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Interactive comment on "Highly Stable Magic Angle Spinning Spherical Rotors Lacking Turbine Grooves" *by* Thomas M. Osborn Popp et al.

Robert Tycko (Editor)

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This manuscript is potentially suitable for publication in Magnetic Resonance after the authors make revisions that fully address the comments of the two anonymous reviewers as well as the following points:

1. The "tennis racquet theorem" says that any object in free space will rotate stably about axes close to its smallest and largest principal axes of inertia, but not stably around the middle axis of inertia. This is also mentioned by one of the anonymous reviewers. The authors should explain how this relates to their statement that "an object is capable of spinning stably about ANY axis ... as long as there are no avenues to dissipate rotational energy." The authors' statement seems erroneous, except perhaps

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because they are discussing situations where the object is not in free space. Their later statement that "a high aspect ratio cylindrical MAS rotor requires active stabilization...in order to spin stably about its axis of symmetry" also appears to contradict the tennis racquet theorem.

2. The examples of satellites and asteroids may not be relevant to an MAS rotor. I suspect the behavior of satellites and asteroids may be affected by INTERNAL dissipation (movement of internal material), which is not an issue for an MAS rotor. This may need clarification.

3. A potential problem with spherical rotors may be that the magic angle needs to be readjusted for each sample, in other words the final direction of the axis of rotation may depend on the mass distribution within the rotor or on imperfections in the rotor itself. Is this true? The authors should comment on this issue, one way or the other.

4. The description that "the nozzle aperture is placed at the complement of the magic angle in order to tilt the spinning axis of the rotor to a value near the magic angle" needs further clarification. A more detailed drawing of the stator in Figure 1 might help.

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