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Systematization of Information on Various Types of GNSS Receivers and Various Types of Interference

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Background

At ICG-11 (November 2016, Sochi, Russia), **Recommendation 11S.1 ”IMT-GNSS compatibility”** was approved.

At ICG-12 (December 2017, Kyoto, Japan), **Recommendation 12S.1 “RNSS protection criteria”** was approved.

At the 12th Baška GNSS Conference (May 2018), it was proposed to begin work on a **new ICG Recommendation** to protect the GNSS spectrum from radio interference from other services other than the radionavigation satellite service.

The Working Group S meeting in Vienna (June 2018) supported this work on the new **ICG Recommendation**

New ICG Recommendation

Objective: GNSS spectrum protection from non-RNSS radio services interference.

Issues under consideration:

- Acceptable levels of protection from interference and measurement methods
- Monitoring of interference environment
- Identification of interference sources
- Recommendations on the elimination/minimization of interference impact.

First steps:

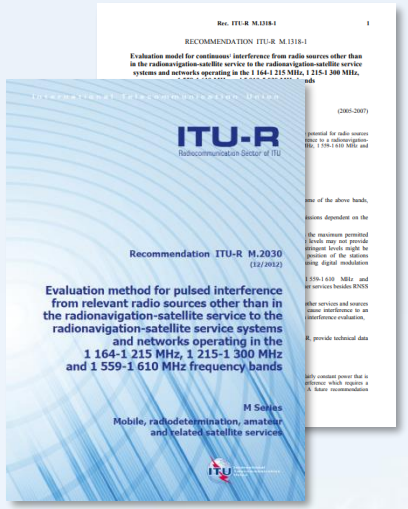
- Systematization and categorization of various types of interference;
- Systematization and categorization of various types of GNSS receivers.

Analyzed sources(1)

- ITU
  - **Recommendation ITU-R M.1902** «Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the band 1 215-1 300 MHz»
  - **Recommendation ITU-R M.1903** «Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) and receivers in the aeronautical radionavigation service operating in the band 1 559-1 610 MHz»
  - **Recommendation ITU-R M.1904** «Characteristics, performance requirements and protection criteria for receiving stations of the radionavigation-satellite service (space-to-space) operating in the frequency bands 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz»
  - **Recommendation ITU-R M.1905** «Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the band 1 164-1 215 MHz»

Analyzed sources(2)

- **ITU**
  - **Recommendation ITU-R M.1318** «Evaluation model for continuous interference from radio sources other than in the radionavigation-satellite service to the radionavigation-satellite service systems and networks operating in the 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz bands»
  - **Recommendation ITU-R M.2030** «Evaluation method for pulsed interference from relevant radio sources other than in the radionavigation-satellite service to the radionavigation-satellite service systems and networks operating in the 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz frequency bands»

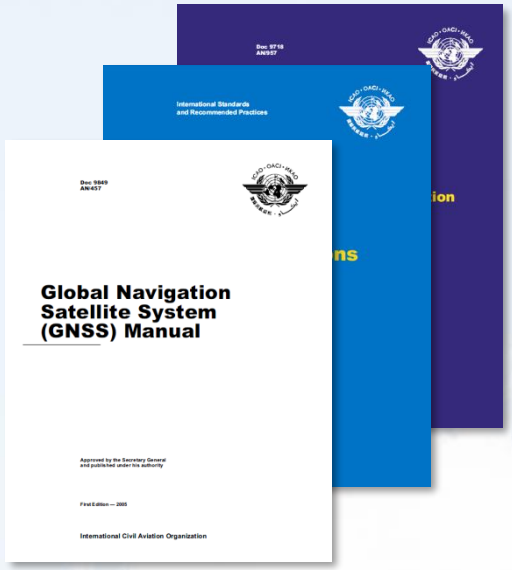


Analyzed sources(3)

- **ITU**
  - **Report ITU-R M.2220** «Calculation method to determine aggregate interference parameters of pulsed RF systems operating in and near the bands 1 164-1 215 MHz and 1 215-1 300 MHz that may impact radionavigation-satellite service airborne and ground-based receivers operating in those frequency bands»
  - **Report ITU-R M. 2305** «Consideration of aggregate radio frequency interference event potentials from multiple Earth exploration-satellite service systems on radionavigation-satellite service receivers operating in the 1 215-1 300 MHz frequency band»

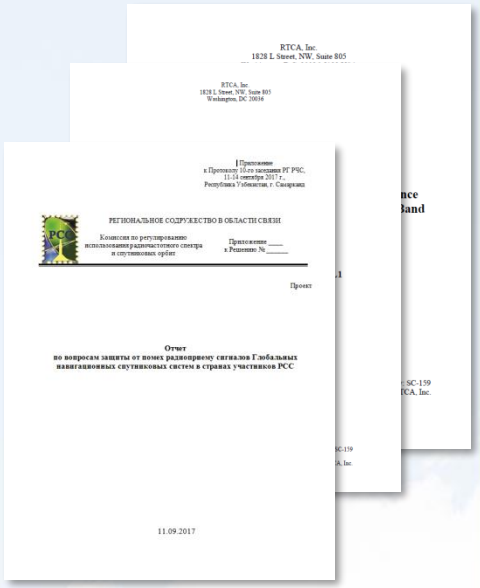
Analyzed sources(4)

- **ICAO**
  - Aeronautical Telecommunications. Annex 10 to the Convention on International Civil Aviation. Volume 1. Radionavigation aids.
  - Global Navigation Satellite System (GNSS) Manual
  - Handbook on Radio Frequency Spectrum Requirements for Civil Aviation.



Analyzed sources(5)

- **RTCA**
  - RTCA/DO-235B «Assessment of radio frequency interference relevant to the GNSS L1 frequency band»
  - RTCA/DO-292 «Assessment of Radio Frequency Interference Relevant to the GNSS L5/E5A Frequency Band»
  - RTCA/DO-368 «Minimum Operational Performance Standards for GPS/GLONASS (FDMA + antenna) L1-only Airborne Equipment»
- **RCC**
  - Report on the issues of protection from interference to RNSS receivers in the countries participants of the RCC



Analysis results(1)

ITU

Receivers

- high precision (M.19xx)
- air-navigation (M.19xx)
- indoor positioning(M.19xx)
- general-purpose(M.19xx)
- space-based (M.19xx)

Interference types

- wideband (M.19xx, 1318, 2305)
- narrowband (M.19xx,)
- pulsed (M. 2220, 2030, in near future M.19xx)

ICAO

Receivers

- high precision
- air-navigation

(GNSS Manual, Annex 10 to the Convention on International Civil Aviation, Handbook on Radio Frequency Spectrum Requirements …)

Interference types

- wideband
- narrowband
- pulsed

(GNSS Manual, Annex 10 to the Convention on International Civil Aviation, Handbook on Radio Frequency Spectrum Requirements …)

Analysis results(2)

RTCA

Receivers

- high precision (DO-235B, DO-292, DO-368)
- air-navigation (DO-235B, DO-292, DO-368)
- maritime (DO-235B)

Interference types

- wideband (DO-235B, DO-292, DO-368)
- narrowband (DO-235B, DO-292, DO-368)
- pulsed (DO-235B)

RCC

Receivers

- high precision
- air-navigation
- indoor positioning
- general-purpose
- space-based

(Report on the issues of protection from interference to RNSS receivers in the countries participants of the RCC)

Interference types

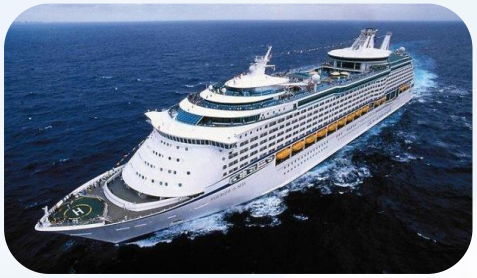
- wideband
- narrowband

(Report on the issues of protection from interference to RNSS receivers in the countries participants of the RCC)

Basic receiver types

Space-based

Air-navigation



Maritime

Ground-based

Basic interference types

- wideband
- narrowband
- pulsed

Further actions

Systematization of protection criteria, and approaches to interference estimation depending on the types of RNSS receivers to elaborate reference values of the electromagnetic environment for their subsequent monitoring to protect GNSS spectrum from radio interference from other radio services other than the radionavigation satellite service.

Interference types / Receiver types	**Wideband**	**Narrowband**	**Pulsed**
Air-navigation	-	-	-
Maritime	-	-	-
Ground-based	-	-	-
Space-based	-	-	-

ICG participants are invited to supplement the proposed material regarding possible types of receivers, and their protection criteria for various types of interference

Thanks for your attention!

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