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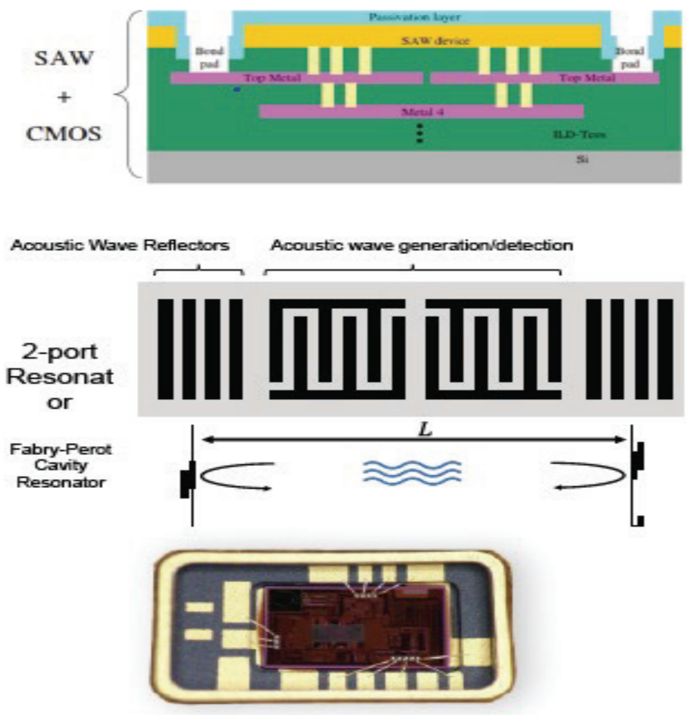
ICT R&D Newsletter in Egypt

MEMS SAW-Based Reference Clock

Pearl Semiconductor

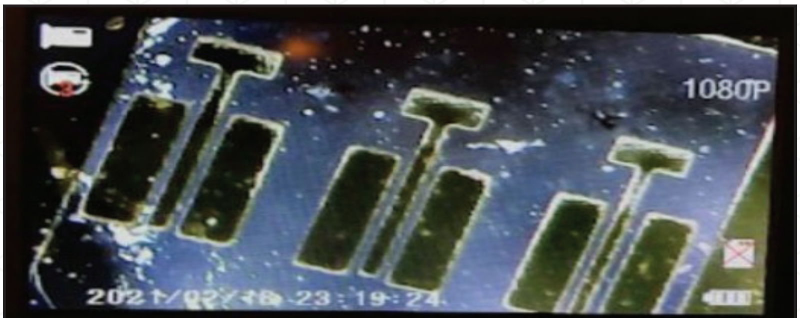
Researchers from pearl semiconductor introduced the PRL21X family. They have dedicated their expertise to the development of the PRL21X—a family of Programmable Low Jitter MEMS Saw-Based Reference Clock Products. Pearl Semiconductor navigated the intricacies of technological advancement, resulting in the PRL21X featuring the pioneering SingleDie™ technology. This innovative technology integrates the MEMS Resonator into the same CMOS die, giving birth to the world's first true Single-Die reference clock. With a wide operating temperature range (up to +125 °C) and Low Jitter (less than 400fs), the PRL21X stands as a testament to the success of the project. "Pearl Semiconductor not only achieved technical milestones but also addressed critical market needs. The PRL21X offers market-centric advantages, including superior shock and vibration resistance, a compact form factor, and a streamlined supply chain as a single-source solution' says Dr. Mohamed Dessouky professor in Faculty of engineering, Ain Shams University. The significance of this achievement was showcased at Electronica 2022 in Munich, where the PRL21X garnered substantial attention from industry leaders, partners, and customers.

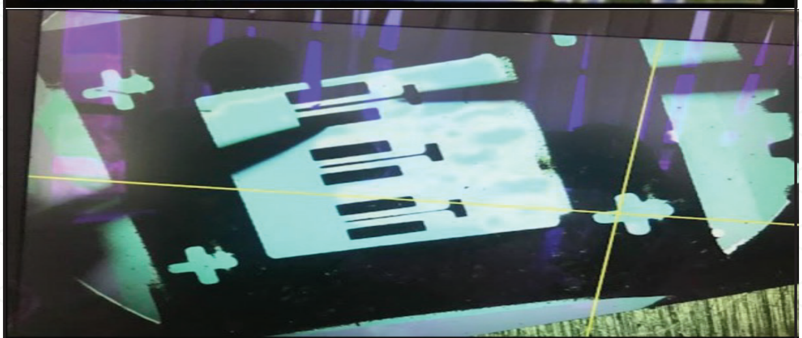


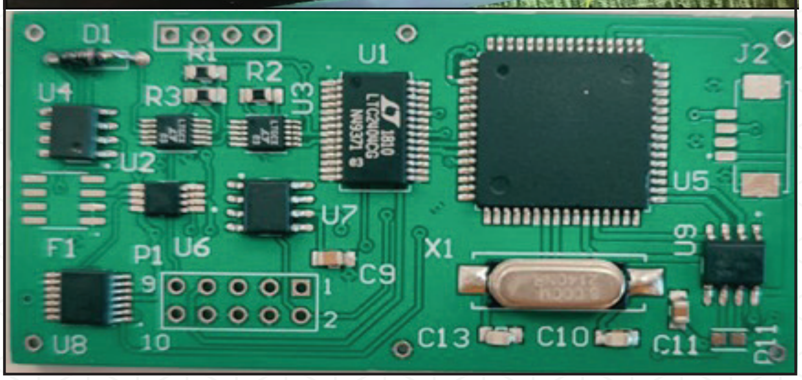
Low-Cost fabricated Radiation sensor based on MOSFET technology marks milestones in the promising Egyptian Semiconductor Industry.

Zewail City of Science, Technology and Innovation, National Authority for Remote Sensing and Space Science, and Egyptian Space Agency

A research team from Zewail City of Science and Technology, National Authority for Remote Sensing and Space Science, and the Egyptian Space Agency, have collaborated to demonstrate a low-cost radiation sensor to measure different doses of radiation, with support from ITAC Proof-of-Concept program. The RadFET was locally fabricated on a lab scale, and a special design readout circuit to measure different doses of radiations has been designed and tested. Nowadays, humankind benefits from radiation in different aspects of life including medicine, industry, and different academic purposes. However, the riskiness of dealing with radiative sources cannot be mitigated unless serious measurements to avoid excess exposure to dangerous levels of radiation. Scientists have used large area MOSFETs with thick oxides as sensors for the Total Ionization Dose (TID), based on cumulative damage to the gate oxide bonds, as a result of radiation. This is called RadFET. The proposed RadFET is fabricated using a basic silicon process, which was modified to our own designed equipment, to produce a sensor with low cost, high-reliability performance accuracy, affordability, and accessibility. In addition, the core technology used to fabricate the RadFET allows large production possibilities through the introduction of 2-inch wafers into the process to increase the production volume even at lower costs. “Our proposed design does not require complex measurement setups nor advanced fabrication techniques, so it can be integrated with our specially designed PCB to have runtime and direct reading for a level of surrounding radiations. In the medical field, it promises to localize the industry of patient care products by enabling real-time monitoring during treatments involving radiation therapy. Furthermore, it offers environmental monitoring, ensuring the safety of communities by detecting any anomalies in radiation levels in outer space in space missions, air, water, or soil’ says Dr. Amr Bayoumi professor in Zewail City of Science and Technology.



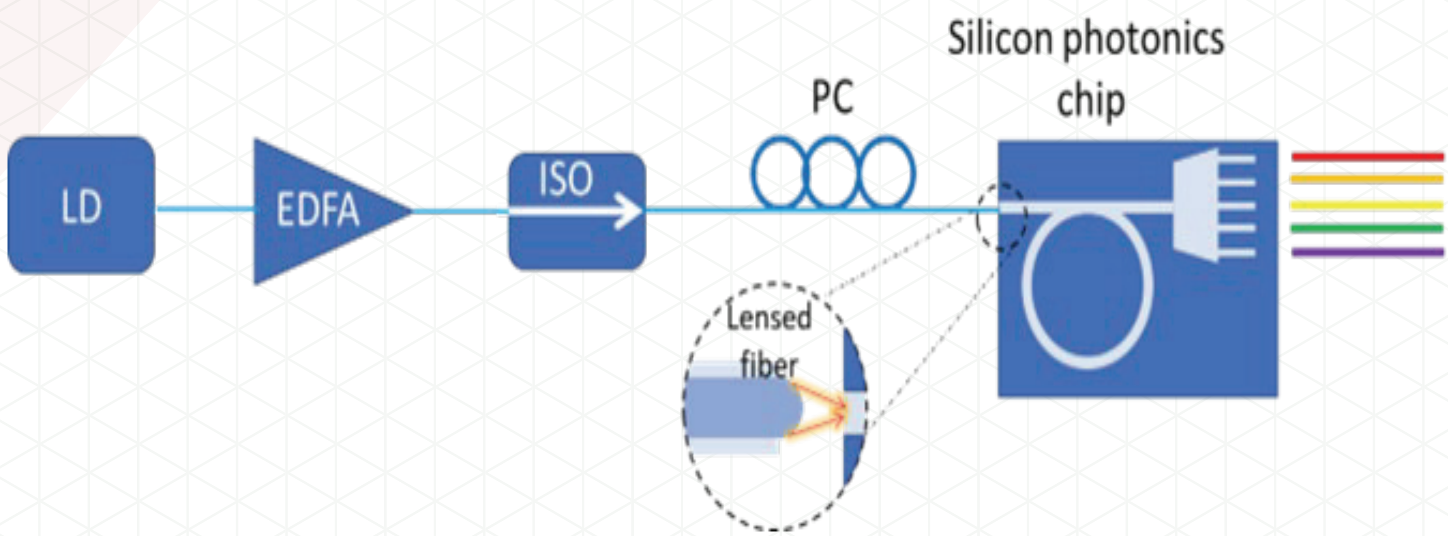




Multi-wavelength laser source based on silicon micro-resonator and dense wavelength division demultiplexer

Ain Shams University

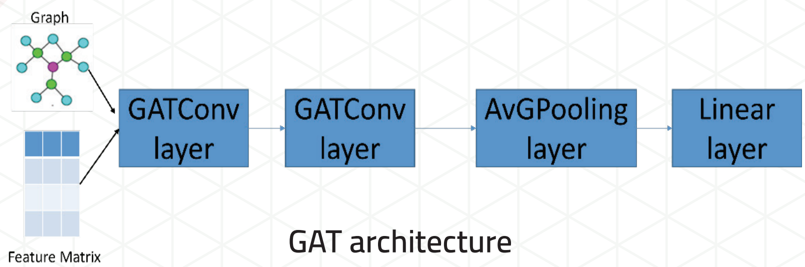
Researchers from Ain Shams University have created a multi-wavelength laser source based on silicon micro-resonator. Ultra-stable multi-wavelength laser source became very important component in dense wave division multiplexing networks. The conventional way is to use array of ultra-stable laser diodes emitting at the frequency grid of the International Telecommunication Union (ITU) recommendation of dense wave division multiplexing systems. This is a very bulky solution and consumes high electrical power. Nowadays, the idea of generating highly stable frequency lines from one laser source is acquiring a lot of attention in research. The information and communication technology (ICT) market in Egypt can support a lot of research in this field, as there is a crucial need for high-data rate communication systems. “The project is divided into two parts: the design of frequency-comb in micro-ring resonator and the design of dense wave-division demultiplexer. For the former one, we built simulation models for designing the proper dispersion curve for the micro-ring resonators. We achieved the main goal of these simulation models to have an anomalous dispersion region over a wide spectral range around 1550 nm. To spatially de-multiplexing the frequency comb frequency lines, an add/drop micro ring resonator is designed to demultiplex eleven frequency lines having a separation of 200 GHz, which are provided by a frequency comb generator.’ Says Dr. Hussein Kotb assistant professor in Electronics and Communication Engineering department, Faculty of engineering, Ain Shams University.



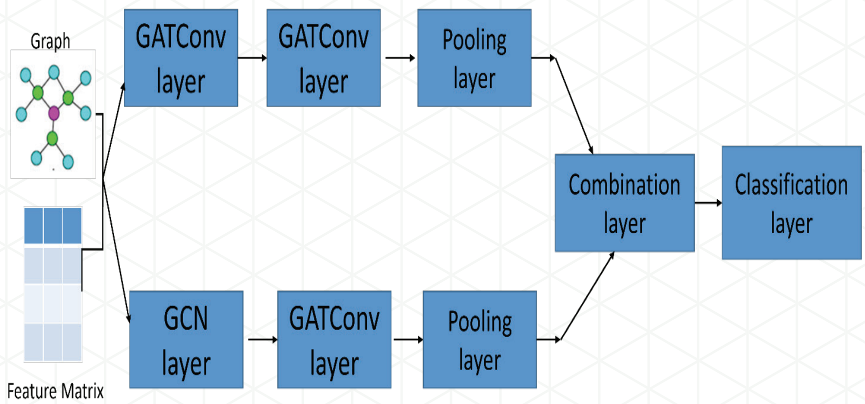
Android Malware Detection via Reservoir Computing and Graph Convolutional Deep Learning Networks

Cairo University

A research team from Cairo University developed a new real-time mobile malware detection system. With the increasing number of malicious applications nowadays, the traditional methods (such as signature-based methods) cannot cope with these rapid changes. Thus, the need for new and effective approaches arises. Therefore, the team proposed an approach based on deep learning and static call graph analysis. "The developed system allows users to check if applications are malware or not in reasonable time. The project devised two architectures for tackling malware detection in Android environments' says Dr. Khaled El Sayed professor in Faculty of engineering, Cairo University. The first architecture combines two deep learning techniques: graph convolutional networks (GCN) and reservoir computing (RC) (RC is also known as echo state networks ESN). They added complexity by combining both GCN and RC while keeping the number of learnable parameters low and exploiting the advantages of both schemes. They evaluated the performance of the proposed GCN_ESN model using Python. They used k-fold cross validation to accurately evaluate the model. The results show good performance with maximum accuracy near 83% and average test time ~0.3 sec which is reasonable for real time requirements. Moreover, large recall exhibits good performance in the classification of malware. In the second architecture, both GCN and graph attention network (GAT) are used for malware detection. They used both algorithms for malware detection to enhance the overall performance. This model achieves high performance with accuracy of 94% and average precision of 97.12%. Decision time on GPU is fraction of second which allows real-time implementation of APK inspection at network gateways.



GAT architecture



GAT_GCN architecture