



# Indian Institute of Science

## Centre for BioSystems Science and Engineering



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### **Domestic Tender Notification for the Procurement of a Multispectral Optoacoustic Tomography system at the Centre of BioSystems Science and Engineering**

**Last Date for Submission of Bids Monday, 22 March 2021, by 5PM**

This is Request for Quote (RFQ) from domestic (India based) manufacturers for the supply of MultiSpectral Optoacoustic Tomography (MSOT) device, as part of a tender for the Centre for BioSystems Science and Engineering at the Indian Institute of Science.

With respect to this request, the rules laid out by the Government of India in order No. P-45021/2/2017-PP (BE-II) issued by the Public Procurement Section, Department of Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, dated 04th June 2020, will be followed. Any 'Non-local supplier', i.e., "a supplier or service provider, whose goods, services or works offered for procurement, has local content less than 20%" is ineligible to participate in this tender.

#### **Procedure:**

1. Please submit hard-copy of the following two documents in separate sealed envelopes
  - a. the technical proposal, and
  - b. the quote/bid
2. The deadline for submission of proposals is 22 March 2021, by 5PM
3. The technical proposal should contain a compliance table besides the technical specifications listed in the description section below
4. The compliance table should include all the items and in the same order. The first column should describe your compliance in a "Yes" or "No" response. If "No" the second column should state the extent of deviation. The "third" column should state the reasons for the deviation if any. The fourth column can be used to compare your solution with that of your competitors or provide details as requested in the technical requirements table below
5. Vendor should clearly indicate the country of manufacture of the individual unit/laser
6. The vendor should also clearly indicate the percentage of local (made in India) components

#### **Specifications of Multispectral Optoacoustic Tomography device**

Preclinical Multispectral Optoacoustic Tomography device to simultaneously deliver functional, anatomical, and molecular imaging in real time within the scope of a whole body small animal imaging system.

### Illumination and detection system:

- Should produce homogenous light field for even distribution of light through tissue at the full depth of a small animal for whole body imaging.
- Laser should allow generation of light from 660-1300 nm wavelengths for continuous imaging from 660-1300 nm allowing optimal imaging of red absorbers (e.g. iRFP) and lipids (at 1064nm).
- Should have at least 256 individual optoacoustic ultrasound transducer elements positioned in an arc spanning at least 270° around the animal for tomographic detection of an ultrasound signal that is induced by photon absorption.
- Should allow combining of these signals and reconstruction to produce quantifiable tomographic cross-sectional images in real time.
- The transducer elements used should have a detection frequency (4-6 MHz) that is optimal for deep-tissue optoacoustic imaging.
- The acquisition electronics should provide photoacoustic detection and possess low noise levels to optimize detection sensitivity from  $\mu\text{V}$  piezoelectric signals.

### Fast-tunable, high-energy laser system for fast multispectral imaging with high Signal to Noise (SNR)

- Should contain a Nd:YAG-pumped OPO tunable laser.
- Laser should uniquely allow tuning between wavelengths in <50 milliseconds.
- Multispectral acquisitions (typically using 5- 7 wavelengths) should be obtained in <1 second for display in real time for capturing fast dynamic processes such as probe clearance kinetics and oxygenation and minimize stress to animals by reducing imaging times.
- Maximum pulse energy should be up to 100 mJ for any wavelength between 660-1300 nm for optimal Signal to Noise Ratio (SNR).

### Real time data acquisition and processing

- Data acquisition system should simultaneously acquire up to at least 256 channels simultaneously at a sampling rate of at least 40 mega samples per second (MSps).
- Acquired data should be reconstructed and visualized in real time.
- Should have additional data analysis methods to allow normalised quantitation of oxygenation measurements.

Below, we list the minimum specifications that are required for this system

<b>System specifications for image acquisition</b>	
Image rate (acquisition and live display)	$\geq 10$ fps (frames per second)
Acquisition time, cross-sectional image	<ul style="list-style-type: none"> <li><math>&lt; 10</math> ms (single wavelength)</li> <li><math>&lt; 1</math> s (multispectral, 10 wavelengths)</li> </ul>
Acquisition time, whole-body scan (120 mm)	$< 6$ min (multispectral, 0.5 mm step size)
Spatial resolution	At least 150 $\mu\text{m}$
<b>Field of view (FOV)</b>	
In-plane FOV (cross-section, x-y axis)	At least 40 x 40 mm
Axial FOV (via translation, standard, z axis)	At least 120 mm
Object positioning / translation	
Axial (z axis)	Motorized stage (min. step size: 0.1 mm)
In-plane (x/y axes)	Motorized stages x/y axes
Animal Management	
Live animal monitoring	Should have CCD camera in chamber
Anesthesia system	Should be Isoflurane-based
Key system components	
<b>Laser illumination system</b>	
Wavelength spectrum covered	660-1300 nm
Pulse repetition rate	10 Hz
Maximum pulse energy	100 mJ
Pulse duration	$< 7$ ns
Wavelength tuning	
Tuning speed (between any two wavelengths)	$< 50$ ms
Minimum step size	1 nm
Tuning accuracy	0.5 nm
Light delivery	Homogeneous ring illumination
Laser-integrated pulse energy meter	Yes
Laser-integrated spectrometer	Yes
Detection system	
Curvature of detector array	$\geq 270^\circ$
Center frequency / bandwidth	4-6 MHz / $> 60\%$
Number of detector elements (min.)	$\geq 256$
<b>Data acquisition electronics</b>	

Number of channels for simultaneous acquisition	≥256
Sampling rate	≥40 MSps
<b>Software for system control and data processing</b>	
Data acquisition & management	Image acquisition, image reconstruction, spectral unmixing, signal quantification, tomographic data/image export
Process Analysis & Export	Dynamic processes, multi-spectral data acquisition, video creation & export
Advanced data analysis	Component analysis, extraction of measurement Report, quantitation of oxygenation measurements
Advanced laser control	Adjustment of pulse energy, repetition rate
Reference anatomy	Anatomy cryo-slice images, male & female anatomy, synchronization with imaging session
<b>General technical specifications</b>	
Scanner console - hardware	Intel Core i7 CPU, 5 TByte HDD, RAID, 24 GByte RAM, 1 GBit Ethernet, ~24" TFT screen
Scanner console - operating system	64-bit Windows 7
Power supply	16 A / 230 V
Safety certification	CE certified (system should be compliant with ISO 61010-1, 60825-1, 61326-1)
Laser classification	Class 1 (contains class 4 laser, secured through interlocks), Class IV as open unit

Heated Injection Pad	Should include temperature-controlled heatingpad (operational surface 220 x 140 mm; heated surface 140 x 70 mm) Should have precise temperature control (30-40°C +/-1°C), fast heating (<5 minutes) Should have detachable aluminium body, easy cleaning and disinfection
Animal Holder	Mouse - up to 120 mm Rat holder (add on) External animal bed for imaging larger animals or volumes in real-time (add on)
Anesthesia System	Should include stand, vaporizer, flow meter, gas exhaust unit, induction chamber, valves, tubing

Phantom Kit	Should include materials required for phantom imaging experiments including: durable phantom, phantom holder, phantom maker, pipettes, syringes, forceps, clear sip straw, tubesealant, agar, agarose lowmelt, glue gun, tube cutter
<b>Commercial terms and conditions</b>	
Warranty	Essential: 3 years full system warranty + 5 years for laser. Preferred: 5 year full system (including laser) warranty
Support	Must provide a dedicated service and application support for the multispectral optoacoustic tomography system
References	Please provide a list of two references from India whom you have sold similar/different scientific equipment.
Shipping	Please specify shipping costs and insurance till site
Breakdown addressing	Service call within 48 hours of complaint registration
User Kit	Should include materials required for vivo imaging experiments including: electrical shaver, depilatory cream, eye protection cream, ultrasound gel, saline, catheters, syringes, needle holder, tissue adhesive

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