Virgo Progress Report
For the EGO Council

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Abstract

This report describes the Virgo activities and progress for the June 2005 to November 2005 period. It starts by a quick status overview and collaboration news, the report is organized in four sections: detector, commissioning, data analysis and outreach status, prepared by the corresponding coordinators with inputs from the various persons in charge.

Summary

1 Overview

1.1 Detector status:

Since the last council meeting, the Virgo commissioning has made significant progresses. All the alignment loops of the interferometer have been turned on, at least with a low bandwidth ("drift mode"). The automation let us lock the interferometer with one single "click". It provides more reproducible procedures and operating conditions. Many different parameters have been tuned. All these progresses allow us to overcome the instabilities ("jumps") problem observed at the beginning of the recycled configuration operations. Consequently, the noise hunting has started in a more systematic way leading to fast progress for the sensitivity. The method to improve the sensitivity is well defined. A detailed noise budget identifies the dominant noises contribution and the corresponding corrective actions are then organized.

A two weeks long run (C6) has been organized in early August. Given the sensitivity improvement made during and after the run, a second run (C7) took place mid-September, right before the shutdown for the injection upgrade. During the 19 days of these two runs, the average science mode duty cycle was 80%. The following figure shows the history of the Virgo sensitivity observed during the commissioning runs.

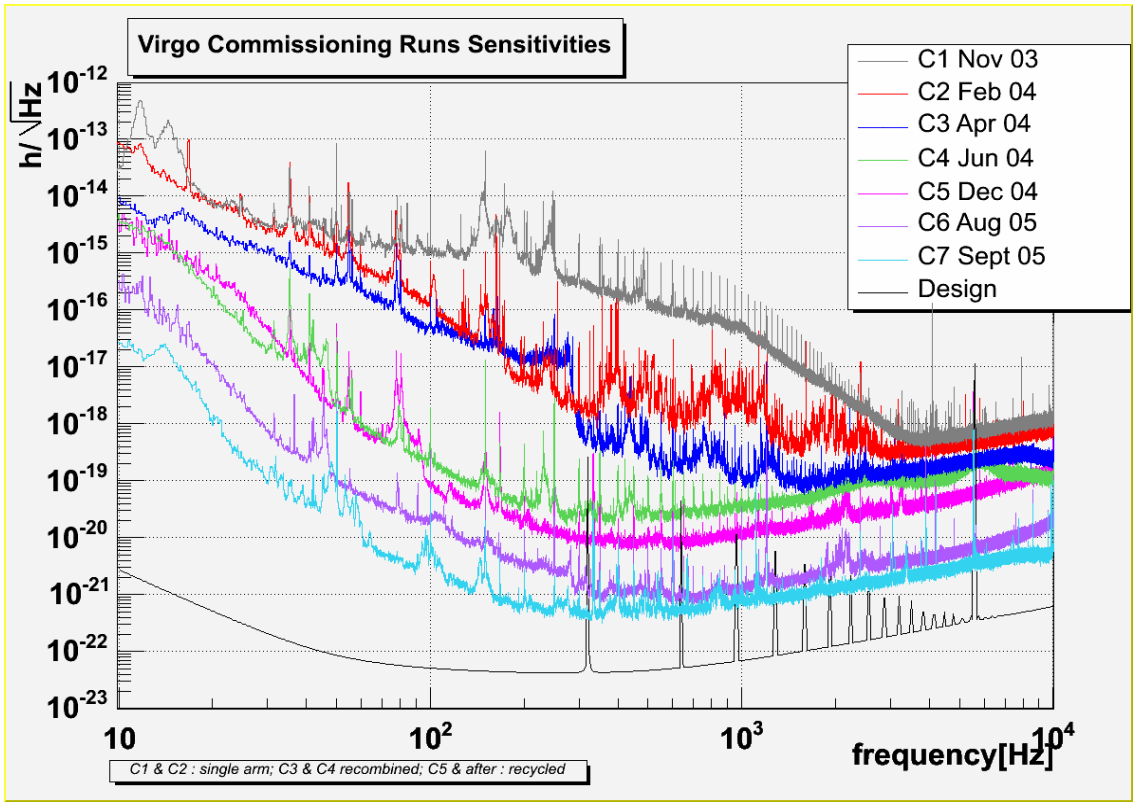

Figure 1: Virgo sensitivity curves. The C5, C6 and C7 sensitivity were obtained with a recycled configuration and an input power of 0.7 W. The C7 horizon for binary neutron stars is above 1 Mpc (for SNR of 8 and optimal orientation)

The data analysis continues to be developed with an active participation to the analysis of the data from the commissioning runs and the preparation of the joint analysis with LIGO and also the Italian bars.

1.2 Up coming activities

The completion of the current installation work (i.e. the interferometer back to vacuum) is expected for the beginning of December. Then commissioning will restart with the goal to improve the sensitivity by about one order of magnitude, using the horizon distance for binary system as figure of merit. Meeting this goal would enable us to take good science data in coincidence with the recently started LIGO S5 run. Prior to this science run, we expect also to interlace the noise hunting and data taking activities by running the detector during the week-end and possibly the night once the stability will be good enough. Example of such analysis is given in the new version of the commissioning plan. This document described the commissioning activities needed from the restart after the current shutdown up to the point where will be able to run Virgo at the design sensitivity.

Therefore, the priority for the beginning of 2006 will be the mid and high frequency which is the area where we could have the fastest progress for the sensitivity and where the data would be more useful for a coincidence data analysis with LIGO. The low frequency part remains a key frequency band for Virgo were progress are also expected in 2006. However, given the challenging difficulties of this part of the spectrum, more commissioning time will be scheduled in 2007 with maybe a short shutdown at the beginning of 2007 to implement the small changes that turn out to be needed, like maybe the reduction of the Eddy current effects.

In parallel to this commissioning activity, the preparation of the data analysis will continue to be ready for the first science data, in a stand alone configuration and also in the network of detector configuration.

1.3 Virgo upgrades:

A first draft of the Advanced Virgo white paper has been submitted to the STAC. Although this is still a preliminary document, it contains the description of our two steps approach for the Virgo improvements.

The first step, “Virgo+” is a set of medium scale improvements that are limited to part of the detector in order to install them without the need of a long shutdown and recommissioning. This means that the overall optical layout and the suspension design will be unchanged. Technology used will be the existing ones. No new R&D is required for Virgo+, just the engineering and construction of existing solution. However, we expect to gain around a factor 3 for the sensitivity for a relativity modest investment. Let us remind that this translates to almost a factor 3^3 for the event rate of most of the extragalactic sources.
Virgo+ could be up and running at the 2008 horizon if we decide now to start it. This planning allows us a significant data taking before the installation of the Virgo+ changes. This installation should be fast and must let us go back quickly to the data taking mode.
We hope that the EGO council will support this initiative.

The second step is a major upgrade of the Virgo antenna (“Advanced Virgo”) aiming at a sensitivity improvement of one order of magnitude. To achieve such a gain, more aggressive and substantial changes are needed, like the change of the beam geometry (displacement of the beam waist or the use of flat beam). This upgrade will be contemporaneous of the advanced LIGO installation (shutdown around 2011). The Advanced Virgo configuration is not yet decided. Four working groups have been set up to continue the work started with the white paper and to produced a detailed proposal around the end of 2007.

1.4 Collaboration organization

Over the last months, we appointed the coordinators of the four Advanced Virgo working groups.
In order to clarify the collaboration organization, Memorandum Of Agreement between the collaboration and the groups are prepared. These documents describe the current contributions of each group. Three of them have been already finalized.

The enlargement of the collaboration is another important issue. Preliminary discussions with a group of scientists from NIKHEF started in October. These scientists have visited the site and attended some meetings to better understand the experiment and prepare with us a proposal for their contribution to Virgo.

The extra manpower needed for the commissioning and subsystem support has been evaluated. A list of eight possible fellowships has been prepared and submitted to the STAC for advice. This list is attached to the report for the EGO council decision.

1.5 External collaboration

The LIGO-Virgo working group on joint data analysis continues to be very active with regular teleconference and face to face meeting a few times per year. The current activity is focused on developing and testing network analysis for bursts and binary signal using simulated data. A key meeting will talk place on November 18 at MIT where the next steps, with the possible move to some real data, will be investigated.

A similar joint effort with the ROG and AURIGA collaborations has started more recently. The project is focused on some joint analysis with C6 and C7 data. A white paper has been prepared and the first exchange of a few hours of data has started.

The needed MOU and corresponding attachments have been signed with the LSC (LIGO and GEO data), AURIGA and ROG. They are now available on the web.

The participation of GEO member to the study of Advanced Virgo as started with the appointment of one GEO person has co-chair of one of the Advanced Virgo working group and another one in the writing committee for the Advanced Virgo white paper. However, the formal MOU is still in preparation.

2 Detector coordinator report

2.1 Introduction

The main detector activity in the last months has been concentrated on the design, preparation and realization of the upgrade of the injection system (ISYS). This activity has been prepared and verified each month in the detector meeting framework (see http://wwwcascina.virgo.infn.it/collmeetings/DMwebpages/). Obviously, many other upgrades have been concentrated in the same period to reduce the inactivity time of the detector. Reports and management of the upgrade activities are reported at the address: http://wwwcascina.virgo.infn.it/collmeetings/DMwebpages/Upgrade2005.html

2.2 Shutdown of the interferometer

A delivery delay by the producer of the main optical components of the new bench (Parabolic mirrors) forced to postpone the shutdown of the interferometer from July to September. This had been a positive effect on the commissioning, because it permitted to perform the very successful C6 and C7 runs. After the C6 run the preliminary assembling activities have been started in the central building, in parallel with the residual commissioning activities. The interferometer has been shut-down the 19th of September, just after the C7 run. After that, the Injection tower payload (bench+marionette) has been transported from the tower to the class 10 clean room to recuperate few of the needed optics. In the same week the payload of the power recycling tower has been dismounted.

2.3 New Injection Bench

The new injection bench has been realized after a long iterative process of study and verification. The mechanics of the bench has been realized in such a way the internal resonant modes occur at frequencies higher than the current bench (>300Hz) and the suspension modes at lower frequency (<25Hz). The optics has been realized in such a way to reduce any beam clipping effect; this has been obtained respecting, everywhere possible, the rule that each mirror must have a diameter larger than 5 times the beam waist. The key component of the new injection bench is the new Faraday isolator; this component is 20mm aperture TGG rod and its performances have been verified to be within the Virgo specifications (Isolation better than 34dB, F_{th}>24m). Since the power recycling mirror is replaced with a parallel faces mirror, the light is injected in the interferometer with a parabolic off-axis telescope. The realization of the supports, of the steering mechanics and electronics and of the alignment procedures has been a crucial point of this upgrade that caused a certain delay respect the foreseen planning.
The IB assembling in the clean room class 10 has been completed the 9/11/2005 and the integration in tower and further alignment procedures are currently in progress. A huge activity has been devoted to tune the Virgo Super-Attenuator for the new payload.

2.4 New Power Recycling mirror

The old PR mirror was realized by a small (12cm diameter) mirror supported by a complex steel-fused silica support. This structure was requested to permit the length adjustment of the recycling cavity. This composite structure caused many problems to the locking of the interferometer; in fact, the resonant modes of this multi-ring structure were located at low frequencies, excited by the locking procedure and slightly drifting with the temperature. The PR mirror was also acting as final lens of the injection expansion telescope and this caused an additional coupling of the vertical oscillation with the horizontal translation. The new power recycling mirror has been realized using a input mirror substrate, selected through simulation

with the best matched residual curvature. The high reflectivity coating has been requested to be about 95%, to nominally increase the current recycling factor up to 44. The produced mirror coating specifications respect the Virgo requirements. The mirror has been prepared with the markers, magnets and spacers in the EGO clean room class 1 and the payload is currently under assembling.

2.5 New Brewster window between the IT and the PR tower

The large size (about 2cm of waist) of the beam coming out the new injection bench, required to change the Brewster window between the injection tower and the power recycling tower. The new Brewster has been realized and a specific aluminium baffle system has been realized to dump the parasitic beams generated in this device or coming from the ITF.

2.6 New auto alignment system of the IMC

Fluctuations of the light power injected in the ITF forced to realize a more stable reference for the beam. The external injection bench has been identified as our reference and a beam monitoring system has been realized and the beam clamped to it. A new quadrant has been added behind the input mode cleaner end mirror and the electronics needed to implement the auto-alignment of the input mode cleaner system has been installed.

2.7 New input mode cleaner end mirror

The origin of the scattered light that requested the insertion of the Faraday isolator is mainly the poor quality and the probable contamination of the IMC end mirror. A new mirror polishing has been commissioned to the REOSC company in France, but after many attempt they abandoned the production. This failure pushed us to search for another polisher (GS-Lumonics in US) but the new mirror is not foreseen before few months. It has been, hence, decided to investigate the possibility to substitute this payload with an heavier one launching a design activity that should last for few months.

2.8 Laser lab activities

2.8.1 New external injection bench layout

The new injection bench required a rearrangement of the external injection bench. New and more solid supports are adopted in this bench. The beam monitoring system has been fully implemented.

2.8.2 New Injection Tower flange and windows

The new patter of the beams travelling between the new IB and the new external IB, required to change the geometry and the size of the windows in the injection tower. A new flange, accommodating these windows has been produced and installed. Particular attention has been put on the stray light dumping in this (and in the all other) new components.

2.8.3 Cabling and electronics racks displacement

The need to install the new auto-alignment system of the ISYS and to upgrade many laser related components pushed to reshuffle the cabling ad electronics in the laser lab. Furthermore, the realization of an acoustic enclosure in the laser lab is under study. And to realize it some rack must be displaced away from the benches. An huge re-cabling effort has been performed reaching a more clean and ordered configuration

2.8.4 Laser improvement

A new 6/22 Mhz modulation scheme has been installed and tested. An improved noise eater board has been received and it will be installed soon.

2.9 Other upgrade activities

As already mentioned, the possibility of profit of this shut-down period has been used to upgrade other components in Virgo. For instance, activity has been performed in the local controls, testing new lasers and adjusting the ADC gains. In particular the environmental monitoring system has been improved.

2.9.1 Environmental monitoring

The main concerns for the upgrade of the environmental monitoring system were to add some probe in order to monitor environmental parameters related to crucial ITF subsystems and to resolve some problems introduced by the presence of the probes on other subsystems, in order to minimize the physical coupling between the systems, especially in terms of disturbances towards ITF signals.
For the first topic several actions were performed: installation, calibration and insertion in the Virgo data flow of temperature probes in the internal area of the end buildings and in the benches attached to the Virgo towers. The possibility to access the PR tower permitted to realize the measure the shielding effect of the tower respect an external magnetic field and to evaluate the effect on the Virgo noise curve.

2.9.2 Linear alignment hardware upgrade

During the upgrade of the injection bench, we took the occasion to modify the quadrant diode front end electronics in order to allow adapting the DC gain according to the changing light power at different locking phases with their varying recycling gains. The goal was to add an external box with a remotely switchable gain of 10. During the electronics modification it turned out that the DC offset compensation of the quadrant diode front-end box was not optimum; this becomes visible especially in the high gain configuration; for this reason, 4 quadrant diodes have been taken to Frascati for modification. It is expected that all diodes will be modified and back on the Cascina site by the 25 of November. The initially foreseen quantitative characterization of the DC offset behaviour as a function of temperature, and of the AC crosstalk between adjacent segments of the diode, will probably have to be postponed to another occasion due to lack of time.

2.10 Planning

The planning of the upgrade has been presented, discussed and continuously verified with the collaboration in the weekly planning meeting. It is composed by 146 activities and the last version is always available on the web and shown at the main entrance of the EGO site. Currently the end of the Assembling and Integration activities is foreseen for the end of November.

3 Commissioning report

For report on the recent commissioning activities, please refer to the sections 1.3 and 3. of the commissioning plan.

4 Data analysis report

4.1 H reconstruction activity

The validity of reconstruction code for the recycled configuration has been checked. The procedure to automatically turn on the needed "calibration lines" on the mirror actuators has been set up and integrated in the standard locking sequence. The reconstruction is therefore running online and has been used not only during the C6 and C7 commissioning runs but is used in the day to day commissioning activities. The horizon for coalescing binaries, a by product of the reconstruction, is a figure of merit that turned out to be a nice tool to assess the overall progress made on the tuning of the interferometer. This online reconstruction was also used as input of the online processing for the coalescing binaries searches.

4.2 Noise Group Activities

The activity of this group has a large intersection and overlap with the items of the commissioning group. Several physicists of the analysis groups participate in the group meetings.
In this period of time several tests have been carried during the runs trying to clarify the contribution of acoustic and magnetic noise to the Virgo noise curve. Data taken in special conditions and with active noise injection have been analyzed. In particular for the acoustic noise coupled to the jitter of the input beam a model has been developed and compared to the experimental data. Through dedicated acoustic tests and by turning on and off vacuum pumps coupling to the detection bench was also found. This has prompted action during the current shutdown to reduce the effects that were found. Moreover other environmental noise studies as the correlations with the lightning activity have been performed. These tests were presented at the VI Amaldi conference and the paper was prepared for the proceedings.

Concerning the analysis of the data collected during the runs C6 and C7 , we focused the effort on defining and testing the veto transient on the auxiliary channels. This activity is under way and we are still pursuing the study of new tools for data conditioning and system identification. In particular the issue of whitening the interferometer signal is being worked on. Also non stationarity coupled to the automatic alignment of the interferometer was found analyzing C6 and C7 data.
Finally the integration of the new tools in the NAP software library is in progress.
Software tools and detailed information on the present activity can be found in the dedicated web site http://wwwcascina.virgo.infn.it/DataAnalysis/Noise/ .

Organization issue:
The VSC appointed as new coordinator of the group, Francesco Fidecaro. Noise meetings have taken place on monthly basis, but we should aim to a bimonthly rate.

4.3 Burst Group Activities

The Burst Group activities since the last council are manifold: analysis of the run data, preparation to the future network analysis with LIGO and with bars and continuation of previous works on development/improvement of filtering methods for burst detection and also for noise stationarity studies .

4.3.1 Development of filters

A new Time-Frequency (Exponential Gaussian Correlator, EGC) has been explored. It has similar time-frequency resolutions as the S-Transform but it is much more robust than the S-Transform with respect to lines for instance. Let's recall that lines (thermal or whatever)

pollute locally the S-Transform outputs due to their energy localized in few frequency bins. This problem disappears totally with EGC.
Tuning of the adaptive Kalman filtering is going on. It is used to remove (thermal) lines in the noise spectrum, useful when whitening of data is required by some burst algorithm. A satisfactory version should be delivered by the end of the year.

4.3.2 Analysis of C6/C7 runs data

Different filters have been used to analyse the C6 and C7 data (regular data as well as Hardware injections). Deeper studies concern the long C6 run. Similar work to what has been done for the C5 run (see previous report) has been performed. It appeared that the data are much glitchy, with a number of "monster" events even during apparent quiet periods of the locked interferometer.
Moreover systematic studies of the glitches have been done in order to develop future vetos. Two kinds of glitches sources have been particularly studied: coild driver glitches and angular loop oscillations, both responsible for numerous glitchy events detected in the dark fringe signals by burst algorithms.
All information can be found in the Burst Group website :
http://wwwcascina.virgo.infn.it/DataAnalysis/Burst/C6.html

4.3.3 LIGOVIRGO joint working group

A joint working group involving members of the Virgo and LIGO Scientific Collaborations has undertaken for the first time the task of defining and examining the prospects of joint burst searches involving data from their gravitational wave detectors.
In the last face to face meeting at Cascina in June, it has been decided to produce two papers for the burst part and the binaries part. Indeed the amount of results obtained by the joint group is largely sufficient to make a paper. The work since June is then mainly devoted to the preparation of this paper. The first part concerns the complete comparison of the burst filters : ROCs (efficiency curves), timing accuracies (more or less already done last year) but also robustness tests and studies of filters combinations (logical combinations like AND/OR).
The second part concerns the network (LIGO-HANFORD, LIGO-LIVINGSTONE and VIRGO) analysis. Some results have been already presented in the last Amaldi conference and show clearly the interest of adding Virgo to the two LIGO interferometers (the sky coverage is increased by about 50% if Virgo is added to the network).
Finally, studies about coherent analysis are going on. Some technical issues like data resampling (Virgo and LIGO data do not have the same sampling frequency) have been addressed.

4.3.4 VirgoBars common work

After having defined the procedures, the Joint Data Challenge for the Virgo-Bars collaboration has started. It has been first decided to analyse four hours of real data simultaneously recorded in the four detectors. The Virgo data which are being analysed are extracted from C6 run, and it is foreseen to use also data from C7. To test the different pipelines and define the coincidence procedures, we have decided to inject via software damped sinusoid signals with central frequencies in the sensitivity band of the bars.
On the Virgo side, it is planned to use several search algorithms, like the Power Filter and the Damped Sinusoid Correlator. At present, the first ROCS have been produced and discussion on the efficiencies and on the detection time accuracy is going on. Next steps will concern the definition and development of the coincidence analysis strategies.

4.4 Coalescing binaries group activities

The group was involved in several lines of activity

- completion of analysis code and pipelines based on Wiener filtering;
- development of code for searching inspiral signals from binary spinning BH;
- development of time-domain vetoes;
- finalization and publication of the analysis made over C5 data;
- analysis of real data (C6 and C7 run);
- LIGO-Virgo network analysis.

4.4.1 Completion of analysis code and pipelines based on Wiener filtering

The MBTA and Merlino pipelines have been integrated in the online analysis system.
The MBTA is now capable of running online and be adaptive to the noise, by including an adaptive estimation of the noise spectral density, as well as an adaptive setting of the thresholds.
The Merlino uses instead a fixed spectral estimation for each locked section, while including adaptivity at thresholding level; further, Merlino applies a χ^2 test as 2^{nd} level trigger, also when running online.
Work is ongoing to define the best strategy for upgrading the online computing system, in order to roughly double its computing power.

4.4.2 Development of code for searching inspiral signals from binary spinning BH

Code for simulating target BBH spinning waveforms at 2PN order has been developed and thoroughly cross-checked with codes developed outside Virgo.
A code for BCV templates for black-hole detection has been written and it is still under test.

4.4.3 Development of time domain vetoes

A general code for applying vetoes based on the behavior of the time-domain correlation between data and templates has been developed and made available in Virgo libraries.

4.4.4 Finalization and publication of the analysis made over C5 data

The C5 data analysis, made with MBTA and Merlino, has been submitted for publication in the proceedings of Amaldi VI conference [1]. The paper describes the pipelines for BNS analysis, and their application to C5 data, including tests of hardware injections detection, and the application of χ^2 and time-domain vetoes.

4.4.5 Analysis of real data (C6 and C7 run)

The MBTA has been running online during C6 and C7 runs, while Merlino was run during the last portion of C6 and then during the entire C7. In both cases, hardware injections were used to measure the detection capabilities of the algorithms.
Since then, it has been decided to run a more refined offline analysis, using the same physical space for Merlino and MBTA, and as similar as possible algorithmic parameters, to be able to cross-check the results. The MBTA met some problems, leading to a dramatic slow-down of the analysis over some data portions; it was then recognized that the problems occurred in data segments at the beginning of the locked segments. Since these segments display extra transient noises, it was already decided to veto them, but the cuts applied turned out to have been too conservative. Correcting for this, the analysis is underway.

4.4.6 Preparation to LIGO-Virgo common analysis

The Virgo CB group has continued its activity in preparation for the LIGO-Virgo joint analysis.

A test of coincidence analysis had been performed, using 24 hours of simulated data, including realistic LIGO and Virgo noise, and random injections of BNS inspiral signals from two locations in the sky.
The test allowed to perform a reconstruction of the source parameters (direction and mass parameters) and has been submitted for publication in the proceedings of Amaldi VI. [2]
Since then, more work has been performed in preparation of partially coherent and then coherent analysis, including estimates of the accuracy reachable using templates with the same mass parameters.

4.5 Activity of the Periodic Source group

For the first time the Virgo real data have been analyzed with the pss software and some adjustments have been introduced.
In the following we list the actions ordered in function of the different steps foreseen for the search

4.5.1 Short FFT and peak map

- Improvements and tuning of the short FFT code to Virgo data: the sds files are used and accessed by the new access library.
- code for adding fake test signal, Doppler modulated.
- code for the non-linear AR spectral estimation; the spectrum is auto-regressively smoothed, with a threshold in order of not spoil it with the presence of big and steep peaks.
- code for the big time disturbance removal; this should decrease the spectral noise background.
- peak map code; this comes out as the relative maxima above a certain threshold of the periodograms normalized by the estimated spectra.
- application to C4 and C5 (for test purpose) and C6 and C7 (for analysis); a particular care has been devoted to document the time needed for the different operations (job running and updating of data-bases) .

4.5.2 Hough map (normal and adaptive)

The Hough transform code was applied (for test) to 1.5 days of C5 data, with a frequency band of 4 Hz. This was accomplished on 5 INFN Grid sites (Roma1, Bari, SPACI-Napoli, Firenze, Padova).

4.5.3 Construction of the candidates database.

Debug activity.

4.5.4 Supervisor

Adaptation of the Supervisor to the Grid environment; some workaround have been devised to solve problems arisen in some of the C++ Api Grid WorkLoad Management System.

4.5.5 Basic and organization

Data access in presence of many holes: the real data of the commissioning runs have such a big number of “holes” that a different access technique had been introduced. This was done for the Matlab and C environment.

Further definition of the pss database structure: the database is replicated in Bologna.

Some quality check programs have been written: for example sds_resume, that creates a resume of sds concatenated files, searching for holes and zeroed data, or sds_spmean, that creates an sds file containing time-frequency information.

Debug of the previous version of pss software library.

Definition of the job reports and of the run report structure: this is our way of documenting the production analysis work. The last version of the reports are at:
http://grwavsf.roma1.infn.it/data/pss/analysis/V_C6_GenRep.pdf
and
http://grwavsf.roma1.infn.it/data/pss/analysis/V_C7_GenRep.pdf .

Analysis of time windowing for pss: a new analysis on the possible windows has been performed; a good choice seems the flat-top, cosine-edge window (that we introduced years ago).

4.5.6 General Remarks and problems

We had a big problem in September, because of the breaking of our NAS server.

4.6 Activity of stochastic background group.

Here is a list of the main activities of the group in the last six months.

4.6.1 Implementation of data analysis software

We continued the porting of stochastic background data analysis software to the new C++ version. General numerical methods was added to the NAP library, while the specific algorithms for simulation, detection and statistical analysis of stochastic background has been encapsulated in the classes of the Sb library, which is available in its more recent form from the Virgo CVS repository.
Although just one physicist working on this project, the new library was used yet and tested in the production of simulated data for the Virgo-Bars collaboration (see the next section).

4.6.2 Virgo Bars collaboration

This is a project of joint data analysis of a restricted period of real data between four detectors: Virgo, Nautilus, Explorer and Auriga. In the first phase we exchanged 4 hours of synchronized data (a fraction of C6 data for Virgo). We injected several sets of simulated stochastic background signals with the aim of doing a test of the detection procedure. The project will continue until the end of November.
As a byproduct of this activity some work of analysis of C6 data is started. For now there are three VIRGO physicists involved, however at a quite small fraction of their time.

4.6.3 Scalar stochastic background

A physicist has worked on this subject for several months, in the framework of his Ph. D. thesis. His activity was mainly a theoretical one, and consisted in the estimation of the sensitivity of a network of detectors to this kind of physical signal.

4.6.4 Contact with the commissioning group

The contact person was nominated (L. Di Fiore) and was involved in the group's activities. We started a collaboration aimed at a better understanding of auxiliary channels available for vetoes.

4.6.5 Collaboration with LIGO

During the last months there was some preliminary discussions with some LIGO physicists about the possibility of a collaboration with LIGO. There is a reciprocal interest in starting with this activity, but more official contacts (which are starting) are needed. There are at least two physicists which will be interested in working on that from the Virgo side.

4.6.6 General comments

As in the past the main problem of this group is the reduced manpower. This can be explained by the fact that perspective for relevant physical results are not as good as for other scientific groups, at least in the short and mid term. The idea is to try to improve the situation encouraging a more strong connection with the activity of noise analysis and commissioning group.

4.7 References

[1] F Acernese et al. (The Virgo collaboration) *The status of coalescing binaries search code in Virgo, and the analysis of C5 data.*, to appear in Class. and Quantum Grav. [Amaldi6 proceedings].

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(The joint LIGO/Virgo working group) *Benefits of joint LIGO – Virgo coincidence searches for burst and inspiral signals*, to appear in Class. and Quantum Grav. [Amaldi6 proceedings]

[3] P. Astone, S. Frasca, C. Palomba, *"The short FFT Database and the peak map for the hierarchical search of periodic sources"*, **CQG** *22, S1197, 2005*

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[5] S. Frasca, P. Astone, C. Palomba, *"Evaluation of the sensitivity and computing power for the Virgo hierarchical search for periodic sources"*, **CQG** 22, S1013, 2005.

[6] F Acernese et al. (The Virgo collaboration) *The Environmental Noise studies in Virgo*, to appear in Class. and Quantum Grav. [Amaldi6 proceedings].

5 Virgo/EGO Outreach report

5.1 Site visits

Since more than three years we have regular site visits by high schools, universities, cultural associations.
In 2004 and 2005, in the period October–June almost every Saturday morning we had one group, sometimes two. Visits are accepted only outside interferometer operation time (working days, 8.00-24.00 and data taking runs). From October 1 to December 31, 2005, all Saturdays but one have already been booked A group normally consists of up to 50 people (conference room capacity).The visit consists of a seminar (45-60 minutes), a visit to the Central Building (30 minutes) and a visit to one Terminal Building and to the tunnel (30 minutes).
For the seminar the group stays together, while to visit the site the group is shared in two subgroups (25 max), with one guide each.
Saturday, March 12, 2005 a "open doors at EGO day" has been successfully organized.
The origin of the visitors is, approximately: Pisa 30%, remaining Tuscany 30%, remaining Italy 25%, Europe 10%, USA 5%. Unfortunately visits come very seldom from France.
The visits have been successfully managed thanks to the secretarial work of S. Oblette and L. Coltelli and to the scientific guidance of C. Bradaschia, F. Carbognani, C. Corda, E. Cuoco, I. Fiori, F. Frasconi, F. Paoletti, D. Passuello.

5.2 Newspapers, reviews, radio, TV, Web

Several articles on local and national newspapers and reviews are published, both in Italy and in France. But, when the author is not a Virgo/EGO member, it still happens to read articles on gravitational waves, not mentioning Virgo/EGO!
A similar situation holds for radio and TV emissions
A good collaboration exists with INFN Ufficio Comunicazione.
As it has been said in the June Council meeting, links with the appropriate CNRS service will be established as soon as possible.

5.3 Expositions, exhibitions, conferences

The entrance hall of the new building will be equipped with exhibits and posters, as soon as the building will be available.
Last October the exposition: "Lumière, lumières" has been inaugurated at le Palais de la Decouverte, in Paris. There is a stand dedicated to Virgo, based on interviews to several Virgo and EGO members, turned few months ago. We are not yet aware of colleagues having visited it.
Since three years EGO/Virgo participate to a one month didactical exposition, in May, in Pisa, directed to students, up to high school level. The most successful item has always been the construction of "100 Euro" interferometers that, after the assembly are donated to the schools for further use. Five interferometers per year have been built in 2004 and 2005.

5.4 New initiatives

Sidereus Nuncius is a theater – music – multimedia event scheduled for next June 22, the same day of Galileo's abjuration in 1633. The event will take place contemporarily in several places in Pisa and at the EGO site, connected through the web. EGO/Virgo contribution will consist essentially of supplying data strings to be converted in audible music. This recalls the "Sonification" technique that is being developed and applied to science data analysis; see e.g;: http://www.techfak.uni-bielefeld.de/ags/ni/projects/datamining/datason/datason_e.html.

Sidereus Nuncius is financed by EU, Pisa and Cascina County Councils and other institutions.

Beyond Einstein is a world wide webcast, scheduled for next December 1st, from noon to midnight; see: http://beyond-einstein.web.cern.ch/beyond-einstein/index.html.
It is organized by CERN, together with other scientific institutions, as last event of the World Year of Physics. It will consist of several web connections among laboratories and institutions all around the world, involving Einstein relatives, scientists and journalists. The public will be the internet user, being able to follow the webcast from home.
EGO/Virgo participation will take place between 20:00 and 20:30, possibly in videocoference from the Virgo control room.