Discover new planets and galaxies with Red Pitaya STEMlab.

There is always plenty information hidden if we only observe things only by using eyes, even when we are exploring the space. Scientists use big telescopes to observe space in optical spectrum, but there are many important informations that can only be seen from the radio spectrum.
It's been almost a century since Bell Telephone Laboratories first detected radiation coming from the Milky Way. Today radio astronomy help us to discover new planets, stars and galaxies, as well as entirely new classes of objects, such as radio galaxies, quasars, pulsars, and masers. Even the discovery of the cosmic microwave background radiation, regarded as evidence for the Big Bang theory, was made through radio astronomy.

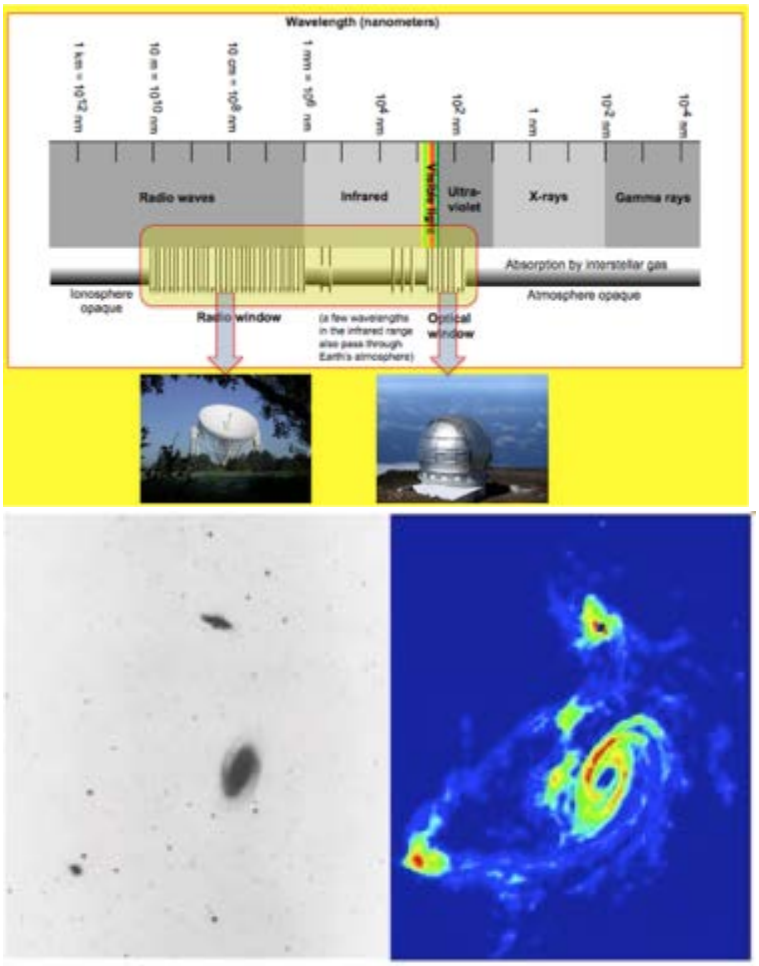
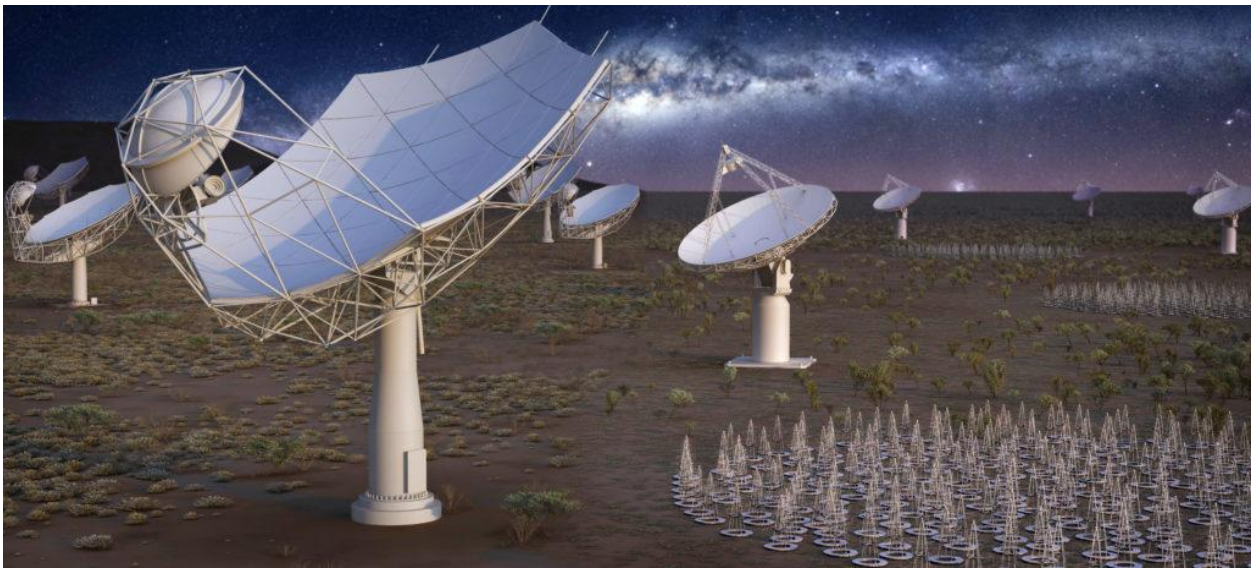


Image of the galaxy: optical image (right), radio image (left)

In order to learn more about objects and matter in space, scientists must build more and more sensitive devices that allow better and better resolution for observation.



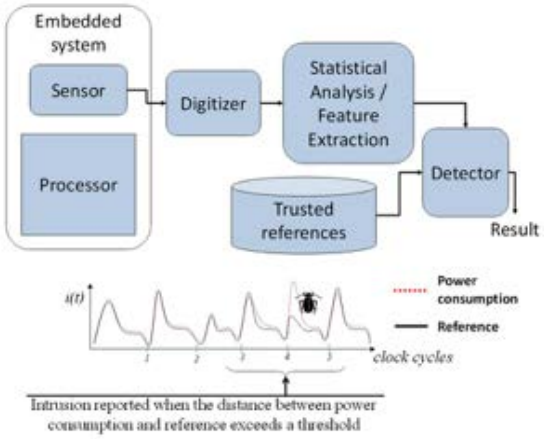
The Square Kilometre Array (SKA) project is an international effort to build the world's largest radio telescope, with eventually over a square kilometre (one million square metres) of collecting area. The scale of the SKA represents a huge leap forward in both engineering and research & development towards building and delivering a unique instrument, with the detailed design and preparation now well under way. As one of the largest scientific endeavours in history, the SKA will bring together a wealth of the world's finest scientists, engineers and policy makers to bring the project to fruition.

Red Pitaya STEMlab platform was proposed as one of the building blocks for the receivers, since it could enable scientist to build better resolution telescope for same budget compared to other solutions. Beside that Red Pitaya STEMlab also supports Tango interface which is very popular among scientists and will be used also for SKA project.

Cybersecurity - the biggest concern of 2017. Redpitaya STEMlab is helping to cure it.
How Red Pitaya STEMlab is helping to cure the biggest concern of 2017 - Cybersecurity
Red Pitaya STEMlab will protect your device from cyber-attacks.

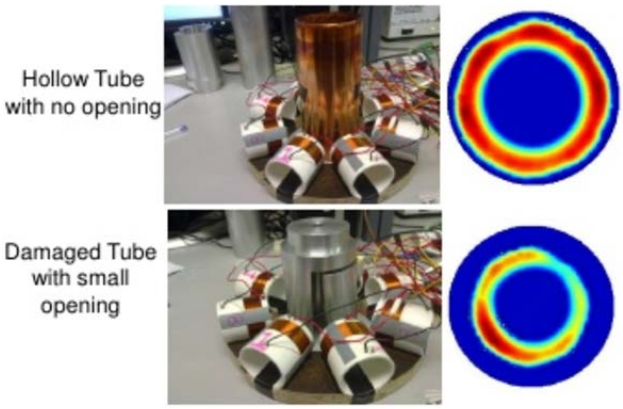
Cyber attacks aren't just happening more frequently, they are also increasing in terms of sophistication. We can read in the news how another company apologizing to their customers for lost “private” information and how Dyn DDOS attack that disables access to many, many sites like (Netflix). But the problem doesn’t ends just there. Almost any device either installed in industry or home, transportation, military or medicine has become network attached and can be reprogrammed remotely causing damage & chaos. There is a real challenge how to protect this devices and us from being exploited to hackers with bad intention.

PFP Cybersecurity (aka Power Fingerprinting Inc.) from VA USA, offers a highly innovative solutions that are able to protect IoT connected device including data centers, medical equipment, power grids, cars, mobile devices, as well as, any other smart devices against cyber-attacks.
Their solution is based on observation of the power usage and EMI data pattern and creating instant alert if any deviation is detected from expected pattern of authorized execution. This approach enables PFP to detect smallest possible changes in code running on exposed device. PFP system can be installed and used with any system without intervention in software of the exposed system and can run as completely independent observer.
Red Pitaya STEMlab platform was used inside PFP devices to help observing the fast and slow analogue signal patterns, collecting, processing and streaming data to the server.

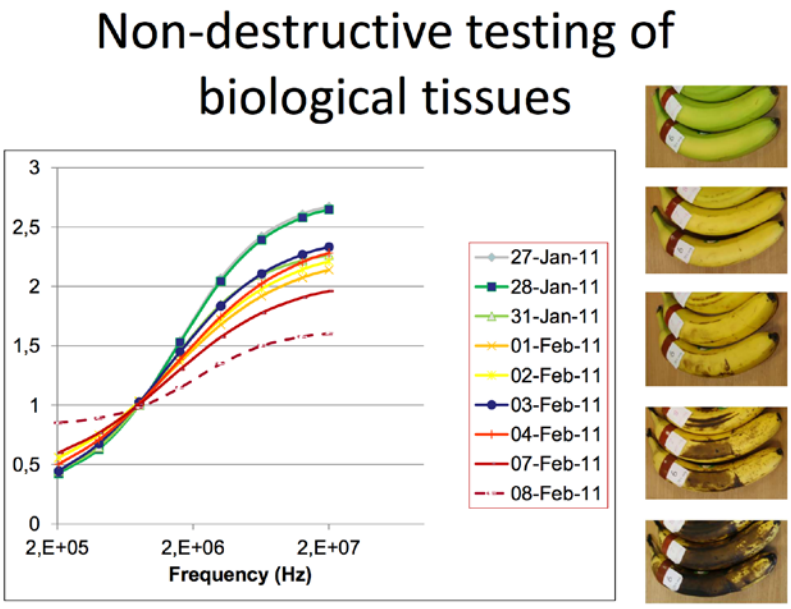


What have quality of steel pipes, bananas and RedPitaya STEMlab in common?

Undiscovered damaged pipelines can cause huge operational costs and environmental disasters. To prevent such faults it is necessary to monitor quality of production of pipelines. There are several techniques available at the moment but they all require highly skilled technicians and requires high cost equipment, but there seems to be a better solution to that. MIT - magnetic induction tomography is an emerging non-invasive imaging technique already used in a number of applications, including medical diagnostics, geophysical exploration and civil engineering that is very suitable. For example, MIT is able to visualise the electrical conductivity of the different states of the solidifying steel and provide an image of its structural composition as it cools. This can help industry to continuously monitor and alter the cooling process and therefore improve the quality, safety, productivity & costs of pipelines.



Another interesting example is use of MIT in food quality control. In this example bananas aging was observed using this same device.



Up till now, expensive digitizers were required to acquire, generate and process the signals that are needed to develop such device. Lately Th. Brandt and R. Patz Kiel from University of Applied Sciences (Germany) build one by using Red Pitaya STEMlab. The have published results where they lowered the costs of previous implementation by 5 times and also significantly improved performances.

	MkII Digitizer	FPGA-based	Red Pitaya
Sample Rate	60MSps	120MSps	125MSps
ADC Resolution	12-bit	14-bit	14-bit
Acquisition	17.47ms	17.47ms	16.67ms
Phase precision	0.7 – 60m°	0.36 – 342m°	0.16 – 9.5m°
Phase drift	3m°	3.2m°	tbd
Phase linearity	0.9999	0.9999	tbd
Gain stages	1, 6, 30, 120	1	1