



International Federation of Surveyors  
Fédération Internationale des Géomètres  
Internationale Vereinigung der Vermessungsingenieure

## Commission 5

Positioning and Measurement (2007-2010)

[www.fig.net/figtree/commission5](http://www.fig.net/figtree/commission5)

# Newsletter March 2010

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## FIG Commission 5 in 2009

### General

In 2009 Commission 5 - Positioning and Measurement - has effectively used FIG events or symposia and our existing relationship with sister or like organisations to fulfil the objectives of our work plan and the needs of members. The focus on spaced based measuring techniques such as GNSS observations or satellite imagery continues to expand into non traditional surveying applications. For example, positioning and geodetic systems that were once specific for land administration are now emerging as integral infrastructure for other industries such as machine guidance, asset and resource supervision, and disaster management. There was also a renewed vigour and interest into global observing systems to assist with the monitoring and measuring of the earth's dynamics and the changes that are occurring as a result of global changes.

Although these were popular topics in 2009, the technical fundamentals of positioning and measurement such as instrument calibration, standards transformations, network adjustments,, and new observing or processing techniques were also prevalent themes at Commission 5 related conferences or workshops.

### Highlights of Working Groups

*WG 5.1 - Standards, Quality Assurance and Calibration - Chaired by David Martin*

- Discussions and work on standards relating to - ISO 17123-4 Electro-optical distance meters (EDM instruments); ISO 17123-8 GNSS CORS Infrastructure and Standards

*WG 5.2 - Reference Frame in Practice - Chaired by Mikael Lilje*

- Facilitation of technical and discussion forums on GNSS CORS infrastructure and reference frames
- Involvement with the Asia Pacific Reference Frame project and support for the Global Geodetic Observing System.

*WG 5.3 - Integrated Positioning, Navigation and mapping Systems - Co-chaired by Andrew Hunter and Naser El-Sheimy*

- Assistance with the 6th International Symposium on Mobile Mapping Technology, which was held in July 2009 at the São Paulo State University, Brazil.

*WG 5.4 - Global Navigation Satellite Systems - Chaired by Volker Schweiger*

- The development and production of "Cost Effective GNSS Positioning Techniques" publication.

- Assisted with the acquisition of kinematic GPS tracks that will be used to evaluate the TanDEM-X digital elevation model

### Co-operation with Other Organisations

Through out 2009 Commission 5 continued interaction with FIG Commissions 4 and 6, but also enhanced relationships with sister or like organisations such as -

- International Association of Geodesy (IAG),
- Institution of Navigation (ION)
- Permanent Committee for GIS Infrastructure Asia - Pacific (PCGIAP), and
- The United Nations committee - International Committee on Global Navigation Satellite Systems (ICG)

### Events in 2009

FIG Commission 5 actively participated at the following events -

- ION International Technical Meeting in Anaheim, USA - January 2009
- The Task Forces on Geodetic References and on Time References of the UN International Committee on GNSS Meeting Paris, France - February 2009
- FIG - World Bank Conference, Washington D.C., USA - March 2009
- FIG Working Week held in Eilat, Israel - May 2009
- International Symposium on Mobile Mapping Technology, in July 2009 at the São Paulo State University, Brazil
- South East Asia Survey Congress in Bali, Indonesia - August 2009
- IAG Scientific Assembly "Geodesy for Planet Earth" in Buenos Aires, Argentina - August 2009
- International Committee on Global Navigation Satellite Systems (ICG), met in St Petersburg, Russia - September 2009
- INTERGEO 2009 in Karlsruhe, Germany - September 2009

- FIG-Regional Conference Hanoi, Vietnam - October 2009
- International GNSS Symposium held on the Gold Coast, Australia - December 2009.

A more detailed report on our annual activities and working group progress will be presented in Sydney at the XXIV FIG International Congress, 11-16 April.



### Chairs Comment on 2009

2009 was another busy year for Commission 5. We have successfully represented and raised our profile on the international surveying scene. I also hope we have delivered a quality technical program at our events and have serviced our delegates / members appropriately. I would like to thank my team for their excellent efforts and support in 2009.

I look forward to see you all in Sydney very soon.

Rudolf Staiger

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## OPENING MEETING FIG International Congress in Sydney 12 April 2010

An open meeting for all Commission 5 delegates will be convened at the FIG International Congress in Sydney. The meeting will be held at the Sydney Conference & Exhibition Centre, Room -

Bayside 102, Monday 12 April 2010, and starting at 0800.

### Draft Agenda

- Welcome
- Technical Sessions in Sydney
- 2007-10 Work Plan and Progress
- Update on liaisons with the UN, IAG, ION, PCGIAP and any other major projects
- Overview of proposed Work Plan for 2011-14
- Coming Events
- Open Discussion

For back ground information about FIG Commission 5 please refer to our web site <http://www.fig.net/figtree/commission5/>

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## TECHNICAL PROGRAM FIG International Congress in Sydney

The proposed technical program for Commission 5 in Sydney will be huge. The current sessions relating to positioning and measurement themes are -

### Monday 12 April

- TS 1C - Geodetic Infrastructure and Datum
- TS 1D- Deformation Measurement of Structures Using GNSS
- TS 1H - Measurements for Mapping and Land Administration
- FS 1C - Geoid and Gravity - Modelling, Measurements and Applications
- FS 1H - GNSS CORS Networks - Positioning Infrastructure, Analysis and Applications I

### Tuesday 13 April

- TS 2C - Low Cost GNSS and New Positioning Techniques
- TS 2D - Deformation Measurement Using GNSS
- FS 2C - Positioning Measurement Techniques and Applications I
- FS 2H - GNSS CORS Networks - Positioning Infrastructure, Analysis and Applications II

- TS 3C - GNSS CORS Networks - Positioning Infrastructure, Analysis and Applications I
- TS 3H - Remote Sensing and Imagery I
- TS 3I - Positioning Techniques for Hydrography
- TS 4C - GNSS CORS Networks - Positioning Infrastructure, Analysis and Applications II
- TS 4H - Remote Sensing and Imagery II

### Wednesday 14 April

- TS 5C - Instrument Calibration
- FS 3C - Positioning and Measurement Techniques and Applications II
- FS 3H - Remote Sensing and Optical Techniques I
- TS 6C - GGOS and APREF I
- TS 6D - Quality Management and Standards
- TS 6I - Technology in Land Administration
- TS 7C - GGOS and APREF II
- TS 7D - LIDAR and InSAR Usage in Surveying
- TS 7J - Forum - Modern Positioning Infrastructure and Technology for Land Administration Projects

### Thursday 15 April

- TS 8C - New GNSS Applications and Developments
- TS 8D - Photogrammetry, RMS and Image Data Processing
- TS8F- GNSS CORS Networks - Positioning Infrastructure, Analysis and Applications III
- FS 4C - Adjustment Techniques and Reference Frames
- FS 4H - Remote Sensing and Optical Techniques II
- TS 9C - Standards
- TS 10C - GNSS Modernisation and Trends
- TS 10I - Vertical Reference Frame

For more information about the Congress, that is registration, refer to the web site - [www.fig2010.com](http://www.fig2010.com)

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## COMING EVENTS in 2010

9-11 March, Bonn, Germany  
2nd International Conference on Machine  
Control & Guidance.

Co-sponsored by FIG Commission 5 and 6.

Web site: [www.mcg.uni-bonn.de](http://www.mcg.uni-bonn.de)

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XXIV FIG International Congress and  
XXXIII General Assembly  
Facing the Challenges - Building the  
Capacity.

11-16 April, Sydney, Australia

Web site: [www.fig2010.com](http://www.fig2010.com)

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EUREF-Symposium

1-5 June in Gavle, Sweden

Web site: [www.lantmateriet.se/euref2010](http://www.lantmateriet.se/euref2010)

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2010 Workshop - International GNSS  
Service (IGS)

Newcastle upon Tyne (UK) June - July

Webs site:

<http://www.ceg.ncl.ac.uk/igs2010/>

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International Association of Geodesy  
School on Reference Frames  
June 7-12, 2010, Aegean University,  
Mytilene, Lesvos Island, Greece.

Website:

[http://www.topo.auth.gr/IAG2010\\_RefSch  
ool/](http://www.topo.auth.gr/IAG2010_RefSchool/)

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10-13 July, San Diego, CA, USA  
The 2010 Survey & Engineering GIS  
Summit.

Organised as part of the ESRI User  
Conference.

Co-sponsored by FIG.

Web site:

[www.esri.com/events/survey/index.html](http://www.esri.com/events/survey/index.html)

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13 -17 September, Hamburg Germany  
International Workshop on Accelerator  
Alignment (IWAA) will be held at the  
Deutsches Elektronen-Synchrotron (DESY)

Web site:

[http://www-  
conf.slac.stanford.edu/iwaa/default.htm](http://www-conf.slac.stanford.edu/iwaa/default.htm)

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15-17 September, Zurich, Switzerland  
2010 International Conference on Indoor  
Positioning and Indoor Navigation (IPIN).

Co-sponsored by FIG Commission 5.

Web site: <http://www.ipin.ethz.ch>

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ION GNSS 2010

September 21-24, 2010 at the Oregon  
Convention Center in Portland, Oregon.

Web site:

[http://www.ion.org/meetings/gnss2010cfa.  
cfm](http://www.ion.org/meetings/gnss2010cfa.cfm)

ION GNSS 2010 is the world's largest  
technical meeting and showcase of GNSS  
technology, products, services and features  
more than 250 technical papers presented by  
the best and brightest leaders in GNSS  
technology.

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### Report on 1st Asia Oceania Regional Workshop on GNSS

25-26 January 2010, Bangkok, Thailand

The following is an overview of the report  
prepared by *Matt Higgins* (FIG Vice  
President). The full report can be sourced  
from the FIG web site -

- FIG Vice President Matt Higgins gave an invited keynote at the opening of this inaugural workshop.
- The workshop was convened by a new organisation known as Multi-GNSS Asia with strong support from the Japan Aerospace Exploration Agency (JAXA), Japan's Satellite Positioning Research

and Application Center (SPAC), Thailand's Geo-Informatics and Space Technology Development Agency (GISTDA) and the United Nations International Committee on Global Navigation Satellite Systems (ICG).

- Chris Rizos, Vice President of the IAG and member of the governing board of the International GNSS Service (IGS) has been closely involved in the establishment and development of the Multi-GNSS Asia concept and is a co-chair of the Steering Committee.
- The purpose of the workshop was to bring together interested parties from the Asia Oceania region to discuss the implications of next-generation of Global Navigation Satellite Systems.
- There were 195 participants from 95 organizations across 18 countries, with representations from the GNSS providers, universities, related research institutes, government agencies and the private sector.
- There were 32 more detailed presentations across 6 applications sessions under the following topics:
  1. Infrastructure, augmentation technologies;
  2. Precise Positioning;
  3. Ionospheric Observation;
  4. Disaster Mitigation and Management;
  5. Intelligent Transport Systems, Mapping and Location Based Service, and;
  6. Timing and Others.
- Four panel discussion groups were established to begin the process of creating projects to explore issues under each broad topic which were:
  1. Multi-GNSS network establishment;

2. Precise positioning;
3. Disaster management;
4. Intelligent Transport System, Mapping and Location Based Services

- FIG Commission 5 will need to consider its -
  1. involvement in any of the Multi-GNSS projects that develop and
  2. The relevance for FIG, its global partners, its member associations and the profession as a whole.

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## Report on "AuScope" VLBI Project Status

By Dr Jim Lovell  
AuScope VLBI Project Manager  
University of Tasmania

### Introduction

In 2007 the National Cooperative Research Infrastructure Strategy (NCRIS) initiated program 5.13, "Structure and Evolution of the Australian Continent", which is funded by the Department of Innovation, Industry, Science and Research and managed by AuScope Ltd. ([www.auscope.org.au](http://www.auscope.org.au)). A major component of this project is the establishment of a national geospatial framework, including satellite laser ranging, ultra-precise gravimetry, a network of ~100 of GPS receivers and VLBI. Total federal funding for this undertaking is \$15.8M, together with \$21M from Universities, State governments and Geoscience Australia. The budget for the radio telescope network and data processing facility is \$8.5M

### Background

Nothing on the Earth is stationary. Continents drift at speeds of centimetres

per year (Australia is moving north-northeast at 6cm/year). The Earth is subject to the tidal attraction of the Sun and Moon just like the oceans and depending on where you are, the Earth can go up and down by up to 40 cm a day. And there are earthquakes too of course. So measuring positions to high precision is very difficult because there's no fixed point of reference on the Earth. Fortunately, radio astronomy can help. By using quasars as our reference frame we can work out the positions of our telescopes to high precision. Quasars are very bright objects, believed to be associated with black holes at the centres of galaxies billions of light years away. Because they're so far away, they are stationary and because they are so bright, they make excellent target objects.

Over the past 24 years the University of Tasmania (UTAS) has played a vital role in maintaining and improving the geographic coordinate system for the Australian continent. Through regular observations, the precise location of the UTAS Mt Pleasant Observatory 26 metre telescope with respect to other telescopes worldwide has been measured and monitored to centimetre precision.

As well as giving important scientific information on the rotation of the Earth, the movement of continental plates and the effects of earthquakes, these measurements provide the fundamental reference frame for all other types of geographic positioning techniques such as the GPS system. At the moment it's possible to make centimetre-level measurements.

AuScope aims to provide a fundamental reference frame in Australia to 1 mm accuracy based on the locations of three radio telescopes as established by VLBI

observations. One telescope will be located in Tasmania, another in Western Australia at Yarragadee and a third in the Northern Territory at Katherine. Each site will also host a permanent GPS receiver to tie the telescope reference frame to the denser GPS frame. The VLBI data will be processed by a supercomputer at Curtin University of Technology in Western Australia. The VLBI array

- Will be owned and operated by UTAS for AuScope
- Will operate for 180 days per year
- AuScope will provide an integrated spatial positioning system spanning the whole continent, enabling:
  - mm-accurate positions for real-time vehicle and aircraft positioning and navigation
  - techniques to better identify and study regions of seismic risk, especially those associated with populated areas and mining
  - precise measurement of variations in sea level

#### **Current status**

- The Hobart telescope has been completed and is now commencing trial observations before becoming fully operational.
- The Katherine and Yarragadee telescopes have now been built and acceptance testing will commence soon
- The data processing facility at Curtin University has been completed and will soon commence participation in trial observations

In February, UTAS hosted the 6th General Meeting of the International VLBI Service (IVS), an international collaboration of organizations which operate or support the VLBI components used for geodesy. The theme of the meeting was "VLBI2010: From Vision to Reality". The VLBI2010

initiative is to upgrade VLBI systems to enable 1 mm position accuracy and station velocities with accuracies of 0.1 mm/yr, provide continuous time series for station positions and Earth orientation, and provide rapid turnaround from observation to geodetic parameters. The IVS meeting coincided with the official opening of the AuScope Hobart 12m telescope.

Following the *General Meeting* week, a workshop will be held in Auckland, New Zealand. on "VLBI and GNSS: New Zealand and Australian Perspectives".



The AuScope 12m telescope at Yarragadee, February 2010

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## Report on Cost Effective GNSS

By Dr Volker Schwieger (Vice Chair FIG Commission 5) and Dr Neil Weston.

During the last three years Commission 5 Working Group 5.4 "GNSS" was been working on the report "Cost Effective GNSS Positioning Techniques". This comprehensive report consists of general

information regarding GNSS and precise differential GNSS techniques as well as the description of effectively using GNSS receivers integrated into Continuously Operating Reference Station (CORS) Networks and/or by purchasing low-cost GNSS receivers. The report has been endorsed by the FIG Council and will be officially released at the FIG Congress in Sydney. It will then be available as FIG Publication No. 45 in both print and digital versions at the Congress and our website <http://www.fig.net/pub/figpub/index.htm> respectively.

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## Call for Ideas - FIG Commission 5 Work plan 2011-14

By Mikael Lilje

In coming Chair for FIG Commission 5

Even though the current Chair of Commission 5 - Rudolf Staiger's term has still one year left to go, I need to start thinking about the coming period 2011-14. Rudolf's set of working groups have worked well during the 2007-10 term and I would like to continue this accomplishment.

In the end of the day, the success of a commission (or working group) depends on the ability of the people to be actively involved. Therefore the during the next year or so I would like to use this opportunity to discuss with people who are interested in being involved and listen to their ideas / projects for the Commission's working groups. It is obvious that FIG Commission 5 should continue to focus on issues as GNSS CORS networks, services connected to them, reference systems / frames, heighting with GNSS, standards and calibration, and others. The Commission should also try to look into the future and it will be focus also on e.g. positioning systems both GNSS and non-GNSS related.

Presently, I am in the process of discussing Commission 5 future activities with both existing and potential working group Chairs and as well as listening to other stakeholders about what FIG can do. Consequently your comments are always welcomed, and I will be available in Sydney to discuss more about the proposed structure and work plan. See you there!

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## Call for Participation in the APREF Project

By Dr John Dawson  
APREF Central Bureau  
Vice-chair PCGIAP Geodesy Working Group

Dear Colleague,

On behalf of the Asia-Pacific Reference Frame (APREF) Steering Committee, I am pleased to announce the Call for Participation (CfP) in the APREF Project. Our objective is to improve the geodetic infrastructure of the Asia-Pacific region.

APREF is a joint effort of the Permanent Committee for GIS Infrastructure for Asia and the Pacific (PCGIAP) and the International Association of Geodesy (IAG). We seek proposals from those organisations that are active in the Asia-Pacific region who are prepared to, on an ongoing basis: provide Global Navigation Satellite Systems (GNSS) data from Continuously Operating Reference Stations (CORS); provide access and on-line archiving of APREF data and products for users; and/or routinely analyse some, or all, of the APREF GNSS CORS data, providing station coordinate estimates.

For a copy of the CfP documentation, which includes instructions as to how to respond, please send an email to [john.dawson@ga.gov.au](mailto:john.dawson@ga.gov.au). Note - this call will remain open until January 2011;

however, we would appreciate your response by 1 April 2010.

Please feel free to forward this message to interested colleagues, and we look forward to your participation in APREF.

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## Swedish Geodesy in the Coming Decade

By Mikael Lilje  
Manager Geodesy Division, Lantmateriet,  
Sweden

Sweden is developing a 10 Year Geodetic Strategic Plan for the country. One important part of the strategic plan is to compare the development in Sweden with other countries but also to verify the findings in our strategic plan with proposed development in other countries. Therefore, I am most eager to get a copy of any type of plan that might exist in your country. Also, it would be very interesting to conduct a cost / benefit investigation regarding national geodetic infrastructure and thus I am also very much interested in finding out how other countries have done this as well. So if you can assist please contact me by email - [Mikael.Lilje@lm.se](mailto:Mikael.Lilje@lm.se). Thanking you in advance.

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If you would like to circulate Commission 5 NEWS to all our members please email your item for consideration to the Vice Chair Administration -

[robert.sarib@nt.gov.au](mailto:robert.sarib@nt.gov.au)