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Deep space communications technology state-of-the-art and challenges in future space exploration missions

Every exploration mission has a communications system to receive commands and other information sent from Earth to the spacecraft, and to return scientific data from the spacecraft to Earth. The vast majority of deep space missions never return to Earth. Therefore the only means mission control has to interact with the spacecraft, after launch, is its communications system. In addition, any issue with the spacecraft can only be diagnosed, repaired, or mitigated via the communications system. Without reliable and efficient communications system, a successful mission would be impossible. The speaker will provide an overview of the current state-of-the-art in deep space communications technology, from an industrial perspective, focusing mainly on the spacecraft side and the required radio links performance. Examples of current and future exploration mission scenarios will be used to illustrate the challenges faced by industry to meet the ever increasing mission demands, such as multiple-user access, autonomous system re-configuration, and hardware miniaturization. At the same time the reliability and survivability requirements have to be met in extreme environmental conditions. New technology developments will be presented, including deep space CDMA, flexible and autonomous transponders, advanced channel coding schemes and secure communications.

Biography

Gabriele Donà was born in Venice, Italy, in 1975. He received the M.Sc degree in Telecommunication engineering, and the Ph.D. degree in Electrical engineering from University of Padua, Padova, Italy, in 2001 and 2005. In March 2004 he joined TRTech, Edmonton, Canada, as research fellow and worked in the area of channel estimation algorithms for mobile multi-carrier multiple-access wireless systems. From 2006 to 2014 he was a Research Scientist at Thales Research and Technology (UK) Ltd., Reading, UK, conducting research on wireless sensors networks, ultra-wideband radar and positioning systems, for security and defence applications. He joined Thales Alenia Space in 2014 with the role of Tracking, Telemetry and Command (TT&C) Specialist for exploration and scientific mission.

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