

LOFAR is an international network of radiotelescopes that are observing the Universe at low radio frequencies. Three of the network elements (stations) were built in Poland by the polish LOFAR consortium POLFAR.. These telescopes will work as a part of the international LOFAR telescope for 4 days a week, the remaining time may be used for other scientific projects. In collaboration with the station owners – the University of Warmia and Mazury, and the Jagiellonian university we are using these telescopes for observations of pulsars.

While a single LOFAR station, as a separate telescope, is an equivalent of a 20-meter single dish radiotelescope, we can still use them for interesting and useful scientific research in the field of pulsar astrophysics. This is because most of the pulsars were not studied in the low-frequency range using the modern observational and data analysis techniques. In our project we want to use pulsars as tools to study the interstellar medium by analysing the effects of radio wave propagation on pulsar signals. We will study the effects of interstellar dispersion (a frequency-dependent delay in the pulse arrival times), the effects of scattering which broadens the observed pulse at low frequencies, and the phenomenon of interstellar scintillation (which resembles the twinkling of stars in the optical range of the EM spectrum). The study of these phenomena will allow us to study the physical properties of the ionized interstellar medium, its structure and distribution in the Galaxy.

Pulsar observations utilizing the modern data acquisition and analysis techniques result in enormous amounts of raw data that is produced, even from a single LOFAR station (up to 20 TB of raw data per day). To make the pulsar observations and on-going data analysis possible we propose to create a new research group in Poland. This group will be based on the Institute of Astronomy of the University of Zielona Góra, a research center that has 25 years of experience with radio pulsar observations and theoretical work in the field of pulsar astrophysics.