BangaloreMirror

MUMBAI MIRROR | AHMEDABAD MIRROR | PUNE MIRROR



# INDIAN ASTRONOMERS HELP CLOCK ROTATION OF MASSIVE BLACK HOLE

Bangalore Mirror Bureau | Mar 11, 2016, 07.48 PM IST

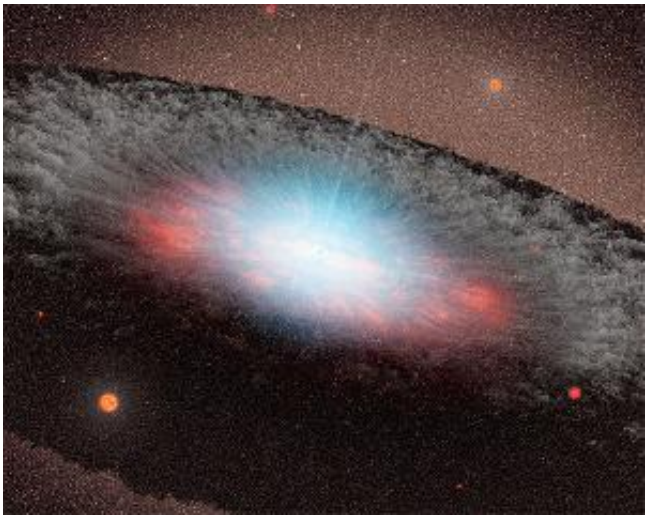

*Image of a supermassive black hole. The observations leading to accurate*

*spin measurement were made due to the collaboration of many optical*

*telescopes in Japan, India, Turkey, Greece, Germany, UK, Spain & USA*

***By: Mihika Basu***

Astronomers from India have helped clock the rotation rate of a supermassive black hole. Prof A Gopakumar from the Tata Institute of Fundamental Research (TIFR), Mumbai, who was part of the international collaboration of close to 100 astronomers, told Bangalore Mirror that this demonstrates that massive black holes can rotate just like sun and earth, although at a much faster rate. He provided the general relativity-based description for the system that enabled the direct measurement of the black hole rotation rate.

"The recent observational campaign involving more than two dozen optical telescopes and NASA's space based SWIFT X-ray telescope allowed astronomers to measure very accurately the rotational rate of one of the most massive black holes in the universe. The rotational rate of this massive black hole is one third of the maximum spin rate allowed in general relativity," said Prof Gopakumar.

This 18 billion solar mass heavy black hole powers a quasar called OJ287, which lies about 3.5 billion light years away from Earth. Experts say that quasars or qausi-stellar radio sources are very bright centres of distant galaxies, which emit huge amounts of electro-magnetic radiation due to the infall of matter into their massive black holes. This quasar lies very close to the apparent path of the Sun's motion on the celestial sphere as seen from Earth, where most searches for asteroids and comets are conducted.

"There are ongoing efforts to detect nano-Hz gravitational waves and it may happen in the very near future. (LIGO observed gravitational waves of around 100 Hz). Sources like OJ287 will be very helpful for nano-HZ gravitational waves," he added.

According to scientists, this provides the first indirect evidence for the existence of a massive spinning black hole binary emitting gravitational waves. This is encouraging news for the "pulsar timing array efforts", which will directly detect gravitational waves from such systems in the near future. The international team said that the present optical outburst of OJ287 adds to the excitement of the first direct observation of a transient gravitational wave signal by LIGO. "Analysis and observation reveal

that OJ287 has produced quasi-periodic optical outbursts at intervals of approximately 12 years, dating back to around 1891. Additionally, a close inspection of newer data sets reveals the presence of double-peaks in these outbursts. These deductions prompted the scientists to develop a model that requires the quasar OJ287 to harbour two unequal mass black holes," said a TIFR official.

The general relativistic model for OJ287 also predicted that the next outburst could occur around November 25, 2015, marking the 100th anniversary of Einstein's General Theory of Relativity. An observational campaign was launched to catch this predicted outburst. The predicted optical flare began around November 18, 2015 and reached its maximum brightness on December 4, 2015. "It is the timing of this bright outburst that allowed scientists to directly measure the rotation rate," added Prof Gopakumar.