

CNES

PROTECTION OF RADIO ASTRONOMY IN THE SZM

DRAFT “WORKING” DOCUMENT

Extract with the optical link part, for CCSDS SLS OPT WG

This contribution exposes CNES positions on lunar radiocommunication (communications & PNT) and radar frequencies, vis a vis the protection of Radio Astronomy in the SZM.

Note: CNES fully support the LunaNet frequency plan which is not in [bracket] in LNIS-V5-draft document. Notably, CNES fully support the LNIS-AFS frequency band (2483.5-2500 MHz) and its two channels BPSK(1) and BPSK(5), both channels being essential for user’s security (including Astronaut’s Safety Of Life).

CNES do not support any of the 2 frequency band in [bracket] in LNIS-V5, due to protection of Radio Astronomy in the Shielded zone of the Moon. One of these frequency bands in [bracket] is 67-70 GHz, as shown by figure X on next page.

1) Introduction

It is to be noted that WRC Resolution 680 notes that Section V of Article 22 addresses protection of radio astronomy in the SZM, that the Recommendation ITU-R RA.479-5, relate to the protection of frequencies for radioastronomical measurements in the SZM, with a view to preserving the unique radioastronomical capabilities in this zone, and that the impact of unintended electromagnetic radiation from electrical and electronic systems into radio astronomy receivers should be assessed (see Question ITU-R 243/1). It is important to consider also ITU-R RA.314 for protection of RAS in the SZM.

This document focus on some fundamental issues for protection of RAS in the SZM.

(...)

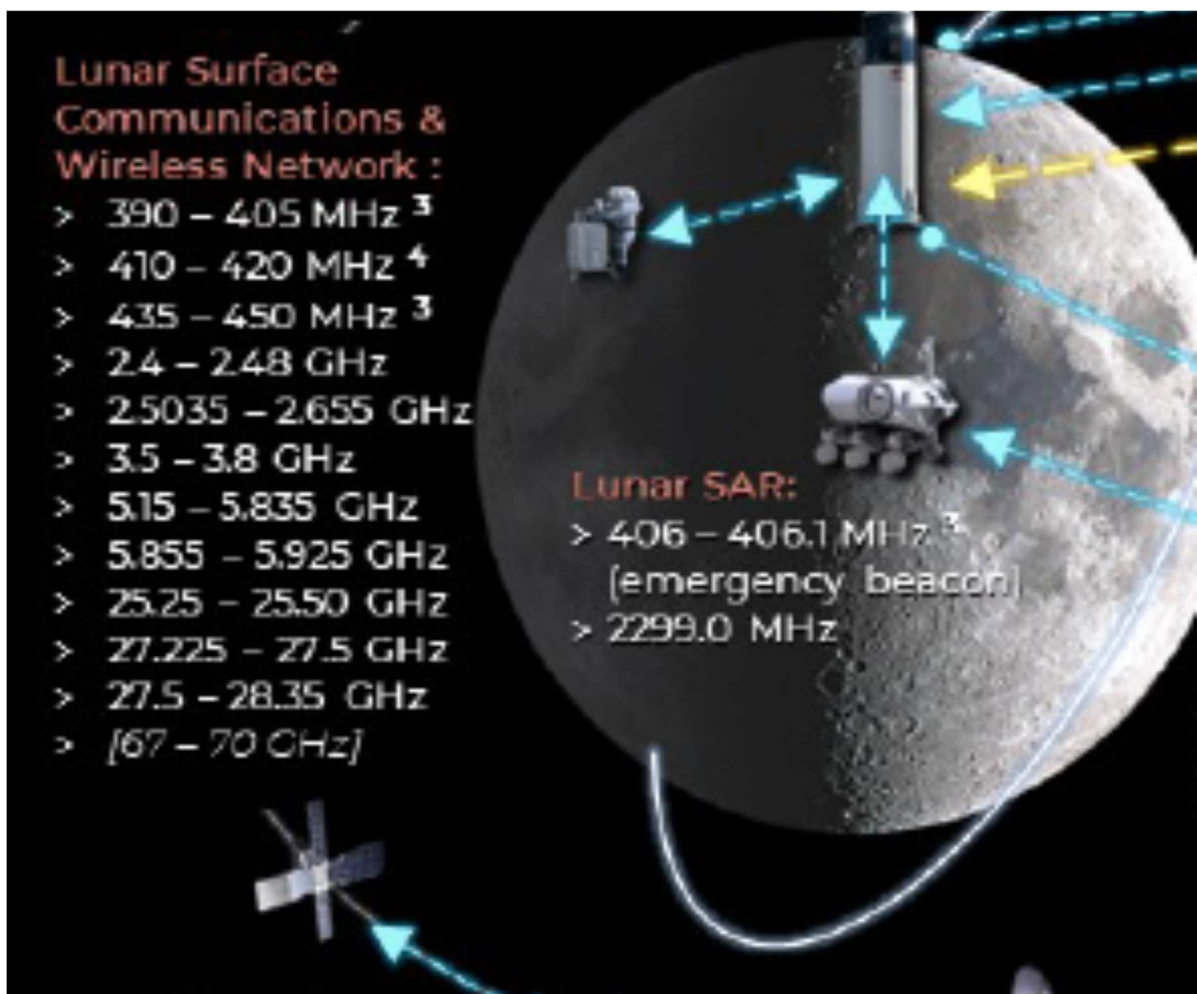
Since it is very important for Radio Astronomy Service (RAS) to have wide spectrum free portions to perform continuum, it is also essential for the Radio Astronomers to keep 40.5-78 GHz free of radiocommunication and radar bands in the SZM. This advantage would be lost if 59-63 GHz or if the 67-70 GHz (figure X) would be selected for point to point lunar surface wireless links, in LunaNet for instance.

That is why lunar optical “point to point” or “short distance” VHDR wireless links, in the 1.55 micron range, looks more appropriate from performance (data rate capacities) and RAS/SZM points of view.

Moreover, the 1.55 micro range is the more appropriate (compared to the 1.06 micron range) for Free Space Optical (FSO) links when astronauts are involved, for eye-safety reasons.

In addition, 1.55 micron range is the more appropriate to reuse mass market wireless FSO standards, exactly like 5G FDD or TDD frequency bands are recommended for lunar surface links, in order to reuse mass market terrestrial wireless standards. More precisely, mass market optical C-band corresponds to the 1530 – 1565 nm range (186.335 – 191.083 THz) and the mass market optical L-band corresponds to the 1570 – 1610 nm range (191.693 - 196,079 THz).

But, taking into account the introducing message **in red**, this CNES suggestion would apply to LUNANET Second Generation (LUNANET G2), and we therefore do not suggest that 186.335 – 191.083 THz and 191.693 - 196,079 THz to be placed in [bracket] (that is under study) in LNIS-V5, unless it would be explicitly mentioned that it would be under study for LUNANET G2.



Notes:

1. Consistent with the IOAG Architecture, NASA-SCaN Lunar Architecture, ICSIS and SFCG REC 32-2R5
2. SFCG REC 32-2R5 also contains amateur radio frequency allocations between the Earth and the Lunar region
3. Limited to outside of the Shielded Zone of the Moon (SZM)
4. 410-420 MHz spectrum used for EVA comm may occur in LO (e.g., from a spacecraft such as Orion or Gateway)

Fig. X: LunaNet Interoperability Specification related to wireless bands