

# 4th Nassau Mossbauer Symposium

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" Velocity scales for Mars Mossbauer data (p. 67-68) David G. Agresti - M. Darby Dyar - Martha W. Schaefer Published online: 11 January 2007 Springer Science + Business Media B.V. 2007 Abstract

Raw Mossbauer data acquired from surface rocks and soils by two Mars Exploration Rovers (MERs) are being made available on-line to the general science community for independent analysis and interpretation. The data are released as counts per channel, so a velocity scale must be defined. The Windows-based computer program MERView does this in two steps. In the first, a scale proportional to the true velocity is derived by adjusting the magnitudes of the drive error signal and a phase shift. This report focuses on the second step, in which mm/s units are assigned to the proportional scale by comparing laboratory-measured  $\alpha$ -iron peak positions with those of spectra of the internal MER calibration targets. We contrast MERView-derived velocity scales for different MER measurement conditions with the velocity scales provided on-line by the MER team, and conclude that independent velocity calibration is generally desirable. Key words Mossbauer data Mars - velocity calibration methodology MER View

1 Introduction Two Mossbauer spectrometers (MIMOS II) [1] have been operating on the surface of Mars since January 2004 as part of the instrument suite of the Mars Exploration Rovers (MERs) Spirit and Opportunity . They have been acquiring spectra of surface rocks and soils in order to contribute to a better understanding of Mars geochemical history, in particular the nature of aqueous processes that may have played a role in defining the observed surface mineralogy. Analyses of spectral data by the MER Mossbauer team, with inferred mineralogy and interpretations in the geologic context, are presented in several reports [e.g. 2--4]. Given the importance of a full assessment of the data by outside investigators , the general science community is provided with the opportunity for independent analysis by regular releases of the MER data, at roughly 90-day intervals, to two principal web sites, the MER Analysts Notebook at and the Planetary Data System (PDS) Geosciences Node at

Mossbauer spectra for each rover are recorded in five detectors in up to thirteen 10-K wide temperature windows (180 K to 290 K), resulting in up to 65 distinct Mossbauer spectra for each sol (Mars day) on which data are recorded. Four detectors record the sample spectra, namely

backscatter spectra of surface material, rock, soil, or dust, while detecting 6.4-keV Fe Ko; X-rays and 14.4-keV  $^{57}\text{Fe}$   $\gamma$  photons. The fifth detector records in transmission mode the reference spectrum of an internal calibration target consisting of an enriched cc-Fe foil overlaid with enriched  $\alpha\text{-Fe}_2\text{O}_3$  and  $\text{Fe}_3\text{O}_4$ . The raw Mossbauer data for a particular sol, essentially as received from Mars, are embedded in a single 160-kB binarycoded file, the Experimental Data Record (EDR), which also includes other pertinent information such as detector energy spectra, temperature data, and a drive error signal. The structure of the EDR file and the nature of the binary coding are described in a Software Interface Specification document, available on line. Most important for this report is that the Mossbauer data are provided as counts versus channel, requiring calibration of the velocity scale to mm/s versus channel, which may be accomplished with use of the drive error signal and the properties of the calibration target." EAN/ISBN : 9783540711278 Publisher(s): Springer, Berlin Format: ePub/PDF Author(s): Alp, E.E. - Wynter, C. I.

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