International Telecommunication Union

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R RA.1417-1
(12/2013)

A radio-quiet zone in the vicinity of the L_2 Sun-Earth Lagrange point

RA Series
Radio astronomy

International Telecommunication Union

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from http://www.itu.int/ITU-R/go/patents/en where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

Series of ITU-R Recommendations

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Series	Title
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M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	**Radio astronomy**
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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RECOMMENDATION ITU-R RA.1417-1

A radio-quiet zone in the vicinity of the L_2 Sun-Earth Lagrange point

(1999-2013)

Scope

The L_2 Sun-Earth Lagrange point or L_2 point, some 1 500 000 km from the Earth, provides a radio-quiet environment and stable orbits that are used for space-based radio astronomy and space research service (passive) missions. Some such missions are currently using the L_2 point, and more are planned. This Recommendation provides timely supporting information and reiterates the importance of preserving the radio-quiet environment of the L_2 point as a basis for future space-based radio astronomy missions.

The ITU Radiocommunication Assembly,

considering

a) that radio astronomy observations from space offer important advantages owing to the absence of atmospheric attenuation and scattering and the possibility of using very long interferometer baselines between antennas;

b) that the low levels of spectral power flux-density in the vicinity of the L_2 point (see Annex 1) from transmitters operating on the Earth and in space between the Earth and the geostationary orbit permit highly sensitive radio astronomy observations;

c) that quasi-stable orbits having radii up to about 250 000 km exist in the vicinity of the L_2 point;

d) that it is desirable for space-based radio astronomy stations in the vicinity of the L_2 point to be able to observe at all radio frequencies, in order to exploit the full scientific potential of the L_2 point;

e) that viewed from the L_2 point almost all sources of radio interference will lie within a cone no more than 3.2° across as determined by the apparent diameter of the geostationary orbit,

recognizing

that space-based radio astronomy missions are currently operating in the vicinity of the L_2 point and that future missions are being planned (see Annex 2),

further recognizing

a) that Earth-space and space-Earth transmissions to/from the vicinity of the L_2 point are needed to control, communicate and relay data from space-based radio astronomy missions operating in the vicinity of the L_2 point;

b) that space research service missions, including space research (passive), not conducting radio astronomy observations may receive and transmit in the space-Earth or space-space directions either in transit or while operating in the vicinity of and beyond the L_2 point;

c) that specific frequency allocations have been made to the space research service for the purposes of controlling, communicating and relaying data from space missions,

recommends

1 that administrations should note the scientific importance of the L_2 Lagrange point of the Sun-Earth system and take all practicable steps to maintain the radio-quiet environment in its vicinity;

2 that administrations, in making frequency assignments that may affect missions operating near the L_2 point, should protect a volume of space of radius 250 000 km centred about the L_2 point as a coordination zone of low electromagnetic emission, where all radio transmissions originating in and passing through the zone are confined to frequency bands allocated to the space research service for the purpose of controlling, communicating and relaying data transmissions;

3 that administrations should mutually coordinate activities involving use of the L_2 point so as to minimize interference to radio astronomy observations or space research (passive) missions in its vicinity.

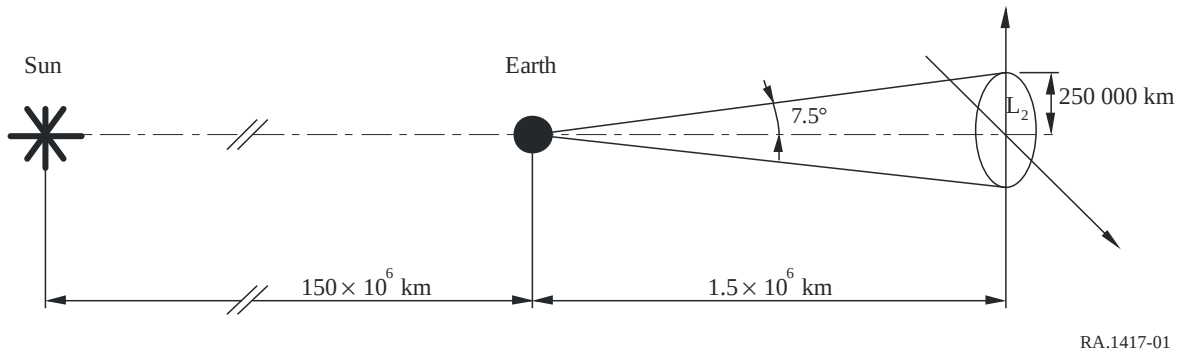
Annex 1

Vicinity of the L_2 Sun-Earth Lagrange point

The L_2 Lagrange point of the Sun-Earth system lies 1.5 million kilometres from the Earth, in the anti-solar direction, on a line joining the barycentres of the Earth and Sun. There is an area around the L_2 point where objects will execute orbits that are stable for long periods of time, and are suitable for long-term space missions (see Fig. 1).

FIGURE 1

Typical geometry of an L_2 orbit



Annex 2

TABLE 1

Space-based radio astronomy missions operating or planned for operation near the L_2 Sun-Earth Lagrange point

Mission/operator aperture	Type of mission observing mode	Dates of operation	Observing frequency bands (GHz)
MAP/NASA 1.4 m × 1.6 m	Single dish continuum imaging of the cosmic microwave background Continuum	2001-2009	18-96
PLANCK/ESA 1.5 m × 1.9 m	Single dish continuum imaging of the cosmic microwave background Continuum	2009-2012	30 ± 3 44 ± 4.4 70 ± 7 100 ± 10 150 ± 28 217 ± 40 353 ± 65.5 545 ± 101 857 ± 158.5
Herschel/ESA 3.5 m	Single dish radio astronomy Spectral line and continuum	2009-2013	490-642 640-802 800-962 960-1 122 1 120-1 250 1 600-1 800 2 400-2 600
Millimetron/ ROSKOSMOS 12 m	Single dish radio astronomy and space very long baseline interferometry (sVLBI) Spectral line and continuum	2015-2030	18-4 800
SPICA/JAXA 3.5 m	Single dish radio astronomy/spectral line and continuum	2018	1 500-10 000