



**Resolution SFCG A26-1R4**

**LUNAR AND MARTIAN INTEROPERABILITY  
AND SPECTRUM COORDINATION**

The SFCG,

CONSIDERING

- a) that its member agencies facilitate early understanding of present and future plans for space systems and services and of other systems affecting these;
- b) that the following member agencies are envisaging or planning missions to the Moon or Mars or both (Lunar/Martian missions):

- CNES (France)
- CNSA (China)
- DLR (Germany)
- ESA (Europe)
- ISRO (India)
- JAXA (Japan)
- NASA (USA)
- ROSCOSMOS (Russia)

- c) that other, as yet unidentified, space agency members of SFCG may undertake plans to operate space missions in the vicinity of the Moon or Mars or both at a future date;
- d) that because spacecraft will be clustered about or on these two bodies (Moon or Mars or both), several spacecraft will lie simultaneously within the beamwidth of an Earth station's antenna;
- e) that Lunar and Martian communications relay satellites and surface elements from multiple member agencies are likely to be in simultaneous operation either jointly or independently;

- f) that since spacecraft can be independently controlled by those member space agencies, it is likely that a multiplicity of spacecraft may be emitting simultaneously, and unless these emissions are carefully controlled and spectrum usage is coordinated, interference events are virtually certain;
- g) that existing operations of non-lunar/Martian missions, ground-based or space-based, may be adversely affected by, or may adversely affect, the operations of lunar/Martian missions;
- h) that it is essential for the identified SFCG member agencies to:
  - identify spectrum requirements as envisioned by SFCG member agencies and operational usage plans;
  - evaluate whether the existing spectrum allocations are adequate;
- i) that an inter-governmental Lunar/Mars mission spectrum agreement was signed in 2006 between SFCG member agencies involved in such programs at this time;

#### CONSIDERING FURTHER

that ground network interoperability should be a top priority not only to reduce costs during periods of network overloads, but also to facilitate back-up during emergencies.

#### RECOGNIZING

- 1) that interoperability is paramount to the success, individually and collectively, of such an extensive set of exploratory space missions;
- 2) that the Interagency Operations Advisory Group (IOAG) was created in 1999 to facilitate interoperability among international Space Agencies' earth stations;
- 3) that the Terms of Reference of the IOAG include providing a forum for identifying common needs across multiple agencies for coordinating space communications policy, high level procedures, technical interfaces, and other matters related to interoperability and space communications;
- 4) that, the IOAG is the preferred mechanism to address interoperability and provide configuration management and maintenance of the Lunar/Mars Mission Models;
- 5) that, the SFCG is the preferred mechanism to provide configuration management for the spectrum use plans for missions to the Moon and to Mars (to include analyzing updated mission requirements in order to assess the adequacy of the spectrum plan in meeting the mission requirements) and to take responsibility for spectrum coordination of specific missions to the Moon and Mars.

NOTING

1. that, due to the long time span (several decades) over which Lunar and Martian missions will be conducted, an enduring organizational mechanism is needed to facilitate the agreed SFCG responsibilities;

RESOLVES

1. that the SFCG undertake future Spectrum Coordination among Lunar missions and among Mars missions, while the IOAG continues to handle matters of interoperability for those missions;
2. that if new spectrum is needed to satisfy the envisioned spectrum requirements, the SFCG should develop a plan for obtaining new allocations;
3. that a Lunar/Martian Spectrum Group (LMSG) be created with Terms of Reference as shown in the Annex to this Resolution;
4. that LMSG Members shall be those chosen to represent member agencies having envisioned or established plans for lunar/Martian missions;
5. that meetings of the LMSG take place as needed to interface with and to support the requirements of the IOAG, taking advantage of opportunities such as the annual SFCG meeting;
6. that an Observer from IOAG is encouraged to participate in meetings of the SFCG;
7. that an SFCG member participate as an Observer in IOAG meetings.
8. that Mrs C. Sham (NASA) is the chairman of the LMSG and the other member agencies points of contact are:

CNSA	Tan Wei
DLR	Ralf Ewald
ESA	Enrico Vassallo
ISRO	P.V. Kumaramohan
JAXA	Kazuyoshi Okuzumi
ROSCOSMOS	Anton Stepanov
CNES	Vincent Meens
NASA	Farzin Manshadi



**ANNEX**

**Lunar/Martian Spectrum Group (LMSG)**

**Terms of Reference**

1. Enable and conduct spectrum pre-coordination to ensure interference free operations for Lunar and Martian missions, including in-situ links
2. Develop, validate, and maintain the following spectrum products based upon the new Lunar/Mars communications services requirements:
  - a. Lunar/Mars Spectrum Plans addressing the following functions :
    - (1) Telemetry
    - (2) Telecommand
    - (3) Tracking
    - (4) Science data return
    - (5) In-situ links
    - (6) Cross-links
    - (7) Navigation
    - (8) Remote sensing (including differential VLBI);
  - b. Assessments of individual mission data rate/ bandwidth requirements,
3. Manage configuration for the Lunar/Mars Spectrum Plans and maintain these plans as current on the SFCG website.
4. Develop coordination methods for use among affected SFCG member agencies.
5. Develop and provide a mechanism for seeking regular periodic updates of the requirements of all space agencies with plans for Lunar and/or Martian robotic and/or human exploration missions.
6. Provide a report on the work of the LMSG to the SFCG at its annual meeting.