Metrological Control of Global Navigation Satellite System (GNSS) Equipment

Teresa F. Pareja1,* , Miguel C. Cortés Calvo2

1 Laboratorio de control metrológico de instrumental geodésico y topográfico. Universidad Politécnica de Madrid. Campus Sur. Carretera de Valencia km 7; 28031 Madrid, Spain
2 Laboratorio de control metrológico de instrumental geodésico y topográfico. Universidad Politécnica de Madrid.
*te_fer@topografia.upm.es

Keywords : GNSS, networks control, traceability, uncertainty

Abstract

The studies carried out so far for the determination of the quality of measurement of geodetic instruments have been aimed, primarily, to measure angles and distances. However, in recent years it has been accepted to use GNSS (Global Navigation Satellite System) equipment in the field of Geomatic applications, for data capture, without establishing a methodology that allows obtaining the calibration correction and its uncertainty.

The purpose of this contribution is to establish the requirements that a network must meet to be considered a Standard Network with metrological traceability, as well as the methodology for the verification and calibration of GNSS instrumental in those standard networks. To do this, a technical calibration procedure, based on ISO17123-8:2007, has been designed, developed and defined for GNSS equipment determining the contributions to the uncertainty of measurement. The procedure, which has been applied in different networks for different equipment, has allowed determining the expanded uncertainty of such equipment following the recommendations of the Guide to the Expression of Uncertainty in Measurement of the Joint Committee for Guides in Metrology (JCGM).

Based on high technical quality studies and observations carried out in these networks previously, it has been possible the estimation of local calibration corrections for high accuracy GNSS equipment in standard networks. In addition, the uncertainty of calibration correction has been calculated using two different methodologies: the first one by applying the law of propagation of uncertainty, while the second has applied the propagation of distributions using the Monte Carlo method. The analysis of the obtained results confirms the validity of both methodologies for estimating the calibration uncertainty of GNSS equipment.