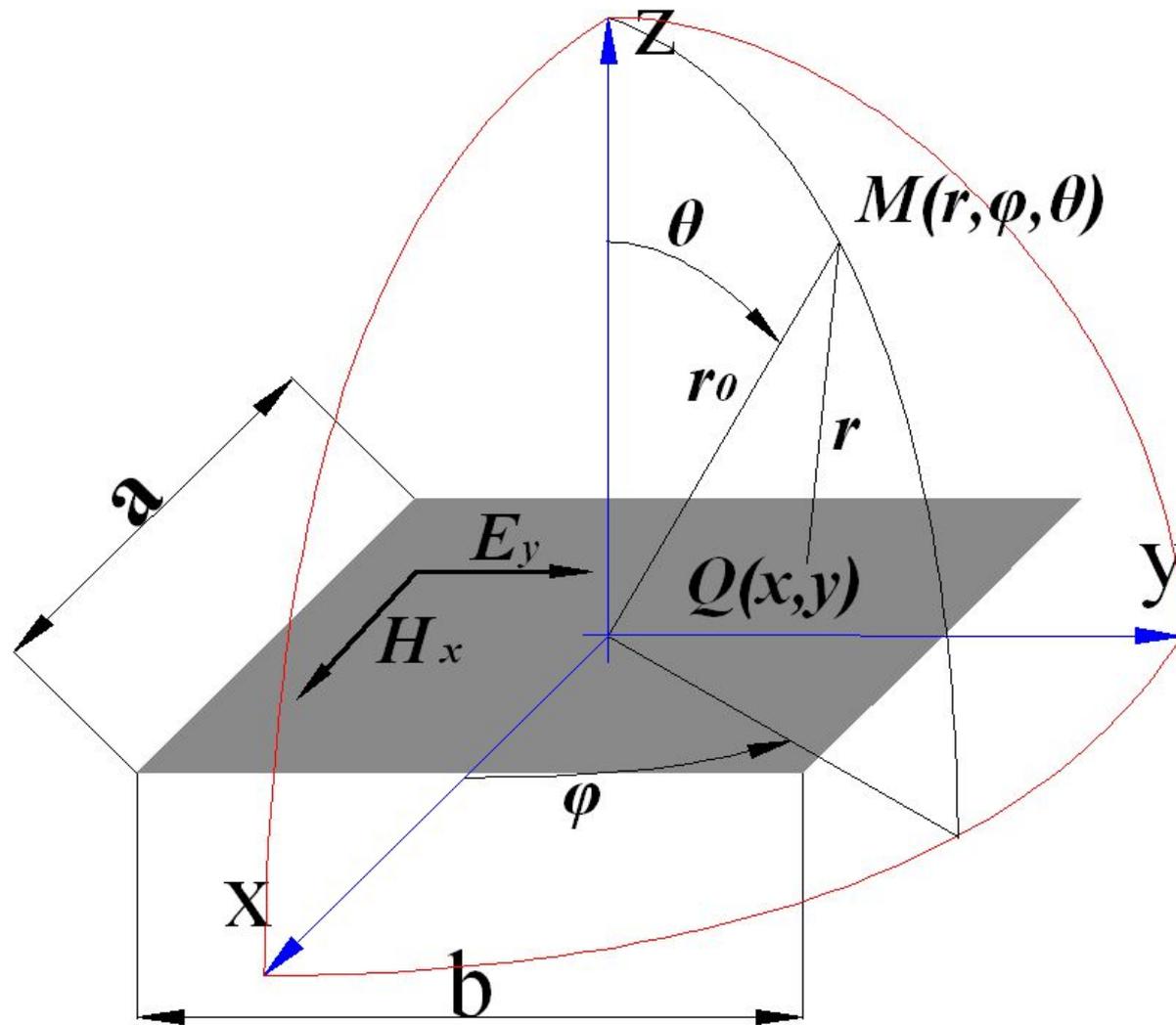


Излучающая прямоугольная поверхность.



Поле излучения прямоугольной поверхности.

$$d\mathbf{E} = i \frac{E_0}{2r\lambda} f(x, y) e^{i\psi(x, y)} (1 + \cos \theta) dx dy e^{-ikr}$$

$$r = r_0 + \Delta r = r_0 + x \cos \varphi \sin \theta + y \sin \varphi \sin \theta$$

$$\mathbf{E} = i \frac{E_0}{2r\lambda} (1 + \cos \theta) e^{ikr_0} \times$$

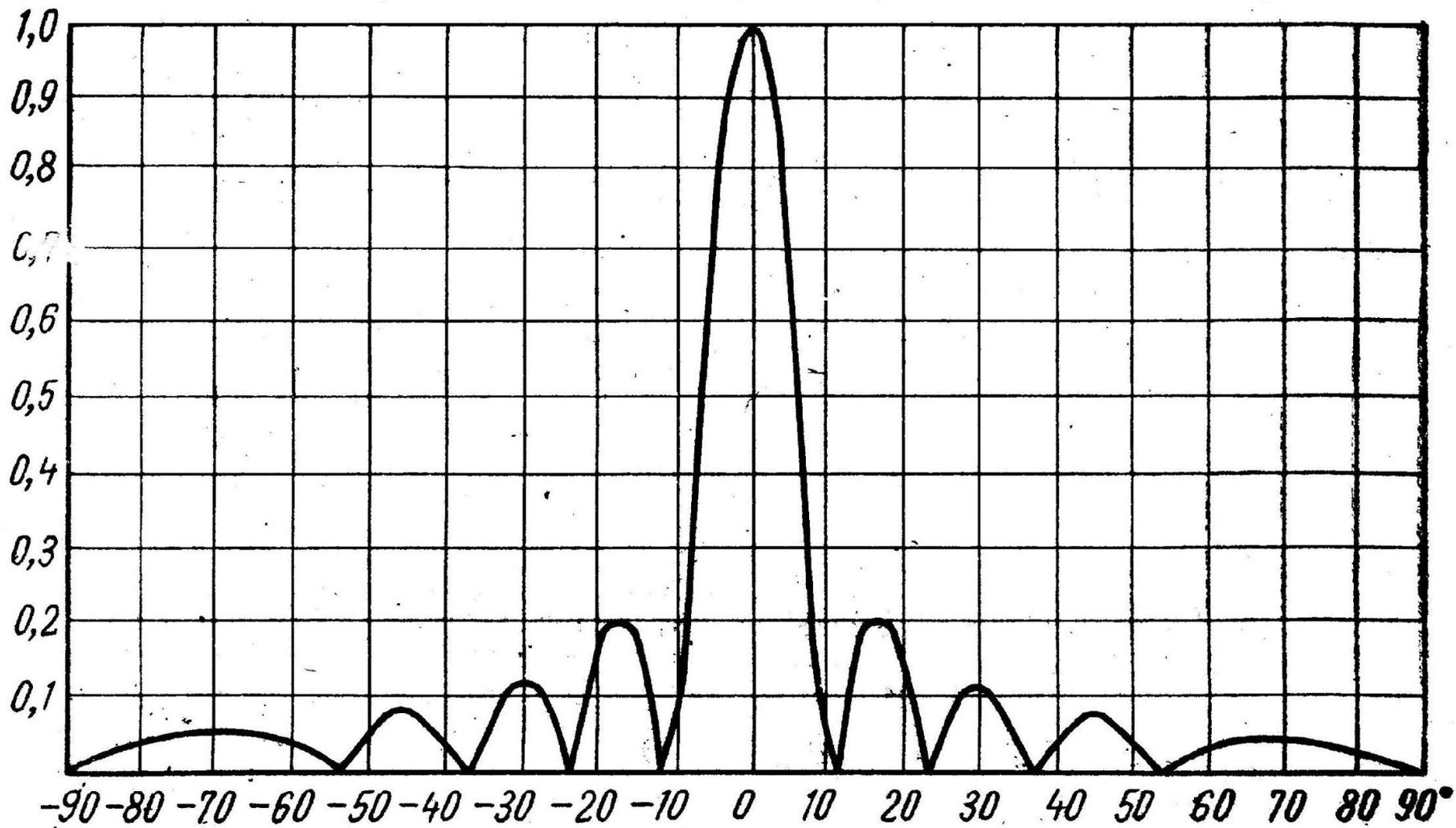
$$\int_{-a/2}^{a/2} \int_{-b/2}^{b/2} f(x, y) e^{i\psi(x, y)} e^{ik(x \cos \varphi \sin \theta + y \sin \varphi \sin \theta)} dx dy$$

Поле излучения прямоугольной поверхности.

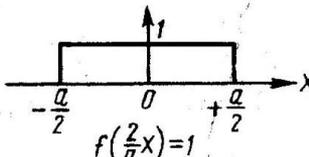
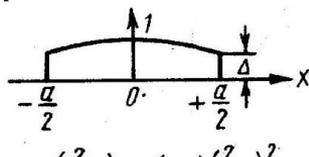
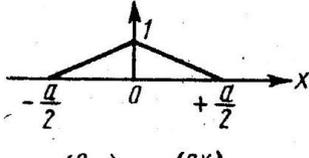
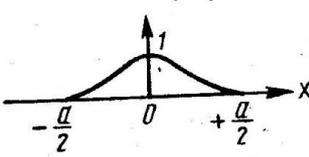
$$E_{\boxtimes} = i \frac{E_0 ab}{2r_0 \lambda} (1 + \cos \theta_E) \frac{\sin\left(\frac{kb}{2} \sin \theta_E\right)}{\frac{kb}{2} \sin \theta_E} e^{-ikr_0}$$

$$E_{\boxtimes} = i \frac{E_0 ab}{2r_0 \lambda} (1 + \cos \theta_H) \frac{\sin\left(\frac{kb}{2} \sin \theta_H\right)}{\frac{kb}{2} \sin \theta_H} e^{-ikr_0}$$

Диаграмма направленности в декартовой системе координат.

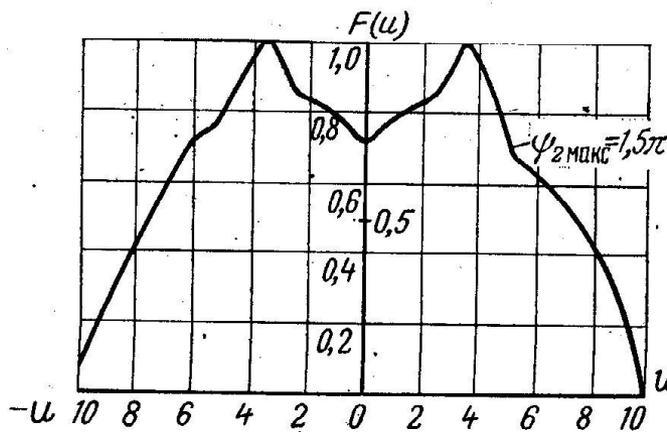
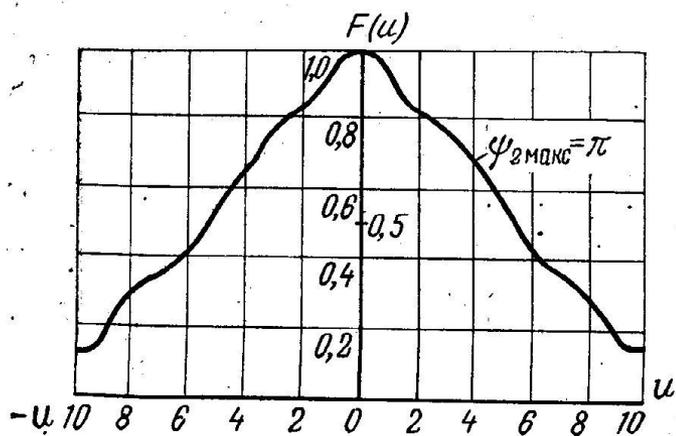
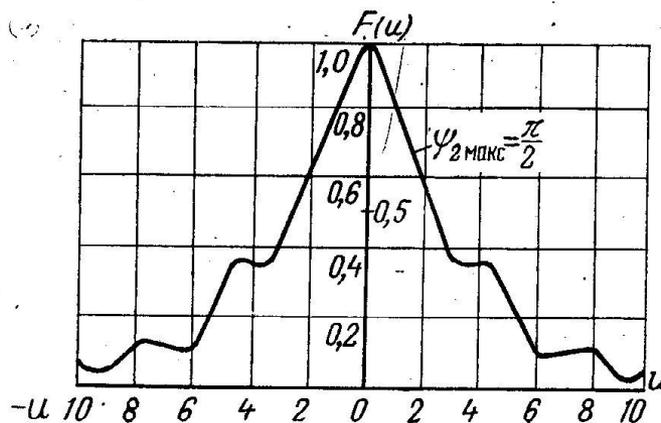
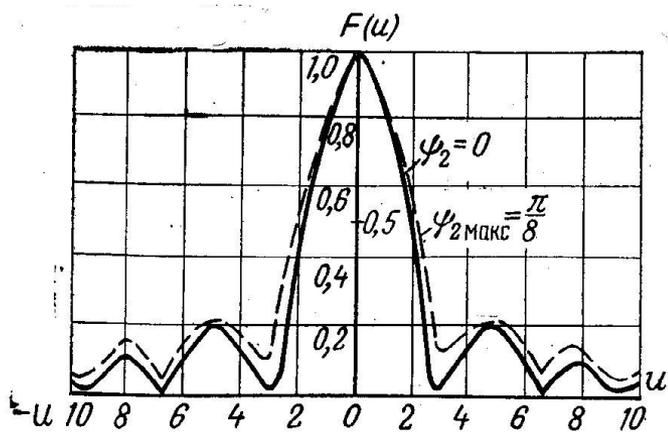


Влияние амплитудного распределения на диаграмму направленности прямоугольной поверхности.

Амплитудное распределение (прямоугольная поверхность)	Множитель системы ($u = \frac{\pi a}{\lambda} \sin \varphi$; Π —знак произведения)	Ширина ДН по половинной мощности, град	Ширина ДН по уровню нулевого излучения, град	Уровень первого бокового лепестка, дБ	Кип
 <p>$f(\frac{2}{a}x) = 1$</p>	$\frac{\sin u}{u}$	$50,8 \frac{\lambda}{a}$	$114,6 \frac{\lambda}{a}$	-13,2	1,0
 <p>$f(\frac{2}{a}x) = 1 - (1-\Delta)(\frac{2}{a}x)^2$</p>	$\frac{\sin u}{u} +$	$\Delta = 0,8$	$52,7 \frac{\lambda}{a}$	$121,4 \frac{\lambda}{a}$	-15,8
	$(1-\Delta) \frac{d^2}{du^2} \left(\frac{\sin u}{u} \right)$	$\Delta = 0,5$	$55,6 \frac{\lambda}{a}$	$130,6 \frac{\lambda}{a}$	-17,1
	$\Delta = 0$	$65,9 \frac{\lambda}{a}$	$163,8 \frac{\lambda}{a}$	-20,6	0,833
 <p>$f(\frac{2}{a}x) = 1 - \left(\frac{2x}{a}\right)$</p>	$\frac{\sin^2 \frac{u}{2}}{u^2/4}$	$73,4 \frac{\lambda}{a}$	$229,2 \frac{\lambda}{a}$	-26,4	0,75
 <p>$f(\frac{2}{a}x) = \cos^n \left(\frac{\pi x}{a} \right)$</p>	$\frac{\sin u}{u \prod_{k=1}^{n/2} \left[(2k)^2 - \frac{4u^2}{\pi^2} \right]}$; n —четное	$n=1$	$68,8 \frac{\lambda}{a}$	$171,8 \frac{\lambda}{a}$	-23
	$\frac{\cos u}{\prod_{k=0}^{\frac{n-1}{2}} \left[(2k+1)^2 - \frac{4u^2}{\pi^2} \right]}$; n —нечетное	$n=2$	$83,2 \frac{\lambda}{a}$	$229,2 \frac{\lambda}{a}$	-32
	$\frac{\sin u}{u \prod_{k=1}^{n/2} \left[(2k)^2 - \frac{4u^2}{\pi^2} \right]}$; n —четное	$n=3$	$95,1 \frac{\lambda}{a}$	$286,4 \frac{\lambda}{a}$	-40
	$\frac{\cos u}{\prod_{k=0}^{\frac{n-1}{2}} \left[(2k+1)^2 - \frac{4u^2}{\pi^2} \right]}$; n —нечетное	$n=4$	$110,6 \frac{\lambda}{a}$	$343,8 \frac{\lambda}{a}$	-48

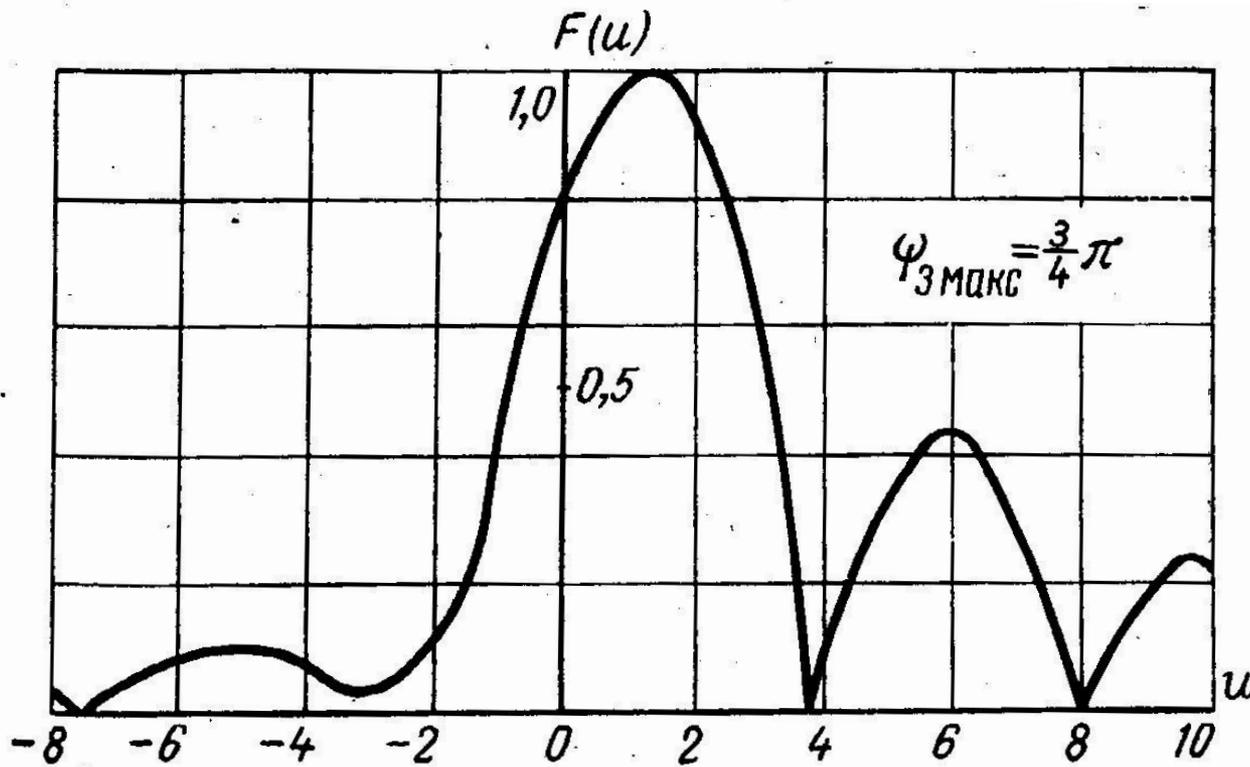
Квадратичное фазовое распределение.

$$\psi(x, y) = \psi_{\max} \left(\frac{2x}{a} \right)^2$$



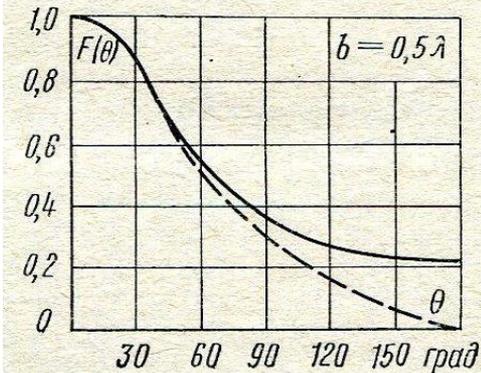
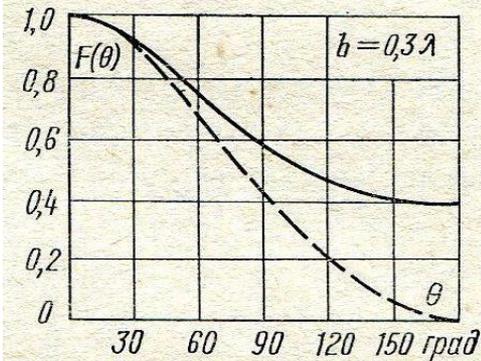
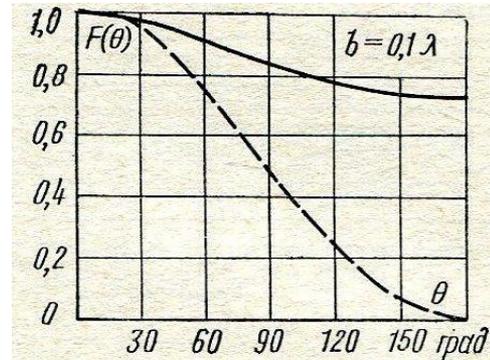
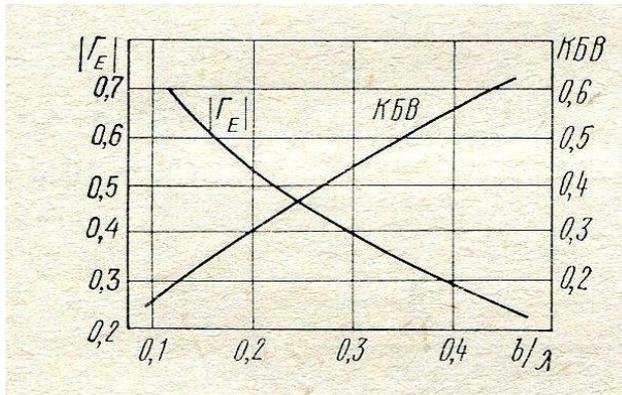
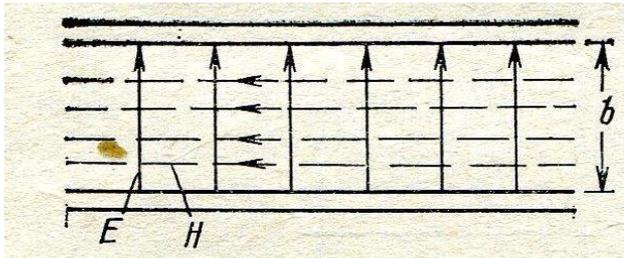
Кубичное фазовое распределение.

$$\psi(x, y) = \psi_{\max} \left(\frac{2x}{a} \right)^3$$

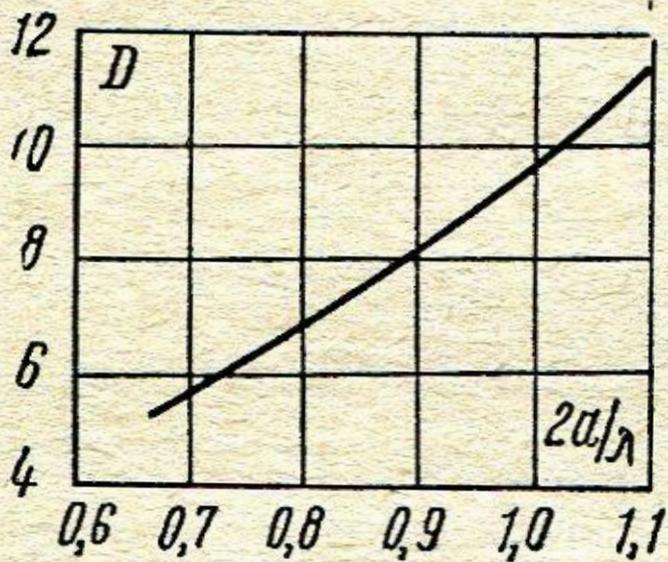
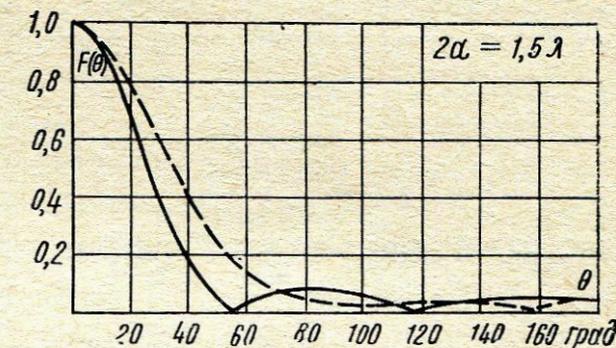
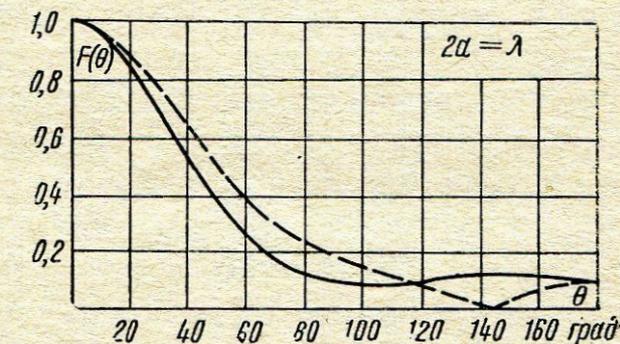
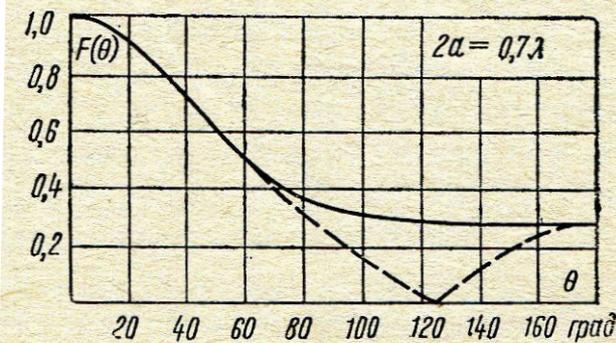
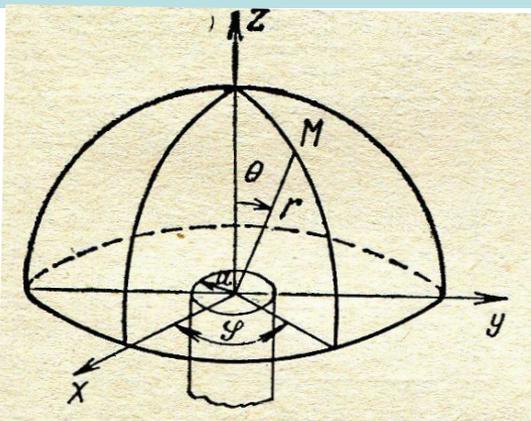


Излучение из открытого конца прямоугольного волновода. Волна H_{10}

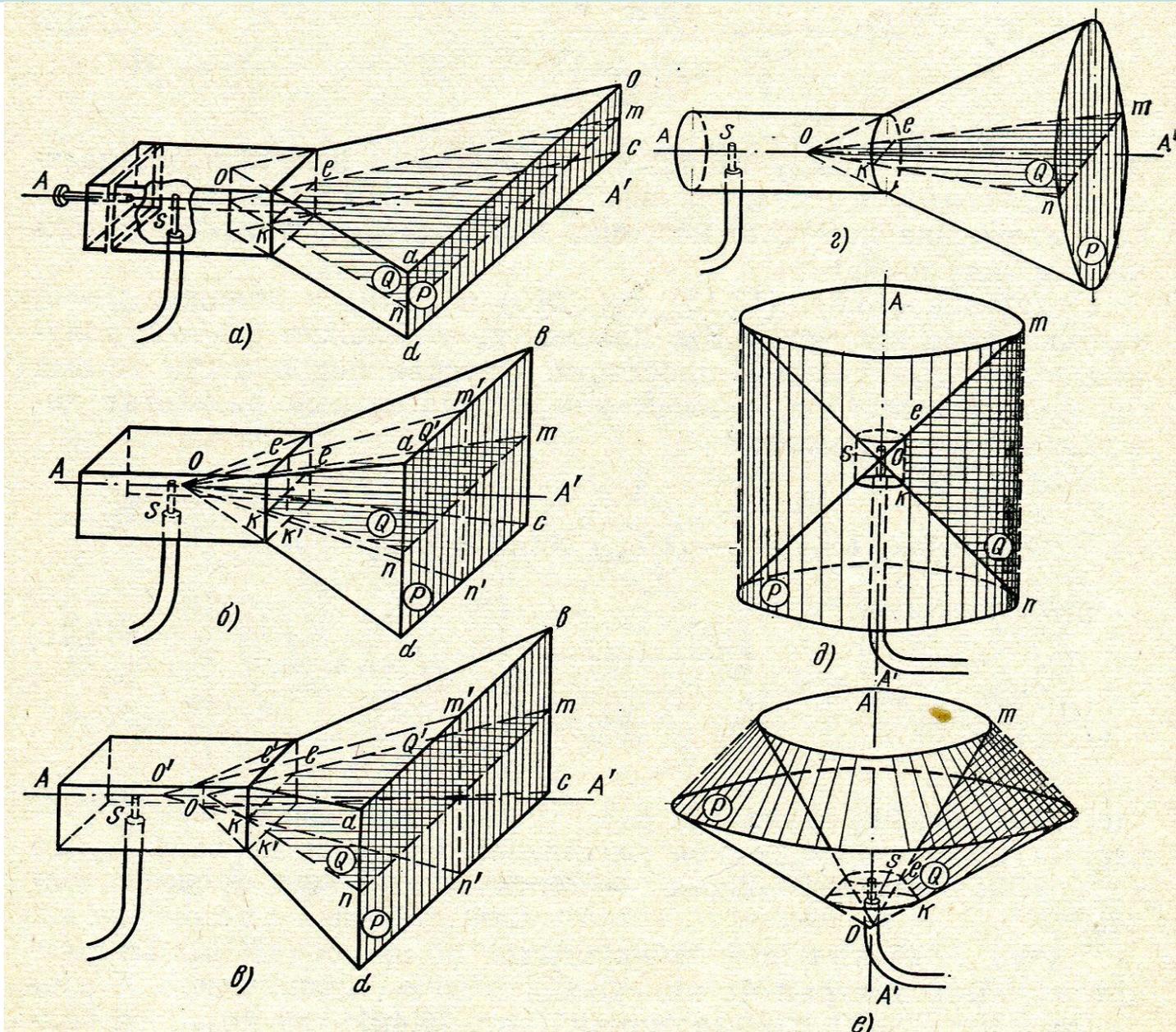
$$F(\theta) = \cos^2 \frac{\theta}{2} \frac{\sin\left(\pi \frac{b}{\lambda} \sin \theta\right)}{\pi \frac{b}{\lambda} \sin \theta}.$$



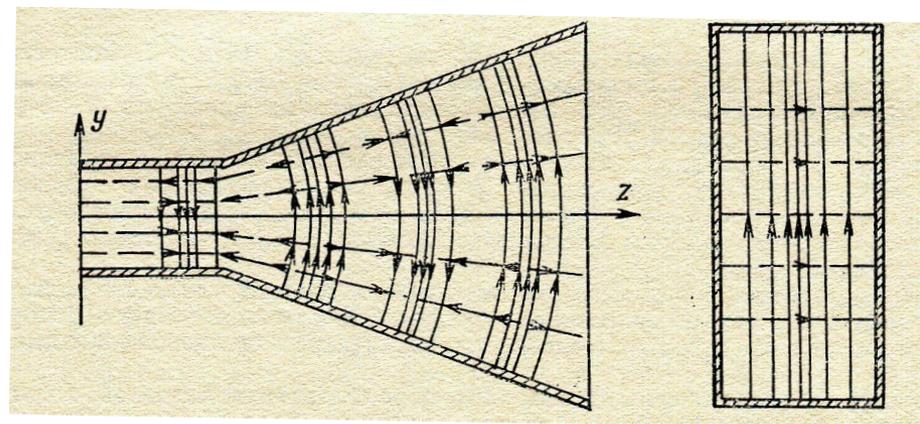
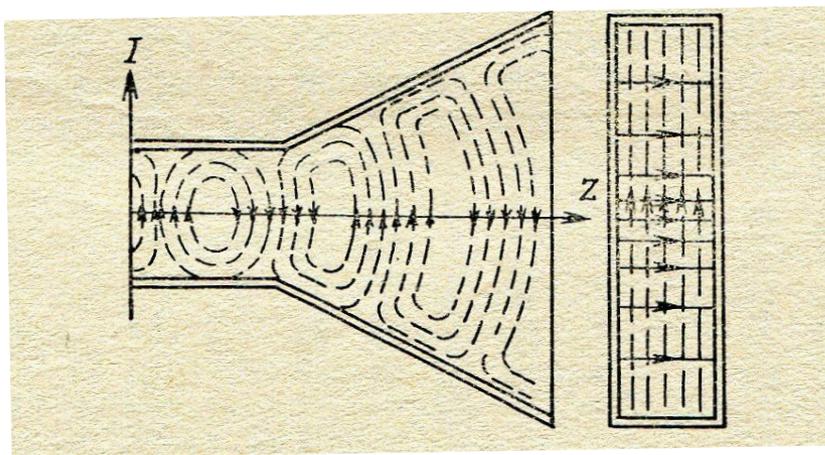
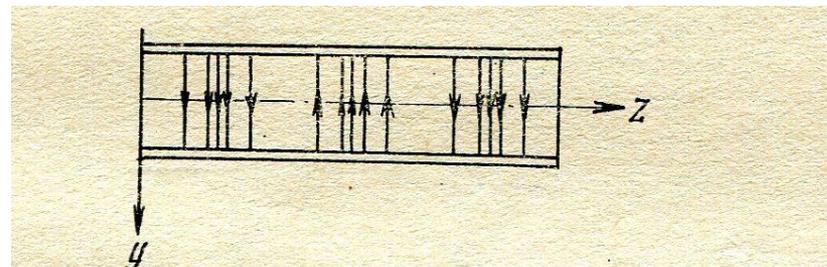
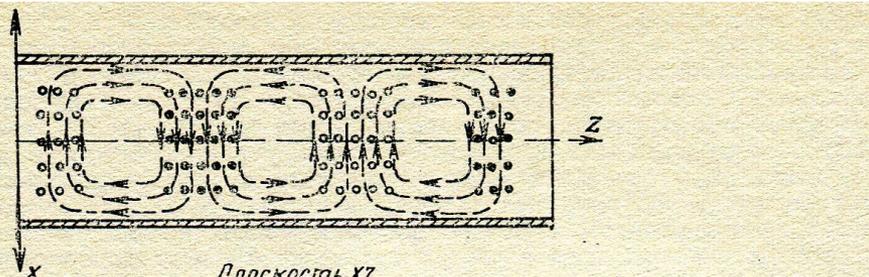
Излучение из открытого конца волновода круглого сечения. Волна H_{11}



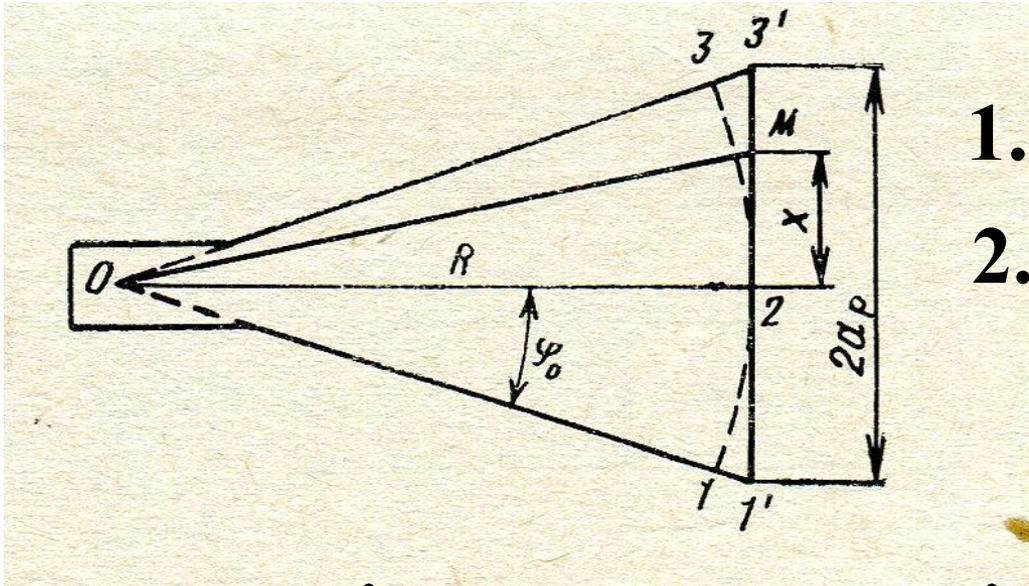
Виды рупорных антенн.



Поле в раскрытии секториальных рупорных антенн.



КНД секториальных рупоров.



$$1. \beta \approx k$$

$$2. R \gg a_p; R \gg x.$$

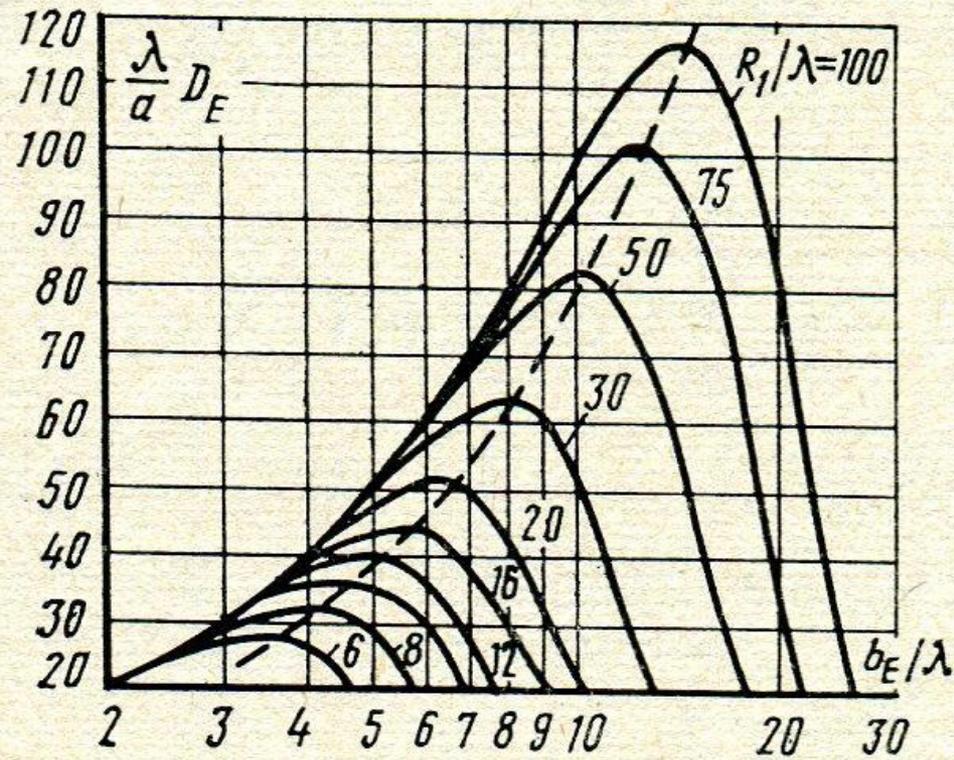
$$\psi(x) = (2\pi / \lambda)(OM - R) = (2\pi / \lambda)\sqrt{R^2 + x^2} - R \approx$$

$$\approx (2\pi / \lambda)(x^2 / 2R - x^4 / 8R^3 + x^6 / 16R^5 - \dots)$$

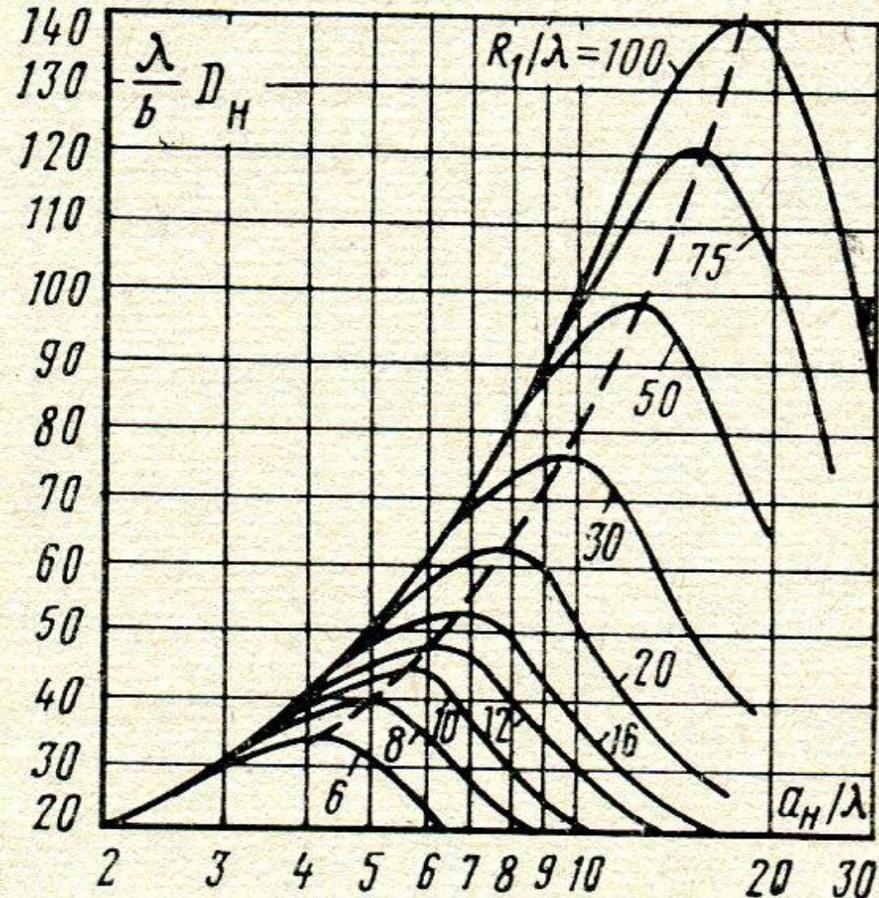
$$\psi_{\max} = (\pi / 4\lambda)(a_p^2 / R)$$

$$R^H_{opt} = \frac{1}{3} \frac{a_p^2}{\lambda}; R^E_{opt} = \frac{1}{2} \frac{b_p^2}{\lambda}$$

КНД секториальных рупоров.



Плоскость E



Плоскость H

Диаграммы направленности Е-секториального рупора.

$R=7\lambda$ ----- $R=20\lambda$

