Introduction and Background This paper introduces a novel miniaturized strong-coupled frequency selective surface (FSS) structure with excellent angular stability. Traditional FSS structures are sensitive to incident angles, which can lead to a change in their frequency response and limit their reliability and stability in practical applications. In order to address this issue, the authors propose a new structure that utilizes two overlapping metal layers with special shapes to improve the robustness of the FSS to changes in incident angles. This new structure has the potential to improve the performance of microwave communication, radar, and antenna equipment. Design and Simulation The proposed FSS structure was designed using computer simulations and optimized for angular stability. The design consists of two overlapping metal layers with a rectangular shape, where the upper layer has a larger period than the lower layer. The metal layers are separated by a dielectric substrate with a thickness of 0.2 mm. The computer simulations were used to determine the optimal design parameters for the FSS, such as the size of the rectangular shapes, the distance between the layers, and the thickness of the substrate. The simulations showed that the proposed FSS structure has a wider angular response range compared to traditional FSS structures, indicating better angular stability. Experimental Results To validate the performance of the proposed FSS structure, the authors fabricated the FSS using a PCB process and conducted experimental measurements. The experimental results showed that the FSS has a stable frequency response over a wide range of incident angles, which demonstrates its excellent angular stability. Additionally, the FSS achieved a strong coupling between the layers, which is important for its frequency selective properties. The experimental results confirm the effectiveness of the proposed FSS structure and its potential for use in practical applications. Conclusion and Future Work In conclusion, this paper presents a novel miniaturized strong-coupled FSS structure with excellent angular stability, achieved through a special design that utilizes two overlapping metal layers with rectangular shapes. The proposed FSS structure was demonstrated to have a wider angular response range and more stable frequency response compared to traditional FSS structures. The experimental results confirmed the effectiveness of the proposed structure and its potential for practical applications. Future work could focus on optimizing the FSS design for different frequency bands and exploring the potential of the structure for use in other areas of electromagnetic engineering.

Q:

What are the limitations of the proposed miniaturized strong-coupled FSS structure? Are there certain frequencies or angles of incidence that it cannot filter or respond to?

How does the proposed FSS structure compare to other latest FSS designs in terms of performance and practicality? What are the unique advantages and disadvantages of each design?

Are there potential challenges in the fabrication and integration of the proposed FSS structure into practical devices? For example, what are the potential manufacturing defects or variations that could affect its performance and reliability in real-world applications?