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Final Report Draft “Asteroid Redirect Mission (ARM) Formulation Assessment and Support Team (FAST) “

The Report presents the following combination of approaches to remote sensing measurements prior to boulder selection and in-situ measurement prior to collection would identify the mineralogy of the boulder for physical properties characterization (page 35):

- Multi-wavelength Spectroscopy (e.g., ultra-violet (UV), visible, near-infrared, thermal etc.);
- Alpha particle X-ray spectrometry (APXS) and/or laser-induced breakdown spectroscopy (LiBS) for elemental abundances;
- Neutron and Gamma-ray spectroscopy for volatiles and elemental abundances;
- Mössbauer spectroscopy for Fe mineralogy;
- X-Ray diffraction (XRD) for general mineralogy.

We do not find any mention of ultrasonics applications for physical properties characterization. So, we would like to offer ultrasonic method to be added the list. Ultrasound has been well studied, and ultrasonic methods have been used for rock characterization for a long time. Ultrasonic measurements proved to have excellent correlation with lab and in-situ testing by other methods. The latest advances in ultrasonic transducer designs based on new materials, such as single crystals, can be a foundation for development of an ultrasonic instrument that can be send to the boulder for in-situ measurements for physical properties characterization and analysis.

We have attached our proposal “Boulder (Asteroids) Physical Properties Evaluation using DPC Ultrasonic Transducers Based on Single Crystals” which combines new dry point contact (DPC) ultrasonic transducer design with single crystal materials and will eliminate the need for using a ultrasonic couplant in space.

Sincerely yours,

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