

# Activity Report of the NAOJ Visiting Scholar Program

Host Project/Division: GW project office Name of Host Scientist: Raffaele FLAMINIO

Name of Visiting Scholar: Matteo BARSUGLIA

Title: Visiting Professor, Visiting Associate Professor, Visiting Research Fellow

(Choose the appropriate one)

Period: from 2014/05/19 to 2014/06/30

## I. Report from the visiting scholar

[ i ] Achievement during the period of stay (in comparison with the initial plan)

(Collaborative Research)

During my stay at NAOJ I have contributed to the design of the KAGRA gravitational-wave detector, and in particular to the design of the beam reducing telescopes.

This research has been extremely useful for both sides. The Virgo group I'm leading at the laboratoire APC is responsible for the design and construction of the Advanced Virgo input and output telescopes, which are now under installation on the Virgo site. Our previous design study has been very useful to contribute to the KAGRA design, since for Advanced Virgo we had explored several telescope configurations (refractive and reflective) and evaluated pros and cons. On the other hand, the work done by KAGRA colleagues has been the occasion to review some of the noise sources of the Advanced Virgo telescopes system. An optical engineer from APC has been also involved in this work.

Thanks to my stay, we have started a very fruitful collaboration between NAOJ and the APC Virgo group, which is still on-going through teleconferences and document exchanges (see as an example [http://gwdoc.icrr.u-tokyo.ac.jp/DocDB/0028/G1402801/001/Telescope\\_Zemax.pdf](http://gwdoc.icrr.u-tokyo.ac.jp/DocDB/0028/G1402801/001/Telescope_Zemax.pdf))

(Education)

During my stay I have co-tutored (and I'm still remotely co-tutoring) an undergraduate student working at NAOJ on the KAGRA output telescopes.

(Others)

- I participated at 6th Korea-Japan workshop on KAGRA, at NAOJ, giving a presentation on the status of the

<p>Advanced Virgo project (<a href="http://tamago.mtk.nao.ac.jp/6th_Korea-Japan/file/11_BARSUGLIA20140620.pdf">http://tamago.mtk.nao.ac.jp/6th_Korea-Japan/file/11_BARSUGLIA20140620.pdf</a>)</p> <ul style="list-style-type: none"> <li>- I gave a conference at the French embassy in Tokyo, about "Gravitational-waves: New messengers for Astrophysics and Cosmology."</li> <li>- I visited Prof.Ando laboratory at University of Tokyo and discussed a collaboration about torsion bar antenna.</li> <li>- I gave a seminar to the GW project office about "Advanced Virgo telescopes design and realization" (<a href="http://gwdoc.icrr.u-tokyo.ac.jp/DocDB/0028/G1402802/001/telescopes_NAOJ_v4.pdf">http://gwdoc.icrr.u-tokyo.ac.jp/DocDB/0028/G1402802/001/telescopes_NAOJ_v4.pdf</a>)</li> </ul>
<p>[ ii ] Any comments on this program</p> <p>The program has been very useful to improve collaboration between the GW project office and the APC-Virgo group.</p>
<p>[ iii ] List of publications and presentations by the visiting scholar in collaboration with NAOJ staff or graduate students</p> <p>Junko Katayama and Matteo Barsuglia "KAGRA BRT/GPT: Preliminary results"</p> <p><a href="http://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/private/DocDB/ShowDocument?docid=2806">http://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/private/DocDB/ShowDocument?docid=2806</a></p>

II. 以下の項目について、受入教員が記入してください。

Report from the host scientist

<p>[ iv ] 本制度に対する意見、要望など</p> <p>Any comments on this program</p>
<p>The visit of Matteo Barsuglia at NAOJ was extremely useful. Indeed he gave an important contribution to the design of the output telescopes for KAGRA. Following his suggestions we revisited the telescope design and we decided to move from a reflective telescope to a refractive one. Under his guidance the student who is working on this subject included in the telescope design study an analysis of the effect of the back-reflected light. The visit allow to start a collaboration with Barsuglia's team at the laboratory AstroParticule and Cosmologie (APC) in Paris where an optical engineer helped us in evaluating the aberrations in the telescope. In addition Matteo Barsuglia started a collaboration with Ando's lab at UTokyo and gave a general public lecture on gravitational waves at the French Embassy in Tokyo.</p>