

Thingy, LLC
Experimental Application

Exhibit information: Narrative Statement (Rev 1)

We hereby request an experimental license for testing the use of satellite-based IoT-Gateways, provided by UK company Lacuna Space Ltd, for our ground-based IoT applications. Thingy provides solutions for various fields in low-cost + low-power telecommunication systems, including LPWAN technologies. For remote device locations, a satellite-based gateway would provide a perfect extension, i.e. in the field of wild fire monitoring or weather monitoring.

To fit our business model, we need a satellite service in the same frequency range as our “traditional” terrestrial service (i.e. 902-928 MHz). We therefore collaborate with Lacuna Space and request to test their satellite gateways in various locations, using up to 100 ground devices. The ground devices are development kits that will transmit in line with Title 47 CFR Part 15 regulations (up to 0 dBW with max 6 dBi gain). Transmissions to each satellite will be possible up to 5 times per day. Transmissions from satellite to the ground are not part of this experimental license request. The devices only transmit when the satellite is in view. In order to consider the use of satellite-based gateways on a large scale, the satellite gateway’s capacity as well as its performance in different environments has to be investigated. This explains the requirement and plan to test up to 100 ground devices in different locations.

The whole experiment will be conducted on a non-interference, non-protection bases. We will use polite spectrum access techniques to not harmfully interfere with existing terrestrial applications. The ground devices will use antennas that are quasi-omnidirectional while reducing emissions in the horizontal plane.

This license request does not include the forwarding of collected data from the satellite gateway back to us. For the data forwarding, Lacuna Space provides other channels to us. The tests in 902-928 MHz will be solely conducted for device-to-satellite gateway transmissions.

Ground Device Antenna Information:

City/ State	Lat, Lon	Height [m]	Number of devices
Bellevue/ WA	47.61450, -122.18874	25	Up to 25 (nomadic)
Yakima/ WA	46.60228, -120.52723	335	Up to 25 (nomadic)
Lompoc/ CA	34.64168, -120.44003	36	Up to 25 (nomadic)
San Francisco/ CA	37.75769, -122.44537	140	Up to 25 (nomadic)

Applicable to all above mentioned ground devices:

Polarization: RHCP

Beamwidth: Omnidirectional

Azimuth: N/A (Omnidirectional)

Height: 0-2 m above ground

Manufacturer: Lacuna Space

Model: LS200_devboard

There is no fixed location for the devices, but rather an approx. 15 km radius around the locations given above. Devices will not be in motion, but exact location might change in this radius for testing purposes.

Information on Lacuna Space satellites

Lacuna Space has filed their spectrum use in 902-928 MHz via the Federal Network Agency of Germany (BNetzA) under the name 'LS-4' (SNS ID 119545250). Lacuna Space is responsible for the control of the satellite, cessation of service in terms of harmful interference and as well as in any other unforeseen events.

Orbital characteristics of the receiving satellite

Several satellites of the Lacuna Space system could be reached on US territory. Therefore, both typical orbits and a specific satellite orbit are given below:

Parameter	Typical	LACUNASAT-3 (NORAD 46492)
Altitude	550-600 km (circular)	548.1 km (perigee) 577.0 km (apogee)
Inclination	~97-98°	97.7°
Period	~96 minutes	95.8 minutes
Number of receiving satellites	1-10	1

Contact

Scott Waller, +14254286100