International Committee on
Global Navigation Satellite Systems

Introduction to National Spectrum Agencies and National Applications

Disclaimer

The views and opinions expressed herein do not necessarily reflect the official policy or position of any government agency

Purpose

- The International Telecommunications Union (ITU) regulates spectrum at the international level
  - Treaty Based Process
- At the national level, the spectrum is managed by each nation's own management office
- The purpose of this presentation is to share a few examples of national spectrum management organizations and illustrate differences in allocation and protection with respect to the ITU

National Spectrum Agency

- National Spectrum Agencies are working to provide an environment in which anyone can safely use radio waves with peace of mind.
- National Spectrum Agencies play an important role, which is to improve/maintain the safety and reliability of radio-communication networks, by such as:
  - Maintaining national laws/regulations/guidelines
  - Managing radio licenses
  - Maintaining radio monitoring systems to counter illegal/unlicensed radio emissions

EU National Spectrum Agencies

- In the EU there is no overall agency responsible for spectrum across the EU
- EU Member States manage their own spectrum individually
- but, there is extensive cooperation both within the EU and in the pan-European collection of regulators "CEPT"
- EU regulators such as ANFR, BNetzA, Ofcom, and Ficora are very active within the EU and CEPT to coordinate European positions for discussion at ITU level
- The Radio Regulations form the basis for spectrum management in Europe

Japan's National Spectrum Agency

- Telecommunication Bureau of MIC (Ministry of Internal Affairs and Communications) is responsible for spectrum management in Japan.
- In Japan, the Radio Regulatory Laws consist of Radio Law, Cabinet Ordinances and Ministerial Ordinances (such as Enforcement Regulations and Regulations for Radio Equipment).
- For Reference;

  http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/index.html

  http://www.tele.soumu.go.jp/e/index.htm

US National Spectrum Agencies

In the US

- There are three categories of allocations
  - Government (Federal)
  - Non-government (includes state and local)
  - Shared
- Spectrum is usually separated and is managed by different agencies
  - Government (Federal) spectrum: National Telecommunications and Information Administration (NTIA)
  - Non-Government (includes state and local) allocations Federal Communications Commission (FCC)
  - NTIA and and FCC coordinate actions for those bands that are “shared” as well as others

International and National Allocations

- In general, the national frequency allocations and protections are aligned with the ITU table of frequency allocation and protection
- However, they are not identical since each nation has sovereign rights to manage its own spectrum (as long as harmful interference into other countries' radio services is not caused)
- Examples follow:

Example 1: US RNSS Allocations

- The US and International RNSS allocation is identical in the 1164-1215 MHz and 1215-1240 MHz frequency band but there is no US RNSS allocation in the 1240-1300 MHz band

Table of Frequency Allocations			941-1435 MHz (UHF)	
International Table			United States Table	
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table
1164-1215 AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.328A			1164-1215 AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328A US224	
1215-1240 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) 5.330 5.331 5.332			1215-1240 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G56 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) G132 SPACE RESEARCH (active) 5.332	1215-1240 Earth exploration-satellite (active) Space research (active)
1240-1300 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) Amateur 5.282 5.330 5.331 5.332 5.335 5.335A			1240-1300 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G56 SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION 5.332 5.335	1240-1300 AERONAUTICAL RADIONAVIGATION Amateur Earth exploration-satellite (active) Space research (active) 5.282

Example 2: Spectrum Policy

- GNSS related Policies/Activities

	Protection of GNSS receivers	Protection from Short-Range Devices
EU	According to the Radio Regulations	No regulation – No short range devices authorized
US	Rules to protect GNSS receivers but not for non-US satellites without waivers	-71.2 dBW/MHz EIRP density limit
Japan	License Control Framework to protect QZSS receivers was settled	-94.3 dBW/MHz EIRP density limit

Take-away

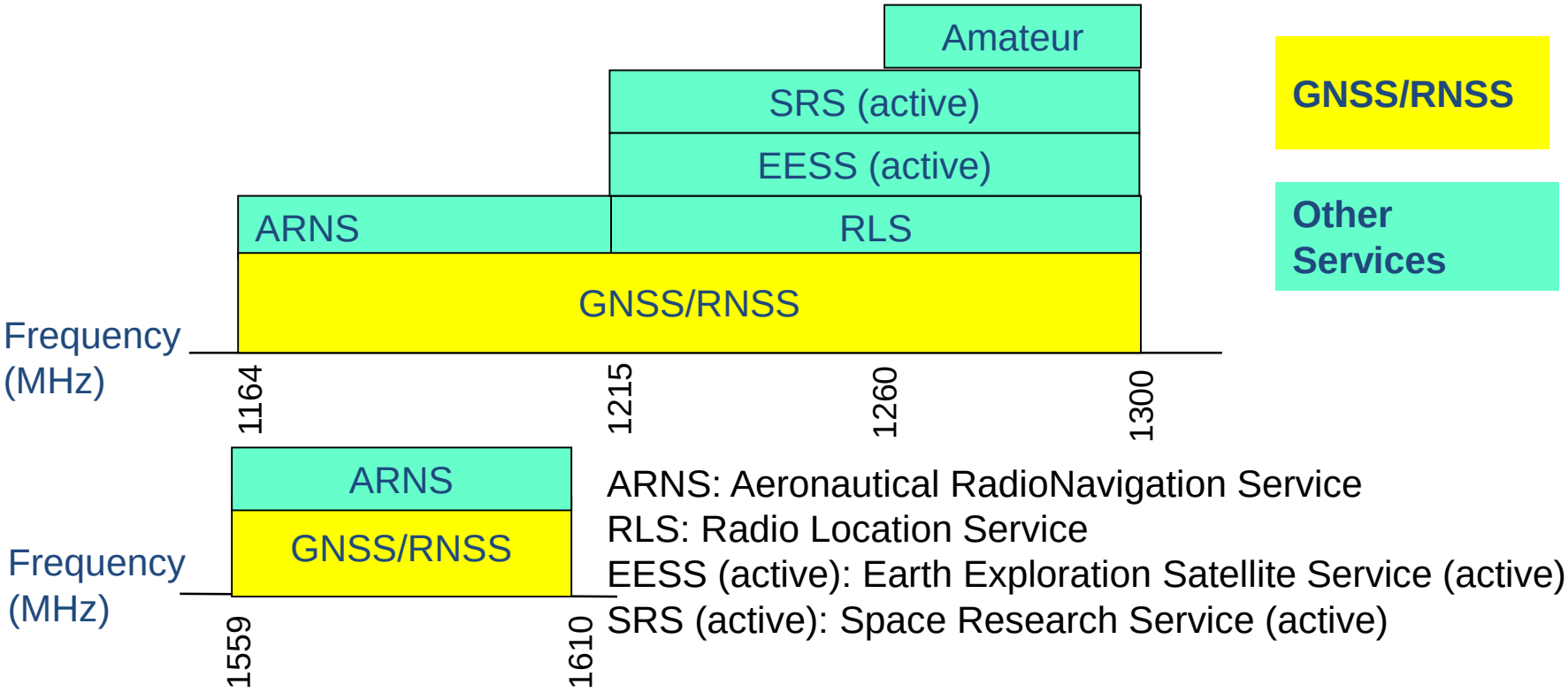
GNSS spectrum protection needs to be at both international and national levels

Detailed Examples of National Spectrum Management

- National Regulators control the following three (3) types of emissions;
  - Radio Service Emissions:
  - ISM Electromagnetic Emissions:
  - Short Range Radio Device Emissions
- Since these emissions are legal, GNSS users must recognize GNSS receivers can potentially exposed to these emissions.

Radio Service Emissions *(1 of 2)*

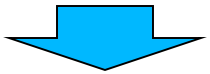
- Since GNSS/RNSS frequency bands are shared with other radio services, GNSS receivers may encounter emissions from such radio services.



Check national frequency allocations in your country!

Radio Service Emissions *(2 of 2)*

- As far as GNSS/RNSS is allocated in domestic allocation, such GNSS/RNSS allocations are expected to be protected by national regulations/guidelines. However, the details of protection may vary among national agencies.
- In case that GNSS/RNSS domestic allocations do not exist, no protection of GNSS/RNSS can be expected.



- Any information is welcomed about details of GNSS/RNSS domestic allocations status, in order to improve interference environment of GNSS receivers.

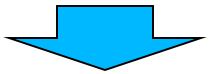
ISM* Electromagnetic Emissions *(1 of 2)*

- Certain levels of electromagnetic emissions from industrial machinery and home appliances should also be recognized.
- International limits for this type of emissions are regulated in IEC CISPR Publication 11.
- Domestic limits for this type of emissions may vary.
  Check national regulations/guidelines in your country!

*: *industrial, scientific and medical (ISM) applications* (of radio frequency energy)*:* Operation of equipment or appliances designed to generate and use locally radiofrequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of *telecommunications*.

ISM Electromagnetic Emissions *(2 of 2)*

- Though ISM electromagnetic emissions are regulated in IEC, no detailed compatibility between CISPR limits and GNSS receivers protection criteria has been studied yet.
- Thus, there is still uncertainty that interference into GNSS receivers may occur even with the emissions from ISM equipment in accordance with CISPR publication 11.



- Any information is welcomed about possible interference incidents from ISM electromagnetic emissions, in order to improve interference environment of GNSS receivers.

Short Range Radio Emissions *(1 of 2)*

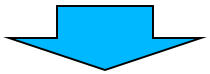
- Most of national agencies prohibit non-licensed emissions except ISM frequency bands. However, some national agencies apply unique regulations to allow extremely low power radio stations to be operated in entire radio frequency bands. Such unique regulations can be significantly different.
  - US: Federal Regulations Title 47, Part 15 (e.g, e.i.r.p. density limit of -71.3 dBW/MHz in L-band)

    http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title47/47cfrv1_02.tpl
  - Japan: Extremely low power radio station (e.g., e.i.r.p. density limit of -94.3 dBW/MHz in L-band)
    http://www.tele.soumu.go.jp/e/ref/material/rule/index.htm

Check national regulations/guidelines in your country!

Short Range Radio Emissions *(2 of 2)*

- Though extremely low power radio emissions for short range communication is allowed in some countries, compatibility between CISPR limits and GNSS receivers protection criteria may not be sufficient.
- Thus, there is still uncertainty that interference into GNSS receivers may occur even with such extremely low power radio emissions.



- Any information is welcomed about possible interference incidents from extremely low power radio emissions, in order to improve interference environment of GNSS receivers.

Remark

- Emissions not categorized in these three (3) ones are illegal. In case you encountered such emissions, you have rights to request such emission to be eliminated.
- GNSS jammers is one example of such illegal emissions. How strictly such prohibition is enforced depends on each national agencies.
- National Regulations/Guidelines can be updated/changed. Be aware of any new potential changes of your national regulations/guidelines which potentially affect GNSS receivers.

Summary

- It is important to have proper knowledge of regulations/guidelines of radio emissions, in order to protect your GNSS use.
- Protection of GNSS use must be implemented by national regulations/guidelines. But levels of protection vary among different national agencies.
- In case of interference incidents on GNSS use, it is encouraged to report such details to GNSS community as well as national agencies, in order to improve the interference environment in GNSS frequency bands.