

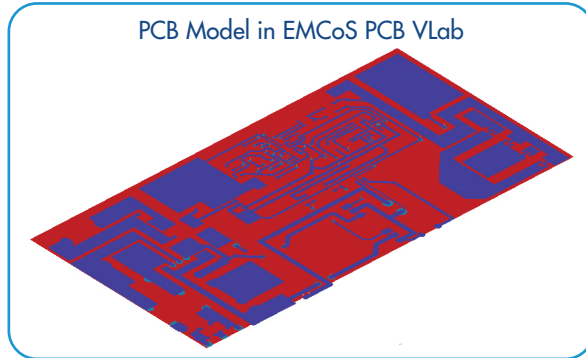


EMI/EMC OF PCB IN AUTOMOTIVE SYSTEMS

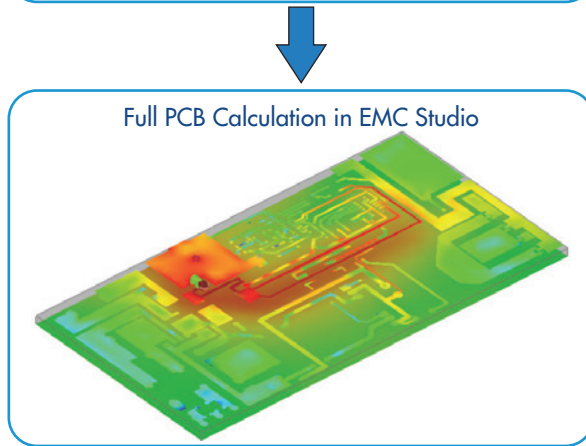
Introduction

This application note considers coupling from radiating PCB to cable in car model. Near Field Source approach based on equivalence principle is used.

Simulation Workflow



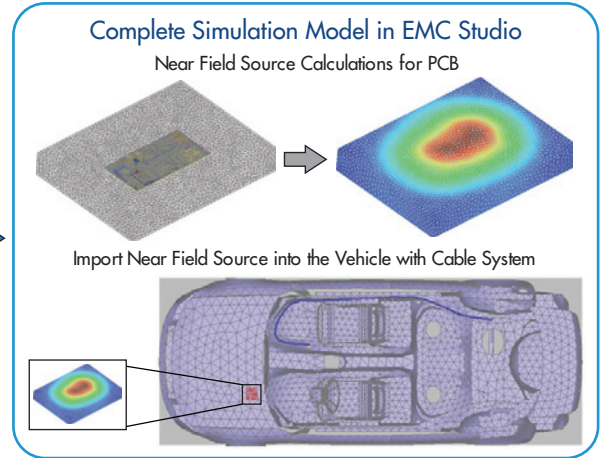
PCB Model in EMCoS PCB VLab



Full PCB Calculation in EMC Studio

Simulation workflow consists of the following steps:

- Importing of PCB geometry from ODB++ format in EMCoS PCB VLab and assignment of physical parameters (metallic traces and dielectric layers)
- Exporting model from EMCoS PCB VirtualLab to EMC Studio and calculation of currents, port parameters and fields radiated by PCB
- Near Field Source calculations for PCB
- Importing of near field source into the vehicle with cable system and construction of complete simulation task



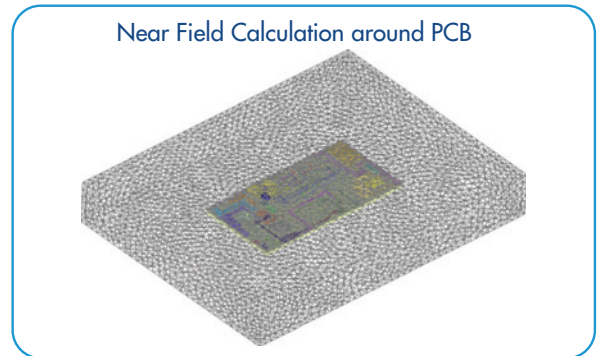
Complete Simulation Model in EMC Studio

Near Field Source Calculations for PCB

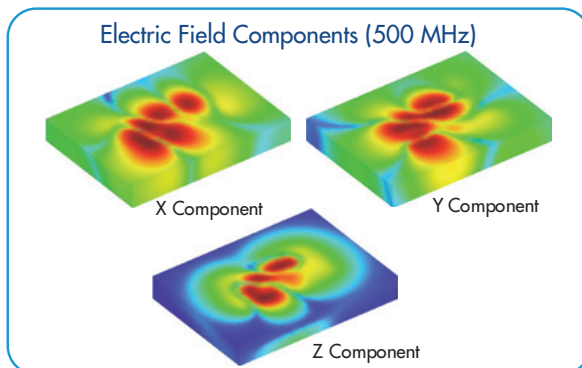
Import Near Field Source into the Vehicle with Cable System

Near Field Source

- The simulation model of complete PCB can be substituted by equivalent Near Field Source
- Required information for Near Field Source is electromagnetic fields produced by ECU on surrounding closed surface
- Electric and magnetic fields for Near Field Source can be calculated without presence of most part of passive objects



Near Field Calculation around PCB

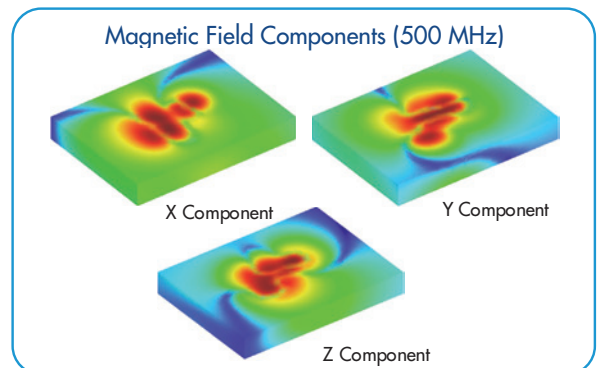


Electric Field Components (500 MHz)

X Component

Y Component

Z Component



Magnetic Field Components (500 MHz)

X Component

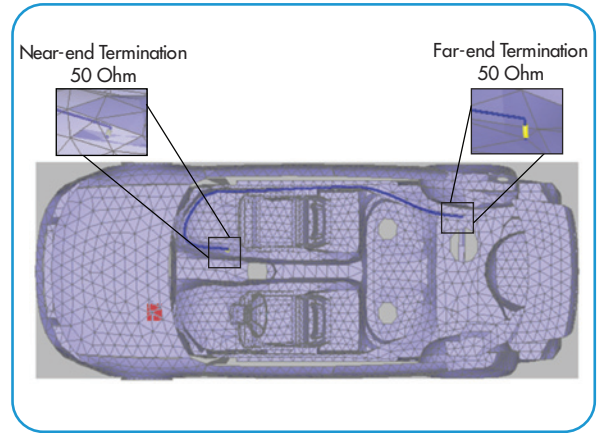
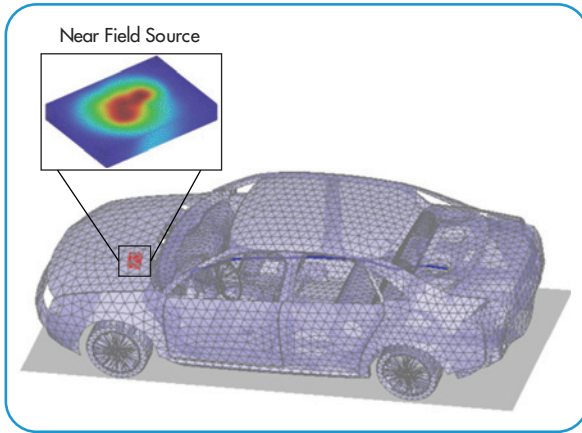
Y Component

Z Component



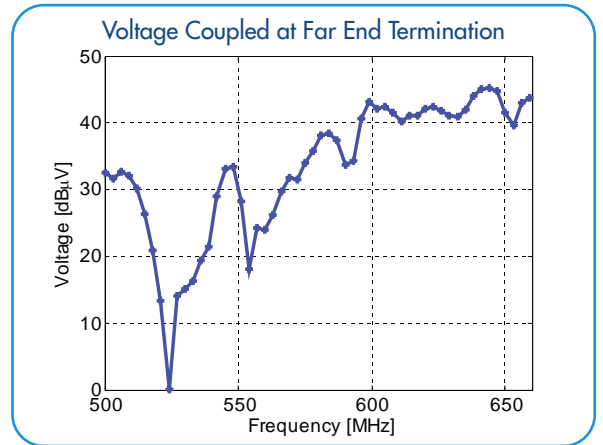
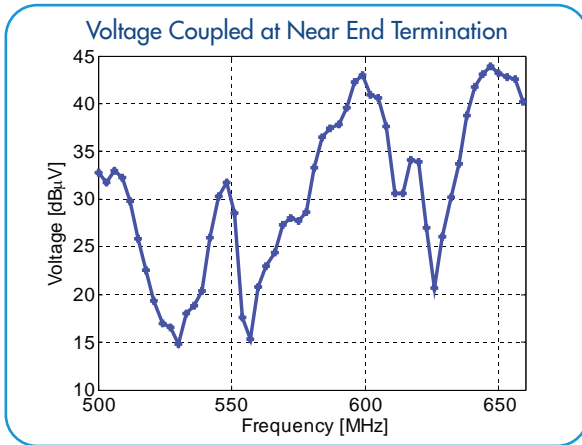
EMI/EMC OF PCB IN AUTOMOTIVE SYSTEMS

Simulation Model Description

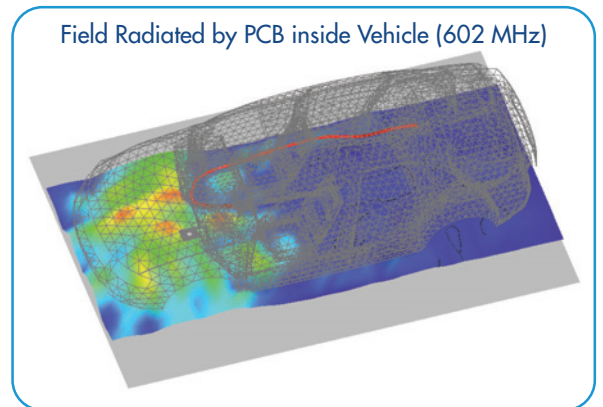
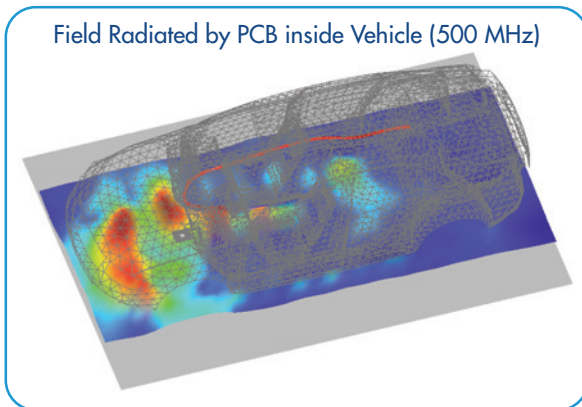


Results

Voltage coupled into the cable from PCB modeled as near field radiation source in the front part of the vehicle is shown below



The field radiated by PCB inside vehicle is shown below.



Conclusions

According to performed investigation the main conclusions are:

- Component level simulation of PCB is done using EMCoS PCB VLab for major preprocessing and EMC Studio for calculation of EMI/EMC of PCB ports and elements
- PCB can be analyzed on system level, as in described example of EMI/EMC in automotive systems using Near Field Source feature