Coordinate Metrology Society
Coordinate Metrology Systems Conference 2021
Virtual conference | September 2021

CMS-2021-011

Telescope Mount Assembly Pointing Accuracy Real Survey for the Large Synoptic Survey Telescope: A Large-Scale Metrology Challenge

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Published by the Coordinate Metrology Society. Reference number CMS-2021-011.
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Telescope mount assembly pointing accuracy real survey for the Large Synoptic Survey Telescope: A large-scale metrology challenge

The Telescope Mount Assembly is one of the main subsystems of the Large Synoptic Survey Telescope, a large (8.4 m) wide-field (3.5 degree) survey telescope, which will be located on the summit of Cerro Pachón in Chile. The TMA provides motions about the azimuth and elevation axes to comply with the space survey mission, so it is of great interest to make sure that the TMA is pointing towards the intended location on the sky as accurately as possible. In this scenario, TEKNIKER developed a custom engineered measurement procedure to assess the pointing accuracy error of the TMA a priori, based on laser tracker technology and several fiducial points fixed to the floor. There are several metrology challenges to tackle, such as the large-scale measurement scenario, the visibility to the optical axis of the telescope or the working range of the TMA. A complete simulation model was built based upon the Monte-Carlo technique within Spatial Analyzer software to anticipate the measurement uncertainty with the suggested methodology and the simulation results already presented at the CMSC General Assembly in Utah suggested that the methodology is fit for purpose. These results showed that achievable uncertainties are better than 2 arcsec for every pointing position within the pointing range of the TMA, which means that the presented methodology is compatible with the pointing accuracy requirements, limited to 50 arcsec at a 95% confidence level (k = 2). For this 2021 CMSC General Assembly, the aim is to show the successful implementation of the suggested new verification method done in situ. A fully automatic measurement procedure is performed through Spatial Analyzer software automation functionalities reducing the test data acquisition down to 75 minutes. TMA pointing accuracy results show that the presented measurement procedure results correlate with the previously simulated performance.