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ONE STEP AHEAD

XGSLab™

THE STATE OF THE ART OF THE ELECTROMAGNETIC SIMULATION FOR POWER, GROUNDING AND LIGHTNING PROTECTION SYSTEMS

XGSLab™ Vs. CDEGS®
GRID IN A MULTILAYER SOIL MODEL

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Introduction

The program XGSLab includes the following module:

- GSA (Grounding System Analysis)

The program CDEGS® (developed by SES & Technologies ltd. Canada) includes many modules and in particular:

- MALT®

The two modules use the same hypothesis of equipotential electrodes and do not consider the drop voltages along conductors.

A comparison between GPR calculates with the two modules is related only to the calculation algorithm used to consider a multilayer soil model.

Comparison between GSA and MALT®

In the following, some calculations taking into account a grid 60 x 60 m are shown in order to verify the agreement of the results obtained using GSA and MALT®.

Main input data:

- Soil models (resistivities and thickness) = see Table 1
- Grid size = 60 x 60 m
- Mesh size = 10 x 10 m
- Depth = 0.5 m
- Wire diameter = 10 mm
- Wires material: copper
- Elements length: 2.5 m
- Layout: see Figure 1

	Two Layers		Three Layers		Four Layers		Five Layers	
Layer	**ρ (Ωm)**	**h (m)**	**ρ (Ωm)**	**h (m)**	**ρ (Ωm)**	**h (m)**	**ρ (Ωm)**	**h (m)**
1	100.00	2.00	100.00	2.00	100.00	2.00	100.00	2.00
2	50.00	Infinite	50.00	6.00	50.00	6.00	50.00	6.00
3			200.00	Infinite	200.00	15.00	200.00	10.00
4					75.00	Infinite	20.00	15.00
5							300.00	Infinite

Table 1: Multilayer Soil Models

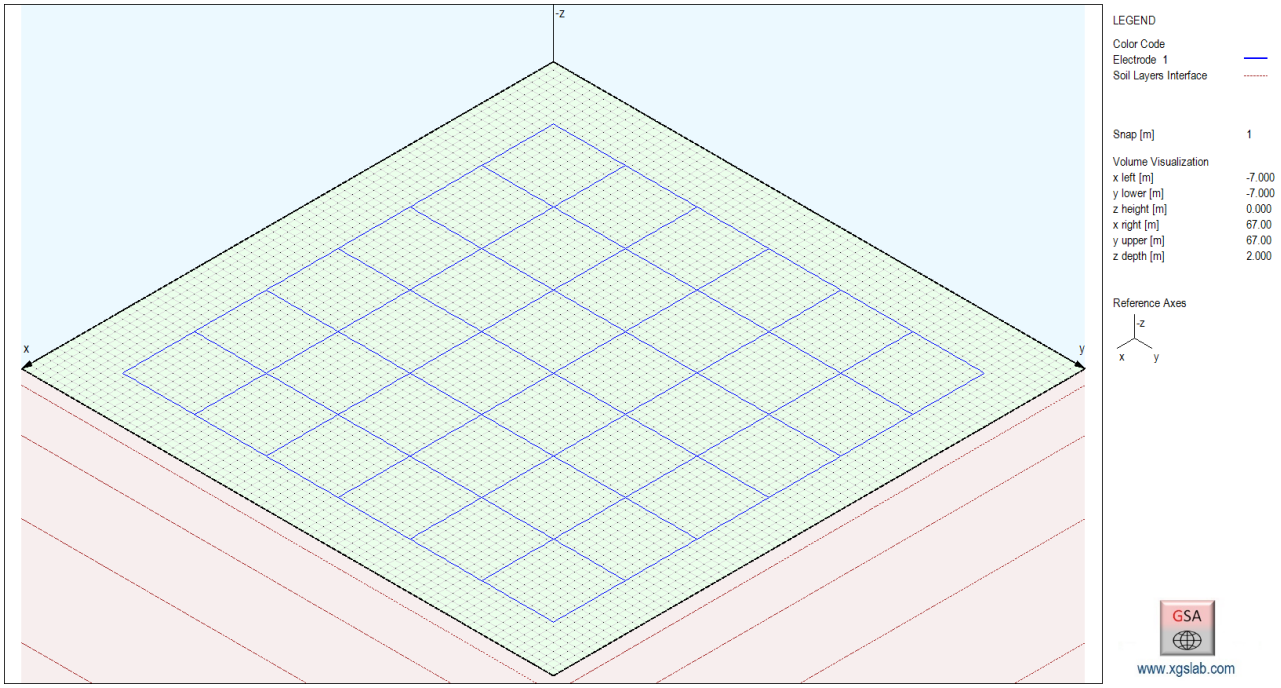

Figure 1: Grounding system layout

The results obtained using GSA are reported out of brackets, the results obtained by using MALT® are into brackets, and differences are related to MALT® results:

- Two Layers: R_E = 0.4911 (0.4902) Ω – difference +0.18%
- Three Layers: R_E = 1.033 (1.030) Ω – difference +0.29%
- Four Layers: R_E = 0.7509 (0.7491) Ω – difference +0.24%
- Five Layers: R_E = 0.7963 (0.7927) Ω – difference +0.45%

The agreement between the results obtained with GSA and results obtained with MALT® is excellent.
The five layers soil model in particular represents a critical case because it includes adjacent soil layers with a great difference in resistivities.