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CONCEPTUAL APPROACH OF A TRACKING STRATEGY FOR RAIN MEASUREMENTS WITH LARGE ANTENNAS IN KA-BAND

Abstract

The Institute of Astronautics (LRT – Lehrstuhl Raumfahrttechnik) at Technische Universitaet Muenchen has a strong background in satellite communication. The efforts were driven by the need of the development and investigations of key methods and hardware environment for On-Orbit Servicing missions on ground. Extensive studies and tests over the last years showed that a higher bandwidth is necessary to fulfil the high performance requirements on a communication link for upcoming On-Orbit Servicing missions with haptic and visual feedback. The Ka-Band ground station of the LRT provides therefore the adequate environment for developing new strategies and concepts for such challenging missions. The Ka-Band ground station of the LRT is a 4.8 m diameter Cassegrain Ka-Band antenna which was realized in collaboration with General Dynamics SATCOM. Rain and other atmospheric disturbances cause in a decrease of the quality of service (QoS) on a satellite communication link using high frequencies like in Ka-Band (20/30 GHz). The investigation of rain fade effects on such high frequency bands requires a continuous measuring of satellite signals especially during the rain event itself. This situation could result in a loss of the antenna tracking capability to the satellite because of a dramatic decrease of the signal from the satellite during a heavy rain event. A typical method of bypassing this problem is to change the ground station site to obtain satellite contact and to continue with the communication as it is usually made by commercial satellite operators. This is not useful for scientific measurements like rain measurements which are done at LRT. This paper describes a conceptual approach of a generic tracking strategy to realize continuous measurements during a rain event in respect to the usage of large antenna systems. To realize a continuous rain measurement without having a satellite signal for antenna tracking purposes, the approach is taking into account different environment parameters like orbit parameters of the satellite or weather data as basis for an evaluation algorithm. Those data will be used as input parameters for the algorithm and will generate in combination with a parameterization of the current antenna status an instruction rule to operate the antenna system in different antenna tracking modes. Based on the available LRT Ka-Band ground station, an outlook of a possible technical implementation of this approach will be presented.