
KMI-Tagen Joint Seminar

Tuesday, May 19, 2015

1:00 pm, KMI Science Symposia (ES-635)

“Non-linear dynamics of axion clouds around a rotating black hole and its observation by gravitational waves”

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Abstract: In these five years, we have continued the investigation of the dynamical evolution of superradiantly unstable axion clouds around a Kerr black hole taking account of non-linear self-interaction of the axion field by a 3D relativistic numerical simulations. As a result, we have realized repeated occurrence of bosenova collapse and superradiant growth of an axion cloud by numerical simulations for the first time and clarified its features quantitatively. Further, on the basis of that, we have calculated gravitational wave emissions from the axion cloud and pointed out that we can get strong constraints on the mass and decay constant for string axions by the current and future observations of gravitational waves from a black hole in a binary inside our Galaxy, such as the Cygnus X1, and the massive black hole at the Sagittarius A. In this talk, I will overview these results including that of our recent work on axion clouds with multiple unstable modes simultaneously excited.

References

- [1] “Probing the string axiverse by gravitational waves from Cygnus X-1”
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- [2] “Gravitational radiation from an axion cloud around a black hole: Superradiant phase”
Hirotaka Yoshino, Hideo Kodama: PTEP 2014 (2014) 043E02 [arXiv:1312.2326].
- [3] “Axiverse and Black Hole”
Hideo Kodama, Hirotaka Yoshino: Int. J. Mod. Phys. Conf. Ser. 7 (2012) 84-115 [arXiv:1108.1365].
- [4] “Exploring the String Axiverse with Precision Black Hole Physics”
Asimina Arvanitaki, Sergei Dubovsky: Phys.Rev. D83 (2011) 044026 [arXiv:1004.3558].
- [5] “String Axiverse”
A. Arvanitaki, S. Dimopoulos, S. Dubovsky, N. Kaloper, J. March-Russell: Phys.Rev. D81 (2010) 123530 [arXiv:0905.4720].