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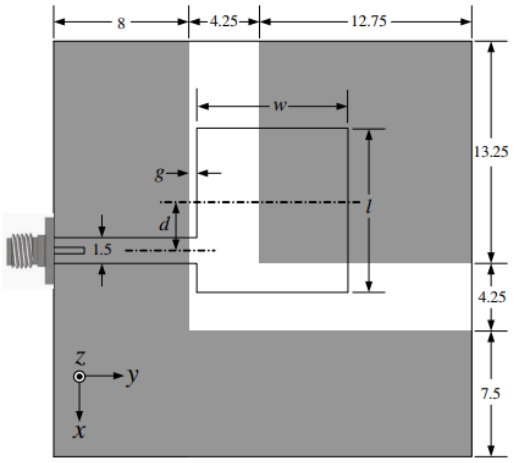
Report3: Open-Ended L-Shaped Slot Anetnna With Asymmetrical Rectangular Patch

Given Dimensions

Simulated and measured return losses of the proposed open-ended L-slot UWB antenna with l = 10 mm, w = 9 mm, d = 2.25 mm, and g = 0.35 mm.



Note:
By carefully tuning the parameters (d and g) we can desgin type A Antenna and the Proposed Antenna.

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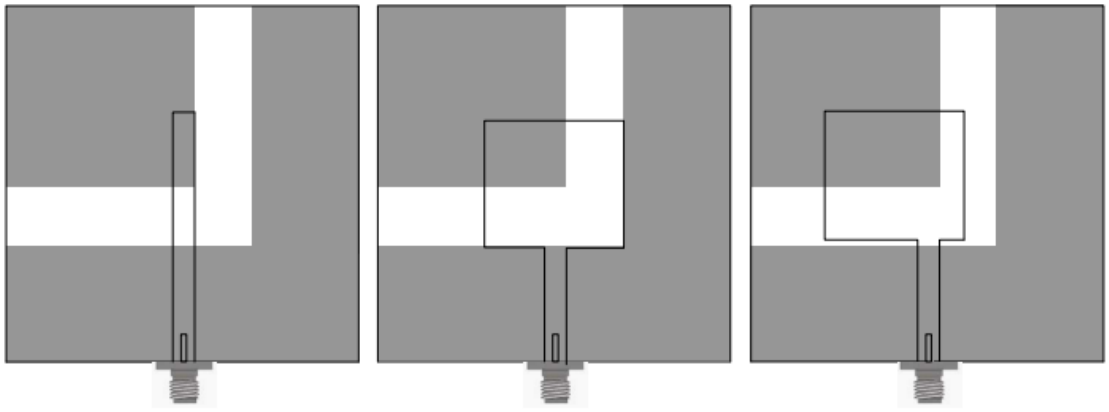
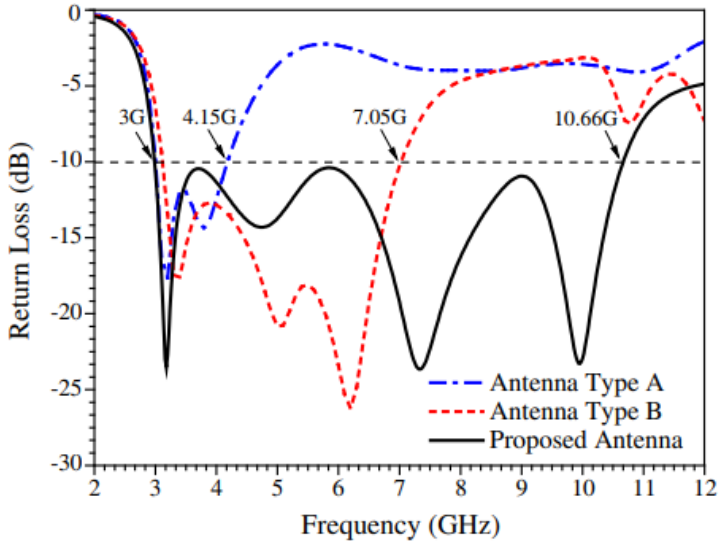
1) Required Antenna types



(a)

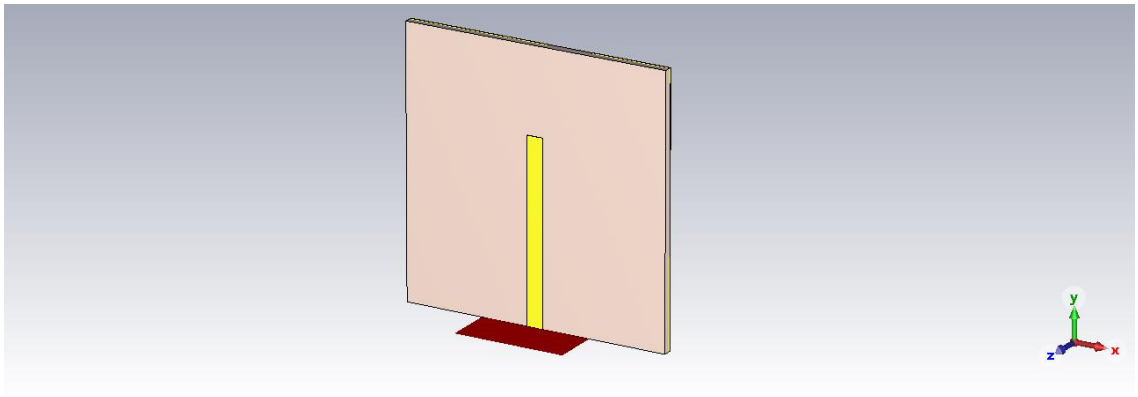


(b)

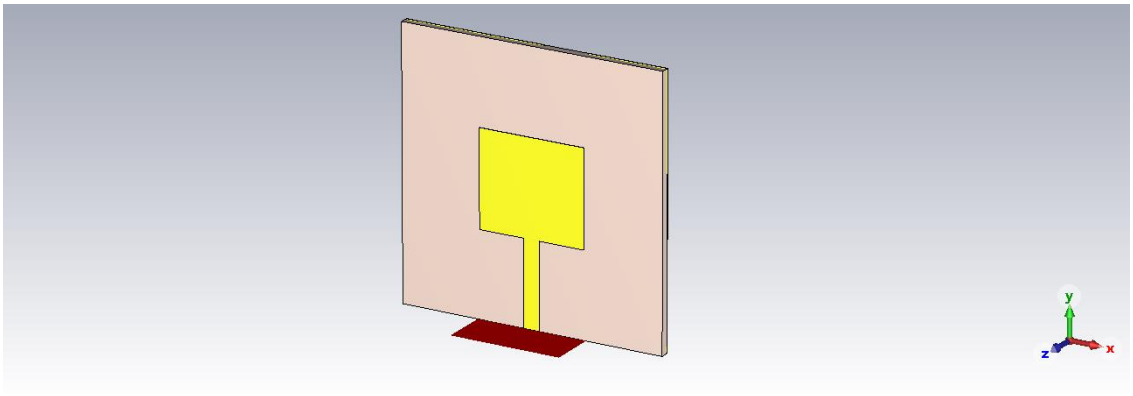
Figure 1:(a) Three mentioned slot antennas. Figure 2:(b) Their corresponding return losses.

2) Structures

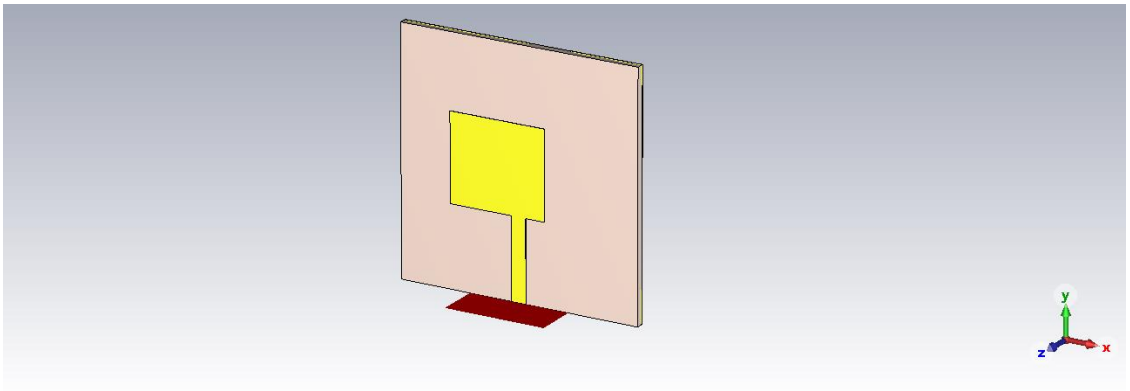
Antenna type A:



Antenna type B:

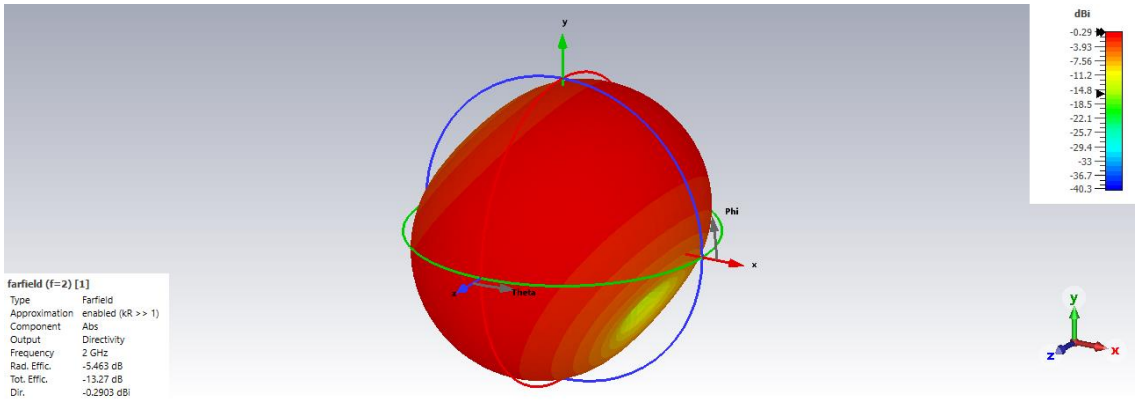


Proposed Antenna:

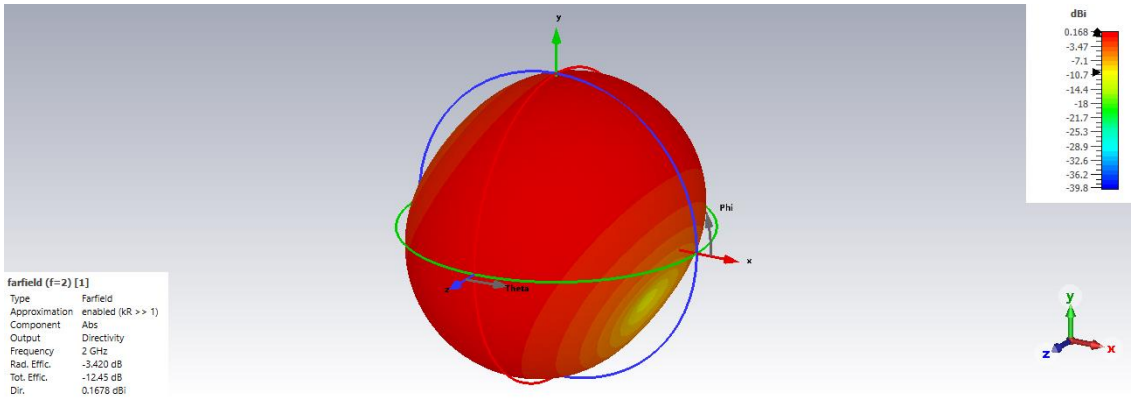


3) Farfield (1D/3D)

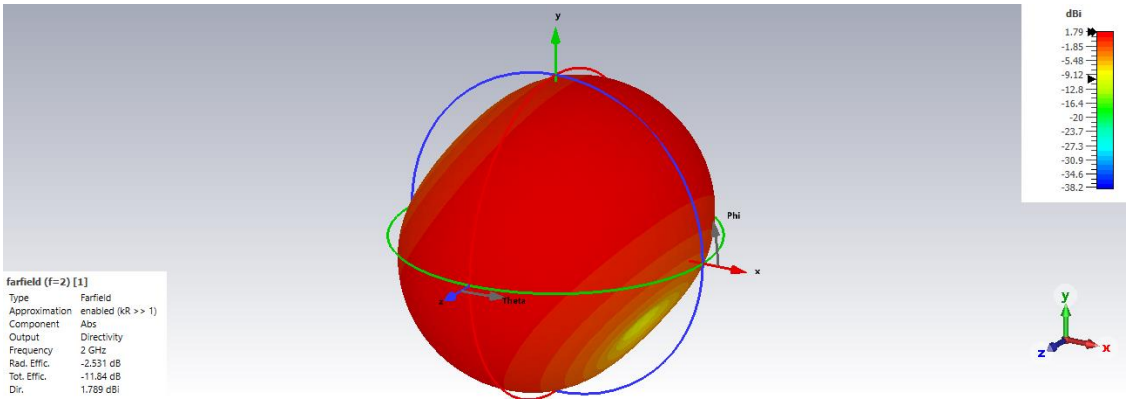
Antenna type A (3D):



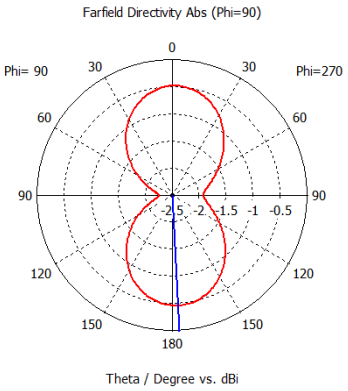
Antenna type B (3D):



Proposed Antenna (3D):

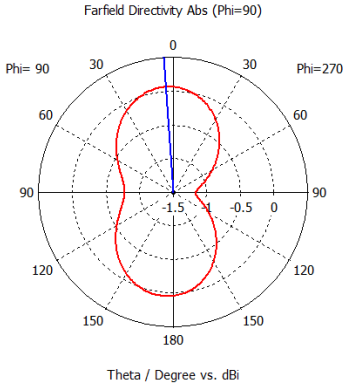


Antenna type A (1D):



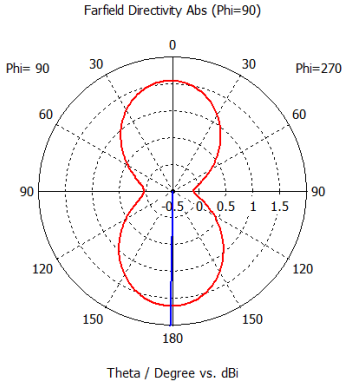
Frequency = 2 GHz
Main lobe magnitude = -0.47 dBi
Main lobe direction = 177.0 deg.

Antenna type B (1D):



Frequency = 2 GHz
Main lobe magnitude = 0.0639 dBi
Main lobe direction = 4.0 deg.

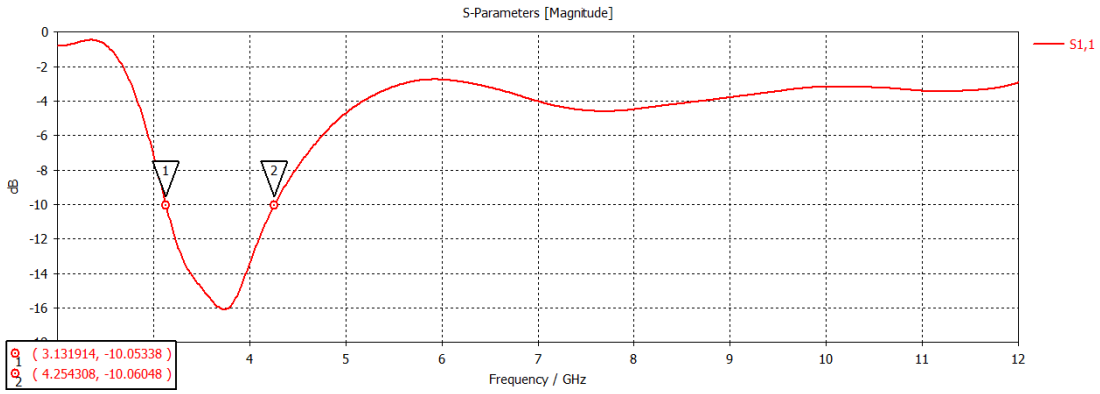
Proposed Antenna (1D):



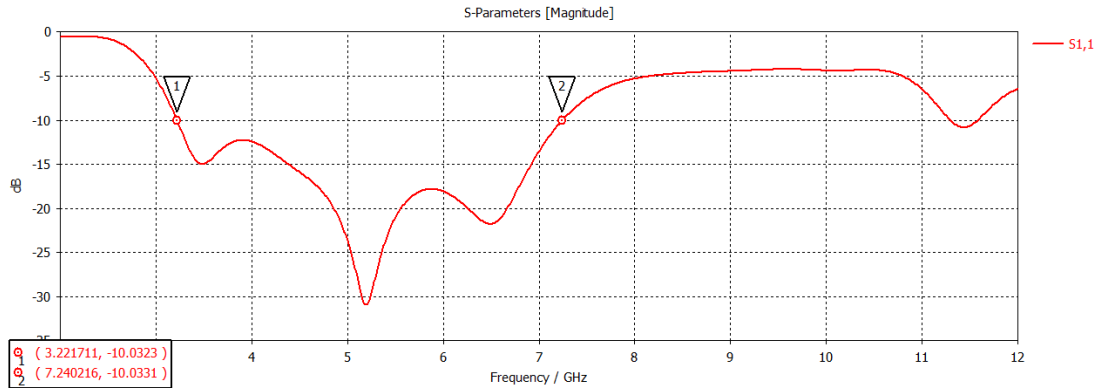
Frequency = 2 GHz
Main lobe magnitude = 1.63 dBi
Main lobe direction = 179.0 deg.

4) S-Parmeter

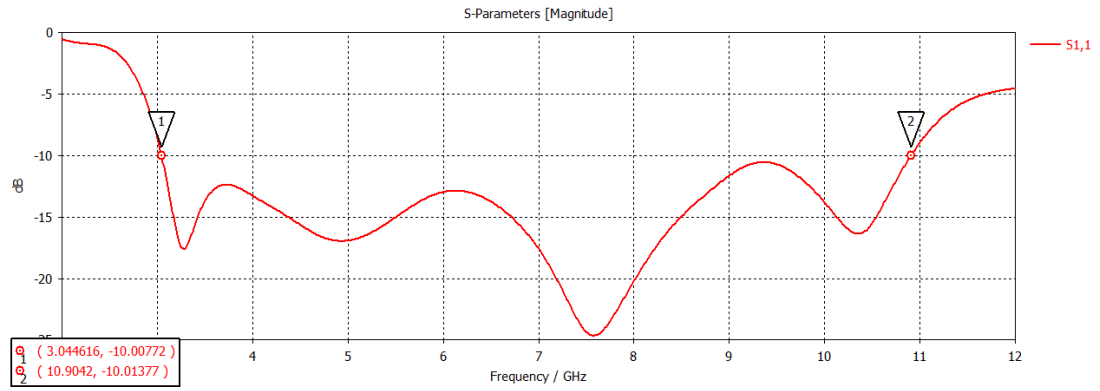
Antenna type A:



Antenna type B:



Proposed Antenna:



5) Conclution

The comparison of Antenna Type A, Antenna Type B, and the Proposed Antenna reveal significant differences in their bandwidth performance.

- Antenna Type A: This antenna design is an open-ended L-slot modified version without an extra-large ground plane. It exhibits a relatively narrow resonant frequency range from 3 to 4.15 GHz. It is meaured in simulation from 3.13 to 4.25 GHz aproximatly.

- Antenna Type B: This design introduces a rectangular patch symmetrically fed by a 50 Ω micro-strip line. The symmetrical feeding results in an enhanced operational bandwidth ranging from 3 to 7.05 GHz. It is meaured in simulation from 3.22 to 7.24 GHz aproximatly. While this is an improvement over Antenna Type A..

- Proposed Antenna: The proposed design features an asymmetrical rectangular patch fed by a 50 Ω micro-strip line. This asymmetrical configuration, combined with the open-ended L-slot, significantly broadens the bandwidth. The proposed antenna achieves a measured operational bandwidth from 3.01 to 11.30 GHz. It is meaured in simulation from 3.04 to 10.9 GHz aproximatly. This substantial increase makes the proposed antenna highly suitable for UWB applications, offering the required wideband performance and a compact size of 25 × 25 mm^2.

In summary, the proposed antenna design markedly outperforms both Antenna Type A and Antenna Type B in terms of bandwidth, making it an excellent candidate for UWB systems and portable applications due to its wide operational range and compact form factor.