potential for Circular Polarisation

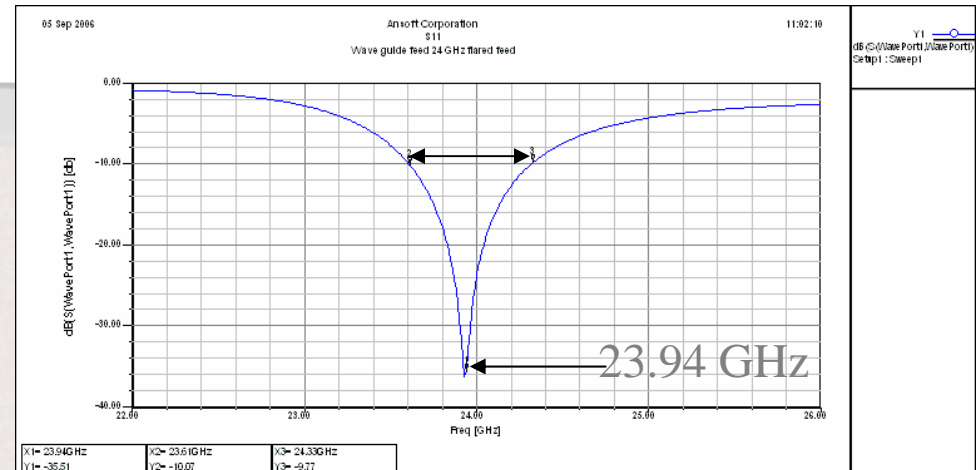
Patch Antenna

- Electromagnetic coupled feed
- Active circuitry on underside

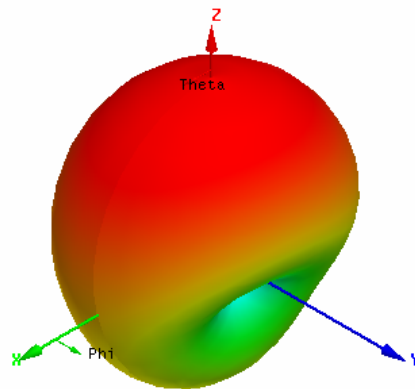
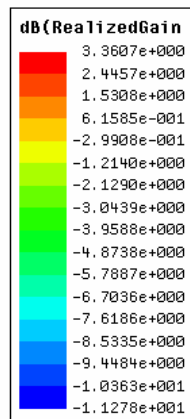


Patch Antenna

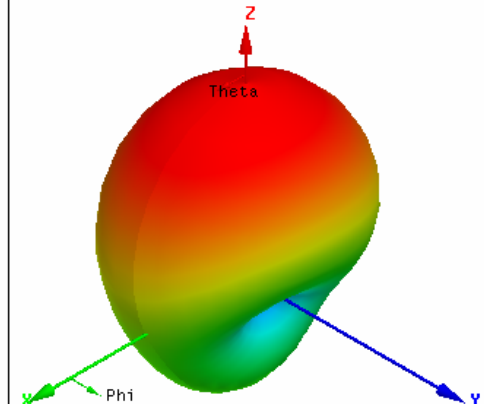
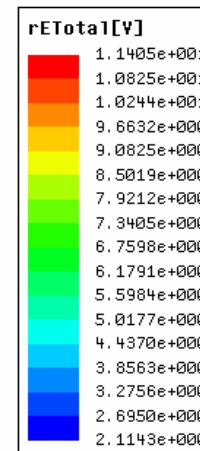
- $RL = -35$ @ 23.94 GHz
- $BW = 720$ MHz
- $Eff = 86\%$



Return Loss (dB)



3D Plot of Gain (dB)



3D Plot of E-Field

Future Work / Conclusions

- Final testing of antennas about to begin
- Circularly Polarised patch still in design process
- Antenna designs fulfil Specknet requirements