IVS Newsletter

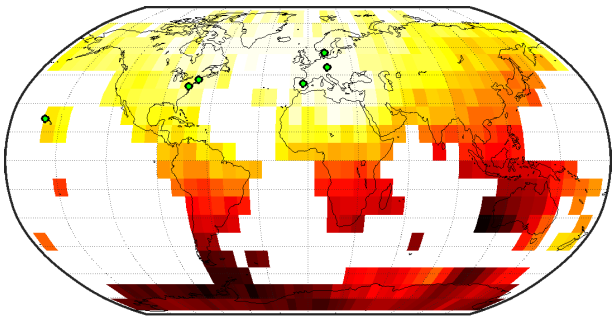
Issue 57, August 2020

IVS Infrastructure Development Plan 2030 – The Making Of …

– Axel Nothnagel, TU Vienna (IVS Chair)

On July 17, 2020, the IVS Directing Board (DB) approved the IVS Infrastructure Development Plan 2030 (see *IVS-InfrastructureDevelopmentPlan2030.pdf*). In this short article, no summary of the content is given; instead, I provide some background information on the evolution of this document and its purpose.

In late 2019, the DB started considering the idea of organizing an IVS Internal Stakeholder Meeting in conjunction with the IVS General Meeting 2020. During this meeting, we wanted to discuss the future of the IVS and its mandate for the next ten years with those who are responsible for organizing IVS components from a functional and financial point of view. In many cases, these persons are the link between the component operators and scientists on the one side and the funding agencies on the other side. An important part of the discussions was supposed to be devoted to how the IVS could fill obvious gaps in its structure to cope with the challenges of the next decade and under what premises further commitments could be made by the stakeholders.



Candidate areas for new VGOS telescopes for improved x pole results (in red), from Schartner et al. 2020 (EPS).

Unfortunately, the face-to-face meeting did not materialize and the DB had to find other ways of interaction with the stakeholders. For this reason, the DB distributed a questionnaire which contained, beyond other things, the main question of how the stakeholders see the relationship between their service and scientific mandate; in other words, what is the main reason for their involvement in the IVS. As a summary conclusion of all the input received, it can be stated that for more than 80 percent of respondents their involvement in the IVS is driven by service considerations.

Based on this background and from current experience as well as reasonable projections, the first draft of an IVS Infrastructure Development Plan 2030, as it was finally called, was produced as a document for summarizing the views of the IVS DB and for giving the stakeholders detailed information for their considerations. It took a few months of lively discussions within the DB and multiple interim versions before we converged on a final text. This is now available on the IVS website for everybody to read (see above).

The purpose of making this document available to the IVS community is not just for information only but, more importantly, to trigger some serious discussions of possible (further) commitments of IVS components for establishing and sustainably maintaining elements identified as missing for further progress. Not only should this document motivate existing IVS components but also provide necessary arguments to new players for a serious need for additional contributors and contributions. The IVS DB very much welcomes input to all issues of the document and looks forward to discussing any topic coming along.

Election Season Is Upon Us

It's that time again. In the fall of this year the IVS will hold its next Directing Board elections. There will be two representative (one Network Representative and one Analysis Center Representative) and the three at-large positions up for election. The Election Committee consisting of Hayo Hase (chair), Gino Tuccari, and Nancy Kotary will distribute a call for nominations in the August/September time frame. Please begin considering who you want to nominate for the positions to be filled. The current composition of the Board, including term information, is available on the IVS website *[https://ivscc.gsfc.nasa.gov/about/org/board/index.html]*.

– Dirk Behrend

Feature

IVS's New Station Stuart

As of the end of June, the IVS has a new Network Coordinator (NC). Stuart Weston from the Auckland University of Technology (AUT) is following in the footsteps of Ed Himwich and took on to be the steward of the IVS stations ("Station Stuart"). Ed had filled the NC position for the first twenty years of the service's existence. Being stationed in New Zealand, Stuart is fairly removed from many IVS Network Stations; however, modern communication means should facilitate his connecting to the stations without major problems. So, it was only fitting that Newsletter editor Hayo Hase conducted an interview via e-mail to learn more about Stuart as a person (including his background, current situation, and future plans) and as the incoming coordinator.

New IVS Network Coordinator Stuart Weston.

Stuart, you graduated from Manchester University, England, and work in Auckland, New Zealand. What are the most important points in your biography? How many languages do you speak?

After graduating from Manchester with an Honours Degree in Physics, I started a career in commercial IT. I worked in Holland, Germany, Hong Kong, Brunei, and then New Zealand. But being a Brit by origin we are hopeless at learning languages; I can survive and order a beer and food in quite a few including a bit of Chinese.

How did you get interested in Very Long Baseline Interferometry? How did that come about?

I first heard about VLBI at Manchester as an undergraduate student and was always amazed that you could correlate signals received at geographically remote antennas and produce scientific results. Reading about some of the early work done at Manchester by Hanbury Brown and Palmer to increase the baseline to resolve these new found radio objects was fascinating.

Why did you leave your positions in industry and go to Warkworth?

I had been in commercial IT long enough that the same old processes and procedures were coming around again and again under new "Names" as being the next great thing. Sigh – seen it all before. The fun, excitement, and interest were gone. While in my last job, I did a few modules of the Swinburne Astronomy Online [https://www.astronomy.swin.edu.au/sao/] in my evenings and weekends and really enjoyed it. In one of the student newsletters I found out that AUT were doing tests with Swinburne for VLBI. My curiosity was piqued and I contacted Prof. Sergei Gulyaev and Tim Natusch at AUT. Next thing, I was signed up for a Master with AUT which focused on modeling VLBI antenna arrays for the proposed SKA bid by Australia and New Zealand, specifically to show the value gained by having longer baselines from Western Australia and the SKA core to New Zealand. Later my then employer made my position redundant so I was at a loose end; I mentioned it to Sergei who then proceeded to offer me a position at the University with the condition that I enroll for a PhD.

You have finished your academic curriculum with a PhD. What did you investigate?

I was looking for a project that could use my IT skills but also involved some real science. With my supervisors being Sergei and Dr. Nicholas Seymour, I investigated applying statistics and algorithms to address the issue of matching objects between different wavelength catalogs. We are now into the domain of "big data", where catalogs contain millions of objects. This has gone well past a few diligent PhD students or experienced astronomers to visually cross-match or apply a simple nearest neighbor approach. So, I got to use my commercial RDBMS experience and programming skills, where so-called "big data" has existed for a while! For those who might be interested, you can read all about it at https://openrepository.aut.ac.nz/handle/10292/13132.

Stuart explaining the features of the 30-m radio telescope at Warkworth.

I assume that working at Warkworth brought you in contact with the IVS for the first time. How did that help in your duties at Warkworth?

The Warkworth antenna was built with the intention of being part of IVS and being identical to the Australian AuScope antennas. The most significant event for us to achieve the aim of being part of IVS was attending a TOW: things suddenly dropped into place and we could progress to become a productive network station. The most important milestone was finally figuring out how to use the Field System for pointing and building a model. As a result, many other things fell into place at the same time. I have now attended two TOWs; each has been invaluable and taken me to another level of understanding. In addition, I have managed to attend a few of the International VLBI Technology Workshops which have also been invaluable.

What was the trigger for you to apply for the position of the IVS Network Coordinator?

Having finally finished my PhD last year and having more time on my hands, I could think about how my new career could evolve. Here at AUT we have often discussed how we could become more engaged and increase our participation with the IVS rather than being a data gathering network station. We had investigated being a correlation center and I have correlated a few non-IVS observations. But when this position was advertised, it seemed an opportune and perfect opportunity for ourselves. I felt that, having nearly ten years of IVS network station experience and many years prior in commercial IT, I could bring a different perspective to the IVS community.

What will be on your agenda as IVS NC? What do you consider your duties?

With this change, the IVS Directing Board is taking the opportunity to review the duties and functions of the NC. So, we are in a period of change and at the moment these duties will change and evolve. So, stay tuned for further developments.

The IVS maintains a legacy S/X network as well as a fledgling VGOS network. Where do you see is more work to be done?

I am very familiar with the legacy S/X system, having now operated one for over ten years. The new wide-band VGOS receiver systems are very interesting not just for the IVS. Another project we are involved in, monitoring masers, would greatly benefit from such technology as we could monitor a whole series of spectral lines across a wide set of frequencies. I have a lot to learn about VGOS and I see a steep learning curve ahead with assistance from others such as Chet Ruszczyk at Haystack.

How are you going to interact with network stations and correlators?

We have the often-overused method of email, but the phone still exists. But it is now the new normal to use tools such as Skype or Zoom for audio/visual interaction. I would ask that, if people want to use social media as a channel of communication, they request a connection via LinkedIn. My profile is *https://www.linkedin.com/in/stuart-weston-phd-mphil-hons-minstp-mrsnz-8b227b22?lipi=urn%3Ali%3Apage%3Ad_flagship3_profile_view_base_contact_details%3Bg6A3wIoWSLKeosBM3avoeg%3D%3D*. I have already received a small number of requests via Facebook; I am sorry if I ignored those. I like to keep that for family and close friends and not as a channel of professional communication.

While being the IVS NC, you are also still affiliated with your original employee. What are your duties there?

I am still employed by AUT University here in New Zealand. My title is "Software Engineer," but my duties are many and very varied. For example, last week I was coordinating a contract company to perform maintenance and replace the elevation gearbox on our 12-m. I had to actually climb up in overalls, hardhat and spanner in my hand 😊. Here in New Zealand you cannot sit in a silo, you have to be broad across many silos. In the same week, I was looking at the new FS10 which I need to install. We do not have the depth of skills and personnel and have to be "jacks-of-all-trades."

When not doing radio astronomy, VLBI, or IVS network coordination, what are your favorite leisure activities?

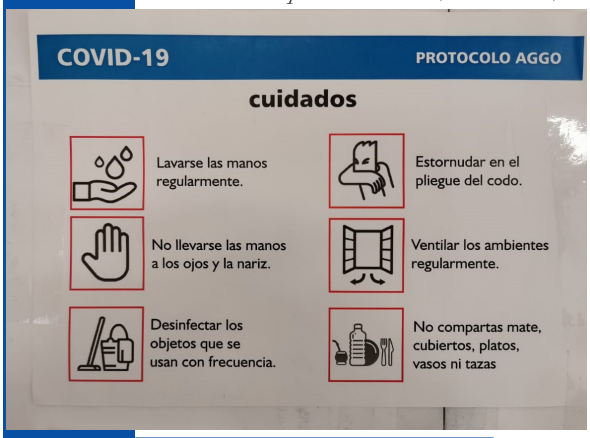
My interests are varied. I love making models, especially 1/32 scale working steam trains. I also stay reasonably fit and active via cycling and practicing the Japanese martial art of Kendo. Also, with the NZ countryside we do lots of fantastic "tramping." In addition, we live on a rural property with lots there to keep us occupied.

Stuart at a Kendo seminar by the famous 8th Dan Ishida Hanshi Sensei.

A panoramic view of the Warkworth site, showing the WARK30M antenna to the right.

How Do the IVS Stations Fare during COVID-19?

Throughout the world, we've seen changing times with the COVID-19 pandemic. Stores, restaurants, and various venues were shut down as were places of employment. Meetings have gone virtual and many sessions have gone remote. No one is certain of when the pandemic will cease and normal life will resume. The following is the account of three IVS members in three different parts of the world who graciously agreed to give us a glimpse into the lives of where they work and live.



Precautions taken at AGGO to prevent the spread of COVID-19. Note that it is forbidden to share maté.

- **Ishioka, Japan** *by Yu Takagi*

In Japan, a state of emergency was declared in some areas on April 7th and was extended on April 16th to the entire country, including Ibaraki prefecture, where the Ishioka VLBI station and Geospatial Information Authority (GSI) of Japan are located. It was not something that involved lockdown, but the people were asked to avoid unnecessary outings and moves. All of GSI's staff, including those responsible for the operation of Ishioka station, were ordered to work 50 percent at the beginning and later 70 percent from home during this period of the State-of-Emergency. Although the Ishioka station was operated by the minimum staff, it was able to participate in all the scheduled sessions since the automatic and remote operation had been established. It was fortune that any critical problem with observational equipment did not happen during this period since the limited number of staff may not have been able to deal with the problem. The Tsukuba VLBI correlator and Tsukuba VLBI Analysis Center were also able to process all the sessions as planned.

After the state of emergency was lifted on May 25th, the operation of the Ishioka station almost returned to normal, although the staff have been ordered to work from home once a week. Fortunately, any staff and their family have not been infected. We have been working fine until now.

The letter issued by the IVS Directing Board on April 2nd entitled "Request for continuation of operational readiness of IVS components for maintenance of globally critical infrastructure" was introduced in a directing board meeting of GSI. As a result, it helped that the executives of GSI recognized the importance of international VLBI observations again.

- **Kokee Park, USA** *by Chris Coughlin*

The COVID-19 pandemic has altered everyone's way of life, and caused pain and suffering for many people around the world. We consider ourselves to be lucky at KPGO given our secluded location, small site staff, and criticality of our mission allowing us to continue our work. We have been able to support all of our operations and maintenance activities at the site, but far from normal as far as staffing and protocols.

We are currently operating the site with a limited onsite staffing plan. Day shift currently consist of three onsite employees to handle operations, maintenance, and logistics (Kiah Imai, Ben Domingo, and Amorita Yaris). Afternoon and night shifts are being manned by Morgan Goodrich and Lawrence Chang with no option to come off shift or rotate shifts. Administration for the site is being handled by the Station Manager (Chris Coughlin) remotely to limit the amount of onsite personnel unless needed onsite for any reason. This is well outside of normal for us, but is being done to best isolate employees so the risk of contracting and/or spreading COVID-19 is minimized for the site staff. This has been a tall hurdle to get over for many of us, but the KPGO team has adapted well thus far.

Like many of us at work and home, KPGO staff has dramatically increased our cleaning protocols at the site as well as practicing social distancing and wearing face masks. For us in Hawaii with the "Aloha Spirit" mentality, it has been hard to except the new practice of social distancing and not being around family as much as normal.

A station operator in the control room of Kokee Park during an IVS session.

With all the adversity in the world today and ongoing pandemic, KPGO has been able to continue our mission, and KPGO staff has been able to remain safe, healthy, and for the most part sane. We hope everyone else in the network is doing the same, and wish you all the best during these odd times.

- **AGGO, Argentina** *by Federico Salguero*

My name is Federico Salguero. I am an electronic engineer who graduated from Universidad Nacional de La Plata (UNLP) and am in charge of coordinating the engineering tasks of the VLBI System here at AGGO (Argentinean-German Geodetic Observatory) since March 2014.

The SARS-CoV-2 virus has affected every country around the globe in different ways. Each nation has its own reality and resources to face it and the situation is very uncertain and complex to handle. In our country we've overcome more than 100 days of social isolation with different degrees of citizen mobility. This is a joint effort to minimize the impact of the virus on the health of the people in the region. CONICET headquarters, in agreement with national authorities, adopted the policy of reducing at its minimum the personnel presence at AGGO, which leads to the possibility of only dealing with essential tasks. We did not allow AGGO staff to continue with VLBI operations for the first two months.

On June 22, and with reduced personnel, AGGO officially resumed the IVS scheduled observation plans. However, joint observations with our Wettzell colleagues have been made since May 28. The current strict social isolation situation forced us to redefine the daily works and tasks carried out by the VLBI team.

My current assignment of assisting the preparation, completion, and data transfers of sessions is carried on remotely from my home. The operation of the VLBI is coordinated with trained onsite personnel that are not only exempt from mobility restrictions now but are part of our regular observation team. The remote assistance consists mainly in system parameter supervision and interaction with operators, especially during personnel night shifts.

I'm also performing home repairing of some baseband replacement modules and, together with our system manager Eng. Jose Vera, we regularly plan virtual meetings to carry on with remote software upgrades, scripting tasks, and maintenance of our servers.

One of our primary focuses for the area is promoting efforts to carry out some tasks that are difficult to execute during the regular operation of the radio telescope. Among them are, for instance, the diagramming of training plans for our whole engineer and technical staff at VLBI. Also, VGOS training is required and arises as a challenge for the future plans at AGGO.

We have also in mind the design of a new Electronics Laboratory space, which it is expected to meet the challenges of existing system hardware maintenance as well as for the equipment that will soon arrive at AGGO in order to modernize our acquisition system for the current antenna.

The incorporation of the daily work space in our homes undoubtedly alters the normal functioning of our families, which must be balanced between the continuity of the education of our children and the housework. However, being able to produce data and contribute to the international VLBI community even during the seriousness of the local situation is a pride for all of us.

Face masks and sanitizer, important paraphernalia during the pandemic, also at AGGO.

We believe that the collaboration between two institutions, such as the BKG and CONICET, in this project called AGGO represents an example to follow in this serious crisis that awaits an unprecedented worldwide collaboration for its solution.

Thank you, Yu, Chris, and Federico, for your contributions and opening up about what is happening in your countries. We continue to hope that everyone stays safe and healthy during this time.

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 the General Editors (see below).

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

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Feature Editor: Hayo Hase (hayo.hase@bkg.bund.de)
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The newsletter is published in color with live links on the IVS web site at

https://ivscc.gsfc.nasa.gov/.

Local VLBI Tie Sessions

– Axel Nothnagel, TU Vienna (IVS Chair)

View of the co-located radio telescopes at Yebes.

We are aware that geodetic local interferometer sessions have already been performed at a few places (e.g., at Wettzell and Onsala), and we gladly accept a grace period for proprietary data usage. However, we would like to request that after this period the data are made available to the IVS community for usage in general data analyses. This is of particular importance for the upcoming submissions to the International Terrestrial Reference Frame (ITRF2020), where analysts are eager to use these data sooner rather than later.

In recent years, an increasing number of IVS stations has augmented their observing capabilities by erecting one or more radio telescopes, mostly of VGOS type, in close proximity to their legacy telescope. This has opened up the possibility—or rather necessitates the observation—of local interferometer sessions among the telescopes of a local site. Carrying out such sessions at all co-location sites would be of great benefit, as it allows to tie together the coordinates of these telescopes with very high accuracy. In addition, these sessions are also important for carrying over and continuing the velocity history from the legacy telescopes and for constructing the VLBI terrestrial reference frame in general. In local sessions only the slowest telescope at a site limits the number of observations possible; also, observations can be carried out quite frequently to low elevation angles in all azimuth directions, as the constraining effect of far distant telescopes on the observing is removed.

For these reasons, the IVS Directing Board strongly recommends that all multi-telescope sites perform local interferometer sessions. These should be executed under the station's own responsibility as often as possible without any direct impulse by an IVS body. The IVS, however, is willing to support these efforts with resources (e.g., schedule writing and correlation capacity) if needed and available from other interested and suitable IVS components. Please send any requests to the new IVS Network Coordinator, Stuart Weston <stuart.weston@aut.ac.nz>, who will present your plans to the IVS Observing Program Committee for allocating needed resources. Of course, you can always prepare your plans with any individual in the IVS with whom you would like to cooperate.

Co-Winners of IVS Raffle

The raffle on "Celebrating 20 Years of IVS" produced two winners. Both Minghui Xu and Harald Schuh submitted noteworthy statements in commemoration of 20 years of VLBI observations and products by the global IVS community based on Zinovy Malkin's review article (see previous Newsletter issue). The winning submissions were:

"I like Figure 3 in Zinovy Malkin's paper most, because it gives me a good feeling about VLBI and IVS. The technique has been steadily growing for 40 years and it holds in it the expectation of giant leaps in the VGOS era." — Minghui Xu

"I like Figure 11 most because it connects the long observation history of globally distributed stations with my personal memory. All these stations show the strong commitment of VLBI experts from all over the world to cooperate within this truly international effort." — Harald Schuh

The organizers (Newsletter Editorial Board and Office for Outreach and Communications) would like to thank everyone who participated in the raffle.

New Satellite Missions Impacting VGOS

– Hayo Hase, BKG and Ganesh Rajagopalan, MIT Haystack Observatory

Radio Frequency Interference (RFI) to the broadband VGOS network from terrestrial telecommunication networks, military and commercial radars, and portable electronics is now well documented and is an area of active engineering engagement. In recent months, however, additional RFI coming from low earth orbiting spacecraft has emerged as an increasing threat. Two specific missions are of concern to the VGOS stations: (1) powerful X-band Synthetic Aperture Radar Systems (SARS) and (2) Ku-band wideband signals transmitted from broadband Internet-providing satellites.

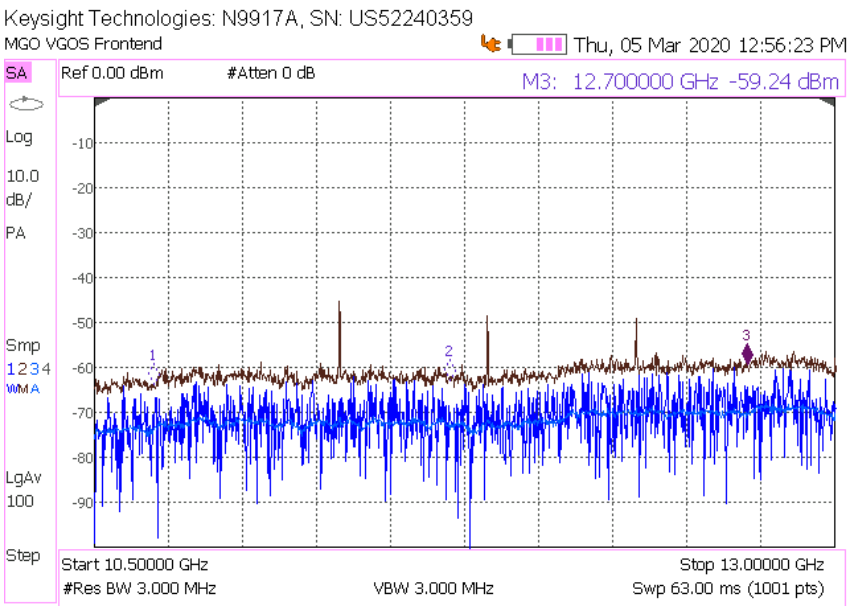
Disruptive CubeSat technology has vastly increased the capabilities of small satellites and there are currently up to 15 existing or planned SAR constellations. Start-up companies like ICEYE, Capella Space, are flying SARS to map Earth's surface with powerful microwave radars in the 9.2–10.4 GHz range. A few more like Umbra Lab and PredaSAR Corp are gearing up to launch fleets of their own (https://spacenews.com/tag/sar/). In contrast to the past, where space agencies had one or two SAR systems in space at a time, the new concept is based on mapping "every square meter, each hour." Some of these SARS signals are expected to be 17 dB above the burn-out level of receivers used in radio astronomy according to ITU-Report RA-2188. Since SARS do not need operating licenses in the countries they fly over and image, any coordination to avoid VGOS sites will be difficult to implement. Pre-LNA notch filtering and dynamic scheduling may be required to protect VGOS receivers in future.

Mega-constellations consisting of hundreds to thousands of satellites in low-Earth orbit are being built by private companies like SpaceX, OneWeb, Amazon. SpaceX is launching at least 60 satellites every month to rapidly expand their Starlink constellation, which will initially consist of 12,000 satellites with possible future extension to 42,000 to provide Internet access anywhere on Earth. This system is planned to be completed by 2027 and will probably be the first reaching that goal. Among several FCC allocated bands, Starlink uses 10.7–12.7 GHz (within the VGOS spectral range) for user downlink. A competing company, OneWeb had launched 74 of 648 planned satellites before declaring Chapter 11 bankruptcy on March 27, 2020. It has now been rescued by the UK government in partnership with an Indian Telecom company. They plan to resume operations with an eventual goal of adding as many as 48,000 satellites to its constellation. By the end of the decade, the radio sky will be very bright in the 10.7–12.7 GHz range.

At the moment Starlink satellites are activated only for test purposes but this will change soon with customer beta testing to begin between the 44th and 52nd parallels North. On March 5, 2020, MIT Haystack Observatory captured several spectra of CW beacons as Starlink satellites passed over the Westford VGOS station (see Figure). Even these beacon amplitudes are clearly 15–20 dB (30–100 times) above ground noise level in 3 MHz resolution bandwidth.

Unfortunately, national regulations do not apply in space, which makes it difficult to protect radio astronomical service sites such as VGOS radio telescopes. The IVS community is challenged to address interference mitigation techniques. While observation planning might become complicated by introducing satellite avoidance strategies, the frequency configuration used by VGOS might be different from what was initially thought. The satellite downlinks will occupy a 2-GHz-wide range (10.7–12.7 GHz) which will partially overlap with the anticipated 1-GHz-wide VGOS Band D. When the full 2-GHz band is transmitted at the FCC permitted level, post-frontend RF amplifiers can get saturated if this band is not filtered at the appropriate stage.

It will be an advantage for VGOS stations to be registered at the ITU-R as Radio Astronomy Service sites, because satellite mission operators may consult this database to avoid harmful incidents. For guidance, refer to *gm2016/011_hase_etal.pdf*.



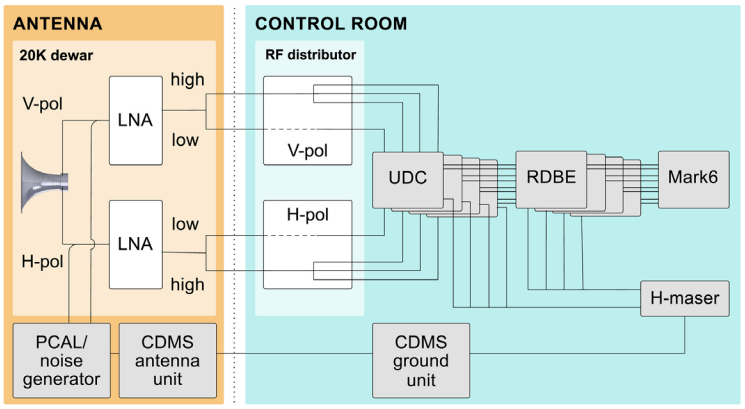
Starlink beacon signals captured at Westford, MA, USA.

How To...

Keeping Our Cryogenics Healthy

– Alex Burns and Mike Poirier, MIT Haystack Observatory

A common item at most of our VLBI sites is the cryogenics system which keeps the frontend equipment cool and sensitive enough to receive signals from distant radio sources. We sometimes take them for granted and watch them run for months without really spending the effort to identify symptoms of upcoming problems. Most systems have a helium compressor which runs a cryogenic cold head. The cold head displacer sits within a cylinder which is mounted in the Dewar. This cylinder is surrounded by the Dewar housing which is under vacuum. Mounted on the cylinder within the Dewar you find all frontend components. Some of you only have the Low Noise Amplifiers (LNAs) within this environment, while the new VGOS broadband systems have LNAs, couplers, and even the actual antenna feed. It is critical to all of these systems that they stay at the cryogenic temperatures to operate correctly. If the temperatures on these devices rise, it could add noise to our data and reduce sensitivity during our operations. Although your systems may have different compressors and various sized cold heads doing this important job, they are all very similar.



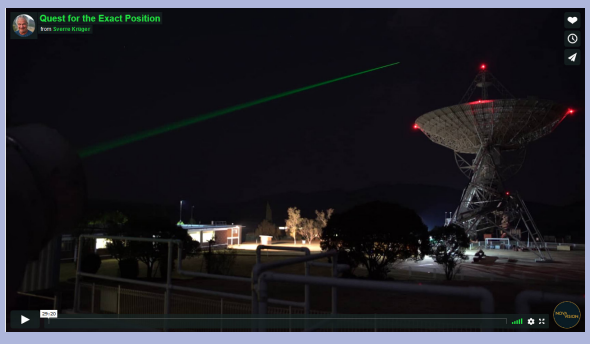
Block diagram of Westford's broadband signal chain (Niell et al. 2018, Radio Science).

Each cold head has a rhythmic sound and motion while running. It is very important to listen and learn the normal sounds of your system. The mechanical movement should be smooth without any hesitation. The sounds, although slightly different for each site, should all be a slight mechanical sound with a pumping overtone. I would suggest that all site personnel spend time listening what is normal for them from a location that is close enough to distinguish those sounds. Be careful not to be too far away from the cold head, as the mechanical movement can be transmitted through many mechanical structures of your antennas.

It is also very important to monitor the temperatures of your 20K and 70K stations within the Dewar. This is another critical factor that could indicate a problem. In some climates where your ambient temperatures vary significantly, you might have to thermally control the environment that your compressor is located in to prevent it operating outside its recommended temperatures. In some systems the ambient temperatures can be directly reflected within the 20K and 70K temperature readings. This also should be monitored and data stored for reference. Each of our systems should have a data base of these temperature readings to refer to.

The Westford system, for example, presently runs an M125 compressor with a Model 350 cold head. In July and August, during our summer months, we see a movement of a couple degrees. When we had the S/X receiver running, it would be normal to see a ten-degree change during the summer months. This can be attributed to running a Model 22 cold head which had a much lower capacity.

If you see unexplained temperature variations or any change in the mechanical sounds from the cold head, it is recommended that you run your specific cold-trap-and-helium-purge procedure to flush out any contaminants. By following these suggestions, you will be able to increase the life of your cryogenic systems and ultimately increase the quality of the data we provide to our sponsors. Feel free to contact the system experts for suggestions to improve your systems.



Outreach Tidbit: "Quest for the Exact Position" Freely Available

The Norwegian geodesy video "Quest for the Exact Position," produced by Sverre Krüger and featuring several familiar IVS faces, is now available on Vimeo in English. More info can be found on the website of the IVS Outreach Office at https://vlbi.org/2020/07/15/quest-for-the-exact-position-now-available-for-free/.

Remembering Reiner Wojdziak (1956–2020)

Our colleague and friend Reiner Wojdziak passed away on June 30, 2020 while enjoying his vacation in Saxony together with his wife. His sudden death at the age of 63 is completely unexpected for all of us and we are still speechless. Roughly two years before his retirement he had plenty of plans for the future and looked forward to enjoy the time together with his wife, his children, and grandchildren.

Reiner riding the wine barrel in Auerbachs Keller during the 16th EVGA meeting in Leipzig in 2003.

Reiner started working at BKG (and its predecessor institutions) in Leipzig in 1982, shortly after his university diploma in informatics. In the early years, his work was connected more with cartography than with geodesy. His connection to geodesy became stronger in 1990 when changing to the informatics department of BKG (then called IfAG), where he got involved in software development and hardware management related to geodetic research. Finally, Reiner joined the geodesy department in 2000, making this time the beginning of his involvement in the IVS.

Reiner built and supported the basis for everybody within the IVS by managing and maintaining the IVS Data Center at BKG. In that sense, everyone within IVS retrieving and/or delivering VLBI data, schedules, or analysis products benefit from the "silent" work of Reiner in the background. He was recently intensively working on developing methods to fully re-establish the data exchange between the three IVS Data Centers, as he was convinced that the actual situation with the VGOS databases does not perfectly fit the users' needs.

Apart from running the IVS Data Center, Reiner was also the BKG-internal data manager for the VLBI analysis group as well as the O'Higgins geodetic observatory. Reiner supported the VLBI analysis group at BKG by taking care of the hardware and software. This was not always an easy task as there are usually no "cookbooks" for geodetic software packages. Struggling with the installation of Calc/Solve and nuSolve was one of his major work items in recent years; but with his broad expertise in informatics and his diverse connections within BKG, he managed to prepare the basis for the VLBI analysis group at BKG. He also began to plan the modernization of the hardware components of the IVS Analysis Center at BKG.

The most extraordinary part of his contribution to the IVS community must be seen in his support for the O'Higgins geodetic observatory. Since 1994 roughly once per year, he spent several weeks in Antarctica during the southern summer. From January until mid-March of this year he has been to O'Higgins together with a colleague from Wettzell. They luckily returned to Germany almost in the last minute before the Coronavirus pandemic lockdown began. But even without the pandemic, the annual trip to O'Higgins was always a demanding challenge that we can only take our hat off to Reiner and admire him for his enthusiasm for O'Higgins. We know that this was also a big strain on his family every year, and we all must be glad and grateful that they supported this extraordinary work. One major achievement of Reiner's work in O'Higgins was that VLBI observing sessions can now be done remotely, which ensures a more regular inclusion of O'Higgins. And when sitting in Leipzig, Reiner also supported the colleagues at Wettzell to prepare, run, and finalize the O'Higgins VLBI sessions at any time of the day and night.

With all the diverse involvements in VLBI activities at BKG, Reiner will leave a big gap. Beyond losing his expertise in informatics, we will miss him mainly as a very friendly and likeable colleague.

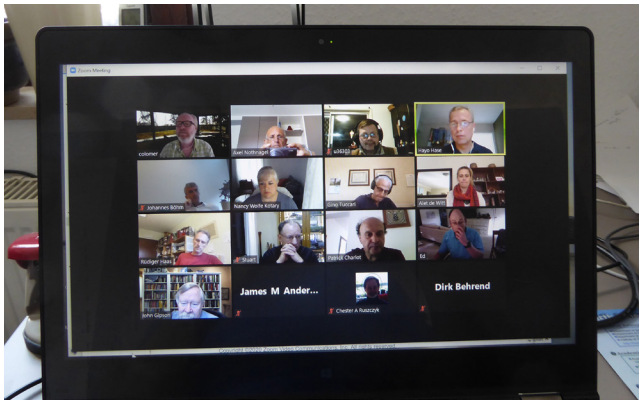
– *Daniela Thaller, Dieter Ullrich, Gerald Engelhardt, Anastasiia Girdiuk*

Reiner at O'Higgins inspecting the geodetic, electronic, and IT equipment at the station. The radio telescope is visible in the background.

Virtual Work Virtually Works – News from the Board

– Dirk Behrend, NVI, Inc./NASA GSFC

Having face-to-face meetings has become virtually impossible following the onset of the COVID-19 pandemic. You could imagine masked IVS crusaders congregating beyond spitting distance in an open space environment; but even traveling to that open space is currently an impossibility. While the IVS Directing Board typically meets in person twice per year, the new situation required to alter that during COVID. So, the Board resorted to what many organizations are doing—going virtual.



A screenshot with IVS Directing Board members during the Zoom session on June 25, 2020.

Following the cancellation of the General Meeting, the Board decided to meet via Zoom about every three months. As the IVS constitutes a global community with commensurate representation on the Board, the Zoom meetings had to be shorter than the full-day regular board meetings; it is not possible to find longer time periods that do not inconvenience at least a few of the board members. As a result, the Board met for a good two hours each on March 26 and June 25. The next meeting in that series is planned for September 25.

The minutes of the two ersatz board meetings have been posted on the IVS Web site at *dbmeet42-e1.pdf* and *dbmeet42-e2.pdf*. Highlights of the proceedings include the discussion about an Infrastructure Development Plan 2030 that started out as a strategy document for the stakeholders meeting. The plan will provide a roadmap for the needed infrastructure over the next decade. It is foreseen to distribute the final draft of the plan to the various stakeholders for feedback.

An obvious discussion was the safeguarding of the IVS operations, in particular, the impact of the pandemic on the stations and correlators. In general, it can be stated that the IVS fared reasonably well under the circumstances. Due to enforced restrictions, some of the maintenance, upgrade, and repair works could not be done or only with delays. This resulted, for instance, in some antennas to observe with a warm receiver for a number of sessions. A snapshot of the current state of the observing network is available at *https://vlbi.org/site-status*.

Other items covered were the effects of massive satellite RFI and ground-based emissions on VGOS as well as the observation of local VLBI tie sessions at sites with two and more antennas. Both topics have dedicated articles in this Newsletter. It is planned to create a Celestial Reference Frame Committee and a first draft of a charter was discussed. The details will be hashed out by the next board meeting. It is also foreseen to establish a clock service on GitHub to ensure that the correlators use a consistent clock model in their data processing.

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