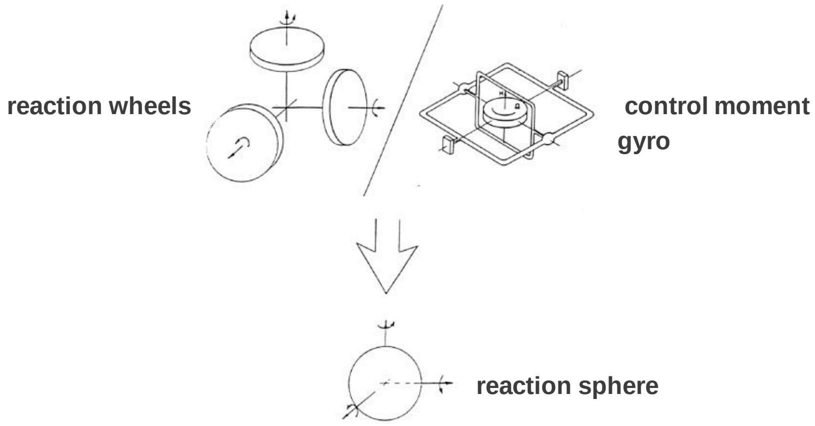

Figure 1: Reaction Sphere concept

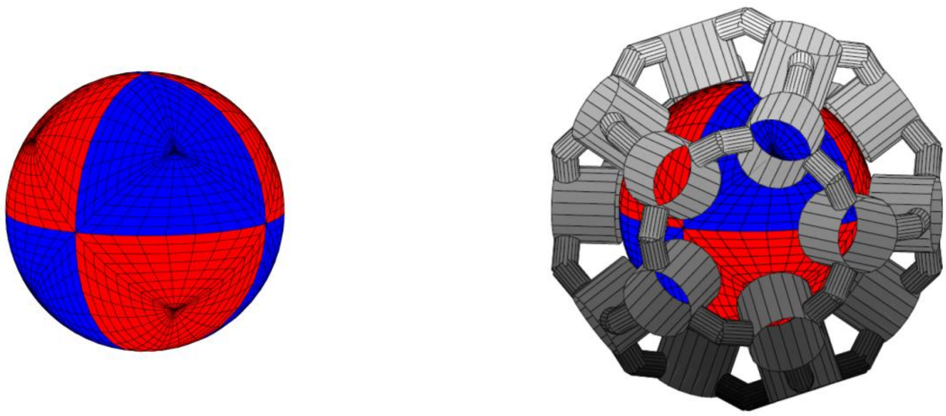

Figure 2: Schematic representation of 8-pole rotor (left) and a 20 pole stator (right)

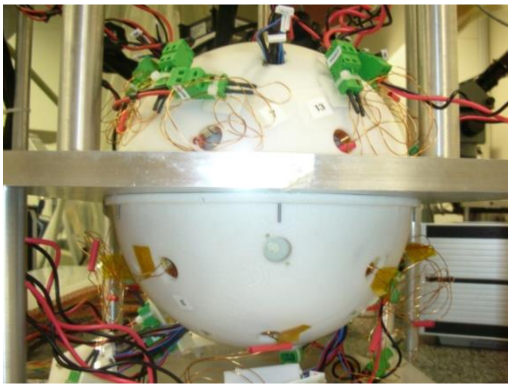

Figure 3: Laboratory prototype of a Reaction Sphere realized with a plastic stator (diameter 20 cm).

Mission	Advantages	Disadvantages
Telecom	Largest market Not demanding the highest requirements	High entry barrier Lifetime Well-proven technologies Momentum bias as a control option
EO	Second largest market	Very high requirements Agility Low microvibration
Science	Specific applications with adaptation of the requirements to the mission needs.	Extremely high performance
Navigation	Medium AOCS performance Governmental missions	Captive market. Development program for achieving a winning position
SAT-AIS	Small satellites "Simple" AOCS In development	Development times

Figure 4: Mission trade-off

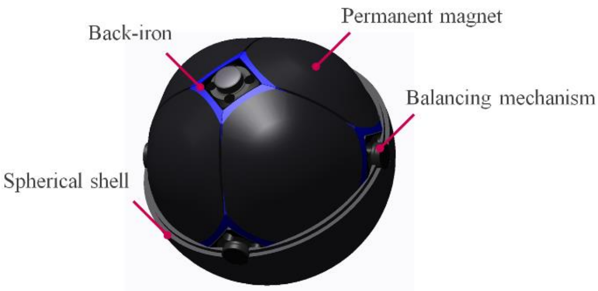

Figure 5. Computer view of the developed spherical rotor. The top part of the rotor is shown without covering shell for illustrative purposes.

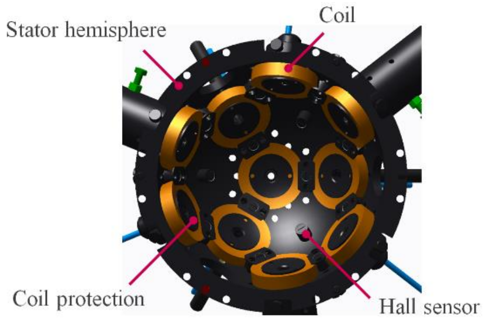

Figure 6. Computer view of the bottom stator.

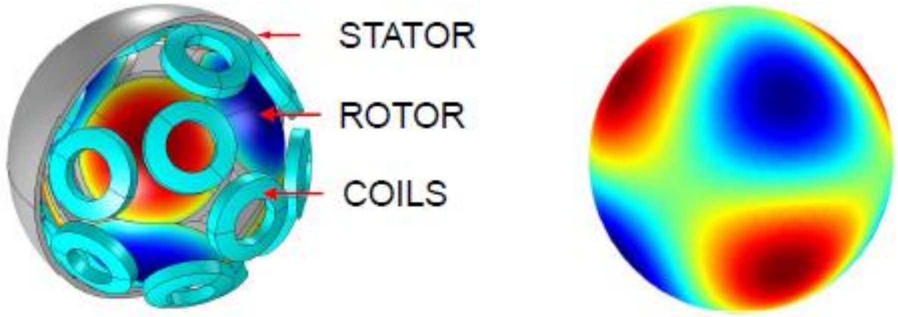

Figure 7: Reaction sphere actuator: on left schematic representation, on right magnetization pattern of the rotor

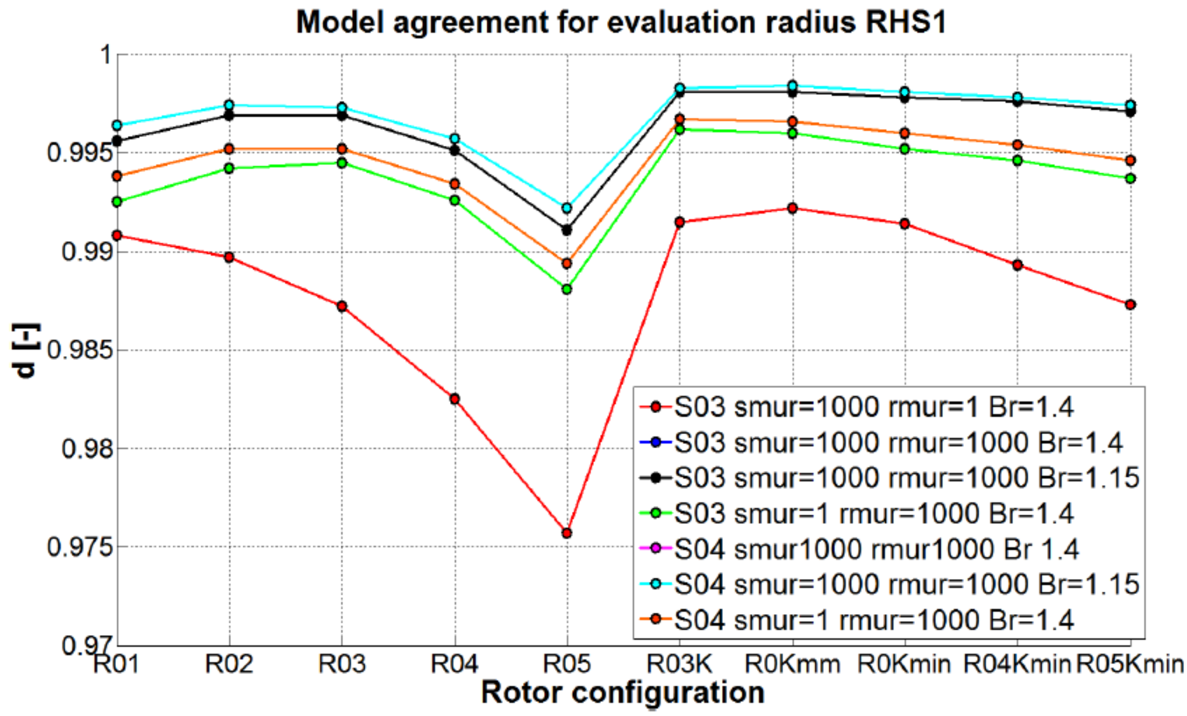

Figure 8: Rotor optimization, evolution of the d parameter

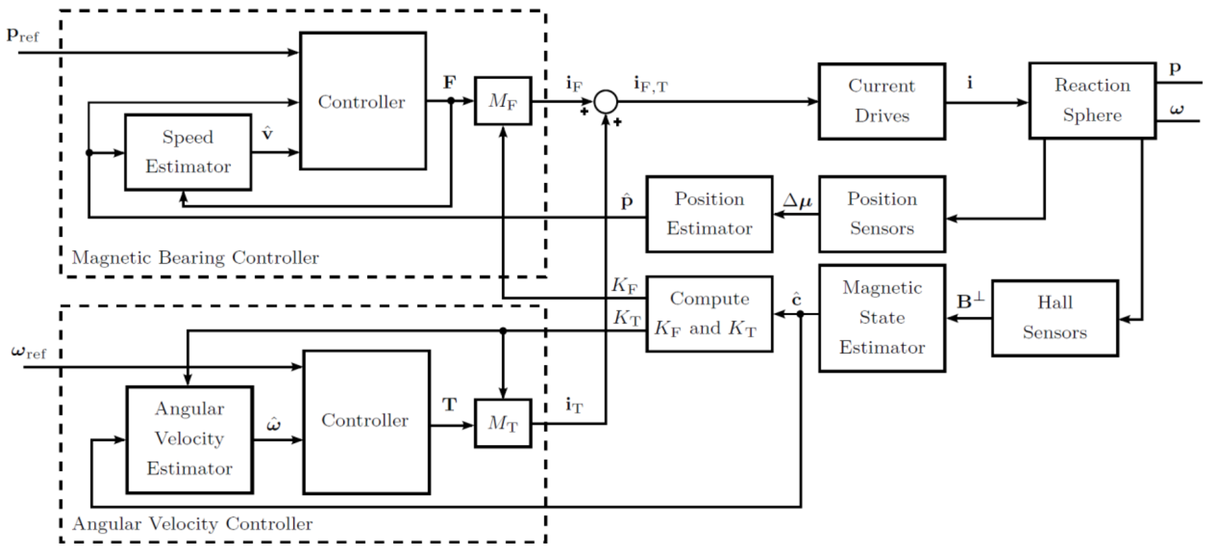

Figure 9: Control algorithm architecture

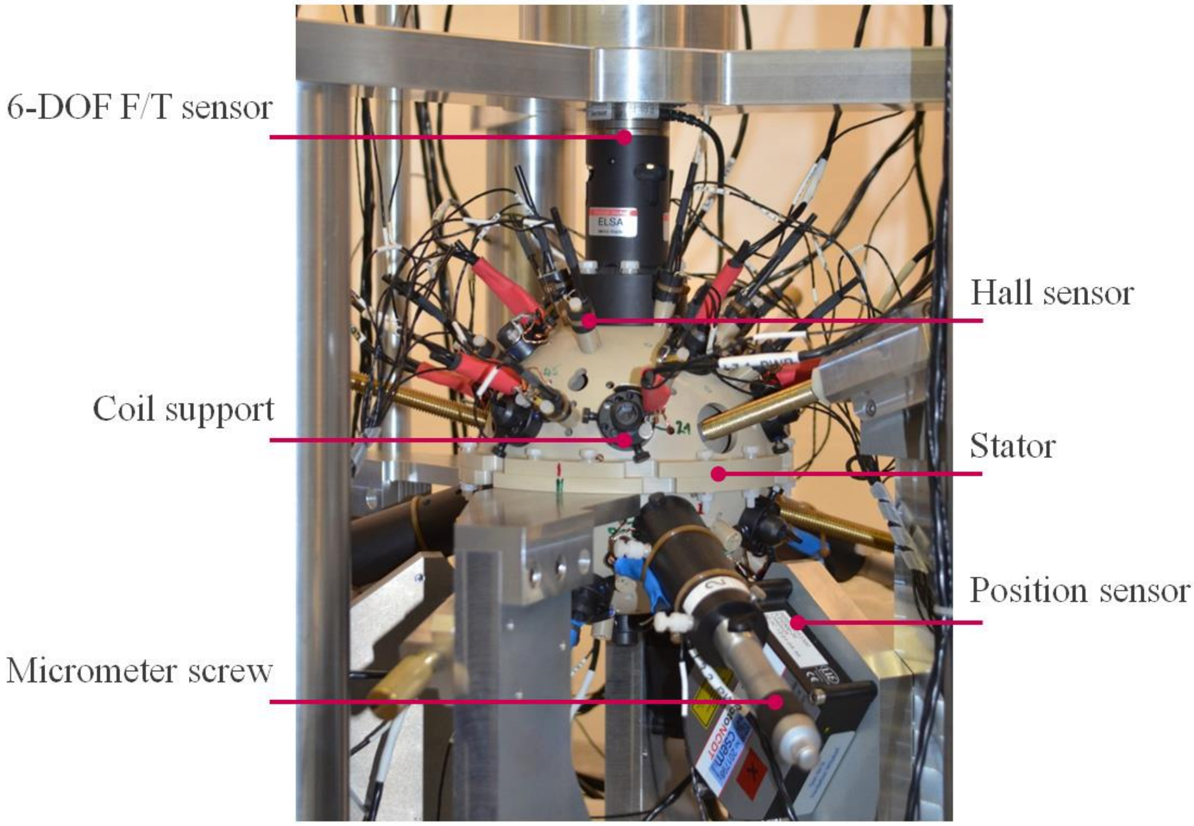

Figure 10: Test bench

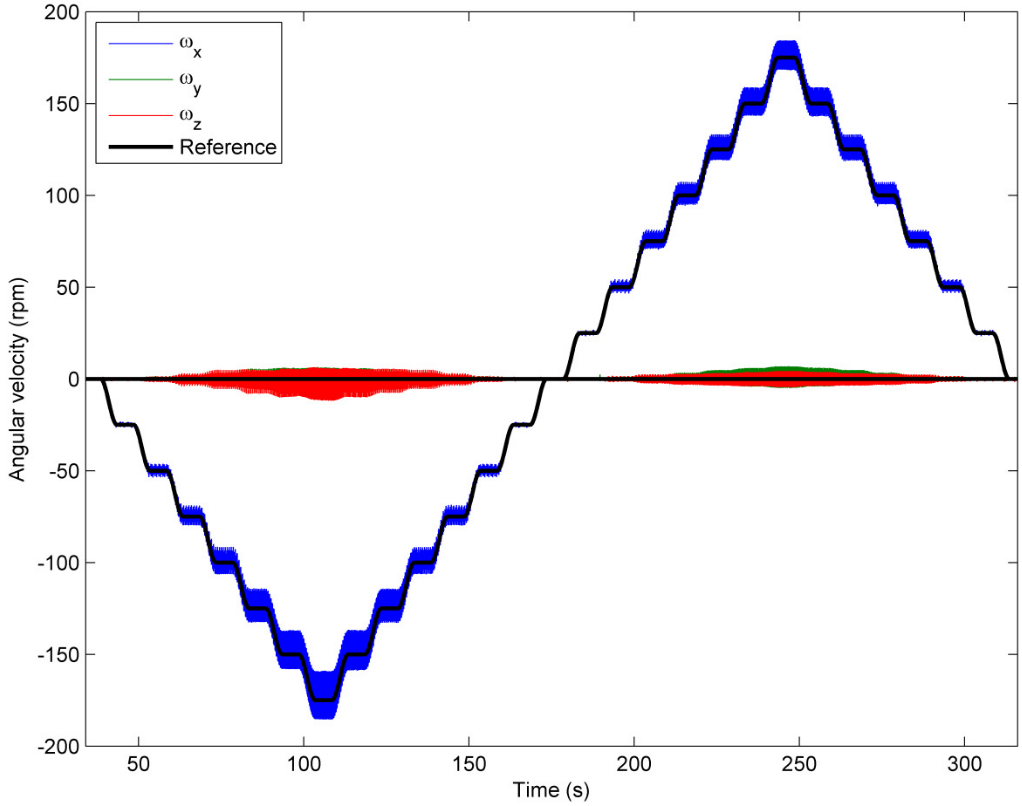

Figure 11: Measured velocity profile

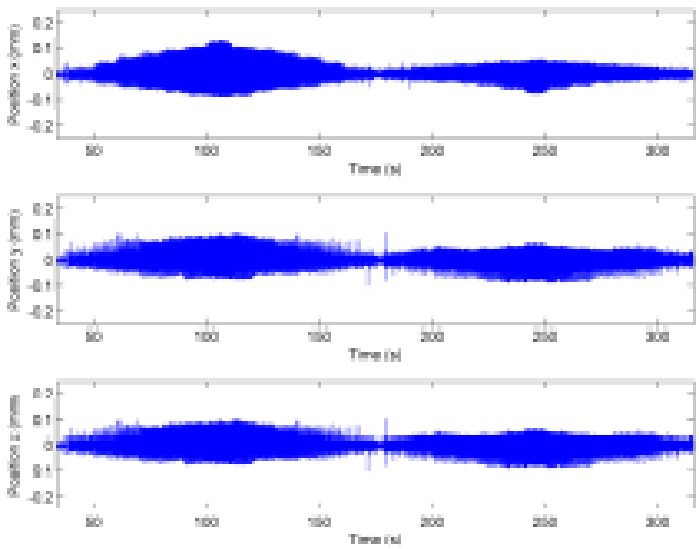

Figure 12: rotor position

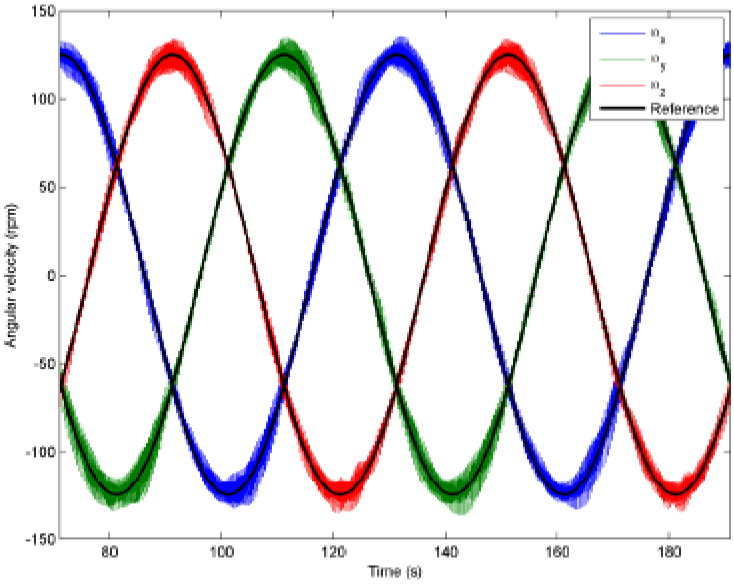

Figure 13: Rotation axis evolution