INTISARI

Mahalnya harga *receiver Global Navigation Satellite System* (GNSS) tipe geodetik membuat biaya survei tidak efektif. *Receiver* GNSS *low cost* berpotensi untuk menggantikan *receiver* tipe geodetik *standard* dalam penentuan posisi. *Receiver* GNSS *low cost* yang dilengkapi modul GNSS u-blox dan antena *patch* saat ini memiliki spesifikasi dan kemampuan yang hampir sama dengan GNSS tipe geodetik. Namun demikian, *build quality receiver* GNSS *low cost* tidak sebaik GNSS geodetik, sehingga berpotensi ketelitiannya menurun pada observasi dengan durasi waktu yang panjang atau pada lokasi berobstruksi dan banyak objek reflektif. Penelitian ini dilakukan untuk mengetahui pengaruh dari variasi kondisi lingkungan dan durasi waktu pengamatan terhadap ketelitian hasil penentuan posisi dari *receiver* GNSS *low cost*.

Penelitian dilakukan di lima lokasi dengan empat sesi pengamatan yang memiliki durasi yang berbeda. Penelitian dilakukan dengan metode statik differensial moda radial dengan *base* menggunakan GNSS tipe geodetik. Selanjutnya dilakukan uji signifikansi untuk mengetahui perbedaan data hasil penentuan posisi antara *receiver* GNSS tipe geodetik dan *low cost* serta regresi untuk menganalisis pengaruh variasi kondisi lingkungan dan durasi pengamatan terhadap ketelitian data hasil penentuan posisi.

Pada lokasi dengan persentase obstruksi 10 % s.d 42 % dan 60% s.d 82% memiliki rentan nilai RMSE 0 – 26.953 m dan 0.3 - 26.181 m. Selain itu, data hasil penentuan posisi dengan GNSS *low cost* tidak berbeda signifikan hanya di lokasi area tebing. Berdasarkan koefisien determinan yang diperoleh ketelitian data hasil penentuan posisi dengan *receiver* geodetik lebih dipengaruhi nilai rerata MP1 dan MP2 sedangkan *receiver* GNSS *low cost* ketelitian horizontal lebih dipengaruhi nilai rerata SNR dan ketelitian vertikal lebih dipengaruhi nilai rerata MP1 dan MP2 .

Kata kunci: *Receiver* GNSS *low cost*, kondisi lingkungan, durasi pengamatan, ketelitian

ABSTRACT

The high cost of geodetic-type Global Navigation Satellite System (GNSS) receivers makes surveying costs ineffective. Low-cost GNSS receivers have the potential to replace standard geodetic-type receivers in position determination. Low-cost GNSS receivers equipped with u-blox GNSS modules and patch antennas currently have specifications and capabilities that are almost identical to geodetic-type GNSS. However, the build quality of low-cost GNSS receivers is not as good as geodetic GNSS, which can potentially reduce accuracy during long-duration observations or in obstructed locations with many reflective objects. This research was conducted to determine the influence of environmental conditions and observation duration variations on the accuracy of position determination results from low-cost GNSS receivers.

The study was conducted at five locations with four observation sessions of different durations. The research was carried out using the static differential radial mode method with a geodetic-type GNSS base. Significance tests were then conducted to determine the differences in position determination data between geodetic-type and low-cost GNSS receivers, and regression analysis was performed to analyze the effects of environmental conditions and observation duration variations on the accuracy of position determination data.

In locations with obstruction percentages of 10% to 42% and 60% to 82%, the range of RMSE values was between 0 and 26.953 m and 0.3 and 26.181 m, respectively. Additionally, there were no significant differences in the position determination data between low-cost GNSS and geodetic-type receivers, except in areas with cliffs. Based on the obtained coefficient of determination, the accuracy of position determination data from geodetic receivers was primarily influenced by the mean values of MP1 and MP2, while the horizontal accuracy of low-cost GNSS receivers was mainly influenced by the mean SNR value, and the vertical accuracy was primarily influenced by the mean values of MP1 and MP2.

Keywords: *Low-cost GNSS receiver, environmental conditions accuracy, obaservation duration, accuracy*