

Varian's T3™ Technology

Redefines MAS Probe Performance



The Challenge

The push to higher field, and hence higher frequency, for solids NMR has led to a loss of efficiency in RF performance. At the same time, higher field magnets have put a premium on bore size, with the result that probe diameter shrinks.

The Cause

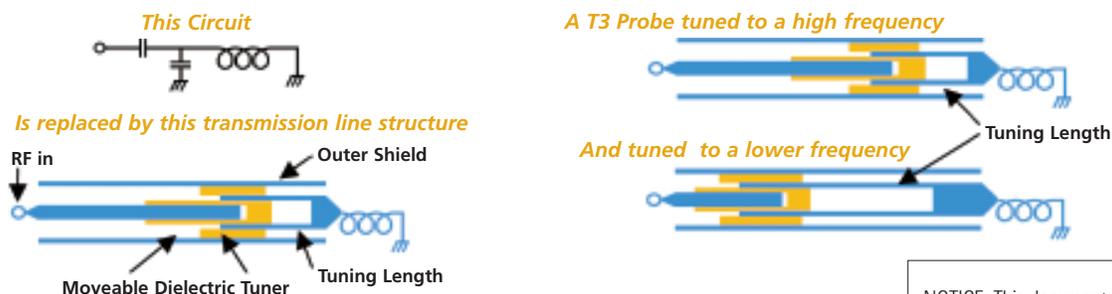
In order to obtain both short π pulse widths and short probe ringdown, Solids NMR has relied on high RF power. This has required physically large capacitors to be positioned in the high magnetic field next to the sample. These capacitors show more and more inductance with increasing frequency. This results in reduced efficiency of the sample coil.

The T3 Solution

Varian's solution to the problem is its innovative T3 (Transmission Tuning Tube) technology. Roughly the same efficiency as the traditional LC circuit in a 400 WB probe, this design becomes far more efficient at higher frequency, or where space is at a premium.

Replacing the tune and match capacitors with a transmission line approach improves efficiency and moves bulky components from the valuable bore real estate. The issue remaining is that of making this a broadband solution.

Broadband tuning is achieved by interchanging tuning tubes, each tuneable over a range of frequencies.



The Benefit

- The efficiency of T3 is apparent in its pulse width specifications. The achievable numbers are independent of ^1H frequency. This translates into strongest decoupling field strengths and shortest $\pi/2$ pulse widths.
- The transmission line approach ensures seamless tuning from ^{31}P to ^{15}N . Simply select the tuning tube of the correct range - tune and match are assured.

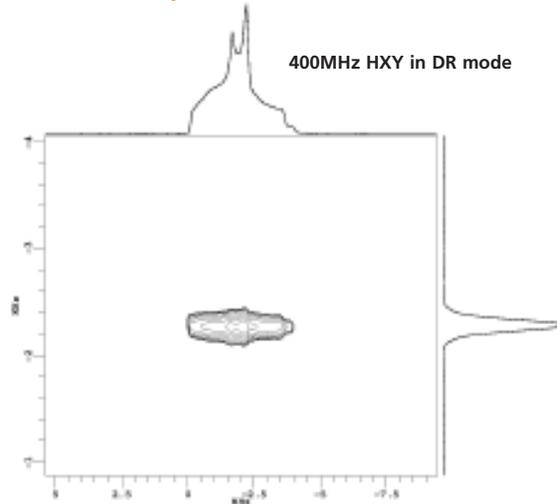


- The transmission line makes the addition of multiple frequencies straightforward. Quad resonance probes are standard, with even more frequencies possible.
- As the space requirement in the magnet bore is primarily dictated only by the number of tuning tubes, probes maintain the same high performance characteristics irrespective of bore size - narrow bore probes share the efficiencies.



- Just as resonances can be added, so in the triple probe they can be removed to give the highly efficient, unique DR mode. This means that there is little performance loss when it is needed.

MQMAS of Sodium Oxalate.



- Most "acoustic ringing" at low frequencies comes from tune and match capacitors being in the high magnetic field. As there are none in the T3 design, ringing is minimized.
- Tuning extension below ^{15}N is as simple as adding an optional low gamma accessory. Almost all NMR sensitive nuclei become available.

