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LOFAR2.0 - a premier low-frequency radio telescope for the 2020s and beyond

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The LOw Frequency ARray (LOFAR) is in many respects the world's largest and most sensitive low-frequency radio telescope. LOFAR stretches across Europe, from Ireland to Latvia, with a dense core and 38 stations distributed throughout the Netherlands, as well as 14 additional stations located in 8 partner countries. The pan-European array is called the International LOFAR Telescope (ILT). LOFAR2.0 is a coordinated set of staged upgrades that are being implemented from 2019-2024 and will keep LOFAR cutting-edge. These upgrades will allow all low-/high-band antennas to be used simultaneously, will increase the field-of-view, and allow for new parallel observing modes on the LOFAR central beam-former and correlator. LOFAR will continue to be unique and world-leading, with an angular resolution > 10 higher than that of the planned Square Kilometre Array low-frequency component (SKA-Low), and also accessing the largely unexplored spectral window below 50 MHz.

I will present the status of the LOFAR2.0 development programme: currently, a full prototype signal chain, the Dwingeloo Test Station, is up and running. This is being used to validate the new hardware and software before testing with a full LOFAR station, and then rolling out to the rest of the array. I will also highlight some of the scientific goals for the upgraded array, which we have summarized in a soon to be released LOFAR2.0 White Paper. The scientific themes span atmospheric and ionospheric studies, to solar activity and space weather, to studies of our own Milky Way, and beyond into deep extragalactic space. LOFAR's wide field of view, large fractional bandwidth, high spatial resolution, and flexible observing modes are all key to enabling its scientific yield.