CONTENTS

LIST OF FIGURES

LIST OF TABLE

ABBREVIATIONS

Abbreviation	Full Form
BeO-SiC	Beryllium Oxide-Silicon Carbide
BWOs	Backward Wave Oscillations
CARM	Cyclotron Auto-Resonance Maser
CPI	Communication and Power Industries
CRM	Cyclotron Resonance Maser
CST	Computer Simulation Technologies
DC	Direct Current
ECRM	Electron Cyclotron Resonance Maser
EM	Electromagnetic
FDTD	Finite-Difference Time-Domain
FEM	Finite-Element Method
FIT	Finite Integration Technique
GHz	Gigahertz
MW	Megawatt
Gyro-amplifier	Gyrotron Amplifier
Gyro-BWO	Gyrotron Backward Wave Oscillator
Gyro-TWAs	Gyrotron Travelling Wave Amplifiers
Gyro-TWT	Gyrotron Travelling Wave Tube
IAP	Institute of Applied Physics
LHC	Large Hadron Collider
MHz	Megahertz
MIG	Magnetron Injection Gun

MoM	Method of Moments
MW	Megawatt
NRL	Naval Research Laboratory
OFHC	Oxygen free High conductivity
PBA	Perfect Boundary Approximation
PBG	Photonic Band Gap
PDL	Periodic Dielectric Loading
PIC	Particle-in-Cell
PML	Perfect Matched Layer
RF	Radio Frequency
SOC	Start Oscillation Current
SSDs	Solid State Devices
SWSs	Slow wave Structures
TE	Transverse Electric
TM	Transverse Magnetic
TeV	Tera Electron Volt
THz	Terahertz
TWAs	Travelling Wave Amplifiers
TWTs	Travelling Wave Tubes
UDL	Uniform Dielectric Loading
VEDs	Vacuum Electronic Devices

LIST OF SYMBOLS

Symbol	Details
γ	Relativistic mass factor
α	Pitch factor
V_b	Beam voltage
I_b	Beam current
r_w	Radius of waveguide
r_g	Electron guiding centre radius
r_{cav}	Radius of cavity
r_L	Larmor radius
r_d	Radius of drift tube
L_c	Length of cavity
L_d	Length of drift tube
L_{wg}	Length of waveguide
v_t	Transverse electron velocity
v_z	Axial electron velocity
ω	Angular frequency of RF wave
Ω	Electron cyclotron frequency
c	Velocity of light in free space
λ	Operating wavelength
e	Electron charge
m_e	Mass of electron
B_0	DC magnetic field
s	Electron beam harmonic number

m_q, n_q	Azimuthal, and radial indices of q^{th} mode
N_q	Total number of modes
q	Particular number of mode
p	Normalized momentum of electrons
p_t	Transverse momentum of electrons
p_z	Axial momentum of electrons
θ	Phase of electron
I_o	Normalized beam current
μ	Normalized interaction length
J_t	Transverse AC current density
H_{mn}	Azimuthal coupling coefficient
x_{mn}	The nth zero of J_m (Bessel function)
ε	Complex permittivity
ε_0	Free-space permittivity
μ_0	Free-space permeability
I_{soc}	Start oscillation current
F	Normalized field amplitude
X	Bunching parameter of the electron beam
$\eta_{\perp}$	Transverse efficiency
η_{ele}	Electronic efficiency
P_{in}	Driver power at the input cavity
E	RF electric field
B	RF magnetic field
E_0	Electric field amplitude at the input cavity
Q	Quality factor
Q_{cpl}	Coupling quality factor

k_t	Transverse propagation constant
k_z	Axial propagation constant
β_t	Normalized transverse electron velocity
β_z	Normalized axial electron velocity
V_d	Voltage depression
I_l	Limiting current
G	Gain
s_d	Skin depth
σ	Conductivity
t_w	Window thickness
r_{win}	Radius of window
ε_{rw}	Relative permittivity of RF window