

generated side-information and the Slepian-Wolf code bits.

The video coding element includes receiving a first reference frame having a first pixel value at a first pixel position, a second reference frame having a second pixel value at a second pixel position, and a third reference frame having a third pixel value at a third pixel position. It determines a first motion vector between the first pixel position and the second pixel position, a second motion vector be-

tween the second pixel position and the third pixel position, and a fourth pixel value for a fourth frame based upon a linear or nonlinear combination of the first pixel value, the second pixel value, and the third pixel value. A stationary filtering process determines the estimated pixel values. The parameters of the filter may be predetermined constants.

This work was done by Ligang Lu, Drake He, Ashish Jagmohan, and Vadim Sheinin of IBM for Stennis Space Center.

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Refer to SSC-00291/309/310, volume and number of this NASA Tech Briefs issue, and the page number.

Apparatus for Measuring Total Emissivity of Small, Low-Emissivity Samples

Goddard Space Flight Center, Greenbelt, Maryland

An apparatus was developed for measuring total emissivity of small, light-weight, low-emissivity samples at low temperatures. The entire apparatus fits inside a small laboratory cryostat. Sample installation and removal are relatively quick, allowing for faster testing.

The small chamber surrounding the sample is lined with black-painted aluminum honeycomb, which simplifies data analysis. This results in the sample viewing a very high-emissivity surface on all sides, an effect which would normally require a much larger chamber volume. The sample and chamber temperatures are indi-

vidually controlled using off-the-shelf PID (proportional-integral-derivative) controllers, allowing flexibility in the test conditions. The chamber can be controlled at a higher temperature than the sample, allowing a direct absorptivity measurement.

The lightweight sample is suspended by its heater and thermometer leads from an isothermal bar external to the chamber. The wires run out of the chamber through small holes in its corners, and the wires do not contact the chamber itself. During a steady-state measurement, the thermometer and bar are individually controlled at the same temperature, so

there is zero heat flow through the wires. Thus, all of sample-temperature-control heater power is radiated to the chamber.

Double-aluminized Kapton (DAK) emissivity was studied down to 10 K, which was about 25 K colder than any previously reported measurements. This verified a minimum in the emissivity at about 35 K and a rise as the temperature dropped to lower values.

This work was done by James Tuttle and Michael J. DiPirro of Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-15697-1

Multiple-Zone Diffractive Optic Element for Laser Ranging Applications

This technology can be used on unmanned aerial vehicles, or in collision-avoidance and robotic control applications in cars, trains, and ships.

Goddard Space Flight Center, Greenbelt, Maryland

A diffractive optic element (DOE) can be used as a beam splitter to generate multiple laser beams from a single input laser beam. This technology has been recently used in LRO's Lunar Orbiter Laser Altimeter (LOLA) instrument to generate five laser beams that measure the lunar topography from a 50-km nominal mapping orbit (see figure). An extension of this approach is to use a multiple-zone DOE to allow a laser altimeter instrument to operate over a wider range of distances. In particular, a multiple-zone DOE could be used for applications that require both mapping and landing on a planetary body. In this

case, the laser altimeter operating range would need to extend from several hundred kilometers down to a few meters.

The innovator was recently involved in an investigation how to modify the LOLA instrument for the OSIRIS asteroid mapping and sample return mission. One approach is to replace the DOE in the LOLA laser beam expander assembly with a multiple-zone DOE that would allow for the simultaneous illumination of the asteroid with mapping and landing laser beams. The proposed OSIRIS multiple-zone DOE would generate the same LOLA five-beam output pattern for high-altitude topographic mapping, but

would simultaneously generate a wide divergence angle beam using a small portion of the total laser energy for the approach and landing portion of the mission. Only a few percent of the total laser energy is required for approach and landing operations as the return signal increases as the inverse square of the ranging height. A wide divergence beam could be implemented by making the center of the DOE a diffractive or refractive negative lens. The beam energy and beam divergence characteristics of a multiple-zone DOE could be easily tailored to meet the requirements of other missions that require laser ranging data.