QO-100

Amateur Radio in Geosynchronous Orbit

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Introduction

History

- Launched on November 15th, 2018 on a SpaceX Falcon 9 rocket
- Operated by Es’hailSat in Qatar
- Built by Mitsubishi Electric in Japan
- 24 Ku Band transponders, 11 Ka Band transponders
- Amateur Radio payload of a Narrow Band and a Wideband Transponder
- Amateur Radio payload designated as QATAR OSCAR - 100
- First satellite in GEO orbit carrying an amateur radio payload

Geostationary Orbit

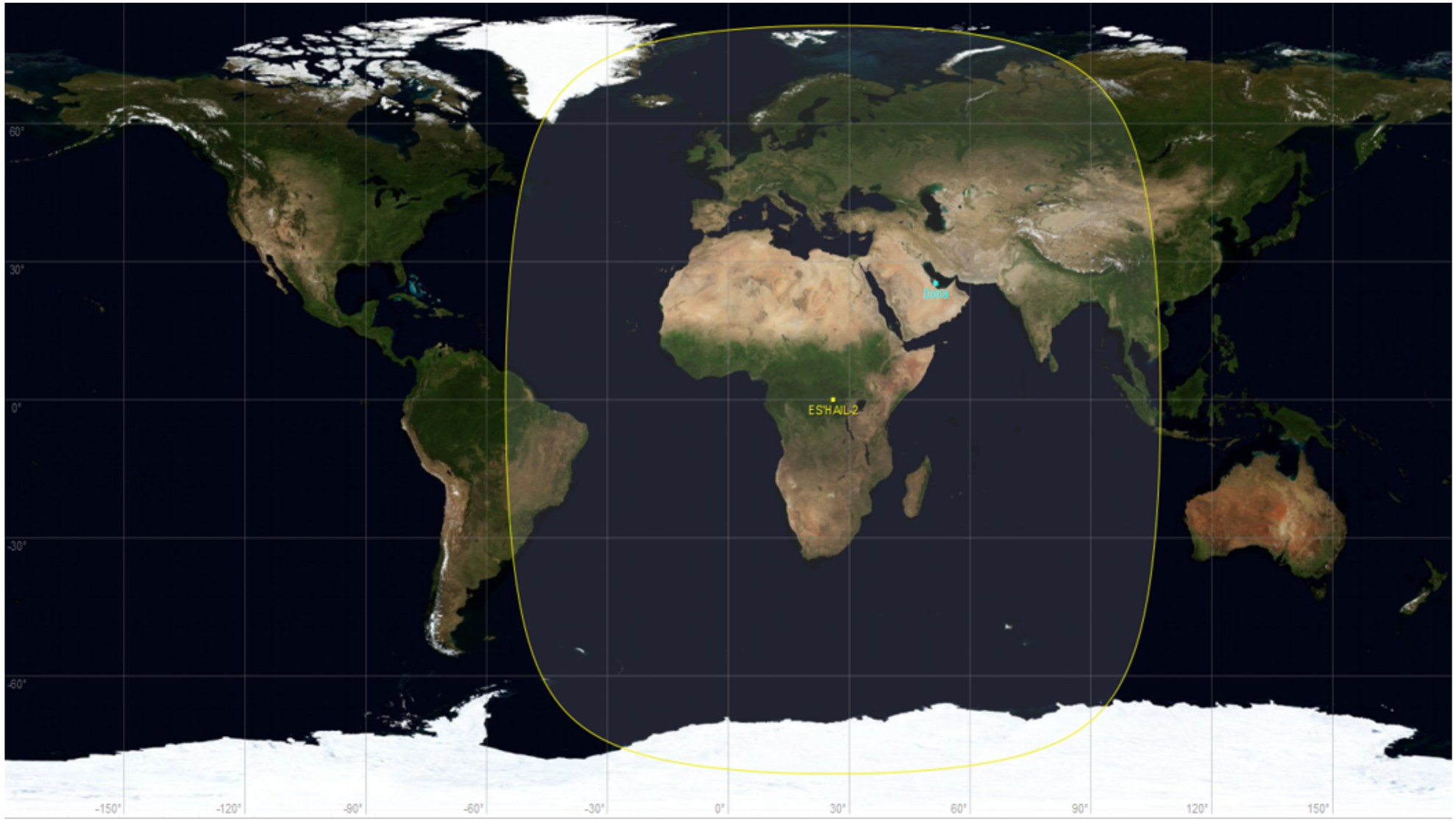
- Earth-centered orbit where a satellite's orbital period matches Earth's rotational period
- 35,786 km altitude gives a wide coverage area
- Satellite footprint doesn’t change. You are either in the foot print or you aren’t.

Why this satellite is important

- Massive footprint
- Large user base
- Lots of bandwidth for many conversations at once
- Demonstrated the feasibility of GEO Satellites

Technical Details

Footprint

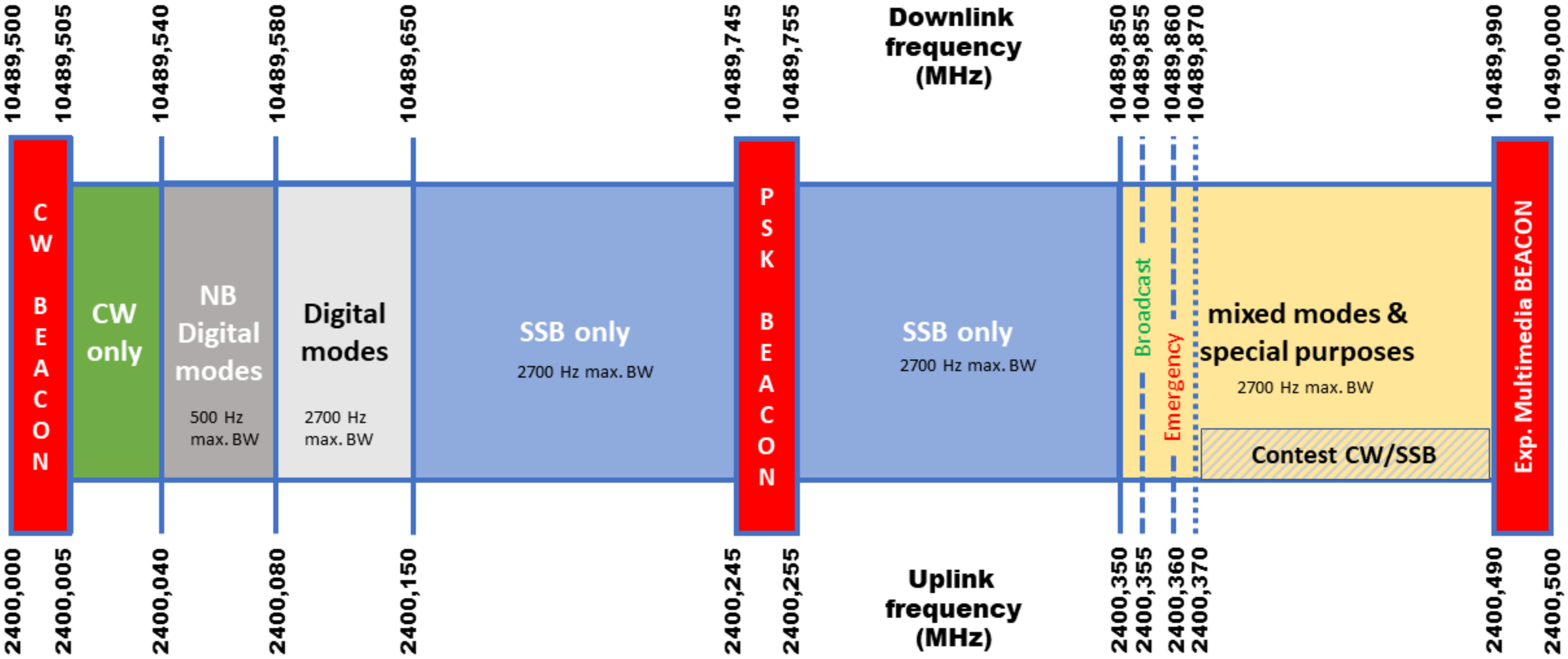


AMSAT QO-100 / P4A
NB Transponder Bandplan

AMSAT-DL
Satelliten für Kommunikation, Wissenschaft und Bildung
Satellites for Communication, Science and Education

Es'hailSat سهيل سات
Qatar Satellite Company الشركة القطرية للأقمار الصناعية

QATAR AMATEUR RADIO SOCIETY Q.A.R.S. الجمعية القطرية لهواة اللاسلكي



Oct 8th 2022

Operation

2.4ghz Downlink

- X-Band 10 GHz Downlink:
- 90 cm dishes in rainy areas at EOC like Brazil or Thailand
- 60 cm around coverage peak
- Narrowband: linear vertical polarization
- Wideband: linear horizontal polarization

10ghz Narrowband Uplink

- S-Band 2.4 GHz NB-Uplink:
- Mode agnostic (CW/SSB/Data)
- 5W nominal Uplink power (22.5 dBi antenna gain, 75cm dish)
- RHCP polarisation

10ghz Wideband Uplink

- Wide band modes, DVB-S2
- Peak EIRP of 53 dBW required (2.4m dish and 100W)
- RHCP polarisation

Challenges

Commercial Equipment

- Expensive!
- DXPatrol Ground Station ~ 1400 SGD
  - Comes with LNB
  - Requires TX antenna (135 SGD for DXPatrol feed)
  - Requires IF radio (IC 9700, etc)
- No dishes for sale in Singapore, must be shipped in

DIY Equipment

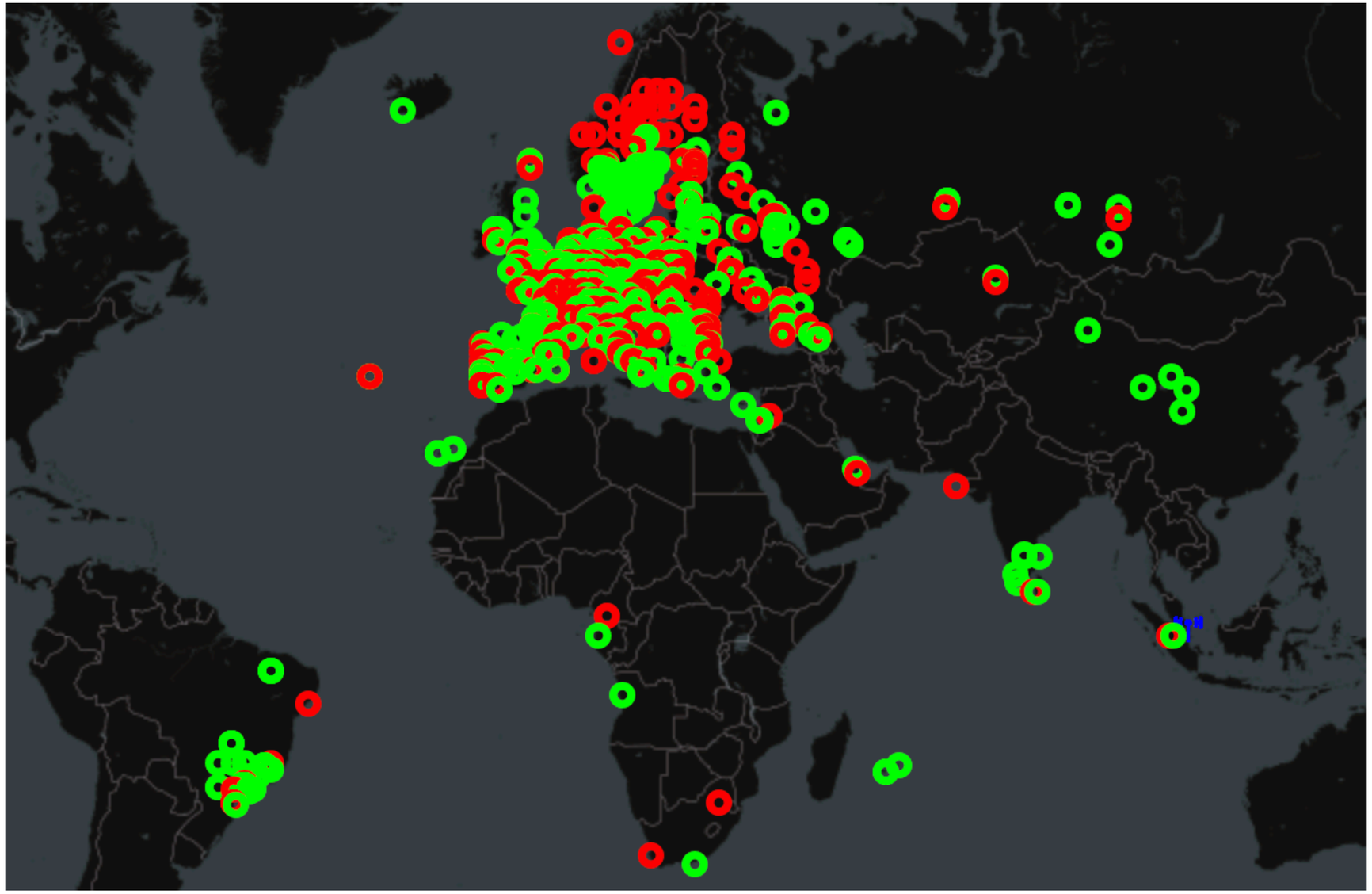
- Expensive!
- May be complicated
- Requires tuning and testing to get clean signal
- Equipment required:
  - TX SDR with TX LNA or IF radio + up converter
  - TX amplifier
  - Downconverter
  - RX SDR
  - GPSDO
  - LNB + TX Antenna

Operation in Singapore

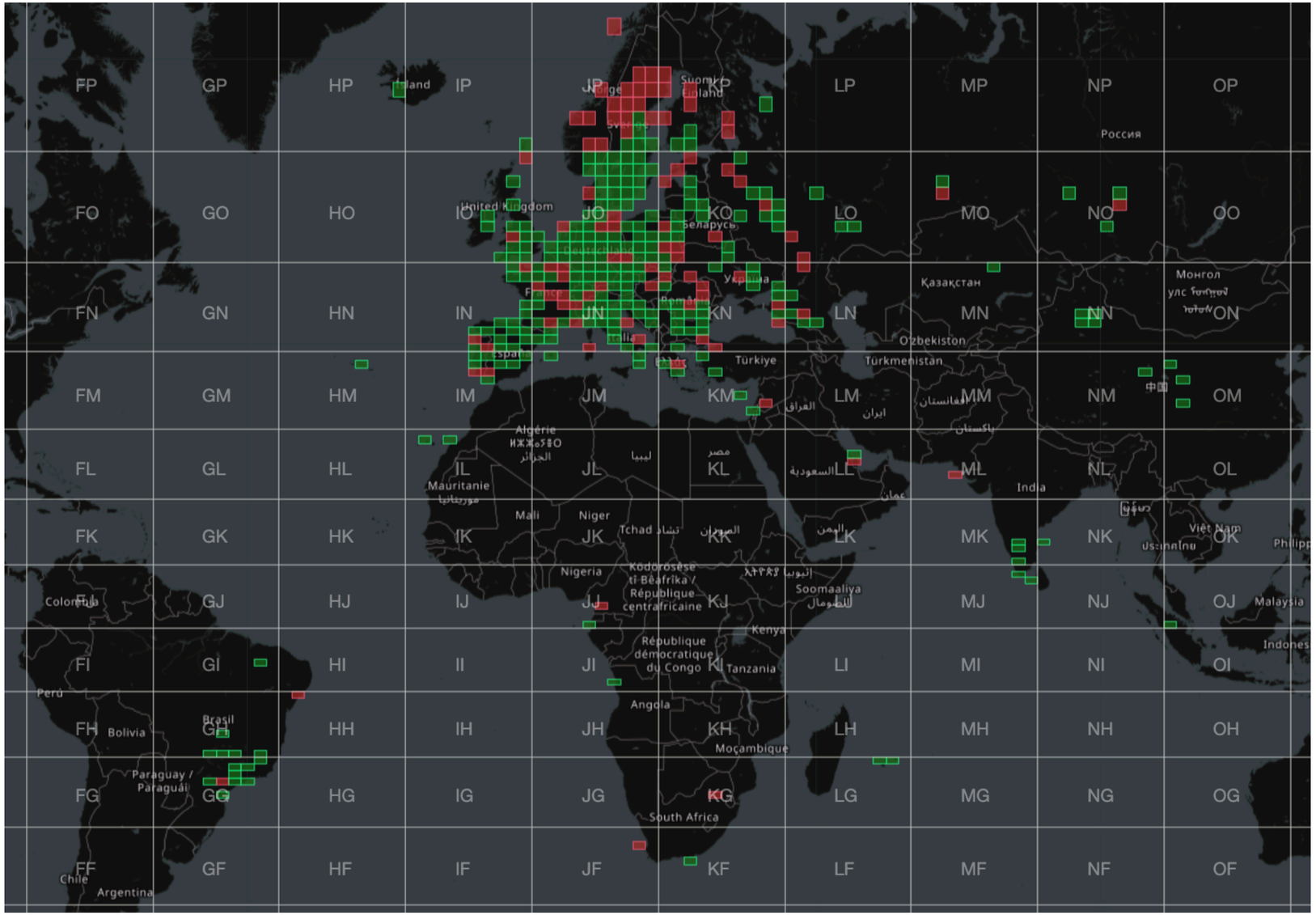
- Low Elevation (~3.2 degrees)
- Lots of tall buildings blocking signal
- Time Zones (many operations are focused around EU hours)
- Requires permission to have a dish
  - Can work some FT8/JT65 with bare LNB for RX + wifi panel/yagi for TX
  - Can use WebSDR for RX, but technically not valid for awards
  - Even with permission, may get unwanted attention with a dish

Results?

First 60 Days On The Air



First 60 Days On The Air



First 60 Days On The Air

- Contacts: 843, 501 Confirmed
- DXCC: 61 Worked, 57 Confirmed
- VUCC: 336 Worked, 253 Confirmed

Questions?

(and maybe answers)