



U.S. GPS/GNSS International Activities Update

Civil GPS Service Interface Committee Meeting

Portland, Oregon

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U.S. Policy Promotes Global Use of GPS Technology

- No direct user fees for civil GPS services
 - Provided on a continuous, worldwide basis
- Open, public signal structures for all civil services
 - Promotes equal access for user equipment manufacturing, applications development, and value-added services
 - Encourages open, market-driven competition
- Global compatibility and interoperability with GPS
- Service improvements for civil, commercial, and scientific users worldwide
- Protection of radionavigation spectrum from disruption and interference



*GNSS: A **Global Navigation Satellite System of Systems***

- Global Constellations

- **GPS (24+3)**
- GLONASS (24+)
- GALILEO (24+3)
- BDS/BEIDOU (27+3 IGSO + 5 GEO).

- Regional Constellations

- QZSS (4+3)
- IRNSS/NAVIC (7)

- Satellite-Based Augmentations

- **WAAS (3)**
- MSAS (2)
- EGNOS (3)
- GAGAN (3)
- SDCM (3)





U.S. Objectives in Working with Other GNSS Service Providers

- Ensure **compatibility** — ability of U.S. and non-U.S. space-based PNT services to be used separately or together without interfering with each individual service or signal
 - Radio frequency compatibility
 - Spectral separation between M-code and other signals
- Achieve **interoperability** – ability of civil U.S. and non-U.S. space-based PNT services to be used together to provide the user better capabilities than would be achieved by relying solely on one service or signal
- Promote fair competition in the global marketplace

Pursue through Bilateral and Multilateral Cooperation



Bilateral Cooperation

China

- First bilateral space-based PNT related meeting on civil cooperation held May 2014 in Beijing
- Second bilateral space-based PNT meeting held June 2015 in Washington, D.C.
- Working Group and Subgroups focused on Interoperability, Aviation and Service Center Cooperation continue to meet as needed

India

- U.S.–India Joint statement signed in 2007
- ITU compatibility coordination completed between GPS and IRNSS/NAVIC
- U.S.-India Civil Space Joint Working Group (CSJWG) met in September 2015, in Bangalore



Bilateral Cooperation (cont)

Europe

- GPS-Galileo Cooperation Agreement signed in 2004
- ITU compatibility coordination completed under Working Group A in July 2014
- Working Group B (Trade & Civil Applications) met March 2016 in Munich
- Working Group C (Next Generation GNSS) met April 2016 in Spain
- 8th U.S.-EU Space Dialogue hosted by U.S. in December 2015

Japan

- Civil Space Dialogue held in Tokyo in September 2015
- U.S. continues to host QZSS monitoring stations in Hawaii and Guam
- ITU compatibility coordination between GPS and QZSS (four satellite configuration) completed in 2015



Additional Bilateral Cooperation Related to Space and PNT

- ***Canada:*** Civil GNSS meeting held in Ottawa – May 2015
 - Agreed to expand cooperation on interference detection and mitigation, jammer enforcement, and geodetic network ground station coverage in Canada
- ***Republic of Korea:*** 2nd bilateral Civil Space Dialogue held in Seoul – April 2016
 - Discussion about Korea's development of their SBAS
- ***Vietnam:*** First U.S.-Vietnam Civil Space Dialogue held in Washington – December 2014
- ***Australia:*** Joint Delegation Statement on Cooperation in the Civil Use of GPS in 2007
 - Last formal space bilateral meeting held in October 2010
 - Informal discussions held regularly



International Committee on Global Navigation Satellite Systems (ICG)

- Emerged from 3rd UN Conference on the Exploration and Peaceful Uses of Outer Space July 1999
 - Promote the **use of GNSS** and its **integration into infrastructures**, particularly in developing countries
 - Encourage **compatibility and interoperability** among global and regional systems
- Members include:
 - **GNSS Providers:** (U.S., EU, Russia, China, India, Japan)
 - Other Member States of the United Nations
 - International organizations/associations



<http://www.unoosa.org/oosa/en/ourwork/icg/icg.html>



U.S. Hosted 10th ICG Meeting (ICG-10): 1-6 November 2015

- Meeting held in Boulder, Colorado at University Corporation for Atmospheric Research (UCAR)
- More than 200 participants
 - Representatives from 28 countries/organizations
 - Representation from all 6 GNSS Providers
- Panel of Experts Session
 - GNSS: Today and Preparing for the Future
- Applications and Experts Session
 - Observing Earth Processes using GNSS
- Local Tours Included:
 - National Space Weather Prediction Center
 - Time and Frequency Laboratory
 - UNAVCO (facilitates geoscience research and education using geodesy)



UCAR Center Green Facility





ICG-10: Significant Accomplishments and Recommendations

- Interference Detection and Mitigation (IDM) & Spectrum Protection
 - Recommendation for Providers to promote the implementation of protection measures of GNSS operations around the world
 - Recommendation for ICG presentation to UN Committee on the Peaceful Uses of Outer Space (COPUOS) - Focused on National Efforts to protect RNSS Spectrum, and pursue Interference Detection and Mitigation in Member States
- Interoperability
 - Discussion about GNSS system time and signals, based on 5 system provider workshops held between 2013 and 2015
- International Multi-GNSS monitoring (IGMA)
 - Existing civil service centers working to establish a link to a new ICG web portal allowing users to easily find GNSS monitoring information and products
 - Recommendation to initiate a trial project between the ICG and IGS to demonstrate a global GNSS Monitoring and Assessment capability



ICG-10: Significant Accomplishments and Recommendations (continued)

- Space Service Volume (SSV)
 - Progress on developing definitions and assumptions for an interoperable SSV
 - Providers to report on new Spaceborne GNSS receiver developments within their region
- Space Weather
 - Presentation/discussion on new U.S. Space Weather Strategy (includes section on international cooperation)
- Orbital Debris Mitigation
 - U.S. presentation on orbital debris strategies in Medium Earth Orbit (MEO)
- Service Center Cooperation
 - Recommendation to develop a template for cooperation between GNSS provider user information centers

***ICG-11: Hosted by the Russian Federation in Sochi,
7-11 November 2016***



ICG Experts Meeting and Seminar on Spectrum Protection & IDM

- Organized by UN Office for Outer Space Affairs (OOSA), through its Program on GNSS Applications
 - Held at UN Vienna International Centre, December 14-18, 2015
 - Approximately 60 experts participated, representing 33 countries/organizations
- Two Day Seminar on Spectrum Protection and IDM
 - Organized and presented by experts from U.S., EU, Japan & ITU
 - Objective: Provide an overview of GNSS spectrum protection and management with a focus on developing nations and other non-GNSS providers
 - Agenda topics included
 - Introduction to GNSS
 - Spectrum Management
 - Spectrum Protection
 - Interference Detection and Mitigation



Other International Activities/Events

The U.S. participated in the following GNSS Related events in 2016:

- International GNSS Service (IGS) 2016 Workshop in Sydney, Australia – February 2016
- Munich Satellite Summit – March 2016
- APEC GNSS Implementation Team Meeting in Papua New Guinea – April 2016
- Royal Institute of Navigation Vulnerabilities Conference in Baska, Croatia – May 2016
- China Satellite Navigation Conference in Changsha, China – May 2016
- International Committee on GNSS (ICG) Intersessional Meetings and Providers' Forum Meeting, Vienna, Austria – June 2016



Summary

- U.S. policy encourages the worldwide use of civil GPS services and cooperation with other GNSS providers
 - Compatibility, interoperability, and transparency in civil service provision are priorities
- U.S. hosted ICG-10 meeting was a success with progress on multilateral cooperation in the areas of interference detection and mitigation, interoperability and civil signal monitoring
- International outreach is a priority, through participation in public events and multilateral fora