Press release
TIFR, Mumbai
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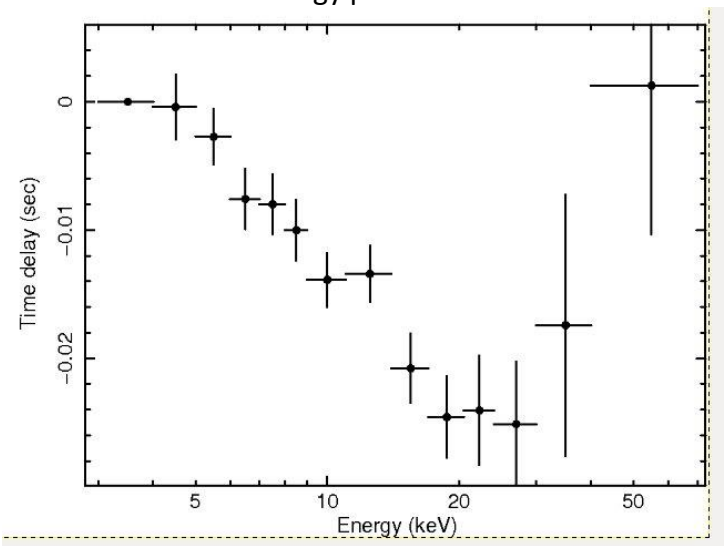
AstroSat observes the high energy X-ray variability of a black hole system

India's first dedicated astronomy satellite, AstroSat, which was launched by ISRO on Sept 28, 2015, has observed for the very first time rapid variability of high energy (particularly >20keV) X-ray emission from a black hole system. **The Large Area X-ray Proportional Counter (LAXPC) instrument which is only instrument worldwide capable of such study, was designed & developed indigenously at the Tata Institute of Fundamental Research (TIFR) Mumbai**.

In black hole systems, mass from a regular star gets stripped off and falls towards the black hole forming a disk around the black hole. The temperature of the disk is more than ten million degrees and hence the system emits X-rays. The total power coming out of these systems is often more than ten thousand times that of the sun. Yet these systems vary rapidly in time-scales much less than a second.

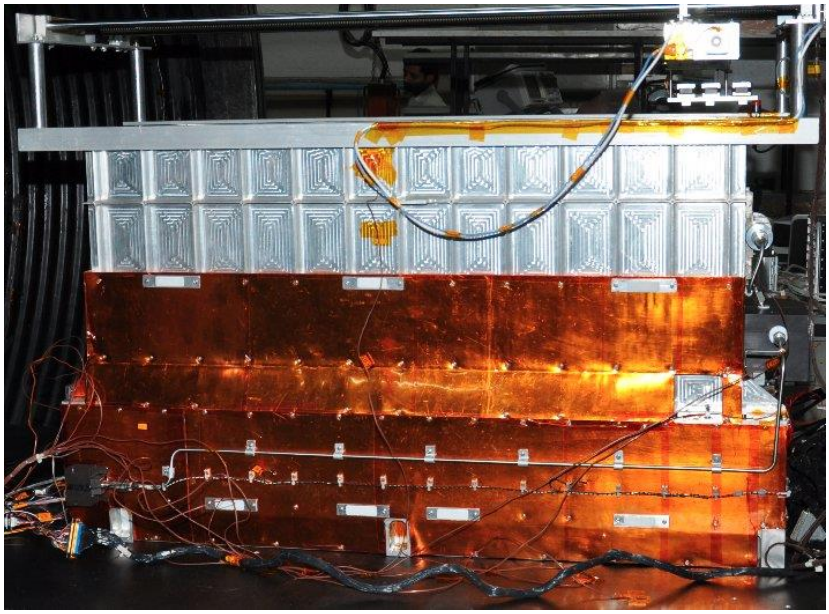
Astronomers have always been puzzled by the enigmatic black hole system called GRS 1915+105. It shows many different kinds of behaviours and its X-ray emission sometimes oscillates nearly periodically (hence these oscillations are termed as Quasi-period oscillations) on a time-scale of a few hundred milli-seconds. Astronomers believe that these oscillations may occur because the inner part of the disk surrounding the black hole precesses (i.e. wobbles) because the spinning black hole drags the space-time fabric around it as predicted by Einstein's General theory of relativity.

While these oscillations have been known and studied earlier in low energy X-rays using the American satellite Rossi X-ray Timing Experiment, they have now been detected and characterized in high energy X-rays by LAXPC instrument on board the ISRO space mission, AstroSat. Observing the phenomenon in high energy X-rays is critical since higher energy photons are expected to be emitted closer to the black hole than low energy photons.



Time delay between low and high energy X-rays

The highly sensitive instrument, LAXPC, also measured the arrival time difference between the high and low energy X-rays (which is of the order of tens of milli-seconds) providing direct clues to the geometry and dynamic behaviour of the gas swirling round a spinning black hole. All this information was obtained by just nine orbits or a few hours of AstroSat observation of the source. No other observatory at present (or earlier) is capable of achieving these results.



LAXPC instrument

After careful performance verification of the instruments on board AstroSat, Indian Scientists are now using AstroSat to unravel the mysteries of the Universe and this finding is just the beginning of a large number of such discoveries that AstroSat is expected to make. This marks a new era for Indian Astronomy with AstroSat being a front-line dedicated astronomy satellite.

The findings have been reported by a team led by Professor J. S. Yadav and other scientists from the Tata institute of Fundamental Research (TIFR) along with astronomers from the Inter-University Centre for Astronomy and Astrophysics (IUCAA), University of Mumbai and the Raman Research Institute (RRI). Their report will be published in the Astrophysical Journal.

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More information available at: http://arxiv.org/abs/1608.07023