

**Memorandum of Agreement
between the Virgo collaboration
and the Wigner Virgo group
for the participation to Virgo**

April, 2015

The purpose of this agreement is to define and describe the participation of the Wigner Virgo group in the Virgo collaboration. The period covered by this Memorandum is two year from the date of the VSC approval.

1. CNRS and INFN signed an agreement concerning the realization of an antenna, VIRGO, for the detection of gravitational waves on 27 June 1994 in Pisa. VIRGO consists of a three kilometer Fabry-Perot interferometric antenna aimed at the detection of gravitational waves in the frequency range 10-10000 Hz. The construction, exploitation and data analysis of the VIRGO antenna is under the responsibility of the VIRGO collaboration, which has been defined in its present form in December 2001. The VIRGO collaboration is represented by its Spokesperson. The operation of the VIRGO antenna is supervised by the EGO Council.
2. The Wigner Research Centre for Physics, Hungarian Academy of Sciences, shortly Wigner RCP, is devoted to perform scientific research and related R&D activities in international collaborations. The main mission of Wigner RCP is to conduct experimental and theoretical studies in particle and nuclear physics, gravitation and other field theoretical disciplines, plasma physics, space science and biophysics at an internationally recognized level.
3. The members of the Wigner Virgo group have good background in both experimental and theoretical physics, in particular, in particle physics and/or in general relativity. They also have experience in developing optimal numerical algorithms and coding these algorithms into efficient computer procedures that can be run on grid clusters. The members of the Wigner Virgo group have direct access of computing resources within various clusters hosted by the computer center of Wigner RCP. For instance, about 25% of the capacity of a 512 CPU SGI ICE machine, we also have access of about 50-80 CPU within the HunGRID cluster. In addition, we also have three GPU machines endowed with GeForce GTX 295 dualcards with about 16-18 TeraFlop performance. We plan to develop a large GPU cluster with about 216 TeraFlop performance. The Wigner Virgo group currently does also have 40TB grid enabled disk storage dedicated to the VIRGO collaboration. All of our computational resources are grid or Pegasus enabled so they are accessible for the entire VIRGO collaboration.
4. The Wigner Virgo group proposes the following contributions to Virgo:
 - Developing and testing of a new all sky search algorithm for the CBC working group for the identification of GWs emitted by coalescing binaries with the inclusion of non-negligible spin and eccentricity. Developing the Reduced Basis approach for eccentric binary sources and testing its performance in data analysis.
 - Developing and managing a GPU cluster and also taking part in developing new data analyzing codes adopted to the use of GPU technology.
 - Coordinating various computing activities inside the Virgo Collaboration and between the Virgo and LIGO collaboration.
 - Help collaboration members in improving and porting their data analysis and/or simulation algorithms to modern many-core architectures.

- The home institute has experience in construction of high precision mechanics and vacuum technological elements. The engineers of the Wigner Virgo group could be involved in the investigation of the technical and economic feasibility of hardware components for the Virgo vacuum system.

The precise nature of these contributions will be defined over the next year in collaboration with the VIRGO spokesperson and the relevant VIRGO coordinators. The group will provide adequate support for the proper operation and maintenance of the devices and tools under its responsibility and for the participation to the collaboration activities.

4. The current RMKI group composition is:

Name	FTE	Author	Student	Main activities and FTE
Debreczeni, Gergely	80%	Yes	No	V (15%) GRID management DA (25%) CW/CBC search DA (20%) GPU cluster AdV (20%) software development
Vasúth, Mátyás	70%	Yes	No	V (20%) Group leader DA (50%) CBC search
Nagy-Egri, Máté Ferenc	50%	No	Yes	DA (50%) GPU cluster
Barta, Dániel	100%	Yes	Yes	DA (100%) CBC search
Kacskovics, Balázs	15%	No	Yes	DA (15%) CBC search
Endrőczy, Gábor	25%	No	No	AdV (25%) mechanical engineer
Ilkei, Tamás	25%	No	No	AdV (25%) mechanical engineer
Kiss, István Gábor	25%	No	No	AdV (25%) mechanical engineer

Remarks:

- It is understood that for a person who just joined the collaboration, the authorship will start one year after the joining of the collaboration except for students and post-docs where there is no delay. However, post-docs having obtained a PhD since more than 2 years ago undergo the same authorship rule applies as for permanent people.
- In the activity section the leading activity and the FTE are specified for each of the four main categories: Virgo operations (V), Virgo+ (V+), Advanced Virgo (AdV) and Data Analysis (DA). Activities that cover several topics (like group leader) are put it under Virgo operation.
- The Wigner Virgo group leader will promptly inform the collaboration of any change in the group composition and of any thesis proposed.

5. Since Hungary is not contributing to EGO, the final integration of the Wigner Virgo group as a regular group into the Virgo collaboration is subject to the approval of the EGO Council who may negotiate agreement(s) with the relevant Hungarian institutions.

Approved:

Virgo Collaboration Spokesperson

Date 01/04/2015



Wigner Virgo Group Leader

Date 01/04/2015