



INVITATION FOR BIDS
OFFICE OF PROCUREMENT & CONTRACTS

1. INSTRUCTIONS FOR BIDDERS

- a. Sealed bids will be received in the Office of Procurement & Contracts, Mississippi State University, for the purchase of the items listed herein.
- b. All bids must be received in the Office of Procurement & Contracts on or before the bid opening time and date listed herein. Delivery of bids must be during normal working hours, 8:00 a.m. to 5:00 p.m. CST, except on weekends and holidays when no delivery is possible.
- c. Bidders shall submit their bids either electronically or in a sealed envelope. To submit electronically, follow the instructions below. Bids CANNOT be emailed.
 - i. Sealed bids should include the bid number on the face of the envelope as well as the bidders' name and address. Bids should be sent to: 245 Barr Avenue, 610 McArthur Hall, Mississippi State, MS 39762.
 - ii. At this time we only accept non-ITS bids electronically. For electronic submission of bids, go to: portal.magic.ms.gov and use the RFX number on the next page as your reference number.
- d. All questions regarding this bid should be directed to the Office of Procurement & Contracts at 662-325-2550.

2. TERMS AND CONDITIONS

- a. All bids should be bid "FOB Destination"
- b. Bidders must comply with all rules, regulations, and statutes relating to purchasing in the State of Mississippi, in addition to the requirements on this form. General Bid Terms and Conditions can be found here:
https://www.procurement.msstate.edu/procurement/bids/Bid_General_Terms_May_2019_V2.pdf
- c. Any contract resulting from this Invitation for Bid shall be in substantial compliance with Mississippi State University's Standard Contract Addendum:
<https://www.procurement.msstate.edu/contracts/standardaddendum.pdf>

Bid Number/RFX Number: 23-12/RFX #3160005673

Opening Date: February 14, 2023 @2:00 p.m.

Description: 800 MHZ Nuclear Magnetic Resonance Console

Vendor Name: _____

Vendor Address: _____

Telephone Number: _____

Days the Offer is Firm: _____

Authorized Signature: _____

Name: _____

Title: _____

Item	Quantity	Description	Unit Price	Total Price
1		800 MHZ Nuclear Magnetic Resonance Console		

Because of the complexity of this system, we ask that all bids submitted include five (5) references for past installations of NMR magnet systems \geq 800 MHz with cryogenically-cooled probes to demonstrate a successful track record of customer satisfaction.

The system must meet specifications as good or better than specified below:

1. 800 MHz Console
 - a. A stainless steel one bay or double bay cabinet for 19-inch format units
 - i. Should provide RF shielding against DVB-T, ATSC, ISDB-T, etc. interference
 - ii. Should offers enough space to accommodate various units like RF amplifiers etc.
 - b. A state-of-the-art Ethernet router providing up to 14 TCP/IP based Ethernet ports for internal and external spectrometer devices such as sample changers, CryoProbe platforms, magnet control and monitoring equipment, NMR accessories, etc.
 - c. Should include a Power Distribution Unit (PDU) to enable software controlled

- console power-up and power-down
 - d. Should include a dedicated system control unit (SCU) containing an embedded processing CPU with ≥ 1 TB hard disk drive that allows for versatile and flexible spectrometer control.
 - e. Other characteristics:
 - i. 80 MHz system clock, 12.5ns timing resolution
 - ii. Synchronicity on all channels within 12.5ns
 - iii. Gradient control for all gradient amplifiers
 - iv. Up to 8 RF channels
 - v. Up to 4 trigger inputs with 12.5ns resolution
 - vi. Up to 4 real time output controls with 12.5ns resolution
 - vii. Ultra-stable, ultra-low noise B0 current source
 - viii. Support for digital NMR Lock for ^2H and/or ^{19}F nuclei
 - ix. Support for shim current sources
 - x. Support for up to 4 independent variable temperature (VT) channels, low temperature accessories, high temperature equipment
 - xi. Support for High Resolution gradient amplifiers
2. Preamplifier system with support for:
- a. Up to 8 RF preamplifiers
 - b. Fully Multi-receive, no extra wiring/components
 - c. Touch screen based human machine interface
 - d. Accurate tuning and matching with factory calibrated preamplifiers
 - e. Fully integrated automatic tuning and matching with ATM probe
 - f. Integrated Probe identification
3. 4K 800 MHz Magnet System
- a. Magnet system with built-in efficient suppression of external disturbances (typically up to 99 %) including subways, railway lines and trams, corridor traffic, elevators, power lines or outside vehicular traffic.
 - b. Standard Bore type (SB) with 54 mm bore size
 - c. Operating field 18.79 T
 - d. Very high field stability with a guaranteed drift rate of <10 ppb/hr
 - e. Extreme small fringe field in vertical and horizontal direction
 - f. Cryo shim system with 9 orthogonal shims
 - g. Helium flow system with one-way check valve for safe operation
 - h. Helium level measurement system
 - i. Alarm functions for low helium level
 - j. Nitrogen flow system with one-way check valve for safe operation
 - k. Nitrogen level sensor with direct display function
4. Magnet stand to support superconducting magnet systems in an upright position. Air piston isolator system (API).
- a. Gimbal piston isolators
 - b. Double chamber with high performance damping effect in vertical and horizontal direction
 - c. Gas pressure of 3.3 to 5.5 bar required
 - d. Control switch for activating/de-activating

5. Helium Transfer Line
 - a. 10 mm diameter
 - b. Short arm 708 mm
 - c. Long arm on the transport dewar 1508 mm
 - d. Bendable part in between 2060 mm

6. N₂ VT GAS Separator - Membrane VT gas separator for production of >98% N₂ gas from compressed air.

7. Standard Bore Magnet Shim System
 - a. 36 Matrix Shim Gradients
 - b. B₀ coil
 - c. Temperature sensor
 - d. Built-in sample-up sensor
 - e. Built-in sample spinning/sample-down sensor
 - f. Prepared for shim system cooling

8. Gradient Amplifier Board for pulsed field gradients (PFG) for shimming and gradient coherence selection
 - a. Offset-free operation without the need of blanking pulses.
 - b. Pulse lengths up to 50ms per second
 - c. Built-in pre-emphasis

9. VT Control
 - a. Digital temperature sensor resolution better than 5 mK
 - b. Temperature stability of about 10 mK/K
 - c. Mass-flow based VT gas flow control and monitoring, up to 3000 l/h
 - d. Built-in sample freeze protection
 - e. Up to 4 independent heater channels (e.g. Flow probes)
 - f. High Temperature NMR ready (> 300°C with HT NMR probes)
 - g. Supports chilled air and LN₂ chilling
 - h. Supports ceramic and standard spinners
 - i. Supports in-tube temperature monitoring

10. 2H Lock RF Unit
 - a. Supports field lock operation on deuterated solvents
 - b. Supports 2H decoupling
 - c. Supports gradient shimming on 2H
 - d. Supports locking with complex deuterated solvents

11. Three RF channel transceivers
 - a. Built in pulse programming engine to support shaped pulses
 - b. 5 to 1200 MHz (transmit and receive)
 - c. 12.5ns timing resolution
 - d. 2.5ns simultaneous setting of amplitude & phase & frequency

- e. 1GB sequencer waveform memory
- f. 1852 MHz high intermediate frequency (IF)
- g. up to 7.5 MHz spectral width
- h. digital resolution (effective dynamic range)
 - > 17 Bit (SWH < 5 MHz)
 - > 19 Bit (SWH < 1 MHz)
 - > 23 Bit (SWH < 6 kHz)
- i. 240 MSPS / 16 Bit ADC, Digital Down Converter (DDC)
- j. 960 MSPS DAC, Digital Up Converter (DUC)

12. RF Amplifiers to support the following:

- a. X-nuclei, 1H (and 19F), and 2H observe and decoupling.
- b. A fast deuterium 2H lock switch to enable fast switching between 2H decoupling and 2H lock operations.
- c. Computer controlled RF amplifier safety with forward/reflected RF power monitoring and diagnostics.
- d. 4 total channels of RF power
 - i. Channel 1 (15-600 MHz): Min. 500W RF peak power (max. 50W CW)
 - ii. Channel 2 (650-900 MHz): Min. 100W RF peak power (max. 25W CW)
 - iii. Channel 3 (105-140 MHz): Min. 250W RF peak power (max. 25W CW)
 - iv. Channel 4 (15-600 MHz): Min. 500W RF peak power (max. 50W CW)
- e. RF outputs to connect to different preamplifiers to minimize re-wiring
- f. Pulse program controlled blanking

13. Two Broadband preamplifiers

- a. For observe and decoupling of nuclei from 57Fe up to 31P with built-in 1H Stop RF filter.
- b. Ultralow ~1dB system noise figure
- c. Max. 4kW peak power RF capability
- d. Active transmit/receive switch
- e. Built-in RF power detector
- f. Factory calibrated for accurate tuning and matching

14. 1H Preamplifier

- a. For 1H and 19F observe, 1H and 19F decoupling and 19F lock operation.
- b. Ultralow ~1.0dB system noise figure
- c. Max. 4kW peak power RF capability
- d. Active transmit/receive switch
- e. Built-in RF power detector
- f. Factory calibrated for accurate tuning and matching

15. 2H Preamplifier.

- a. For 2H observe, 2H decoupling and 2H lock operation.
- b. Very low ~1.4dB system noise figure
- c. Max. 500W peak power RF capability
- d. Active transmit/receive switch

- e. Fast, pulse program controlled mode switching
- f. Built-in RF router for 2H lock and 2H observe
- g. Factory calibrated for accurate tuning and matching
- h. No external filters required

16. 13C Preamplifier

- a. For 13C or 79Br observe and decoupling operation.
- b. Very low ~1.4dB system noise figure
- c. Max. 500W peak power RF capability
- d. Active transmit/receive switch
- e. Factory calibrated for accurate tuning and matching
- f. No external filters required

17. 15N Preamplifier

- a. For 15N observe and decoupling operation.
- b. Very low ~1.4dB system noise figure
- c. Max. 500W peak power RF capability
- d. Active transmit/receive switch
- e. Factory calibrated for accurate tuning and matching
- f. No external filters required

18. PC For Controlling NMR System with the following minimum features:

- a. Linux operating system
- b. Intel Xeon E5-1620v4 (up to 3.8 GHz), Quad Core
- c. 16GB DDR4-2133 (2x8 GB) RAM
- d. NVIDIA Quadro K620 2 GB GFX graphics card
- e. 2TB 7200 RPM SATA HDD
- f. Integrated Intel I-218 Gbit LAN (for spectrometer)
- g. Intel Ethernet I210-T1 PCIe NIC (for network connection)
- h. 9.5 mm Slim SuperMulti DVD-RW 1st ODD
- i. USB US-Keyboards and USB mouse
- j. 24" LCD Monitor

19. Software for full control of NMR system, pulse programming, data acquisition

- a. Supports NMR data acquisition in arbitrary dimensions, with guided acquisition setup
- b. Runs on Linux operating system for integration into existing MSU NMR facility backup system
- c. Includes a library for training of users in use of 1D and 2D
- d. Supports automation
- e. Supports standard NMR data processing (1D, 2D, 3D, 4D and 5D)
- f. Supports processing of Non Uniformly Sampled (NUS) data for 2D spectra
- g. Supports Integration and deconvolution of NMR spectra
- h. Supports simulation of pulses and NMR experiments along with prediction of 1D and 2D spectra
- i. Supports relaxation analysis (T1/T2)
- j. Supports advanced NUS processing and relaxation/dynamics analysis of NMR

samples

20. Cryogenically cooled probe with ^{13}C , $^1\text{H}/^{19}\text{F}$, ^{15}N , and ^2H channel
 - a. Probe includes cooled preamplifiers for ^1H & ^{19}F , ^{13}C , ^{15}N and ^2H .
 - b. Designed for ^1H or ^{19}F observation
 - c. ^{13}C and ^{15}N decoupling (triple or double)
 - d. Designed for ^{13}C observe with ^1H decoupling
 - e. ^2H lock
 - f. Z-gradient with $6 \text{ G/A}\cdot\text{cm}$
 - g. Automated Tuning & Matching (2G ATM)
 - h. VT range: -40°C to $+150^\circ\text{C}$ (using N_2)
 - i. Easy removal of

21. Cryoplatfom for delivery of LHe to cryogenically cooled probe
 - a. Air cooled outdoor He-compressor
 - b. Cooling water monitoring kit
 - c. 30 meter outdoor He-flexline set with sound insulation
 - d. Transferline support set to absorb vibrations
 - e. Mounting system for He CryoProbe
 - f. He gas bottle adaptor with 10 meter flexible line

22. Cryoplatfom N_2 Liquefier
 - a. Provides a re-condensation of the N_2 gas within the LN2 dewar of a NMR magnet system.
 - b. Extends the magnet system LN2-refill interval up to 1 year.

23. CryoProbe Lift accessibility for easy mounting/dismounting of the cryoprobe

24. Cryoprobe cold removal kit for rapid probe changes

25. 24 Position Automatic sample changer
 - a. 24 easily accessed sample positions
 - b. Random access for sequential- or batch automation
 - c. Push-button sample exchange
 - d. Supports all common sample-tubes in spinners or shuttles
 - e. Includes 24 standard bore spinners for applications up to 1 GHz with temperature range: 0°C ... $+80^\circ\text{C}$

26. VT Chiller Unit for cooling NMR probes
 - a. VT gas temperature about -40°C (at the end of the transferline)
 - b. Up to 3600 litre per hour

27. Triple resonance optimized 5mm room temperature probe for ^1H observation with ^{19}F , ^{31}P and/or BB decoupling.
 - a. Designed for ^1H observation
 - b. ^{31}P and BB (^{31}P to ^{109}Ag) decoupling
 - c. ^2H lock

- d. Z-gradient with 5 G/A*cm
- e. Automated Tuning & Matching (2G ATM)
- f. VT range: -150°C to +150°C (N2 gas)

28. Uninterruptible Power Supply (UPS) to support console equipment above

29. Installation charges, including rigging for magnet

30. Liquid helium and nitrogen for installation

31. Onsite Cryoplatfrom service at 10,000 hours of use

32. Fully automated NMR calibration software integrated to optimize acquisition parameters. These include 3D shims, temperature settings and pulse lengths for proton and carbon.