By the Light of the Moon

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The image of the moon is courtesy of NASA.

The gently glowing moon is more than just a pretty ball in the sky—for gamma-ray astronomers, the moon could become a unique target for calibrating instruments such as the Gamma-ray Large Area Space Telescope (GLAST).

Once GLAST is up and running, scientists will need a way to confirm that it's working properly. Fortunately, the moon provides a big, bright "standard candle"—an object with an absolutely known gamma-ray output.

In a December *Astrophysical Journal* paper, that candle's exact brightness is derived by Stanford's physicist Igor Moskalenko, a member

of the GLAST collaboration and the Kavli Institute for Particle Astrophysics and Cosmology, and Troy Porter of UC Santa Cruz and the Santa Cruz Institute for Particle Physics, also a GLAST collaboration member.

Having such a standard provides a unique tool to calibrate GLAST, and will prove a useful cross-check with other calibration methods. If the moon through GLAST matches Moskalenko and Porter's calculations, then images of the rest of the galaxy are probably correct. If the moon looks funny, then it's time to adjust the instrument's response.

Unlike any other object in the sky, the moon has a known composition and the flux of incident particles producing the gamma-ray emission is well understood, which makes it possible to calculate how many gamma rays it ought to emit. The fact that the moon is nearby means that we can see the gamma rays coming from its surface quite well.

"For the moon, we know absolutely everything," Moskalenko said.

Moskalenko and Porter aren't the first to calculate the moon's capacity for emitting gamma radiation, but Moskalenko said their results incorporate the most recent data and state-of-the-art simulation tools; the scientists computed how cosmic-ray particles would interact with moon rock and produce gamma rays. They then applied that data to the levels of cosmic rays that bombard the moon.

The moon would be especially useful for calibrating GLAST, Moskalenko said, because of the inclination of its orbit with respect to the plane of the Milky Way. "It visits different areas of the sky," he said. "Using the moon as a calibrator, you can always be sure that your data are accurate."

Source: by Amber Dance, SLAC Today