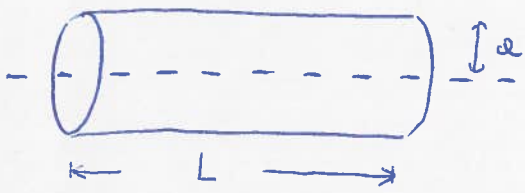
CAVITA' CILINDRICA: PILL BOX



MODO FONDAMENTALE

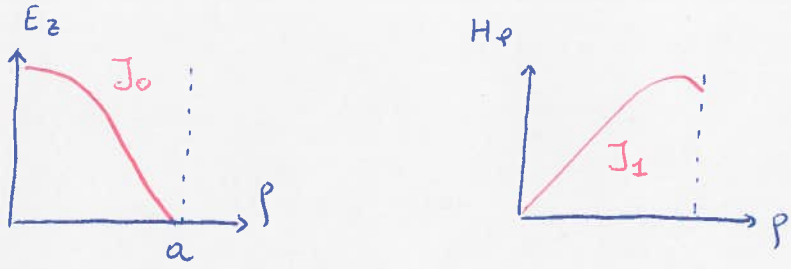
$L/a < 2{,}03 \quad TM_{010}$

$L/a > 2{,}03 \quad TE_{111}$

TM_{010}

$$\begin{cases} E_z = E_0 \, J_0\left(\dfrac{\chi_{01}}{a}\rho\right) \\ Z_0 H_\varphi = J \, E_0 \, J_1\left(\dfrac{\chi_{01}}{a}\rho\right) \end{cases}$$

$\ldots \chi_{m,m} : J_m(\chi_{mn}) = 0$



$$W = 2\left[\frac{1}{4}\varepsilon_0 \int_V |E|^2 d\tau\right]$$

$$P_d = \frac{R_s}{2} \oint_S |H|^2 dS$$

$$Q = \frac{\omega_0 W}{P_d}$$

$$R_s = \sqrt{\frac{\omega_0 \mu}{2\sigma}} = \frac{1}{\sigma\delta}$$

PER TM_{010} SI DIMOSTRA CHE

$$Q = \frac{\omega_0 W}{P_d} = \frac{1{,}2025 \; Z_0}{R_s\,(1 + a/L)}$$

[illegible]

PER CASA

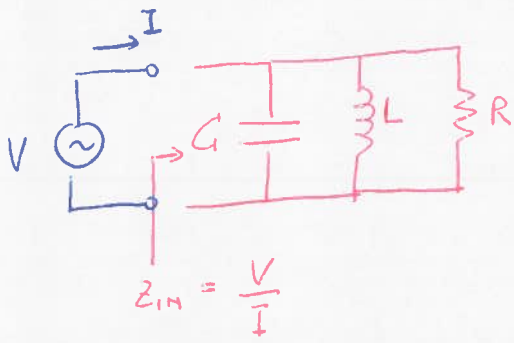
$a = 6$ cm

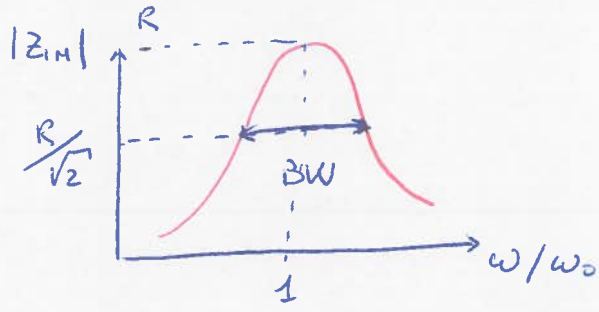
$L = 4{,}3$ cm

CALCOLARE I MODI FINO A 6 GHz

CIRCUITO EQUIVALENTE DI UNA CAVITA'

CIRCUITO SERIE E CIRCUITO PARALLELO





$$Z_{IN} = \left(\frac{1}{R} + \frac{1}{j\omega L} + j\omega C\right)^{-1} = \frac{R}{1 + j Q_0 \delta}$$

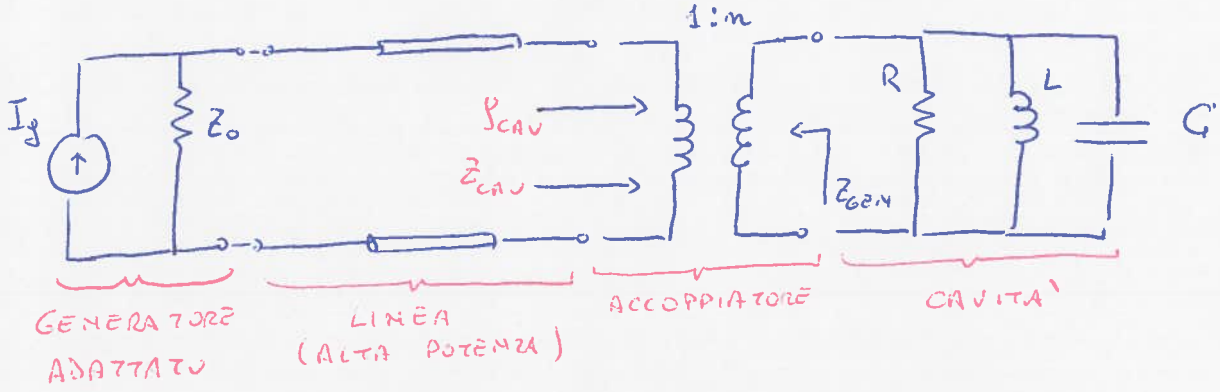
$$\delta = \frac{\omega}{\omega_0} - \frac{\omega_0}{\omega} \simeq 2\frac{(\omega - \omega_0)}{\omega_0} \qquad \omega_0 = \frac{1}{\sqrt{LC}}$$

$$Z_{IN} \simeq \frac{R}{1 + 2 Q_0 \Delta\omega/\omega_0} \qquad \frac{\Delta\omega_{3dB}}{\omega_0} = \frac{BW}{\omega_0} = \frac{1}{Q_0}$$

CON $Q_0 = \omega_0 \dfrac{W_E + W_M}{P_{LOSS}}$ ← C, L, R

$$= \frac{R}{\omega_0 L} = \omega_0 R C$$

ACCOPPIAMENTO IN CAVITA'



$$Z_{CAV} = \frac{R/n^2}{1 + j Q_0 \delta} \qquad Q_0 = \omega_0 \frac{W}{P_{CAV}}$$

W EN. IMMAGAZZINATA

P_{CAV} POTENZA PERSA SULLE PARETI DELLA CAVITA'

P_{EXT} POTENZA IRRADIATA ATTRAVERSO IL COUPLER E DISSIPATA SU Z_0 (IMPEDENZA DEL GENERATORE)

LOADED Q

$$Q_L = \frac{\omega_0 W}{P_{CAV} + P_{EXT}} \qquad \frac{1}{Q_L} = \frac{1}{Q_0} + \frac{1}{Q_E}$$

EXTERNAL Q

$$Q_E = \frac{\omega_0 W}{P_{EXT}}$$

COUPLING β

$$\beta = \frac{P_{EXT}}{P_{CAV}} = \frac{Q_0}{Q_E} = \frac{R}{n^2 Z_0}$$

$$\Rightarrow \quad Q_L = \frac{Q_0}{1+\beta}$$

MISURA DEI PARAMETRI DI UNA CAVITA'

$$Z_{CAV} = \frac{\beta Z_0}{1 + j Q_0 \delta} \Rightarrow \rho_{CAV} = \frac{Z_{CAV} - Z_0}{Z_{CAV} + Z_0} = \frac{\beta - 1 - j Q_0 \delta}{\beta + 1 + j Q_0 \delta} \quad (S_{11})$$

$$|\rho_{CAV}| = \sqrt{\frac{\left(\frac{\beta-1}{\beta+1}\right)^2 + (Q_L \delta)^2}{1 + (Q_L \delta)^2}}$$

$$\rho_{CAV}\Big|_{\substack{f=f_0 \\ \delta=0}} = \frac{\beta - 1}{\beta + 1}$$

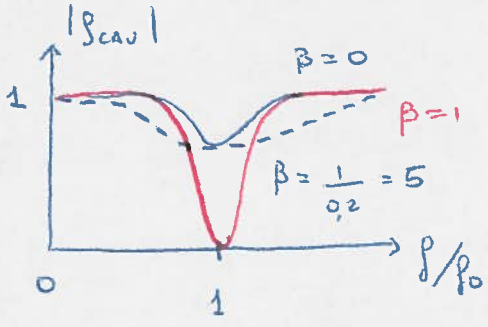
$$\angle \rho_{CAV} = -\operatorname{tg}^{-1}\left[\frac{2\beta Q_0 \delta}{\beta^2 - 1 - (Q_0 \delta)^2}\right] \approx \frac{2\beta}{1-\beta^2} Q_0 \delta \simeq \frac{2\beta}{1-\beta^2} Q_0 \frac{2(f - f_0)}{f_0}$$

RETTA ....

β INFLUENZA → RIFLESSIONE PORTA INGRESSO

β INFLUENZA → P_{EXT} / P_{CAV}

β INFLUENZA → LARGHEZZA RISONANZA

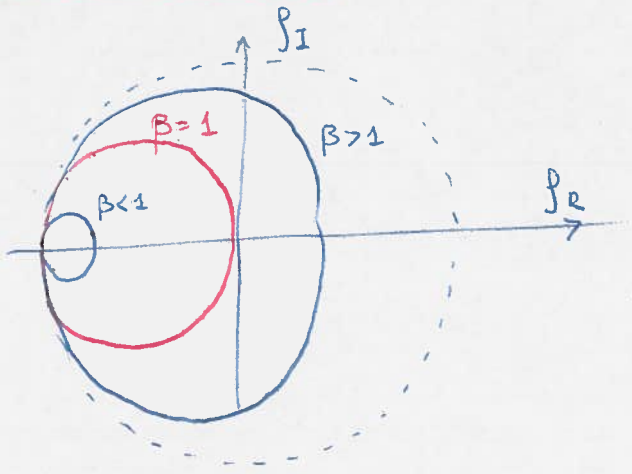


$\beta < 1$ SOTTOACCOPPIATO

$\beta = 1$ ACCOPPIAMENTO CRITICO

$\beta > 1$ SOVRACCOPPIATO

CARTA DI SMITH



MISURA DI β

SWR @ $f = f_0$

$\beta < 1$ $\quad |SWR|_{f=f_0} = 1/\beta$

$\beta > 1$ $\quad |SWR|_{f=f_0} = \beta$

MISURA DI Q_0

- INTERPOLAZIONE $\quad |\rho_{CAV}| \longrightarrow Q_L \xrightarrow{\beta} Q_0$

- FIT LINEARE $\quad \angle \rho_{CAV} \longrightarrow \dfrac{4\beta_0 Q_0}{(1-\beta^2) f_0} \xrightarrow{\beta} Q_0$

- $\rho_{CAV} \xrightarrow{\text{CONVERSIONE}} Z_{CAV} \xrightarrow[\text{A } 3\,dB]{\text{BANDA}} Q_0 = \dfrac{f_0}{\Delta f_{3dB}}$