Non-GSO FSS
large constellation satellite systems

Orbit/spectrum regulatory challenges

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Non-GSO FSS satellite systems at LEO orbits

Advantages

- *Less rocket booster* (launch power) required
- *Less latency delay* in the transmission path
  - ✓ *GSO satellite latency ~ 280ms, HEO ~150ms, LEO ~* ***40ms***

[NOTE - At latitudes above about 81°, geostationary (GSO) satellites are below the horizon and cannot be seen from the Earth at all]

- Suitability for providing service at *higher latitude*

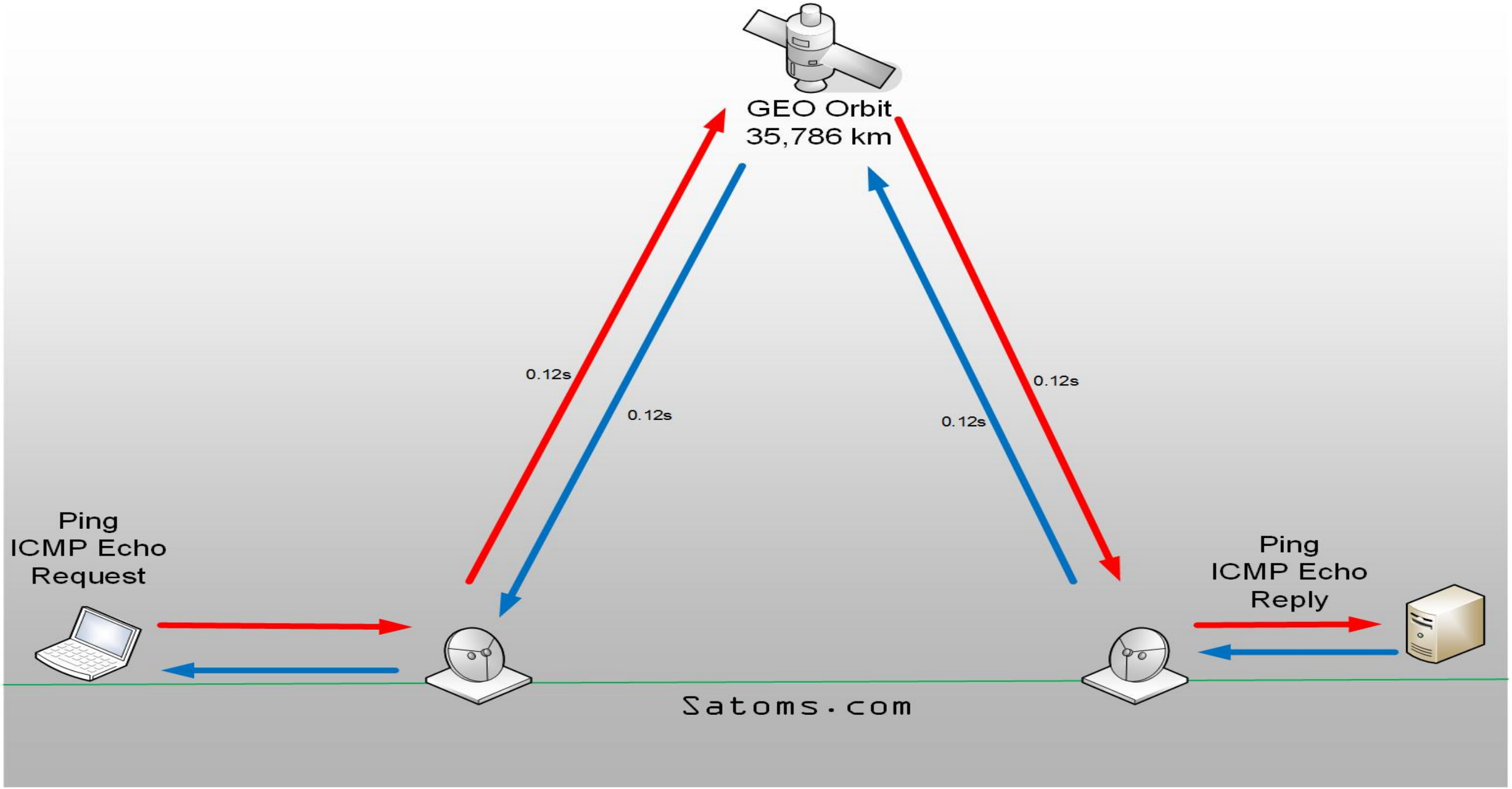
[NOTE - Because of GSO latitude limitation, some communication satellites are using highly elliptical orbits, which have excellent visibility at high latitudes]

- *Lower cost* per satellite to build and launch non-GSO satellites to the LEO orbit

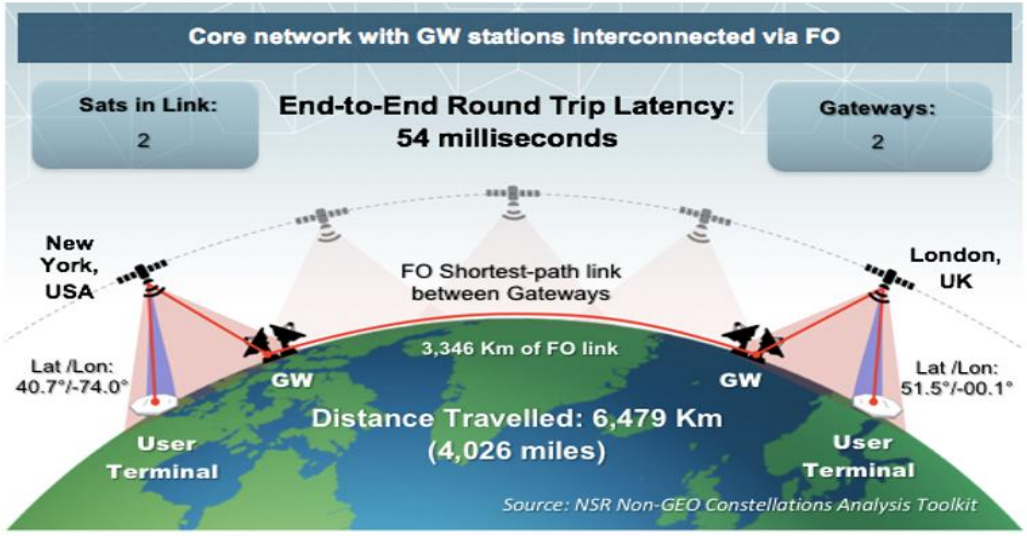
Disadvantages

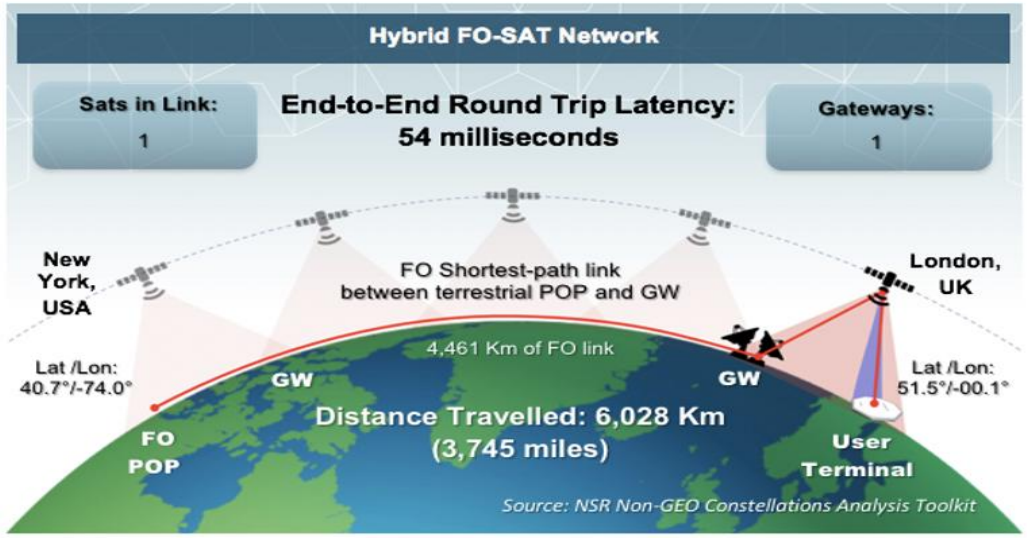
- *Satellite system and ground segment are expensive*
- *Less expected life of satellites* at non-GSO due to ionizing radiation effects, requires *frequent replacement*
- Requirements for a *frequent deorbiting*

*Geostationary (**GSO**) satellite latency – 280ms*

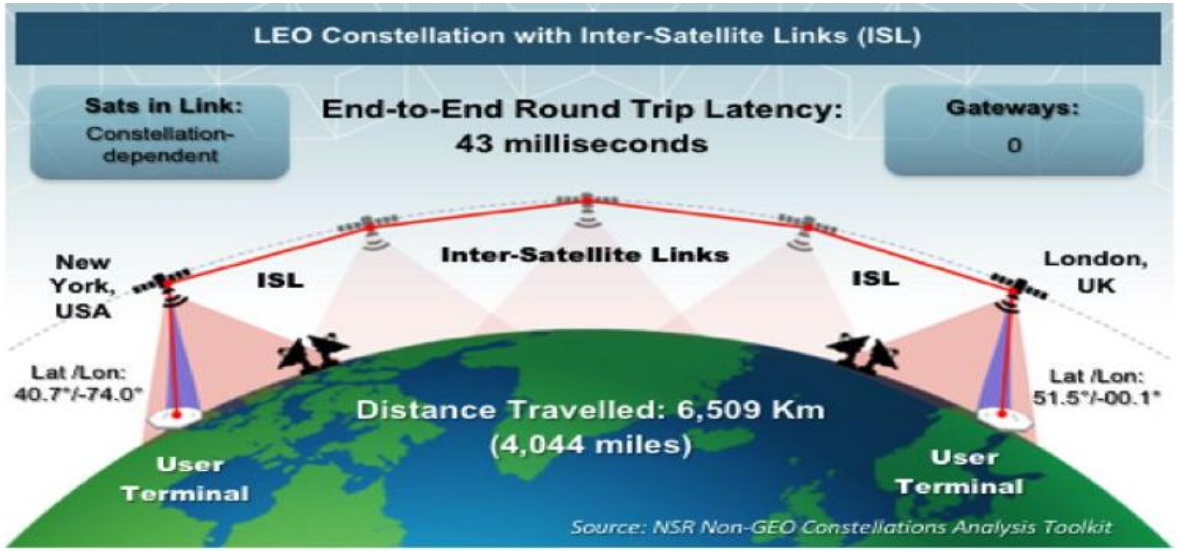


Non GSO FSS system **without** Inter-Satellite-Links (ISL) latency – **54** ms

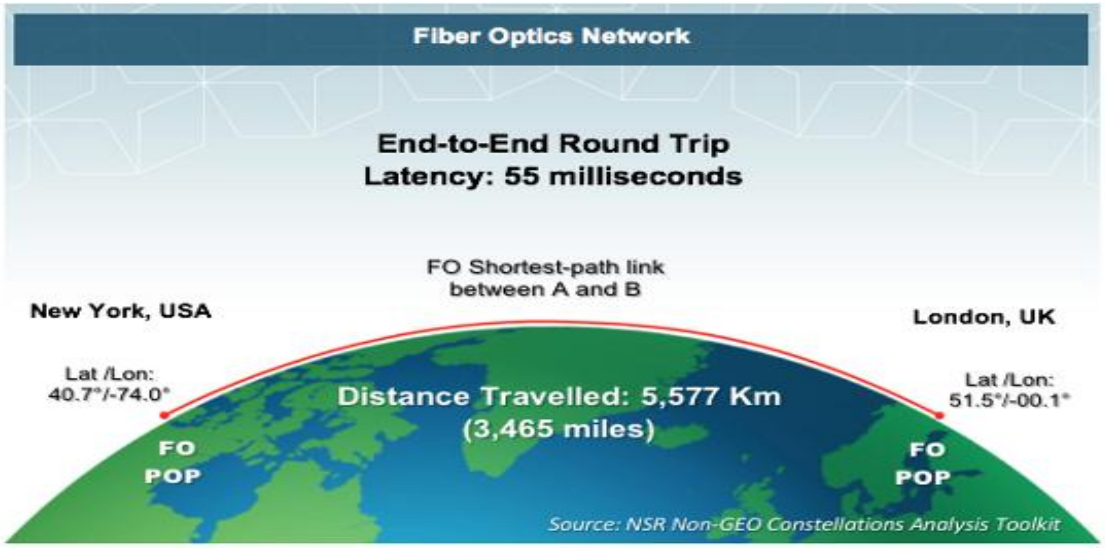




Non GSO FSS system **with** Inter-Satellite-Links (ISL) latency – **43** ms



Fiber optics can't deliver latency ***below 55 ms*** *due to fiber's light refraction index, which essentially makes light travel around 40% slower than in vacuum*



Non-GSO FSS projects

- As of **2014**... private companies *re*-started the idea of **non-GSO FSS *large*** satellite constellation projects...

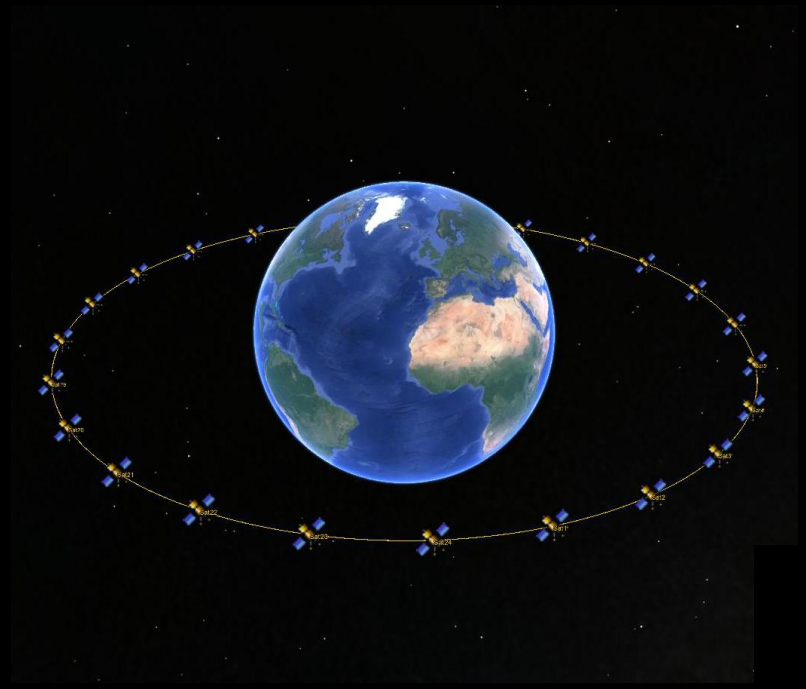
  - ✓ global coverage
  - ✓ broadband internet > **100 Mbps**
  - ✓ low latency < **50ms**
  - ✓ simple use terminal in **KU** band, gateways in **KA** band

  - ***O3b (UK)*** first non-GSO FSS broadband *in operation (2014)*
  - ***OneWeb (UK/F)*** *(after Chapter 11 bankruptcy process) offering service as of 2024...*
  - ***STARLINK*** (SpaceX) ***(NOR / USA)*** *in full constellation and operation - offering service as of 2022*

- **PLANNED non-GSO FSS systems** *(no RES-35 info yet...)*
  - ***KUIPER*** *(AMAZON)* ***(USA)*** *expected to offer service in 2026 ?*
  - **SPACEWAY, C-SAT-LEO, ACONNECT-B *(CHN)*** *– service in 202x ?*
  - **SKY-F, EXPRESS-RB, IK-NGSO-A10K *(RUS)*** *– service in 202x ?*

- **PLANNED European non-GSO FSS systems**
  - **MCSAT & AST-NG *(F)*** *– expected to offer service in 202x ?*
  - *several filings* ***(D)*** *– expected to offer service in 202x ?*
  - **3ECOM *(LIE)*** *– expected to offer service in 202x ?*
  - **OMNIA *(LUX)*** *– expected to offer service in 202x ?*
  - **IRIS² *(EU)*** *– expected to offer service in 202x?*

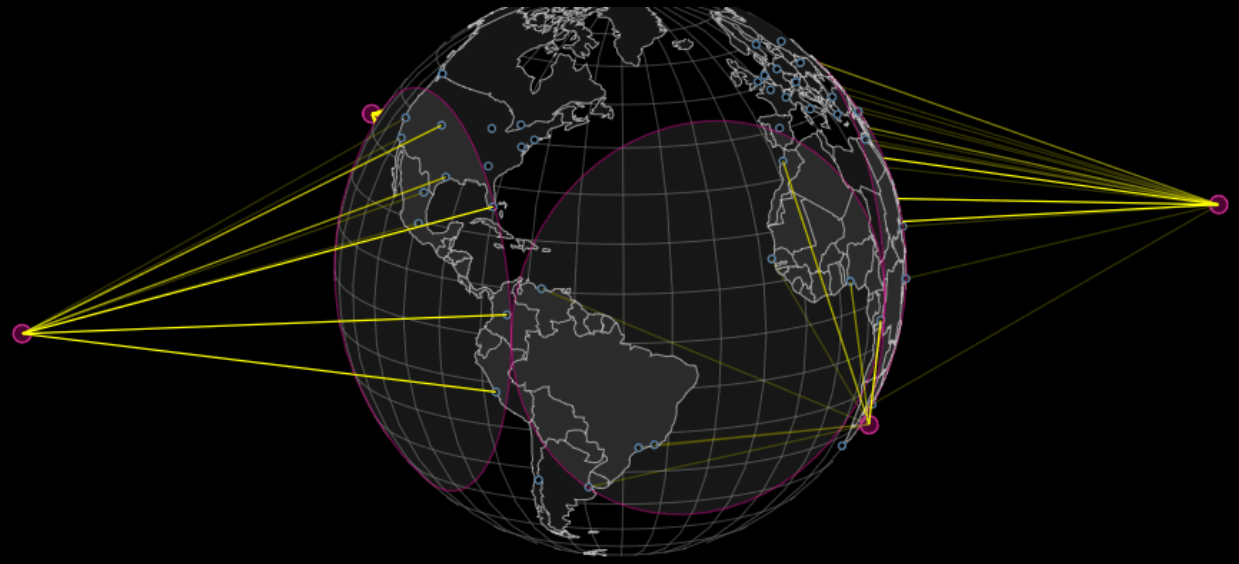
O3b



- *Circular* Orbit 8 062 km
- 1 Equatorial plane
- Service ±45º Latitude

- Roundtrip latency of less then **150ms**

- *Notified **24** satellites*



O3B notifying ADM and satellite networks

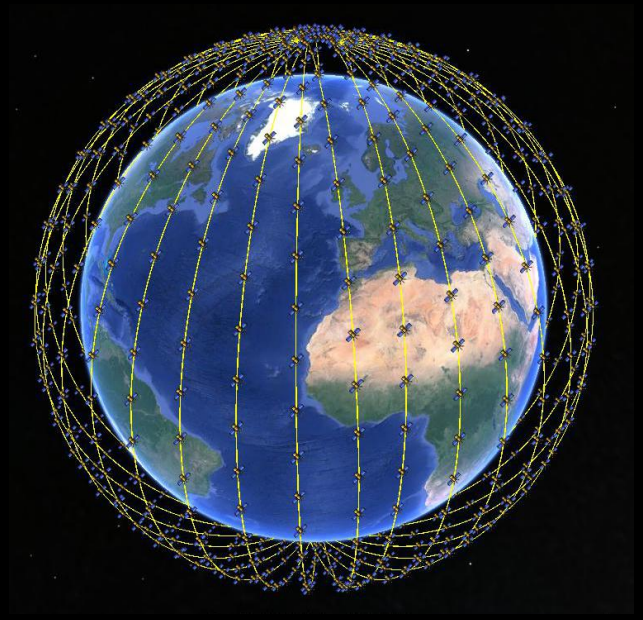
https://www.itu.int/net/ITU-R/space/res35

Satellite Name	ADM	BIU limit	M0	M1	M2	M3	No. of notified space stations	**No. of deployed space stations**
O3B-A	G	01.1.2021	Met	Met	01.1.2026	01.1.2028	24	**2**
O3B-B	G	01.1.2021	Met	Met	01.1.2026	01.1.2028	24	**2**
O3B-C	G	02.9.2021	Met	**Not Met**	02.9.2026	02.9.2028	<40 **(60)**	**4**

O3b

The first-generation O3b satellites launched on board of an Europeanized version of Russia's Soyuz rocket.
(Credit: ESA/CNES/Arianespace – Photo credit: P. Piron)

OneWeb



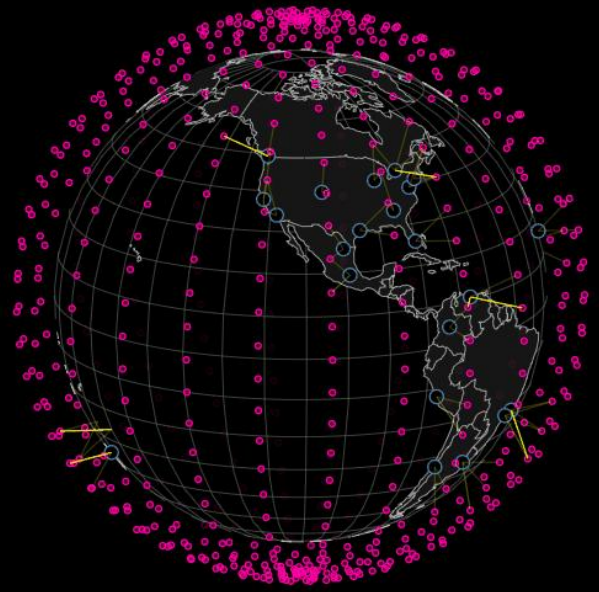
- *Circular polar* orbits at **800** - **1200** km
- 67 orbital planes at *88º* inclination

- Notified to the ITU 2692 satellites

- Up to MAY.2023 (last launch) launched *648 satellite / 12 orbits*

- Complete initial deployment **774** satellite / ***18*** orbits (first-generation satellite fleet) – Service in 2024 ?

OneWeb demonstrated a latency of below 100ms (< 70ms)



ONEWEB notifying ADM and satellite networks

https://www.itu.int/net/ITU-R/space/res35

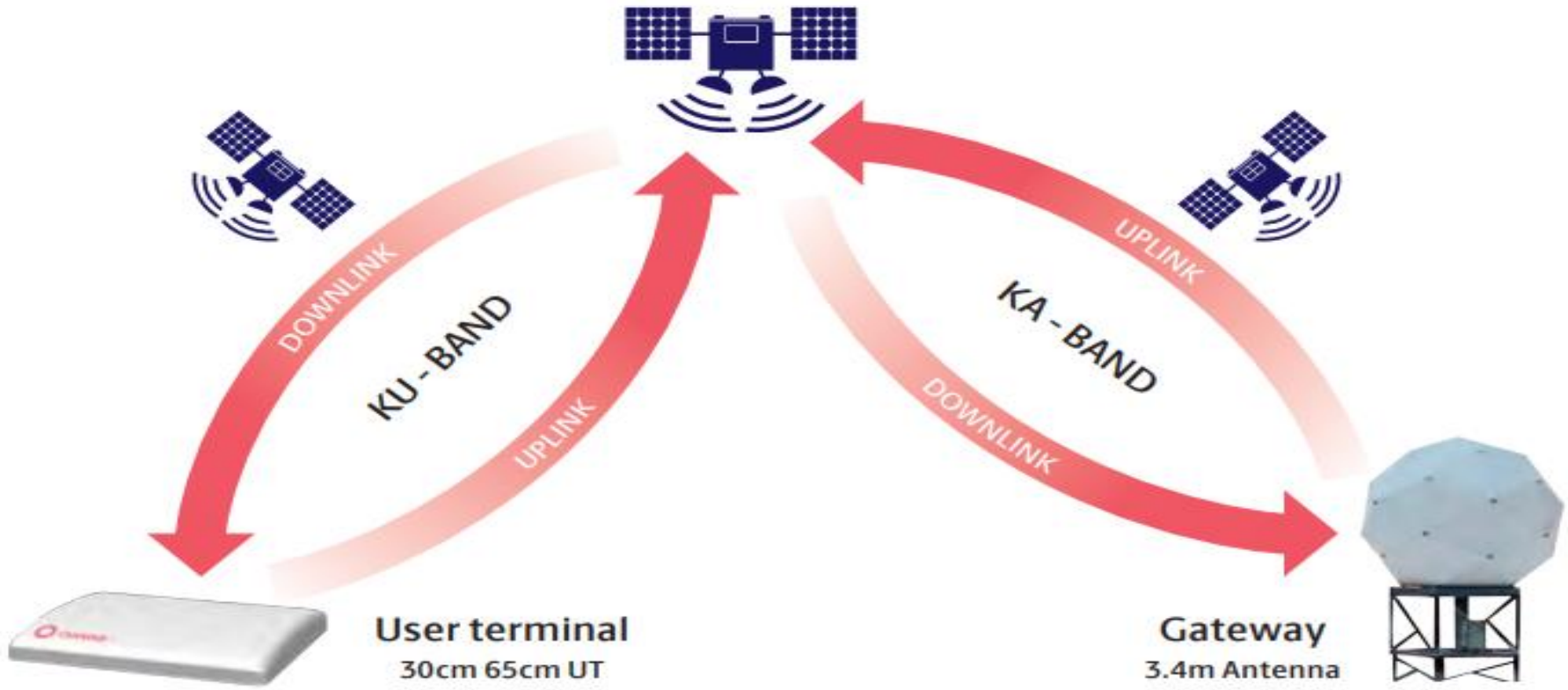
Satellite Name	ADM	BIU limit	M0	M1	M2	M3	No. of notified space stations	**No. of deployed space stations**
MCSAT LEO	F	01.1.2021	Met	Met	01.1.2026	01.1.2028	774	**77**
L5	G	01.1.2021	Met	Met	01.1.2026	01.1.2028	2692	**279**
THEO	G	22.6.2023	Met	22.6.2025	22.6.2028	22.6.2030	882	**2**
VERA	G	01.3.2024	Met	01.3.2026	01.3.2029	01.3.2031	882	**1**

OneWeb

(A stack of 36 OneWeb satellites 150 kg in mass are seen in launch configuration ahead for OneWeb's launch mission. Photo credit: Arianespace)

OneWeb network architecture

How **our connectivity** works



Constellation

- Low Earth Orbit (LEO) at 1,200km
- Low mass satellites positioned on 12 planes
- 49 satellites per plane with in-orbit spares
- Connectivity pole to pole

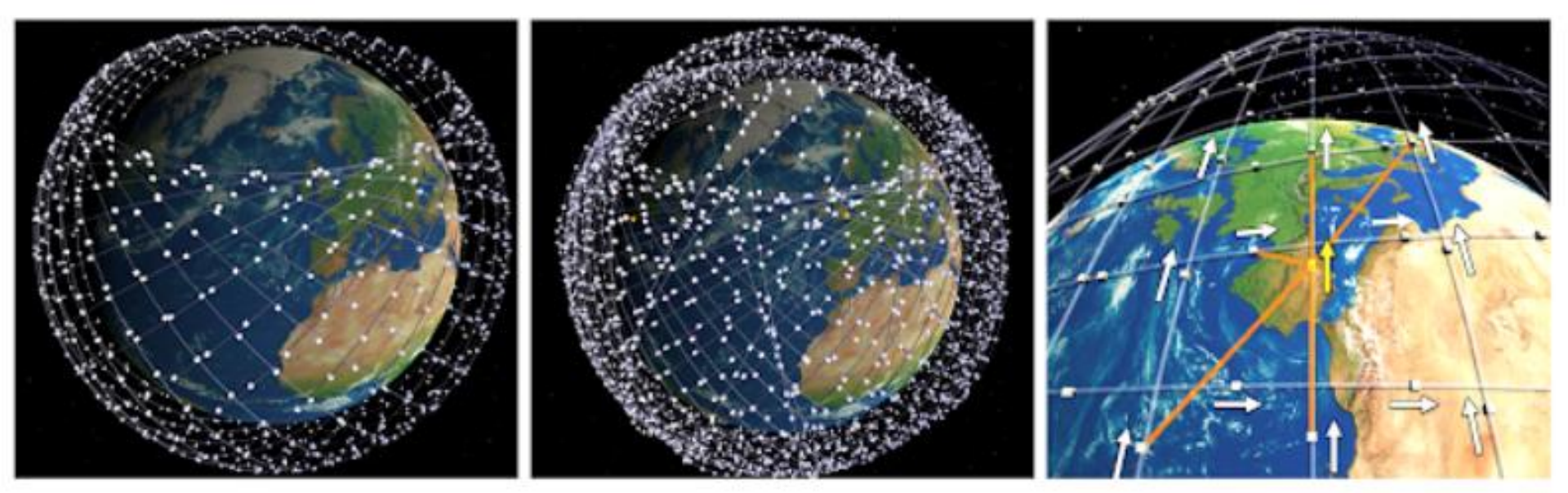
Ground

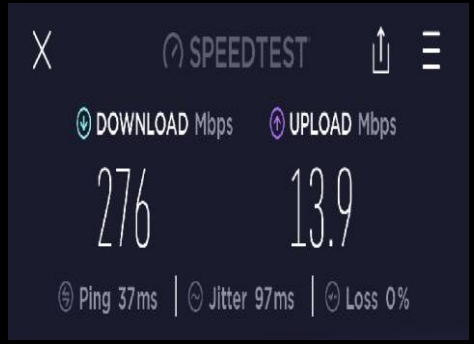
- Low-mass satellite production line
- Gateway earth stations located around the world
- User terminals designed for target markets
- Better look angles for signal strength

SpaceX - STARLINK

- Circular LEO orbits 550-1150 km
- 54 orbital planes at inclined (53º)
- 6 planes (70º) and 5 planes (81º)
- Notified to the ITU ***4408*** *satellites*
- **MAY 2025 – sats: 7.986 launched** / *7.105 operational*
- Initial service offer 2021

STARLINK advertises a max latency 20-40 ms, current field tests shows average around 40-50 ms





STARLINK notifying ADM and satellite networks

https://www.itu.int/net/ITU-R/space/res35

Satellite Name	ADM	BIU limit	M0	M1	M2	M3	No. of notified space stations	No. of deployed space stations
STEAM-1	NOR	27.6.2021	Met	Met	27.6.2026	27.6.2028	4408	**442**
STEAM-2	NOR	27.6.2021	Met	Met	27.6.2026	27.6.2028	1312	**133**
STEAM-2B	NOR	01.1.2024	Met	01.1.2026	01.1.2029	01.1.2031	1584	**1**
USASAT-NGSO-3A-R	USA	01.1.2024	Met	01.1.2026	01.1.2029	01.1.2031	1584	**1**
USASAT-NGSO-3B-R	USA	01.1.2024	Met	01.1.2026	01.1.2029	01.1.2031	1584	**1**
USASAT-NGSO-3D	USA	01.1.2024	Met	01.1.2026	01.1.2029	01.1.2031	1512	**1**

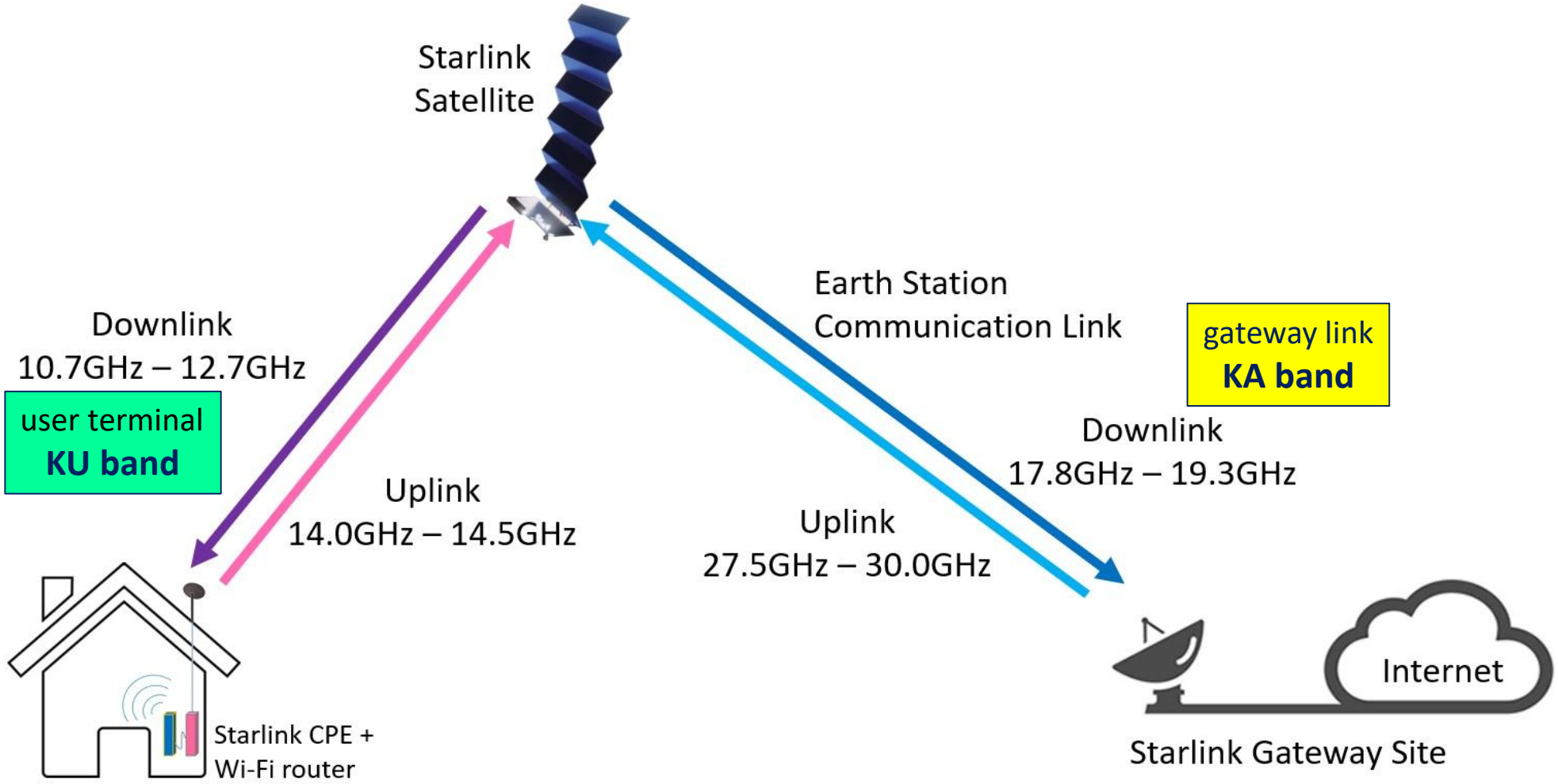
STARLINK

(Stack of 46flat-packed STARLINK satellites, each about a *250kg in mass*. Photo credit: SpaceX)

STARLINK – GEN1 & GEN2 "mini" *comparison*

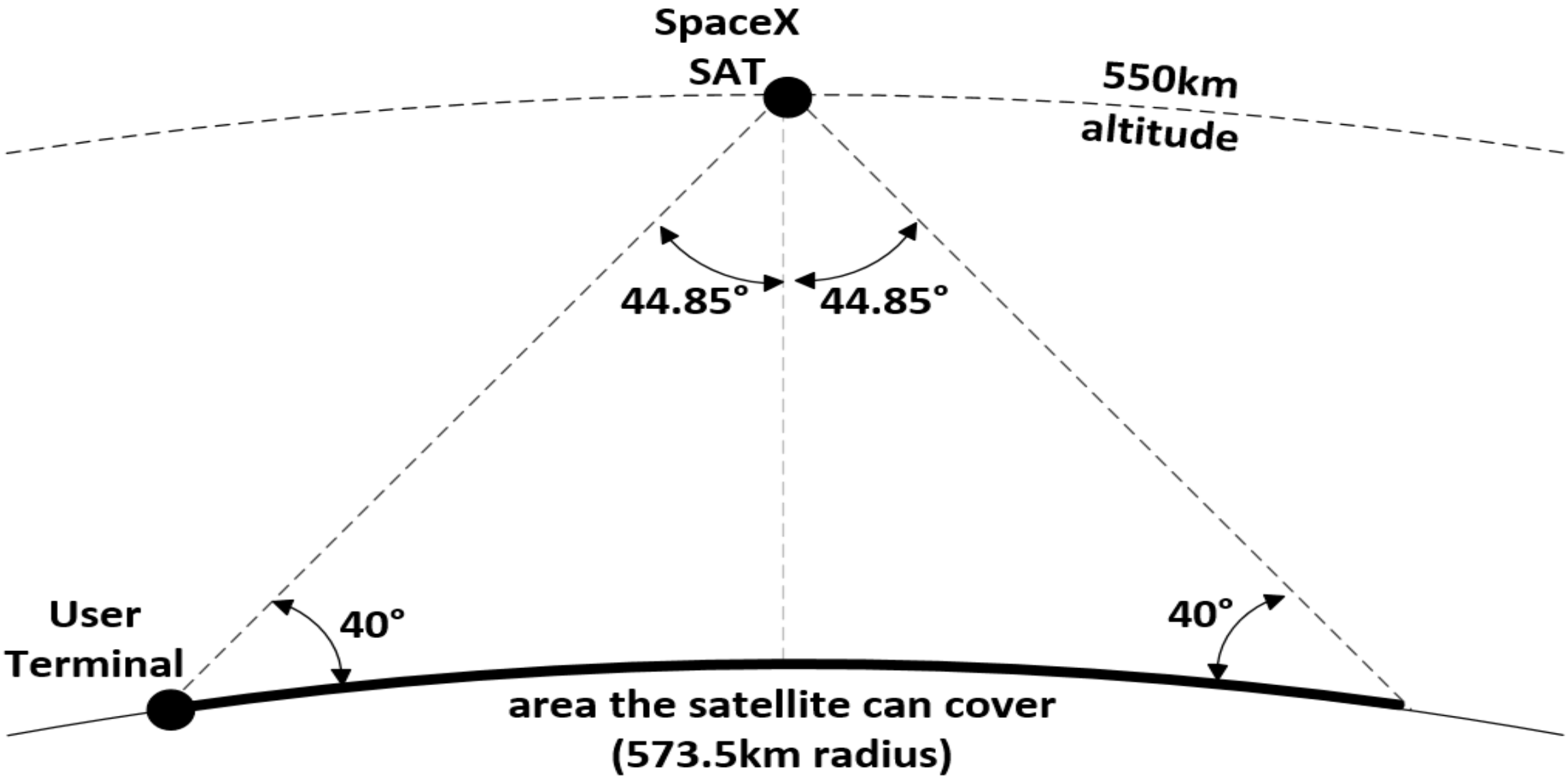
	Length (m)	Width (m)	Number	Area (m^2)	DAS Area (m^2)	DAS Mass (kg)
Solar Array F9-1	8.1	2.8	1	22.68		
Bus F9-1	2.8	1.3	1	3.64		
Total Area F9-1				26.32	30	303
Solar Array F9-2	12.8	4.1	2	104.96		
Bus F9-2	4.1	2.7	1	11.07		
Total Area F9-2				116.03	120	800
Solar Array Starship	20.2	6.36	2	256.94		
Bus Starship	6.4	2.7	1	17.28		
Total Area Starship				274.22	294	2000

Starlink Network Architecture

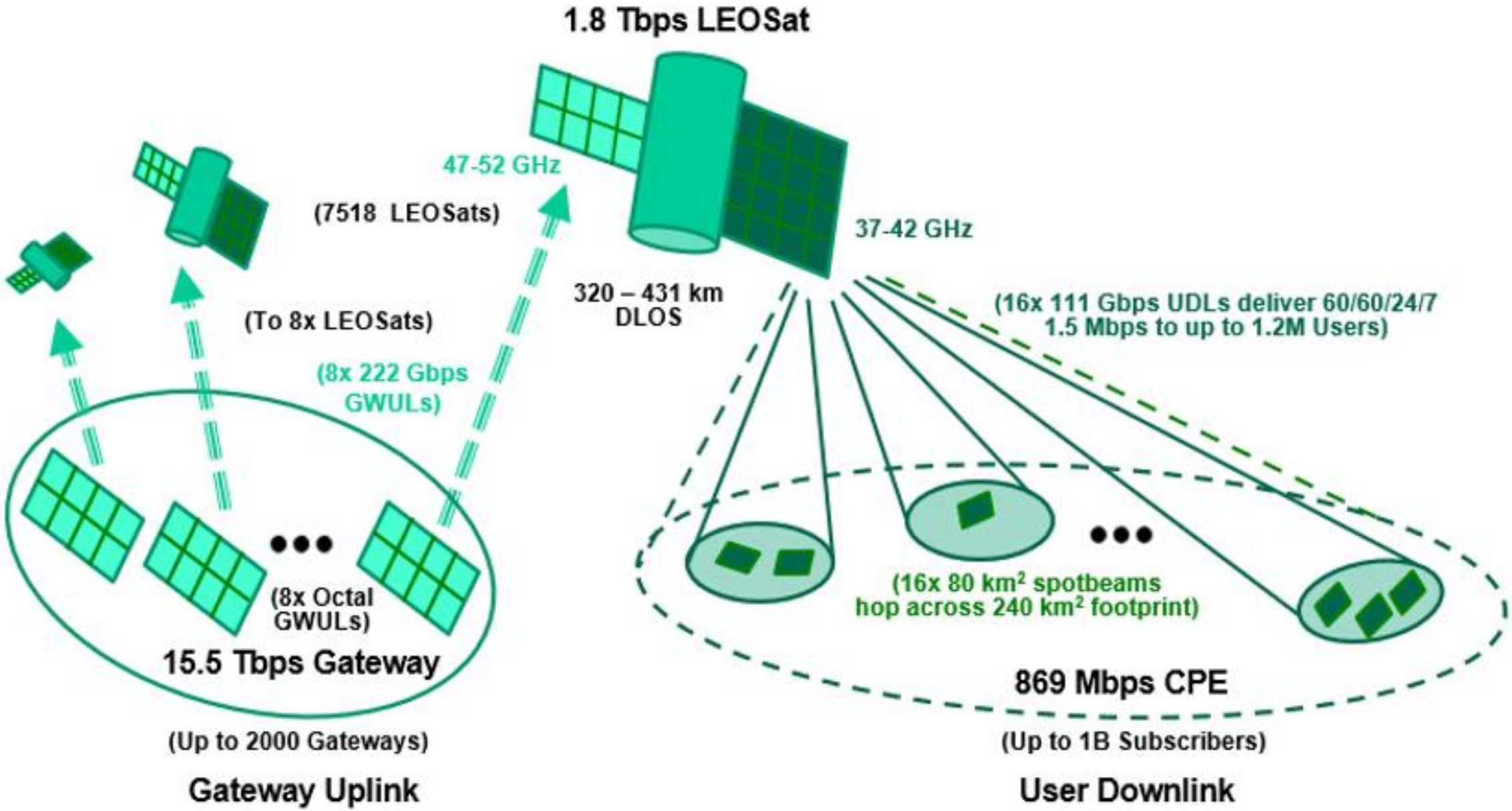


Based on Starlink Services submission to FCC

Steerable *Service area* range of STARLINK beams at 550 km altitude



STARLINK "GEN2" Network architecture



Non-GSO FSS user terminals

O3b

Terminal is comprised of a pair of 2.4m **CONSTANTLY TRACKING** dish antennas under the control of a single dedicated antenna control unit.

The tracking function is done by having one antenna acquire and follow a rising O3b satellite while the second antenna is parked in a home position awaiting the next rising O3b satellite.

New Get SAT terminals can use a single electronically steered antenna ***20x60cm/15kg*** *to access the O3b network*

OneWeb

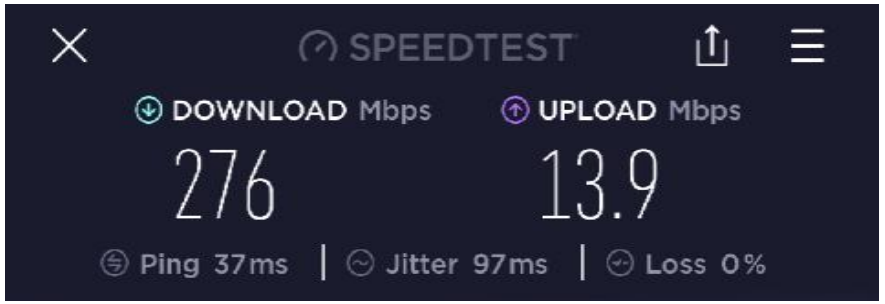
Electronically steered user terminal flat-panel antenna **50x43x10 cm / 10 kg**

STARLINK

Automatic elevation setup and electronically steered terminal

V2 – dish **58cm/7.3 kg**

V3 - flat-panel antenna **59x39x20cm/3.2 kg**



EU – IRIS²

https://defence-industry-space.ec.europa.eu/eu-space-policy/iris2_en

- The **EU** Governmental Satellite Communications **IRIS²** <*Infrastructure for Resilience, Interconnection & Security by Satellites*> will improve and expand the components of the **existing** EU Space Programme:
  - **GALILEO** - EU Global Navigation Satellite System (**GNSS**)
  - **EGNOS** - EU GSO Navigation Overlay Service (regional Satellite-Based Augmentation System (**SBAS**))
  - **COPERNICUS** - EU Earth Observation (**EO**) programme (space based observation at our planet and its environment)
  - Secure SATCOM **- GOVSATCOM** - resilient satellite communications for security and safety critical missions and governmental operations managed by the EU

- Aims at providing high speed broadband *secure and cost-efficient communications capabilities to security and safety critical missions and operations* managed by the EU and its Member States, *including national security actors and EU Agencies and EU embassies*
- Support for Machine to Machine (**M2M**) and Internet of Things (**IoT**) communications

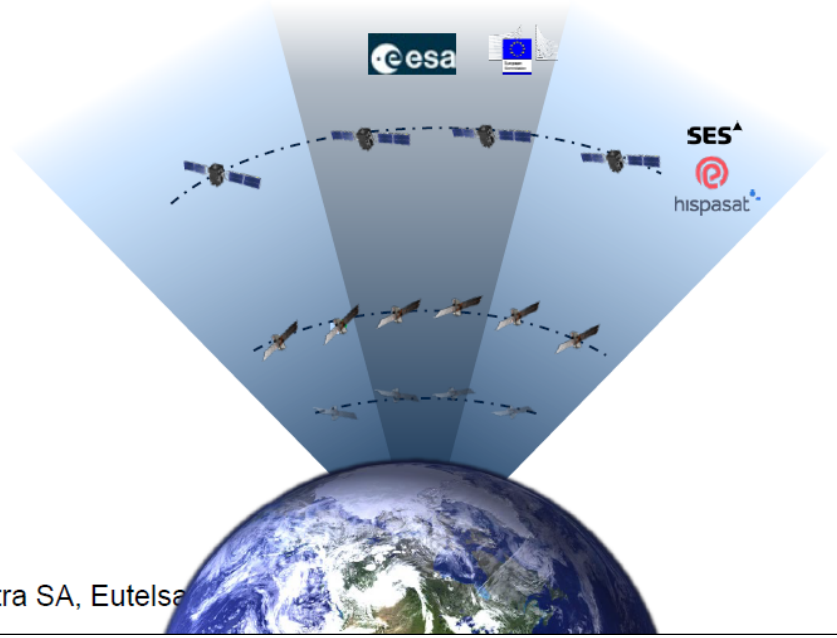
SpaceRISE and Core Team

SpaceRISE

SpaceRISE as IRIS² concessionaire

EUTELSAT	SES	HISPASAT

- **Designing, Developing and Delivering** the IRIS² governmental infrastructure
- **Operating and Maintaining** IRIS² governmental infrastructure and Deliver IRIS² governmental services
- **Co-investing to Develop and Deliver** IRIS² commercial services based on IRIS² infrastructure and commercial infrastructure



Supported by a wide industrial set-up

Airbus Defence and Space	OHB	T-Systems	Telespazio
Thales Alenia Space France	Thales SIX	Orange	Hisdesat

Space Infrastructure, Ground Infrastructure, Engineering support, Security, Operations, Service

To maximise participation of the industry, SpaceRISE encourages its Core Team Members to host additional industry days

Space Resilient, Interconnected and Secure Europe https://www.spacerise.eu

esa esa-star Publication

News

Log-in

- COVID-19 measures and instr...
- EMITS to be replaced by the ...
- All News
- Announcements
- Events
- General
- Procurement Related News
- Procurement Review Board Ann...

UNION SECURE CONNECTIVITY PROGRAMME (IRIS²) – SPACERISE HIGH-LEVEL GROUND SEGMENT PROCUREMENT PLAN

Publication Date	Last Update On	Classification
19/09/2025	19/09/2025 09:42 CET	Procurement Related News

At the request of the SpaceRISE consortium - consisting of Eutelsat S.A., Hispasat S.A., and SES Astra - ESA is hereby publishing this high-level procurement plan in the frame of the Union Secure Connectivity Programme (IRIS²). Further details are available in the attached PDF document.

Attachments

IRIS2 Programme_High-level Ground Segment procurement plan.pdf

Download

IRIS² multi-orbit constellation services and features overview

SpaceRISE

IRIS² services

	HardGov services	LightGov services	Commercial services
Users	Governmental authorized users, robust security grade services	Governmental authorized users, assured security grade services	Commercial users
Infrastructure	Governmental Infrastructure Interf. with G-Hub (Serv. Mgt)	Shared and Commercial infrastructure Interf. with G-Hub (Serv. Mgt)	Shared and Commercial infrastructure.
Applications	Crisis Management / Surveillance / Key infrastructure Protection and Mgt. / **Robust Space data relay**	Crisis Management / Surveillance / Key infrastructure Protection and Mgt.	Commercial apps incl. mobile and fixed broadband, trunking for B2B services, etc.

5G

IRIS² Features

High Resiliance and Security

- Highest security standards
- Robust and assured security grade services
- High automation and man-in-the-loop safety

Committed SLAs

Guaranteed throughput, very low latency and high availability covering all type of applications (fixed, mobility and nomadic)

Open Platform and High flexibility

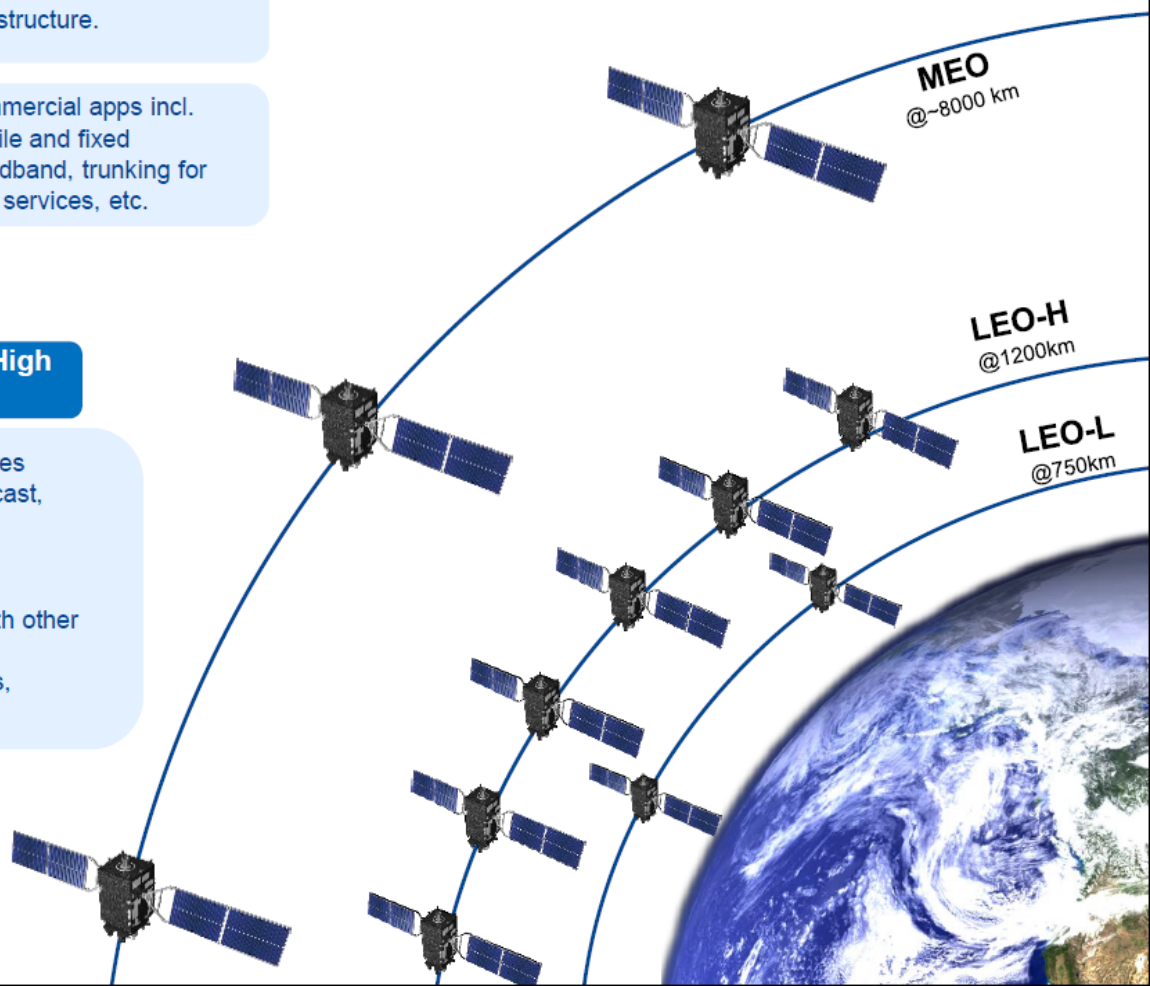
- Transparent mode services
- Support of unicast, multicast, mesh and star network configurations
- UT to UT connectivity
- Capability to integrate with other EU Space Programme Components (Copernicus, Galileo, etc.)

Full 5G compatibiity

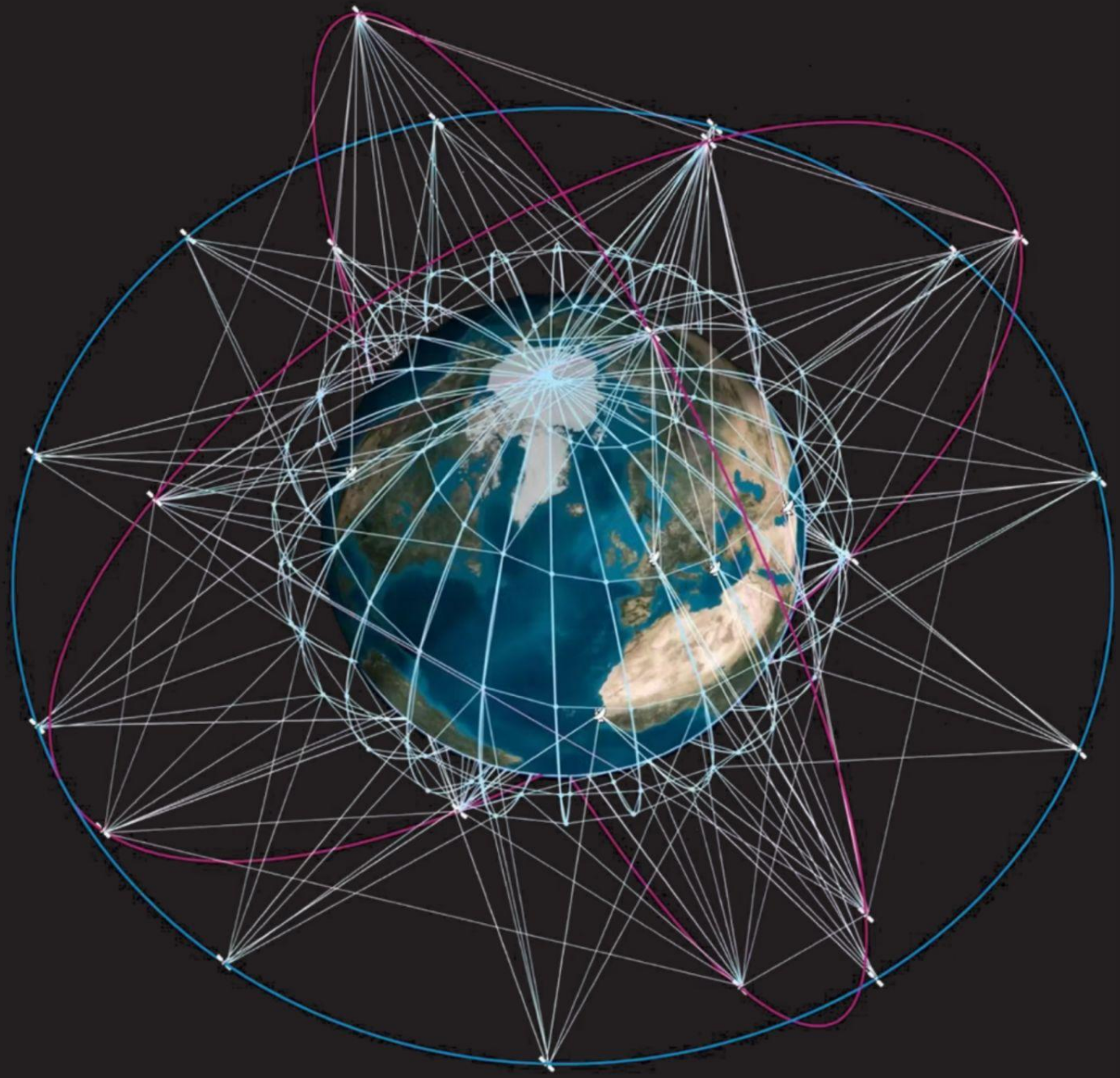
- 5G regenerative capabilities from LEO and MEO
- UT to UT through 5G mesh

Global Coverage

- MEO Polar coverage
- MEO+LEO continental Europe coverage
- Full ISL mesh



IRIS² multi orbit constellation



Multi-orbital constellation of 290 satellites

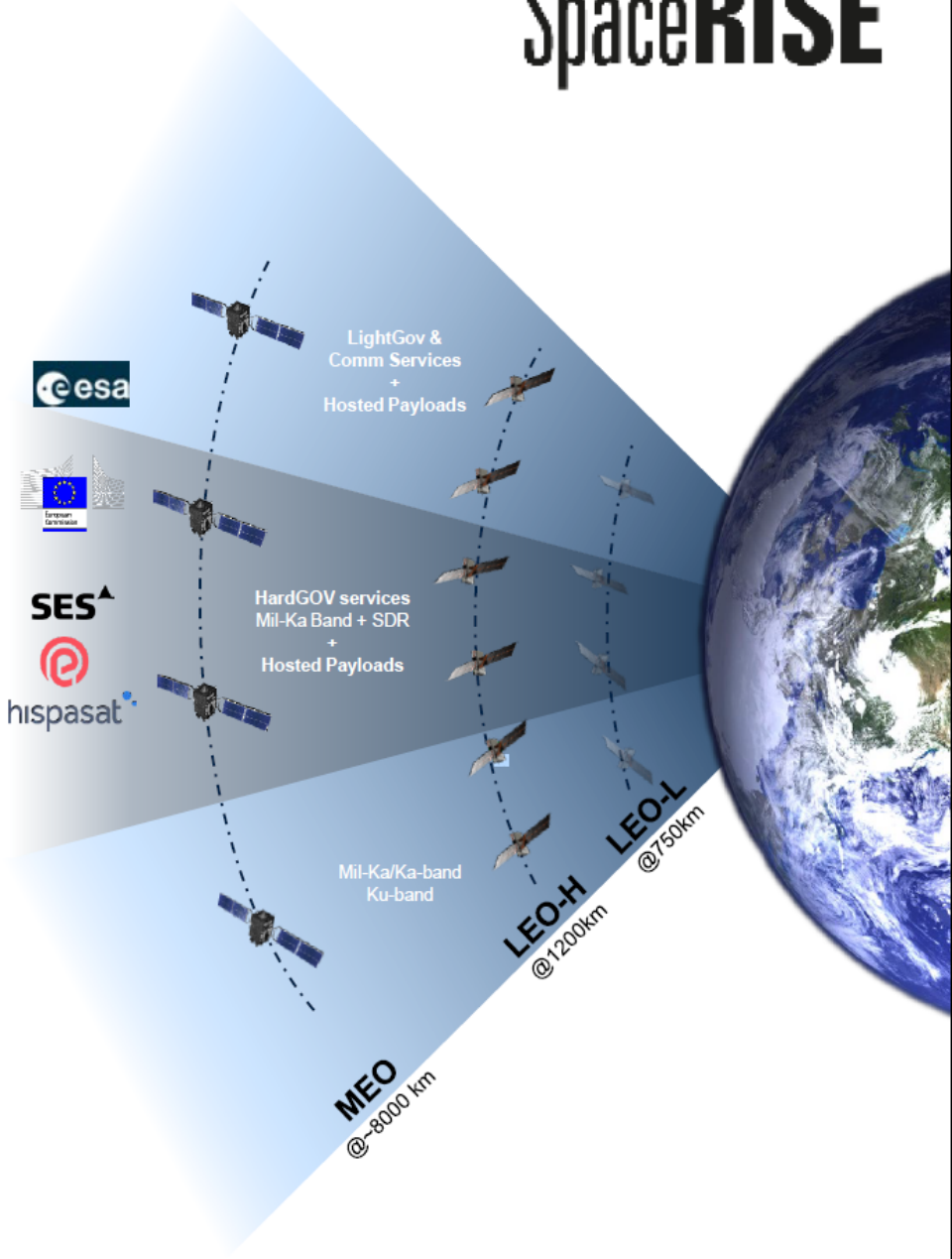
IRIS² multi-orbital design architecture

Multi-orbital constellation of 290 satellites

SpaceRISE

IRIS² design architecture			
Space Segment			
Constellation	18 MEO	264 LEO-H	10+ LEO-L
Payload	Regenerative + Transparent	Regenerative + Transparent	
Multiband	Ka-Mil/Ka virtualized + UHF (tbd) + SDR	Ka-Mil/Ka virtualized + Ku + SDR	
Network	5G Mesh		
Ground Segment	5G Core Network		
User Terminals	Multi-purpose FPA | Multi-waveform | Phased array | Multi orbit		

IRIS² innovation and security highlights			
Innovation & Technology	Regenerative processor, 5G – multi-waveform	Digital Beam Forming Network	Sovereign Cloud based Ground Infrastructure
	Active antennas	Optical Inter Satellite Link	
Security	Robust and assured security grade		



IRIS² notifying ADM and satellite networks

INTERNATIONAL TELECOMMUNICATION UNION
RADIOCOMMUNICATION BUREAU

Special Section of
BR IFIC No. 3026
dated 23 July 2024

Change of Notifying Administration for FMS-LEO and DEUMULTIORBIT satellite networks

Following the decision of the Member States of the European Union to form a group of ITU Member States to jointly manage frequency assignments of the space stations within the framework of the European Union's satellite constellation program for secure connectivity (IRIS²), the Administrations of France and Germany, acting as the notifying administrations of the intergovernmental satellite organization EUROPEAN UNION (F/UE and D/UE) on behalf of this organization and acting on behalf of AUT, CZE, D, EST, F, FIN, HNG, HOL, HRV, SVK have informed the Radiocommunication Bureau to transfer the frequency assignments of FMS-LEO and DEUMULTIORBIT satellite networks from F and D to F/UE and D/UE respectively.
The information has been updated in the following Special Sections and Parts.

ntc_id	sat_name	d_rcv	ssn_ref	ssn_no	ific_no	ific_date
120545249	FMS-LEO	13.10.2020	API/A	12684	2935	08.12.2020
120545249	FMS-LEO	13.10.2020	API/B	1604	2946	18.05.2021
121500068	FMS-LEO	08.04.2021	PART I-S		2947	01.06.2021
121500068	FMS-LEO	08.04.2021	PART II-S		2959	16.11.2021
123545061	DEUMULTIORBIT	13.03.2023	API/A	13277	2997	30.05.2023
123545061	DEUMULTIORBIT	13.03.2023	API/B	2396	3009	14.11.2023

Total No. satellites	No. of orbital planes	Inclination angles	Orbits (km)	Freq. bands (GHz)
19, 708	899	0 - 85	500 – 1,400 8,100 12,000 -23, 222	7.25-7.75 7.9-8.4 20.2-21.2 / 30-31

Non-GSO FSS satellite system & the RR - 1

There is no formal regulatory definition in the RR related to "Satellite *large* "**MEGA**" constellation"

➢ It can be considered as *a constellation* comprised of *a group of non-GSO satellites* operating in the frequency bands allocated to the Fixed-Satellite service (**FSS**) (RR No.**1.21**)

- with *similar characteristics and functions*
- operating in *a similar or complementary orbital planes at LEO, MEO or HEO orbits*
- *under* a shared control and
- *a coordinated ground coverage*

❖ RR No.**22.2** Non-GSO systems *shall not cause unacceptable interference to / not claim protection* from GSO FSS & BSS (*ULTIMATE protection*)

❖ According to RR No.**22.5I** - No.**22.2** obligation is ***FULFILLED*** by the non-GSO FSS, *if they comply with equivalent power-flux density (**epfd**) limits,* (given in Tab 22 of RR ART **22**)

without requiring individual coordinations with all GSO systems worldwide

Non-GSO FSS satellite system & the RR - 2

Non-GSO FSS spectrum

in C, Ku, Ka, Q and V bands

Bands subject to epfd limits

- RR Article **22** apply
- *epfd limits imposed* on N-GSO FSS satellites *to protect* GSO FSS&BSS

No.22.5I - epfd COMPLIANCE

Bands subject to coordination

- N-GSO and GSO satellite syst. *are treated on equal footing*
- First-come, first served
- Coordination is effected under Nos. **9.11A/9.12/9.12A**

ART 9 Coordination is REQUIRED

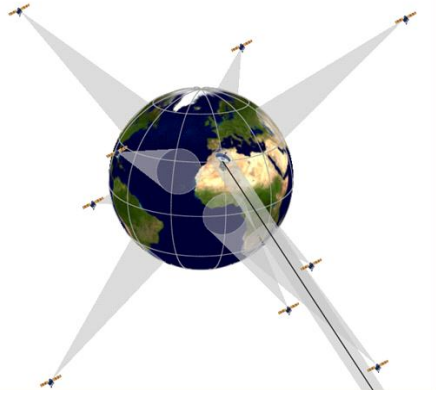
Bands NOT subject to coordination

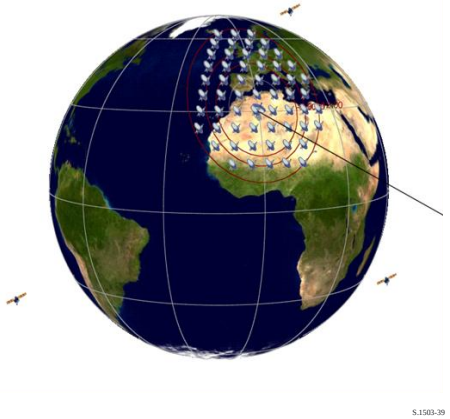
- N-GSO satellite systems *are treated on equal footing*
- API commenting under No.**9.3**

ART 9 Coordination is NOT REQUIRED

Non-GSO FSS satellite system & the RR - 3

- Equivalent power-flux density (**epfd**) takes into account the *aggregate* of the emissions from all non-GSO satellites in the direction of any GSO satellite or GSO earth station, taking into account the GSO antenna directivity
- **epfd** considers *pointing of a* victim receiving antenna with respect to any source of interference
- Complex calculation methodology considers an *interference varying in time and space*
- The *current epfd validation software* is based on Recommendation ITU-R **S.1503-2**





epfd data and epfd examination results

https://www.itu.int/ITU-R/go/space-epfd/

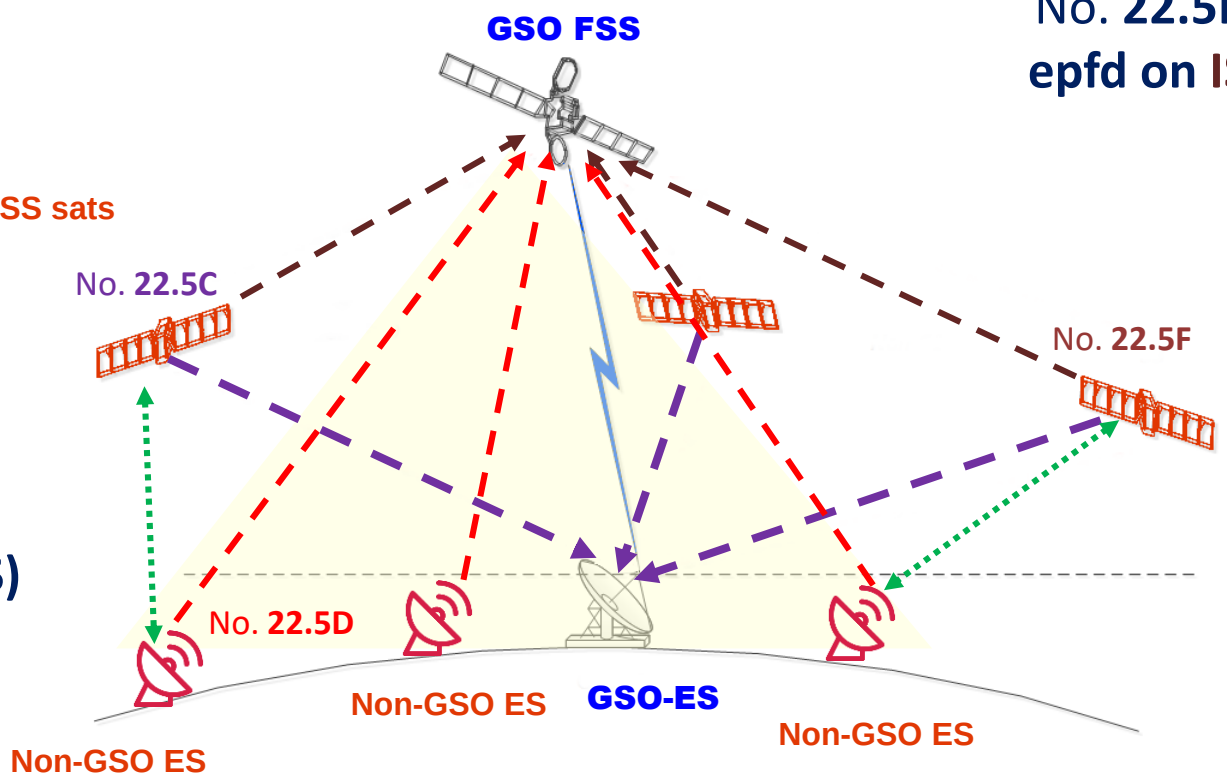
Non-GSO FSS satellite system & the RR - 4

❖ Recommendation ITU-R **S. 1503** (Part C) provides details on procedure to create masks.

- **PFD masks** define an *envelope of the power radiated by the non-GSO space stations* taking into account different beam steering and/or switching strategy, power control due to specific service latitude or decrease sidelobe radiation *towards any potential GSO victim receiver communicating with GSO space station located anywhere on GSO visible arc*
- **EIRP-mask** define an *envelope of radiation of non-GSO earth station* which would basically correspond to earth station antenna pattern and transmitted power which may be changing with the latitude of earth station
- An additional type of **EIRP-mask** defining an *envelope of transmission from non-GSO space station towards GSO-arc* which required in the frequency bands where potential victim GSO link may operate in Earth-to-space direction (such as 17.8-18.4 GHz where non-GSO and GSO links may operate in opposite direction)

Non-GSO FSS satellite system & the RR - 5

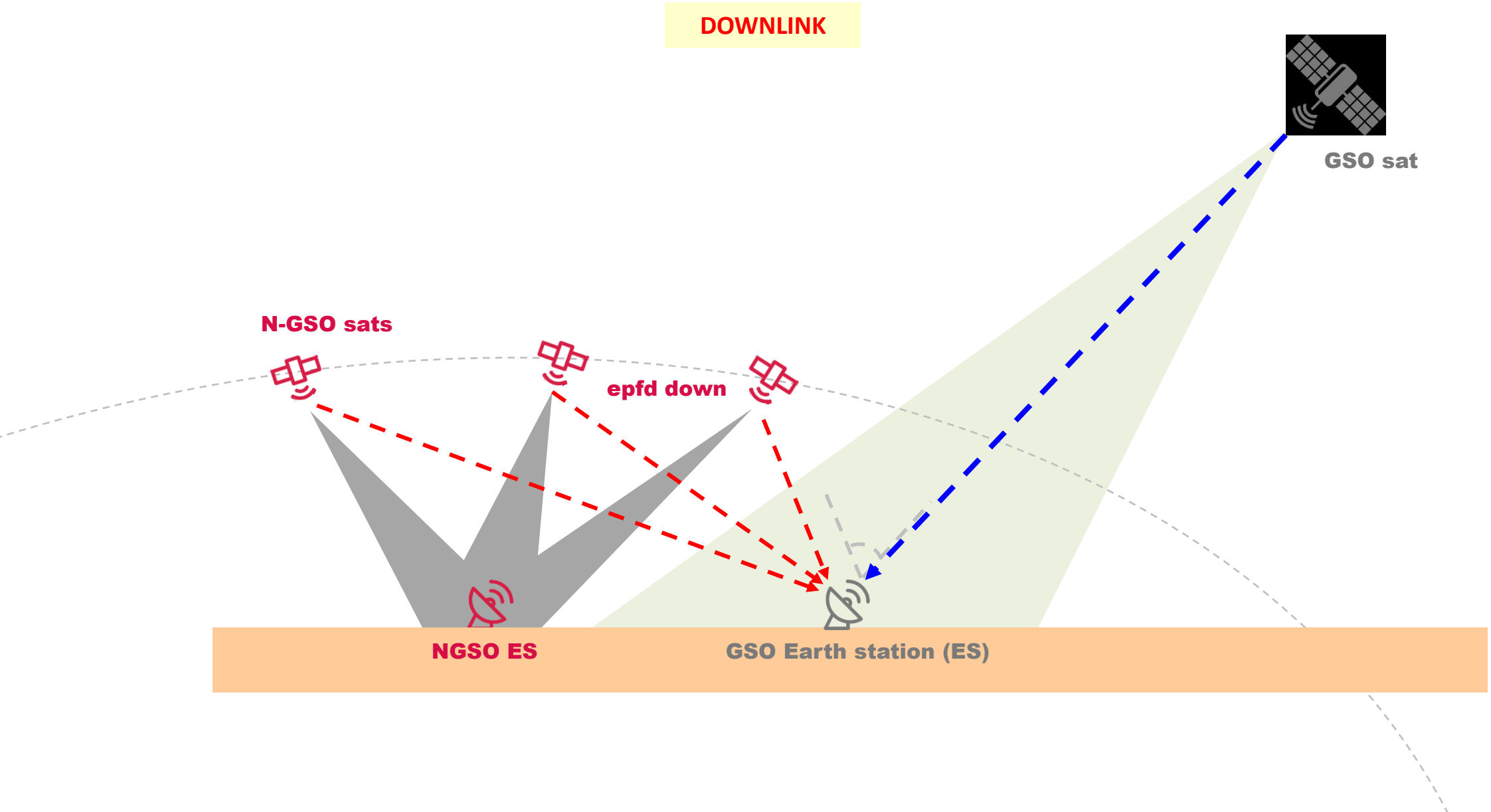
No. **22.5F**
epfd on IS



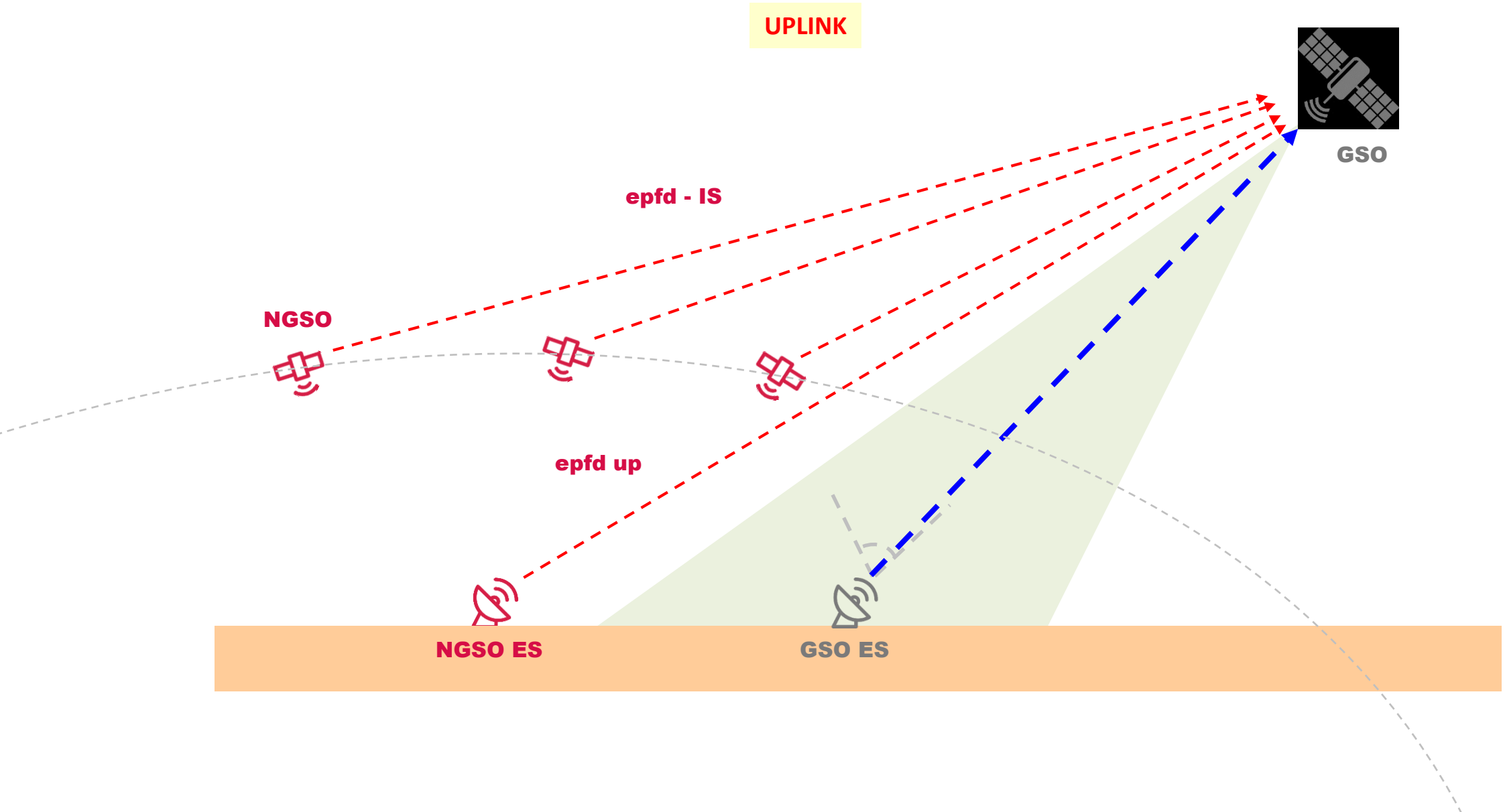
No. **22.5C**
epfd on downlink

No. **22.5D (non-GSO ES)**
epfd on uplink

Non-GSO FSS satellite system & the RR - 6



Non-GSO FSS satellite system & the RR - 7



WRC-19 – non-GSO FSS BIU Decision

No.11.44C A frequency assignment to a space station in a *non-GSO system in the FSS, MSS or BSS* *shall be considered as having been brought into use*

- when ***a*** *space station* with the *capability of* transmitting or receiving that frequency assignment,
- *has been deployed and maintained* ***on one*** *of the notified orbital plane*(s) of the non-GSO system *for a continuous period of 90 days,*
- ***irrespective*** *of the notified number of orbital planes and satellites per orbital plane in the network or system*
- *The notifying ADM shall so inform the Bureau within 30 days from the end of the 90-day period...*

WRC-19 – RES-35 non-GSO FSS Milestone Decision

RES-**35** (WRC-19) - A milestone-based approach for the implementation to space stations in a non-GSO system in *specific frequency bands and services*

- adoption of a milestone-based approach is providing *a regulatory mechanism to help ensure that the ITU Master International Frequency Register (MIFR) reasonably reflects the actual deployment of such non-GSO systems* and improve the *efficient use of the orbital/spectrum resource in those frequency bands and services;*

- in defining the timeline and objective criteria for the milestone-based approach, there is a need to seek *a balance between the prevention of spectrum warehousing, the proper functioning of coordination mechanisms, and the operational requirements* related to the deployment of a non-GSO system;

- *adherence to fixed milestone periods is desirable*, as this creates certainty with respect to the deployment

✓*Specific* frequency bands in **Ku**, **Ka**, **Q** and **V** – applicable to non-GSO systems in FSS, BSS or MSS

WRC-19 – RES-35 non-GSO FSS Milestone dates / periods

resolves 2 ***(No.11.44*** ***on / after 1JAN 2021)*** period under *resolves 7*	*resolves 3* ***(No.11.44 expired*** ***prior 1JAN 2021)*** dates under *resolves 8*	number of space stations ***declared as deployed*** *are equal or more as*	**ADM shall submit a MOD** to the *notified characteristics* if the number of space stations *declared as deployed* is
a) 30 days after the expiry of the **2-year period** after No.**11.44** *(i.e. 9 years after CR submission)*	*a) no later than* **1 FEB 2023** (i.e. 1JAN+*30days*)	a) **≥10% of the total** number of satellites - **OK**	a) **<10%** - the modified total number of satellites *shall **not be greater** than ten (**10**) times* the number of space stations declared as deployed
b) 30 days after the expiry of the **5-year period** after No.**11.44** *(i.e. 12 years after CR submission)*	*b) no later than* **1 FEB 2026** (i.e. 1JAN+*30days*)	b) **≥50% of the total** number of satellites - **OK**	b) **<50%** - the modified total number of satellites *shall **not be greater** than two (**2**) times* the number of space stations declared as deployed
c) 30 days after the expiry of the **7-year** period after No.**11.44** *(i.e. 14 years after CR submission)*	*c) no later than* **1 FEB 2028** (i.e. 1JAN+*30days*)	c) **=100% of the total** number of satellites - **OK**	c) **<100%** - the modified total number of satellites *shall **not be greater** than the number of space stations declared as deployed*

WRC-19 – RES-35 non-GSO FSS Milestone failure

❖ In case of failure to meet a RES-35 Milestone, ADM *shall submit **MOD**ification of notification* (*resolves 11*)

❑ These modifications are *limited to*:

- Reduction of the number of orbital planes (AP**4** data item ***A.4.b.2***)
- MODs to the longitude of the ascending node (AP**4** data item ***A.4.b.4.j***) associated with the remaining orbital planes
- Reduction of the number of space stations per plane (AP**4** data item ***A.4.b.4.b***)
- MODs of the initial phase angle of the space stations (AP **4** data item ***A.4.b.4.h***) within planes

✓ **a commitment** stating that the characteristics as modified *will not cause more interference or require more protection than the characteristics provided in the latest notification information* published in Part I-S of the BR IFIC for the frequency assignments (AP**4** data item ***A.23.a***)

WRC-23 RES-35 MOD – non-GSO BIU post milestone Decision

r19) ADM shall communicate to BR deployment information (Annex1) after the expiry of the 11-years period (ref. in No.11.44)

r20) ADM shall communicate to BR information (Annex1) 4 years from the date under *r 19*, and *every **4 years** thereafter*

r21) IF the number of satellites reported pursuant to *r19 or 20* is less than:

$$X = N \cdot 50\% \text{ for } N \leq 340$$

$$X = N - 67 \cdot \log(N) \text{ for } 340 < N \leq 4\,950$$

$$X = N \cdot 95\% \text{ for } N > 4\,950$$

(***N** is the total number of satellites in the non-GSO system indicated in the MIFR)*

- *IF the number of satellites deployed remains less than **X**, on the **due da**te of the subsequent report under r20*,
- ADM shall submit **MOD** to the characteristics of the notified frequency assignments ***to align** with the number of space stations declared as deployed*

r22) non-GSO system that has completed the milestone process... *if the number of satellites falls below the total number of satellites indicated in the MIFR*, ADM shall, *for information purposes only:*

a) provide a report to BR, on an annual basis, containing the date when this events began, and a general explanation of the event(s) for each affected satellite;

b) provide to BR, either as part of the annual report under *r22a)*, or with the next report under *r19 or 20*, *the dates on which each affected satellite was restored to operational status or replaced*;

WRC-23 RES-8 – Orbital characteristics tolerances Decision 1

RES-**8** - Tolerances for certain orbital characteristics of non-GSO systems in the FSS, MSS or BSS

- ADM shall communicate to the BR the **deployed space stations** according to the Annex 1 (1.4.2025 or at BIU date)

➢ ***WHEN***:

*a) the difference between the observed and the notified distances (apogee and perigee) is **70 km** or **less** (or of 5% in km or less (for a notified altitude greater than 2 000 km)),and*

b) the difference between the observed and the notified angle of inclination is 2 degrees or less (or 3 degrees or less (for a notified altitude greater than 2 000 km)

❖ *ADM shall provide as part of its report, **an explanation of why there is a difference** between the observed and the notified values for the orbital characteristics of the space station*

➢ ***WHEN***:

*a) the magnitude of the difference... is between **70** and **100 km** or 5% and 10% in km (> 2 000 km)*

b) the magnitude of the difference... is between 2 and 3, or 3 and 4 degrees (> 2 000 km),

❖ ADM shall provide an explanation of *why there is a difference...* and a technical demonstration confirming that a difference...*does not result in any increased interference protection requirements as compared to those requirements for operation in accordance with the notified orbital characteristics...*

➢ ***WHEN:***

*a) the magnitude of the difference... is **GREATER** than the values specified above...*

❖ *ADM shall submit to the BR MODs of the frequency assignments reflecting the revised orbital parameters;*

○ *a failure to provide such a MOD will result in the frequency assignments subject not being considered as BIU under No. **11.44C** or brought back into use under No. **11.49.2**, or counted toward a milestone under the procedures in RES-**35***

WRC-23 RES-8 – Orbital characteristics tolerances Decision - 2

✓ ADM shall ensure that its notification information aligns with the fully-deployed system in accordance with info in the Annex

a) the *max allowed difference* between the *observed distance (*apogee/perigee) and *previously declared* is **30 km**;
b) the *maximum allowed difference* between the observed angle of inclination of the orbital plane and the orbital plane *previously declared* under this RES is **2 degrees** or 3 degrees (> 2 000 km)

✓ any space station deployed, *shall not exceed the tolerances* for a max of **60** consecutive days

❖ **IF** the max allowed differences have exceeded for more than 60 consecutive days,

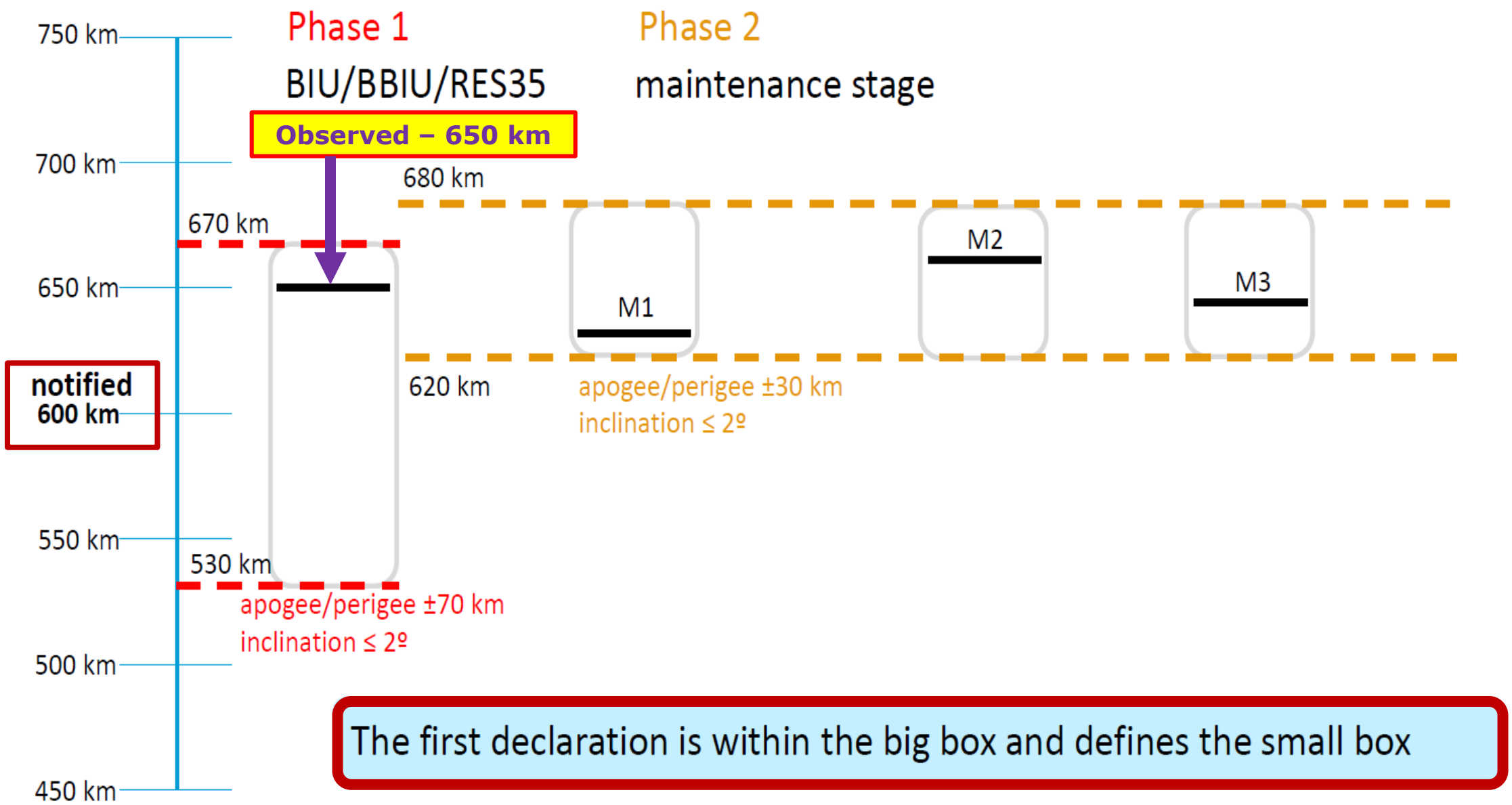
- ADM shall provide the BR, with the information in Annex, within 30 days after the end of this 60-day period
- within 90 days after the end of this 60-day period, submit MOD reflecting the revised parameters...

❖ **IF** the ADM has informed the Bureau before the end of the 60-day period that it is temporarily discontinuing use of the frequency assignments, it may, within **3** years after the initiation of the discontinued use, inform the Bureau of the resumption of use within the maximum allowed differences, subject to the condition that the space stations cannot be counted towards any RES-35 milestone submission prior to such resumption

❖ **IF** information provided by ADM, results in frequency assignments *not retaining their original dates of entry in the MIFR (after application of this RES),* those space stations with altitude or inclination deviations that caused this result, shall not be included in the total number of space stations deployed as part of the system for purposes of the RES-35 !

Example of NGSO Notified Altitude (Alt) ≤ 2000 km

(assuming notified apogee = perigee = 600km)



The first declaration is within the big box and defines the small box

THANK YOU !

Attila MATAS

am@orbitspectrum.ch