



Recommendation ITU-R SA.1018-1
(07/2017)

**Hypothetical reference system for
networks/systems comprising data relay
satellites in the geostationary orbit and
their user spacecraft in low-Earth orbits**

SA Series
Space applications and meteorology



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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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Series of ITU-R Recommendations

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Series	Title
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BS	Broadcasting service (sound)
BT	Broadcasting service (television)
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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 SA.1018-1

Hypothetical reference system for networks/systems comprising data relay satellites in the geostationary orbit and their user spacecraft in low-Earth orbits

(Question ITU-R 117/7)

(1994-2017)

Scope

This Recommendation provides architecture and characterization of a hypothetical reference system for network/systems comprising data relay satellites.

Keywords

DRS, space-to-Earth, Earth-to-space, space-to-space, forward feeder link, return feeder link

Related ITU-R Recommendations and Reports

Recommendations ITU-R SA.510, ITU-R SA.1019, ITU-R SA.1155, ITU-R SA.1274, ITU-R SA.1275, ITU-R SA.1276, ITU-R SA.1414.

The ITU Radiocommunication Assembly,

considering

- a) that communications between the ground and low-orbiting spacecraft and launch vehicles used for space research, Earth exploration and other purposes is essential;
- b) that such communications may be required to be continuous or near continuous;
- c) that such communications may be required while the spacecraft are passing over specific points on the Earth's surface;
- d) that a land-based station has only limited visibility of a low-orbiting spacecraft;
- e) that available land-based stations are only able to cover limited portions of any low orbit;
- f) that it is not economically or practically feasible to extend networks of land-based stations to provide full or more complete coverage;
- g) that a data relay satellite (DRS) in geostationary orbit can provide communications between a single earth station and a low-orbiting spacecraft for more than one-half of its orbit (see description in Annex);
- h) that two such DRSs, suitably located in geostationary orbit, with a wide separation angle, can provide communications between two co-located earth stations and a low-orbiting spacecraft almost continuously, with the exception only of a zone of exclusion (ZOE), above the part of the Earth opposite to these earth stations;
- i) that two such DRSs, suitably placed in geostationary orbit, can provide fully-continuous coverage between two separate earth stations and a low-orbiting spacecraft;
- j) that a DRS system comprising two DRSs can serve several user spacecraft simultaneously, and many more user spacecraft by means of time-sharing;
- k) that a DRS system can also serve additional earth stations, either both transmitting and receiving or only receiving signals from user spacecraft;