This subtopic seeks hardware and software technologies necessary to establish, maintain and operate hyper-
precision spacecraft constellations to a level that enables separated spacecraft optical interferometry. Also sought
are technologies for analysis, modeling, and visualization of such constellations.

In a constellation for large effective telescope apertures, multiple, collaborative spacecraft in a precision formation
collectively form a variable-baseline interferometer. These formations require the capability for autonomous
precision alignment and synchronized maneuvers, reconfigurations, and collision avoidance. It is important that, in
order to enable precision spacecraft formation keeping from coarse requirements (relative position control of any
two spacecraft to less than 1 cm, and relative bearing of 1 arcmin over target range of separations from a few
meters to tens of kilometers) to fine requirements (micron relative position control and relative bearing control of 0.1
arcsec), the interferometer payload would still need to provide at least 1Â·150;3 orders of magnitude
improvement on top of the S/C control requirements. The spacecraft also require onboard capability for optimal
path planning, and time optimal maneuver design and execution.

Innovations that address the above precision requirements are solicited for distributed constellation systems in the
following areas:

- Integrated optical/formation/control simulation tools;
- Distributed, multitiming, high fidelity simulations;
- Formation modeling techniques;
- Precision guidance and control architectures and design methodologies;
- Centralized and decentralized formation estimation;
- Distributed sensor fusion;
- RF and optical precision metrology systems;
- Formation sensors;
- Precision microthrusters/actuators;
- Autonomous reconfigurable formation techniques;
- Optimal, synchronized, maneuver design methodologies;
- Collision avoidance mechanisms;
- Formation management and station keeping; and
- Six degrees of freedom precision formation testbeds.