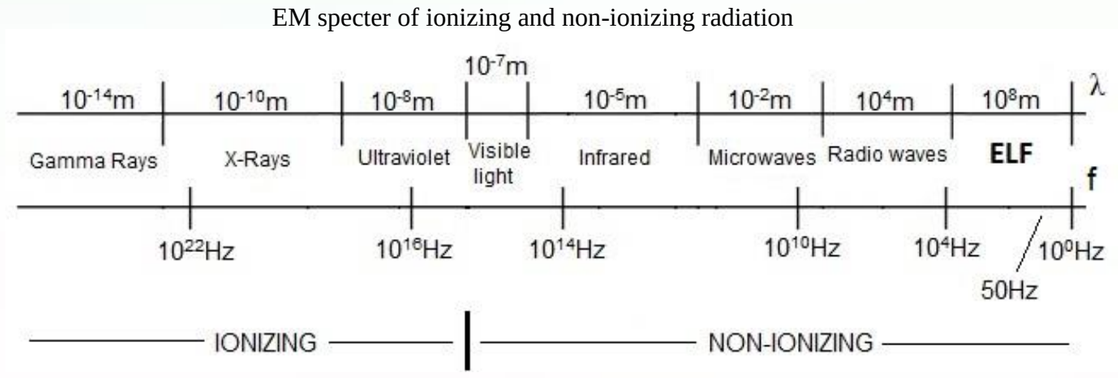
XI INTERNATIONAL CONFERENCE
INDUSTRIAL ENGINEERING AND ENVIRONMENTAL PROTECTION 2021
IIZS 2021, October 07-08, 2021, Zrenjanin, Serbia

THE IMPACT OF VALID REGULATIONS ON ELECTROMAGNETIC FIELDS OF THE ERNESTINOVO SUBSTATION

EM specter of ionizing and non-ionizing radiation



Council of Europe recommended thresholds for the EMF exposure of general population

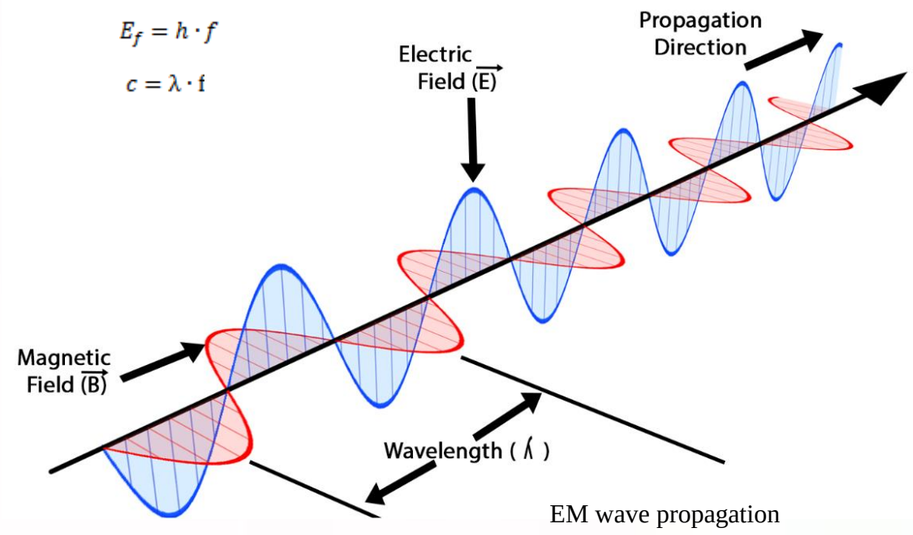
Frequency f (Hz)	Electric field E (V/m)	Magnetic field H (A/m)	Magnetic field density B (μT)	Power density S_{ekv} (W/m²)
<1	-	32000	40000	-
1-8	10000	$32000/f^2$	$40000/f^2$	-
8-25	10000	4000/f	5000/f	-
250-8000	250/f	4/f	5/f	-
8000-3000	250/f	5	6,25	-
3-150 k	87	5	6,25	-
0,15-1 M	87	0,73/f	0,92/f	-
1-10 M	$87/f^{1/2}$	0,73/f	0,92/f	-
10-400 M	28	0,073	0,092	2
400-2000 M	$1,375\ f^{1/2}$	$0,0037\ f^{1/2}$	$0,0046\ f^{1/2}$	f/200
2-300 G	61	0,16	0,20	10

Croatian threshold values of electric field and flux density in the vicinity of overhead lines

Type of power line	Electric field E (V/m)	Magnetic field density B (μT)
Newly installed line / Area of professional exposure	5	100
Newly installed line / Areas of enhanced sensitivity	2	40
Existing line / Area of professional exposure	5	100
Existing line / Areas of enhanced sensitivity	5	100

$$E_f = h \cdot f$$

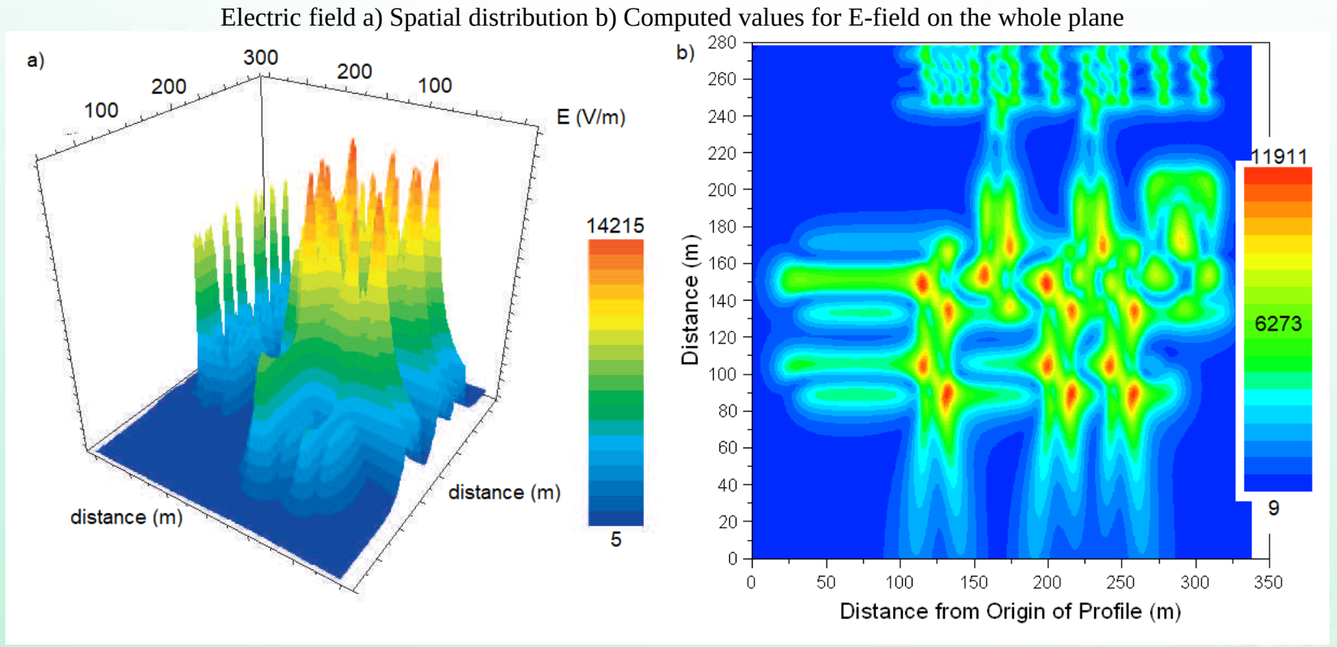
$$c = \lambda \cdot f$$



EM wave propagation

Bird's-eye view of the TS 400/110 kV Ernestinovo

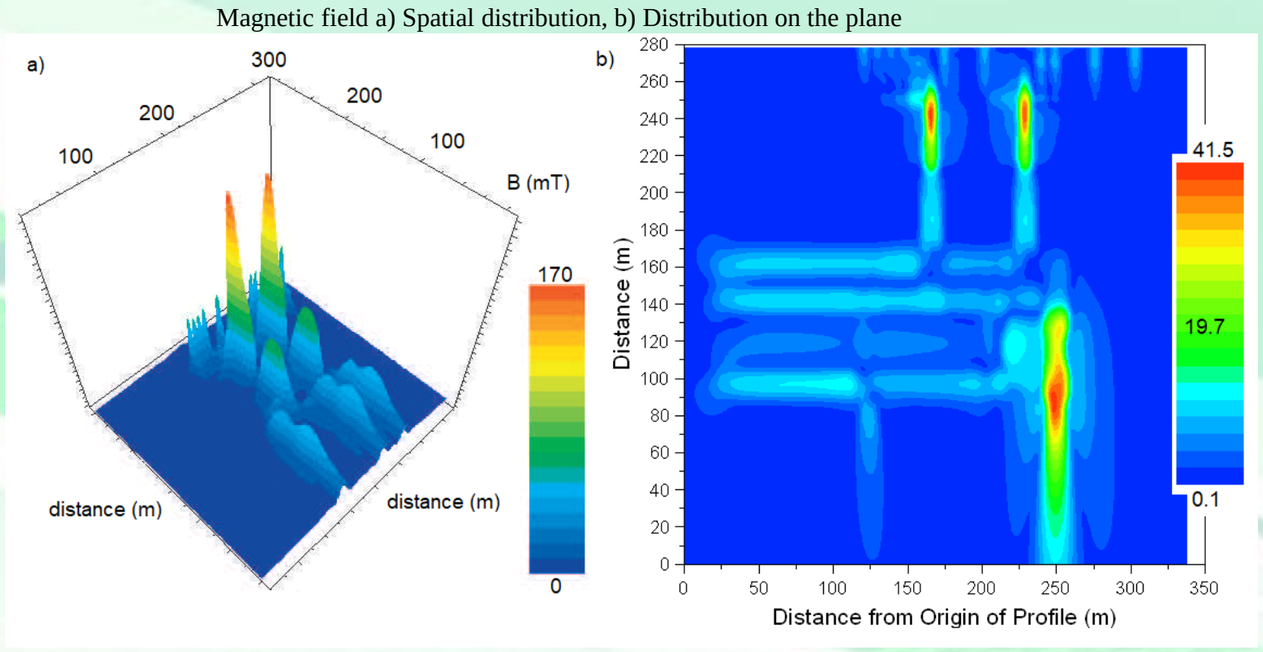
Electric field a) Spatial distribution b) Computed values for E-field on the whole plane



E < 1000 V/m – around the perimeter of the fence

Emax=14000 V/m – under the 400 kV busbars

Magnetic field a) Spatial distribution, b) Distribution on the plane



B > 100 μT – under the transformer conductors

- professional exposure (8 hours per day):
  - electric field intensity E_{8h} = 5000 V/m
  - magnetic field density B_{8h} = 100 μT
- enhanced sensitivity (24 hours per day):
  - electric field intensity E_{24h} = 2000 V/m
  - magnetic field density B_{24h} = 40 μT

- **violations of electromagnetic field thresholds for 8-hour exposure**
- **24-hour electromagnetic field thresholds outside of the substation where general population reside**