

# ASTROPHYSICS AND PARTICLE PHYSICS

November 13-15, 2017 San Antonio, USA

## Stable field detection as a novel method for blind sensing of weak radio signals

Jakub Nikonowicz and Mieczysław Jessa  
Poznań University of Technology, Poland

Since the discovery of space radio waves in the early 1930s, most astronomical objects have been perceived as radio waves sources. Radio-astronomy observations ultimately consist in measuring the energy received from a distant source, with particular emphasis on the detection of unknown and weak signals. The most commonly used blind detection method relies on energy detection with noise power estimation. The variability of the radio environment, however, greatly complicates the entire detection process. In order to solve the problem of detection in varying noise conditions, we propose a novel method of blind signal detection called Stable Field Detection (SFD), which does not require any knowledge of the noise variance. The proposed method uses the bin value distribution of the received signal's power spectrum density and the moving average. It refers to the mutual relations between the distributions of random variables to extract more information from the spectrum than normal energy detection. As a result, SFD operates on thresholding Gaussian distribution, which makes it as easy to use as energy detection, but remains much more effective. The simulation results for radio pulses show that the performance of the method is significantly improved under the proposed scheme. With regard to weak signals, when compared to the energy detection, the lower limit of the permissible signal-to-noise ratio has been decreased by 4dB. At the same time, the proposed solution maintains low  $O(n \log n)$  computational complexity. SFD is considered a new, effective and simple software defined detector that addresses the challenges of modern astronomy.

### Biography

Jakub Nikonowicz has received his MSc degree in electronics and telecommunication engineering from the Poznań University of Technology in 2014. Since September 2014, he is a PhD student at the Faculty of Electronics and Telecommunications. His current research interest lies in the field of signal processing for spectrum sensing and blind signal detection.

j.nikonowicz@vp.pl

### Notes: