



Report ITU-R SA.2191
(10/2010)

**Spectrum requirements for future SRS
missions operating under a potential new
SRS allocation in the band 22.55-23.15 GHz**

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***Note:** This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.*

Electronic Publication
Geneva, 2010

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1 Introduction

WRC-12 Agenda item 1.11 proposes for consideration a companion band to the existing SRS space-to-Earth allocation in the band 25.5-27.0 GHz. This would enable the support of high data rate Earth-to-space links for SRS missions in near-Earth orbits, including missions in transit to the Moon, near the Moon and missions to Lagrangian points L1 and L2. Existing allocations near 2 and 8 GHz are becoming congested due to the increasing usage requirements of co-primary services and will not provide sufficient bandwidth for remote system management and updates, tele-operation, network management, mission data, high resolution imagery/video and maps, interactive management instructions, and command and control links for these future generation missions. Detailed description of spectrum usages, symbol rates and bandwidths is contained in Annex 1 for both unmanned and manned missions.

Multinational activities amongst space-faring nations have started in 2005 with the objective to coordinate future programmes for the exploration of the Moon. It is envisioned that these exploration missions will be robotic for the foreseeable future and manned in the long term. In the early phases, extensive robotic missions will be predominant, examining the lunar terrain, environment and potential landing sites. The use of SRS earth stations in this band will focus on support of lunar missions with antenna diameters of around 18 m. In addition, also Lagrangian point missions are planned to be supported by earth stations with antenna diameters of around 35 m. Low-Earth orbiting missions may also use this band and could generally be supported by antennas of around 10 m diameter.

It is anticipated that worldwide, over the next few decades, some 10-15 SRS earth stations of the various participating space agencies will use this band mainly for support of lunar and Lagrangian missions. The stations are almost exclusively deployed around mid-latitudes for mission specific reasons. Since several systems are expected to operate simultaneously in the vicinity of the Moon and their coincident appearance within an earth station antenna beam, frequency separation will be required between affected missions.

Earlier studies performed in the frame of the Space Frequency Coordination Group (SFCG) anticipated that a cumulative total net uplink bandwidth of up to 500 MHz will be needed for support of lunar missions only. In addition, this band will also be required for Lagrangian point (L1 and L2) missions. These missions will require less bandwidth than lunar missions but will also need exclusive frequencies as they will all be located within the main beams of antennas of the various space agencies.

Furthermore, detailed studies revealed that for reasons outlined below, it is not practicable to simply add one channel after the other. As explained, it would in practice not be feasible to assign the required channels in one contiguous band.

Annex 1 is taken from an SFCG Report and it presents details, based on the plans of the major space agencies worldwide, demonstrating the types of links that Lunar missions will use, their usage descriptions, the expected types of users, and the associated symbol rates and bandwidth requirements.

In summary, the indicated forward requirements of space agencies for their near-Earth, lunar and Lagrangian exploratory missions reveal that, even with global coordination within bodies such as the SFCG to achieve optimum efficiency in spectrum usage, their aggregate requirements will barely be accommodated in 600 MHz and will certainly require careful planning and extensive frequency coordination.