COMPENDIUM OF TECHNOLOGIES

Developed by CSIR-CEERI

BUILDING BRIDGES, GOING DISTANCES


CSIR-CEERI

Foreword

It gives me great pleasure to present this Compendium of Technologies developed by CSIR-CEERI on the occasion of our 73rd Foundation Day. This compilation embodies our continuous pursuit of innovative, application-driven research in electronics and allied domains, with a strong emphasis on translation into industry-ready solutions.

In alignment with national missions such as Make in India, Atmanirbhar Bharat Abhiyan, and Digital India, our focus has been on fostering indigenous design, development, and deployment of technologies that not only enhance our self-reliance but also create opportunities for industrial growth and competitiveness. The technologies captured in this volume provide avenues for collaboration with industry partners, startups, and MSMEs, enabling the conversion of ideas into commercially viable products and systems.

It is our conviction that this compendium will serve as a bridge between our research laboratory and industry stakeholders, facilitating knowledge transfer, joint development, & adoption of innovations aimed at strengthening India's technological ecosystem. By nurturing such partnerships, we aspire to contribute to the nation's journey of building a robust, future-ready, and globally competitive electronics industry.

I extend my sincere appreciation to all members of CSIR-CEERI family for their dedication, and invite industry partners, academia, and entrepreneurs to engage with us in advancing the spirit of self-reliance and technological excellence.

Dr. PC Panchariya
Director

Technology Readiness Level Details

TRL 1: Basic principles observed.

This is the initial stage where basic scientific research begins to be translated into applied research.

TRL 2: Technology concept formulated.

At this stage, the practical application of the technology is identified, but it remains largely theoretical.

TRL 3: Experimental proof-of-concept.

This involves analytical studies and experiments to validate the technology's basic functionality.

TRL 4: Technology validated in lab.

Basic technological components are integrated and tested in a laboratory setting.

TRL 5: Technology validated in a relevant environment.

The technology is integrated with reasonably realistic supporting elements & tested in a simulated environment.

Technology Readiness Level Details

TRL 6: Technology demonstrated in a relevant environment.

A prototype is developed and tested in a relevant environment, demonstrating its functionality and performance.

TRL 7: System prototype demonstration in operational environment.

The system prototype is demonstrated in an operational environment, such as a field test.

TRL 8: System complete and qualified.

The system is complete and qualified through successful test and evaluation in its final form and under mission conditions.

TRL 9: Actual system proven through successful mission operations.

The technology is in its final form and has been proven through successful mission operations.

Index

Index

Index

Index

Index

CSIR-CEERI
1953

Milk

Scanalyser

1.

Milk **Scanalyser**

Unique Selling Proposition (USP)

- Ksheer Scanalyser can detect health hazardous adulterants (urea, salt, detergent, soda, caustic soda, boric acid, ammonium sulphate, hydrogen peroxide, etc.) and milk constituents (fat, SNF, protein, lactose, density & added water) in raw and pasteurised milk.

Technical Specifications

Minimum Detection limits of major adulterants

Urea --- 0.1%
Salt --- 0.15%
Detergent --- 0.2%
Soda --- 0.15%
Ammonium Sulphate --- 0.15%
Caustic soda --- 0.15%

Milk Constituents	Range	Accuracy
Fat	0-14%	±0.1%
Solid non-fat	3-12%	±0.2%
Protein	2-7%	±0.2%
Lactose	0-6%	±0.2%
Added Water	0-75%	±0.2%
Density	1045-1040 kg m-3	±0.3 kg m-3

Significance/Relevance for Real-Time Applications

- Milk Collection Centres, Sweet Makers, and Enforcement Agencies.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **No**

Computer-aided

Vision System

Computer-aided vision system for the **authentication of herbal plants**

Unique Selling Proposition (USP)

- A system for assistance in visual microscopic inspection and authentication of herbal plants used in the manufacturing of traditional medicines.
- A system that interfaces the digital camera, microscope, and computational system for microscopic image acquisition, processing, information extraction, data management, and quality report generation

Technical Specifications

- A complete camera-microscope-computer-based system that will aid the botanist for a seamless experience of the manual herbal authentication process.
- Reference database collection of microscopic cross-sectional views of authentic herbal plants with storage and retrieval of humongous image data for plant comparison and authentication.
- Generation of Quality certificates based on observations by comparison with the reference

Significance/Relevance for Real-Time Applications

- The system aids in the authentication of herbal plants, thus providing reduced operator fatigue during visual inspection and increased specimen testing throughput. The software is user-friendly and customizable based on industrial requirements.

Status: Readiness for Commercialization	:	**Yes**
Commercialized	:	**Yes**
Generated IP	:	**Software Copyright 26130/2023-CO/SW**

Affordable-PCR

Affordable-**PCR**

Unique Selling Proposition (USP)

- Versatile, portable, on and off-field deployable, cost-effective, indigenous technological solution for PCR.

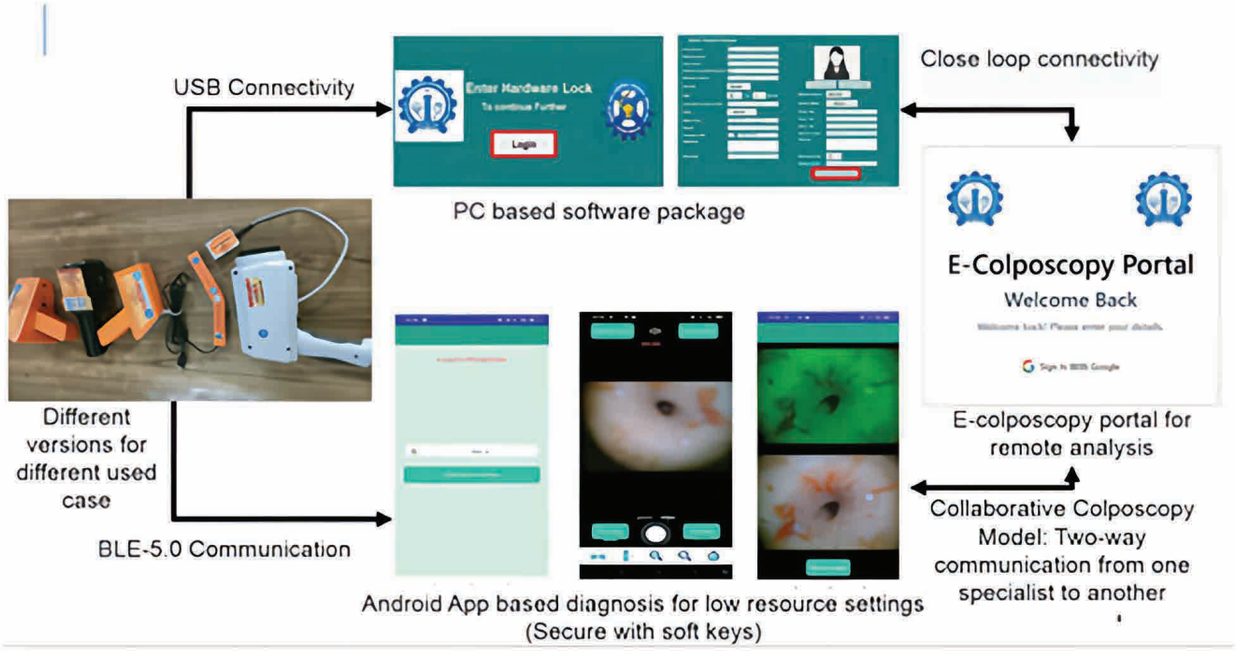
Technical Specifications

S.No.	Parameter	Specification
1.	Temperature Range	4°C-100°C
2.	Thermocycler Sample wells	16 wells
3.	Power	~ 120 W
4.	Temperature Control	Peltier with PID control
5.	Heating/Cooling Ramp Rate	2-3°C/Sec
6.	Temperature accuracy	+/- 1°C
7.	In-built data analysis software	No
8.	Affordability	BOM for PCR: ~Rs. 8000/-

Significance/Relevance for Real-Time Applications

- Academic and research institutions, Skill development & training centers, Diagnostic laboratories.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **Patent Application No. 202411019851**



IoT-enabled

Colposcope

IoT-enabled Colposcope for **Pre-stage Cervical Cancer Examination** for PHCs

Unique Selling Proposition (USP)

- IoT-enabled remote consultation.
- AI-ready for early detection.

Technical Specifications

- Data storage on smartphones and cloud.
- Zoom (55X) Feature in the selected area for a detailed, magnified view.
- Software-based prediction for cervical cancer
- Software-based algorithm for lesion prioritization for biopsy

Significance/Relevance for Real-Time Applications

- The IoT-enabled colposcope provides real-time visualization and remote expert connectivity, ensuring timely detection and referral of pre-cancerous cervical conditions at the primary healthcare level.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **Copyright granted (SW-17225/2023)**

IoT-Enabled

2D Endoscope

IoT-Enabled 2D Endoscope for **Minimal Invasive Surgery**

Unique Selling Proposition (USP)

- AI-Ready for Smart Surgery
- Multi-device collaboration
- Edge processing for low latency

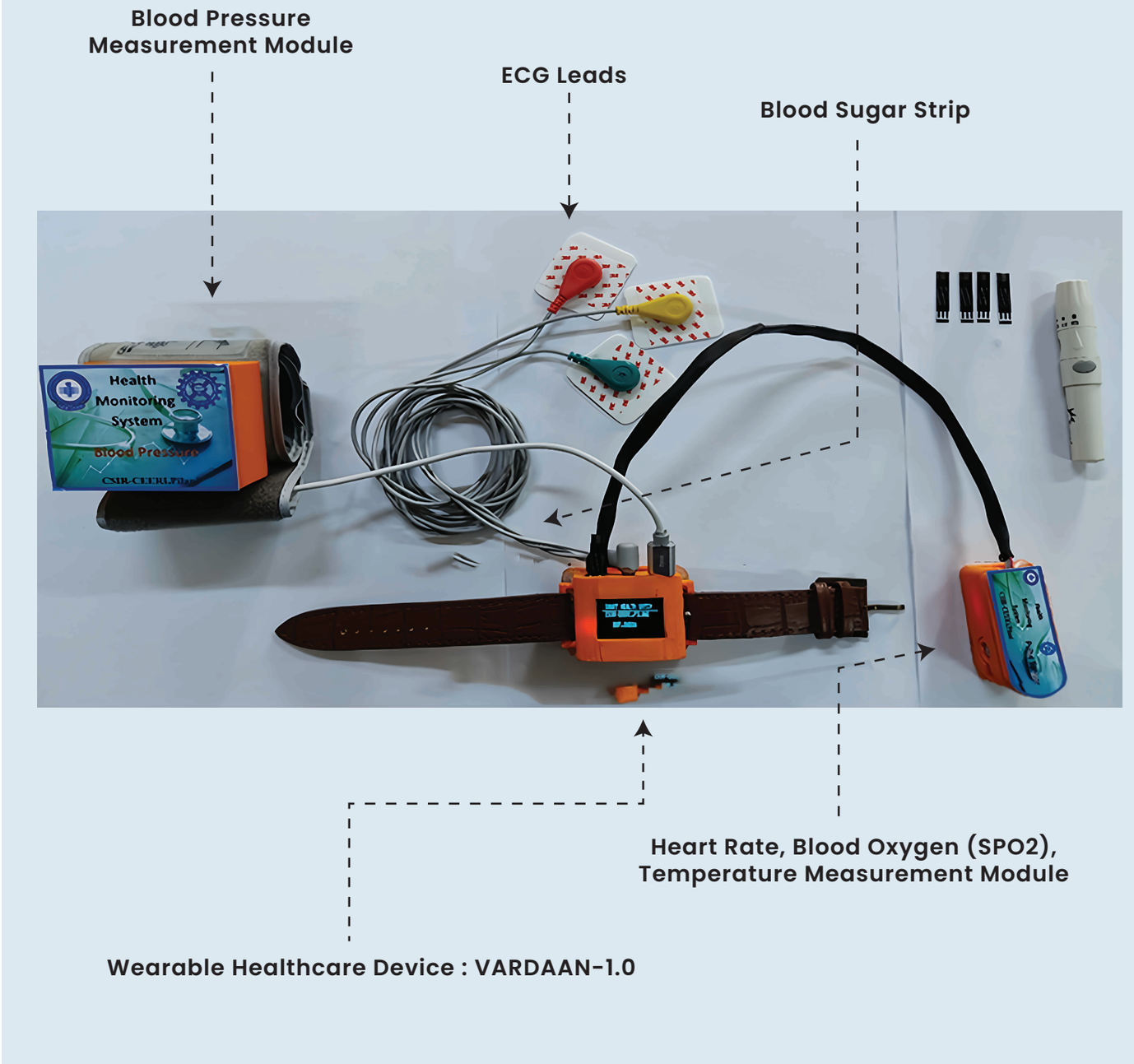
Technical Specifications

- Suitable for diagnostic and therapeutic applications.
- 1x1/3 CMOS image sensor, high resolution 1920×1080p.
- Focus-coherent lens technology with high-intensity inbuilt LED.
- Present modes for surgery, ENT, gynaecology, urology, orthopaedics, neuro, and spine applications.

Significance/Relevance for Real-Time Applications

- The IoT-enabled 2D endoscope ensures real-time visualization & secure remote access, making it highly relevant for immediate surgical decision-making and collaborative minimally invasive procedures.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **IP filing is in process**



IoT-Enabled

Wearable Device

IoT-Enabled Wearable Device for **Vital Health Parameters Monitoring**

Unique Selling Proposition (USP)

- Continuous and real-time monitoring.
- IoT-enabled remote and health access.
- Personalized health insights.

Technical Specifications

- System monitors BP, SPO2, HR, PR, ECG, Body Temperature and Blood Sugar.
- Accuracy: ± 1%
- Qualifies Medical compliance for each health parameter (NABL Certified)
- Connected to a close health network between doctor and patient

Significance/Relevance for Real-Time Applications

- The IoT-enabled wearable device enables continuous real-time monitoring of vital health parameters with remote accessibility, ensuring timely detection & intervention in critical situations.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **IP filing is in process**

Haemoglobin

Measurement System

Handheld Minimally Invasive-based **Haemoglobin Measurement System**

Unique Selling Proposition (USP)

- Minimally Invasive & Patient-Friendly.
- Portable & Rapid Testing.
- IoT & Data Integration.

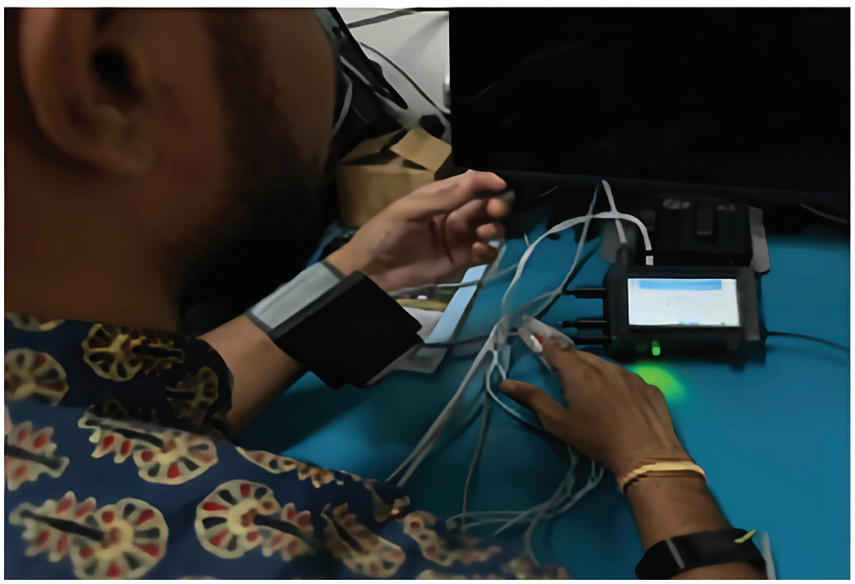
Technical Specifications

- Rapid haemoglobin measurement from a drop of blood sample.
- Less than 10 paisa per test
- Accuracy: ±1%
- AI-based analysis and early prediction for anemia
- Qualifies Medical compliance (NABL certified)

Significance/Relevance for Real-Time Applications

- The handheld minimally invasive haemoglobin system enables rapid, point-of-care measurement with real-time results, ensuring timely diagnosis & management in both clinical and field settings.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **IP filing is in process**



ICU Patient

Monitoring System

IoT-Enabled, Multi-parameter, **ICU Patient Monitoring System**

Unique Selling Proposition (USP)

- Comprehensive real-time monitoring.
- IoT-enabled remote access.

Technical Specifications

- Measures NIBP, PPG, ECG (12-lead ECG), and IR-based body temperature.
- Developed for ICU and post-recovery wards use case.
- AI-based event prediction (cardiac conditions, glycaemic load conditions)
- On board Sub-GHz-based communication services
- Remote monitoring of hospital patients
- Validated through clinical trials

Status: Readiness for Commercialization	:	**Yes**
Commercialized	:	**Yes**
Generated IP	:	**IP filing is in process**

High-Intensity

Light Source

Unique Selling Proposition (USP)

- High luminance and uniform illumination.
- Compact and low-heat design.
- Compatible with any of the existing endoscope cameras.

High-Intensity Light Source for **Endoscopy Applications**

Technical Specifications

- The system provides timer-based measurement to view the total surgery time
- The system provides timer-based auto-on/off.
- Closed-loop-based temperature monitoring and auto-cut to increase the shelf life of the source.
- Peltier and DC fan-based cooling to avoid overheating conditions.
- **Operation temperature :** 0-150 °C
- **Mode :** Configurable to single and dual light sources.
- **Power :** Tested with 60, 90, and 120-watt chip-on-board LEDs.

Significance/Relevance for Real-Time Applications

- The high-intensity light source ensures reliable, real-time illumination during endoscopic procedures, enhancing surgical accuracy while reducing heat and power consumption.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **IP filing is in process**

IoT-Enabled Field

Testing Kit

IoT-Enabled Field Testing Kit for **Rapid Water Quality Analysis**

Unique Selling Proposition (USP)

- Rapid on-site testing, IoT enables connectivity, AI-Ready data analysis.

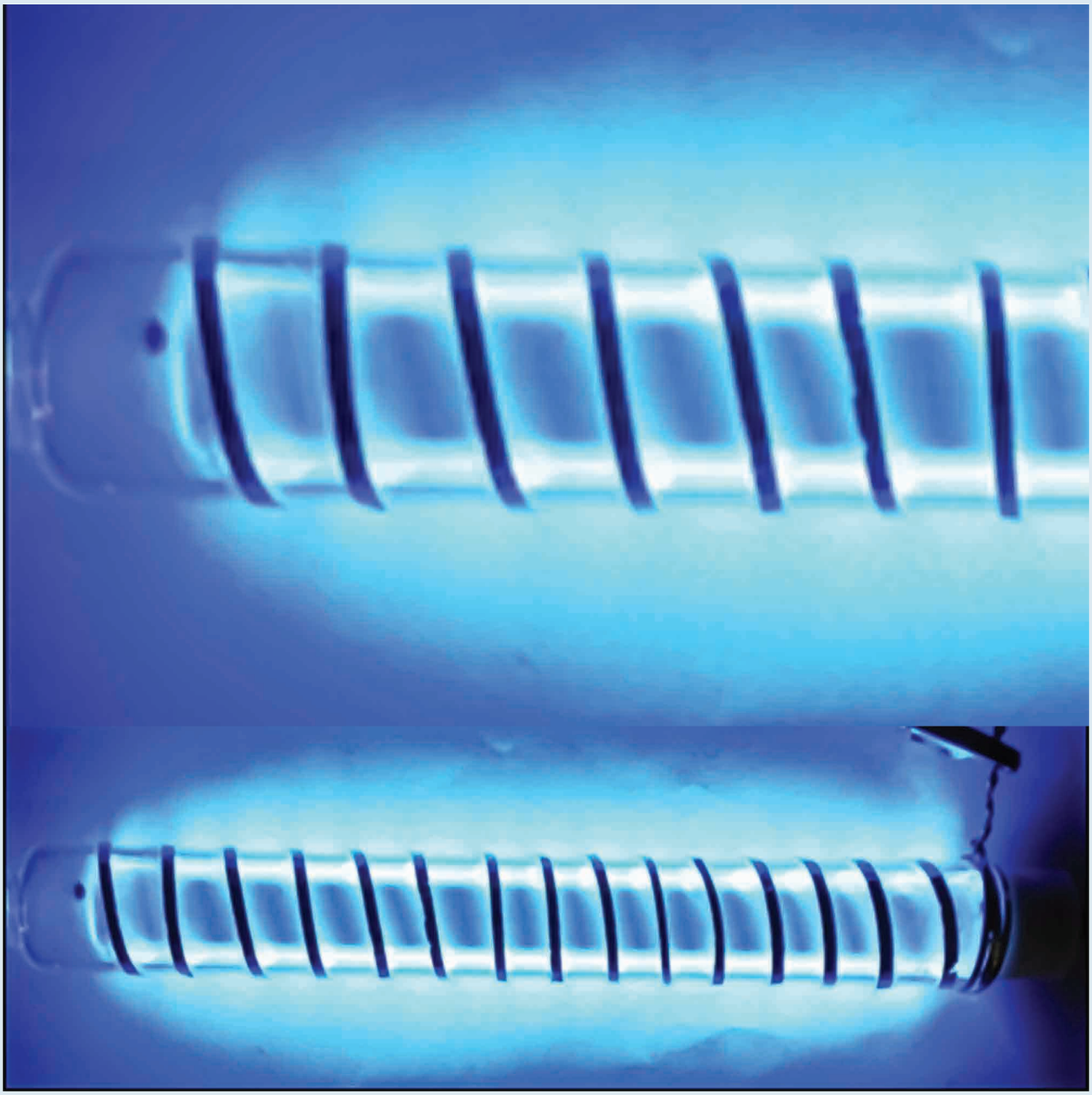
Technical Specifications

- Multi-Parameter Detection: Measures multiple parameters as per JJM guidelines:
  - Nitrate, Nitrite, Iron, Fluoride, Chloride, Sulphate
  - pH, TDS, EC, ORP, Turbidity
  - Free Chlorine, Hardness, Alkalinity
- Power Efficient & Portable
  - Runs on USB and Solar Power
  - Optimized for rural & remote deployments

Significance/Relevance for Real-Time Applications

- The IoT-enabled water testing kit provides rapid, on-site analysis of critical parameters with real-time data transmission, ensuring timely detection of contamination and supporting safe water management decisions.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **IP filing is in process**



DBD-based Mercury-Free Plasma

UV Lamps

DBD-based Mercury-Free Plasma UV-Lamp for **Water Purification**

Unique Selling Proposition (USP)

- Mercury-free plasma (MFP) UV lamp, filament less, repairable, eco-friendly technology, instantaneous start-up.

Technical Specifications

- **Operating input Pulse Voltage** : ~5kV peak, ~25kHz PRR, ≤ 2μs pulse width
- **Obtained Wavelengths** : 253 nm, 265 nm, and 172 nm (all broadband)
- **Operating Temperature** : ~ Room Temperature
- Gases Xenon with a very low percentage of Iodine

Significance/Relevance for Real-Time Applications

- The MFP-UV lamp is very much suitable for potential water & air purificatio applications. The technology has been demonstrated for efficient bacterial disinfections in water.

Status: Readiness for Commercialization	:	**Yes**
Commercialized	:	**Yes**
Generated IP	:	**Granted Indian Patent; Patent 475241, dated 30 Nov., 202**

In-line Water Quality

Measurement System

In-line Water Quality Measurement System to Toxic Heavy **Metals and Compounds**

Unique Selling Proposition (USP)

- Real-time continuous monitoring
- High sensitivity and selectivity
- IoT & cloud connectivity.

Technical Specifications

- The system has the ability to measure physical parameters (pH, TDS, turbidity), toxic heavy metals (Cu, Cd, Zn, F), and toxic compounds (nitrate).
- Ion-selective electrode-based real-time measurement
- Installable at any remote locations for continuous monitoring.

Significance/Relevance for Real-Time Applications

- The in-line water quality system enables real-time detection of toxic heavy metals and compounds, ensuring continuous safety surveillance and timely intervention in drinking and industrial water supplies.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **IP filing is in process**

pH Industrial Current

Transmitter

pH Industrial **Current Transmitter**

Unique Selling Proposition (USP)

- 2-Wire 4 to 20 mA current loop transmitter (according to NAMUR NE43)
- Surge Immunity: ± 1-kV line-line (as per IEC 61000-4-5)

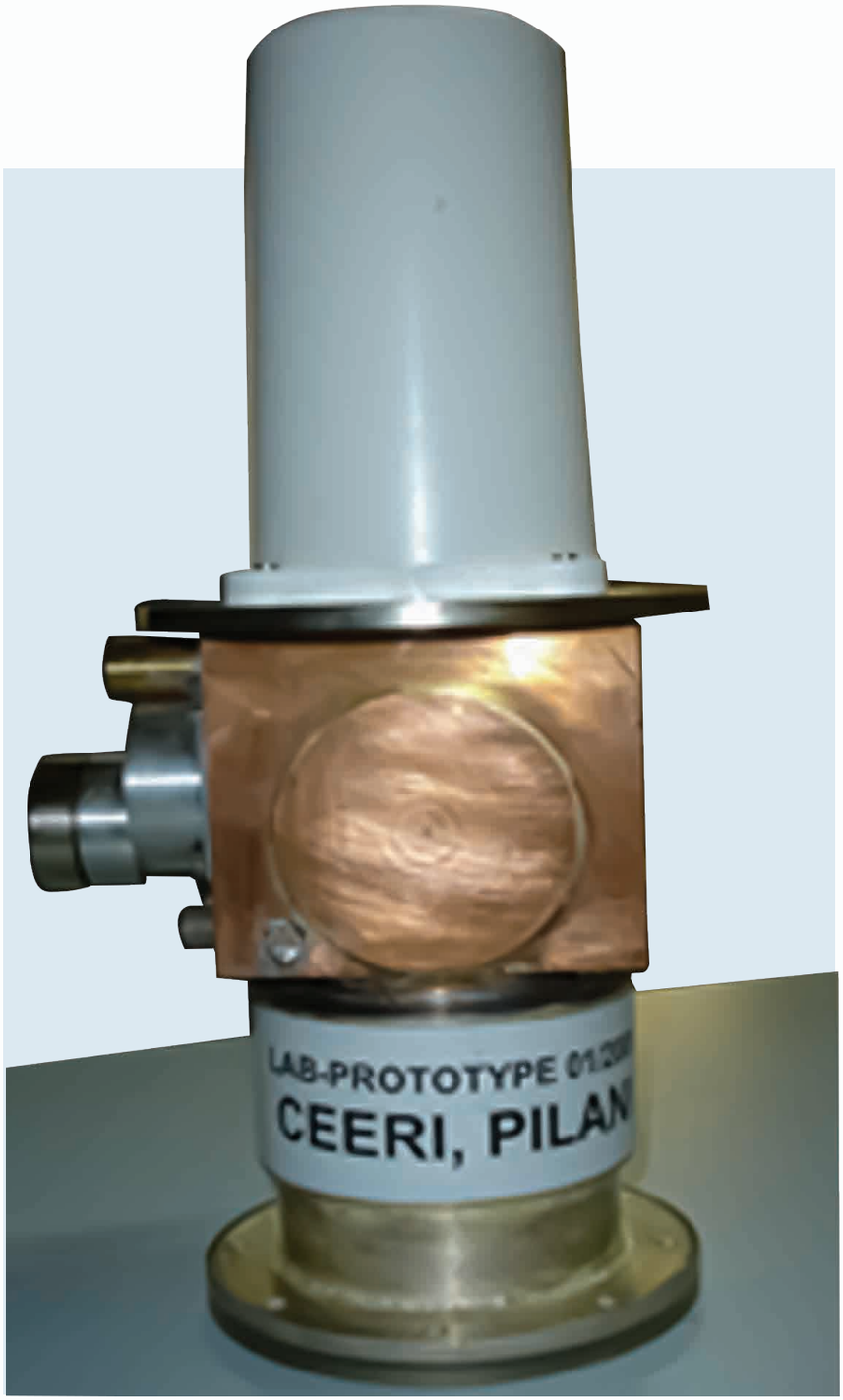
Technical Specifications

Current Output	Parameter	Power
4 to 20 mA	**0 to 14 pH & 0 to 50 °C**	**Loop Powered**

Significance/Relevance for Real-Time Applications

- The developed transmitter integrates an ultra-low-precise current measurement with Bluetooth Low Energy wireless communication, & provides an industrial current(output) signal, as per IEC standards

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **Copyright SW-19152/2024**



2.6 MW S-Band Tunable

Pulsed Magnetron

2.6 MW S-Band Tunable Pulsed Magnetron

Unique Selling Proposition (USP)

- Performance similar to imported E2V Tube
- Rugged ceramic cathode support

Technical Specifications

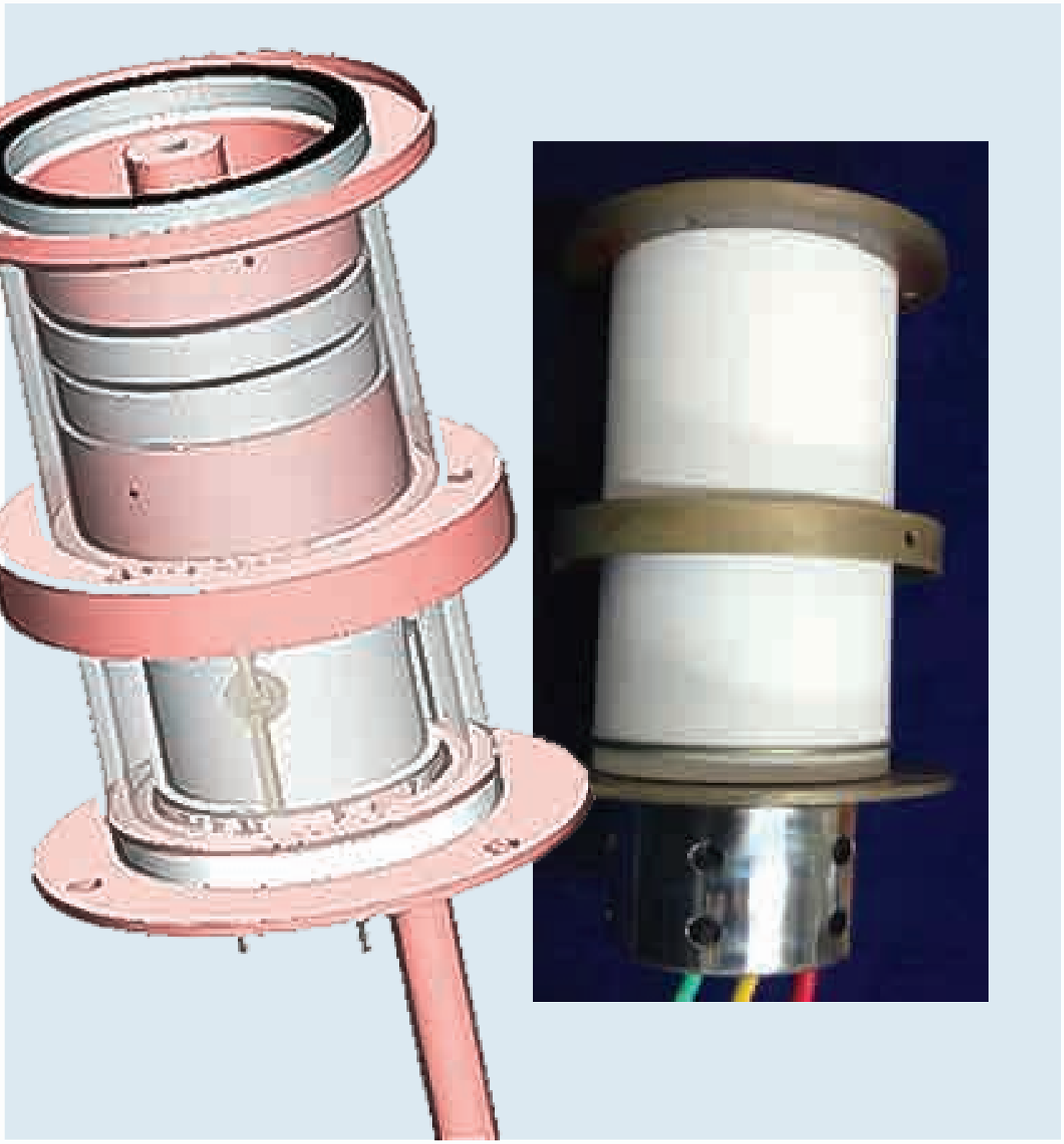
Peak Power	Tuning range (Min.)	Frequency
2.6 MW	**2992 to 3002 MHz**	**2998 MHz**

Pulse duration (Max.)	Magnetic field	Pulse repetition rate (Max.)
4.5 µS	**1550 ±25 Gauss**	**250 PPS**

Significance/Relevance for Real-Time Applications

- Developed 2.6 MW high-power pulsed magnetrons act as an RF source in medical LINAC systems, hence have applications in medical LINAC for radiotherapy machines for cancer treatment. CSIR-CEERI successfully developed & delivered an S-band 2.6 MW tunable pulsed magnetron with the support of the Department of Information Technology (Medical Electronics & Telemedicine Division), Ministry of Communications & Information Technology, Govt. of India.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **No**



35 kV/3kA

Thyratron Switch

35 kV/3kA Thyratron Switch for Fast Pulsed **Power Applications**

Unique Selling Proposition (USP)

- Ultra-fast, high-power, and reliable switching under extreme pulse and environmental conditions

Technical Specifications

Peak forward anode voltag **35 kV max**	Peak forward anode current **3 kA max**	Average anode current **2 A max**
Rate of rise of anode current **≥ 5 kA/µs**	Pulse repetition rate **250 Hz max***	Pulse width **5 µs**

Significance/Relevance for Real-Time Applications

- Thyratron technology is pivotal in pulse modulator systems, enabling ultra-fast & reliable high-power switching that powers next-generation accelerators, medical inacs, radar, and security platforms.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **Patent 202411043451, filed on 04/06/2024**

Thick-film Hotplate Integrated

Microfarming Unit

Thick-film Hotplate Integrated **Microfarming Unit**

Unique Selling Proposition (USP)

- Customized thick film hotplates for germination and growth of tiny plants at high altitude cold deserts.
- Thermally stable interconnections

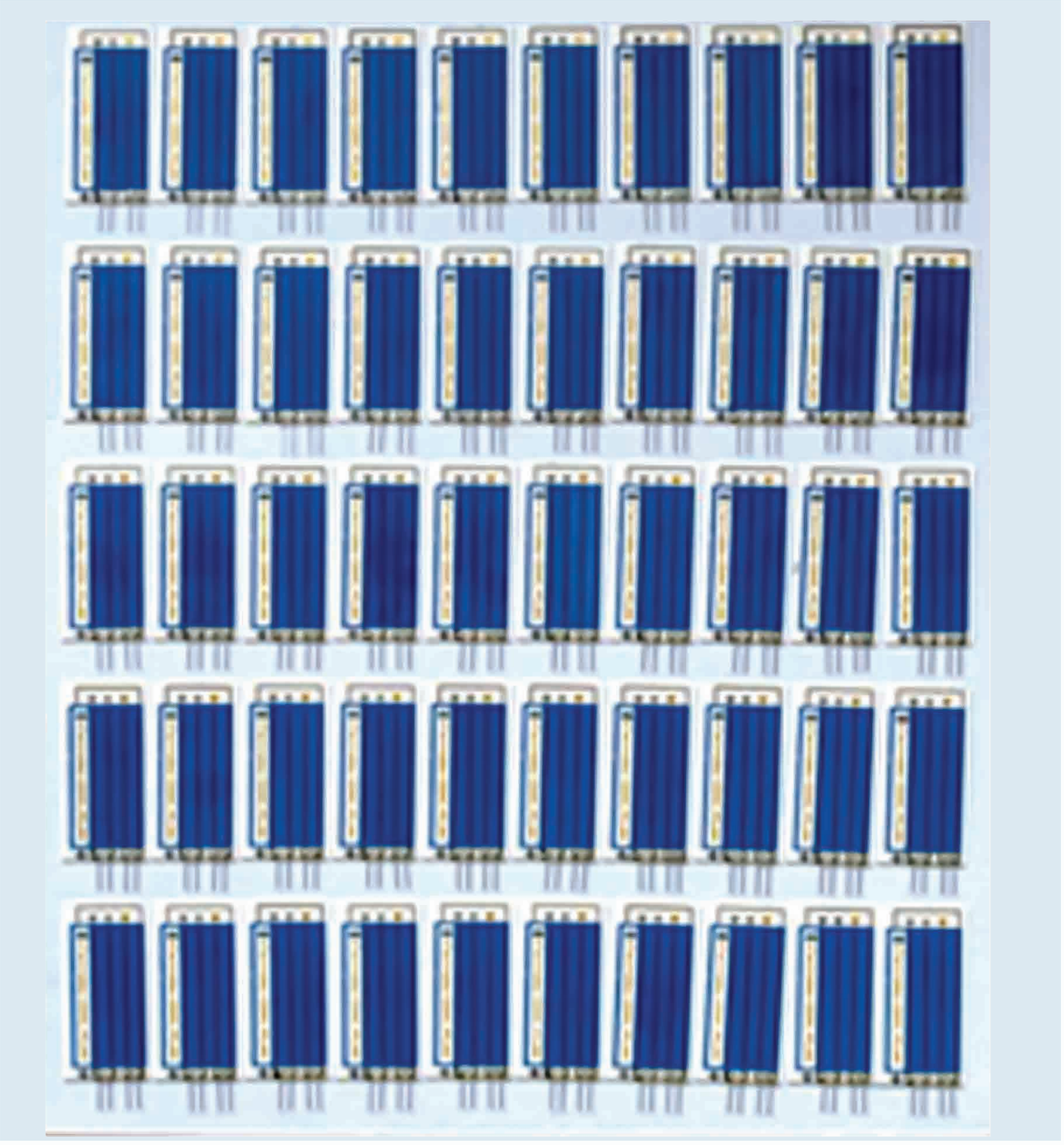
Technical Specifications

Hotplate Plate Operating Voltage **12 V DC**	Hotplate Temperature **70-100 ˚C**
Outside Temperature **10 ˚C or less**	Inside Temperature **15-20 ˚C**

Significance/Relevance for Real-Time Applications

- Thick-film hotplate integrated microfarming unit is essential for germination & growth of microgreens for army soldiers posted at high altitudes, cold climatic regions, and people living in such areas

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **No**



Thick Film Hotplate

Sensor Electrodes

Thick Film Hotplate **Sensor Electrodes**

Unique Selling Proposition (USP)

- Rugged, Reliable, Reusable thick film electrodes

Technical Specifications

Substrate	Line width	Substrate Size
Alumina	**500 µm**	**~ 1”X 2”**

Significance/Relevance for Real-Time Applications

- Useful for various applications, viz., milk analyser, detection of soil nutrients, biosensing, etc.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **No**

Dual Energy X-Ray Image

Analysis Technique

Unique Selling Proposition (USP)

- High Resolution Image using dual energy image fusion
- Discriminate Organic, Inorganic, and Metallic Materials

Dual Energy X-Ray Image Analysis Technique for **Material Discrimination**

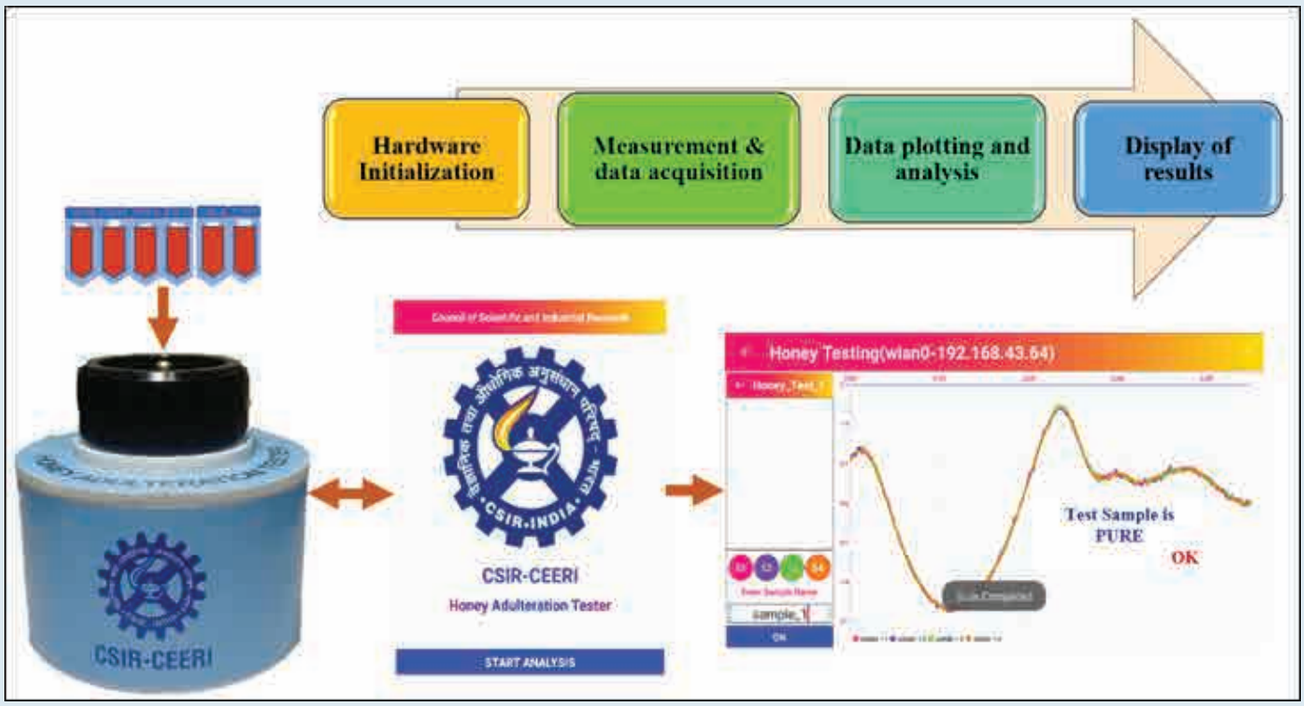
Technical Specifications

- 16-bit grey scale image data processing.
- Dual energy image fusion.
- Determination of atomic number and density of scanned material items.
- Based on atomic number, the material items were labelled and displayed as 3-color & 6-color material discrimination images under different categories, namely organic, inorganic, and metals. Atomic number (Z) ranges from 0 to 30.
- Separate buttons were provided for image processing functionalities such as loading image data, image fusion, 3-color coding, 6-color coding, density image, organic stripping, inorganic stripping, and metal detection.
- Display of density image
- Algorithm implementation as a DLL library
- High-density region alarm.

Significance/Relevance for Real-Time Applications

- The dual-energy X-ray image analysis technique is widely employed in passenger baggage inspection as a security measure to detect and identify illegal, prohibited, & hazardous items. During real-time scanning, materials are distinguished based on their effective atomic number and density characteristics

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **Yes**
- **Generated IP** : **Copyright SW-20036/2025**



Honey Adulteration

Detection System

Honey Adulteration **Detection System**

Unique Selling Proposition (USP)

- The system can detect the adulterants from both C_3 and C_4 plant-based syrups with a minimum detection limit: Corn syrup/10%, Sugar syrup/10%, Jaggery syrup/10% and Rice Syrup/10%

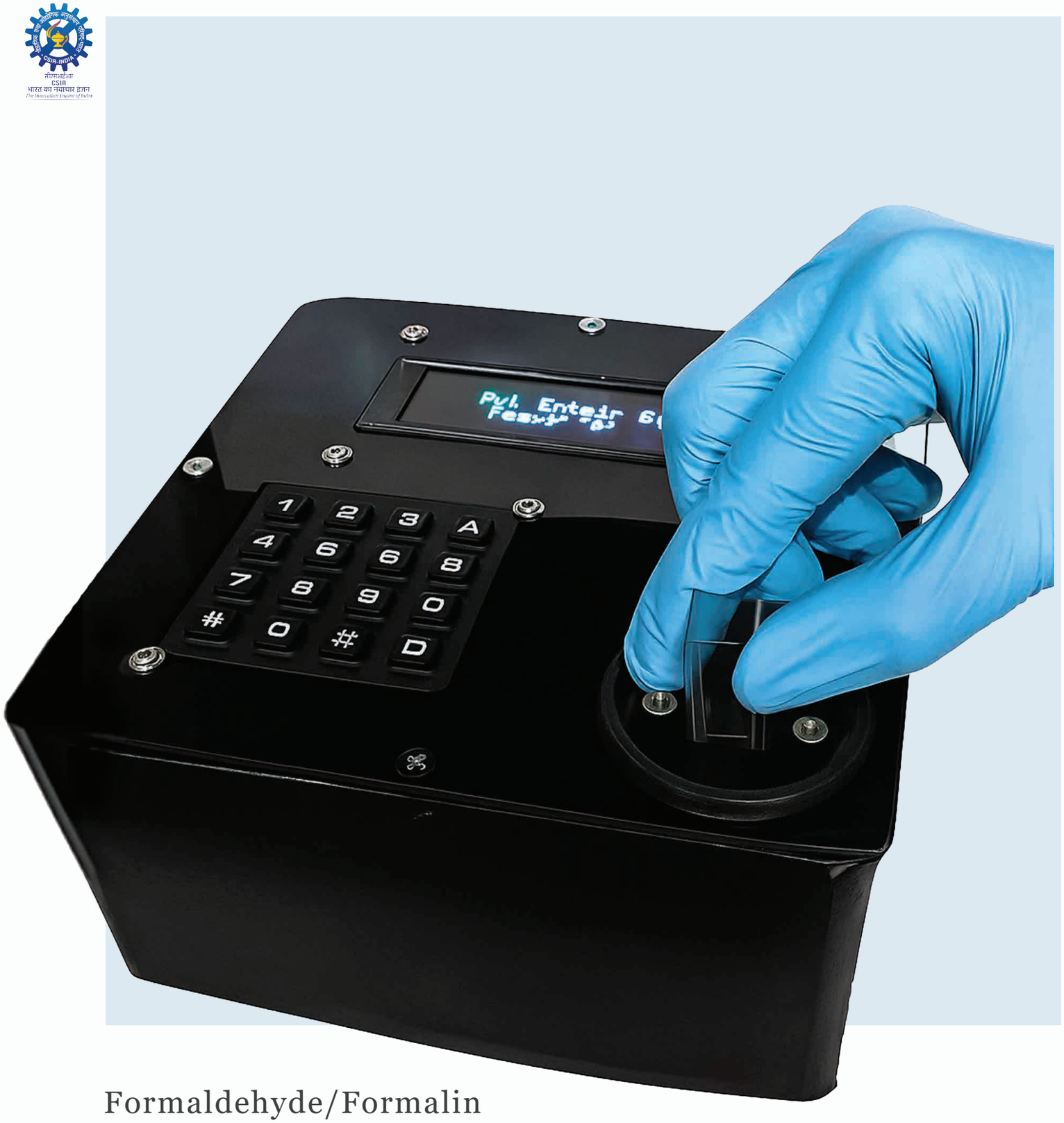
Technical Specifications

- Measurement time : ~ 1 min
- Sample Volume : 1 ml
- Green Technology (chemical-free adulteration check).
- Handheld, user-friendly, battery-operated, low-cost system.
- Adulterants/minimum detection limit: Corn syrup/10%, Sugar syrup /10%, Jaggery syrup/10% and Rice Syrup/10%.
- An Android-based application for user interaction and data acquisition

Significance/Relevance for Real-Time Applications

- On-site detection of adulteration in honey.

Status: Readiness for Commercialization	:	**Yes**
Commercialized	:	**No**
Generated IP	:	**Patent 202411019851, Copyright SW-17233/2023**



Formaldehyde/Formalin

Tester

Formaldehyde/Formalin **Tester**

Unique Selling Proposition (USP)

- On-the-spot adulteration check– detection of formalin (adulterant).
- Portable and Battery Operated.

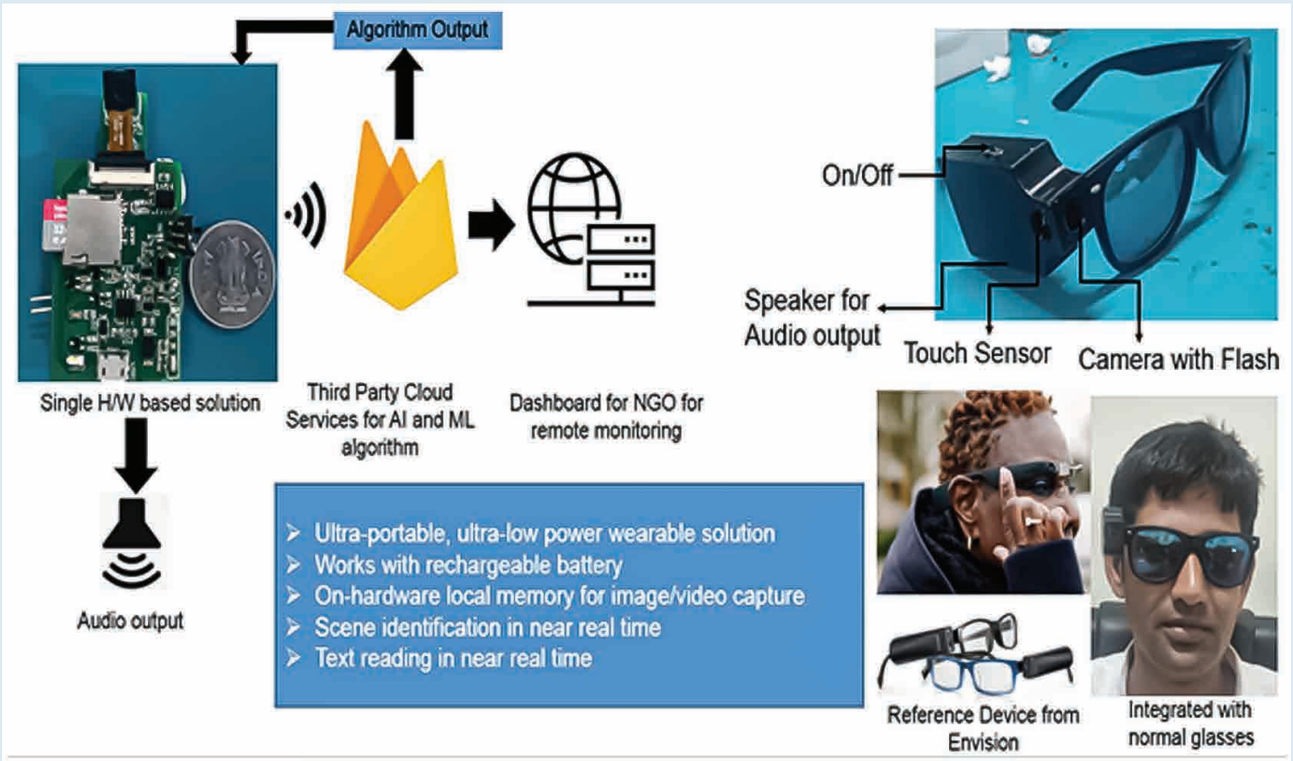
Technical Specifications

Measurement Principle **Fluorescence**	Limit of detection **100ppb**
Measurement time **5 to 10 min**	Measurement range **100ppb – 100ppm (>100 ppm)**

Significance/Relevance for Real-Time Applications

- The developed system finds applications of quality checks in Fisheries, Domestic usage, and Food inspection agencies.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



Vision-Based

Aiding Tool

Vision-based **Aiding Tool for Blind Person** for scene identification, currency identification, text reading, etc.

Unique Selling Proposition (USP)

- Multi-functional assistance, AI-powered and affordable, IoT & smart integration

Technical Specifications

- Able to perform scene identification, text reading currency recognition in real time
- Connected to open AI for any question answer in real-time
- Available with dual language Hindi and English
- Ultra-low power and ultra-portable

Significance/Relevance for Real-Time Applications

- The vision-based aiding tool delivers real-time scene understanding, text reading, and currency identification, empowering blind persons with independence and timely access to critical information

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **IP filing is in process**

Power Assistive

E-Tricycle

Unique Selling Proposition (USP)

- Variable speed control through the mobility controller, adapting to dynamic road conditions.
- Variable speed control through the mobility controller, adapting to dynamic road conditions. Power assist functionality that enhances manual hand-pedaling, especially on hilly, inclined, or uneven surfaces, and an indigenously designed & developed electronic controller for a 250 W BLDC motor.

Power Assistive E-Tricycle for **People with Disability**

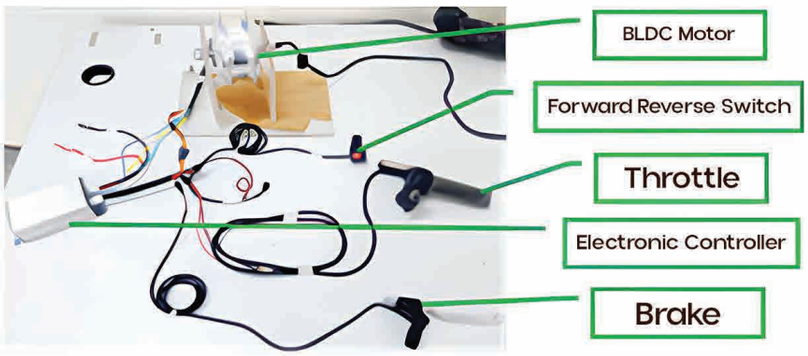
Technical Specifications

- Variable speed control through the mobility controller, adapting to dynamic road conditions.
- Power assist functionality that enhances manual hand-pedaling, especially on hilly, inclined, or uneven surfaces, and an indigenously designed and developed electronic controller for a **250 W BLDC motor**.

Significance/Relevance for Real-Time Applications

- The development of an advanced closed-loop control system for improving battery performance in the e-Assist Tricycle aims to address critical challenges faced by differently abled individuals in India. Manual tricycles often cause severe pain and repetitive strain injuries to the upper extremities, leading to long-term musculoskeletal issues. Despite the growing demand for electric tricycles (50,000 to 100,000 units annually), existing solutions are costly, unreliable, and often fail to provide the necessary power, especially on inclined roads or flyovers. The indigenous electronic controller developed by CSIR-CEERI is a game-changer, as it offers a cost-effective, reliable solution that meets the power demands in challenging terrains.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **Patent 202311066470**
  Copyright SW-17002/2023
  Design Registration No. : 404671-001



Motor Controller

Conversion kit

E-Bicycle - Electronic Motor Controller
Conversion kit

Unique Selling Proposition (USP)

- Variable speed control through the mobility controller, adapting to dynamic road conditions.
- Indigenously designed and developed an electronic controller for a **250 W BLDC motor**.

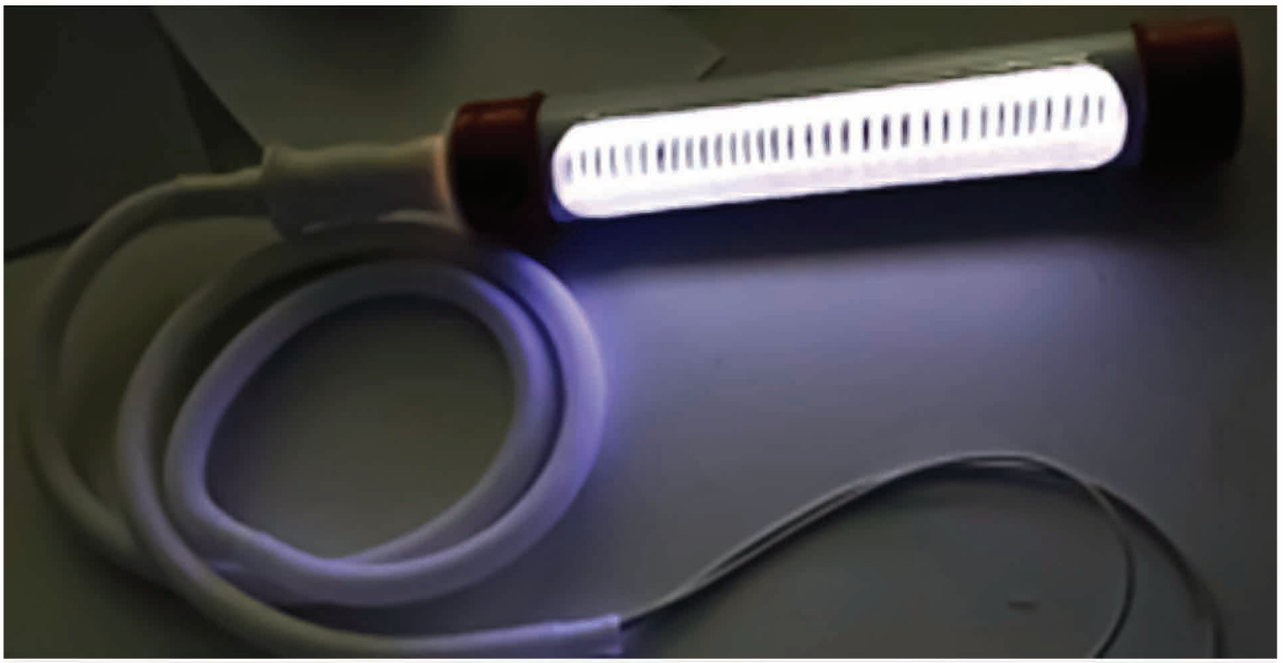
Technical Specifications

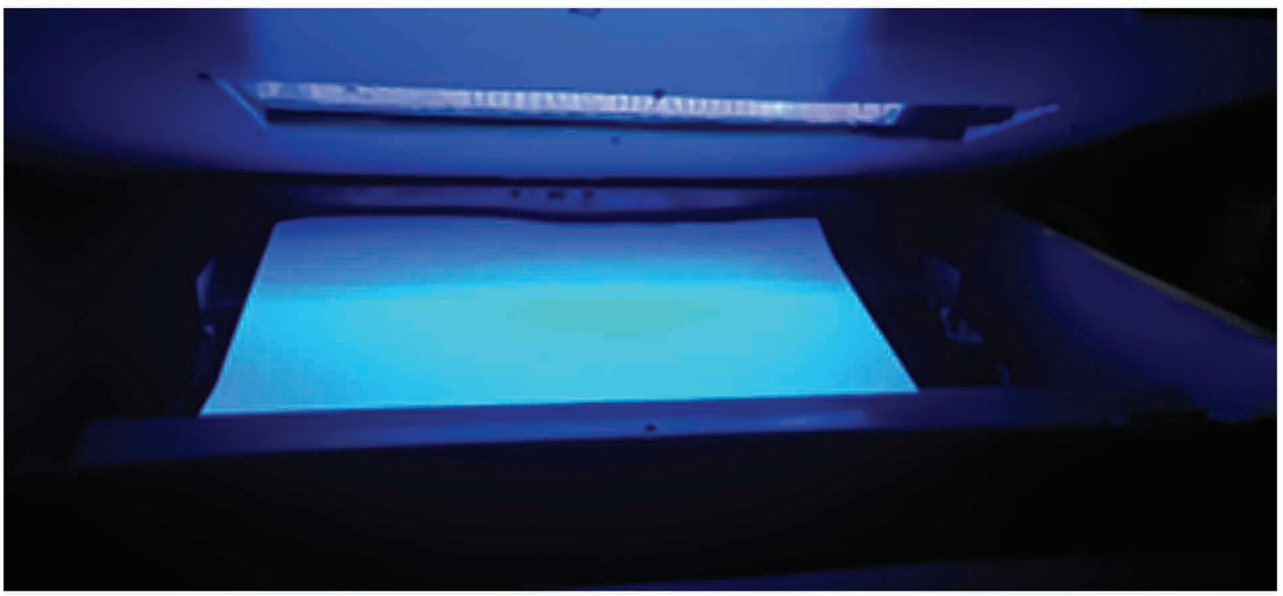
EMI EMC AIS-004 Part-3 compliant	Indigenously designed electronic controller 250Watt	Distance covered per charge 20Km, with 24V 18Ah Battery, Speed 25Km/Hr in Fwd; 7Km/Hr in Rev

Significance/Relevance for Real-Time Applications

- The proposed E-Bicycle with the Electronic Motor Controller Conversion Kit is highly relevant for school students, the elderly population, and working women in villages, providing them with a safe, affordable, and eco-friendly mobility solution. It reduces physical strain, ensures reliable daily commuting, & promotes accessibility in rural settings where transport options are limited. By integrating an indigenously developed electronic controller, the product supports sustainable transport and enhances self-reliance, while contributing to social and economic empowerment.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **Patent 202311066470**
  Copyright SW-17002/2023





222 nm Far UV-C

Radiation Sources

Portable and Hand-held 222 nm Far UV-C Radiation Sources for **Disinfection**

Unique Selling Proposition (USP)

- 100% Green Technology – Uses only water to produce ozone, eliminating toxic chemical byproducts (unlike traditional methods).
- Energy-Efficient & Low-Cost – Electrochemical ozone production (EOP) from water minimizes power consumption and low cost for disinfection.

Technical Specifications

Current **0.5-1 A**	Electrical data for the power supply unit of the pump & fan **Input :** 24 V DC, 7Ah **Output :** 5 V	Max voltage **20 V DC**
Media Temperature **25-35 ℃**	Electrical data for the power supply unit for the EOP cell **Input :** 24 V DC, 7Ah **Output :** 20 V	Electrodes **BDD**

Significance/Relevance for Real-Time Applications

- Powerful Disinfectant: Ozone can eliminate a wide variety of inorganic, organic and microbiological problems and taste and odour problems.
- Better quality of water: Ozone leaves no residual in the water; Ozone lowers the use of chlorine and improves overall water quality

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

4K 3D

Laparoscopy Tower

4K 3D Laparoscopy Tower for **Minimal Invasive Surgery**

Unique Selling Proposition (USP)

- Ultra-high resolution & depth perception.
- Ergonomic & surgeon-friendly.

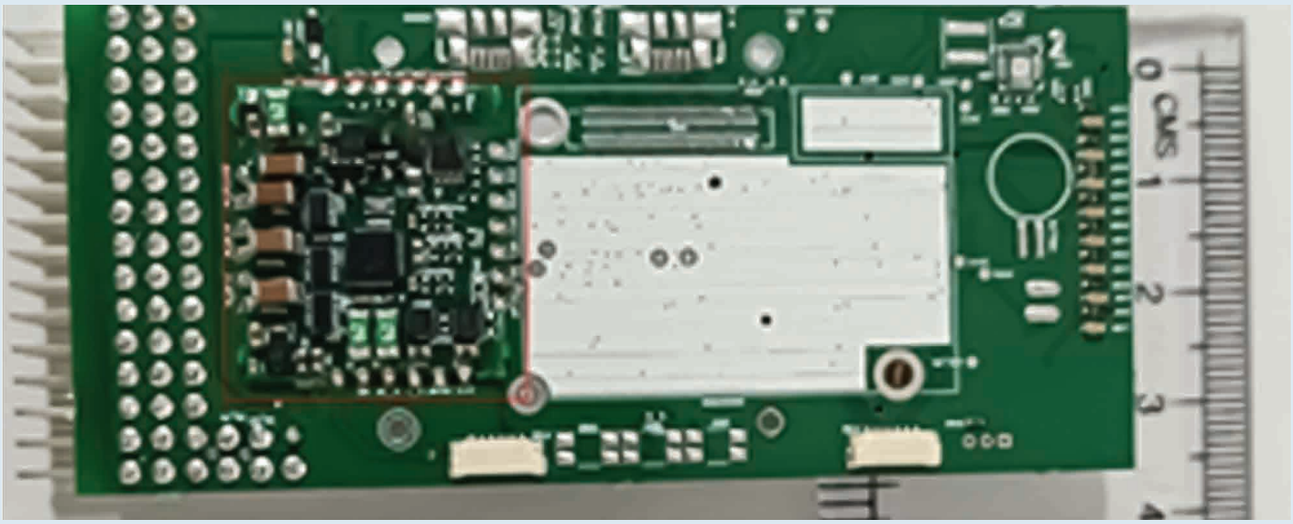
Technical Specifications

- The system is equipped for any kind of surgery
- The overall system consists
  - High-intensity light source for illumination,
  - Irrigation suction pump for fluid management,
  - 4K camera for visibility and
  - CO_2 insufflator to increase visibility and also to control bacterial growth
- Connectivity to PC and Android-based based s/w package

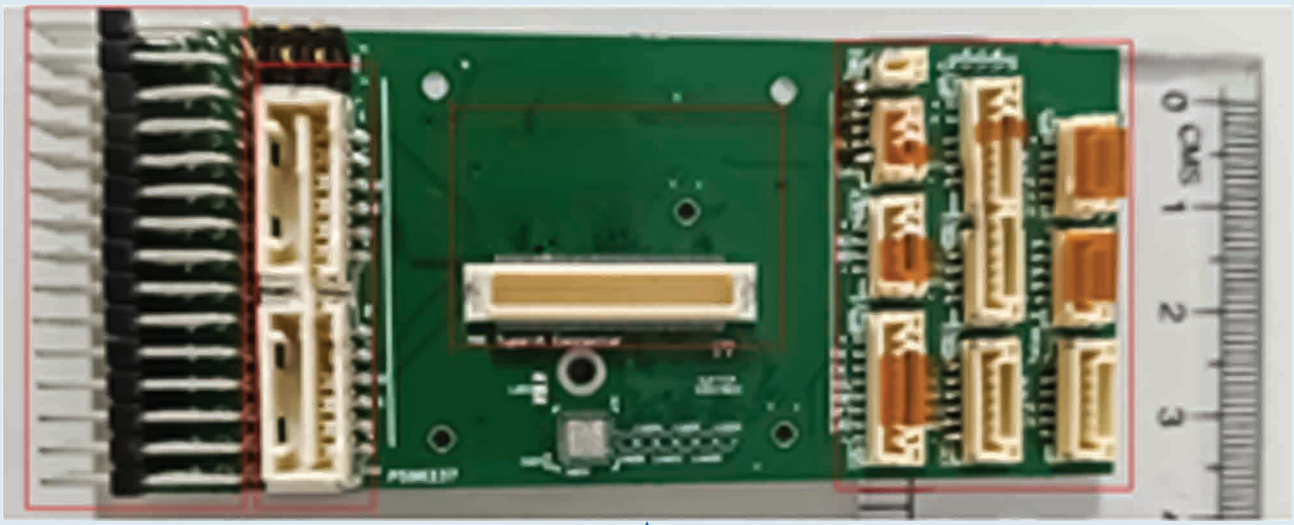
Significance/Relevance for Real-Time Applications

- The 4K 3D laparoscopy tower enables real-time ultra-high resolution depth perception, enhancing surgical precision, reducing complications, & supporting advanced minimally invasive procedures.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **IP filing is in process**



Bottom Side



Top Side

Indigenous Drone

Flight Controller

Indigenous Drone Flight **Controller**

Unique Selling Proposition (USP)

- FMUv5 PX4 architecture-compatible carrier board design
- Custom-built with the latest sensors
- Upgraded with high performance H7 processor
- On board Power Management (4-layer PCB)
- Multi-power source with UV / OV protection
- Peripheral and FMU interconnect with Modular attachment (4-layer PCB)

Technical Specifications

- IO Ports: 14 PWM servo outputs (8 from IO, 6 from FMU)
- 5x UART (serial ports), 2x CAN, RSSI (PWM or voltage) input, I2C, SPI
- 3.3v ADC input
- Internal micro-USB port and external micro-USB port extension

Significance/Relevance for Real-Time Applications

- Indigenous flight controller for mid to high range drones catering to octocopters.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

Autonomous

Al Drone

Autonomous Al Drone for **Agriculture/Orchards**

Unique Selling Proposition (USP)

- Autonomous flight without human intervention.
- Easy manual to Auto mode switch.
- Dual camera system for navigation and scouting.
- Live real-time disease detection/identification.
- Adjustable flight height as per the application.
- FPV mode for remote human inspection.

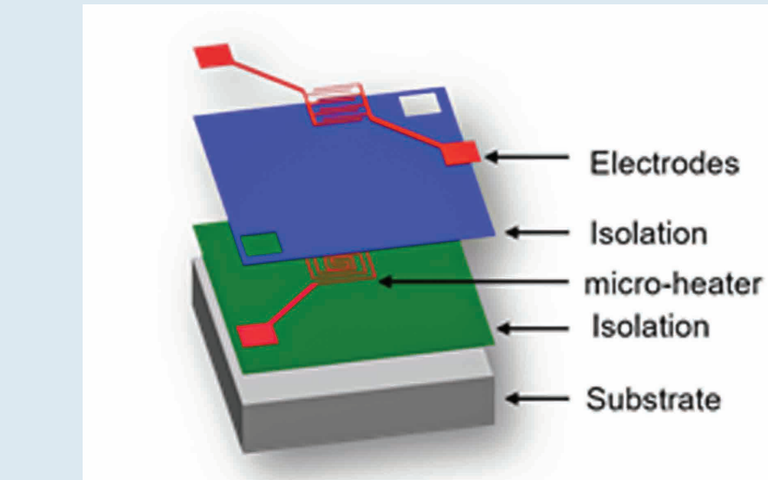
Technical Specifications

- Quad drone 40 TOPS AI computation
- Autonomous flight without human intervention
- Easy manual to Auto mode switch
- Adjustable flight height as per the plantation

Significance/Relevance for Real-Time Applications

- The AI Agriculture Drone autonomously navigates your fields using advanced AI algorithms, eliminating the need for manual scouting. The drone can identify plantations and passages within orchards/trees and can traverse within the orchard with ease. This technology enables farmers to automate repetitive tasks and cover larger areas. The drone can also traverse tree lines and automate tasks such as spraying and watering, along with aerial inspection for diseases on the fly.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



Micro-heater platform with

Control Electronics

Micro-heater platform with Control Electronics of heater control and resistance measurement of the sensing film (gas sensing)

Unique Selling Proposition (USP)

- **Low power operation (<200 mW)**: Enables efficient performance in battery-powered and energy-constrained environments
- **Compact form factor**: Optimized for seamless integration into portable, and wearable systems
- **Precision thermal control**: Maintains accurate and stable temperatures tailored to sensing film requirements, enhancing selectivity and sensitivity

Technical Specifications

Chip size	Substrate	Platform Temperature	Operating Voltage
2.5mm × 2.5 mm	**Glass / Silicon**	**up to 250 °C**	**12 V DC**

Significance/Relevance for Real-Time Applications

- The platform's precise thermal modulation enables dynamic tuning of the sensing environment, enhancing selectivity and sensitivity through temperature-dependent gas interactions. Its thermal cycling supports reliable detection in complex mixtures and variable conditions. Combined with a compact, low-power design, it is ideally suited for portable, wearable, and IoT-integrated real-time sensing applications.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

IoT-based Smart Emergency Alerting

System & Relay

IoT-based smart emergency **alerting system & relay**

Unique Selling Proposition (USP)

- Support duplex communication and relay with Sub 1 GHz modules
- 1 KM aerial (line of sight) and more with (repeater)
- Support communication with WiFi & BLE.

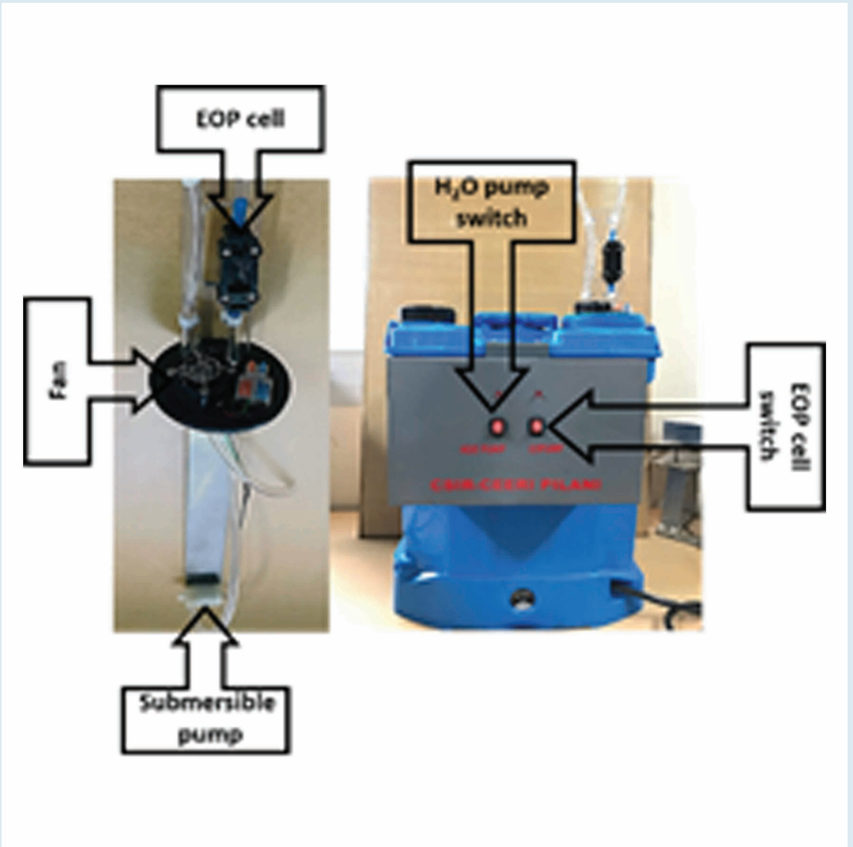
Technical Specifications

- Low-power Sub 1 GHz modules transceivers with WIFI and BLE support.
- Can operate in a no-network zone in LOS.
- SD card support for event logging.
- Buzzer enabled.
- Relay support.

Significance/Relevance for Real-Time Applications

- Smart home security hub, intruder alarm system including security camera, panic alarm, SOS service, and fire alarm

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



Development of Green

Technology

Unique Selling Proposition (USP)

- 100% Green Technology – Uses only water to produce ozone, eliminating toxic chemical byproducts (unlike traditional methods).
- Energy-Efficient & Low-Cost – Electrochemical ozone production (EOP) from water minimizes power consumption and low cost for disinfection

Development of Green Technology-Based Electrochemical **Ozone Production System**

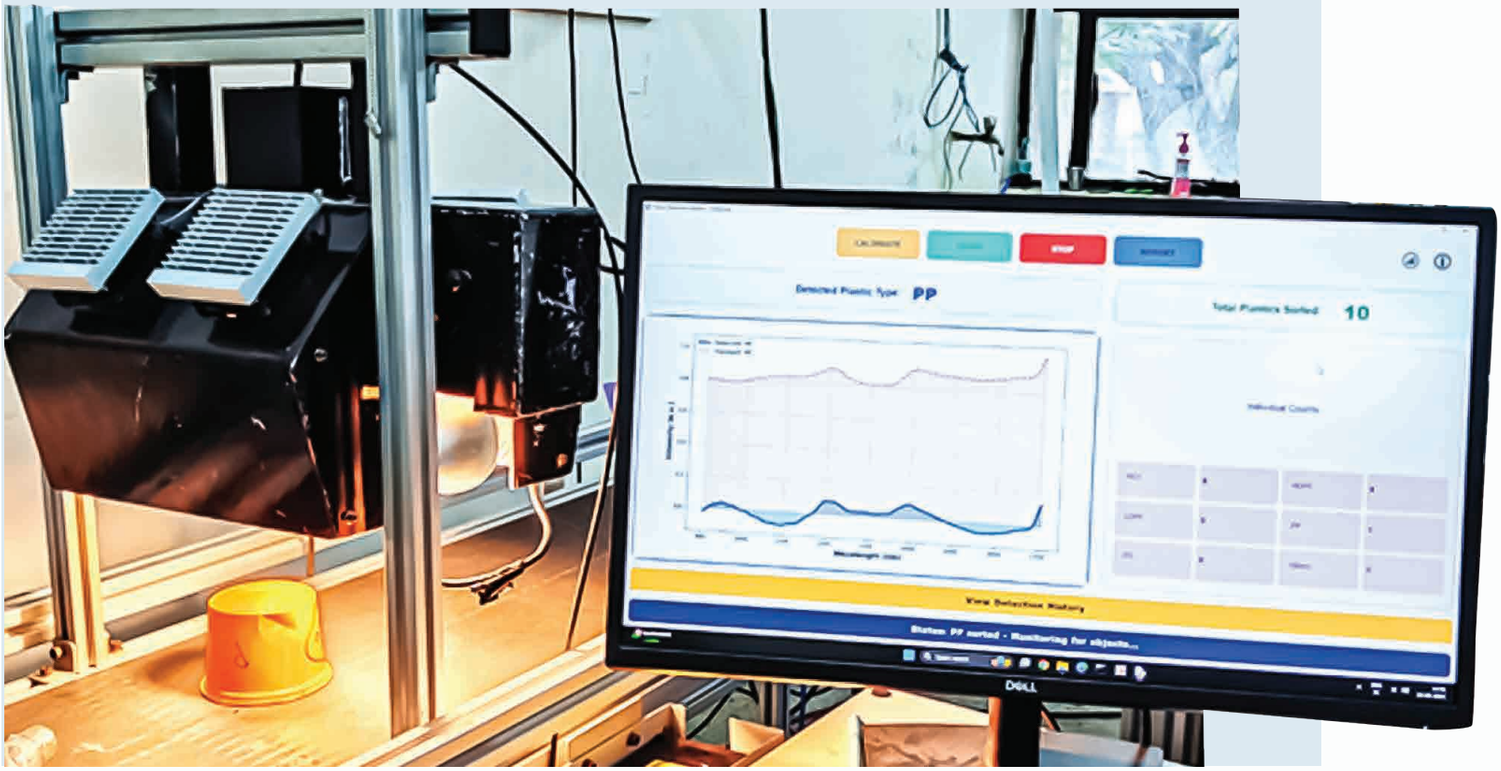
Technical Specifications

Device name	EOP system
Electrical data for the power supply unit of thepump and fan	Input: 24 V DC, 7Ah Output: 5 V
Electrical data for the power supply unit for the EOP cell	Input: 24 V DC, 7Ah Output: 20 V
Current	0.5 – 1 A
Max Voltage	20 V DC
Media temperature	25 – 35 ^{o}C
Electrodes	BDD

Significance/Relevance for Real-Time Applications

- Powerful Disinfectant: Ozone can eliminate a wide variety of inorganic, organic & microbiological problems and taste and odour problems.
- Better quality of water: Ozone leaves no residual in the water; Ozone lowers the use of chlorine and improves overall water quality

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



AI-Enabled

Optical Sorters

AI-Enabled Optical Sorters for **Waste Plastics**

Unique Selling Proposition (USP)

- Real-time, non-destructive sorting of mixed waste plastics into distinct polymer fractions for recycling.
- AI-driven NIR spectral analysis enabling high-speed, accurate identification across multiple polymer types.

Technical Specifications

- Identification & **sorting speed: 100–150** objects/min; throughput: **50–150 kg/hr** (upgradable).
- Supports polymer-based identification of PET, HDPE, LDPE, PP, and PS in all rigid colours except carbon black & grey **(>200 microns, >5 cm diameter)**.
- Open-source software, optimized optical interface, pneumatic sorting of 2 types (extendable to more).

Significance/Relevance for Real-Time Applications

- Enables efficient & automated segregation of mixed waste plastics in recycling facilities, reducing manual labour and improving material recovery rates.

Status: Readiness for Commercialization	:	**Yes**
Commercialized	:	**No**
Generated IP	:	**Copyright SW-18234/2024, Design Registration: 013DN2023**

Extremely Aler	Neither Alert nor Sleepy Some Signs of Sleepiness
Very Alert	Sleepy but No effort
Alert	Sleepy but Some effort
Fairly Alert	Very Sleepy Great Effort

Early detection of

Sleepiness

Early detection of sleepiness through physiological signal (ECG) and facial parameters

Unique Selling Proposition (USP)

- Hybrid Physiological Signal (ECG) & Video based Drowsiness Detection.
- Seven-Point Drowsiness Severity Indicator with Real-ECG signal and HR display.

Technical Specifications

- High-conductive Stainless steel 3-D printed ECG steering wheel electrodes.
- High electrically conductive stainless steel SS316 dry electrodes over the circumference of the steering wheel as LA & RA for ECG signal acquisition.
- High-resolution IR camera, Latte Panda, ECG Acquisition MAX30003 AFE integrated with ESP 32 Processor.
- 99.9 % QRS Complex detection and AI-based fusion method for drowsiness detection.
- Mouth Aspect Ratio (MAR), Eye Aspect Ratio (EAR), PERCLOS, and Head movement detection.

Significance/Relevance for Real-Time Applications

- The system combines video-based behavioral analysis with ECG/HRV monitoring to enable early, accurate, and real-time drowsiness detection.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

Renewable

Energy

Renewable Energy-based **DC Microgrid System**

Unique Selling Proposition (USP)

- Supervisory Control with Digital Energy Management Schemes.
- Solid-State Protection Circuit
- Battery Charging Scheme: Maximum Power Point Tracking (MPPT)

Technical Specifications

Compatibility with Market Available AC Loads

(BLDC Fans, LED Lights, etc.)

Peak Power rating
2.5 kW

With

Peak Power rating
15kW

Units generated

300 units/month

Significance/Relevance for Real-Time Applications

- India's per capita electricity consumption remains less than one-third of the global average, reflecting persistent gaps in reliable energy access. Centralized grid dependency, high transmission losses, and unviable rural electrification for DISCOMs exacerbate the challenge. DC microgrids emerge as a real-time solution by enabling efficient, decentralized power with direct integration of renewable sources and storage. Their simplified control ensures reliability & cost-effectiveness, making them highly suitable for critical buildings in remote areas such as healthcare centers, schools, & emergency facilities.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **Patent 202311006417**
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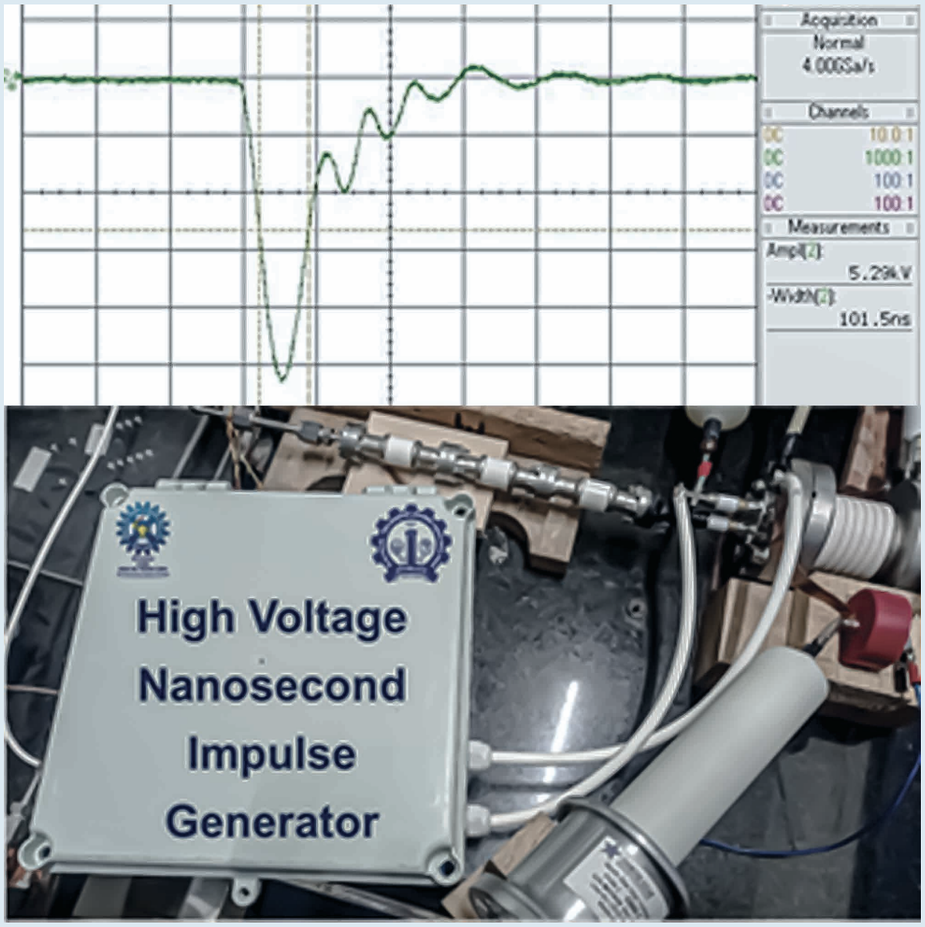


High Voltage Nanosecond

Impulse Generator

Unique Selling Proposition (USP)

- Generates a high voltage (up to -8 kV) nanosecond pulse with respect to floating output up to -15 kV.
- Adjustable pulse parameters (duration, frequency, amplitude, polarity) with min. pulse duration 101 ns and max. amplitude ±8 kV.
- Single switch design leading to low component count

High Voltage Nanosecond Impulse Generator suitable for **THz NDT System**

Technical Specifications

Frequency **Mono shot to 1000 Hz**	Measurement Principle **101 ns to 1,000 ns**
Amplitude **up to ±8 kV**	Floating output voltage **up to ± 15 kV**

Significance/Relevance for Real-Time Applications

- Nanosecond pulse generators are essential in driving high-voltage electron beam sources & plasma based terahertz (THz) generation systems, where precise, short-duration pulses are required to accelerate charged particles and initiate transient plasma states. Their sharp rise times enable efficient coupling of electrical energy into plasma, producing broadband THz radiation with higher intensity and stability. Such systems are gaining real-time significance for non-invasive medical diagnostics, security imaging, ultrafast spectroscopy, & next-generation wireless communication. By providing controlled high-voltage nanosecond pulses, these generators form the backbone of compact, tunable THz sources, bridging the gap between laboratory-scale experiments & field-deployable technologies.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **Patent 202511017907 (Indian Patent, Filed)**
  Copyright SW-17317/2023 (Granted)

High Voltage Unipolar

Impulse Modulator

High Voltage Unipolar Impulse Modulator for **172 nm DBD Plasma Source**

Unique Selling Proposition (USP)

- Customizable Pulse width and pulse repetition frequency
- Fast rise and fall time.

Technical Specifications

Unipolar pulsed output voltage	Pulse repetition frequency	Pulse width
08.00 kV	**100ppb**	**~1µsec.**

Significance/Relevance for Real-Time Applications

- in running text (1/2 lines): The impulse modulator enables precise real-time control of 172 nm-based DBD plasma sources used for surface activation and modifications. Its accurate high-voltage pulse delivery also makes it suitable for various low-power, high-voltage applications requiring reliable operation.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

Short-pulse High-voltage Bipolar

Impulse Modulator

Short-pulse High-voltage Bipolar Impulse Modulator for **222 nm DBD Plasma Source**

Unique Selling Proposition (USP)

- Customizable Pulse width and pulse repetition frequency
- Fast rise and fall time

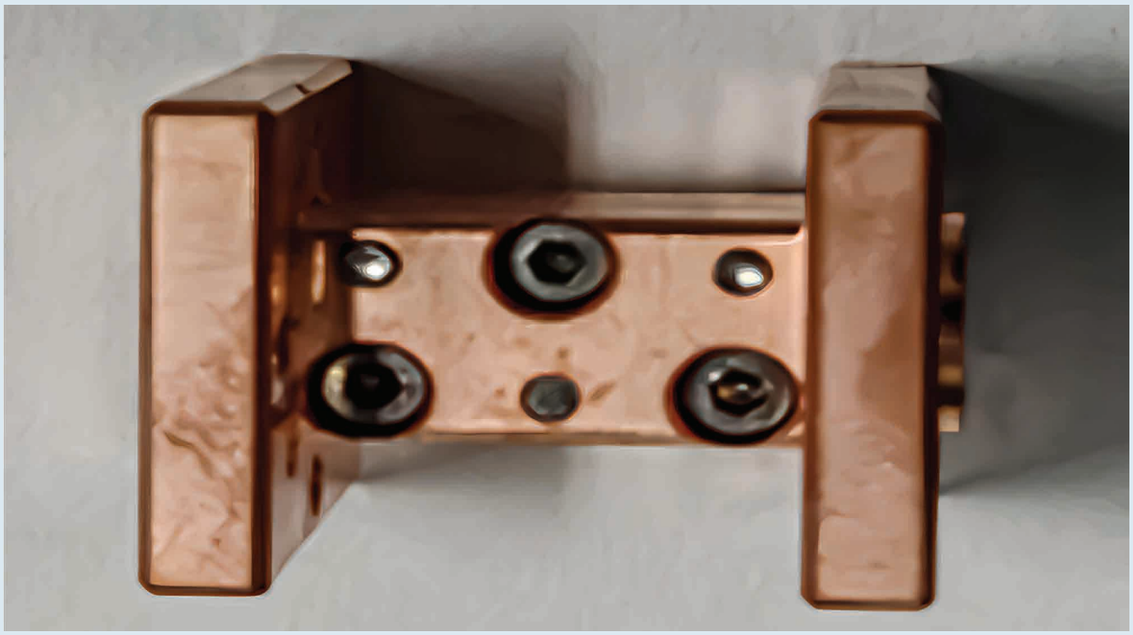
Technical Specifications

Bipolar pulsed output voltage	Pulse width	Pulse repetition frequency
~32 kHz	**~1 µSec**	**±08.00 kV**

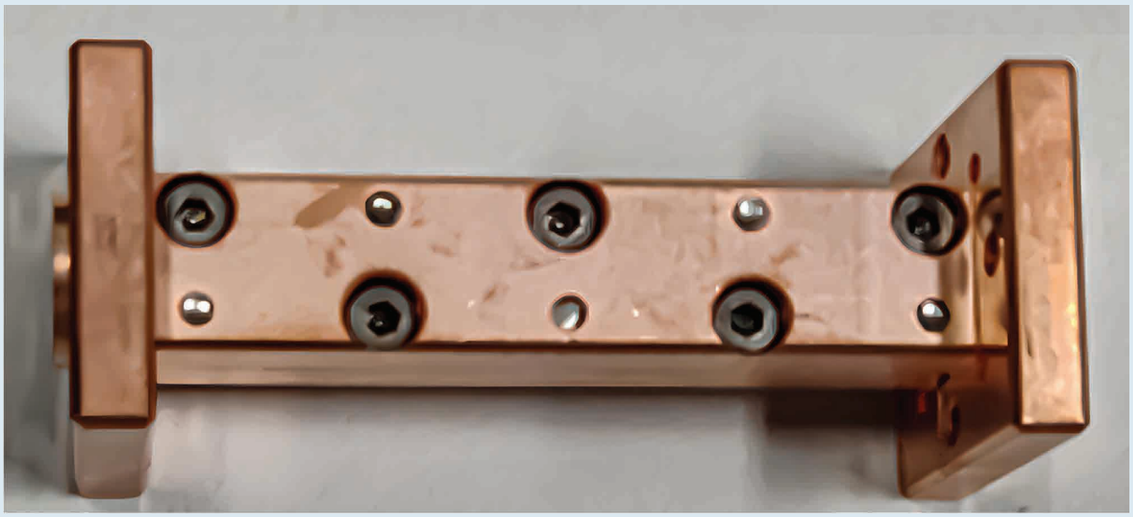
Significance/Relevance for Real-Time Applications

- The developed high-voltage impulse modulator is suitable for real-time applications such as driving 222-nm-based DBD plasma sources used in disinfection & surface treatment. It can also function independently in various low-power, high-voltage systems, making it versatile for applications like biomedical devices and material processing.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **Copyright SW-18496/2024**



1-inch WR-5 Waveguide



2-inch WR-5 Waveguide

WR-5

Waveguide

WR-5 Waveguide

Unique Selling Proposition (USP)

- Performance of the waveguide is comparable to that of the imported WR-5 waveguide
- Technology ready for commercialization.

Technical Specifications

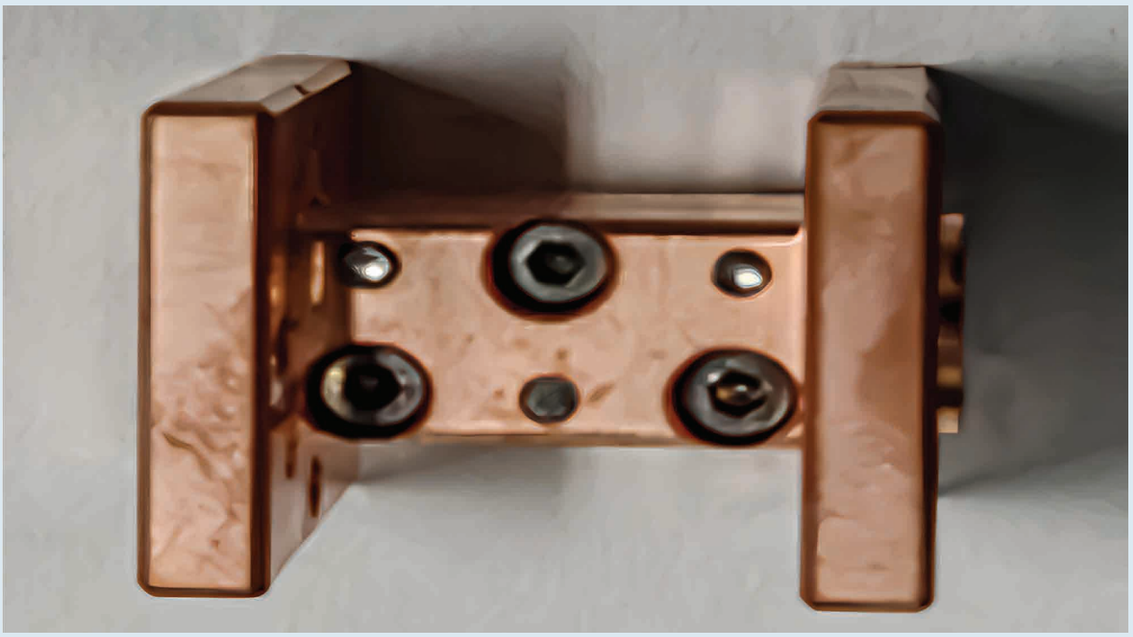
Frequency Range	Interface	Insertion Loss
140-220 GHz	**UG-387**	**<1 dB**

Cross-section	Material
Rectangular	**OFHC Copper**

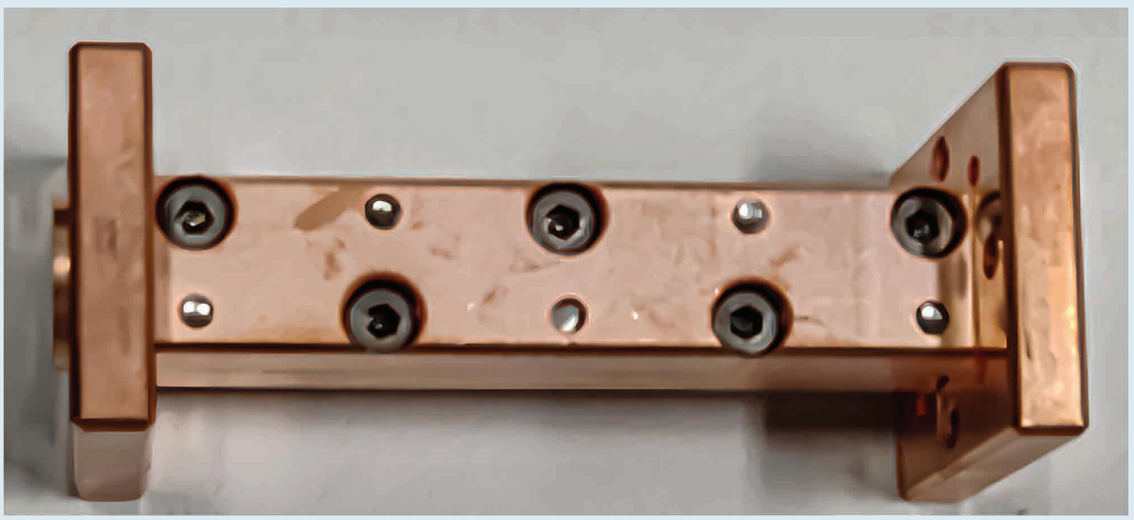
Significance/Relevance for Real-Time Applications

- Used for communication and Radar applications

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



1-inch WR-6 Waveguide



2-inch WR-6 Waveguide

WR-6

Waveguide

WR-6 Waveguide

Unique Selling Proposition (USP)

- Performance of the waveguide is comparable to that of the imported WR-6 waveguide
- Technology ready for commercialization.

Technical Specifications

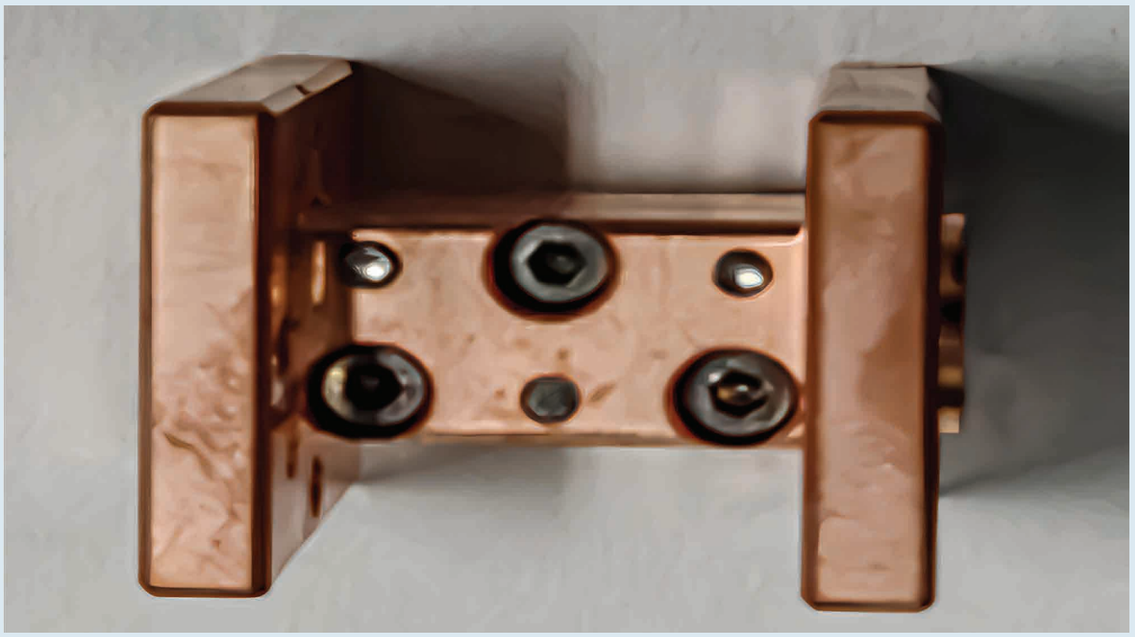
Frequency Range	Interface	Insertion Loss
110-170 GHz	**UG-387**	**<1 dB**

Cross-section	Material
Rectangular	**OFHC Copper**

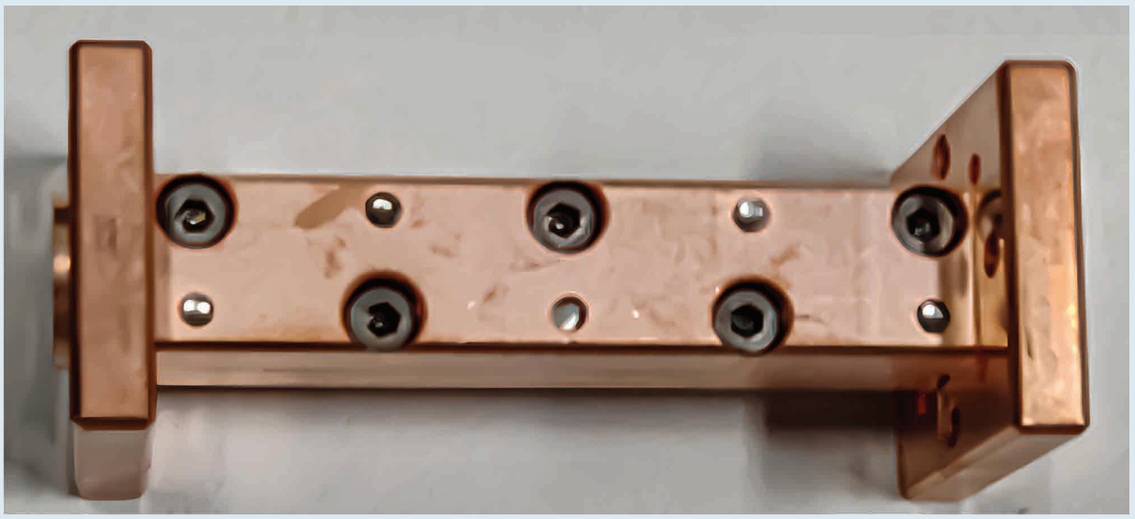
Significance/Relevance for Real-Time Applications

- Used for communication and Radar applications

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



1-inch WR-10 Waveguide



2-inch WR-10 Waveguide

WR-10

Waveguide

WR-10 Waveguide

Unique Selling Proposition (USP)

- Performance of the waveguide is comparable to that of the imported WR-10 waveguide
- Technology ready for commercialization.

Technical Specifications

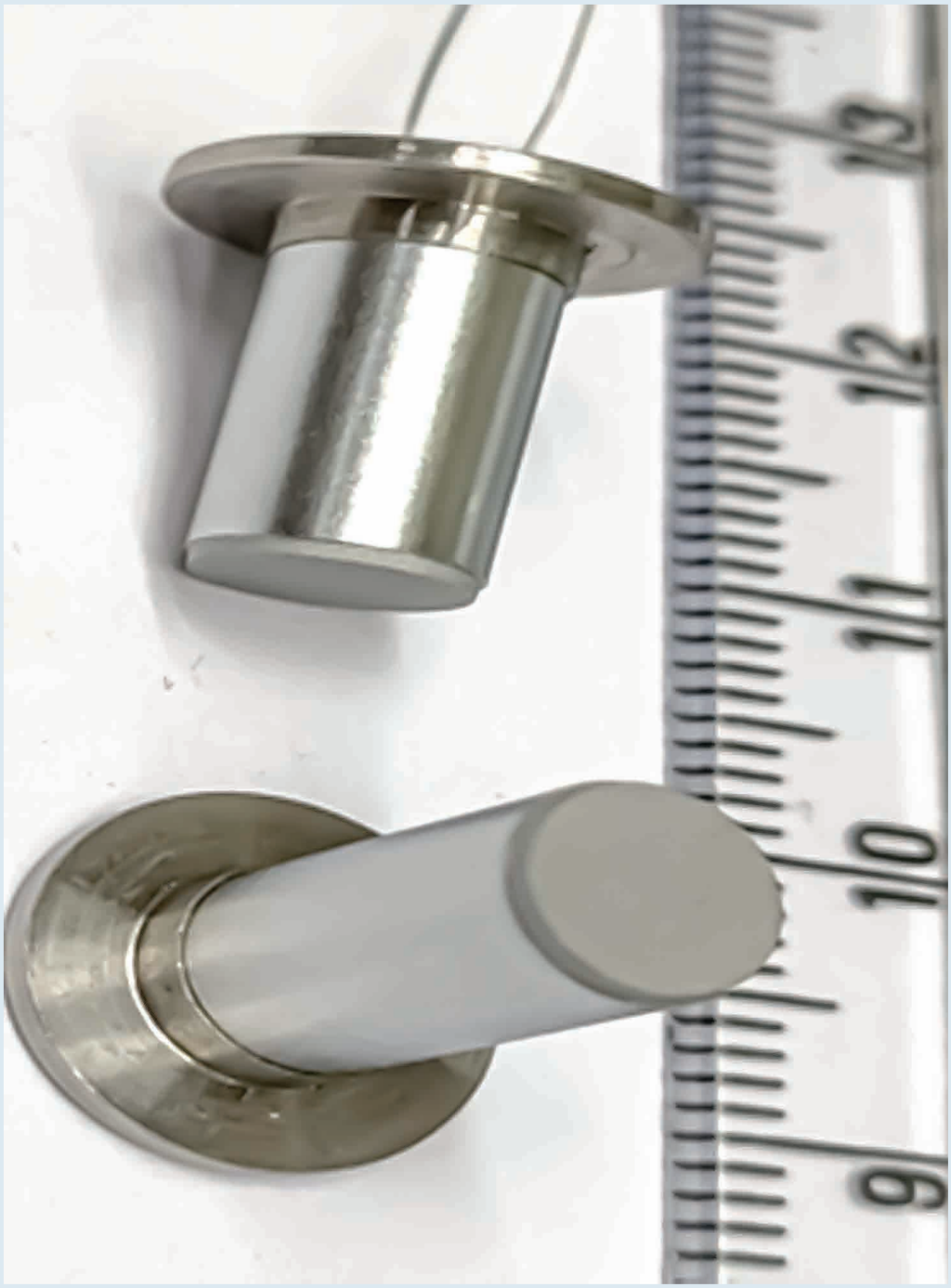
Frequency Range	Interface	Insertion Loss
75-110 GHz	**UG-387**	**<1 dB**

Cross-section	Material
Rectangular	**OFHC Copper**

Significance/Relevance for Real-Time Applications

- Used for communication and Radar applications

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



B-type

Cathode

B-type Cathode for LINAC as well as **Microwave tube Application**

Unique Selling Proposition (USP)

- Indigenous development of dispenser cathode will directly benefit our country in terms of cutting down the price and will enable to tailor the device as per our country's requirements. Also, it will strengthen the nation's capabilities in the field of cathode development, which is a direct contribution to the "Atma-nirbhar Bharat" program.

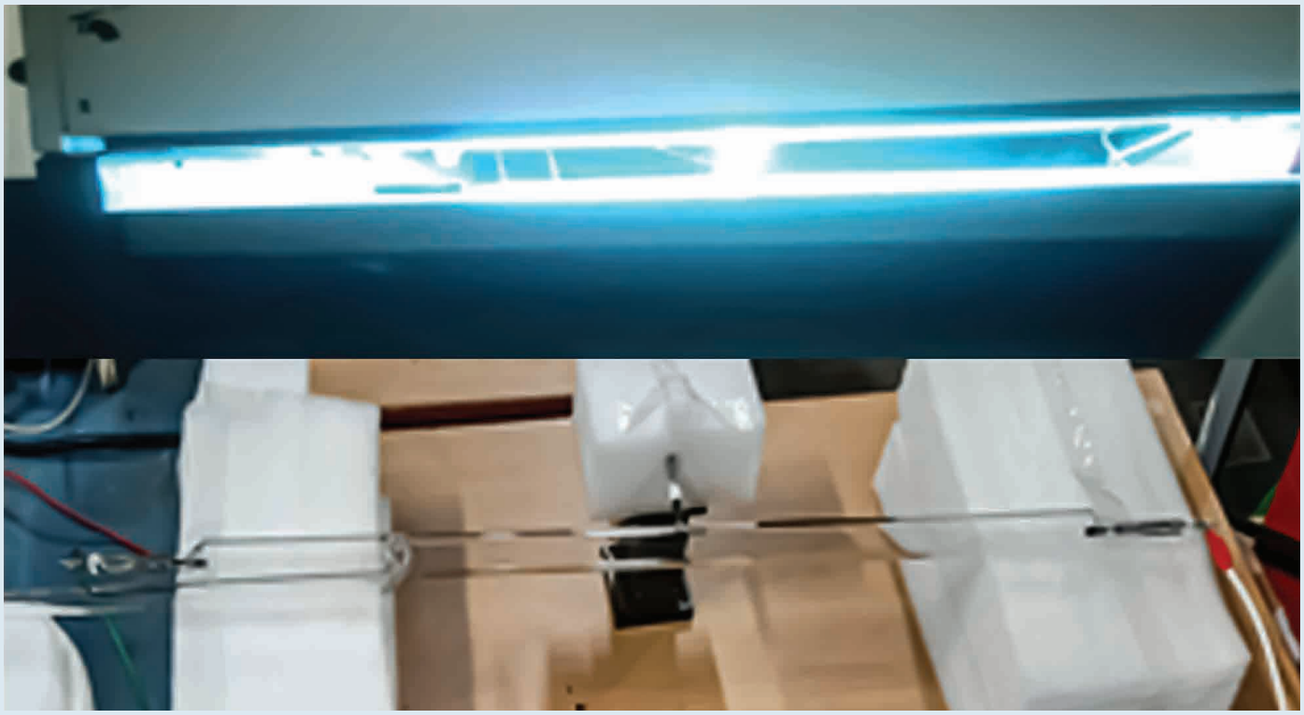
Technical Specifications

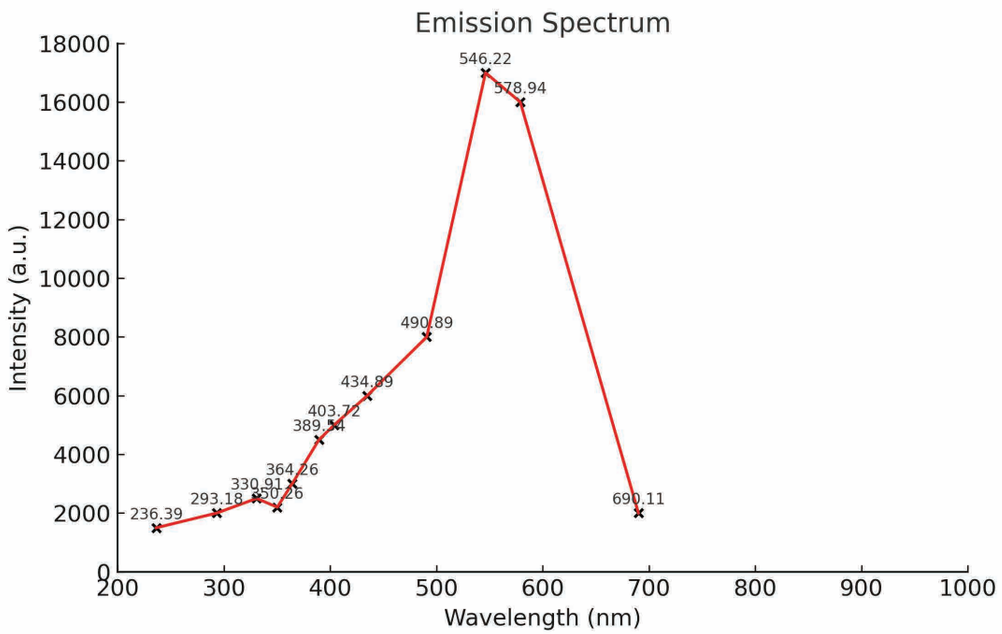
Device Dimension	Current Density	Work Function
6.35 mm emission pellet diameter	**> 3 A/cm2 @1050 C**	**< 2.1 eV**

Significance/Relevance for Real-Time Applications

- The rapid requirements of high-power vacuum electron devices (VEDs) at millimeter-wave and sub-millimeter wave in various fields, such as medical, communication, space, and strategic. The cathode, as being the heart of the tube, is a very critical component of every microwave tube. The development of a high current density, long life, stable, and uniform emission dispenser cathode is the key requirement for microwave vacuum devices such as TWT, Klystron, Magnetron, Gyrotron, etc.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**





Medium-Pressure High-Power

UV Lamps

Development of Medium-Pressure High-Power UV Lamps for **Semiconductor Applications**

Unique Selling Proposition (USP)

- Indigenous Technology for broadband UV generation at higher power ratings (1-5kW).

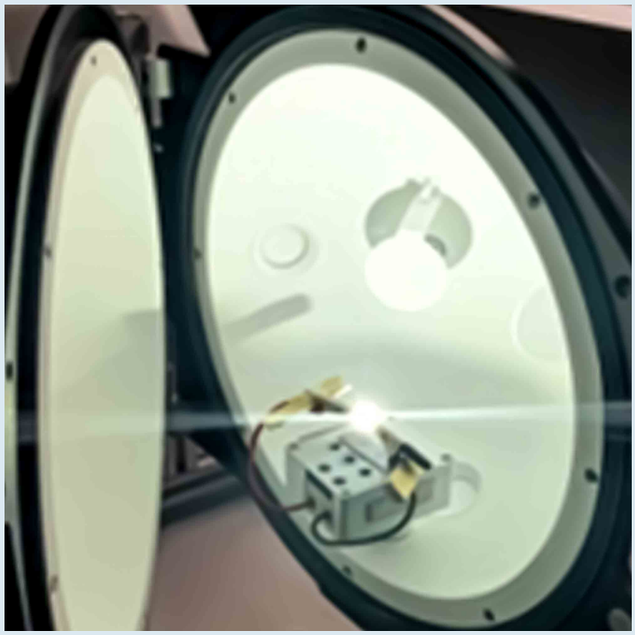
Technical Specifications

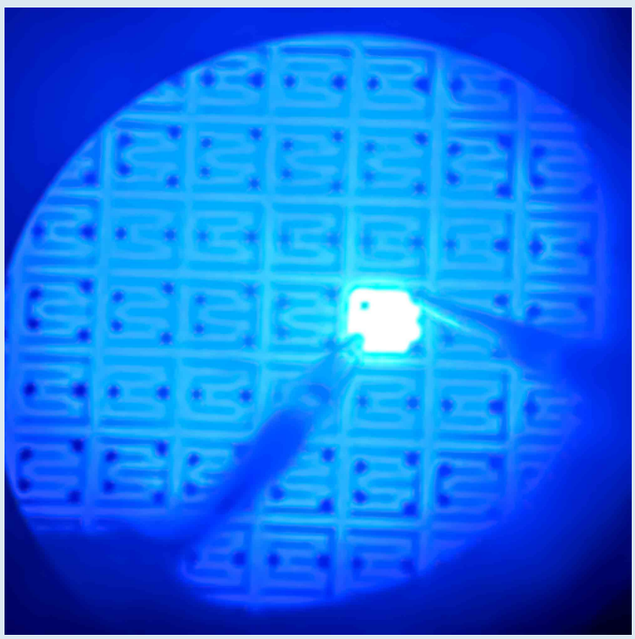
- **Size: Arc length** : ~600-650 mm, Dia: 20-25 mm.
- **Power rating** : ~200W/Inch
- The power ratings of the UV Lamps can be customized as per the applications (1-5 kW).
- Cooling through Air
- Design flexibility for custom development.

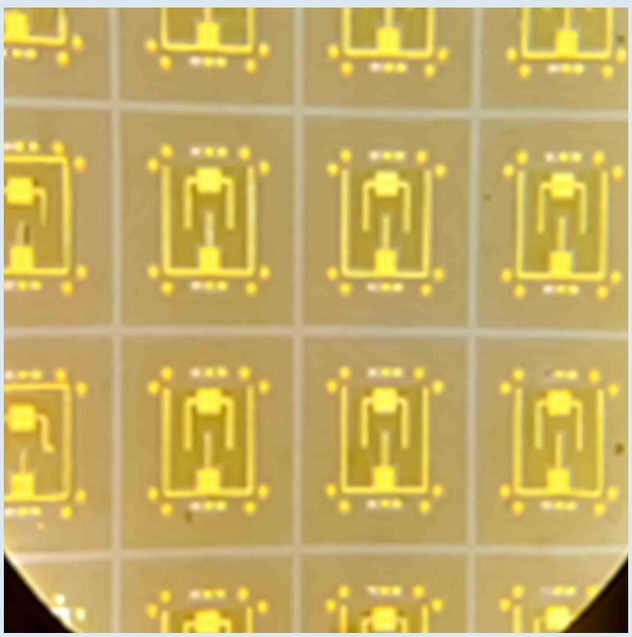
Significance/Relevance for Real-Time Applications

- Capable of generating a broadband spectrum of UV light for curing coatings, inks, and adhesives; drying, photo-lithography, sterilization, etc.

Status: Readiness for Commercialization	:	**Yes**
Commercialized	:	**No**
Generated IP	:	**No**







GaN Based Blue and White

LED

GaN Based Blue and White LED

Unique Selling Proposition (USP)

- Indigenous Developed Technology

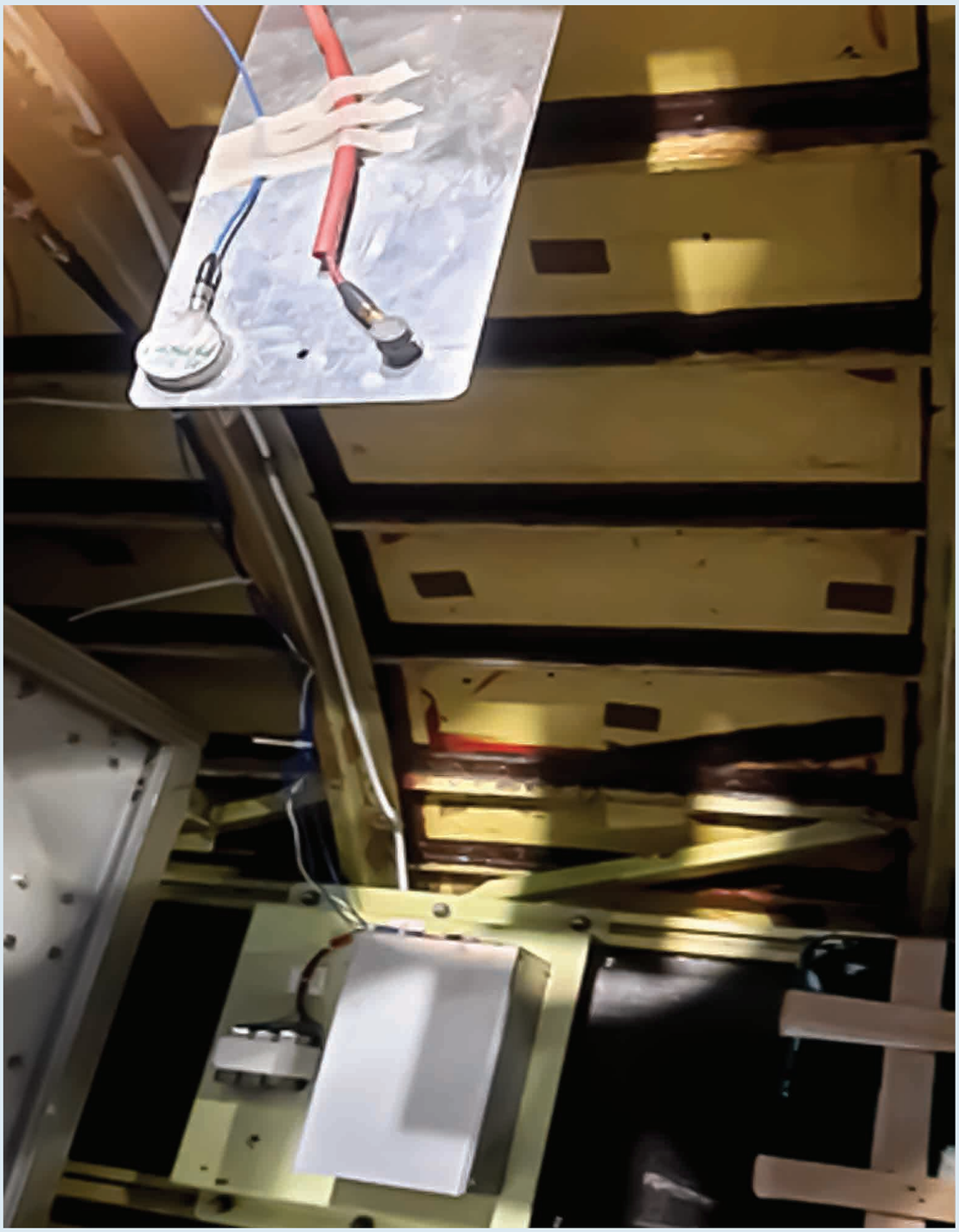
Technical Specifications

Hotplate Operating Voltage **1.0 mm x 1.0 mm & 0.5 mm x 0.5mm**	Wavelength (Blue) **455 ± 5 nm**	Forward Voltage (VF) **0-4 V**
Forward Current (IF) **10-250 mA**	Output Power (Blue) **20-24 mW @20 mA**	Luminous Efficacy (White) **80-98 lm/W**

Significance/Relevance for Real-Time Applications

- Lighting Applications (Indoor, Outdoor), Decoration, Display

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



Vibration

Sensing Module

Vibration Sensing Module for **Aerospace Applications**

Unique Selling Proposition (USP)

- Direct charge to voltage converter with high output swing for the in-house developed (CSIR-NAL) accelerometer
- Suitable for high temperature applications (aircraft engine)

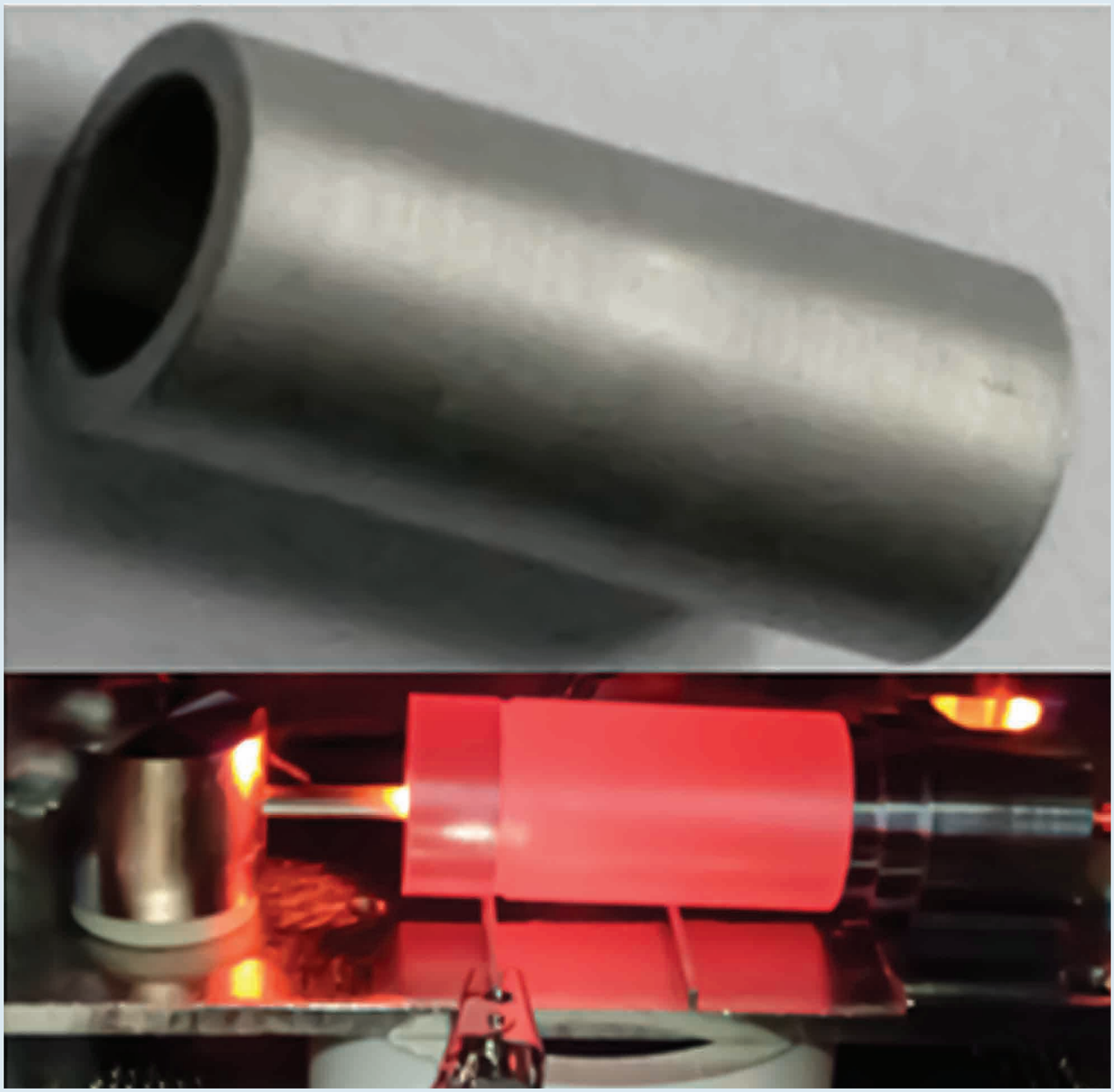
Technical Specifications

Operating Mode	Acceleration	Spectral Range
-10 °C to 90 °C	**10g**	**70mV/g**

Significance/Relevance for Real-Time Applications

- Vibration measurement in harsh conditions and immune to external interference and high ambient temperature. Suitable for engine health monitoring, wing health monitoring and fuselage health monitoring.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



Hollow Thermionic

Emitter

Hollow Thermionic Emitter for **Thruster Application**

Unique Selling Proposition (USP)

- Worldwide only two USA based company are available who can commercially supply emitter.
- Sometimes they deny to supply for strategic application.
- Indigenous development of emitter will lead to self-reliance and strategic independence.

Technical Specifications

Device Dimension **OD x ID x L: 7.0 mm x 5.0 mm x 15 mm**	Current Density **> 12 A/cm2 @1200 C**
Compressive strength **> 900 MPa**	Life **> 3000 hours**

Significance/Relevance for Real-Time Applications

- E-thrusters offer precise control and higher payloads. Thermionic cathodes are required for ionization of propellant and neutralization.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

Thick film Hotplate Integrated

Heating Machine

Thick film Hotplate Integrated Heating Machine for **Liquid Vaporiser**

Unique Selling Proposition (USP)

- Rugged, Reliable thick film microheaters
- Low-power heating methodology

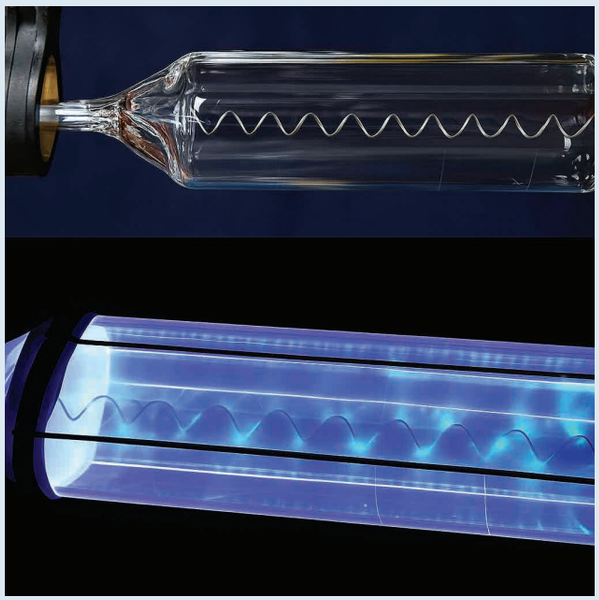
Technical Specifications

Hotplate Operating Voltage	Hotplate Temperature	Power Consumption
DC-220 V	**up to 80-120 ˚C**	**6-8 W**

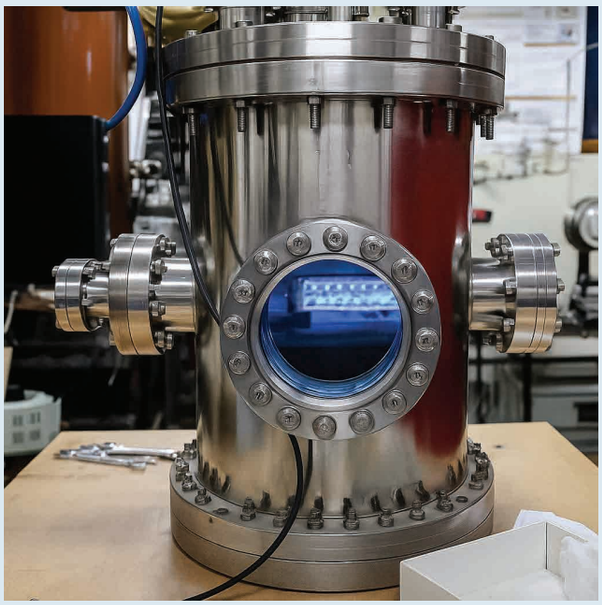
Significance/Relevance for Real-Time Applications

- In real-time applications, it is useful for vaporizing mosquito repellent liquids, for diffusing aromatic liquids, and essential oils

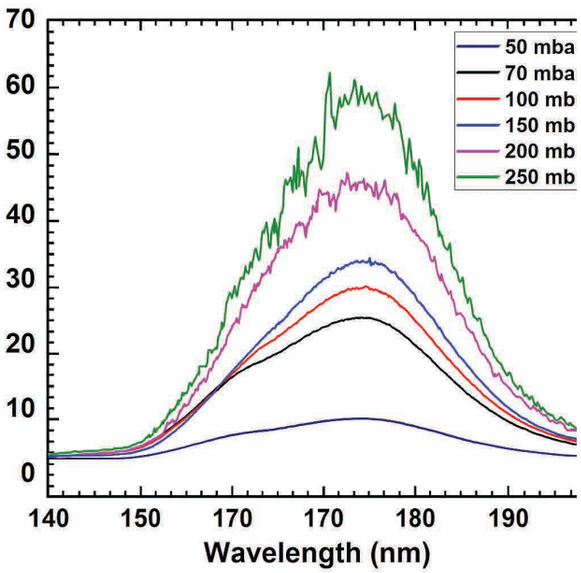
- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



Developed a portable sealed-off VUV excimer Lamp & its spectrum



Developed VUV system with lamp in closed vacuum/inert gas chamber for surface treatment



Mercury-free VUV (172nm)

Excimer Lamp

Mercury-free VUV (172nm) Excimer lamp for **Surface Activation and Modifications**

Unique Selling Proposition (USP)

- Mercury-free VUV excimer lamp technology

Technical Specifications

- Electrical power: 20 watts
- The absolute VUV (172nm) power up to ~ 15 MW/cm2 at the lamp surface
- Single dielectric barrier discharge configuration for efficient discharge.
- Sealed-off lamp excited by in-house developed Pulse power supply (5kV pulsed voltage, 25kHz PRF,1µs PW) for efficient VUV emission.
- Synthetic fused silica used as lamp envelope for higher transmittance.
- Design flexibility for custom development.

Significance/Relevance for Real-Time Applications

The VUV technology demonstrates high potential in semiconductor industries in ultra-cleaning of wafers, bonding of different substrates, & improving surface adhesion by increasing the hydrophilicity of the surface, thereby offering a mercury-free, real-time solution for scalable manufacturing and advanced material processing.

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

Portable ATR-MIR

Spectrometer

Portable ATR-MIR **Spectrometer**

Unique Selling Proposition (USP)

- Inhdeveloped system ouse based on IR filters.
- Easy to operate and user-friendly GUI.

Technical Specifications

Sample **Solid, Liquid**	Operating Mode **MIR**	Spectral Range **1818-909 cm-1 (5.5 – 11.0µm)**
Measurement time **30s**	ATR crystal **ZnSe**	Dispersing element **LVF filter**
Source **Pulsable Thermal infrared emitter/ Electrically modulated MEMES emitter**	Detector **128-pixel uncooled pyro-electric array**	

Significance/Relevance for Real-Time Applications

- The technology, as well as its spin-offs, finds various applications, viz., Optical Milk Analyser - for detection of adulteration in milk and milk composition analysis/ estimation of milk parameters. Essential Oil analysis – adulteration detection

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

RTD-based Temperature

Sensor Probe

RTD-based Temperature Sensor Probe for **RT-120 ºC (Temperature readout/ 4-20 mA output)**

Unique Selling Proposition (USP)

- **High Accuracy & Stability** : Pt-100 RTD ensures precise readings across 0°C to +120°C, with minimal drift over time.
- **Universal 4–20 mA Output** : Industry-standard current loop minimizes signal degradation over long cable runs and simplifies PLC/DCS integration.

Technical Specifications

- **Temperature Range** : 0 °C - 120 °C
- **Sensor Type** : Pt-100 RTD
- **Output Signal** : 4 - 20 mA linear current loop / Temperature
- **Measurement Error** : Typically, ≤ ± 0.16 °C
- **Power Supply** : 12 - 36V DC or as required
- **Wire Configuration** : Teflon-coated (3 Wire)

Significance/Relevance for Real-Time Applications

- The Developed RTD can be used for ambient as well as liquid temperature monitoring. Being a platinum-based temperature sensor, this sensor is stable for a wider temperature range.
- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

RTD-Based Temperature

Sensor Ribbon

RTD-Based Temperature Sensor Ribbon
with four sensors for measuring the temperature uniformity across the lamination machine platform

Unique Selling Proposition (USP)

- **lexible multi-point sensing :** Ribbon RTD design simultaneously measures temperature at multiple points, ensuring accurate uniformity analysis.
- **Portable and user-friendly :** Compact data logger with display enables real-time monitoring and easy handling.

Technical Specifications

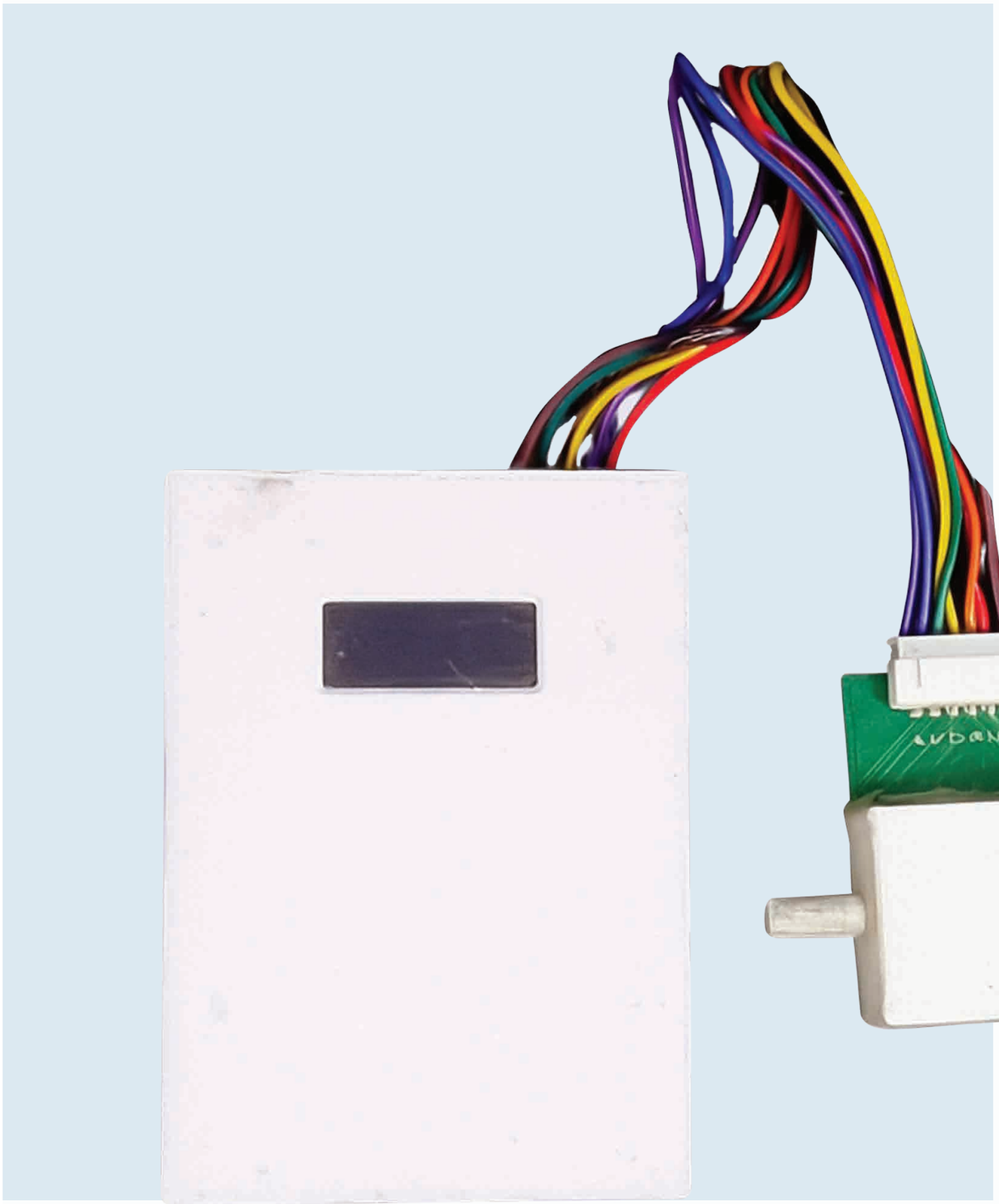
Temperature Range	Sensor Type	Ribbon material
-50 °C - 150 °C	**Pt-100 RTD**	**polyimide**

Ribbon Size	Data Output
Length = 400 mm, Width = 50 mm, thickness = 150um/ customizable	**Display and Serial Communication**

Significance/Relevance for Real-Time Applications

- Real-time thermal mapping, Early detection of non-uniformity,Versatile usability

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**



Micro-Thermal Flow

Sensor System

Micro-Thermal Flow Sensor System with **flow display (0-6 LPM)**

Unique Selling Proposition (USP)

- **Broad measurement range :** Precisely measures flow rates of 0–6 LPM with high sensitivity.
- **Tiny and integrated design :** Integrates flow sensing and digital display into one convenient system.

Technical Specifications

Measurement Range	Power Supply	Body Material
0–6 LPM	**12 V DC**	**Aluminium**
Dimensions	**Output**	**Sensor Type**
Diameter 63 mm × Height 21 mm	**Digital flow display (real-time monitoring)**	**Micro-thermal flow sensor**

Significance/Relevance for Real-Time Applications

- Real-time monitoring, Early detection of fluctuations, Enhanced process control

- **Status: Readiness for Commercialization** : **Yes**
- **Commercialized** : **No**
- **Generated IP** : **No**

Controlled Environment

Agriculture

Controlled Environment **Agriculture**

Unique Selling Proposition (USP)

- Use of indigenous sensors and grow lights developed at CEERI as import substitution

Technical Specifications

- No effect of climate on crops
- Very little water consumption
- IoT-enabled controlled environment agriculture (CEA) for saffron growth
- Grow light-based IOT setup
- Vertical farming structure for higher throughput in a small area

- **Status: Readiness for Commercialization** : **No**
- **Commercialized** : **No**
- **Generated IP** : **No**

Solar PV-Based

Cooking System

Solar PV-Based Induction Cooking System for **Rural Application**

Unique Selling Proposition (USP)

- A renewable energy-based induction Cooking system is an efficient cooking solution, along with addressing environmental issues.
- Capable of operating either with DC input (48V) from Solar Battery and AC Input (230V)

Technical Specifications

- **Nominal DC Input Voltage** : 48V, Nominal AC Input Voltage: 230V
- **Max Power Level** : 1kW, Typical Coil Current : 20A
- **Battery Type for DC Input** : Lead Acid Input

Significance/Relevance for Real-Time Applications

- Energy required for cooking in many rural areas of our country is still derived from firewood, cow dung, etc. The combustion of these solid biomass fuels leads to many environmental and health problems
- The system is suitable for application in Rural villages and Remote locations, which have poor access to LPG

- **Status: Readiness for Commercialization** : **No**
- **Commercialized** : **No**
- **Generated IP** : **No**

Hearing Aid

Solution

Hearing **Aid** Solution (Bluetooth)

Unique Selling Proposition (USP)

- low latency <= 25msec
- A low-cost hearing aid that can connect with all commercial BLE devices

Technical Specifications

- The current prototype can connect to any commercial Bluetooth ear pods & can achieve a low latency of 25 milliseconds.
- It uses Advanced Audio Distribution Profile & uses Low Complexity Sub-Band Codec (SBC codec to transfer stereo audio signals.
- The lab prototype is having rechargeable battery support (currently 1250 mAh, 3.7V) that can last more than 10 hours in a single full charge. It has a stereo mic and adjustable gain

Significance/Relevance for Real-Time Applications

- The prime application is for a hearing aid solution for elderly people. It can be used for a Bluetooth-based decibel meter with a small change.

- **Status: Readiness for Commercialization** : **No**
- **Commercialized** : **No**
- **Generated IP** : **No**

FluoriPCR

FluoriPCR

Unique Selling Proposition (USP)

- Indigenous technological solution for PCR, RT-PCR, Fluorescence spectroscopy, cost-effective, portable, Versatile, customizable as per industry requirements

Technical Specifications

- Thermocycler with temperature range 4°C to 100°C.
- Sample holder for 1, 8, 12, 16 samples.
- Sample Holder Temperature accuracy: +/- 1°C
- Heating/Cooling Ramp Rate: ~ 3°C/Sec
- Fluorescence spectrum from 340 nm to 780 nm with a resolution of 10 nm.

Significance/Relevance for Real-Time Applications

- Academic and research institutions, Skill development & training centers, Diagnostic laboratories.

Status: Readiness for Commercialization	:	**No**
Commercialized	:	**No**
Generated IP	:	**Patent 202311051602, 202411019851, Copyright L-144486/2024, 028CR2022.**

3 MW S-Band Tunable

Pulsed Magnetron

3.0 MW S-Band Tunable Pulsed Magnetron

Unique Selling Proposition (USP)

- Performance similar to E2V Tube
- Rugged axial cathode support with integral water channel for better thermal management

Technical Specifications

Peak Power	Tuning range (Min.)	Frequency
3.0 MW	**2849 to 2863 MHz**	**2856 MHz**

Pulse duration (Max.)	Magnetic field	Pulse repetition rate (Max.)
4.5 µS	**650 ±25 Gauss**	**250 PPS**

Significance/Relevance for Real-Time Applications

- CSIR-CEERI has successfully developed & tested a S-band 3.0 MW tunable pulsed magnetron. The developed magnetron has been delivered along with development know-how to BARC, Mumbai, to be used in LINAC-based X-ray machines being extensively used for Security (Cargo Screening Machines) Applications

- **Status: Readiness for Commercialization** : **No**
- **Commercialized** : **No**
- **Generated IP** : **No**

THz based Non-Destructive

Testing System

THz based Non-Destructive **Testing System**

Unique Selling Proposition (USP)

- NDT of highly absorbing material
- Sample may be placed in Far-field also

Technical Specifications

- Driven by High Power 0.1 THz Source
- Source to Target distance in meter range

Significance/Relevance for Real-Time Applications

- Quick scanning time for highly absorbing material like GFRP and CFRP structures

Status: Readiness for Commercialization	:	**No**
Commercialized	:	**No**
Generated IP	:	**Patent 359771 (Granted), 202411023767, 202111015499**

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