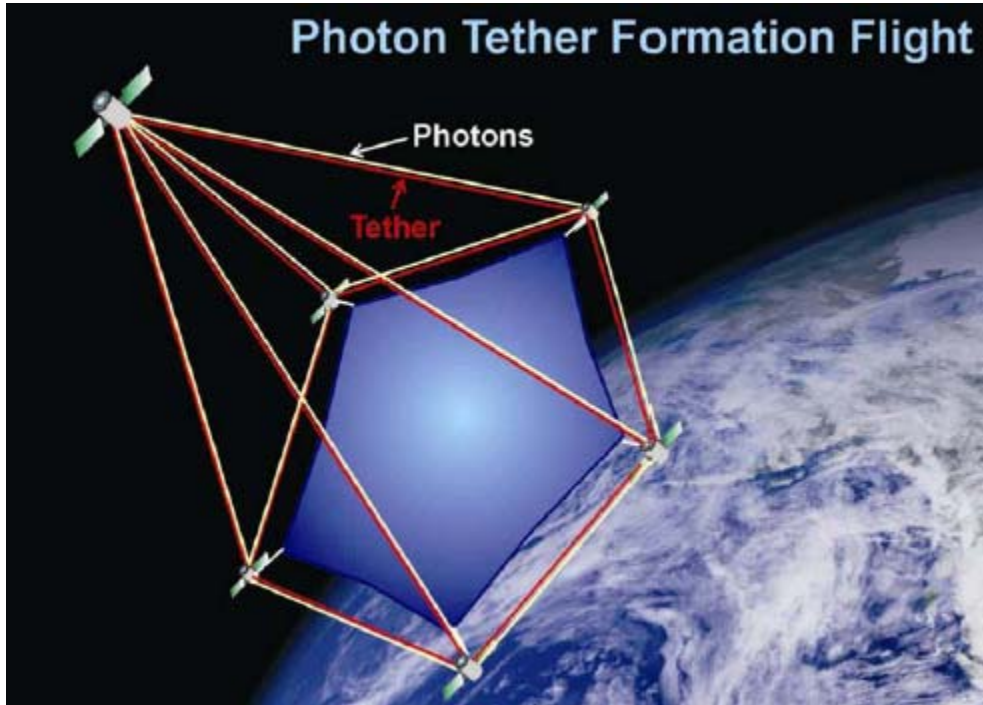


A Contamination-Free Ultrahigh Precision Formation Flight Method Based on Intracavity Photon Thrusters and Tethers: *Photon Tether Formation Flight*

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We proposed a revolutionary nano-meter accuracy formation flight method with photon thrusters and tethers, **Photon Tether Formation Flight (PTFF)**, with the maximum baseline distance over 10 km for next generation NASA space missions. PTFF is inflated by trapped photons between spacecraft mirrors, and stabilized by tethers, thus it is contamination-free and highly power efficient, and provides ample mass savings. In addition, PTFF is predicted to be able to provide an unprecedented angular scanning accuracy of 0.1 micro-arcsec, and the retargeting slewing accuracy better than 1 micro-arcsec for a 1 km baseline formation. These quantum-leaping capabilities of PTFF are predicted to enable emerging revolutionary mission concepts, such as New World Imager Freeway Mission proposed by Prof. Cash, which searches for advanced civilization in exoplanets and Fourier Transform X-Ray Spectrometer proposed by Dr. Schnopper, in addition to redefining and simplifying the existing NASA mission concepts, such as SPECS and MAXIM. As the present concept is more publicized, many other exciting concepts are predicted to follow.

One of such possible NASA missions would be the construction of ultralarge adaptive membrane space telescope with diameters up to several km for observing and monitoring space and earth-bound activities. The conclusion of our Phase I study is that the implementation of the proposed method in the foreseeable future is well within reach of the present technologies. Therefore, we are confident that the proposed PTFF needs thorough continued study that will establish a reliable technical path to the launch of an exciting new class of NASA space mission. During this NIAC Phase II, we plan to build and demonstrate a prototype PTFF engine, address the engineering issues of key problems, and continue its full development for adapting PTFF for a wide range of NASA space missions in the near future with the help of several expert consultants.