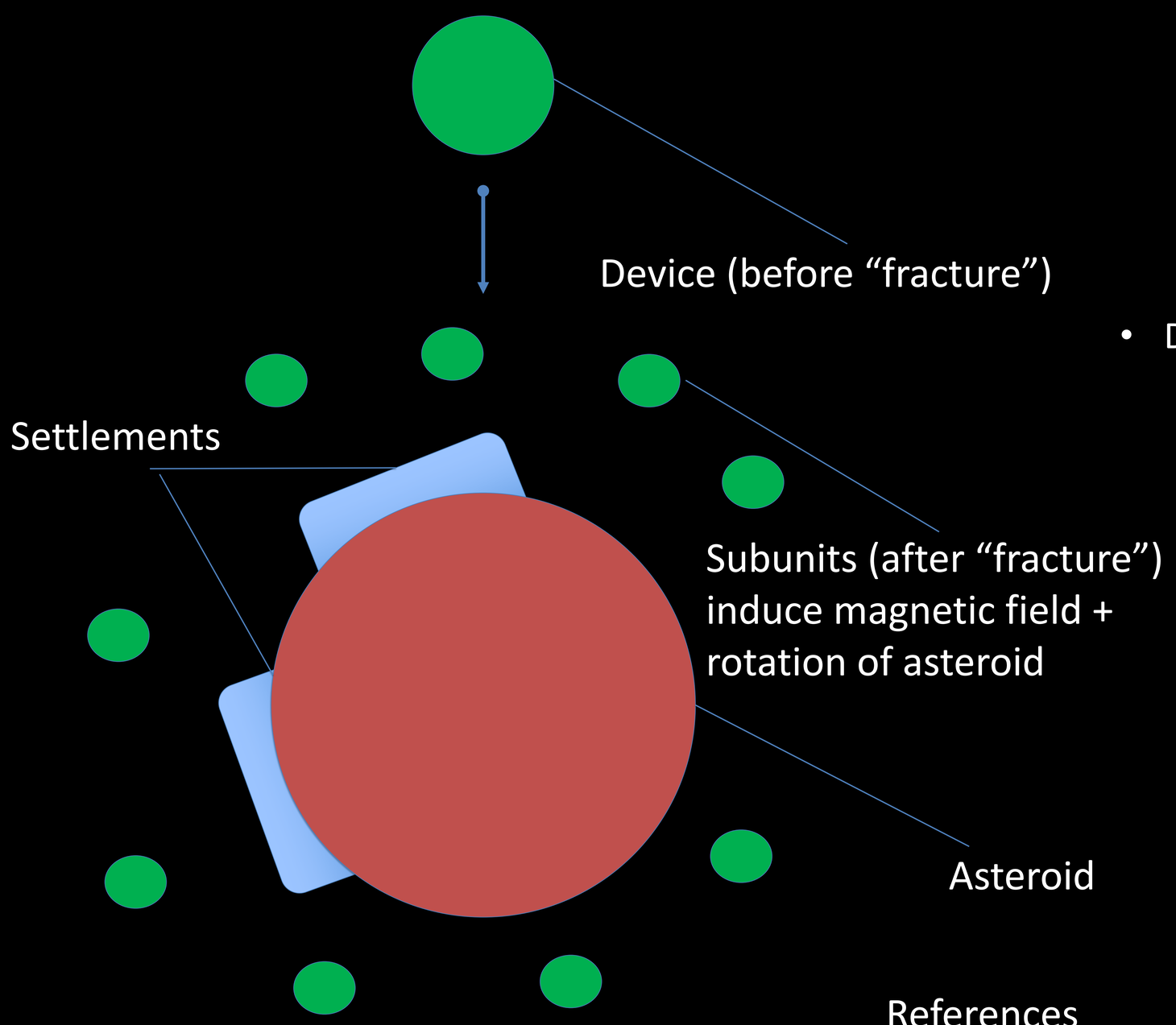
A Model for the Simulation of Artificial Gravity in Settlements on Metallic Low-Gravity Celestial Objects

Archit Kalra
Carmel High School, Carmel, IN
archit.mc2@gmail.com

Current artificial gravity models

- Amplify centrifugal force on *settlement* (i.e., by rotating the container)
    - Therefore, model is localized to settlement
- For settlements on a (reasonably massive) space object, artificial gravity has no impact on object itself

- Issue: on objects with a large settlement or very many small settlements, synchronization with a ”universal” artificial gravity system may be more efficient



Proposed artificial gravity model

- Amplify centrifugal force on entire space object (i.e., by using a magnetic field to induce rotation)

- Send one compact and highly dense device to object and take advantage of Roche limit to allow it to break apart into smaller subunits
    - Create lines of weakness within object to make it easier for it to break along desired lines
    - To drastically increase density, use quark-gluon plasmas (QGPs) to allow Roche limit to exist and be large enough such that device can break apart
    - Each subunit is an electromagnet; combining the effects of each individual magnetic field can lead to production of an effect powerful enough to rotate the object at a desired speed
- Discretions:
    - Although some matter may dislodge and fly into space, it will be easier to collect samples for study
    - QGP is quite difficult to produce and even harder to store. A superheated ion trap that may be able to keep it stable for a long amount of time could be used to alleviate this. Additionally, the QGP could be used to transfer some energy and power the electromagnets themselves, though I do not have a detailed plan for how this may be possible yet.

References

Chen, B.; Chitturi, G.; Kalra, A.; Sriram, R. The Trojan Initiative: A Proposal for a Research Settlement on 2011 HM102 and a Framework for Future Settlement on Asteroids. Preprints 2021, 2021040215 (doi: 10.20944/preprints202104.0215.v1).