Reconfigurable Radio Systems Demonstrations
Submission Form
To be sent to events@etsi.org
by 3rd October 2014 at the latest

CONTACT INFORMATION

Family name: Šolc	**First name:** Tomaž
Company: Jožef Stefan Institute Ljubljana, Slovenia	**Email address:** tomaz.solc@ijs.si

DESCRIPTION OF THE PROPOSED DEMONSTRATION

Title: SNE-ESHTER: A low-cost, compact receiver for advanced spectrum sensing in TV White Spaces.

Abstract:
A device employing a reconfigurable radio requires an accurate picture of the situation in the radio spectrum to successfully adapt to its environment. With up-to-date channel occupancy table such a device can choose channels with the lowest level of noise and interfering transmissions. This is especially important in secondary usage scenarios where a white-space device is required to avoid interference with incumbents, even when the primary user's signal is very weak.

Spectrum sensing as a method of obtaining such a channel occupancy table has several drawbacks. Energy detection, while economical to implement, has proven to be unusable in situations where weak incumbent signals need to be detected. It is sensitive to changes in noise power and in most practical cases unable to detect signals below the thermal noise floor. Advanced methods of detection that address these problems exist. However, their implementation typically requires either software-defined radio architectures with inefficient general-purpose CPUs or expensive application-specific integrated circuits. This forms a barrier to their adoption in battery-powered or low-cost consumer devices.

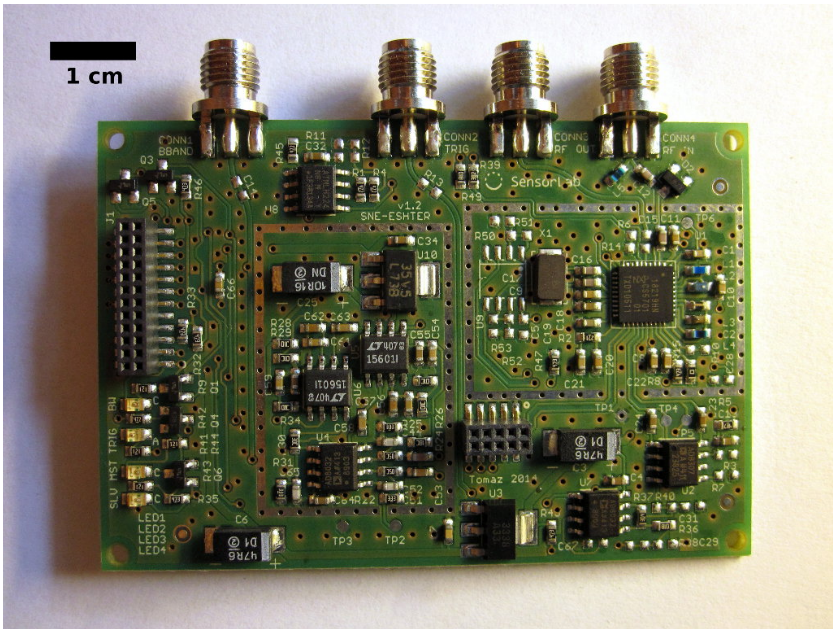

Fig. 1. A photograph of the SNE-ESHTER circuit board. The board contains a UHF tuner, anti-aliasing filters and low-noise power supply.

In this demonstration we present SNE-ESHTER, a low-cost, compact UHF receiver based on an off-the-shelf DVB-T integrated tuner. Combined with a low-powered ARM microcontroller with integrated analogue-to-digital converters it forms a compact spectrum sensor capable of advanced spectrum sensing in TV White Spaces. It is capable of acquiring baseband signal traces of up to 25 ksample length with 2 Msample/s and uses no custom integrated circuits. A demo application on a laptop shows traces recorded by the sensor in real-time in both time and frequency domain.

Sample-covariance and eigenvalue-based detection are a relatively recent development and have been identified as a good compromise between implementation complexity and detection performance. We demonstrate that the capabilities of our system are sufficient to implement these methods. A demo application shows several advanced channel occupancy test statistics and compares them with energy detection. We show that these statistics can be used to construct a channel occupancy table.

Using a signal generator we demonstrate that our system is capable of detecting legacy analogue FM wireless microphone transmissions while being resistant to noise power changes.

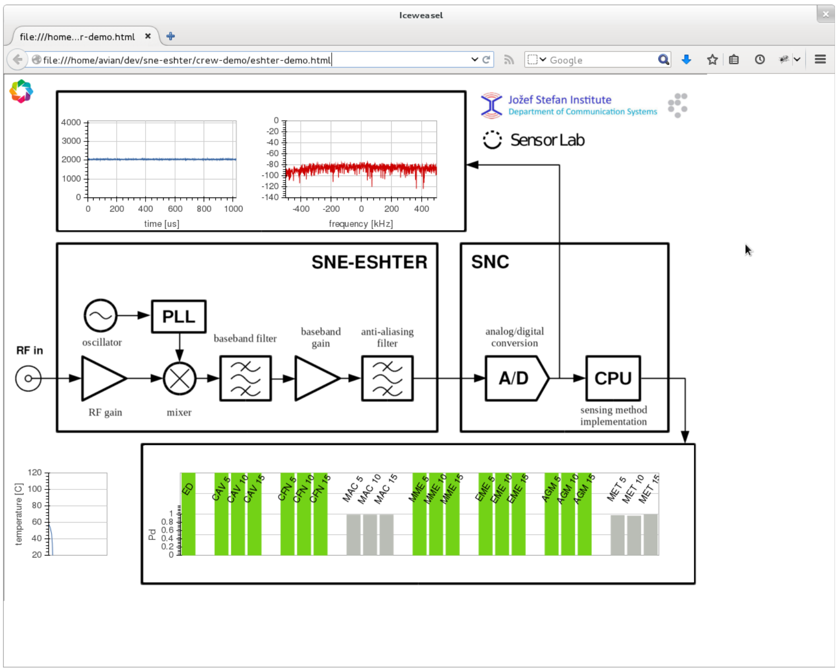

Fig. 2. Screenshot of the demo application running on a laptop PC. Shown in real-time are the captured baseband signal waveform in time (top left) and frequency domain (top centre) and channel occupancy test statistics from energy, covariance-based and eigenvalue-based detectors (bottom)

Acknowledgments:
This work has been partially funded by the European Community through the 7th Framework Programme project CREW (FP7-ICT-2009-258301). Author would like to thank Mihael Mohorčič for his support.