Métodos de RMN no estado sólido

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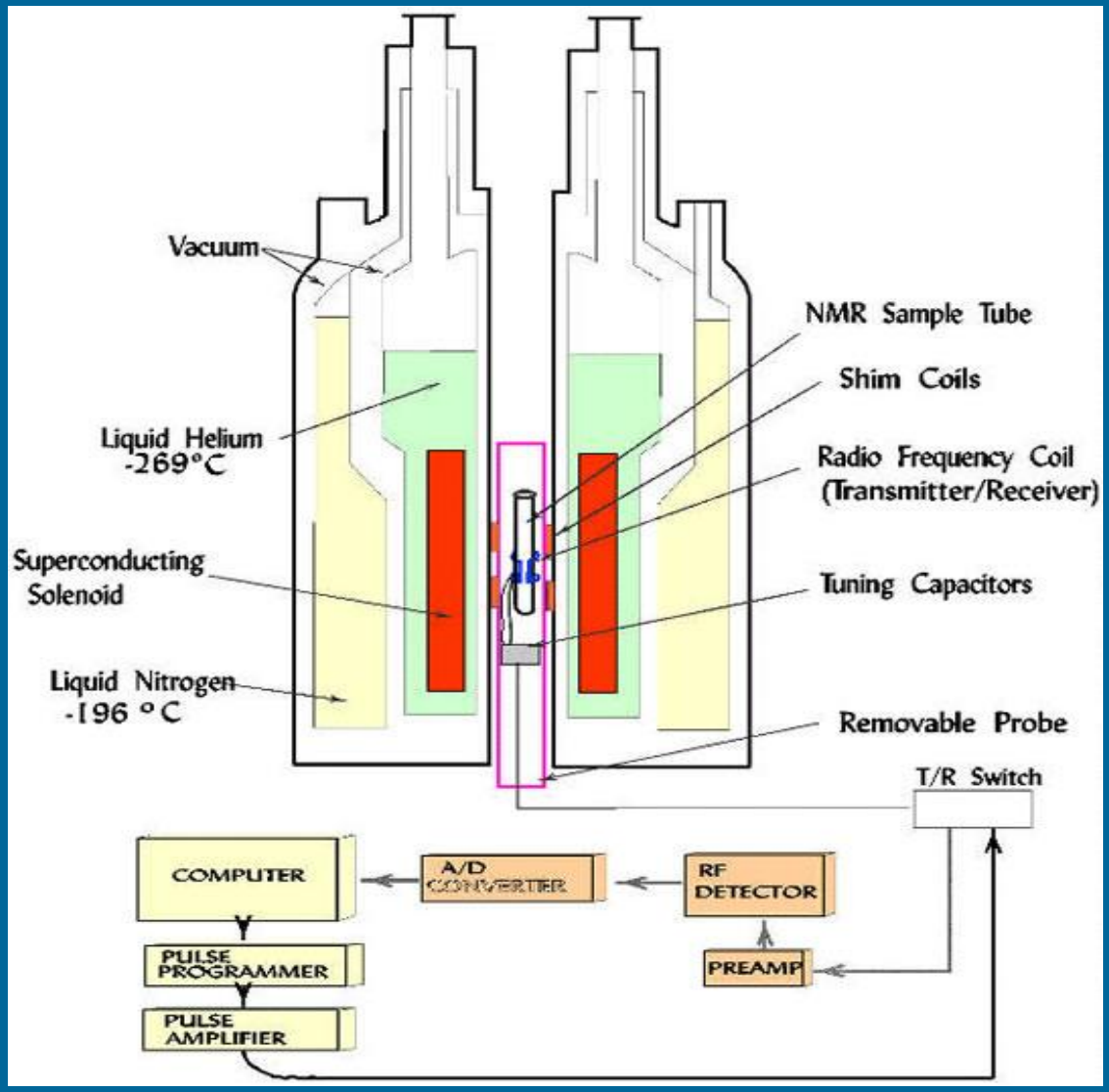
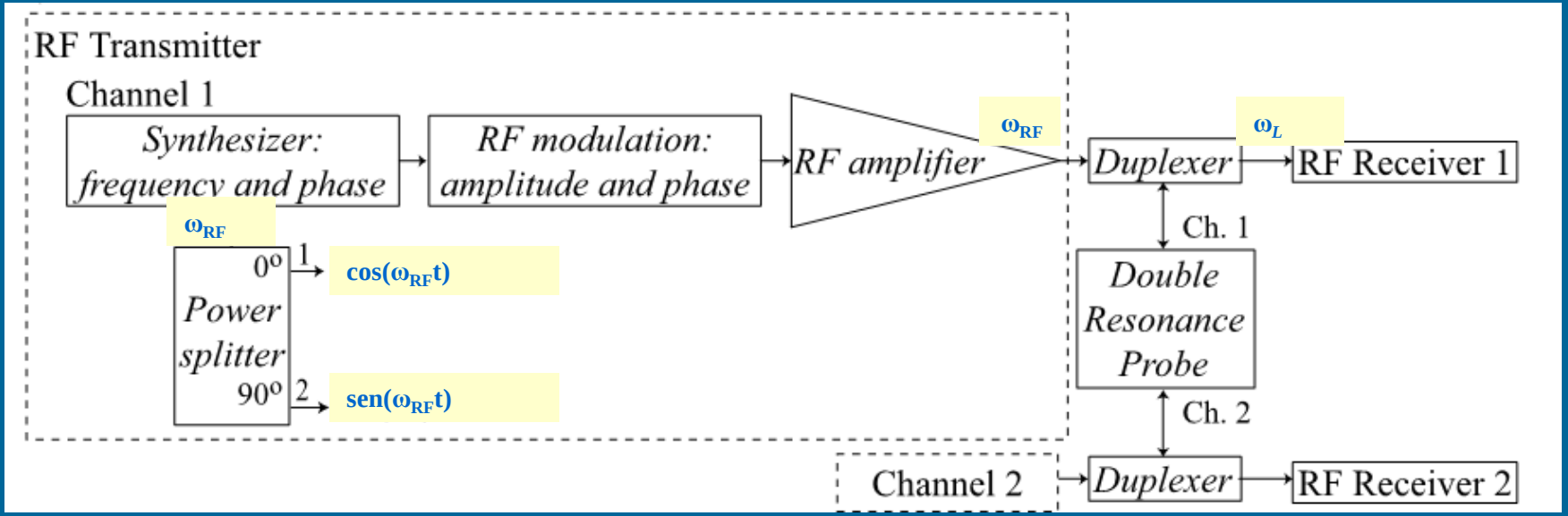
Sumário

- Instrumentação para RMN:
  - Componentes principais do espectrômetro:
    - Duplexador.
      - Diodos cruzados.
      - Cabos $\lambda/4$.
    - Sonda de RF.
      - Circuitos RLC.
      - Sintonia.

Espectrômetro de RMN



Transmissor e duplexador



"Spin dynamics", M. H. Levitt. John Wiley & Sons, 2002.

Duplexador

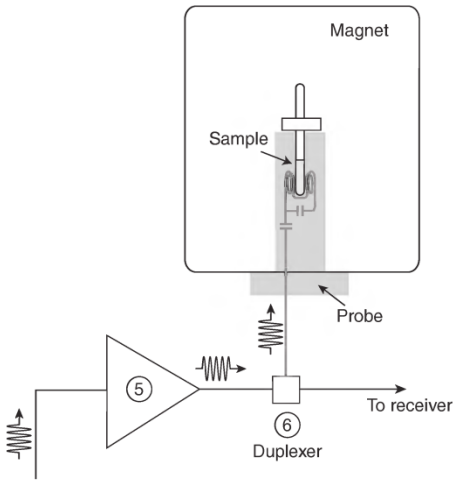


Figure 4.8
The duplexer in transmit mode.

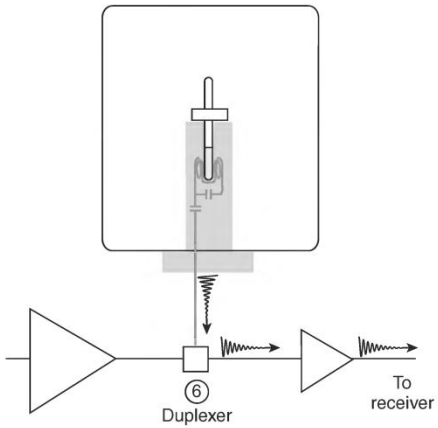


Figure 4.9
The duplexer in receive mode.

"Spin dynamics", M. H. Levitt. John Wiley & Sons, 2002.

Duplexador

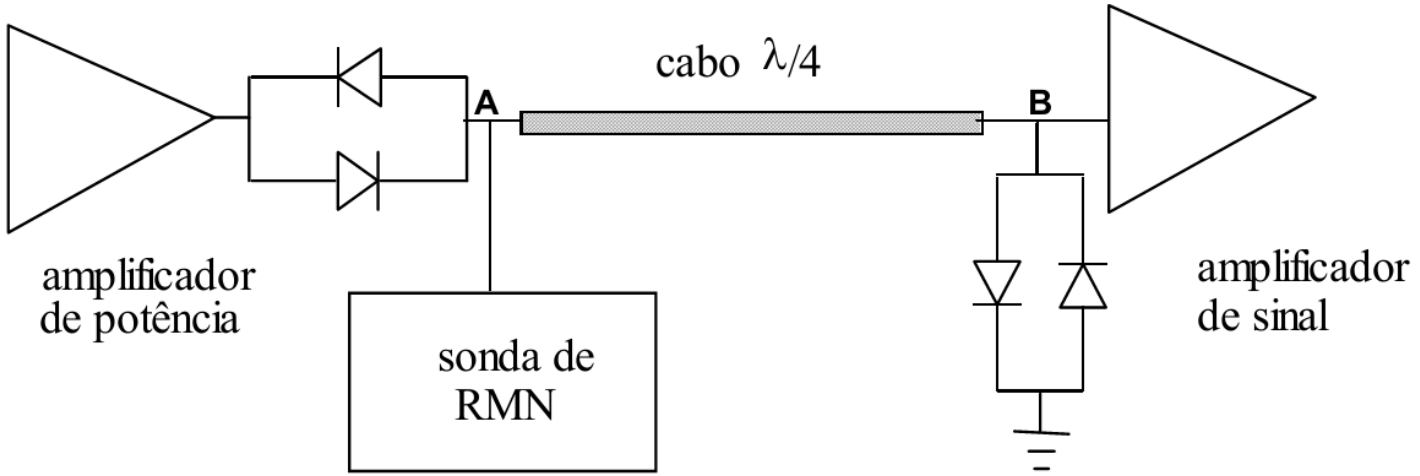
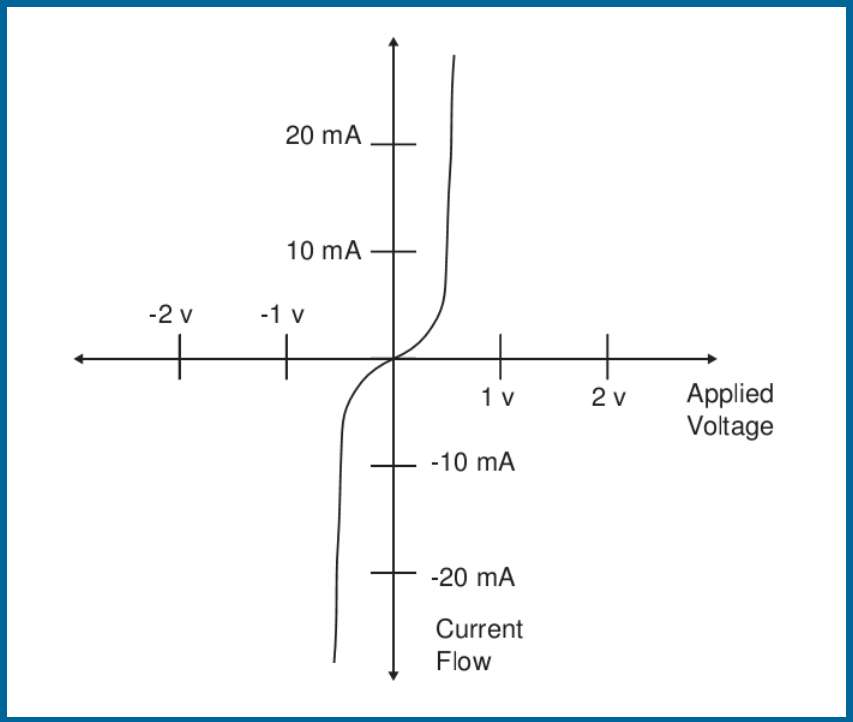


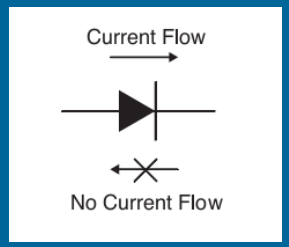
Figura 3-7: Diagrama de um duplexador passivo utilizando diodos cruzados e cabos λ/4.

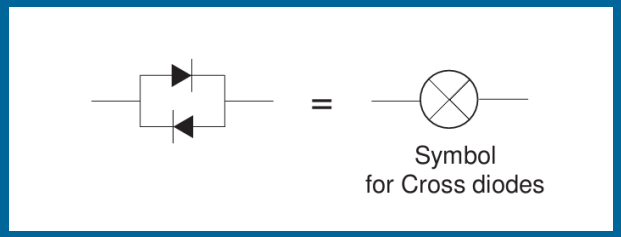
Lowe & Tarr. *J. Phys. E* 1968;1:320

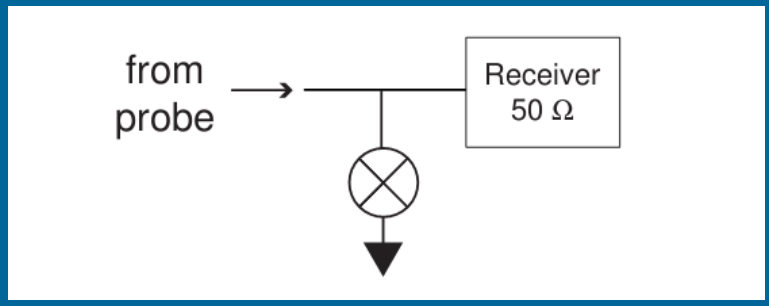
Duplexador

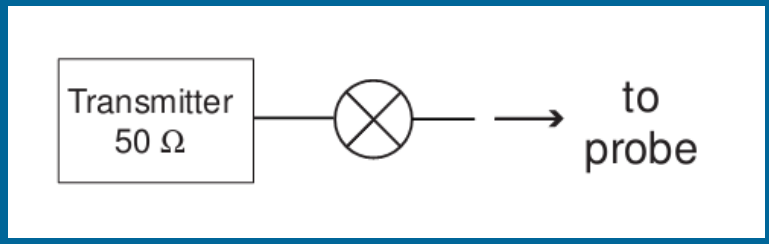
Diodos cruzados:











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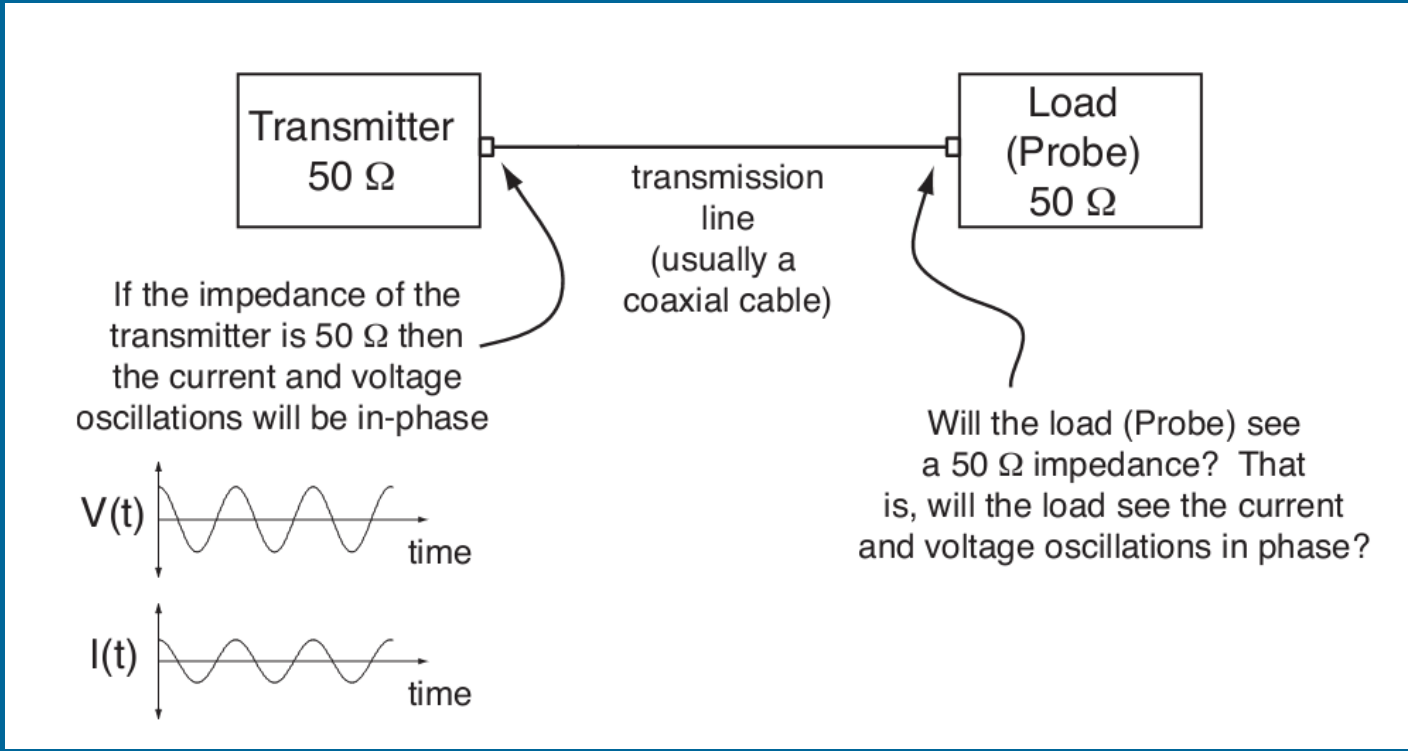
Duplexador

Linhas de transmissão:

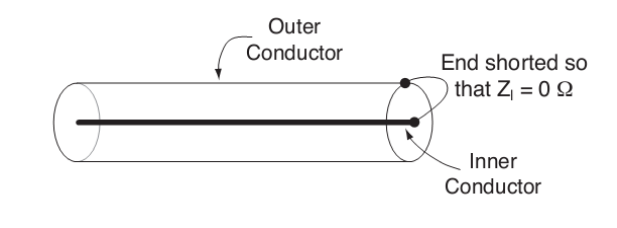


$$Z_0 = \sqrt{Z_s Z_l}$$

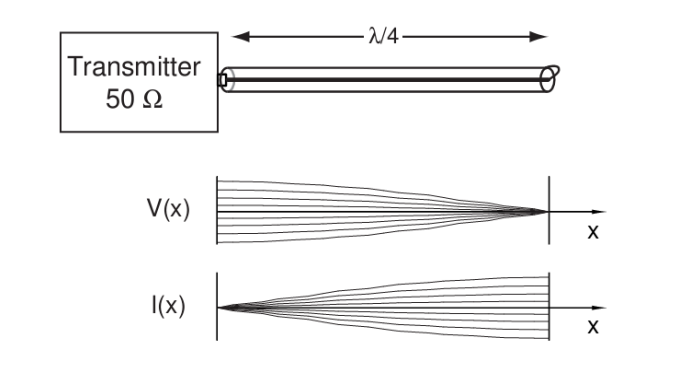
http://grandinetti.org/Teaching/Chem824/Notes

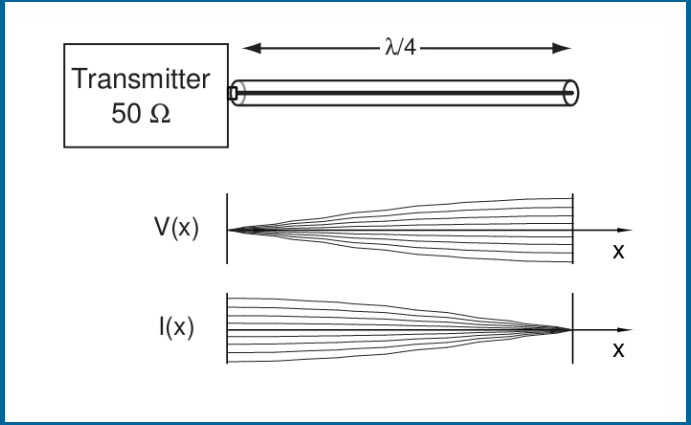
Duplexador

Cabos λ/4:



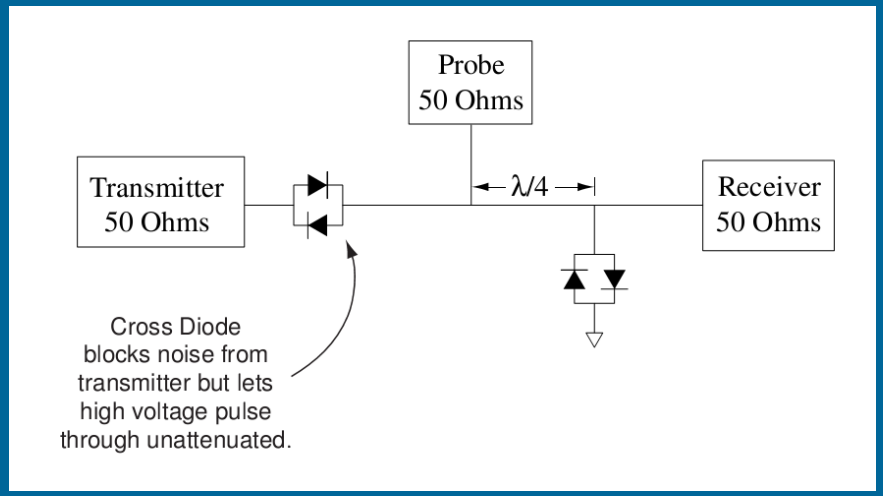
$$Z_0 = \sqrt{Z_s Z_l}$$



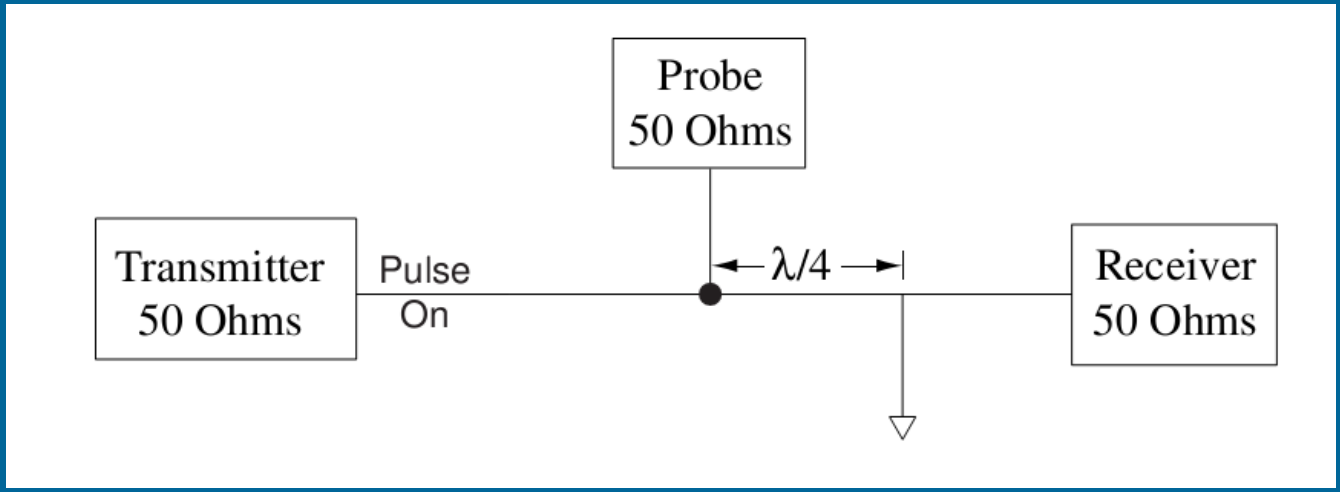


http://grandinetti.org/Teaching/Chem824/Notes

Duplexador

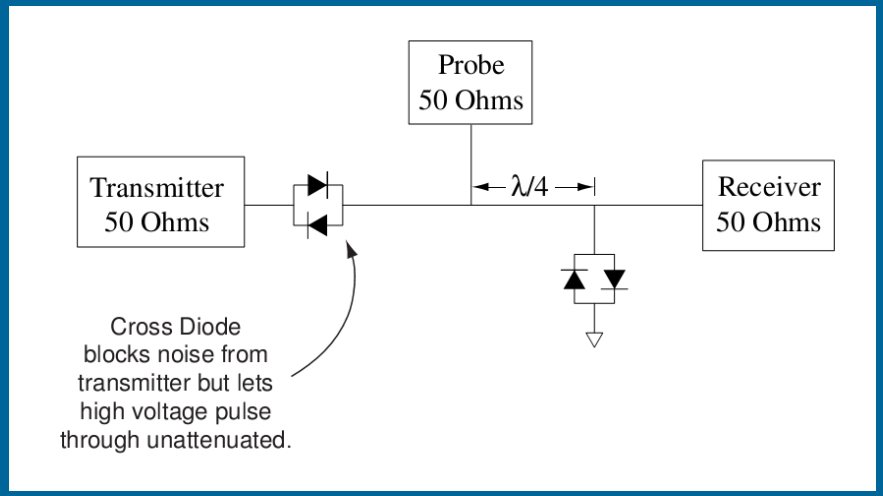


Pulso “On”:

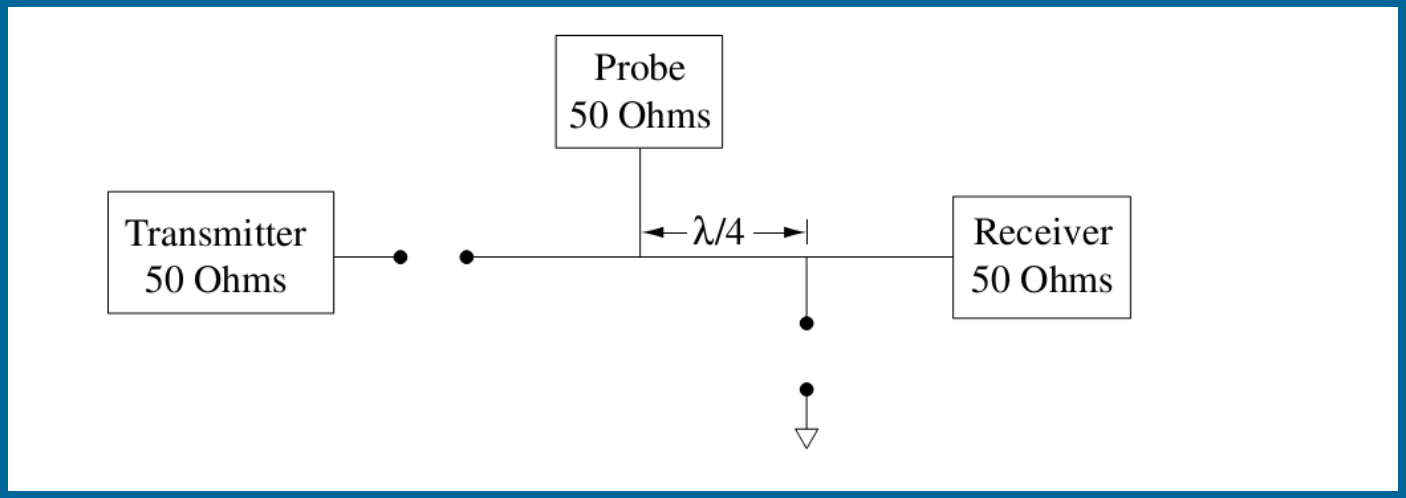


http://grandinetti.org/Teaching/Chem824/Notes

Duplexador



Pulso "Off":



http://grandinetti.org/Teaching/Chem824/Notes

Sonda de RF (“probe”)

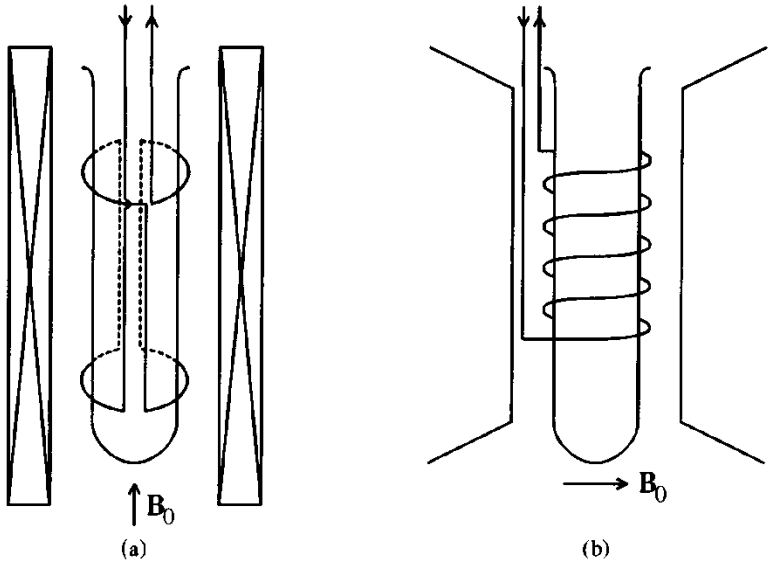
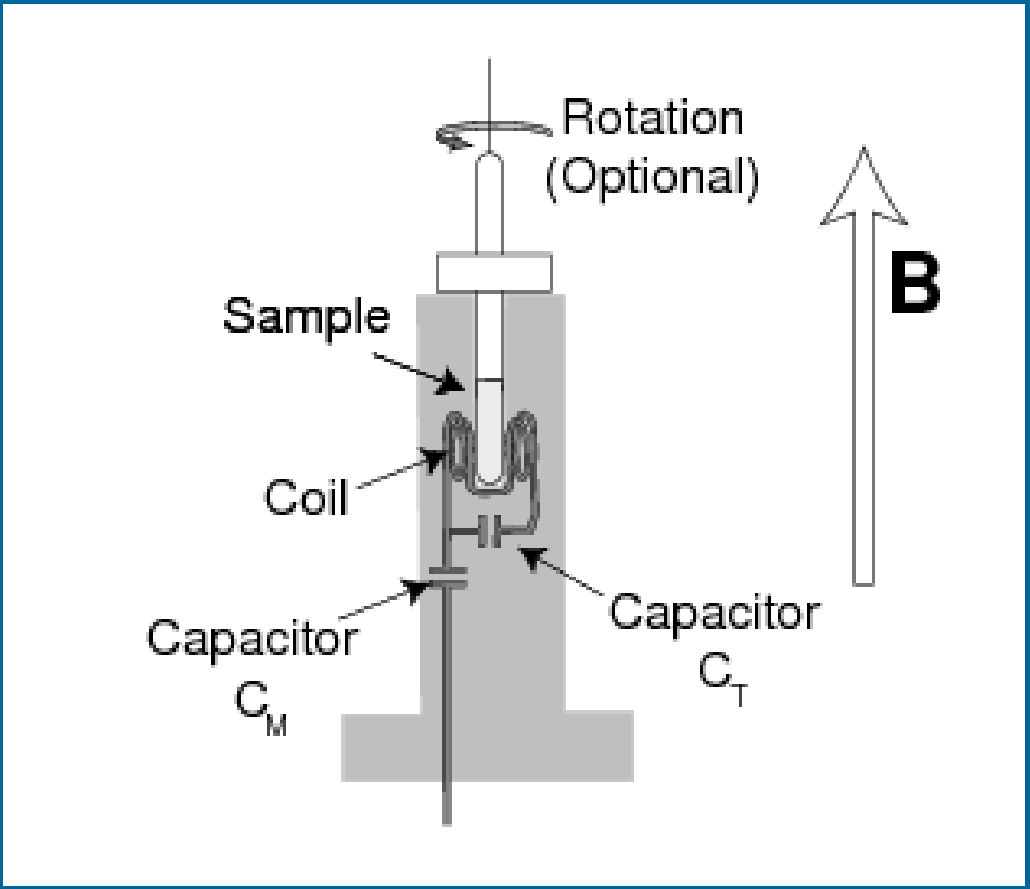


Figure 3.7 Sample coil configuration for use in superconducting solenoids and iron core electromagnets: (a) superconducting solenoid; (b) iron core electromagnet.

“NMR and relaxation”, Cowan. Cambridge University Press, 1997.

Sonda de RF (“probe”)

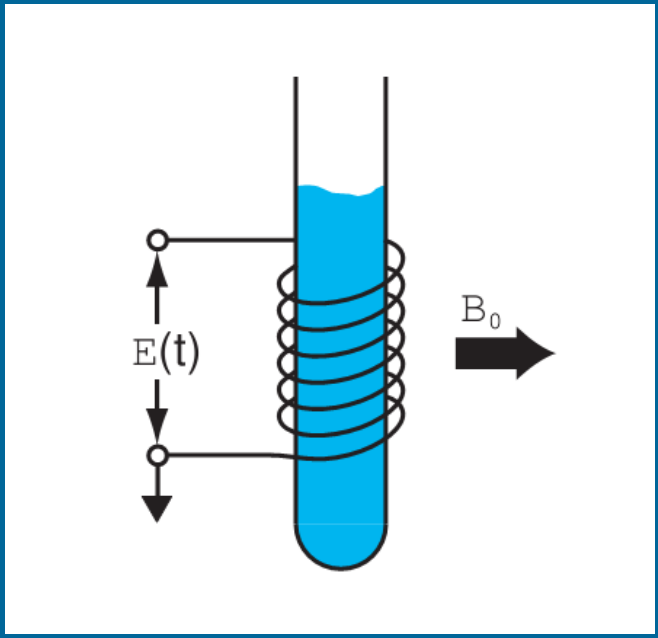


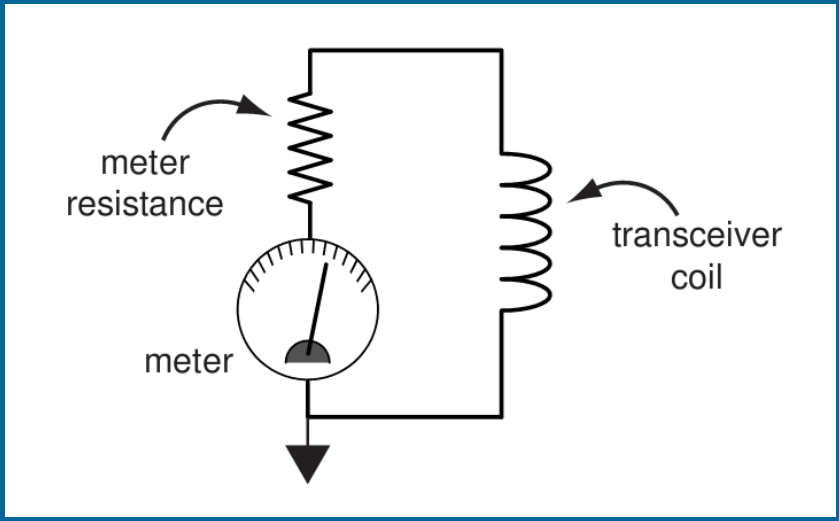
“Spin dynamics”, M. H. Levitt. John Wiley & Sons, 2002.

Sonda de RF (“probe”)

Sonda de ressonância dupla

Sonda de RF (“probe”)

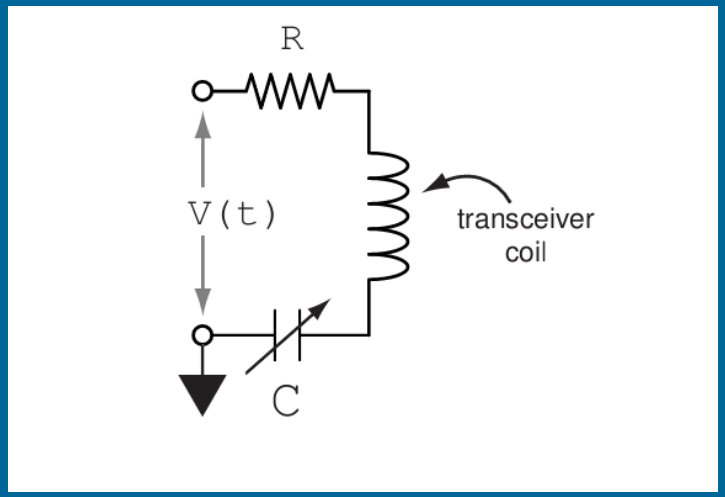




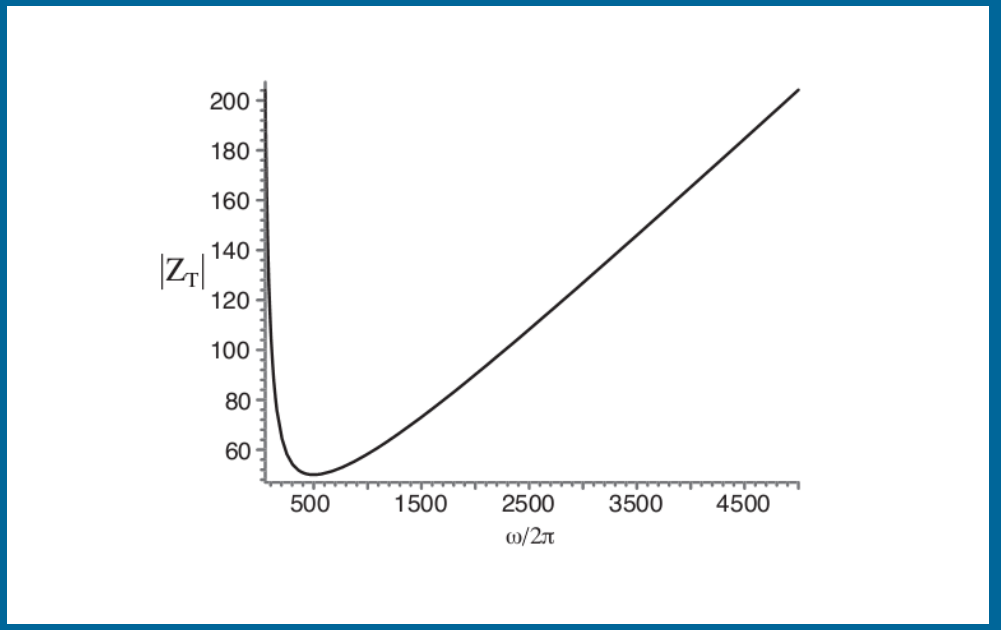
http://grandinetti.org/Teaching/Chem824/Notes

Sonda de RF (“probe”)

Circuito RLC:



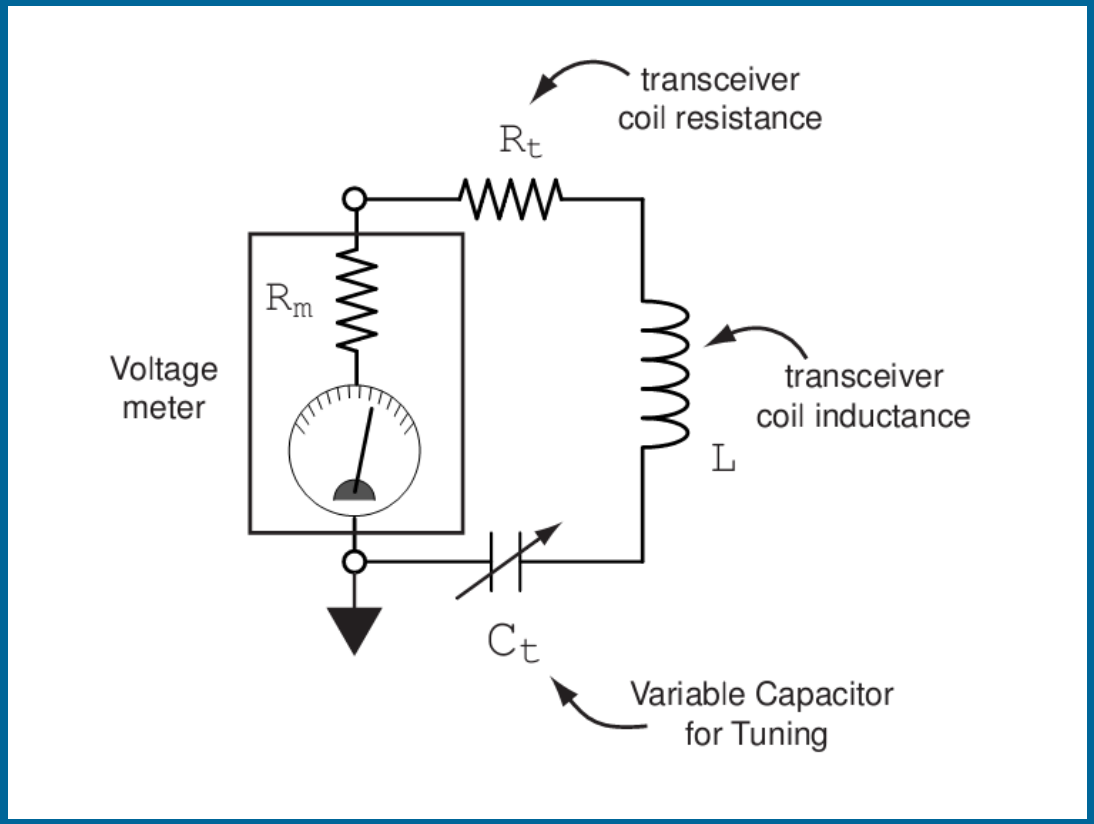
$\omega_0 = 1/\sqrt{LC}$ *(ressonância elétrica)*



http://grandinetti.org/Teaching/Chem824/Notes

Sonda de RF (“probe”)

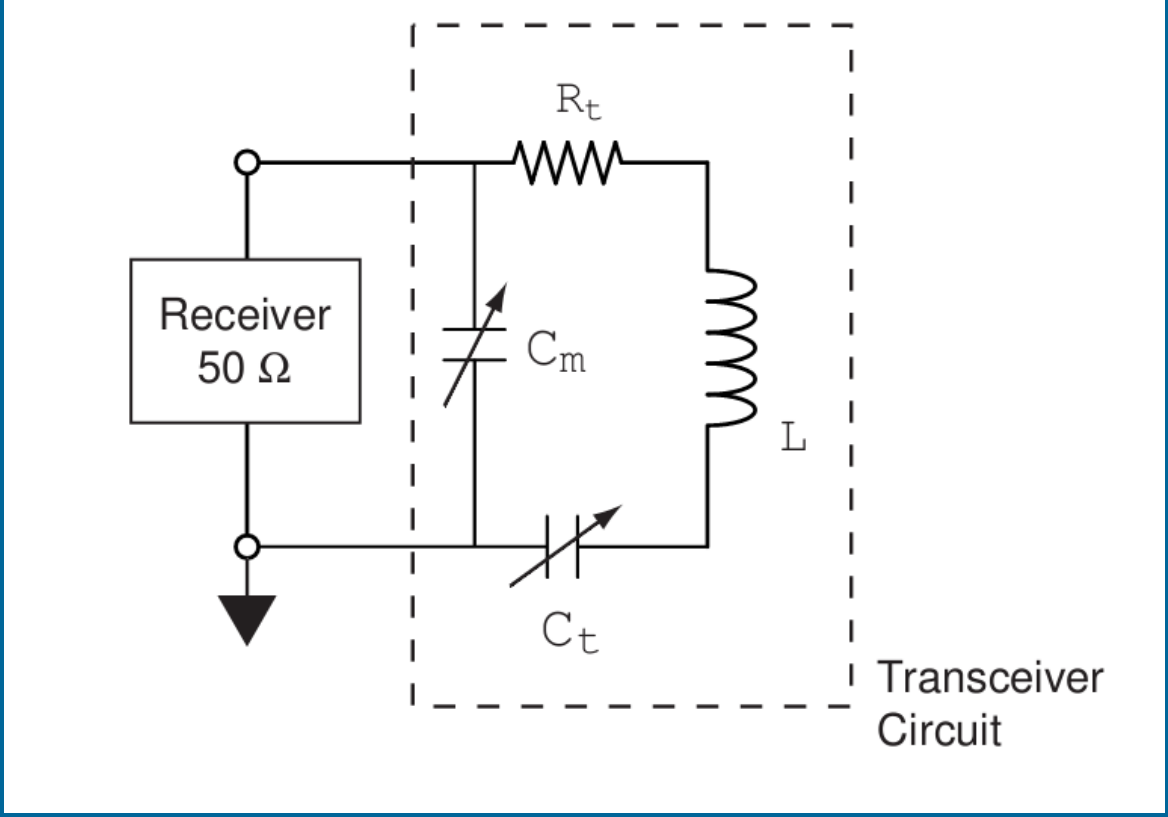
Sonda sintonizável:



http://grandinetti.org/Teaching/Chem824/Notes

Sonda de RF (“probe”)

Sonda sintonizável (circuito “tanque”):



$$\frac{1}{Z_T} = i\omega C_m + \frac{1}{R_t + i\left(\omega L - \frac{1}{\omega C_t}\right)}$$

http://grandinetti.org/Teaching/Chem824/Notes

Sonda de RF ("probe")

Sonda de dupla ressonância:

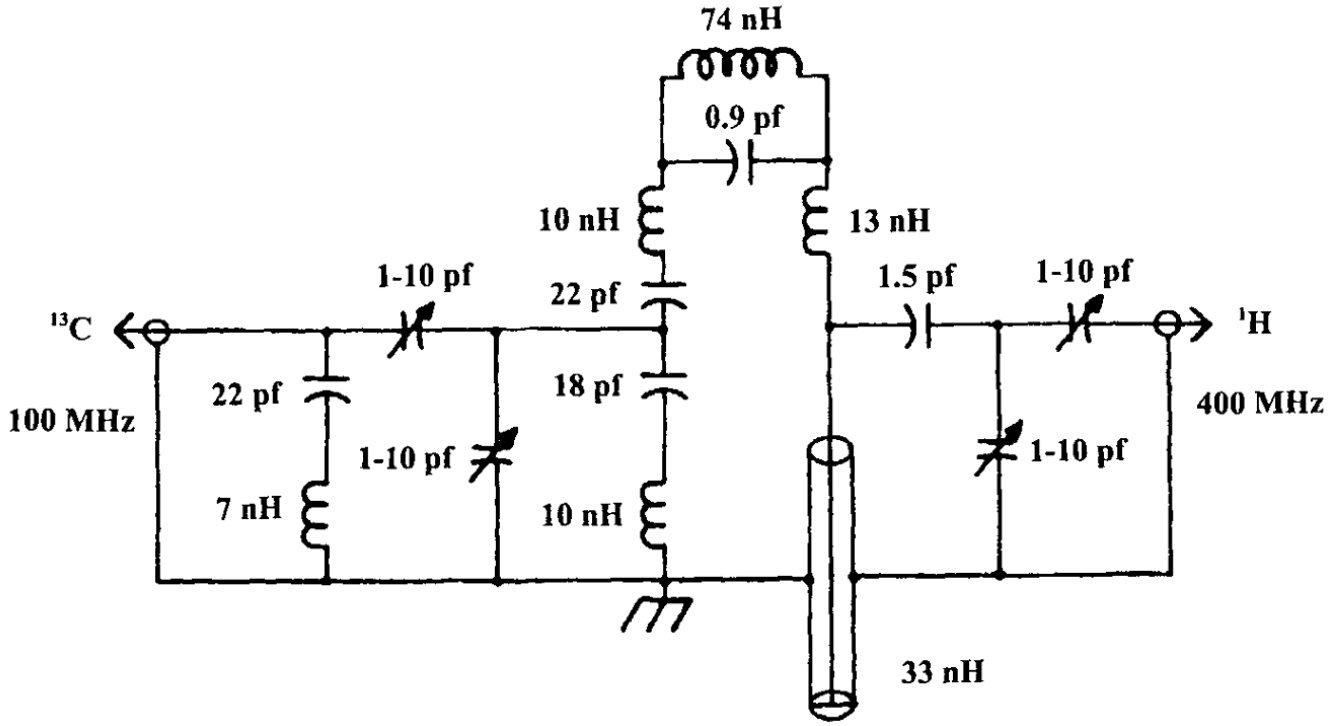
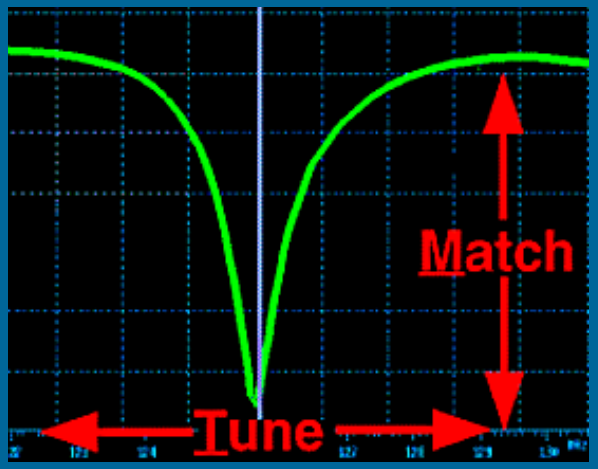


Figure 3.6. Typical circuit of a doubly resonant probe from Doty *et al.* (1988) with permission of the copyright owner.

"Multinuclear solid-state NMR of inorganic materials", Mackenzie & Smith. Pergamon, 2002.

Sonda de RF (“probe”)

Sintonia:



http://triton.iqfr.csic.es/guide/nmr/manual/2c_prelim.html

Tuning Controls

The tuning controls for the AutoSwitchable and ATB probes extend from the bottom of the probe base. Shown in Figure 1 is the base of the AutoSwitchable. The base of the ATB is similar.

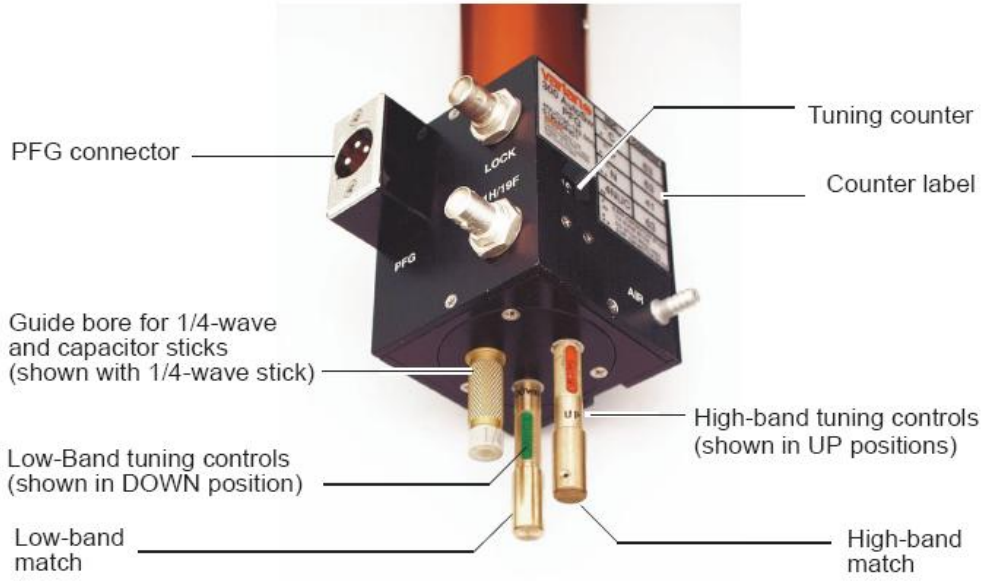
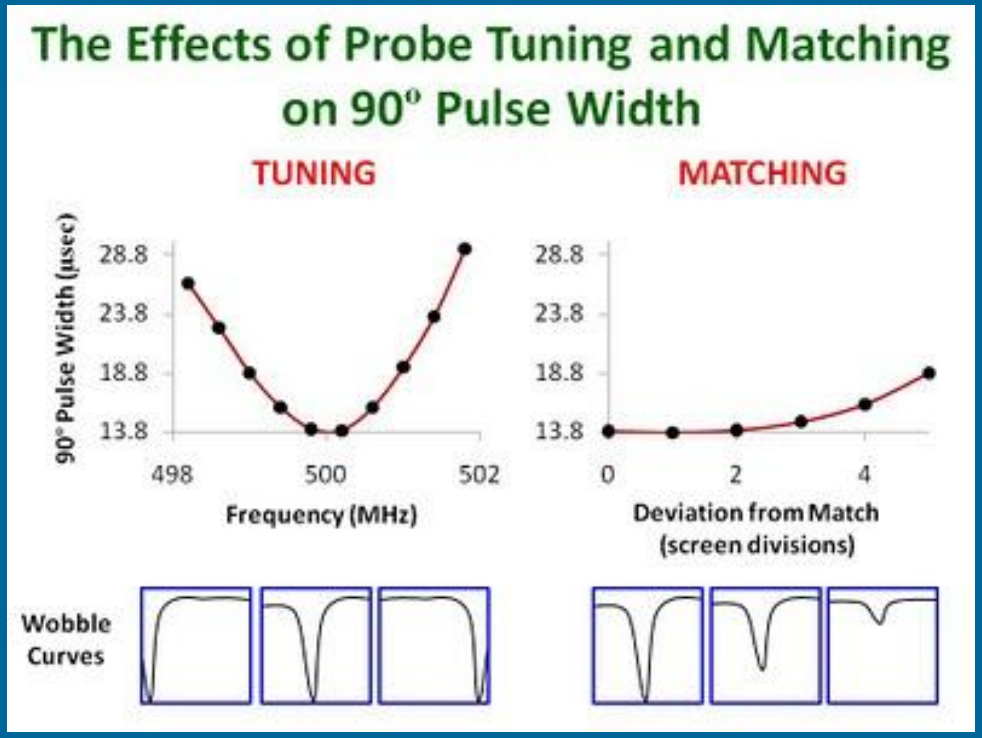


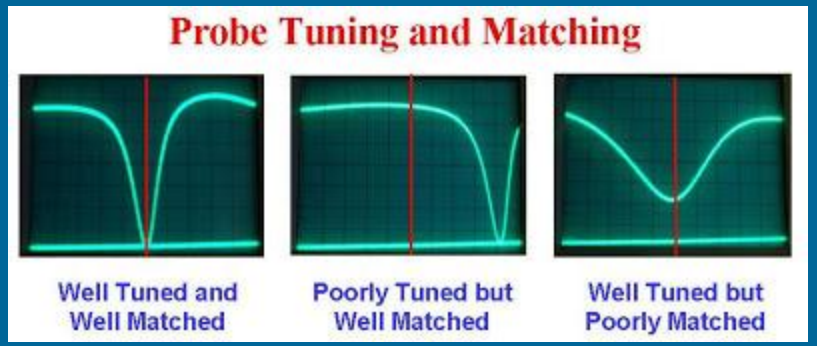
Figure 1. AutoSwitchable PFG Probe Tuning Controls And Connectors

http://web.chem.ucsb.edu/~nmr/protocols/NMR400_ATB.html

Sonda de RF (“probe”)

Sintonia:





http://u-of-o-nmr-facility.blogspot.com

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- “Nuclear magnetic resonance and relaxation”, B. Cowan. Cambridge University Press, 1997.
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