15th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Generic Technologies for Nano/Pico Platforms (6B)

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NANOSATELLITE COMMUNICATION SYSTEM TRENDS

Abstract

This paper will discuss the rise of nanosatellite communication capabilities over the last years and establish an outlook of what can be expected of future systems. The complete communication chain, including the ground segment, will be discussed and all aspects of the link will be addressed based on historic data and the expected future trends. Next to the technical aspects of frequency and modulation selection also the very important differences between commercial and amateur usage of communication systems and the regulatory aspects of nanosatellite missions will be addressed.

There has been a steady rise in performance of spacecraft in all sizes and shapes. This growth has mainly been caused by the miniaturisation and increase in capabilities of the available electronic components but has also led to more complicated payloads on satellite missions. The trend in growth of capabilities has been well characterised over the years for conventional and more recently small satellites. With the emergence of the nanosatellite class missions over the last years we can see the early stages of the same familiar pattern repeating itself. Nanosatellite communication system performance has rapidly increased over the last years. As we are currently at the beginning of the curve it is interesting to look into what can be expected from these nano data links in the future.

The paper will use example mission to illustrate the performance trends, starting from flight proven early CubeSat missions such as Delfi-C3. After this mission the performances increased rapidly up to current missions (tens of kilobits per second, as in Triton 2 mission from IDS) and they seem to show an even steeper growth with next years, with high speed data links up to several hundred kilobits or megabits per second being delivered from nanosatellites in orbit in about one to two years.

Since similar trends were identified for bigger missions, it would be interesting to establish whether they will also follow the same trends as their bigger brothers or are more limited due to their inherent size and power constraints.

Furthermore, new ground segment architectures are emerging, taking advantage of ground station networks (most of the times mission-specific like Rascal or More dBs) actually increasing the downlink possibilities of new satellites and modifying the trade-off between high speed / low coverage and lower speed / higher coverage.