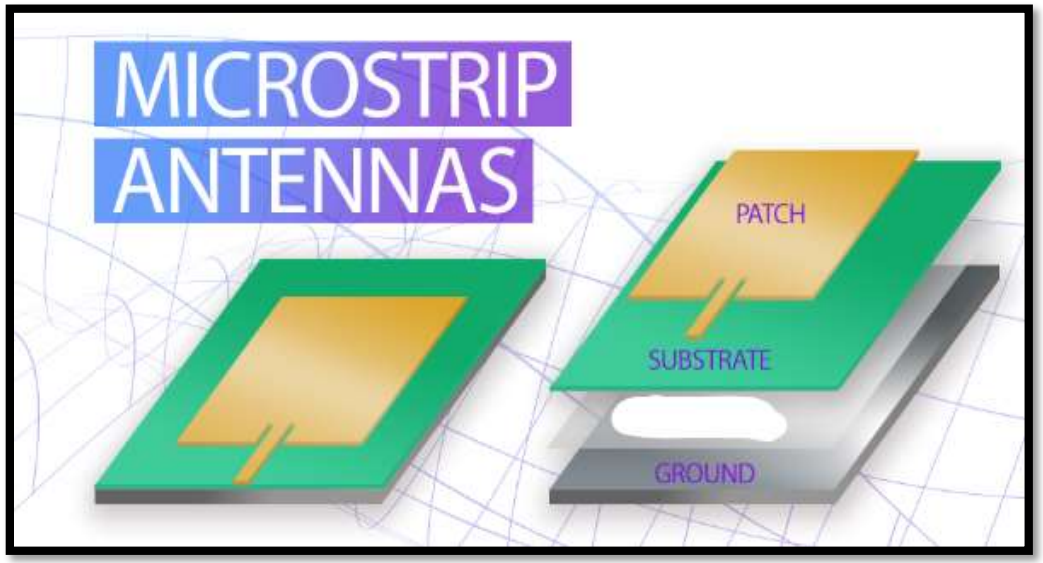
PLANAR RESONATOR STRUCTURES



Common Stack for All Sensors

- **Top Layer:** Varies - METAL (patch, IDC, SRR, CSRR, etc.)
- **Substrate**: Typically a Dielectric (like FR4, Rogers RT, Rogers RO, F4B-2, etc.)
- **Bottom Layer**: METAL Usually a solid ground plane (especially for microstrip-based sensors)

TRANSMISSION LINES

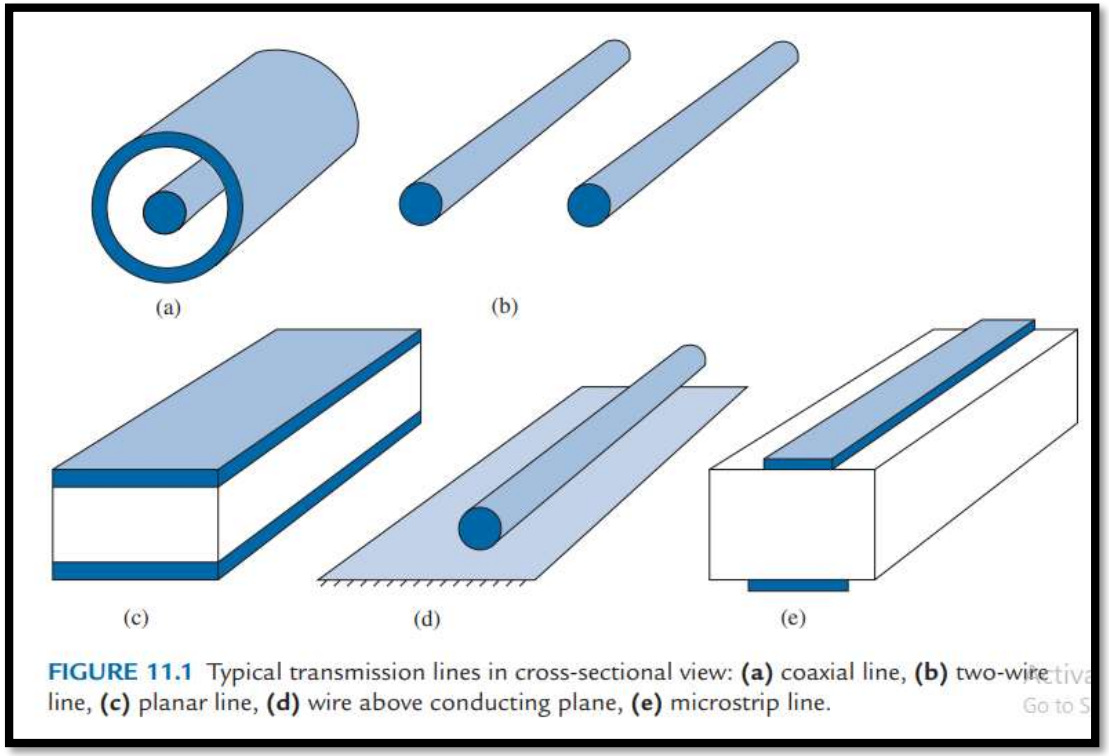


FIGURE 11.1 Typical transmission lines in cross-sectional view: **(a)** coaxial line, **(b)** two-wire line, **(c)** planar line, **(d)** wire above conducting plane, **(e)** microstrip line.

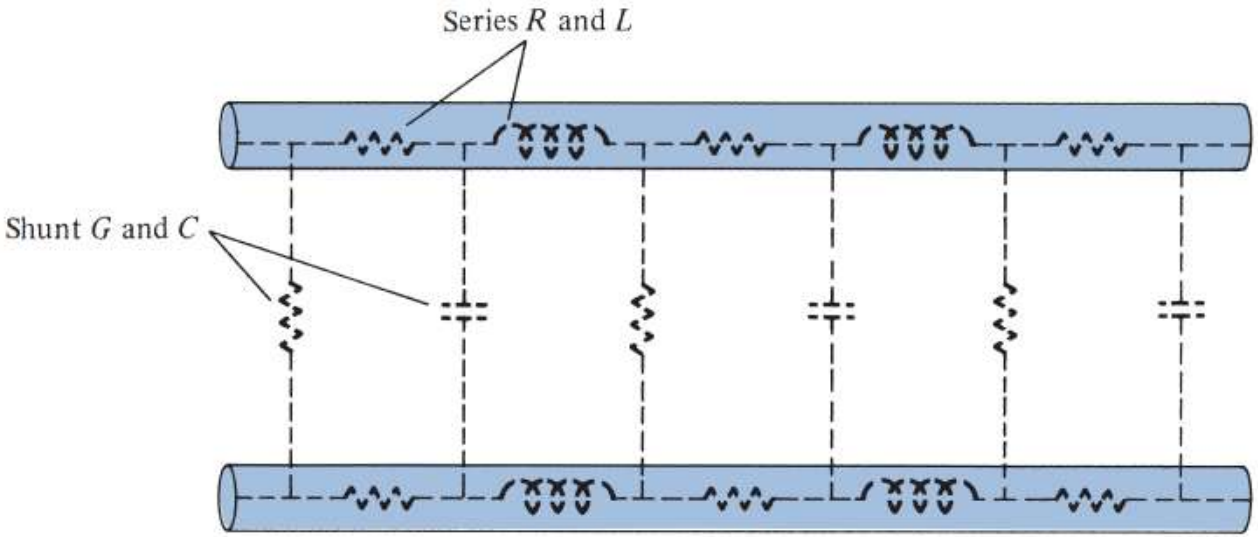


FIGURE 11.3 Distributed parameters of a two-conductor transmission line.

COAXIAL CABLE AND VNA SETUP

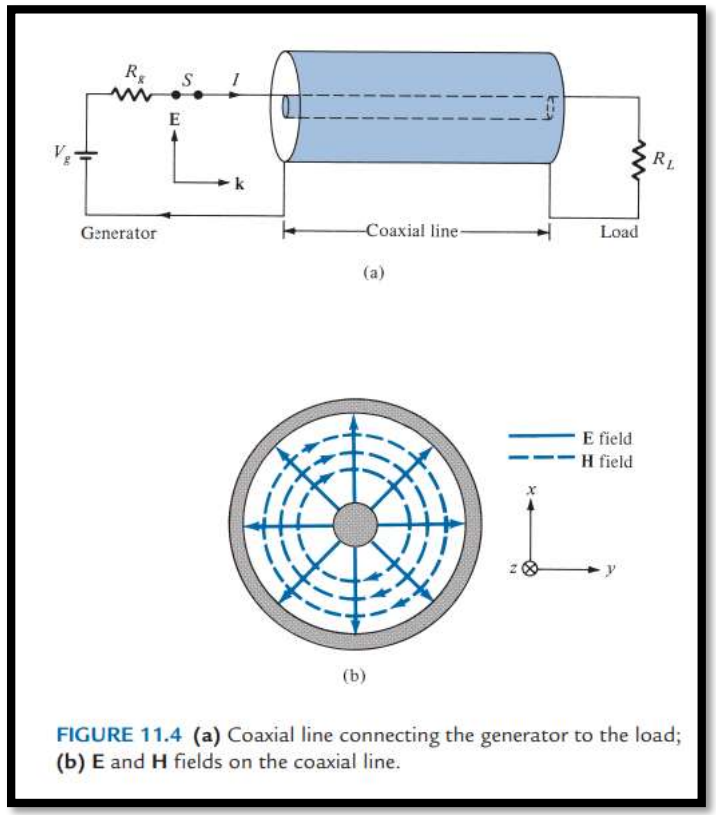


FIGURE 11.4 **(a)** Coaxial line connecting the generator to the load; **(b)** **E** and **H** fields on the coaxial line.

Without Load vs With Load

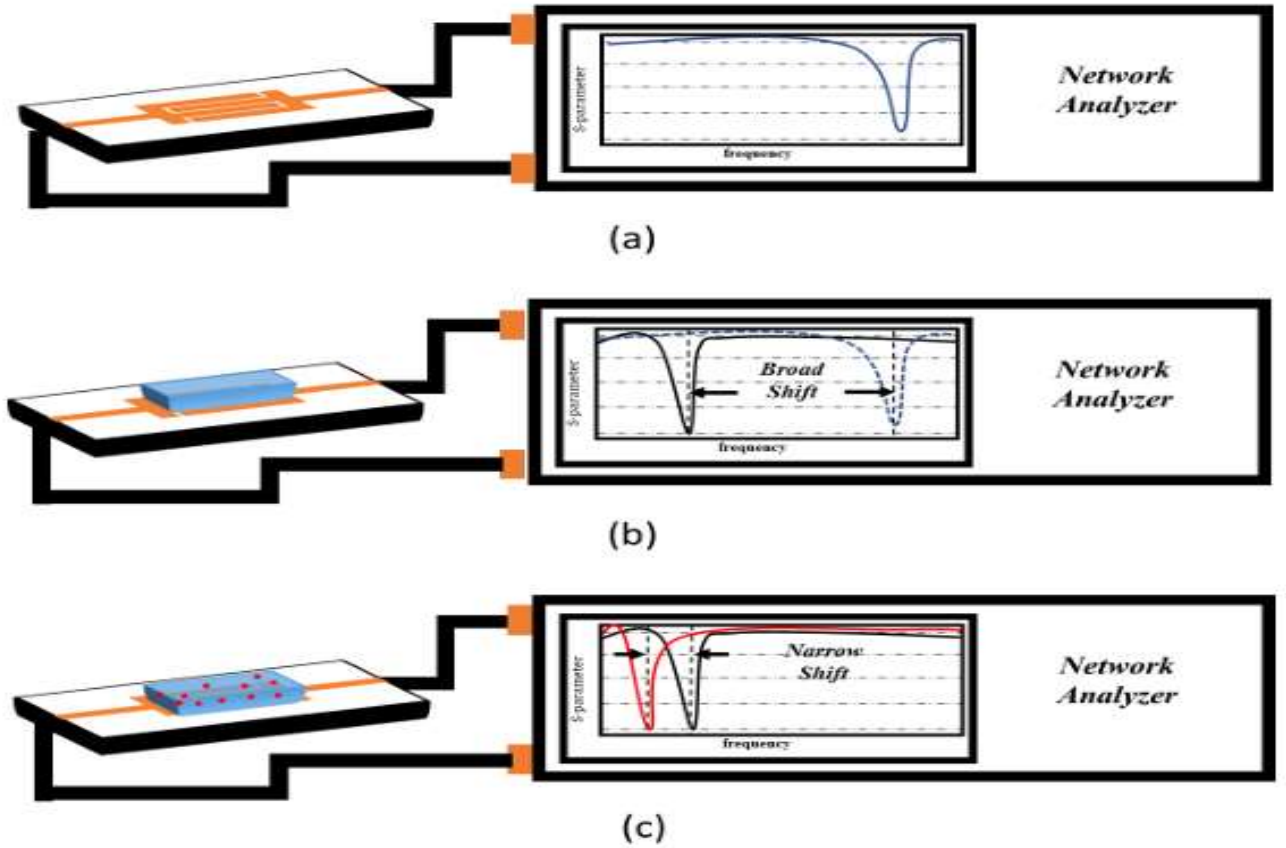
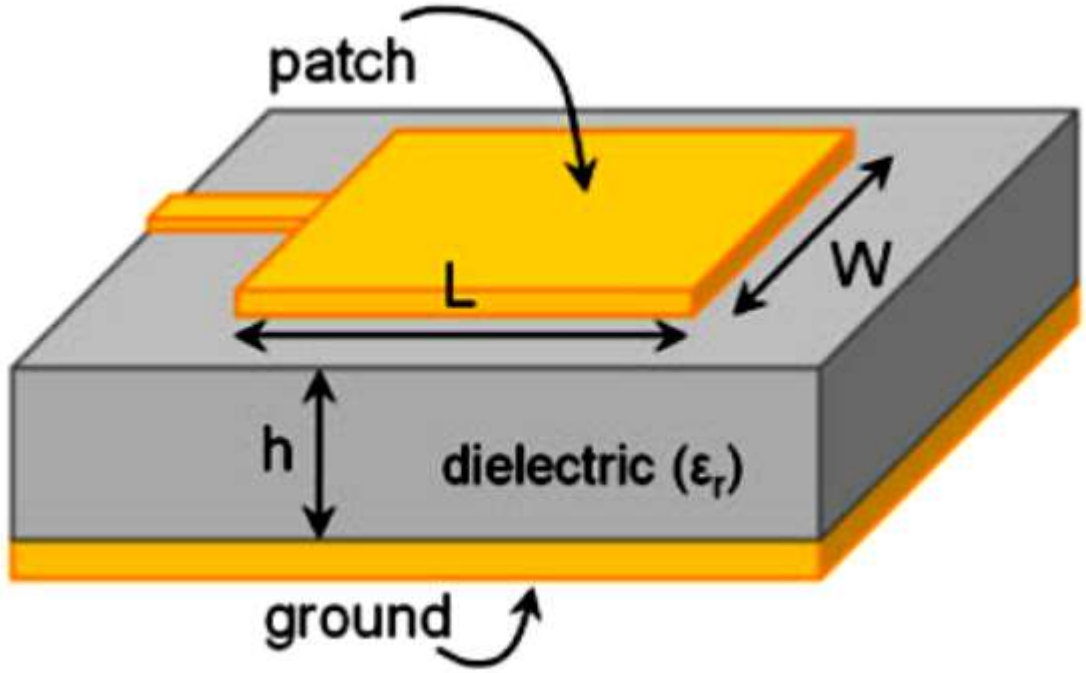
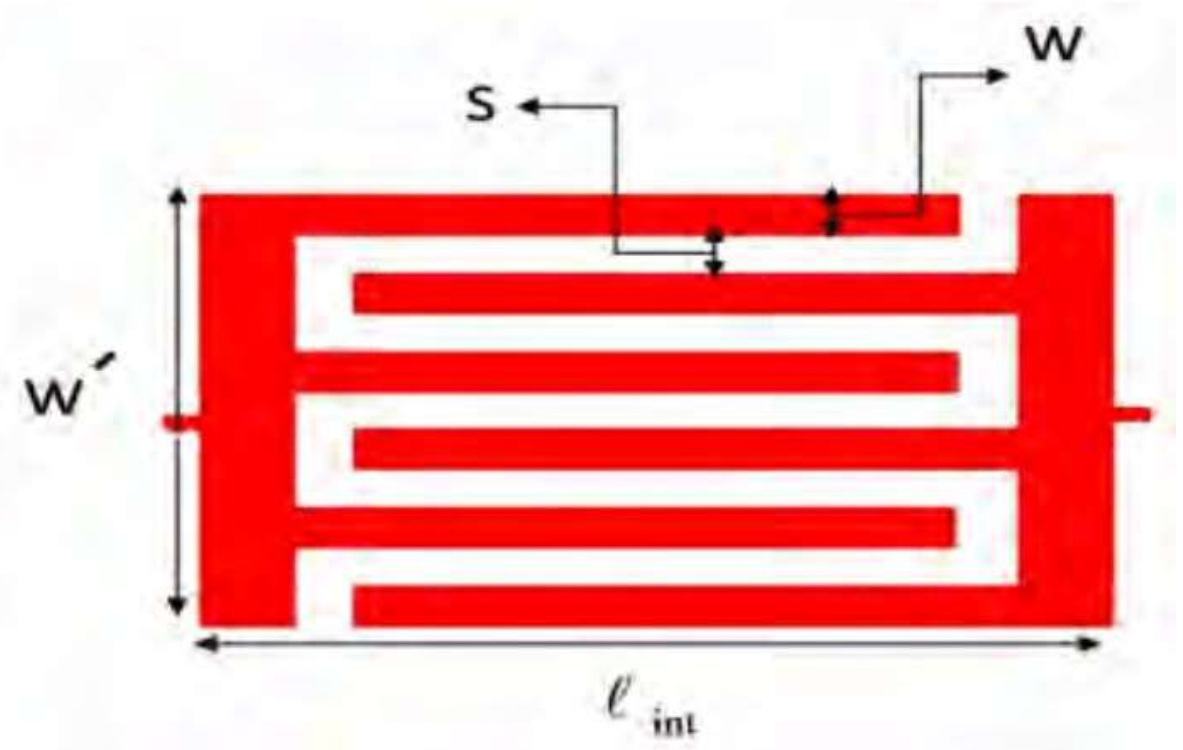


Fig. 1. Shift in frequency at different stages. (a) Empty RF biosensor. (b) Solvent over RF biosensor. (c) Mixture of solvent and solute over RF biosensor.

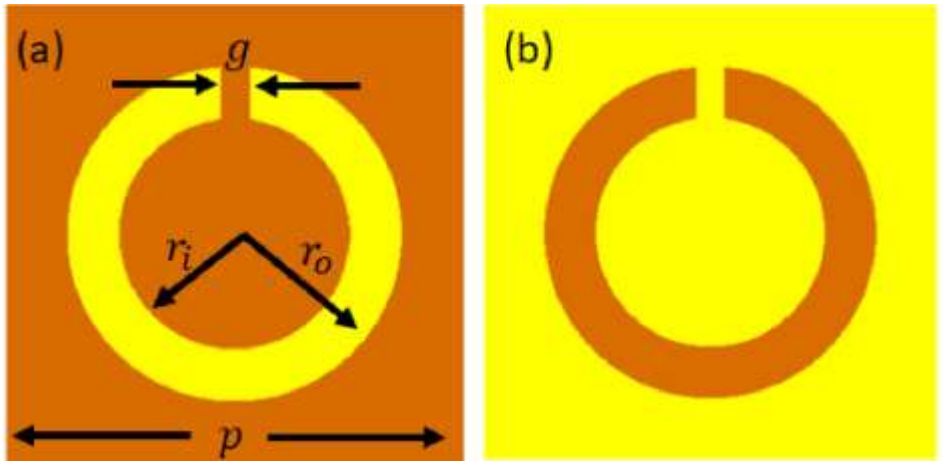
MICROSTRIP PATCH RESONATOR

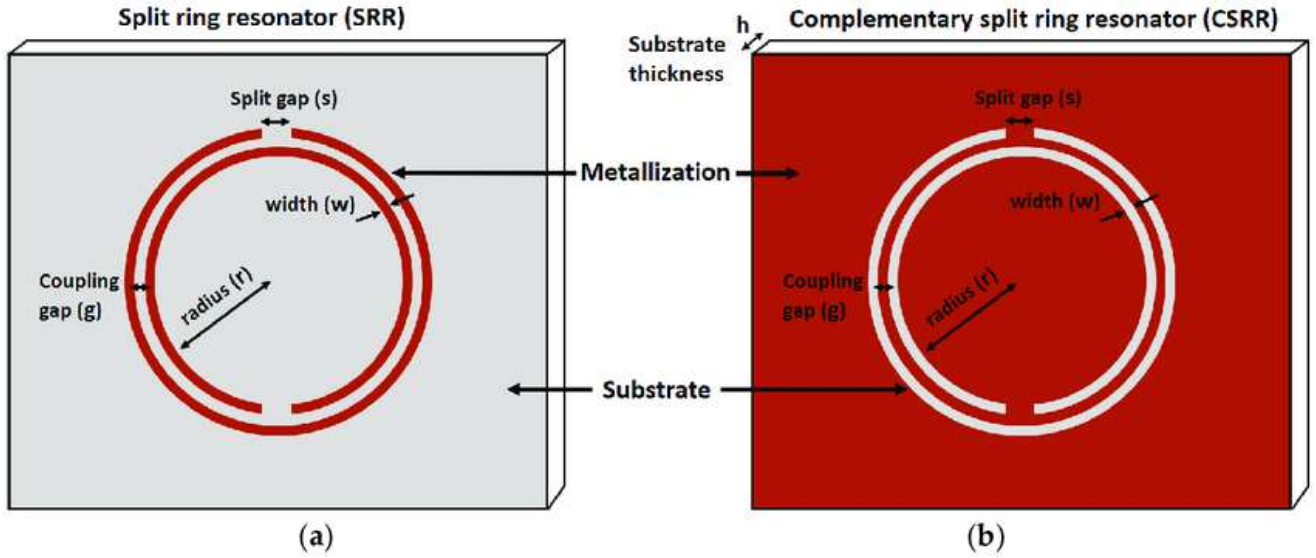


INTERDIGITATED CAPACITOR (IDC)

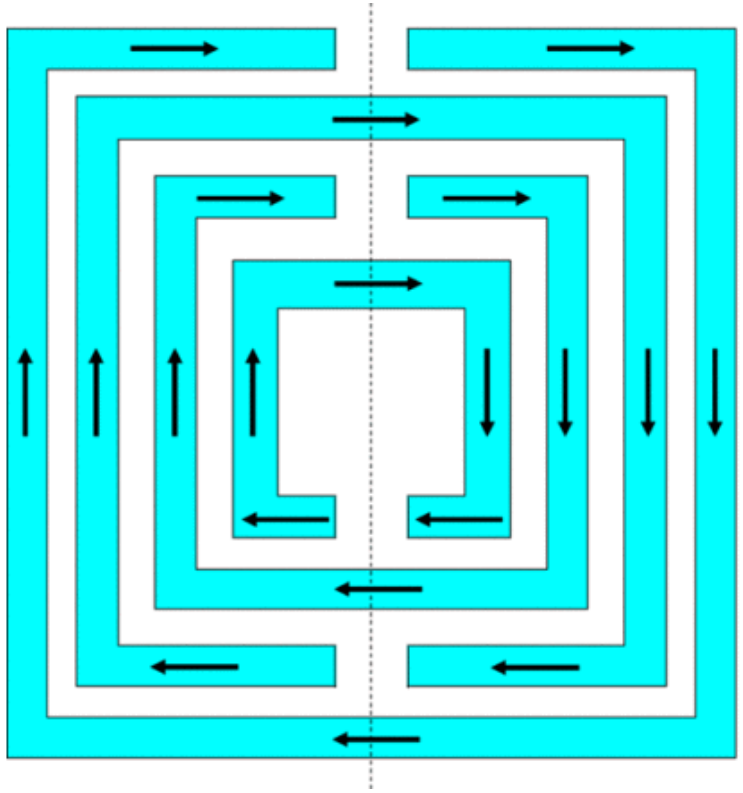


SPLIT RING RESONATOR (SRR) COMPLEMENTARY SPLIT RING RESONATOR (CSRR)

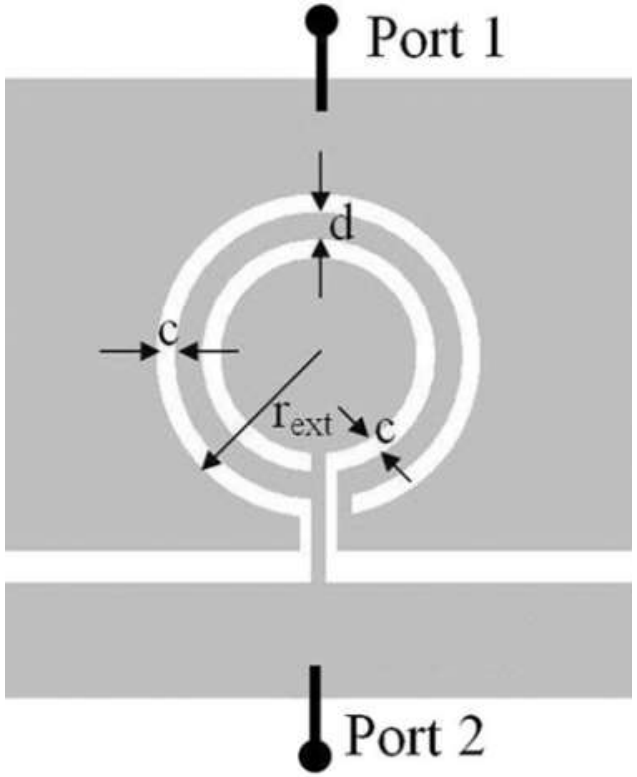




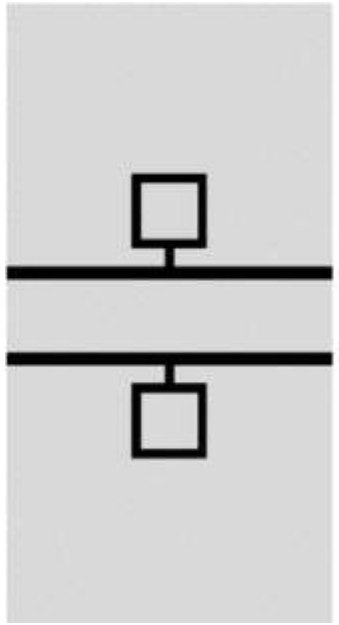
MULTIPLE SPLIT RING RESONATOR (MSRR)

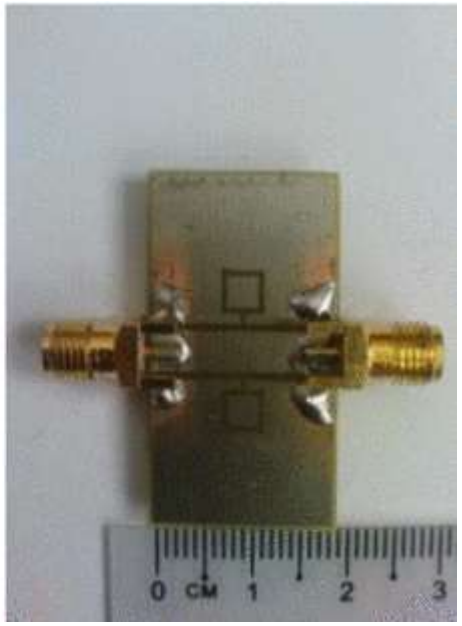


OPEN COMPLEMENTARY SPLIT RING RESONATOR (OCSRR)

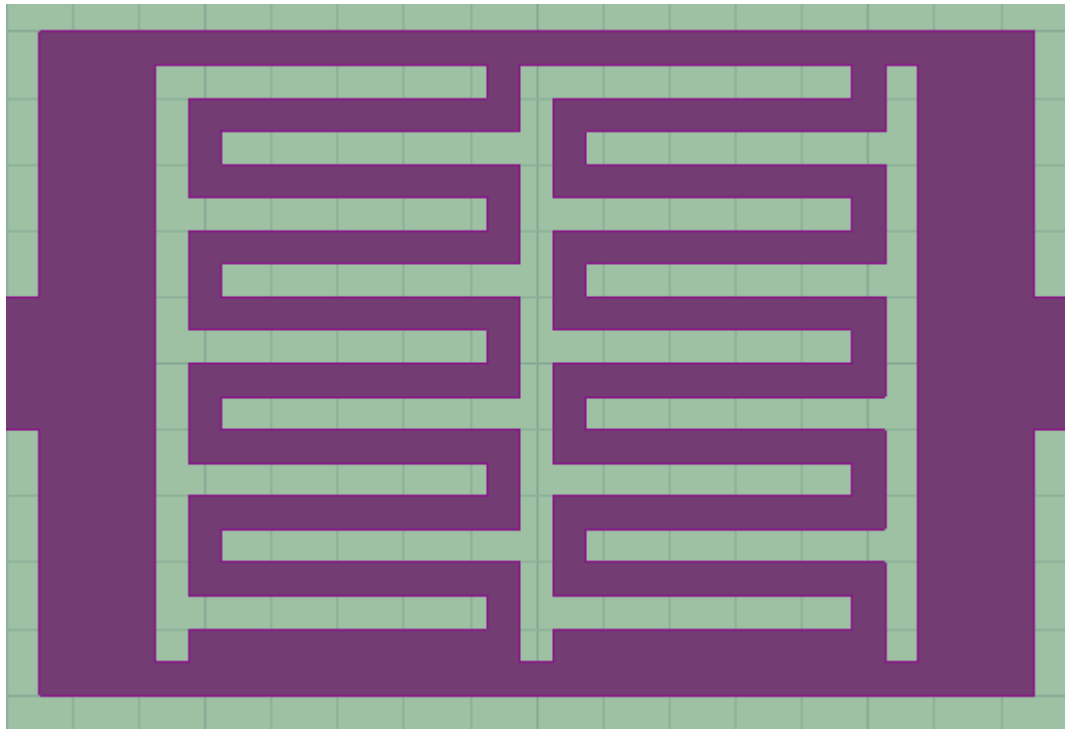


DEFECTED GROUND STRUCTURE (DGS)

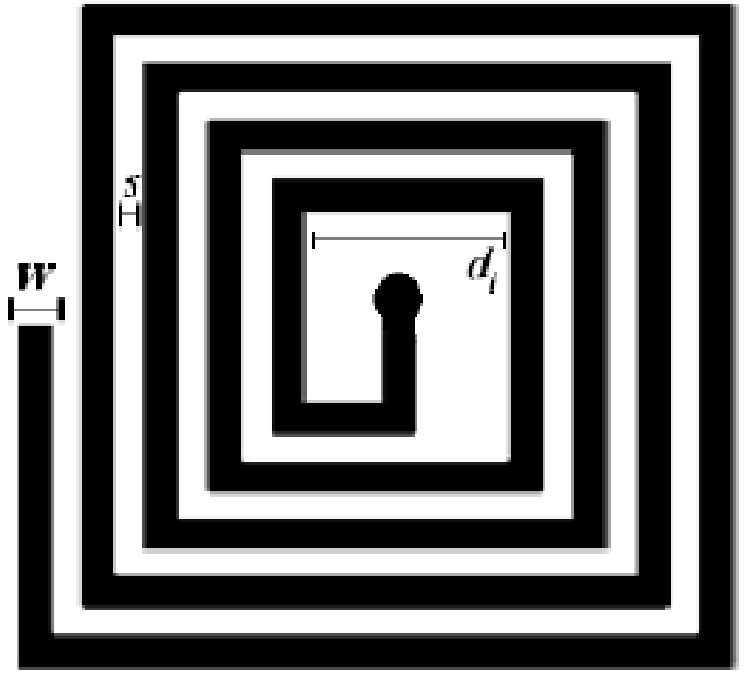




MEANDER LINE RESONATOR

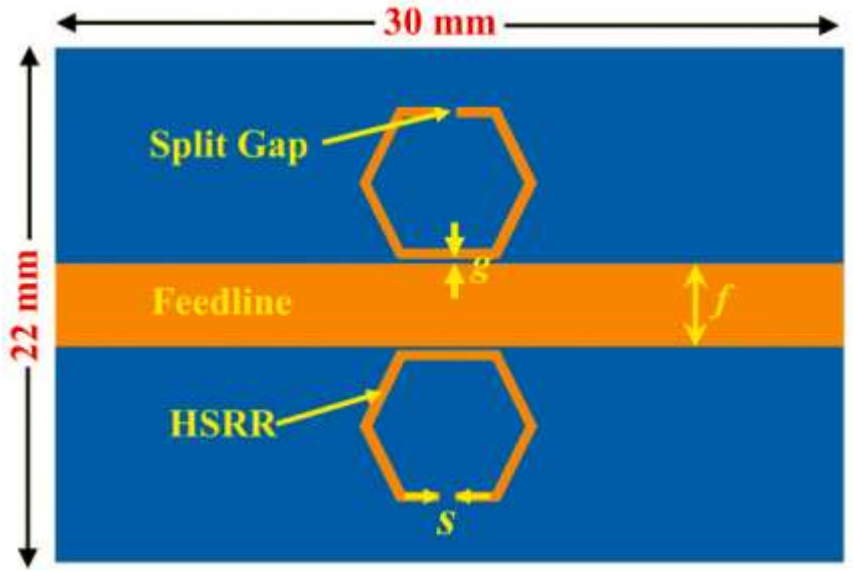


SPIRAL INDUCTOR



MANY OTHER PLANAR RESONATOR STRUCTURES CAN BE DESIGNED, INCLUDING:

- Multiple rings to enhance sensitivity.
- Complementary versions of existing resonators.
- Open-structured variants for higher field interaction.
- Differential planar resonators.



Project Specifications

- Operating Frequency (<6GHz)
- S11 : < -10dB
  S21 : > -3dB
- Sensitivity > 10%
- Size as minimum as possible

Additional Specifications:

- Based on the fabrication facilities choose Dielectric Substrate and Metal appropriately.
- Measurement results will be awarded with Maximum marks.