Attachment Number 1 (LIGO-M0900312, VIR-0109A-10)

To the Memorandum of Understanding (LIGO-M0900311, VIR-0109A-10)

between the

IceCube Collaboration

and the

Laser Interferometer Gravitational Wave Observatory (LIGO) Scientific Collaboration

and

Virgo

November 28, 2009

This Attachment No. 1 to the Memorandum of Understanding (MOU) between the IceCube Collaboration, the Laser Interferometer Gravitational-Wave Observatory Scientific Collaboration (LSC) and Virgo governs the terms and conditions governing the joint analysis of LSC, Virgo and IceCube data[1] collected during LIGO's S5 science run (covering the period from November 4, 2005 through September 30, 2007) and S6 science run (covering the period from July 7, 2009 through December 31, 2010), Virgo's VSR1 science run (covering the period from May 18, 2007 through September 30, 2007) and VSR2 science run (covering the period from July 7, 2009 through December 31, 2010), and IceCube's 22-string science run (covering the period from May 31, 2007 through April 4, 2008) and 59-string and 77-string science runs (covering the period from May 20, 2009 through December 31, 2010).

This analysis effort using IceCube data may not continue beyond December 31, 2011 without the explicit extension of this Attachment agreed to by all parties.

1. Proposal for Analysis of LSC, Virgo, and IceCube data.

   A proposal for the joint analysis of IceCube, LSC and Virgo data is appended to this attachment.

   The data exchanged pursuant to agreements in this Attachment can only be used in the context of this amendment and the proposal.

2. Joint IceCube-LSC-Virgo gravitational wave-high energy neutrino working group

   Participation in the joint IceCube-LSC-Virgo Gravitational Wave-High Energy Neutrino ($GW+HEN^{IceCube}$) working group will be open to any IceCube, LSC and Virgo members contributing to its work. The $GW+HEN^{IceCube}$ group will operate under the auspices of,

[1] LSC data includes data from the LIGO and GEO detectors.

and will report to, the LSC-Virgo and IceCube data analysis group(s) pertinent to the joint analysis.

Any unresolved disputes within the GW+HEN^{IceCube} working group will be brought before the signatories to this Attachment for resolution.

The GW+HEN^{IceCube} working group is led by three coordinators, one from each collaboration. Each coordinator is appointed by the corresponding spokesperson.

3. Data exchange and analysis

This Attachment covers the joint analysis of IceCube-LSC-Virgo scientific data between Nov 4, 2005 and December 31, 2011.

The joint working group will be responsible for establishing the technical details of the data exchange. The GW+HEN^{IceCube} search methodology uses GW and HEN candidate event lists, with the advantage of significantly lowering the rate of accidental coincidences. Any GW/HEN event shall be described by its timing, arrival direction and associated angular/time uncertainties (possibly in the form of a significance sky map) and any other auxiliary information necessary for the analysis. This is the data that will be exchanged.

Access to collaboration web sites and/or mailing lists may be granted by the Spokesperson to facilitate working together. Any information exchanged related to this MOU or more concerning IceCube, LSC, Virgo is confidential. The coordinators are responsible for ensuring that all involved persons, including students and technical staff, are aware, understand and respect the sensitive nature of the data and information exchanged.

4. Publications, Presentations and Authorship

LSC, Virgo, and IceCube will cooperate on any publication on scientific results covered by this attachment.

Any intention to publish (in any form, including peer-reviewed articles, conference proceedings, theses, press releases) results, status or prospects of the IceCube-LSC-Virgo joint analysis must be communicated to and receive prior approval by the signatories to this Attachments.

The preparation of any publication will follow procedures in accordance with provisions established by the LSC, Virgo and IceCube publication policies.[2]

A separate author list showing the IceCube authors (and according to the IceCube policies for author listing) under "IceCube Collaboration" and the LSC and Virgo authors under "LIGO Scientific Collaboration" and "Virgo Collaboration" according to the joint LSC-Virgo MOU[3]

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[2] The publication rules are available in the following documents: LIGO/LSC http://www.ligo.caltech.edu/docs/T/T010168-03/, VIRGO [VIR-0560A-09 https://tds.ego-gw.it/ql/?c=6872 and VIR-0559A-09 https://tds.ego-gw.it/ql/?c=6871], IceCube [http://www.icecube.wisc.edu/collaboration/governance.php]

[3] LIGO-M060038-01-M & VIR-PLA-DIR-1000-223. Memorandum of Understanding between VIRGO and

for author listing will be used. The IceCube Spokesperson will determine the order of authors within the IceCube Collaboration, and the order of authors within the LSC and Virgo subgroups will be determined by LSC and Virgo policies. Whenever an individual author listing is not allowed, the contributing author will clearly identify the fact that he/she represents all three collaborations.

All outside presentations concerning preliminary results from the joint GW+HEN^{IceCube} working group including talks, seminars, colloquia and conferences will be required to receive prior approval by the signatories to this Attachment.

For the special case of a 'detection' of high energy neutrino of astrophysical origin and/or a gravitational wave, the following rules for the publication of observational results apply:

- if either IceCube on the one hand or LSC/Virgo on the other hand can make a detection/evidence claim based solely on a separate analysis of their own data and in the absence of corroborating evidence from the other party, then each party may choose to publish their result separately and independently of the other.

a joint follow-up article may complement an individual paper. It is desired that the time delay between the discovery article(s) and the joint follow-up paper be as small as possible.

- if neither IceCube or LSC/Virgo can make a claim of a detection/evidence based solely on a separate analysis of their own data, but the joint analysis covered in this attachment results in a detection/evidence, the publication will be a jointly authored article.

- if there is no discovery, a joint paper shall state upper-limits and associated interpretation.

Any press release(s) reporting the observational results of this work must be coordinated and approved by LIGO Executive Director, LSC Spokesperson, Virgo Spokesperson, and IceCube Spokesperson.

GW+HEN^{IceCube} working group methods/technical papers that do not use real data will have author lists consistent with the policies of the IceCube, LSC, and Virgo collaborations.

Presentations at conferences including observational results from the GW+HEN^{IceCube} project shall be approved by all parties, according to the conference participation rules of each collaboration.

The LIGO Executive Director, LSC Spokesperson, Virgo Spokesperson, and IceCube Spokesperson may veto any presentation or publication of observational results from the GW+HEN^{IceCube} project at any time prior to its release.

5. Theses

   Any theses work on the GW+HEN^{IceCube} combined analysis will be in accordance with provisions established by the LSC, Virgo and IceCube publication policies for theses.

6. Reporting

   The joint GW+HEN^{IceCube} working group will report on its activities every three months to the LSC and Virgo Collaborations, and as requested, to the IceCube Collaboration. The participation of an IceCube (resp. LSC/Virgo) member of the group to a LSC/Virgo (resp. IceCube) meeting has to be approved by the corresponding Spokesperson. The requests will be routed by the coordinators of the GW+HEN^{IceCube} working group.

7. Authorization to read/comment upon joint papers.

   All parties to this agreement and all members of the IceCube, LSC, and Virgo Collaborations will be given the opportunity to read and comment upon any scientific publications resulting from this joint collaboration and the scope of this document before their submission to any public archive or submission for publication.

8. Presentations/ Seminars after the publication of the relevant papers.

   All parties to this agreement and all members of the IceCube, LSC and Virgo Collaborations will be able to present publicly any results published as a result of this agreement, but must abide by prevailing polices of all collaborations.

   All such presentations must give credit to the IceCube, LSC and Virgo Collaborations.

Jay Marx 2010.03.01 14:41:33 -08'00'

Jay Marx
LIGO Laboratory Executive Director

Date

A Lazzarini 2010.02.27 08:45:49 -08'00'

Albert Lazzarini
LIGO Laboratory Deputy Director

Date

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