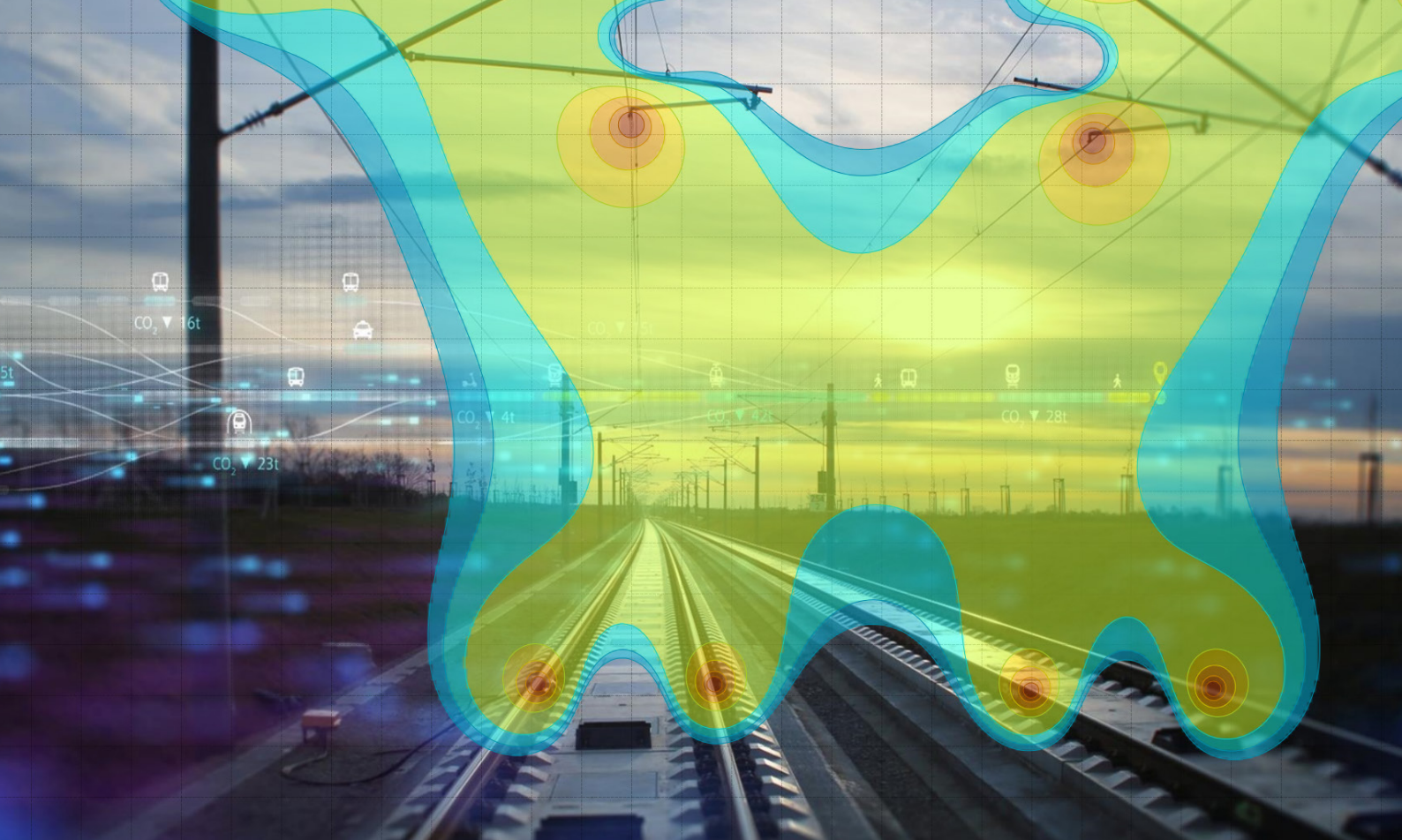




Version
1.0.1

PRODUCT INFORMATION

Sitras EMF – Calculation of electric and magnetic fields for traction power supply systems

[siemens.com/rail-electrification](https://www.siemens.com/rail-electrification)

SIEMENS

Sitras EMF simplifies the process of comprehensive electric and magnetic field calculations for electric installations. The software is applicable for general electric systems with a focus on traction power supply systems for railways.

Sitras EMF can support the design process for new installations as well as the validation and extension of existing systems.

Features

- D modelling of conductors, transformers and inductors to investigate the area of:
 - substations
 - contact line systems
 - overhead lines
 - cable routes
- Simplified input of geometrical arrangement as a table or via screen measuring on design drawing files
- Individual or combined input of conductor currents and voltages
- Calculation and evaluation of:
 - electric field strength
 - magnetic field strength
 - magnetic flux density
 - noise level according to C.I.S.P.R and Chartier
 - radio noise level according to C.I.S.P.R
- Graphical representation of calculated fields
- Superposition for simultaneous exposure to multiple frequency fields
- Interface to Sitras Sidytrac with integrated data import filter.

Areas of Application

Sitras EMF performs the calculation of electric and magnetic fields as well as acoustic noise, which occur due to the electrical operation of overhead lines, traction substations, cable routes and contact lines of electric traction systems.

The investigation of electric and magnetic fields is one cornerstone of the EMC assessment for electrical traction systems. The emitted fields must not exceed standardized limits or lead to disturbances of the surrounding area, e.g. of sensitive equipment close to the railway tracks. Sitras EMF assists to evaluate if the limits of the fields are respected within a certain range of the electrical traction components and whether measures to reduce the fields are effective.

Data Input and Modeling

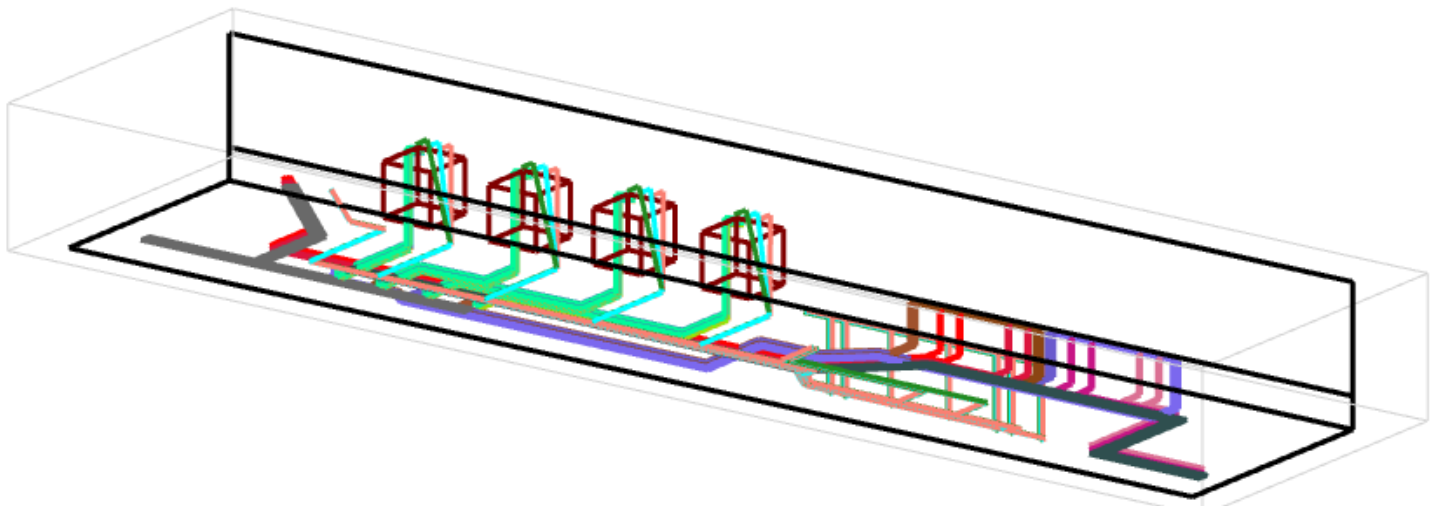
The user inserts the general input data, such as geometry, properties and electrical operating parameters of the electrical components into the software. For the magnetic field calculations, the conductor currents must be available; electrical field calculations require the voltage of each conductor.

There are various input options. Besides, the tabular input of x, y, z-coordinates also a design drawing, e.g. cable layout plan, can be used as a background image.

After the background image is scaled, the individual conductors can be traced by mouse and included into the model. Moreover, conductors can be replicated and shifted parallel.

An easy parameter setting of windings enables a fast input of air coils, transformers are included based just on a few parameters.

Once an element is added, it will be included in a 3D overview of the data supporting the model generation.



3D-view of input data

Calculation and Output Data

The calculations are performed in a cartesian coordinate system with a flexible grid of measuring points defined by the user. The magnetic fields are calculated according to the physical laws of Biot and Savart while for the electric field computation applies the complex image method. For the noise calculation the method according to C.I.S.P.R or Chartier is applied.

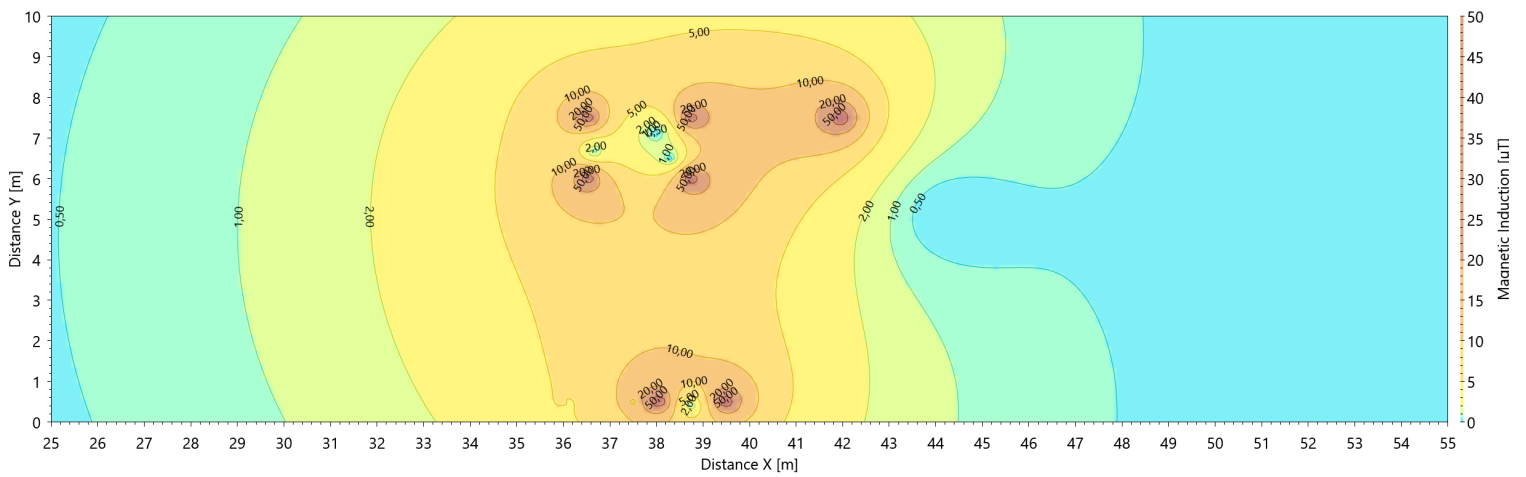
The results can be displayed in a graph with the fields shown along a straight measuring line. Additionally, a visualisation in two-dimensional measuring planes is possible where isolines of equal magnitude are connected and values within a user-defined range are grouped by colour. This visualization can be arranged to overlay the background image.



Magnetic field of an electric traction substation

The calculated border field strength, electric charge, field strength and noise level are displayed directly. Additionally, each computation is stored in separate ASCII files giving the opportunity for post processing. For each point of the measuring grid the calculation results can be taken from the result graphics or the ASCII file.

The graphical illustration of the fields and noise level, as well as the conductor geometry can be exported in a Portable Network Graphic (PNG) format. It contains a bitmap of indexed colors and uses lossless compression, similar to a .GIF file but without copyright limitations.



Magnetic field of a contact line system

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