

CONTENTS

<i>List of Figures</i>	XIX
<i>List of Tables</i>	XXVII
<i>List of Abbreviations</i>	XXIX
<i>List of Symbols</i>	XXXI
<i>Preface</i>	XXXV

Chapter 1: Introduction

1.1	Metamaterial	2
1.2	Metasurface	5
1.3	Metasurface Antenna	7
1.3.1	Design Analysis	8
1.3.2	Analysis of the Unit Cell	11
1.3.3	Other Parameters for Metasurface Antenna Design	12
1.4	Metasurface Synthesis and Circuit Model	15
1.5	Literature Survey	17
1.5.1	Antenna with radiating element and metasurface on the same surface	18
1.5.2	Antenna with the radiating element below the metasurface	20
1.5.3	Antenna with the radiating element above the metasurface	22
1.6	Motivation of the Thesis	24
1.7	Thesis Contribution and Organization	25

Chapter 2: A Modified Slotted Patch Antenna with Defected Ground using Metasurface for Dual-band Applications

2.1	Introduction	29
2.2	Design and Analysis	31
2.2.1	Design of the Microstrip Slotted Patch	32
2.2.2	Unit Cell in the Ground Plane of Rectangular Fractal Patch	35
2.2.3	Unit Cell along with partial Ground of Rectangular Fractal Patch	37
2.3	Simulated Results	38
2.4	Experimental Results	41
2.5	Concluding Remarks	46

Chapter 3: A Gain-Enhanced Slotted Patch Antenna Using Metasurface as Superstrate Configuration

3.1	Introduction	47
3.2	Design of the Antenna	48
3.2.1	Fractal Slotted Patch	51
3.2.2	Introduction of Dielectric Via	52
3.2.3	Addition of Rectangular Slots and Dielectric Via in the Ground Layer	53
3.2.4	Inclusion of Array of Square Patches	54
3.2.5	Design of the Metasurface	56
3.3	Simulated Results	59
3.4	Experimental Results	62
3.5	Concluding Remarks	68

Chapter 4: Efficient High-Performance Modified Slotted Patch Antenna using Metasurface for Dual-band Applications

4.1	Introduction	69
4.2	Design Analysis of the Single-Layered Metasurface Antenna	71
4.2.1	Geometry of Antenna	71
4.2.2	Design of the Patch Antenna	75
4.2.3	Geometry of Metasurface Unit cell	78
4.3	Results and Discussion of the Single-Layered Metasurface Antenna	81
4.3.1	Simulated Results	81
4.3.2	Measured Results	84
4.4	Design of the Multi-layered Metasurface Antenna	89
4.4.1	Design of the Conventional Patch	91
4.4.2	Design of the Metasurface Antenna	96
4.5	Results and Analysis of the Multi-Layered Metasurface Antenna	102
4.6	Concluding Remarks	110

Chapter 5: A Planar Low-Profile Gain-Enhanced CPW-Fed Slotted Patch Antenna Using AMC Surface

5.1	Introduction	113
5.2	Design of the Metasurface Antenna	114
5.3	Results and analysis	124
5.4	Concluding Remarks	130

Chapter 6: Conclusion and Future Scope

6.1	Major Conclusions	131
6.2	Research Proposals for the Future	134

References	137
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Author’s Publications	163
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LIST OF FIGURES

Fig. 1.1:	The structural evolution of metamaterials	2
	First realized left-hand metamaterials (a) using circular rings (b)	3
Fig. 1.2:	using square rings	
Fig. 1.3:	A generalized metasurface structure (a) side view and (b) top view	6
Fig. 1.4:	Radiating element arrangement in an MS antenna (a) radiator above MS (b) radiator below MS	8
Fig. 1.5:	The architecture of conventional MS antenna in which electromagnetic waves from the source antenna can be partially transmitted and reflected by the metasurface	9
Fig. 1.6:	Various MS elements and associated circuit models (a) inductive grid (b) Capacitive patch (c) capacitive cross and (d) inductive cross	16
Fig. 1.7:	(a) Antenna prototype (b) Fabricated structure (c) Reflection characteristics (d) Gain characteristics	19
Fig. 1.8:	(a) Antenna prototype (b) Fabricated structure (c) Reflection and Gain characteristics	19
Fig. 1.9:	(a) Antenna prototype (b) Fabricated structure (c) Reflection characteristics (d) Gain characteristics	20
Fig. 1.10:	(a) Antenna prototype (b) Fabricated structure (c) Reflection characteristics (d) Gain characteristics	21
Fig. 1.11:	(a) Antenna prototype (b) Fabricated structure (c) Reflection characteristics at port1 and port2 (d) Gain characteristics	22
Fig. 1.12:	(a) Antenna prototype (b) Fabricated structure (c) Reflection characteristics (d) Gain characteristics	23

Fig. 2.1:	(a) Top and (b) bottom views of the proposed antenna	31
Fig. 2.2:	Design evolution for the proposed structure with different modifications	32
Fig. 2.3:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) for different variations of the antenna is mentioned in Fig. 2.2, along with the proposed antenna	33
Fig. 2.4:	Plot of $ S_{11} $ (dB) with respect to frequency (a) at constant n variations (b) at constant q variations	34
Fig. 2.5:	(a) The bottom view of the unit cell of the defected ground structure for the proposed antenna	35
Fig. 2.6:	The plot of reflection and transmission characteristics of MS with respect to frequency (GHz)	36
Fig. 2.7:	The plot of $ S_{11} $ (dB) with respect to frequency for g -variations	37
Fig. 2.8:	The plot of $ S_{11} $ (dB) with respect to frequency for t_g -variations	38
Fig. 2.9:	Plot of $ S_{11} $ (dB) with respect to frequency (GHz) for conventional patch antenna along with the proposed one	39
Fig. 2.10:	Electric field distributions of the proposed antenna at (a) 2.6 GHz and (b) 5.1 GHz	39
Fig. 2.11:	Surface current distributions at (a) top and (b) bottom surfaces at 2.6 GHz and 5.1 GHz	40
Fig. 2.12:	3D Polar Plot at different operating frequencies within the proposed antenna	41
Fig. 2.13:	Proposed fabricated structure: (a) top view, (b) bottom view, (c) $ S_{11} $ measurement using VNA, (d) E-plane radiation pattern measurement, and (e) H-plane radiation pattern measurement within the anechoic chamber	42
Fig. 2.14:	The plot of simulated and measured return losses with respect to the frequency of the proposed antenna	42
Fig. 2.15:	Co-polarized and Cross-polarized (a) E-plane and (b) H-plane radiation patterns at different operating frequencies of the proposed antenna structure	44

Fig. 3.1:	(a) Three-dimensional geometry of proposed structure with (b) top view of the conventional patch and (c) rear view of conventional patch	49
Fig. 3.2:	Design steps of the conventional patch with different modifications	50
Fig. 3.3:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) for various modified antennas is specified in Fig. 3.2	51
Fig. 3.4:	The plot of $ S_{11} $ (dB) with respect to frequency for n - and q -variations	51
Fig. 3.5:	The plot of $ S_{11} $ (dB) with respect to the frequency at d -variations	52
Fig. 3.6:	Plot of $ S_{11} $ (dB) with respect to frequency (a) at constant $c = 0.4$ mm and l_l variations (b) at constant $l_l = 10$ mm and c variations	53
Fig. 3.7:	The plot of $ S_{11} $ (dB) with respect to the frequency at l_l , c , and d -variations	54
Fig. 3.8:	The plot of $ S_{11} $ (dB) with respect to the frequency at t_g and t_p variations	54
Fig. 3.9:	Design of structure with (a) air spacer and (b) Teflon dielectric in between two FR4 substrates	56
Fig. 3.10:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) for different cases of the antenna along with the proposed design	57
Fig. 3.11:	(a) The unit cell of MS with (b) 5×5 order MS (c) 3D view of unit cell (d) Effective permittivity of unit cell (e) Effective permeability of unit cell	57
Fig. 3.12:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) of the proposed antenna	59
Fig. 3.13:	Electric field distributions at (a) top and (b) rear surfaces of the patch (c) 5×5 order metasurface at different operating frequencies within the proposed structure	60

Fig. 3.14:	Surface current distributions at (a) top and (b) rear surfaces of the patch (c) 5×5 order metasurface at different operating frequencies within the proposed structure	61
Fig. 3.15:	3D Radiation Pattern at different operating frequencies within the proposed antenna	62
Fig. 3.16:	Proposed fabricated structure (a) top view (b) rear view (c) 5×5 order metasurface (d) Three-dimensional view of the proposed antenna (e) S-parameter measurement of using VNA (f) Plot of Simulated vs Measured S_{11} (dB) with respect to frequency	63
Fig. 3.17:	(a) Radiation pattern measurement using anechoic chamber (b) Responses of Simulated vs Measured peak realized gain (dB) with respect to frequency of the proposed antenna	64
Fig. 3.18:	Radiation pattern (a) E-plane Co-polarized and Cross-polarized and (b) H-plane Co-polarized and Cross-polarized at different operating frequencies within the proposed structure	65
Fig. 4.1:	(a) Proposed structure with top and bottom surfaces (b) Conventional patch with top and bottom surfaces (c) SRR (d) Proposed unit cell (e) Equivalent circuit model of SRR (f) Equivalent circuit model of the proposed unit cell. $R_1, R_2, L_1, L_2, L_3, L_4, C_1, C_2, C_3, C_4$, and C_5 are the resistances, inductances, and capacitances of the SRR and the proposed unit cell	72
Fig. 4.2:	Equivalent circuit model of the proposed MS structure. Numbered in sequence from 5, 6, 7..., 58, 59, and 60 for the subscript of inductance (L) and numbered in sequence from 6, 7, 8..., 59, 60, and 61 for the subscript of capacitance (C) are the total number of inductances and capacitances mentioned different unit cells	73
Fig. 4.3:	Design steps of conventional patch antenna with different modifications	75
Fig. 4.4:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) for different antenna modifications	76
Fig. 4.5:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) for rectangular slots width (t_w) and length (t_h) variation	76

Fig. 4.6:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) at (s_w) variation	77
Fig. 4.7:	(a) The 3D view (b) Effective permittivity and (c) Effective permeability of the unit cell.	78
Fig. 4.8:	Plot of $ S_{11} $ (dB) with respect to frequency (GHz) (a) at different p -variations and (b) at different g -variations	80
Fig. 4.9:	Plot of $ S_{11} $ (dB) with respect to frequency (GHz) at different u_w variations	80
Fig. 4.10:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) for different antenna variations	81
Fig. 4.11:	Electric field distributions of the proposed prototype at (a) 11.65 GHz and (b) 14.44 GHz	82
Fig. 4.12:	Surface current distributions of the proposed prototype at (a) top and (b) bottom surfaces.	83
Fig. 4.13:	Proposed fabricated structure (a) top view (b) bottom view (c) S-parameter measurement of using VNA (d) Plot of Simulated vs Measured $ S_{11} $ (dB) with respect to frequency	84
Fig. 4.14:	Far-field measurement using an anechoic chamber	85
Fig. 4.15:	Responses of Realized Gain (dBi) and Efficiency (Mag.) at different operating frequencies within the conventional patch and the proposed antenna	85
Fig. 4.16:	Co-polarized and Cross-polarized (a) E-plane and (b) H-plane at different operating frequencies within the proposed structure	86
Fig. 4.17:	(a) 3D geometry of the proposed structure, (b) conventional patch, (c) 7×7 order MS structure	89
Fig. 4.18:	Design steps of the conventional patch with different modifications	91
Fig. 4.19:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) for various modified antennas specified in Fig. 4.18	91
Fig. 4.20:	(a) The equivalent electrical circuit model and (b) Ansys HFSS simulation vs ADS simulation characteristics of the simple patch antenna with quarter-wave transformer feed (Case-I)	92

Fig. 4.21:	(a) The equivalent electrical circuit model and (b) Ansys HFSS simulation vs ADS simulation characteristics of the slotted patch antenna with quarter-wave transformer feed (Case-II)	92
Fig. 4.22:	(a) The equivalent electrical circuit model and (b) Ansys HFSS simulation vs ADS simulation characteristics of the conventional patch antenna with quarter-wave transformer feed (CASE-III).	93
Fig. 4.23:	Plot of $ S_{11} $ (dB) with respect to frequency for Case-II and Case-III in Fig. 4.18 with MS	95
Fig. 4.24:	The proposed unit cell with geometrical dimensions	96
Fig. 4.25:	(a) The three-dimensional view of the unit cell (b) reflection phase characteristics with respect to frequency (c) effective permittivity of the unit cell (d) effective permeability of the unit cell	97
Fig. 4.26:	Variation of the reflection phase of the MS at two different frequency bands (a) 4-4.5 GHz (b) 8-12 GHz	98
Fig. 4.27:	The plot of $ S_{11} $ (dB) with respect to the frequency at sh_I variations of the MS antenna	100
Fig. 4.28:	Plot of $ S_{11} $ (dB) with respect to frequency (a) at constant $p_I = 5$ mm and p variations (b) at constant $p = 5.2$ mm and p_I variations	100
Fig. 4.29:	(a) The equivalent electrical circuit model of the proposed patch antenna with the metasurface as a superstrate (b) Plot of $ S_{11} $ (dB) with respect to frequency using Ansys HFSS simulation vs ADS simulation characteristics comparison	101
Fig. 4.30:	The plot of $ S_{11} $ (dB) with respect to frequency (GHz) of the proposed antenna	102
Fig. 4.31:	Electric field distributions at (a) radiating patch (b) 7×7 order metasurface at different operating frequencies	103
Fig. 4.32:	Surface current distributions at (a) radiating patch (b) 7×7 order metasurface at different operating frequencies.	104
Fig. 4.33:	Proposed fabricated prototype (a) Conventional patch (b) top view of 7×7 order metasurface (c) Three-dimensional view of the proposed antenna (d) S-parameter measurement of using VNA	105

Fig. 4.34:	Radiation pattern measurement of the proposed antenna using an anechoic chamber	105
Fig. 4.35:	(a) The plot of the simulated and measured $ S_{11} $ (dB) along with circuit model simulation with respect to different frequencies (b) Responses of realized gain (dBi) and radiation efficiency with respect to frequencies simultaneously	106
Fig. 4.36:	Radiation pattern (a) E-plane co-polarized and cross-polarized and (b) H-plane co-polarized and cross-polarized at different operating frequencies within the proposed structure	108
Fig. 5.1:	The 3D view of the proposed AMC based metasurface structure	115
Fig. 5.2:	Proposed AMC based MS antenna with (a) Radiating patch and (b) 7×7 order AMC surface	116
Fig. 5.3:	(a) The 3D view (b) Reflection Phase characteristics (c) Effective permittivity and (d) Effective permeability of the unit cell	117
Fig. 5.4:	AMC-based MS antenna with (a) Radiating patch and (b) 5×5 order AMC surface	117
Fig. 5.5:	The 3D view of the AMC-based structure with 5×5 order MS	118
Fig. 5.6:	The plot of $ S_{11} $ (dB) with respect to the frequency of the antenna configuration is shown in Fig. 5.4	119
Fig. 5.7:	Design steps of the conventional patch with different modifications	120
Fig. 5.8:	The plot of reflection characteristics comparison with respect to the frequency of the different antenna configurations shown in Fig. 5.7.	120
Fig. 5.9:	The plot of $ S_{11} $ (dB) versus frequency at s_l variations of the MS antenna	121
Fig. 5.10:	The comparison of the reflection characteristics of the conventional antenna and the metasurface antenna with respect to frequency	121
Fig. 5.11:	The plot of $ S_{11} $ (dB) versus frequency at t_f -variations of the MS antenna	122
Fig. 5.12:	Plot of $ S_{11} $ (dB) with respect to frequency (GHz) (a) at different m -variations and (b) at different n -variations	122

Fig. 5.13:	The plot of $ S_{11} $ (dB) versus frequency at p -variations of the MS antenna	123
Fig. 5.14:	Fabricated structure of the proposed antenna with (a) three-dimensional (3D) view (b) top and (c) MS surface.	124
Fig. 5.15:	Antenna measurement in an anechoic chamber (a) using VNA (b) broadband horn antenna and (c) the fabricated MSA under test	125
Fig. 5.16:	The plot of the simulated and measured $ S_{11} $ (dB) with respect to frequency	125
Fig. 5.17:	Surface current distributions at (a) radiating patch (b) 7×7 order MS at different operating frequencies	126
Fig. 5.18	Responses of realized gain (dBi) and radiation efficiency with respect to frequency	127
Fig. 5.19:	Radiation patterns in the (a) E-plane and (b) H- plane at frequencies of 2.34 GHz, 11.52 GHz and 11.98 GHz	128

LIST OF TABLES

TABLE. 1.1:	Metasurface Elements Classification and circuit model topology	17
TABLE. 2.1:	Effect of Slot Loading on the Patch with Different Iteration	34
TABLE. 2.2:	Comparison of Simulated Results with Measured Results of the Proposed Antenna	43
TABLE. 2.3:	Comparison of the Proposed Antenna with Existing Metasurface Based Antennas	45
TABLE. 3.1:	Performance Comparison of Simulated Results with Measured Results of the Proposed Antenna	64
TABLE. 3.2:	Comparative Study of the Proposed Antenna with some High-Performance Antennas	67
TABLE. 4.1:	The optimized geometrical parameters of the proposed antenna	74
TABLE. 4.2:	Comparison Table for the performance of the proposed antenna with existing GHz antennas	87
TABLE. 4.3:	The optimized geometrical parameters of the MS antenna	90
TABLE. 4.4:	Comparative Study of Proposed Metasurface Antenna with some Reported Metasurface Antennas	109
TABLE. 5.1:	Comparison of the Proposed Work with Some Existing Antennas	129

LIST OF ABBREVIATIONS

Abbreviation	Full Form
EM	Electromagnetic
GHz	Gigahertz
TE	Transverse Electric
TM	Transverse Magnetic
PCB	Printed Circuit Board
HFSS	High Frequency Simulation Software
CST	Computer Simulation Technology
ADS	Advanced Design Systems
MS	Metasurface
MTM	Metamaterial
MSA	Metasurface Antenna
2D	Two-Dimensional
3D	Three-Dimensional
AMC	Artificial Magnetic Conductor
EBG	Electromagnetic Band Gap
FSS	Frequency Selective Surface
HIS	High Impedance Surface
PEC	Perfect Electric Conductor
PMC	Perfect Magnetic Conductor
DPS	Double Positive
ENG	Epsilon Negative

Abbreviation	Full Form
MNG	Mu-Negative
DNG	Double-Negative
ENZ	Epsilon-near-zero
MNZ	Mu-near-zero
ZIM	Zero-Index Materials
CPW	Coplanar Waveguide
FP	Fabry-Perot
CSR	Complementary Spiral Ring Resonator
EHL	Embedded Hilbert Line
MED-WG-MTM	Magneto-electro-dielectric waveguided MTM
PRS	Partially Reflected Surface
AIS	Artificial Impedance Surface
RCS	Radar Cross Section
CAMS	Checkerboard-organized Metamaterial Superstrate
VNA	Vector Network Analyzer
SLL	Side Lobe Level
SRR	Split Ring Resonator
Tx	Transmitter
Rx	Receiver

LIST OF SYMBOLS

Symbol	Details
N	Numbers of cells
P	Periodicity
β_{SW}	Propagation constant of surface wave resonances
L_{MS}	The overall length of the MS structure
β_{TM}	Propagation constants of TM-wave
β_{TE}	Propagation constants of TE-wave
η	Intrinsic Impedance
ε_0	Permittivity in free space
ε_r	Relative permittivity
μ_0	Permeability of free space
μ_r	Relative permeability
β	Phase change experienced by the wave
k_0	Wavenumber
n	Refractive index
E	Electric field
H	Magnetic field
J	Surface current density
c	Speed of light in air
λ_0	Free-space wavelength

Symbol	Details
Z	Equivalent Impedance
θ	Angle of Incidence
E_i	Resultant of the reflected field vectors
i	Transmitted wave index
E_0	Amplitude of the electromagnetic wave
f	Frequency
z	Normalized Impedance
h	Bottom and top layer distance
d	Maximum length of the unit cell
W	Width of the Microstripline
t	Thickness of the substrate
S_{11}	Reflection coefficient
S_{21}	Transmission coefficient
ν	Normal incidence angle
Ω	Ohm
L	Inductance
C	Capacitance
L_p	Equivalent Inductance of the patch
C_p	Equivalent Capacitance of the patch
C_g	Ground Capacitance
L_{eq}	Effective Inductance
C_{eq}	Effective Capacitance

Symbol	Details
φ_s	Reflection phases of MS Layer
φ_g	Reflection phases of the ground layer
R_m	Radiation resistance of the metasurface resonator
L_m	Inductance values of the MS slot resonator
C_m	Capacitance values of the MS slot resonator
C_{cm1}	Coupling capacitance along the vertical directions of the MS layer
C_{cm2}	Coupling capacitance along the horizontal directions of the MS layer