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LIST OF ABBREVIATIONS

ABBREVIATION	FULL FORM
FSS	Frequency Selective Surface
EM	Electromagnetic
FEM	Finite Element Method
MoM	Method of Moments
FDTD	Finite-Difference Time-Domain
MRI	Magnetic Resonance Imaging
CT	Computed Tomography
RFID	Radio-Frequency Identification
RAM	Radar-Absorbing Material
RCS	Radar-Cross-Section
TE	Transverse Electric
TM	Transverse Magnetic
DC	Direct Current
SIW	Substrate Integrated Waveguide
HFSS	High Frequency Structure Simulator
NSL	No of Substrate Layers
NCL	No of Conducting Layers
VNA	Vector Network Analyzer
DUT	Device Under Test

LIST OF SYMBOLS

Symbol	Details
E	Electric field
H	Magnetic field
Γ	Reflection coefficient
τ	Transmission coefficient
ε_r	Relative permittivity of the dielectric material
tan δ	Loss tangent
L	Inductor
C	Capacitor
Z_0	Intrinsic impedance of free space

PREFACE

Frequency Selective Surfaces (FSS) are periodically arranged metal patches or slots on a metal sheet, supported by a dielectric. The surface either stops or allows particular frequency waves to pass through when a wave traverses the surface, and the frequency depends on the shape of the patch or slot. Due to this frequency-filtering property of FSS, they find numerous applications in wireless communication, space, defense, and commercial sectors.

One significant application of the bandstop FSS is microwave shielding and interference reduction for wireless devices and systems. In the literature, many FSS structures have been reported to stop various microwave frequencies. The author designed a bandstop FSS to prevent specific satellite downlink frequencies, as these frequencies may act as noise signals for various electronic and communication systems. Apart from complex structures, the author developed a simple single-element structure to block two bands of satellite downlink frequencies. The challenge in a single-elemental structure lies in optimizing the structure dimensions for dual-stop band resonance frequencies simultaneously; otherwise, achieving resonance in one frequency may lead to detuning in the other resonance frequency.

Another important application FSS is in the design of radomes for spacecraft (aircraft or missiles). Radomes designed using band pass FSS allow only desired frequencies to pass through, scattering all other frequencies. This results in a significant reduction in the radar cross-section of the spacecraft antenna and other metal parts inside the radome. Thus, bandpass FSS plays a crucial role in the design of stealth radomes. The drawback of a single-slot layer bandpass FSS is its slow roll-off, which may cause the spacecraft's antenna to reflect signals at the passband edge, making the spacecraft detectable. To overcome this problem, multilayer structures are useful, and 3-D structures have been reported in the literature.

The objective of the research is to design a bandstop FSS to block satellite downlink frequencies with high angular stability. A highly angularly stable FSS structure has been designed, fabricated, and tested to block satellite downlink frequencies in both the C-band (3.7-4.2 GHz) and X-band (7.25-7.75 GHz).

Another objective of the research is to design a fast roll-off band-pass FSS for radome applications. Simple fast roll-off single-band pass and dual-band pass structures, consisting of one substrate layer and two conducting layers, have been designed, fabricated, and tested.

The author specifically focused on very simple, low-profile structures rather than sophisticated ones to avoid fabrication errors and ensure ease of practical implementation.

To determine equivalent circuit parameters of the proposed structures a new and distinct approach is adopted, enhancing the overall novelty and contribution of the research.