MAGNETIC SIGNATURE OF NAVAL SHIP IN THE EARTH'S MAGNETIC FIELD

EMC Studio

Introduction

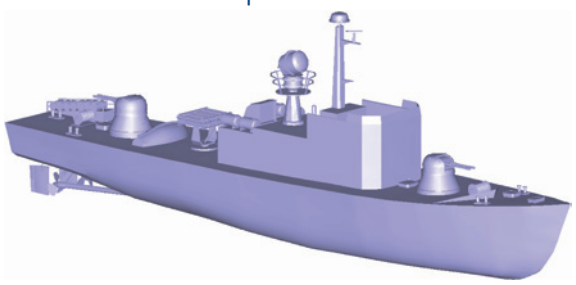
Investigation of electromagnetic signatures produced by ships in Earth's magnetic field plays important role in naval ship design. These signatures need to be kept below safe levels. The main source of the static magnetic field of a ship is ferromagnetic material used for construction. If this magnetic signature is measurable in the local magnetic field of the Earth, then several threats to ship's safety are present:

- Detection of a naval ship by radars
- Detection of the ship by sea mines with subsequent detonation

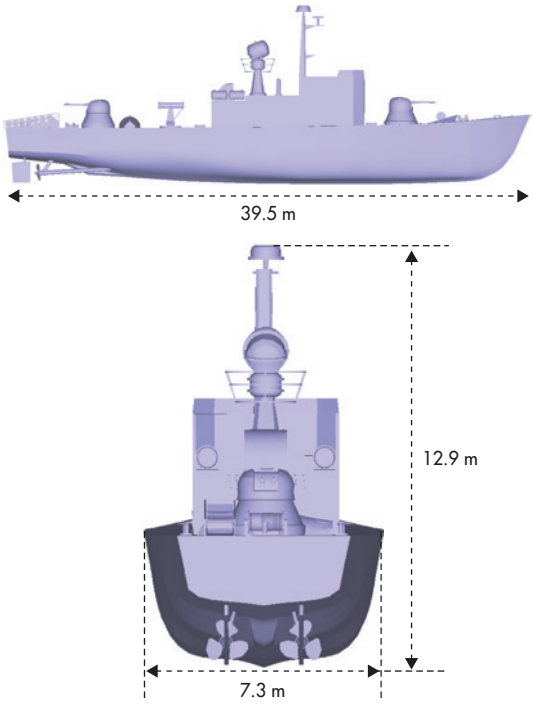
This application note demonstrates simulation of electromagnetic signature produced by ship in the Earth's magnetic field.

Simulation Model Description

Ship Model



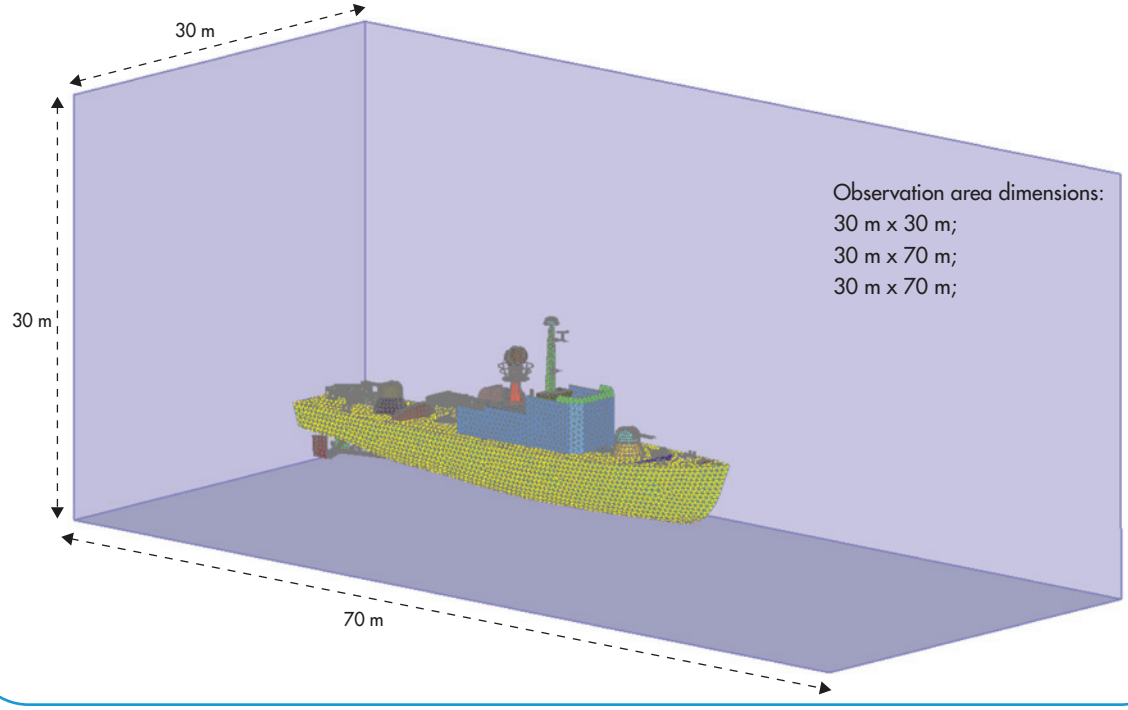
Ship Dimensions



Simulation model parameters are the following:

- Ship model contains 51317 triangles
- Ship length from bow to stern is 39.5 m
- Ship width is 7.3 m and height is 12.9 m
- High strength steel (HY-100) is considered as hull material with relative permeability 300 and conductivity 3.306e+06 S/m
- Average thickness of hull material is set to 0.01 m
- Ship is placed in magnetic field having the same value as average value of the Earth's magnetic field ~ 40 A/m
- Simulation frequency 80 Hz

Simulation Model View in EMC Studio



EMCoS Ltd.
27 Pekin Street, Tbilisi, 0160, Georgia
Phone: +995-32-389091
E-mail: info@emcos.com
www.emcos.com

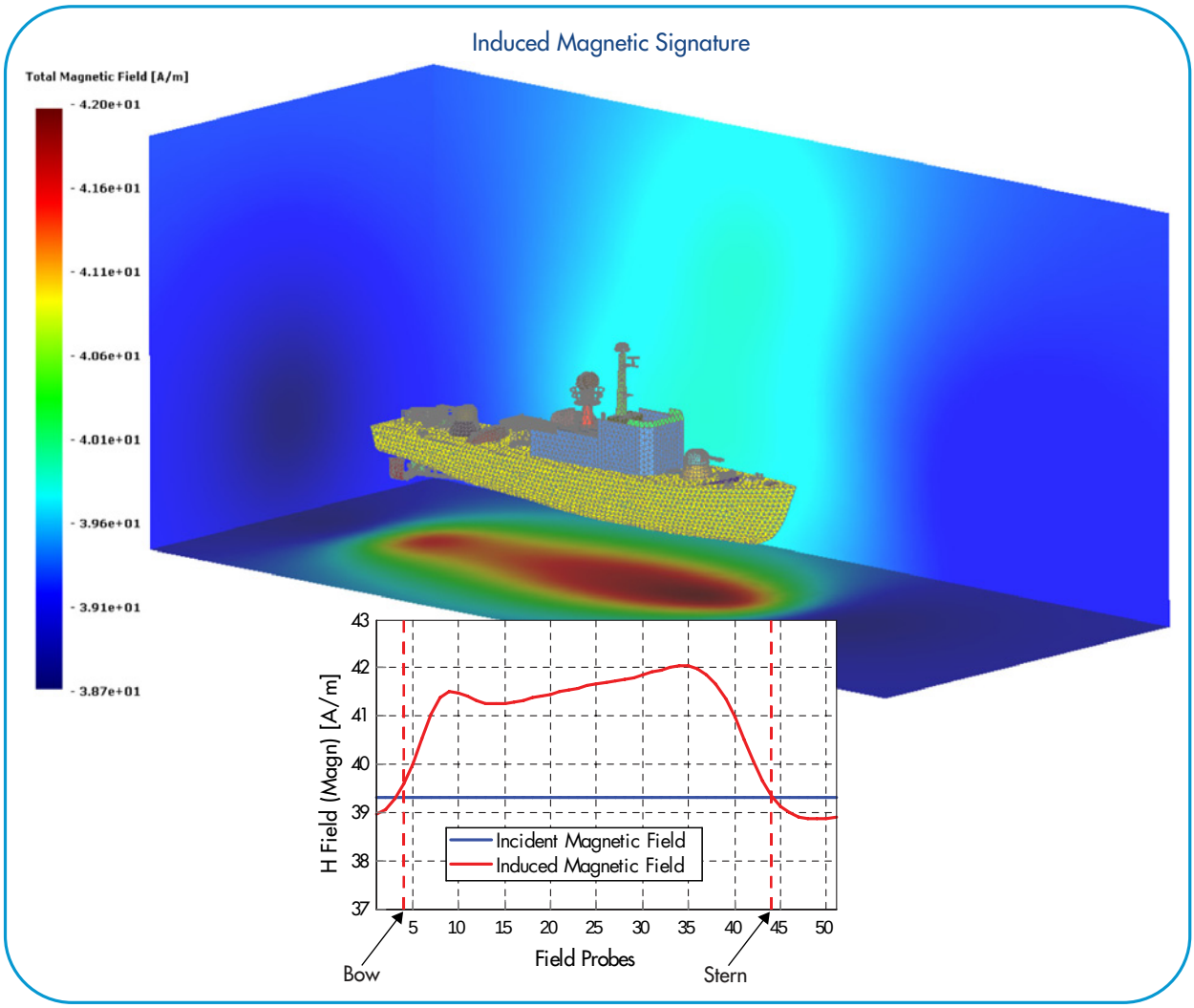
EMCoS Consulting and Software

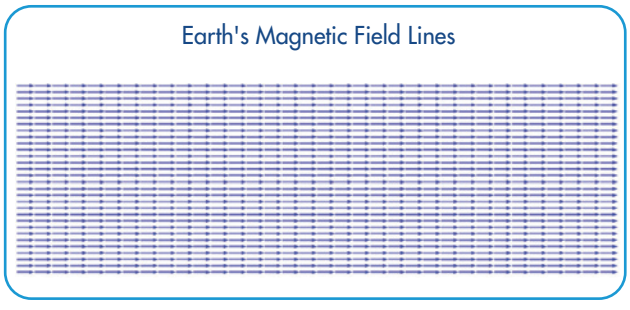
MAGNETIC SIGNATURE OF NAVAL SHIP IN THE EARTH'S MAGNETIC FIELD

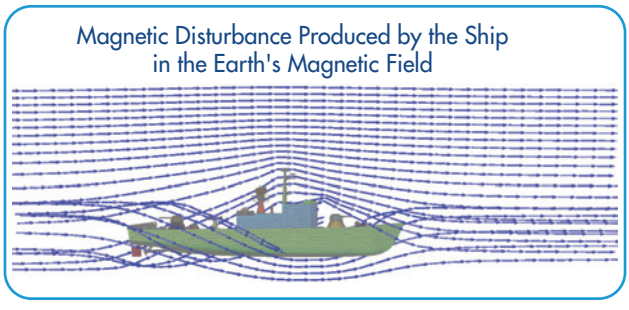
EMC Studio

Results

Magnetic disturbance produced by the ship in the Earth's magnetic field (incident magnetic field ~ 40 A/m) is shown below:







Conclusions

EMC Studio provides powerful analysis module (Low Frequency Magnetic Field Analysis Type) for low frequency magnetic fields interaction with thin 3D sheets characterized by combined resistive and magnetic properties. This analysis type allows to simulate and analyze electromagnetic signatures of the ships in the Earth's magnetic field depending on material properties used for hull construction.

Based on these knowledge ship designers can reduce local disturbance of the Earth's magnetic field produced by the ship and, therefore, maximize its protection level.

EMC Studio Application Note: #08

EMCoS Consulting and Software

EMCoS Ltd.
27 Pekin Street, Tbilisi, 0160, Georgia
Phone: +995-32-389091
E-mail: info@emcos.com
www.emcos.com