Advanced Topics in Optoelectronics, Microelectronics and Nanotehnologies
August 25-28 2022
Constanta, ROMANIA

Antenna design and optimization for Terahertz applications

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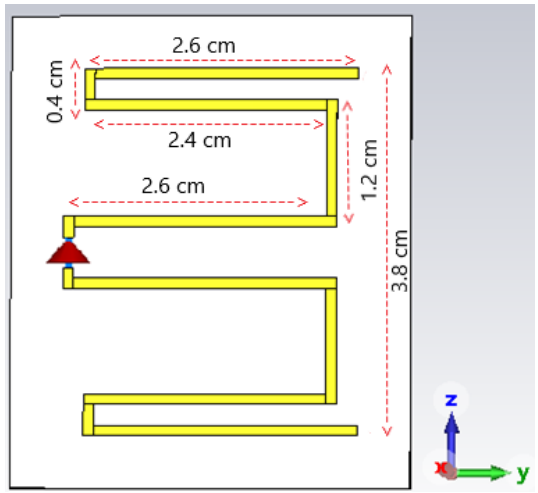
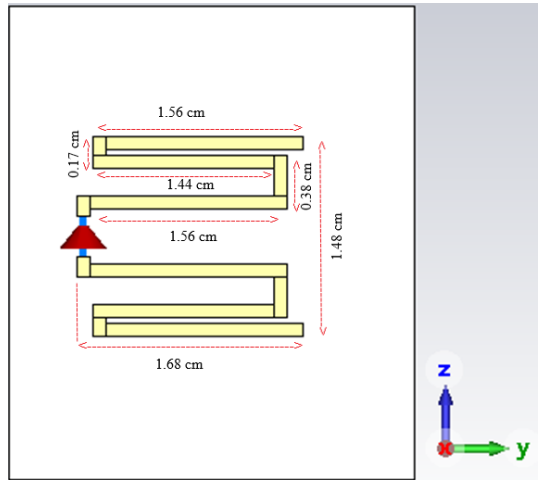
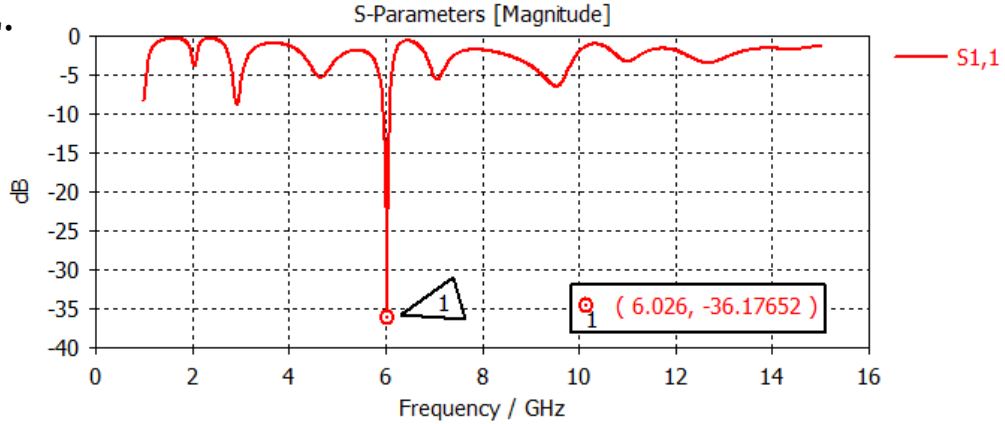
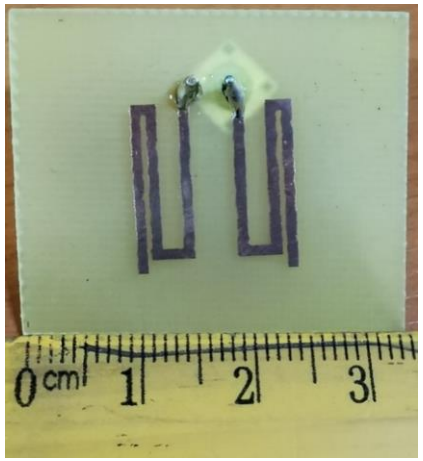
INTRODUCTION

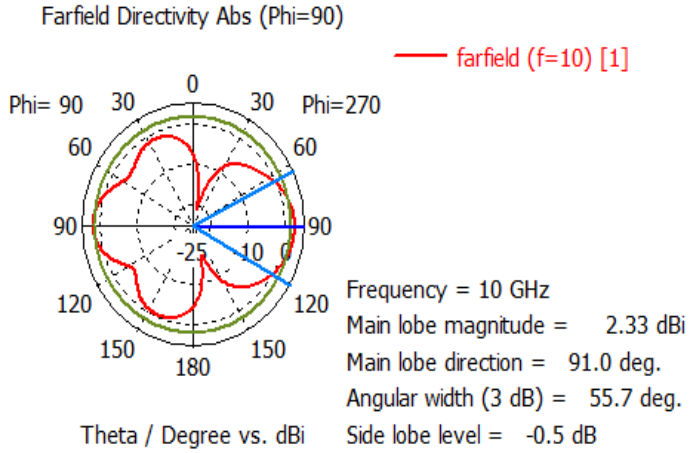
- In this paper, we propose a THz antenna design based on a scaling method from a microwave antenna, a meander line dipole antenna resonating at 790 MHz.
- The proposed meander line antenna was analyzed over a broad frequency band which determined the best features at 6 GHz.
- The scaled meander line dipole antenna presents a maximum directivity of 2.33 dBi at 10 GHz.





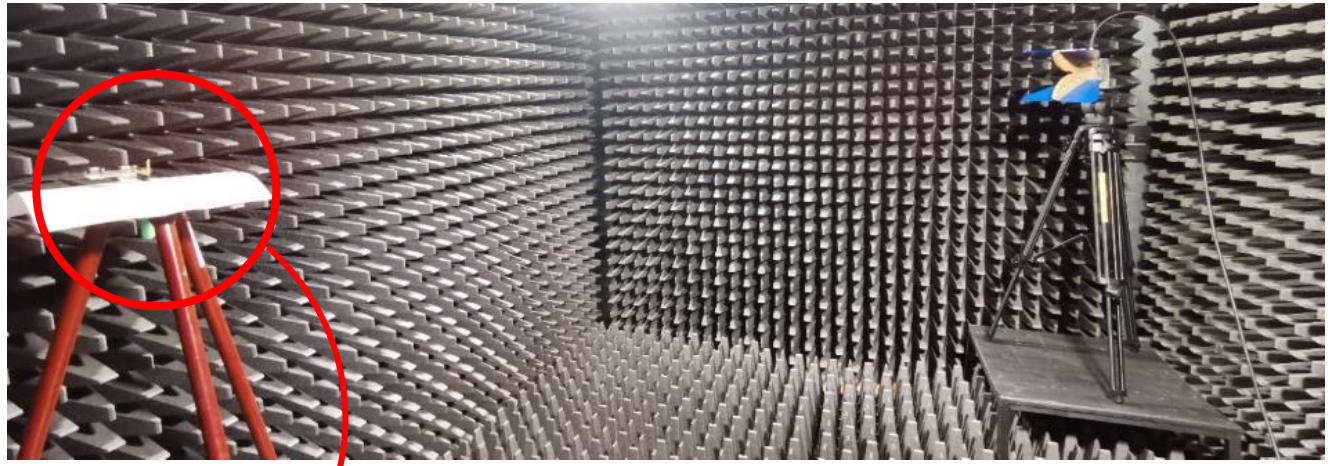


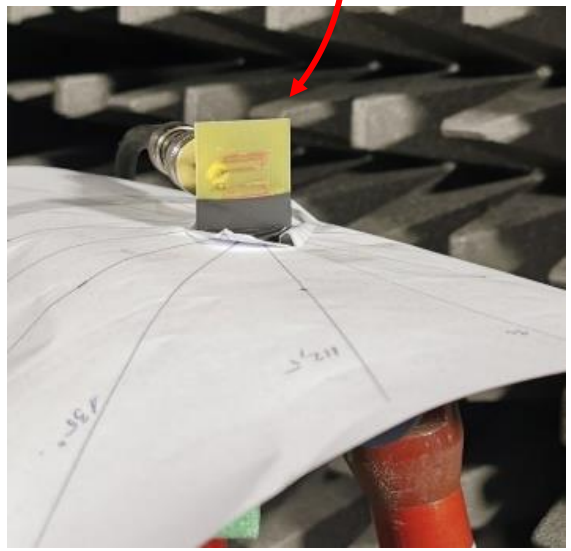


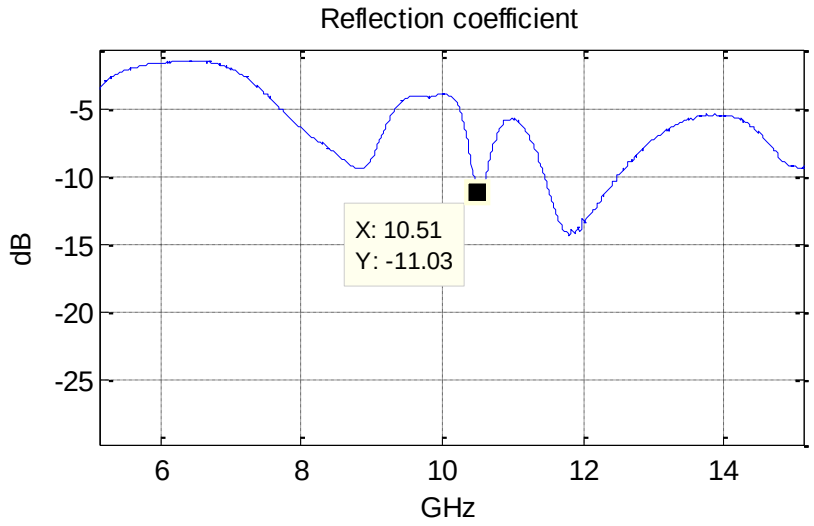


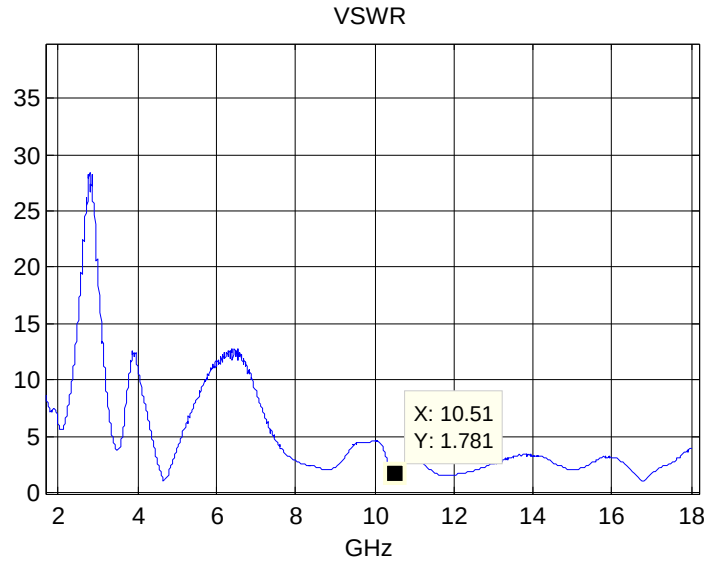
ANTENNA PARAMETERS

- The voltage standing wave ratio of the scaled meander line dipole antenna and has a low value of 1.78 at the interest frequency of 10.51 GHz.
- The reflection coefficient of the proposed antenna shows a value below -10dB around the frequency of 10.51 GHz.





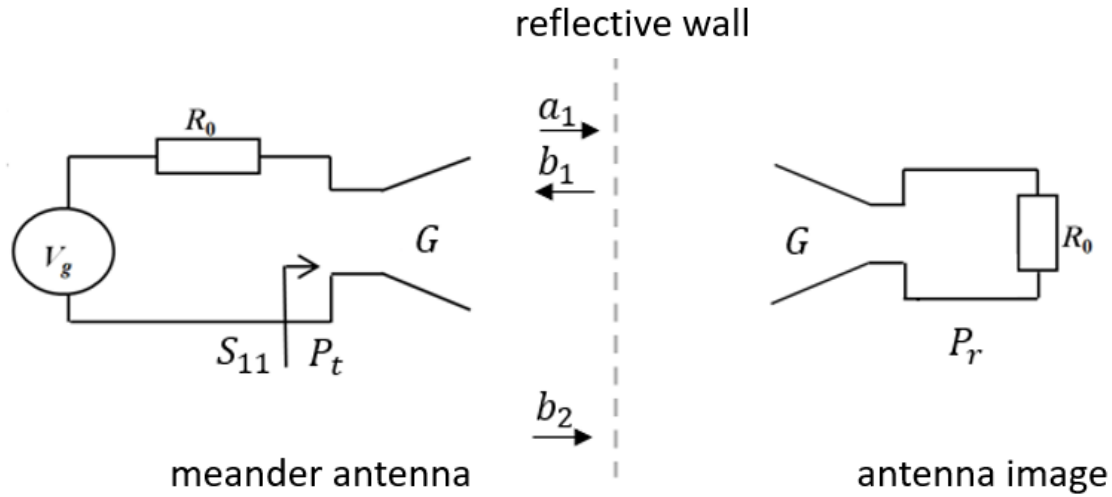




EXPERIMENTAL DETERMINATION OF ANTENNA GAIN WITH ONE ANTENNA METHOD

- In order to determine the gain of the scaled meander line dipole antenna from S parameters measurements, it is considered Friis transmission formula for free space, in which case, if the gain of the transmission antenna is known, the gain of the reception antenna can be determined as:

$$G_r = \frac{1}{G_t}\left(\frac{4\pi r}{\lambda}\right)^2 \frac{R_0}{R_{a2}(f)} \frac{|S_{21}|^2}{|1-S_{22}|^2(1-|S_{11}|^2)}$$



- Therefore, as the reception/transmission antenna is the same, the gain, G of the measured antenna can be determined:

$$G = \sqrt{\left(\frac{4\pi r}{\lambda}\right)^2 \frac{R_0}{R_{a2}(f)} \frac{|S_{21}|^2}{|1-S_{22}|^2(1-|S_{11}|^2)}}$$

where: $S_{11} = S_{22}$ is the reflection coefficient of the antenna and S_{21} is the transmission between the antenna and its image.

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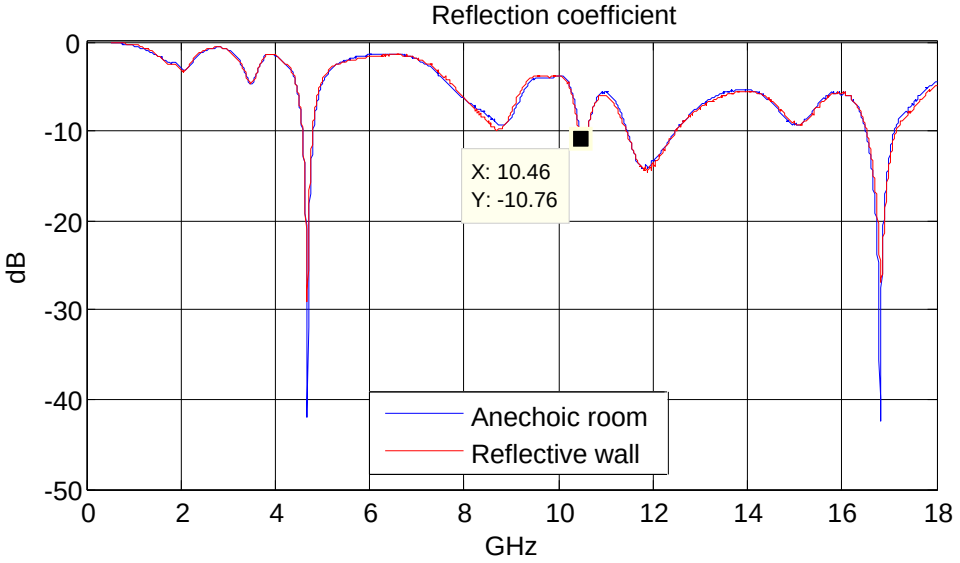
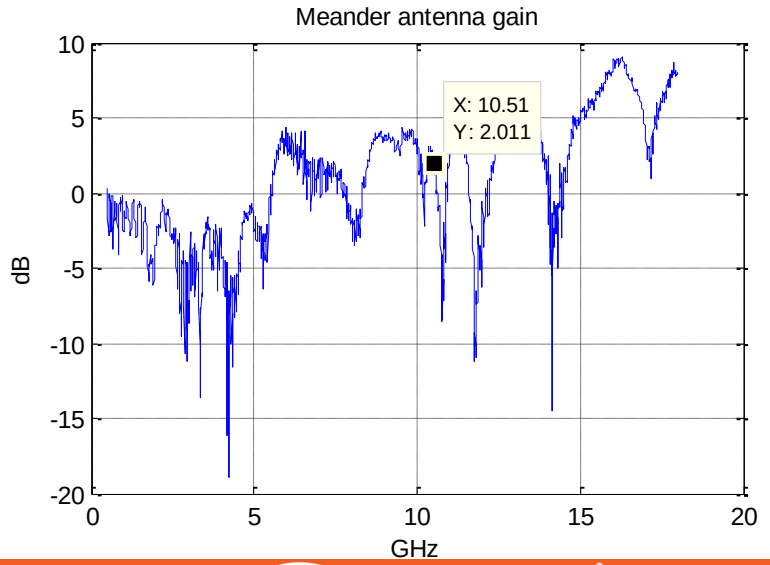


- The meander line dipole antenna, characterized by reflection on a conductive wall, has the determined gain of 2.01dB at the frequency of 10.51 GHz.



Thank you!