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Innovation, Science and Economic Development Canada
Senior Director, Spectrum Planning and Engineering
Engineering, Planning and Standards Branch
235 Queen Street, (6th Floor, East Tower)
Ottawa ON K1A 0H5

Re: Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band

For your consideration,

The Global VSAT Forum (GVF) hereby submits its comments on the Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band ("Consultation") issued by Innovation, Science and Economic Development Canada's ("ISED") on November 19, 2020 on behalf of its members. The satellite operators who form part of the GVF are today providers of vital telecommunications services in Canada and the region, and continue to expand their service offerings. These services are possible due to protection provided to satellite services allocated on a primary basis, including the protection afforded to primary operations within the 5925-7125 MHz band.

The GVF is the only global non-profit association of the satellite industry. Founded in 1997 and headquartered in London, it brings together organizations from around the world representing the satellite ecosystem that are engaged in the development and delivery of satellite technologies and services for consumers, commercial and government organizations worldwide.[1]

The GVF welcomes the opportunity to provide comments on this Public Consultation and remains at your disposal should you have any questions about this submission.

Respectfully submitted,

David Meltzer
Secretary General
Global VSAT Forum

[1] For more information about the GVF, see https://gvf.org/.

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Submission of

Global VSAT Forum (GVF)

in response to SMSE-014-20: *Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band*

I. Introduction

GVF recognizes and welcomes ISED's recognition of existing services and that the proposals for unlicensed operation are geared towards protection of these services. A fundamental principal of spectrum management relevant to the consideration of RLANs in the 5925-7125 MHz range is that unlicensed devices with no status in the Allocation Table must protect licensed services with status in the Allocation Table and not claim protection from the allocated service. This principle must be the foundation of consideration of technical, operational and coexistence considerations for assigning RLANs, including low-power devices and WiFi systems, in Canada.

II. Responses to Questions

Q1
ISED is seeking comments on the timelines for the availability of:

- ***a. low-power equipment ecosystems, both Wi-Fi 6E and 5G NR-U***
- ***b. standard-power equipment ecosystems, both Wi-Fi 6E and 5G NR-U, under the control of an AFC***
- ***c. AFC***

No comment.

Q2
ISED is seeking comments on its proposals to allow licence-exempt RLAN use in the 5925-7125 MHz band.

One of ISED's stated goals for this proceeding is to ensure that all Canadians can access wireless services as they become increasingly integrated into their lives. Satellite wireless have long been an integral part of Canada's ecosystem of telecommunications services, helping meet the baseline standard that ISED highlights in this proceeding for such services: high-quality, affordable and available in every region of the country. Now as in other crises, satellite services have helped meet the demand for connectivity during the COVID-19 pandemic.

GVF urges ISED to adopt a technical and policy framework for license-exempt uses of the 6 GHz band that acknowledges and continues to support the role of satellites in Canada's telecommunications infrastructure, particularly in those areas that are dependent on satellite services for broadband connectivity, enterprise connectivity, and media content distribution. A list of GVF member satellites with coverage of the Americas region, including Canada, is

attached as Annex A. The reliable and robust nature of C-band capacity sustains critical connectivity across Canada and from Canada to its neighbors in the hemisphere.

Other important satellite services rely on FSS allocations in the 5925-7125 MHz range. FSS allocations in the band 6700-7075 MHz, limited to feeder links (in the space-to-Earth direction) for NGSO MSS systems, have been in the Radio Regulations since WRC-95. Within the band the FSS is also allocated in the space-to-earth direction 6700-7075 MHz that is limited to feeder links (in the space-to-Earth direction) for NGSO MSS systems, which has been in the Radio Regulations since WRC-95. Notified MSS systems have made use of all or a portion of these allocations continuously since 1998. Current MSS feeder link stations, depending on location, can require access to the sky in all azimuths at elevation angles down to approximately 6 degrees. These feeder-link stations are designed to receive very low-level signals transmitted from the MSS system spacecraft. A single IMT transmitter can emit EIRP levels several orders of magnitude higher than the received satellite transmitted signals at the feeder link receive antenna.

Satellite services relevant to the frameworks proposed in this consultation include FSS operations in the 6725-7025 MHz band, the uplink band for the ITU Appendix 30B Allotment Plan. This band has a special status of this band in the Radio Regulations, as the spectrum allocation intended to ensure that all countries have access to spectrum and orbital resources for satellites.

GVF does not oppose the introduction of licence-exempt RLAN use in the 5925-7125 MHz, provided that adequate measures are in place to protect the primary Fixed Satellite Service (FSS) and Fixed Service (FS) in the band.

Q3
ISED is seeking comments on the proposed footnote Cxx and the changes to the CTFA as shown in table 2.

No comment.

Q4
ISED is seeking comments on the proposed rules for standard-power RLANs:

- ***a. indoor and outdoor operation would be permitted***
- ***b. RLAN access points would only be permitted to operate under the control of an AFC system in the 5925-6875 MHz frequency range***
- ***c. maximum permitted e.i.r.p. would be 36 dBm***
- ***d. maximum permitted power spectral density would be limited to 23 dBm/MHz***
- ***e. use of a vertical elevation mask, with a maximum e.i.r.p. of 125 mW at elevation angles above 30 degrees over the horizon, would be required***

GVF would urge Canada to limit license-exempt devices in this band to indoor-only applications and to power levels equivalent to those adopted in the European Union (EU)/CEPT in this band. Local area radio networks in Canada in the 5925-7125 MHz band can feasibly coexist with satellite services only where operational constraints that minimize the potential for interference at the satellite are observed. A proliferation of devices in the 5925-7125 GHz range will create risk of harmful interference to satellite receive operations, which cannot be adequately mitigated by other types of deployment of the band.

Any additional services to be introduced in the 5925-7125 GHz range must protect current and future critical incumbent FSS services and allow for coexistence there. Systems in the FSS currently operating within this frequency range in Canada are used extensively as the basis of satellite connectivity for connecting remote areas in Canada.

Of the three classes of RLAN's listed, only low-power indoor-only RLANs operating without AFC control represents a compatible use of the 5925-7125 MHz frequency band with FSS in Canada, because it poses the lowest risk of harmful interference to existing and future FSS operations.

For this reason urges that ISED limit unlicensed devices in this band to indoor only applications and in particular to power levels equivalent to those adopted in the EU/CEPT in this band. With the entire EU adopting this standard, there should be an established equipment ecosystem with ample economies of scale.

GVF notes that the proposed power maximum EIRP 36 dBm is higher than the level adopted in the European Communications Committee (ECC) Decision. The ECC in Decision (20)01 allows low-power, indoor-only devices in 5925-6425 MHz with a maximum EIRP of 23 dBm and maximum EIRP density of 10 dBm/MHz.[2] This higher EIRP level raises concerns for GVF because there is no means to assure that the devices will only be operated indoors. In other words, it would be possible for consumers to take these in-door devices outside for example to their patios of their homes.

It is important to consider that the potential impact on the FSS satellite receivers is the result of interference produced by stations (licensed or not) not only in Canada, but also from all stations located in the coverage beam of a space station. The question of coexistence is thus an international issue when the satellite beam covers more than one country. Considering the number of public consultations currently in process and completed in the Americas, GVF urges ISED to consider that the impact to satellite services from terrestrial devices operating in the 5925-7125 MHz band will be much higher than the result of a specific analysis that only considers the Canadian market.

[2] ECC Decision (20)01, Annex 1 table 1, available at https://docdb.cept.org/document/16737.

It is also important to consider the protection of the Appendix 30B and FSS plan in the 6725-7025 MHz band, to the extent such frequencies are among those operated on satellites registered in Canada. The Plan is the cornerstone of the principle of equitable distribution of the orbit-spectrum resource, ensuring that access to orbit-spectrum resource is guaranteed to all nations. Limiting the levels of emissions associated with any new use of this spectrum will guarantee the continued protection of access to the spectrum subject to the Plan by all the nations of the Region 2.

Under the technical and operational characteristics for coexistence with the FSS recommended by GVF, deployment of RLANs would be possible across the full band allocated to the FSS on a primary basis, 5925-7125 MHz. However, terrestrial services operating outdoors or at high power will interfere with reception of signals from earth stations communicating with satellite networks and thus will disrupt existing and planned satellite operations in the 5925-7125 MHz band. The long-term impact of deployment of high-power devices outdoors will depend on factors that are difficult to predict and therefore difficult to mitigate, as well as on the same factors in other jurisdictions within the region, as satellites will receive signals from any country or region within their uplink beams.

Given the nature of regional coverage, it is necessary to consider emissions from devices inside and outside of Canada. For example, in a band used to uplink to FSS satellites the interference level, given expected EIRP levels, of any single unlicensed device will not be significant. However, the aggregation of millions or potentially billions of such devices within a given uplink beam would lead to degradation of the satellite throughput achievable and eventually harmful interference. Where beam size exceeds national boundaries, the potential for harmful interference in this band is inherently international, with the interference likely to be measurable when the aggregate emissions from multiple countries exceeds certain thresholds.

Q5
ISED is seeking comments on allowing access to the additional 100 MHz of spectrum in the 6425-6525 MHz sub-band for standard-power operation.

No comment.

Q6
ISED is seeking comments on the equipment availability of standard-power RLANs in the 6425- 6525 MHz band and the impact on the development of AFC systems for Canada due to a potential lack of international harmonization for that sub-band.

No comment.

Q7
ISED is seeking comments on the proposed rules for low-power indoor-only RLANs:

a. operation would be permitted indoor only across the 5925-7125 MHz band
b. the use of a contention-based protocol (e.g. listen-before-talk) would be required
c. maximum permitted e.i.r.p. would be 30 dBm
d. maximum permitted power spectral density would be limited to 5 dBm/MHz

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

GVF would urge Canada to limit license-exempt devices in this band to indoor-only applications, and in particular to power levels equivalent to those adopted in the EU/CEPT in this band. Low power operations should be permitted to operate at a maximum permitted EIRP of no greater than 30 dBm indoors, with a maximum permitted power spectral density of no greater than 5 dBm/MHz.

Technical and operational characteristics required for coexistence without harmful interference

The results of Decision (20) 01 of the ECC, about the harmonized use of the frequency band 5945-6425 MHz, illustrate GVF concerns and favour a technical and regulatory framework that helps ensure adequate protection of the FSS. The EU (CEPT/ECC) has studied the issue extensively and agreed on power limits for wireless access points for the protection of the FSS, without the need to design and implement an intricate database for management and enforcement of protection levels.

The studies demonstrated the sensitivity of the results to the parameters of the device deployment model. Notwithstanding the need to make several projections about these parameters, the interference generated by use of high-power devices outdoors is evident.

GVF remains concerned that the indoor-only restriction may be difficult to enforce and that the total number of unlicensed devices will eventually cause harmful interference into FSS receivers in space, especially C-band satellites with higher-gain satellite receivers. Additionally, there is no means to control the actual number of mass marketed devices that will be deployed, in other words the number of devices can exceed expected projections. It is necessary for regulators to include some margin to take into account the uncertainty of deployment, use of indoor devices outdoors and non-compliant equipment that may unintentionally be deployed. These concerns notwithstanding, the relatively low power levels approved by the EU provide enhanced assurance that interference impacts are unlikely to occur.

It is important to emphasize that ECC Decision 20 (01) does not require establishing an automatic spectrum management and coordination database, which streamlines implementation of unlicensed devices at the European level especially since the database would need to be regional in nature to accurately predict the interference to a satellite receiver.

Therefore, although satellite operators continue to be concerned about the evolution of the deployment of devices in the 6 GHz band and the consequent increase in the aggregate level of

emissions to the satellites, especially in the new generation of V-HTS type that are launched in the next 10 years, we recognize that the conditions described in ECC Decision (20)01 allow for the coexistence of fixed service and FSS with unlicensed and license-exempt devices. However, we emphasize that this is a long-term problem, regional in nature, and that the interference will be visible as the number of devices increases (with figures in the order of millions) and administrations need monitor the deployment of unlicensed devices and take action as necessary. These considerations make it is even more important to consider the protection of the Appendix 30B and FSS plan in the 6725-7025 MHz band, in particular Canada's proposal to introduce outdoor license-exempt use in the 6725-6825 MHz range. The Plan is the cornerstone of the principle of equitable distribution of the orbit-spectrum resource, guaranteeing all nations access to the orbit-spectrum resource.

Appendix 30B Plan implementation includes spot beam coverage that would be very sensitive to outdoor emissions of the kind that would be seen with terrestrial RLAN operations. Any aspects of technical, coexistence and operation conditions for deployment of RLANs should thus take into account and the on the continued operation of satellite systems under the Appendix 30B Plan.

The integrity of Plan is of fundamental importance to guarantee the continued protection of access to the spectrum subject to the Plan by all the nations of the Region 2, restricting the levels of emissions associated with any new use of this spectrum. An autonomous decision by Canada will have consequences for the use of the spectrum by other nations in Region 2, evidencing the international nature of this discussion.

Q8

ISED is seeking comments on the proposed rules to allow very low-power RLAN devices:

- ***a. operation would be permitted indoors and outdoors across the frequency range 5925-7125 MHz band***
- ***b. the use of a contention-based protocol (e.g. listen-before-talk) would be required***
- ***c. maximum permitted e.i.r.p. would be 14 dBm***
- ***d. maximum permitted power spectral density would be limited to -8 dBm/MHz***

GVF considers that RLANs that operate outdoors, or at high-power, will disrupt existing and planned satellite operations in the 5925-7125 MHz band. The long-term impact of deployment of high-power devices outdoors will depend on factors that are difficult to predict and therefore difficult to mitigate, as well as on the same factors in other jurisdictions within the region, as satellites will receive signals from any country or region within their uplink beams.

If the ISED should determine that local area radio networks (RLANs) operating in outdoor environments are to be introduced in this range, only very low power should be permitted to minimize the potential for harmful interference to existing and future FSS operations. If very low power outdoor devices are allowed, ISED's proposed maximum EIRP and EIRP density would be necessary to protect FSS uplinks. GVF concerns regarding outdoor use of RLANs parallel

those raised above about the adequacy of methods for mitigation of the potential for aggregate interference from indoor-only RLANs. The number of devices can exceed expected projections, which in any case were only projected through 2025 in Europe and in the U.S. studies, and non-compliant equipment that may unintentionally be deployed.

Q9
ISED is seeking comments on potential business models for AFC administrators to operate their AFC systems in Canada.

Noting again GVF's opposition to outdoor use in the band, if there are multiple databases and/or database operators, they must communicate with each other to account for aggregate emissions. If there is a regional footprint for satellite coverage, the databases must communicate to adequately account for potential interference from multiple devices.

Q10
ISED is seeking comments on its proposal to permit the approval of multiple, third party AFC systems, taking into account the potential for the development of a sustainable market for AFC systems in Canada.

See Q9 response.

Q11
ISED is seeking comments on potential exit strategies if the AFC administrator decides to cease operation in Canada.

No comment.

Q12
ISED is seeking comments on adopting an AFC system model that is harmonized to the maximum extent possible with the AFC system model being implemented in the U.S. and other international markets.

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

Noting again GVF's opposition to outdoor use in the band, AFC systems should communicate with each other to account for aggregate emissions from RLAN devices. The AFC system model being implemented in the U.S. failed to require the database to account for the aggregate emissions from license-exempt devices towards FSS space station receivers with coverage of Canada, or the potential impact of U.S. RLAN deployment on satellite services in Canada. GVF suggests that ISED engage with the U.S. to address this impact, as commercial satellite operations often employ the same satellite facility to serve Canada as well as the U.S.

Q13
ISED is seeking comments on the implementation considerations for the operation of an AFC system, specifically:

- ***a. information required from licensed users***
- ***b. interference protection criteria for computation of exclusion zones***
- ***c. c. information required from standard-power Aps***
- ***d. frequency of AFC update of licensee information***
- ***e. security and privacy requirements***

GVF recommends indoor-only deployment of RLANs, in part because outdoor uses of RLAN networks that must rely on complex AFC cannot assure the future protection of the FSS and the many valuable services provided in the FSS bands.

The U.S. Federal Communications Commission recently adopted rules for the operation of RLAN devices in indoor and outdoor environments. In GVF's view, the FCC's approach that includes outdoor use is not recommended.

Among other issues, the Commission's technical and operational framework for operations in the 5925-7125 GHz band does not adequately address the long-term impact that the deployment of high-power devices outdoors will have on FSS. To ensure adequate protection of FSS operations in the band and guarantee the coexistence of FSS and RLAN services beyond the year 2025, the date used for projections in studies on potential aggregate interference from RLANs in the 6 GHz range, any outdoor deployment of RLANs would have to be accompanied by multiple measures to limit emissions toward satellite receivers, including: a restriction to the vertical tilt angle of the antennas (down-tilt); restrictions on the installation of devices (especially their horizontal or vertical orientation), and; active monitoring of the aggregate level of transmitted signal.

The need for such measures complicates the deployment of unlicensed devices and maintenance of the automatic spectrum and frequency management system and will limit their effectiveness for the protection of the FSS. There is no mechanism for ensuring proper installation and orientation of outdoor access points and the AFC database mechanism is likely to be difficult to implement, depending as it does on rapidly updated and accurate regulatory information on the locations of licensed deployments. This degree of complexity will mean greater challenges in keeping it updated with relevant information so that the transmission analyses necessary to guarantee interference-free coexistence is accurately performed.

Of particular importance is that any automatic management system conceived to support the coexistence of services must include the control of the aggregate levels of transmission towards the FSS stations in the geostationary arc. The management system must guarantee, through active and real-time control of the number of allowed devices and permanent monitoring of the aggregate level of transmission, that current and future FSS satellites operating in the band are not affected. Without an accurate and comprehensive monitoring and control capability, the

effectiveness of the system will be reduced, and it will not be possible to guarantee the future coexistence of these services.

Q14
ISED is seeking comments on any additional considerations, limits or general concerns that should be taken into account in setting detailed standards and procedures for AFC operation.

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

No comment.

Q15
ISED is seeking comments on its proposal to require AFC systems to protect the following types of licensed stations from standard-power APs:

a. ***fixed microwave stations***
b. ***fixed point-to-point television auxiliary stations***
c. ***radio astronomy stations***

In providing comments, respondents are requested to include supporting arguments and rationale.

No comment.

Q16
ISED is seeking comments on the sample agreement related to the designation and operation of an AFC system in Canada.

No comment.

Q17
ISED is seeking comments on the proposed approach to incremental implementation of an AFC system in Canada.

No comment.

Q18
ISED is seeking comments on the objective to maximize the potential for synergies, where possible, in defining the technical and administrative requirements for the respective databases addressing different bands under different technical regimes.

No comment.

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ANNEX
List of GVF Member Satellites with Coverage of the Americas Region

Satellite	Orb. Loc. (°W)	Frequency Bands	Coverage
INTELSAT 1002	1	C, Ku	Americas
EUTELSAT 12 West B	12.5	Ku	East Coast US & Canada, the Caribbean and South America
TELSTAR 12 VANTAGE	15	Ku, Ka	Eastern US, Caribbean, Central and South America
INTELSAT 37E	18	Ku	Americas
NSS-7	20	Ku	East US & Canada, Mexico, the Caribbean and South America
SES-4	22	Ku	East US & Canada, Mexico, the Caribbean and South America
INTELSAT 905	24.5	C, Ku	Americas
INTELSAT 907	27.5	C, Ku	Americas
INTELSAT 904	29.5	C, Ku	Americas
HISPASAT 30W-5	30	Ku, Ka	East US & Canada, Mexico, the Caribbean and South America
HISPASAT 30W-6	30	C, Ku, Ka	East US & Canada, Mexico, the Caribbean and South America
INTELSAT 35e	34.5	C, Ku	Americas
HISPASAT 36W-1	36	Ku, Ka	South America
NSS-10	37.5	C	East US & Canada, Mexico, and South America
TELSTAR 11N	37.5	Ku	Americas
SES-6	40.5	C, Ku	North and South America
INTELSAT 32e	43	Ku	East Canada, US, Mexico and the Caribbean
INTELSAT 11	43	C	Americas
INTELSAT 14	45	C, Ku	Americas
SES-14	47.5	C, Ku	North and South America
INTELSAT 902/INTELSAT 9	50	C, Ku	Americas
INTELSAT 23	53	C, Ku	Americas
INMARSAT-3 F5	54	L, C	Atlantic Ocean, Americas
INMARSAT-5 F2	55	Ka	Americas
INTELSAT 34	55.5	C, Ku	Americas
INTELSAT 21	58	C, Ku	Americas
AMAZONAS 2	61	C, Ku	Americas
AMAZONAS 3	61	C, Ku, Ka	Americas
AMAZONAS 5	61	Ku, Ka	Americas
ECHOSTAR XVI	61.5	Planned BSS	North America

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Satellite	Orb. Loc. (°W)	Frequency Bands	Coverage
TELSTAR 14R	63	Ku	Americas
TELSTAR 19 VANTAGE	63	Ku, Ka	Americas
EUTELSAT 65 WEST A	65	Ku, Ka	US, Mexico, the Caribbean, Central and South America
SES-10	67	Ku, Ka	Mexico, the Caribbean, Central and South America
SES-17 **Launch in 2021**	67	Ka	Americas
STAR ONE C4	70	Ku	Americas
STAR ONE CC2	70	Ku	Mexico and South America
STAR ONE D2	70	C, Ku, Ka	Mexico, the Caribbean, Central and South America (Ka only South America)
VIASAT-2	70	Ka	North America, Caribbean, Latin America and Atlantic Ocean
AMC-3	72	Ku	North America
HISPASAT 74W-1	74	Ku	South America
STAR ONE C3	75	Ku	South America
STAR ONE D1	84	Ku, Ka	Mexico, the Caribbean, Central and South America
AMC-16	85	Ku, Ka	US, Mexico and the Caribbean
SES-2	87	C, Ku	North America, Mexico, Caribbean
GALAXY 28	89	C, Ku, Ka	North America, Caribbean
GALAXY 17	91	C, Ku	North America, Caribbean
GALAXY 11	93	C, Ku	North America, Caribbean
SPACEWAY 3	95	Ka	North America
ECHOSTAR XXIV **(a.k.a. JUPITER 3)** 2021 Estimated launch	95	Ka, Q/V	Americas
GALAXY 3C/INTELSAT 30/INTELSAT 31	95	C, Ku	Americas
ECHOSTAR XIX **(a.k.a. JUPITER 2)**	97	Ka	Canada, US, Mexico, the Caribbean, Central America, Colombia
GALAXY 19	97	C, Ku	North America, Caribbean
INMARSAT-4 F3	98	L, C	Canada, United States, Mexico, the Caribbean, and South America
GALAXY 16	99	C, Ku	North America, Caribbean
SES-1	101	C, Ku	North America, Mexico, Caribbean
SES-3	103	Ku	North America
AMC-15	105	Ka	US (+Alaska +Hawaii)
SES-11	105	C	US (+Alaska +Hawaii), Mexico, Caribbean
ECHOSTAR XVII **(a.k.a. JUPITER 1)**	107	Ka	Canada, US

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Satellite	Orb. Loc. (°W)	Frequency Bands	Coverage
ANIK F1	107.3	C, Ku	Americas
ANIK F1R	107.3	C, Ku	North America
ANIK G1	107.3	C, Ku, X	Americas
TELSTAR 12	109.2	Ku	North America, Gulf of Mexico, Caribbean
ECHOSTAR X	110	Planned BSS	North America
ECHOSTAR XI	110	Planned BSS	North America
WILDBLUE 1	111	Ka	Canada, US
TERRESTAR 1	111.1	S, Ku	North America
ANIK F2	111.1	Ku, Ka	Canada, US
EUTELSAT 113 West A	113.0	C, Ku	Americas
EUTELSAT 115 West B	114.9	Ku	Americas
VIASAT-1	115.1	Ka	Southern Canada, US (+Alaska +Hawaii)
EUTELSAT 117 West A	116.8	C, Ku	Americas
EUTELSAT 117 West B	117.0	C, Ku Ext	US, Mexico, the Caribbean, Central and South America
ANIK F3	118.7	C, Ku, Ka	North America
ECHOSTAR VII	119	Planned BSS	North America
ECHOSTAR XIV	119	Planned BSS	North America
ECHOSTAR IX	121	Ku, Ka	North America
GALAXY 23	121	C	North America, Caribbean
GALAXY 18	123	C, Ku	North America, Caribbean
AMC-21	125	Ku	US, Mexico, the Caribbean, Central America
GALAXY 14	125	C	North America, Caribbean
GALAXY 30	125	C, Ku, Ka	North America, Caribbean
HORIZON 1/GALAXY 13	127	C, Ku	North America, Caribbean
SES-15	129	Ku, Ka	North America, Caribbean
GALAXY 12	129	C	North America, Caribbean
GALAXY 15	133	C	North America, Caribbean
INTELSAT 5	137	C, Ku	North America
ViaSat-3 (Location to be announced)		Ka	North America, Caribbean
O3b	NGSO	Ka	Global
O3b mPOWER 2021 Launch commencement	NGSO	Ka	Global
SpaceX	NGSO	Ku	Global
Project Kuiper	NGSO	Ka	Global
Telesat LEO	NGSO LEO	Ka	Global