

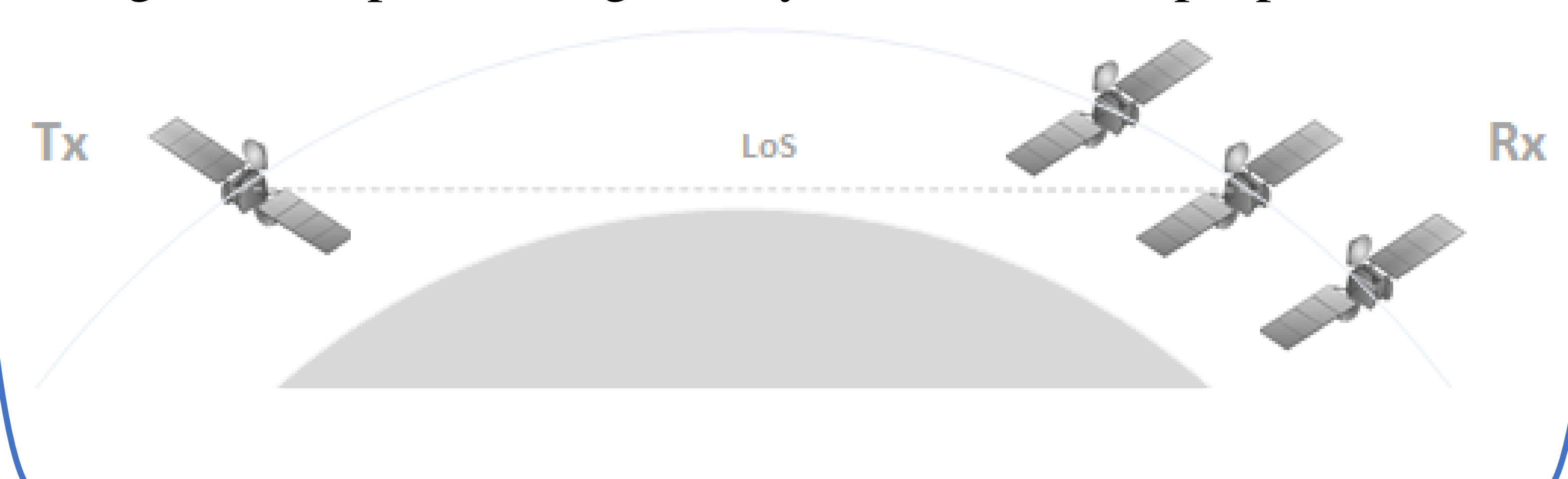
SATCROSS Project: Mission Analysis & Payload

Payload design

- CubeSat platform
→ miniaturised systems

System	Feature	TRL	
ASDC	accurate pointing	9	MARKET
on board computer	commands and data	9	
telecommunication	high data rate	9	
power supply	50 W	9	
mechanical structure	12 U	9	
antenna	> 30 dBi, 2 U	3	SCIENTIFIC PAYLOAD
transmitter	> 30 dBm, 1.5 U	4	
receiver	< -100 dBm, 1.5 U	3	

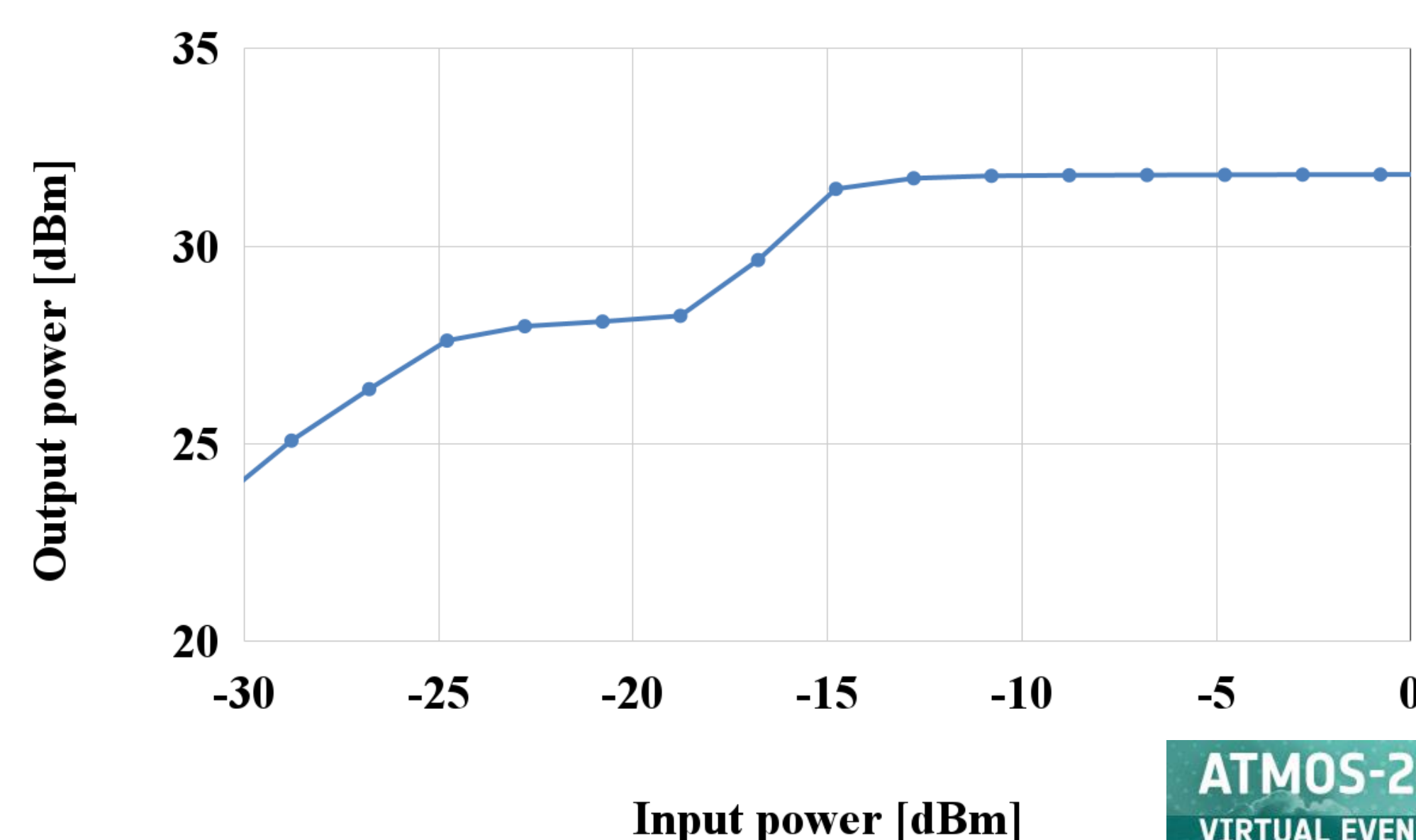
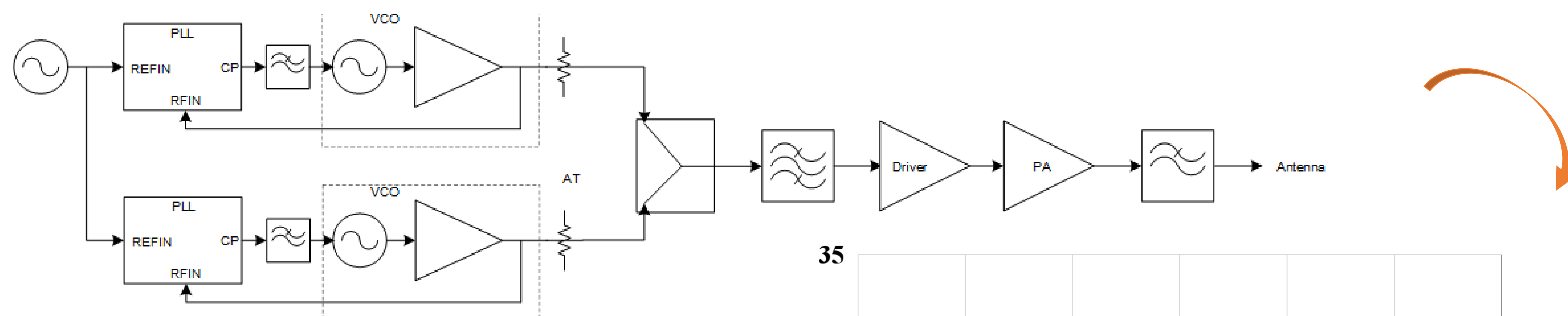
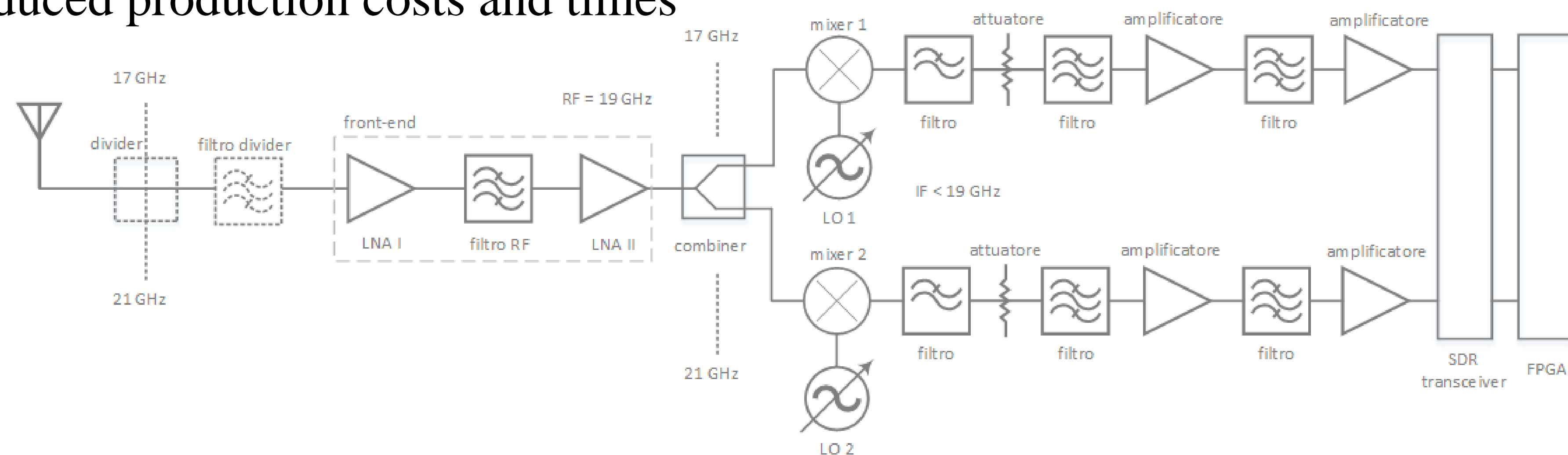
The SATCROSS mission aims at measuring two-dimensional water vapour fields on vertical sections of the lower troposphere. This result is achieved observing the attenuation a couple of very close radiofrequency K-band (20 GHz) signals experiences while crossing atmosphere at altitudes below 10 km. **Architecture:** a train of transmitting (Tx) and receiving (Rx) satellites is placed along the same orbit in such a way their line of sight (LoS) passes tangentially to the Earth troposphere.



Mission design

- orbital altitude
→ signal power according to link budget, and shielding according to ionizing radiation analysis rule out altitude which is too much above 400 km;
→ orbital decay due to atmospheric drag rules out altitude which is too below 400 km;
→ 400 km, as the best option, may take advantage of the International Space Station.

- design based on commercial-of-the-shelf (COTS) components
→ reduced production costs and times



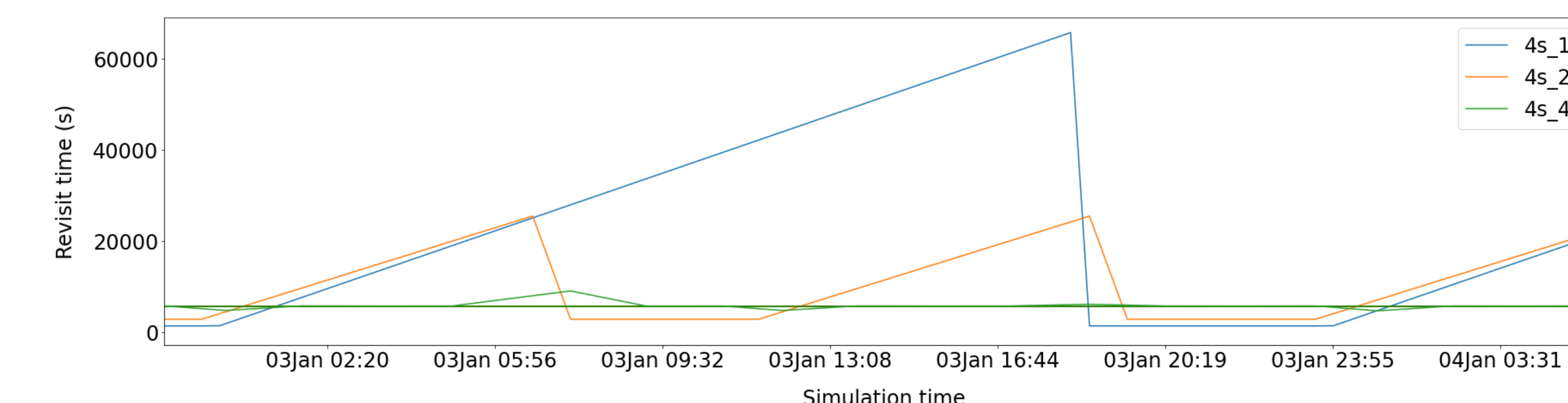
- preliminary verification
→ transmitter RF power



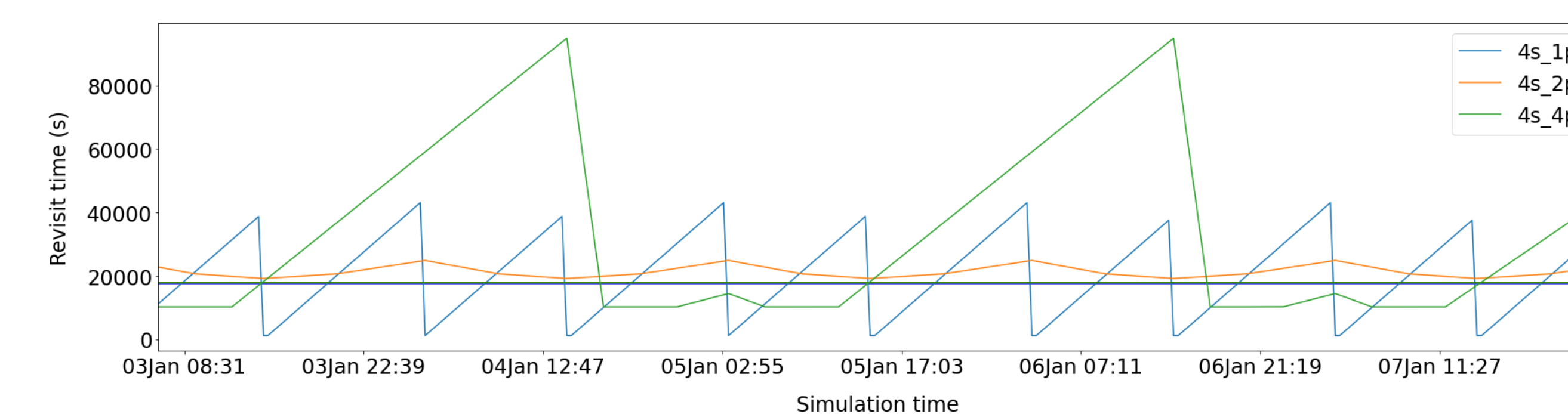
- simulations for a mid-latitude atmosphere section target

→ revisiting time was investigated to assess constellations where 4 trains of sats are arranged along up to 4 orbits

$i = 45^\circ$ best: 4 trains on 4 orbits (green)
pro: the shortest revisiting times
pro: homogeneous coverage
con: short link access span



$i = 98.5^\circ$ best: 4 trains on 2 orbits (orange)
pro: large link access span
pro: common orbits
con: longer revisiting times
con: inhomogeneous coverage



→ non-uniform constellations can be used in case of spatial limited regions so as to get short revisiting times

