THE MINIATURISED MOESSBAUER SPECTROMETER MIMOS II: APPLICATION FOR THE "PHOBOS-GRUNT" MISSION. G. Klingelhoefer[1], D. Rodionov[1,2], M. Blumers[1], B. Bernhardt[4], I. Fleischer[1], C. Schroeder[1,3], R. V. Morris[3], J. Girones Lopez[1], [1]Institut fuer Anorganische und Analytische Chemie, Universitaet Mainz, Germany (klingel@mail.uni-mainz.de), [2]Space Research Institute IKI, Moscow, Russia (rodionov@iki.rssi.ru), [3]NASA Johnson Space Center, Houston, Texas, USA, [4]Von Hoerner&Sulger GmbH, Germany.

Introduction: Moessbauer spectroscopy is a powerful tool for quantitative mineralogical analysis of Fe-bearing materials. The scientific objectives of the Moessbauer investigation are to obtain the mineralogical identification of iron-bearing phases (e.g., oxides, silicates, sulfides, sulfates, and carbonates), the quantitative measurement of the distribution of iron among these iron-bearing phases (e.g., the relative proportions of iron in olivine, pyroxene, ilmenite and magnetite in a basalt), and the quantitative measurement of the distribution of iron among its oxidation states (e.g., Fe^{2+}, Fe^{3+}, and Fe^{6+}).

Current status of extraterrestrial Moessbauer spectroscopy: In January 2004, the first in situ extraterrestrial Moessbauer spectrum was received from the Martian surface. At the present time (September 2007) two Miniaturized Moessbauer Spectrometers (MIMOS II) on board of the two Mars Exploration Rovers are still operational after more than 3 years of work, returning valuable scientific data [1-3]. To date more than 600 spectra were obtained with a total integration time for both rovers exceeding 270 days.

The MER mission has proven that Moessbauer spectroscopy is a valuable technique for the in situ exploration of extraterrestrial bodies and the study of Fe-bearing samples. The Moessbauer team at the University of Mainz has accumulated a lot of experience and learned many lessons during the last three years. All that makes MIMOS II a feasible choice for future missions to Mars and other targets. Currently MIMOS II is on the scientific payload of two planned missions: Phobos-Grunt (Russian Space Agency) and ExoMars (European Space Agency).

The Moessbauer spectrometer for the "Phobos-Grunt" mission: "Phobos-Grunt" is scheduled to launch in 2009. The main goals of the mission are: a) Phobos regolith sample return, b) Phobos in situ study, c) Mars and Phobos remote sensing.

The Moessbauer spectrometer for Phobos-Grunt will be based on the MER version with some modifications and improvements (Fig. 1). The new design includes additional mass reduction (total mass is planned to be ~320 g). The dimensions of the electronic-board will be minimized by using state of the art digital electronics. A new ring-detector system (Si-Drift detectors) will be used, thus greatly improving energy resolution. We expect an energy resolution of around 140-160 eV for temperatures lower than 250 K. This will increase the signal to noise ratio by a factor of 10 and, therefore, integration times might be reduced significantly. New firmware is developed to optimize the instrument's performance (based on MER experience and new electronics capabilities).

Like on MER, the MIMOS II instrument will be mounted on a robotic arm (on the landing module). Currently, an engineering model is being manufactured for testing purposes.

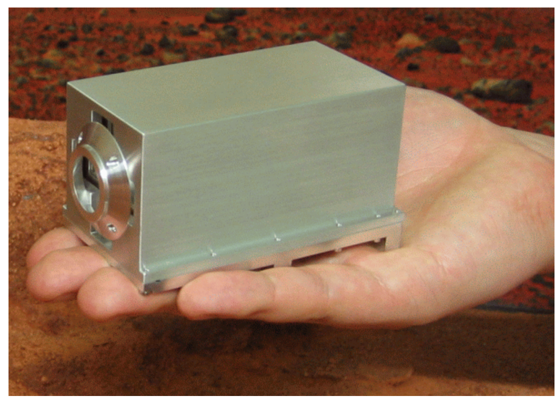

Fig. 1. MIMOS II Sensorhead

References: [1] Klingelhoefer G. et al., «Two years of Moessbauer studies of the surface of Mars with MIMOS II», (2006), *Hyp. Int. 170.* [2] Morris R. V., Klingelhoefer G., «Moessbauer mineralogy of rock, soil, and dust at Gusev crater, Mars: Spirit's journey through weakly altered olivine basalt on the plains and pervasively altered basalt in the Columbia Hills», (2006), *JGR, 111*, [3]. Morris R. V., Klingelhoefer G. et al., «Moessbauer mineralogy of rock, soil, and dust at Meridiani Planum, Mars: Opportunity's journey across sulfate-rich outcrop, basaltic sand and dust, and hematite lag deposits», (2006), *JGR, 111.*