The mitigation of RFI in space borne and ground based radio diagnostics

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1. Introduction

Matter in the Earth's space environment, is mostly in the plasma state and is dynamically controlled by electric and magnetic fields of widely differing scale sizes. The fundamental driver of natural geospace dynamics is Solar activity with CMEs as the most effective solar events. The efficiency of the solar driver depends on the actual state of the near-Earth environment. Human activity such as radio broadcasting and operation of electric power systems and heavy industry installations constitute another source of energy which is released into geospace and affects the plasma. Both natural and anthropogenic drivers can lead to a variety of plasma processes, specifically wave-particle interaction, which lead enhanced plasma turbulence and result in occasionally very intense electromagnetic emissions. Radio wave diagnostics located on board of the spacecraft as well as ground based radio diagnostics can be an excellent tools for diagnostics the local properties of the space plasma as the remote region of space and extra galactic sources.

In order to give a more detailed and complete understanding of physical plasma processes that govern the solar terrestrial space, it is necessary to mitigate different RFI contribution. On the other hand the diagnostics of electromagnetic pollution gathered by spaceborne registration as well as the ground base radio telescope can be excellent tools for diagnostics the turbulent properties of space plasma and for proof-of-concept space weather applications.
Novel ground based wide area sensor networks, such as the LOFAR (Low Frequency Array) radar facility, comprising wide band, and vector sensing radio receivers and multi-spacecraft plasma
diagnostics should help solve outstanding problems of space physics and describe long-term environmental changes and create the map of man-made electromagnetic pollution.

The main purpose of this presentation is to describe new advanced diagnostic techniques of the near Earth space plasma and point out the scientific challenges of the RFI diagnostics. Moreover as an example of mitigation the FRI disturbances we will present idea for new space mission DSL-P in the frame of Chang'E-4 project which will be pathfinder for future higher-resolution, higher-sensitivity multi spacecrafts mission DSL.