Evaluation of Timing Performance by GGTO Depending on Number of Unknown Parameters

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INTRODUCTION

Interoperability of GPS and Galileo can be expressed as the improvement of performance using a combined receiver. Each system will produce the same resultant within their individual advertised accuracy. This is called system interoperability [1][2].

To attain interoperability, the Global Navigation Satellite System (GNSS) components must be designed, built and operated in such a way that they do not jam each other's signals, allowing the user to combine the signals of both the systems so that the final output signal to the end user receiver is of a higher quality. Galileo has to achieve these conditions and GPS has to consider the modernization [3].

In this paper we show the GPS-Galileo Time Offset (GGTO) effects on user timing receivers by KRISS simulation algorithm which has been developed as part of the "PROGENY" project funded by the European GNSS Supervisory Authority (GSA). An official European Union Regulatory Authority, the European GNSS Supervisory Authority (GSA) manages all public interests related to European GNSS programmes.

ANALYSIS OF GGTO EFFECTS ON USER TIMING

Two representative papers showed the simulation results about the GGTO effects. They discussed different approaches to solve the problems faced when using both navigation systems together.

We also provide the interoperability effects on timing receiver with being analyzed by proposed methods in this study. For this analysis, we consider eight different cases, and these case studies are intended to investigate the effects of unknowns on the timing interoperability between GPS and Galileo. Eight cases can be divided into two groups: the single-frequency receiver group and the dual-frequency receiver group. The difference between the two groups lies in removing the ionospheric delay, which is one of the greatest propagation errors of GNSS signals. Except for this difference, the two groups consist of same four sub-cases which differ from each other by which unknowns are estimated in the solution process. Table 1 summarizes unknown parameters in each sub-case. Fig. 1 shows that simulation scheme for this study. We conduct the blue colored block using a proper algorithm and an estimation method such as time variance.

Table 1. List of sub-cases

Sub-case	Receiver Position	Broadcast GGTO
1	Known	Used
2	Known	Not used
3	Unknown	Used
4	Unknown	Not used

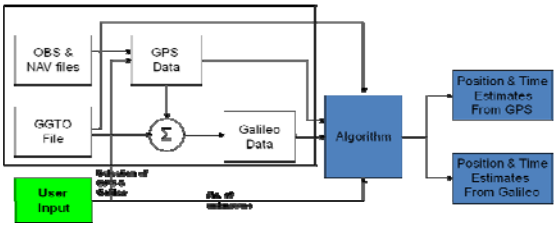

Fig. 1. Diagram of performance evaluation.

CONCLUSIONS

This paper analyzed the effect of GGTO on the timing performance in GNSS receivers according to the type of unknowns, and computed the different error budgets depending upon the number of unknowns and satellites.

REFERENCES

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