

ICTS Astrophysical Relativity Seminar

- Title** : Testing the Sagittarius A* Spacetime Metric with the 2017 EHT Observations
- Speaker** : Prashant Kocherlakota (Harvard University, USA)
- Date** : Wednesday, 07th December 2022
- Time** : 11:00 am (IST)
- Abstract** : Astrophysical black holes (BHs) are expected to be described by the Kerr solution of the Einstein's equations. We explore potential deviations from the Kerr metric and present new constraints on these using the 2017 EHT observations of Sagittarius A* (Sgr A*). The EHT observes a bright ring-like feature, whose size depends on (a) the mass-to-distance (M/D) ratio for Sgr A*, (b) the spacetime metric, and (c) the properties of the emitting plasma. Using a large library of images obtained from both Kerr and non-Kerr simulations, we calibrate the size of the BH shadow boundary, which is determined purely by the spacetime-geometry, to the size of the observed ring in the image. The prior measurements of M/D can then be folded in to yield a $\sim 10\%$ constraint on the deviation of the shadow size of Sgr A* from the Schwarzschild value. We use these bounds to constrain spacetime metrics that are parametrically different from Kerr, as well as the generalized charges of several alternative *solution* metrics (including ones inspired by string theory). In particular, we are able to rule out a general class of wormhole metrics and a number of naked singularity solutions as models for Sgr A*. Using the observed image size and the broadband spectrum of Sgr A*, we can also conclude that it cannot have a thermal surface and that it's having a specularly-reflective one is rather unlikely. Together with the bounds found for stellar-mass BHs and the BH in M87, our observations provide further support that the external spacetimes of all astrophysical BHs are well described by the Kerr metric, independent of their mass. Time permitting, I will briefly comment on the exciting future of BH imaging vis-à-vis studies of strong-field gravity.
- Venue** : **Hybrid Seminar**
- Offline:** Chern Lecture Hall
- Online:** Please click on the below link to join the seminar
- <https://icts-res-in.zoom.us/j/82483064431?pwd=NURWWU0vWHlGRldlMXJlRWZXdC84UT09>
- Meeting ID: 824 8306 4431
- Passcode: 112211