26th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Generic Technologies for Nano/Pico Platforms (6B)

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# BEESAT-5: A NEW LEVEL OF SATELLITE MINIATURIZATION AND INTEGRATION

**Abstract**

Distributed satellite systems enable novel applications like Earth observation with high temporal coverage, space-based machine-to-machine communications or radio astronomy, where the satellites form a synthesized aperture telescope. But these applications are only profitable when using highly miniaturized but still high-capacity spacecrafts. Miniaturization is achieved by multifunction component assembly, the utilization of commercial off-the-shelf parts as well as the implementation of power supply and communication buses. Essential functions of a distributed system are the communication and the relative navigation among the satellites.

At TU Berlin a picosatellite swarm mission was developed consisting of the four identical quarter-unit CubeSats BEESAT-5...8 with a mass of 330 grams each. The picosatellites were designed fully redundant and almost complete single-fault tolerant. The primary mission objective is to demonstrate a newly developed communications subsystem in the UHF band and an experimental GNSS receiver. Furthermore, the satellites contain a multifunctional star tracker and an experimental X-band transmitter. They are equipped with retroreflectors on all sides for laser ranging from ground.

BEESAT-5...8 will be one of the first quarter-unit CubeSats in space. The satellite swarm will be launched in 2019 into a sun-synchronous orbit. The flight results and the verified components will be used for future nanosatellite formation and swarm missions of TU Berlin. The presentation gives a detailed insight into the satellite design and the commissioning results.