Faculty of Enigeering

Cairo University

Antenna Engineering

ELC 3050 Project - Manufacturing Report

Design a Microstrip Patch Antenna

Operating at 2.4 GHz

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1. Abstract:

For any wireless communication, the antenna plays a very important role. The request for this technology is reduced antenna size, weight, and cost with a low profile, high performance, and low return loss (RL). To meet these requirements, the microstrip patch antenna (MPA) can be used. This report represents the design and manufacture of the MPA for the 2.4 GHz applications with very low RL. High Frequency Structural Simulator (HFSS) is used to design and simulation. The proposed MPA is fabricated on flame retardant (FR-4) material as a substrate. The results show that the MPA is capable of dealing with RL of -28.11 dB at the frequency of 2.37 GHz on HFSS & -23.876 dB at the frequency 2.361765 GHz in Manufacture Site. The volume of the antenna is 75.85 × 57.23 × 1.6 mm^3 [1].

2. MPA On HFSS Simulation:

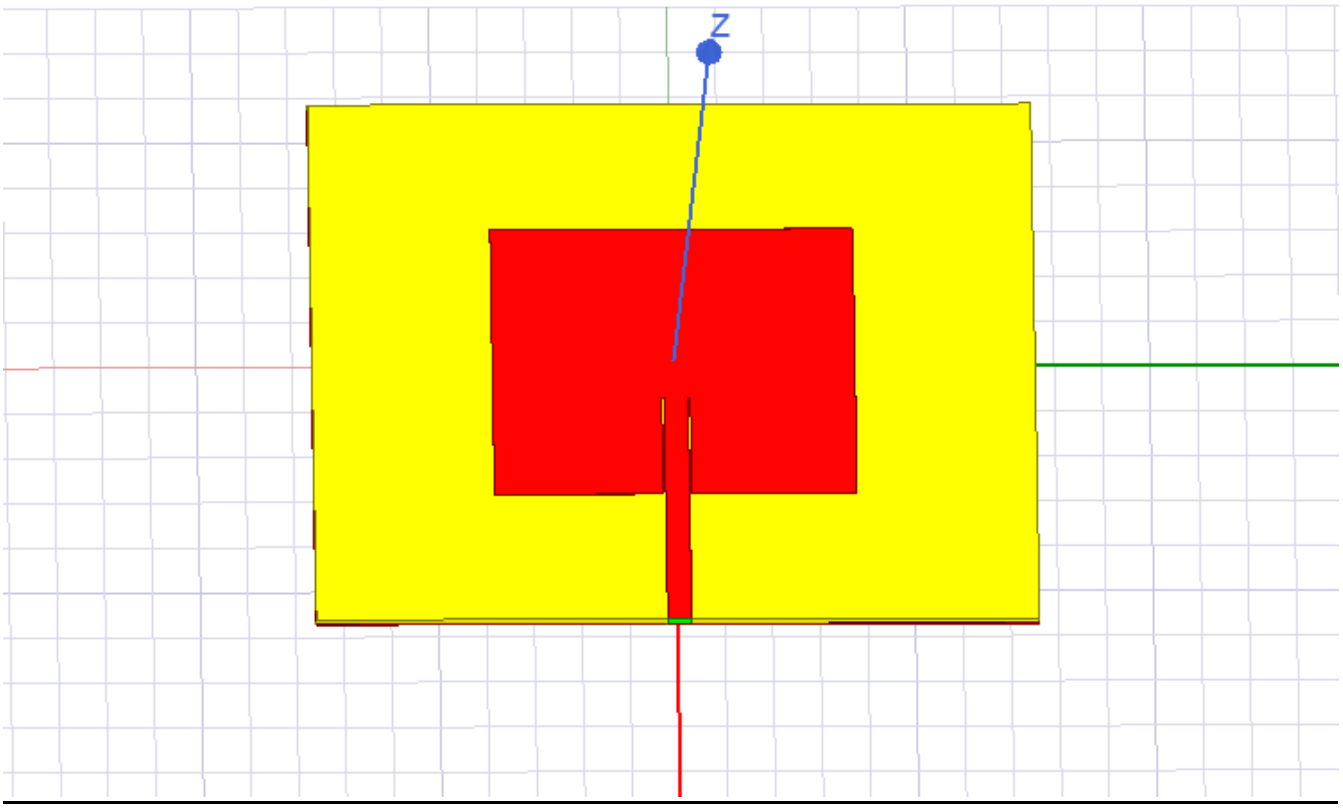

Figure 1: Edge Feeding MPA 3D Structure

3. MPA On Site:

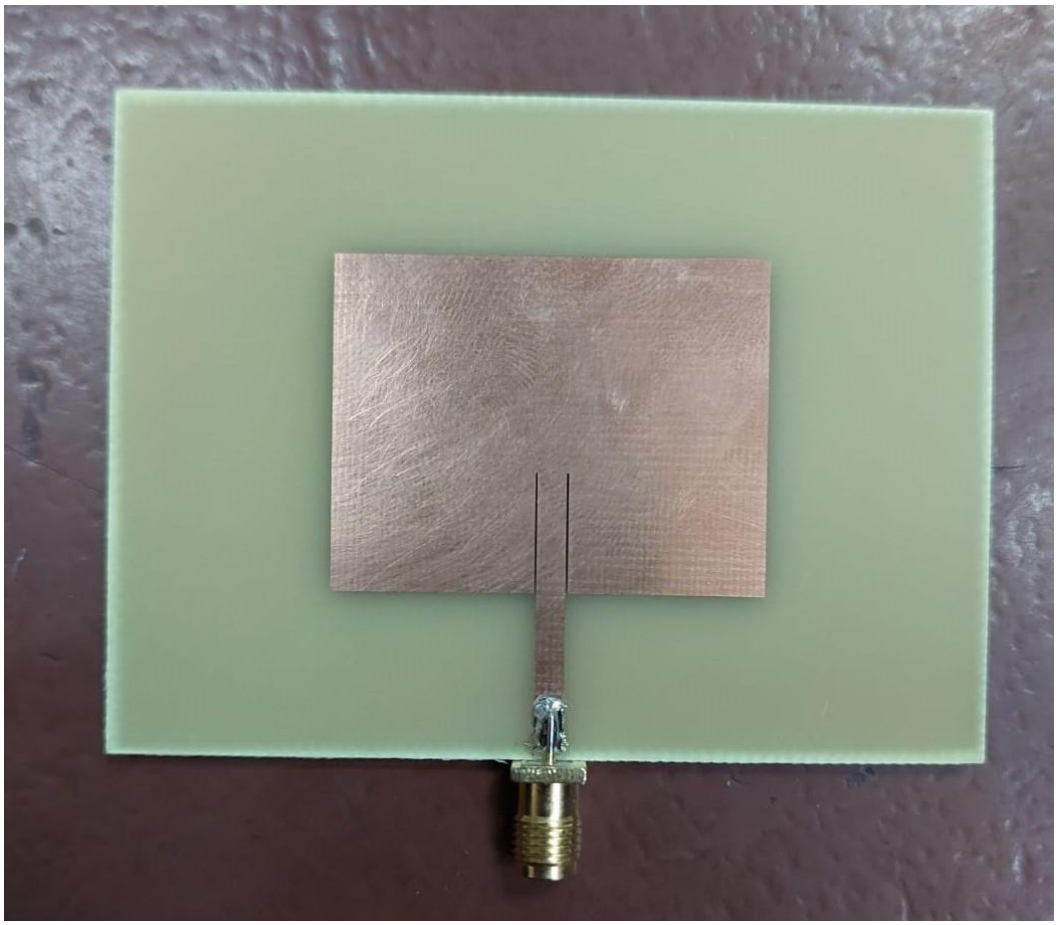

Figure 2: MPA Front After Manufacturing

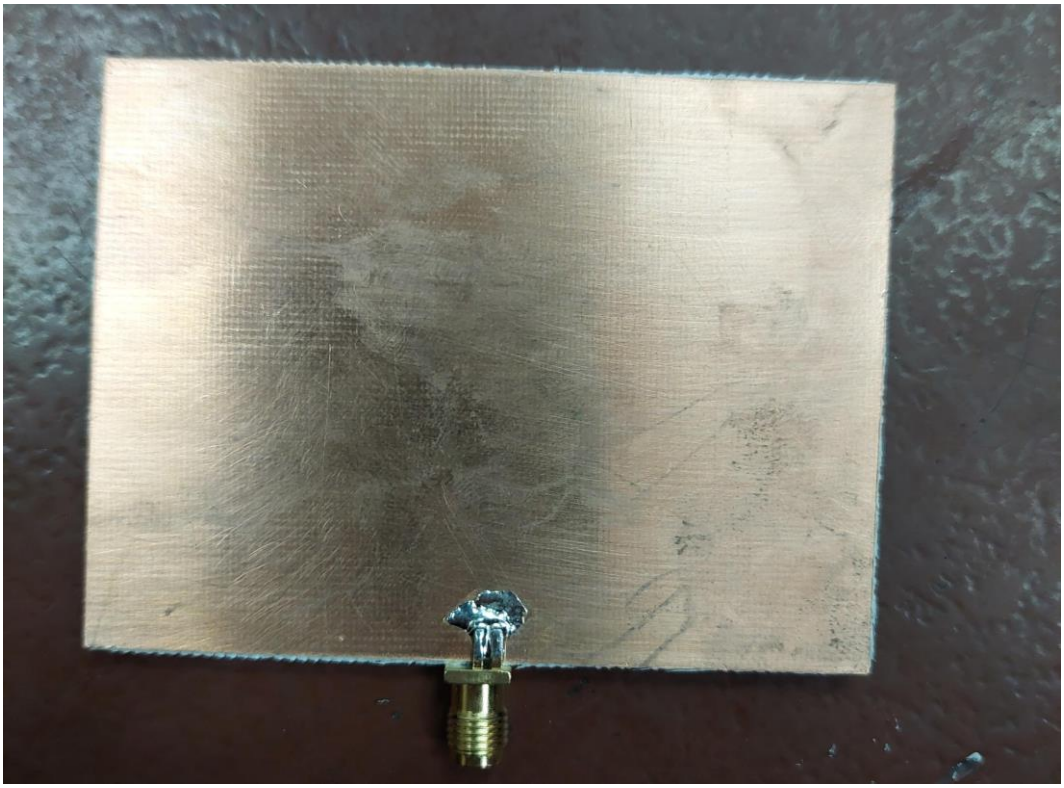

Figure 3: MPA Back After Manufacturing

4. Results:

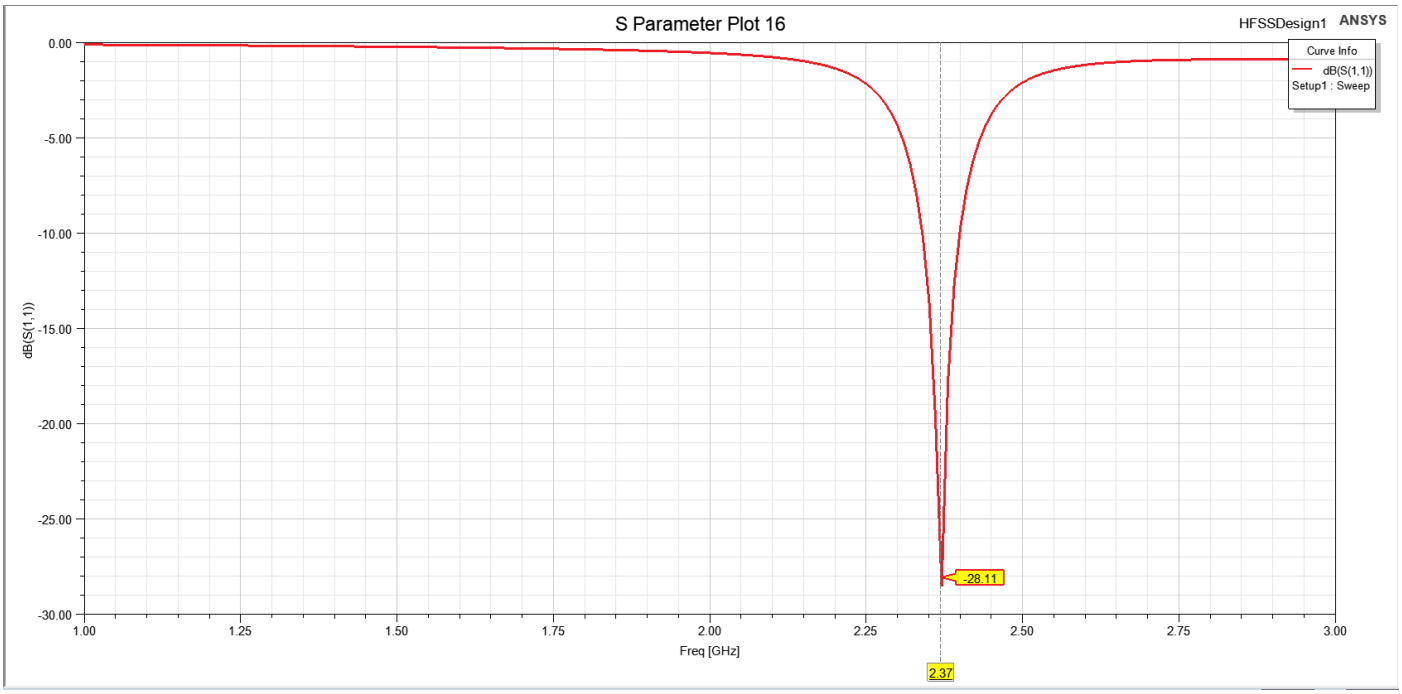

Figure 4: S11 (Return Loss) = -28.11 dB on HFSS

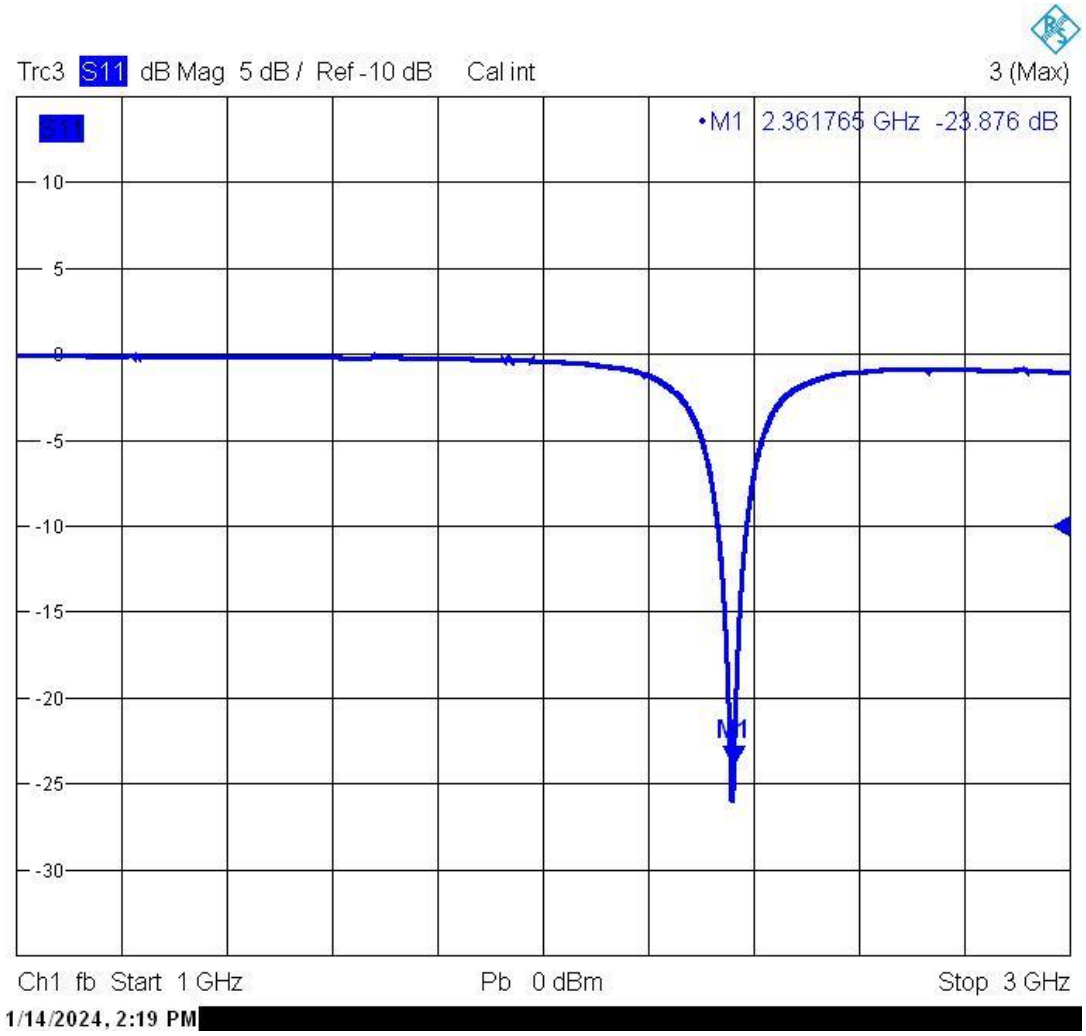

Figure 5: S11 (Return Loss) = -23.876 dB After Manufacturing

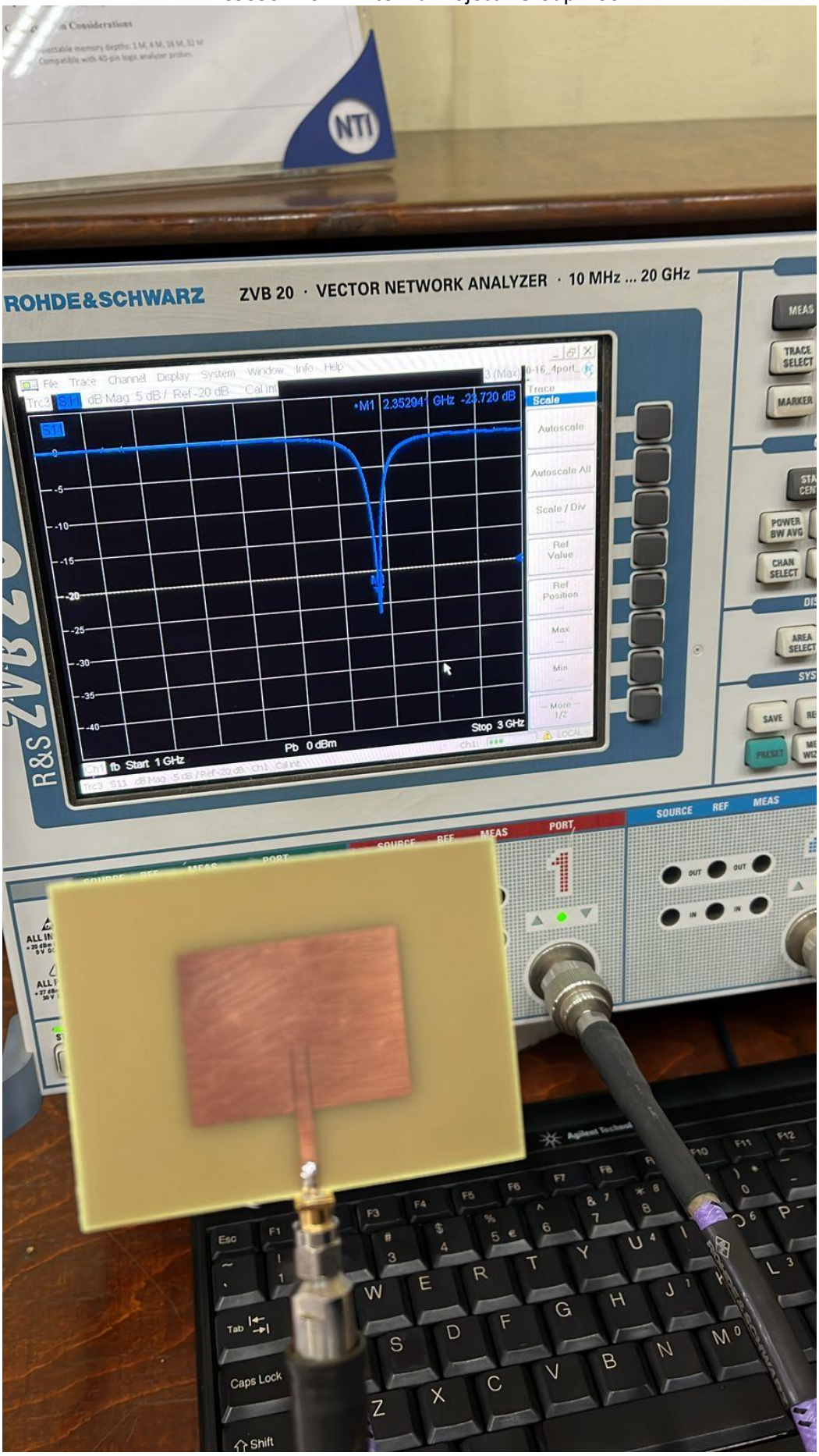

Figure 6: MPA at NTI

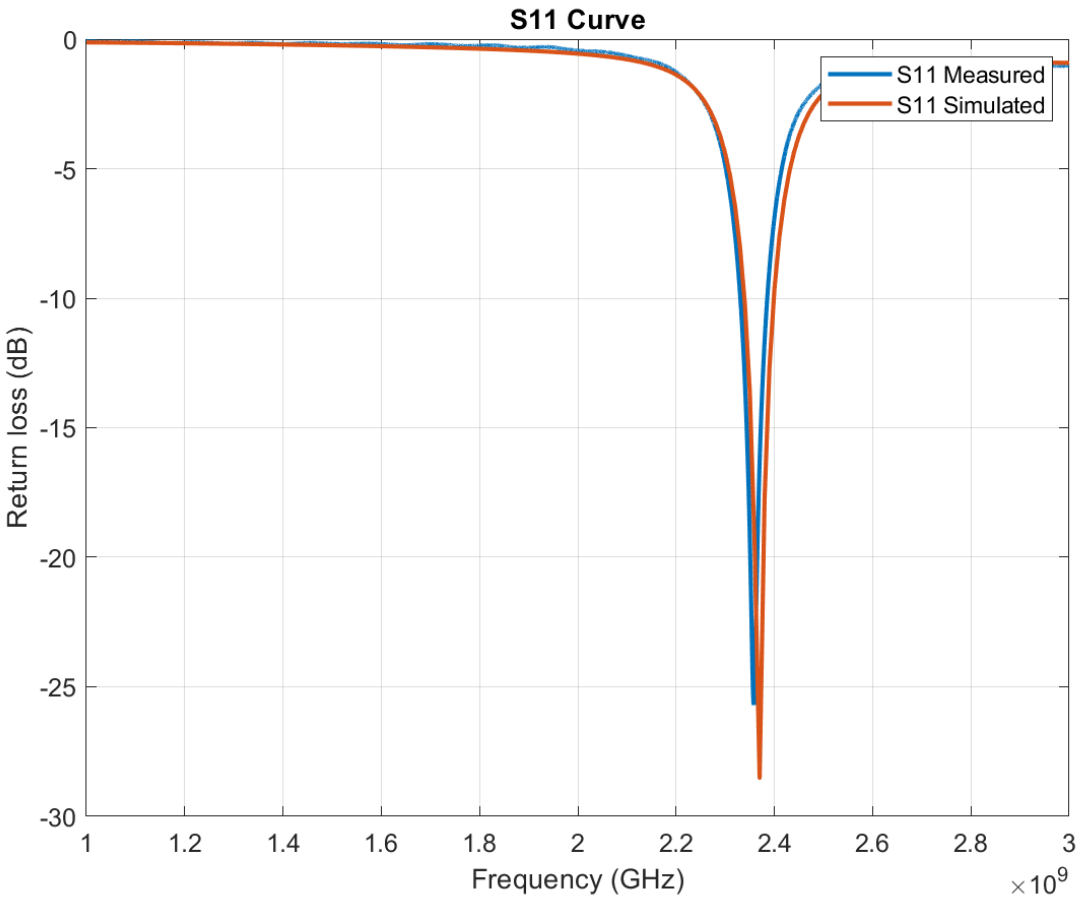

Figure 7: Simulation Vs Manufacturing

As Shown in Figure (4) the Return Loss $(S_{11} = -28.11\ dB)$ @ Frequecny $f = 2.37\ GHz$ On HFSS Simulator, in Figure (5) the Return Loss $(S_{11} = -23.876\ dB)$ @ Frequecny $f = 2.361765\ GHz$ after Manufacturing And for a good design the value of $RL < -10\ dB$ and that is Satisfied in Both Cases.

5. Conclusion:

In the process of designing and manufacturing edge feed antennas, a notable consistency in S11 behavior has been achieved between simulation and production. This similarity in behavior indicates a successful transition from theoretical design to practical application. The antennas exhibit comparable and reliable performance characteristics in both simulated scenarios and real-world production as Shown in Figure (7).

6. References:

[1] Abdulhussein1, A.M., Khidhir2, A.H. and Naser3, A.A. (2021) *IOPscience, Journal of Physics: Conference Series*.
Available at: **https://iopscience.iop.org/article/10.1088/1742-6596/2114/1/012029** (Accessed: 25 January 2024).