SATISHIELDING

HIGH SENSITIVITY ELECTRONIC LABORATORIES SHIELDING
ST MICROELECTRONICS (AGRATE BRIANZA)

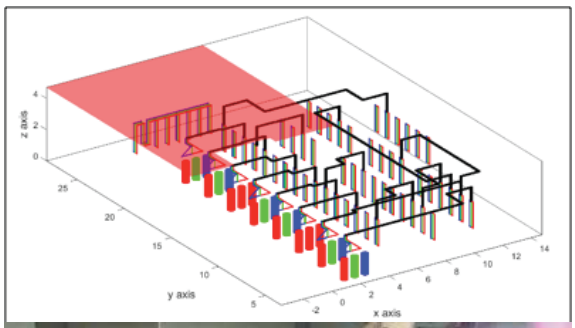
Description of the problem

This application refers to the shielding of magnetic fields generated by a complex power substation on a test area where sensitive electronic devices are installed. Such devices are employed in a semiconductor industry for the wafer testing and very low electrical currents are measured (in the order of femto-Amperes). External magnetic fields have to be low enough in order to not disturb the current measurements.
Level of 0.2 - 0.3 microT are usually required in the environment where the testing machines are placed.
Some preliminary measurements show a magnetic pollution in the testing close to 2-3 microT. Such value is quite constant because the substation works 24 hours a day at constant load. A shielding factor of at least 10 is required.

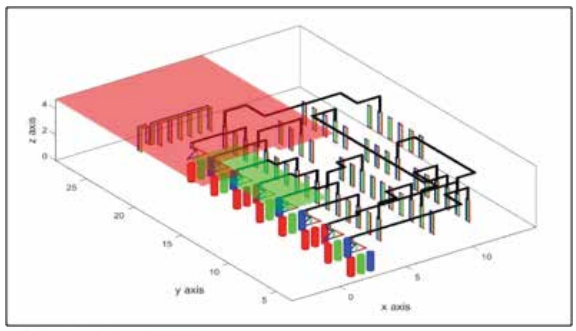
Solution

The shield (red surface) simulation makes it possible to obtain above the substation a significant reduction of the magnetic field, even if in some area, close to the shielding boundary, the limit is exceeded. This is due to the edge effects produced by the shield and the only solution, which was not allowed in the presented application, is the extension of the shield outside the sensitive area. An alternative solution for increasing the shielding efficiency is based on the application of an additional shield on the top of each power transformer (green surface).

FIRST SHIELD: BASEMENT OF THE LABORATORY



ADDITIONAL SHIELD: ON THE TOP OF THE TRANSFORMERS



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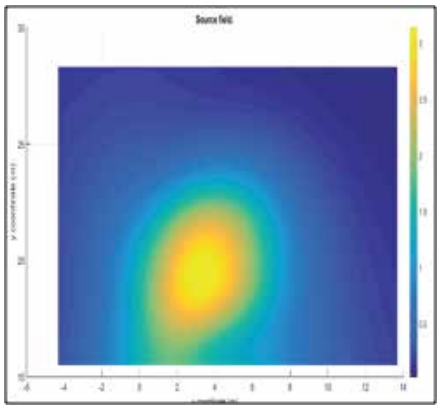
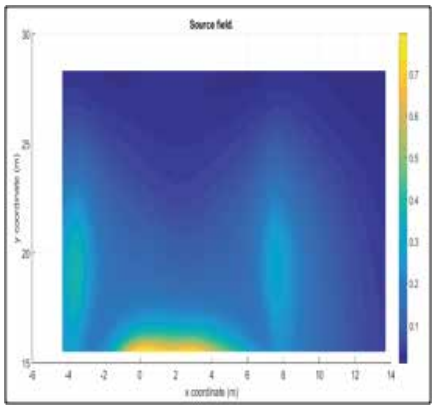
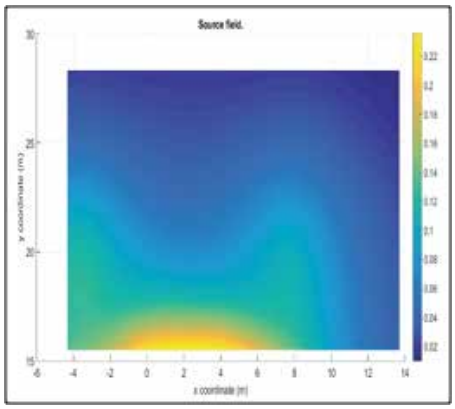
Results



The simulation of the magnetic flux density at the ground level of the testing area is reported in Figure. According to the measurement, the maximum value calculated is equal to 3 μT.



The application of the first shielding solution on the pavement of the laboratory is reported in the below figure. It possible to observe a significant reduction of the magnetic field, even if in some area, close to the shielding boundary, the required limit is exceeded (around to 0.7 μ).



As it can be seen the magnetic flux density globally does not overcame the limit of 0.2 μT

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