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Einstein Telescope site characterization in Sardinia

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Due to its unique geophysical features and to the low population density of the area, Sos Enattos is a promising candidate site to host the Einstein Telescope (ET), the third-generation Gravitational Wave Observatory. The characterization of the Sos Enattos former mine, close to the first of the possible ET corners, started in 2010 with the deployment of seismic and environmental sensors underground. In particular, since 2019 an extensive array of seismometers, magnetometers and acoustic sensors have been installed in three stations along the underground tunnels, with one additional station at the surface. Moreover, temporary arrays of seismometers and geophones were installed in the surrounding area. For the characterization of the other two corners, named P2 and P3, two boreholes 270 m deep were excavated, determining the good quality of the drilled granite and orthogneiss rocks and the absence of significant thoroughgoing fault zones. The two boreholes are instrumented with broadband seismometers, measuring since 2021 the seismic noise at 252m and 264m of depth, revealing an outstanding low level of vibrational noise in the low-frequency band of ET-LF (2-10Hz), beating the Peterson's low noise model (NLNM) and resulting -along with those installed at Sos Enattos- among the quietest seismic stations in the world in that frequency band. The low seismic background and the reduced number of seismic glitches ensure that just a moderated Newtonian noise subtraction would be needed to achieve the ET target sensitivity at low frequencies. In addition to passive seismic measurements, active seismic campaigns have been carried out at the two corners to reveal the features of the subsoil. Moreover, the electromagnetic noise is monitored with magnetometers deployed close to the boreholes, and acoustic noise sensors will be deployed in the area during this year. Finally, a temporary array of broadband seismometers has been recently deployed along a 15-km long line, stretching from the P2 corner to the closest wind farm, to characterize the attenuation with distance of noise produced by existing wind turbines.

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