

# IVS Newsletter

Issue 38, April 2014



## CONT14 Just Around the Corner

– Dirk Behrend, NVI, Inc.



Updated map for the upcoming CONT14, which will feature 17 stations at 16 sites. Sites shown with red circles will e-transfer their data, whereas sites shown with blue triangles will ship their modules to Bonn.

With a scheduled observation period from 6–20 May 2014, the CONT14 campaign is almost upon us. The final preparations for realizing another successful continuous VLBI campaign are in full swing. Several changes have been made to the early stages of the planning, which were described in the August 2013 issue of the Newsletter. The following gives a summary of the major updates.

The most significant change is that the correlation will now be done at the Bonn Correlator. The Washington Correlator will not be in an operational state with their new DiFX software correlator by the time of CONT14. For that, the Bonn group agreed on taking on the burden of correlating the full CONT14 campaign. With MPIFR Bonn having more bandwidth for possible e-transfers, the correlator change has the “positive side-effect” that eight stations will be able to e-transfer their data. The remainder of the stations will still ship their recording modules physically. In order to meet the 15-day turnaround time requirement for the five rapid session equivalents (R1s and R4s), the e-transfer for these session days will be done first.

There will be 17 stations participating at 16 sites. The initially planned participation of two broadband stations (Westford and GGAO12M) had to be canceled, because the “mixed-mode” correlation/fringing of the legacy S/X data and the broadband data is not operational yet. Hence, the 12-m antenna at GGAO dropped out of the list of CONT14 stations and Westford will observe using their legacy system. Tsukuba will participate in the campaign following their successful repair last year. At Hobart both the 12-m and the 26-m antennas will be part of CONT14.

The media needed for CONT14 are being shipped to the stations. The recording will be done in recording groups of up to four CONT14 session days onto one module, where the split into groups is dictated by the rapid session equivalents. In order to record that many session days onto a single module, the Mark 5 software needed to be updated to allow for more than 1023 scans per module. It is planned to have a scan check organized before the immediate start of the campaign (e.g., an hour before) to make sure that all stations work properly. We look forward to a successful CONT14 campaign!

### Newsflash.. Newsflash..

The Directing Board approved a proposal of the VGOS Project Executive Group (VPEG) for a VGOS observing plan for the broadband stations. The plan foresees trial operations in 2015 and a pilot project in 2016 with the then available VGOS stations. The plan can be downloaded from the IVS Web site as a PDF document ([http://ivscg.gsfc.nasa.gov/technology/vlbi2010-docs/vgos\\_observing\\_plan\\_140213.pdf](http://ivscg.gsfc.nasa.gov/technology/vlbi2010-docs/vgos_observing_plan_140213.pdf)).

## The New IVS Technology Development Center at IGN Yebes Observatory

*At its meeting on March 8, 2014, the IVS Directing Board accepted the proposal of the IGN Yebes Observatory to become an IVS Technology Development Center (TDC). Now the IVS counts seven TDC components. The Director of the new TDC, José Antonio López Fernández, was interviewed by feature editor Hayo Hase.*



*José Antonio López Fernández, the director of the new IVS Technology Development Center (TDC).*

*José Antonio, since the 2012 IVS General Meeting at the latest, the IVS community is aware of the long history of the Spanish Instituto Geográfico Nacional (IGN) and its observatories.*

*What were the reasons for IGN to become an IVS Technology Development Center?*

Our VLBI and instrumentation activities started in the early 1980s and now IGN is deeply involved in VGOS with RAEGE, which is an ambitious project that consists of much more than four new radio telescopes. New instrumentation and experimental techniques are required, some of which have been under development at the labs of Yebes Ob-

servatory in the recent past. We want to share our knowledge and collaborate with other institutions. Let's make VLBI also a joint effort of the contributing labs!

*Who is working with you and who is responsible for what kind of activity? Do you mind introducing us to your team?*

We are a group of forty people; 15 of them are engineers

who specialize in different areas. The LNA lab is led by Juan Daniel Gallego, cryogenics are the responsibility of José Manuel Serna, and the antennas are designed by Félix Tercero. José Antonio ("Pepe") López Pérez is dealing with the receivers, and Pablo de Vicente is always fighting with the control software. Paco Colomer is in charge of the coordination and Alberto Barcia and Jesús Gómez González

are the voice of our experience. Furthermore, we are really lucky because we have an experienced (albeit small) team of technicians, a special kind of skilled people that bring our designs to reality.

*What are the capabilities of your laboratories at Yebes?*

We are instrumentalists with a focus on cryogenics. Our laboratories are well equipped for that purpose—a result of many years of investments. We have the CAD tools and also

the microwave measuring instrumentation such as VNAs or Spectrum Analyzers covering up to 120 GHz. We have the machines for making things (e.g., CNC, bonding, welding). This allows us to design, build, and test LNAs (up to 50 GHz) as well as cryogenic receivers or to characterize feeds (up to 140 GHz) in our anechoic chamber. Part of our scope is also the radio holography technique, which we use to improve the aperture efficiency of radio telescopes.

*The Spanish-Portuguese RAEGE project is a major contribution to the international VLBI efforts. What kind of developments have you been carrying out for the RAEGE project?*

I like to say that RAEGE is a development in itself. We are not talking about a network of four radio telescopes only. But beyond that, we dedicate, for instance, a big effort on the development of receivers. One highlight in this respect is the tri-band (S/X/Ka) system that is compatible with the legacy receivers, allowing us to properly characterize the radio telescopes. We also make progress on our broadband system, putting a lot of effort into the feed and the LNA.

*What is the status of the RAEGE radio telescope family?*

We are fortunate because we are more or less on time with the schedule. The Yebes telescope is already operational. A tri-band receiver is installed and we are optimizing the antenna performance. We plan to observe the first VLBI session soon and to participate in the first VGOS session at the beginning of 2015. The work on the Santa María telescope (Azores Islands) is progressing well. The telescope has been built and soon we will install the first receiver, also a tri-band. Before the end of 2014, Santa María should yield first fringes. For the Canary Islands site on Tenerife, the civil works will begin and we are confident that they will join the VGOS family before the summer of 2016. Not so far advanced is the work at the second Azorean telescope on Flores Island which is expected to be ready in 2017.

*Do you think that the developments for the RAEGE radio telescopes will be useful for other VGOS sites?*

I think and do hope so. We live in dynamic times with many VGOS telescope projects at the outset. We would like to share our experience with them. We are not talking only about receivers but also about technical procedures and, of course, mistakes.

*Besides hardware developments, do you also engage in software development? If so, what kind of software?*

Pablo and his team did a great job in developing control software for the 40-m antenna. Now they are doing this also for the new RAEGE radio telescopes. This software includes the main axes control as well as the monitoring and control of the receivers and other instruments. Software control is very important and we hope that this software could be used at other sites as well.



*The RAEGE VGOS antenna (foreground) and the 40-m antenna (background) at the Yebes site.*

*Do you have the capacity to develop or produce products, such as front ends, for other IVS stations?*

Our group is willing to develop instrumentation for our IVS colleagues. Many of our LNAs are being used in other observatories as well as satellites. We also helped other institutes improve the efficiencies of their radio telescopes using radio holography. We are really proud that a tri-band receiver, designed and built at Yebes, is now employed at Ishioka and that we collaborated with our BKG colleagues on their S/X legacy receivers. This has been very important for us and I appreciate the trust of our colleagues in us. So, why not continue along those lines!

*What are your plans w.r.t. Yebes becoming a GGOS station?*

Becoming a GGOS station is a very important for us; we are working hard towards that goal. VLBI is in good shape with the new VGOS radio telescope and also with the 40-m antenna as a legacy station (S/X). Our relative superconducting gravimeter has been routinely recording data for two years now and we plan to install new GNSS permanent stations. Finally, we have plans to install an SLR station. We hope that as soon as we install our RAEGE radio telescopes we can afford the construction of this new system.

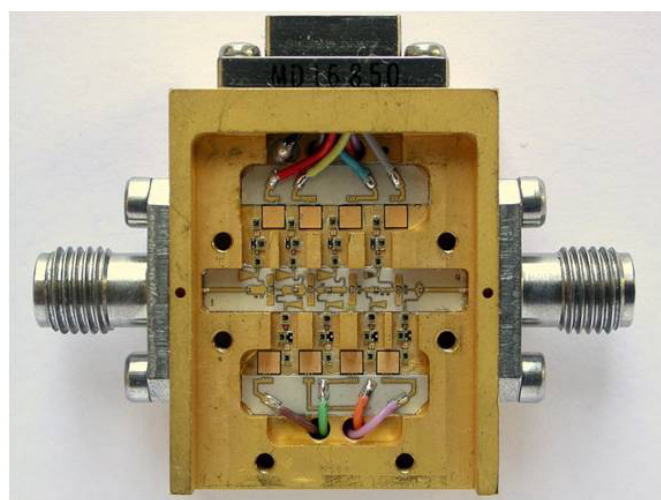
*What do you do if you are not at work? Do you pursue other interests, hobbies, or leisure activities?*

Well, during the week there is not so much time and I have to admit that I can be a very boring guy. However, I'm lucky to live in the countryside and weekends can be very nice, so I spend all my time with my family. I cook Paella (a typical Spanish rice dish) for them, I try to keep up with my son when we ride our mountain bikes (which is almost impossible), or I walk my dog. And, of course, I cannot miss the weekly FC Barcelona football match; that's mandatory.

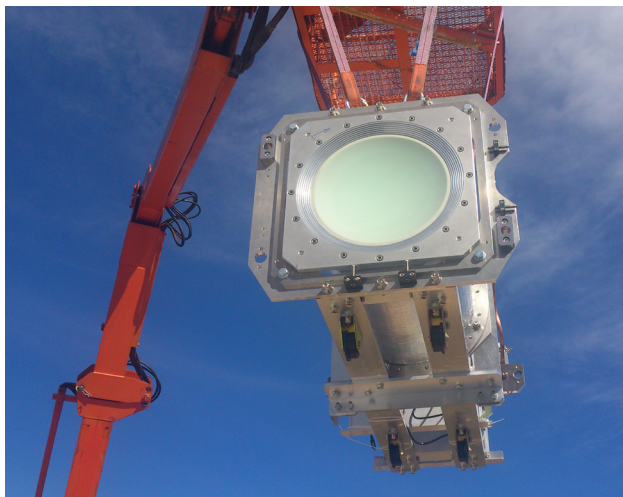
*Thank you very much for the interview.*



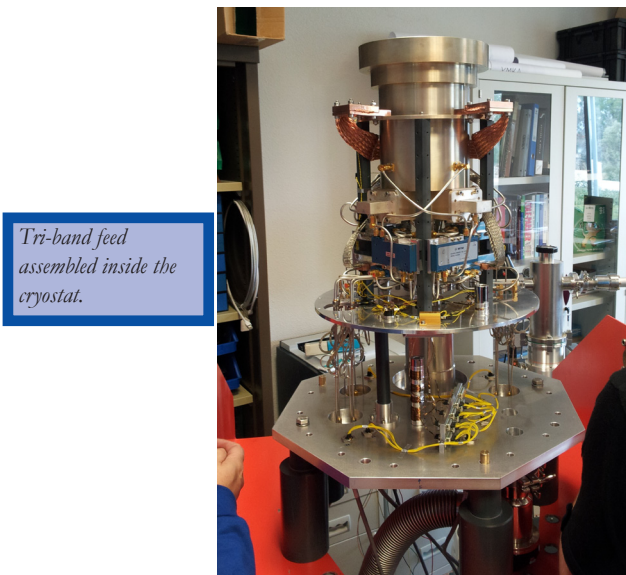
*IVS Technology Development Center Team. Upper row: Félix, Alberto, José Antonio, Paco, Pablo, Pepe, Carlos and Jesús. Lower row: José Manuel and Juan Daniel.*



*Ka-band LNA (25-35 GHz).*



*The Ishioka cryostat going to be tested at the Yebes VGOS radiotelescope.*

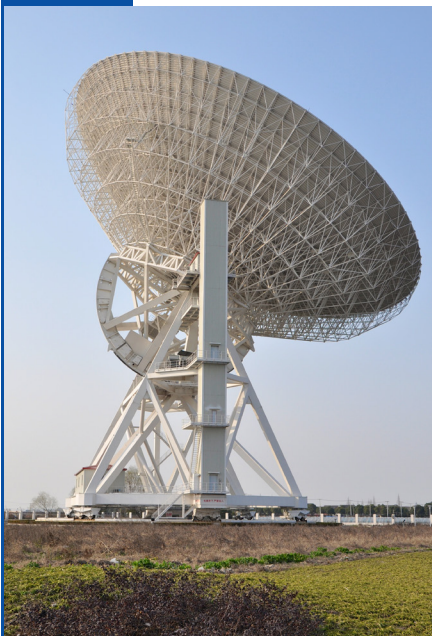


*Tri-band feed assembled inside the cryostat.*

## The 8th IVS General Meeting in Shanghai – Bright Lights, Big City

– Glenda Coetzer, Aletha de Witt and Marisa Nickola, HartRAO

Our eagerly awaited Chinese adventure lifted off on Friday, February 28, just after noon local time with the wheels of our Cathay Pacific Boeing 777 leaving the runway at ORT International Airport in Johannesburg, South Africa. We were heading northeast over the Indian Ocean for the much anticipated 8th IVS General Meeting to be held in Shanghai from March 2–7, 2014. A day later we landed at Pudong International Airport, bleary-eyed and wilted. Our spirits lifted quickly on catching the Maglev train to our hotel and enjoying the superb views of the buildings along Caoxi Road and the Shanghai Astronomical Observatory (SHAO) telescope dome from our hotel windows.



The new Tianma 65-m antenna.

Saturday night our party set out in search of food and had our first introduction to local cuisine and Tsingtao beer. Sunday morning we aimed for Yuyuan Gardens and ended up in Old Town where we saw many sights, bought many trinkets, and enjoyed tea with flowers in the cups.



Pearl Tower and other brightly lit buildings along the Huangpu river bank.

The friendly and efficient LOC made short work of our registration on Sunday afternoon and spoiled us with stylish pouches and rotating Maglev globes depicting the IVS network. Sunday evening our hosts from SHAO graciously treated the 150 participants to tasty Chinese finger foods and beverages during the icebreaker reception. From the laughter and excited conversation, it was apparent that everyone was having a good time. It was an occasion for old friends to reunite and new friendships to be forged.

On the first day of the meeting, participants were welcomed by the former and current Directors of SHAO, Professors Shuhua Ye and Xiaoyu Hong, as well as Axel

Nothnagel, the IVS Chair. Papers were presented in six scientific/technical sessions, Monday through Thursday. The first session, chaired by Bill Petrachenko and Hayo Hase, dealt with the evolution of the VGOS network. Richard Gross delivered the keynote presentation on the contribution of VGOS to science and society. Arthur Niell and Xiuzhong Zhang chaired the second session in which technology development for VGOS was discussed. Later on that evening, a group of us set out for the Bund with the idea of combining our search for food with some sightseeing. Photographs of the bright lights of the Bund, Oriental Pearl Tower, and other buildings along the Huangpu were taken with total disregard for the traffic. After the photo opportunities and having whetted our appetites for danger, we continued our adventures in Chinese cuisine—once again putting ourselves at the mercy of the waitress and the menu pictures.

The third session, dealing with stations, correlators, and operations centers, starting on Tuesday morning, was chaired by Alessandra Bertarini and Shinobu Kurihara. Later that afternoon, Minghui Xu chaired Session 4 during which progress in data structure, software development, and analysis strategies were reported on. The poster session followed on Tuesday night and, as during the entire meeting, interesting and relevant topics were covered, thought-provoking questions were asked, expert advice was given and scrumptious snacks were consumed. After the poster session, Jing Sun led the way to a restaurant where we had the honor of enjoying a special meal consisting of such delicacies as chicken and duck head as well as frog legs and chicken feet ('runaways' in South African parlance).

On Wednesday morning, Session 4 continued with John Gipson as chair. It was followed by presentations of VLBI results and their geodetic/astrometric interpretation during Session 5 chaired by Sergei Kurdubov. Shortly after noon, we got on the bus and headed out of the city of Shanghai to the Sheshan base for a visit to the Shanghai 65-m and 25-m radio telescopes as well as the astronomical museum. We were given an opportunity to visit the very impressive modern VLBI Data Center, dishes, control rooms, and servers. Then it was off to Sheshan Hill for a visit to the Shanghai Astronomical Museum to learn about the history of Chinese astronomy from our very able and enthusiastic guide. Interesting equipment included a 40-cm binocular refracting telescope and a prime meridian instrument used during international longitude determination. Astronomical tomes, some dating back 200 years, graced the shelves of the century-old library. On our way back to Shanghai, we passed the Guangfulin historical sight. The sun setting over the ruins of ancient civilizations provided another beautiful and lasting impression of Sheshan.

# NEWS...

Once the site visits had been concluded, it was time for the buffet banquet on a Huangpu River cruise boat. On arrival at the Yangjiuda wharf, we were pleasantly surprised to be directed onto the gangplank of a stylish and brightly-lit cruise boat. On board, we were treated to an exquisite evening filled with great food and drink, beautiful traditional Chinese music, a most skillful Bian Lian performance, and fairyland scenery along the river bank. What a great experience!

Session 5 continued on Thursday morning with David Gordon as chair. During the last session of the meeting, chaired by Lucia Plank and Chris Jacobs, new horizons for VLBI were presented. Once the session had concluded, Ludwig Combrinck was given the opportunity to invite participants to the next IVS General Meeting to be held in South Africa in 2016. Axel Nothnagel then invited participants to attend the analysis software demonstration later the afternoon before closing and adjourning the 8th IVS General Meeting. On Friday, an IVS Analysis Workshop took place at SHAO, followed by an ICRF-3 Working Group meeting. Last but not least, the IVS Directing Board meeting took place on Saturday, March 8, at SHAO.

The 8th IVS General Meeting allowed us to interact with our friends from the global geodetic VLBI community, to dip into an enormous pool of VLBI knowledge, experience and expertise, and to strengthen current collaborations and form new ones for future projects. To SHAO (especially the LOC) and the SOC, congratulations on and thank you for an excellently organized meeting. We invite our VLBI family to join us under African skies for the 9th IVS General Meeting in South Africa in 2016. We have much to live up to.



*Guangfulin historical site.*



*Musicians playing traditional Chinese instruments.*



*Participants during sessions.*

*Sheshan VLBI Data Center.*

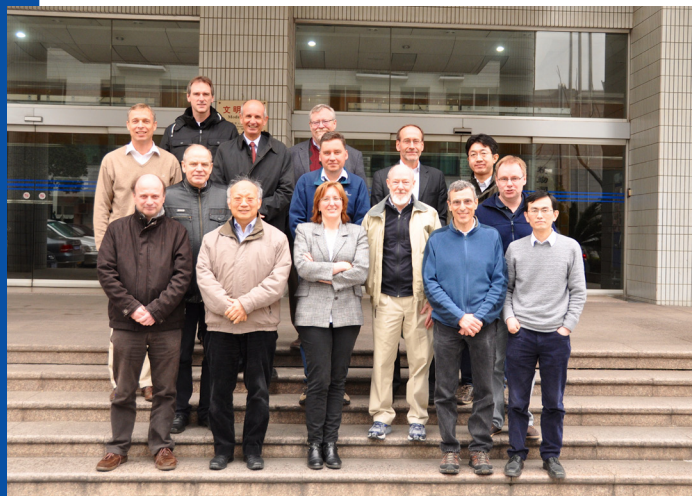


*South African delegation (standing: Aletha and Marisa; kneeling: Denise, Sayan, and Glenda). Ludwig was the photographer.*



## Board Meets in Shanghai, Makes Decisions

— Dirk Behrend, NVI, Inc.



*The Directing Board in front of SHAO's main building.*

At the end of a very busy week at the General Meeting, the IVS Directing Board met for its 31st meeting for a full day on Saturday, March 8, 2014 at the Shanghai Astronomical Observatory (SHAO). IVS Chair Axel Nothnagel welcomed a group of 14 exhausted Board members. Nonetheless, the meeting turned out to be very successful and a number of important decisions were made. In particular, several new bodies such as task forces and working groups were established or initiated. Furthermore, a new component was accepted into the IVS family.

One decision that was made was the Board unanimously accepting the creation of the new Committee on VLBI Education and Training as a new permanent body within the IVS. This committee will be chaired by Rüdiger Haas and is an outgrowth of the successful work of the working group of the same name. Also, the VLBI2010 Committee (V2C) was renamed to VGOS Technical Committee (VTC) in recognition of the fact that the year-attachment conveys the notion of an outdated system. The Observing Program Committee (OPC) was given the mandate to also coordinate and supervise the broadband (VGOS) observing. Harald Schuh was given the task of preparing the charter and a structure for a Working Group on Satellite Observations with VLBI.

The Board initiated the creation of a Task Force on Ka-band support. This task force will be led by Alessandra Bertarini. Also, the Board agreed on establishing a new Task Force on Seamless Auxiliary Data under the leadership of A. Neidhardt. The IVS members from the Asia-Oceania region are working on the establishment of an Asia-Oceania VLBI Group for Geodesy and Astrometry, a group that is expected to be similar in scope as the EVGA for Europe.

The IGN Yebees Observatory applied for becoming an IVS Technology Development Center (TDC), and the Board unanimously accepted the proposal. We are happy to welcome Yebees also as a TDC in the IVS (see also pages 2–3 of this Newsletter issue).

The International Association of Geodesy (IAG) initiated an evaluation process of its 13 international services following a decision of the IAG Executive Committee in September 2013. The criteria of the services assessment include their performance, products, governance, and public visibility, among other things. Axel Nothnagel will represent the IVS at a kick-off meeting for this purpose in Vienna on 25 April 2014.

We would like to thank our local hosts from SHAO for the warm welcome and hospitality. A special thanks to Fengchun Shu for making all the arrangements—it was perfectly organized. Xiexie.



*Hayo Hase presenting the work of the VGOS Project Executive Group (VPEG) to the Board members.*

### Upcoming Meetings...

EGU General Assembly Vienna, Austria April 27-May 2, 2014	Symposium of Japan VLBI Consortium Tsukuba, Japan October 29-31, 2014
Journées 2014 St. Petersburg, Russia September 22-24, 2014	SciDataCon 2014 New Delhi, India November 2-5, 2014
EVN Symposium 2014 Cagliari, Italy October 7-10, 2014	AGU Fall Meeting San Francisco, CA USA December 15-19, 2014

<http://ivscc.gsfc.nasa.gov/meetings>

## How to Handle Power Failures at a Station

— *Rich Strand, NVI, Inc.*

In this issue I discuss power failures at a VLBI station during observing. This subject is usually not covered at the TOW meeting, simply because there is just too much to do and each station has their own unique guidelines. Hopefully very few stations turn the electronics off at the end of a session. This allows the operator to follow his check-off list to verify that all is well for the next session quickly and with the least amount of equipment start-up problems.

A power failure is well beyond the check-off list and is in fact starting from scratch. It requires multiple decisions and, as most of us know, a lot of things may not come up or turn back on correctly. Certainly this subject is well beyond a few paragraphs making it almost impossible to list action items in any kind of order. But there are plenty of things to discuss even at this level and it may have some value for managers to understand the basic process of recovery.

Assume that all is going well, the telescope is on source and tracking, the last scan check was okay, and you just entered the last weather report. Then lights go out, the fans slow to a stop, and the silence is only broken by an alarm—maybe from the maser room—and the click of the emergency lights coming on. This is the time to check that the maser is running on batteries and that all the electronics that may be on a UPS system—like the GPS clocks or the TAC—is running okay.

A critical item and the first thing to check is the Dewar of the receiver. The station's compressor may be off and the Dewar is warming up. Many radio observatories have emergency backup generators and the down time may be just a few minutes. If so, the Dewar will cool back down. If not, it will continue to warm and, at a certain point, will not recover. Then it is best to keep the compressor off to allow the Dewar to warm up completely. IVS usually requires at least 18 hours of data collection for a good solution. One example of not continuing the session is if you are past the 18 hours and have another session starting very soon. It is always better to have the most sensitive instrument possible for IVS observing, i.e., to have a cold receiver.

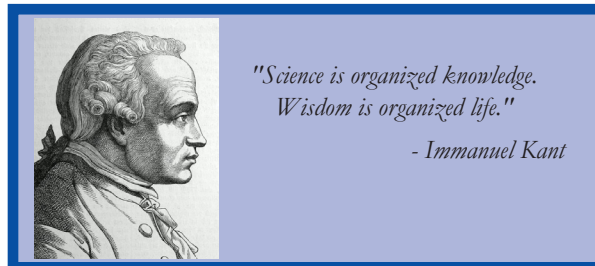
Then the power returns and the data rack is turned back on. The telescope comes up okay and the Field System is started, so you can reset the data rack or DBBC. The formatter (or Mark 5B) will need to be reset using FMSET. But remember not to leave it running. Make sure the GPS and formatter offsets are back to what was reported for this session at the start, when you restart the Mark 5 device software.

Assuming we will continue to observe, we need to find a good starting point in the schedule. At the TOW meeting, we always suggest using the printouts with the line numbers. It is good practice to plan ahead and be conservative rather than to assume the telescope can get to the next source in the schedule. For an Az/El telescope you should be careful

to make sure the antenna goes to the correct wrap. Once the session is restarted using the correct line number, it is best to verify the first recorded scan to make sure that no error was reported.

At this time it is a good idea to go through the pre-checks list for anything obviously out-of-order (e.g., the cable calibration) and to verify that the receiver housekeeping is normal and tracking is on source. Now is the moment to report the data loss period in the Field System log. This is important for the correlator team to know when to look for fringe data again and for the analysts to know that they may have a clock jump and lost observations. This information should be reported in the "End" message as well.

Finally, this is where stations can lose power supplies. Depending on preventive maintenance, some fans may not start up after a power failure causing parts to overheat over time, especially the large DC capacitors. As capacitors fail, they cause the DC ripple to increase, which, in turn, disturbs the digital logic and analog circuits. Often just a few minutes of checking to be sure the fans are turning can prevent a lot of headaches later.



The IVS Newsletter is published three times annually, in April, August, and December. Contributed articles, pictures, cartoons, and feedback are welcome at any time.

Please send contributions to [ivs-news@ivscc.gsfc.nasa.gov](mailto:ivs-news@ivscc.gsfc.nasa.gov).

The editors reserve the right to edit contributions. The deadline for contributions is one month before the publication date.

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The newsletter is published in color with live links on the IVS web site at

<http://ivscc.gsfc.nasa.gov/>.

## Got VGOS Technical Info?

— Brian Corey, MIT Haystack Observatory



As more VGOS systems are being designed and built, there is an increasing need to share information about VGOS technique development in general, and about the design and performance of station hardware in particular. With this goal in mind, the IVS Directing Board recommended at their March meeting in Shanghai that the wiki maintained by the VGOS Technical Committee (VTC), formerly the VLBI2010 Committee (V2C), be promoted in the IVS community as a vehicle for sharing information.

This wiki was originally set up with two purposes in mind: providing a forum for discussion within the VTC and serving as a repository for VGOS-related information for the wider IVS community. Until now, the latter function has been poorly advertised. The intent of this note is to encourage all IVS members to contribute material to the wiki and to refer to the wiki when searching for information.

Contributions related to all VGOS activities are welcome, including broadband system hardware and processing algorithms, RFI, source structure, atmosphere, observing schedule optimization, automation, and

antenna deformation and site ties. With the current spate of activity in building and outfitting new VGOS antennas, particularly timely is material on the design and performance of antennas, feeds, receivers, phase and noise calibration system, backends, and recording systems. Proceedings and journal papers, technical reports, and general summaries are all appropriate—anything that would help others understand your system or technique, its rationale, and its capabilities and limitations.

Ideally documents should be stored on servers external to the wiki (e.g., at one's home institution or the IVS Web site), with the wiki providing links to the documents, but the wiki can store a limited number of documents if necessary.

The home page of the wiki, which recently underwent a name change from V2C to VTC, is <https://wikis.mit.edu/confluence/display/VTC>.

Everyone is encouraged to access the wiki to learn about VGOS developments. But its usefulness obviously depends on the quality and completeness of the information on it. So please think about what documents you have that might be of interest to the VGOS world.

If you have links or documents to contribute, you may either post them yourself on the wiki (contact Brian Corey at [bec@haystack.mit.edu](mailto:bec@haystack.mit.edu) for instructions on how to obtain write permission) or send them to Brian Corey or Bill Petrachenko ([Bill.Petrachenko@nrc-nrc.gc.ca](mailto:Bill.Petrachenko@nrc-nrc.gc.ca)), who will post them for you.

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