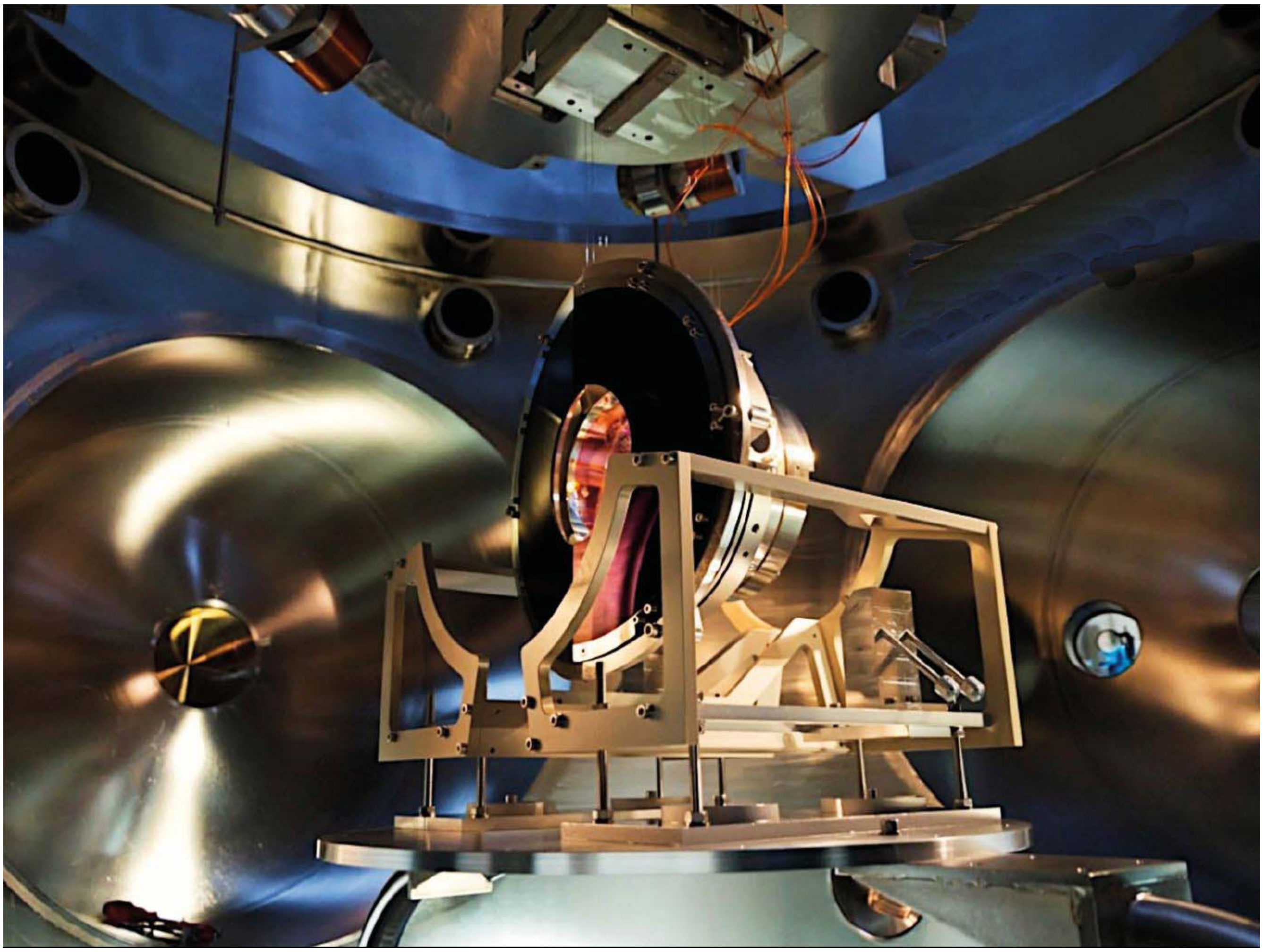
h

THE GRAVITATIONAL VOICE

number 26

JULY 2014



NEWS FROM THE COLLABORATION

Mode Cleaner
The Radboud Virgo group

LIFE IN CASCINA

Virgo seen from la Verruca
The death of a giant

News from EGO and VIRGO

CONTENTS

"h - The Gravitational Voice" is an internal publication of the European Gravitational Observatory (EGO) and the Virgo Collaboration.

The content of this newsletter does not necessarily represent the opinion of the management.

Editor: Carlo Bradaschia

Editorial Staff:
Henrich Heitmann
Gary Hemming
Martin Mohan
Séverine Perus

Production:
Andrea Matteini

Published in electronic format on the EGO Web:
www.ego-gw.it

EDITORIAL

This editorial consists of three short parts, dealing with two pleasant subjects and an unpleasant one.
The first and most important pleasant subject is the feeling of pride at successfully locking, in due time, the Input Mode Cleaner cavity. This is an important achievement, encouraging us towards the completion of Advanced Virgo by the end of 2015. Congratulations to the team!
The second pleasant subject is that the h editorial team is very happy to host in this issue a nice article by our dear Australian colleague, David Blair. Enjoy reading!
The third, and unpleasant, subject is that the h-chief-editor (i.e. me) on the occasion of his 70th birthday - July 8th - was planning to toast the day with those colleagues on site. However, due to the new restrictions on the drinking of alcohol at EGO, he refused to celebrate with a water and fruit juice toast. Too bad!

C.Bradaschia
Chief Editor

GWADW in Takayama, Japan

At some point in your life, you may wonder why you are in a mine, mud up to the ankles, staring with admiration at two perpendicular 3km-long tunnels. If it happened to you, then the chances that you are a physicist involved in the gravitational-wave quest are very high, and I bet you were visiting the site of the future KAGRA interferometer. I could also go further and suppose you were attending the Gravitational Wave Advanced Detector Workshop (GWADW 2014) in the lovely town of Takayama (Japan).

But let us start from the beginning. GWADW is, according to my little experience, the most proficuous series of workshops for the GW-instrument scientists. It is a workshop with an informal atmosphere, where people are not afraid of discussing crazy ideas, networking happens smoothly in front of good food (and alcohol), and it is usually held in attractive locations around the world.

This time was no expception. We met in Takayama, Japan, the “high-mountain town” renowned for its traditional carpentry and wooden houses.

figure 2 : Traditional houses in Takayama (left) during a rainy but lively day (right).

The welcome was warm and met all expectations in terms of traditional Japanese hospitality. Just to give an idea, this was the first time to my knowledge that a physics workshop was heralded by an official poster in front of the main station of the town hosting it.

Then, once we reached the actual place of the workshop, it was a pleasure to meet once more people who are friends, rather than colleagues, while being surrounded by good food improved everything.

The meeting began with a talk by Kazuaki Kuroda complaining about time passing by without detection. We hope that he (we!) will not have to wait much longer for this event.

But this is not the only achievement that the experience with the huge interferometric antennae could allow.

Actually, the first day was partly devoted to illustrating the “side-effects” of the technological and scientific development of the GW-detectors.

Among others, Matteo Barsuglia talked about improving the early warning for earthquakes from 15s (currently) to 35s at 100km distance from the epicenter by using a gravity-based system, while Enrico Calloni gave a talk about the possibility of using GW detector hardware for testing the speed of tachyons (if any!) in EPR experiments and for weighing the vacuum state of electromagnetic fields.

In the same session, Stan Whitcomb gave a talk about a proposal for testing the Equivalence Principle for Dark Matter using gravitational waves, while further on Valera Frolov presented a proposal for Dark Matter Detection with Laser Interferometers.

But there were even crazier ideas, such as giant vertical Atomic Interferometers and using the Earth and Moon as resonant GW detectors . But I guess that even the proposal of the detectors we are currently building sounded like crazy ideas at their time.

figure 1: Visiting the KAGRA site

Figure 3 - AdV Commissioning Coordinator (Bas Swinkels) welcomed by Takayama town. The greeting band is outside of the picture.

Figure 4 - Food was superb, but it raised some suspicions among some elderly Western people (top-right).

Of course, much of the meeting was devoted to the core business of the community: the detection of gravitational waves with better and better sensitivity.

The challenges in commissioning of Advanced Detectors were described in a dedicated session, where we were reminded of the progress made so far for aLIGO, AdV, GEO600 and KAGRA. In particular, the schedule for the KAGRA interferometer seemed impressively tough.

We wish all the best to our Japanese colleagues and really hope that they will manage to be online by the end of 2015, even though the tunnels were only very recently completed. On the other side, the breaking news about a 1-hour full ITF lock for aLIGO-Livingston was given during the meeting and was welcomed by all of us.

This impressive achievement gives us even more confidence that what was so far only simulated can be translated into a solid and working detector.

Many other topics were covered, not only during regular sessions, but also in casual chats during coffee breaks (with interesting local cakes, the average lifetime of which was measured to be well below 9 minutes).

Besides the coffee breaks and the dinners (all served at the conference hotel), the visit to the KAGRA site and KAMIOKANDE were also really interesting. At the KAGRA site we were able to appreciate the gigantic efforts that are needed to complete all the infrastructure on time, while KAMIOKANDE was the counterpart of a beautiful scientific quest, paying back the sweat and blood with new insight in Nature. That is exactly what we all aim for.

The meeting was not only an occasion for inspiring discussions, but also to taste Japanese culture in many ways. We experienced some of the things for which Japan is renowned in the world: sight-seeing in the wild, Karaoke, local clothes, extreme tech embedded in everyday things, and so on.

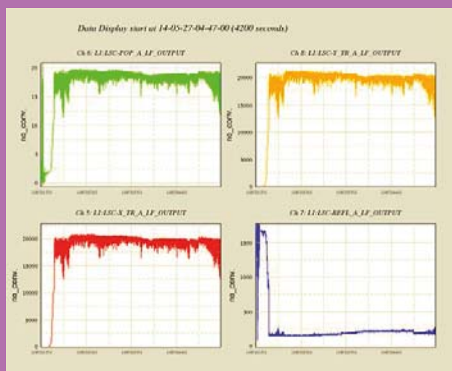


Figure 5 - LLO full RSE locked for one hour!

Figure 6 - Some random pics from the talks.

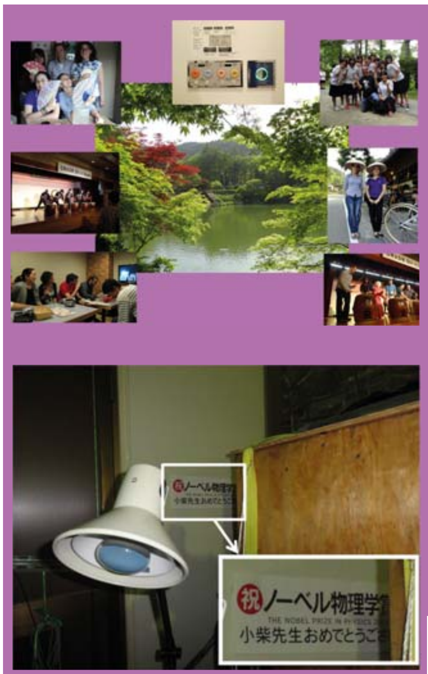


Figure 7 - KAMIOKANDE experiment was awarded the Nobel Prize in 2002. The memorial label was barely visible behind some piece of furniture at the site: an example of Japanese understatement.

Figure 8 - GWADW 2014 in Takayama

The overall impression of this workshop is that it was amazingly organized (while keeping a "cheap" fee when compared with other meetings of the community), despite the fact that the attendance figure for the meeting was a record for this series (134 participants from all over the world).

Attending this workshop was not only useful, but also inspiring. And I cannot help but think about all the efforts, the work and the vision that keep all this quest ongoing towards the final goal.

A.Chiummo

BICEP 2:
primordial gravitational waves detected?

In March 2014 the BICEP2 collaboration announced the detection of a particular polarization in the Cosmic Microwave Background that might be an effect of primordial gravitational waves [1].
If confirmed by other experiments, it would be a major discovery, which could shed further light on the famous "first three minutes" of our Universe.
For some commentators, this discovery has been all the more surprising because BICEP2 is a relatively inexpensive experiment: in a nutshell, it is a small telescope, with an aperture of just 26cm (it would fit in an amateur's dome), equipped with a sophisticated polarimeter; its optics are refrigerated at 4K, and the focal plane is made up of 512 innovative, polarization sensitive bolometers, kept at 250mK and coupled to the radiation by way of "feed-horns".
It is located at the US South Pole base, and has been observing a region of sky, which should have a low foreground contamination.

BICEP2 has been observing the e.m. radiation at 150 GHz, very close to the 160 GHz peak of the CMB power spectrum, with the purpose of measuring its degree of polarization, in turn carrying information about scattering processes that affected light when the CMB originated.

To understand the connection between this polarization and gravitational waves, we need to quickly recapitulate the standard . picture of the first 400.000 years or so of our Universe.

Shortly after the Big Bang, the Universe underwent an extremely brief period (lasting between 10^-33 and 10^-32 s) of exponential growth, during which quantum fluctuations in its density were stretched to macroscopic scales, thanks to an expansion by more than 10^26 of the size of the Universe.

One effect of this fantastic stretching is that the Universe appears now to us remarkably homogeneous and spatially flat; this is because what we can observe today, namely the galaxies, which are less distant than the distance light can have travelled since the Big Bang, all derive from a small, relatively uniform portion of the initial Universe.

However, even this portion of the initial Universe was affected by small quantum fluctuations, and they acted as "seeds" for inhomogeneity that ultimately facilitated the gravitational collapse of clumps of gas in galaxies.

Inflation cooled the Universe, but it remained a very hot place until about 380,000 years after the Big

Figure 1 The sun sets behind BICEP2 (in the foreground) and the South Pole Telescope (in the background). (Steffen Richter, Harvard University)

Bang, when the expansion drove the temperature down enough to allow electrons and protons to recombine and form atoms; at this time, finally light started to decouple from matter, and the CMB is precisely the light last scattered by the primordial plasma that was turning into an ordinary gas, a process which was completed over about 100,000 years.

The light interacted with plasma mainly by a Thomson scattering on the free electrons, and the CMB is essentially a black body radiation, having a temperature today of about 2.75 K.

However, anisotropies in the distribution of the primordial plasma translate into small anisotropies in the CMB, more precisely in its apparent temperature, because denser areas in the plasma were also hotter, and in thermal equilibrium with light, until the last scattering epoch. These are the anisotropies that WMAP and Planck have observed, and are direct proof of the fluctuations in plasma densities, in turn believed to be due to primordial quantum fluctuations spatially amplified by inflation.

However, this is not the end of the story [2]: if we think back to the classical mechanism of Thomson scattering, namely a free electron being driven back and forth by the electric field of the impinging light, and re-emitting like a dipole, we understand that this mechanism naturally leads to linearly polarized light.

For instance, if light propagating along direction x and polarized along direction y gets scattered, an observer located on axis z will see the scattered light polarized along y. Instead, if the original light is polarized along z, no radiation is scattered towards the observer.

Therefore, if the original light propagating along x is an equal mixture of polarizations, the scattered one along z is instead polarized along y.

But wait! In the turmoil of the primordial plasma, the free electron received also light from direction y, and the scattered light towards the observer would be polarized along x, thus yielding unpolarized light.

True: but not necessarily so if density fluctuations are present, like acoustic waves in the plasma. For instance if the density fluctuations carry a quadrupolar component, that could mean that there's more plasma, and therefore a more intense light coming from direction y than from x.

An observer on axis z will see a net polarization, oriented along x. Hence if the CMB (small) temperature anisotropies are due to such fluctuations, then the radiation must also display (some) polarization, and this was indeed first discovered by the DASI experiment in 2002, and confirmed one year later by WMAP.

But density fluctuations aren't the only mechanism for producing such an effect, which can also be due to Gravitational Waves crossing the plasma. After all, we are used to say that GWs "stretch" matter along one direction and "compress" it along the other, thus producing the kind of quadrupole that we would need to polarize light via Thomson scattering; one could also say that the wavelength of the incoming light is "blue shifted" or "red shifted" at orthogonal directions, causing a quadrupole asymmetry and polarizing the scattered light. Nice, but can the two sources of quadrupole asymmetry be disentangled?

Actually, yes! They give rise to different spatial correlation properties, reflecting the scalar or tensorial nature of the field that causes them.

Making these considerations quantitative, or even just a bit more precise, goes beyond the scope of this note: it will suffice to say that gravitational waves produce also "B-mode" polarizations, characterized by a curl, whereas density fluctuations produce only "E-mode" polarizations, which exhibit just a gradient.

Now back to BICEP2; it could measure precisely the "B-mode" polarization, and found it non-zero; more precisely, it measured a ratio $r = 0.20_{-0.05}^{+0.07}$ of the tensorial to scalar component, excluding r = 0 with a 7σ significance. If this result is not due to some other effect, it's a clear sign of primordial gravitational waves!

And BICEP2 could characterize them; the sky angular distribution of the polarization pattern (technically, its decomposition in angular multipoles) reveals what are the characteristic wavelengths of these Inflationary Gravitational Waves, which are quite long: BICEP2 signal peaks at around l = 100 in the multipole expansion, which means it should be due to IGWs having wavelengths roughly comparable to 1/100th of the observable universe.

The frequency of these waves is today far below the sensitivity range of man-made detectors! It's like the Universe itself being used as a detector of Gravitational Waves.

However, if the paradigm of slow-roll inflation is correct, the gravitational waves spectrum should have a very slow frequency dependence, and the BICEP2 observation allows for predicting the amplitude in the bandwidth of LIGO and Virgo, at $\Omega_{GW} \sim 5\times 10^{-16}$ [3].

This amplitude is not accessible even to the 2nd generation advanced detectors, which will be sensitive down to $\Omega_{GW} \sim 5\times 10^{-9}$; however, other models of the GW spectrum exist, which predict a growth with frequency, hence it is still worth looking for such waves with aLIGO and AdV!

How reliable are BICEP2 results? The biggest challenge comes from the possibility that the measured B-mode is not a cosmological effect, but a foreground effect, for instance due to Milky Way dust, which affects the polarization of the CMB.

This source of contamination has been considered by the BICEP2 collaboration, which has tried subtracting a foreground based on several dust models: even after subtraction, the measured value of r remains highly significant.

However, the collaboration acknowledges that their estimate of the foreground is uncertain, because the amount of polarized dust could be higher than anticipated.

It is also worth noticing that BICEP2 results are in tension with previous indirect estimates, at r<0.11, based on temperature and polarization maps resulting from data from several experiments, including Planck and WMAP; also in this case, a possible explanation is a contribution from polarized dust, that would affect BICEP2 measurements.

To limit the foreground, the BICEP2 collaboration has chosen to observe a region of space "ultra-clean" of dust, an order of magnitude cleaner than the average.

But this choice was based on maps of unpolarized dust, hence an anomalous excess of polarized dust could still affect the results. Understandably, the literature is now awash with papers that challenge the initial BICEP2 claim of a discovery of IGW, and assert instead that the signal is compatible with a foreground.

For instance, a nice study appeared recently on the preprint archives [4]; it exploits data from several experiments and argues that "the predicted level of polarized emission from interstellar dust ... might leave room for a primordial gravitational wave contribution, but could also be high enough to explain the observed excess B-mode power".

It will require considerably more work, data and ingenuity to confirm or rule out the BICEP2 claim. Anyway, the interest for these results just cannot be exaggerated: if the claim were true it would represent direct evidence of the Big Bang, inflation and quantum fluctuations in the space-time metric.

We therefore look forward to the results of other experiments, including the Keck Array, a successor of BICEP2 already operating at the South Pole, made of five telescopes, each duplicating their predecessor.

A.Vicerè

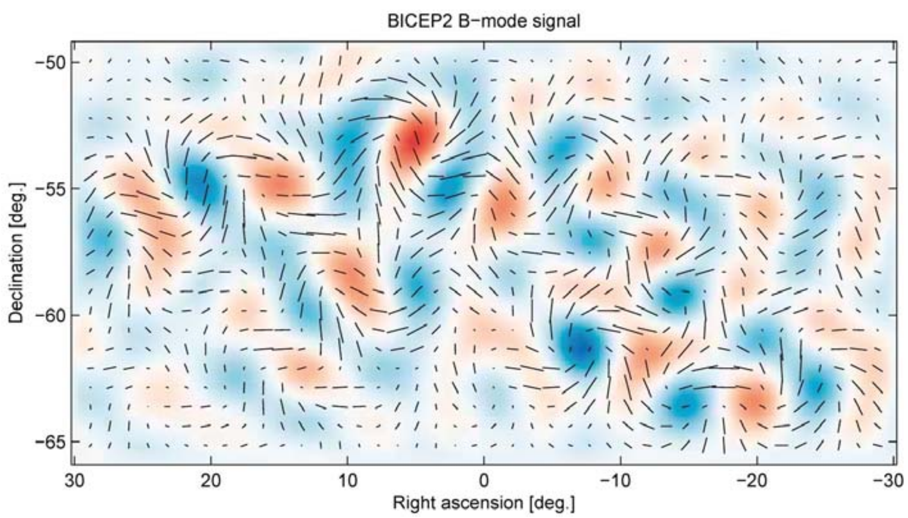


Figure 2 Gravitational waves from inflation generate a faint but distinctive twisting pattern in the polarization of the CMB, known as a "curl" or B-mode pattern. Shown here is the actual B-mode pattern observed with the BICEP2 telescope, with the line segments showing the polarization from different spots on the sky. The red and blue shading shows the degree of clockwise and anti-clockwise twisting of this B-mode pattern. (BICEP2 Collaboration)

References
[1] *P.A.R. Ade et al. (The BICEP2 Collaboration), Detection of B-Mode Polarization at Degree Angular Scales by BICEP2, PRL 112, 241101 (2014)*
[2] *P.Cabella and M.Kamionkowski, Theory of cosmic microwave background polarization, Lectures given at the 2003 Villa Mondragone School of Gravitation and Cosmology: ``The Polarization of the Cosmic Microwave Background,'' Rome, Italy, September 6-11, 2003. Revised version (March '05),arXiv:astro-ph/0403392*
[3]*J. Aasi et al. (The LIGO Scientific Collaboration, the Virgo Collaboration), Improved Upper Limits on the Stochastic Gravitational-Wave Background from 2009-2010 LIGO and Virgo Data, arXiv:1406.4556 [gr-qc]*
[4] *R. Flauger, J. Colin Hill and D. N. Spergel, Toward an Understanding of Foreground Emission in the Bicep2 Region, ar Xiv:1405.7351 [astro-ph.CO]*

GraWItoN Project

The GraWIToN Project is an Initial Training Network (ITN) which is funded by the European Commission for 4 years, with a €3.7M grant. 13 PhD students, Early Stage Researchers (ESR) in the FP7 jargon, will be hired by the project partners; they will participate in the activities of Advanced Virgo and GEO-HF and will be trained for three years in the science and technology of gravitational wave research.

In fact, the aim of the ITN tool is the training of young researchers, focusing on those aspects that can fill the gap between academia and industry.

The composition of the GraWIToN consortium, coordinated by EGO, matches this requested multi-disciplinary constraint of an ITN: four research institutions, five universities and four private companies will collaborate to train the ESR in Data Analysis, Optics, Simulation and Laser science and technologies through a complex programme of international schools and training by research. Multi-disciplinary skills, such as project management and scientific communication, are important ingredients of the training activities.

The ESR will have the possibility to achieve a doctorate degree at the end of the GraWIToN training period, thanks to the involvement in the project of universities in Italy, France, Germany and the UK.

For example, the ESR recruited by EGO will participate in the doctorate programme of the University of Pisa (along with the ESR recruited by the University itself) and the ESRs recruited by the INFN will have their first year of doctorate training at the newly-born Gran Sasso Science Institute (GSSI).

The candidate selection procedure has already been started in each of the consortium member institutions. EGO, thanks to GraWIToN, has also recruited an administrative assistant to support the complex management of this project.

The GraWIToN project is a new brick, following on from the ET design Study and ELiTES FP7 projects, in the construction of the European Research Area in the Gravitational Wave field, which underlines the centrality of EGO and Virgo in the European scenario.

M.Punturo

GraWIToN website: http://www.grawiton-gw.eu/
Network Schools: http://www.grawiton-gw.eu/index.php/network-schools
Available positions: http://www.grawiton-gw.eu/index.php/jobopportunities
Coordinator: EGO

Input Mode Cleaner cavity back in operation

As you may have heard, the Input Mode cleaner (IMC) cavity is back in operation after a bit more than 2 years of shutdown.

It is a big step for the Injection subsystem (INJ) towards the completion of the installation of the parts produced by the subsystem, but it is also for sure a strong signal sent to the GW community and our funding agencies, even if we cannot detect Gravitational waves with only the mode cleaner cavity.

I won't go too much into the details, but this cavity is one major component of the laser frequency pre-stabilization loop. It filters the laser beam spatially before injecting it into the interferometer, thus making it an almost perfect fundamental Gaussian mode.
The other interest of this cavity is its length (about 150m) and it could be a nice occasion to train new people, or remind older ones, how to align such a long cavity.

The IMC cavity is composed of 3 mirrors. Two of them are installed on the Suspended Injection Bench 1 (SIB1) (see figure 1) (assembled between January 13 and March 20 in the Central building clean rooms). This bench was suspended from the super attenuator on April 15, 2014.

The third mirror is installed in the MC tower and suspended to the MC super-attenuator (see fig. 2).

This mirror was assembled and installed in the MC tower between January and March.

Following a careful alignment of the cavity using an auxiliary laser, the optics required to bring the beam from the Laser Bench to SIB1 were installed in the Laser Lab. Finally, the Advanced Virgo input mode cleaner was locked on June 19th (see figure 3).

I would like to underline that this important result, lead by the INJ subsystem and EGO, required the effort of many other subsystems (Laser (PSL), Vacuum, Super-Attenuator (SAT), Suspended Benches (SBE) for the EIB-SAS, SLC for the design and production of the baffles needed for INJ and DAQ for the data acquisition system) and groups from the Collaboration (APC, INFN-Perugia, INFN-Pisa, INFN-Roma1, LAPP, LMA, Nikhef).

We are now entering into a first commissioning phase, before the installation of the final elements of the INJ subsystem on the second suspended bench (SIB2).

E.Genin

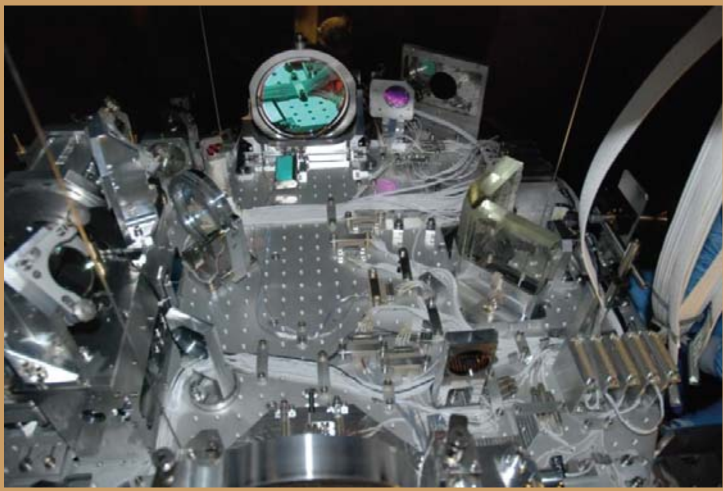


Figure 1. a view of the IMC input and output mirrors on SIB1 bench (IB tower).

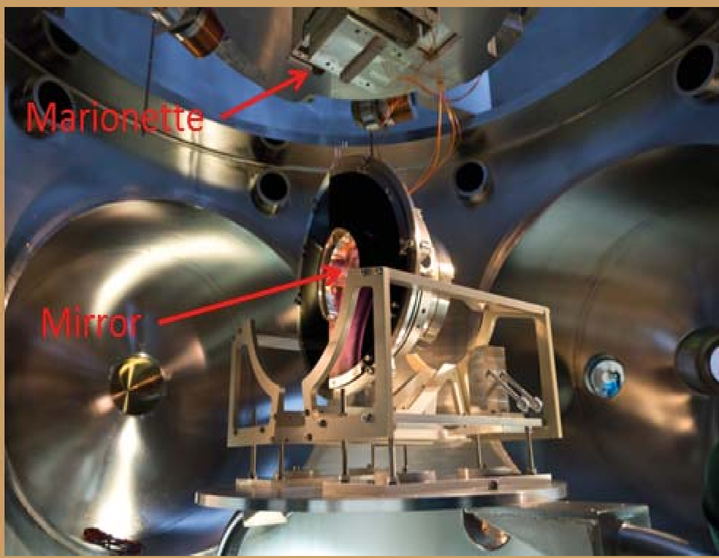


Figure 2: IMC end mirror in the MC tower.

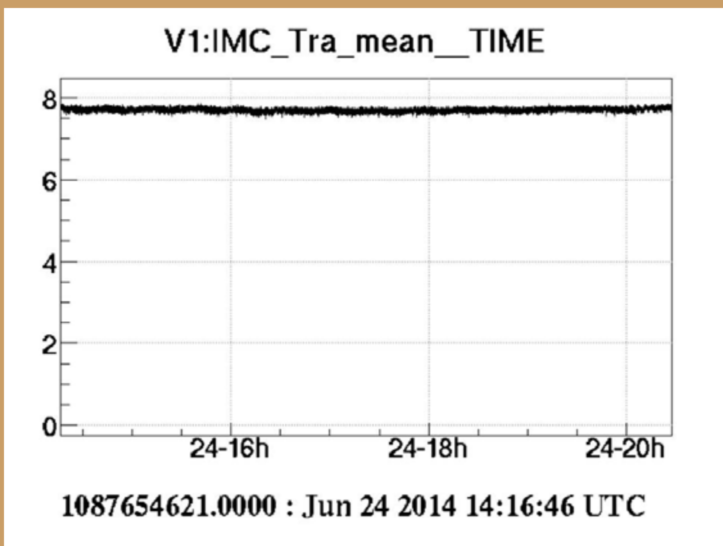


Figure 3: IMC transmitted beam measured with a photodiode. No unlocks over 6 hours.

Radboud University, Astrophysics group

The RU group is a peculiar group within the Virgo Collaboration because it is a group of astronomers that have little involvement with the building of the actual detector, but instead work on the electromagnetic follow-up and in the interface between GW and EM data analysis.

Our group is very young: only in 2002 did the Radboud University decide to (re)start an astronomy group and appointed a professor and an assistant professor.

Fig. 1: The building hosting the Department of Astrophysics at Radboud University

Fig. 2: the BlackGEM array of telescopes

Due to good management and some lucky developments, the group has now grown to consist of more than 60 people, 10 full time staff members, 15 post-docs and 30 PhD students.

The main research topics of our group are astroparticle physics (origin and acceleration of cosmic rays; sources, detection and EM follow-up of GW); the formation, evolution and (accretion) physics of black holes, neutron stars, white dwarfs and stellar (binary) populations in the nearby Universe.

Our interest in GW astronomy dates back to my time as a PhD student, when I worked on the Galactic population of close double white dwarf binaries that are prominent sources for a space-detector such as eLISA.

The same theoretical modelling tools are also used for calculating the population and merger rate of neutron star and black hole binaries and thus form a natural bridge to Virgo and LIGO. At the same time, the research topic of Paul Groot, who worked on GRBs in the 1990s moved to optical transient searches and so we decided that we should get involved in the Virgo/LIGO data analysis to optimise both the EM follow-up as well as the scientific exploitation of Virgo/LIGO detections for GW astrophysics by developing joint EM-GW data analysis.

In order to realise this, we started to collaborate with the Nikhef group (which is quite an achievement, given the large divide between the physics and astronomy communities in the Netherlands) and have jointly organised the Dutch GW community.

Since 2012 we have become a part of the Virgo Collaboration.

The main activities that our group is currently undertaking are the design and construction of an array of optical telescopes (BlackGEM), dedicated to GW follow-up observations, development of tools for the interaction between GW and EM partners, joint GW-EM data analysis and tools for interpreting these data in the context of astrophysical questions.

The design of BlackGEM is almost finished and the first prototype will be built later this year. Next year the first four BlackGEM telescopes will be constructed and the phase-1 operations will begin in 2016.

These will be partly focussed on charting the variability on short time scales, in order to have a good estimate of contamination by false positives and partly on making a first all-sky map that serves as a reference to which the first images of a GW error box can be compared in order to look for a counterpart.

For the interaction between GW

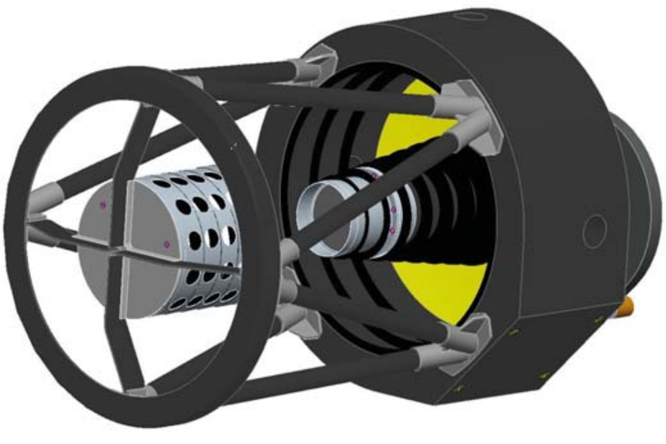


Fig. 3: One element of the BlackGEM array

and EM partners we focus on the content of the alerts, the optimal covering of the error box and the prospect of fast yet accurate sky localisations.

For the astrophysical questions, the challenge will be to determine which of the measurements do and which do not robustly constrain the questions such as which stars form neutron stars and which black holes and how the compact binaries are formed.

We are very much looking forward to the first science runs and hope that the GW community will be an example of close collaboration between the physics and astronomy communities.

G. Nelemans

Visit of a Nobel Prize holder: Sam Ting

On the 8th of May we had the pleasure of hosting a visit by Samuel Ting to the Virgo site.

Samuel Ting was the winner, along with Burton Richter of SLAC, of the 1976 Nobel Prize for the discovery of the J-Psi particle.

The discovery of this particle had very important consequences in terms of particle structure knowledge, since it was shown to be an excited state of a quark - antiquark system, where the quark was of a new kind: the Charm quark.

I had had the opportunity to meet Samuel Ting at a party held by Giorgio Bellettini, I do not remember the exact date, but it was certainly very close to the Nobel Prize date. Very recently he expressed the desire to visit Virgo, and the EGO Director, Federico Ferrini, invited him for a tour; Franco Cervelli (INFN Pisa), who is now a prominent researcher within his group, very kindly accompanied Ting at the Virgo site.

At first we (Ting, Cervelli, Ferrini, Giovanni Losurdo and myself) met in the Council room where Giovanni made a detailed presentation of Advanced Virgo, interrupted by several questions from Ting.

The Virgo visit followed subsequently, as Giovanni continued to explain, with great satisfaction: Ting was asking for many details on several Virgo parts, in particular in relation to the Superattenuator system and, when Giovanni quoted that we can observe a 50 kg mass moving by only 10(-19) metres, Ting was really amazed and impressed.

When I brought Gerard T'Hoft, who won the Nobel Prize for demonstrating the renormalisability of the electro-weak theory, for a visit to the site, I also saw the same reaction; Virgo performances cannot be easily explained to people, but, sometimes, someone understands it.

Following the visit, we had a nice dinner, all together at the EGO Canteen, where we spoke with With Samuel about old times, in particular remembering his visit to Pisa following his Nobel Prize in '76. Since I knew Ting was considered to be a very energetic and "powerful" experimentalist, I was impressed by his quiet and kind way of communicating and, let me say, by his charisma.

At the end of the tour, Federico gave Ting a beautiful map of the Virgo site and we will not forget this warm visit which demonstrated, once more, that you cannot buy class.

A.Giazotto

Ting at EGO

Open Doors

31 May 2014

The latest 'Porte Aperte' episode on the 31st of May 2014 once again provided satisfying results.

As usual, bookings for the visit reached the maximum allowable number, but, as a result of the weather forecasts during the days preceding the event, which foresaw cloudy skies and a slight possibility of rain, there were fewer people in attendance than expected.

In addition to the visit to the Virgo site, many visitors usually count upon a satisfactory observation of the sky with the available telescopes.

The two afternoon visits were attended by 50 and 35 people respectively, while the, approximately 40, evening visitors, after having attended the briefing and having followed the explanations of the objects located in the Main Building atrium and Control Room, were able to observe the skies with the telescopes with full satisfaction; even staying until a late hour.

Actually, to make the last 20 tenacious visitors understand that at midnight the time available to them was at an end, those people assisting with the visit had to turn the lights back on again.

Episodes, of the type already seen in the past, of people trusting themselves blindly to technology and consequently finding themselves completely and utterly lost, were once again a feature.

One gentleman, who was part of a group, had arranged to reach the site autonomously with a navigation system.

The result was that he found himself at the time of the start of the visit among the Livornese hills.

At this point, the rest of the group, who had arrived punctually on site, put their faith in one of the site staff, who served as navigator for the lost gentleman with the intention of guiding him to the site.

The poor, unfortunate navigator, in telephone contact with the missing person, had first to determine where the gentleman was on the basis of vague descriptions of places along the road, before finally having to guide him step-by-step into Via Amaldi.

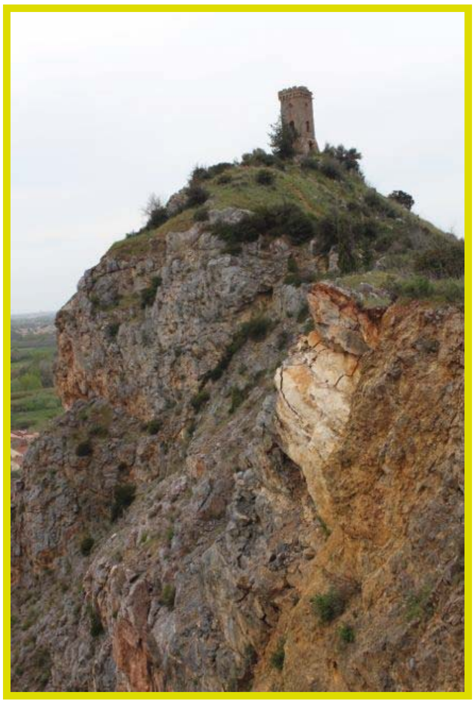
C.Fabozzi

Virgo seen from la Verruca

Everyone who has seen the beautiful aerial view of the Virgo detector has seen the mountains in the background.

The nearby forested peaks are between 500 and 700 metres high, but the one that stands out is the one nearest to Virgo, Mt Verruca, which is about 540 metres high.

On our recent visit to Virgo to discuss three mode interaction monitoring and parametric instabilities, Ju Li, my 14 year old son Julian and I thought it might be nice to look at Virgo from above.



The tower at Caprona

Virgo as seen from la Verruca

The fort atop la Verruca

We drove to the tiny town of Calci which is just below the mountain. Centuries of quarrying have left some deep artificial gorges.

A medieval tower perched over a high cliff, with ruined quarrying machinery far below marks the path to the mountain

It wasn't difficult to find a place to leave our car, and the path leading to the tower. From here we could see a track towards Mt Verruca. Below us there were many picturesque buildings including a big and ornate convent now turned into a natural history museum, and old villages perched on the steep hillside amongst the olive farms.

There were no sign posts but the peak above us made navigation easy. We followed a track on a ridge, but near the top we decided to take a short cut through the forest. This was a bad idea! The paths were made by deer and pigs.

You had to crawl through tiny gaps, climb over fallen trees and get scratched by bushes. Later we found that the rough forest track would have been much easier.

Our surprise was to find a ruined fortress on the peak. The trees are just high enough to disguise it from a distance. From the walls of the fortress there is a fabulous view across the plain. Stretching across the plain was Virgo. Its scale is amazing. The grassy castle-keep and ruined stone structures made a great place for a picnic.

We took a short cut down through another very steep valley, following a tiny path used by mountain bikers, past picturesque rocky outcrops, small mountain streams and many spring wildflowers. Later we found that the castle featured in many wars between 1288 and 1503.

Apparently the ruins we see are from its last repairs soon after it was besieged and overthrown by Florentine troops in 1503. An army from Florence had previously destroyed it in 1402.

D.Blair

...Addendum

It may be of interest to David to note that his suggestion of the Verruca being an ideal location for a picnic has already been tried and tested by two Virgonauts. Paolo and Gary, as can be seen in the photo above, ventured up that way for just that reason back in February 2005.

The death of a giant:
Alas poor tree, we knew it well

Visitors to the site may have become aware of something being not quite right of late; a feeling that something isn't quite as it should be, as though the Virgo universe had skipped a GPS second and no-one had noticed. Well, look no further, as the mystery is hereby resolved: the great old gothic tree, which heralded the approach to the site along Via dello Zannone for seemingly an eternity, is no more.

Following heavy late-winter downpours, the decision was taken in the local corridors of power – the local council, one presumes – to have off with its head before it had off with someone else's.

And so it was that one damp, but not un-clement, early spring morning, adventurers to the site were greeted by a horde of orange-clad chainsaw-wielding tree-annihilators, busily swarming about their business.

Have little fear though, kind reader, for those of a nervous disposition will be cheered to know that it was all over mercifully quickly. Cold comfort, to be sure.

And so, having stood for many a year, beneath all of the punishment that the heavens had to offer, the time had come to say goodbye.

A look at the remains of the stump, show that there was seemingly little else to be done.

Of interest, or potentially mere coincidence, is the fact that the tree aligns with a change in crop in the adjacent fields, and does so in earlier photography as well, suggesting it was possibly used, along with the North End of Virgo, as a crude marker in the alignment of the two areas.
Who knew that all this time we were also aligning the local agriculture as well! Of course, this may be apocrypha, but whose to prevent it seeping into rural legend?

G.Hemming

Save Lives !

Being located in the countryside, the site of EGO hosts lots of small animals that most of the time, are invisible to us.

Some days ago, a grass snake (http://en.wikipedia.org/wiki/-Grass_snake) came out from the vegetation near the river-lined road that leads to the site entrance.

Unfortunately, this gorgeous exemplar was hit by a car and did not survive until the end of the day.

Let's try to keep an look-out to prevent such events from happening again and we might see some of the wonderful creatures that are sharing the site and its surroundings with us!

Welcome to Viola, born on February 12, and congratulations to the Cosci family: Luca, Francesca and grand-parents Cristina and Roberto Cosci!

Another happy event occurred for one of our colleagues: Marta Budroni from the Administration dept. married Cristiano Gambicorti on May 3, 2014.

Congratulations to them!

Welcome to Violeta, born on April 25, and congratulations to the Ruggi family: Paolo, Angela and Juan Diego!

Nicole Berni was born to parents Francesco and Samanta at 06:15 on the morning of the 21st of July.

In relation to the birth of Nicole, we note that Roberto Cosci once again predicted the due date well in advance of the event; the keen gardener basing his predictions on the patterns of the new moons. Given that Nicole was born a couple of weeks prior to her due date, Roberto's prediction is, in this instance, even more impressive.

In Italy we say "non c'e' due senza tre" – 'there isn't two without three' - so here is a third: a new-born Viola. She is the three-day-old grand-daughter of the h-editor, Carlo Bradaschia. Congratulations to the parents, Edoardo and Giulia.