Declaration

I hereby declare that the work presented in this Thesis titled *"Study and Realization of Microwave & Millimeter-wave Circuits using Substrate Integrated Coaxial Line Technology (SICL)"* submitted to the Indian Institute of Technology Jodhpur in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy, is a bonafide record of the research work carried out under the supervision of *Dr. Soumava Mukherjee*. The contents of this Thesis in full or in parts, have not been submitted to, and will not be submitted by me to, any other Institute or University in India or abroad for the award of any degree or diploma.

Idury Satya Krishna
P17EE003

Certificate

This is to certify that the Thesis titled *"Study and Realization of Microwave & Millimeter-wave Circuits using Substrate Integrated Coaxial Line Technology (SICL)"*, submitted by *Idury Satya Krishna (P17EE003)* to the Indian Institute of Technology Jodhpur for the award of the degree of *Doctor of Philosophy*, is a bonafide record of the research work done by him under my supervision. To the best of my knowledge, the contents of this report, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

Dr. Soumava Mukherjee
Ph.D.Thesis Supervisor

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Idury Satya Krishna
Ph.D. Student

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List of Symbols

Symbol	Description
E	Electric Field Intensity
H	Magnetic Field Intensity
k	Wave Number
λ	Number of temporal frames used for bit-requirement estimation
c	Speed of Light in Free Space
α	Attenuation Constant
β	Propagation Constant
ε_r	Relative Permittivity of the Dielectric
tan_δ	Loss Tangent of the Dielectric
σ	Electrical Conductivity

List of Abbreviation

Abbreviation	Full form
SICL	Substrate Integrated Coaxial Line
SIW	Substrate Integrated Waveguide
TE	Transverse Electric
TM	Transverse Magnetic
$Quasi - TEM$	Quasi -Transverse Electromagnetic
PCB	Printed Circuit Board
PEC	Perfect Electric Conductor
SNR	Signal to NoiseRatio
FCC	Federal Communications Commission
HPBW	Half-power Beam Width
Q	Quality Factor
RF	Radio Frequency
CPW	Coplanar Waveguide
GCPW	Grounded Coplanar Waveguide
GSM	Bits per second
WCDMA	Cumulative Distribution Function
LTCC	Low Temperature Co-fired Ceramic
WLAN	Wireless Local Area Network
5G	5^{th} Generation
WBAN	Wireless Body Area Network
WPC	Wireless Planning Commission
HMSIW	Dynamic Indexing
HMSICL	Half-Mode Substrate Integrated Waveguide
QMSICL	Quarter-Mode Substrate Integrated Waveguide
IoT	Internet of Things
SMA	Sub-miniature Version A
FR	Frequency Ratio
VNA	Vector Network Analyzer
NR	New Radio
HFSS	High Frequency Structural Simullator
DGS	Defected Ground Structure
FBW	Fractional Bandwidth
UC	Unit Cell
WiMAX	Worldwide Interoperability for Microwave Access
PCS	Personal Communication Service
WiBro	Wireless Broadband
PTH	Plated Through Hole
FEM	Finite Element Method
UMTS	Universal Mobile Telecommunication System
LNA	Low Noise Amplifier
PA	Power Amplifier Photographic Experts Group
SMD	Surface Mount Device

Abbreviation	Full form
LPF	Low Pass Filter
BLC	Branch Line Coupler
LTE	Long-Term Evolution