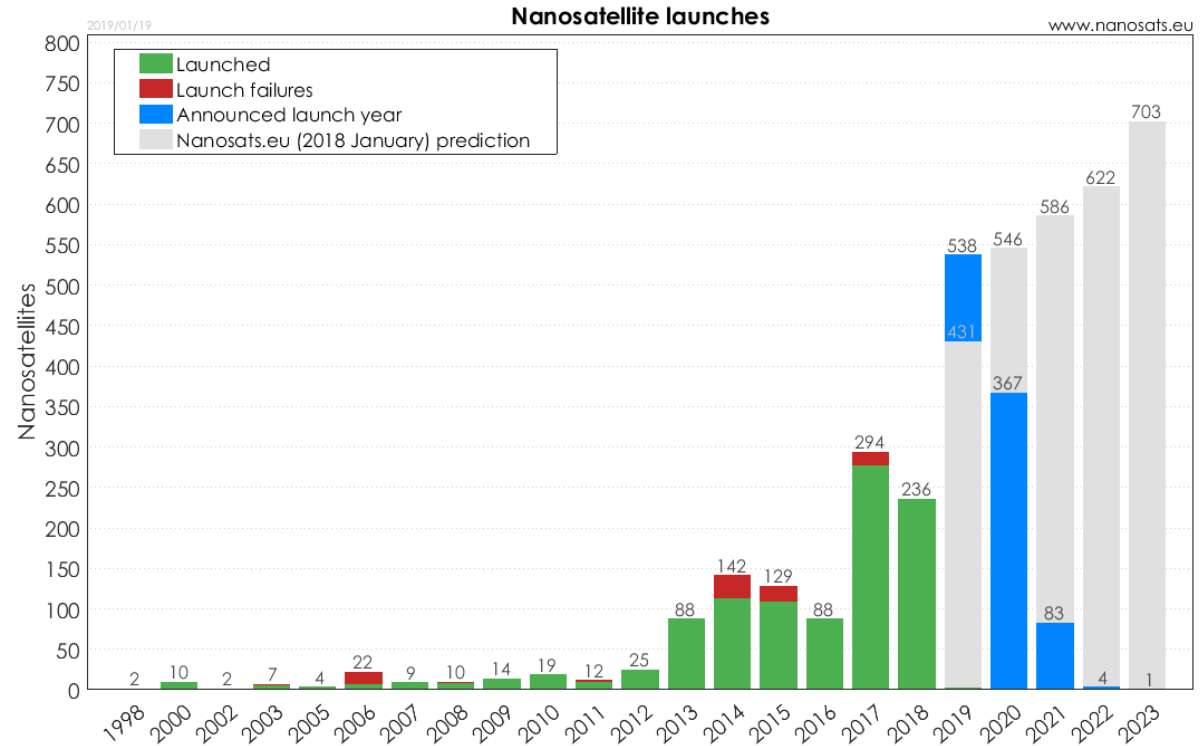


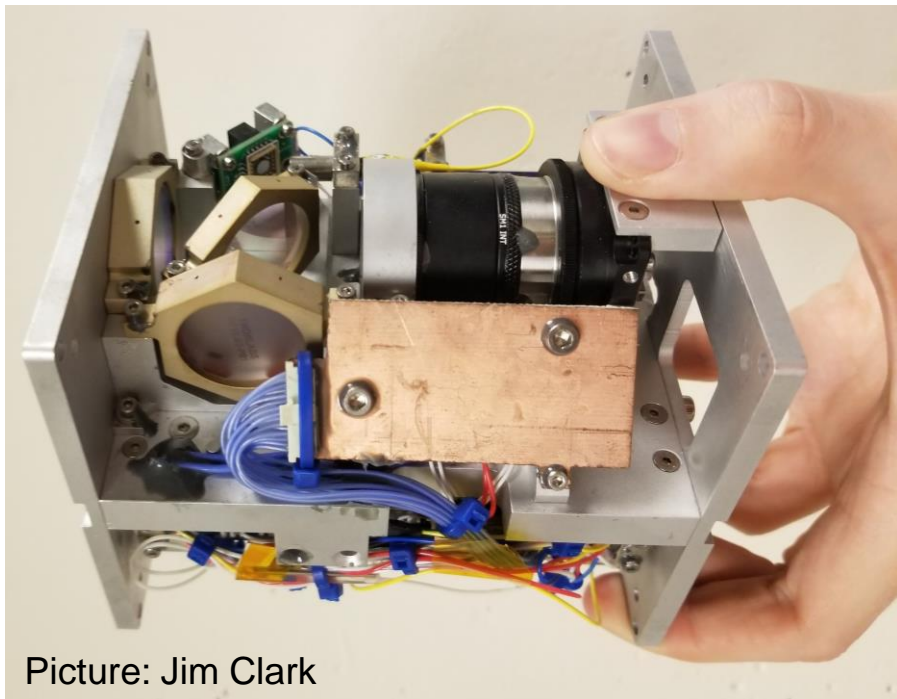
CHOMPPTT, a 3U CubeSat
~ 30 cm x 10 cm x 10 cm

- Can be inexpensive, free launch options available to universities
- Standardized components
- Limited electrical power and volume
- Unique communication challenges



Source: Erik Kulu

CLICK A



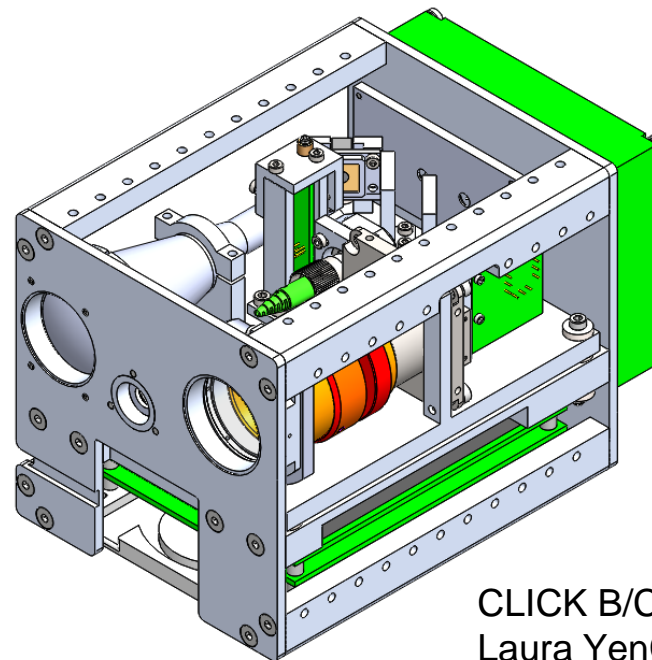
Picture: Jim Clark

- 20 Mbps downlink from LEO (500 km)

For both payload:

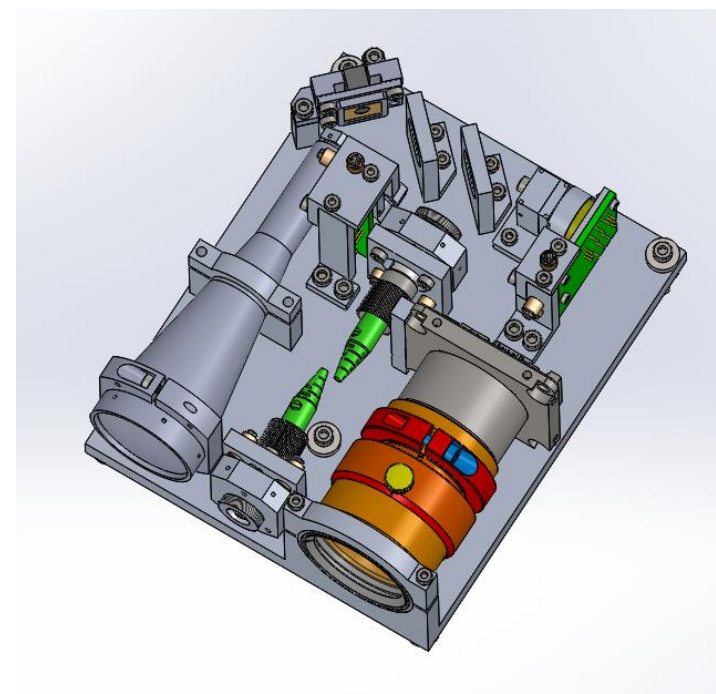
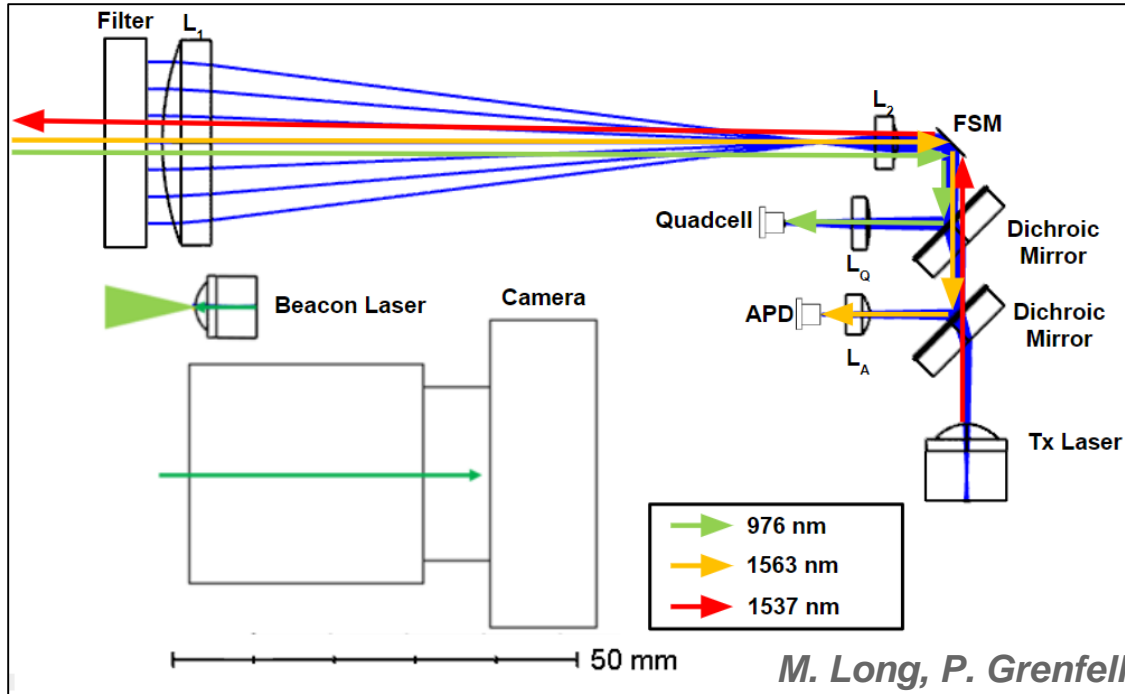
- Directly modulated seed laser and COTS 1550 nm EDFA
- Pulse-Position Modulation (Direct detection, High efficiency, Lower rates)
- Less than 1.5 CubeSat U (10 cm x 10 cm x 15 cm)

CLICK B/C

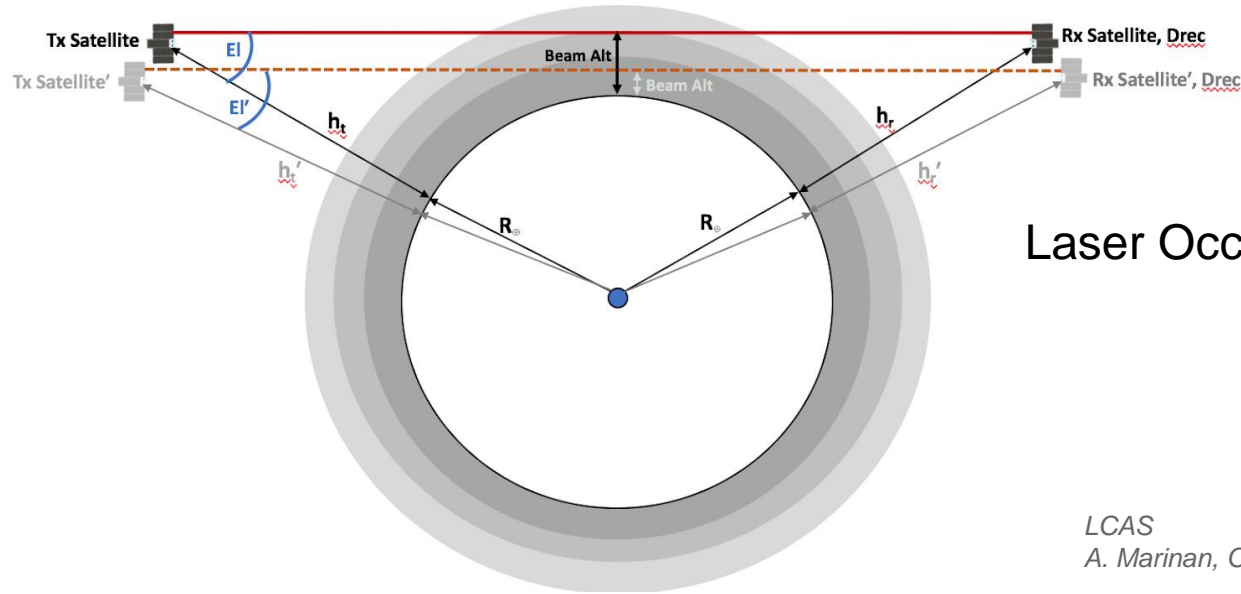


CLICK B/C CAD Model
Laura YenChesky

- 50 Mbps crosslink up to 855 km
- Downlink and uplink
- 3 cm ranging and 200 ps timing



- Pointing
 - For the same aperture, diffraction at 1550 nm is 100,000 time less than S-band
 - More than half of CLICK-B/C power is dedicated to pointing
- Volume and Miniaturization, with COTS components
 - Tight constraints on electronics
 - Optical isolation with a shared telescope
- Range
 - Crosslink form 10 to 855 km yield a dynamic range of up to 60dB power



Laser Occultation Geometry

LCAS
A. Marinan, C. Payne

- Great improvements in tradeoff between data rate, range, power and volume
 - LEO to GEO crosslinks, LEO constellation trunking, Deep-space
- Opportunities for new scientific applications and capabilities
 - Laser Occultation
 - Quantum Key Distribution
 - Time transfer with optical combs
- Improved ranging and timing
 - Precise Navigation in GPS denied environment, or beyond earth orbit
 - Signal triangulation, distributed measurements