Effect of Dissipative Edge Terminations on the Radiation from Power/Ground Planes

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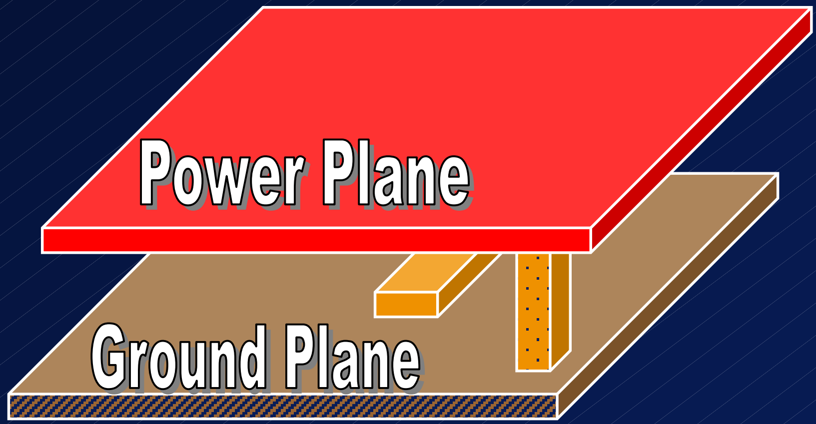
1.Introduction

- Power/Ground Plane Radiation
  - Microstrip Antenna
- Sources of Excitation
  - Traces
  - Vias



2. How to Design "Bad Antennas"

$$\text{Radiation\_Efficiency} = \frac{\text{Radiation\_Resistance}}{\text{Radiation\_Resistance} + \text{Loss}}$$

- Decrease Radiation Resistance
  - e.g. Reduce P/G plane spacing
- Increase losses
  - e.g. Resistive Loading

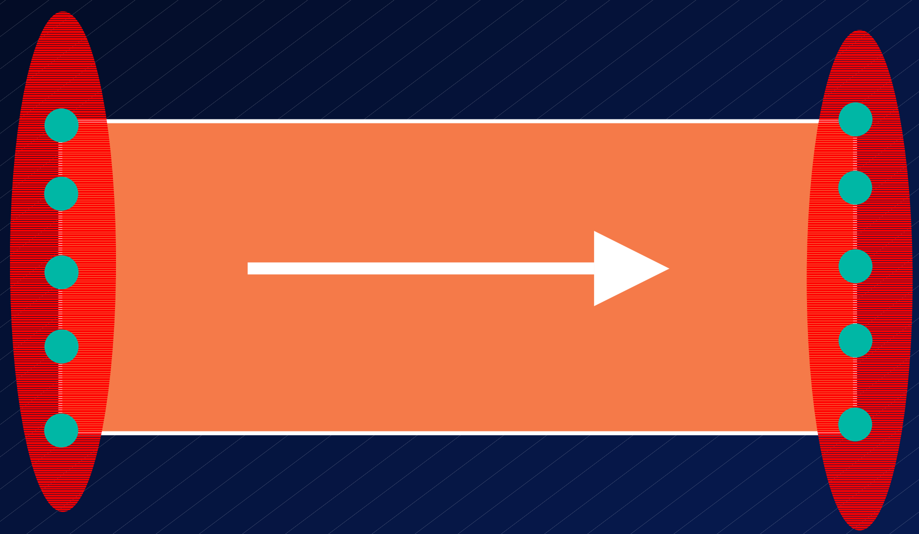
3. Implications

- LOW P/G Impedance is necessary for :
  - Proper Power Distribution
  - Reducing Simultaneous Switching Noise
  - Reducing Radiation

- Resistive Loading can increases P/G Impedance at certain frequencies

4. Trade Off

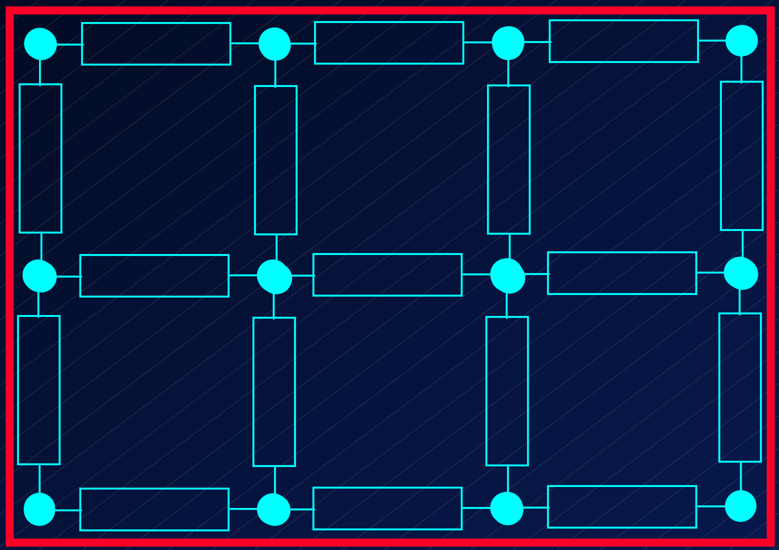
- Dominant Radiating regions are at the Physical Edges



- DISSIPATIVE EDGE TERMINATION

5. Modeling -Transmission Line Mesh

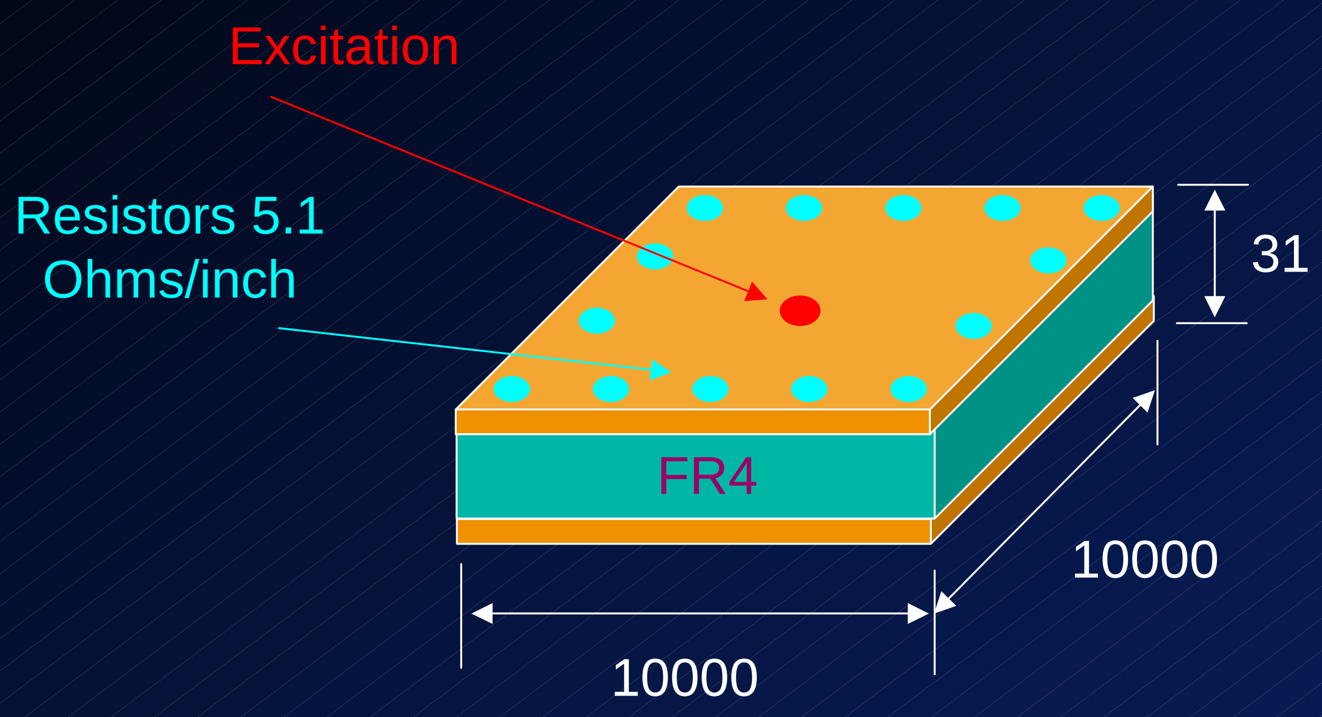
- Termination resistance = characteristic impedance of the short transmission lines



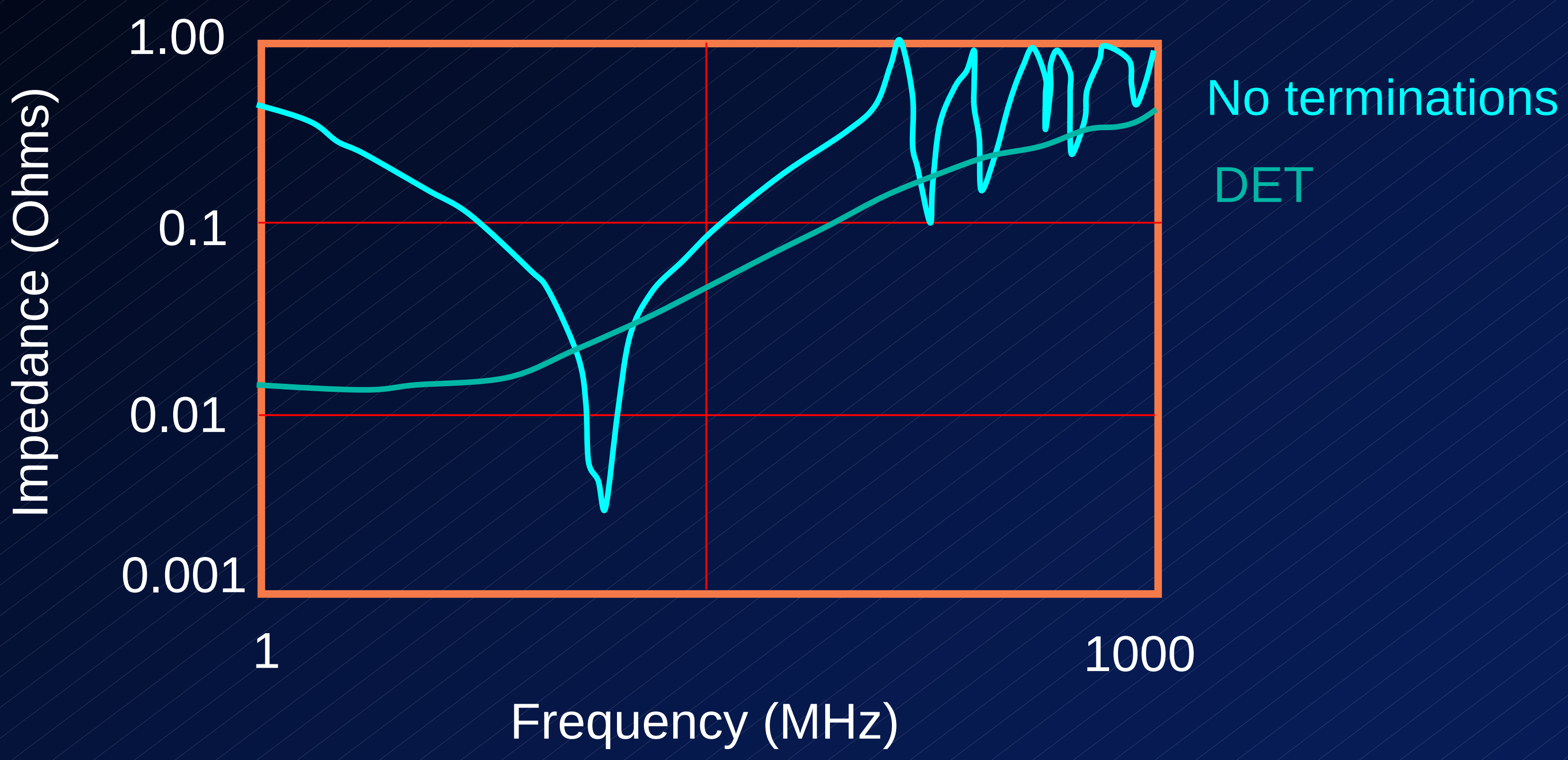
6. Radiation

- Transmission line approach is suited for impedance evaluation
- Radiation is computed rigorously using the Method of Moments (Mixed Potential Integral Equation Technique)
- Resistive loads are accounted using multi-port network theory
- Radiation is computed from the current distribution

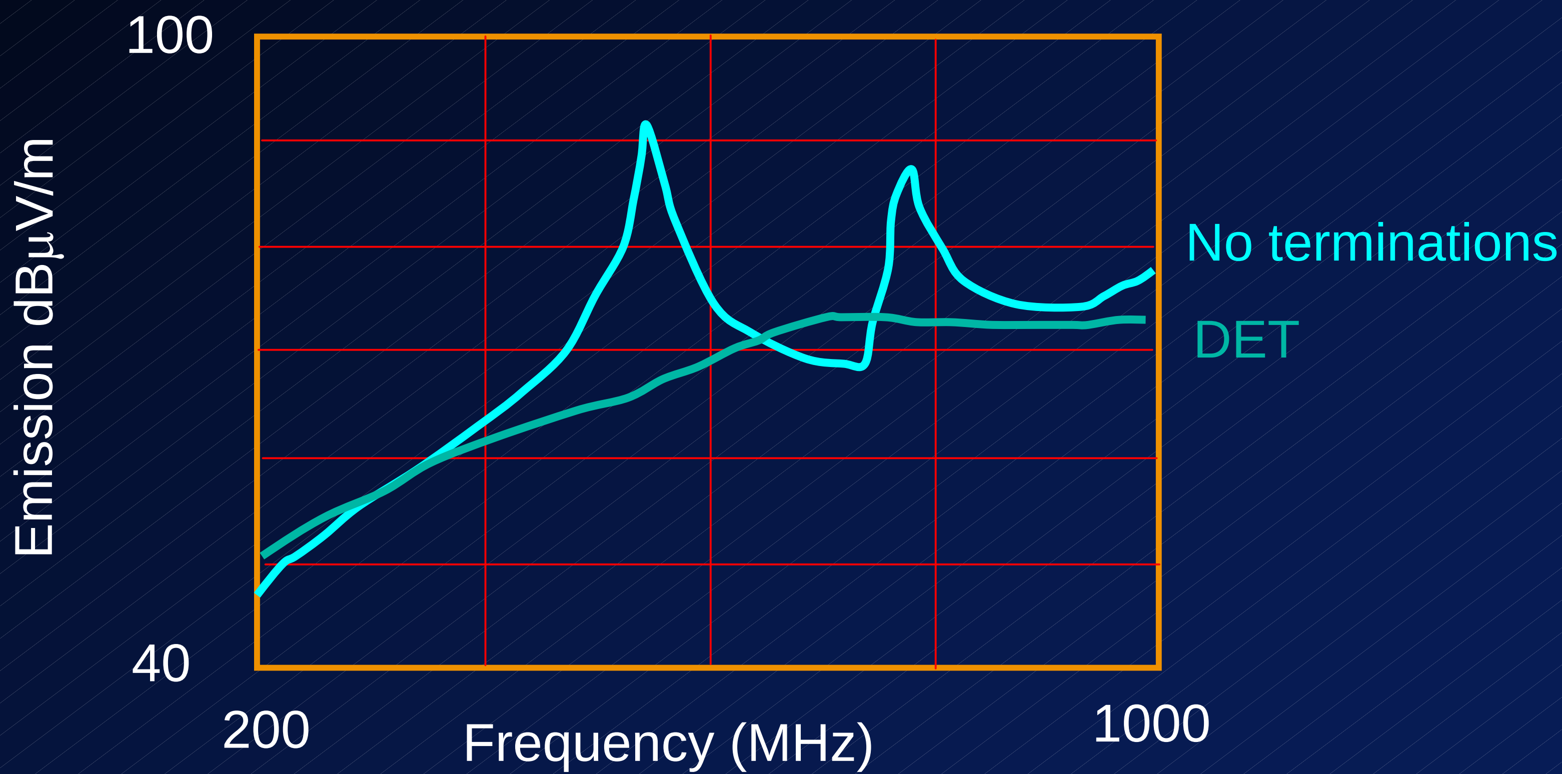
7. Example



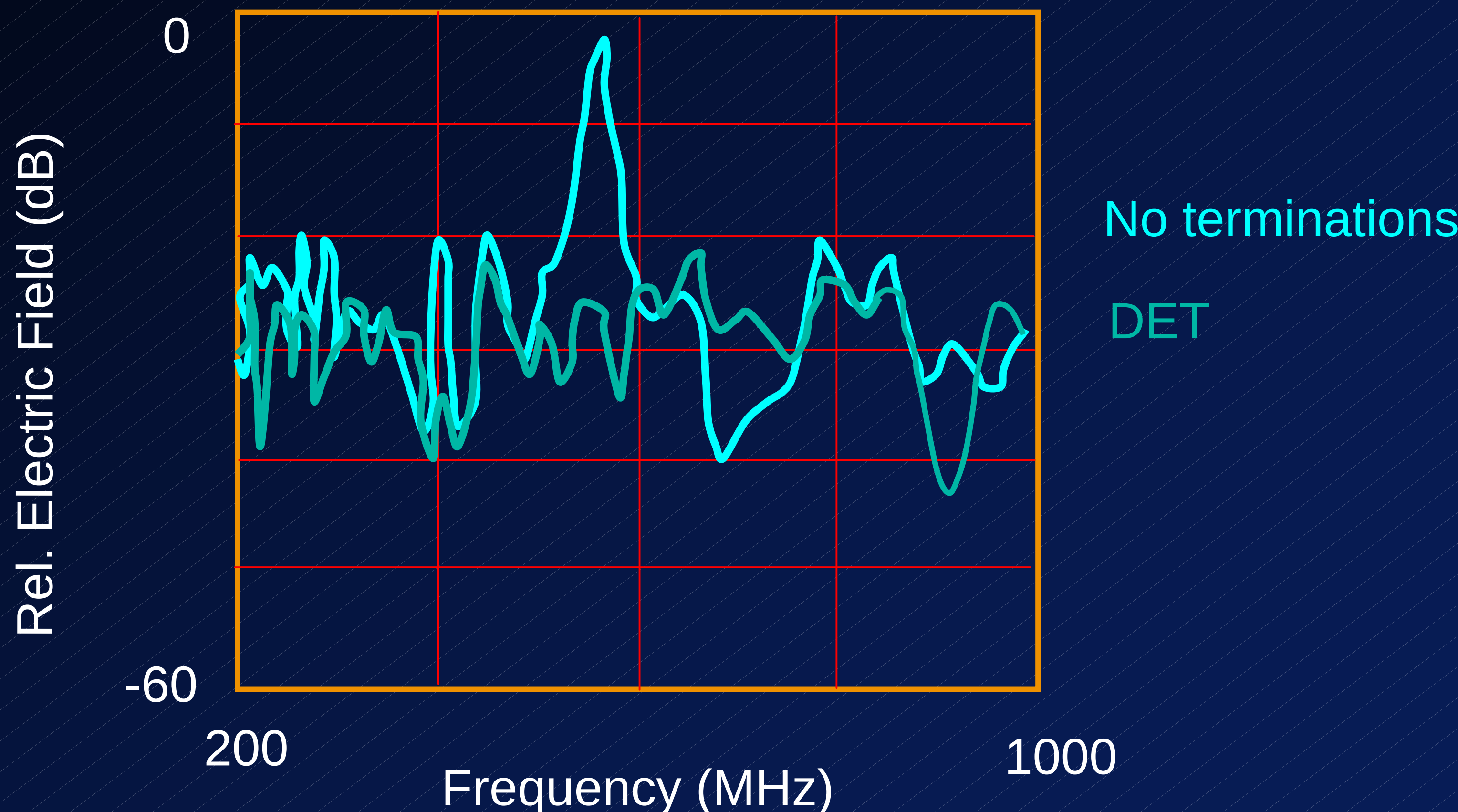
8. Measured Impedance



9. Computed Radiation



10. Measured Radiation



Conclusion

- Selective use of resistive terminations at the edges of P/G planes is useful in suppressing radiated emission levels, particularly at resonances.
- This is also useful to yield a smooth impedance profile
- The technique has been validated by measurements