

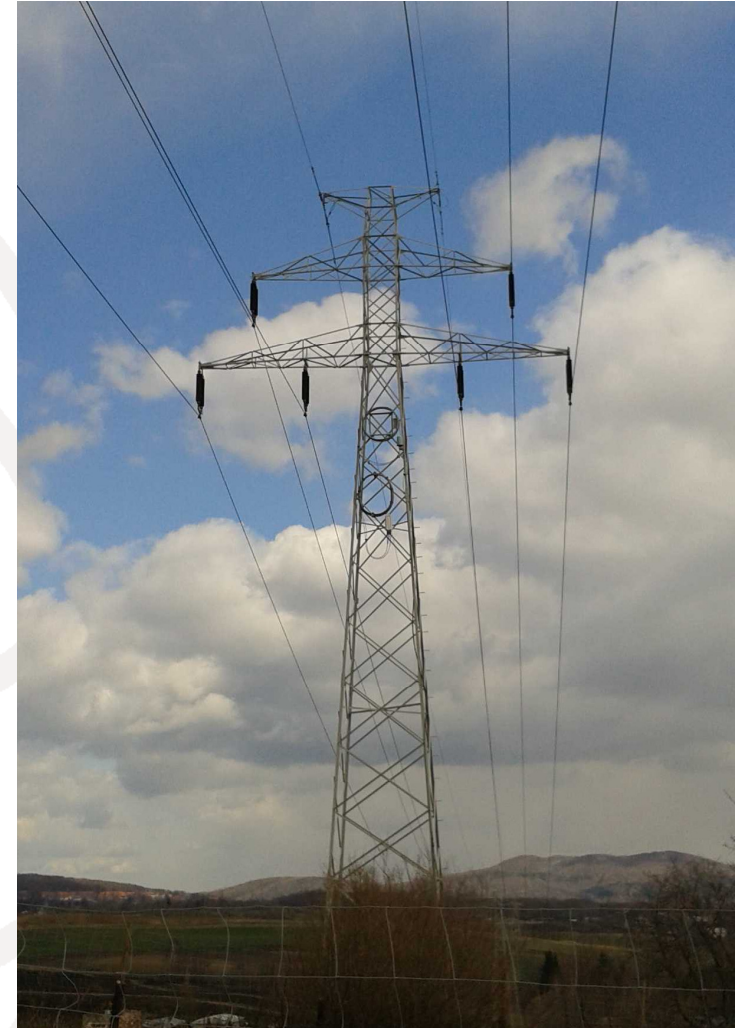


ITU-T Technical Session on EMF

Power supply lines Calculation of the electric and magnetic field strength (ITU-T Rec. K.mag)

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- Telecommunication network personnel often works in vicinity of Medium Voltage and High Voltage power supply systems
- The radio and telecommunication equipment is frequently located on the power line towers
- There are three kinds of hazards to workers working near energized power lines:
 - Exposure to power-frequency magnetic fields
 - Exposure to power-frequency electric fields
 - Possibility of sparkover between the exposed energized conductor and the worker's body or tool held by the worker.
- ITU-T Recommendation K.57 Protection measures for radio base stations sited on power line towers – is prepared with respect to safety and risk of damage to equipment



Fiber-optic line on power supply tower

- The protection of workers is presented in the new ITU-T Recommendation K.mag

Evaluation techniques and working procedures for compliance with limits to power-frequency (DC, 50 Hz, and 60 Hz) electromagnetic field exposure of network operator personnel

- The Appendix to this Recommendation is a software EMFACDC allowing for the evaluation of the electric and magnetic field around power supply lines



<http://hmin.tripod.com/als/ccs/docs/pdf/RadioBase.pdf>

- Since network operator personnel are not employees of the power system operator, the exposure limits for general public should be applied
- ICNIRP limits are given in Tables 1 and 2

Table 1. Reference levels for occupational exposure

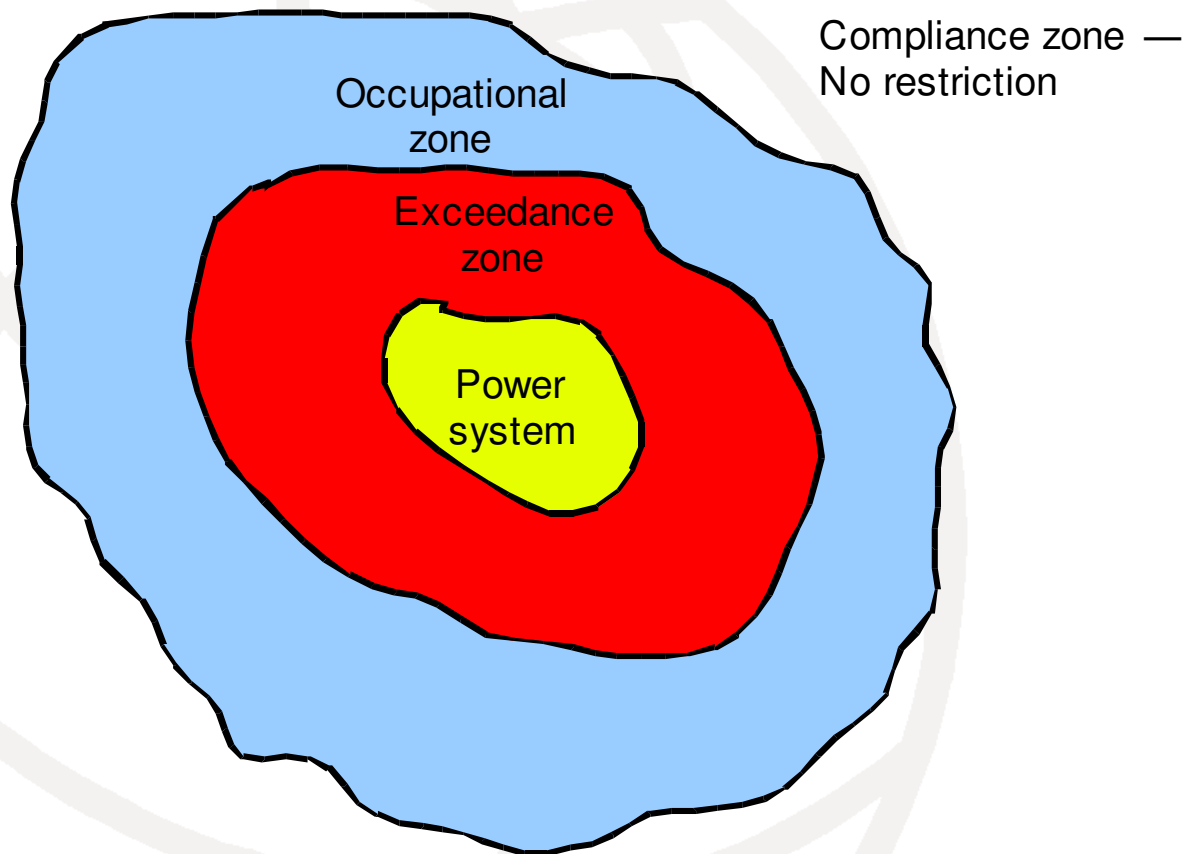
| Frequency | B limit (H limit) mT (Am^{-1}) | E limit kVm^{-1} |
|-----------|--|------------------------------|
| 50 Hz | 1.0 (800) | 10 |
| 60 Hz | 1.0 (800) | 8.3 |

Table 2. Reference levels for general public exposure

| Frequency | B limit (H limit) mT (Am^{-1}) | E limit kVm^{-1} |
|-----------|--|------------------------------|
| 50 Hz | 0.2 (160) | 5 |
| 60 Hz | 0.2 (160) | 4.2 |

Exposure zones

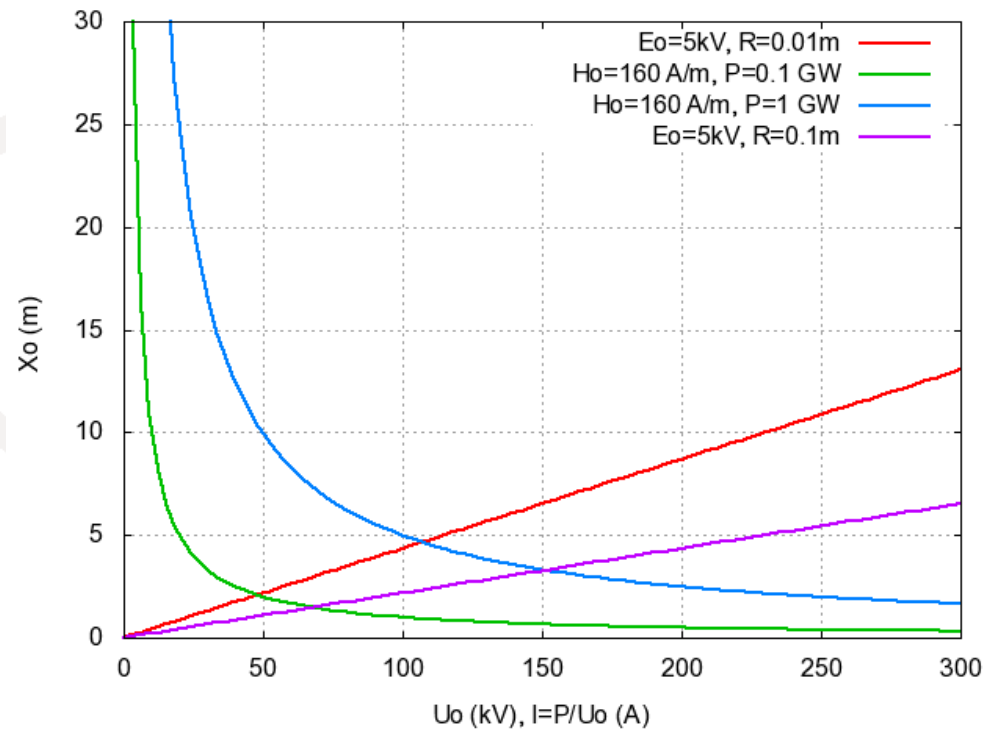
Three zones are defined



Figurative illustration of exposure zones

E and H fields

The placement of the zone boundaries is determined mainly by the electric field.



The distance of exposure zone boundary (X_0) from a single conductor for respective electric and magnetic field limits, as a function of potential U_0 , at assumed conductor effective radius (R) and constant transmitted power (P)



Software EMFACDC



Valid only for the power supply lines (DC and AC)

Project About

Coordinates of plotted area

x1 [m] y1 [m]

x2 [m] y2 [m]

Step [m]

Parameters for the line chart

Horizontal line, Y - coordinate [m]

Vertical line, X - coordinate [m]

Wire parameters

Effective radius [mm]

Number of conductors

Conducting ground

No

Yes

Examples:

- 110kV 1000A - single wire
- 110kV 400A - single-circuit (B2)
- 220kV 900A - single-circuit (H52)
- 400kV 1500A - double-circuit (Z33)

Add Delete Save

110kV 400A - single-circuit (B2)

Results:

| n | X(n) | Y(n) | V(n) | V_phase(n) | I(n) | I_phase(n) |
|---|------|------|--------|------------|------|------------|
| 1 | -2.8 | 6 | 110000 | 0 | 400 | 0 |
| 2 | 3.6 | 6 | 110000 | 120 | 400 | 120 |
| 3 | 2.8 | 9.6 | 110000 | 240 | 400 | 240 |

LEGEND:

n - wire number

X(n), Y(n) - coordinates of wire number n (in METERS)

V(n) , V_phase(n) - voltage (in VOLTS) and corresponding phase (in DEGREES)

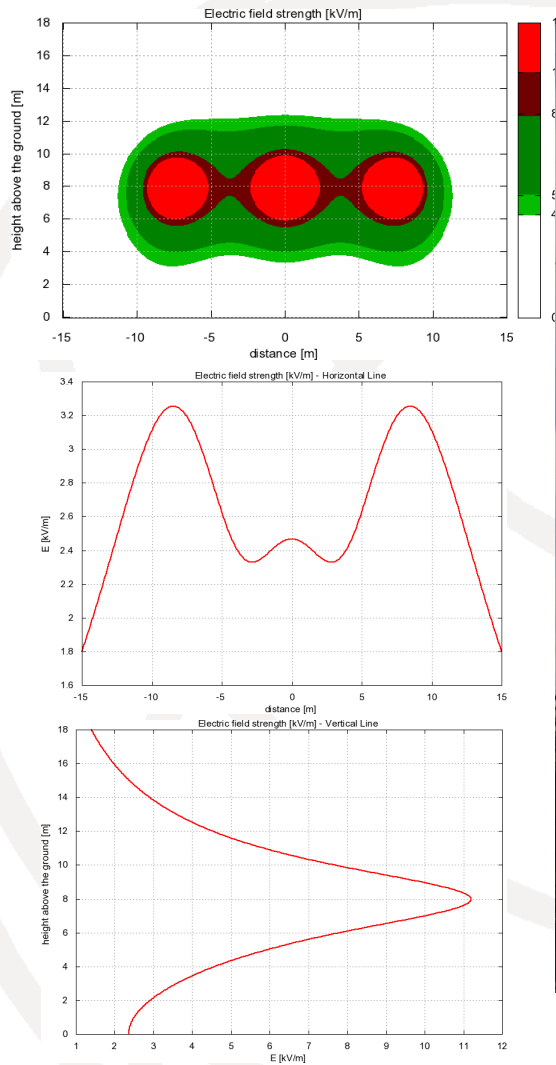
I(n) , I_phase(n) - current (in AMPERS) and corresponding phase (in DEGREES)

ITU International Telecommunication Union

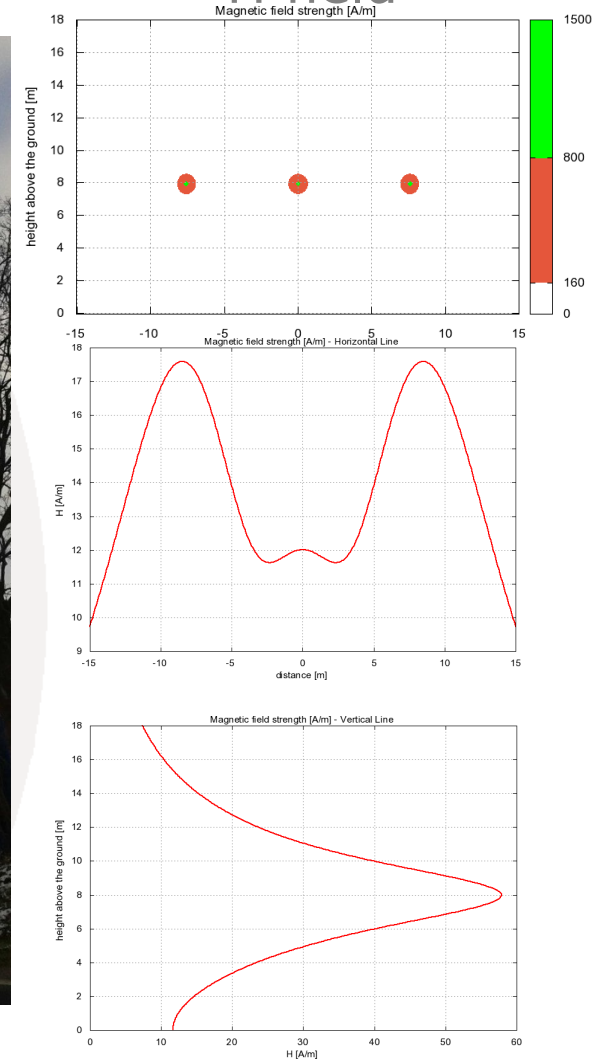
The main screen of the EMFACDC software

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Geneva, 16 April 2012

E field



H field



- The number of radiocommunication and telecommunication equipment mounted on power supply towers is constantly increasing
- The ITU-T Recommendation K.mag is close to the approval





Thank you

**Questions,
Comments?**

