

## **Abstract**

The Low Frequency ARray (LOFAR) is the world's largest effort to explore the radio

sky at long wavelengths and is leading the rapid evolution of modern low-frequency

radio astronomy on the path to the low frequency SKA.

LOFAR is an new generation aperture synthesis array distributed on continental scale

in Europe across the Netherlands, Germany, UK, France, Sweden, Poland, Ireland, and Latvia.

Due to the unprecedented high processing and bandwidth requirements, innovative approaches for

data transfer, handling and analysis are being driven making this radio telescope a unique

laboratory to understand the modeling of ionospheric effects and calibration of long-baseline

data at low frequencies.

After giving an introduction to the LOFAR radio telescope and to the most important challenges

for data transfer, calibration and imaging, I will focus on the most relevant LOFAR

Key Science Projects. In particular I will also make use of several recent achievements on CRs,

galaxy clusters, radio-galaxies and star-forming galaxies to demonstrate the potential of LOFAR

observations in producing a breakthrough in many areas of astrophysics in the next years.

In the final part of the talk I will describe the ongoing actions carried out by INAF to join LOFAR

and its upgrade to LOFAR 2.0. I will briefly discuss the status of the negotiations, the Italian roadmap and the opportunities for our community.