

Gambling on Gravitational Waves

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At the Institute of Physics conference Photon 04 today, Professor Jim Hough, one of the UK's leading scientists, revealed that he thinks high street bookmakers are crazy to be offering odds of 100-1 on whether Gravitational Waves (wrinkles in relativity) will be discovered before 2010. He has placed a personal bet of £25 – the maximum Ladbrokes allowed him to stake. The available odds were quickly cut from an initial offering of 500-1.

Professor Jim Hough, from the University of Glasgow and one of the leaders of the UK search for Gravitational Waves, said: "I think the real odds are more like a favourite at 2-1 or 3-1, I'm almost certain we'll discover them in the very near future. I would have had much more money on at the odds they were offering but the maximum bet they allowed me to have was £25!" Gravitational waves are ripples in the fabric of spacetime and are one of the more exotic predictions of Einstein's theory of gravity – General Relativity. Initially thought not to exist, the reality of gravitational waves is no longer doubted by scientists. The gradual changes in the orbit of a binary pulsar called PSR 1913 +16 (a pair of orbiting neutron stars, one of which is a pulsar emitting precisely timed radio pulses) can be explained only if angular momentum and energy is carried away from this system by gravitational waves.

Weak gravitational waves are probably passing through us all the time but are too faint to detect. Scientists are currently trying to detect the strongest waves, for example those created in violent events such as supernovae but none of the instruments looking for them have yet picked

up a clear and definite signal. Improvements in the sensitivity of these instruments, and some promising initial results, should mean that scientists are very close.

There are currently four teams working to try and detect them – two in the US, a UK/German team with an interferometer based in Germany, a France/Italy collaboration in Pisa, and a smaller 300 metre instrument in Japan.

The US experiment, based in Hanover and called LIGO, is the largest at 4km. The UK device, called GEO 600, is much smaller at only 600 metres long. "We couldn't afford to build an instrument as big as LIGO so we had to be innovative to compete" said Professor Hough.

"We built a slightly more experimental instrument with two unique features – silica fibre wires and a new way of processing the signal. We use silica fibre wires to suspend the mirrors, rather than steel. Silica creates a purer resonance – like the perfect note you get when you tap a good quality wine glass – and this means it's a lot more sensitive."

"We also put an extra mirror in the output channel which forces the photons back into the system where they are processed for longer. This enhances any signal from a gravitational wave that might be present. GEO's been so successful that LIGO intend to implement some of our improvements in their instrument when they're next refitted."

Looking to the future, he said "Even if gravitational waves are not detected in the next few years, I think we're certain to find them in or around 2010 when LIGO is upgraded. The odds Ladbrokes are offering are bound to keep falling and falling!"

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