

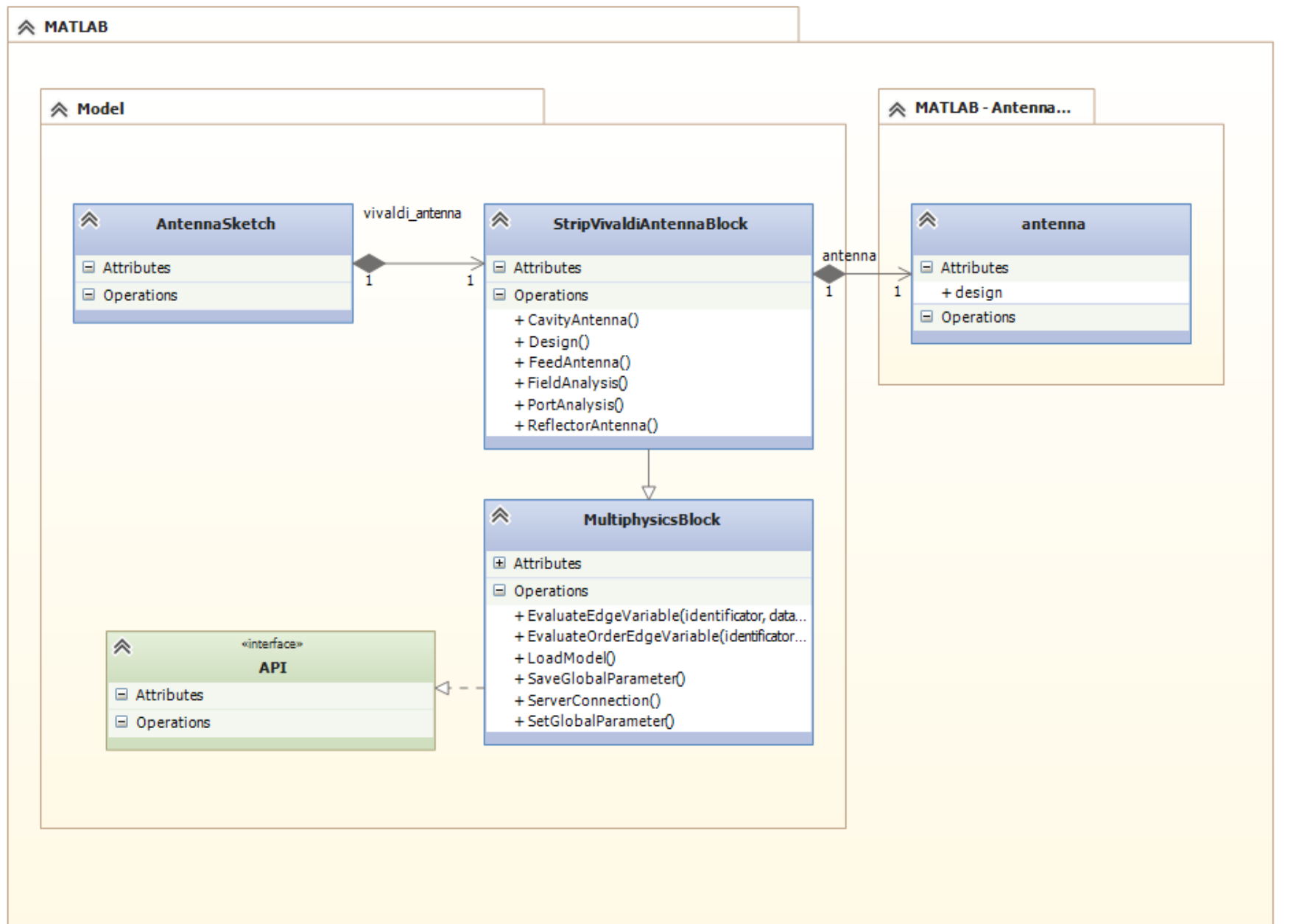
Návrh Vivaldiho štěrbinové antény

Jiří Marek

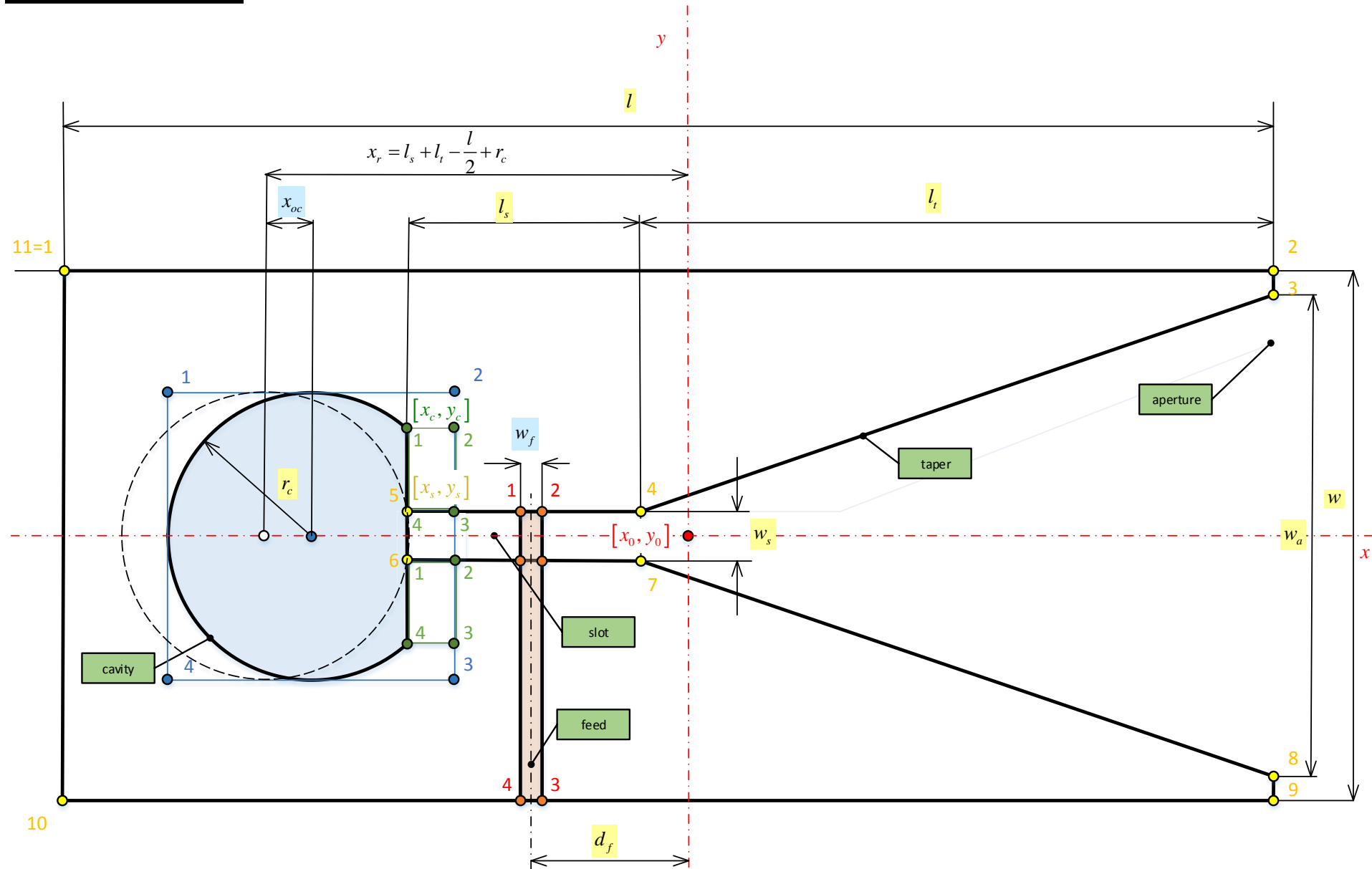
Setkání uživatelů COMSOL 2018

Bořetice (7. a 8.) června 2018

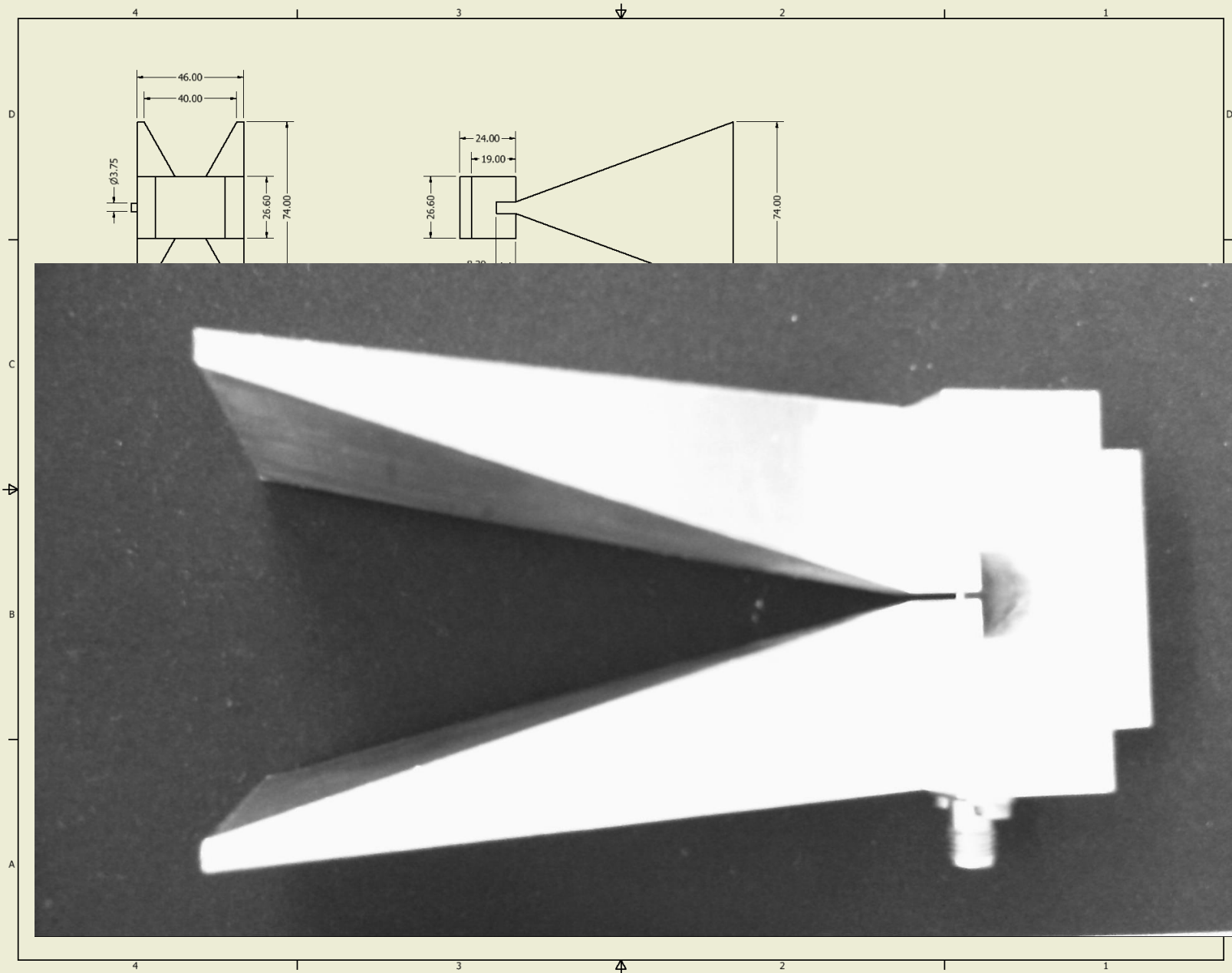
UML model



Náčrt



Konstrukce



Theorie

Maxwell

$$\text{rot } E(r,t) = \nabla \times E(r,t) = -\frac{\partial B(r,t)}{\partial t}$$

$$\text{rot } H(r,t) = \nabla \times H(r,t) = \frac{\partial D(r,t)}{\partial t} + J(r,t)$$

$$\text{div } B(r,t) = \nabla \cdot B(r,t) = 0$$

$$\text{div } D(r,t) = \nabla \cdot D(r,t) = \rho_q(r,t)$$

$$B = \mu \cdot H$$

$$D = \varepsilon \cdot E$$

$$\mu = \mu_r \cdot \mu_0, \mu_0 = 4 \cdot \pi \cdot 10^{-7}$$

$$\varepsilon = \varepsilon_r \cdot \varepsilon_0, \varepsilon_0 = 8.854 \cdot 10^{-12}$$

$$c_0^2 = \varepsilon_0 \cdot \mu_0$$

$$V(r,t) = \text{Re}\{V(r) \cdot \exp(i \cdot \omega \cdot t)\}$$

$$\frac{\partial(V(r) \cdot \exp(i \cdot \omega \cdot t))}{\partial t} =$$

$$= V(r) \cdot \frac{\partial}{\partial t}(\exp(i \cdot \omega \cdot t)) = i \cdot \omega \cdot V(r)$$

$$\nabla \times E(r) = -i \cdot \omega \cdot \mu \cdot H(r)$$

$$\nabla \times H(r) = i \cdot \omega \cdot \varepsilon \cdot E(r) + J(r)$$

$$\nabla \cdot H(r) = 0$$

$$\nabla \cdot E(r) = \frac{1}{\varepsilon} \cdot \rho_q(r)$$

$$\nabla \times E(r) = -i \cdot \omega \cdot \mu \cdot H(r)$$

$$\nabla \times \nabla \times E(r) = -i \cdot \omega \cdot \mu \cdot (\nabla \times H(r))$$

$$\nabla \times H(r) = i \cdot \omega \cdot \varepsilon \cdot E(r) + J(r)$$

$$\nabla \cdot (\nabla \cdot E(r)) - \nabla^2 \cdot E(r) = -i \cdot \omega \cdot \mu \cdot (i \cdot \omega \cdot \varepsilon \cdot E(r) + J(r))$$

$$k_0^2 = \omega^2 \cdot \mu \cdot \varepsilon$$

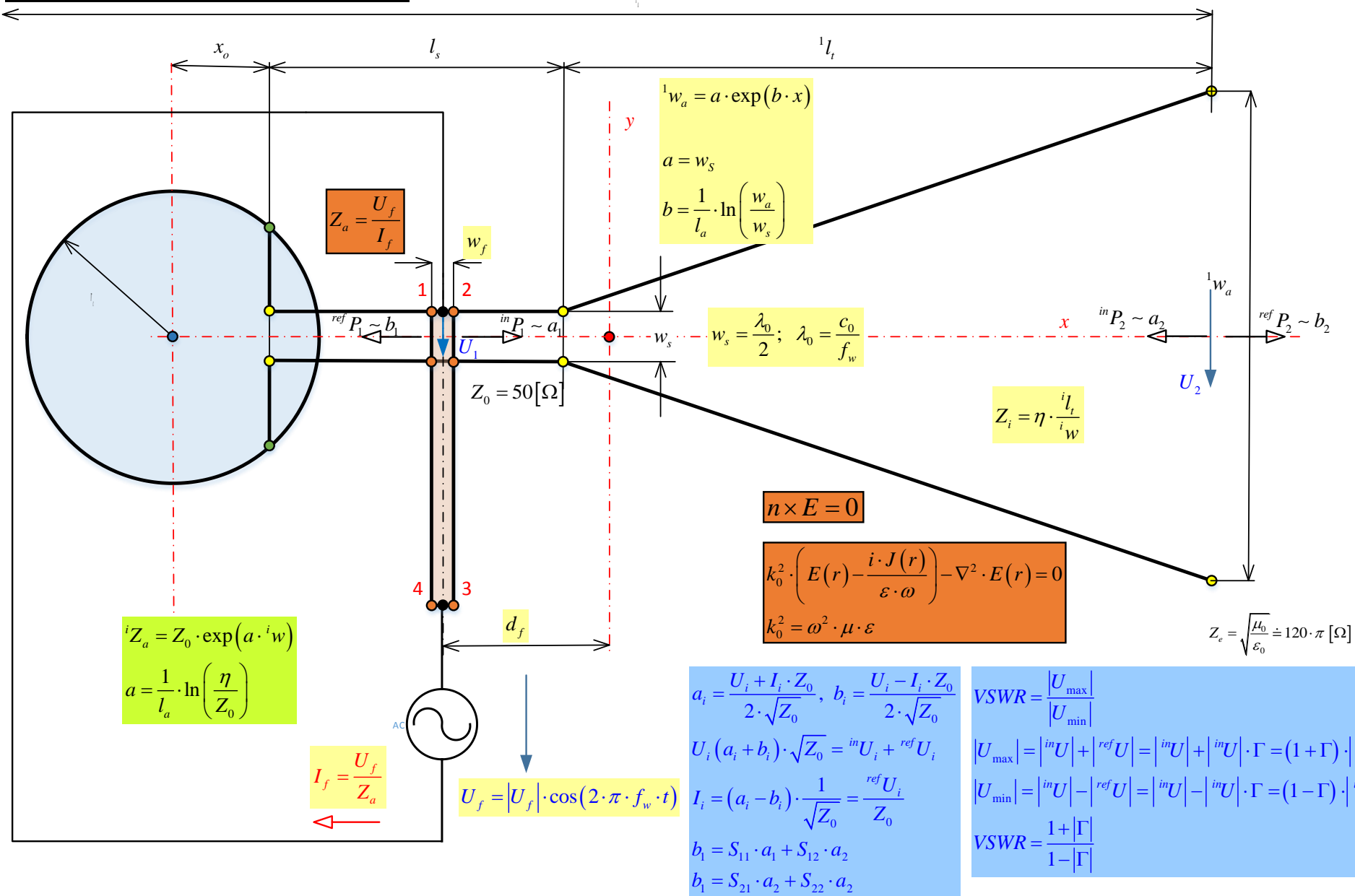
$$\rho_q = 0 \Rightarrow \nabla \cdot E(r) = 0 \Rightarrow$$

$$-\nabla^2 \cdot E(r) = \omega^2 \cdot \mu \cdot \varepsilon \cdot E(r) - i \cdot \omega \cdot \mu \cdot J(r)$$

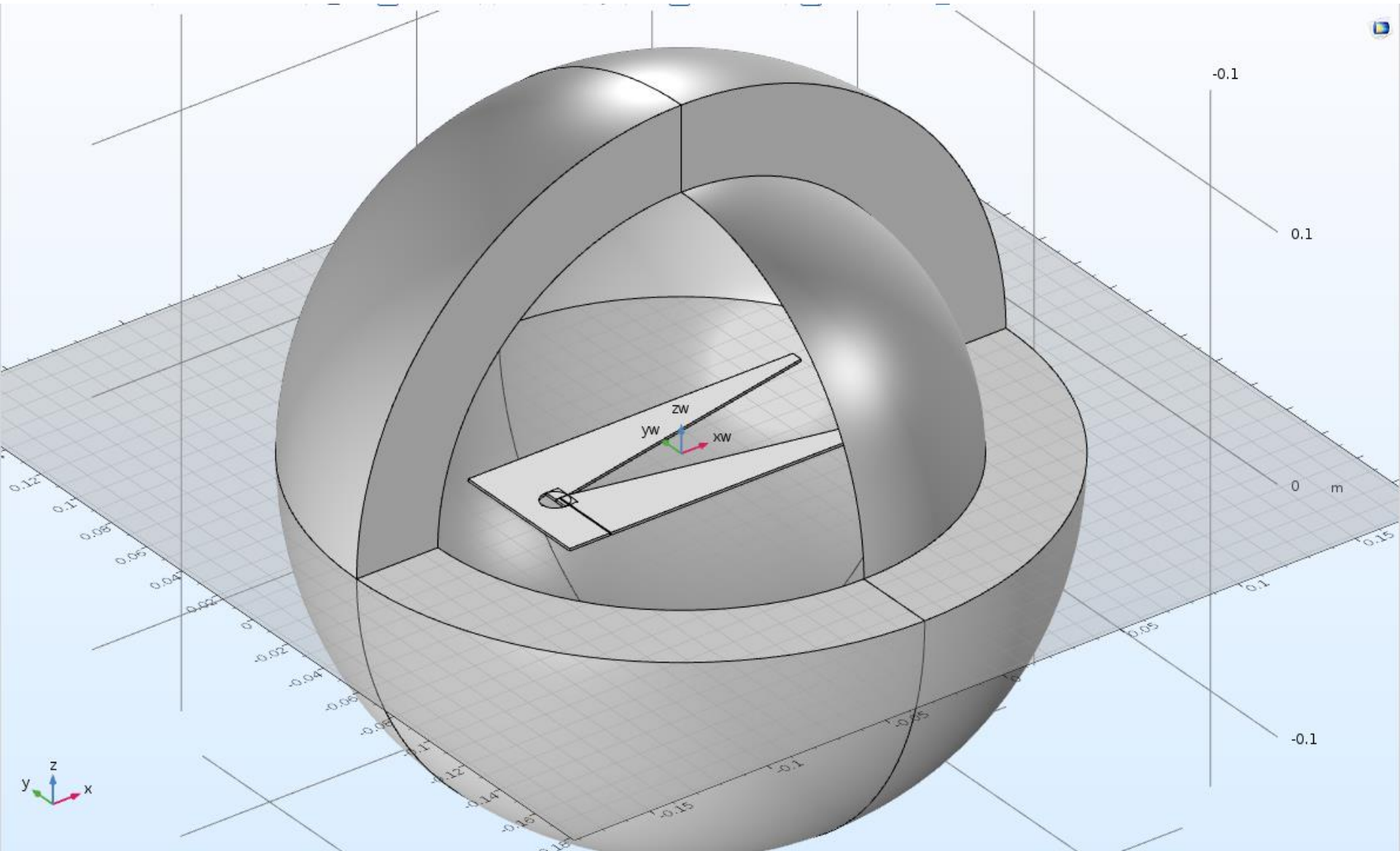
Helmholtz

$$k_0^2 \cdot \left(E(r) - \frac{i \cdot J(r)}{\varepsilon \cdot \omega} \right) - \nabla^2 \cdot E(r) = 0$$

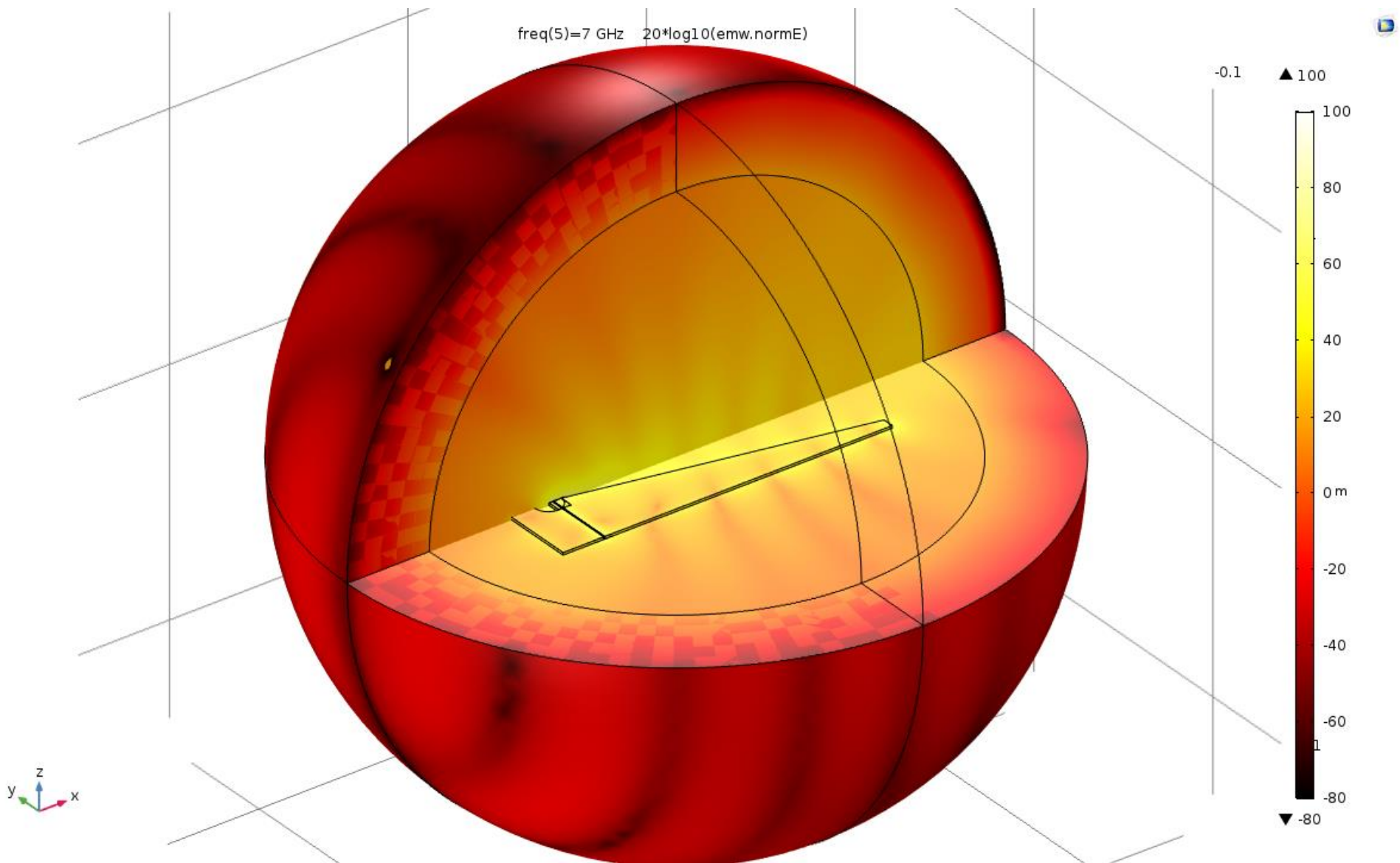
Parametry antény



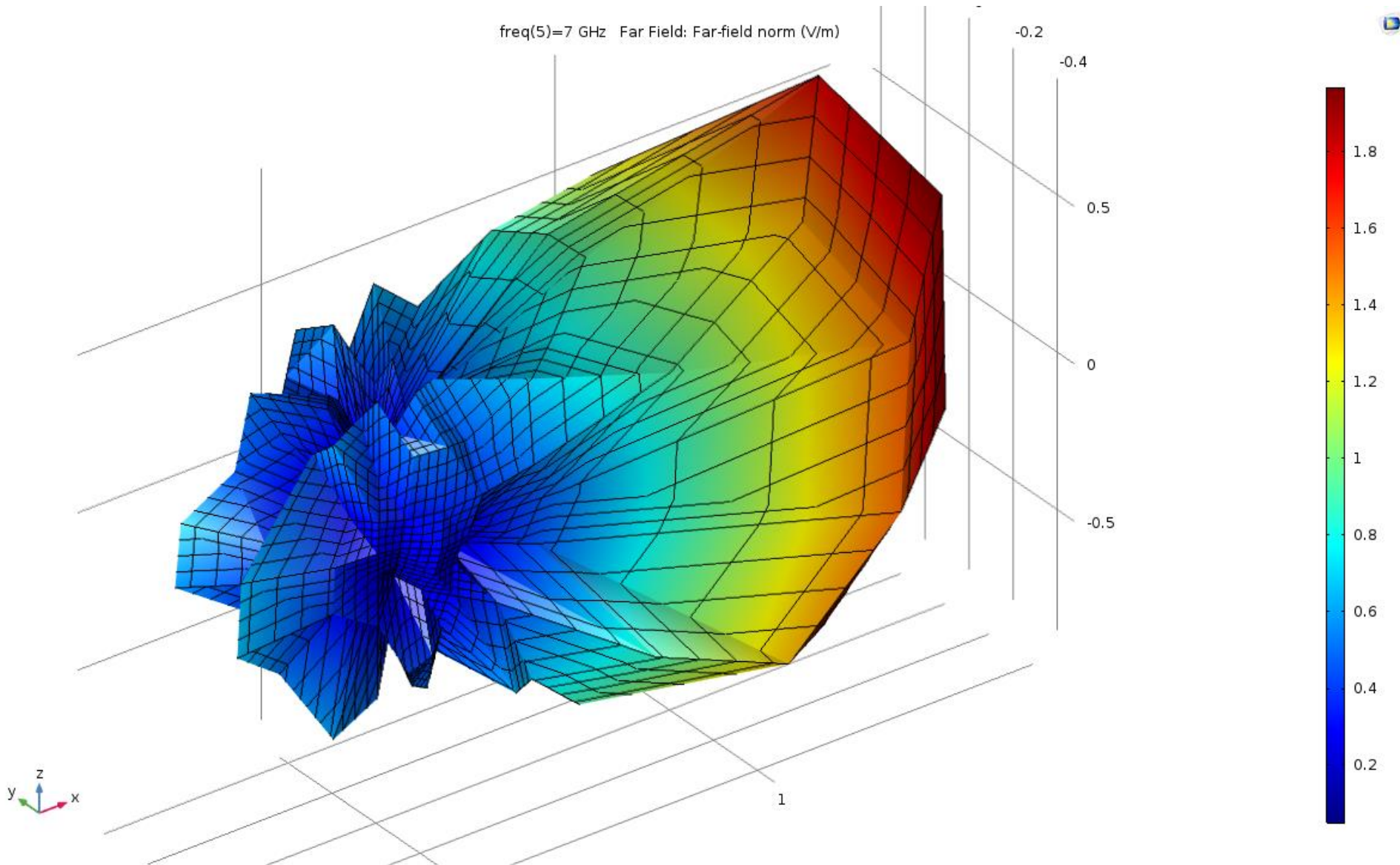
Geometrie



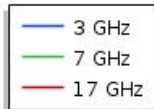
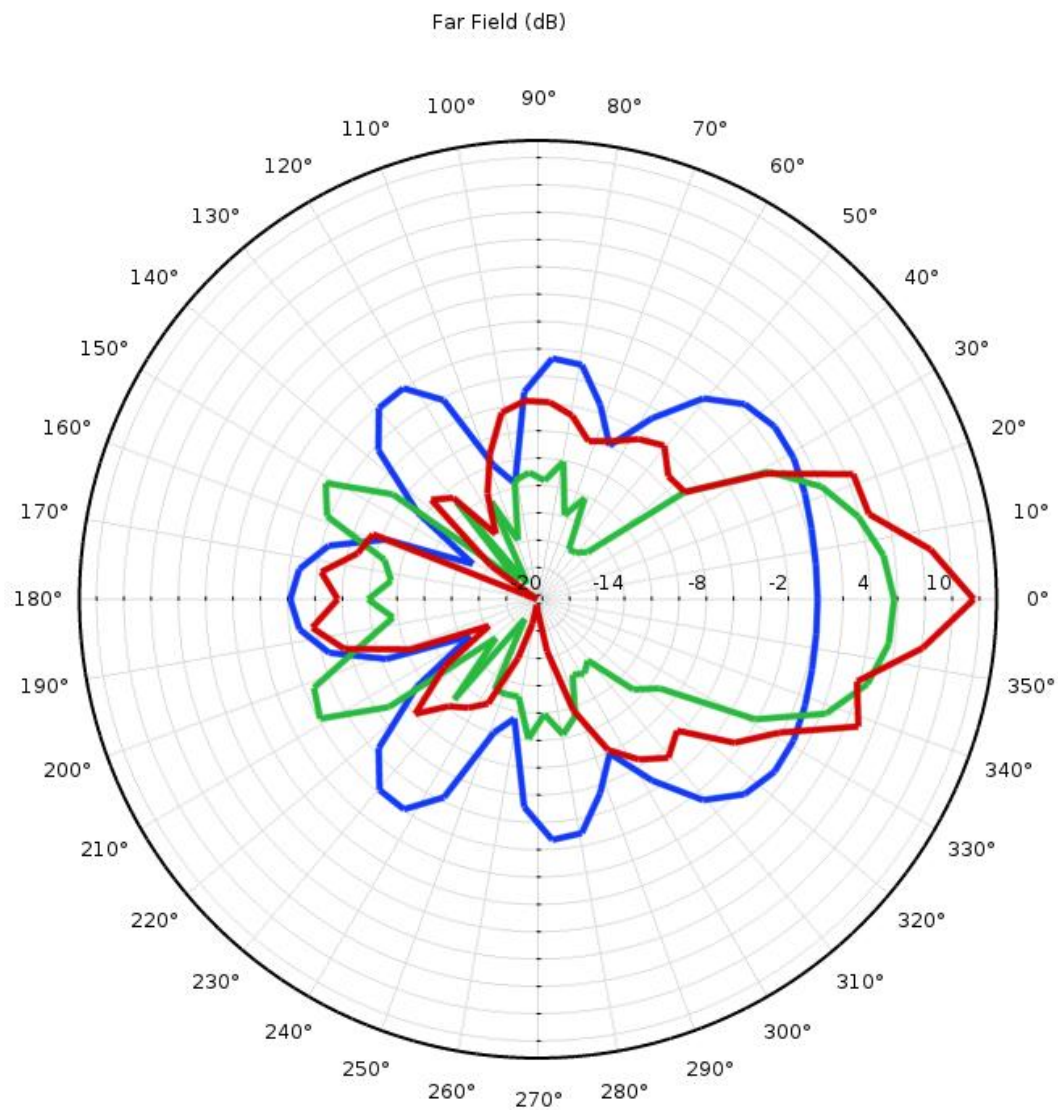
Řešení – rozložení elektrického pole



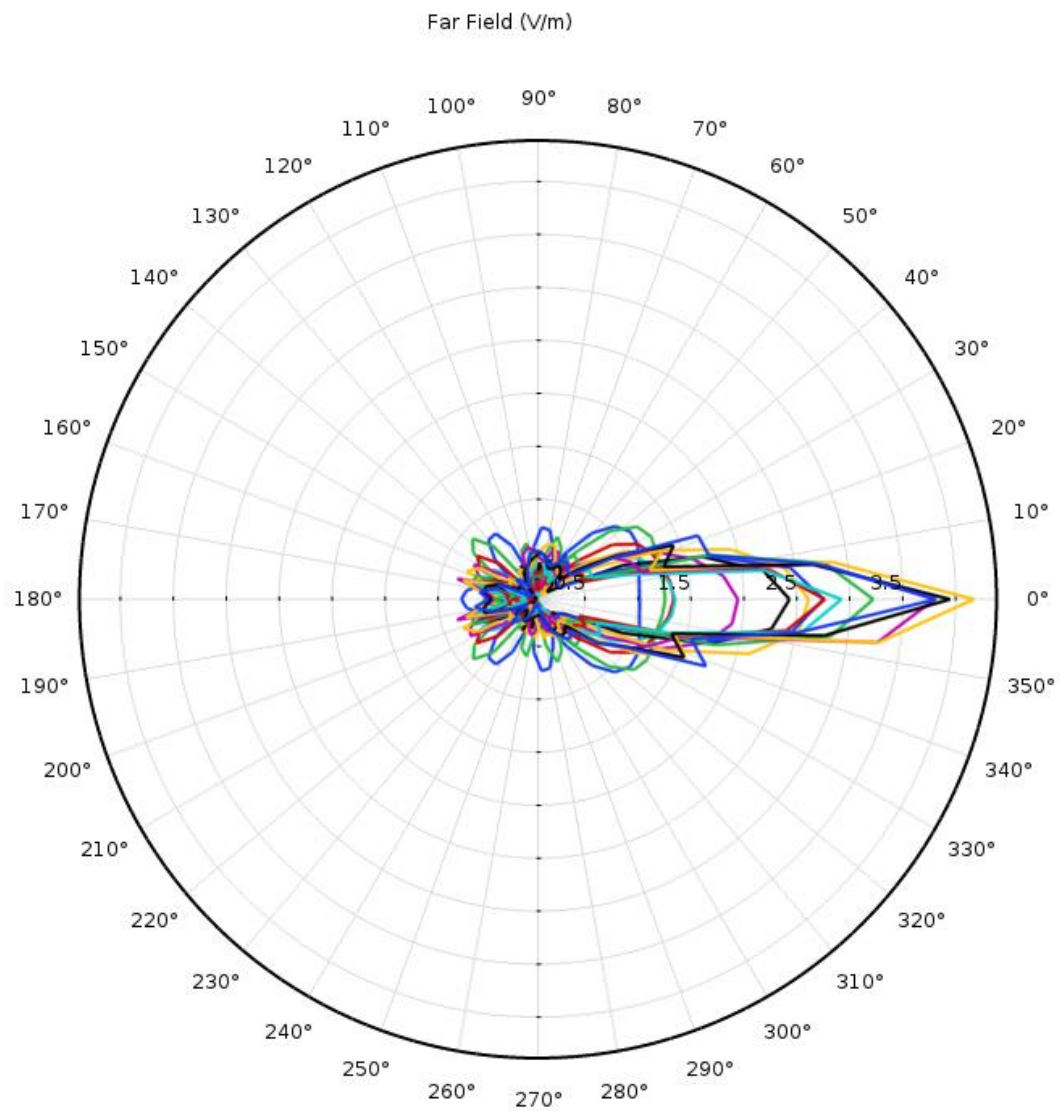
Řešení – směrová charakteristika



Řešení – směrová charakteristika

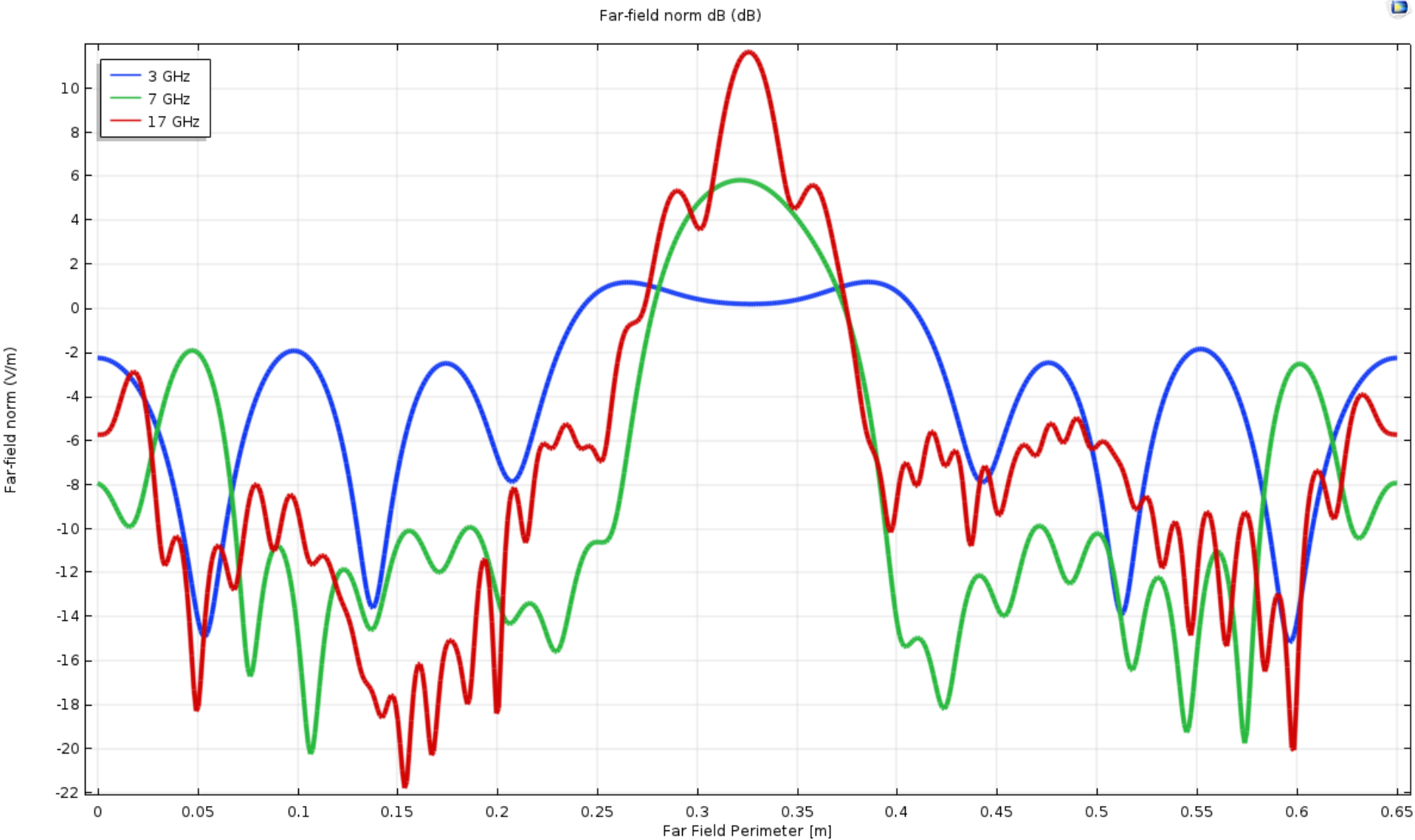


Řešení – směrová charakteristika



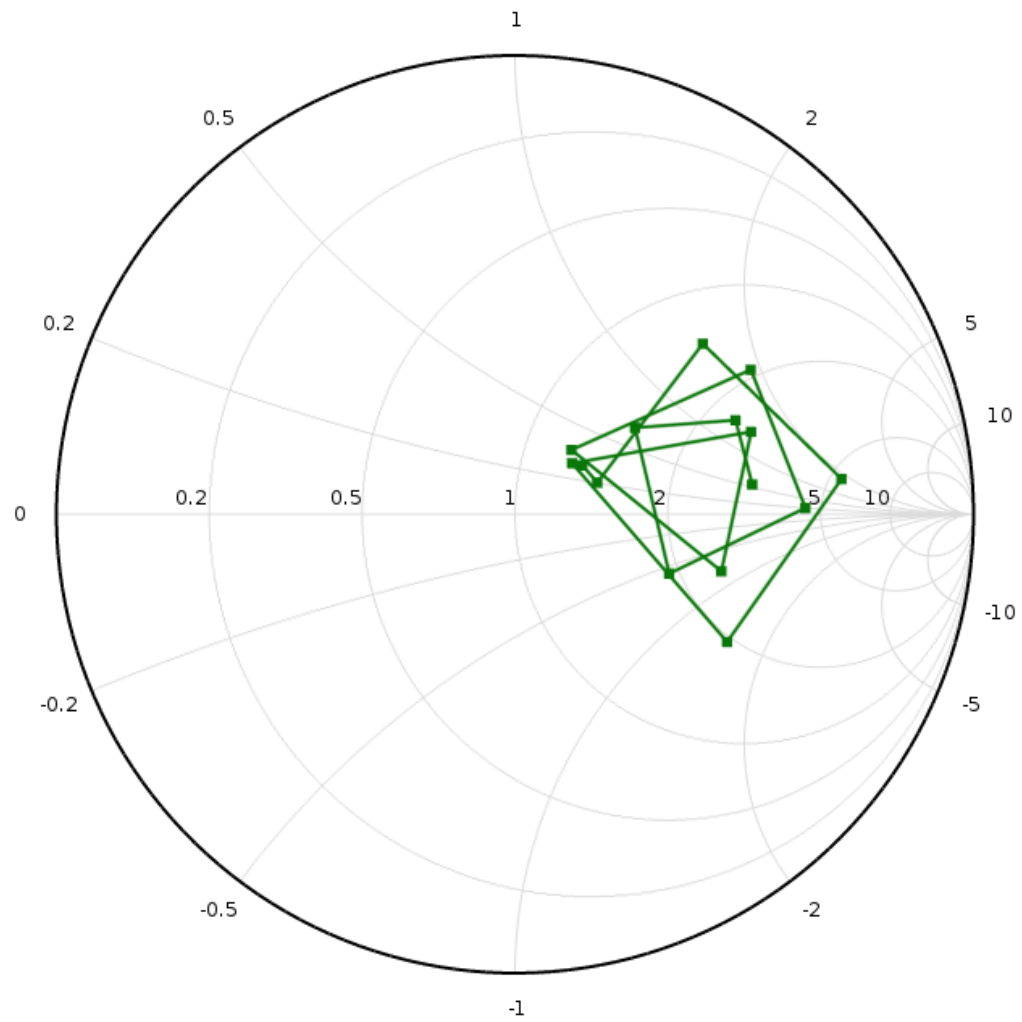
- 3 GHz
- 4 GHz
- 5 GHz
- 6 GHz
- 7 GHz
- 8 GHz
- 9 GHz
- 10 GHz
- 11 GHz
- 12 GHz
- 13 GHz
- 14 GHz
- 15 GHz
- 16 GHz
- 17 GHz

Řešení – směrová charakteristika



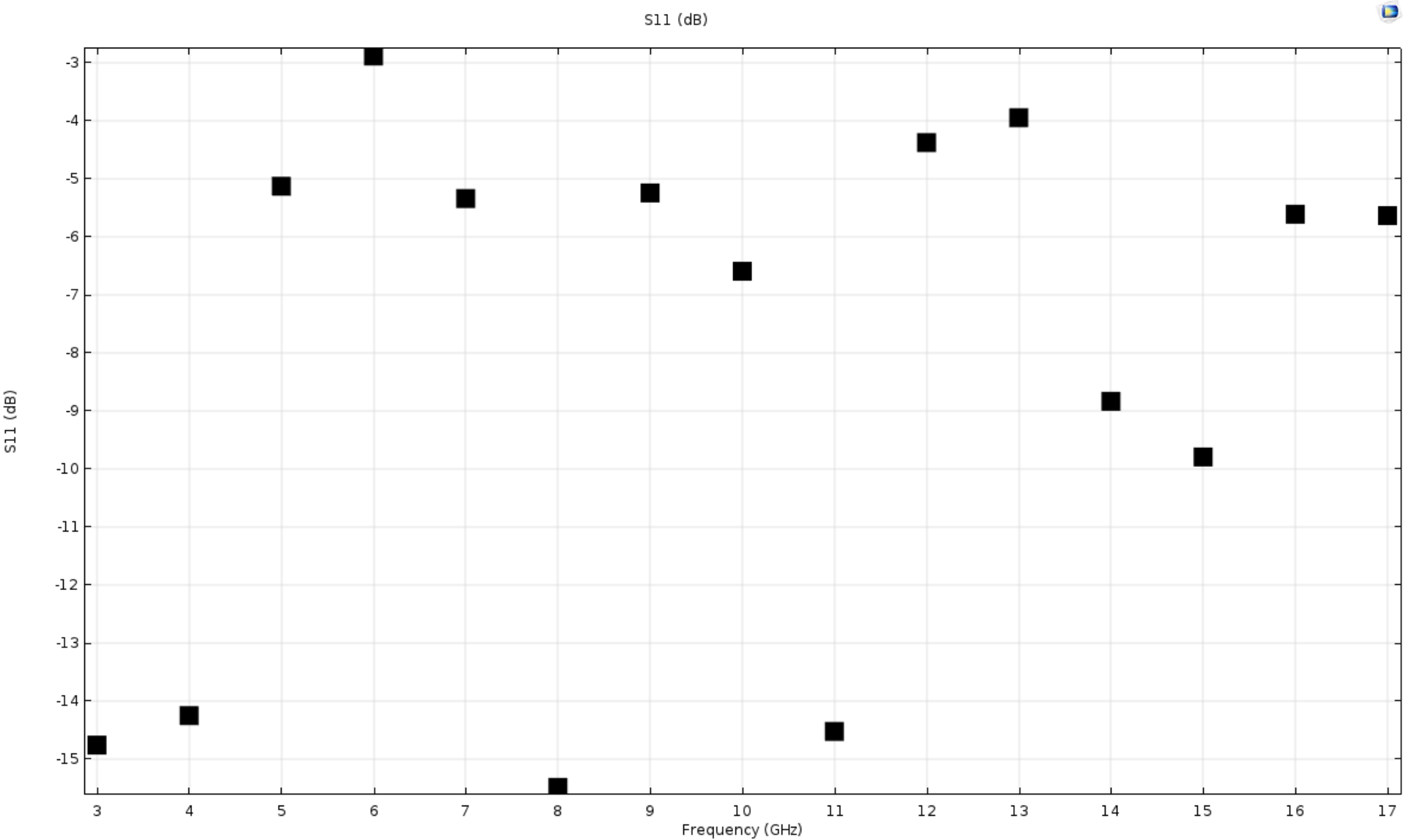
Řešení – Impedance

Impedance Graph: Impedance 1 (Ω)

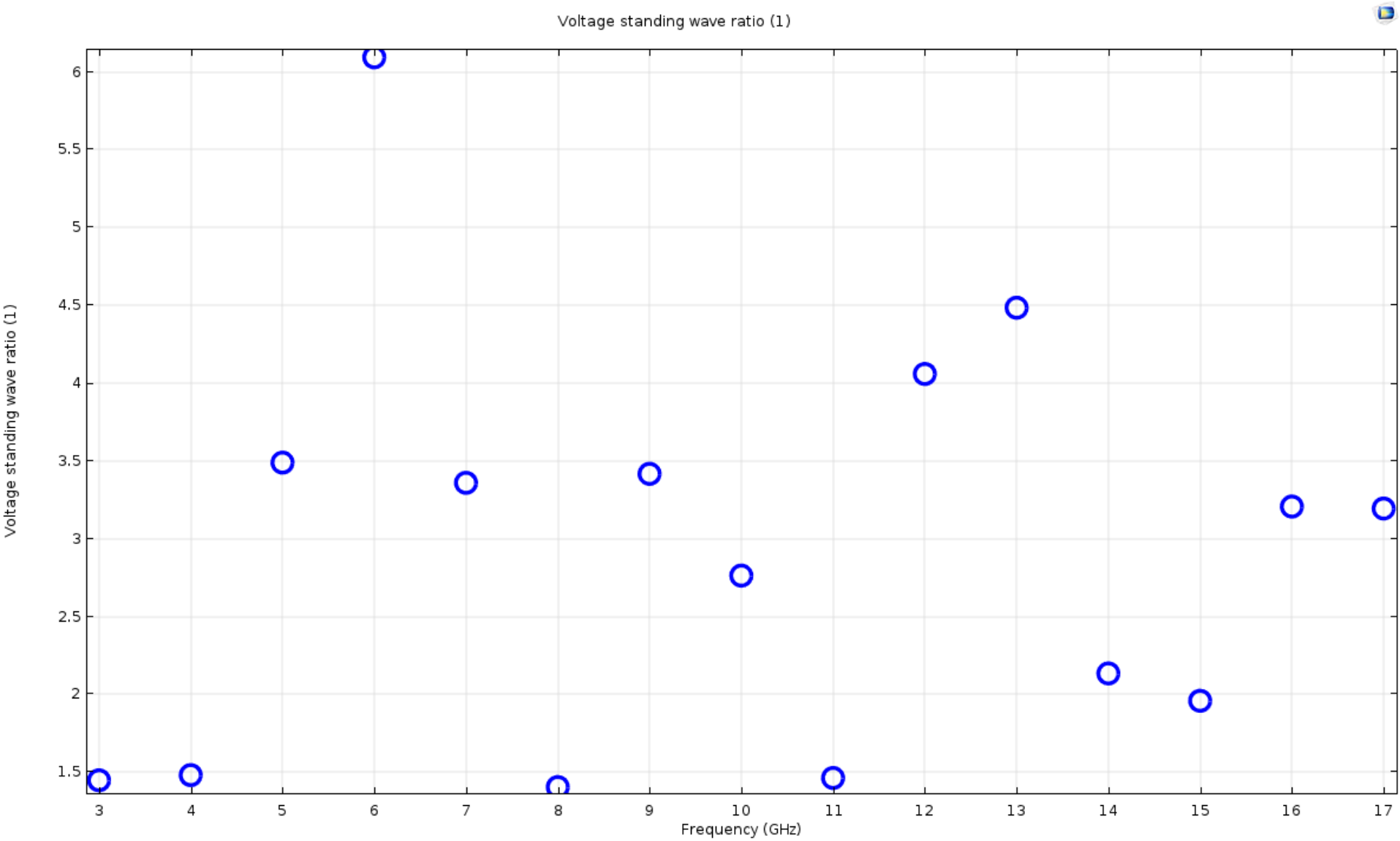


Impedance 1

Řešení – S11 parametr



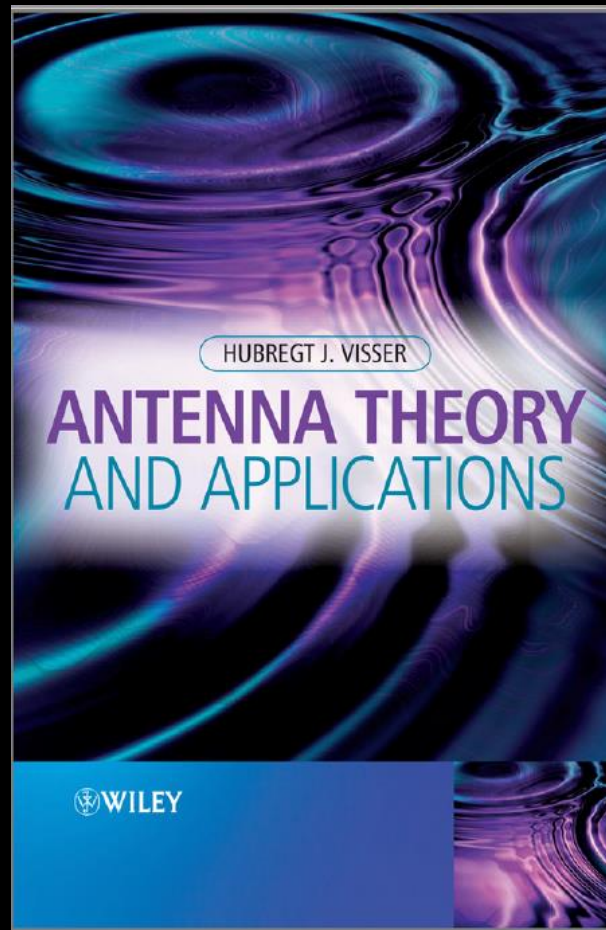
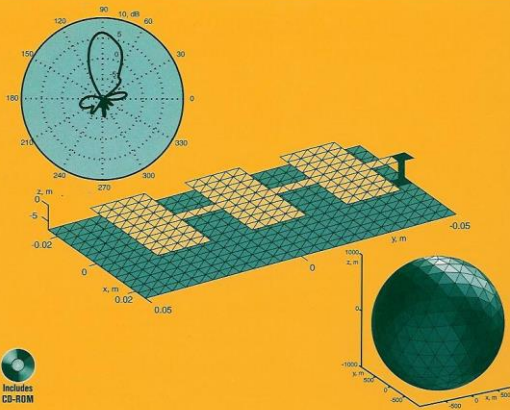
Řešení – Voltage Standing Wave Ratio



 WILEY

Antenna and EM Modeling with MATLAB[®]

Sergey N. Makarov



UNIVERZITA OBRANY

Fakulta vojenských technologií

Katedra radiolokace (K 207)

Studijní program: Vojenské technologie Ev. číslo: 363/13
Studijní obor: Radiolokace Výřik č.: 1



DIPLOMOVÁ PRÁCE

Téma: Trychtýřová antena s širokopásmovým balunem (TASB)

Vypracoval: por. Bc. Jan STANĚK
Vedoucí DP: Ing. Jana OLIVOVÁ, Ph.D.
Kouřitřit: mjr. Ing. Lukáš DLAB

Brno 2013

Děkuji za pozornost