

This thesis is dedicated to
[My Beloved Parents]



इलेक्ट्रॉनिकी अभियांत्रिकी विभाग

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CANDIDATE'S DECLARATION

*I hereby declare that the work presented in the dissertation entitled “**Study of Metasurfaces in Terahertz Domain**” is an authentic record of my own work carried out at the Department of Electronics Engineering, Indian Institute of Technology (Banaras Hindu University), Varanasi as the requirement for the award of the degree of doctor of philosophy in Electronics Engineering, submitted in the Indian Institute of Technology (Banaras Hindu University), Varanasi for the session 2017-18 under the supervision of **Dr. Somak Bhattacharyya**, Department of Electronics Engineering and **Prof. P. Chakrabarti**, Department of Electronics Engineering, Indian Institute of Technology (Banaras Hindu University), Varanasi.*

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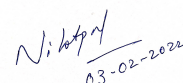
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Thank you

Nilotpal.

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LIST OF ABBREVIATIONS

Abbreviation	Full form
EM	Electromagnetic
THz	Terahertz
TE	Transverse Electric
TM	Transverse Magnetic
TM	Transverse magnetic
CA	Circuit Analog
FP	Fabry-Perot
PCB	Printed Circuit Board
CST	Computer Simulation Technology
ECM	Equivalent Circuit Mode
ADS	Advanced Design Systems
CPC	Cross Polarization Converter
PCR	Polarization Conversion Ratio
MMPA	Metamaterial Perfect Absorber

LIST OF SYMBOLS

Symbol	Details
ω_p	Plasma frequency
N	No. of free electrons
γ	Collision frequency
$x(t)$	Displacement of the of the electron from its initial position
q	Charge of electron
$R(\omega)$	Resistivity
$T(\omega)$	Transmissivity
$A(\omega)$	Absorptivity
θ_{in}	Angle of incidence
ϵ_r	Relative permittivity
μ_0	Permeability of free space
μ_r	Relative permeability
β	Phase change experienced by the wave
k	Propagation vector
η	Refractive index
E	Electric field
H	Magnetic field
J	Surface current density
c	Speed of light in air

λ_g	Guided wavelength
ϕ	Polarization angle time step for time-domain calculations
Z_{diel}	Characteristics impedance of dielectric
Z_o	Characteristics impedance of air
Z_{total}	Total impedance of the structure
X_1	Impedance of metasurface 1
X_2	Impedance of metasurface 2
f	Frequency
t	Time taken by the wave to reflect back to port 1
h	Distance between port 1 and top metasurface layer
S_{11}	Reflection coefficient
ϵ_{top}	Dielectric permittivity of the top layer
ϵ_{bottom}	Dielectric permittivity of bottom metallic layer