

**PROPOSAL FOR PROCUREMENT OF
HYPER SPECTRAL CORE SCANNER WITH LIBS
AND XRF THROUGH NMET FUND FOR CAPACITY
AUGMENTATION IN MECL**



MINERAL EXPLORATION AND CONSULTANCY LIMITED

DR. BABASAHA B AMBEDKAR BHAWAN

SEMINARY HILLS

PLACE: NAGPUR

DATE: 2ND JANUARY, 2024

**SUMMARY FOR PROCUREMENT OF HYPERSPECTRAL CORE SCANNER WITH LIBS
AND XRF THROUGH NMET FUND FOR CAPACITY AUGMENTATION IN MECL**

S.No.	Name Of the Equipment	Rate (approx.) Rs. in Lakh Excluding GST	Unit	Amount In Rs. Excluding GST	Specifications	Availability within the Department
1	Hyperspectral Core Scanner with LIBS	1868	1	1868 Lakhs	1. Payloads/Sensor Types: RGB Sensor , VNIR Sensor 2. LIBS Sensor : LIBS upto ppm level 3. Laptop: yes 4. Processing Software: yes 5. Output: Mineral Assemblage and elemental Analysis with near about precision of ICPMS. 6. Warranty: 1 Year 7. Truck Mounting and Fabrication: Yes	Nil Only one RGB Core scanner present for core scanning
2	Hyperspectral Core Scanner with XRF	1110	1	1110 Lakhs	1. Payloads/Sensor Types: RGB Sensor, VNIR Sensor, SWIR Sensor 2. XRF Sensor: XRF upto ppm level 3. Laptop: yes 4. Processing Software: yes 5. Output: Mineral Assemblage and elemental Analysis 6. Warranty: 1 Year 7. AMC: 5 Years after warranty 8. Truck Mounting and Fabrication: Yes	Nil Only one RGB Core scanner present for core scanning

The Detail proposal for procurement of Hyperspectral Core Scanner with LIBS and XRF through NMET fund for capacity augmentation in MECL is attached herewith.

**PROPOSAL FOR PROCUREMENT OF HYPERSPECTRAL CORE SCANNER
WITH LIBS AND XRF THROUGH NMET FUND FOR CAPACITY
AUGMENTATION IN MECL**

1.0.0 Introduction

1.1.0 Overview:

- 1.1.1 The hyperspectral core scanning is an indirect method of mapping the drill cores in which ore related alteration minerals are used as indicators for mineralization. It has the capability for measuring spectral signatures of core chips, drill cores as well as core samples. Drilling as well as core storage of drill cores is an expensive activity hence by using hyperspectral core scanner which has the capability of high-quality digital photography along with mineral and elemental scanning can be used for systematic understanding of cores and mineralization of the area. Which can lead to find out extension area and new area with similar alteration signature.
- 1.1.2 The hydrothermal fluids that are responsible for the formation of several types of mineral deposits can produce extensive hydrothermal alteration haloes in the surrounding host rocks. These alteration haloes typically consist of fine-grained assemblages of hydrated minerals, commonly including biotite, chlorite, and white mica. In many cases, telescoped mineralogical zones are present around these hydrothermal centers, which can serve as vectors to mineralization if correctly identified. Within each mineralogical zone, progressive changes in mineral chemistry can serve to further refine vectors to mineralization (e.g., Sillitoe, 2010; Wilkinson et al., 2015). Obtaining mineral chemistry, however, is typically a time-consuming process, requiring the careful preparation and examination of samples, usually followed by electron microprobe analysis (EMPA). In many cases, the fine-grained nature of the alteration minerals can hinder analysis, as suitably large grains (e.g. > 5 μm) need to be located, if available at all. Unlike conventional analytical techniques, shortwave infrared (SWIR) reflectance spectroscopy is not negatively impacted by the fine-grained nature of alteration minerals (Hunt and Salisbury, 1970), and is therefore an ideal tool for the rapid identification and characterization of alteration zones in hydrothermal mineral deposits. In the SWIR reflectance spectra of hydrated minerals, cation-OH bonds produce characteristic absorption features, which can be used to identify mineralogy (Hunt, 1977; Clark et al., 1990), and in many cases the position of these characteristic absorption features can also be used to estimate mineral chemistry.

The reflectance data can be acquired from rock surfaces in a few seconds, and require no sample preparation, spectral data sets can be far more extensive than datasets obtained using conventional analytical techniques. Spectroscopic studies can therefore rapidly cover large geographical areas with a high sampling density. In a laboratory setting, line-scanners Hyperspectral scanner can provide continuous spectral measurements from drill core, and intervals of several thousand or tens of thousands of meters can be rapidly investigated (e.g., Arne et al., 2016; Mauger et al., 2016; Wells et al., 2016).

- 1.1.3 Different EM spectrum have dominant atomic mechanisms that govern the spectral characteristics of the minerals. The visible to near infrared (VNIR) region (0.4 to ~ 1 μm) contains diagnostic features associated with electronic effects of oxidized and reduced Fe, and transition elements. VNIR data therefore enable discrimination of Fe-oxides and oxyhydroxides such as goethite, hematite and jarosite, which are often associated with Fe-gossans or in alteration zones of base-metals deposits. In VMS and Au deposits the VNIR is typically useful for mapping Fe-rich gossans.
- 1.1.4 The short-wave infrared (SWIR) region (~ 1 to 2.5 μm) contains diagnostic features associated with absorption of vibrational energy in the crystal lattice, particularly with Al–OH, Fe–OH & Mg–OH bonds and water. Characteristics absorption features are distinctive for most clays and many others OH-bearing silicates (e.g. micas, chlorites, epidote, prehnite, carbonates, amphibole). This allows for the discrimination and mapping of distinctive minerals or mineral suites commonly associated with hydrothermal mineral alteration zones around gold and base-metal deposits.
- 1.1.5 In gold and VMS deposits SWIR data are particularly useful for mapping white (Al-rich) micas, biotite and chlorite. Spectral methods have been shown to be highly effective in recognizing and delineating zones of hydrothermally altered rocks that are spatially and temporally related to mineralization. Hydrothermal alteration mineralogic styles (e.g., chloritization, sericitization, carbonatization) associated with certain mineral deposits, including VMS, orogenic gold, and intrusion-related are ideally suited for detection by reflectance spectral methods.
- 1.1.6 The LIBS/XRF technology allows a full microanalysis of the drill core, bringing complete set of information from the quantitative automated mineralogy to multi-elemental assays.
- 1.1.7 Presently, emphasis has been given to make digital library for core and generate more information about mineral assemblage from drill cores. For the enhancement technical capacity and continuous up-gradation of the technology, induction of hyperspectral core scanner with LIBS/XRF technology enhance the business model of MECL in mineral exploration market.

1.1.8 Large international mineral exploration companies are utilizing this hyperspectral core scanning with XRF technology to characterize the alteration mineralogy associated with ore zones aiming better targeting of mineralized zones. By utilizing this technology large volume of drill cores can be rapidly scanned. The data generated is in the form of spectral signatures which can be linked to certain alteration minerals like various kinds of mica or amphibole associated with mineralized zones with the help of software creating a mineralogical mapping. This technology can also be used in ongoing NMET funded drilling projects of MECL, which may help to find out the extension of existing blocks with similar mineral alteration signature.

1.2.0 Background:

1.2.1 Addl. Secretary, MoM along with Secretary, MoM during their visit on 5th December, 2022, suggested MECL for procuring upgraded model of digital hyperspectral core scanner to enhance business model and to enhance its potency to do core scanning of GSI and other organizations core analysis under diversification programme.

1.2.2 In the review meeting of MECL held on 23rd August, 2023, Addl. Secretary, MoM also suggested for technical upgradation, MECL may procure two or three advanced core scanner. He also suggested to grab the business opportunity of digitalization of approx. 5.0 lakhs meter skeletal core repository of GSI and other organization for future reference and building of technical database by scanning the cores with advance hyperspectral scanning instrument with elemental analysis mechanism instead of simple RGB core scanning instrument.

2.0.0 Hyperspectral Core Scanner with LIBS Technology

2.1.0 Outline of Hyperspectral Core scanner with LIBS Technology:

2.1.1 A hyperspectral core scanner with LIBS (Laser-Induced Breakdown Spectroscopy) technology is an advanced analytical tool designed for the comprehensive analysis of samples, especially geological cores. This integrated system combines the capabilities of hyperspectral imaging and LIBS, providing detailed spectral and elemental information about the composition of materials.

2.1.2 A hyperspectral core scanner with LIBS technology represents a cutting-edge analytical tool with broad applications, offering valuable insights into the composition of diverse samples across different fields of study.

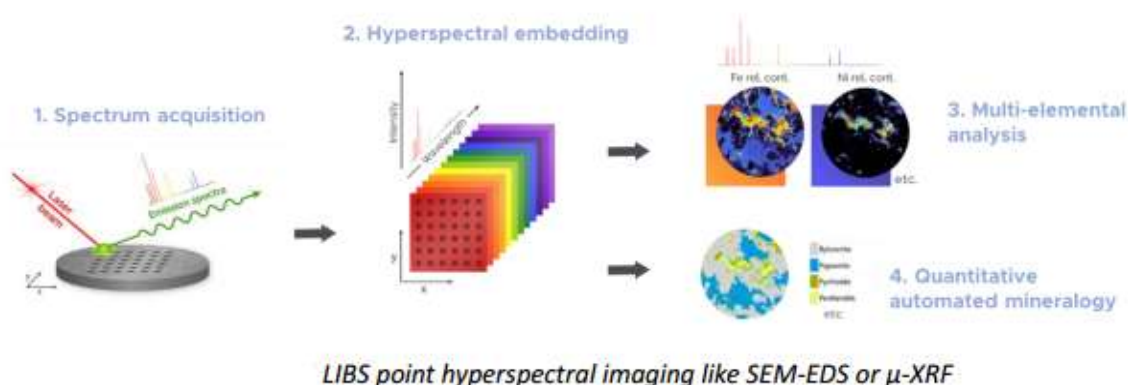
2.2.0 Key Components:

2.2.1 Hyperspectral Imaging System:

- i. Sensor: A hyperspectral sensor captures data across a wide range of wavelengths, dividing the electromagnetic spectrum into numerous narrow bands.
- ii. Optics: Optics focus on the sample, ensuring high spectral and spatial resolution.
- iii. Detector: Captures the reflected or emitted light from the sample in each spectral band.

2.2.2 LIBS System:

- i. Laser Source: A high-energy laser generates a plasma on the surface of the sample through laser ablation.
- ii. Spectrometer: Analyzes the emitted light from the plasma to identify the elemental composition of the sample.
- iii. Detectors: Capture the spectral lines emitted by the plasma for elemental analysis.
- iv. Hyperspectral data is acquired for each pixel, providing a spectral signature for every location on the sample. High spectral selectivity atomic emission lines are found from ultra-violet (UV) 220 nm to 320 nm, the visible (Vis) 320nm to 700 nm and in the near-infrared (NIR) 700 to 1000 nm. Each atom or their ions have several electronic transitions in the UV-VIS-NIR spectra which enable the accurate line overlap deconvolution using modern algorithm. Atomic emission lines are ultra thin around 100 picometers
- v. LIBS Analysis: The LIBS system fires a laser pulse onto the same location on the sample, inducing a plasma. Emitted light from the plasma is analyzed by the spectrometer to determine the elemental composition of the material.
- vi. The combination of hyperspectral and LIBS data provides both spectral and elemental information for each location. Data Fusion and Analysis: Hyperspectral and LIBS data are fused, creating a comprehensive dataset for analysis.
- vii. Advanced algorithms and software analyze the data to identify minerals, elements, and other materials present in the sample.





4 Comparison of sensitivity (limit of detection) and achievable spatial resolution.

2.2.3 Control and Data Processing Unit:

- i. **Control System:** Manages the operation of the hyperspectral core scanner, including laser firing, data acquisition, and synchronization between hyperspectral and LIBS systems.
- ii. **Data Processing Software:** Processes and analyzes the hyperspectral and LIBS data, extracting valuable information about the composition of the sample.

2.2.4 Operation:

- i. **Sample Preparation:** Geological cores or other samples are prepared for analysis, ensuring a flat and clean surface.
- ii. **Hyperspectral Imaging:** The hyperspectral imaging system scans the sample, capturing detailed spectral information across a wide range of wavelengths.

Hyperspectral data is acquired for each pixel, providing a spectral signature for every location on the sample.

- iii. **LIBS Analysis:** The LIBS system fires a laser pulse onto the same location on the sample, inducing a plasma. Emitted light from the plasma is analyzed by the spectrometer to determine the elemental composition of the material.

- 2.2.5 The combination of hyperspectral and LIBS data provides both spectral and elemental information for each location. Data Fusion and Analysis:

Hyperspectral and LIBS data are fused, creating a comprehensive dataset for analysis.

Advanced algorithms and software analyze the data to identify minerals, elements, and other materials present in the sample.

2.3.0 Applications:

- 2.3.1 Geological Exploration: i. Identification of mineral composition in geological cores for resource exploration.

ii. Mapping of mineralogy and alteration zones.

- 2.3.2 Material Science: i. Analysis of materials for research and development purposes.

ii. Quality control and characterization of materials in manufacturing.

- 2.3.3 Environmental Monitoring:

i. Analysis of soil, water, and air samples for environmental studies.

ii. Detection of pollutants and contaminants.

2.4.0 Advantages:

- 2.4.1 Comprehensive Analysis: Provides both spectral and elemental information for detailed material characterization.

- 2.4.2 High Sensitivity: LIBS offers high sensitivity for trace elemental analysis.

2.5.0 Available instrument

2.5.1 Elemission LIBS Technology:

A Canada base company, Elemission LIBS technology is one of the very few companies manufacture Hyperspectral Corescanner with LIBS technology.

ECORE is the one their model of having Hyperspectral LIBS core scanning Instrument. The specification of the instrument has been provided below.

TECHNICAL SPECIFICATION FOR HYPERSPECTRAL CORE SCANNER INSTRUMENT AND PROCESSING SOFTWARE WITH LIBS

Sl.No.	Item	Specification
1.	Dimension of Instrument	3800 mm x 1650 mm X 2100 mm
2.	Weight of Instrument	450 kg
3.	Camera/Sensor Type (RGB, VNIR, SWIR)	Class 1 laser, Imaging line camera
I	RGB Camera	
A	Resolution of RGB Camera	high-resolution image of 57 micrometers per pixels
B	Scanning Speed	1 cm ² at 50 micron resolution in less than 40 seconds – OPTION 30 s @ 1300 Hz
II	Hyperspectral Camera	
i	Spectral Range -VNIR	220 nm to 930 nm
ii	Spectral Resolution	Factory set ~ 50 micrometers
III	LIBS sensor	
A.	Analytical Range	
B.	Detection limit	Unmatched high speed 1000Hz electronics, High resolution spectrometer with spectral coverage from 220 nm to 930 nm, high transmission fiber optics cable for maximum plasma emission light collection.
E.	Calibrations modules	Linear and polynomial fitting calibration, advanced calibration model using broadband LIBS spectra.
F.	System Calibration Facilities	System fitted calibration and software module.
G.	Data Acquiring Speed	1300 measurements per second (1300 Hz) access the average value of your sample in sec.
4.	Overall Scanning Speed using all the sensor and LIBS	1000 measurements per second (1000 Hz) - (OPTION 1300 Hz)
5.	Core Length	1500mm
6.	Core diameter	300mm
7.	Image Scanning Mode (Planner)	
8.	Laptop Specification	Integrated computer (inside instrument) - Intel i7 with Windows 10 Pro, 32GB RAM, 1 TB SSD M.2, 24" LCD Monitor, keyboard and mouse - subject to

		change with current model offered Tower computer - Intel i9 12th generation with Windows 10 Pro, 128GB RAM, 4 TB SSD M.2, - subject to change with current model offered
9.	Software	- LIBS peak integration - LIBS spectra - Continuum and background signal subtraction - LIBS spectra curve fitting - LIBS statistics tracking during multiple laser shot data collection - LIBS signal statistics tracking during multiple laser shot data collection - 2D mapping of the selected elements - Quantitative analysis with linear and polynomial fitting calibration - Advanced calibration model using broadband - Sample library building for sample classification analysis, - Comparative LIBS spectra analysis, PLSR1, Auto PCA imaging that allows you to view the most probable image after an acquisition - Intuitive and easy to train supervised learning algorithm (SAM).
10.	Power Supply of Core Scanner	220-240 / 20 A @ 50-60 Hz
11.	Operating temperature of Core Scanner	Normal laboratory conditions 15 TO 28 °C
12.	Mounting in truck with AC Chamber	Will be specified by bidder
A.	Dimension of Operational Space	Additional 500mm of equipment dimension.
B.	Generator specification	Suitable generator will be provided
13.	Training of Equipment, Software and Operation	Training will be provided by OEM engineers.
14.	Delivery Period	32-36 weeks

2.5.2 DMT Germany:

DMT is an another well known company having Hyperspectral core scanner with LIBS technology. However, detail of the instrument is not available with us at present time.

2.6.0 Cost of Instrument:

2.6.1 As per the market survey, MECL obtained an quotation from an Indian supplier of ECORE core scanning instrument with an cost of 18.68 Cr excluding GST. The quotation has been attached below.



Aimil Ltd.
Instrumentation & Technologies




Mai Duchakke Mansion, 1st Floor, Plot No. U-24, Narendra Nagar, Ujjwal Co-op Housing Society, Nagpur - 440015
Tel : 0712 -2786600/01 Fax : 0712-2786611 Email : nagpur@aimil.com

Ref: A.NGP/ QUOTE/ IMPORT/ VH/ 23-24/ 108 Date: 25.08.2023

The General Manager (Exploration)
Mineral Exploration & Consultancy Ltd.
Nagpur.

Kind Attn: Mr. P. Ravindran

Subject: Budgetary Quotation for Ecore & Ecore Flex Hyper-Spectral Imagine System (Core Scanning System)

LIBS based Hypersepctral Core Scanning System				
Sl. No.	DESCRIPTION	UNIT PRICE IN Rs.	Qty.	TOTAL PRICE IN Rs.
1.	ECORE- LASER CORE SCANNER ECORE is the ultimate core scanner: combine the novel geochemical laser ablation sensor to ELEMISSION automation expertise and, increase your on-site workflow.	13,70,62,500.00	1	13,70,62,500.00
2	Installation, Commissioning and Training by ELEMISSION engineers	36,55,000.00	1	36,55,000.00
3	Mobile Van Fabrication with Suitable Chassis	2,50,00,000.00	1	2,50,00,000.00
4	Custom Duty, Clearance, Freight, Sea Shipment Charges	2,11,07,625.00		
	Basic Total Inclusive above all (1+2+3+4)	18,68,25,125.00		
	GST 18%	3,36,28,522.00		
	Net Cost with GST	22,04,53,648.00		
	Note-We are Quoting in Rs , considering highest possible conversion rates is 1 USD, approx. equals 85 INR, These prices can be increased or decreased depending on USD to Rs transfer rates & Changes in other Taxes & levies rates. Item No 4 will be fabricated in India as per required Standard given by OEM. Chassis of which will be purchased by MECL & allow us to fabricate it as per given Design.			

GSTIN : Z7AACCA7217J1ZO PAN : AACCA7217J CIN-U74899 DL1972 PLC 006093

Corporate Office: Naimex House, A-8, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi 110044, India
Phone: 91-11-30810200 Fax: 91-11-26950011 Email: info@aimil.com Website: www.aimil.com

Branches: Bengaluru, Bhubaneswar, Chandigarh, Chennai, Guwahati, Hyderabad, Indore, Kochi, Kolkata, Lucknow, Mumbai, Pune, Vadodara

Beyond Options. Solutions



Mai Duchakke Mansion, 1st Floor, Plot No. U-24, Narendra Nagar, Ujjwal Co-op Housing Society, Nagpur - 440015
Tel : 0712 -2786600/01 Fax : 0712-2786611 Email : nagpur@aimil.com

TERMS AND CONDITIONS:

Prices	: 100% Advance with suitable mode of Payment
Delivery	: Within 36-40 weeks
Payment Terms	: By Wire Transfer OR Letter Of Credit
Validity Of Quotation	: 60 days.
Import License	: To be arranged by AIMIL Ltd.
Make	. Elimission, Canada Sr No 4 is Local Make & Fabricated
Freight and Insurance charges	Included
Customs Clearance and Import Duty	: The Custom clearance and transportation from docks / airport has to be arranged by AIMIL. If your Organization is eligible for Duty Free Imports, NMI and CDE Certificates may be obtained prior to shipment or against the Passbook, if available with your Organization.,
ORDER TO BE PLACE ON	: AIMIL Ltd, Naimex House A-8, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi - 110 044
Warranty	: The Instruments supplied will carry warranty obligations for a period of 12 months from the date of receipt of equipment in good condition or 12 months after satisfactory commissioning..

NOTE: YOUR ORDER SHOULD BE MADE OUT IN THE NAME OF OUR PRINCIPALS AND SHOULD BE SENT TO US IN DUPLICATE FOR PROCESSING.

Yours faithfully,
For AIMIL Limited



Vivek Hirde
Jt. Business Manager

GSTIN : ZTAACCA7217J1ZO PAN : AACCA7217J CIN-U74899 DL1972 PLC 006093

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Beyond Options. Solutions

3.0.0 Hyperspectral Core-scanner with XRF Technology

3.1.0 Overview:

3.1.1 A hyperspectral core-scanner with XRF (X-ray fluorescence) is a sophisticated analytical instrument used in geosciences, environmental science, and mining to characterize the composition of core samples in a non-destructive manner.

3.2.0 Key Components:

3.2.1 Hyperspectral Imaging System:

- i. Definition: Hyperspectral imaging involves capturing and processing information from across the electromagnetic spectrum.
- ii. Functionality: The hyperspectral core-scanner captures detailed spectral information for each pixel in the image. This enables the identification of specific minerals and elements based on their unique spectral signatures.

3.2.2 X-ray Fluorescence (XRF):

- i. Definition: XRF is a technique that uses X-rays to excite the atoms of a material, causing them to emit characteristic X-ray fluorescence. By analyzing the emitted X-rays, the elemental composition of the material can be determined.
- ii. Functionality: In the context of the core-scanner, XRF is employed to analyze the elemental composition of the geological samples. It provides quantitative data on the presence and concentration of various elements

3.2.3 Control and Data Processing Unit:

- i. Control System: Manages the operation of the hyperspectral core-scanner, including controlling of different probe, data acquisition, and synchronization between hyperspectral and XRF systems.
- ii. Data Processing Software: Processes and analyzes the hyperspectral and XRF data, extracting valuable information about the composition of the sample.

3.2.4 Operation:

- i. Sample Preparation: Geological cores or other samples are prepared for analysis, ensuring a flat and clean surface.
- ii. Hyperspectral Imaging: The hyperspectral imaging system scans the sample, capturing detailed spectral information across a wide range of wavelengths.

Hyperspectral data is acquired for each pixel, providing a spectral signature for every location on the sample.

iii. Elemental Analysis: The XRF probe attached with instrument provides elemental analysis.

3.2.5 In summary, a hyperspectral core-scanner with XRF combines advanced imaging technology with elemental analysis to provide detailed and non-destructive insights into the composition of geological core samples, making it a valuable tool in various scientific and industrial applications.

3.3.0 Applications:

3.3.1 Geological Exploration: i. Identification of mineral composition in geological cores for resource exploration.

ii. Mapping of mineralogy and alteration zones.

3.3.2 Material Science: i. Analysis of materials for research and development purposes.

3.3.3 Environmental Monitoring:

i. Analysis of soil, water, and air samples for environmental studies.

ii. Detection of pollutants and contaminants.

3.4.0 Advantages:

3.4.1 Comprehensive Analysis: Provides both spectral and elemental information for detailed material characterization.

3.4.2 The use of hyperspectral imaging and XRF allows for non-destructive analysis of core samples.

3.5.0 Available instrument

3.5.1 Geotek Limited:

3.5.1.1 A UK base company, Geotek Ltd is one of the very few companies manufacture Hyperspectral Corescanner with XRF technology. Geotek Ltd. (UK) specialises in high-resolution, non-destructive analysis of geological cores. They have designed, built, and supplied range of Multi-Sensor Core Logger (MSCL) systems for over 20 years, using a suite of geophysical and geochemical sensors primarily aimed at non-destructive core analysis. Geotek provides equipment sales and services to science and industry worldwide.

3.5.1.2 Boxscan is the one their model of having XRF combined in Hyperspectral core scanning Instrument.



3.5.1.3 **Cost of Instrument:** As per the market survey, MECL obtained an quotation from an Indian supplier of Boxscan instrument with an cost of 11.10 Cr with 5 years CAMC after 1 year of warranty but excluding GST. The quotation has been attached below.



PAN INDIA CONSULTANTS PVT. LTD.

SALES DEPARTMENT

CORPORATE ADDRESS: 105, PHASE IV, UDYOG VIHAR, GURGAON-122015, HARYANA, INDIA
PHONES: +91 124 4300950, 4013954, **FAX:** +91 124 2346646, 2342680, **CIN -** U74899DL1985PTC021177
e-mail: paie@panindiagroup.com, www.panindiagroup.com

BUDGETARY QUOTATION

To, Mineral Exploration and Consultancy Limited Dr. Babasaheb Ambedkar Bhawan, Seminary Hills, Nagpur, Maharashtra 440006		Quotation No: PIE-369/039B/UK			
		Date: 04/09/2023			
		Ref: Inquiry			
		GSTIN: 06AAACP0622N1ZK			
		PAN: AAACP0622N			
Sl. No.	Description of Goods	HSN /SAC Code	Qty	Unit Price INR	Total Price INR
1.	BoxScan (MKIV) Base System with Geoscan VI and 3D Laser Includes: - Automated core analysis platform - Electronics - Acquisition computer - Core Imaging Linescan Camera - AreaScan camera for whole box imaging - Automated spray bar system for wet core imaging - 3D Laser for core topography - Accepts core boxes up to 1.5 m in length	9015	01no.	3,10,85,046.00	3,10,85,046.00
2.	Automated spray system for wet core photography Wet imaging of mining core without any specular reflection due to polarised source and detector.		01no.	12,39,300.00	12,39,300.00
3.	BoxScan: Olympus Vanta M + Integration Kit Note: Olympus Vanta pXRF includes a 15W X-ray source. Customer is responsible for obtaining necessary permissions to use Olympus Vanta		01no.	96,39,000.00	96,39,000.00
4.	BoxScan: Malvern Panalytical Labspec 4 + Integration Kit Hyperspectral VNIR/SWIR imaging for mineralogical determination.		01no.	1,67,48,370.00	1,67,48,370.00
5.	Perpetual License for MinSpec for VNIR/SWIR interpretation of Labspec data		01no.	1,13,40,000.00	1,13,40,000.00
6.	Annual Gold Service Contract for Boxscan system		05yrs.	73,87,200.00	3,69,36,000.00
SubTotal					10,69,87,716.00
IGST@18%					1,92,57,788.88
Total(including IGST)					12,62,45,504.88
(Rupees Twelve crore sixty-two lakh forty-five thousand five hundred four only)					

REGD. OFFICE: OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA
PHONES: +91 11 26137657, 26137659, 26899952, 26899962, 26132214 **FAX:** +91 11 26138633

PAN INDIA CONSULTANTS PVT. LTD.

Optional Item

Vehicle fabricated with BoxScan in AC Chamber: Rs 40,00,000.00 plus GST(Rupees Forty lakh plus GST)
Vehicle Registration and permit documents will be provided by MECL, Nagpur.

Terms and Conditions

1	Price	Prices are in INR Ex-works Pan India Consultants Pvt. Ltd., Gurgaon Quoted prices vary with GBP-INR rate fluctuation (Calculated price 1GBP: 106INR)
2	Taxes	IGST@18% will be charged as indicated
3	Delivery	13-15weeks after receipt of confirmed purchase order
4	Payment	Prepayment
5	Warranty	12 months
6	Installation & Training	Installation & Training by Pan India Consultants Pvt Ltd at site
7	Force Majeure	Applies

for PAN INDIA CONSULTANTS PVT. LTD.



Umesh Kumar (M: 9650797647)
Manager
(Email: umeshkumar@panindiagroup.com)

REGD. OFFICE: OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA
PHONES: +91 11 26137657, 26137659, 26899952, 26899962, 26132214 FAX: +91 11 26138633

3.5.2 DMT Germany:

3.5.2.1 DMT is another well known company having Hyperspectral corescanner with XRF probe.

3.5.2.2 ANCORELOG is a mobile drill core logging system that measures chemical, mineralogical, and textural rock properties with high accuracy.



3.5.2.3 ANCORELOG uses J&C Bachmanns XRF sensor TEXAS. With this sensor it is possible to identify chemical elements with the atomic number 15 (sulfur) upwards (red frame in the right image)

PERIODIC TABLE OF ELEMENTS																			
1 H Hydrogen																	2 He Helium		
3 Li Lithium	4 Be Beryllium													5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium													13 Al Aluminium	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton		
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon		
55 Cs Cesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon		
87 Fr Francium	88 Ra Radium	89 Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson		
58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium						
90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium						

3.5.2.4 Cost of Instrument: As per the market survey, MECL obtained an quotation from an Indian supplier of Ancorelog instrument with an cost of 17.03 Cr with 5 years CAMC after 1 year of warranty but excluding GST. The quotation has been attached below.



EI/BQ-DMT/45A-2/G
12th September 2023

Mineral Exploration & Consultancy Limited
Dr. Babasaheb Ambadkar Bhawan
Seminary Hills, Nagpur – 440006

Kind Attn: GM (Exploration), MECL

Budgetary Quotation for AncorelogSystem with Hyperspectral Imaging Sensor and XRF Sensor from DMT GmbH,Germany.

Item	Qty	Description	Price in INR
1.	1	DMT ANCORELOG Mobile system : for physical and textural properties of drill core Which includes - laser profile sensor (Gocator) - RGB line scan camera - transport box - laptop or workstation - steering software	2,62,55,340
2.	1	HYPER SPECTRAL imaging sensor (HySpex SWIR-384) for mineralogical drill core composition Spectral range: 930-2500nm Spatial resolution: 5 pixel/mm (127 dpi) Spectral resolution: 5.4 nm (288 bands)	4,54,87,575
3.	1	HYPER SPECTRAL imaging sensor (HySpex VNIR 1024) for mineralogical drill core composition Spectral range: 400-1000nm Spatial resolution: 18 pixel/mm (457 dpi) Spectral resolution: 5.4 nm (108 bands)	1,97,00,000
4.	1	XRF Sensor (JCBachmann TEXAS) for Chemical drill core composition	4,37,58,900
5.	1	Software Drill core logging and data management system. Analysis for structural evaluation. Interpretation software for HSI data based on machine learning and neural network	26,54,707
6.		Installation and Commissioning: Five days onsite installation by Electrotek Engineers at MECL, Nagpur.	Included
7.		Training by OEM Experts: Training by DMT experts at an <u>additional cost</u> for five days at Site. This includes travel, accommodation and other travel expenses of DMT expert.	15,00,000

Note: GST is additional and will be charged as per actual at the time of invoice.

E-mail : contact@electrotekintl.com Phone : 2499 6743 / 2499 6327 / 2499 5816



ELECTROTEK INSTRUMENTS (P) LTD.

19, Sir C.V. Raman Road, Alwarpet, Chennai - 600 018, India. Fax : 0091-44-2499 4056

AMC (after the standard warranty of one year)

Year	Total AMC Cost (INR)
1 st Year	54,00,000
2 nd Year	67,60,000
3 rd Year	67,60,000
4 th Year	67,60,000
5 th Year	67,60,000

Note: GST is additional and will be charged as per actual at the time of invoice.

Commercial Terms:

Prices	Prices are in FOR Destination
Taxes	CGST & SGST / IGST @18% will be charged or as applicable
Currency	Price quoted is in INR (Rs.)
Payment	95% of the value and 100% GST within 10 days from the date of Delivery of the product. Balance 10% within 15 days after the installation.
Country of Origin	Germany
Warranty	15 months from the date of receipts of the goods OR 12 months from the date of installation, which ever is earlier.
Validity	60 days
Approx. delivery time	4-6 months after receipt and acceptance of purchase order

E-mail : contact@electrotekintl.com Phone : 2499 6743 / 2499 6327 / 2499 5816

3.5.3 Photon etc:

3.5.3.1 Photon etc is an another well known company having Hyperspectral corescanner with XRF probe.

3.5.3.2 nCore is a mobile drill core logging system developed by Photon etc.

3.5.3.3 As per the market survey, MECL obtained an quotation from an Indian supplier of nCore with with 5 years CAMC which has been attached below.

Ref: CIS/MECL/251023

25.10.2023

Dr. Swroop Dhara
Manager (Geology)
Mineral Exploration Consultancy Limited
Nagpur

Sub: Offer for Multi-Sensor Hyperspectral Core Scanner

Dear Sir,

This is in reference to your requirement for Multi-Sensor Hyperspectral Core Scanner. Produced below is our offer for the same for your kind perusal

Sl No	Item description/specification	Quantity	Unit Price (INR)
1	RGB 4K Imaging Camera Spatial channels: 4096 px across line scan f/ number range: f/1.4 - f/22 Pixel Size: 7.04 μ m x 7.04 μ m Depth of field range: 16 mm - 250 mm Illumination	1	33,80,000.00
2	VISNIR Hyperspectral Imaging module Enhanced Pika XC2 Spectral range: 400-1000 nm Spectral channels : 447 Spatial sampling: 1.3 nm/px Spatial sampling: 0.31-0.4 mm/px (FOV 25 -32 cm) 100 FPS 17 mm objective illumination	1	65,00,000.00
3	SWIR Hyperspectral Imaging Module L-EOS 2.5 Hyperspectral Camera Spectral range: 950 - 2500 nm Spectral channels : 320 Spectral sampling: 2.5 nm/pix Spectral channels : 256 Spatial sampling: 1.0-1.25 mm/px (FOV 25 -32 cm) Spatial channels : 256 100 FPS HypIRia 15, 15 mm objective Temperature range (10-30 °C)	1	1,82,00,000.00

Complete Instrumentation Solutions Private Limited,
Suite #512, Suncity Business Towers, Golf Course Road, Sector-54, Gurgaon, Haryana
Tel: 0124-4929000 Fax:0124-4929010 (E) info@instrumentation-solutions.com
(W) www.instrumentation-solutions.com

	illumination		
4	Handheld XRF High count rate, high resolution, extra large area silicon drift detector (1µm graphene window) Detector ProGuard protection included. 2.8 lbs with battery (1.3 kg) X-Ray Tube: Ag anode (6-50kV, 0-500uA, 5W max) Filter: Six (6) position filter wheel for enhanced spectral range coverage Current: Dynamically adjustable current for optimal sensitivity on every analysis Standard: 8mm collimation Optional: 3mm small-spot collimation 9.54 x 8.19 x 2.67 in (242.56 x 208.17 x 67.90 mm) 12V lithium-ion battery, or 12V DC, 3A, 3.6W power supply Hot swap functionality keeps analyzer powered during battery replacements	1	1,10,50,000.00
5	Calibration unit	1	13,00,000.00
6	Profilometer Spatial sampling: xy: 100 µm / z : 200µm	1	30,55,000.00
7	PhySpec™ Software (VISNIR and SWIR) PhySpec™ control software (64 bits) with user manual to control VISNIR and SWIR Photon etc.'s proprietary software for instrument and camera control and data analysis. It provides a sequencer with measurement automation as well as analytical tools for rapid extraction of sample information. Non-exclusive licence, the software may be installed on multiple PCs simultaneously Sequential acquisitions defined by user via software: » Allow user to define custom exposure time, region of interest, non-uniformity correction, calibration, and image processing Hyperspectral imaging analysis toolbox: » Pixel-spectrum visualization tools » Hyperspectral data processing (dark subtraction, normalization, smoothing, curve fitting, binning, cropping, spectral map) » Hyperspectral files exportable in HDF format (.H5) and fits (compatible with other softwares) » Spectrum data files exportable in HDF format (.H5) and CVS (excel compatible) Imaging analysis toolbox: » Multithreaded architecture for expedites processing complex algorithms » Image files exportable in HDF format (.H5), JPEG, PNG, FITS and BMP	1	45,00,000.00

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 (W) www.instrumentation-solutions.com

8	Software Development Kit (VISNIR and SWIR) The training Photon etc.'s proprietary API, its SDK and multiple examples are provided for you to build your own control software or integrate our cameras in your system. Natively based on C++, we provide Python bindings and C wrappers for further flexibility. It is available for 64-bit and 32-bit Windows, as well as Linux X64.	1	22,00,000.00
9	Onsite training (one week)	1	15,00,000.00
10	Support 200 hours of live support and email support (software integration, hardware integration, etc.) to help you integrate the hyperspectral camera and develop your custom system. We have availability during the following time slots: 7:30 AM to 9:30 AM IST, and 4:40 PM to 5:30 PM IST.	1	1,30,00,000.00
	Options and accessories		
11	Bar code reader	1	45,50,000.00
12	Benchtop Lean Lean benchtop push-broom imaging system with a translation stage The lean benchtop include a translation stage mounted on a optical breadboard with mountings stands for L-EOS and Photon etc. illumination. Do not include the L-EOS and illumination. The translation stage, the L-EOS and the illumination are control by PhySpec. Spectro and Illumination are secured on independent structures and are not designed to be adjusted Base plate : Optical breadboard No trigger option Foot print (approx): 570 mm X 450 mm X 800 mm (L X W X H) Tray dimension (W x L) : 20 cm x 20 cm Maximum payload : 10 kg Movement speed: 100 mm/s (medium) 199 mm/s (maximum) Translation stage travel: 300 mm	1	45,50,000.00
13	MWIR Hyperspectral Imaging module Photon Spectrometer MWIR Spectral range: 3000-5000 nm Spectral channels : 246 Spectral sampling: 8.0 nm/pix Spectral channels : 246 Spatial sampling: 1.0-1.25 mm/px (FOV 25 -32 cm)	1	2,86,00,000.00

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 (W) www.instrumentation-solutions.com

	Spatial channels : 256 100 FPS MWIR Lens		
14	Air-conditioned Container for Operation of Equipment with Horse	1	1,50,00,000.00
	Shipping and Insurances	1	20,00,000.00
	TOTAL (EXWORKS GURGAON)		11,93,85,000.00
	GST @18%		2,14,89,300.00
	TOTAL		14,08,74,300.00
	Comprehensive Annual Maintenance Charges (CAMC)- can not provide the amount as it will depend on the configuration you opt for. Also this does not include software mentioned above which comes with an yearly subscription fee		
	1st Year after warranty		1,79,07,750 (15%)
	2nd Year after warranty		2,05,93,913.00 (17.25%)
	3rd Year after warranty		2,36,38,230.00 (19.8%)
	4th Year after warranty		2,72,19,780.00 (22.8%)

TERMS AND CONDITIONS

Manufacturer	M/s PHOTON ETC. 5795 DE GASPE AVENUE, #222 MONTREAL, QUEBEC, H2S 2X3 CANADA
Prices	Exworks Gurgaon
Payment	Through Wire Transfer. 50% along with the order, 45% at the time of shipment from Montreal and 5% after installation and commissioning
Bank Details	Account Name: Complete Instrumentation Solutions Private Limited Bank: ICICI Bank Limited, Suncity, Sector-54, Gurgaon Account No. : 039905003896 RTGS/NEFT: ICIC0000399 PAN: AAEC3061C TIN: 06271832864

Complete Instrumentation Solutions Private Limited,
 Suite #512, Suncity Business Towers, Golf Course Road, Sector-54, Gurgaon, Haryana
 Tel: 0124-4929000 Fax:0124-4929010 (E) info@instrumentation-solutions.com
 (W) www.instrumentation-solutions.com

	GST: 06AAECC3061C1Z9
Delivery Time	Within 90 weeks
Offer Validity	30 Days
GST No.	06AAECC3061C1Z9
GST	@18% or what will be applicable at the time of invoicing
Permits for shipment to MECL	Will be the responsibility of MECL
Registration and Insurance of Vehicle and equipment	Will be the responsibility of MECL

Thanking you.

Complete Instrumentation Solutions Pvt Ltd



 Bharti Gupta



Complete Instrumentation Solutions Private Limited,
 Suite #512, Suncity Business Towers, Golf Course Road, Sector-54, Gurgaon, Haryana
 Tel: 0124-4929000 Fax:0124-4929010 (E) info@instrumentation-solutions.com
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3.6.0 Comparative Study:

3.6.1 Comparative study has been done for the instruments discussed under the point 2.1, 2.2 and 2.3 which has been presented below. Moreover, MECL also contacted with Terracore and Core scan Pty Ltd, Australia for gathering information regarding Hyperspectral core scanner with XRF. But due to unavailability of XRF probe in their instrument, the comparative study only carried out on Boxscan, Ancorelog and nCore instrument.

Comparison of Advance Core Scanner with Hyperspectral and XRF Probe			
Particulars	M/s Pan India Consultant Pvt. Ltd	M/s Electrotek Instruments (P) Ltd	M/s Complete instrumentation Solutions Pvt Ltd
Manufacture Company	GEOTEK, U.K	DMT, Germany	Photon, Canada
Model	Box Scan	Ancorelog Mobile system	nCore
Payloads/Sensor Type	RGB, VNIR, SWIR, XRF	RGB, SWIR, VNIR, XRF	RGB, VISNIR, SWIR, XRF
Image Scan Mode	Planner	Planner	Planner
Deployment	Lab and Field	Lab and Field	Lab and Field
Image Processing	By Purchaser through given software	By Purchaser through given software	By Third Party Software
Output	Mineral Assemblage and elemental Analysis	Mineral Assemblage and elemental Analysis	Mineral Assemblage and elemental Analysis
Warranty	1 year	1 year	1 year
AMC	Yes- optional Included for 5 Years after warranty of 1 year	Yes- optional Included for 5 Years after warranty of 1 year	Yes- optional Included for 5 Years after warranty of 1 year
Truck Mounting and Fabrication	Included in quotation	Not included in quotation	Included in quotation
Tentative Cost without GST	11.10 Cr.	17.03 Cr	30.82 Cr.

Comparison of Payloads offered with Hyperspectral Core Scanner and XRF Prob			
Particulars	M/s Pan India Consultant Pvt. Ltd	M/s Electrotek Instruments (P) Ltd	M/s Complete instrumentation Solutions Pvt Ltd
Model	Box Scan	Ancorelog Mobile system	nCore
RGB Sensor	100 mm/pixel	60 mm/pixel	75 mm/pixel
VNIR Sensor	350nm to 1000nm	400nm to 1000nm	400nm to 1000nm
SWIR Sensor	900nm to 2500nm	930nm to 2500nm	950nm to 2500nm
XRF Sensor	Vanta XRF upto ppm level	Total Elemental X-ray Analysis System upto ppm level	Industrial XRF upto ppm level
LIBS Sensor	NA	NA	NA

Laptop	Yes	Yes	Yes
Processing Software	Yes	Yes	Yes
Core scanning speed with RGB sensor *	16mm/s	6.6mm/s	5.50mm/s
Max sample weight	50 kg	Not mentioned	50 kg
Total Weight	500 kg	300 kg	Not mentioned
* Scanning speed may vary with other sensor/payloads.			
** XRF probe not available with this model.			

3.6.2 After obtaining detail specification of the instrument, a common minimum specification has been curved out for procuring Hyperspectral Core Scanner with XRF probe which is given below.

Common Minimum Specification for hyperspectral Core Scanner with XRF		
Sl. No.	Item	Specification
1.	Dimension of Instrument	Length: Max. 2.55 m, Width: Max. 1.50 m, Height: Max. 1.90 m
2.	Weight of Instrument	Max. 950kg
3.	Camera/Sensor Type (RGB, VNIR, SWIR)	RGB, SWIR and VNIR, XRF
I	RGB Camera	
A	Resolution of RGB Camera	40 pixel/mm
B	Scanning Speed	Min. 900mm/s @ 40 pixel/m
II	Hyperspectral Camera	
i	Spectral Range - VNIR	400-1000 nm
B	Spectral Resolution	Min. 3.0nm
C	Spectral Bands	150
D	Scanning Speed	Min. 10mm/s
E	Bit Resolution	16 bit
ii	Spectral Range - SWIR	Min. 930- 2500 nm
B	Spectral Resolution	Min. 5.45 nm
C	Spectral Bands	250
D	Scanning Speed	10mm/s

F	Bit Resolution	16 bit
III	XRF sensor	
A.	Analytical Range	10 ppm – 100% (0.01% - 100% by weight)
B.	Detection limit	Min 10ppm
E.	Calibrations modules	Built into software package
F.	System Calibration Facilities	Manual and automatic calibration modules included.
G.	Data Acquiring Speed	Min 10mm/s
4.	Overall Scanning Speed using all the sensor and XRF	100m/shift (shift = 8h)
5.	Core Length	Min 1m
6.	Core diameter	Min 10cm
7.	Image Scanning Mode (Planner)	Line scan
8.	Laptop Specification	Laptop with intel-i7; 32GB RAM
9.	Software	Software included
10.	Power Supply of Core Scanner	230V/ 1000W
11.	Operating temperature of Core Scanner	Min 10-30°C
12.	Mounting in truck with AC Chamber	Truck/Mini Truck mounted
A.	Dimension of Operational Space	6m x 2.5m x 2.5m
B.	Generator specification	3Kw to 5Kw.
13.	Training of Equipment, Software and Operation	Training by OEM for 5 days
14.	Delivery Period	4 Months

4.0.0 Justification of Procurement

1. Hyperspectral imaging core scanner is an emerging technology that complements traditional exploration and ore characterization methods. Hyperspectral drill-core scanning can be integrated into standard core-logging procedures and supports on-site geologists with fast, efficient, and unbiased means of extracting valuable mineralogical information.
2. A hyperspectral drill core scanner provides a comprehensive analysis of mineralogy, lithology, and alteration mineral mapping. It creates detailed maps of mineral distribution within the cores, aiding in identifying valuable mineral deposits. This detailed information allows geologists to gain deeper insights into the subsurface geology, aiding in the discovery of mineral deposits and understanding geological formations.
3. Traditional methods of core analysis can be time-consuming. Hyperspectral scanning automates and speeds up the process, increasing efficiency while reducing the margin for human error in mineral identification and analysis. The initial investment might seem significant, hyperspectral scanning can lead to long-term cost savings. It reduces the need for extensive laboratory testing, as it provides comprehensive mineralogical data in a quicker timeframe. Moreover, it assists in better targeting high-value mineral deposits, optimizing exploration efforts, and potentially optimize the exploration costs. Hyperspectral scanning not only identifies minerals but also assists in assessing rock alteration, geotechnical properties.
4. Presently a huge core repository is lying in the different parts of India generated through the exploration campaign carried out by different agency in the last few decades. As per the general practice, the borehole samples were analyzed for targeted elements due to non-availability of ICPMS technology and budgetary constrain. Now these cores can be scanned with the means of hyperspectral and XRF/LIBS probes and potentiality of hosting any other important trace elements can be evaluated.
5. Hyperspectral core scanning with LIBS technology is combines the novel geochemical laser ablation sensor and increases the on-site workflow, analyses and obtain results in real time at speeds compatible. Lithium, beryllium, Sodium, detection limits are lower than 1 ppm (w/w).
6. The laser-based technology allows a full microanalysis of the drill core, bringing complete set of information from the quantitative automated mineralogy to multi-elemental assays (keeping spatial information like texture and deportation). This drill core scanner brings the solution with a sensitivity that competes with LA-ICP-MS and true elemental analyzer from H to U. It has Broad elemental coverage, including lighter elements, such as H, Be, Li, C, N, O, Na, and Mg. By utilizing this technology large volume of drill cores can be rapidly scanned. The data generated is in the form of spectral signatures which can be linked to certain alteration minerals like various kinds of mica or amphibole associated with mineralized zones with the help of software creating a mineralogical mapping. Digitization of core with mineral mapping is the current market

requirement and the same is intended for the purpose of expertise diversification and enhancement of MECL.

7. Moreover, utilizing advanced technology like hyperspectral scanning can provide a competitive edge in the mining industry. It enables more precise targeting of valuable mineral resources, potentially leading to better-quality discoveries compared to competitors using traditional methods.
8. MECL already have one set of RGB core scanner since 2021. This instrument continuously engaged with capturing of core scanning in HCL and RSMML projects core photography.

5.0.0 Work projection for next 5 years and utilization of the instrument

Based upon the current market scenario, the emphasis has been given for digital core library to reduce the cost of the storage facility. Apart from that, procuring of advance model of digital hyperspectral core scanner with LIBS technology will diversify the business model and enhance the potency of the company. Procuring of this equipment will also help us to grab the opportunity of digitalization of approx. 5.0 lakhs meter skeletal core of GSI lying at different core repository and building of technical database with elemental analysis mechanism. Moreover, drill core generated through NMET funded projects of NEA/NPEA may also considered for scanning for mineral mapping particularly for basemetals, critical and strategic minerals.

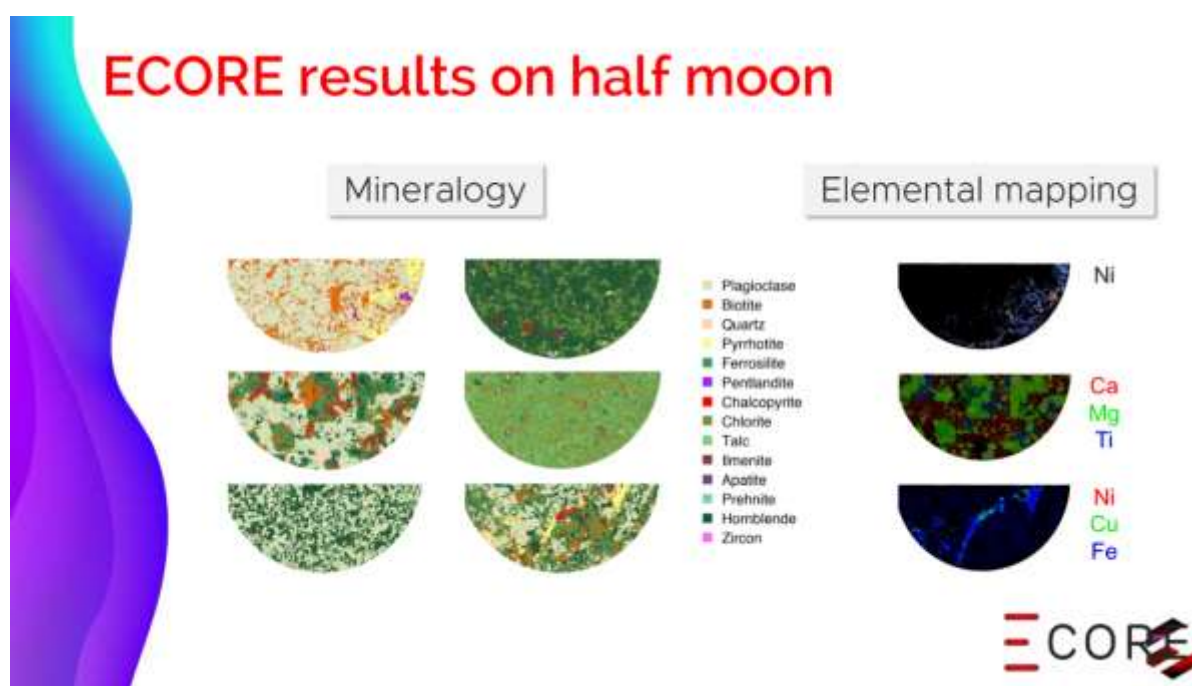
6.0.0 Details of Technical Capabilities of MECL for running the instruments

1. Presently 92 Nos of experienced Geologist of different levels engaged in Exploration Division. They are well trained professionals with expertise in spectroscopy, geology, remote sensing, and data analysis. The recruitment of 18 nos of experienced Geologist is in pipeline.
2. In order to adopt advance technological innovation in the exploration value chain, Mineral Exploration Corporation Limited (MECL) procured automatic RGB Digital Drill Core Scanner and run successfully since 2021. This digital intervention would offer a reliable system for structuring and evaluating the drill cores for mineral exploration projects and ultimately promoting cost and data efficiency. The Drill Core Scanner provides high resolution images of the drill core in a unique 360-degree processing for better interpretation. MECL has Trained operators who can handle and operate scanners efficiently.
3. Continuous improvement in techniques, potentially involving ongoing projects in the field and also able to locate a new green field areas with similar spectral signature. Efforts directed towards improving methodologies, software tools, and techniques for enhanced data interpretation and visualization. This instrument continuously engaged with capturing of core scanning in HCL and RSMML projects core photography. Till date around 30000m core of

phosphorite mineralization of RSMML and 20000m core of copper mineralization of HCL photography have been carried out by RGB core scanner. Client also demands about hyperspectral core scanning. But due to non-availability of the instrument, MECL unable to offer the service.

4. Presently around 5 lakhs meter core is lying at GSI core repository in the different parts of India, which were generated through the exploration campaign carried out by GSI. These are very old core and in general, core samples were analyzed for major targeted elements. Now these cores can be scanned with the means of hyperspectral and XRF/LIBS probes and potentiality of hosting any important trace elements (Critical/Strategic) can be evaluated.
5. Provision of training sessions from OEM for Geologists to get equitant and stay updated on instrument operation, data analysis techniques, and advancements in the field. Encouragement for skill enhancement and further education to keep abreast of the latest technological advancements.

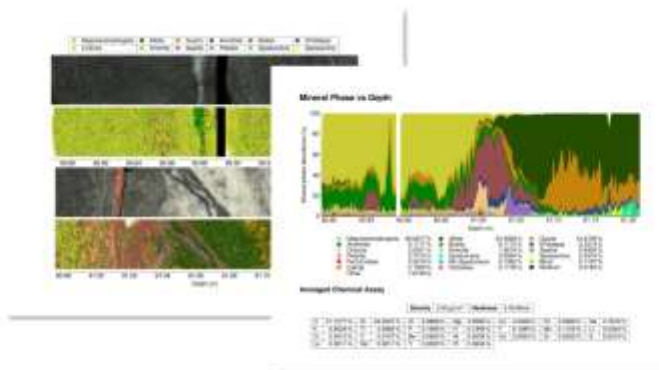
7.0.0 Glimpses of outcome of Hyperspectral Core Scanner with LIBS





Data Reports

Professional outputs detailed to your needs.



www.elemission.ca

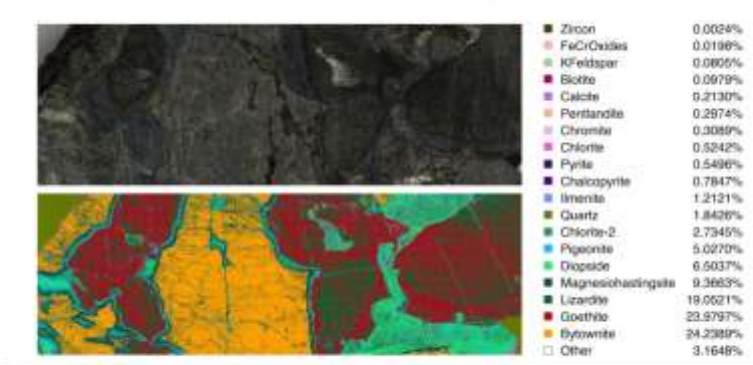
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Pt-Pd-Ni Mine

DRILL CORES

Mineralogy



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57



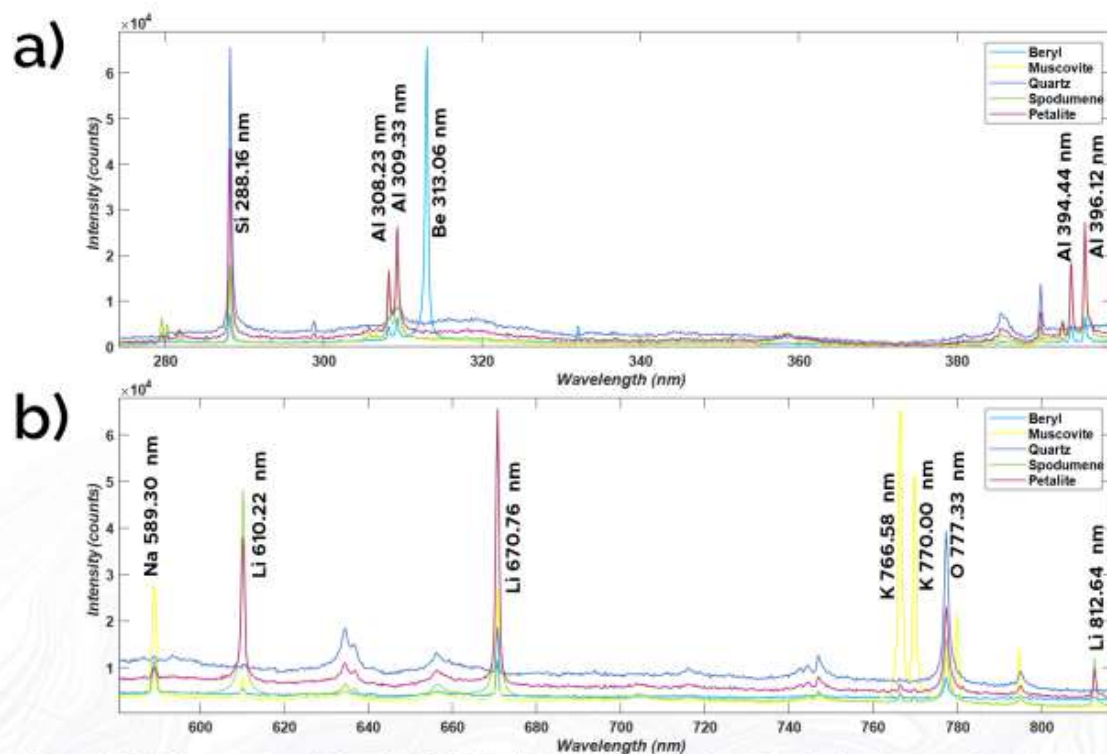
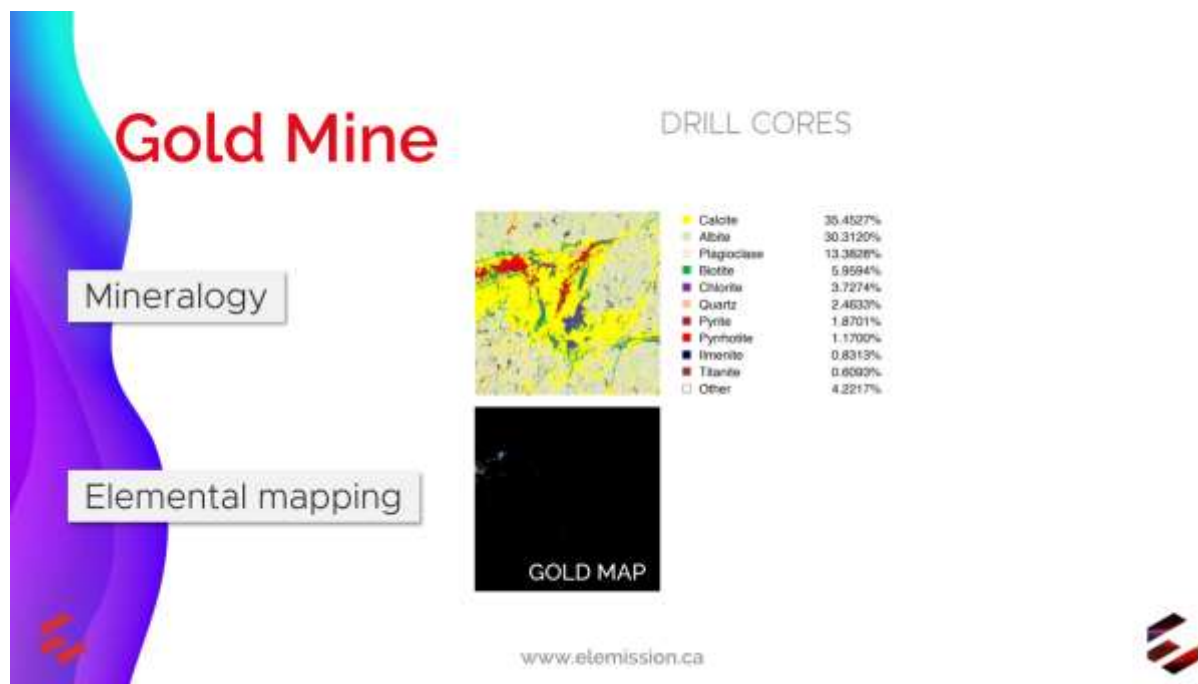


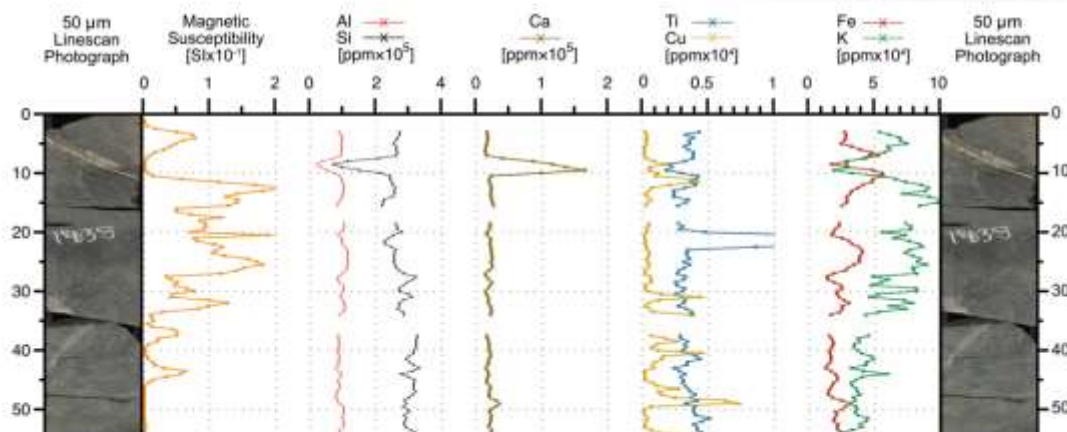
Figure 1 Emission spectra obtain with ECORE for light elements bearing minerals: beryl, muscovite, quartz, spodumene, and petalite; **a)** for the ultraviolet/visible selected region and **b)** the visible/near-infrared selected region.

Practical core scanning for every laboratory

MANUAL MEASUREMENTS ARE A THING OF THE PAST!

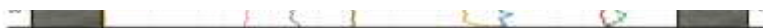
BoxScan solves, the often resource-draining, practicalities of acquiring laborious handheld data by delivering **automated** and **simultaneous** acquisition of **geotechnical** and **geochemical** parameters from one **easy to use** core box scanning system.

- ✓ **Maximise** data recovery
- ✓ **Reduce** the human component
- ✓ **Standardised** measurement
- ✓ **Depth co-registration**



"No longer is XRF core scanning limited to proprietary sensor technology as boxScan will integrate directly with your existing Olympus Vanta or Bartington MS2E"

IF CORE'S WORTH TAKING, IT'S WORTH LOGGING

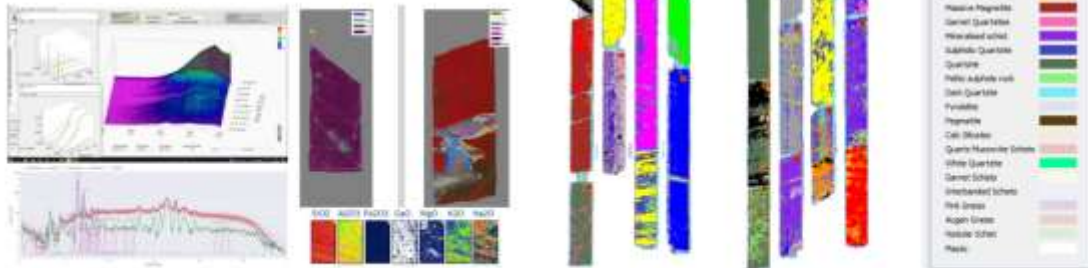


DMT

ANCORELOG – ANALYTICAL CORE LOGGING SYSTEM

Classification Models

- Mineralogical and chemical compositions as well as textural features are used to define classes of interest (e.g. lithologies, alteration zones or certain mineral/elemental abundances).



9/1/2022

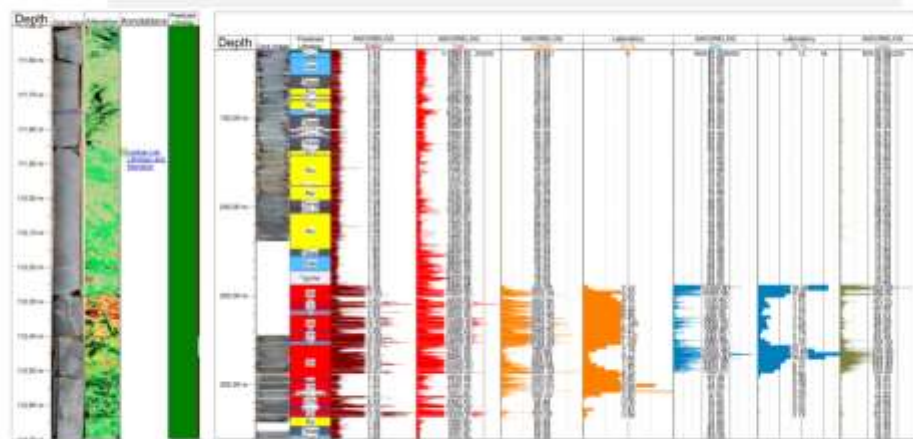
Slide 11

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Engineering Performance

DMT

ANCORELOG – ANALYTICAL CORE LOGGING SYSTEM



ANCORELOG data visualization

9/1/2022

Slide 11

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Engineering Performance

ANCORELOG – ANALYTICAL CORE LOGGING SYSTEM

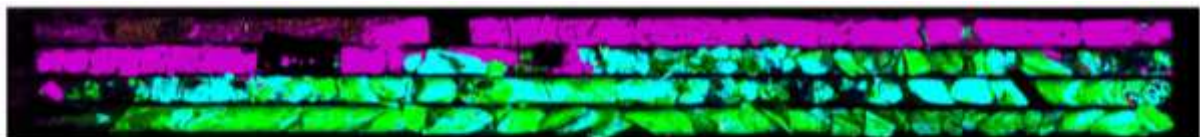
Classification Models



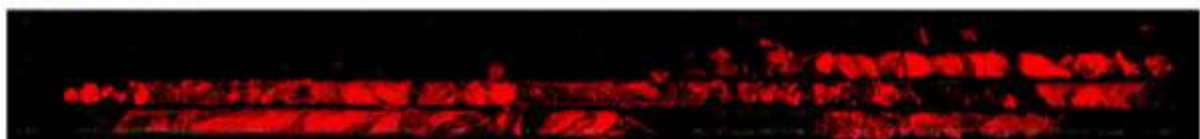
Engineering Performance



VNIR



Kaol Dck Halloy
Pyro Ms Illite Smectite



Amp Chl Serp Talc
Bt Ep Zoi

Provided by College of North Atlantic, CNA

**PROPOSAL FOR PROCURING 2 NOS. OF GAMMA RAY
SPECTROMETERS
FOR MINERAL PROSPECTING AND GEOLOGICAL
MAPPING THROUGH NMET FUND FOR CAPACITY
AUGMENTATION IN MECL**



MINERAL EXPLORATION AND CONSULTANCY LIMITED

**DR. BABASAHAB AMBEDKAR BHAWAN
SEMINARY HILLS**

PLACE: NAGPUR

DATE: 2ND JANUARY, 2024

SUMMARY FOR PROCURING 2 NOS. OF GAMMA RAY SPECTROMETERS FOR MINERAL PROSPECTING AND GEOLOGICAL MAPPING THROUGH NMET FUND FOR CAPACITY AUGMENTATION IN MECL

S.No.	Name Of the Equipment	Rate (approx.) Rs. in Lakh Excluding GST	Unit	Amount In Rs. Excluding GST	Specifications	Availability within the Department
1	Gamma Rays Spectrometer	30	2	60 Lakh	Energy range: 20 KeV to 3 MeV (Gamma) Beam: Single Band width: Gamma Spectrometer-2048 channels Bit: 16 bits Element: K, U, Th assay, Natural Gamma dose rate GPS: Inbuilt Accessories: Software for data processing, Battery with charger	Nil

The Detail proposal for procurement of 2 nos. of gamma ray spectrometers for mineral prospecting and geological mapping through NMET fund for capacity augmentation in MECL

**PROPOSAL FOR PROCURING 2 NOS. OF GAMMA RAY SPECTROMETERS
FOR MINERAL PROSPECTING AND GEOLOGICAL MAPPING THROUGH NMET
FUND FOR CAPACITY AUGMENTATION IN MECL**

1.0.0 Introduction

1.1.0 Overview

- 1.1.1 A gamma-ray spectrometer is an instrument used to detect, measure, and analyze gamma-ray emissions from radioactive materials. It's a valuable tool in various fields like nuclear physics, environmental monitoring, geology (for mineral exploration), and space exploration.
- 1.1.2 The use of gamma ray spectrometer as a geophysical exploration tool for mapping radioelements concentrations of K, U, Th and Natural Gamma dose rates, spectral measurements with identification of radiation sources are used extensively and have wide applications for diverse fields particularly for Rare earth elements (REE)& RM as well as for base metals by tracing out alterations, faults and shearing zones. Gamma ray spectrometer measure both the intensity and energy of radiations thus enabling the source of radiation to be diagnosed.
- 1.1.3 The spectrometer consists of a detector that registers gamma rays emitted by radioactive substances. When a gamma ray interacts with the detector, it creates a signal that can be analyzed to determine the energy and intensity of the gamma ray. This information helps identify the radioactive isotopes present in a sample
- 1.1.4 In exploration, gamma-ray spectrometers are used to analyze the composition of bodies. By detecting and analyzing gamma-ray emissions, scientists can infer the elemental composition of these bodies, providing valuable insights into their geological makeup and history

1.2.0 Background

- 1.2.1 As presently the country is in tremendous need of REE & critical minerals and specific attention is now made on the exploration of these critical minerals by the Ministry of mines (MOM). Since in the exploration of these resources the geophysical tool the gamma ray spectrometer along with the magnetic survey has an important role in identifying the potential area for exploration of these high value minerals. Thus, by procuring 2 numbers of gamma ray spectrometers as geophysical exploration tools MECL can have wider scope in proposals for identifying the potential areas bearing REE, critical minerals etc. which will be an additional resource under diversification scheme for value addition also to MECL.

2.0.0 Outline of Gamma Ray Spectrometer

2.1.0 General

- 2.1.1 A gamma-ray spectrometer is an instrument used to detect, measure, and analyze gamma-ray emissions from radioactive materials. It's a valuable tool in various fields like nuclear physics, environmental monitoring, geology (for mineral exploration), and space exploration. The use of gamma ray spectrometer as a geophysical exploration tool for mapping radioelements concentrations of K, U, Th and Natural Gamma dose rates, spectral measurements with identification of radiation sources are used extensively and have wide applications for diverse fields particularly for rare earth elements (REE) & RM.

2.2.0 Key Components

- i. 2048-channel geophysical gamma ray spectrometer, includes all needed features and accessories for field, borehole and carborne survey with K, U, Th assays and dose rate measurement. Its easy operated control unit with attachable wirelessly coupled compact probe allows to create a cost-effective assembly regarding required accuracy and speed of measurement. The instrument works with either natural or artificial isotope spectrum stabilization, which is useful especially for quick and reliable measurement at very low gamma activities.
- ii. Measuring Modes: Spectrum & Assay - spectral measurements with determination of concentrations of K, U, Th (% , ppm, ppm) and of natural gamma dose rate (nGy/h or nSv/h) with spectrum view (isotope library) and with selectable measuring time (IAEA conformity).
- iii. Dose Rate - measurement of natural gamma dose rate (nGy/h or nSv/h) with selectable measuring time (IAEA conformity).
- iv. Search - quick search with cps histogram and loud pitch audio indication (typ. 90 dB at loudspeaker) with adjustable cps range and threshold Spectrum & Assay and Dose Rate modes can be performed as point, profile, borehole and continuous readings accompanied with GPS coordinates.
- v. Detector: Scintillation Bismuth Germanate Oxide (BGO) detectors and Sodium Iodide NaI(Tl) detectors in stainless steel housing - see next page.
- vi. Spectral Analyzer: 2048 channels, 3 MeV linearized energy range.

- vii. Measuring Time Selectable from 10 s to 2 h according to required accuracy of results and to estimated concentration levels of K, U, Th.
- viii. Data Management and Export: Each measured file identified with file number, time of measurement, instrument serial number and complete headline is stored in memory of Gamma Surveyor Vario. This information serves for reliable data management (storage and processing) after data download from instrument. ASCII lines with MS Excel compatible structure consist of columns with results, GPS coordinates and remarks. Enclosed PC software provides data export of chosen results for processing by e.g. Surfer or Geosoft SW with either latitude / longitude or UTM coordinates.



3.1.0 Applications

3.1.1 Gamma-ray spectrometers have a wide range of applications across various fields due to their ability to detect and analyze gamma-ray emissions from radioactive materials. Some key applications include:

1. Geological Exploration: Gamma-ray spectrometers are used in geology to survey and map the Earth's surface for natural radioactive elements such as uranium, thorium, and potassium. By measuring the gamma-ray emissions from these elements, geologists can identify mineral deposits, map rock formations, and locate potential oil and gas reservoirs.
2. Environmental Monitoring: These spectrometers play a crucial role in environmental studies, particularly in monitoring radiation levels in soil, water, and air. They help assess

potential contamination from sources such as nuclear accidents, industrial processes, or waste disposal sites.

3. Nuclear Industry: Gamma-ray spectrometers are utilized in nuclear power plants for monitoring and analyzing the composition of nuclear fuels, assessing radiation levels, and ensuring the safety and efficiency of nuclear reactors.
4. Archaeology and Anthropology: In archaeology, these instruments aid in analyzing artifacts and archaeological sites by detecting radioactive isotopes present in ancient materials. They assist in dating artifacts and determining the age of archaeological finds.
5. Space Exploration: Gamma-ray spectrometers are deployed in space missions to study celestial bodies such as planets, moons, asteroids, and comets. They help in determining the elemental composition and geological characteristics of these bodies from a distance.
6. Medical Imaging and Radiology: In the medical field, gamma-ray spectrometers are utilized in gamma-ray imaging techniques like Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET) scans for diagnosing and monitoring diseases like cancer.
7. Security and Homeland Defense: These instruments are employed in security applications for detecting and identifying radioactive materials at ports, borders, and checkpoints to prevent illicit trafficking of nuclear materials.

Gamma-ray spectrometers provide valuable insights into the composition, structure, and radiation levels of various materials, making them indispensable tools in scientific research, industry, and security-related applications.

4.0.0 Available instrument

4.1.0 Gamma Ray Spectrometer:

- 4.1.1 A Czech Republic base company, Gf Instruments is one of the companies manufacture Gamma Ray Spectrometer.
- 4.1.2 The specification of the instrument has been provided below.

Technical Specifications of Gamma Ray Spectrometers-02 nos.

S.No.	Specification	Technical Requirement of MECL
1.	Spectrum Analyzer	2048 or more
2.	Energy Range	3 MeV linearized
3.	Control Unit	Detachable
4.	Assembly	Both horizontal and vertical
5.	Probes	Exchangeable probes with BGO and NaI detectors in stainless steel housing
6.	Spectrometric Probes	BGO detector NaI(Tl) detector
7.	Modes	K,U,Th, assay, dose rate and search mode
8.	Measuring Range	Selectable from 10s to 2 hours
9.	Calibration	10 ROI's, Isotope Library, possibility of user calibration
10.	Data download	USB port or flash disk
11.	Batteries	Rechargeable Li-Ion cells for 24 hours operation
12.	Alternative power supply	To be provided from 6 AA cells (single use or NiMh), external 12 V car battery.
13.	Communication	Bluetooth communication with external GPS
14.	Display	Colour Transreflective or black and white LCD
15.	GPS	Built in
16.	Firmware	Should be upgradable without the need of being sent back to the OEM
17.	Memory	More than 500,000 full spectrum and assay readings with text and voice remarks or better
18.	Operating Temperature	0° C to +45°C or better
19.	Protection	Water and shock proof assembly
20.	Data download	Data download to PC, export of measured files and visualization of spectra
21.	Laptop (2 units)	12th Generation Intel® Core™ i7 processor; 512 GB SSD Hard drive; 16GB RAM; 16 inch diagonal display with onboard graphics
22.	Batteries and Cables	Two sets of spare batteries and cables to be provided

4.2.0 Cost of Instrument:

As per the market survey, MECL obtained a quotation from an Indian supplier of Gf Instruments with a cost of 60.00 Lakhs excluding GST for two units of Gamma Ray spectrometer.



Ref: CIS/MECL/241123

24.11.2023

Head
Geophysics Group
MECL
Nagpur

Reg: GAMMA SURVEYOR VARIO

This is in reference your e-mail wherein you have shown interest **GAMMA SURVEYOR VARIO**. We are pleased to submit our offer for the same manufactured by our overseas principals M/s GF Instruments s.r.o., Czech Republic

S.No	Item Description	QTY	Price INR
	GAMMA SURVEYOR VARIO – 2048-channel geophysical gamma-ray spectrometer consist of the control unit and the selected type of probe:		
1	Control unit for use with any of the Gamma Surveyor Vario probes	1	
2	Spectrometric probe VB1 BGO detector dia 1" x 1.5" long, volume 1.2 ln3 (19 cm3)	1	
3	Spectrometric probe VN6 NaI(Tl) detector dia 2" x 2" long, volume 6.3 ln3 (103 cm3)	1	
4	Laptop 12th Generation Intel® Core™ i7 processor; 512 GB SSD Hard drive; 16GB RAM; 16 inch diagonal display with onboard graphics	1	
5	Batteries and Cables Two sets of spare batteries, chargers and cables		
	TOTAL (For 2 units) @ INR 30,00,000/unit		INR 60,00,000.00
	GST @18%		INR 10,80,000.00
	TOTAL WITH GST FOR 2 UNITS		INR 70,80,000.00

Complete Instrumentation Solutions Private Limited,
Suite # 512, Suncity Business Tower, Golf Course Road, Sector-54, Gurgaon-122011, Haryana
Tel: 0124-4929000 | E-mail: info@instrumentation-solutions.com | CIN: U33112HR2011PTC104541
www.instrumentation-solutions.com

5.0.0 Justification:

- 1 The use of gamma ray spectrometer as a geophysical exploration tool for mapping radioelements concentrations of K, U, Th and Natural Gamma dose rates, spectral measurements with identification of radiation sources are used extensively and have wide applications for diverse fields particularly for Rare earth elements (REE) & RM as well as for base metals by tracing out alterations, faults and shearing zones. Gamma ray spectrometer measure both the intensity and energy of radiations thus enabling the source of radiation to be diagnosed.
- 2 As presently the country is in tremendous need of REE & critical minerals and specific attention is now made on the exploration of these minerals by the Ministry of mines (MOM). In the exploration of these resources the gamma ray spectrometer along with the magnetic survey has an important role in identifying the potential area for exploration of these high value minerals. Thus, by procuring 2 numbers of gamma ray spectrometers as geophysical exploration tools MECL can have wider scope for identifying the potential areas bearing REE, critical minerals etc. This will be an additional resource under diversification scheme for value addition also to MECL.
- 3 Gamma Ray Spectrometers able to operate in three modes namely
 - A. Spectrum and Assay for spectral measurements with determination of concentrations of Th, U and K (ppm, ppm, %).**
 - B. Natural gamma dose rate with spectrum view and selectable measuring time.**
 - C. Search mode for quick search with histogram and audio indication.** It should be possible to do spectral, Assay and Dose rate measurements in point and continuous modes with GPS coordinates.

6.0.0 Work projection for next 5 years and utilization of the instrument

- 1 MECL has taken more numbers of Critical and REE projects through NMET funding. Presently 4 projects are running.
- 2 The Ministry of Mines giving more thrust on exploration of REE and Critical Minerals in recent year. This will help the country to reduce dependency on foreign critical minerals inputs.
- 3 May be utilized in investigation in NMET projects of REE and RM. We are also getting queries from different PSUs for carrying out radiometric surveys for exploring high value minerals.

7.0.0 Details of Technical Capabilities of MECL for running the instruments Technical Capabilities of MECL:

- 1 The Geophysical wing of MECL is having professionals trained in handling all the geophysical equipment's like TDEM, MT, CSAMT, AMT, Magnetic, Resistivity, IP, gravity etc. along with carrying out geophysical borehole logging including the Spectrometric gamma ray logging for identifying Potash, Alteration, radioactive zones encountered in drilling. The certain numbers of geophysicists professionals of MECL are also trained and certified by Bhabha Atomic Research Centre (BARC) in handling radioactive sources attached with logging units and in operation of radiations survey meters.
- 2 17 numbers of Geophysicists trained in handling all types of Geophysical equipment.

PROPOSAL FOR PROCURING 01 NO. OF
“WAVELENGTH DISPERSIVE X-RAY FLUORESCENCE (WD-
XRF) SPECTROMETER WITH ACCESSORIES & 05 YEARS OF
WARRANTY PERIOD”
THROUGH NMET FUND FOR CAPACITY AUGMENTATION IN MECL



MINERAL EXPLORATION AND CONSULTANCY LIMITED

DR. BABASAHAB AMBEDKAR BHAWAN
SEMINARY HILLS

PLACE: NAGPUR

DATE: 2ND JANUARY, 2024

SUMMARY FOR PROCURING 01 NO. OF**“WAVELENGTH DISPERSIVE X-RAY FLUORESCENCE (WD-XRF) SPECTROMETER
WITH ACCESSORIES & 05 YEARS OF WARRANTY PERIOD”****THROUGH NMET FUND FOR CAPACITY AUGMENTATION IN MECL**

S.No.	Name Of the Equipment	Rate (approx.) Rs. in Lakh Excluding GST/Duties	Unit	Amount In Rs. Excluding GST	Specifications	Availability within the Department
1	WD-XRF	2,06,87,101 Plus GST, Customs Duties Etc.	1	2,06,87,101 Plus GST, Customs Duties Etc.	The proposed technical specifications are given in detail proposal	01

**DETAILED PROPOSAL FOR PROCURING 01 NO. OF
“WAVELENGTH DISPERSIVE X-RAY FLUORESCENCE (WD-XRF)
SPECTROMETER WITH ACCESSORIES & 05 YEARS OF WARRANTY PERIOD”
THROUGH NMET FUND FOR CAPACITY AUGMENTATION IN MECL**

1.0.0 Introduction

1.1.0 Overview

- 1.1.1 MECL laboratory deals with different type of mineral analysis. For major oxide and trace elements in solid samples, WD-XRF is used. MECL has 01 no. of WD-XRF which was procured vide Supply Order No: 1810000276/MECL/MM/FIL/PUR/PGC/177 dated 03.08.2021 and since installation it is being fully utilized.
- 1.1.2 Due to the day by day shorter timelines of geological report submission, the solid samples for major oxide and trace elements testing also take higher priorities and need to be analyzed by the earliest. As the existing WD-XRF is the only available instrument of its kind in this laboratory, whenever the machine goes in maintenance/ repair the analytical work of such testing comes to a halt. It is therefore necessary to procure one additional WD-XRF to boost the productivity and to minimize downtime.

2.0.0 Outline of WD-XRF

2.1.0 General

- 2.1.1 Wavelength Dispersive X-ray fluorescence (WD-XRF) Spectrometer is a widely used analytical technique in the field of exploration sample testing, offering **rapid and non-destructive analysis** of geological samples. It is particularly valuable in mineral exploration and mining operations where the elemental composition of rocks, ores, soils, and sediments needs to be determined quickly and accurately.
- 2.1.2 In exploration sample testing, XRF instruments are used to analyze the elemental composition of samples collected from various exploration sites. These samples can include drill core samples, surface soil and rock samples, trench samples, and other geological materials. The goal of XRF analysis in this context is to provide detailed information about the presence and concentration of elements relevant to mineral exploration.

- 2.1.3 The process of XRF analysis involves exposing the sample to high-energy X-rays, which causes the atoms in the sample to emit characteristic fluorescent X-rays. These emitted X-rays are then detected and analyzed to determine the elemental composition of the sample.
- 2.1.4 One of the key advantages of WD-XRF in exploration sample testing is its speed. The sample preparation for WD-XRF is quicker than other solution based instruments. Furthermore, XRF is a non-destructive technique, meaning that the samples analyzed using XRF remain intact and can be used for further testing or archival purposes. This non-destructive nature is advantageous when working with limited sample material or when preserving samples for future reference.
- 2.1.5 In summary, WD-XRF is a powerful tool for exploration sample testing, offering rapid, non-destructive, and accurate analysis of geological samples.

2.2.0 Key Components

- i. Fully Automated computer controlled Sequential Wavelength Dispersive X-ray Fluorescence spectrometer (WD-XRF) with accessories. The WD-XRF system is capable of analyzing major, minor and trace elements in rocks/ores/minerals and geological materials as solid samples. The instrument has capability of analyzing elements from Beryllium (Be) to Uranium (U).
- ii. Sample preparation: This instrument uses solid samples in the form.
- iii. Pallet Press machine – This machine is used to prepare pressed pellets for WD-XRF sample testing
- iv. Data Management and Export: The instrument comes with user friendly intelligent software for Qualitative and Quantitative analysis, process parameter setting, calibration curve setting and other functions as required to cover entire analytical range.

3.0.0 Applications

Wavelength Dispersive X-ray fluorescence (WD-XRF) Spectrometer is a widely used analytical technique in the field of exploration sample testing, offering rapid and non-destructive analysis of geological samples. It is particularly valuable in mineral exploration and mining operations where the elemental composition of rocks, ores, soils, and sediments needs to be determined quickly and accurately.

4.0.0 Available instrument

There are various companies who manufacture WD-XRF instrument under different brand names like Panalytical, Rigaku, Thermo, Bruker etc.

The detail technical specification of Wavelength Dispersive X-Ray Fluorescence (WD-XRF) Spectrometer with accessories & 05 years of warranty period is given below

Sl. No.	Technical Specification	Requirement of MECL
1	Wavelength Dispersive X-Ray Fluorescence (WD-XRF) Spectrometer with accessories	Supply, installation and commissioning of latest model Fully Automated computer controlled Sequential Wavelength Dispersive X-ray Fluorescence spectrometer (WD-XRF) with accessories. The WD-XRF system should be capable of analysing major, minor and trace elements in rocks/ores/minerals and geological materials as solid samples (pressed pellets and fusion beads). The instrument should have capability of analysing elements from Beryllium (Be) to Uranium (U).
2	Make & Model	Bidder to specify make & model of the quoted WD-XRF instrument.
3	Country of origin	Bidder to declare country of origin of quoted instrument
4	X-Ray Tube	4 kW Rh anode X-ray tube with adequate insulation material with ≤ 75 micron Be window
5	X-Ray Generator	The power rating of generator should be 4.0kW or more. The generator should have rating of 60kV (or more) and 120 mA (or more).
6	Goniometer and Optics	1. The spectrometer should be equipped with minimum eight position crystal changer and minimum 5 crystals i.e. LiF200, LiF220, PET, a suitable crystal (for analysis of O to Mg) and Ge crystal for P&S. The spectrometer should be equipped to cover entire analytical range. 2. Three primary collimators or better 3. Angular Accuracy should be ± 0.002 degree for theta and 2 theta or better 4. Angular reproducibility should be ± 0.005 degree for theta and 2 theta or better 5. It should have suitable filter changer and sufficient numbers of suitable filters as per the requirement of instrument to cover entire analytical range.
7	Detectors	It should have minimum 2 detectors i.e. Gas Flow Proportional Counter and Scintillation Counter for coverage of entire elemental range
8	Auto-sampler	1. Samples to be loaded as pressed pellets and fused beads 2. Sample holders for pellets & fused bead analysis to be provided 3. The auto-sampler must be capable to handle minimum 48 samples (minimum 48 sample positions.) in one go. Minimum 50 numbers of sample holders should also be provided for pellets and fused beads.

Sl. No.	Technical Specification	Requirement of MECL
9	Computer	Suitable PC to be provided alongwith the instrument. The standard instrument software should be installed in it. The PC should have licensed suitable MS windows and MS Office software. The PC should be WiFi enabled and should have port for LAN connection. A colour laser jet printer should also be supplied with PC.
10	Software	User friendly intelligent software for Qualitative and Quantitative analysis, process parameter setting, calibration curve setting and other functions as required to cover entire analytical range. The bidder to provide software update from time to time (if required) after installation at no extra cost.
11	Standard less analysis software	The instrument should come with standard-less analysis software for analysis of totally unknown samples (major minor and traces). Any monitor samples if required for its calibration, should also be supplied at no extra cost.
12	Power Supply	As per Indian conditions
13	Chiller	Suitable water chiller to be supplied along with instrument at no extra cost
14	Pellet Press	40 Ton capacity pellet press to be provided with instrument for making sample pressed pellets. Pellet dimension should be suitable for quoted XRF model. It should come with 04 sets of pressing tool of suitable diameter along with 4000 pieces of pellet rings/cups.
15	p-10 Gas	02 numbers of filled P-10 gas cylinders with 02 nos. gas regulators should be supplied at no extra cost. The laboratory building of MECL is having centralised gas supply, all kind of adaptors for connecting the instrument to it, should also be provided by the bidder at no extra cost.
16	CRMs	Suitable set of solid powder CRMs to be provided for Iron Ore, Bauxite, Limestone, Dolomite, Chromite ore, Rock phosphate, Gold ore, Manganese Ore, Copper Ore, Zinc Ore, Soil, stream sediments etc. [Minimum 100g quantity of three different ranges for each ore type]
17	UPS	Branded UPS (with sealed maintenance free batteries) for at least 30 minutes backup to the instrument and its accessories. MECL shall only provide electric supply. All kind of connecting cables, MCBs, Industrial sockets (as required) for connecting UPS to power supply or UPS to instrument shall be supplied and installed by the bidder at no extra cost
18	Accessories	All kind of accessories items which are required for smooth running of instrument should be provided at no extra cost.
19	Safety	All kind of safety protections like electrical, electronic & radiations should be inbuilt and as per the international norms.
20	Warranty	5 Year warranty from the date of installation. Warranty to cover all components & accessories supplied with equipment including x-ray tube.
21	Operation & Service Manual	Minimum 1 copy
22	Delivery of the instrument	The equipment along with accessories should be delivered to Chemical Lab. MECL, Seminary Hills, Nagpur 440006, within 04 Months or earlier from the date of issue of supply order
23	Installation, Commissioning and	Installation, commissioning will be done at the premises of Chemical Lab. MECL, Seminary Hills, Nagpur 440006 by the authorised service engineer of

Sl. No.	Technical Specification	Requirement of MECL
	training	the bidder at no extra cost. The engineer will also provide 10 days free of cost training to MECL executives for calibration, operation & regular maintenance of the instrument after installation and commissioning.
24	General requirement	1. Bidder has to provide Name, address and contact details of the OEM & authorized dealer/s (if any) for the quoted instrument, with the technical bid. 2. Bidder should submit the valid authorization certificate of OEM for the quoted instrument, with the technical bid. 3. Bidder to submit technical broucher of the quoted instrument
25	Eligibility of bidders	The bidder should have supplied and installed minimum 01 no. of WD-XRF of the quoted make to any govt./ PSU/ state govt./ UT govt./Autonomous govt. organizations in last 10 years from the date of floating of tender. The bidder should submit copy of PO and Installation report/performance certificate obtained from the customer concerned as documentary evidence.

Note:

- 1. The technical specifications will be further finetuned in consultation with probable bidders.**
- 2. Cost of all the items mentioned above compatible to the model should be included in the price bid.**
- 3. All essential and necessary items required to run the instrument should be supplied and installed at no extra cost.**

5.0.0 Cost of Instrument:

Based on the budgetary quote received from a likely bidder, the estimated cost of the equipment with 5 years warranty will be around Rs. 2,06,87,101 Excluding taxes/duties/ custom duties etc. (Quotation received from a likely bidder is attached)

Sales Quotation										
		I. R. Technology Services Pvt. Ltd. EL 91, TTC Industrial Area, Electronic Zone, MIDC, Mahape, Navi Mumbai- 400710 Mumbai - 400710 State - MAHARASHTRA, State Code - 27 CIN NO:U74220MH1977PTC019758 , 02227688817 , GST -27AAAC1256K12L CIN:U74220MH1977PTC019758			Quotation Number : 410963 Date of Quotation : 02/01/2024 Validity : 30 Days Warranty : 60 months as below Delivery : As given in the terms & conditions. Payment Terms: 100 % Advance			Your Ref. No. : PRIMUS IV Currency : INR		
Details of Receiver (Billed to) - Mineral Exploration Corporation Ltd. HOD - (Procurement & Contract), MECL Premises Seminary Hills, Dr.Babasaheb Ambedkar (Bhawan) Nagpur - 440006 State - MAHARASHTRA, State Code - 27 GSTIN - 27AABCM9165C12H Contact Person - Rohit Sharma Phone - 0712- 2510977 / 0712- 2510977 Email - chem-lab@mecl.co.in					Details of Consignee (Shipped to) - Mineral Exploration Corporation Ltd. HOD - (Procurement & Contract), MECL Premises Seminary Hills, Dr.Babasaheb Ambedkar Bhawan, Nagpur - 440006 State - MAHARASHTRA, State Code - 27 Place of Supply - MAHARASHTRA GSTIN - 27AABCM9165C12H					
S.No	Item Code / Description of Goods	HSN / SAC Code	Qty	UOM	Unit Price	Amount	CGST		SGST	
							Rate	Amount	Rate	Amount
1	PRIMUS IV / Rigaku make Sequential Wavelength Dispersive X-ray Fluorescence Spectrometer Model ZSX Primus IV ZSX Primus IV (Tube-above) base unit, "Consisting of X-ray generator 4kW, max. 60kV-150mA, Built-in water cooled heat exchanger, Sample changer (ASC): max. 48 sample capability, Primary beam filter changer with Al2S, Al12S, Ni40 and Ni400, 6 position diaphragm changer: 35, 30, 20, 10, 1, 0.5 mm in diameter, 10 position crystal changer with the standard crystal set: LIF(200), GeH, PETH and RX26 (GeH, PETH: curved crystal); covering 80 – 96Cm, 3 position slit changer with fine and coarse slits, Powder trap attachment, Costers, FPC and SC detector, Windows11 (64 Bit) compatible software without computer, including data transmission function, instruction manuals (paper and CD-R). Standard accessories: 3 reference metal disks (Cu, Ti and Al), Glass monitor disk, Tool set, Fuses, Oil and grease	90220000	1.00	Set(s)	20,687,101.00	20,687,101.00	0.00	0.00	0.00	0.00

S.No	Item Code / Description of Goods	HSN / SAC Code	Qty	UOM	Unit Price	Amount	CGST		SGST	
							Rate	Amount	Rate	Amount
13	3399B003 / Sample holder without mask	90279090	48.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
14	3399D004 / Sample holder mask SS Ø30: with 30mm-diameter opening Sample holder mask SS Ø30: with 30mm-diameter opening Even when the customer requires only the masks with another size of opening, it is strongly advisable to order 30mm masks because the service needs 30mm masks for checking intensities in maintenance.	90279090	48.00	Pc(s)	0.00	0.00	9.00	0.00	9.00	0.00
15	A00011225 / Precalibration Package "GEO-TRACE-PAK"; For trace elements in geological materials (ores, rocks, minerals) by the pressed powder method.	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
16	A00004279 / Basic spare parts set	90229090	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
17	3299Z004 / Export packing charge	90220000	1.00	Lump sum	0.00	0.00		0.00		0.00
18	Branded Computer / DESKTOP DELL OPTIPLEX 5060MT 15/16GB RAM/1 TB HDD/WIN 10 PRO/DVD RW/19"/2 GB GRAPHIC CARD	90279090	1.00	Nos	0.00	0.00	9.00	0.00	9.00	0.00
19	Branded Color Printer / Compatible Printer	84433240	1.00	No	0.00	0.00	9.00	0.00	9.00	0.00
20	SMART CHILLEX 52 / WATER RECIRCULATING CHILLER for 5.2 KW @20 C	84181090	1.00	NOs	0.00	0.00	9.00	0.00	9.00	0.00
21	UPS 30 KVA / ONLINE UPS 30 KVA WITH 30 MINS BACKUP	85043200	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
22	Step Down Transformer 15 KVA / Step Down 15KVA Transformer	90279090	1.00		0.00	0.00	9.00	0.00	9.00	0.00
23	40 T Hydraulic Press /	84629914	1.00	No(s)	0.00	0.00	9.00	0.00	9.00	0.00

S.No	Item Code / Description of Goods	HSN / SAC Code	Qty	UOM	Unit Price	Amount	CGST		SGST	
							Rate	Amount	Rate	Amount
24	P10 GAS CYLINDER / P-10 GAS (10% METHANE+90% ARGON)	90279090	2.00	EACH	0.00	0.00	9.00	0.00	9.00	0.00
25	DOUBLE STAGE SS REGULATOR / Two stage Gas Regulator with S.S. Diaphragm	90279090	2.00	Nos.	0.00	0.00	9.00	0.00	9.00	0.00
Total Amount							20,687,101.00			
GST Amount							0.00			
DAP MECL NAGPUR Total							INR 20,687,101.00			
Quotation Total (In Words) : Rupees Two Crores Six Lakhs Eighty Seven Thousand One Hundred One Only										
Remarks : NOTE: GST & CUSTOMS DUTY IS EXCLUSIVE. THESE COSTS NEEDS TO BE PAID EXTRA AT ACTUALS BY MECL.										
Declaration : Force Majeure : The Seller shall not be held responsible for any delay in delivery or non-delivery of the goods or services due to Force Majeure conditions due to pandemic situation globally .										
TERMS & CONDITIONS:										
Address of the Manufacturer: Rigaku Corpora on 3 9 12 Matsubara cho, Akishima shi, Tokyo 196 8666 Japan										
Order Should be place on: I.R.Technology Services Pvt.Ltd, EL 91, TTC Industrial Area, Electronic Zone, Mahape, NaviMumbai 400710, Ph : 022 6789 6600, 6789 6631 / 28, Fax 022 27681253										
Installation and Operational Training:										

S.No	Item Code / Description of Goods	HSN / SAC Code	Qty	UOM	Unit Price	Amount	CGST		SGST	
							Rate	Amount	Rate	Amount
2	A00005392 / 5 year system warranty (4 year extension)	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
3	3199A105 / 5 year X-ray tube warranty	90270000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
4	ELECTRIC SUPPLY / Three-phase, 200 V, 50/60 Hz, 40 A	90220000	1.00	EACH	0.00	0.00	9.00	0.00	9.00	0.00
5	3006B023 / Crystal LIF(220) for Cr - Cm: high resolution (SQX is not available)	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
6	A00012243 / Vacuum type with AFX90L(4kW, Rh target) X-ray tube	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
7	A00004099 / Vacuum pumps (2 sets); made by UHVac	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
8	3006B114 / SQX software *- E2 Scan - Fixed angle measurement function - Thin-film analysis by FP - Automatic overlapping correction by theoretical intensity - Drift correction library with library drift correction samples - Photoelectron correction - Analysis film correction - Impurity correction - He atmosphere correction*	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
9	3006B115 / Matching Library Function	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
10	3006B118 / Quant Scattering FP Method	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
11	3006B149 / Automatic program operation	90220000	1.00	Set(s)	0.00	0.00	9.00	0.00	9.00	0.00
12	31992038 / Sample tray for ASC: 12 positions per tray	90220000	4.00	Pc(s)	0.00	0.00	9.00	0.00	9.00	0.00

5.0.0 Justification:

MECL laboratory deals with different type of mineral analysis. For major oxide and trace elements in solid samples, WD-XRF is used. MECL has 01 no. of WD-XRF which was procured vide Supply Order No: 1810000276/MECL/MM/FIL/PUR/PGC/177 dated 03.08.2021 and since installation it is being fully utilized.

Due to the day by day shorter timelines of geological report submission, the solid samples for major oxide and trace elements testing also take higher priorities and need to be analyzed by the earliest. As the existing WD-XRF is the only available instrument of its kind in this laboratory, whenever the machine goes in maintenance/ repair the analytical work of such testing comes to a halt. It is therefore necessary to procure one additional WD-XRF to boost the productivity and to minimize downtime.

6.0.0 Work projection for next 5 years and utilization of the instrument

- 1 MECL has various projects through NMET funding.
- 2 MECL also gets samples from various outside agencies like state DMGs, GSI, CMPDIL etc

7.0.0 Details of Technical Capabilities of MECL for running the instruments Technical Capabilities of MECL:

- 1 The Chemical laboratory of MECL is an NABL accredited lab and is having experienced professionals in handling all the type of mineral testing equipment's like WD-XRF, AAS, ICPOES, ICPMS, XRD, PROXIMATE ANALYZER, BOMB CALORIMETER, ULTIMATE ANALYZER, HGI TESTER etc.
- 2 14 numbers of Chemists well trained and experienced in handling all types of mineral testing equipment.