

Base Station and Wearable Antennas

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Introduction

Base station antennas

- ❖ Wideband/ UWB operation to support different wireless standards
- ❖ Shared-aperture antenna with multiple bandwidth widening techniques and decoupling methods
- ❖ Dual polarization feeding design with high isolation
- ❖ Optimized to support beam steering capability

Wearable antenna

- ❖ Electrically small wearable antenna for wearable health monitoring device
- ❖ Switchable between different bands and evaluated on body phantom

Objectives / Scope

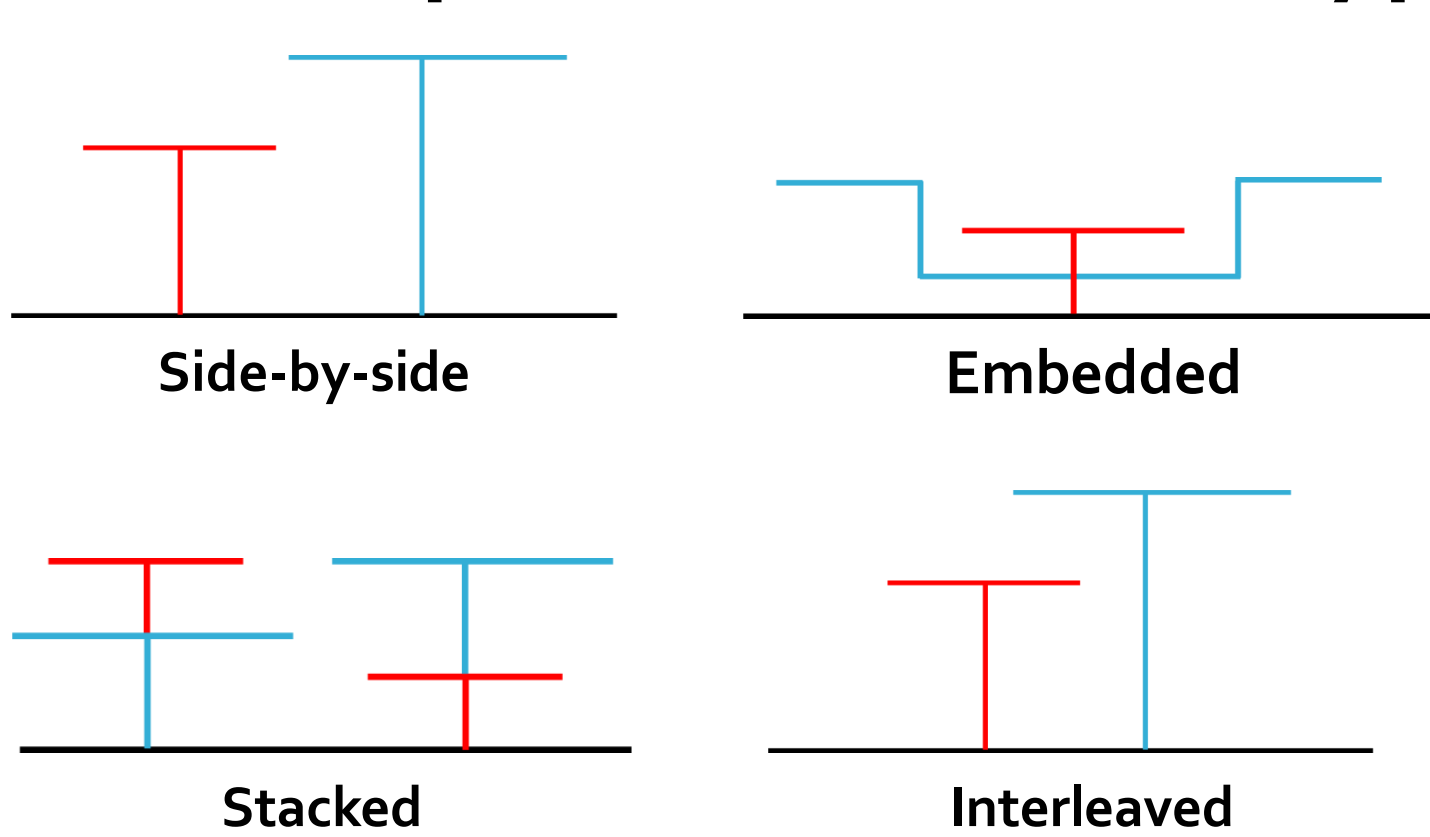
Base station antennas

- ❖ FR1 – UWB, dual-pol @ 2-4.2 GHz
- ❖ FR3 – UWB, dual-pol @ 6-15 GHz
- ❖ FR2 – Dual wideband, dual-pol @ 24-48.2 GHz

Wearable antennas

- ❖ Sub-GHz, 1.7 – 2.2 GHz – switchable
- ❖ Low SAR & restricted size

Shared-Aperture Antenna Types



Shared-Aperture Antenna Advantages

- ❖ Compact size, reduced cost and space
- ❖ Improve the bandwidth

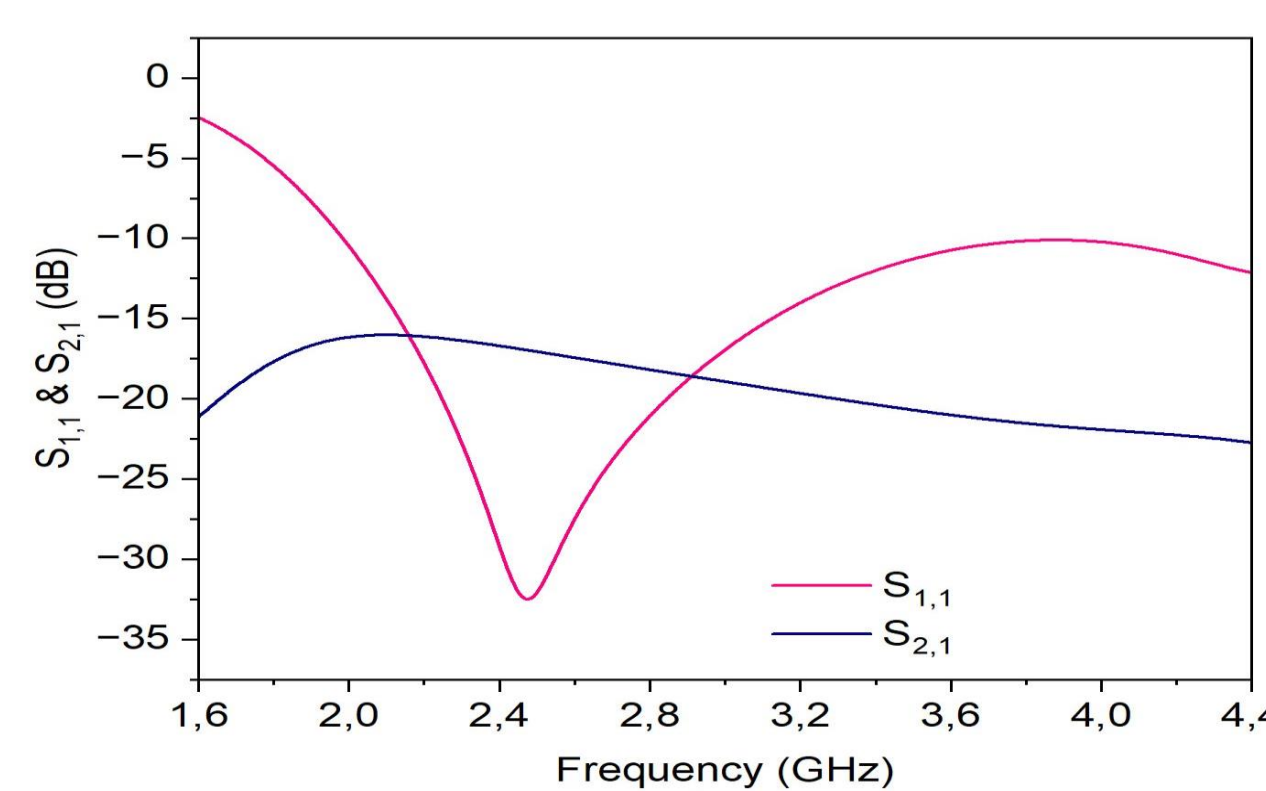
Limitations of Different Schemes

- ❖ Side-by-side: larger size
- ❖ Embedded: small frequency ratio
- ❖ Stacked: high profile
- ❖ Interleaved: scattering

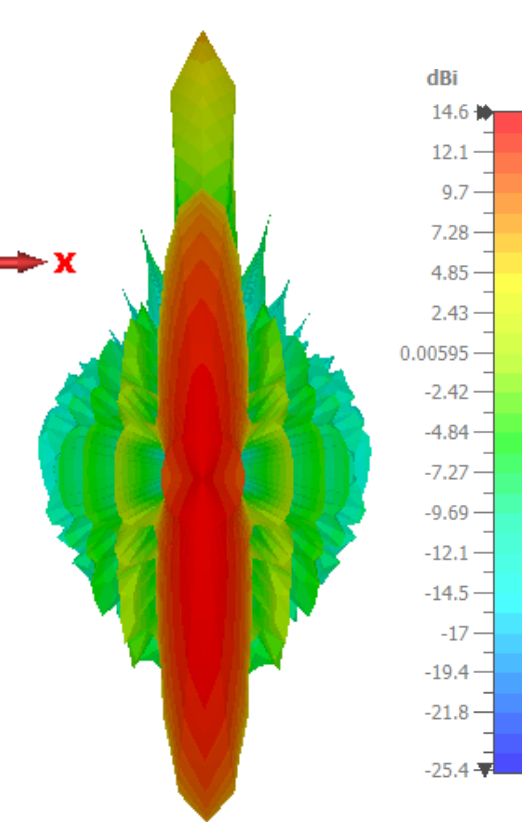
Base Station Antennas

FR1

- ❖ Dual polarized low profile planar UWB FR1 (2-4.2 GHz)
- ❖ 70% impedance bandwidth
- ❖ Array of 8x8 elements
- ❖ Wide angle scanning $\pm 65^\circ$ in E-plane and $\pm 55^\circ$ in H-plane

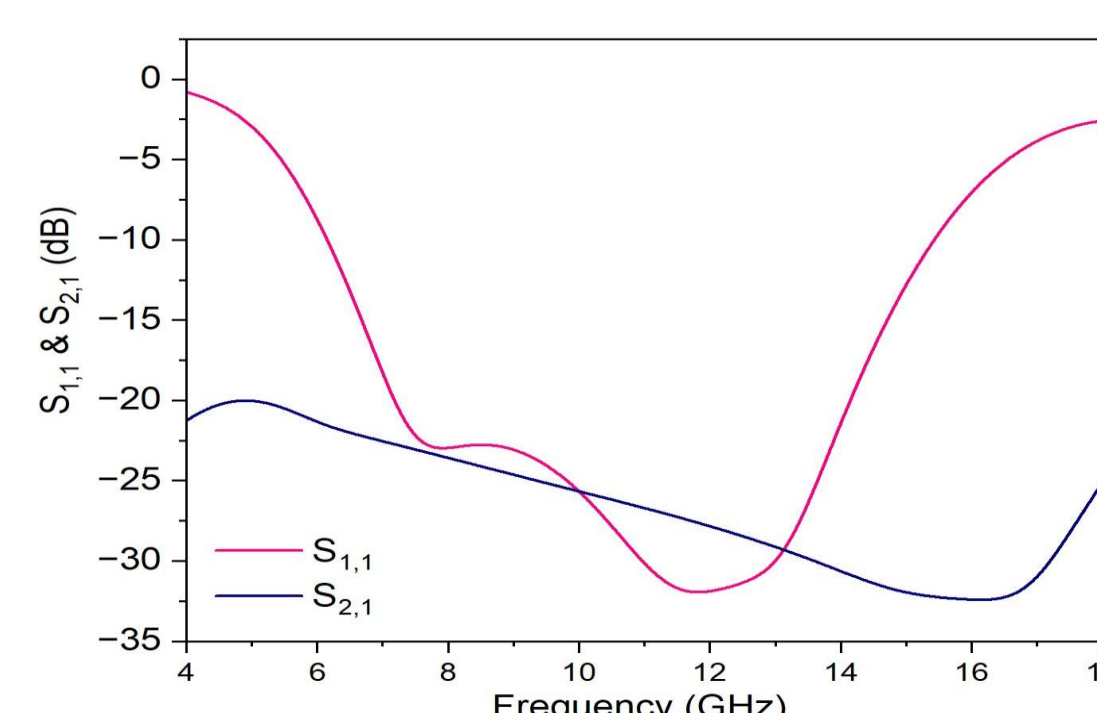


Frequency (GHz)	Array Elements	Gain (dBi)
3-5	16x1	14.5 dBi

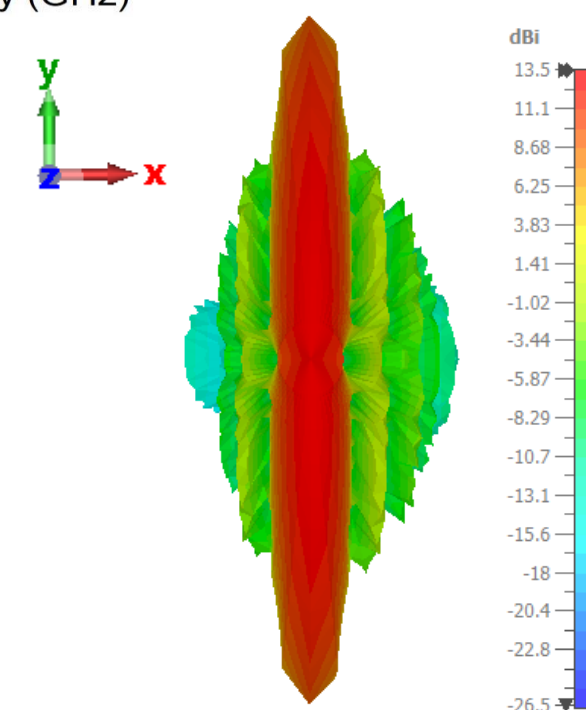


FR3

- ❖ Dual polarized low profile planar UWB FR3 (6-15 GHz)
- ❖ 86% impedance bandwidth
- ❖ Array 16x16 elements
- ❖ Wide angle scanning $\pm 65^\circ$ in E-plane and $\pm 55^\circ$ in H-Plane

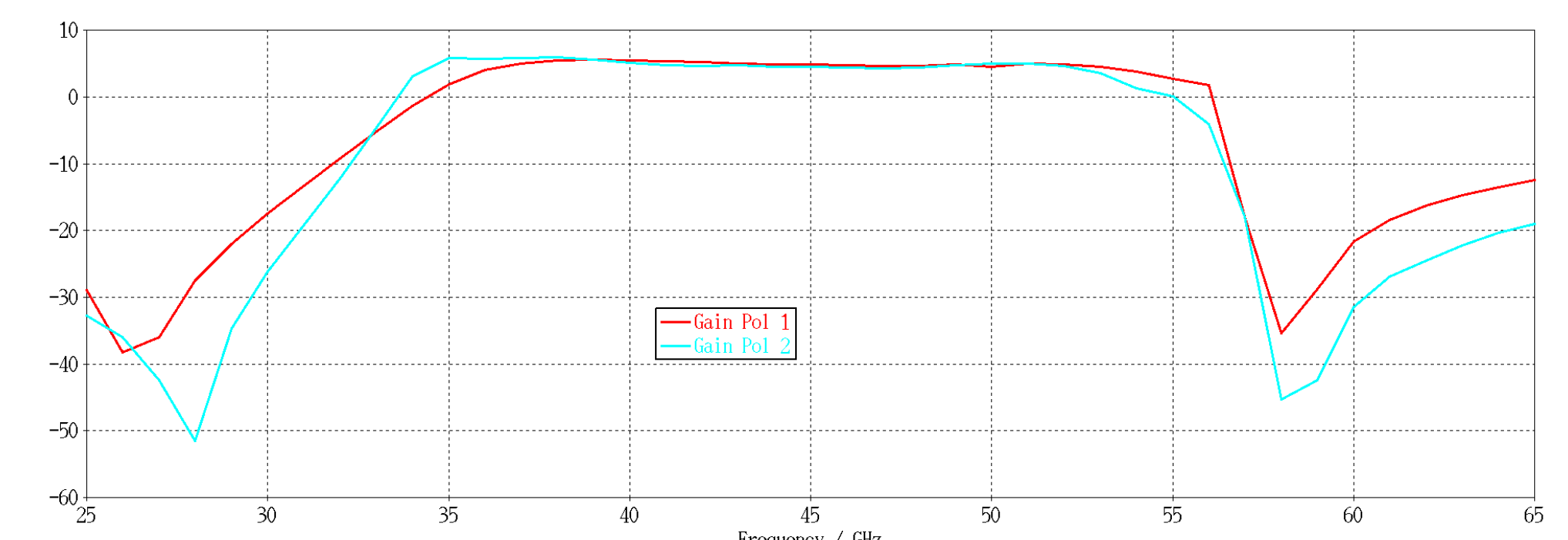
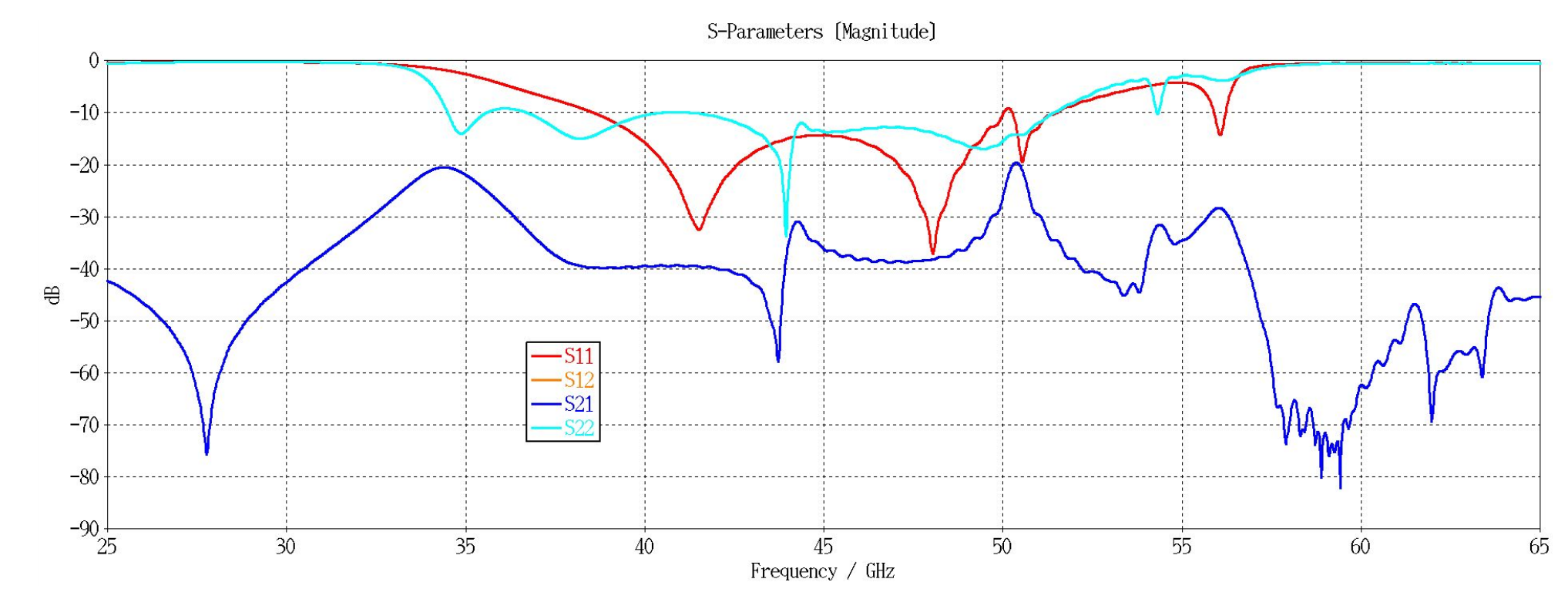


Frequency (GHz)	Array Elements	Gain (dBi)
11	16x1	13.5 dBi

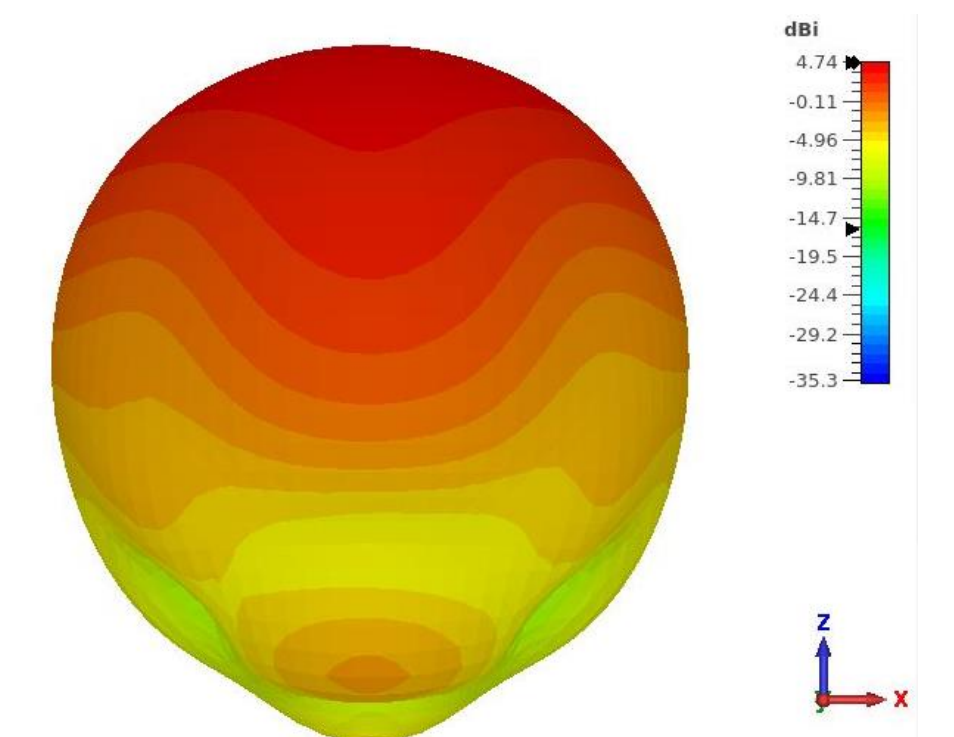


FR2 band for 37-48.2 GHz

- ❖ Dual-polarized high band antenna design to cover upper band FR2-1 for 37-48.2 GHz (26.3%)
- ❖ Single element gain ~ 5 dBi
- ❖ Radiation pattern in broadside
- ❖ Filtering feature with sharp band edges and gain suppression at both bands



Single Element at 43 GHz	
Pol.	Gain (dBi)
1	4.7
2	4.5

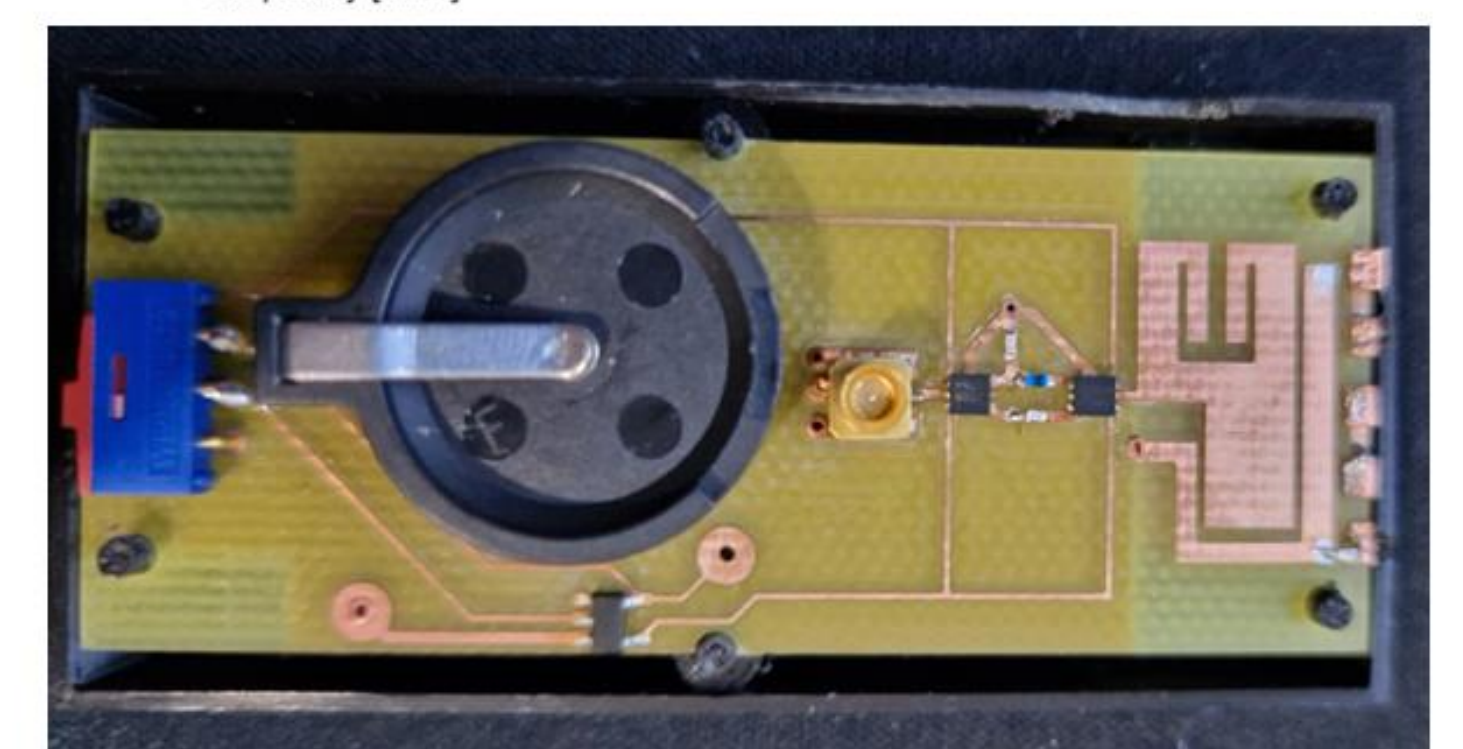
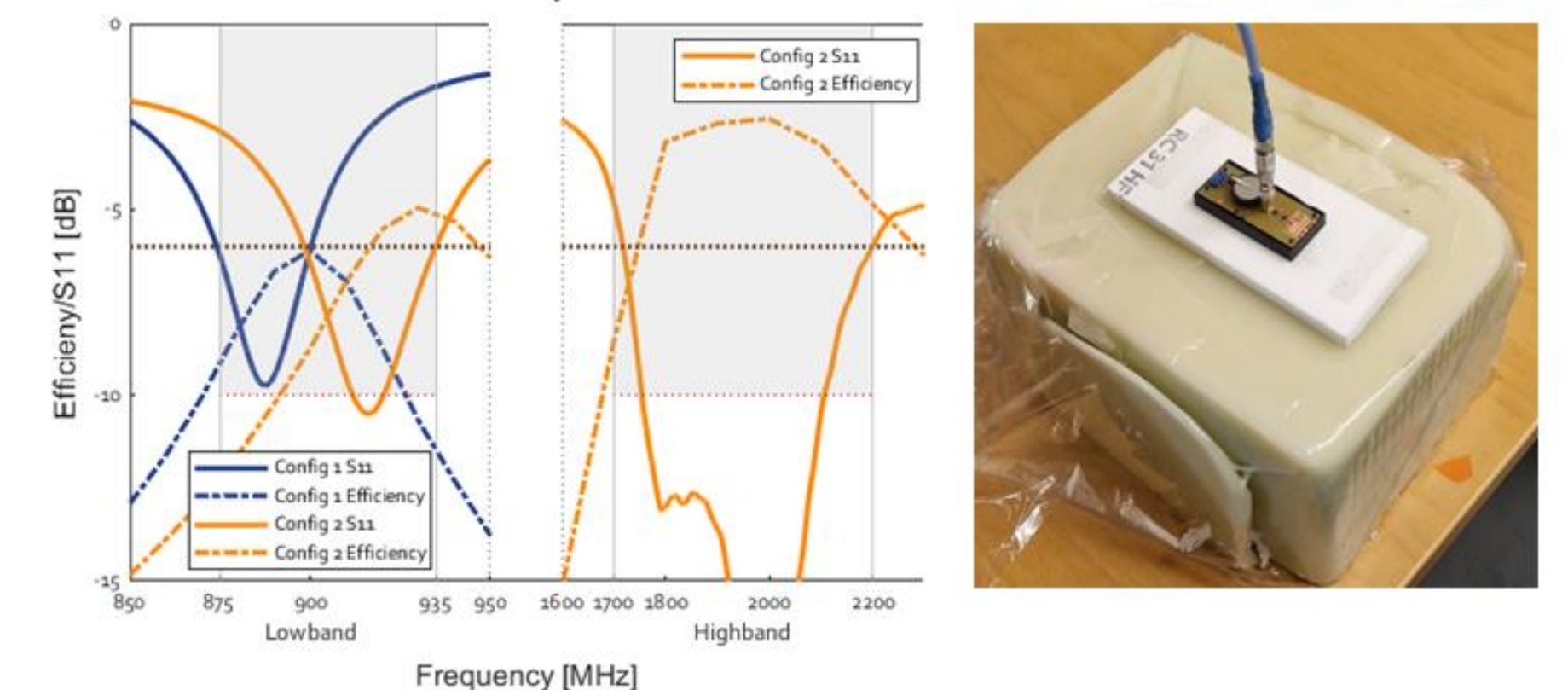


Wearable Antenna

An electrically small reconfigurable on-body antenna for wearable health monitoring applications. Switchable between two configurations.

- ❖ Total footprint: 63.2 x 25 mm²
- ❖ Antenna size: 14 x 25 mm² (0.04 x 0.07 λ^2).
- ❖ Simulated SAR < 0.5 W/Kg

Measured On-Body Performance



Future Works

- ❖ Shared-aperture antenna design for FR2 bands 24-29.5 GHz & 37-48.2 GHz
- ❖ Fabrication and measurements of fabricated all designs (FR1, FR2 & FR3)
- ❖ Comparison of measured results versus simulations



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