Black Hole's Heart Still Beating

The first confirmed heartbeat of a supermassive black hole is still going on – and even stronger – more than ten years after first being observed, as revealed in a latest study.

X-ray satellite observations spotted the repeated beat once again, after its signal was blocked by our Sun for a number of years.

Astronomers say this is the most long-lived heartbeat ever seen in a black hole and tells us more about the size and structure close to its event horizon – the space around the central black hole from which nothing, even light, can escape.

The astronomers, from the National Astronomical Observatories of the Chinese Academy of Sciences (NAOC), China, and Durham University, UK, jointly reported their discovery lately in the journal Monthly Notices of the Royal Astronomical Society.

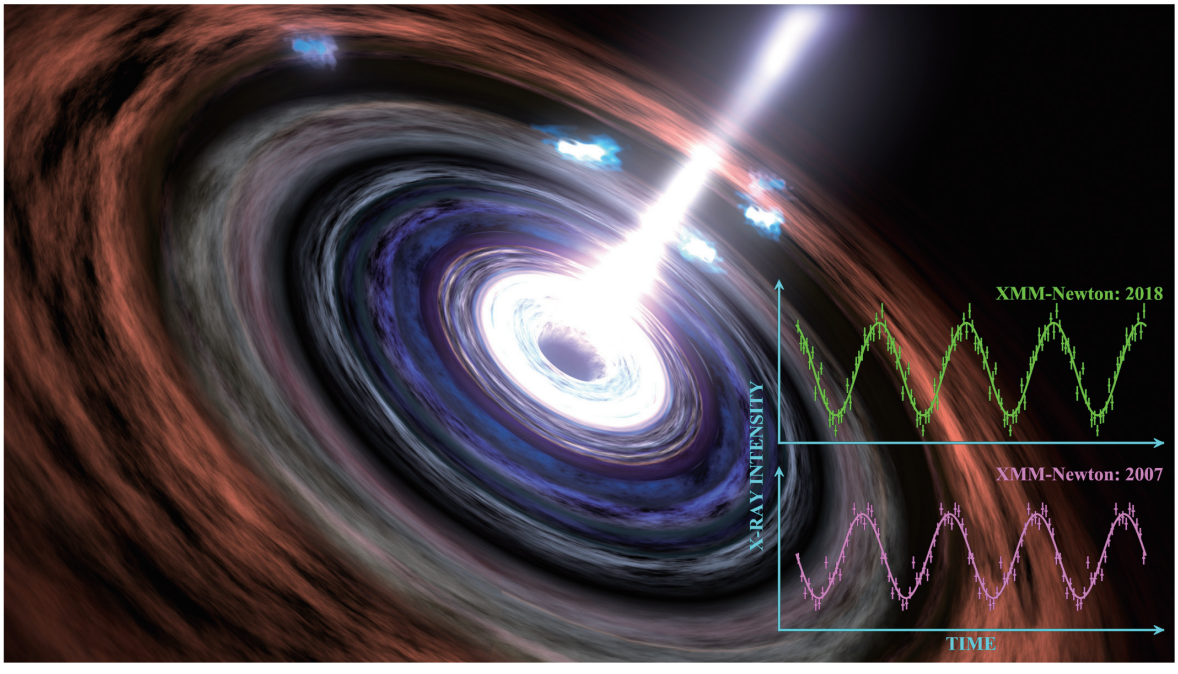
The black hole's heartbeat was first detected in 2007 at the center of a galaxy called RE J1034+396, which is approximately 600 million light years from Earth.

The signal from this galactic giant repeated every hour and the same behavior had been seen in several snapshots taken before long-duration satellite observations became impossible due to the blocking of our Sun in 2011.

In 2018, the European Space Agency's XMM-Newton X-ray satellite was able to finally re-observe the black hole and to scientists' amazement the same repeated heartbeat could still be "heard".

Matter falls on to a supermassive black hole as it fuels the accretion disc of material surrounding this gravity abysm and releases an enormous amount of energy from a comparatively tiny region of space – but this is rarely seen as a specific repeatable pattern like a heartbeat.

The time between beats can tell us about the size



A black hole including the heartbeat signal observed in 2007 and 2018 (Credit: JIN Chichuan, NASA/GSFC)

and structure of the matter close to the black hole's event horizon.

Professor Chris Done, in Durham University's Centre for Extragalactic Astronomy, collaborated on the findings with colleague Professor Martin Ward, Temple Chevallier Chair of Astronomy.

Professor Done said: "The main idea for how this heartbeat is formed is that the inner parts of the accretion disc are expanding and contracting."

"The only other system we know which seems to do the same thing is a 100,000 times smaller stellar-mass black hole in our Milky Way, fed by a binary companion star, with correspondingly smaller luminosities and timescales," she continued, "This shows us that simple scaling with black hole mass works, even for the rarest types of behavior."

"This heartbeat is amazing!" Said lead author Dr. JIN Chichuan at NAOC. "It proves that such signals arising from a supermassive black hole can be very strong and persistent. It also provides the best opportunity for scientists to further investigate the nature and origin of this heartbeat signal."

The next step in the research, as conceived by the astronomers, is to perform a comprehensive analysis of this intriguing signal, and compare it with the behavior of stellar-mass black holes in our Milky Way.

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(NAOC)