



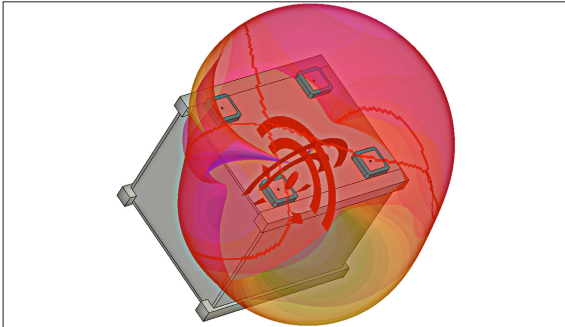
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Phase centre simulation and measurement of a GNSS antenna for cubETH

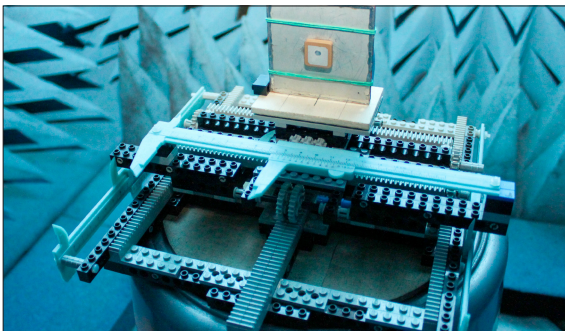


Model of the satellite (cubETH) with the designated phase centre and the associated phase pattern

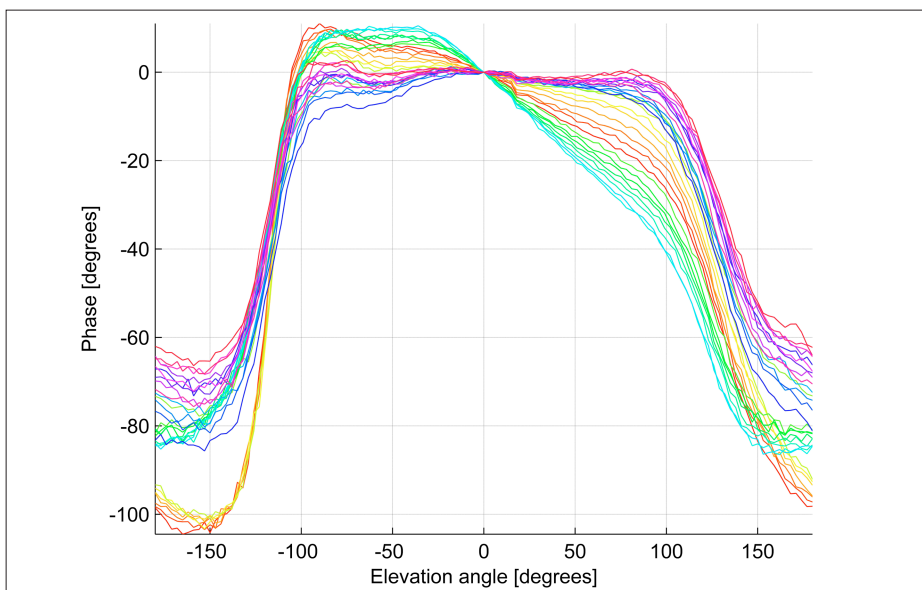
Introduction: This study deals with the phase centre of GPS antennas, assembled on a cube-sat, the cubETH. The phase centre is defined as the point of an antenna from which radiation emanates spherically in every direction. The location of the phase centre may be affected by the antenna structure, and only individual analysis can establish its exact location. Geodesic measurements involving antennas can, for example, be set to a very high standard in terms of accuracy. Inexactitude is highly problematic, especially in space technology. The main objective of this study is to investigate the difference the phase centre encounters when such an antenna is first considered as an individual, independent unit and is then installed as part of a quadruple antenna array, on a satellite.

Approach/Technologies: Utilization of the two conventional radio frequency simulation tools, CST MWS and Ansys HFSS, allow effects to be investigated by virtual means. Practical observation and measurement of the effects were performed in the university's internal anechoic chamber. Because no phase measurements had ever been carried out there, every aspect of the system initially needed to be reviewed. Based on the measurements obtained, an additional mathematical approach enabled the phase centre position to be computed, which shortened the procedure.

Result: Comparison of the results not only revealed differences among the simulation software, but also produced notable measurements. A significant displacement of the phase centre was confirmed. However, although an antenna array appears to present a viable solution, detailed examination is recommended in order to guarantee precision. The current study lays a comprehensive basis for further research and development in this field of application.



Antenna under test in an anechoic chamber, mounted onto a specifically developed positioning system



Measured phase patterns of the patch antenna; used to determine the phase centre