ADVANCES IN SATCOM

ON-THE-MOVE TESTING

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The Satcom On-The-Move (SOTM) market has experienced a rapid growth in recent years. In situations where no terrestrial communication infrastructure exists (e.g. disaster scenarios), SOTM systems represent one of the best solution. SOTM is a strong candidate in many other applications such as news gathering, mobile TV, public security, rescue, maritime, aeronautical and military applications. However, the maritime market sector has proven to be the biggest and the most experienced through a vast number of applications amongst which are offshore oil and gas industry, rescue and entertainment.

In a SOTM application, the terminal is mounted on a moving platform and has to keep connected to a desired satellite albeit being on-the-move. This imposes the biggest challenge not only to SOTM system manufacturers who need to equip their terminals with a decent tracking unit but also to the satellite operators who need to insure that their satellite networks are not harmed by adjacent satellite interferences caused by sub-optimal terminals which do not belong to their legitimate clients.

SOTM testing application

SOTM Testing is currently performed either in a free field or in a laboratory. In the free field, the terminal is tested on a vehicle moving along a certain track. At least two operational satellites need to be involved. One satellite acts as the target satellite and the other acts as the adjacent one. Based on the a-priori knowledge of the antenna pattern, the antenna de-pointing estimation is possible. Although the free field enables testing the complete terminal as it will be used by the customer, it does not guarantee a repeatable or a cost efficient way of testing since operational satellites need to be hired. On the other hand, testing the SOTM terminal in a laboratory offers the opportunity for a cost efficient test in repeatable conditions.

FORTE enables the emulation of the full reality around the SOTM terminal through the usage of satellite payload emulators, a 3-axis motion emulator, channel emulators and a GPS emulator. At FORTE, a two dimensional sensor array mounted on the antenna tower enables the estimation of antenna de-pointing with a very high degree of precision. A block diagram with

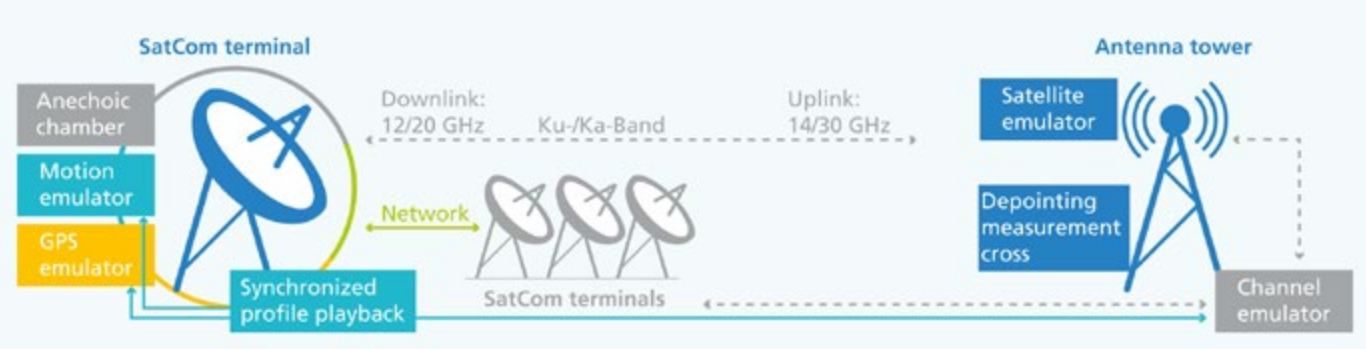

Figure 1: An overview of the structure of the Fraunhofer Facility for over-the-air Research and Testing (FORTE)

the full structure of FORTE is shown in Figure 2.

One of the main advantages of FORTE is that SOTM tests are performed on standard motion profiles for the maritime and the land mobile environments. The standard motion profiles define a clear reference for testing and offer a fair basis of comparison between different SOTM terminals. Before the definition of the standard motion profiles, a terminal with a sophisticated tracking unit can fail to be approved if it was tested on an extremely tough terrain. On the other hand, a terminal with a poor-performing tracking unit can pass the same type approval if it was tested on a paved terrain. Fraunhofer IIS aims in the future at extending the motion profile manifold by developing standard motion profiles for the aeronautical and the high speed train environments.

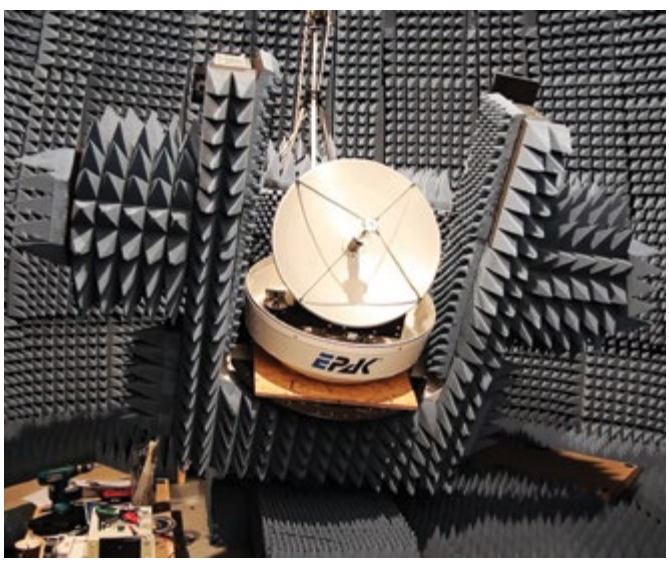

Figure 2: The DSi6 antenna from EPAK while being tested at the Fraunhofer Facility for Over-the-air Research and Testing (FORTE)

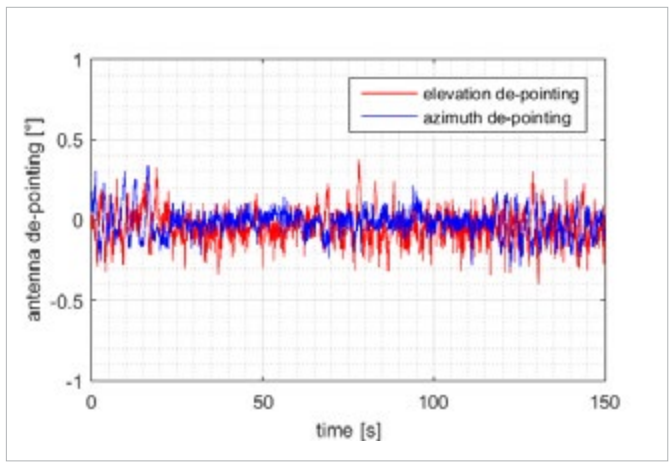

Figure 3: De-pointing estimation results of the DSi6 antenna from EPAK when tested on the maritime Class A standard motion profile developed by Fraunhofer IIS

EPAK GmbH and its DSi6 SOTM antenna

EPAK GmbH has developed the DSi6 SOTM antenna to be used for maritime applications. The antenna has a 60 cm dish and is operating in Ku-band. It is equipped with a 3-axis tracking unit, to be able to track in azimuth, elevation and skew. The antenna has been tested at FORTE where its performance and abilities have been demonstrated. Figure 3 shows the DSi6 antenna mounted on the motion emulator at FORTE.

The tests were performed according to the GVF recommendations (GVF-105) and the type approval specifications of EUTELSAT (EESS-502 and ESOG-120). The DSi6 antenna was able to demonstrate its compliance to the pointing requirements for EUTELSAT. The antenna de-pointing does not exceed 0.4° on the maritime standard motion profiles. Figure 4 depicts the de-pointing estimation results along azimuth and elevation when the antenna was tested on the maritime class A motion profile. The class A motion profile has a maximum angular rate of 27 °/s and a maximum angular acceleration of 154 °/s2.