Satellite mass and design

Our satellite has a similar design as another project, the SMART-OLEV project. The SMART-OLEV designed a satellite as an orbital life extension vehicle for commercial spacecraft without propellant to manoeuvre themselves in the GEO. So, it is similar to our mission since both imply manoeuver between several objects and need a docking mechanism.

These two satellites have a similar docking mechanism and a similar electrical thruster as we shall describe later. The SMART-OLEV satellite uses 6 PPS-1350-G thruster which have a total mass of 32 kg and a total power of 9 kW. Our satellite shall use a BHT-8000 thruster which has a mass of 25 kg and a power of 8 kW. Thus, the same kind of solar panel is going to be able to provide enough energy for our satellite. So, both of the propulsion systems have a similar total mass.

Propellant used on SMART-OLEV according to our source is 350 kg xenon and our satellite is using 300 kg xenon according to our calculation presented later. So, our satellite is a little lighter on the mass of the propellant.

Since the SMART-OLEV satellite is on the GEO where is almost always be able to get solar energy, we assume that the SMART-OLEV satellite does not require a huge battery. But our satellite can be block by the Earth from the Sun. So, we need a battery. The longest time our satellite is going to be without power input is half the orbiting period. The longest orbiting period is at the highest altitude. With the Kepler’s third law we can find that the battery needs to hold for 30 minutes. After comparison, we find the battery with the minimum mass and satisfies these energy and power requirement is the NMC battery and it shall have a total mass of 20 kg.

The SMART-OLEV satellite has a mass of 1 ton and our satellite shall be around 1 ton as well since the mass differences are unremarkable compare to 1 ton. And thus both satellite shall have similar dimension.