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The Distance from CERN to LNGS

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The calculation of the distance from CERN to Gran Sasso involves the combination of three independent sets of measurements: the calculation of the distance between pillars included in the geodetic reference network at CERN and LNGS; and the transfer on each site of coordinates, from the geodetic surface network, underground into the tunnel or experiment hall installations.

The transfer of coordinates, from the surface, underground at the two sites was not done as part of the CNGS Project. Initial survey concerns for the project were directed towards the orientation of the beamline from CERN to LNGS to within ~100 m. Gyro-theodolite measurements underground were planned at CERN so a transfer would effectively only translate the target point. Given the precision estimated for previous transfers, it was decided not to undertake expensive and time consuming measurements campaigns for a negligible gain in accuracy. Therefore only GPS measurements at the two sites were carried out.

The Opera results which raised questions about the speed at which neutrinos travelled, increased interest in the calculated distance between the two installations. In spite of the estimated distance precision two measurement campaigns to establish the link between the surface network and the underground networks were undertaken, together with further GPS measurements. Details of these campaigns, with comparisons to the initial values, and revised estimates of the distance will be given.

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