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Astrometric observations of Phobos and Deimos during solar transits imaged by the Curiosity Mastcam

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Precise observations of the positions of the Martian moons can be used to refine knowledge of their orbits, allowing measurement of the rate at which their orbits evolve. Three transit events were targeted with the MSL Mastcam: sol (Martian day) 37 and 42 for Phobos, and 42 for Deimos. Observations were designed to take a large number of video frames with each camera. Observations were processed to determine the relative position of the satellite and the Sun through the transit. Comparison of the observations to the JPL Horizons ephemeris predictions results in Phobos arriving at the predicted time to within measurement precision, and Deimos arriving 3.0 sec early. Phobos was 3.3 km north of its predicted track, while Deimos was 1.7 km north. Uncertainties and possible systematic errors will be further refined and discussed.