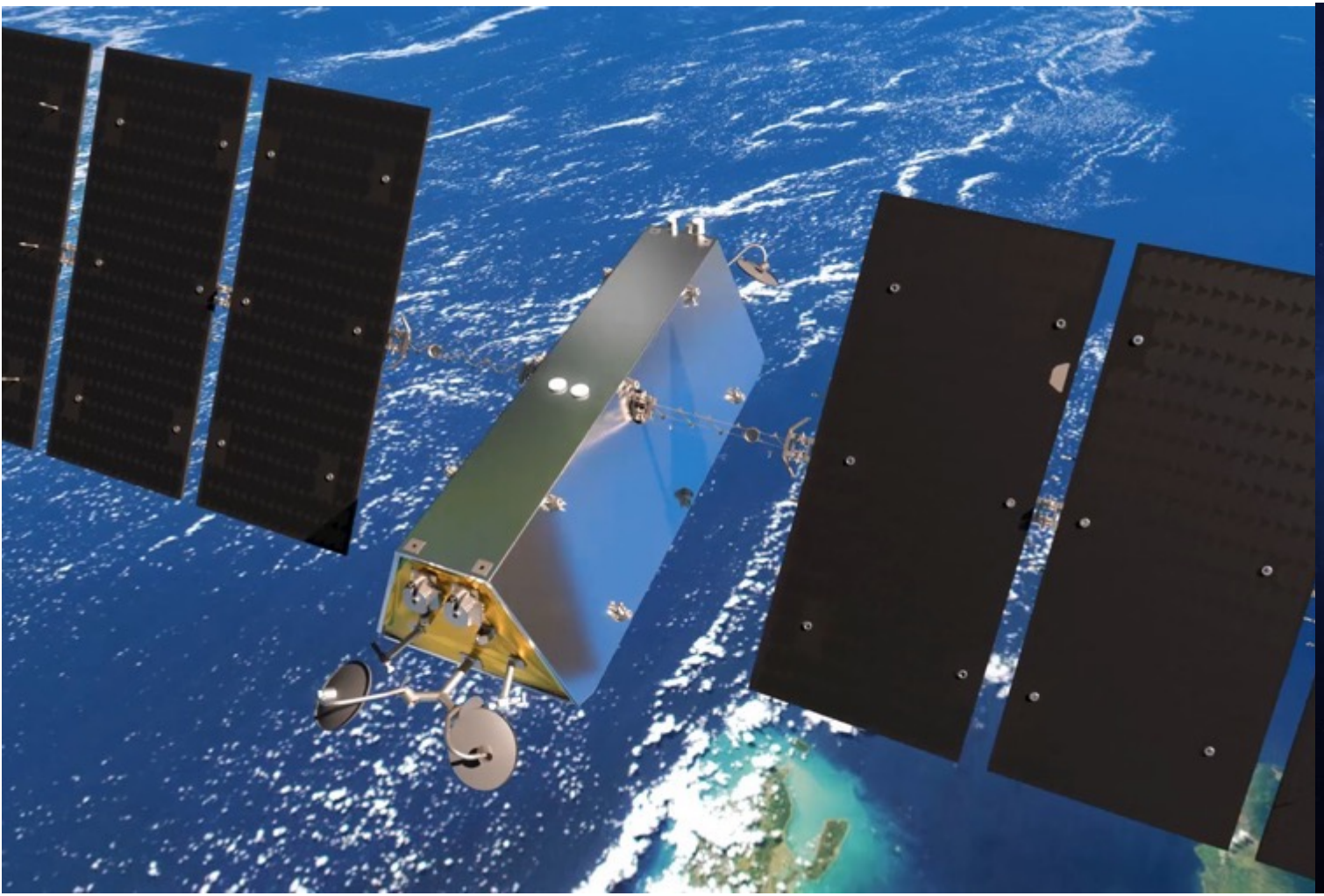


Mass Element Phase Array

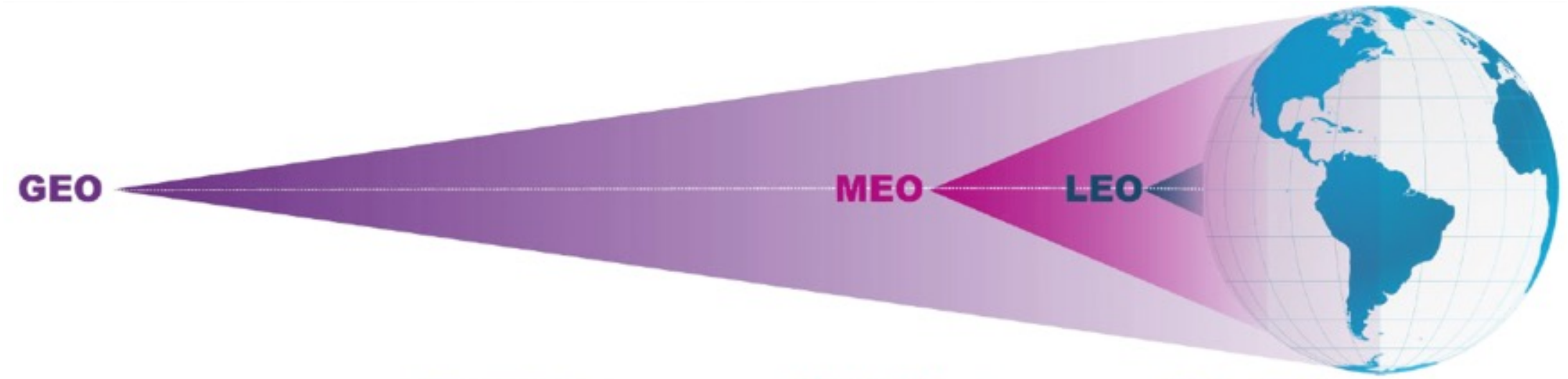
Opportunity & Challenge

2022.08.25

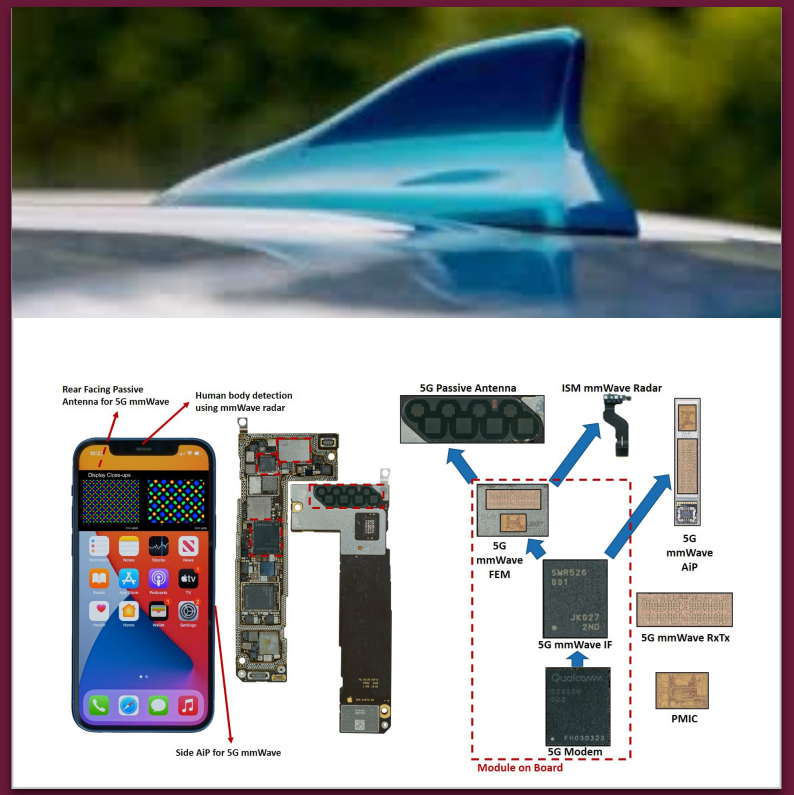
MEPA LABS INC

a LEO/MEO Connectivity Technology Company

Satellite Orbit Moving to MEO/LEO



	GEO	MEO	LEO
Altitude	36000km	8000km	1000km
Latency	700ms	150ms	50ms
Gateway	Fixed, few	Flexible, some	Flexible, local
Operation Effort	Simple	Simple	Complex
Coverage Diameter	15000km	8000km	800km
Constellation Cost	$1~1.5B	$1.5B	$5~15B
Life time	15 yr	12 yr	5~7 yr



Hidden Antenna is moving to main part in Satellite Communication

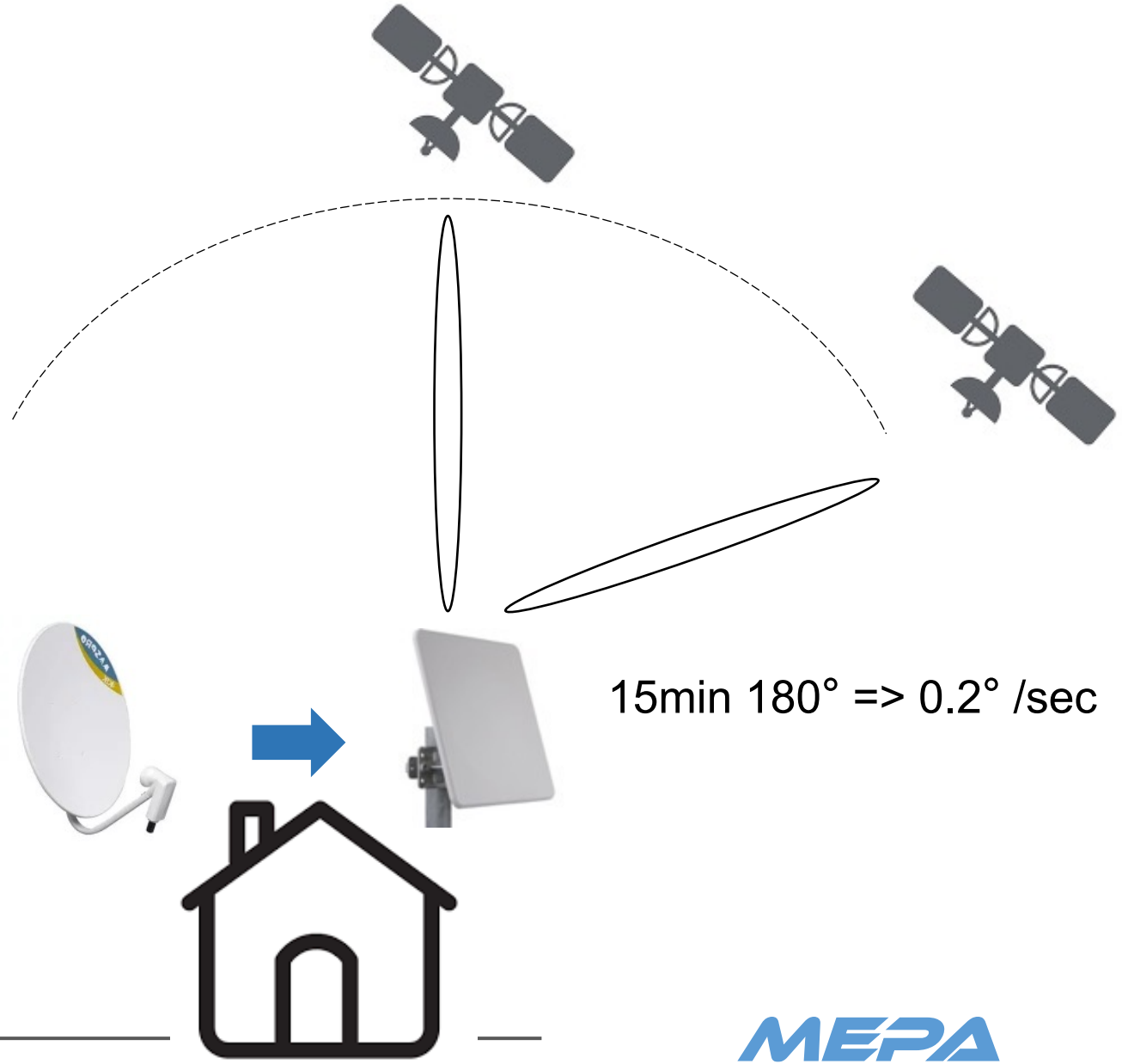
MEO/LEO Satellite Tracking

Opportunity

1. Low Earth Orbit Satellite
2. **Low latency/ High throughput** from LEO

Challenge

1. Satellite pointing frequency
2. Beam forming frequency/precision
3. Handover from 1 Sat to another



15min 180° => 0.2° /sec

User Terminal Mobility

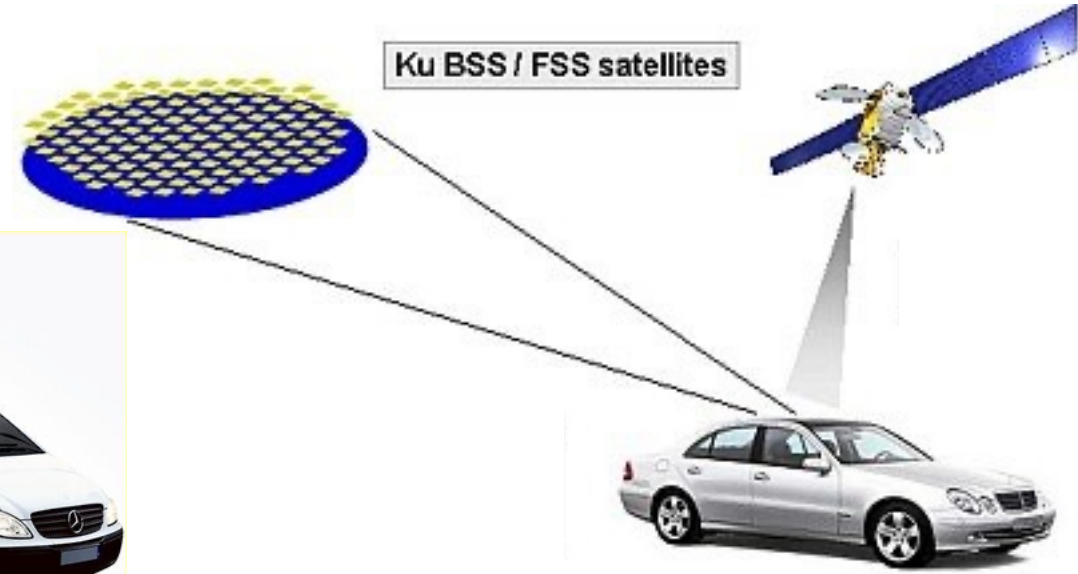
Opportunity

1. Fixed Point Connectivity: COTP auto-acquire 2min
2. Mobility Connectivity: COTM real-time auto-acquire

Challenge

1. Beam forming frequency/precision
2. 3D sensor frequency/precision

COTP: eg. SNG



COTM

MEPA

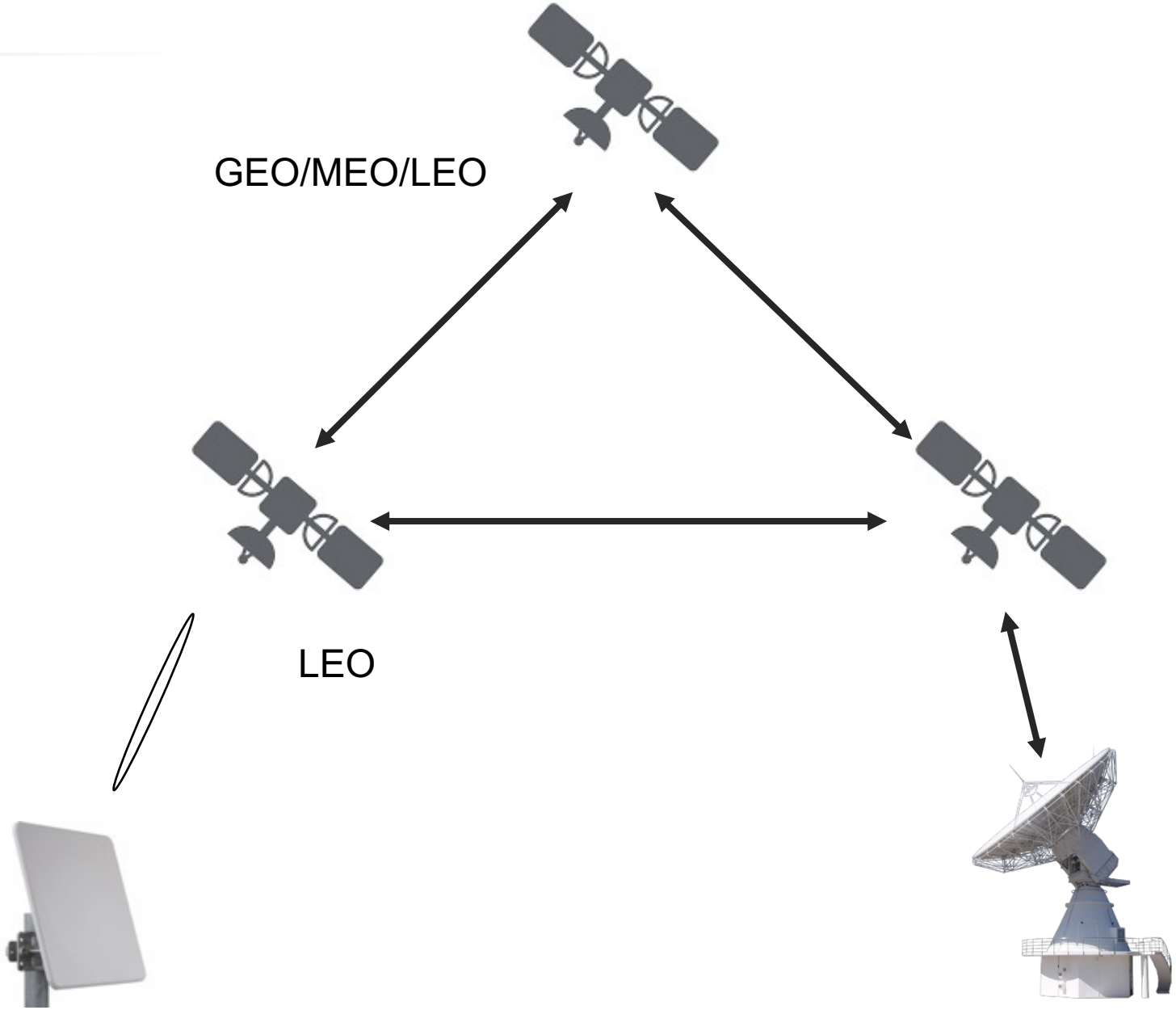
Required Gateway

Opportunity

1. Network load balance
2. Mesh data center
3. Low latency everywhere
4. Backbone everywhere

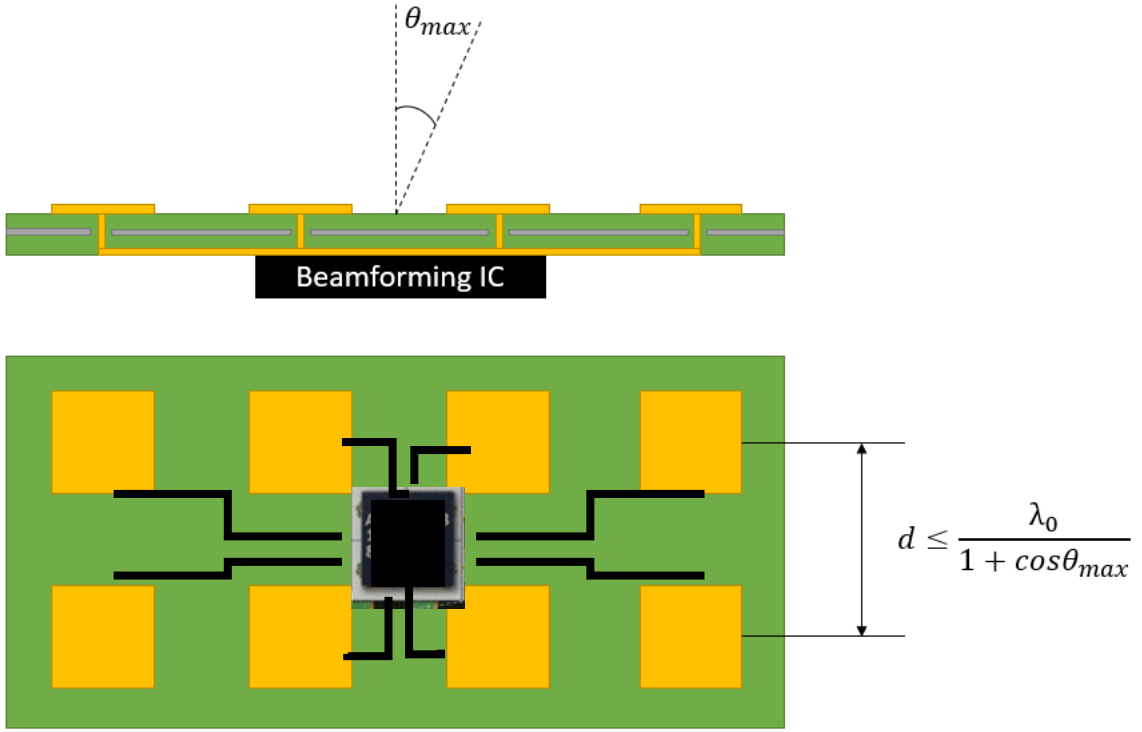
Challenge

1. ISL (Inter Satellite Link)
2. Local Gateway per region



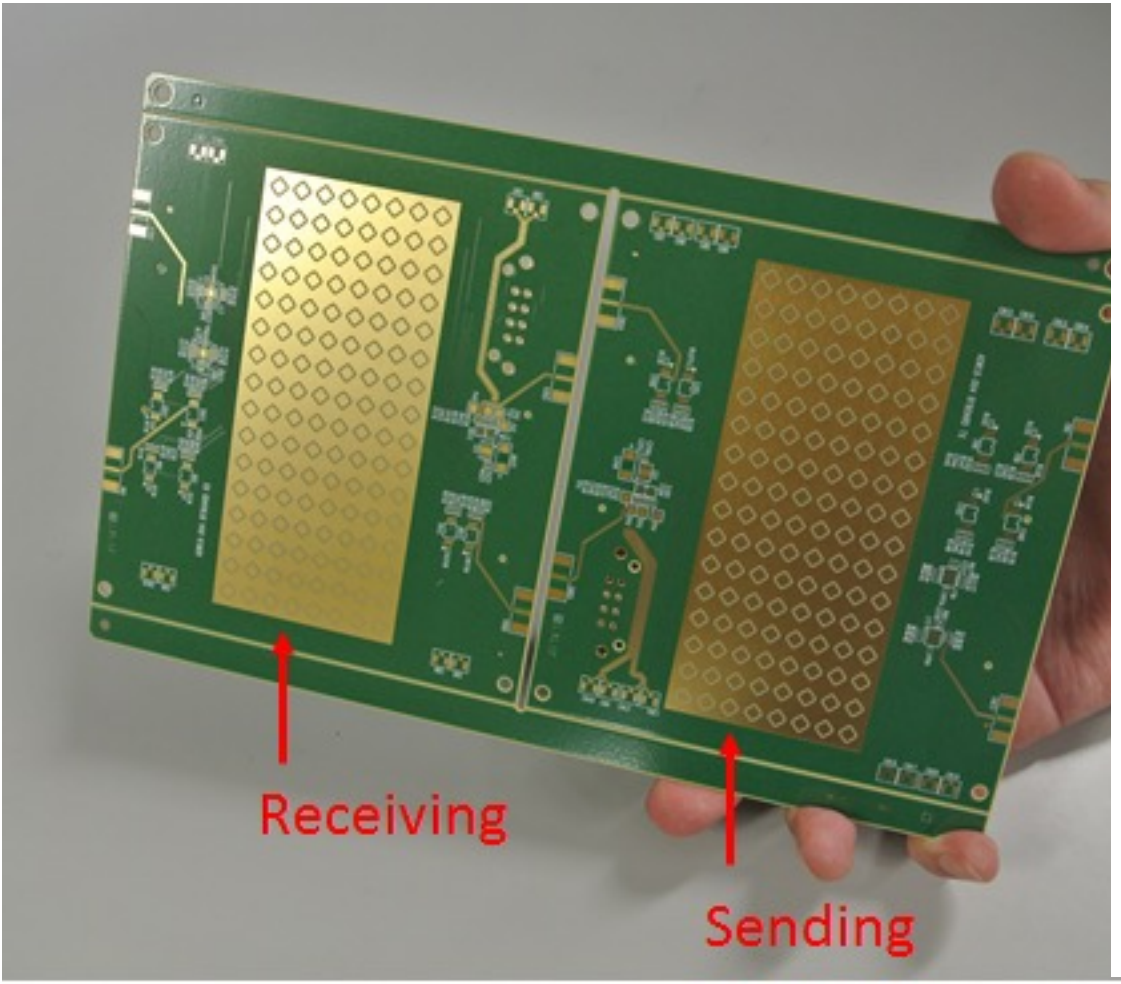
Challenge on Mass Element Phase Array Antenna

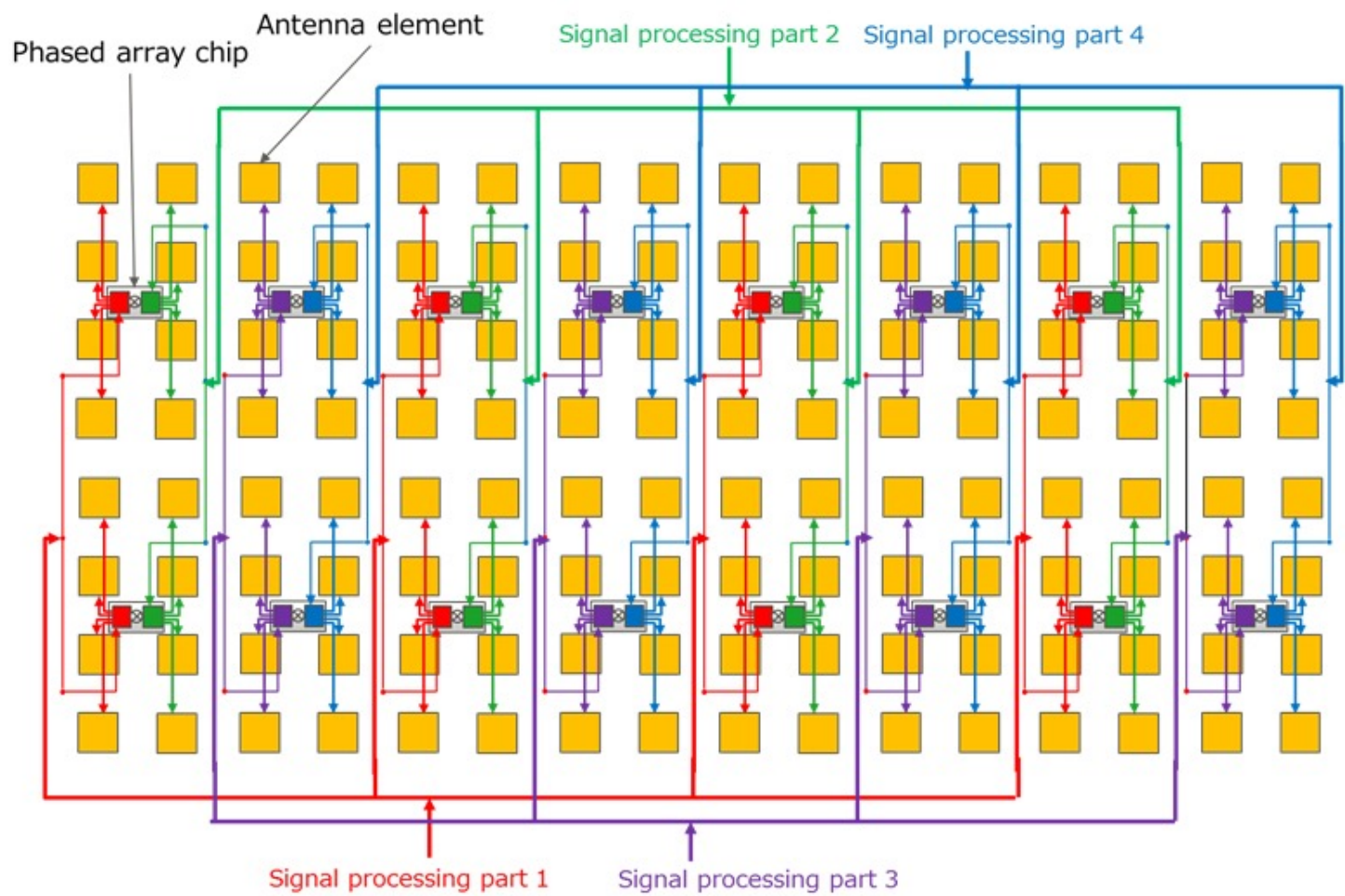
1. Insertion loss from chip to array
2. More insertion loss as 1chip support multi array



Challenge on Mass Element Phase Array Antenna

1. 8*16 elements with Tx and Rx each
2. Very complex control line involved by SPI
3. 6+bit resolution control signal for better beam forming accuracy

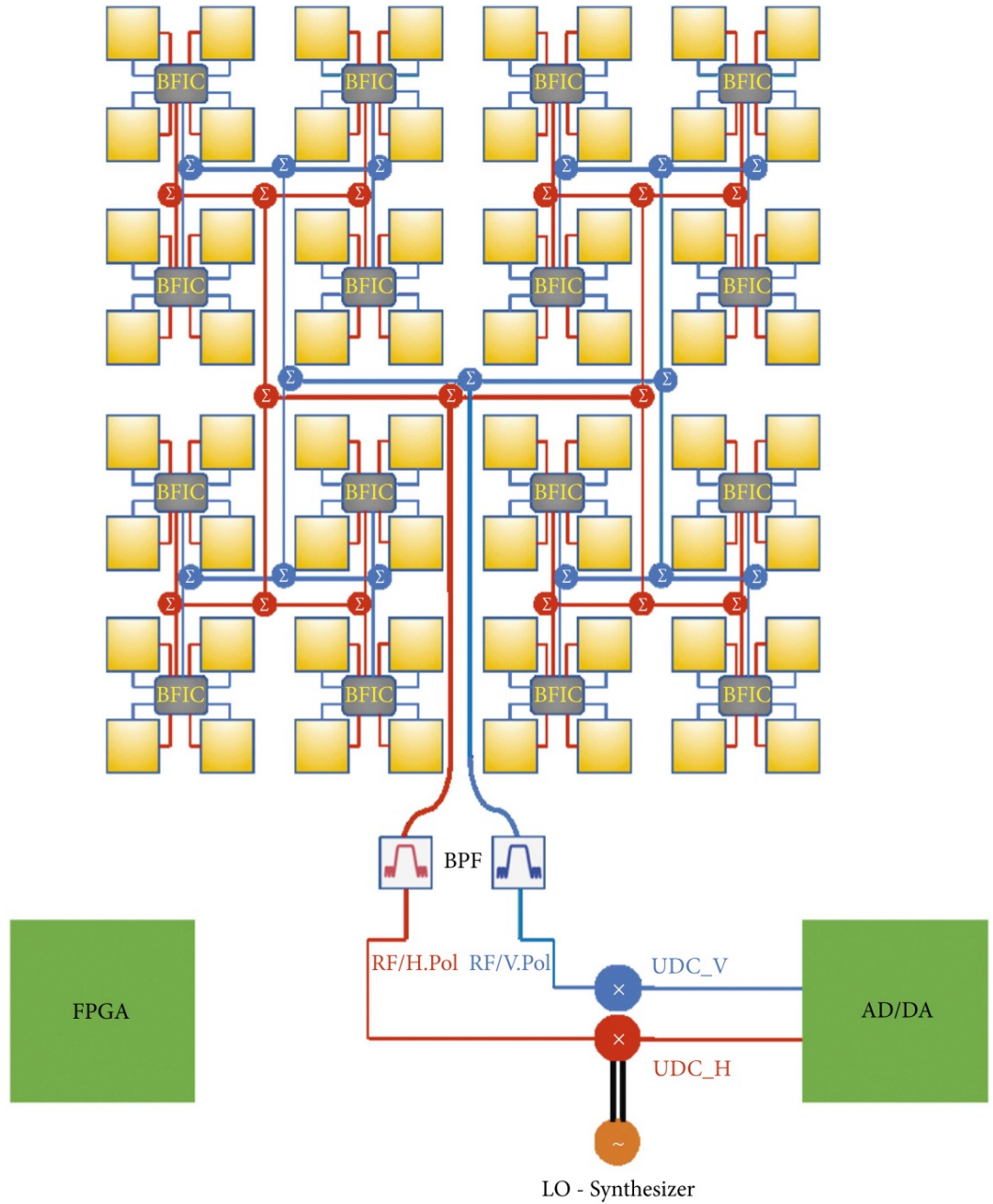




Fujitsu 2018 solution https://www.microwavejournal.com/articles/print/31458-fujitsu-demonstrates-28-ghz-4-beam-128-element-phased-array-antenna

Challenge on Mass Element Phase Array Antenna

1. High insertion loss from chip to antenna
2. -18dB in 64 elements array. High PDN loss(-30dB) for1000+ array
3. Complexity to control >1000 array



https://www.hindawi.com/journals/ijap/2021/5514972/

Thanks for listening!

Wayne.Tsai@mepalabs.com