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Radomes

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A radome (an acronym of “radar” and “dome”) covers an antenna and protects it from the damage that its environment will inflict on it. In this document, we concentrate specifically on radomes which cover Comms-On-The-Move antenna systems.

The requirements that radomes on Comms-On-The-Move antenna systems have to fulfill are even more challenging than the requirements of radomes of larger earthstations, due to their special shapes and designs that are needed to have them operate well on vessels, aircraft and vehicles. For satellite operators it is important that the RF performance of antenna systems underneath radomes is influenced as little as possible by the presence of the radome, although influences will never entirely be avoided.

A certain antenna system can be suited well for operation in flight or on land / sea, but the associated radomes will differ fundamentally in their design. While lightness of material is essential for operation on aircraft, the radome on a vessel needs to be robust and water-tight, as water absorption in the radome material will increase the insertion loss of the antenna underneath and result into a degradation of signal strength. An important aspect is the choice of the material, its structure and the manufacturing process, to be able to provide constant and homogenous thickness throughout the product. The thickness of the radome material is the parameter which determines the frequency band that passes through the radome, so the frequency band in which the antenna system underneath is designed to operate in. Small irregularities and variations in material thickness may contribute to increased antenna side-lobe degradation, depolarization (reduction in cross-pol isolation) and beam deflection (introduction of a pointing error). Summarizing it can be stated that there has to be the greatest possible harmony between the physical requirements of the radome to withstand influences from its environment (water, UV radiation, vibration, temperature, and air pressure), the material choice and the manufacturing process, so as to ensure adequate RF performance in a given environment and over a decent period of time.

Satellite operators will have to design link analyses in accordance with the combined product, so antenna system plus its radome, specific to the anticipated service. In order to ensure that the levels of constraints to which satellite operators of adjacent satellites are contractually bound are met, the systems can only be analyzed as a whole. If necessary, additional margins in uplink- and downlink power density levels will have to be applied.