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ICT R&D Newsletter in Egypt

Calida nCPAP

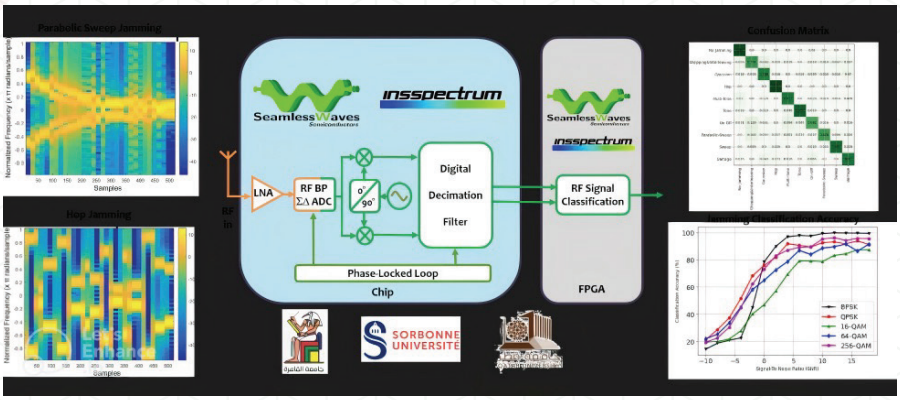
Cairo University and BioBusiness

Researchers from Cairo University and Biobusiness have addressed the urgent global challenge of preterm births, where millions of infants require respiratory support. In Egypt alone, 480,000–600,000 neonates annually need specialized care, yet high costs and reliance on imported medical devices strain healthcare systems. Traditional invasive ventilators pose severe risks, making non-invasive solutions like nasal Continuous Positive Airway Pressure (nCPAP) critical. However, existing nCPAP devices remain prohibitively expensive, costing up to $15,000. Calida nCPAP introduces a ground breaking valve – based technology, transitioning from conventional blower systems to enhance precision in airflow control across three modes (nCPAP,HFNC,NIPPV). This innovation reduces production costs by EGP 604,000 while maintaining compliance with international safety standards (IEC 60601). Key advantages include real-time cloud-based monitoring, modular design for easy sterilization, and integration of IoT for remote data tracking—a first in the Middle Eastern market. Leveraging the adult device's certified foundation (Egyptian Drug Authority-approved), the neonatal version integrates IoT-enabled cloud monitoring, modular components for sterilization, and cost-reducing innovations., with successful trials across 13 hospitals. Deliverables include a production-ready prototype, CE marking readiness, and localization of medical device manufacturing to curb Egypt's EGP 10.1 billion medical import reliance. "By prioritizing affordability, safety, and scalability, Calida nCPAP aims to save lives, reduce healthcare inequality, and position Egypt as a leader in neonatal care innovation' says Dr. Sherif Elgohary Assistant Professor at Faculty of Engineering, Cairo University.

SPECTRAWARE SPECTRum AWAREChip for intelligent and Secure Wireless Communications

University and Insspectrum

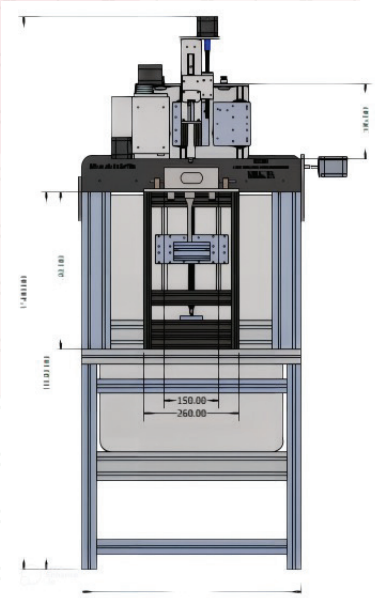
Researchers from Cairo University and Insspectrum company have developed a novel single-chip solution that enhances both spectrum efficiency and wireless security which called Spectraware chip. As wireless communications continue to penetrate more aspects of our lives, the impacts of network congestion and cyber threats are becoming more serious in critical applications such as healthcare, smart cities, and autonomous vehicles so Spectraware project addresses these challenges. Spectraware integrates two major innovations: a low-power RF front-end capable of sweeping a broad frequency range (1.5–3.5 GHz) and an AI-based digital processing unit that classifies radio frequency (RF) signals and detects malicious activity. "Unlike traditional bulky and power-intensive solutions, this chip is compact, power-efficient, and cost-effective. It is designed to fit seamlessly into 5G base stations and connected vehicles. The core technology is a Bandpass Sigma-Delta Analog-to-Digital Converter (BP Δ ADC) paired with deep-learning circuits, enabling the measurement of spectrum occupancy and the detection of wireless threats in real time. This enables dynamic frequency selection and security-aware communication, thereby, optimizing quality-of-service and reducing power consumption' says Dr. Amr Wassal Professor at faculty of Engineering, Cairo University and the project principal investigator. Major deliverables include a custom demonstration board showcasing spectrum measurement and real-time hacker detection. The project is developed collaboratively by Cairo University and insspectrum, with contributions from Seamless Waves (France) and Qatar University. SPECTRAWARE positions Egypt as a key innovator in the global semiconductor landscape.



Development of Binder Jet Additive Manufacturing Machine for Metallic and Ceramic Products

Ain Shams University and Robota Industries Company

A collaborative team from Ain Shams University and ROBOTA Industries has successfully developed an Egyptian version of Binder Jet Additive Manufacturing (BJAM) machine. The BJAM operates by selectively depositing a binder onto a powder bed, followed by sintering to obtain near-net-shaped metallic or ceramic products. This process enables the production of complex, lightweight parts with minimal material waste, supporting environmental sustainability and manufacturing efficiency. “The machine can be used to produce precision parts for electronic devices, such as heat-dissipating components, custom-designed hardware, and others. This initiative transforms Egypt’s position from technology importer to technology producer’ says Dr. Ahmed Moneeb Elsabbagh Professor at faculty of Engineering, Ain Shams University. The BJAM prototype integrates locally sourced components and a fully developed control system. Future development will focus on process optimization for commercialization. The project sets the stage for Egypt to lead in additive manufacturing in Africa and the Middle East, with potential applications in automotive, medical, aerospace, and ICT industries.



AI Assisted Automated Optical Alignment System (AI-OAS) for Hybrid Photonics Integration

The German University in Cairo

Researchers from the German University in Cairo have developed AI-OAS by GUC Micro Optics Lab and AI-Quanta Engineering combines AI assisted machine vision, deep-learning based laser profiling and deep-learning laser tracking for automated alignment and testing of lasers and integrated photonic systems. They aim at building AI automated photonic testing and integration systems in Egypt. Integrated photonic systems aims at providing photonics systems on a chip scale enabled by micro fabrication and integration technologies. This would drastically reduce the size and cost of photonic systems enabling mass production and more functionalities with huge economic impact. AI-OAS is mainly targeting automated testing of Silicon photonics, automated laser coupling, automated laser profiling and automated hybrid photonics integration. The system is trained on Silicon photonic chips of well-known foundries and different semiconductor lasers profiles. The system is equipped with high resolution machine vision system allowing accurate chip to chip, laser to chip, laser to fiber and chip to fiber-array alignment. Cloud connectivity insures up-to-date trained models. A single friendly GUI and comprehensive software package provides full control of the AI-AOS system. "The AI-AOS will substantially accelerate development and testing process of Silicon photonics, hybrid photonic systems and semiconductor lasers reducing R&D costs and time to market' says Dr. Haitham Abdelsalam Omran Associate Professor at the German University in Cairo.