



Update on the Activities of the IEEE GRSS Frequency Allocations in Remote Sensing (FARS) Technical Committee



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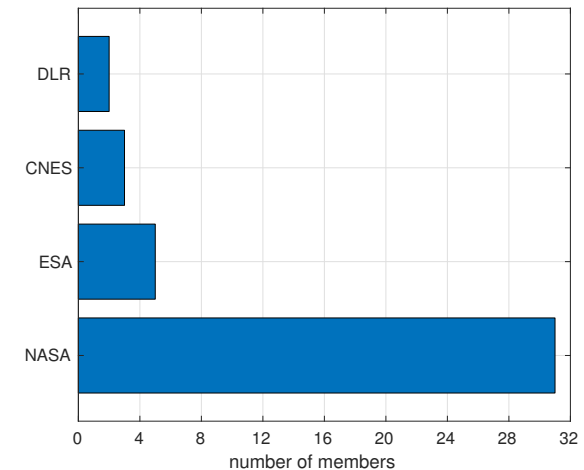
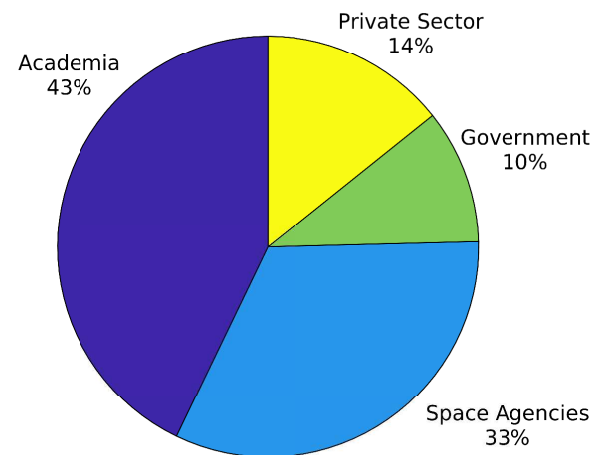
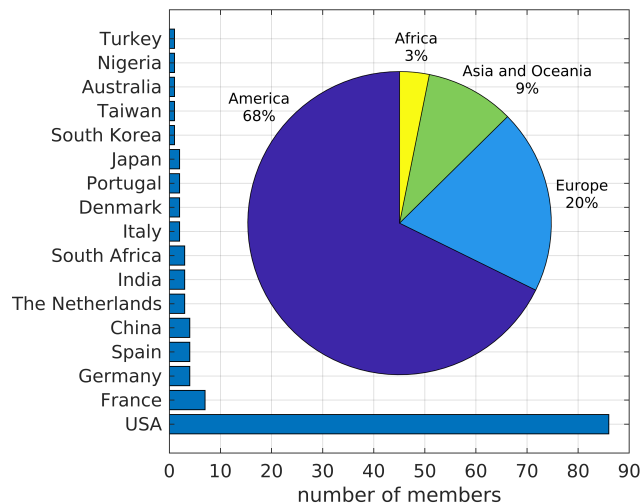
Mission

The Frequency allocations in Remote Sensing Technical Committee goal is to interface between GRSS and the radio-frequency regulatory world by

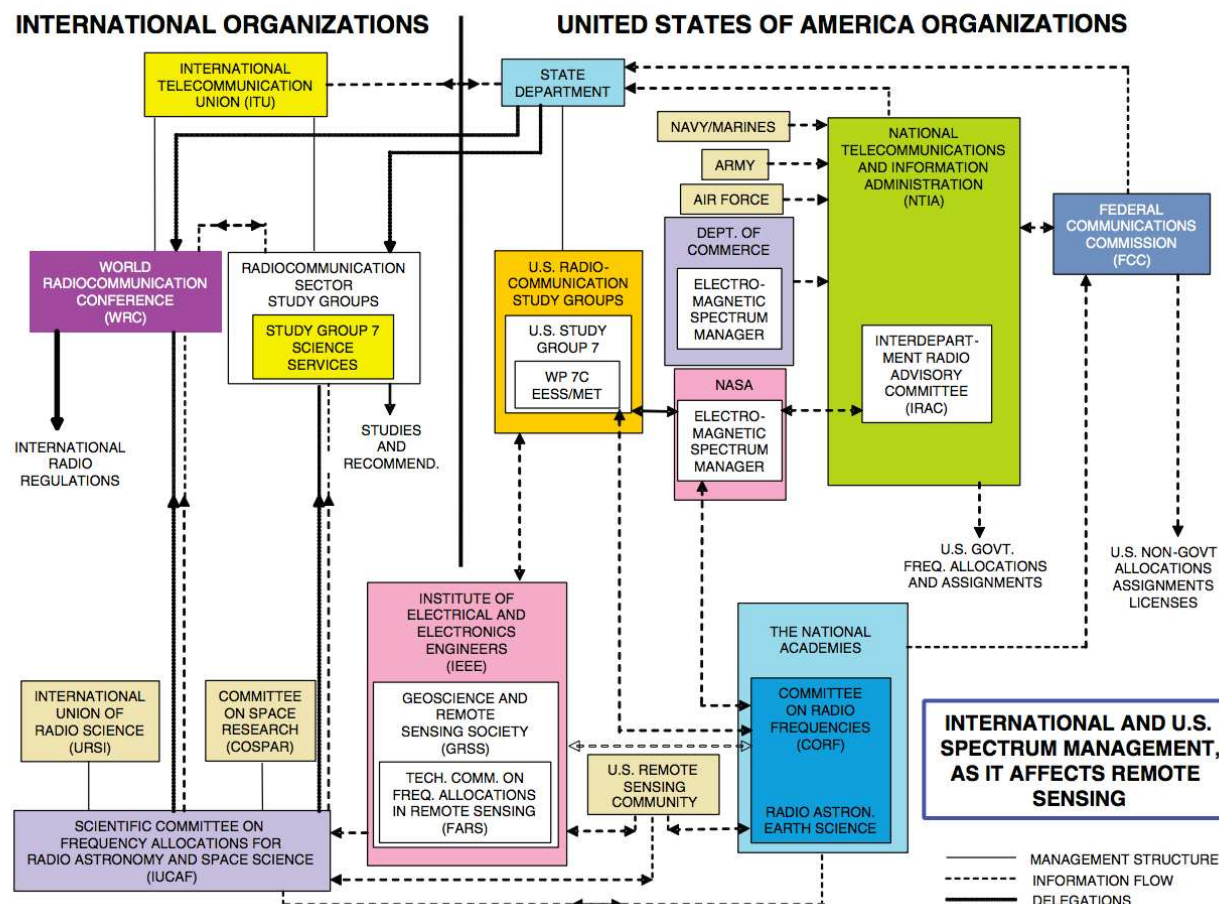
- educating the remote sensing community on spectrum management processes and issues
- promoting the development of radio frequency interference detection and mitigation technology
- organizing technical sessions at conferences, workshops, etc. on the above processes, issues and technologies
- providing spectrum managers and regulators with technical input and perspective from remote sensing scientists and engineers
- fostering the exchange of information between researchers in different fields, such as remote sensing, radio astronomy, telecommunications, etc., with the common scope of minimizing harmful interference between systems

Membership

- 130 members from 17 countries
- majority is from USA, working in academic institutions and space agencies
- more involvement needed from Asia
- more members from less represented space agencies sought



FARS-TC and Other Organizations



Source: Handbook of Frequency Allocations and Spectrum Protection for Scientific Uses, National Academies Press, 2007.

Types of FARS Technical Committee Activities

- academic/educational
 - giving presentations and/or planning technical session at scientific conferences writing technical papers to educate the remote sensing community about spectrum management and RFI issues
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 - organizing conferences, tutorials, etc.
- participation in spectrum management meetings
- interaction with space agencies to report interference and related issues

IGARSS 2019

- the International Geoscience and Remote Sensing Symposium (IGARSS) is the main annual GRSS conference
- the 2019 edition will be held in Yokohama (Japan), from July 28 to August 2, 2019
- FARS-TC has organized:
 - three technical oral session and a poster session on interference and RFI detection techniques in both passive and active sensors
 - a tutorial on spectrum management RFI detection and mitigation in microwave remote sensing
- the FARS-TC annual membership meeting is held during IGARSS



<http://www.igarss2019.org>

RFI 2019 Workshop

- follow-on to a successful RFI 2016 Workshop held in Socorro, NM
- cooperation between remote sensing and radio astronomy community
- opportunity for scientists and engineers affected by RFI to meet, report and discuss recent achievements and developments in instrumentation, methodology and applications to tackle this problem
- RFI 2019 will take place in Toulouse, France on September 23-26, 2019

<http://www.rfi2019.org>



FARS TC Chapter in China

- creation of new chapter that will act as a liaison between the main FARS TC leadership and the Chinese technical/scientific community
 - widespread RFI observed over China and the large number of new remote sensing instruments planned by China in the near future provide good motivation
 - goal is to raise awareness of RFI and spectrum management issues within the local scientific community and enabling it to more effectively initiate change from within China itself
 - inauguration planned for August 2019 with a one-day seminar with lectures on various RFI and spectrum management issues with particular attention to the local national situation

International Spectrum Management Role of FARS-TC

- GRSS is an international society
- as a result, FARS-TC is in the unique position of representing only the remote sensing community without having to compromise its position with other interests
- FARS-TC spectrum management focus is more on international involvement:
 - ITU-R Study Groups
 - GRSS can participate under IEEE
 - as society of IEEE GRSS/FARS-TC has started attending meetings in Geneva in 2018
 - Space Frequency Coordination Group
 - IEEE GRSS is an observer , as society of IEEE
 - number of contributions have been increasing over the years
 - FARS-TC will attend SFCG-38 in Berlin, Germany, in July 2019

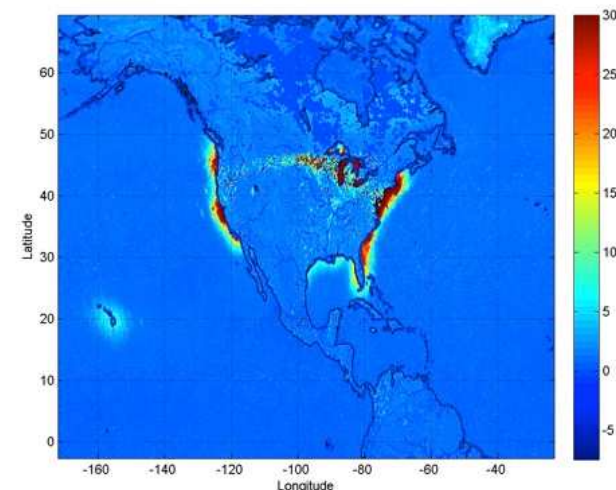
Other Recent Presentations

- **CSSMA-SFCG Workshop**
 - in Washington, DC, on May 10, 2019
 - hosted by the Commercial Smallsat Spectrum Management Association (CSSMA)
 - focus on coordination and interaction between CSSMA and SFCG included speakers from the Space Frequency Coordination Group (SFCG) and a presentation from IEEE GRSS

- **National Spectrum Management Association (NSMA) Annual Conference**
 - in Arlington, VA, on May 14-15, 2019
 - FARS-TC was invited to make a presentation

ITU-R Study Groups Contributions

- contributions have focused on interference issues at 18.6-18.8 GHz
- WP7C May 2018: document is on WRC-19 Agenda Item 1.5 (Earth Stations in Motion)
- WP4A July 2018: contribution on draft CPM text for Agenda Item 1.5
- WP7C September 2018: modifications to draft report on "Analysis of reflected RFI caused to EESS (passive) in the 18.6-18.8 GHz band"
- WP3J/M May 2019: contribution on Model for reflections from water surfaces in the 18.6-18.8 GHz band
- WP7C May 2019: further modification to draft report on RFI caused by reflections in the 18.6-18.8 GHz band"



RFI Observations and Frequency Allocations Tools

Motivation:

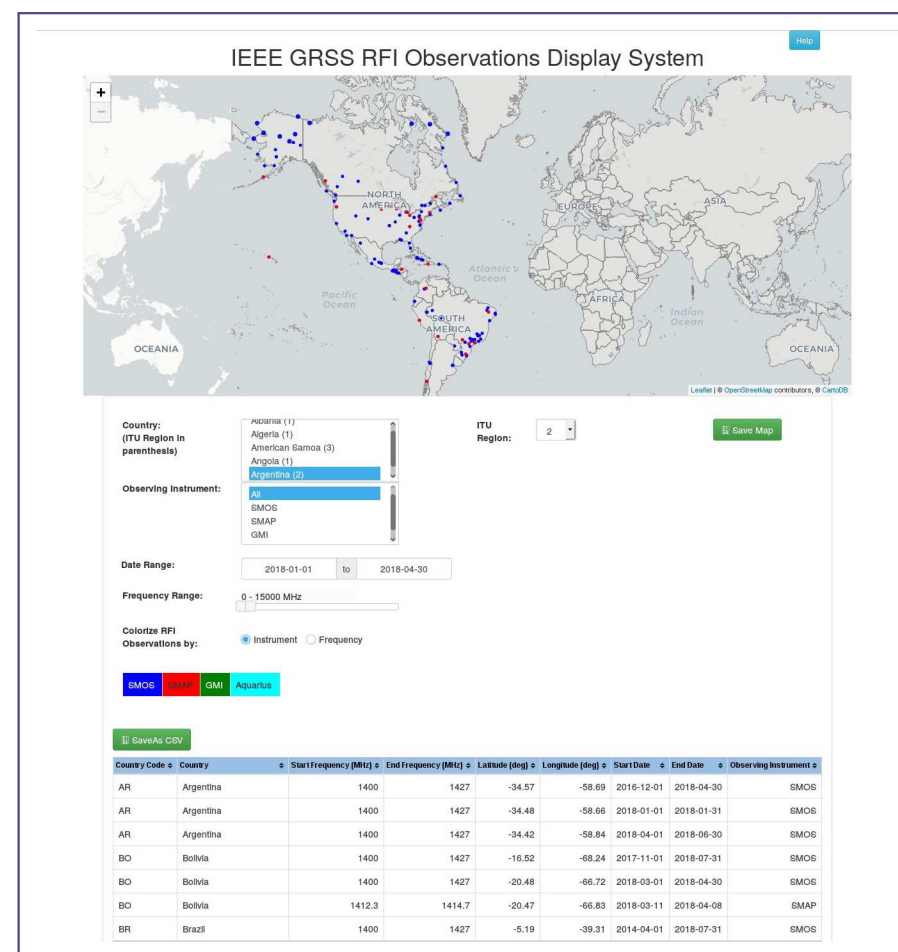
- to increase awareness for the increasingly tight regulations for remote sensing bands and allowable interference levels, along with the actual interference observed in those bands
- to pinpoint regulation enforcement for different regions and countries and allow a free exchange of information between remote sensing scientists and engineers regarding potential interference hazards
- to be used by a community broader than IEEE GRSS
- to aid local authorities in mitigation of non-primary interfering sources globally

RFI Observations and Frequency Allocations Tools

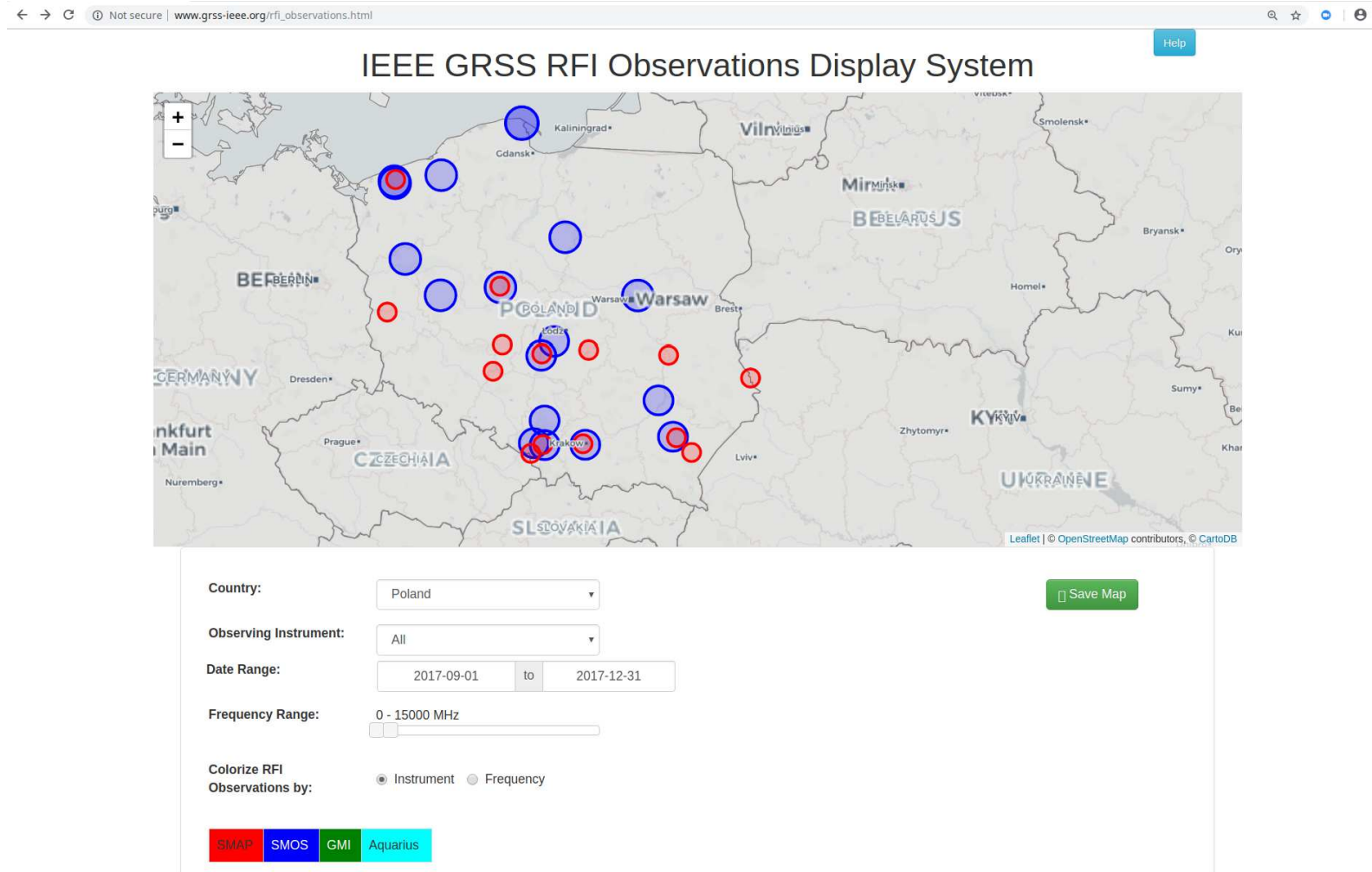
- The online interface currently under development includes two distinct tools:
 - a searchable database of interference observed by some remote sensing instruments
 - a display system for frequency allocations, with particular focus on remote sensing (EESS) bands
- hosted on the GRSS website at
<http://www.grss-ieee.org/fars-tools/>

Database of RFI Observations

- online repository of RFI observations by remote sensing instruments
- RFI data can be selected by:
 - observing sensor
 - country or ITU region
 - frequency
 - time range
- RFI locations are shown on a map and listed in a table
- currently contains SMOS and SMAP data, GMI RFI coming soon
- available on the GRSS website at http://www.grss-ieee.org/rfi_observations.htm



RFI Observations: Graphic User Interface



RFI Observations: List of Locations

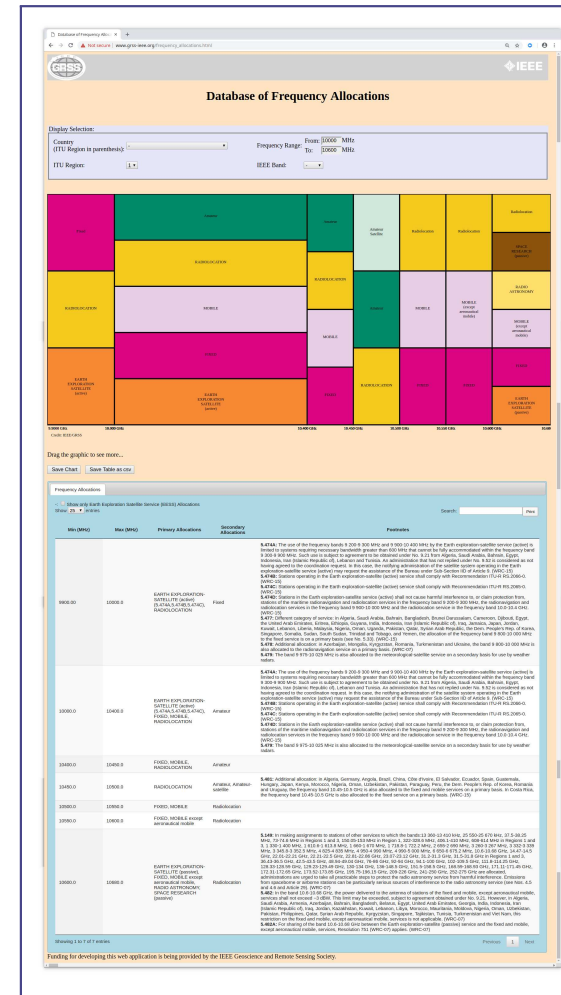
- table can be ordered by column content
- list can be saved as a CSV file

← → ↻ ⓘ Not secure | www.grss-ieee.org/rfi_observations.html 🔍 ☆ ⌂ ⌵

Country & Code	Start Frequency (MHz)	End Frequency (MHz)	Latitude (deg)	Longitude (deg)	Start Date	End Date	Observing Instrument
PL: Poland	1412.3	1414.7	49.90	18.59	2017-09-24	2017-10-22	SMAP
PL: Poland	1412.3	1414.7	49.92	22.48	2017-10-22	2017-11-19	SMAP
PL: Poland	1400	1427	50.03	18.92	2017-09-01	2018-01-31	SMOS
PL: Poland	1400	1427	50.03	19.91	2017-10-01	2018-01-31	SMOS
PL: Poland	1412.3	1414.7	50.04	18.87	2017-10-22	2017-12-17	SMAP
PL: Poland	1412.3	1414.7	50.05	19.85	2017-09-24	2018-04-08	SMAP
PL: Poland	1400	1427	50.06	18.66	2017-12-01	2017-12-31	SMOS
PL: Poland	1412.3	1414.7	50.14	22.12	2017-12-17	2018-03-11	SMAP
PL: Poland	1400	1427	50.16	22.03	2017-09-01	2017-09-30	SMOS
PL: Poland	1400	1427	50.41	18.92	2017-09-01	2017-09-30	SMOS

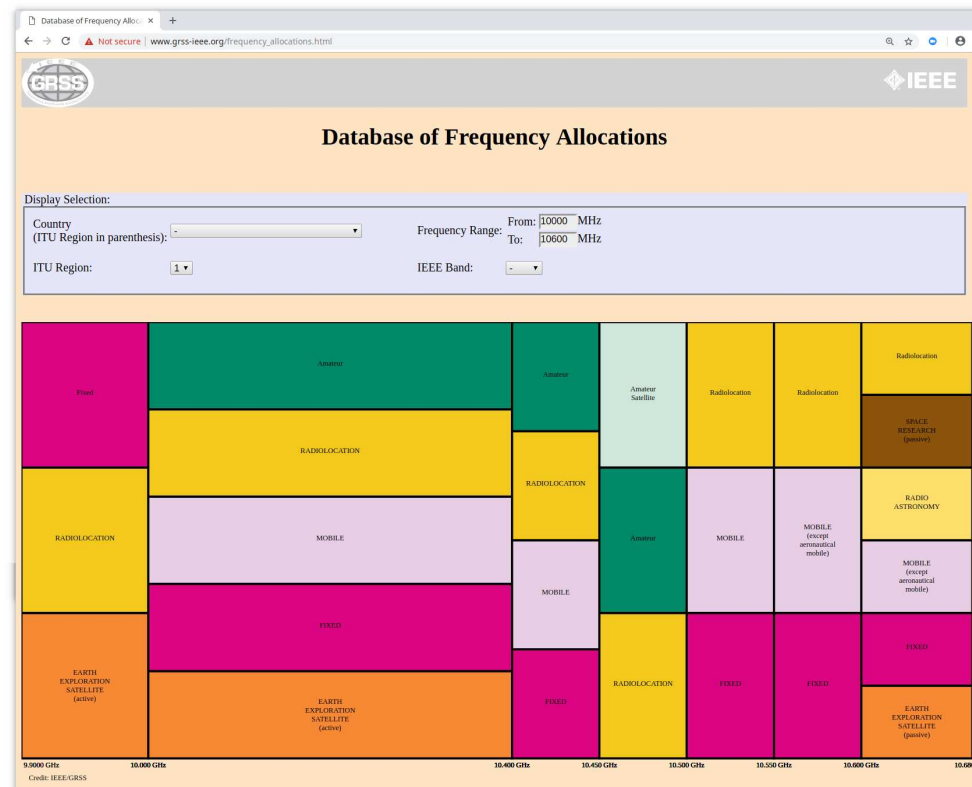
Frequency Allocations Tool

- displays and lists frequency allocations from the Radio Regulations
- selection is possible by:
 - ITU region
 - frequency range
- footnotes are also included
- option to see only EESS band with adjacent allocations
- available on the GRSS website at http://www.grss-ieee.org/frequency_allocations.htm



Frequency Allocations Chart

- new graphical display for allocation bands
- chart can be saved as an image file



Frequency Allocations Table View

Frequency Allocations				
-: ☐ Show only Earth Exploration Satellite Service (EESS) Allocations Show 25 entries				
Min (MHz)	Max (MHz)	Primary Allocations	Secondary Allocations	Footnotes
9900.00	10000.0	EARTH EXPLORATION-SATELLITE (active) (5.474A,5.474B,5.474C), RADIOLOCATION	Fixed	5.474A: The use of the frequency bands 9 200-9 300 MHz and 9 900-10 400 MHz by the Earth exploration-satellite service (active) is limited to systems requiring necessary bandwidth greater than 600 MHz that cannot be fully accommodated within the frequency band 9 300-9 900 MHz. Such use is subject to agreement to be obtained under No. 9.21 from Algeria, Saudi Arabia, Bahrain, Egypt, Indonesia, Iran (Islamic Republic of), Lebanon and Tunisia. An administration that has not replied under No. 9.52 is considered as not having agreed to the coordination request. In this case, the notifying administration of the satellite system operating in the Earth exploration-satellite service (active) may request the assistance of the Bureau under Sub-Section IID of Article 9. (WRC-15) 5.474B: Stations operating in the Earth exploration-satellite (active) service shall comply with Recommendation ITU-R RS.2066-0. (WRC-15) 5.474C: Stations operating in the Earth exploration-satellite (active) service shall comply with Recommendation ITU-R RS.2065-0. (WRC-15) 5.474D: Stations in the Earth exploration-satellite service (active) shall not cause harmful interference to, or claim protection from, stations of the maritime radionavigation and radiolocation services in the frequency band 9 200-9 300 MHz, the radionavigation and radiolocation services in the frequency band 9 900-10 000 MHz and the radiolocation service in the frequency band 10.0-10.4 GHz. (WRC-15) 5.477: Different category of service: in Algeria, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, Cameroon, Djibouti, Egypt, the United Arab Emirates, Eritrea, Ethiopia, Guyana, India, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Japan, Jordan, Kuwait, Lebanon, Liberia, Malaysia, Nigeria, Oman, Uganda, Pakistan, Qatar, Syrian Arab Republic, the Dem. People's Rep. of Korea, Singapore, Somalia, Sudan, South Sudan, Trinidad and Tobago, and Yemen, the allocation of the frequency band 9 800-10 000 MHz to the fixed service is on a primary basis (see No. 5.33). (WRC-15) 5.478: Additional allocation: in Azerbaijan, Mongolia, Kyrgyzstan, Romania, Turkmenistan and Ukraine, the band 9 800-10 000 MHz is also allocated to the radionavigation service on a primary basis. (WRC-07) 5.479: The band 9 975-10 025 MHz is also allocated to the meteorological-satellite service on a secondary basis for use by weather radars.
10000.0	10400.0	EARTH EXPLORATION-SATELLITE (active) (5.474A,5.474B,5.474C), FIXED, MOBILE, RADIOLOCATION	Amateur	5.474A: The use of the frequency bands 9 200-9 300 MHz and 9 900-10 400 MHz by the Earth exploration-satellite service (active) is limited to systems requiring necessary bandwidth greater than 600 MHz that cannot be fully accommodated within the frequency band 9 300-9 900 MHz. Such use is subject to agreement to be obtained under No. 9.21 from Algeria, Saudi Arabia, Bahrain, Egypt, Indonesia, Iran (Islamic Republic of), Lebanon and Tunisia. An administration that has not replied under No. 9.52 is considered as not having agreed to the coordination request. In this case, the notifying administration of the satellite system operating in the Earth exploration-satellite service (active) may request the assistance of the Bureau under Sub-Section IID of Article 9. (WRC-15) 5.474B: Stations operating in the Earth exploration-satellite (active) service shall comply with Recommendation ITU-R RS.2066-0. (WRC-15) 5.474C: Stations operating in the Earth exploration-satellite (active) service shall comply with Recommendation ITU-R RS.2065-0. (WRC-15) 5.474D: Stations in the Earth exploration-satellite service (active) shall not cause harmful interference to, or claim protection from, stations of the maritime radionavigation and radiolocation services in the frequency band 9 200-9 300 MHz, the radionavigation and radiolocation services in the frequency band 9 900-10 000 MHz and the radiolocation service in the frequency band 10.0-10.4 GHz. (WRC-15) 5.479: The band 9 975-10 025 MHz is also allocated to the meteorological-satellite service on a secondary basis for use by weather radars.

Frequency Allocations for EESS

- option to show only EESS bands with information on allocation of neighboring bands

Frequency Allocations							
-: ☒ Show only Earth Exploration Satellite Service (EESS) Allocations Show 25 entries							
Search: Print							
Min (MHz)	Max (MHz)	Primary Allocations	Secondary Allocations	Lower Freq Band (MHz)	Lower Freq Band Allocations	Upper Freq Band (MHz)	Upper Freq Band Allocations
9900.00	10000.0	EARTH EXPLORATION-SATELLITE (active) (5.474A,5.474B,5.474C), RADIOLOCATION	Fixed	9800.00-9900.00	RADIOLOCATION, Earth exploration-satellite (active), Fixed, Space research (active)	10000.0-10400.0	EARTH EXPLORATION-SATELLITE (active) (5.474A,5.474B,5.474C), FIXED, MOBILE, RADIOLOCATION, Amateur
10000.0	10400.0	EARTH EXPLORATION-SATELLITE (active) (5.474A,5.474B,5.474C), FIXED, MOBILE, RADIOLOCATION	Amateur	9900.00-10000.0	EARTH EXPLORATION-SATELLITE (active) (5.474A,5.474B,5.474C), RADIOLOCATION, Fixed	10400.0-10450.0	FIXED, MOBILE, RADIOLOCATION, Amateur
10600.0	10680.0	EARTH EXPLORATION-SATELLITE (passive), FIXED, MOBILE except aeronautical mobile, RADIO ASTRONOMY, SPACE RESEARCH (passive)	Radiolocation	10550.0-10600.0	FIXED, MOBILE except aeronautical mobile, Radiolocation	10680.0-10700.0	EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
Showing 1 to 3 of 3 entries Previous 1 Next							