

Design of the Alpha CubeSat:

Technology Demonstration of a ChipSat-Equipped Retroreflective Light Sail

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SSDS

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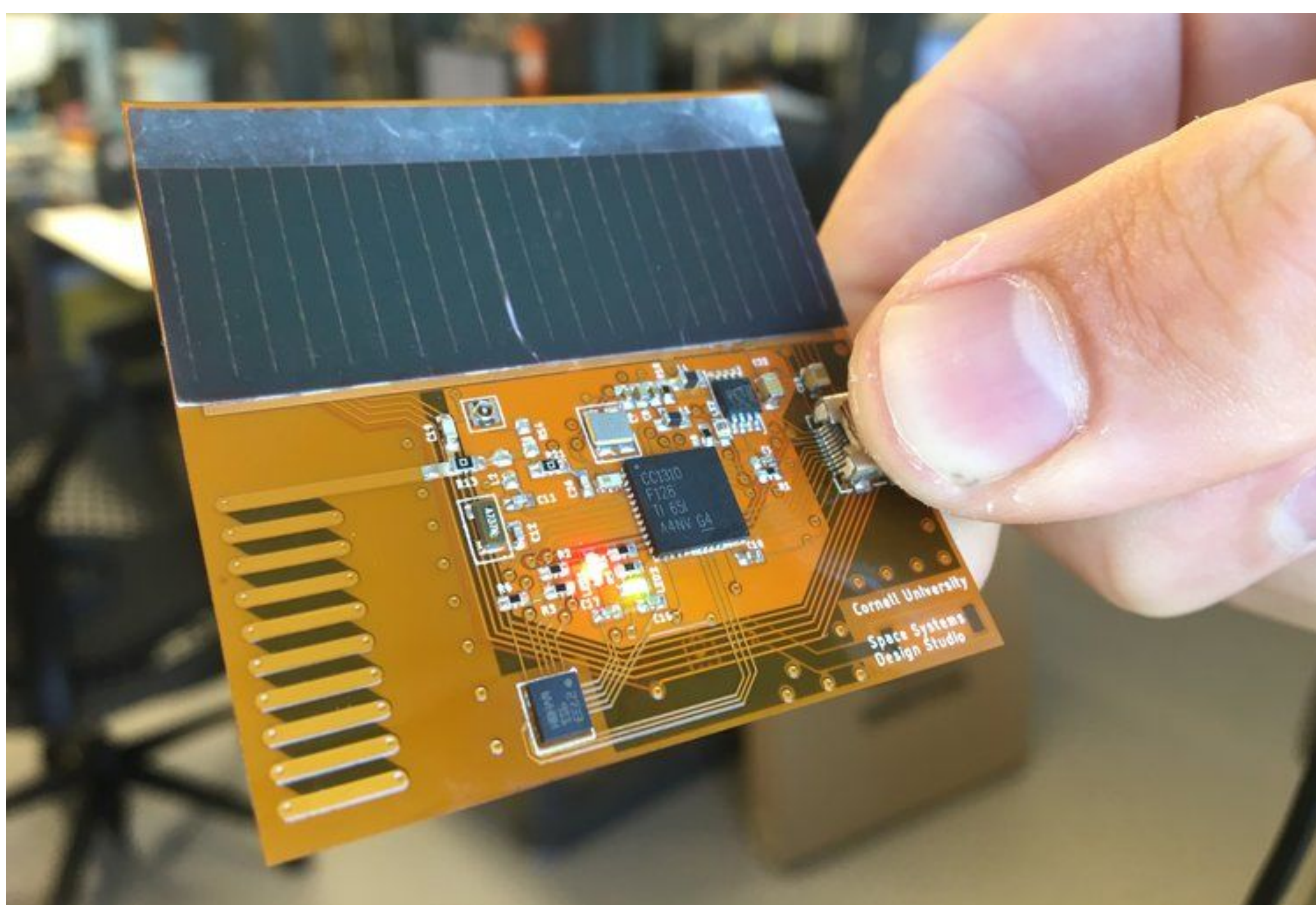
Alpha is a rapidly developed, low-cost CubeSat mission to verify the performance of a highly retroreflective material for light-sail propulsion.

A free-flyer

Alpha's light sail completely separates from the spacecraft that deploys it into orbit. It is the first sail to accomplish this, and is possible via:

- ChipSats (gram-scale spacecraft) as the sail's flight computers
- Shape-memory alloy frame establishes a near-instantaneous deployment via expansion from miura-fold origami storage configuration.
- Retroreflective material aligns the thrust vector with the direction of the light source

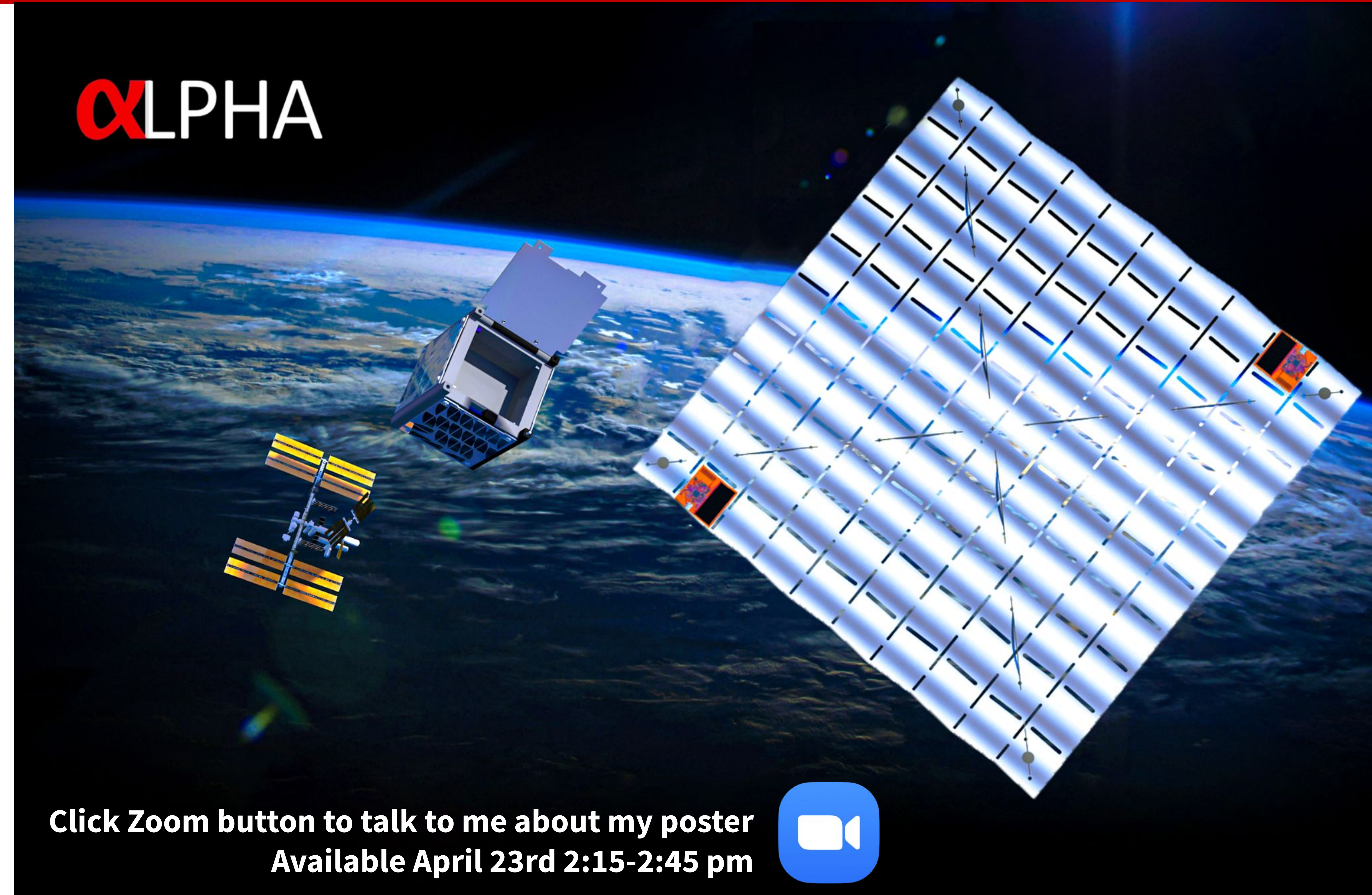
These innovations drive the sail's mass below 100g, enabling accelerations on par with the fastest light sails to date.



Next-generation Monarch ChioSat onboard the Alpha sail

Holographic message plaque

Alpha is among the first exhibitions of holography in space, a medium that shows longer-term promise as both a message plaque and a means of light-sail stabilization on the interstellar journey to Alpha Centauri



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Artistic representation of the Alpha mission

CubeSat Deployment Vehicle

The 1U Alpha CubeSat is a technology demonstration mission in its own right. With 0.5U dedicated to the sail compartment, and 0.5U for electronics, the vehicle features:

- A magnetorquer-only ACS that achieves nonlinear angular rate control
- An Iridium modem that provides global coverage via web Interface, bypassing the need for costly ground station equipment
- An entirely 3-D printed Structure to enable quick and inexpensive prototyping.
- Electrical subsystem is composed entirely from inexpensive commercial off-the-shelf (COTS) components.

