

# NASA TECH BRIEF

## *Manned Spacecraft Center*



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### Remote Sensing X-Ray Spectrometer

A new X-ray spectrometer measures the chemical composition of lunar rock by remote sensing from orbit. The spectrometer senses lunar X-rays produced by the interaction of solar X-rays and elements on the lunar surface. The instrument features high sensitivity, a data handling system that accumulates and prepares data for telemetry, and automatic calibration. The spectrometer has three major assemblies, the X-ray Detector Assembly, the X-ray Processing Assembly and the Solar Monitor Assembly.

The X-ray Detector Assembly senses X-rays emitted from the lunar surface and converts them to voltage pulses for the processor assembly. The detector has built-in calibration sources for gain, resolution and efficiency. Thermistors and heaters are located at strategic points to monitor and control the detector temperatures. Foil filters are used to differentiate between aluminum, silicon and magnesium.

The X-ray Processor Assembly sorts and counts the pulses from the X-ray Detector. Pulses are sorted by height into eight energy levels which range from .69 KEV to 3 KEV. A pulse count at each energy level is accumulated over an 8 second period and is then transmitted as data. A pulse shape discriminator is used to differentiate X-ray events from background noise. Included in the processor is electronic circuitry to format the data for telemetry.

The solar monitor is used to monitor solar X-rays during a given experiment since solar intensity exhibits

a great degree of variability over short time periods and this may introduce variability into the X-ray data.

The unit exhibits a degree of sensitivity not currently available. Sensitivity is improved by two orders of magnitude when compared with conventional laboratory instruments, allowing very low level X-ray radiation intensities to be detected and analyzed. The unit, if a suitable excitation source is developed, may provide a tool which can be used to non-destructively measure material composition remotely in real time. The spectrometer may also be useful as a geochemical investigative unit.

#### Note:

Requests for further information may be directed to:

Technology Utilization Officer  
Manned Spacecraft Center, Code JM7  
Houston, Texas 77058  
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#### Patent status:

No patent action is contemplated by NASA.

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