

## IONOSPHERIC PROPAGATION PREDICTIONS AND WIDEBAND COMMUNICATIONS USING HF SDR SENSORS FOR INFORMATIONAL SUPPORT IN EMERGENCY SITUATIONS IN ROMANIA

### Goal of the project

The project aims to implement software and hardware solutions that integrate ionospheric sounding algorithms in a network of SDR (Software Defined Radio) sensors in order to develop and validate a HF (High Frequency) ionospheric prediction model for the territory of Romania.

### Short description of the project

The project targets a systemic approach of the communication network through the implementation, development and integration of recent technological solutions from the perspective of providing information support for the management of interventions in disaster areas where communication infrastructure does not exist or is damaged. Project results can be applied not only in the rapid resolution of remote communications in emergency situations, but also can be extended to other applications in the HF communications range, such as encrypted data communication links for the government or the military.

### Project implemented by:

- Land Forces Academy "Nicolae Bălcescu", Sibiu - coordinator
- Interactive Systems & Business Consulting, Bucharest - partner
- Politehnica University Timișoara - partner
- Technical University of Cluj-Napoca - partner

### Implementation period

21.11.2014 - 30.09.2017

### Main activities

- Building a SDR sensor network for ionospheric sounding
- Elaboration of an application for HF propagation predictions in Romania.
- Development of broadband HF communications by the implementation of adaptive systems



HF antenna

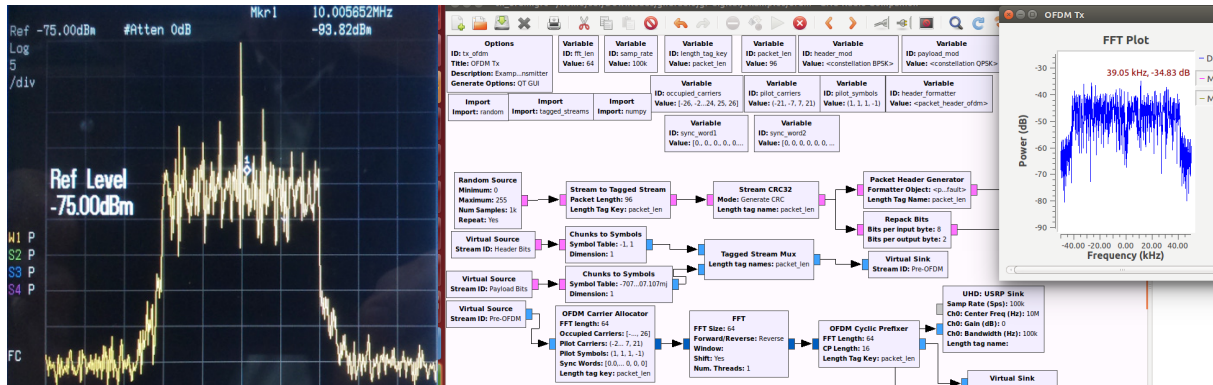
### Results

The main deliverables of the project are:

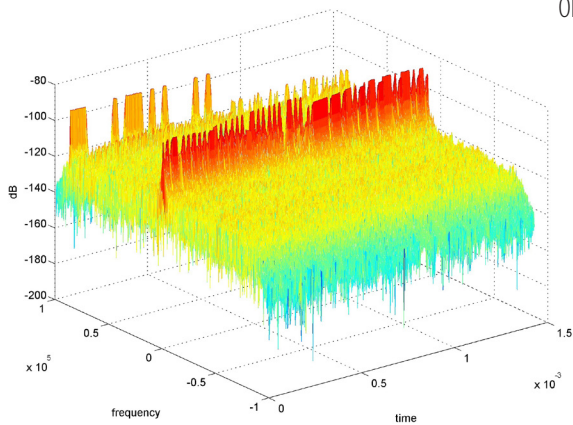
- an ionospheric model which is specific for Eastern Europe;
- algorithms for the automatic identification and classification of waveforms in order to increase the transfer rate and to implement techniques for dynamically accessing the HF resources;
- SDR solutions for local monitoring and collaborative spectrum sensing in the HF range;
- a HF radio network on the territory of Romania which allows high transfer rates in collaborative environments, by automatically adapting to specific conditions of ionospheric propagation at high angles of elevation.



Experimental setup

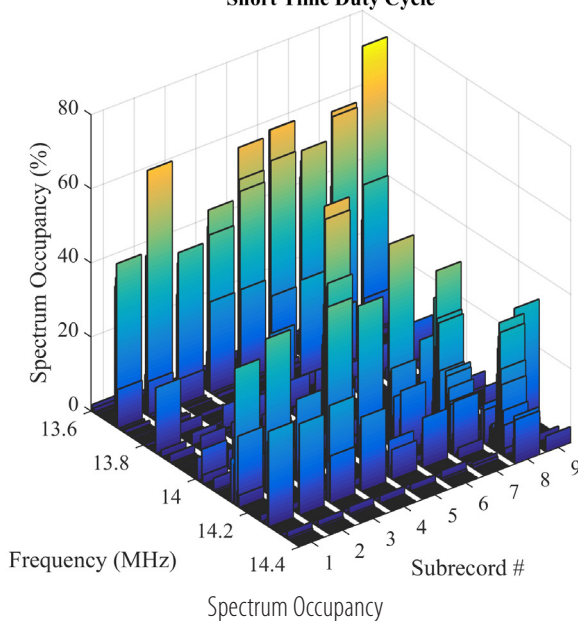


OFDM signal



Time-Frequency representation of the HF signal

### Short Time Duty Cycle



### Applicability and transferability of the results

- creating an integrated software application for HF propagation predictions adapted to the propagation particularities of our country
- implementing the ionospheric measurement capability for HF radio stations with SDR architecture
- measurement and modeling of Spectrum Occupancy in the HF range
- implementing algorithms for the adaptation of broadband waveforms to the ionospheric channel status
- implementing an integrated system for monitoring the ionosphere

### Financed through/by

PN-II-PT-PCCA-2013-4

### Research Centre

ICER

### Research team

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