Contribution ID: **462** Type: **Talk in the parallel session**

Back-reaction of Matter Fluctuations in Asymptotically non-flat Black-hole Space-times

Tuesday, 6 July 2021 07:55 (25 minutes)

Hawking radiation remains a crucial theoretical prediction of semi-classical gravity and is considered one of the critical tests for a model of quantum gravity. However, Hawking's original derivation used quantum field theory on a fixed background. Efforts have been made to include the space-time fluctuations arising from the quantization of the dynamical degrees of freedom of gravity itself and to study the effects on the Hawking particles. Using semi-classical analysis, we study the effects of quantum fluctuations of scalar field stress-tensors in asymptotic non-flat spherically symmetric black-hole space-times. Using two different approaches, a statistical mechanical approach and a quantum field theoretic approach, we obtain a critical length-scale from the horizon at which gravitational interactions become large, i.e., when the back reaction to the metric due to the scalar field becomes significant. The work can be found at [arXiv: 2008.00429].

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Session Classification: Black Hole Thermodynamics

Track Classification: Black Holes: Theory and Observations/Experiments: Black hole thermodynamics