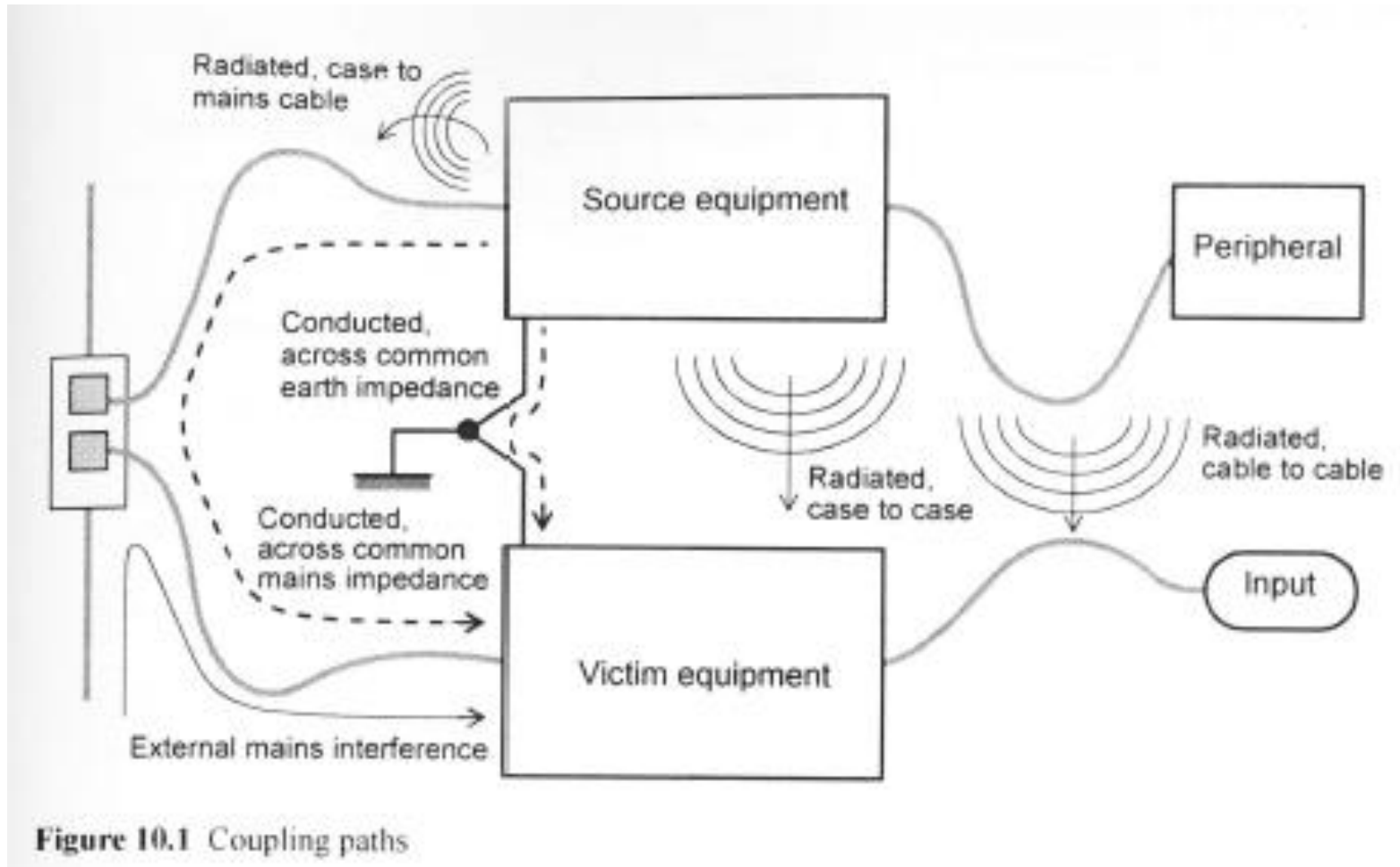


Föreläsning 5

IE1332 Utveckling av elektronikprodukter

- Kapitel 10 Interference coupling mechanisms
- Kopplingsvägar
 - Gemensam jord
 - Induktiv och kapacitiv koppling
 - Via elnätet, ledningsbundet
 - Via elektromagnetiskt fält, utstrålat
- Emission

Kopplingsvägar



Koppling via gemensam jord

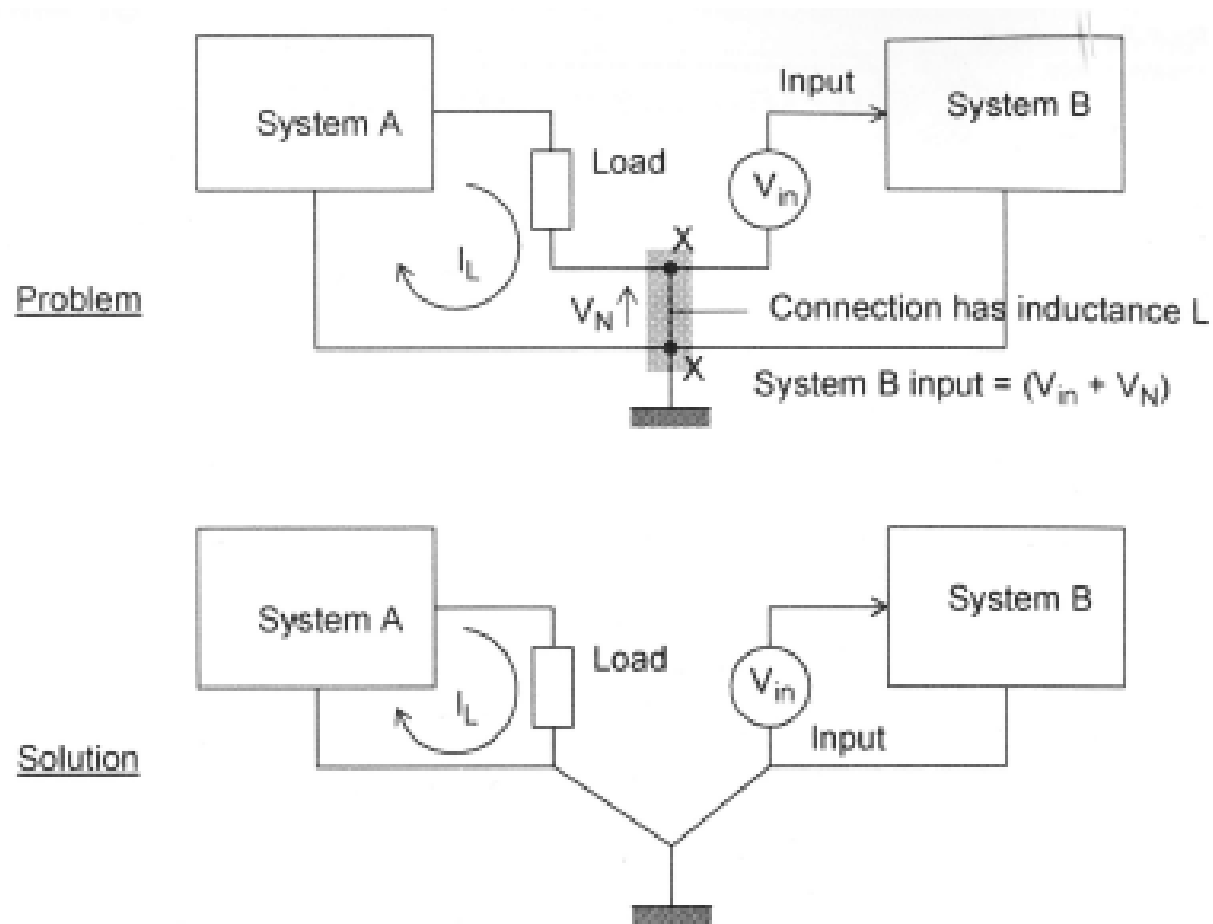


Figure 10.2 Conducted common impedance coupling

Induktiv och kapacitiv koppling

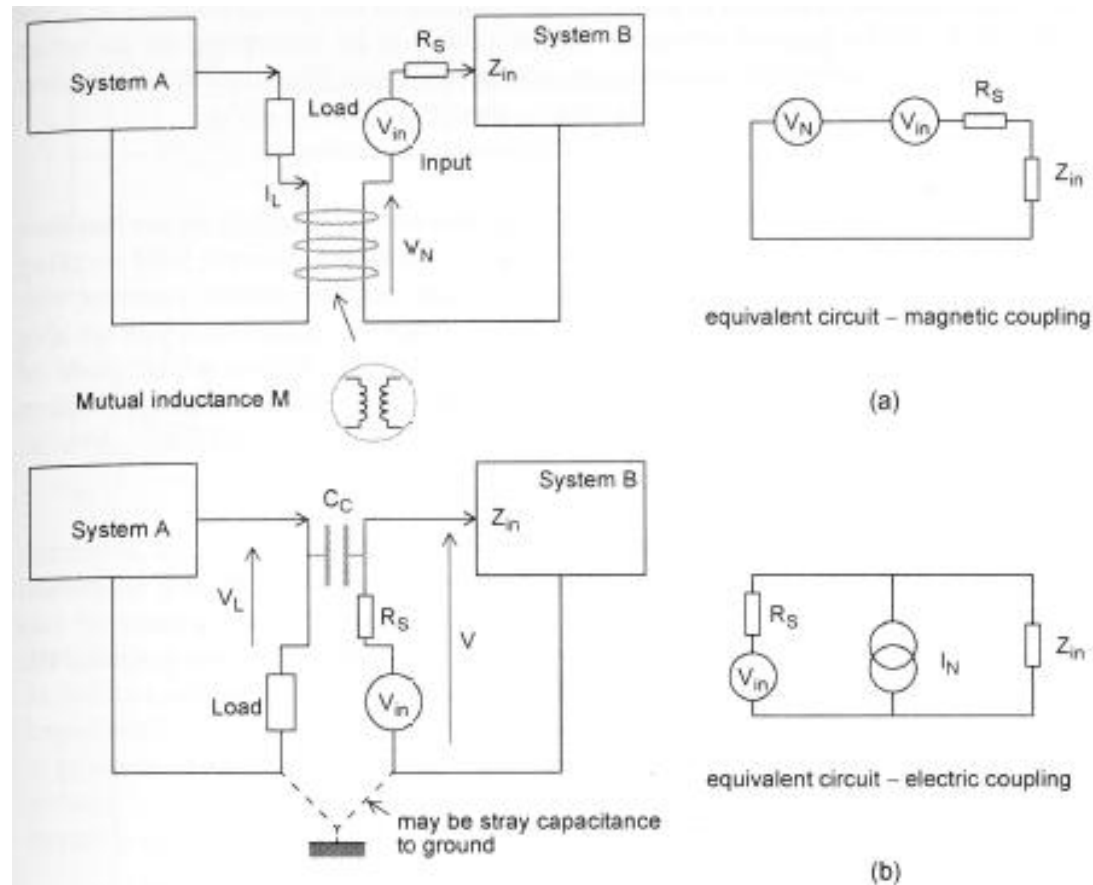


Figure 10.3 Magnetic and electric induction

Ömsesidig kapacitans och induktans

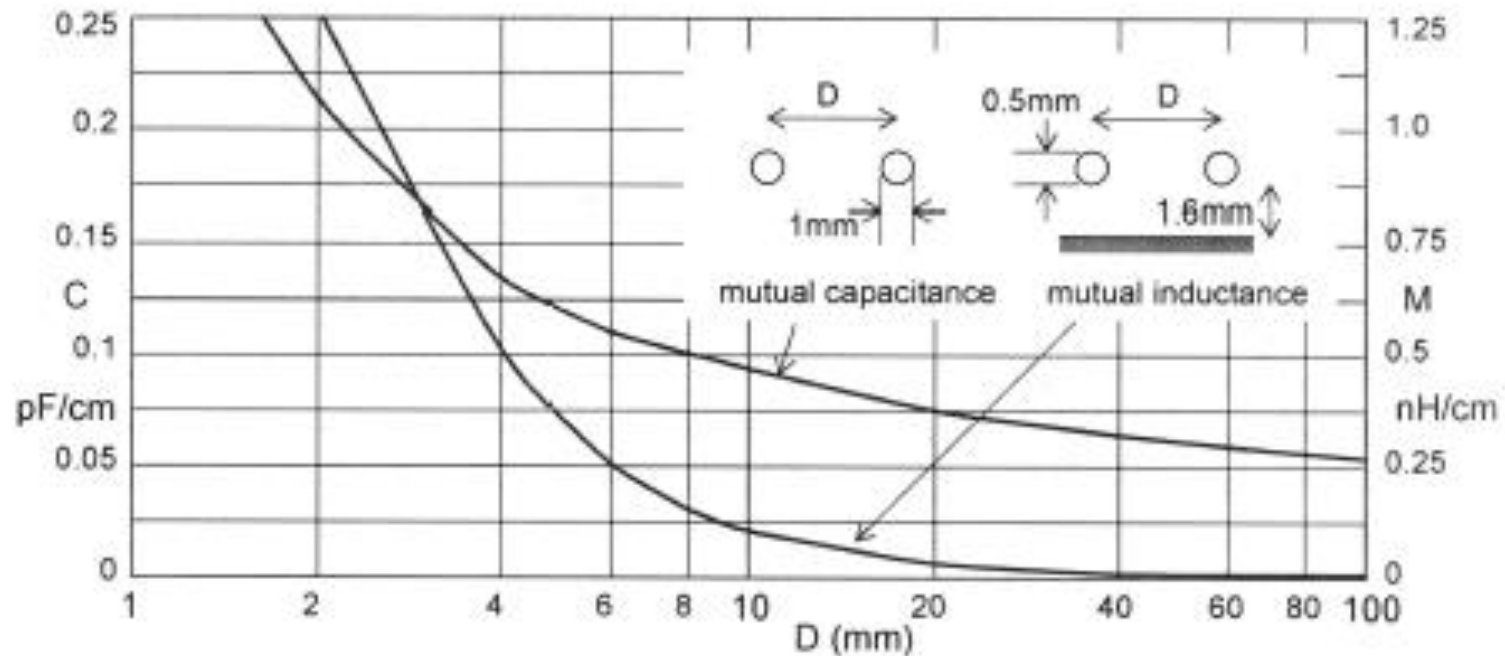
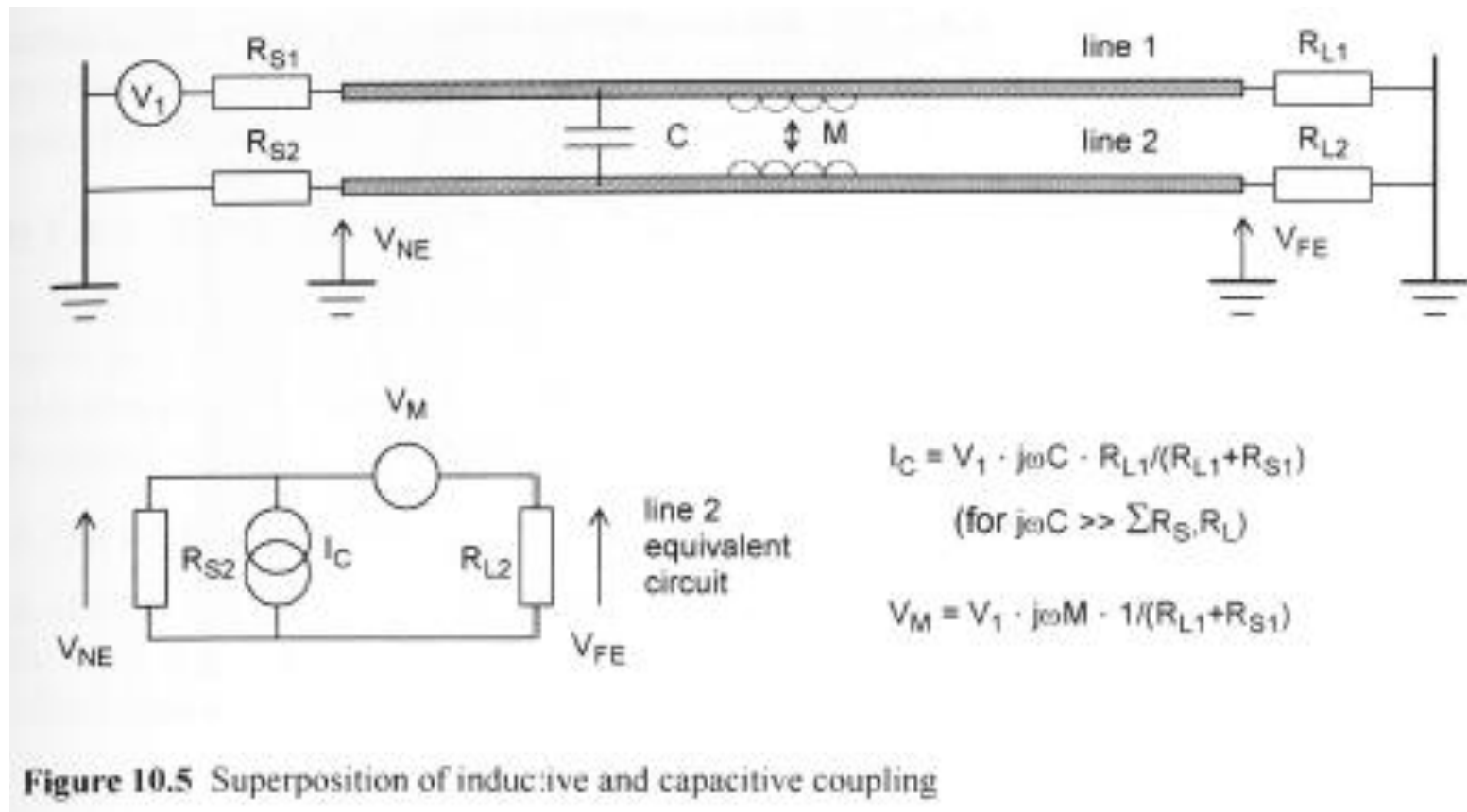


Figure 10.4 Mutual capacitance and inductance versus spacing

Superposition av induktiv och kapacitiv koppling



Koppling vid höga frekvenser

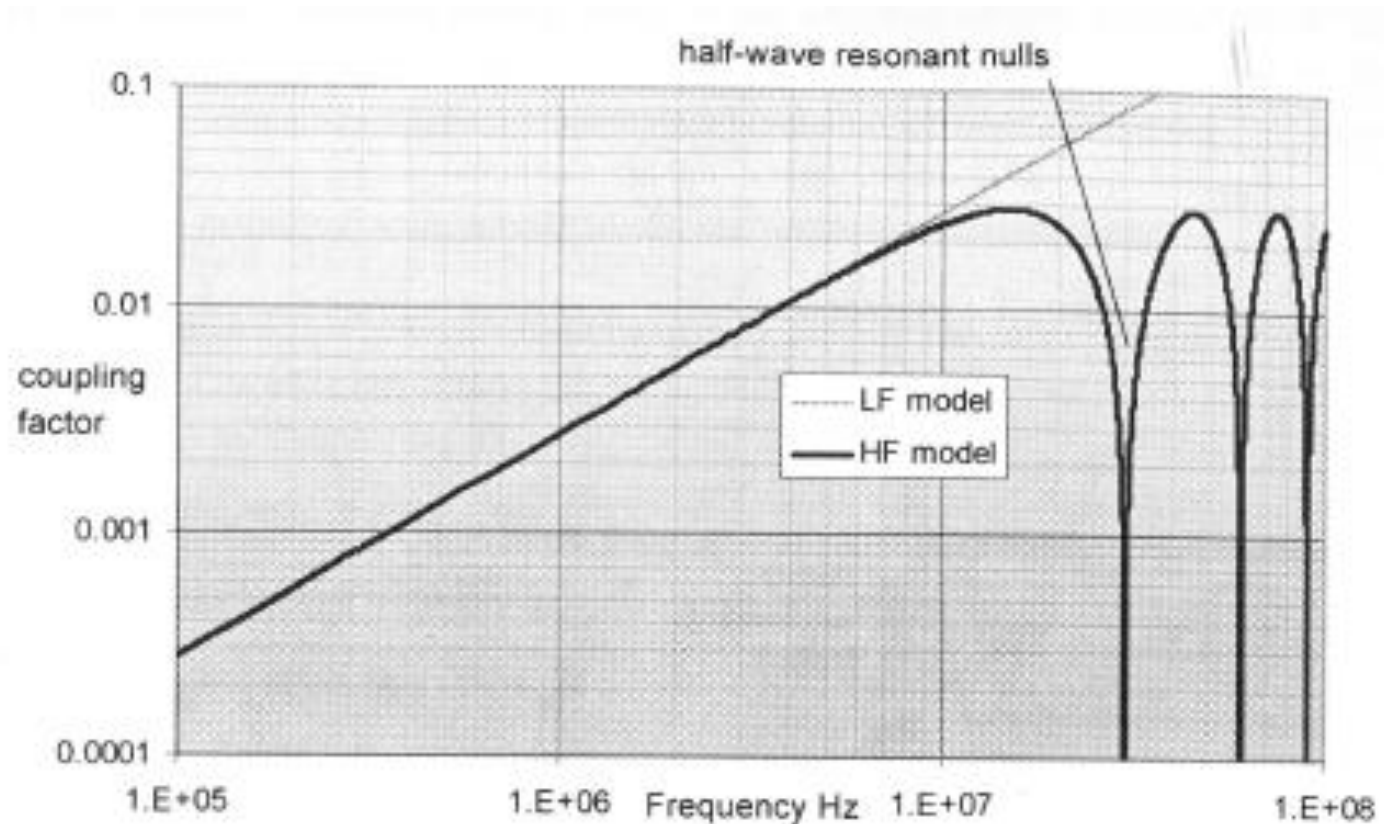


Figure 10.6 High frequency line coupling, line length 5m

Koppling via elnätet

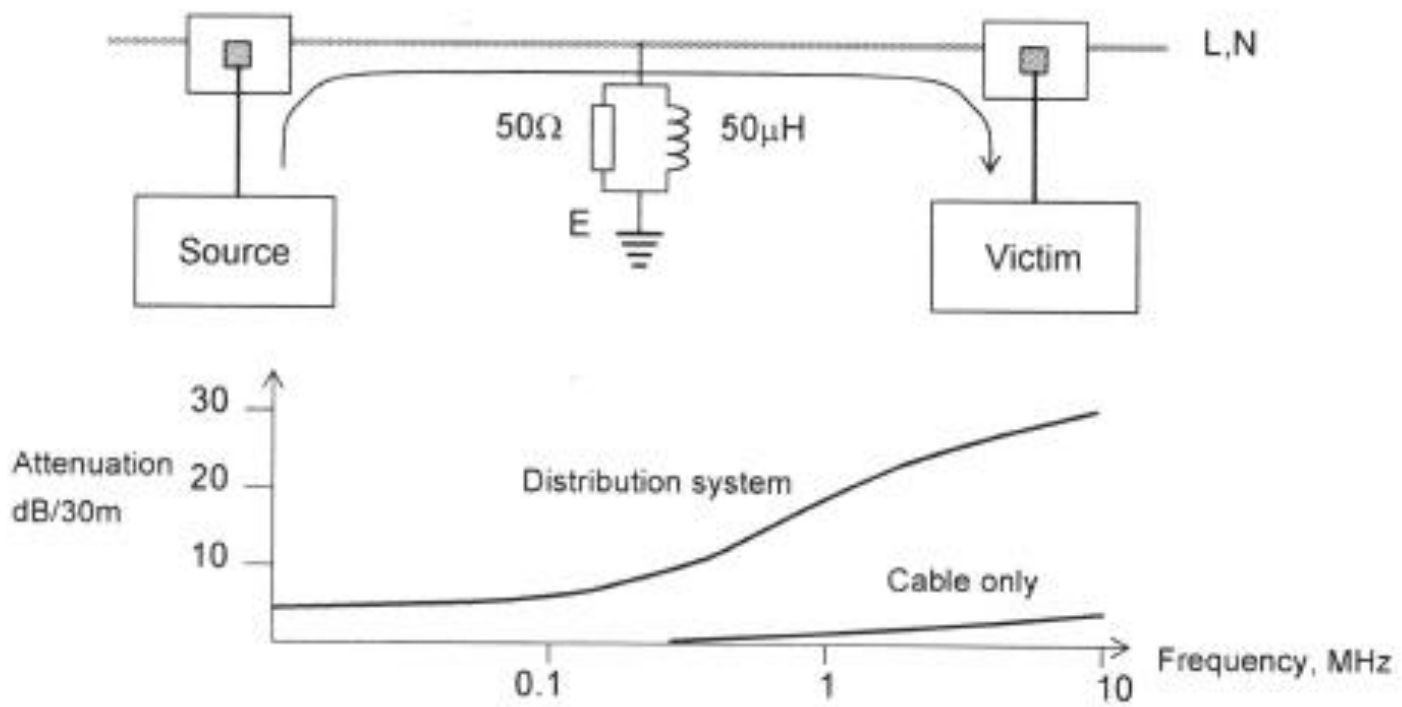


Figure 10.7 Coupling via the mains network

Koppling via elektromagnetiskt fält

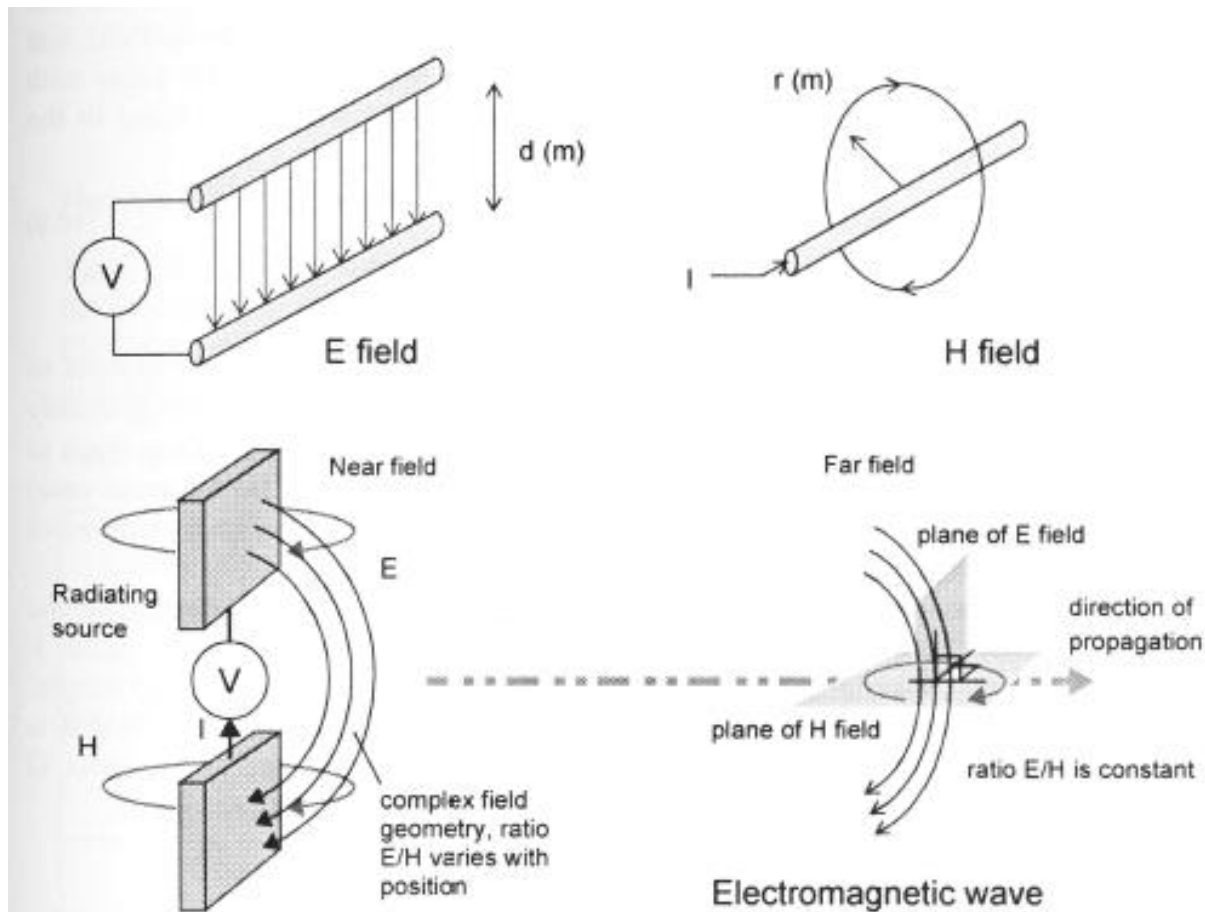


Figure 10.8 Electromagnetic fields

Vågimpedans elektromagnetiskt fält

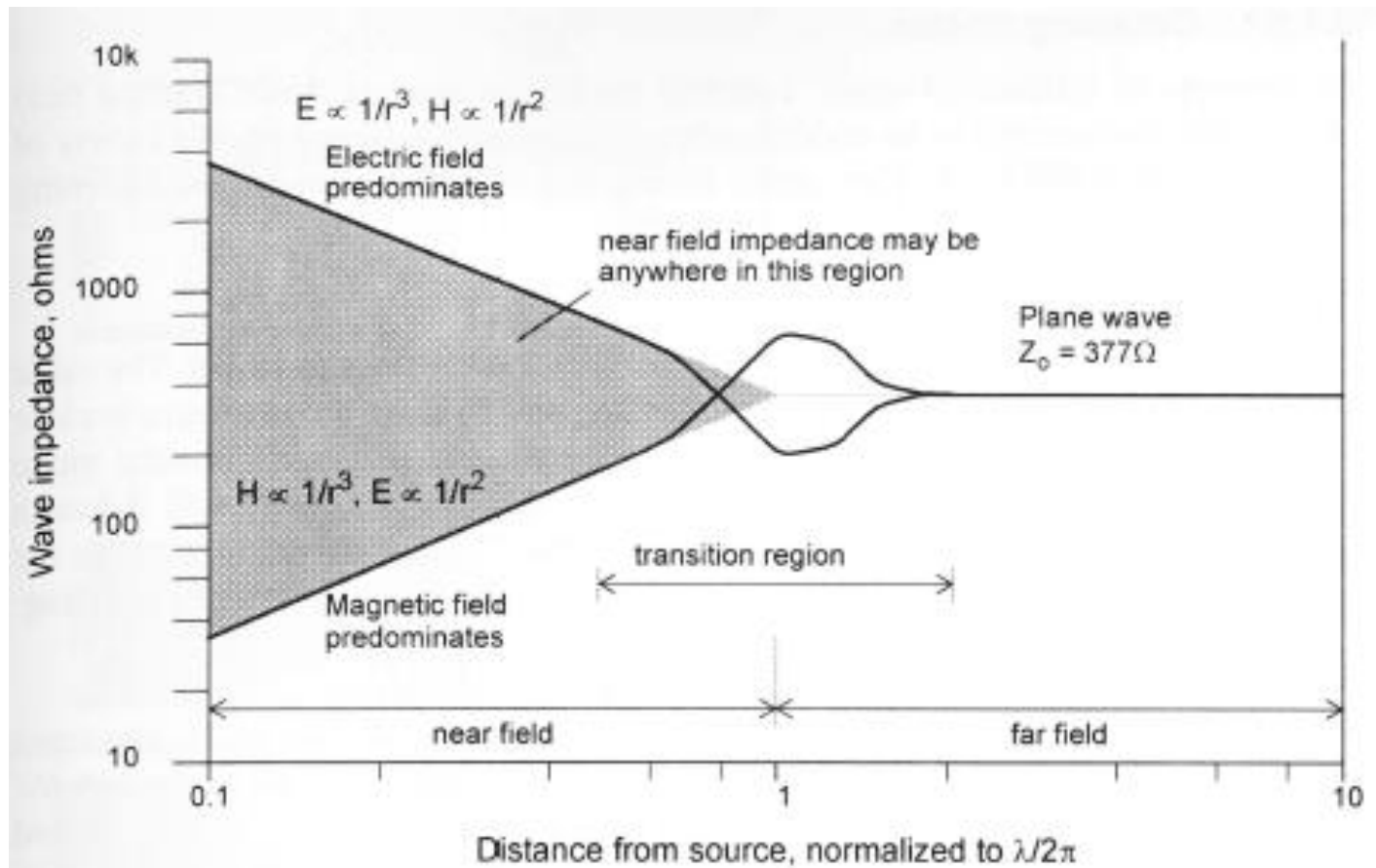
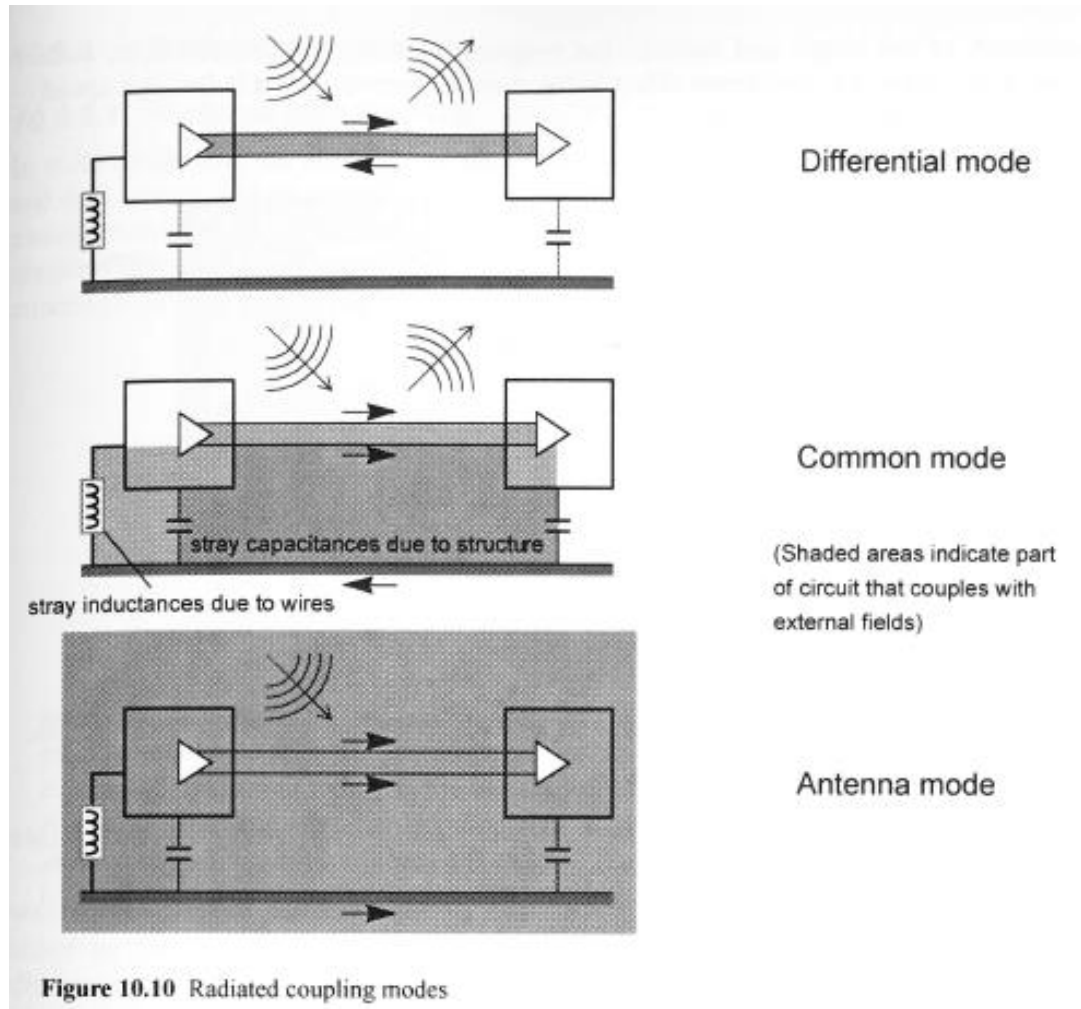


Figure 10.9 The wave impedance from Maxwell's laws

Kopplingsmoder



Differentiell till common mode

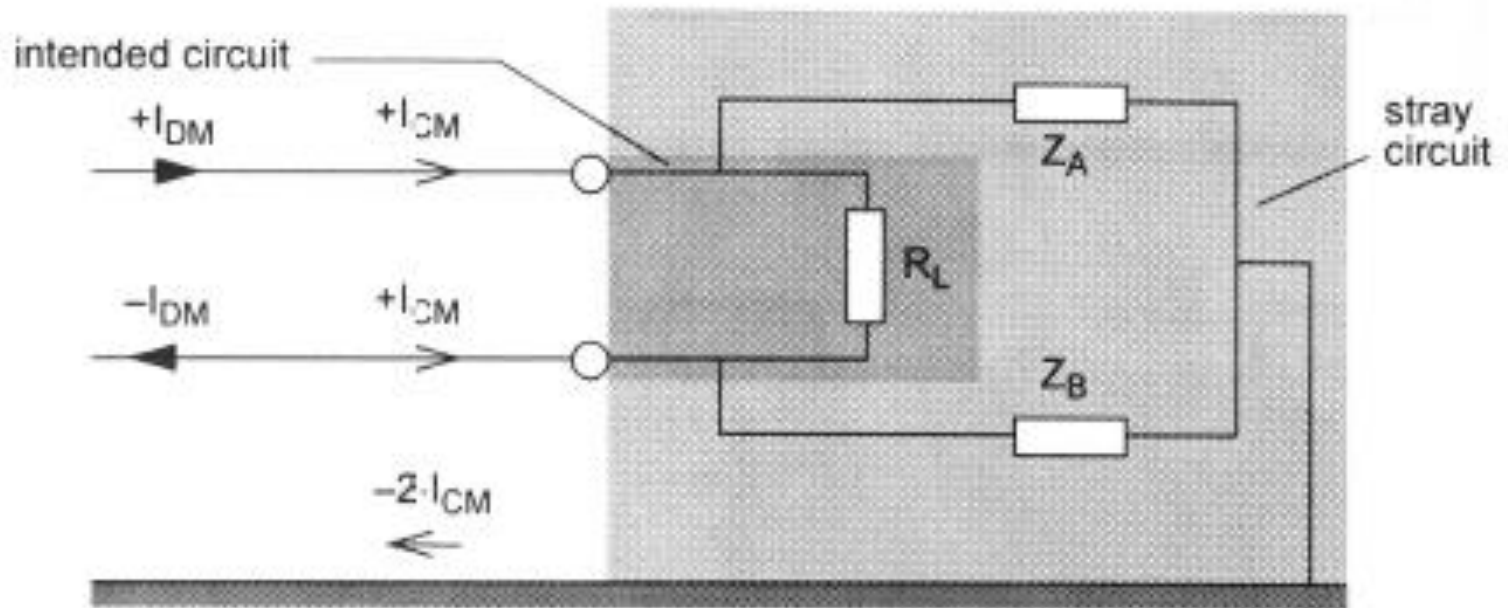
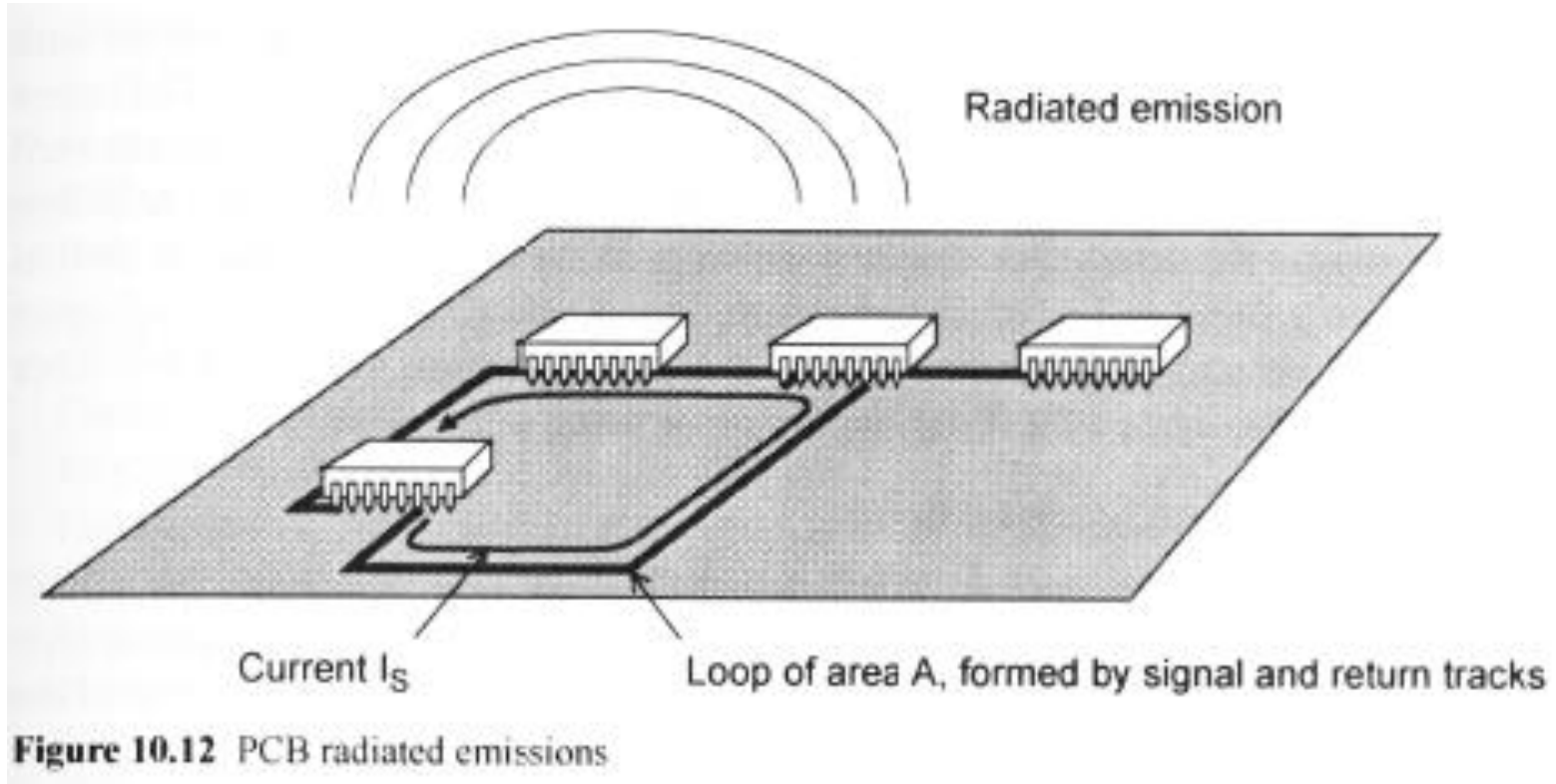


Figure 10.11 Differential to common mode conversion

Emission från PCB



Patch-antenn

edge radiation increases with h and is maximized when $L = n \cdot \lambda/2$ (centre feed) or $n \cdot \lambda/4$ (end feed)

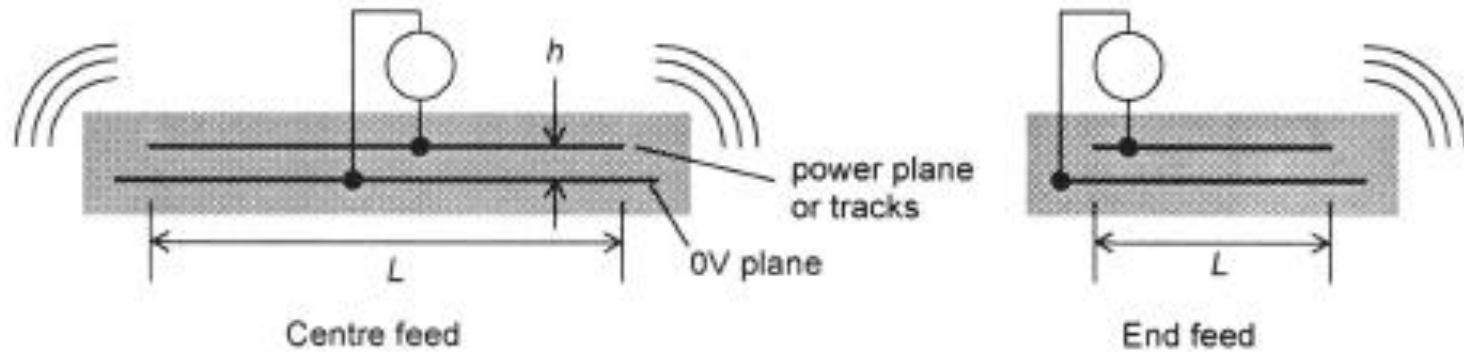


Figure 10.13 The patch antenna model

Strålning från kabel

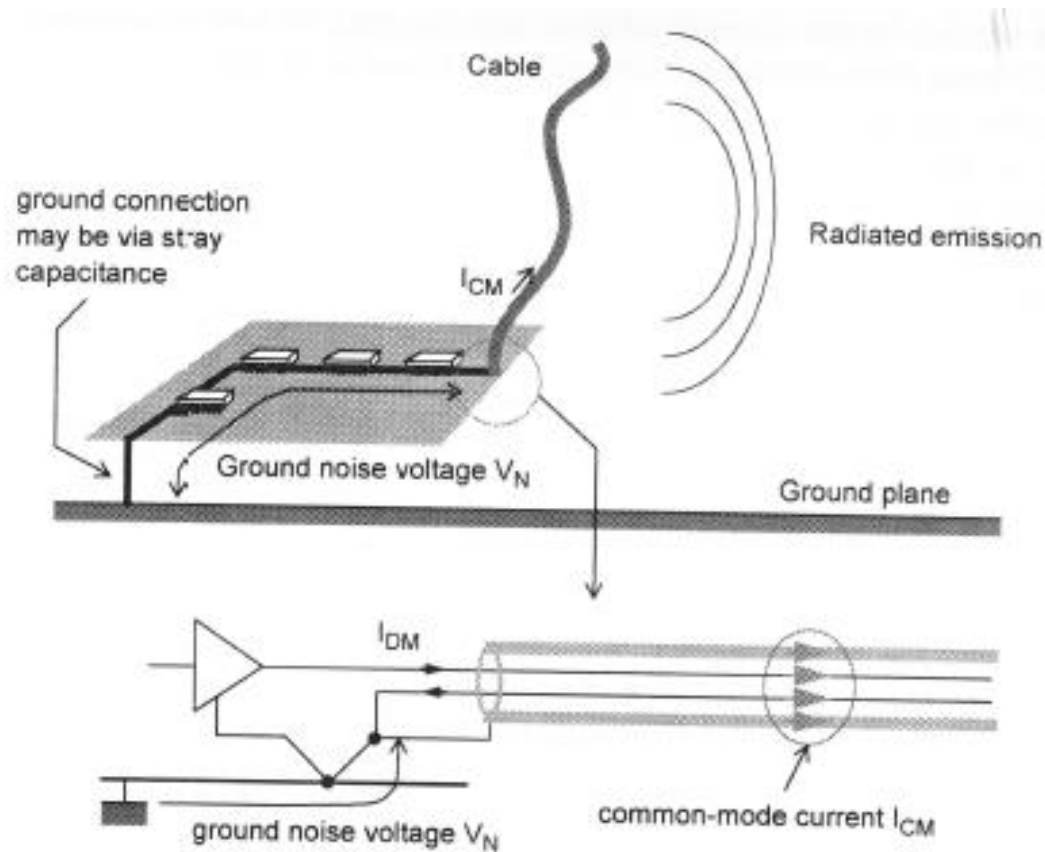
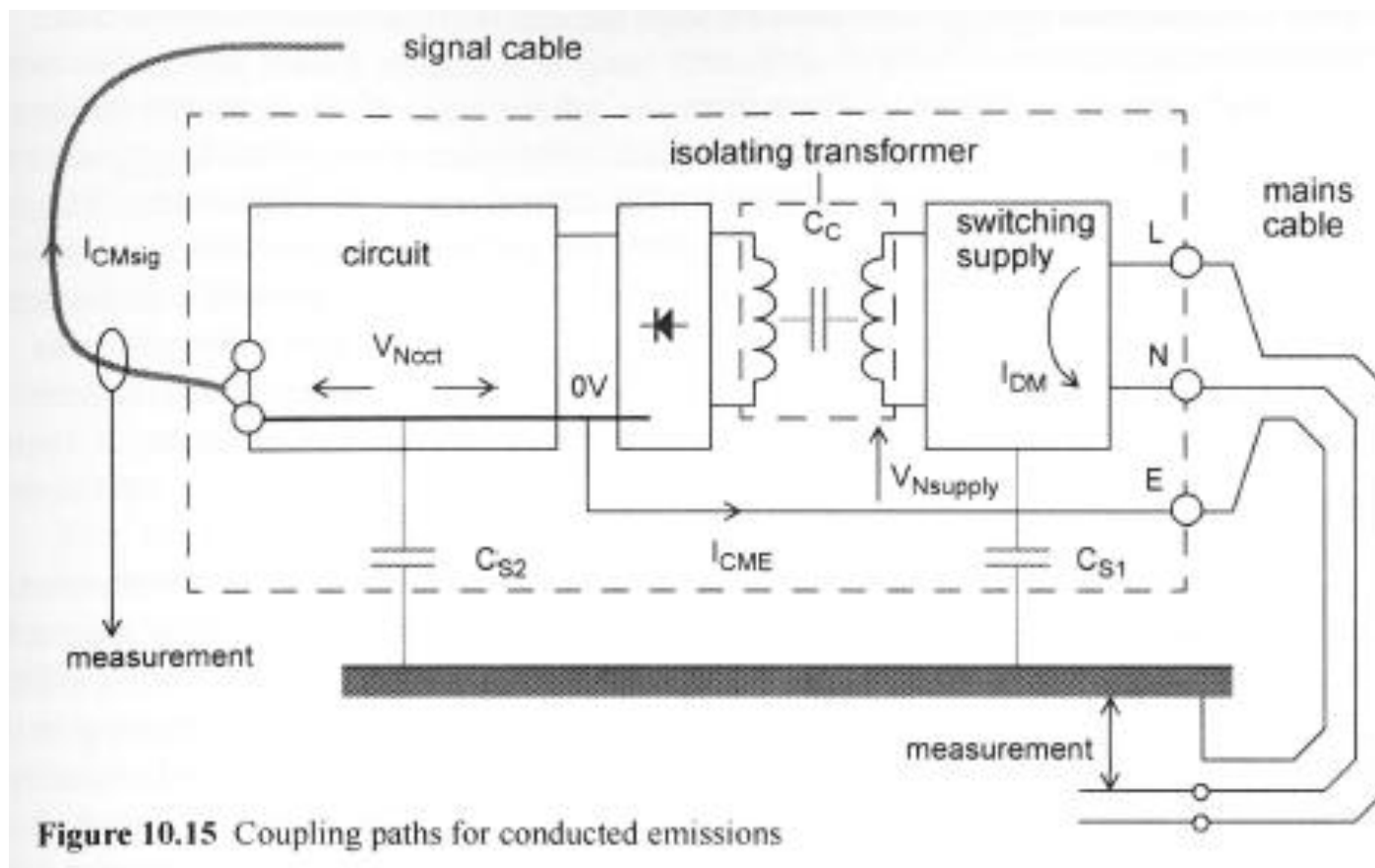


Figure 10.14 Cable radiated emissions

Ledningsbunden emission



Koppling utstrålat fält

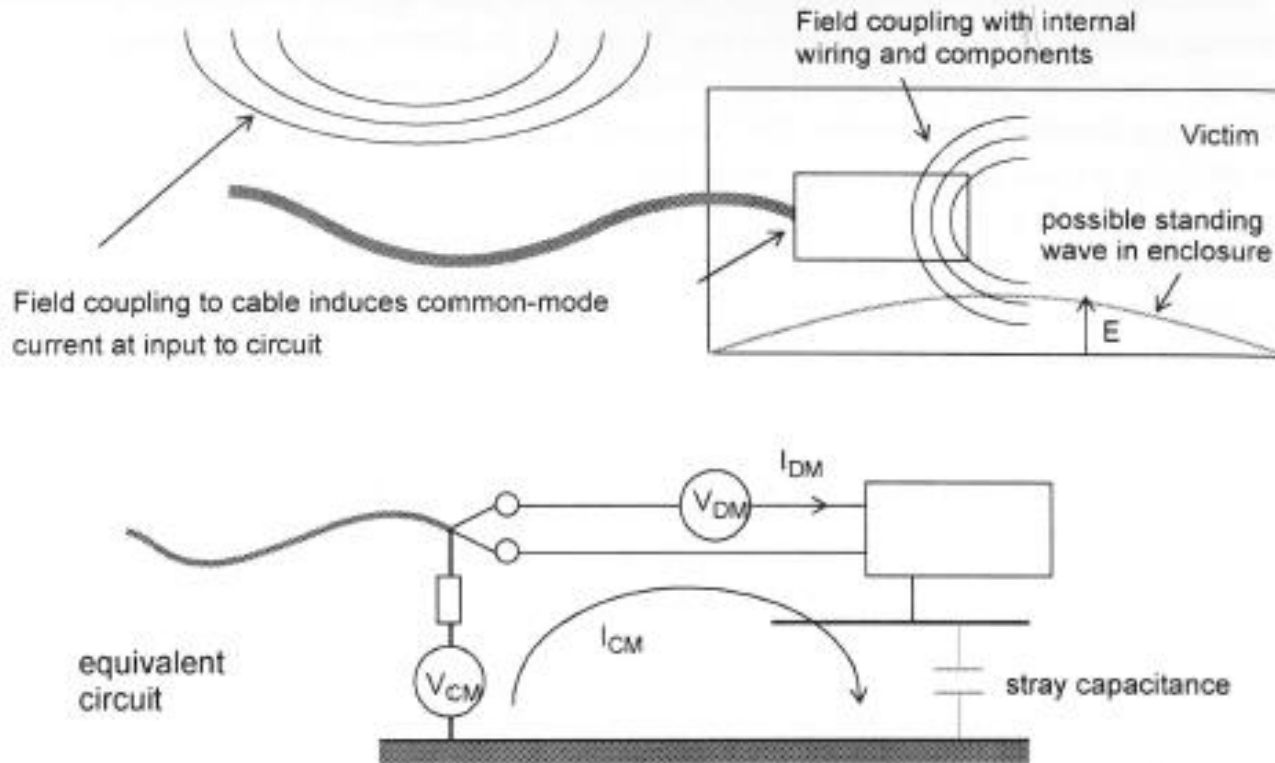


Figure 10.17 Radiated field coupling

Koppling kabel till utstrålat fält

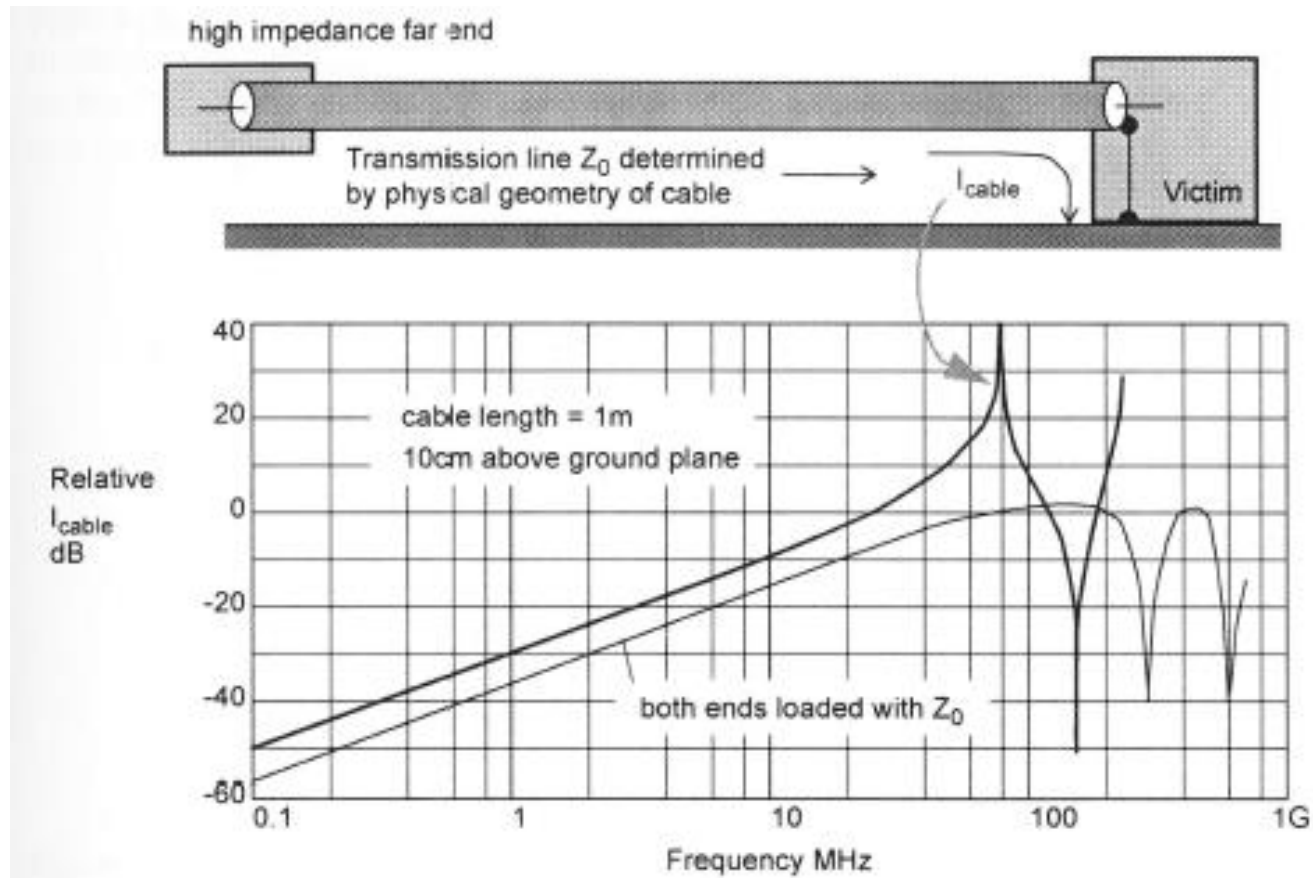


Figure 10.18 Cable coupling to radiated field

Spänning och ström på resonant kabel

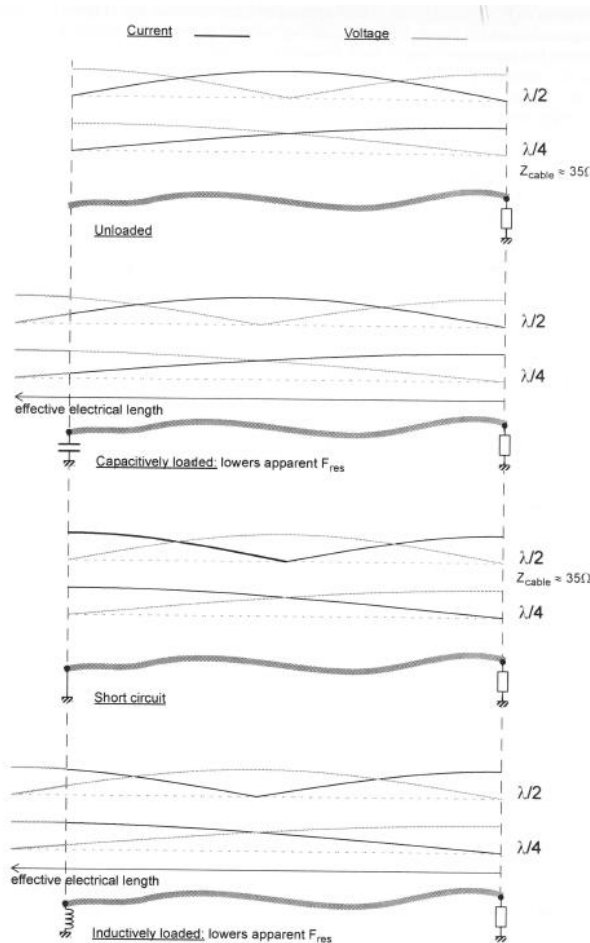
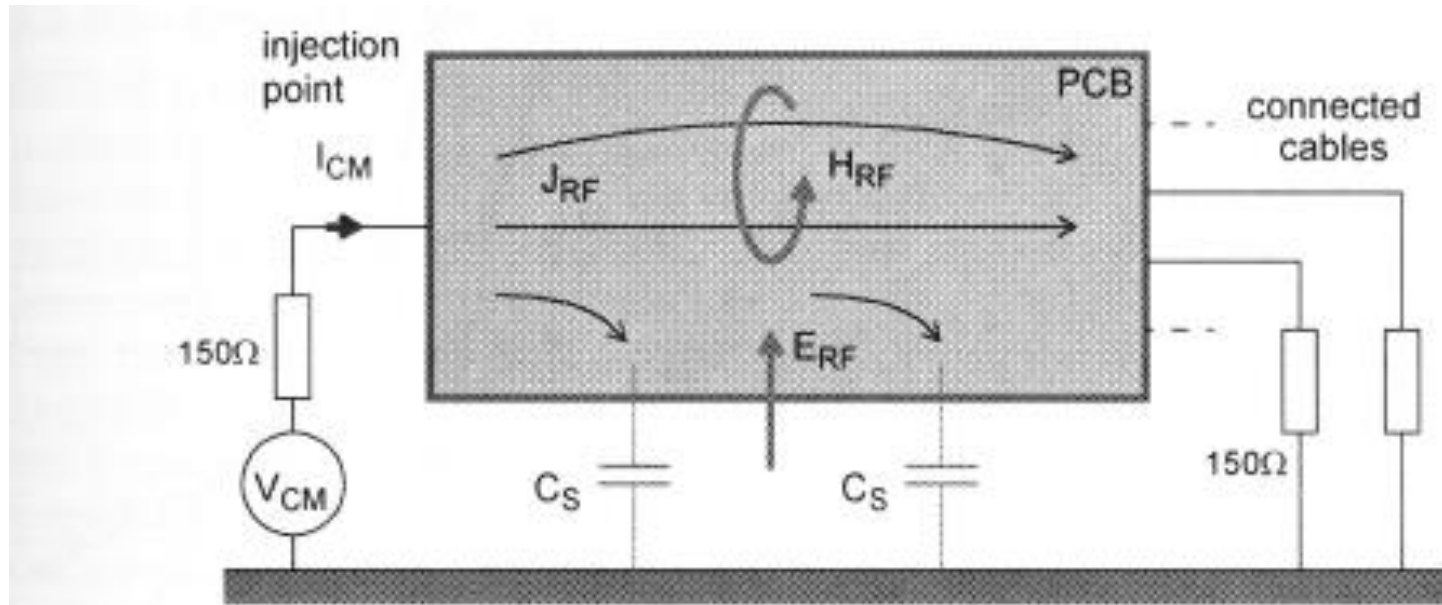


Figure 10.19 Current and voltage distribution along a resonant cable

Common mode RF injektion



J_{RF} represents common mode RF current density through the PCB

Figure 10.20 Common mode RF injection