

$$(\nabla^2 + k_c^2)A = 0$$

+RB

$$k_c > 0$$

$$\omega_c = ck_c$$

$$k_z = -j\sqrt{k_c^2 - k^2}$$

TE-Wellen
H-Wellen

$$\vec{E} = \text{rot}(A^H(a, b)\vec{e}_z)e^{\mp jk_z z}$$

$$\vec{H} = \frac{\pm 1}{Z_F^H} \vec{e}_z \times \vec{E} + \frac{jk_c^2}{\omega\mu} A^H(a, b)e^{\mp jk_z z}\vec{e}_z$$

$$Z_F^H = \sqrt{\mu/\varepsilon} \frac{k}{k_z}$$

TM-Wellen
E-Wellen

$$\vec{H} = \text{rot}(A^E(a, b)\vec{e}_z)e^{\mp jk_z z}$$

$$\vec{E} = \pm Z_F^E \vec{H} \times \vec{e}_z - \frac{jk_c^2}{\omega\varepsilon} A^E(a, b)e^{\mp jk_z z}\vec{e}_z$$

$$Z_F^E = \sqrt{\mu/\varepsilon} \frac{k_z}{k}$$

$$k_c = 0$$

$$k_z = k$$

TEM-Wellen

$$\vec{E} = \pm Z_F \vec{H} \times \vec{e}_z$$

$$\vec{H} = \frac{\pm 1}{Z_F} \vec{e}_z \times \vec{E} = \text{rot}(A^E(a, b)\vec{e}_z)e^{\mp jk_z z}$$

$$Z_F = \sqrt{\mu/\varepsilon}$$

$$(\nabla^2 + k_c^2)A = 0$$

+RB

$$\omega_c = ck_c$$

$$k_z = -j\sqrt{k_c^2 - k^2}$$

TE-Wellen
H-Wellen

$$\vec{E} = \text{grad}(A^H) \times \vec{e}_z e^{\mp jk_z z}$$

$$\vec{H} = \left(\frac{\pm 1}{Z_F^H} \text{grad}(A^H) + \frac{jk_c^2}{\omega\mu} A^H \vec{e}_z \right) e^{\mp jk_z z}$$

$$Z_F^H = \sqrt{\mu/\varepsilon} \frac{k}{k_z}$$

TM-Wellen
E-Wellen

$$\vec{H} = \text{grad}(A^E) \times \vec{e}_z e^{\mp jk_z z}$$

$$\vec{E} = \left(\pm Z_F^E \text{grad}(A^E) - \frac{jk_c^2}{\omega\varepsilon} A^E \vec{e}_z \right) e^{\mp jk_z z}$$

$$Z_F^E = \sqrt{\mu/\varepsilon} \frac{k_z}{k}$$

$$\nabla^2 \Phi = 0$$

+RB

$$k_z = k$$

TEM-Wellen

$$\vec{E} = -\text{grad}(\Phi) e^{\mp jk_z z}$$

$$\vec{H} = \frac{\pm 1}{Z_F} \vec{e}_z \times \vec{E}$$

$$Z_F = \sqrt{\mu/\varepsilon}$$

TE-Wellen, H-Wellen $A(x, y, z) = C \cos\left(\frac{m\pi}{a}x\right) \cos\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$

$$E_x = \frac{\partial A}{\partial y} = -C \frac{n\pi}{b} \cos\left(\frac{m\pi}{a}x\right) \sin\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$E_y = -\frac{\partial A}{\partial x} = C \frac{m\pi}{a} \sin\left(\frac{m\pi}{a}x\right) \cos\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$H_x = \pm \frac{1}{Z} \frac{k_z}{k} E_y = \pm C \frac{1}{Z} \frac{m\pi}{a} \frac{k_z}{k} \sin\left(\frac{m\pi}{a}x\right) \cos\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$H_y = \mp \frac{1}{Z} \frac{k_z}{k} E_x = \pm C \frac{1}{Z} \frac{n\pi}{b} \frac{k_z}{k} \cos\left(\frac{m\pi}{a}x\right) \sin\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$H_z = \frac{jk_c^2}{\omega\mu} A = \frac{jk_c^2}{\omega\mu} C \cos\left(\frac{m\pi}{a}x\right) \cos\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

TM-Wellen, E-Wellen $A(x, y, z) = C \sin\left(\frac{m\pi}{a}x\right) \sin\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$

$$E_x = \mp Z \frac{k_z}{k} H_y = \pm CZ \frac{m\pi}{a} \frac{k_z}{k} \cos\left(\frac{m\pi}{a}x\right) \sin\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$E_y = \pm Z \frac{k_z}{k} H_x = \pm CZ \frac{n\pi}{b} \frac{k_z}{k} \sin\left(\frac{m\pi}{a}x\right) \cos\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$E_z = -\frac{jk_c^2}{\omega\epsilon} A = -\frac{jk_c^2}{\omega\epsilon} C \sin\left(\frac{m\pi}{a}x\right) \sin\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$H_x = \frac{\partial A}{\partial y} = C \frac{n\pi}{b} \sin\left(\frac{m\pi}{a}x\right) \cos\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

$$H_y = -\frac{\partial A}{\partial x} = -C \frac{m\pi}{a} \cos\left(\frac{m\pi}{a}x\right) \sin\left(\frac{n\pi}{b}y\right) \exp(\mp jk_z z)$$

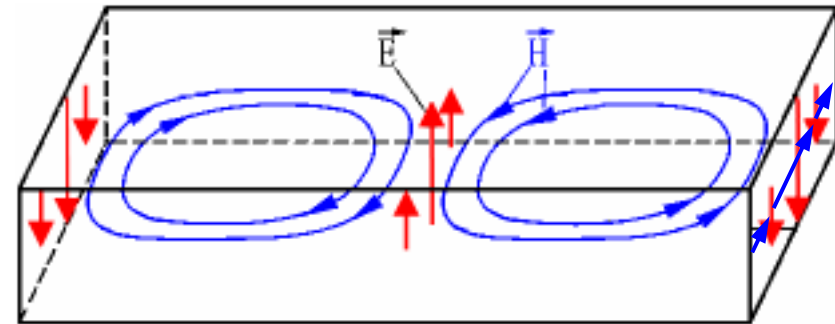
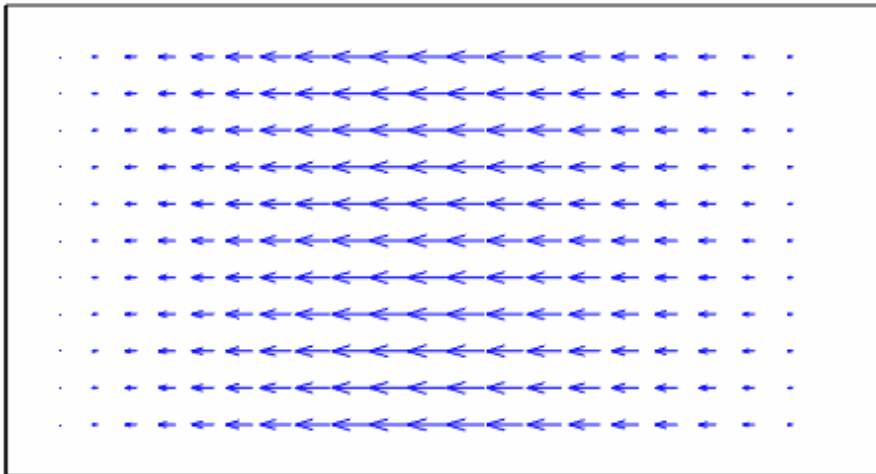
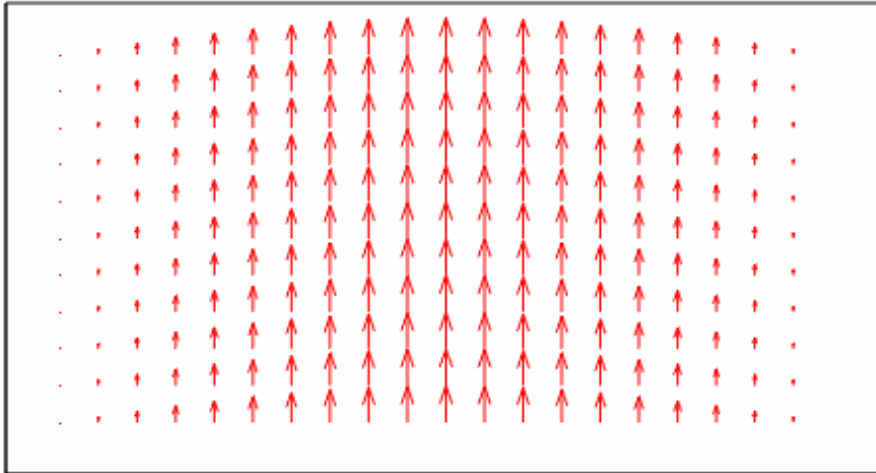
transversale Komponenten

$m = 1$

$n = 0$

H_{10}

E-Feld, H-Feld



transversale Komponenten

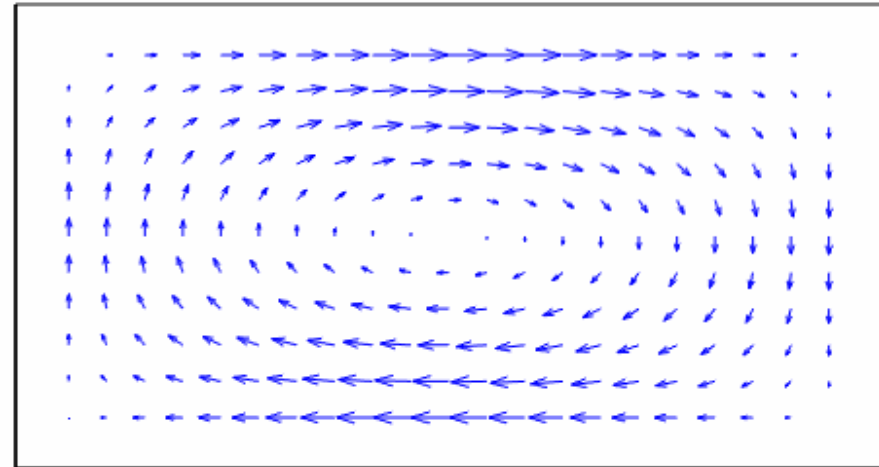
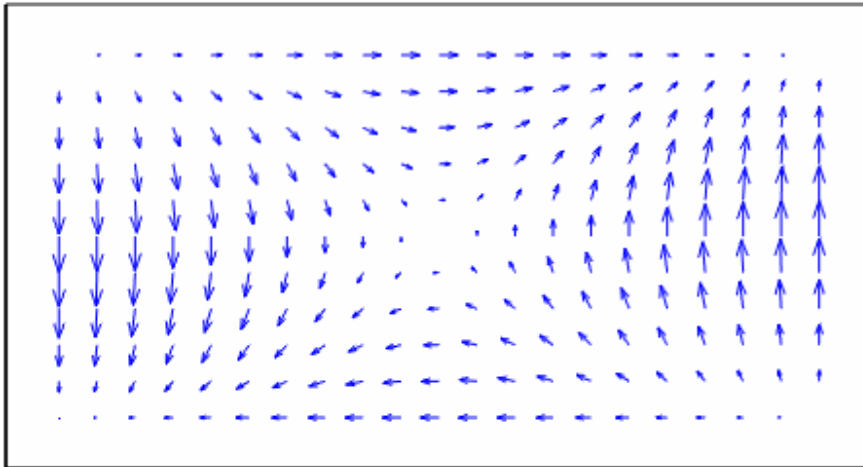
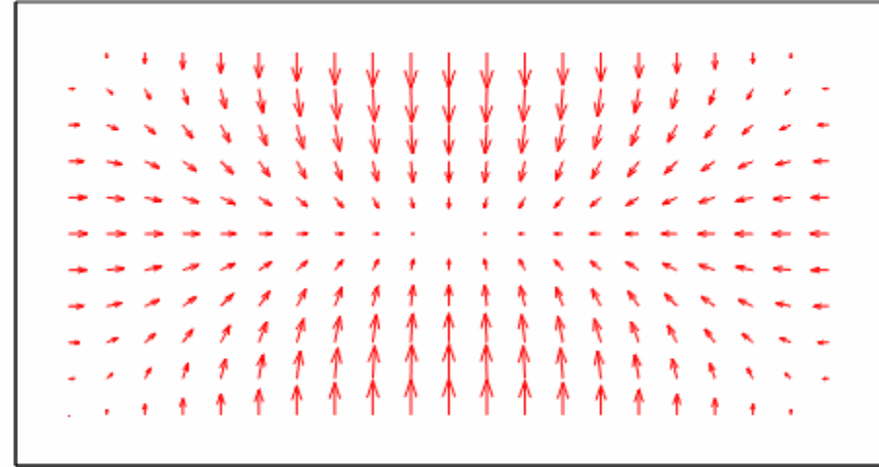
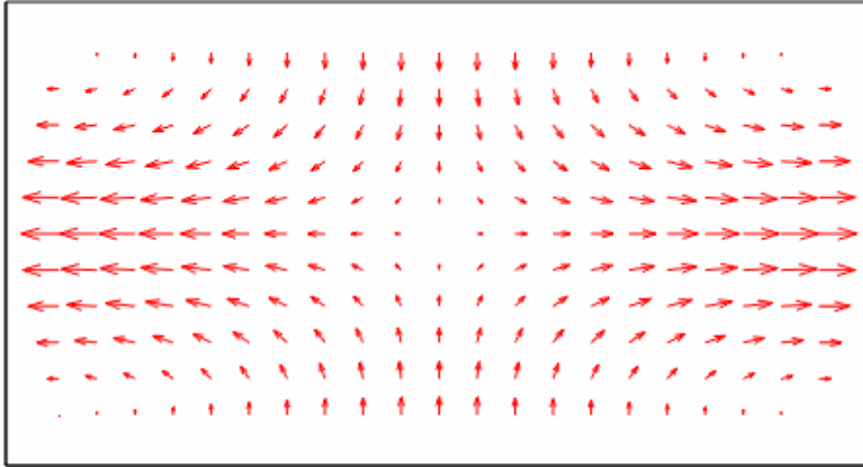
$m = 1$

$n = 1$

H_{11}

E-Feld, H-Feld

E_{11}



transversale Komponenten

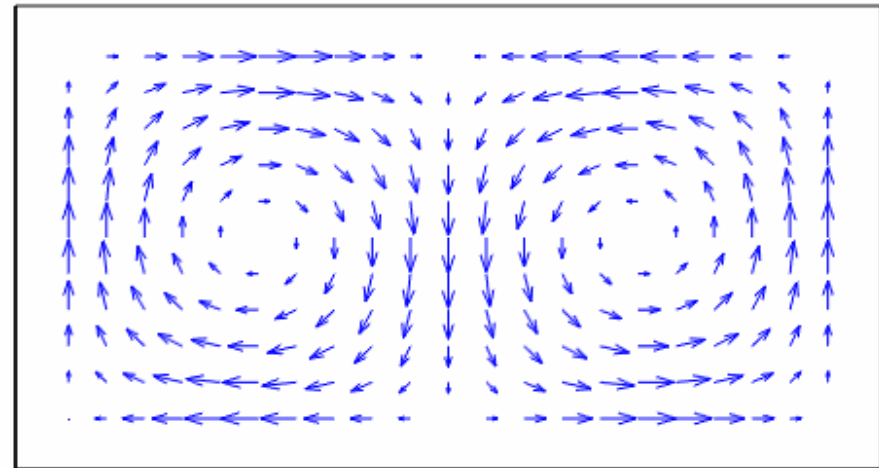
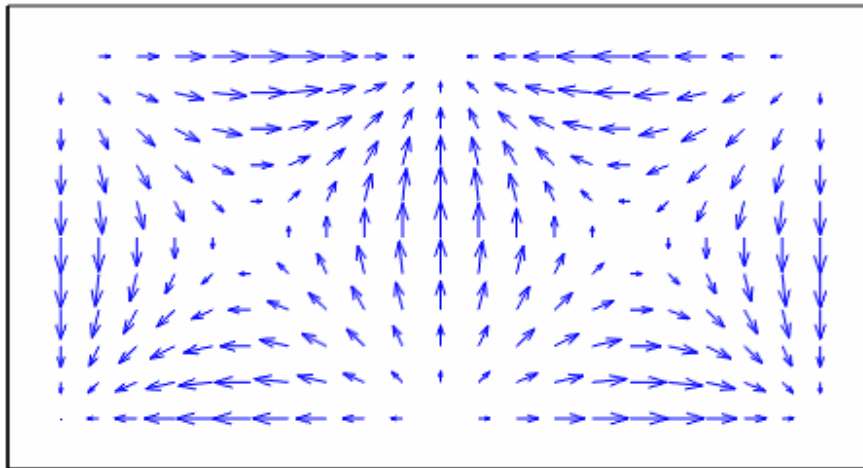
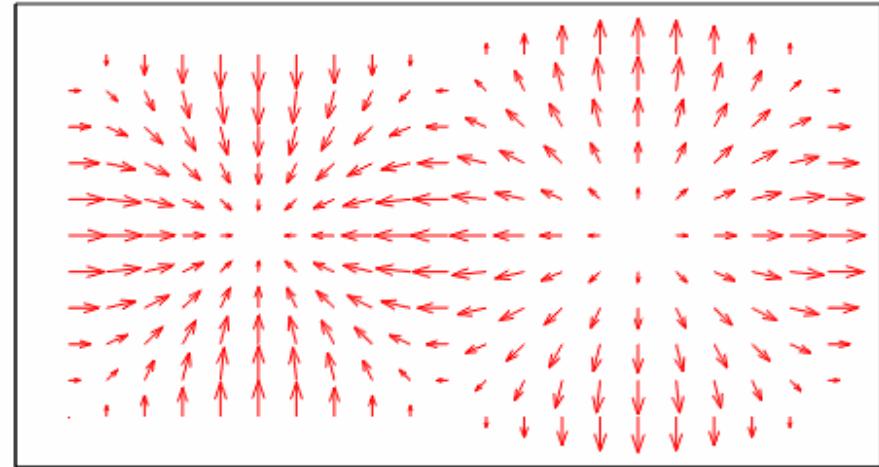
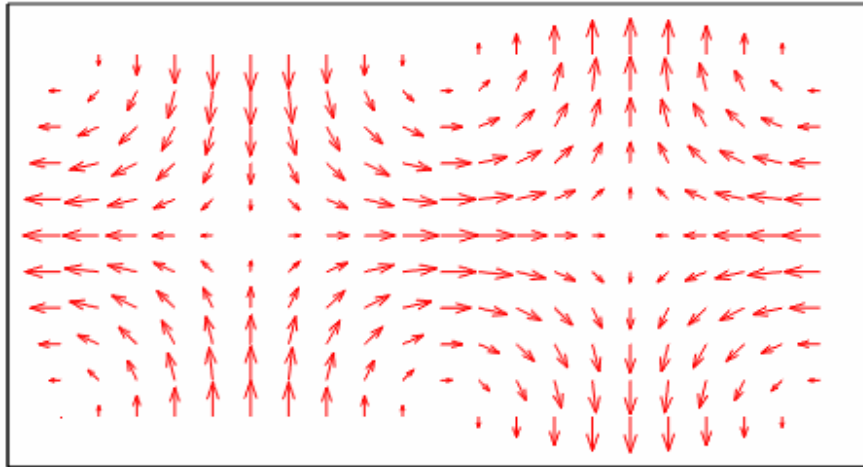
$m = 2$

$n = 1$

H_{12}

E-Feld, H-Feld

E_{12}



NLC Linac RF Unit

Low Level RF System

One 490 kV 3-Turn Induction Modulator

Eight 2 KW TWT Klystron Drivers (not shown)

Eight 75 MW PPM Klystrons

Delay Line Distribution System (2 Mode, 4 Lines)

Eight Accelerator Structure Sextets

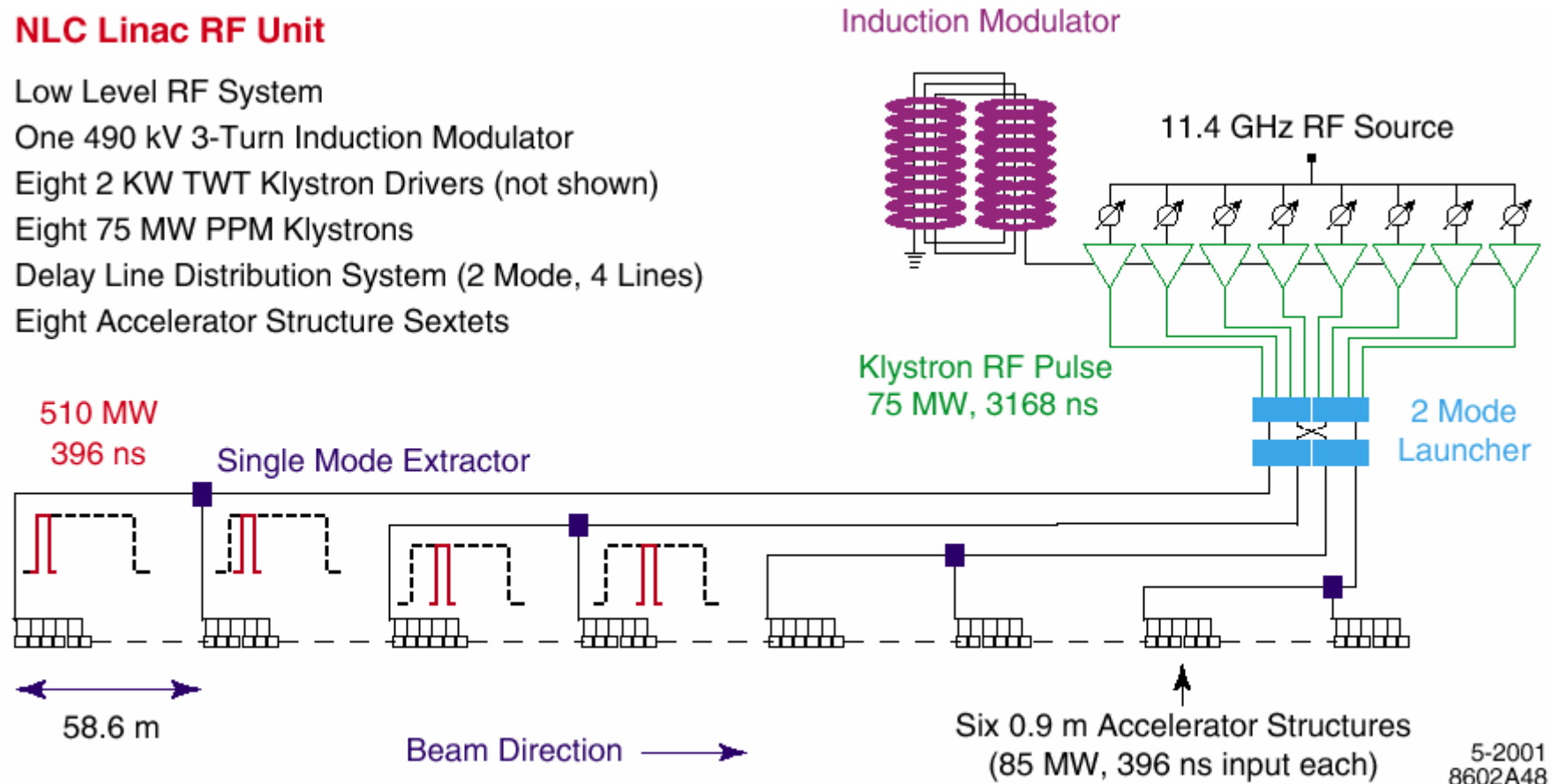


Figure 4.1: Schematic of a linac rf unit (one of 117 per linac).



Martin Dohlus Mai 2002



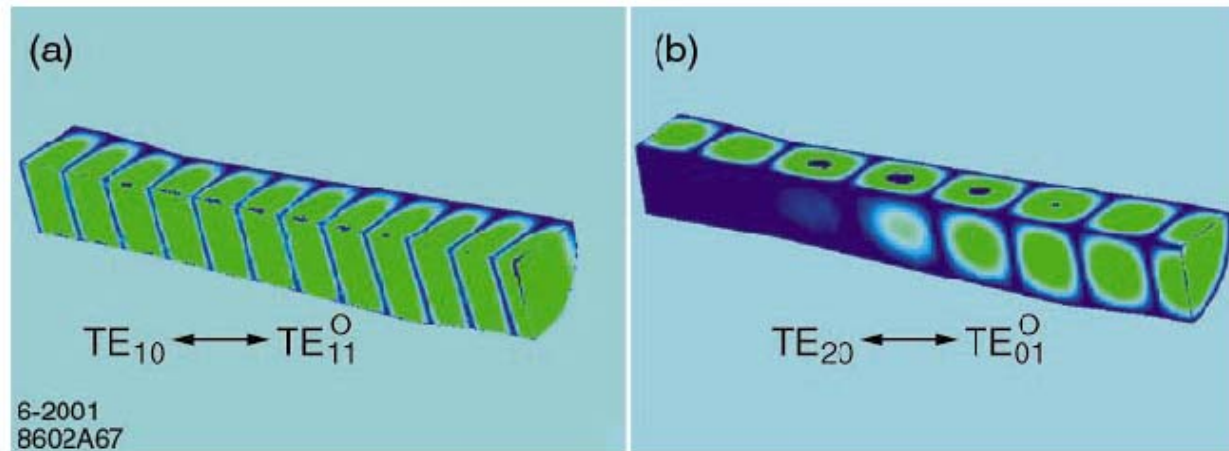


Figure 4.19: Rectangular-to-circular mode converter ($1/4$ geometry shown) with field patterns illustrating conversion between a) rectangular TE_{10} and circular TE_{11} and b) rectangular TE_{20} and circular TE_{01} .

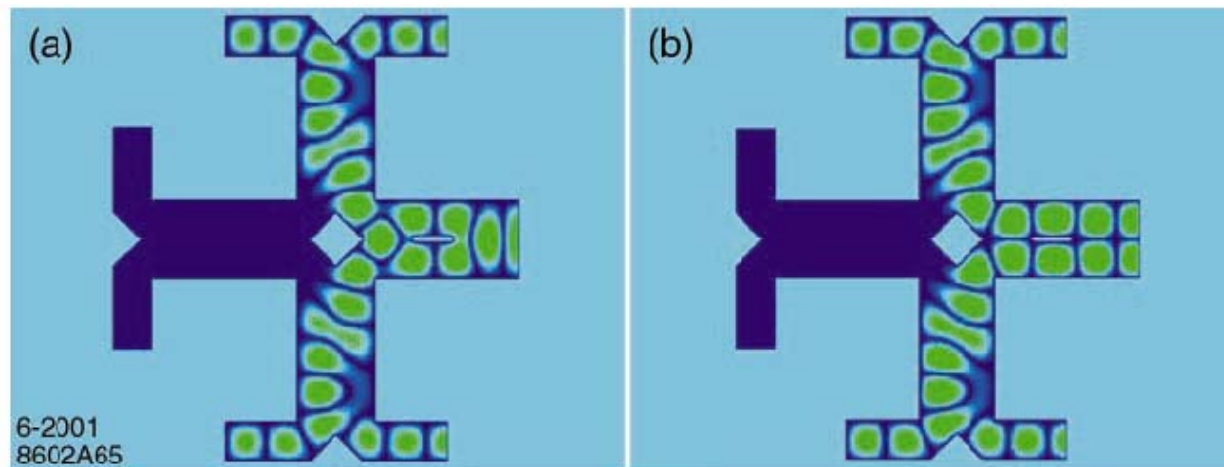


Figure 4.20: Cross-potent launcher with electric field patterns illustrating launching a) TE_{10} and b) TE_{20} in the right overmoded rectangular port with the indicated relative phases for four equal amplitude inputs. Alternate phasing of the inputs sends the power to either of the left ports.

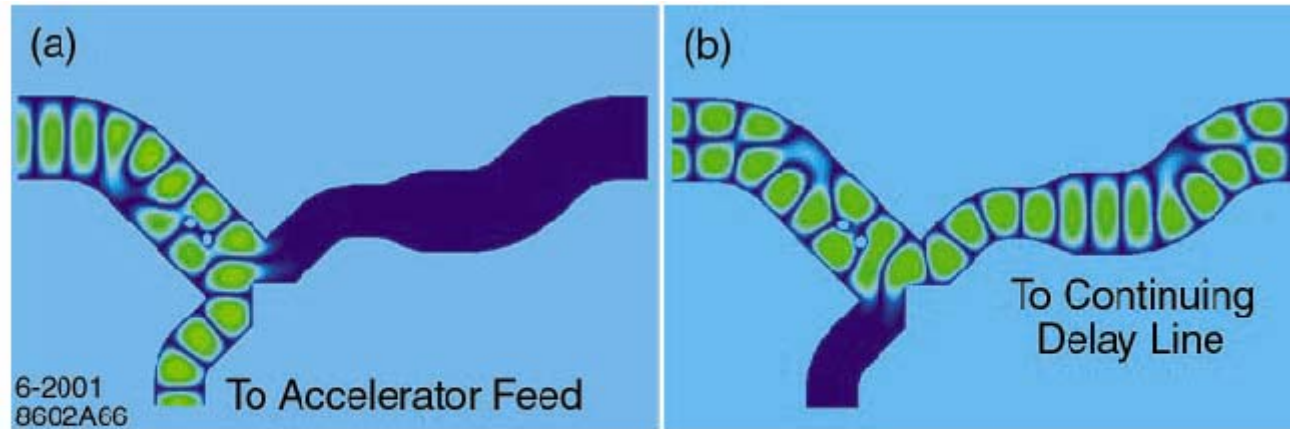


Figure 4.22: Extractor with electric field patterns illustrating a) extraction of the TE_{10} mode and b) passing the TE_{20} mode.

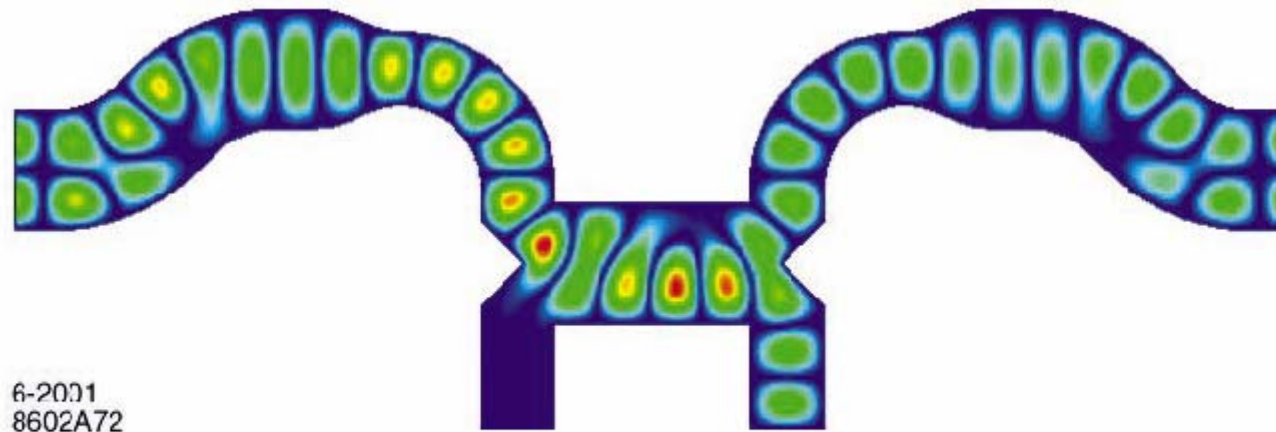


Figure 4.23: A 3-dB tap-off made with a ‘magic H’ hybrid and jog converters. Electric field patterns are shown for power flow from left to right.

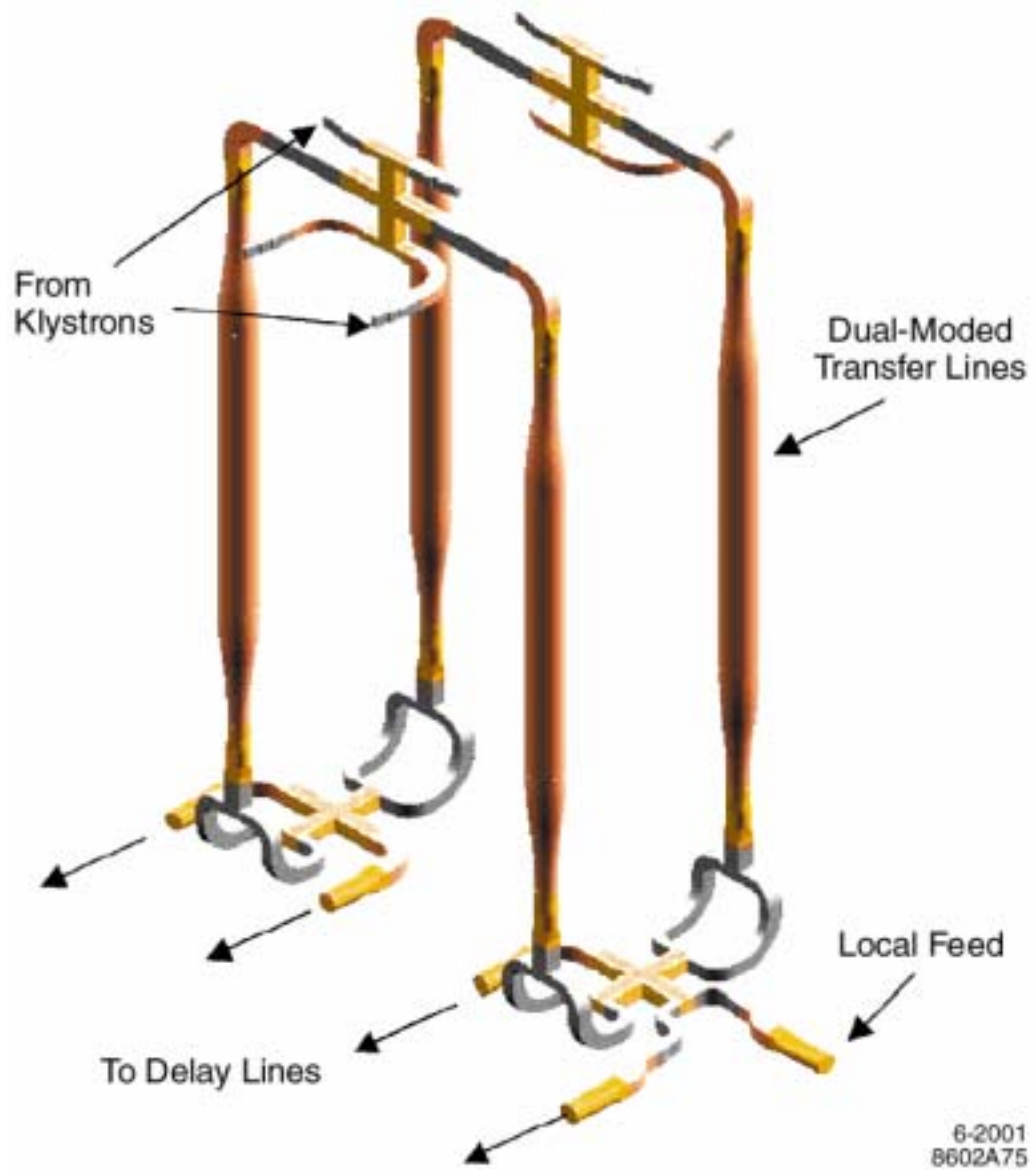


Figure 4.21: DLDS launcher circuit.

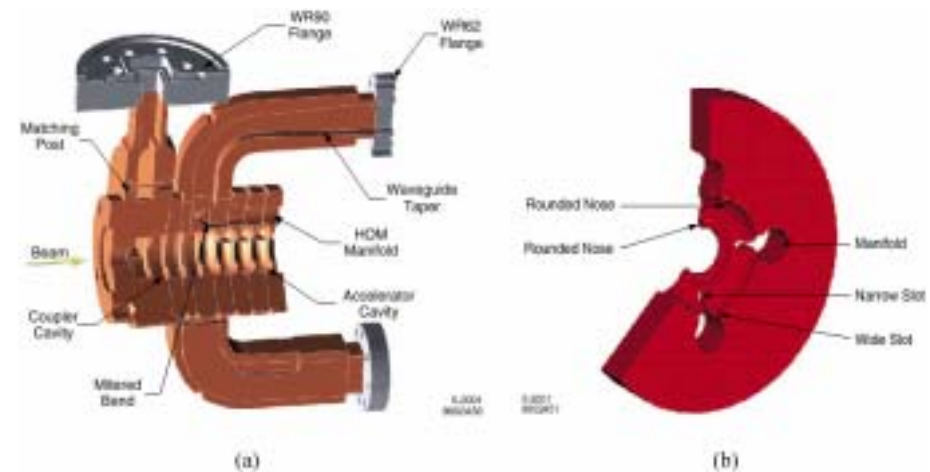


Figure 4.24: Cutaway view of (a) upstream end of RDDS1 and (b) RDDS1 cell.