



Altair Technology Conference

Israel 2019



Wikipedia

Shielding Effectiveness Analysis

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Content

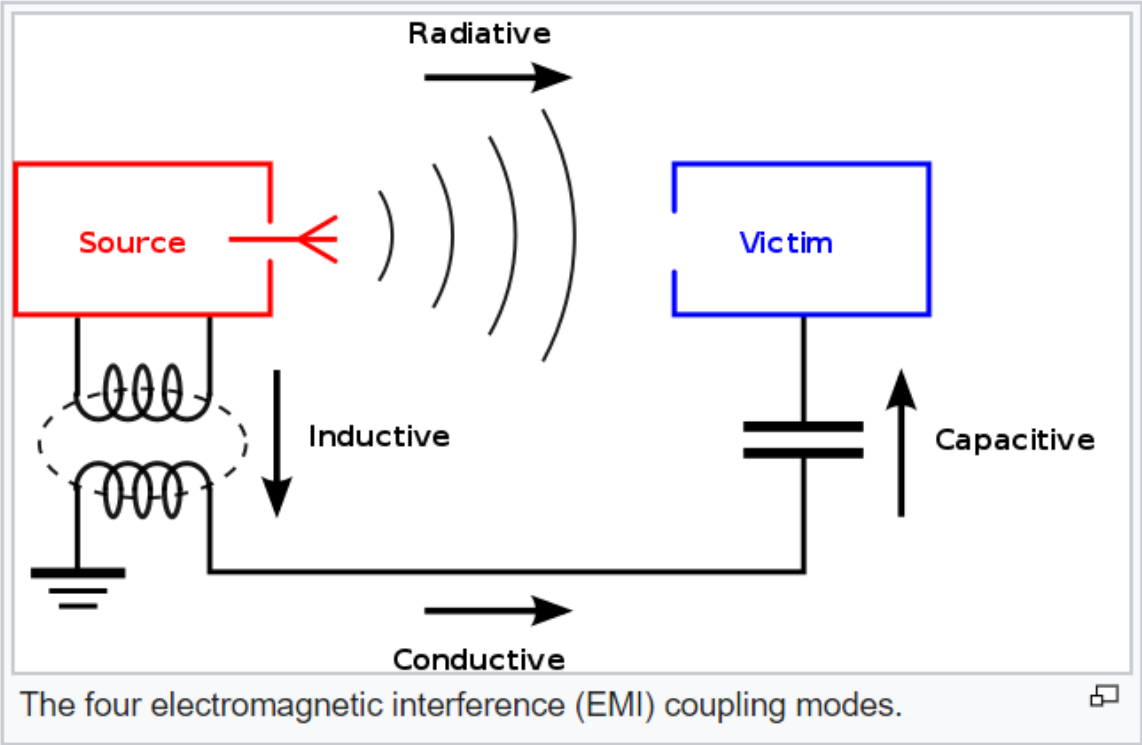
- What is EMC?
- Coupling mechanisms.
- What is Radiated Emission (RE) ?
- What is Radiated Susceptibility(RS)?
- What is shielding effectiveness(SE)?
- Theory of Shielding Effectiveness.
- SE Simulation
- Discussion

What is EMC? Live and Let Live

- **Electromagnetic compatibility (EMC)** is the ability of electrical equipment and systems to function acceptably in their [electromagnetic environment](#), by limiting the unintentional generation, propagation and reception of electromagnetic energy which may cause unwanted effects such as [electromagnetic interference](#) (EMI) or even physical damage in operational equipment.^[1] The goal of EMC is the correct operation of different equipment in a common electromagnetic environment. It is also the name given to the associated branch of electrical engineering.(Wikipedia)

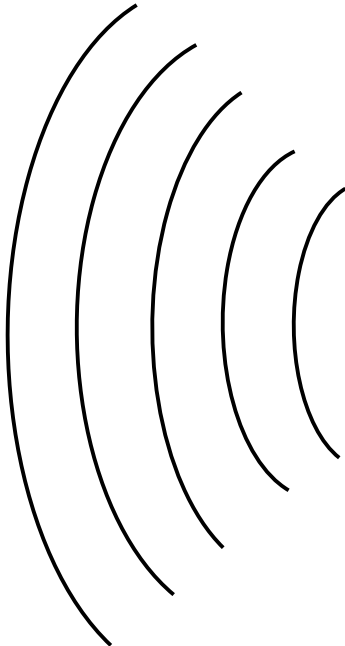


Coupling mechanisms

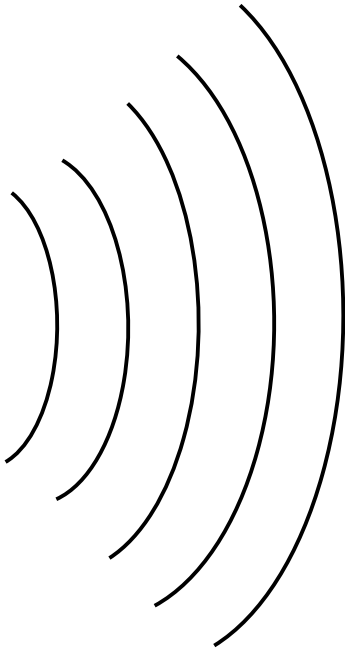


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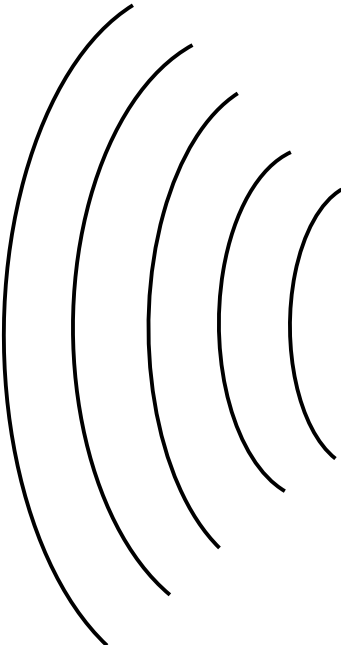
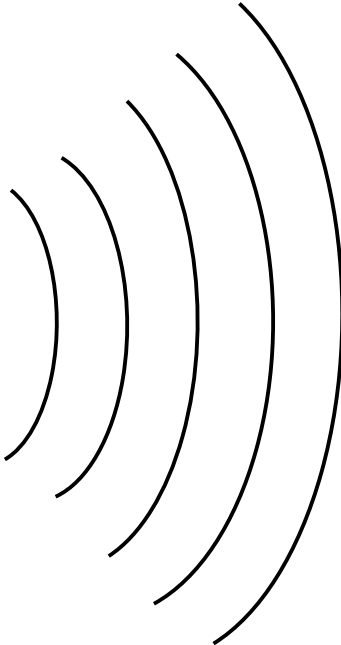
What is Radiated Emission (RE) ?



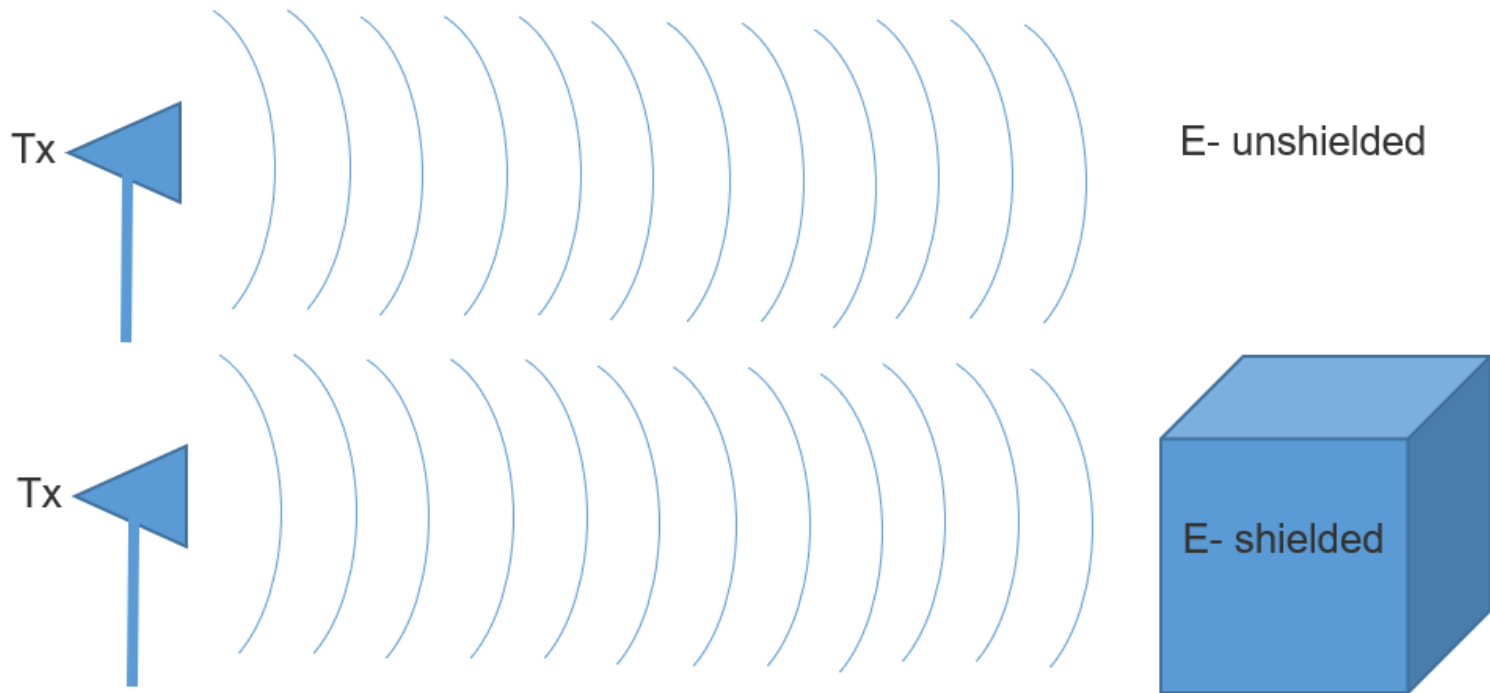
Wikipedia



What is Radiated Susceptibility(RS)?



What is “Shielding Effectiveness”(SE)?



What is “Shielding Effectiveness”(SE)? Cont.1

$$SE=20*\log\left(\frac{E_{unshield}}{E_{shield}}\right)$$

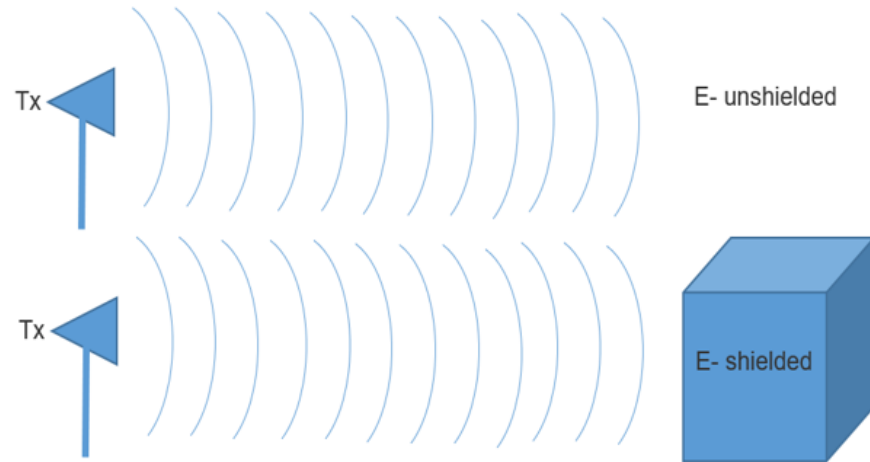
$$SH=20*\log\left(\frac{H_{unshield}}{H_{shield}}\right)$$

$$S=A+R+B$$

A=Absorption loss

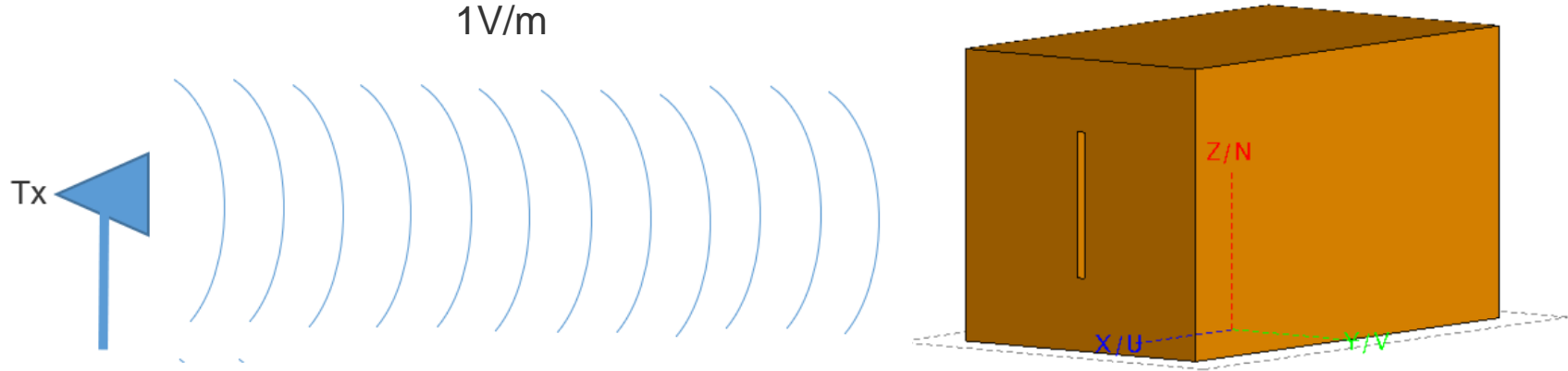
R=reflection loss

B=Multiple reflection factor

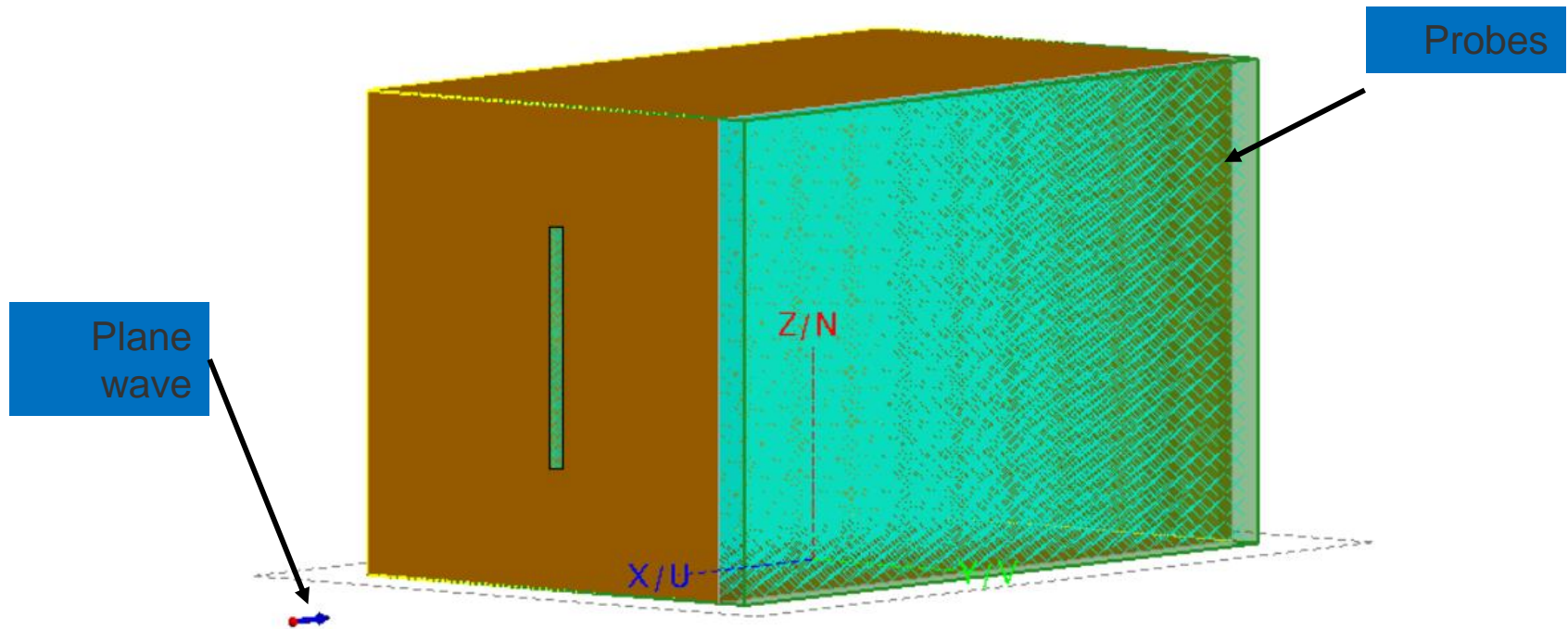


Does the simulation methods have an impact on the SE level

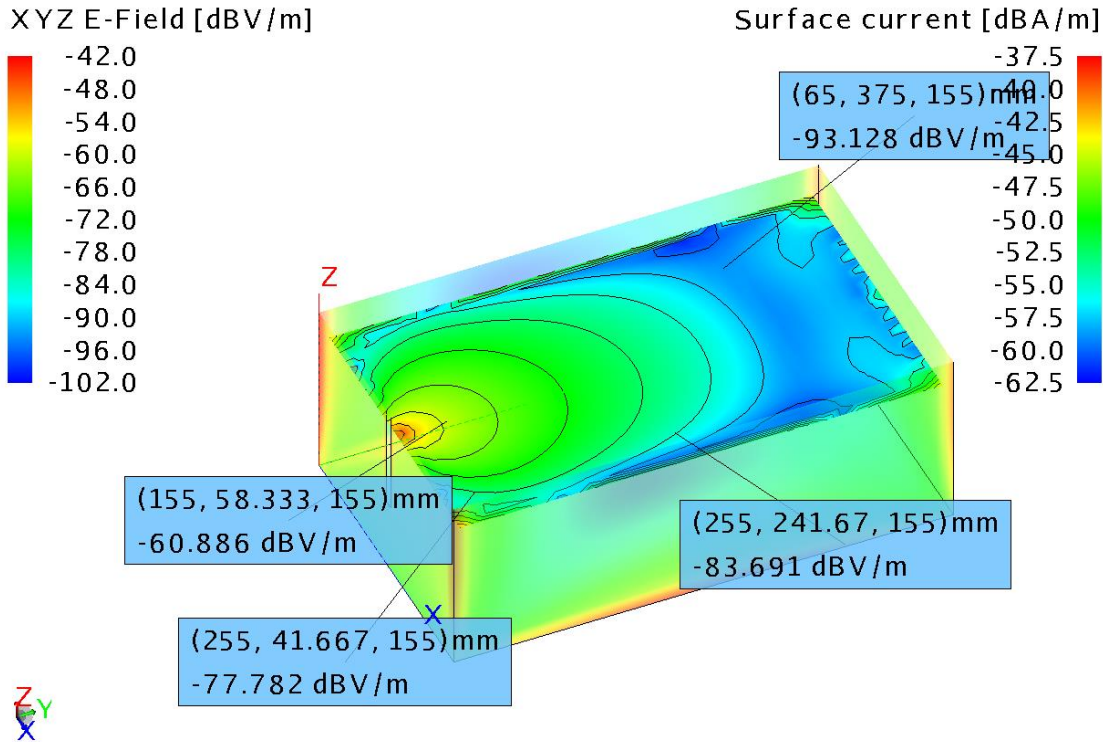
Method 1



$$E[\text{dBV/m}] = 20 \cdot \log(1\text{V/m}) = 0$$

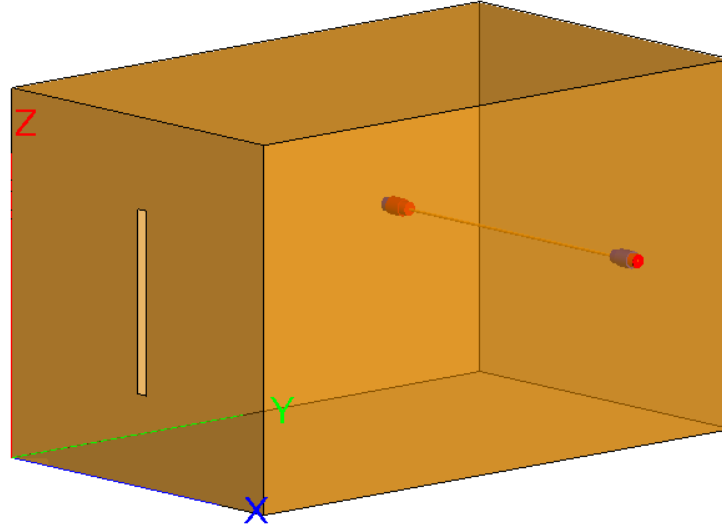


Method 1



Does the simulation methods have an impact on the SE level

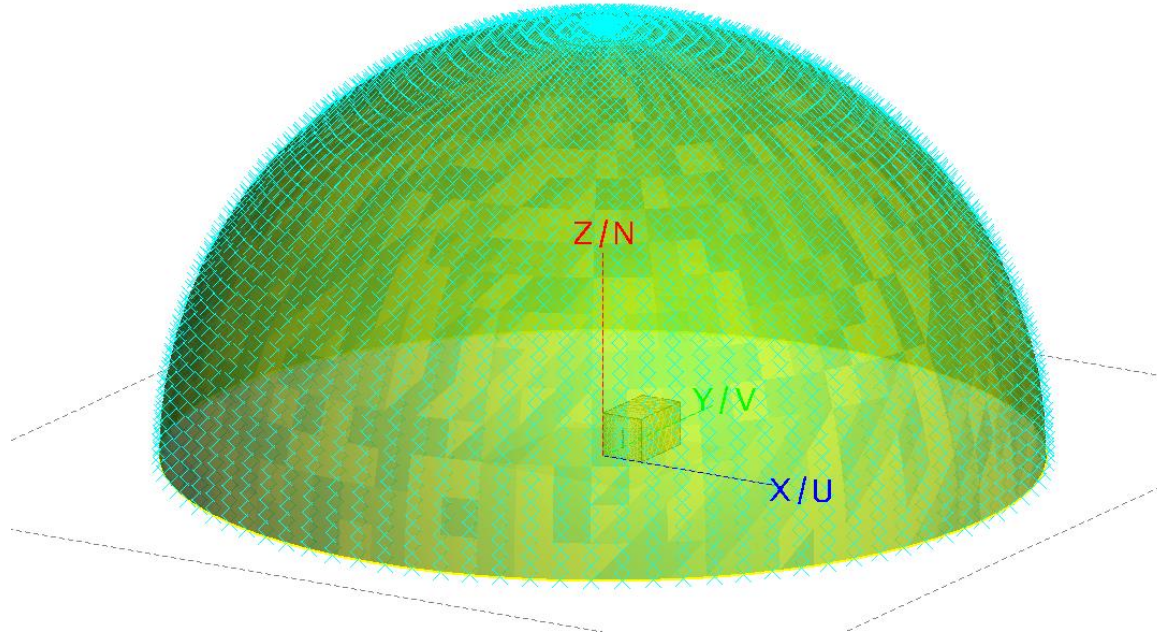
Method 2

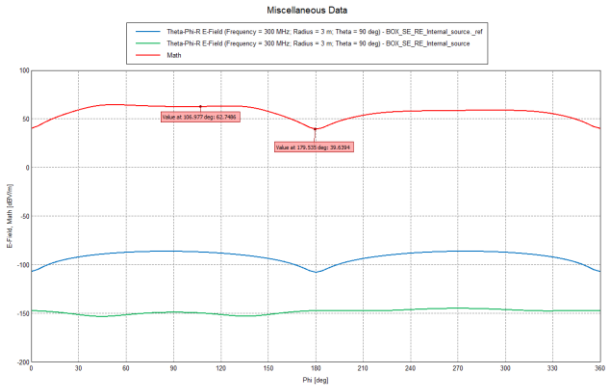
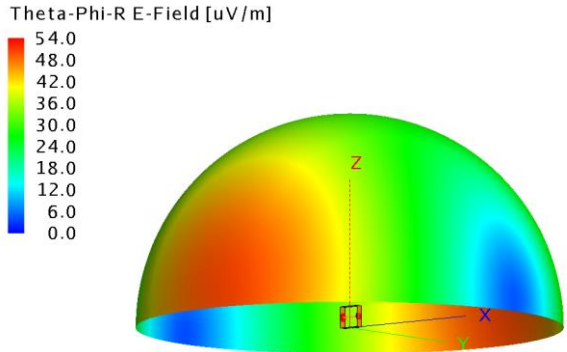
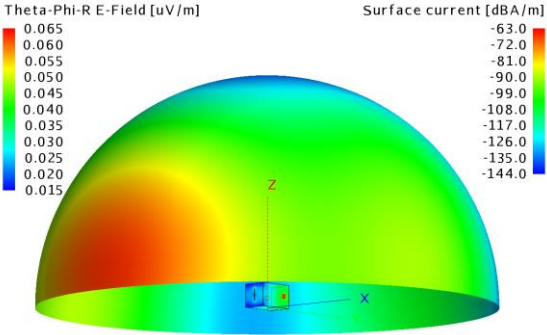


Concept was taken From “EMI from Cavity Enclosures”, IEEE Trans. EMC Feb. 2000

Does the simulation methods have an impact on the SE level

Method 2

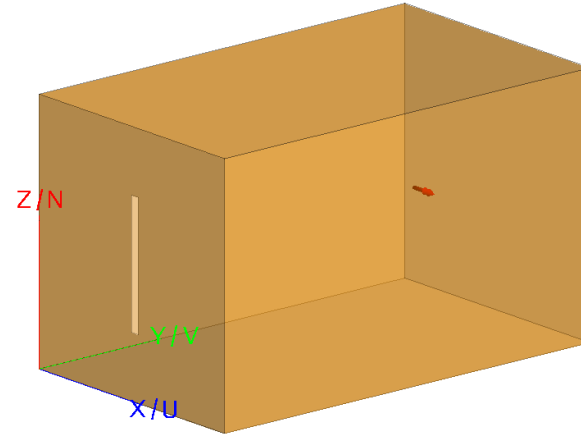
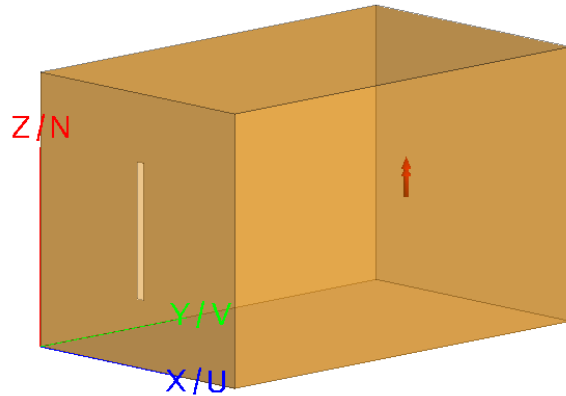




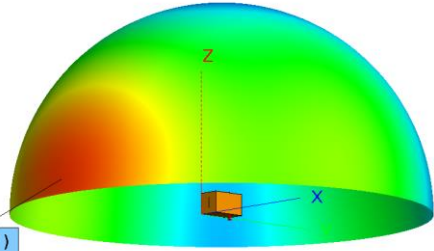
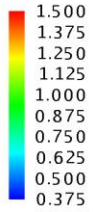
From “EMI from Cavity Enclosures”, IEEE Trans. EMC Feb. 2000

Does the simulation methods have an impact on the SE level

Method 3

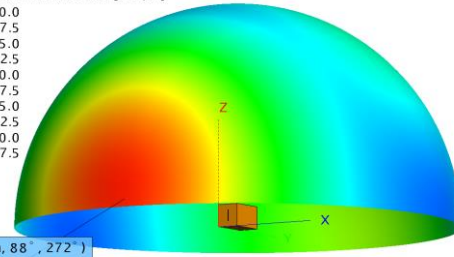


Theta-Phi-R E-Field [V/m]



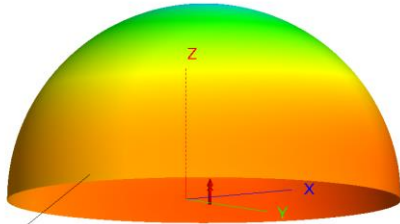
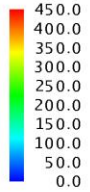
(3 m, 86°, 268°)
1.4385 V/m

Theta-Phi-R E-Field [mV/m]



(3 m, 88°, 272°)
29.314 mV/m

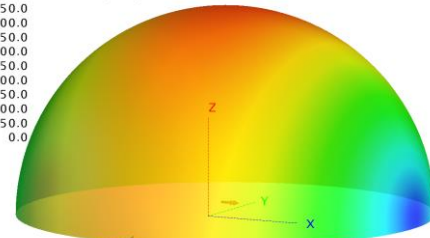
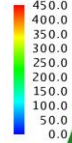
Theta-Phi-R E-Field [V/m]



(3 m, 88°, 272°)
376.88 V/m

48dB

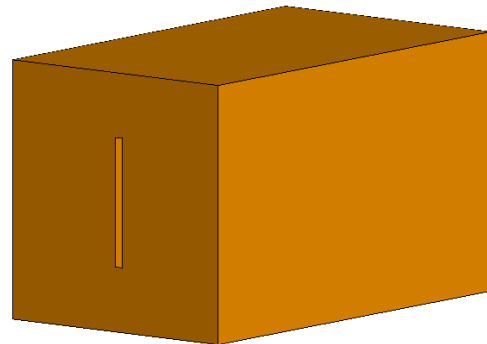
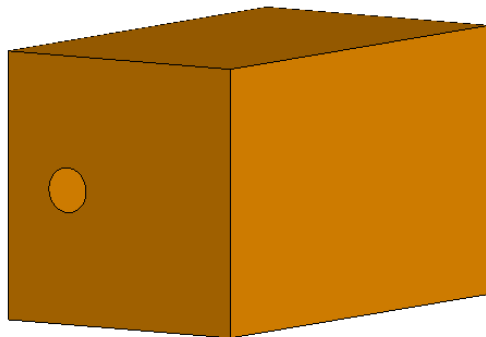
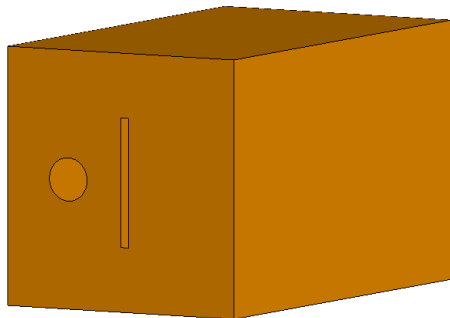
Theta-Phi-R E-Field [V/m]

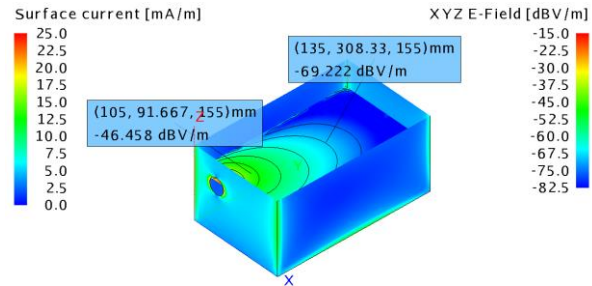
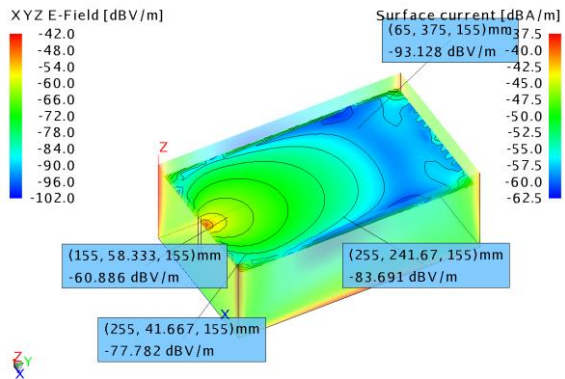
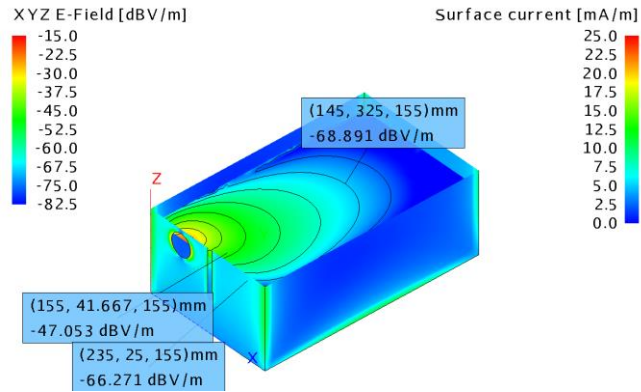


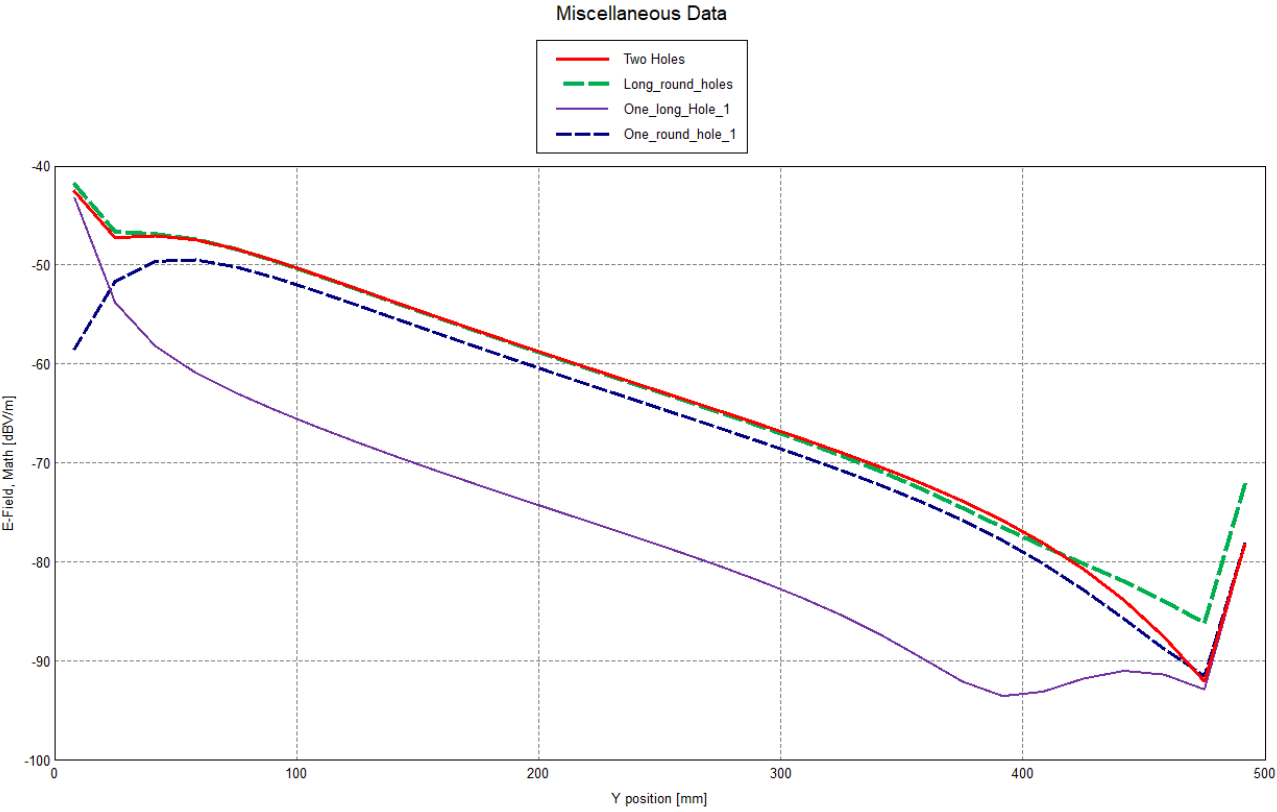
(3 m, 88°, 272°)
376.71 V/m

82dB









Discussion



Thank You !

