Nuclear Magnetic Resonance Spectrometer CAN600

Nuclear Magnetic Resonance (NMR) Spectroscopy is a powerful analytical technique used primarily to determine the structure of organic compounds, study molecular dynamics, and analyze the composition of various substances. It leverages the magnetic properties of certain atomic nuclei to provide detailed information about the physical and chemical properties of the atoms or molecules in which they are contained.

Product Introduction

CAN600 is an intelligent liquid-state NMR spectrometer. The instrument consists of a 600 MHz superconducting magnet with high homogeneity and ultra-shielding, a console with advanced distributed architecture and modular integration, a probe with high sensitivity and fully automated tuning capacity,and other advanced accessories.

CAN600 includes multiple highly integrated RF transceivers. The new algorithms optimize the performance of tuning and shimming, significantly reducing experimental time.

Accessories such as the intelligent control screen expand the management interface of the NMR system. Sample insertion and ejection can be controlled and monitored via a touchscreen, elevat- ing the flexibility of various experiments.

CAN600 combines high-performance hardware and intelligent software, providing users with a more reliable and convenient NMR experimental platform.

Product Highlights

Expansibility

The distributed console
Facilitates flexible instrument configuration and upgrade

Performance

Timing resolution ≤4 ns, frequency resolution ≤0.0005 Hz
Supports fast automatic sample changing, with sample change time reduced to the second level.

Intelligence

Intelligent control screen
Remote access and control
Provides users with more options for managing the NMR spectrometer.

Product Features

01 Low Consumption, Highly Homogeneous, Ultra-Shielded 600 MHz Superconducting Magnet

02 High-Sensitivity Auto Tuning Probe supporting detection of various atomic nuclei

03 Advanced Distributed Console which is expandable to 8 independent transceiver RF channels. Timing resolution: ≤4 ns.Freguency resolution: ≤0.0005 Hz

04 72 slots auto sample changer, installed at the waist of the magnet,Fast sample changing

05 Intelligent Control Screen allows users to monitor instrument status and control sample entry and exit directly from the touchscreen

06 The intelligent Software allows users to remotely power on/off the spectrometer and monitor experiments and equipment status

CAN600 Module Introduction

The sub-modules of the CAN600 NMR Spectrometer primarily consist of the magnet, console, probe, and preamplifier. Controlled by advanced software, the spectrometer system can accurately collect and analyze experimental data, providing users with more comprehensive and precise analytical results. The intelligent control screen and remote control capabilities optimize the user experience.

Magnet

> 14.09 Tesla magnetic field
> 54 mm standard bore, compatible with various probes.
> Long liquid helium hold time.
> Liquid helium level gauge including alarm functions for low helium level.
> Intelligent control screen providing quick access to system status.

Console

> RF transceiver channels:default 2,expandable to 8.
> High-precision digital control with 4 ns timing resolution, 0.0005 Hz frequency resolution, and 0.001° phase resolution. Frequency, amplitude, and phase can be set simultaneously in 4 ns.
> High-speed data acquisition with 16-bit amplitude resolution and 250 Msps sampling rate.
> 12.5 MHz maximum receiver spectral width.
> Enable software-controlled console power-up and power-down.

Probe

> Suitable for 5 mm diameter sample tubes.
> ^1H, ^{13}C, ^{15}N, ^{31}P, ^{19}F, and other nuclei.
> Equipped with deuterium lock channel.
> Supports manual and automatic tuning.
> High sensitivity and resolution.
> Wide temperature range.
> Capable of ^{19}F NMR experiment with ^1H decoupling and ^1H NMR experiment with ^{19}F decoupling.

Preamplifier

> Preamplifier separated from the console.
> Multi-channel preamplifier.
> Low noise brings minimizes impact on signal acquisition.
> Built-in dynamic transmit-receive switch on all channels.
> Expandable design.

Auto Sample Changer

> 72 slots
> At the midsection of the magnet rotation
> Prepares the next sample in advance
> Supports fast sample changing

Software
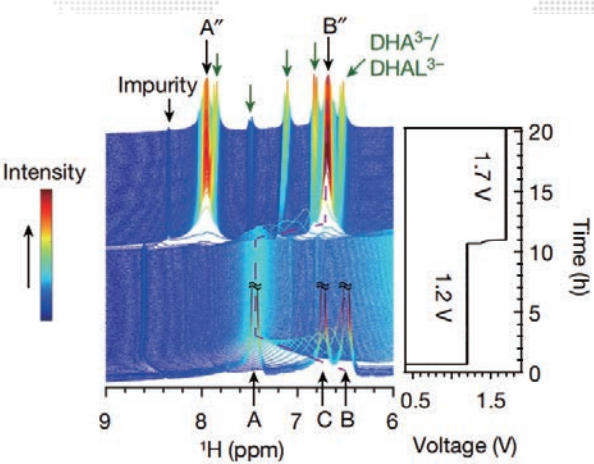
Intelligent software simplifies user operations

Streamlined software with one-click data processing improves experimental efficiency

Experimental data can be saved in universal formats

CAN600 Application Areas

Application Examples

^{1}H NMR spectra of 100 mM DHAQ during a potential hold at 1.2 V and 1.7 V, following charging at 100 mA.

Research on redox flow batteries requires fundamental insight at the molecular level to improve performance. By applying in situ nuclear magnetic resonance (NMR) methods to the electrolyte, electrolyte decomposition and battery self-discharge canbe explored in real time.

Reference: Nature, 2020, 579(7798): 224-228.

The quantitative ^{31}P NMR partial spectrum of a hardwood poplar lignin derived with TMDP using NHND as an internal standard

In lignin, groups with unstable protons can react with phosphorus-containing reagents to form phosphorus-containing derivatives. By using the technique of quantitative ^{31}P NMR spectroscopy, the quantity and structure of functional groups such as carboxyl and hydroxyl groups can be studied.

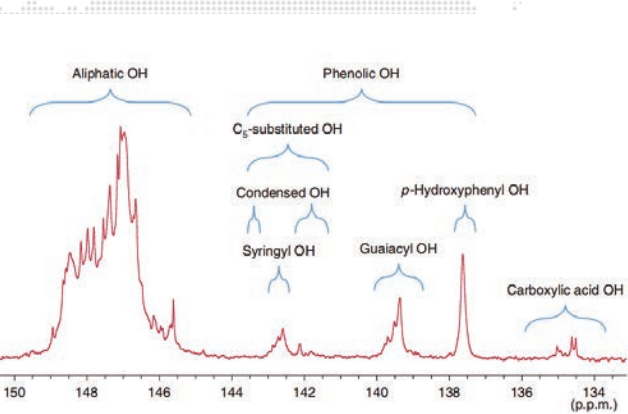**Reference:** Nature Protocols, 2019, 14(9): 2627-2647.

Application Fields

Chemistry Field
· Study of chemical reaction kinetics
· Determination of catalyst structures
· Analysis of intermediate
· Screening and combinatorial synthesis of compound libraries
· Identification of unknown products

Environmental Science Field
· Detection of heavy metals and radionuclides(HMR)
· Analysis of phosphorus forms and environment
· Study of soil organic matter(SOM) and stability
· Analysis of atmospheric aerosols

Energy Field
· Research on electrolyte for sodium and lithium batteries
· Analysis of battery electrode
· Analysis of liquid fuel and lubricant components
· Study of photochemical catalytic in hydrogen energy

Biological Science Field
· Determination of structures of bacterial RNA
· Identification mechanisms of protein complex interaction
· Biological structure analysis of membrane proteins and fibrils
· Analysis of cellular biomolecular complexes
· Analysis of biological metabolites

Food Field
· Analysis of fatty acid components
· Detection of adulteration and quality control
· Identification of agricultural produce origins
· Detection of food additives

Pharmaceutical Field
· Analysis of disease-causing proteins
· Study and inhibition of virus life cycles
· Analysis of cancer cell development and inhibition processes
· Mechanism of drug action and antibody research
· High-throughput drug screening

CAN600 Specifications

Magnet	Magnetic Field Strength	14.09 Tesla
	Bore Diameter	54 mm
Console	Transceiver RF Channels	default 2, expandable to 8
	Frequency Resolution	0.0005 Hz
	Timing Resolution	4 ns
	Minimum Duration	4 ns
	RF Frequency Range	5-1300 MHz
	Digital Resolution	16 bit
	Memory per Channel for Shapes	100,000 points
	Maximum Receiver Spectral Width	12.5 MHz
Probe	Detected Nuclei	^{1}H, ^{13}C, ^{15}N, ^{31}P, ^{19}F, and other nuclei
	Deuterium Lock Field	Supported
	Tuning and Matching	Supports rapid automatic tuning and matching
Software	Operating System	Windows
	Language	English
	Supported Experiments	Data acquisition and processing capability for 1D, 2D, and other NMR experiments
	Experimental Data	Includes common NMR experimental methods, supports data reading in third-party formats, and allows data to be saved in universalformats.
	Pulse Simulation	Supports pulse sequence editing and graphical interface
	Remote Control	Enable software-controlled console power-up and power-down
Auto Sample changer	Slots	72
	Installation Position	At the midsection of the magnet
	Rotation Direction	Bidirectional rotation
	Fast Sample Changing	Equipped with a quick pre-sample device, allowing the next sample to be prepared in advance.