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POTENTIAL NEW ALLOCATIONS TO SMALL SATELLITE TT&C AND REGULATORY STATUS OF SMALL SATELLITES

Abstract

Now that more than 700 small satellite systems have been launched with more than 200 launched or planned systems in 2017, it became clear even to the critics that (very) small satellites present a serious platform for a variety of applications in space. Satellites of this new class are smaller, lighter and have shorter mission durations than traditional, larger satellite systems. From a technical point of view, the satellites have less power available, lower attitude control accuracy and use lower frequency bands. Even though developers put great effort in developing higher band transceivers (e.g. in the S-band and X-band), small satellite tracking, telemetry and control (TT&C) is still commonly performed in the bands below 1 GHz. The reasons for this are the advantageous transmission characteristics, the low attitude control requirements of the systems and the availability of cheap hardware. The biggest disadvantage is the low data throughput, which is why payload data transmission is performed in higher bands.

The bands below 1 GHz are already used by various satellite services (space research, Earth observation, amateur, broadcasting, telecommunications, radiolocation, astronomy and others) and the potential of interference is magnified by the new systems and constellations that are launched and planned by small satellite developers. However, there might be parts of the bands which are not used anymore or still offer some capacity for new systems. For this reason, the International Telecommunication Union (ITU) decided at the last World Radiocommunication Conference 2015 (WRC-15) that existing bands for TT&C (*space operation service* in ITU terminology) should be examined regarding their current use. Based on that, it should be evaluated whether these bands can assimilate the vast number of new small satellites. If the studies show that the existing bands are not sufficient, new potential frequency bands below 1 GHz for small satellite TT&C should be analyzed.

This paper reviews the existing bands that are allocated to the space operation service and their applicability for small satellite TT&C. Furthermore, potential new bands in the ranges 150.05-174 MHz and 400.15-420 MHz are examined. The results are then put into context with the intermediate results of the ITU study groups that meet between ITU WRC-15 and WRC-19. Based on this, a recommendation will be given on how small satellite operators and developers should plan their TT&C systems.