Multifunction Imaging and Spectroscopic Instrument

There would be no repositioning for different observations of the same specimen.

NASA’s Jet Propulsion Laboratory, Pasadena, California

A proposed optoelectronic instrument would perform several different spectroscopic and imaging functions that, heretofore, have been performed by separate instruments. The functions would be reflectance, fluorescence, and Raman spectroscopies; variable-color confocal imaging at two different resolutions; and wide-field color imaging.

The instrument was conceived for use in examination of minerals on remote planets. It could also be used on Earth to characterize material specimens. The conceptual design of the instrument emphasizes compactness and economy, to be achieved largely through sharing of components among subsystems that perform different imaging and spectrometric functions. The input optics for the various functions would be mounted in a single optical head. With the exception of a targeting lens, the input optics would all be aimed at the same spot on a specimen, thereby both (1) eliminating the need to reposition the specimen to perform different imaging and/or spectroscopic observations and (2) ensuring that data from such observations can be correlated with respect to known positions on the specimen.

The figure schematically depicts the principal components and subsystems of the instrument. The targeting lens...
Position-Finding Instrument Built Around a Magnetometer
A coarse indication of position is derived from a relatively inexpensive instrument.

Goddard Space Flight Center, Greenbelt, Maryland

A coarse-positioning instrument is built around a three-axis magnetometer. The magnetometer is of a type that is made of inexpensive hardware and is suitable for use aboard spacecraft orbiting no more than 1,000 km above the surface of the Earth. A data processor programmed with suitable software and equipped with a central processing unit, random-access memory, programmable read-only memory, and interface circuitry for communication with external equipment are added to the basic magnetometer to convert it into a coarse-positioning instrument. Although the instrument was conceived for use aboard spacecraft, it could be useful for navigation on Earth under some circumstances.

A major feature of the proposed instrument is an ability to generate a coarse estimate of its position in real time (that is, without start-up delay). Algorithms needed to solve the position equations have been developed. These include algorithms to work around gaps in measurement data that arise from a singularity near the minimum in the magnetic field of the Earth.

Some work has been done to develop a prototype of this instrument incorporating a standard three-axis flux-gate magnetometer and a Pentium P-5 (or equivalent) processor with a clock frequency of 120 MHz. Alternatively, the processor could be of the ‘486 class. A computer model of the instrument has been completed and tested.

This work was done by Eleanor Ketchum of Goddard Space Flight Center. Further information is contained in a TSP (see page 1).

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Improved Measurement of Dispersion in an Optical Fiber
The lower limit of measurability is extended.

NASA’s Jet Propulsion Laboratory, Pasadena, California

An improved method of measuring chromatic dispersion in an optical fiber or other device affords a lower (relative to prior such methods) limit of measurable dispersion. This method is a modified version of the amplitude-modulation (AM) method, which is one of the prior methods. In comparison with the other prior methods, the AM method is less complex. However, the AM method is limited to dispersion levels ≥ 160 ps/nm and cannot be used to measure the symbol of the dispersion. In contrast, the present modified version of the AM method can be used to measure the symbol of the dispersion.