Scanning Webb's surrogate eye

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Credit: NASA/Chris Gunn

(Phys.org) -- Engineer Erin Wilson adds aluminum tape to electrical cables to protect them from the cold during environmental testing of special optical equipment. These tests will verify the alignment of the actual flight instruments that will fly aboard NASA's James Webb Space Telescope.

"Because the flight science instruments detect infrared light, they must be extremely cold to work, and so the environment we test them in must be extremely cold too," Wilson says.

Wilson is working in the Space Environment Simulator thermal-vacuum chamber at NASA's Goddard Space Flight Center in Greenbelt, Md. The subject of the testing is the Optical Telescope Element (OTE) Simulator, or OSIM. The hardware seen in the background is the Beam Image Analyzer, which will be used to measure OSIM. It sits above the OSIM, which is under the platform that Wilson is working on. The OSIM is about two stories tall and almost as wide as the whole test chamber.

The job of the OSIM is to generate a beam of light just like the one that the real telescope optics will feed into the actual flight science instruments. Because the real flight science instruments will be used to test the real flight telescope, their alignment and performance have to be verified first, using OSIM, and before that can happen, the OSIM has to tested and verified.

In space, the telescope optics act as Webb's eye, and on the ground, the OSIM substitutes for the telescope optics, says Robert Rashford, manager for the OSIM as well as the Integrated Science Instrument Module (ISIM) Electronics Compartment. This hardware is being tested in an environment that mimics the hard vacuum and cold temperatures that Webb will experience in space. After Erin and others were done setting things up in the test chamber, Goddard engineers sealed it up, evacuated all the air and lowered the temperature of the equipment being tested to 42 Kelvin (-384-point-1 Fahrenheit or -231-point-1 Celsius).

"It has taken a little over a month to get temperatures cold enough to duplicate the temperatures that Webb will see in operation in space," Rashford says.

In the next couple weeks Rashford and the team of Goddard engineers will measure the OSIM with the Beam Image Analyzer. This extremely cold or "cryogenic" optical testing and verification process will likely take 90 days to complete.

Provided by NASA