



Physics Colloquium

Friday March 12th, 2010

4:10 - 5:00pm, 108 EPS

Testing the Equivalence Principle with Tidal Streams

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Abstract:

The equivalence principle, that all objects fall at the same rate in a gravitational field, is a cornerstone of Einstein's theory of general relativity. It has been confirmed to exquisite accuracy for the motion of test masses in the laboratory and planets in the Solar System. However, the Universe consists primarily not of atoms but dark matter and dark energy. Do these unseen components obey the equivalence principle as well, and how might we tell? I will show that the tidal streams produced when satellite galaxies are gravitationally disrupted by larger host galaxies constitute a surprisingly rigorous test of the equivalence principle for dark matter. If dark matter falls more quickly than the atomic matter from which stars are made, stellar tidal debris will trail instead of lead a satellite galaxy in its orbit about the host galaxy. Our own Milky Way Galaxy is tidally disrupting the Sagittarius dwarf galaxy, and the existence of a leading tidal streams conservatively shows that dark matter satisfies the equivalence principle to within 10%.

Host:

Neil Cornish