

## DEAR COLLEAGUE:

It seems strange to realize that the last conference we traveled to was in March 2020. It felt like we went home to a different world. While dealing with Covid here in South Carolina, not traveling, and with our work interrupted at times by Covid's rough hand, important things have been happening at Doty Scientific.

There were exciting new developments in dual frequency MRI RF coils. There were also new developments in several NMR probes. Some of these advances were presented in a webinar at the Virtual 2021 ENC. [Click here to view the webinar slides.](#)

We published a paper in JMRO, "*New insights from broadband simulations into small over-moded smooth and corrugated terahertz waveguides and transitions for NMR-DNP*",

<https://doi.org/10.1016/j.imro.2020.100009> plus we received a NIH grant to continue our work on

## In This Issue

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microwave waveguides.

Another exciting event, our new JEOL 500MHz NMR Console has been installed and will greatly facilitate quad channel MAS probe advances.

Also, at the virtual ENC, Paul Ellis presented a [poster on SAS-PFG probe](#) development.

We miss seeing you. We hope you are safe and well, and that we will see you again soon.

David and Judy Doty

## Dual Frequency MRI Coils $^1\text{H}/\text{X}$ and $^1\text{H}/^{19}\text{F}$

Dual-frequency MR Coils enable MR spectroscopy and imaging techniques, including hyperpolarized nuclei. Detailed full-wave simulations ensure the highest sensitivity, homogeneity, and isolation between channels. B1 field maps and SAR maps included with each coil. Flexible design can be customized for your application and MR system.



65 x 52 mm  $^1\text{H}/\text{X}$  Dual Frequency Coils

- Efficient, easy to tune and match over a broad range of sample loadings.
- Each channel for TxRx.
- For observe / decouple – with both channels simultaneously.
- For interleaved acquisitions - with each channel used sequentially.
- Robust design, mechanical stability.

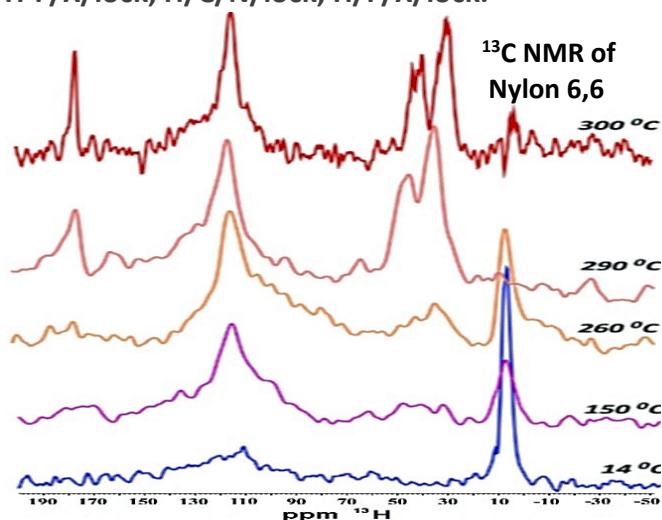
Examples of recent dual-frequency coils we have supplied (*ID x RF length*):

- 65 x 52 mm,  $^1\text{H}/\text{X}$ , [ $\text{X} = ^{13}\text{C}$ ,  $^{15}\text{N}$ ], @ 3 T; 1.5 T; 1 T; 0.5 T; and 0.3 T.
- 45 x 36 mm,  $^1\text{H}/\text{X}$  [ $\text{X} = ^{31}\text{P}$ ,  $^{13}\text{C}$ ], @ 7 T.
- 38 x 34 mm,  $^1\text{H}/\text{X}$ , [ $\text{X} = ^{31}\text{P}$ ,  $^{13}\text{C}$ ], @ 9.4 T.
- 25 x 22 mm,  $^1\text{H}/\text{X}$ , [ $\text{X} = ^{31}\text{P}$ ,  $^{13}\text{C}$ ], @ 9.4 T.
- 25 x 22 mm,  $^1\text{H}/^{13}\text{C}$ , @ **14.1 T**.
- **200 x 160 mm**,  $^1\text{H}/^{23}\text{Na}$ , @ **4.7 T**.
- 38 x 55 mm,  $^1\text{H}/^{19}\text{F}$ , @ 7 T.
- Surface Coil 16 mm,  $^1\text{H}/^{15}\text{N}$ , @ 7 T.

## High Temperature HR Liquids and PFG Probes



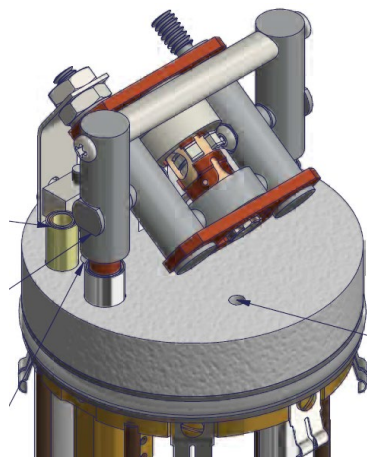
- Extended Temperature (XVT) to **+300 °C**  
For liquid samples including macromolecules
- With water cooled Z-gradient.
- Pulsed gradient >1000 G/cm.
- 5 mm sample coil
- Many tuning options: H/X/lock, H-F/X/lock, H/C/N/lock, H/F/X/lock.



The temperature dependence of the <sup>13</sup>C NMR of Nylon 6.6 was measured with a three channel (<sup>1</sup>H-<sup>19</sup>F/X/<sup>2</sup>H Lock) 600 MHz NB high temperature Doty PFG probe.

The peak near 10 ppm is from the silicone oil which surrounded a nylon screw. The oil was displaced by the nylon when it melted above 264C (and ran down, filling the sample window), and then the narrowed lines from the liquid nylon become prominent.

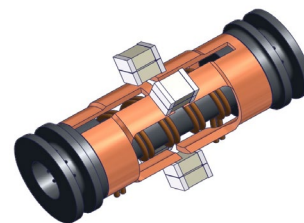
## High Temperature Ultra-Range MAS probes



### Widebore HT Ultra-Range

- Widebore 4, 5, or 7 mm Ultra-Range  
Thin-wall metal dewar enclosure  
Hot/cold zone limited to spinner region
- Broad High Temperature Range  
5 mm: 10 kHz MAS at **+500 °C**  
7 mm: 7 kHz MAS at +350 °C
- Broad Tuning Range <sup>31</sup>P to <sup>103</sup>Rh  
<sup>1</sup>H/X or <sup>1</sup>H/X/Y  
Highly optimized rf circuitry  
see **Doty, Concepts Magn. Reson., 2019.**
- 300 MHz to 750 MHz

### Two-coil RF – Inner solenoid



- **Outer Low-E coil**, 300-750 MHz, high efficiency with long leads, for short pulses & high decoupling
- **Inner solenoid** for X or X/Y with high efficiency and max S/N