Manufacturing, packaging and assembly of advanced and highly integrated electronics for 5G SOTM application

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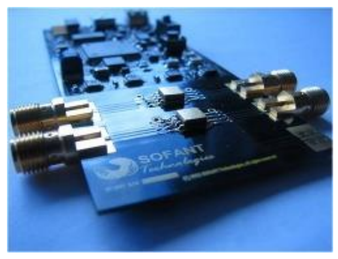
1. Introduction

5G SOTM Market requirements

- Watching video on the move (i.e. trains, vehicles, etc.)
- Frequency scaled up: 28 GHz TX; 20 GHz RX (i.e. US & South Korea)
- High Data rate
- Smart & relatively compact Antennas [1-2]

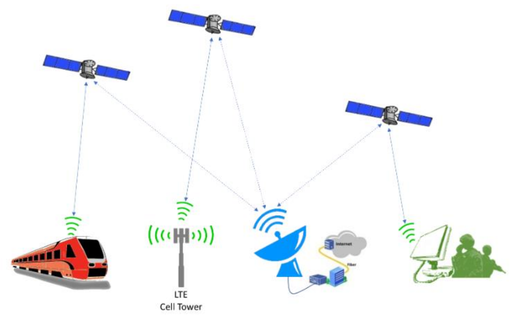
Sofant MEMS technology

- CMOS compatible RF MEMS device
- Low loss
- Low cost
- Configurable [3]



Outcome

- Reconfigurable Phased Array for 5G SOTM application
- Electronically steerable
- Low power consumption.
- Compact



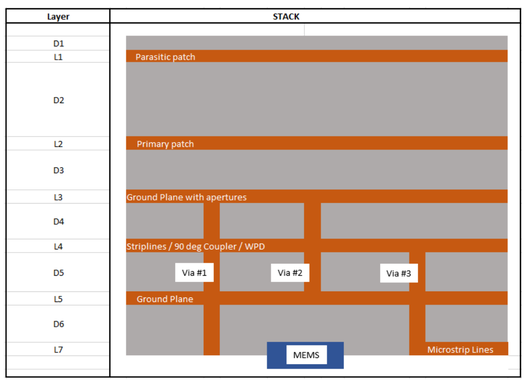
Research Challenges

- High yield/Low cost Stack
- High Integration
- Antenna Design
- Interconnection Problems

2. Today's Mobile Satellite terminals

- Dish antennas
  - Complex mechanically
  - Heavy
  - Power Consuming
- Conventional electronic arrays
  - Amplifiers at each antenna element [4]

3. Proposed Stack & Integration

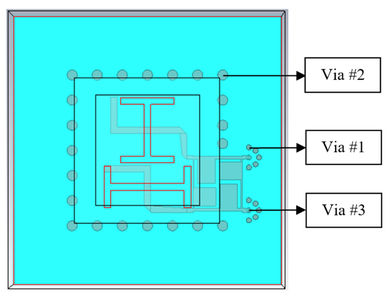


PCB Layers description

- L1:L7 → Copper
- D6:D1 → Substrate

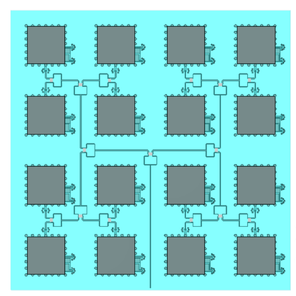
4. Proposed Design and performances

Specs	Freq.	Refl. Coeff.	Polarization	AR	Scanning
	18 – 20 GHz	-10 dB	Dual CP	< 3 dB	+/- 40 deg

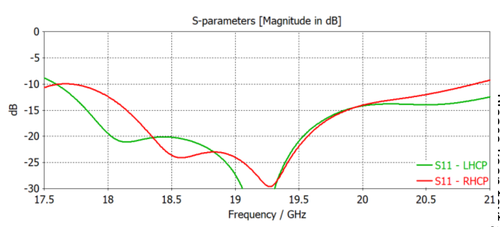


Unit Cell Design

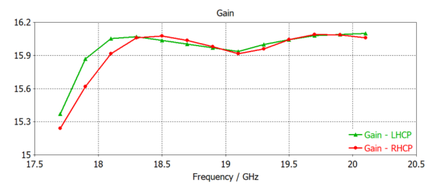
4 x 4



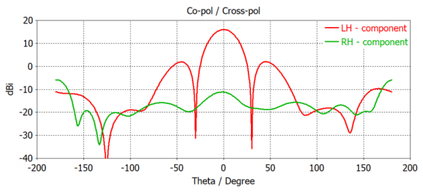
4x4 Subarray



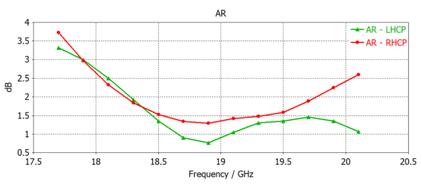
Reflection coefficient



Gain



Radiation pattern



Axial Ratio

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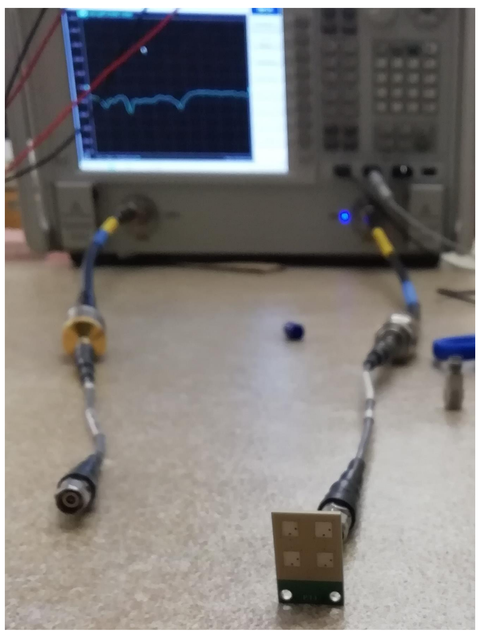
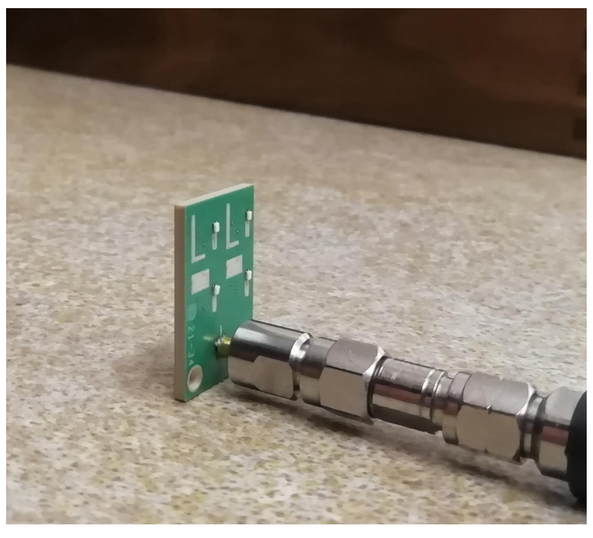
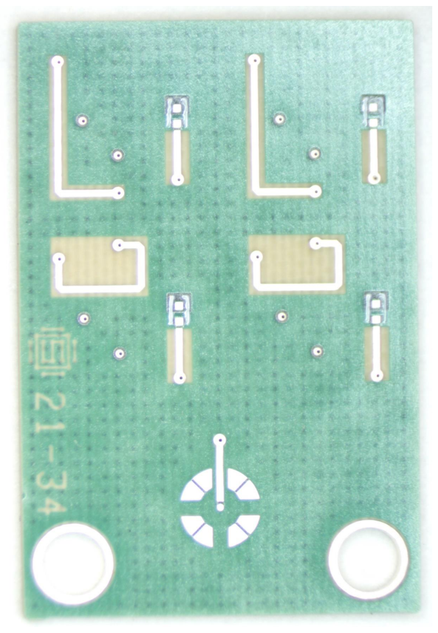
5. Testing Setup of the proposed Prototype (2x2 Array)







6. Future Work

- Increase the design robustness
- Second Tape-Out
- Phased Array Antenna Calibration

7. References

[1] Granet, C., Kot, J. S., & Ness, J. (2019, March). Wideband Ka-Band SATCOM-On-The-Move Antenna Concept: Preliminary Design Study. In 2019 13th European Conference on Antennas and Propagation (EuCAP) (pp. 1-5). IEEE.
[2] Al-Saedi, H., Abdel-Wahab, W. M., Raeis-Zadeh, S. M., Alian, E., Palizban, A., Ehsandar, A., ... & Safavi-Naeini, S. (2018, August). Active Phased-Array Antennas for Ka/K Mobile Satellite Communications. In 2018 18th International Symposium on Antenna Technology and Applied Electromagnetics (ANTEM) (pp. 1-3). IEEE.
[3] Shifter, R. M. P., & Attenuator, R. M. S. White Paper RF MEMS based Passive Smart Antenna Array.
[4] Luo, Q., & Gao, S. (2017, March). Smart antennas for satellite communications on the move. In 2017 International Workshop on Antenna Technology: Small Antennas, Innovative Structures, and Applications (iWAT) (pp. 260-263). IEEE.

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