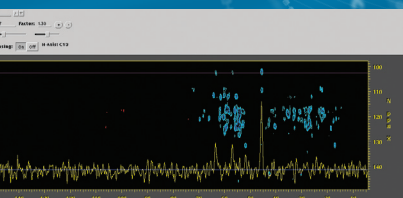


Agilent Solid State NMR Solutions

## HIGH-POWER TOOLS FOR SOLIDS SAMPLES

The Measure of Confidence



**Agilent Technologies**

# OPTIMIZE SOLID STATE NMR CAPABILITIES

Agilent Technologies delivers a comprehensive solution for demanding solid state NMR analysis with advanced probe technology, innovative software, and a robust console. As a result, you can overcome the challenging requirements of biosolids and materials analyses to achieve effective results with these complex samples.

## Exceptional Performance

Take advantage of Agilent's wide selection of probes for solid state NMR. Based on transmission tuning tube (T3) technology, Agilent's T3 probes offer exceptional sensitivity and RF power handling. They are simple to tune over the broadest range of NMR active nuclei, and provide easy sample spinning and stability over a broad temperature range.

## Maximum Efficiency

Agilent's most popular solids probes are available for use in narrow bore magnets with little compromise in performance. As a result, you can quickly and efficiently switch modalities between solids and liquids probes with minimal system downtime.

## Innovative Interface

VnmrJ is a versatile software environment that accommodates both experienced users developing complex pulse sequences and novice users who want to select from a comprehensive collection of ready-to-go pulse sequences designed for solids applications.

## Flexible Platform

Agilent DD2 consoles are the robust and flexible choice for NMR experiments. They feature fast, fully parallel operation with no hidden delays and include innovative technologies like advanced amplifier linearization.



The Agilent DD2 console and a 600 MHz Premium Compact magnet.

## Choose a Configuration that Suits Your Sample Needs

In order to achieve effective results, whatever your sample type, it is critical to have the right collection of components for your NMR system. The Agilent NMR platform contains a variety of probes, amplifiers, software, and accessories all focused on the needs of the solids NMR spectroscopist, with suggested configurations designed for biosolids or materials samples, or to add solids capability to a liquids system.

### Popular Biosolids, Materials, and Mixed Use NMR System Configurations

		TYPICAL SYSTEM REQUIREMENTS BY APPLICATION		
		BIOSOLIDS	MATERIALS	MIXED SOLIDS/LIQUIDS
Magnets	Narrow Bore 54 mm	•	•	•
	Wide Bore 89 mm	•	•	•
Amplifiers	Low Power, 100 W H, 300 W X/Y	•	•	•
	High Power, 800 + W H, 1 kW X/Y	•	•	•
T3 MAS, Probes	HX, 3.2 – 7.5 mm	•	•	•
	HXY, 1.2 – 4.0 mm	•	•	•
	HXY BioMAS 3.2 mm	•	•	•
	HFX, 1.6 – 4.0 mm	•	•	•
Other Probes	FastNano	•	•	•
	Static and BioStatic	•	•	•
Accessories	Low-γ Upgrade for T3 Probes	•	•	•
	VT Gas Preconditioner	•	•	•
Software	VnmrJ	•	•	•
	SolidsPack	•	•	•
	BioSolids Pack	•	•	•
	STARS	•	•	•

\*Magic angle spinning (MAS)

# OVERCOME BIOSOLIDS CHALLENGES

## High Salt Content

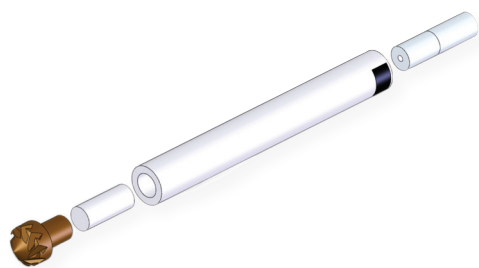
Protein samples are often highly ionic and very delicate at the same time. They cannot withstand the powerful electric fields generated by conventional NMR probes, which heat ionic samples and cause structural degradation. Agilent BioMAS probes overcome this issue using unique coil geometry.

## Small Quantities

Sometimes it is extremely labor intensive to synthesize even a few microliters of your protein sample for biosolids analysis. Agilent's 1.2  $\mu$ L, 1.2 mm rotor solves this problem by ensuring the best filling factor for small sample quantities.

## Complex Structures

Biosolids samples are by definition quite complicated, requiring high spinning speeds and complex multi-pulse experiments to gain useful insight. BioSolids Pack, a collection of double and triple resonance sequences used in conjunction with Agilent T3 probes, enables complex experiments to be performed with minimal up front setup. In addition, you can efficiently go from data collection to processed results using VnmrJ in conjunction with NMRPipe.



The Agilent 4 mm magic angle spinning sample rotor.

## Pencil Spinning Technology

Used in all Agilent's solid state magic angle spinning (MAS) probes, Pencil spinning technology allows solid and liquid samples to be spun at high speed. A range of Pencil rotors are available in diameters ranging from 1.2 to 7.5 mm.

### ADVANTAGES

- Robust long rotor design for exceptionally stable spinning. Spacers ensure the sample sits in the optimum RF region where B1 homogeneity is highest.
- Stable sample spinning over a wide temperature range since temperature control gas is independent and well separated from drive and bearing gases.

## Tools Focused on Biosolids Analysis

### Probes for Biosolids

#### T3 BIOMAS

The T3 BioMAS probe is designed specifically for work on solid state biological samples. Featuring scroll coil technology to minimize RF heating in high salt content samples, the scroll coil has the added benefit of unsurpassed RF homogeneity which is vital for complicated pulse sequences.

### Probes for Solids and Liquids

#### T3 HXY

A powerful range of triple resonance probes for both narrow and wide bore magnets, with spinning modules from 1.2 to 4 mm. T3 technology ensures the probe is very easy to use, and delivers exceptional power handling and sensitivity. T3 HXY probes are a versatile choice for both biosolids and materials work at moderate to fast spinning speeds.

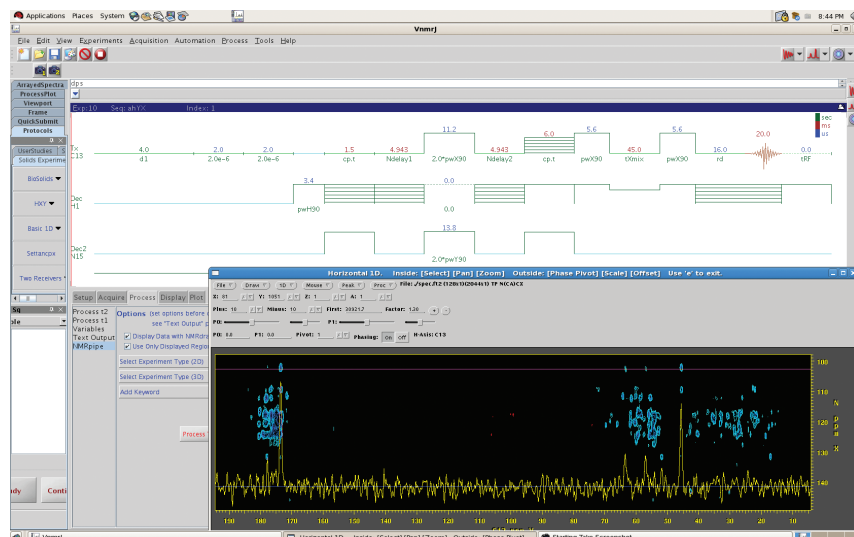
#### FASTNANO

Designed for semi-solid samples, the FastNano is an indirect detection liquids probe platform with a 10 kHz MAS spinning module. A lock circuit and Z pulsed field gradient are also included. The FastNano probe is ideal for liquids applications where residual anisotropic broadening needs to be removed.

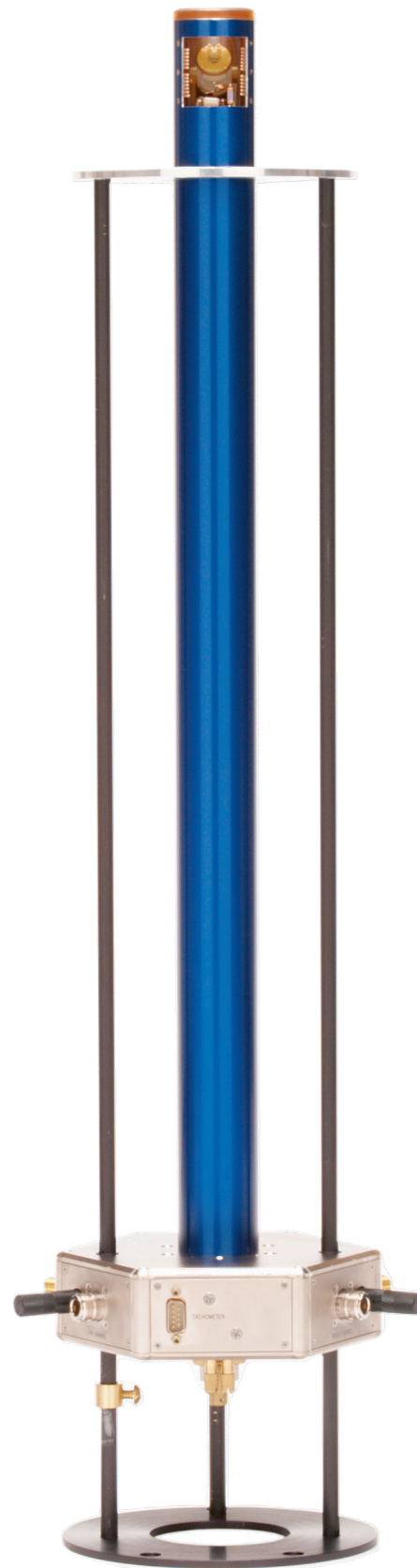
### Software

#### BIOSOLIDS PACK

Working together, BioSolids Pack and VnmrJ software provide a comprehensive package of pulse-sequence experiments for the structural determination of biological solid-state proteins. BioSolids Pack's compatibility with BioPack's automated workflow and auto calibration features allow experiments to be setup quickly and efficiently.



BioSolids Pack and VnmrJ.



The Agilent T3 MAS probe platform.

# BYPASS MATERIALS CHALLENGES

## Strong Interactions

Short high power RF pulses and fast spinning speeds are crucial for many materials NMR studies where the presence of strong interactions between spins can spread signal over a wide range. Agilent T3 probes have been designed with excellent power handling capabilities and are offered with a range of fast spinning rotor sizes to overcome the strong interactions of materials samples.

## Exotic NMR Nuclei

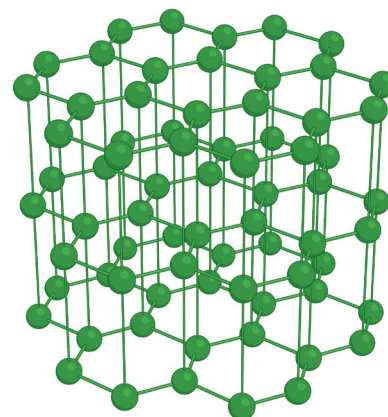
It is possible to study a wide range of NMR nuclei using solid state NMR, but their specific physical properties can present a number of obstacles.

Nuclei with low natural abundance generally require larger sample quantities to acquire signal in a timely manner. The Agilent 450  $\mu\text{L}$ , 7.5 mm rotor is well matched to address this requirement.

Nuclei with a low gyromagnetic ratio can be inaccessible using conventional NMR probes. T3 probes make easy work of this when combined with the Agilent low- $\gamma$  tuning accessory.

## Temperature Control

Accurate regulation of sample temperature is critical for observing the effect of different temperatures *in situ*. Agilent's Pencil spinning module technology employs an independent VT gas to ensure optimal temperature control over a wide range.

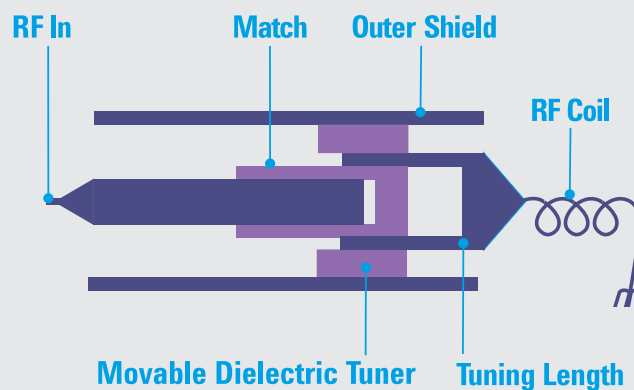


## T3 Probe Technology

Agilent's T3 probes feature transmission tuning tube (T3) technology which replaces the conventional tune and match capacitors with a transmission line structure that has a range of benefits for solid state applications.

### ADVANTAGES

- Extraordinary RF power delivery
- Seamless tuning from  $^{31}\text{P}$  to  $^{15}\text{N}$
- Removal of ceramic tune and match capacitors minimizes probe ringing



## Tools Designed for Materials Analysis

### Solids Probes

#### T3 HX 3.2 – 7.5 MM

A great choice for routine solids work requiring only single or double resonance experiments, the HX probe is a workhorse solution that combines ease of use with excellent sensitivity and unmatched power handling. A range of spinning rotors is available to minimize the background signals of different nuclei. For faster spinning speed or triple resonance work, consider the T3 HXY probe.

#### T3 HFX 1.6-4 MM

Agilent HFX probes build on the proven HXY platform by incorporating a separate  $^{19}\text{F}$  channel. They are ideal for fluoropolymers, fluorine containing pharmaceutical products, and biosolids samples.

The HFX probe is available for both narrow and wide bore magnets. It offers exceptional flexibility with the added option of operation in HXY, HX, and HFX modes. Whichever configuration the probe is operated in, setup is easily performed using VnmrJ visual tuning functions.

### Software

#### SOLIDSPACK

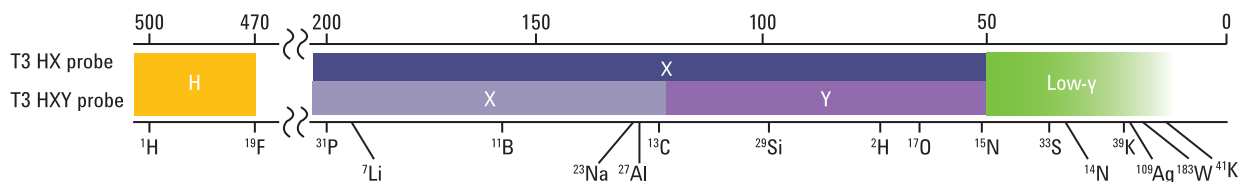
SolidsPack is a comprehensive collection of over 100 pulse sequences, encompassing all areas of solid state NMR, that can be used straight out of the box.

The building blocks of these sequences can also be used to create new specialized experiments via an intuitive programming interface that requires minimal effort.

### Accessories

#### LOW- $\gamma$

Expand your access to low frequency NMR nuclei below  $^{15}\text{N}$  by simply attaching the low- $\gamma$  accessory onto your T3 probe. Installation and operation are quick and simple. Probe ringdown is minimal because the tune and match capacitors are located at relatively low magnetic field strengths inside the low- $\gamma$  accessory box.



Extend the tuning range of T3 probes using the low- $\gamma$  accessory.

Learn more

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Asia Pacific

**[inquiry\\_lsca@agilent.com](mailto:inquiry_lsca@agilent.com)**

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