



Protection of the GNSS spectrum

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INAOE-CRECTEALC

New post-graduate program in GNSS

- CRECTEALC is a small center hosted by INAOE (National Institute for Astrophysics, Optics and Electronics).
- INAOE offers M.Sc. & Ph. D. degrees in astrophysics, optics, electronics and computer science
- Beginning in 2014, INAOE/CRECTEALC offer
 - M. Sc. in Space Science and Technology;
 - Students specialize in: RS/GIS, SatCom, Space Environment (NEOs, Space Weather), or **GNSS**
 - Ph. D. in Space Science and Technology from January 2017



Regional Centre for Space Science and Technology Education for Latin America and the Caribbean

2016 report of the Scientific and Technical Subcommittee –
A/AC.105/1109 - United Nations

- 140. The Subcommittee also noted that the regional centres for space science and technology education, affiliated to the United Nations, which also served as information centres for ICG and its Providers' Forum, were working towards the establishment of a network of institutions involved or interested in GNSS.



Regional Centre for Space Science and Technology Education for Latin America and the Caribbean (CRECTEALC)

- CRECTEALC serves as an Information Centre for ICG and its Providers' Forum;
- CRECTEALC is contributing towards the establishment of a network of institutions involved or interested in GNSS; one of the recommendations of ICG's WG-C.
- Space policy and space law workshops (2016) – **included the importance of protecting the GNSS spectrum**
 - Managua, Nicaragua (May 2016)
 - RCSSTEAP - China (September 2016)



Future GNSS work at CRECTEALC

- Further develop the use of GNSS in modelling of formation flying.
- CRECTEALC signed a Memorandum of Understanding (Nov. 2016) with Samara State Aerospace University (Russia) to strengthen, promote and develop academic and research co-operation.
 - Use of GLONASS and other GNSS systems
 - Exchange of professors, students
 - Sabbatical year
- Will sign similar MOU with RCSSTEAP (China)



Use multi-GNSS resources

Proposal: PNTAB should promote the use of multi-GNSS

- GPS, GLONASS, Galileo, Beidou, the four global PNT systems will soon be interoperable
- Except for identified national security applications, they should be used as systems complementary to GPS
- There will be a learning curve in deciding in which critical infrastructures to use any, or more, of the signals in case of a GPS outage ... and how
- Their use does not negate the development of an eLoran or any other GPS complementary



Protecting the GNSS spectrum - International activities

Protection initiatives are ongoing in several fora

ICG

The Working Group on Systems, Signals and Services (WG S), through its Compatibility and Spectrum Protection subgroup decided to continue addressing the need for worldwide GNSS spectrum protection through an updated

- Recommendation for ICG member administrations to encourage protection of Radio Navigation Satellite Service (RNSS) spectrum from the unwanted emissions; and
- Efforts to encourage reporting on domestic RNSS spectrum protection through the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space: 2017 and beyond



Protecting the GNSS spectrum International activities

United Nations - STSC 2016 report – A/AC.105/1109

- 145. The Subcommittee noted the proposal by ICG that the Subcommittee explore, at its next session in 2017, the feasibility of a focused review, within its current agenda item on recent developments in global navigation satellite systems, of issues related to GNSS spectrum protection and interference detection and mitigation. The Subcommittee also noted that the intent behind the proposal was to **raise awareness of this issue among States** members of the Committee on the Peaceful Uses of Outer Space as part of efforts to achieve the overall goal of promoting effective use of GNSS open services by the global community.



Protecting the GNSS spectrum International activities

UN COPUOS Guidelines for the long-term sustainability of outer space activities (as of Feb. 2017)

Space-related

•4.3 Consistent with the purpose of article 45 of the ITU Constitution, States and international intergovernmental organizations should **ensure that their space activities are conducted in such a manner as not to cause harmful interference with the reception and transmission of radio signals related to the space activities of other States and international intergovernmental organizations, as one of the means of promoting the long-term sustainability of outer space activities.**

Space and ground-related

•4.4 In their use of the electromagnetic spectrum, States and international intergovernmental organizations **should consider the requirements for space-based Earth observation systems and other**



Use multi-GNSS resources

Goal: UNGA to invite MS to report on IDM measures

Proposal: PNTAB should

- Make technical presentations/statements at the sessions of the STSC (30 January – 10 February 2017) in Vienna
 - The nature of the problem
 - The importance of the use of GNSS in every country's social and economic state and development
 - Capacity needs/resources to carry out IDM



THANK YOU!

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