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RADIO SIGNAL MONITORING AND ANALYSIS FROM SPACE AND GROUND

Abstract

The use of satellites has become increasingly more ingrained in our day-to-day lives. From navigation on the road, to precise timing at the stock-exchange and Earth observation for climate change, we grow more and more accustomed, and even dependent, to the data and services that satellites provide. To task these satellites and get the acquired data back to the ground, satellite use radio signals. Without radio signals, satellites would not be able to receive commands or send data back to Earth, making them useless for the mission they were build.

The use of radio frequencies by satellites is regulated by the International Telecommunication Union (ITU). The ITU makes sure that the limited available EM spectrum can be efficiently used by satellite operators, while limiting interference to others. Monitoring the use of radio signals is necessary to ascertain users are adhering to rules, regulations and the assigned frequency bands.

Besides the organizational and regulatory aspect, a lot of information can be deducted from the emitted radio signals transmitted by satellites. For example, the emission of a frequency by an object shows the object is active and not a piece of debris. The frequency and bandwidth, chosen by the satellite operator, relates to the amount of data expected to be transmitted, which in turn links to the mission of the satellite. Many more examples can be found and will be summarized.

In this paper, the different uses of radio signal analysis will be discussed, together with the advantages this information can provide to customers in civil, commercial and military organizations. Lastly, a design for a payload in a sub-GEO satellite system is presented, which will be able to contribute to radio signal monitoring and analysis from space.