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LOFAR2.0

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Extended Abstract

LOFAR, the Low-Frequency ARray, is the largest and most powerful low-frequency (10 – 250 MHz) radio telescope [1,2]. It was conceived in the early 2000's and realised by ASTRON and international partners. LOFAR currently comprises fifty-two stations of simple, static dipole antennas. Thirty-eight stations are sited in the Netherlands, whilst the rest are located in partner countries France, Germany, Poland, Sweden, Latvia, Ireland and the UK. LOFAR has been fully operational for eleven years and is one of a new series of 'software telescopes' relying on intensive, high-throughput processing to interpret the complex sky response of tens of thousands of receptors.

Researchers from around the world use LOFAR for a wide variety of studies, which span investigations of the Earth's lightning and ionosphere, space weather and planetary science, to a wide variety of astronomical studies of objects within our own Milky Way (e.g. active stars, pulsars and supernova remnants), extragalactic research on supermassive black holes and galaxy clusters, and even cosmological studies of the early history of the Universe.

In this contribution we will describe the in-progress upgrade to LOFAR, termed 'LOFAR2.0'. This upgrade to LOFAR's clock distribution, receivers and digital systems will extend its science capabilities and facilitate full-resolution low-frequency (<80 MHz) imaging coincident with high-frequency operations (110-240 MHz). This is achieved through increasing the capacity of the receivers and digital processing system, distributing a central clock and frequency reference over fibre to all Dutch stations, and by implementing a new calibration pipeline for the frequencies below 80 MHz. These capabilities, and the improved operability, will secure LOFAR's productivity through at least 2030 and possibly beyond.

References

[1] M. de Vos, A. W. Gunst and R. Nijboer, "The LOFAR Telescope: System Architecture and Signal Processing," *Proceedings of the IEEE*, vol. 97, no. 8, pp. 1431-1437, Aug. 2009.

[2] M.P. van Haarlem et al., LOFAR: The Low Frequency Array, *A&A* 556, A2 (2013)