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Multi-messenger Observations of Gravitational-Wave Sources in the Advanced Detectors Era[1]

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In the near future the advanced ground-based gravitational-wave detectors will open a new direction in observational astronomy. Detection of gravitational waves will allow us to perform the first unambiguous observations of coalescence of compact binaries consisting of neutron stars and stellar-mass black holes. The multi-messenger and multi-wavelength observations of such transient gravitational-wave events with other instruments will help us to identify their location, understand their environment and examine their hypothesized connection with the short gamma-ray bursts. They will also provide a wealth of complementary data from which we can infer new information about compact objects and various physical processes taking place during or after the coalescence. In addition to coalescing binaries, we should also be prepared to discover completely new classes of gravitational-wave transients, for which verification and understanding the multi-messenger observations at other wavelengths would be equally important. In this talk I will give an overview of the observing plans for the advanced detectors in the second half of this decade, and their projected capabilities in discovering and localizing the transient gravitational-wave sources. I will describe the main challenges in performing the multi-messenger observations of such sources and what we do to overcome them in preparation for future observational campaigns. I will conclude by presenting the initiative led by the LIGO and Virgo collaborations to involve a wider astronomical community in the follow-up multi-messenger observations starting with the very first advanced detectors science run in 2015.

[1]for the LIGO Scientific Collaboration and the Virgo Collaboration