In-Lab Experimental Evaluation of 6G Intersatellite Communications

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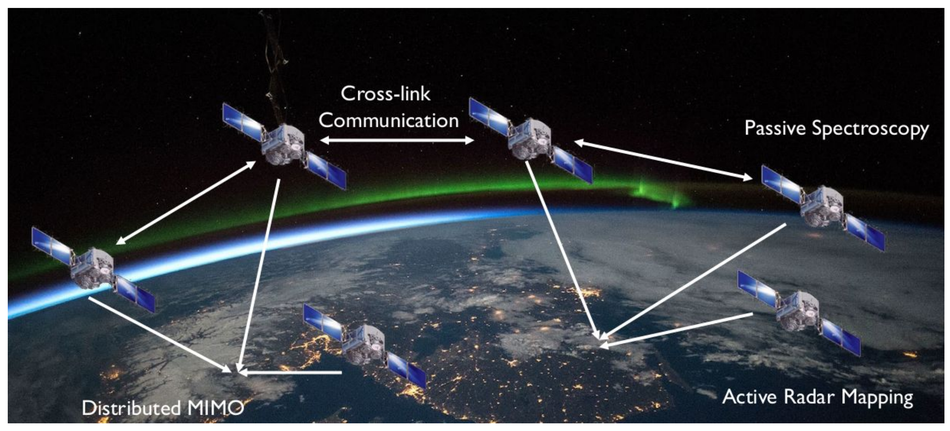
- 6G non-terrestrial networks will need to include inter-satellite communication links
- These links will have to provide very high band-width and co-exist with other services in space.
- Terahertz (THz) radio technology could be a potential solution for this use case as provides very large bandwidths and does not interfere with existing mm-wave or optical links.

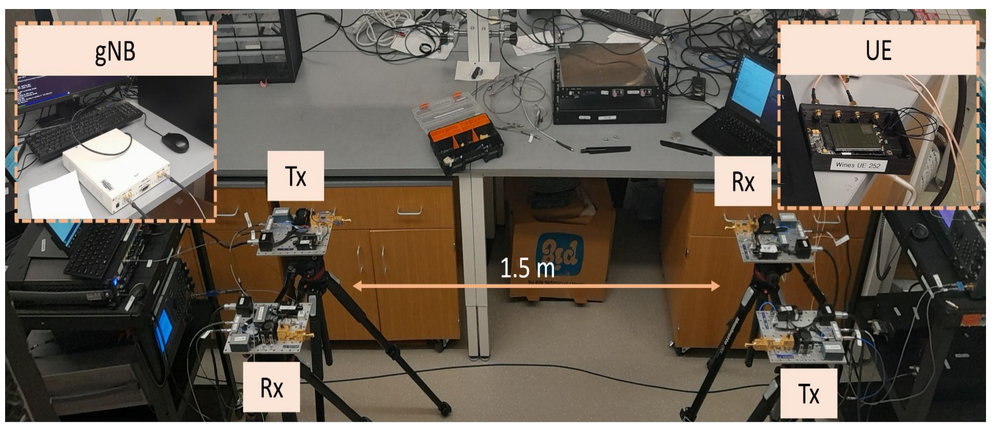


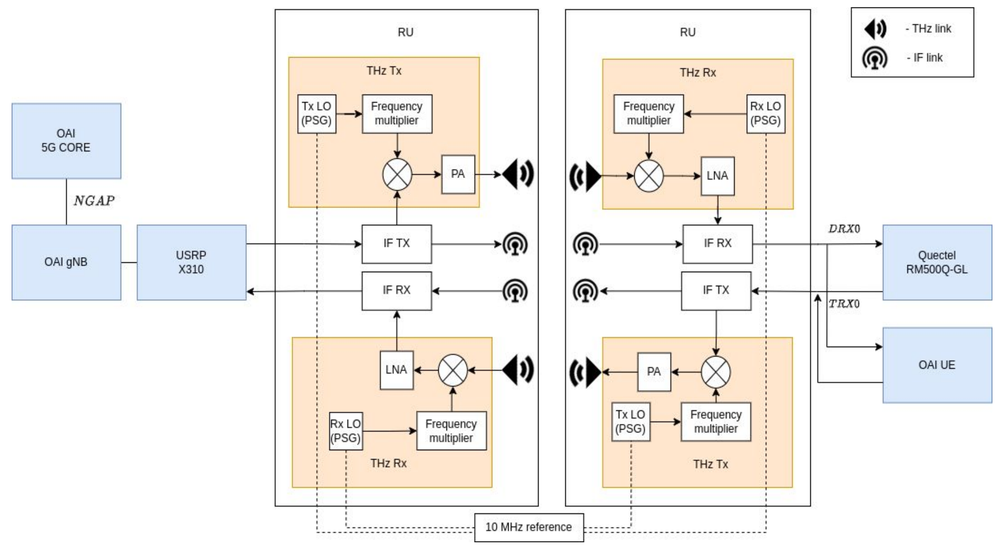
TeraNova laboratory

- RF front-ends with a frequency range from 0.095 THz – 1.05 THz.
- Directional antennas with gains ranging from 21 dBi to 55 dBi.
- Bandwidth 32GHz, IF frequency

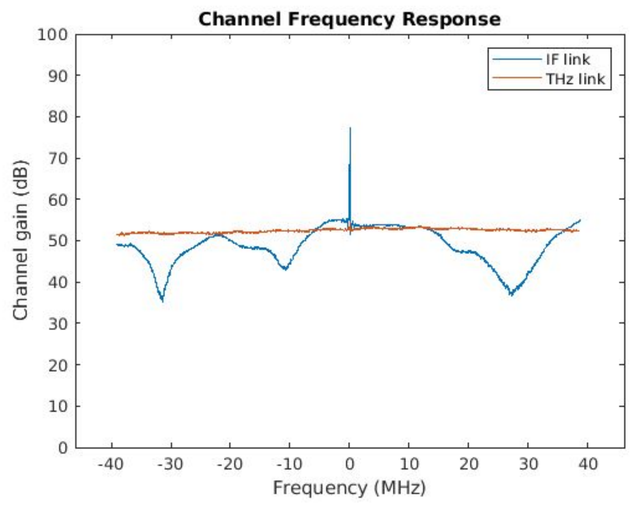
OPEN AIR INTERFACE

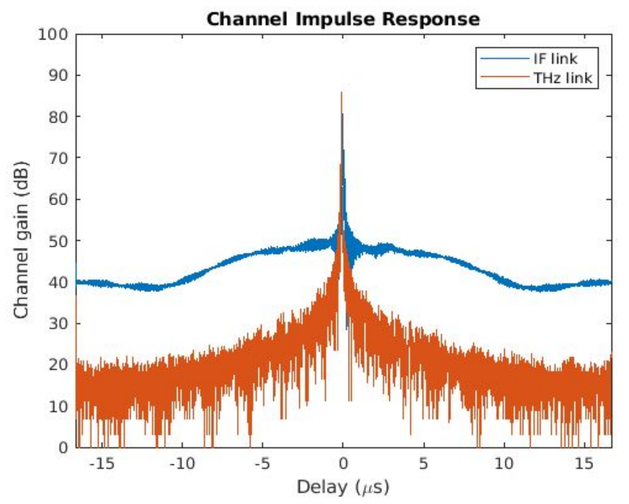
- OpenAirInterface software provides open-source implementation of 5G networks
- Compliant to 3GPP and O-RAN specifications
- Includes support for Rel. 17 NTN
- Works with USRPs as well as commercial O-RUs





Parameter	Value
Bandwidth	80 MHz
Subcarrier Spacing	30 kHz
Intermediate Frequency	3.39 GHz
LO Frequency	130 GHz
Center Frequency	133.39 GHz
Sampling Rate	92.16 Msps
TDD configuration	7 – 1 – 2



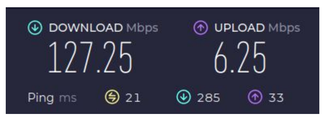


Conclusions

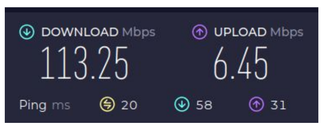
- First end-to-end open source real-time test-bed that operates at THz.
- Interoperable with a commercial User Equipment.

Limitations and future work:

- Increase bandwidth
- Mobility
- Inter-satellite THz communication testbed using cubesats (funded by NASA CubeSat Launch Initiative).



Speed test at IF



Speed test at THz

References

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2. Völk, Florian; Schlichter, Thomas; Kaltenberger, Florian; Heyn, Thomas; Casati , Guido; Schwarz , Robert T.; Knopp, Andreas, "Field trial of a 5G non-terrestrial network using OpenAirInterface," IEEE Open Journal of Vehicular Technology, Vol.3, 16 May 2022
3. Kumar, Sumit; Querol, Jorge; Chatzinotas, Symeon; Hammouda, Marwan; Heyn, Thomas; Schlichter, Thomas; Marques, Paulo; Pereira, Luis; Magueta, Roberto; Volk, Florian; Schwarz, Robert T.; Knopp, Andreas; Kaltenberger, Florian; kapovits, Adam; Cioni, Stefano, "5G-NTN prototyping and experimentation results," EUCNC 2023/6G Summit, Workshop 7 - Aligning European NTN Convergence and Integration, 5 June 2023, Gothenburg, Sweden

5G OPERA

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