YTTEK

Business Opportunities and Design Challenges of LEO Satellite Communication

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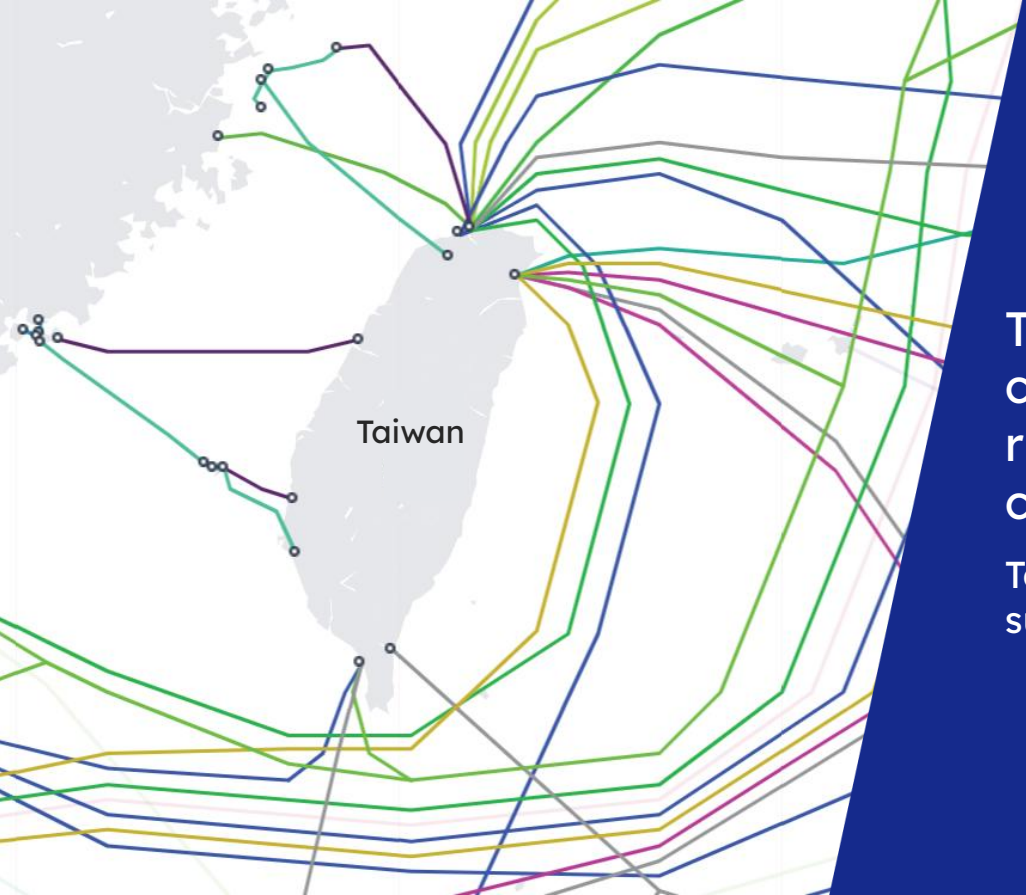
CEO, YTTEK Technology



Taiwan's communications fully rely on undersea cables

Taiwan operates 14 submarine cables today

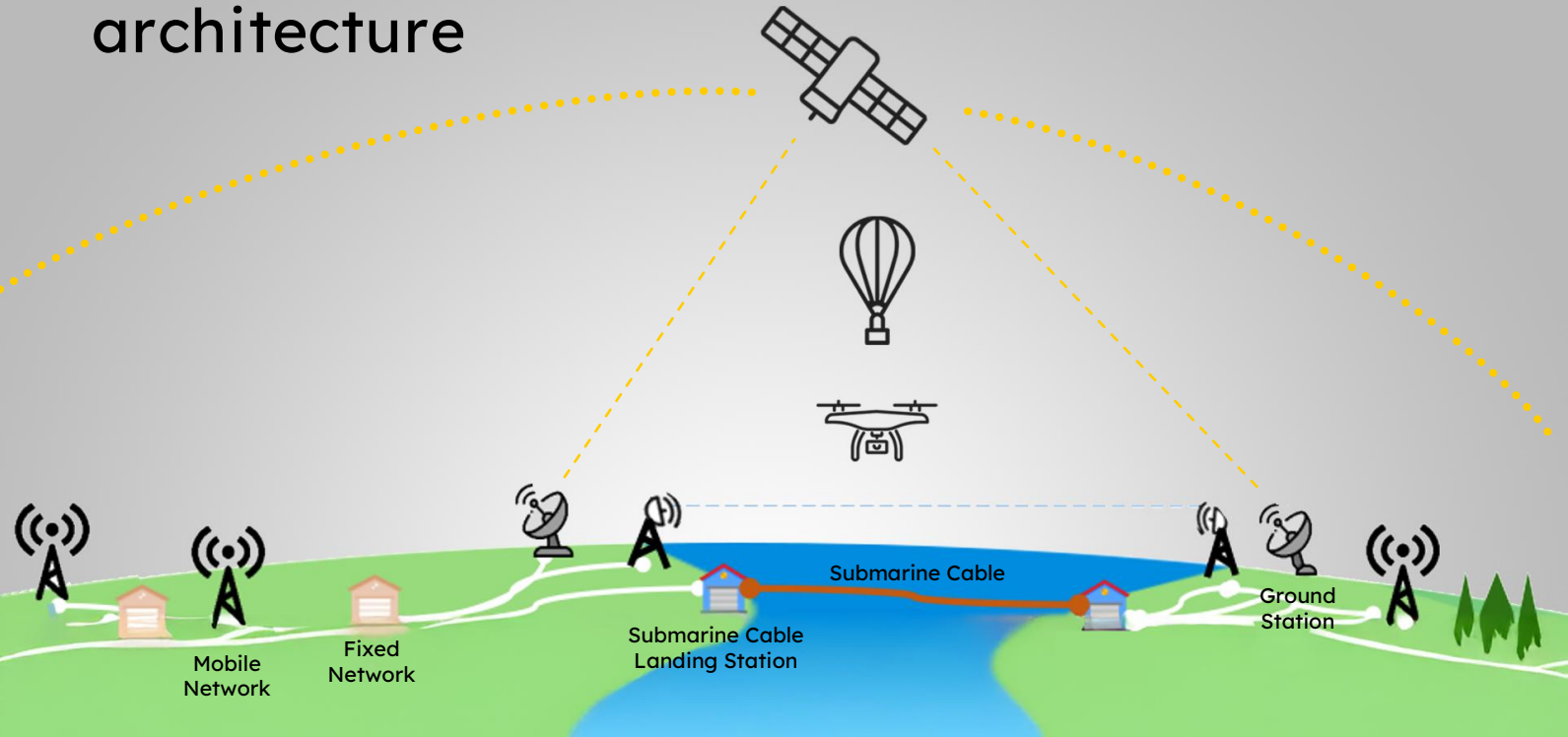
Stay Connected During Disasters

Earthquake

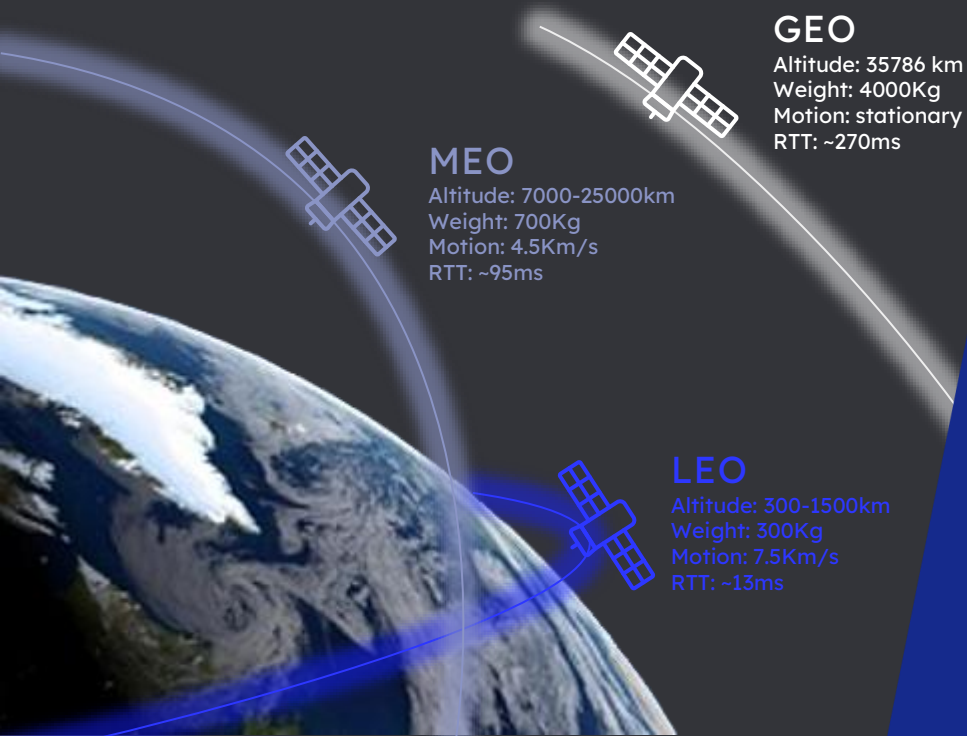
Stay Connected During Disasters

War

Communication network architecture



Orbit Classes



GEO
Altitude: 35786 km
Weight: 4000Kg
Motion: stationary
RTT: ~270ms

MEO
Altitude: 7000-25000km
Weight: 700Kg
Motion: 4.5Km/s
RTT: ~95ms

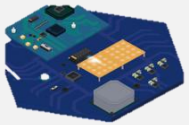
LEO
Altitude: 300-1500km
Weight: 300Kg
Motion: 7.5Km/s
RTT: ~13ms

Why LEO?

Lowest cost
Smaller size, lower cost
Include manufacturing cost and launch cost

Shortest latency
Lower altitude, shorter latency

Architecture of Satellite Communication



User terminal

Ground station

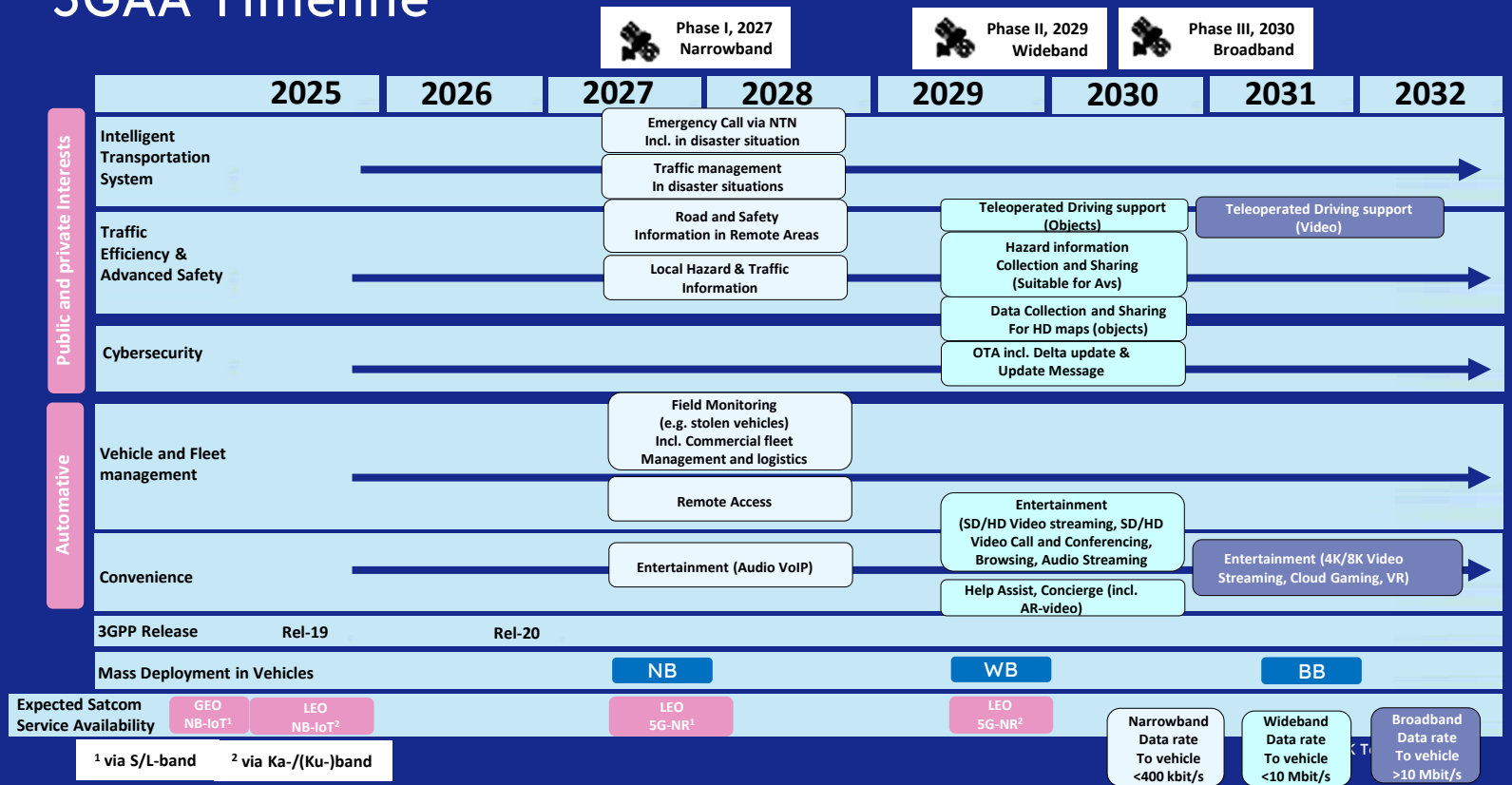
HyperSDR

Enable Space agencies:

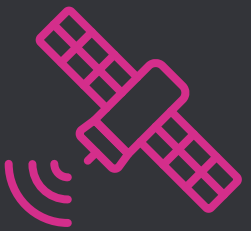
Real-time high-speed modem:

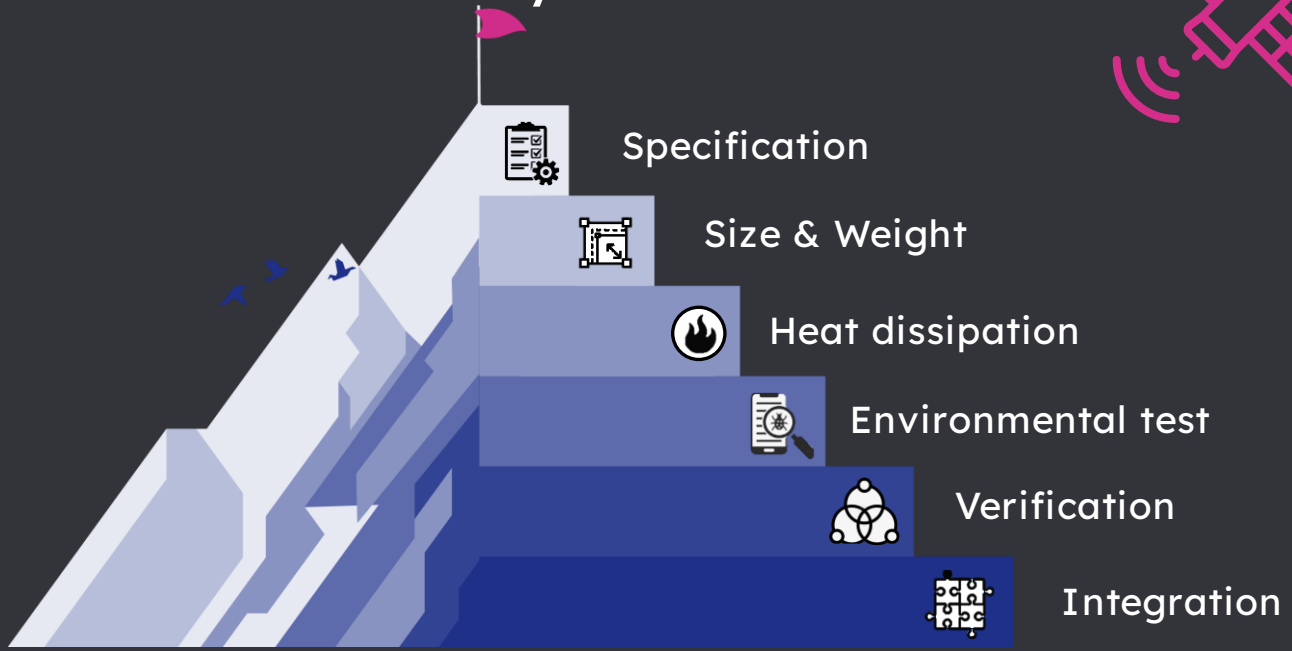
- Telemetry application by CCSDS
- Communication application by DVB-S2
- Utilized as a RF recorder for field trial debugging

5GAA Timeline



Challenges for LEO Communication Payload





Ideal for satellite and UAV

Satellite

SDR CubeSat Payload

Y.LOAD S

Lightweight and compact size for CubeSat

TX/RX Bandwidth: 200 MHz

Output power: 5 W

Downlink: 8.025 - 8.4 GHz

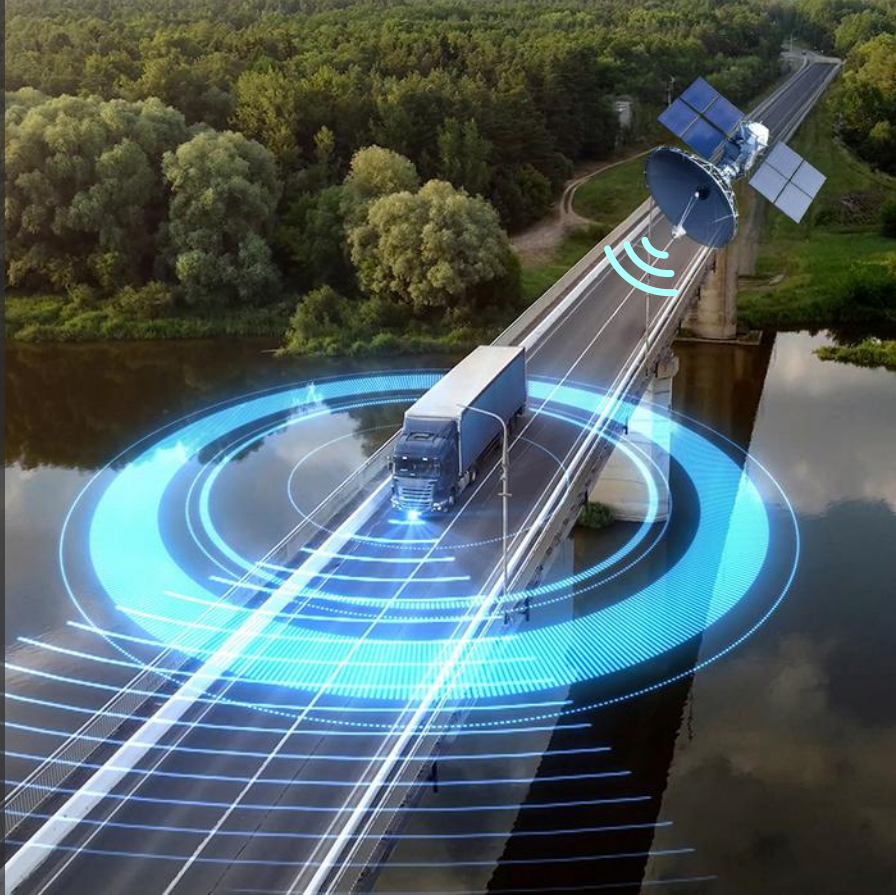
Uplink: 14.0 - 14.5 GHz

Compliant with

CCSDS 131.0-B-4

Vehicle-to-Satellite Technology

- Up link: Ka band
  Down link: K band
- Payload:
  Ka: 256-element
  K : 64-element
- User terminal
  Ka: 384-element
  K : 32-element



Tasa Project (TASA Local Server)

Speed x2

Control: TASA Local Server

Current Time: Mon Feb 5 13:59:54 2024

Config:

YTTEK

Message: Success of acquiring control authorization!

Release Authorization

Current State: Start

Reset | Start | Stop

Information: PHY Frame: Received

Error Rate | Protocol Error Log | FPGA Status | Constellation | Engineering

ES1

(1.57075; 1.79371)

ES2

1.5
1
0.5
0
-0.5
-1
-1.5

-1.5 -1 -0.5 0 0.5 1 1.5

FPGA | Protocol | Data Stream | RF Setting | RF Recorder

Path :

Path 1 Path 2

Tx Power:

ON OFF

Tx IQ Swap Rx IQ Swap

Frame Sync.:

Tx

EVM(estimated; dB): 0.990589

Power: 0 dBm Set

Frequency: 720 MHz Set

Rx

Attenuation: 0 dB Set

Frequency: 720 MHz Set

Apply All

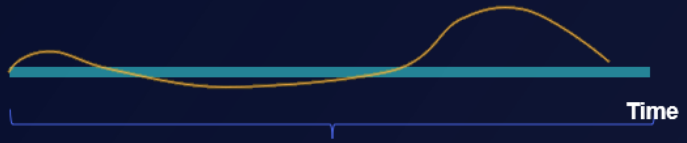
Config

FPGA Config Status: SUCCESS → PHY ready

Protocol Config Status: SUCCESS → protocol ready

Y.FORCE S High Speed Satellite MODEM

To record baseband I/Q raw data continuously



Recorded period is depends on the volume of SSD

- For example: Total volume of SSD is 4TB, sampling rate: 400MHz. The recorded period is 4TBx8/400M=2500 secs

Satcom

Ground Station

400M
Bandwidth

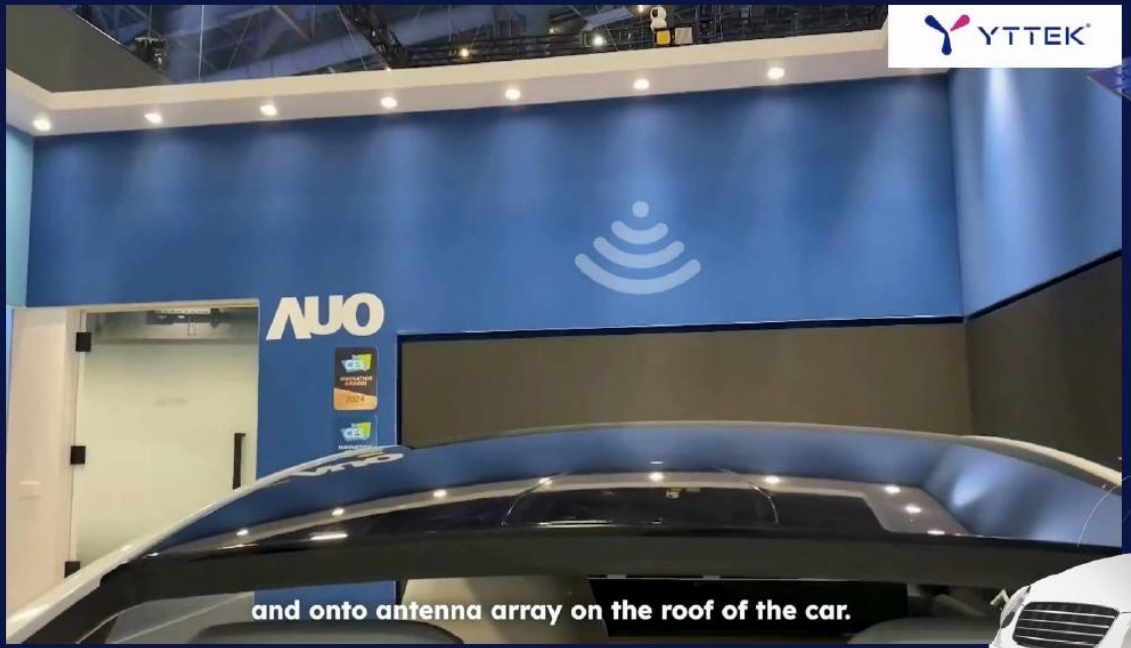
10M-9GHz
Frequency

CCSDS

Successfully decode

FORMOSAT-5, Landsat-8, Lnadsat-9

LEO Communication for Car Application in CES2024



https://www.youtube.com/watch?v=Ajwct_m_LI0

Architecture of Satellite Communication

Satellite

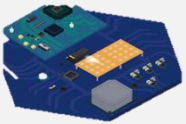
SDRspace
Communication payload for 6U CubeSat

PluSDR
Enable Satellite companies:
Offline testing (VSG & VSA) before launching the payload

Service link

Feeder link

PluSDR



Enable UT companies:
- PluSDR utilized as a VSG & VSA for offline and non-signaling test
- HyperSDR utilized as a RF recorder for field trial debugging

User terminal

Ground station

Enable Antenna Array:

低軌道衛星玻璃天線

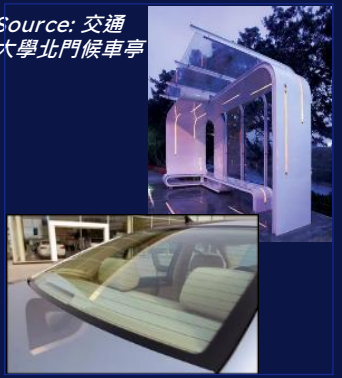
Connection under the sky
(衛星連線)

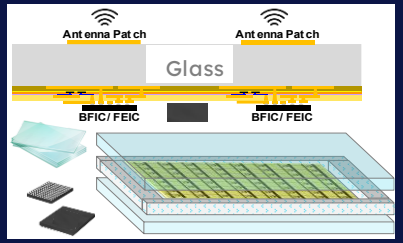
Glass makes Design free
(透光性)

低軌道衛星
玻璃天線

Integration more to less
(整合)

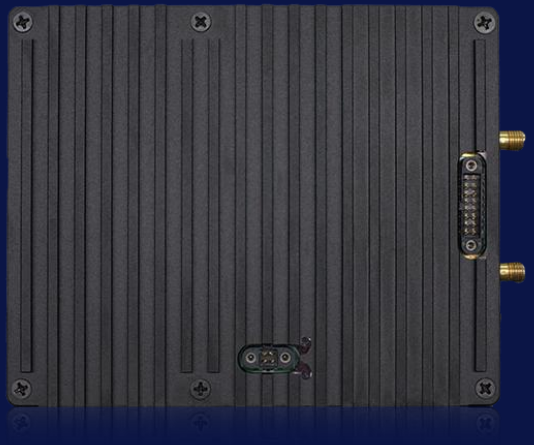
AIoT everywhere
(互聯網)





SDRone™

UAV communication transceiver



Agile hopping:
1,000 hops/s

01 High-speed frequency hopping for anti-detection & anti-jamming

02 Up to 80 Mbps throughput for high-speed data transfer

03 Three communication Range options:
15 km, 50 km, 200 km

04 2T2R RF chain for superior signal performance

05 960 -1215 MHz frequency band

06 Link 16 accessible


YTTEK
tomorrow's wireless, today
YTTEK
円通科技
About YTTEK Technology Corp.
Algorithm Optimization
FPGA / SOC BB Implementation
Novel Antenna Design
Major Sponsors
SEETEL

YTTEK: Experts in Wireless Communication Innovation

- SDR-based wireless communication solutions.
- Affordable non-signaling test tools for WiFi, 5G NR, and Satellite.
- Innovative payloads for Satellite and UAV.
- High-speed satellite receivers for ground stations.
- Partnering with AUO on satellite modems for smart mobility.

Question & Discussion

- Opportunities for Taiwan in LEO Communication
- Introduction to Satellite
- Challenges for Taiwan into LEO Communication Industry
- Opportunities for Glass into LEO Communication Industry

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tomorrow's wireless, today