

Oсна skupina $|F(\Theta_{MAX}=0, \Phi_{MAX})| < 1$

$$F(\Theta, \Phi) = \cos\left(\frac{\phi}{2} + \frac{kh}{2} \cos \Theta\right)$$

$$D = \frac{2|F(\Theta_{MAX}, \Phi_{MAX})|^2}{1 + \frac{\sin(kh)}{kh} \cos \phi} = \frac{2\left|\cos\left(\frac{\phi}{2} + \frac{kh}{2}\right)\right|^2}{1 + \frac{\sin(kh)}{kh} \cos \phi} = \frac{1 + \cos(\phi + kh)}{1 + \frac{\sin(kh)}{kh} \cos \phi}$$

$$\frac{\partial D}{\partial \phi} = 0 = \frac{-\sin(\phi + kh) \left[1 + \frac{\sin(kh)}{kh} \cos \phi\right] - [1 + \cos(\phi + kh)] \left[-\frac{\sin(kh)}{kh} \sin \phi\right]}{\left[1 + \frac{\sin(kh)}{kh} \cos \phi\right]^2}$$

$$0 = -\sin(\phi + kh) - \sin(\phi + kh) \frac{\sin(kh)}{kh} \cos \phi + \frac{\sin(kh)}{kh} \sin \phi + \cos(\phi + kh) \frac{\sin(kh)}{kh} \sin \phi$$

$$-\sin(\phi + kh) \cos \phi + \cos(\phi + kh) \sin \phi = -\sin(kh)$$

$$0 = \frac{\sin(kh)}{kh} \sin \phi - \sin(\phi + kh) - \frac{\sin^2(kh)}{kh}$$

$$0 = \left[\frac{\sin(kh)}{kh} - \cos(kh)\right] \sin \phi - \sin(kh) \cos \phi - \frac{\sin^2(kh)}{kh}$$

$$\left[\frac{\sin(kh)}{kh} - \cos(kh)\right] \sin \phi - \frac{\sin^2(kh)}{kh} = \sin(kh) \sqrt{1 - \sin^2 \phi}$$

$$\left[\frac{\sin(kh)}{kh} - \cos(kh)\right]^2 \sin^2 \phi - 2 \left[\frac{\sin(kh)}{kh} - \cos(kh)\right] \frac{\sin^2(kh)}{kh} \sin \phi + \frac{\sin^4(kh)}{(kh)^2} =$$

$$= \sin^2(kh) - \sin^2(kh) \sin^2 \phi$$

$$\left[\frac{\sin^2(kh)}{(kh)^2} - 2 \frac{\sin(kh)}{kh} \cos(kh) + 1\right] \sin^2 \phi -$$

$$- 2 \left[\frac{\sin(kh)}{kh} - \cos(kh)\right] \frac{\sin^2(kh)}{kh} \sin \phi + \frac{\sin^4(kh)}{(kh)^2} - \sin^2(kh) = 0$$

Približek $h < \lambda/4 \rightarrow \phi \approx \pi + \frac{kh}{3}$