# Performance of the XRS instrument onboard the MUSES-C and its observation plan.

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The MUSES-C, a new technology demonstration mission for asteroid sample-return, is planned to be launched in May, 2003, to near-earth asteroid 1998SF36. We present the characteristics and performances of the X-ray fluorescence spectrometer, XRS, onboard the MUSES-C, including the results of pre-flight tests, its status after launch, and the future observation plan. We will also estimate the anticipated results and limitations for the XRS observation, based on the ground performance tests, laboratory experiments of the XRF on the rough surface, and many constraints of observation sequences.

The XRS will determine the major elemental composition of the asteroid surface through remote X-ray fluorescence spectroscopy. This method has been proven during the Apollo 15 and 16 missions, and the NEAR-Shoemaker, and will be carried out in the SELENE and SMART-1 missions to the Moon and Bepi Colombo mission to Mercury. Although it should be designed with compacted size and reduced mass budget, the XRS instrument shows good performance by using an array of X-ray CCDs with good energy resolution when it is sufficiently kept cool and by installation of the SH-3 based onboard computer.

During the rendezvous, or encounter, phase with the asteroid, the position of the MUSES-C will be controlled within the Home Position, several kilometers sunward relative to the asteroid, and stabilized its attitude with the scientific instruments pointed to the asteroid. Those instruments are allowed to perform continuous observation of asteroid. The XRS will also perform continuous observation of fluorescent X-rays from asteroid excited by solar X-rays. The XRS concurrently observes X-rays from a onboard standard sample that are mounted at the sunlit position of the spacecraft, which allows the XRS to achieve quantitative elemental analysis. The coverage of the whole surface and the longitudinal variation of composition will be investigated by asteroid rotation of 12 Hr period. Those data will assist us to understand what the asteroid is made of.

The XRS observation will be planned even during the cruising phase to asteroid and back to the Earth when the Ion Propulsion System is turned off. The XRS will observe X-rays from cosmic backgrounds 10 thousand seconds every week as the nominal observation sequence. The fields of view of 3.5 degree, just-in size of viewing the asteroid from the home-position will cover half of the track along the MUSES-C trajectory. The XRS will point some X-ray emitting bodies for their observation by attitude control of the spacecraft. These data will be also utilized for in-flight calibration of the XRS instrument.