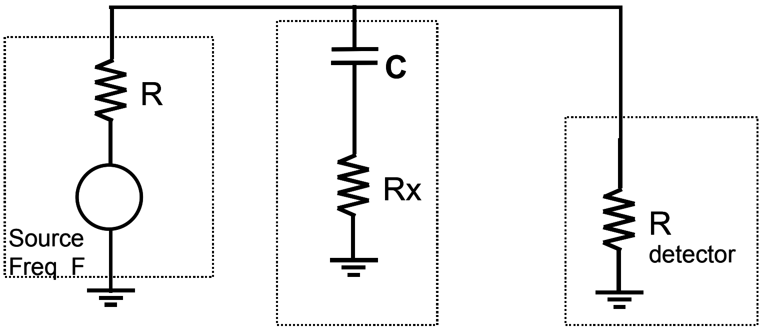
CALCULATION OF THE APPARENT CAPACITANCE (C) IN SHUNT IN A TRANSMISSION CIRCUIT with C and Rx in SERIES



Ici C= capacité équivalente du ckt RLC série F < Frésonnant

$R := 50$ $\quad MHz := 10^{6}$ $\quad F := 146 \cdot MHz$ $\quad F = 1.46 \times 10^{8}$

$C := 10 \cdot 10^{-12}$ $\quad Rx := 0.5$

ATT = Linear attenuation in the transmission ckt, R= source and detector resistance

$$ATT = \left| \frac{\dfrac{R \cdot \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)}{R + \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)}}{\dfrac{R \cdot \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)}{R + \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)} + R} \right|$$

$$ATT := \left| \frac{\dfrac{R \cdot \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)}{R + \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)}}{\dfrac{R \cdot \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)}{R + \left(\dfrac{1}{j \cdot 2 \cdot \pi \cdot F \cdot C} + Rx\right)} + R} \right| \qquad ATT = 0.487$$

After simplification:

$$\mathrm{ATT} = \left|\frac{1}{2}\cdot\frac{(-i + 2\cdot Rx\cdot\pi\cdot F\cdot C)}{(-i + 2\cdot Rx\cdot\pi\cdot F\cdot C + R\cdot\pi\cdot F\cdot C)}\right|$$

solve for C:

$$\begin{bmatrix} \dfrac{1}{2}\cdot\dfrac{\sqrt{-4\cdot ATT^2 + 1}}{\left[\sqrt{4\cdot ATT^2\cdot Rx^2 + 4\cdot R\cdot Rx\cdot ATT^2 + R^2\cdot ATT^2 - Rx^2}\cdot(\pi\cdot F)\right]} \\ \dfrac{-1}{2}\cdot\dfrac{\sqrt{-4\cdot ATT^2 + 1}}{\left[\sqrt{4\cdot ATT^2\cdot Rx^2 + 4\cdot R\cdot Rx\cdot ATT^2 + R^2\cdot ATT^2 - Rx^2}\cdot(\pi\cdot F)\right]} \\ \dfrac{1}{2}\cdot\dfrac{\sqrt{-4\cdot ATT^2 + 1}}{\left[\sqrt{4\cdot ATT^2\cdot Rx^2 + 4\cdot R\cdot Rx\cdot ATT^2 + R^2\cdot ATT^2 - Rx^2}\cdot(\pi\cdot F)\right]} \\ \dfrac{-1}{2}\cdot\dfrac{\sqrt{-4\cdot ATT^2 + 1}}{\left[\sqrt{4\cdot ATT^2\cdot Rx^2 + 4\cdot R\cdot Rx\cdot ATT^2 + R^2\cdot ATT^2 - Rx^2}\cdot(\pi\cdot F)\right]} \end{bmatrix}$$

After simplification:

$$C := \frac{1}{2}\cdot\frac{\sqrt{1 - 4\cdot ATT^2}}{\left(\sqrt{4\cdot ATT^2\cdot Rx^2 + 4\cdot R\cdot Rx\cdot ATT^2 + R^2\cdot ATT^2 - Rx^2}\cdot\pi\cdot F\right)} \qquad C = 1\times 10^{-11}$$

$att := 2\cdot ATT$ **att = atten. in a R - R ohms system (source - det)**

$att = 0.974$

$$ATT := \frac{att}{2}$$

$$C := \frac{\sqrt{1-att^2}}{\left(\pi \cdot F \cdot \sqrt{4 \cdot att^2 \cdot Rx^2 + 4 \cdot R \cdot Rx \cdot att^2 + R^2 \cdot att^2 - 4 \cdot Rx^2}\right)}$$

$C = 1 \times 10^{-11}$

$dB := 20 \cdot \log(att)$ $\quad$ $att = 10^{\frac{dB}{20}}$ $\quad$ $dB = -0.231$ $\quad$ $att = 0.974$

$att(dB) := 10^{\frac{dB}{20}}$ $\quad$ $att(dB)^2 = 0.948$

$$C(dB) := \frac{\sqrt{1-att(dB)^2}}{\pi \cdot F \cdot \sqrt{4 \cdot att(dB)^2 \cdot Rx^2 + 4 \cdot R \cdot Rx \cdot att(dB)^2 + R^2 \cdot att(dB)^2 - 4 \cdot Rx^2}}$$

NOTE that C is the apparent Capacitance

$C(dB) = 1 \times 10^{-11}$

$dB := -20, -19.9 .. -0.1$