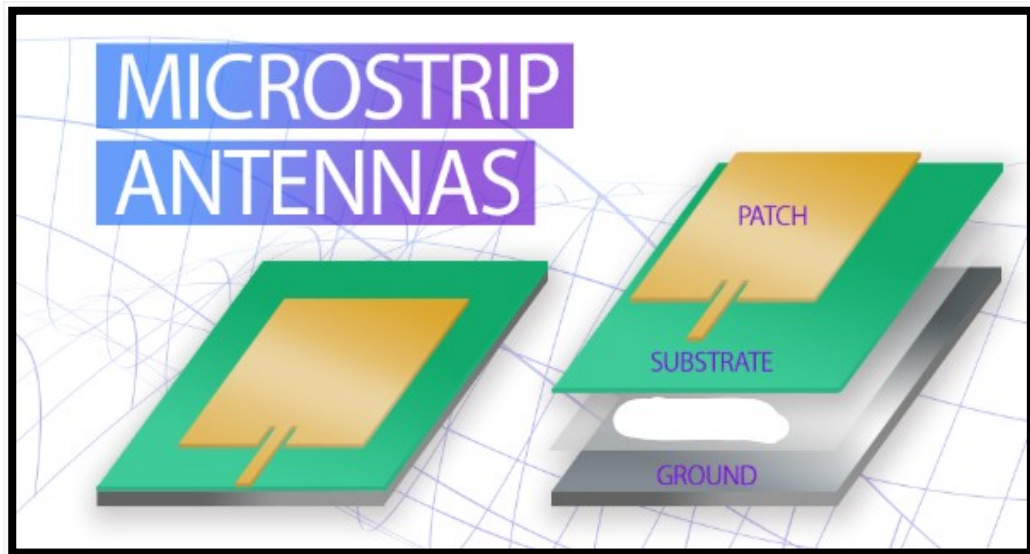


---

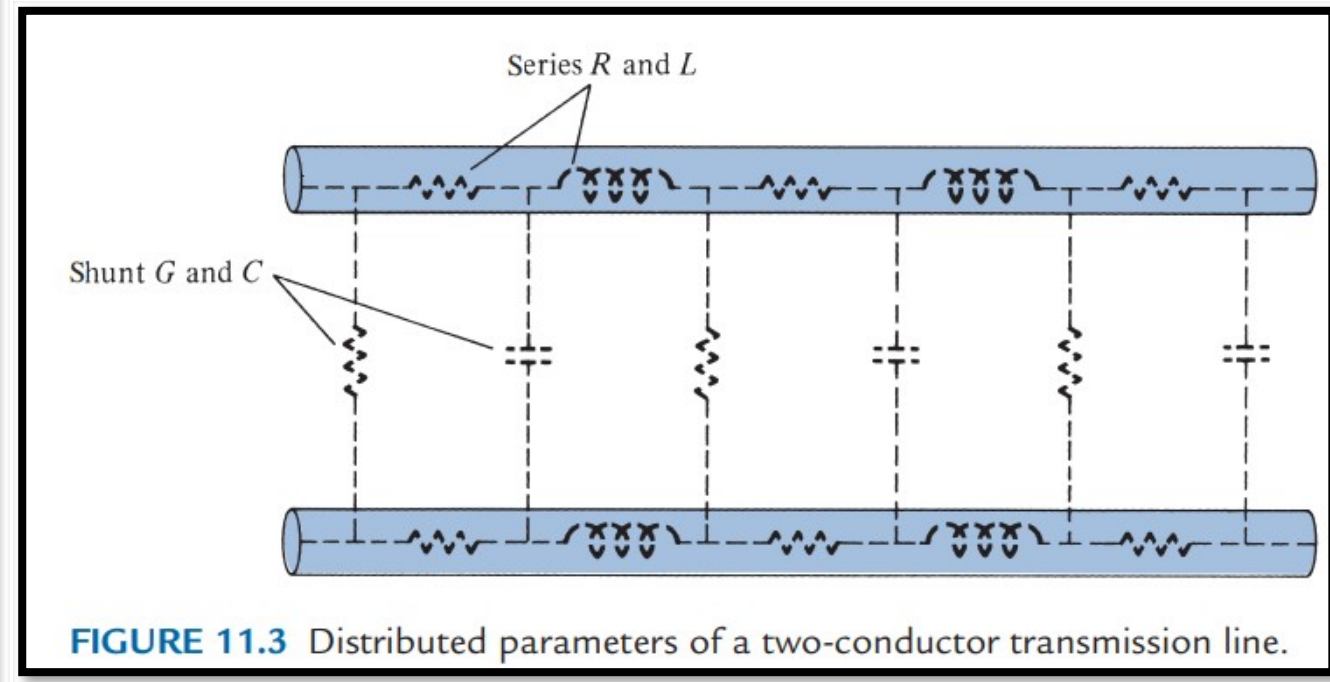
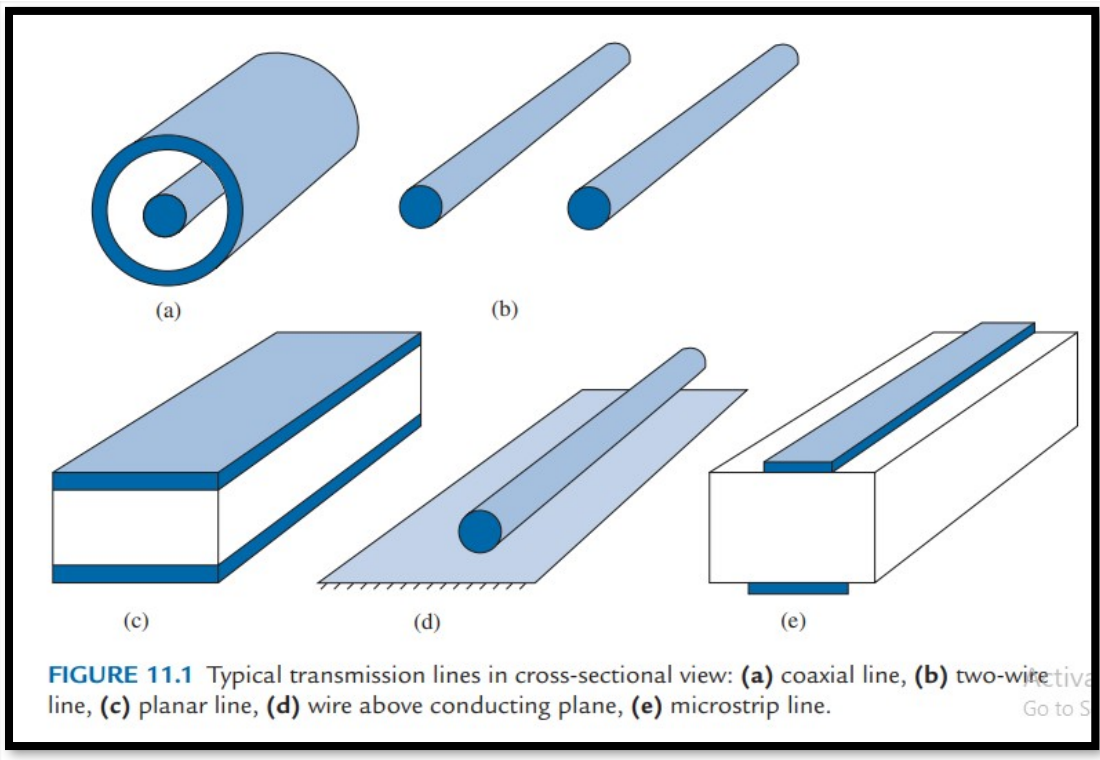
# PLANAR RESONATOR STRUCTURES

## Common Stack for All Sensors

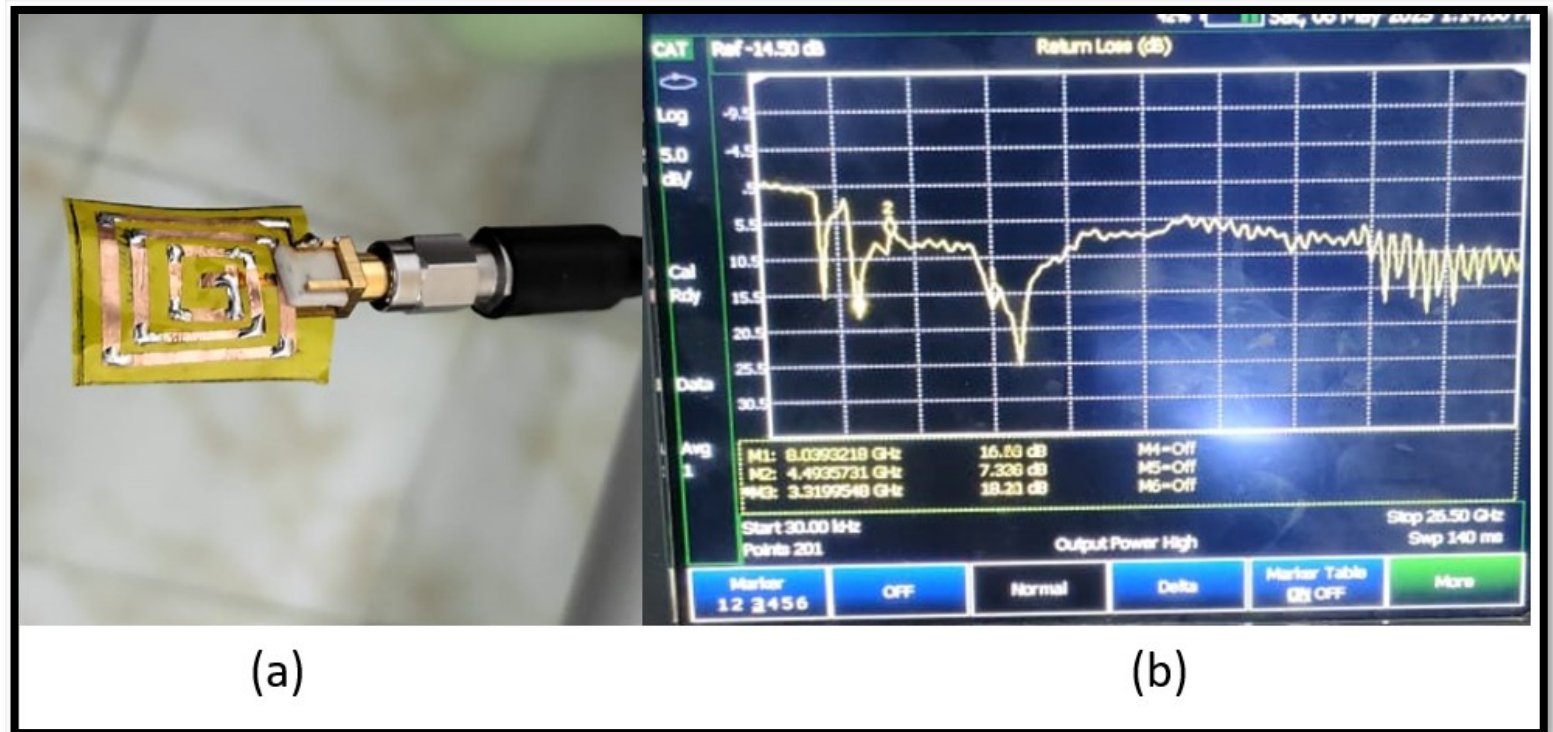
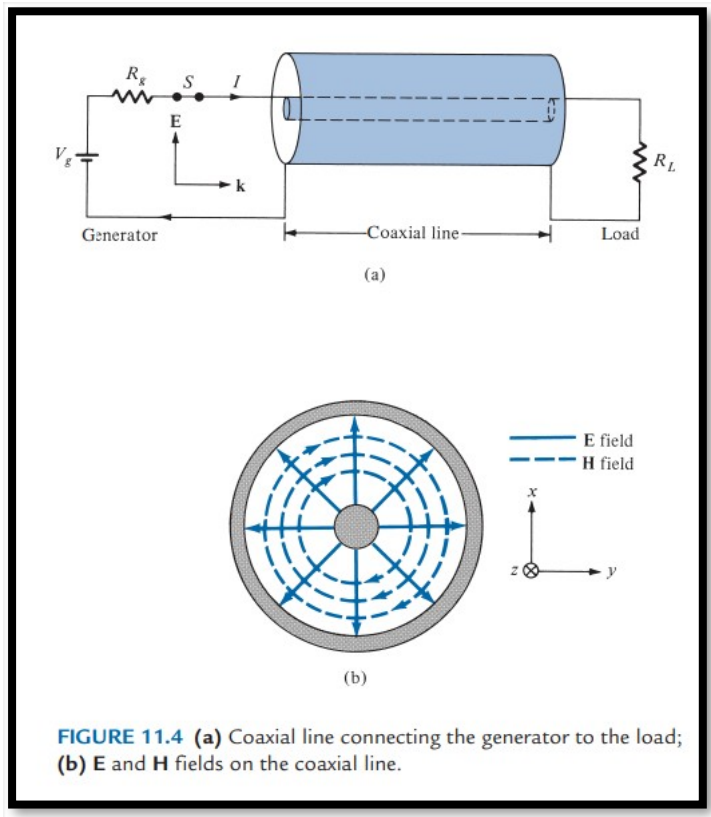


- Top Layer:** Varies - **METAL** (patch, IDC, SRR, CSRR, etc.)
  - Substrate:** Typically a **Dielectric** (like FR4, Rogers RT, Rogers RO, F4B-2, etc.)
  - Bottom Layer:** **METAL** Usually a solid ground plane (especially for microstrip-based sensors)
-

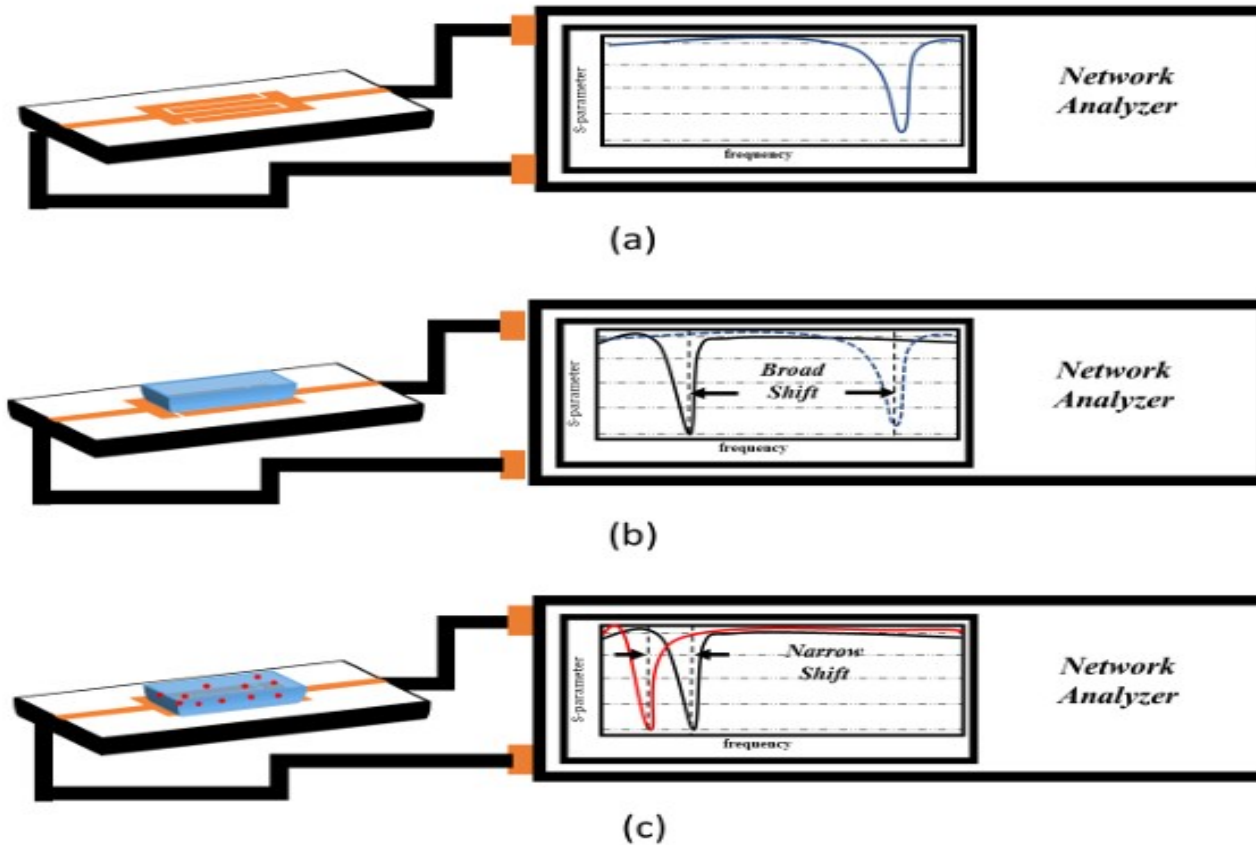
# TRANSMISSION LINES



# COAXIAL CABLE AND VNA SETUP



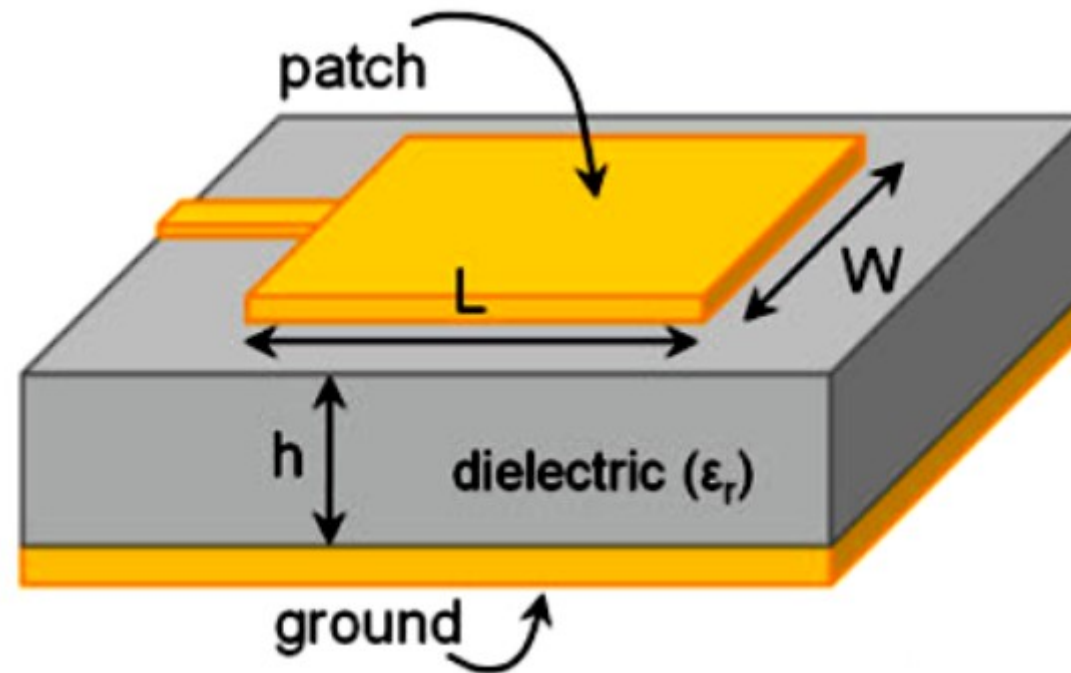
# Without Load vs With Load



**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.

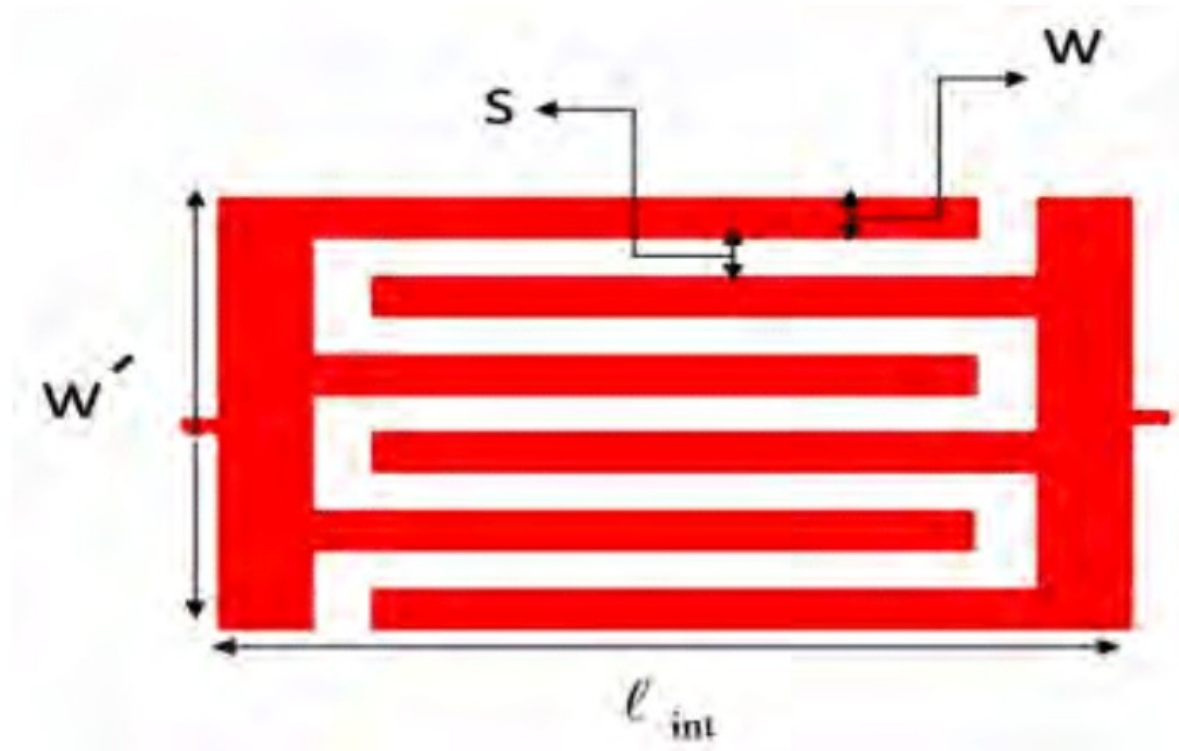
---

# MICROSTRIP PATCH RESONATOR



---

# INTERDIGITATED CAPACITOR (IDC)

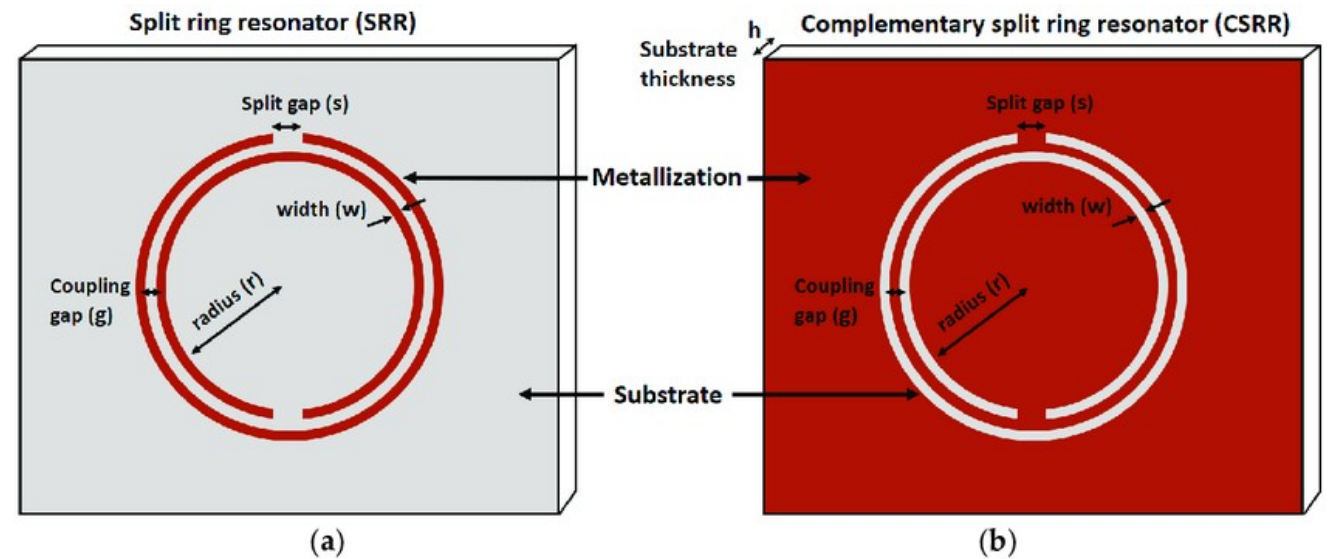
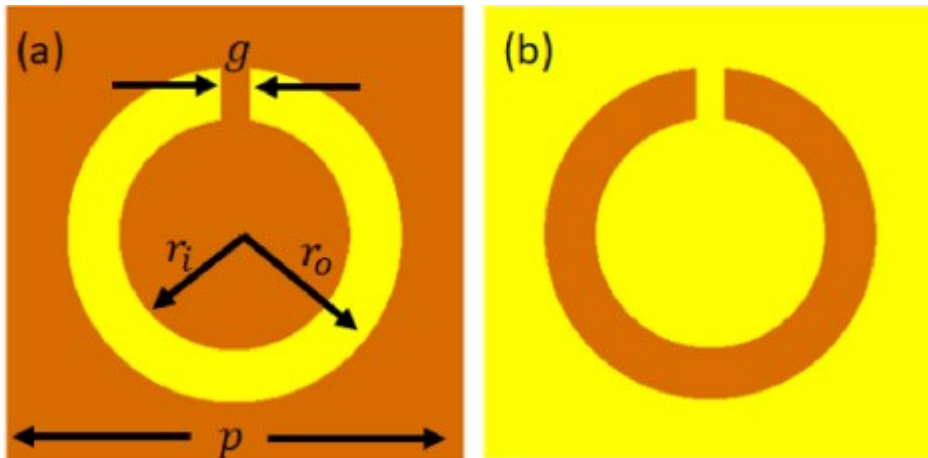




---

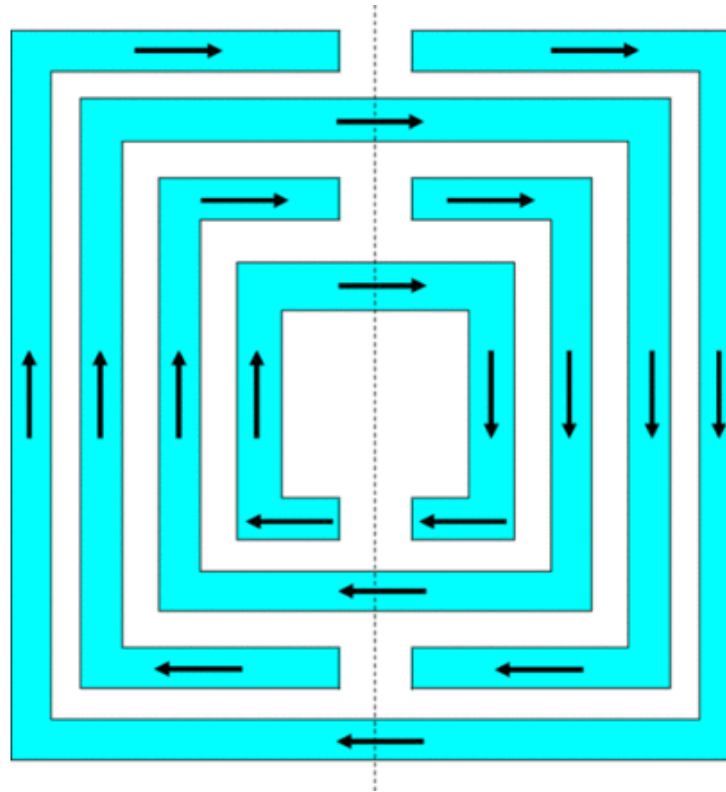
# SPLIT RING RESONATOR (SRR)

## COMPLEMENTARY SPLIT RING RESONATOR (CSRR)



---

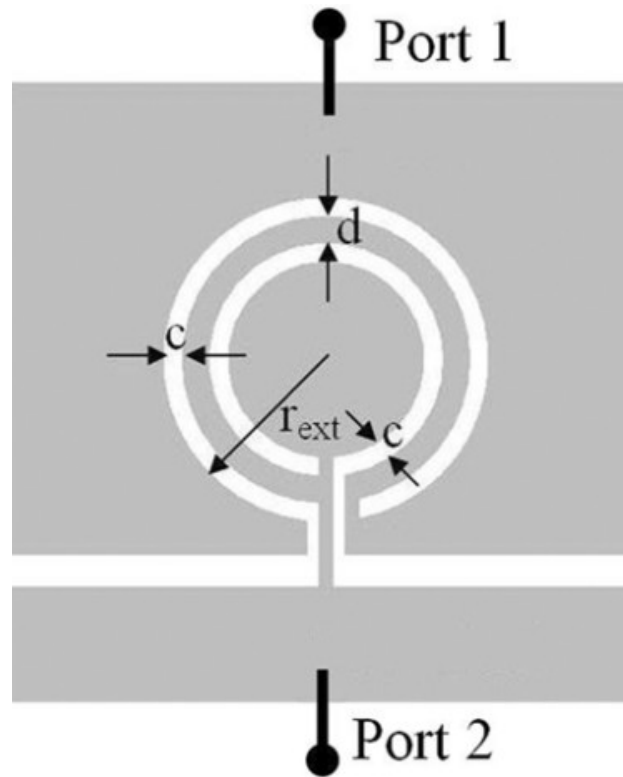
# MULTIPLE SPLIT RING RESONATOR (MSRR)





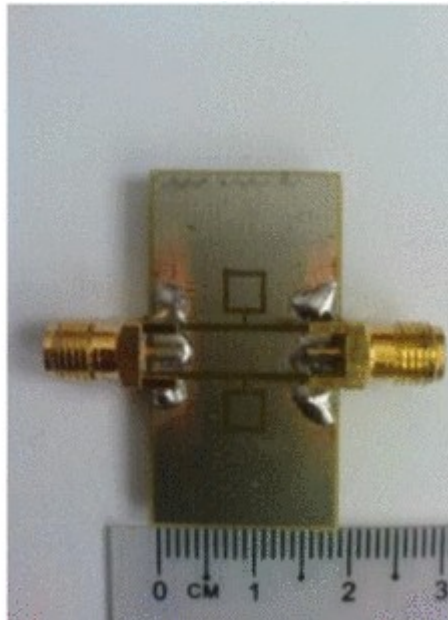
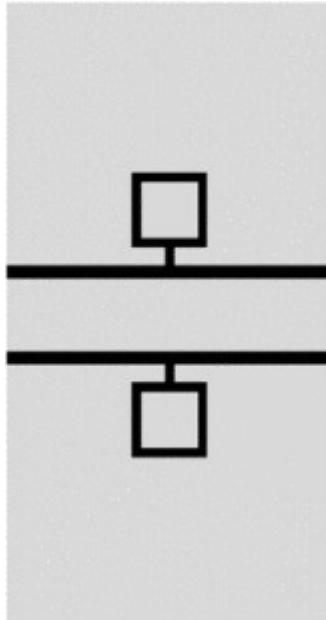
---

# OPEN COMPLEMENTARY SPLIT RING RESONATOR (OCSRR)



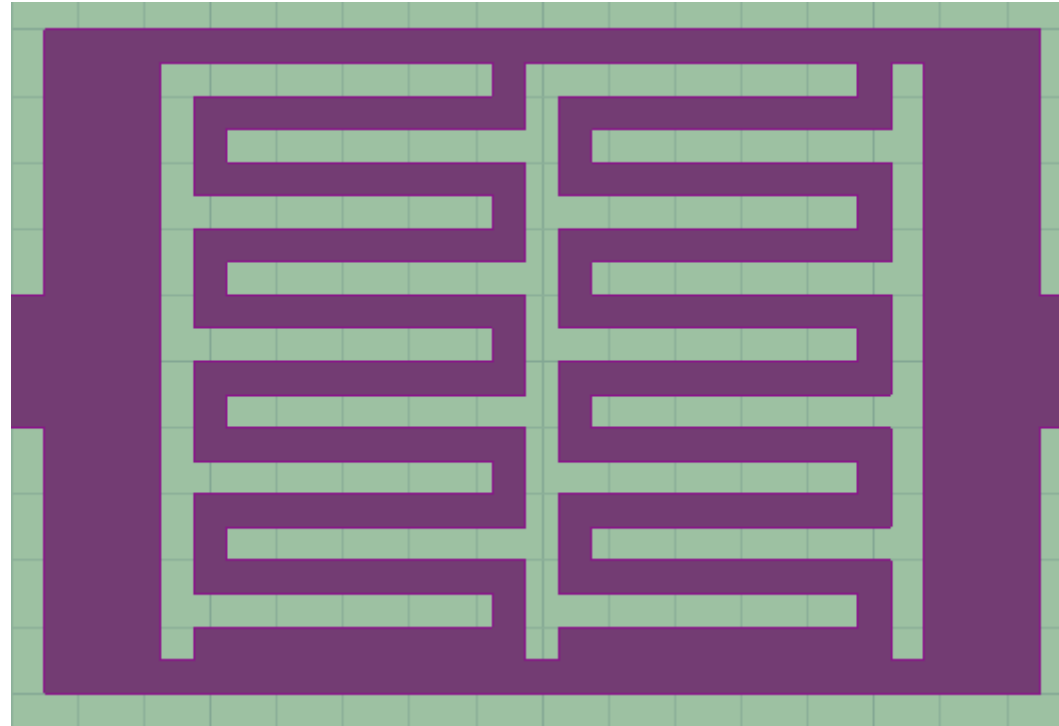
---

# DEFECTED GROUND STRUCTURE (DGS)



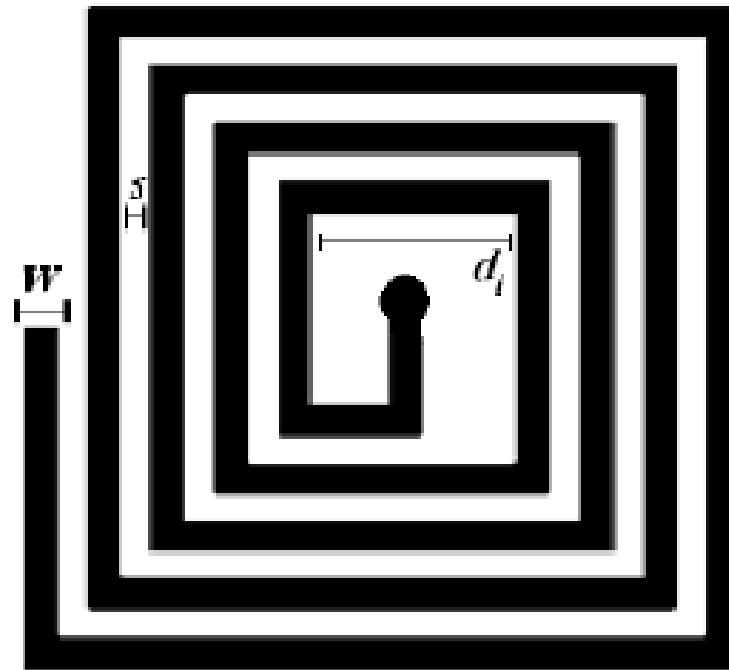
---

# MEANDER LINE RESONATOR



---

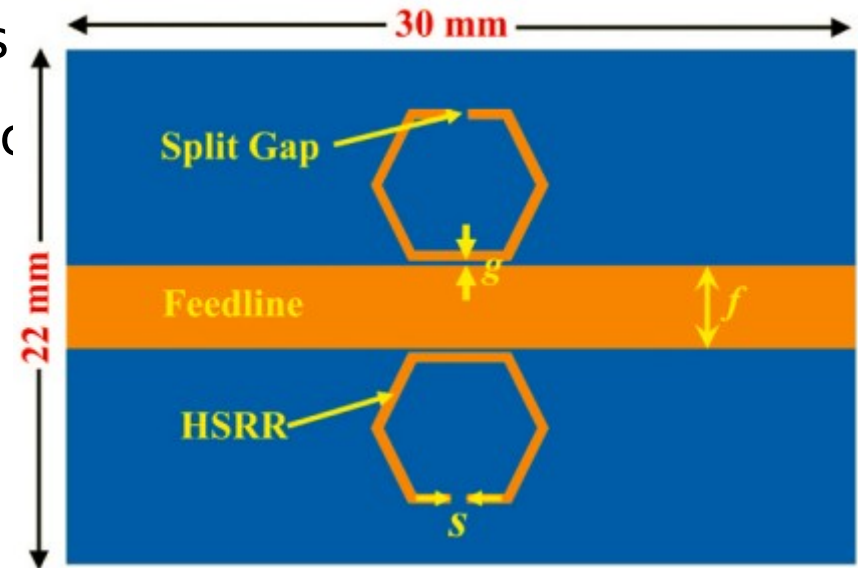
# SPIRAL INDUCTOR



---

# 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 ( $< 6\text{GHz}$ )
- $S_{11} : < -10\text{dB}$   
 $S_{21} : > -3\text{dB}$
- 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.
-