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Author: Mr. Jia Tian
China Academy of Space Technology (Xi'an), China, jia_epfl_tian@163.com

Mr. wang yanguang
China, yanguang.wang@epfl.ch
Prof. Wei Wang
China, wwei98@163.com
Prof. pingyan Shi
China, Shipingyan@gmail.com
Mr. Vincenzo Capuano
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, vincenzo.capuano@epfl.ch
Dr. Jérôme Leclère
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, jerome.leclere@epfl.ch
Dr. Cyril Botteron
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, cyril.botteron@epfl.ch
Prof. Pierre-André Farine
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, pierre-andre.farine@epfl.ch

CROSS-BAND AIDED ACQUISITION ON HEO ORBIT

Abstract

Global positioning system (GPS) has been demonstrated to be a valid and efficient system for various space application in low earth orbit (LEO) and Medium earth orbit (MEO), such as location determination and time synchronization. However, in much broader high earth orbit (HEO), the number of space application is much smaller because of the high sensitivity and bad geometry dilution of precision (GDOP). To solve this problem, the normal method is to add L5 processing module to the receiver. It will have these benefits: 1) higher ranging precision and higher anti-jamming performance, 2) existing pilot channel which is helpful for tracking and acquisition. But the drawbacks are also obvious especially in resource restricted condition, 1) the length of FFT and the amount of RAM needed for L5 acquisition module is huge, 2) the acquisition time is long because of secondary code and frequency search space. In this paper, cross-band aided acquisition method and architecture of L1&L5 are presented, which satisfy the requirements for extremely high sensitive environment without any further assistance. Compared with traditional architecture of L1&L5 acquisition method (L1 and L5 are acquired sequentially), this method acquires the L1 signal firstly because the structure of L1 signal is simple and there is no need to search the secondary code, then sends the code search space and frequency search space to acquisition module of L5. It will bring huge benefits to the receiver: 1) the resource needed for L5 acquisition is reduced tremendously, 2) the acquisition time of L5 is reduced considerably. The FPGA implementation result shows that the 2% ALM, 6% DSP and 55% RAM (ALTERA EP3SE260F) can be saved, the 99.38% L5 acquisition time can be saved compared with traditional method and architecture.