

International Committee on Global Navigation Satellite Systems: Programme on GNSS Applications

(online) African Workshop on Global Navigation Satellite Systems and Space Weather

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International Committee on GNSS (ICG)

- UNOOSA serves as the executive secretariat of ICG
- Established in 2005, ICG provides a mechanism for multilateral discussion and coordination on GNSS issues of concern
- Encourages **coordination** among GNSS providers
- **Promotes** the introduction and utilization of GNSS services in developing countries
- **Assists** GNSS users with their development plans and applications
- Contributes to the **sustainable development** of the world
- Assure GNSS **interoperability and compatibility** among providers and users globally for enhanced services and applications





ICG: Working Groups

- **Systems, Signals and Services (*United States & Russian Federation*)**: Compatibility and spectrum protection; interoperability and service standards; system-of-system operations
- **Enhancement of GNSS Performance, New Services and Capabilities (*India, China & ESA*)**: Future & novel integrity solutions; implementation of interoperable GNSS Space Service Volume (SSV) and its evolution; *examination of performance of atmospheric models, establish dialogue with space weather/RS community*
- **Information Dissemination and Capacity Building (*UNOOSA*)**: Focused on education and training programmes, *promoting GNSS for scientific exploration (incl., space weather and its effects on GNSS)*
- **Reference Frames, Timing and Applications (*IAG, IGS & FIG*)**: Focused on monitoring and reference station networks



Working Group Systems, Signals and Services (S)

The subgroup on compatibility and spectrum protection:

- continued its campaign to promote adequate protection of GNSS spectrum through education and outreach;

<http://www.unoosa.org/oosa/en/ourwork/icg/working-groups/s/IDMIndex.html>

- continued to investigate methods of implementing interference detection and mitigation capabilities through permanent network-based solutions and through crowdsourcing techniques
- ***Recommendation (ICG-14): GNSS Spectrum Protection Booklet***
- *Fundamentals of GNSS; Interference and Spectrum Management; Interference Threats; Methods of Interference Detection and Mitigation; Current Interference Challenges*



Working Group Enhancement of GNSS Performance, New Services and Capabilities (B)

Recommendation (ICG-14): Release of GNSS Transmit Antenna Patterns including Side Lobes

GNSS Service Providers consider

- releasing the antenna gain patterns or equivalent representative modelling information (including both main lobe and side lobes for each frequency, for open services) for each of the transmit antennas of the GNSS satellites in the respective satellite constellations in order to enable and/or improve the use of GNSS in the SSV

For future satellite developments

- GNSS Service Providers consider conducting antenna gain measurements, testing and/or characterization, including both main lobe and side lobes for each open service signal.



Working Group Enhancement of GNSS Performance, New Services and Capabilities (B)

- All providers have agreed on the information presented in this booklet, and on several recommendations to continue development, support, and expansion of the multi-GNSS SSV concept.
- This publication, and the work of WGB, show the significant value of GNSS SSV for a much wider scope of future space exploration activities for countries all over the world.
- GNSS SSV and its potential augmentations can enable ambitious future missions and activities in the context of space exploration going beyond low-Earth orbit to the Moon, Mars and other celestial bodies.



http://www.unoosa.org/res/oosadoc/data/documents/2018/stspace/stspace75_0_html/stspace_75E.pdf



Working Group Reference Frames, Timing and Applications (D)

Specific progress **on monitoring the offsets between GNSS times:**

- Studies have been conducted by some Providers and the timing community identifying several methods to improve their time offset determination and impact on positioning;
- Additional work is necessary for the Providers to assess the accuracy goals in the determination of the GNSS time offsets and impact on positioning, so as to specify a recommended method to determine and monitor them;
- To continue to work together (WG C and D) and contribute to capacity building on GNSS and utilization of GNSS in Geodesy and Reference Frames;



ICG: Programme on GNSS applications

❖ **United Nations Regional Workshops/training courses on the use and applications of GNSS**

- to reinforce the exchange of information between countries and scale up the capacities in the region for pursuing the application of GNSS solutions;
- to share information on the national, regional and global projects and initiatives, which could benefit the regions; and
- to enhance cross-fertilization among them



ICG: Programme on GNSS applications

- **Sustainability and modernization of GNSS continuously operating reference stations and geospatial infrastructure through capacity development (WGD):** to provide information on the importance of planning and its link to the “why, what and how” of developing long-term capability with respect to GNSS and geospatial infrastructure and related activities:
- There was a need for standards and procedures that were “fit for purpose”, including consolidated checklists that would serve to ensure consistent and sustainable use of GNSS, and related activities in the regions;
- Engagement with the private sector, especially for training, data provision and processing, was encouraged.



ICG: Programme on GNSS applications

❖ Space Weather and GNSS (WGB&C)

- Promotes the use of GNSS for scientific applications and space weather in developing countries
- Increased number of students and young scientists studying and using GNSS, including increasing participation by women, and many opportunities for research (improved imaging of the ionosphere over the equatorial region, ionospheric effects on augmentation systems...)
- *In cooperation with the Institute for Scientific Research at Boston College, the United States, and the Abdus Salam International Centre for Theoretical Physics, Italy: A series of outreach workshops on space weather effects on GNSS operations*



ICG: Programme on GNSS applications

2021: African Workshop on GNSS and Space Weather, Rabat, Morocco

- To provide updated knowledge of how GNSS operate and their applications; to describe the science of SW; and how to perform ionospheric and SW research with GNSS data
- Introduction to Global Navigation Satellite Systems
- GNSS Applications
- Ionospheric Total Electron Content
- Scintillation
- Ionospheric Modeling
- Space Weather
- The Sun-Earth Connection
- Hands-on laboratories





Conclusion

- The activities and opportunities provided through the ICG result in the development and growth of capacities that will enable each country to enhance its knowledge, understanding and practical experience in those aspects of GNSS technology that have the potential for a greater impact on its economic and social development, including the preservation of its environment
- The ICG is an important vehicle in the multi-lateral arena, as satellite-based positioning, navigation and timing becomes more and more a genuine multinational cooperative venture

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