

ENC 2021 Doty Webinar



2021

WELCOME TO OUR WEBINAR



F. David Doty



Paul Ellis



Laura Holte



We Were Hoping to Meet You Here



1. Over-view: NMR probes: MAS, WL, Liquids.

MRI products: volume and surface coils, ^1H , $^1\text{H}/\text{X}$, $^1\text{H}/^{19}\text{F}$

Laura Holte

2. In More Detail: Ultra-range MAS, up to **+500 °C**.

HT PFG and Liquids, up to **+300 °C** .

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

F. David Doty

3. Product Development, SAS-PFG: highlights of Technical Poster.

Paul Ellis



1. NMR probes for NB or WB

– *Laura Holte*

MAS probes:

- Low-E ^1H coil, for minimal sample heating; H/X, H/X/Y, H/F/X, ^1H tunable to ^{19}F , option for Magic Angle Gradient (MAG) coil.
- Quad MAS: H/X/Y/Z and H/F/X/Y

Non-spinning (Wideline) probes: 3, 4, 5, 7, 8, or 10 mm sample coils.

Liquids Probes:

- with sample coils from 5 mm to 25 mm
- with Z-gradient coil for diffusion measurements (up to 3300 G/cm)

Compatible with Agilent, Bruker, JEOL, Q.One, and Tecmag.

3, 4, 5 and 7 mm MAS

Conventional solids probes are a cornerstone of many solids research programs. Doty offers many robust features and easy to spin rotors.

- **H-F/X and H-F/X/Y broad-band tuning with maximum performance.**
- **Widest sample-temperature ranges.**

NB options from -170°C to $+150^{\circ}\text{C}$

WB options from -170°C to $+250^{\circ}\text{C}$, **$+500^{\circ}\text{C}^*$**

- RF coils can be solenoid only, or solenoid + a **low-E ^1H coil.**

Spinner assembly	Max speed
3 mm DI-3	28 kHz
4 mm DI-4	18 kHz
4 mm XC4	22 kHz
5 mm XC5	18 kHz
7 mm XC7 (WB only)	12 kHz

Patented Low E ^1H coils



Doty 4 mm
MAS with B_{\max}
low-E ^1H coil.

Low E Fields since 1997, via patented cross coil (inner coil) or DE coil (outer coil).

Lower decoupler heating *by an order of magnitude* compared to solenoid-only.

For NB and WB, available with:

- $^1\text{H}/\text{X}/\text{Y}$ – Double-broadband X & Y channels
- $^1\text{H}/\text{X}$ – broadband X channel
- ^{19}F tuning options: $^1\text{H}-^{19}\text{F}$, or $^1\text{H}/^{19}\text{F}$, $^1\text{H}/^{19}\text{F}/\text{X}$
- Option for **Magic Angle Gradient (MAG)**, for up to 450 G/cm

The Doty Quad MAS probe



4 efficient high power channels:

$^1\text{H}/\text{X}/\text{Y}/\text{Z}$ OR

$^1\text{H}/^{19}\text{F}/\text{X}/\text{Y}$ - *with dedicated ^1H and ^{19}F channels for ^1H and ^{19}F operation simultaneously.*

Extended VT Range option, for ± 150 °C.

3 mm spinner or smaller (1.3 mm soon).

WB or NB Probes.

Wideline Probes for solids

Wideline



Standard sizes: 3 mm, 4 mm, 5 mm, 7 mm, 8 mm, or 10 mm (WB only) sample diameters

Wide-bore or Narrow-bore probes

RF tuning options: ^2H only, $^1\text{H}/\text{X}$, $^1\text{H}-^{19}\text{F}/\text{X}$, $^1\text{H}/\text{X}/\text{Y}$, $^1\text{H}-^{19}\text{F}/\text{X}/\text{Y}$;
2-3 μs 90 degree pulses available for 4 and 5 mm coil sizes.

VT ranges:

-80 °C to 120 °C standard VT for Narrow-Bore

-110 °C to 250 °C, extended VT for Narrow-Bore

-110 °C to 150 °C standard VT for Wide-Bore

-110 °C to 320 °C, extended VT for Wide-Bore

Double resonance with multinuclear observe

Triple resonance

Liquids NMR Probes with Z gradient

Liquids Diffusion



- Sample diameters from 5, 10, 15, and 20 mm H/X/N/lock
- Sample VT range to +160 °C, **+300 °C***
- **Highest strength gradients, Minimal eddy currents**
- Air-cooled or water-cooled gradient coil.
- **Up to 3300 G/cm pulsed gradient.**
- Measure the lowest diffusion coefficients - to $10^{-15} \text{ m}^2/\text{s}$
- **$^1\text{H}/\text{X}$, direct or indirect.**

HR Liquids



DOTY MRI coils

– *Laura Holte*

**MRI Volume
Coils with
Superb
Homogeneity
and S/N**



MRI RF Volume Coils

- ^1H or Dual Frequency: H/X* or H/F*, with patented Litz (linear) or Litzcage (CP) RF coils.
- Much Easier Tuning
- B_1 Homogeneity Is Typically 10-40% Better
- Significant B_0 Homogeneity Advantage in Small Coils.
- SNR Is At Least 10% Higher – Up To 30% Higher



DOTY quadrature ^1H Litzcage module, with active detuning for surface coil receive.

Vs. conventional similar CP birdcages



Small Animal Imaging Platforms

**Linear and quadrature Litz coils are easily tuned and matched.
The coil (supported by a coil form) is attached to a support tray.
The removable rf shield allows full access to the coil.**





Small Animal Imaging Platforms

Open, accessible coils for easier small animal placement,
 ^1H or dual frequency.

3 T 4.7 T 7 T 9.4 T 11.7 T

Standard Coil Sizes:

25 mm

38 mm

50 mm

63 mm



Short, medium, and long coil lengths.

MRI Surface Coils

Hundreds of Surface Coil

**Options: ^1H , $^1\text{H}/^{13}\text{C}$, $^1\text{H}/^{31}\text{P}$, TxRx,
Rx-only, active detuning.**

Standard Sizes

8 mm

12 mm

16 mm

20 mm

24 mm

3 T 4.7 T 7 T 9.4 T 11.7 T

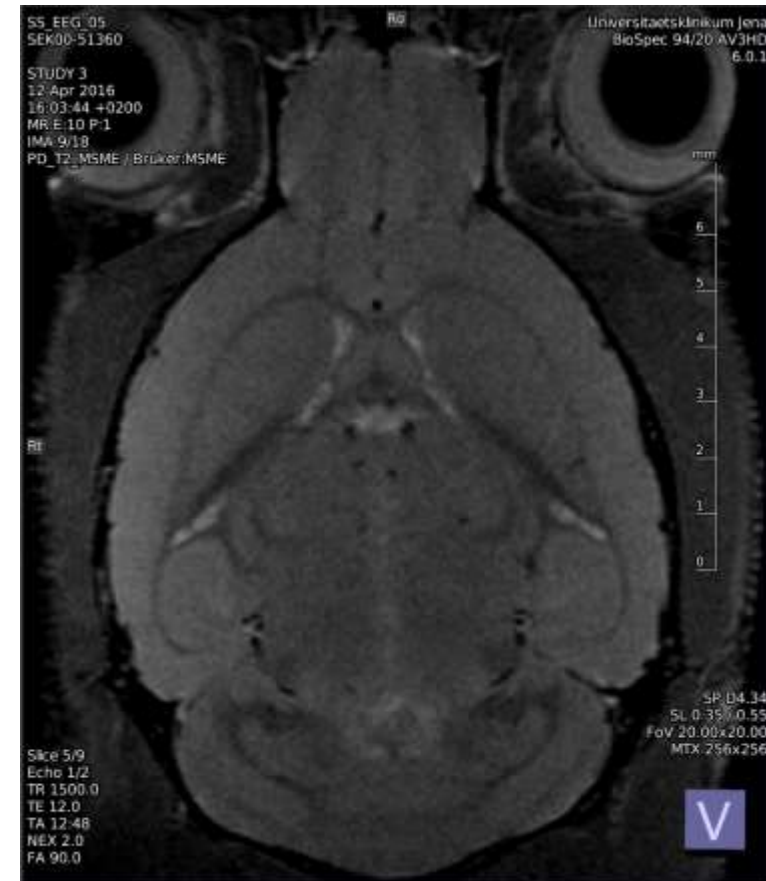


Curved MRI Surface Coils



The DOTY loop coil is 20 mm long x 16 mm wide, with a left-right curvature of radius 9 mm. Shown with user supplied animal bed.

Mouse Brain, T2 Coronal



Results from 9.4 T Bruker imager:
University Hospital Jena; Friedrich-
Schiller University, Jena, Germany.

Thank you for your attention



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