**Lab 10: Design of a Patch Antenna For Ultra-Wide Band Application**

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| **Introduction：**  In this experiment, we used HFSS to model and simulate a Patch Antenna for Ultra-Wide Band Application. During the simulation, we modeled the antenna structural parameters according to the theoretical content we learned. Finally, after the modeling was completed, we optimized the performance of the antenna by utilizing the functions of HFSS to maintain good performance in the 7 GHz band.  **Lab results & Analysis：**  **Question: Design a Patch Antenna For Ultra-Wide Band Application working at 7GHz. The model is shown below:**  20220425215647  **Fig.1: Ultra-wideband microstrip patch antenna. (a) Top view. (b) Bottom View.**  **Model diagram and Simulation Setup:**  Through calculation of relevant parameters, we can establish the following antenna model:  20220425223704  Figure 1 The overall model  20220425223818  Figure 2 The Back of the model  20220425224014  Figure 3 Port configuration  20220425224041  Figure 4 Set the frequency sweep range  **Parameter list:**  20220425224108  Figure 5 All parameters in the model | |
| **Simulation results:**   1. **S-parameter**   **20220425224237**  Figure 6 S-parameter image of this antenna  As can be seen from the above image, the S11 parameter of the antenna reaches a valley value at 6.45GHz, While around the operating frequency of 7GHz, the value of S11 is below -15dB, which reflects the working performance of the antenna we designed basically meets the requirements of the question.   1. **VSWR**   20220425224426Figure 7 The VSWR figure of this antenna  According to the VSWR figure of the antenna model, it can be seen that the valley value of the image appears near 6.45Hz, which is consistent with the characteristics of the S11 parameter image above, proving that the antenna has low reflection and good performance near 7GHz.   1. **Radiation Pattern**   **20220425230325**  Figure 8 The Gain phi/theta radiation pattern of this antenna at 7GHz **(phi = 90deg)**  **20220425230355**  Figure 9 The Gain phi/theta radiation pattern of this antenna at 7GHz **(phi = 0deg)**     1. **Peak Gain**   **20220425230449**  Figure 10 The Peak Gain figure of this antenna   1. **Radiation Efficiency**   **20220425230517**  Figure 11 The Radiation Efficiency figure of this antenna   1. **3D polar plot**   **20220425230743**  Figure 12 The 3D polar plot of Gain total of this antenna  **Experience**  In this experiment, we deepened the modeling process of HFSS and designed a Patch Antenna for Ultra-Wide Band Application by combining HFSS with theoretical calculation. Through the simulation of our model, we can get the images of various parameters of the antenna, and further deepen the understanding of the antenna properties with the theory. Finally, through our simulation we can achieve good performance at the specified working frequency point of our antenna. | |
| **Score** |  |