



Measurement requirements for a near-Earth asteroid impact mitigation demonstration mission

Stephen D. Wolters, Andrew J. Ball, Nigel Wells, Christopher Saunders, Neil McBride

(Submitted on 21 Jul 2011)

A concept for an Impact Mitigation Preparation Mission, called Don Quijote, is to send two spacecraft to a Near-Earth Asteroid (NEA): an Orbiter and an Impactor. The Impactor collides with the asteroid while the Orbiter measures the resulting change in the asteroid's orbit, by means of a Radio Science Experiment (RSE) carried out before and after impact. Three parallel Phase A studies on Don Quijote were carried out for the European Space Agency: the research presented here reflects outcomes of the study by QinetiQ. We discuss the mission objectives with regards to the prioritisation of payload instruments, with emphasis on the interpretation of the impact. The Radio Science Experiment is described and it is examined how solar radiation pressure may increase the uncertainty in measuring the orbit of the target asteroid. It is determined that to measure the change in orbit accurately a thermal IR spectrometer is mandatory, to measure the Yarkovsky effect. The advantages of having a laser altimeter are discussed. The advantages of a dedicated wide-angle impact camera are discussed and the field-of-view is initially sized through a simple model of the impact.

Comments: 28 pages

Subjects: **Earth and Planetary Astrophysics (astro-ph.EP)**; Space Physics (physics.space-ph)

DOI: [10.1016/j.pss.2011.06.015](https://doi.org/10.1016/j.pss.2011.06.015)

Cite as: [arXiv:1107.4229v1](https://arxiv.org/abs/1107.4229v1) [astro-ph.EP]

Submission history

From: Stephen Wolters Dr [[view email](#)]

[v1] Thu, 21 Jul 2011 10:36:46 GMT (984kb)

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