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## VALIDATION TESTS OF ATTITUDE DETERMINATION SOFTWARE FOR NANOSATELLITE EMBEDDED SYSTEMS

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### Abstract

This article presents an assessment step of the development of a fault tolerant attitude determination system (SDATF) for nanosatellites. This system will be flight validated as payload of the NanosatC-BR2, a 2U-size cubesat that is being developed by the Brazilian Institute for Space Research (INPE) and partner universities. The SDATF has been designed with the purpose of providing real time, accurate and reliable attitude information to the attitude control system. Its technical features include fault tolerance techniques and triple redundancy in data processing to prevent problems caused by exposition of integrated circuits to space radiation. In the present phase of work, the tests consist of numerical simulations of the main algorithms before the software installation in the SDATF board. The analyzed algorithms are the attitude determination (the QUEST method), the computation of the Sun direction vector in inertial coordinates, the computation of the geomagnetic direction vector in North-East-Down local coordinates, and other auxiliary algorithms. The most critical aspect of these algorithms is the necessity of truncation and simplification of mathematical models in reason of the strong restrictions in the onboard processing, time of computation, and memory limitations. The obtained results can be considered compatible with the ones seen in other systems developed for other nanosatellite missions, and the performance of the attitude determination software is adequate to the requirements of the system.

**Keywords:** *Nanosatellites, Attitude Determination, Embedded Systems, Solar Position Model, Geomagnetic Field Model.*

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