



In recent years the rapid progress in RF and Microwave electronics has created an increasing demand for virtual training platform which can provide a high degree of simulation with great visualization. Looking after this requirement Sciencetech has designed Simtel RF and Microwave Simulation Software.

Simtel RF and Microwave Simulation Software is a very powerful and user friendly software for understanding the complex concepts and working principle of RF and Microwave engineering. It explains this complex subject virtually through high quality animations, rich learning contents, attractive graphics with reference results.

Simtel includes simple mathematics where needed. Wave effects such as field patterns, higher order modes excitation, which are less intensively discussed in books, are exhaustively classified, analyzed and visualized.

Simtel starts with field patterns of various modes inside waveguide and resonator cavities, behavior of terminated coaxial line, Smith chart applications etc. For the first time, a new way of interacting with the MICs have been introduced. A variety of Microwave devices and components have also been deeply covered.

### Benefits:

- Explore the concept of Microwaves through interactive animation
- In depth study of RF and Microwave components, devices and systems
- Attractive three dimensional field patterns with different view angles
- Observation, Analysis and Calculation of typical parameters and their effect
- Simulate Microwave mathematical concepts in an innovative way.

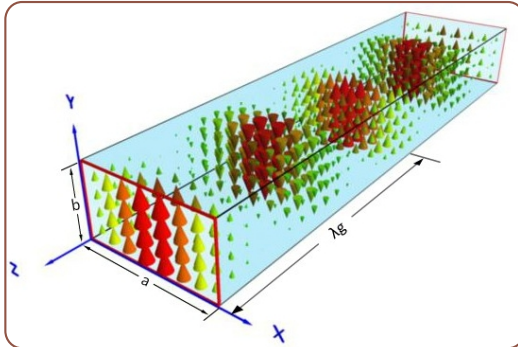
### Features

- 3D animated field patterns (TE/TM ) of Waveguides and Cavities
- Time/Frequency domain behavior of terminated Coaxial line
- Impedance measurement and Impedance matching using Smith chart
- Characteristics Impedance and reflection coefficient of Transmission line
- 3D animated field patterns and characteristics Impedance of Planar transmission line
- 3D animated field patterns of Microstrip components Microwave circuit analysis of Amplifiers and Frequency doublers

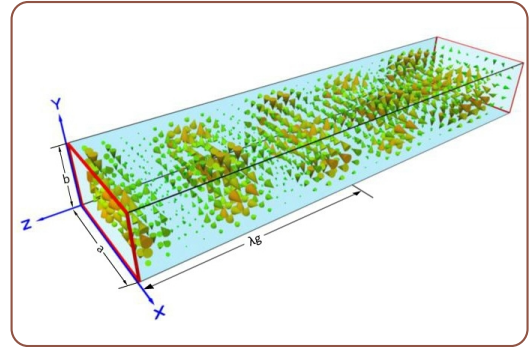
Study Microwave semiconductor devices, Microwave tubes and Microwave measuring instruments

- Electromagnetic Waves : Basic concepts
- Waveguides : Rectangular and Circular waveguides
  - Modes of propagation (TE/TM)
  - Study of field pattern of various modes inside a rectangular waveguide

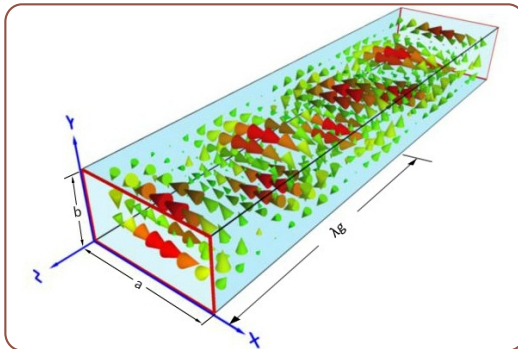
TE<sub>10</sub>-E field



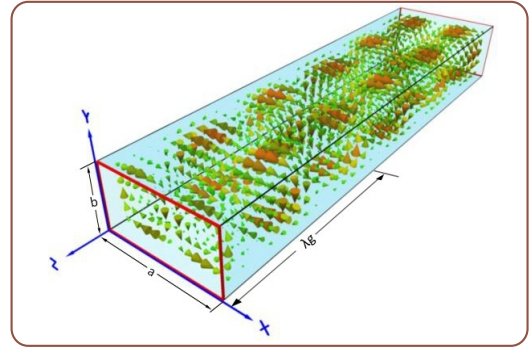
TE<sub>21</sub>-E field



TM<sub>11</sub>-H field

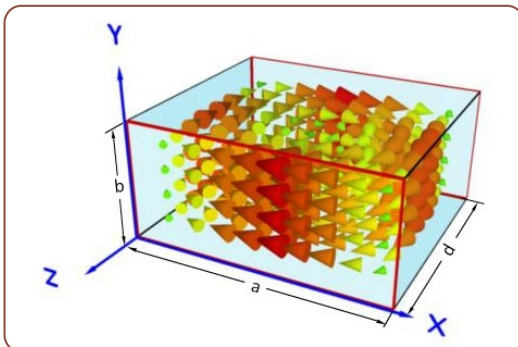


TM<sub>21</sub>-H field

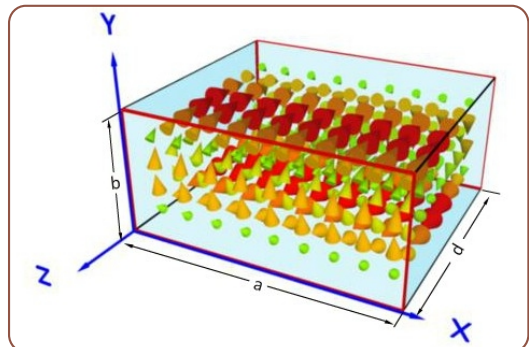


- Resonator Cavity: Rectangular waveguide cavity
  - Modes of propagation (TE/TM)
  - Study of field pattern of various modes inside a rectangular waveguide cavity

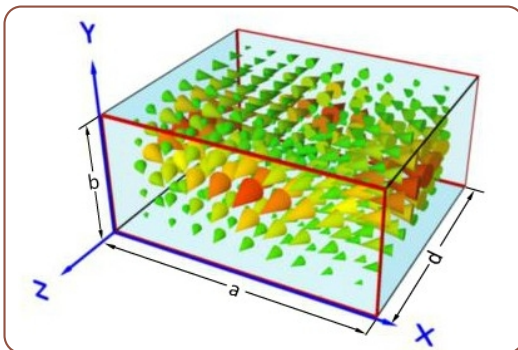
TE<sub>10</sub>-H field



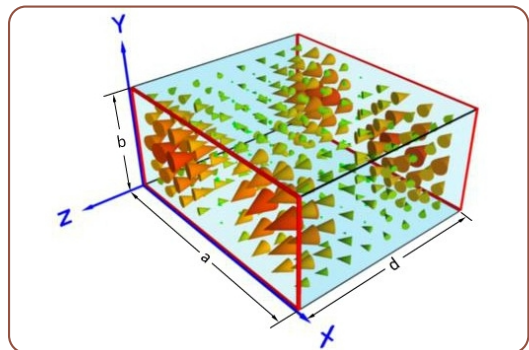
TE<sub>01</sub>-H field



TM<sub>11</sub>-E field



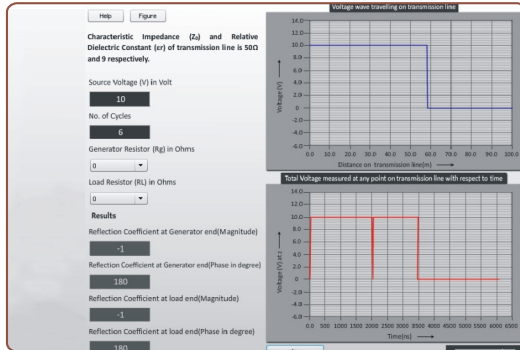
TE<sub>21</sub>-E field



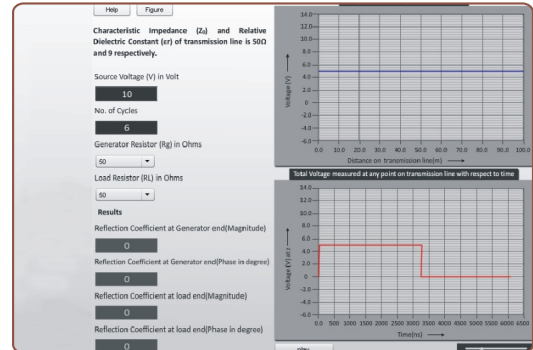
## • TransmissionLine

- Study the time domain behavior of terminated coaxial transmission lines
- Study the frequency domain behavior of terminated coaxial transmission lines

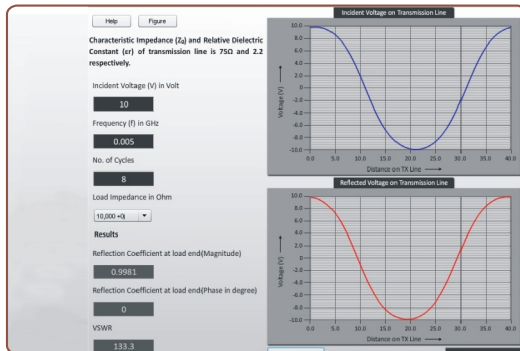
Time domain behavior of unmatched line



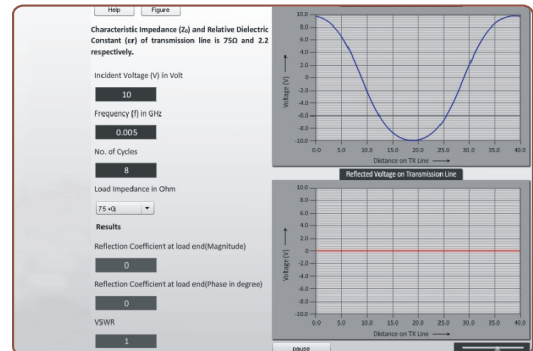
Time domain behavior of matched line



Frequency domain behavior of unmatched line



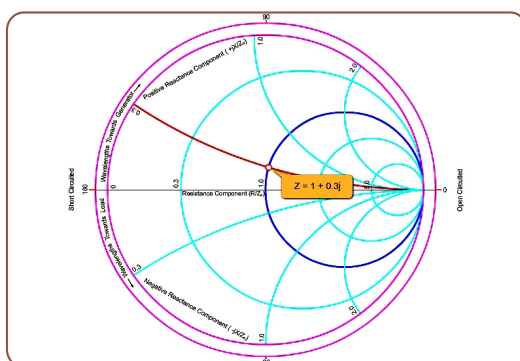
Frequency domain behavior of matched line



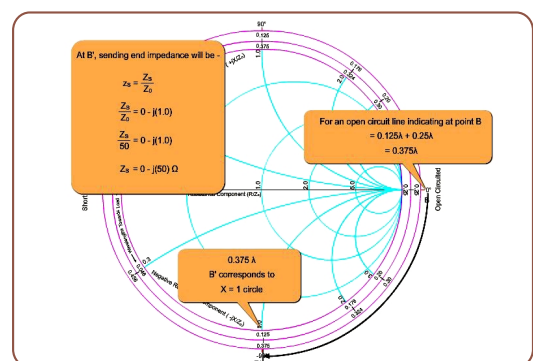
## • The Smith chart

- Smith chart and its application for the unknown impedance measurement
- Study the behavior of impedance matching for Passive networks (RL, RC, RLC, T and p network) using Smith chart

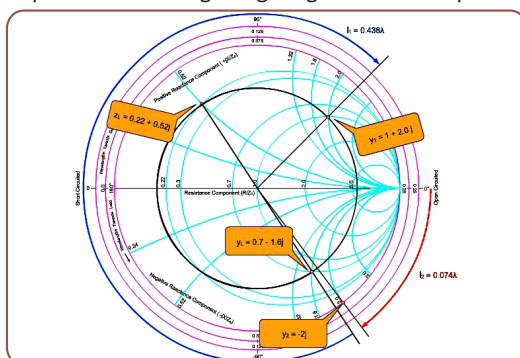
Impedance determination



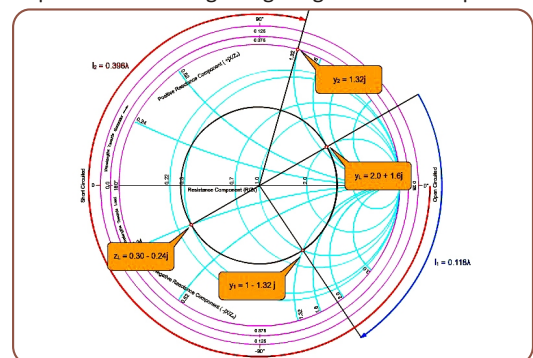
Impedance measurement



Impedance matching using single stub technique



Impedance matching using single stub technique

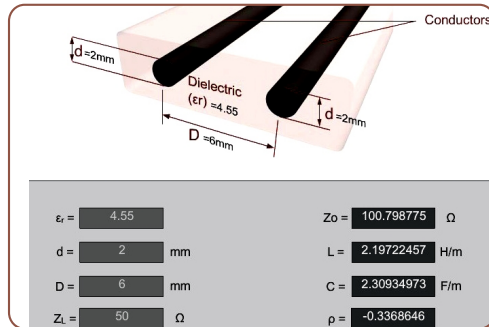




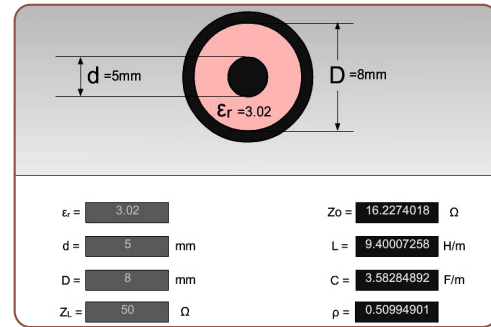
### Transmission Line

- Study the change in characteristics impedance and reflection coefficients of the transmission line by changing the dielectric properties of materials embedded between two conductors

Calculation of  $Z_L$  and  $r$  for two wire transmission line



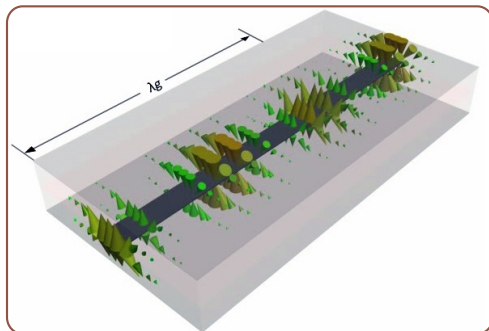
Calculation of  $Z_L$  and  $r$  for coaxial line



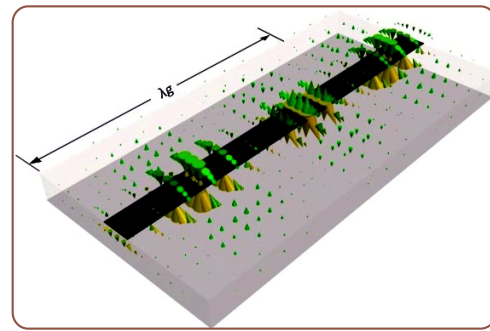
### Planar Transmission Line

- Simulation of Striplines and determining the field patterns and characteristic impedance
- Simulation of Microstrip lines and determining the field patterns and characteristic impedance

Stripline E-field

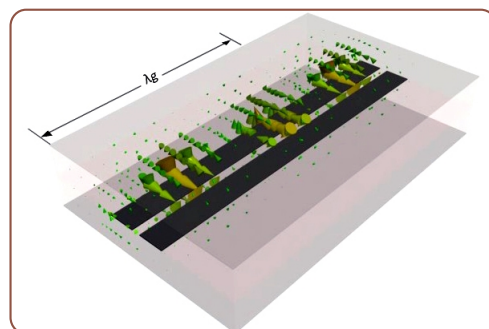


Microstrip line E-field

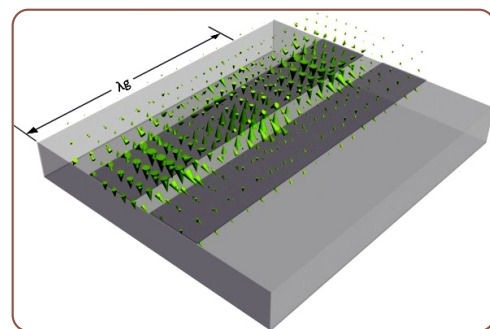


- Simulation of Parallel coupled striplines and determining the field patterns and characteristic impedance
- Simulation of Parallel coupled microstrip lines and determining the field patterns and characteristic impedance

Parallel coupled stripline H- field

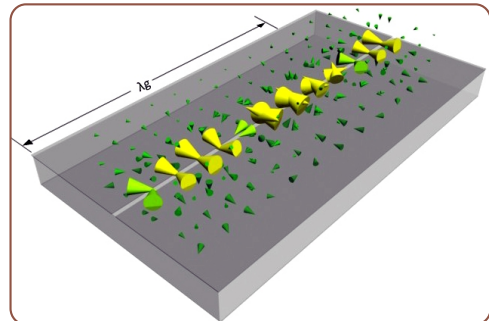


Parallel coupled microstrip line E- field

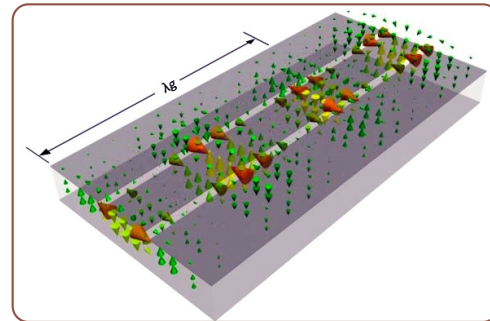


- Simulation of Parallel coupled striplines and determining the field patterns and characteristic impedance
- Simulation of Parallel coupled microstrip lines and determining the field patterns and characteristic impedance

Slot line H- field



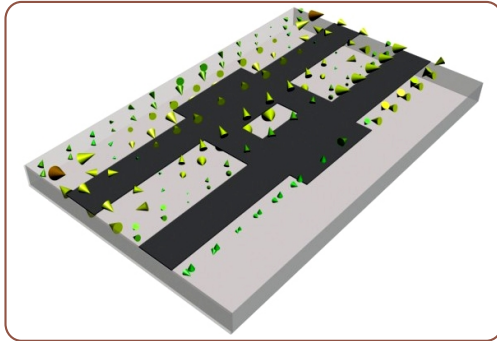
Coplanar line E- field



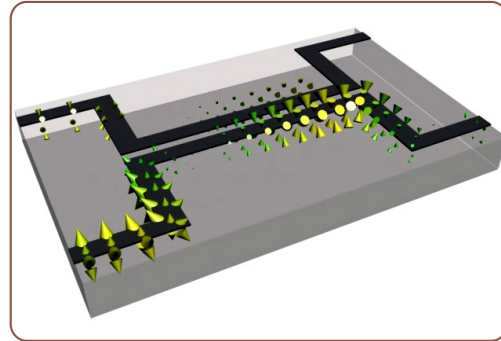
- **MIC components**

- Simulation of 3-dB branchline coupler and determining the field patterns
- Simulation of backward wave coupler and determining the field patterns

3-dB branchline coupler (E- field)

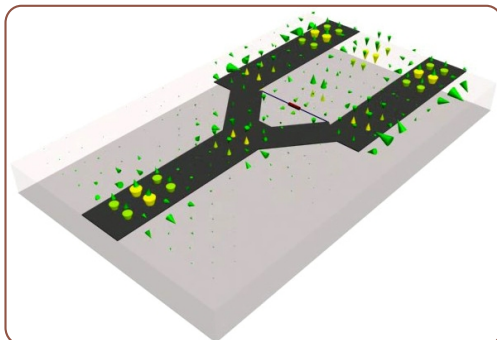


Backward wave coupler (H- field)

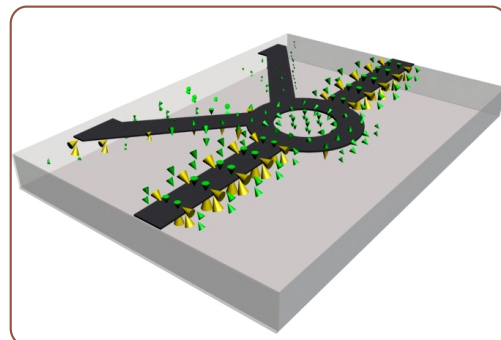


- Simulation of Wilkinson power divider and determining the field patterns
- Simulation of Rat-race hybrid ring and determining the field patterns

Wilkinson power divider E- field

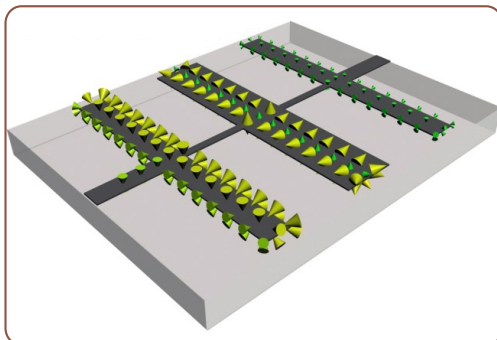


Rat-race hybrid ring (E- field)

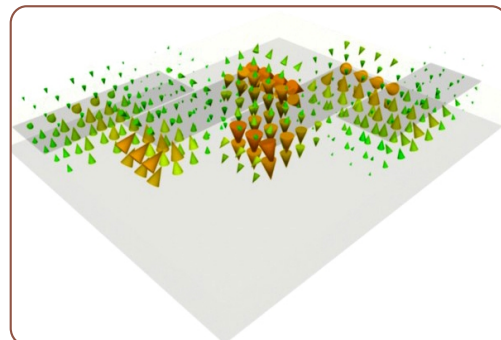


- Simulation of Low pass filters and determining the field patterns
- Simulation of Band pass filters and determining the field patterns

Low pass filter at 10GHz (E- field)

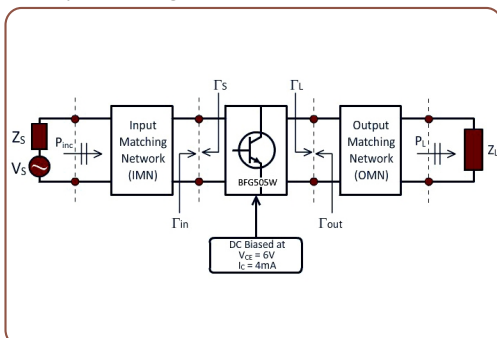


Band pass filter (E- field)

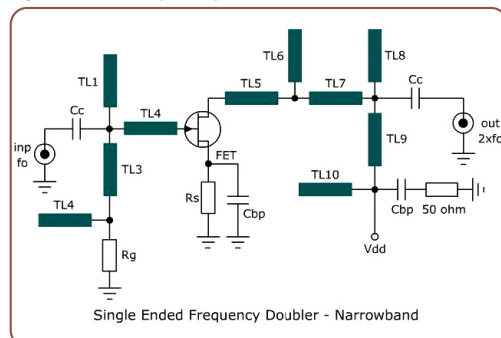


- Study of RF amplifier using microwave BJT.
- Study of RF frequency doublers using microwave FET.

RF amplifier using microwave BJT

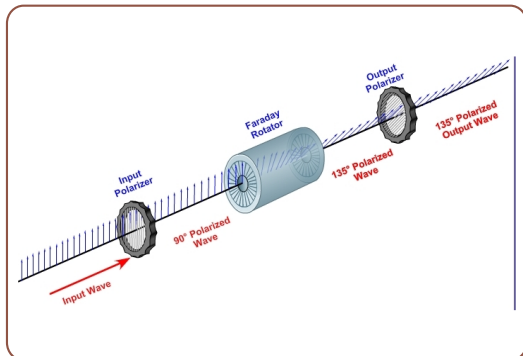


Single ended frequency doubler-narrowband

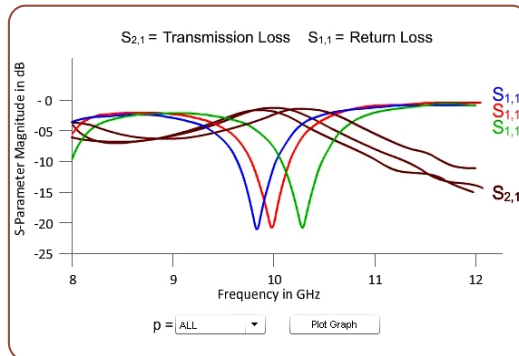


- Microwave components: Cavity, Directional Coupler, Circulator, Isolator, Tees
- Microwave tubes: Conventional tube, Velocity modulation, Two cavity and multi cavity Klystron, Reflex Klystron, Travelling wave tube, Magnetron, Cross field amplifier
- Microwave active components: Gunn, Tunnel, PIN and Varacter diodes

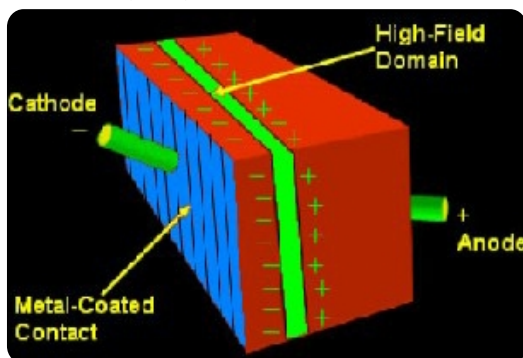
Forward mode microwave isolator



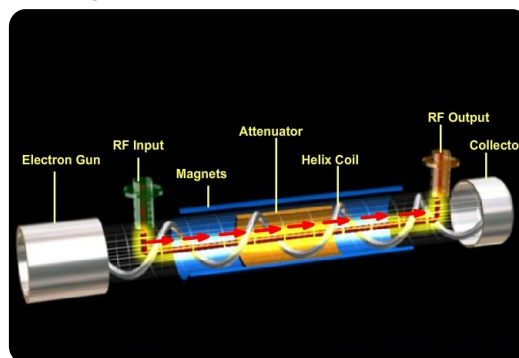
S-parameters graph of BPF for different strip lengths



Gunn diode (GaAs)



Travelling wave tube

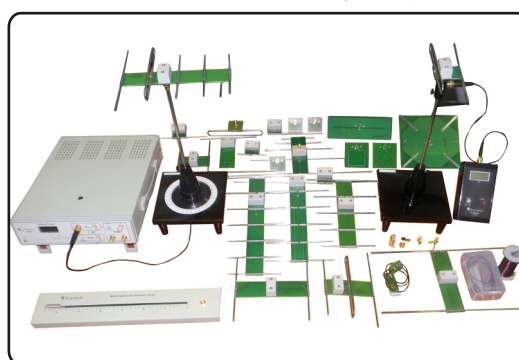


## Hardware

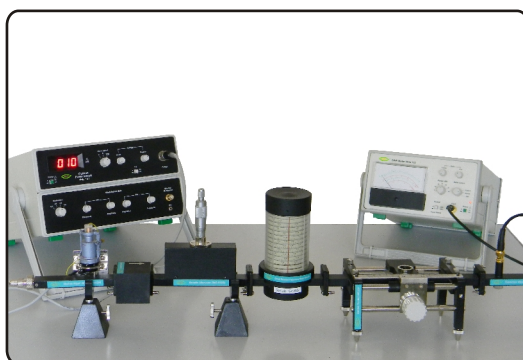
Sciencetech RF Boards (optional)



Sciencetech 2261 Antenna Trainer (optional)



Microwave TestBench Nvis 9000 Series (optional)



MIC Training System Nvis 9008A (optional)

