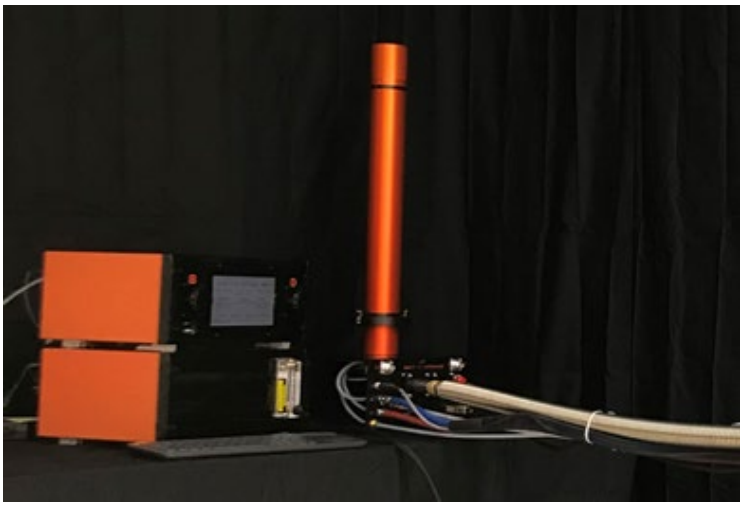
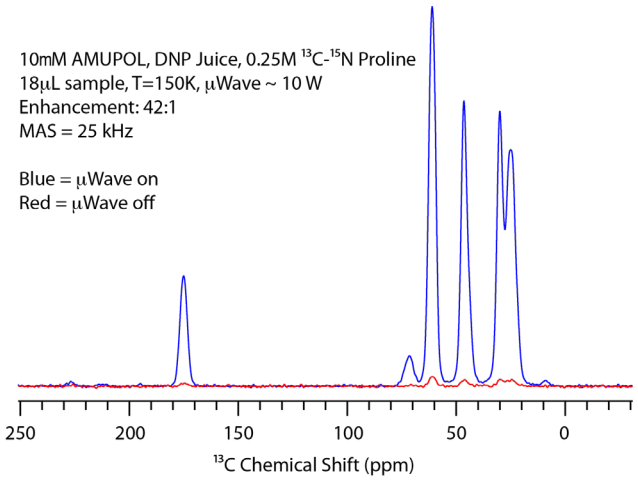
PHOENIXNMR
Elevating your science

PhoenixNMR Does DNP!

Dynamic Nuclear Polarization (DNP) signal-enhancement capability is now available in combination with innovative Phoenix Solid-State NMR (SSNMR) probe technology to expand the scope and sensitivity of biomolecular, pharmeucetical, and materials SSNMR research at 400-600 MHz. The new Phoenix MAS-DNP probe system utilizes the same robust, professional design strategy that scientists have come to expect in all Phoenix SSNMR probes and accessories. Bridge12 Technologies components pair with Phoenix probes and controllers to provide the full DNP system.



The PhoenixNMR MAS-DNP probe system: a) WB Quad Resonance HFXY probe, b) MAS controller, c) VT cryogenic and sample insert/eject controller, d) Cryogenic counter-flow heat exchanger. Not shown: 50-liter LN2 Dewar. The 50-liter Dewar provides ~36 hrs of operation at T = 90 K and can be refilled at any time.



^{13}C CP/MAS DNP enhancement of 42:1 was measured [1,2] using a PhoenixNMR 395 GHz/600 MHz DNP HFXY probe fitted with a 2.5 mm spinning module. Sample Temperature = 150 K at MASS = 25 kHz. The sample was prepared using 10 mM AMUPol biradical and "DNP Juice" = d_8-Glycerol/H_2O/D_2O in a 6/3/1 ratio.

- Add a new Phoenix DNP probe to expand capability on an existing DNP SSNMR instrument; or
- Add a Turn-key DNP System, including gyrotron, to an existing 9.4 – 14.1 T, Wide-Bore SSNMR instrument, pairing the robust PhoenixNMR probe technology with Bridge12 Technologies components to complete the DNP package;
- Combine DNP with HFXY and HFX probe configurations;
- Optional Probe Accessories allow low-gamma nuclei and/or simultaneous H/F operation;
- Operating Temperature Range is 90 K to 373 K (actual sample temperature is dependent on spinning speed);
- 2.5 mm MASS Module is available for spinning speeds up to 25 kHz;
- Insert and Eject Samples In-Situ at cold and warm temperatures;
- Modest up-front Costs beat other commercially-available DNP probe systems;
- Unique VT Design minimizes the use of cryogens to dramatically reduce operational costs.

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Full DNP Probe System from PhoenixNMR includes:

- PhoenixNMR DNP wide bore (WB) HFXY or HFX probe (low-gamma accessory, simultaneous H and F operation, and lock channel optional) including sample eject;
- PhoenixNMR MAS speed controller;
- PhoenixNMR VT cryogenic and sample insert/eject controller;
- 50-liter LN2 dewar, provides ~36 hours of operation per fill at 90 K, and can be refilled during operation;
- Bridge12 Technologies Waveguide utilizing corrugated waveguide sections and a Focusing Lens directed perpendicular to sample coil for maximum DNP efficiency;
- PhoenixNMR Cryogenic counter-flow heat exchanger.

Full DNP System from PhoenixNMR includes the above, plus:

- Bridge12 Technologies fastwave gyrotron operating at 263 GHz (for 400 MHz instrument) or 395 GHz (for 600 MHz instrument) and controller.

PhoenixNMR DNP Probe Performance*

Tuning Range

Quadruple Resonance Mode: **H:** ^{1}H and ^{19}F **X:** ^{31}P to ^{13}C **Y:** ^{23}Na to ^{15}N
Triple Resonance Mode: **H:** ^{1}H and ^{19}F **X:** ^{31}P to ^{15}N
Tuning on X can be lowered to ~15 MHz with optional Low Gamma box.
H channel can be tuned to simultaneously deliver ^{1}H/^{19}F power and/or observe ^{1}H/^{19}F with an optional probe accessory.

Spinning Module

Spin Rate: 5 kHz to 25kHz @ 90 K to 373 K (set temperature)
Stability: +/- 5 Hz or +/- 0.2%, whichever is larger, over 24 hrs
Sample Volume: 18 µL Active sample volume used for all NMR tests
VT Range: 90 K to 373 K
90 K @ 5 kHz Spin Rate, Sample T = 115 K
90 K @ 25 kHz Spin Rate, Sample T = 130 K

Resolution

Adamantane (^{13}C): 0.05 ppm FWHM, 0.2 ppm @ 10%, 0.35 ppm @ 2%

Signal to Noise (Glycine, Matched filter, 32 acquisitions, 293 K)

HFCN Mode 150:1
HFC Mode 170:1

RF Performance @ 90K and 300K:

Nucleus	pw90µs
^{1}H/^{19}F	2.5 µs (50 ms, 2% duty factor)
^{1}H & ^{19}F	2.8 µs (50 ms, 2% duty factor)
^{13}C	2.5 µs (10 ms, 2% duty factor)
^{31}P	2.5 µs (10 ms, 2% duty factor)
^{15}N	5.0 µs (10 ms, 2% duty factor)

*Probe Performance Specifications are quoted herein for a PhoenixNMR 395 GHz/600 MHz DNP HFXY probe fitted with a 2.5 mm spinning module, utilizing a Bridge12 Technologies gyrotron and waveguide. Other hardware configurations may result in different probe performance specifications. Request a quote for detailed specifications.

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