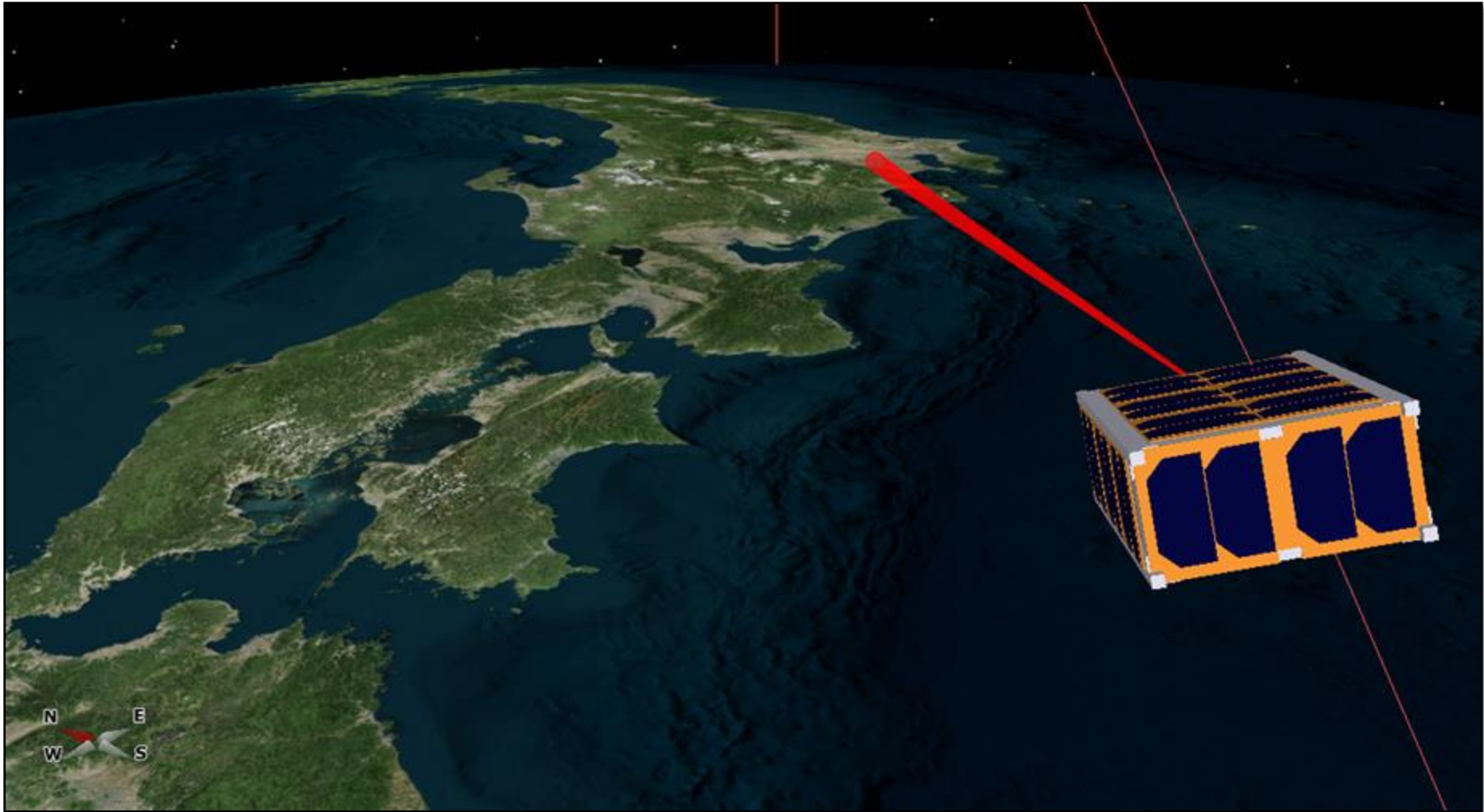


Group Discussion 1 - Space laser communications



7th UNISEC Global Meeting
3 December 2019



東京大学
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Letter to Santa Claus

- Let's find out what the CubeSat community would expect from lasercom compared to RF
- The ideal goal is to imagine a hypothetical commercial lasercom terminal that could fill an existing gap in current CubeSat components
- NICT is interested in demonstration missions that prove feasibility of potential commercial products, leveraging risk of private sector



Some discussion points

Main discussion:

- Increasingly amount of data to be transmitted to ground from CubeSats
- The current alternative for high-speed in CubeSats is x-band transmitters
- However, it has important drawbacks: jamming, regulation, limitation
- Lasercom could be another alternative for high-speed communications
- Intensity Modulation and Direct Detection (IM/DD) limit is around 1 Gbit/s
- Beyond that, OGS becomes complex (AO, EDFA, etc.), thus expensive
- With current IM/DD technology, >100 Mbit/s is achievable in a CubeSat
- This will probably be good enough for 90% of CubeSat (LEO-ground)
- We identified this application as the main target for commercialization

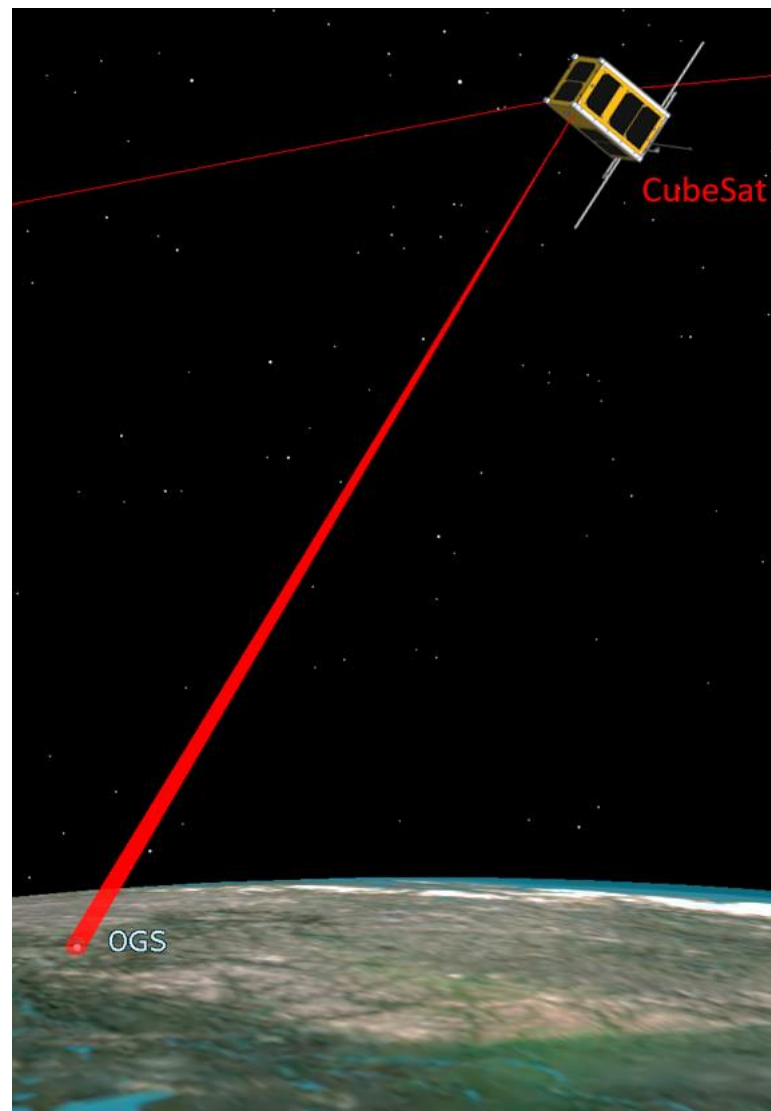
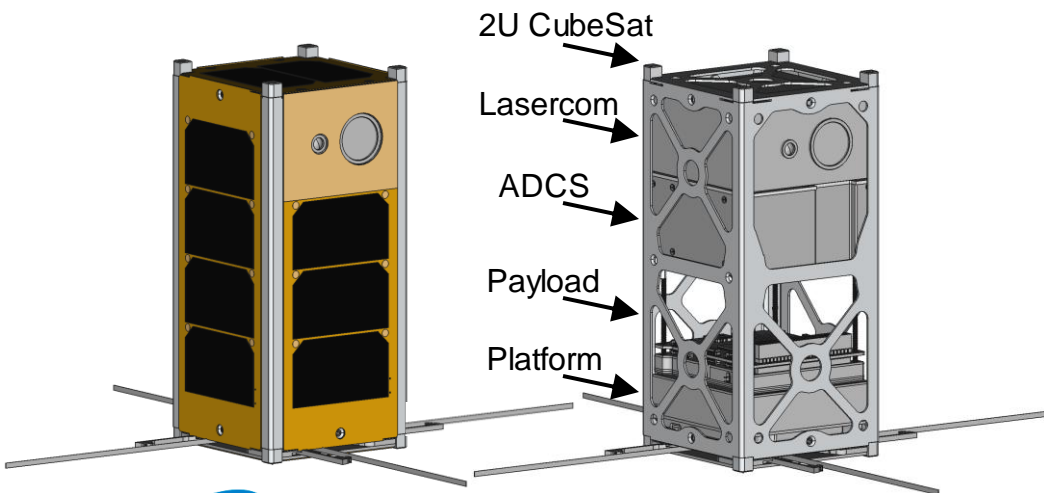
Others interesting points:

- Standardization is a key for OGS shared network for site diversity
- For >Gbit/s data rates (microsatellites?), lasercom is the only alternative
- Integrated photonics will be a breakthrough in a few years, but still early
- Lasercom will be a very efficient solution for deep space, but expensive

Lasercom possible commercial product

High-speed LEO to ground

- Data rate: 100-500 Mbit/s (IM/DD)
- Body-pointing based (accuracy < 1 mrad)
- Close loop with ground laser beacon
- 40-cm Optical Ground Station required
- Price \approx 20k€ (terminal) + 20k€ (OGS)
- $\sim 0.5U$ (for CubeSats bigger than 2U)
- Potential: miniaturization or higher speed



Thank you!



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