



## Shielding Effectiveness of Metallic Enclosure

### A metallic enclosure containing a number of apertures is modeled in FEKO to determine its shielding effectiveness

As wireless communication increases in popularity the shielding of radiation sensitive devices / circuitry becomes more and more important. A simple shielding technique is to place the radiation sensitive device in a metallic enclosure. However, these enclosures often contain a number of apertures (e.g. for ventilation or cabling purposes). The shielding effectiveness (SE, ratio of field strength with enclosure absent to field strength with enclosure present) of such enclosures have been investigated in literature [1], [2]. Here the SE of a rectangular enclosure containing a number of rectangular apertures is investigated.

Figure 1 shows the FEKO model of the enclosure containing a single aperture and the incident plane wave used to illuminate the structure (the blue arrow indicates the direction of propagation and the red arrow the polarization of the wave). As the incident field is specified, the field strength with the enclosure absent is already known and only the field inside the enclosure needs to be computed.

Figure 1: Metallic enclosure with a single aperture

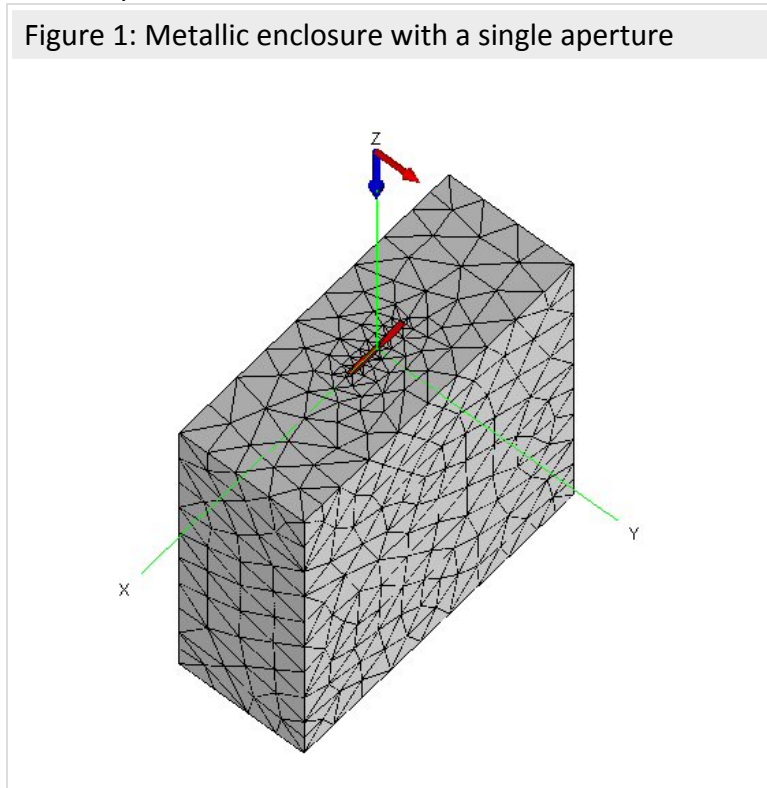
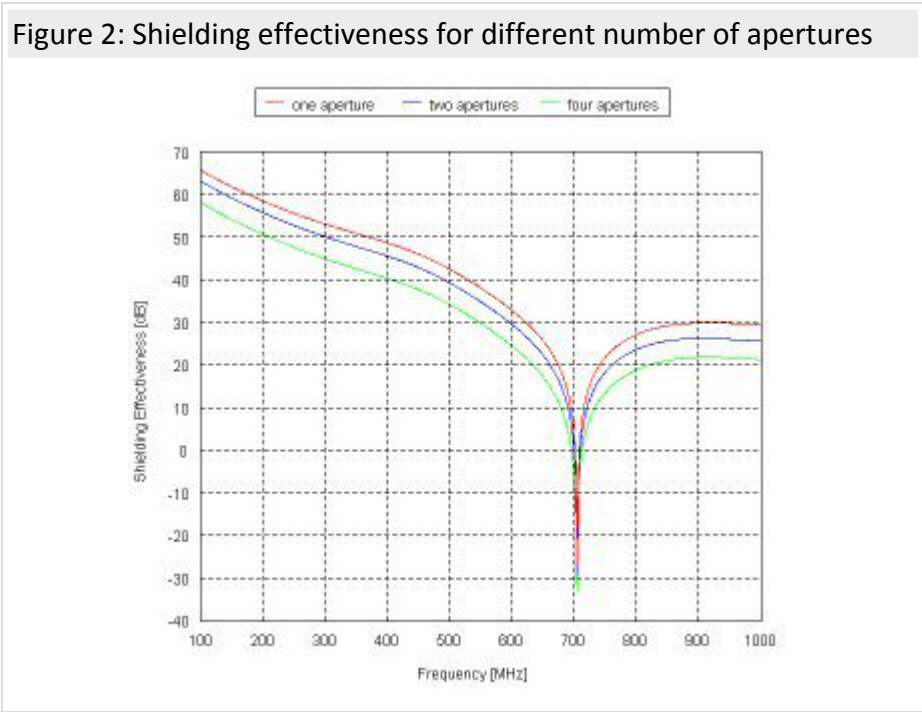
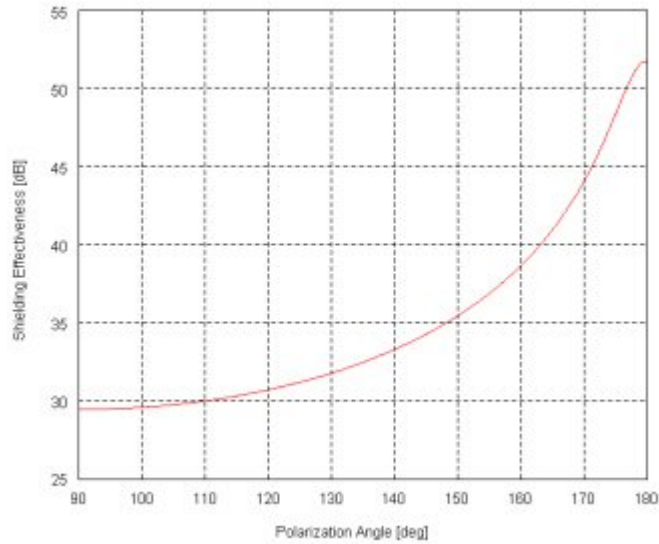


Figure 2 shows how the shielding effectiveness varies with frequency for a normally incident plane wave (Figure 1). Enclosures with different numbers of apertures are also compared and as the number of apertures increase, the shielding effectiveness decreases.



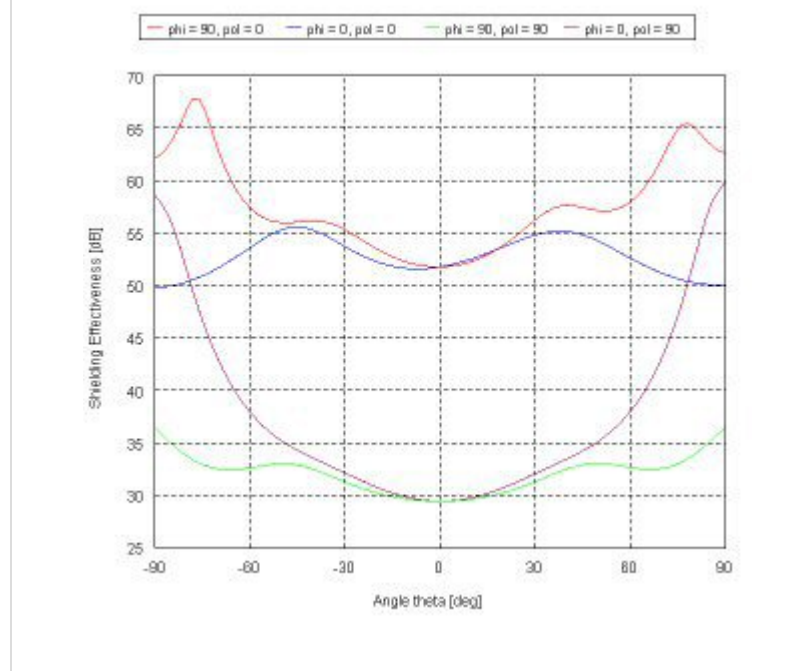
In Figure 3 the shielding effectiveness for an incident plane wave of different polarizations is shown (1000MHz). The plane wave is normally incident and the angle of polarization measures the direction of the E-field from the x-axis in the xy-plane. As the wave polarization varies from the E-field lying across the aperture length to lying along the aperture length, the shielding effectiveness is increased by more than 20dB.

Figure 3: Polarization dependency of shielding effectiveness



Finally the shielding effectiveness with variation in plane wave incident angle is shown in Figure 4 (1000MHz). The angle  $\phi$  is measured from the x-axis in the xy-plane. Two polarization angles are compared in each case,  $\text{pol} = 0$  corresponding to the incident E-field lying along the aperture length and  $\text{pol} = 90$  corresponding to the incident E-field lying across the aperture length. The difference in SE for the different polarizations is in agreement with the results shown in Figure 3.

Figure 4: Shielding effectiveness for different incident angles



## References

- [1] Z.A. Khan, C.F. Bunting, M.D. Deshpande, "Shielding Effectiveness of Metallic Enclosures at Oblique and Arbitrary Polarizations", IEEE Transactions on Electromagnetic Compatibility, Vol. 47, No. 1, February 2005.
- [2] V. Ramani, C.J. Reddy, A.Q. Martin, "Analysis of a Narrow Slot backed by a Rectangular Cavity using FEKO", IEEE/ACES International Conference on Wireless Communications and Applied Computational Electromagnetics, April 2005.



[www.feko.info](http://www.feko.info)



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