Solutions for Innovation | JEOL

TECHNICAL DATA LIST
JNM-ECZL400S

1. CONFIGURATION

Reference	LABEL		Quantity
JNM-ECZL400S: FT NMR SYSTEM			
ELECTRONIC CONSOLE			
NM-70010S4L1	400MHZ SPECTROMETER		1
NM-71130SMC4	SHIM COIL 40		1
NM-71190AT	AUTO TUNING UNIT		1
WORKSTATION CONTROL UNIT			
NM-DELL	WORKSTATION		1
SOFTWARE			
NM-66300SW	ECZL STANDARD SOFTWARE		1
NM-JASON	ADDITIONAL JASON SOFTWARE ANNUAL ACADEMIC LICENSE		5
NMR PROBE FOR LIQUID SAMPLES			
NM-80008HFXS	400MHZ FG/ROHFX DIGITAL AUTO TUNE PROBE		1
NM-REF	SET OF STANDAR REFERENCES		1

FULL COMPATIBILITY WITH :

- SUPRACONDUCTIVE MAGNET JMTC-400/54/SS
- AUTOMATIC SAMPLE CHANGER ASC24
- PROBE NM-03811RO5S (40RO5AT/FGSQ)

2. GENERAL : ECZL400S FT NMR SYSTEM

The JNM-ECZL series is an FT NMR system equipped with cutting-edge digital and high-frequency technologies. This system satisfies a wide variety of demands for current and future NMR measurements by providing the following excellent functions and performance:

STS (Smart Transceiver System), a high-precision RF control technology with high-speed digital circuits
Complex pulse sequences (passing pulses, asynchronous decoupling, etc.) generated by fully independent, multiple high-speed programmable sequencers
Purely generated and transmitted RF signals provided by compact, highly integrated functions
High-speed and high-stability power amplifiers
Low-noise and high-sensitivity preamplifiers
High-precision RF reception and detection over a wide frequency range
High-stability shim control achieved by high-precision NMR lock
High-accuracy and high-stability field gradient control
High-stability and wide-range variable temperature control
MFDS (Multi Frequency Drive System), a multiple frequency control technology that enables multiple resonance measurement without increasing transmitter and receiver channels

To make operations of the NMR system stable over a long period of time even for highly sophisticated NMR measurements, the JNM-ECZL series is equipped with the spectrometer control computer SCC (Spectrometer Control Computer) dedicated to controlling the spectrometer.
The SCC and the operator client computer communicate as network terminals independently of each other. Thus, the SCC can operate as a stand-alone unit, preventing measurement omission and missing data due to incorrect operations by the operator or communication problems.
Furthermore, the SCC and the client computer use a state-of-the-art network communication system. This unique system enables the JNM-ECZL series to implement a many-to-many communication paradigm while performing access control and allows for the combination of multiple spectrometers and multiple client computers.
The client system Delta NMR software provides advanced data processing and an easy-to-use interface with the NMR spectrometer. The Delta system is built on a highly virtual architecture, thus providing an operating environment that can adapt to rapid changes in modern computer technology over a long period of time.
Supporting the standard graphics environment with OpenGL, the Delta system can efficiently perform routine data processing.

The JNM-ECZL400S FT NMR system provides excellent functionality and performance well suited for high-level research. In addition, this NMR system offers exceptional general versatility for simple operations, thus shortening the work time for measurements. Despite being a low-cost, compact instrument, this innovative NMR system provides high quality NMR data and will greatly contribute to general-purpose NMR analyses.

3. 400MHZ SPECTROMETER

3.1. GENERAL

The NM-70010S4L1 is a 400 MHz spectrometer that is the basic unit of the FT NMR system (^{1}H observation frequency: 400 MHz).

3.2. SPECIFICATIONS

Standard frequency:	^{1}H: 400 MHz
Stability:	0.1 Hz/h (^{2}H internal digital lock used)
Channels:	HF: 1 CH, LF: 1 CH, Lock: 1 CH
Frequency band widths:	
HF:	365 to 430 MHz
LF:	5 to 170 MHz

Note: The specification may be limited depending on the system configuration.
Refer to the specification of the power amplifier included in the configuration.

Spectrometer control computer	
CPU:	Intel® Core™ i7-4700EQ Processor
Memory:	8 GB
Hard disk drive:	1 TB
OS:	Microsoft® Windows® 10 IoT Enterprise 2016 LTSB
Pulse controller (sequencer)	
Time resolution of control:	5 ns
Pulse width setting:	
Minimum width:	5 ns
Step:	5 ns
Control method:	Multiple-pulse controller (multi-sequencer)
External input/output control:	
Channels:	Input: 4 CH, Output: 6 CH
Signal level:	LVTTL
Radio frequency (RF) transmission/reception method:	Automatic switching between superheterodyne and direct conversion (patented)
RF transmission control	
Independent frequency source:	Digitally mixed 4 tones/CH each (8 tones in total)
Frequency range:	5 to 1,300 MHz or more
Frequency shift (offset):	
Range:	Maximum 0 to 10 MHz or more
Step:	Minimum 0.001 Hz or less
Switching time:	20 ns or less
Switching interval:	Minimum 5 ns
Phase shift:	
Range:	0 to 360°
Step:	Minimum 0.005° or less
Switching time:	20 ns or less
Switching interval:	Minimum 5 ns
Amplitude shift:	
Range:	0 to 100%
Step:	Minimum 0.01% or less
Switching time:	20 ns or less

Switching interval:	Minimum 5 ns
Amplitude attenuation:	
Range:	Maximum 0 to 79 dB or more
Step:	1 dB
Total amplitude range:	Maximum 159 dB or more (Minimum 0.01% step or less)
Digital-to-analog (DA) conversion:	
Sampling rate:	800 Msps (MHz)
Resolution:	14 bit
Sequence memory:	2 GB
Sequence data transfer method:	Streaming (without capacity limitation) (patented)

Power amplifier

Channels:	HF: 1 CH, LF: 1 CH
HF	
Output frequency:	365 to 430 MHz
Maximum output power:	50 W (pulse), 5 W (CW)
Maximum pulse length:	200 ms
Maximum pulse duty:	10%
Rise/fall time:	100 ns
LF	
Output frequency:	10 to 170 MHz
Maximum output power:	150 W (pulse), 15 W (CW)
Maximum pulse length:	5 ms
Maximum pulse duty:	10%
Rise/fall time:	200 ns (20 MHz or more)

RF reception control

Spectrum width:	50 Hz to 10 MHz
Detection method:	Digital QD (quadrature detection) Automatic switching between undersampling and oversampling (patented)
Demodulation:	Frequency shift, phase shift (patented)
Analog-to-digital (AD) conversion:	
Sampling rate:	100 Msps (MHz)
Resolution:	16 bit
Data memory:	2 GB
Data length:	64 bit

Preamplifier

HF:	Low-noise GaAs amplifier
LF:	Low-noise wideband SiGe amplifier

Shim

Applicable magnet:	400 MHz narrow-bore superconducting magnet
Shims:	25 Z_0, Z_1, Z_2, Z_3, Z_4, Z_5, Z_6, X, Y, XZ, YZ, X_2, Y_2, XZ_2, YZ_2, X_2Z, Y_2Z, X_3, Y_3, XZ_3, YZ_3, X_2Z_2, Y_2Z_2, X_3Z, Y_3Z
Coil channel:	28 CH

Field gradient

Axes (channels):	Z axis (1 CH)
Maximum output current:	±10 A
Maximum pulse length:	20 ms

Maximum pulse duty:	5%
Rise/fall time:	40 us
Output intensity resolution:	16 bit
Time resolution of control:	5 ns
Minimum pulse width:	80 ns
Control method:	Current output enable/disable control

Note: The specification may be limited depending on the system configuration.
The actual performance of the gradient magnetic field varies depending on the configuration of optional attachments.

Variable temperature

Range:	–170 to +250 °C
Setting accuracy:	0.1 °C
Control method:	Computer control

Note: The specification may be limited depending on the system configuration.
The variable temperature range at the sample measurement portion varies depending on the configuration of optional attachments.

Required power capacity

Spectrometer:	Single phase 100 to 240 V AC, 50/60 Hz, 15 A

Note: Refer to the installation guide.
Note: The specification of the entire system may be limited depending on the system configuration.

4. SHIM COIL 40

4.1. GENERAL

The NM-71130SMC4 is a 400 MHz narrow-bore (DM) shim coil.
This unit is used in combination with a narrow-bore (DM) shim unit, and attached to the 400 MHz narrow-bore superconducting magnet to enhance the homogeneity and stability of the magnetic field.

4.2. SPECIFICATIONS

Applicable magnet:	400 MHz narrow-bore superconducting magnet
Coil channel:	28 CH

Note: The specification of the entire system may be limited depending on the system configuration.

5. AUTO TUNING UNIT

5.1. GENERAL

The NM-71190AT is an auto tuning unit. This unit is attached to the FT NMR system, and enables automatic tuning and matching of auto tune probes.

5.2. SPECIFICATIONS

Number of dials driven:	6
Power:	Single phase 100 to 240 V AC ±5% (maximum 250 V), 50/60 Hz ±5%, 2 A

Note: The specification of the entire system may be limited depending on the system configuration.

6. WORKSTATION & SOFTWARE

6.1. WORKSTATION

A computer station will be dedicated to both the acquisition and processing of data:
A “DELL” workstation under Windows with a 3.6 GHz processor or higher, two 1 TB hard drives, graphics card with at least 2 GB, RAM 16GB or more, CD-DVD reader-writer, network cards, etc. are provided. Two 24-inch monitors, USB optical mouse, USB keyboard are the main peripherals.

6.2. DELTA SOFTWARE

The 'Delta NMR' software allows the acquisition, processing and analysis of 1D, 2D, 3D and 4D data on all current nuclei (such as 1H, 13C, 19F and 31P) including COSY, NOESY, HSQC, HMBC, DOSY, classical proton selective homo decoupling or broadband homodecoupling experiments (also known as Pure Shift experiments such as Psyche or Zangger-Sterk types), modulated pulses, selective excitations, combined experiments such as HSQC-TOCSY, data sampled with non-uniform sampling (NUS), quantitative NMR (qNMR), solvent suppression methods such as Watergate and WET, a large number of experiments for protein analysis, solid state experiments for spin-half nuclei and quadrupolar nuclei, etc.
It is a point-and-click graphics software that allows automatic operations such as pulse calculation, spectra manipulation, and automatic decisions on how to perform subsequent experiments during acquisition Datas. Different automation mechanisms and sequences pulses can be easily created as needed. It has a library of more than 900 experiments and methods for any analytical study. Complete and up-to-date pulse sequence and system user manuals are included.
Pulse sequences and standard parameter files can be edited. New developments by NMR methodology laboratories can be implemented with JEOL application support.
Delta software includes a comprehensive suite of Good Laboratory Practice (GLP) system test protocols that can be run via a remote connection.
The software offers the possibility of calibration and performance monitoring of the instrument. In addition, the “Delta” software complies with CFR21Part11 regulations.
The spectrometer can be controlled remotely. Also, secure remote maintenance is available for all equipment. The user client requires remote monitoring (viewing mode) of his instrument for an initial diagnosis. If applicable,
the user customer, in agreement with his IT department, authorizes JEOL after-sales service to take control of his equipment for a more precise definition of the diagnosis (engineer mode).

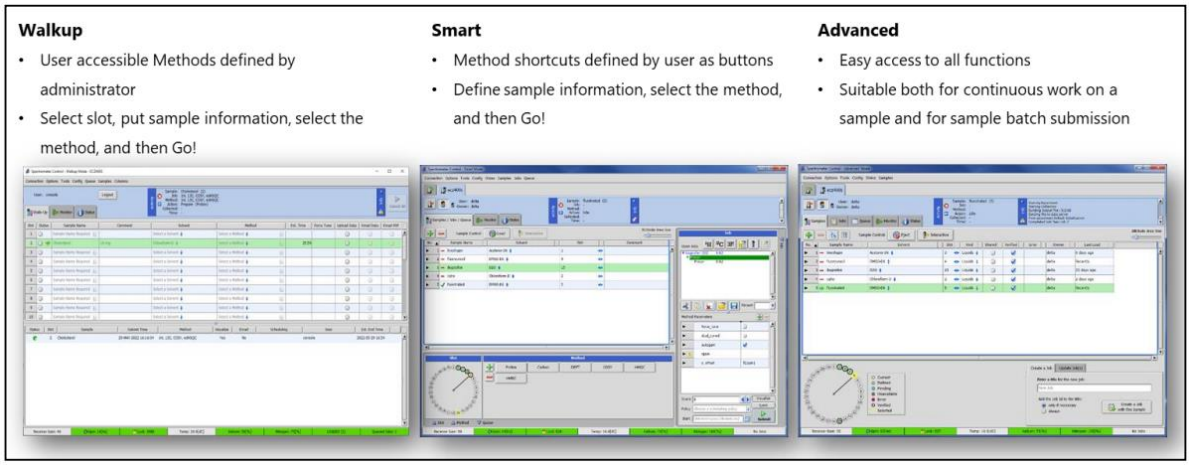
Additional processing licenses are free.

“Delta Software” control software is equipped with different interfaces depending on the users:

WALKUP mode: Basic operator interface in routine/open access

SMART mode: intermediate operator type interface routine and experiment optimizations

ADVANCE mode: expert operator interface, optimizations and research developments



The additional processing licenses are free and can be downloaded directly from JEOL website.

6.3. JASON SOFTWARE

The additional “JEOL JASON” software for data processing will also be made available: 5 annual individual “academic” discovery licenses; allowing functionalities complementary to that of Delta Software.

This software allows:

- Help with structural analysis - elucidation
- Software for 1, 2, and 3D NMR processing
- Processing, visualization and plotting of spectra
- Point-and-drag graphics software for automatic operations as :
  - ✓ Superposition of spectra
  - ✓ Drag and drop your data very easily
  - ✓ Optimized reprocessing
  - ✓ Dynamic reprocessing between 1D 2D spectra etc.
  - ✓ Spectrum prediction
  - ✓ Creation of molecules
- Reading the data obtained by “NUS”
- Allows you to open any type of NMR data

- Windows/MAC0S environment

Blog, user manual and videos are accessible directly on : https://www.jeoljason.com/

7. 400MHZ FG/ROHFX DIGITAL AUTO TUNE PROBE

7.1. GENERAL

The NM-80008HFXS 400MHZ FG/ROHFX Digital Auto Tune Probe is designed for ^{1}H, ^{19}F, and multinuclear NMR observation using a 5 mm sample tube in the FT NMR system. This probe also enables multinuclear observation with ^{1}H irradiation, multinuclear observation with ^{19}F irradiation, and multinuclear observation with ^{19}F and 1H simultaneous irradiation. In addition, it also allows ^{1}H observation with ^{19}F irradiation, ^{19}F observation with ^{1}H irradiation, and $^{1}H/^{19}F$ observation with multinuclear irradiation.
Moreover, measurement using a pulsed magnetic field gradient is also possible.
By using the optional Auto Tuning Unit (sold separately), you can tune the probe for multiple nuclei, automatically switch between single mode (^{1}H or ^{19}F) and dual mode (^{1}H and ^{19}F), and perform continuous measurement with double resonance (such as $^{13}C\{^{1}H\}$) and triple resonance (such as $^{13}C\{^{1}H, ^{19}F\}$).

7.2. SPECIFICATIONS

Sample tube O.D. (nominal):	5 mm
Nuclei for observation and irradiation:	
	^{1}H, ^{19}F, ^{31}P to ^{15}N, ^{39}K, ^{109}Ag
NMR lock nucleus:	^{2}H
^{1}H line shape of chloroform (spinning)	
Peak width at half height:	0.5 Hz or less
Peak width at 0.55% height:	6 Hz or less
Peak width at 0.11% height:	12 Hz or less

Spinning side band: 1% or less for ^{1}H

^{1}H line shape of chloroform (not spinning)

Peak width at half height: 0.8 Hz or less
Peak width at 0.55% height: 8 Hz or less
Peak width at 0.11% height: 16 Hz or less

Sensitivity:

270 or higher for ^{13}C (10% ethylbenzene in the sample tube equivalent to 555-PPT made by Wilmad, one scan)

230 or higher for ^{13}C (ASTM in the sample tube equivalent to 555-PPT made by Wilmad, one scan)

110 or higher for ^{31}P (0.0485M TPP, one scan)

35 or higher for ^{15}N (90% formamide, one scan)

600 or higher for ^{1}H (0.1% ethylbenzene in the sample tube equivalent to 555-PPT made by Wilmad, one scan, single resonance)

600 or higher for ^{19}F (0.05% TFT, one scan, single resonance)

350 or higher for ^{1}H (0.1% ethylbenzene in the sample tube equivalent to 555-PPT made by Wilmad, one scan, dual resonance)

450 or higher for ^{19}F (0.05% TFT, one scan, dual resonance, ^{1}H non-decoupling)

600 or higher for ^{19}F (0.05% TFT, one scan, dual resonance, ^{1}H time sharing decoupling)

90° pulse width:
12 µs or less for ^{13}C at 80 W
18 µs or less for ^{31}P at 50 W
21 µs or less for ^{15}N at 150 W
(24 µs or less at 120 W, for ECZLS)
7 µs or less for ^{1}H at 30 W (single resonance)
9 µs or less for ^{19}F at 30 W (single resonance)
(10 µs or less at 26 W, for ECZLS)
14 µs or less for ^{1}H at 30 W (dual resonance)
12 µs or less for ^{19}F at 30 W (dual resonance)
(13 µs or less at 26 W, for ECZLS)

Variable temperature range: –100 to +150°C

Gradient magnetic field output:
Approximately 0.3 T/m (at 10 A setting)
Approximately 0.9 T/m (at 30 A setting)

Gradient magnetic field duty cycle at room temperature:
Max. 2 % (at 10 A setting)
Max. 0.4 % (at 30 A setting)

Pulse duration of the gradient magnetic field current at room temperature:
Max. 20 ms (at 10 A setting)
Max. 10 ms (at 30 A setting)

8. SET OF STANDARD REFERENCES

A set of 7 reference tubes, packaged in 5mm tubes, including:

- 0.1% Ethylbenzene +0.01% TMS in Chloroform-D
- 10% Ethylbenzene in Chloroform-D
- 40% P-Dioxane in Benzene-D6
- 0.05% Trifluorotoluene in Benzene-D6
- 90% Formamide in DMSO-D6

- 3% Chloroform in Acetone-D6
- 0.0485 M Triphenyl Phosphate without Acetone-D6

Typ a parametry DELL řídící jednotky, která bude dodávána jako zakázková dodávka:

Model	OptiPlex Tower 7020
Procesor	Procesor Intel Core i5-14500 vPro (24 MB cache, 14 jader, 20 vláken, až 5,0 GHz Turbo)
Operační systém	Windows 11 Pro, angličtina, čeština, maďarština, polština, slovenština
Paměť	16 GB, 1 x 16 GB, DDR5
Pevný disk	512GB disk SSD, M.2 2280, PCIe NVMe, třída 40
Reproduktory	Interní reproduktor
Grafická karta	Intel Graphics
Bezdrátové připojení	Bez karty bezdrátové sítě LAN
Napájecí kabel	Evropský napájecí kabel
Přídavný pevný disk	Dodatečný 3,5palcový 2TB pevný disk SATA, 7 200 ot./min
3. pevný disk	Bez dalšího pevného disku
Klávesnice	Multimediální klávesnice Dell-KB216-čeština/slovenština (QWERTZ)- černá
Myš	Optická myš Dell – MS116-černá
Zadní kryt	Bez krytu kabeláže
Varianty šasi	OptiPlex Tower with 300W Platinum Power Supply
Správa systémů	No vPro support
Možnosti obnovení operačního systému	Médium s OS-Windows není součástí balení

2 ks monitoru typu „Monitor LCD Dell UltraSharp 24“