

ABBREVIATIONS

Abbreviation	Details
A	Ampere
BeO-SiC	Beryllium Oxide-Silicon Carbide
BWOs	Backward Wave Oscillators
CARM	Cyclotron Auto-Resonance Maser
CPI	Communication and Power Industries
CRM	Cyclotron Resonance Maser
CST	Computer Simulation Tool
CW	Continuous Wave
CVD	Chemical Vapor Deposition
DC	Direct Current
DFT	Discrete Fourier Transform
DNP	Dynamic Nuclear Polarization
ECR	Electron Cyclotron Resonance
ECRM	Electron Cyclotron Resonance Maser
EM	Electromagnetic
EPR	Electron Paramagnetic Resonance
FD	Finite Differences
FDTD	Finite-Difference Time-Domain
FETD	Finite-Element Time-Domain
FFT	Fast Fourier Transform
FIT	Finite Integration Technique

FVTD	Finite-Volume Time-Domain
GHz	Gigahertz
GW	Gigawatts
GUI	Graphical User Interface
Gyro-BWO	Gyrotron Backward Wave Oscillator
Gyro-TWT	Gyrotron Travelling Wave Tube
HPM	High Power Microwaves
IAP	Institute of Applied Physics
keV	Kilo Electron Volt
kV	Kilovolts
kW	Kilowatts
LHC	Large Hadron Collider
LSA	Large Signal Analysis
MHz	Megahertz
MIG	Magnetron Injection Gun
MIT	Massachusetts Institute of Technology
MMW	Millimeter-Wave
MoM	Method of Moments
MW	Megawatt
NRL	Naval Research Laboratory
OFHC	Oxygen free High conductivity
PBA	Perfect Boundary Approximation
PBG	Photonic Band Gap
PIC	Particle-in-Cell

PMS	Permanent Magnetic Systems
RF	Radio Frequency
TD	Time Domain
TE	Transverse Electric
TM	Transverse Magnetic
TeV	Tera Electron Volt
THz	Terahertz
TWTs	Travelling Wave Tubes
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_b	Electron beam radius
r_L	Larmor radius
v_t	Perpendicular electron velocity
v_z	Axial electron velocity
ω_0	Angular frequency of RF wave
ω_c	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
v_p	RF Phase velocity
v_g	RF Group velocity
s	Harmonic number
m, l	Azimuthal, and radial mode indices
p	Normalized momentum of electrons
p_t	Transverse momentum of electrons
p_z	Axial momentum of electrons
Λ	Phase of electron
I	Normalized beam current
C_{ml}	Transverse TE mode normalization coefficient
μ	Normalized interaction length
Δ	Detuning parameter
J_t	Transverse AC current density
H_{ml}	Coupling Coefficient
x'_{ml}	The l^{th} zero of J (Bessel function)
ε	Complex permittivity

ϵ_0	Free-space permittivity
μ_0	Free-space permeability
J_m	m^{th} order ordinary Bessel function of first kind
I_{st}	Start oscillation current
F	Normalized field amplitude
f_{dr}	Driver frequency
f	Mode amplitude
ψ	Mode phase
h	Profile function
q	Bunching parameter of the electron beam
L	Length of cavity
R_d	Drift tube radius
L_d	Drift tube length
η_{\perp}	Transverse efficiency
η_{el}	Electronic efficiency
P_{in}	Driver power at the input cavity
$P_n\{\tau\}$	Time-Dependent RF Output power
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
Q_D	Diffraction quality factor
N	Number of interacting modes
k_{nt}	Transverse propagation constant
k_z	Axial propagation constant
$\beta_{\perp 0}$	Normalized transverse electron velocity
β_{\parallel}	Normalized axial electron velocity
V_d	Voltage depression
I_L	Limiting current
ρ	Ohmic wall loss
U_w	Energy stored in the cavity
χ	Susceptibility
A	Amplitude of the signal

G	Gain
ξ	Stagger-tuning parameter
δ	Detuning parameter
σ	Conductivity