



Telesat

Appendix I

Telesat Clearing Commitment

**Consultation on the Technical and Policy Framework for the
3650-4200 MHz Band and Changes to the Frequency
Allocation of the 3500-3650 MHz Band**

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Spectrum Management and Telecommunications

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1. Introduction

This document is an attachment to Telesat's reply comments to the Consultation Document (capitalized terms used but not defined in this document have the meaning ascribed to them in Telesat's reply comments) and sets forth the particulars of the C-band Clearing Commitment (the "Commitment") that Telesat is making to entities ("C-band Users") that contract with Telesat or another satellite operator for the use of 3700-4200 MHz spectrum in Canada ("Services") and to entities that have Qualified Earth Stations (defined in Section 2.1 below) that receive 3800 MHz services in Canada ("End Users").

The Commitment is contingent upon ISED's Decision in response to the Consultation Document ("ISED Decision") adopting the core elements of the Telesat Revised Proposal (as set forth in paragraph 8 of the Telesat Revised Proposal), and the Additional Conditions (set forth in Section 6.1 below). ISED is expected to release, in connection with the ISED Decision, the earth station data for Qualified Earth Stations, which Telesat will use to finalize its clearing plan. While Telesat believes all items to be accurate on the date hereof, Telesat may need to issue updates based on this earth station data as well as in the event of an error or omission, or to address changes in the technical solutions available during the program. Telesat will inform C-band Users and End Users of such updates in writing.

For the avoidance of doubt, the submission of this document does not itself create any obligations on Telesat. Any obligations related to the Commitment will only arise as set forth in the Telesat Revised Proposal (including this attachment as updated) and the ISED Decision that adopts its core elements.

2. Overall Program Management

- 2.1 Application and Timing. The Commitment applies to Services that are in effect on the date of the ISED Decision and with respect to those earth stations that the ISED Decision states are to be covered by the Commitment ("Qualified Earth Stations"), as discussed in the Revised Proposal. The timing of the transition of Services will depend on when the ISED Decision is issued. C-band Users' Services migration process (if applicable) will begin following an ISED Decision and will proceed according to the transition timeline set forth in Attachment B. Telesat will provide C-band User with reasonable (generally, **at least 90 days**) prior written notice in advance of the start of any transition of its Services or necessary dual illumination period as set forth in Section 4.1 below or such other notice period as C-band User and Telesat may agree.
- 2.2 Transition Responsibility and Costs. Telesat, at its own expense, agrees to undertake, manage, and complete all necessary actions to effectuate the transition of Services. For efficiency and consistency, Telesat intends to utilize the services of third-parties to manage many aspects of the transition and implement the transition plan; however, Telesat is and will remain obligated to C-band User under the terms of this Commitment for this transition. C-band Users and End Users may elect to manage and/or perform work themselves. In that case, Telesat will reimburse reasonable costs, as explained in Attachment A. If C-band User is a customer of Telesat's, the agreement between Telesat and C-band User (the "Agreement") will remain in effect and service fees for Services provided by Telesat to C-band User will remain valid, both during the transition period and the remainder of the term of the Agreement. The Commitment also applies to C-band Users, and the End Users for those Services (as well as End Users receiving U.S. origin video signals), that are not customers of Telesat.
- 2.3 Communication with End Users. In order for Telesat to fulfill the Commitment, C-band User shall be responsible for informing all of its End Users that may be impacted by the transition of that C-band User's Services of the timing and the dual illumination period. Telesat shall provide C-band User with a communication kit for use in this communication, which will describe the process and the role Telesat and its third-party contractor(s) will play in the transition. To facilitate this process, C-band User shall provide Telesat with contact information for each of the End Users that need to be contacted or provide reasonable assistance to Telesat to create a database of End Users that cannot be identified by C-band User.

3. Satellite Capacity Loading and Satellite Operations

- 3.1 Loading and Restoration Plan. Each C-band User shall have a specific satellite loading and restoration plan as described in Attachment B. This plan will outline the current and future loading of C-band User's **transponder Services, consistent with the capacities** currently contracted in the Agreement. Satellite performance and coverage after service transition will continue to meet the contractual performance specifications.
- 3.2 Satellite Payload Spares and In-Orbit Redundancy. Upon completion of the required Services migration to a new transponder, polarization or satellite (or any combination thereof), C-band User shall maintain the same level of protection as described in the Agreement and shall continue to have access to space amplifiers (a component of space equipment) in case of an in-orbit failure, if such access is provided in the Agreement.

4. Satellite Uplinks and Uplink Operations

- 4.1 Dual Illumination. In some cases, C-band Users may need to dual illuminate transmissions to both the existing and post-transition transponder capacity in order to migrate Services to the new transponder capacity and allow for the required upgrades or revisions in the downlink sites. If dual illumination is required, C-band User's Service shall be provided both on C-band User's existing transponder and on the post-transition transponder as set out in C-band User's **satellite loading and restoration plan** at no additional cost payable by the C-band User to Telesat.
- 4.2 Uplink for Dual Illumination. If required, Telesat shall provide C-band User with uplink services from one of Telesat's teleports, a transportable uplink, or a third-party teleport at no additional cost during the dual illumination period. Fibre transport costs (or, where appropriate, satellite turnaround services) to and from Telesat or third-party teleport facilities in support of the dual illumination will also be covered by Telesat.
- 4.3 Move of Uplink/Downlink and Hub Facilities to Protected Gateway Facilities. If required to facilitate the reception of signals on frequencies in the 3700-4000 MHz band, Telesat shall provide Gateway Services to C-band User at no additional cost from **Telesat's** protected gateway facility located in Allan Park, ON to ensure continued provision of C-band User's Service post-transition for the 20 year period following the date the ISED Decision is issued (**the "Post-Transition Period"**). A third-party gateway facility in Weir, QC is expected to be recognized as a protected gateway and may be used, **in Telesat's** reasonable discretion, as an alternate protected gateway facility. "Gateway Services" consist of RF uplink and downlink and co-location services provided through a manned teleport facility with protected power. The demarcation point of the Gateway Services is at the fibre interconnect point of presence located in Toronto, ON. The cost of fibre from the interconnect point to the protected gateway will also be covered by Telesat for the Post-Transition Period.
- 4.4 Technical Support Costs. Telesat will pay C-band User for any reasonable time and material costs incurred by C-band User during the transition for internal activities to prepare facilities, including facilities maintained by third parties contracted for uplink services by C-band User, and End User notifications relating to uplinks to support the transition.

5. Satellite Downlink

- 5.1 Installation of Filters and Additional Equipment. Once C-band User's Services have been fully transitioned to the post-transition transponder(s), where applicable and as set forth in C-band **User's satellite loading and restoration plan**, Telesat shall deliver and install the necessary 5G rejection filter(s) (the "**Filters**") compliant with the specification shown in Attachment C for all affected Qualified Earth Stations at all C-band User and End User locations outside the satellite-dependent regions identified in Attachment D. To the extent additional equipment is required to ensure continued provision of Service based on Telesat's reasonable judgment, Telesat will procure and install such equipment at no cost to the C-band User or the End User. C-band User

shall provide best efforts to ensure:

- a) reasonable access to C-band User and End User facilities, and
 - b) reasonable cooperation from C-band User and End Users as necessary for Telesat or its third-party contractor(s), to deliver and install the Filters and additional equipment.
- 5.2 Signal Quality at Earth Station Output. The signal degradation at the earth station output will be no greater than 1 dB due solely to the insertion loss of the filter. Downlink adjacent satellite interference and cross-polarization interference will remain within currently allocated margins.
- 5.3 Technical Support and Costs. Telesat, either directly or through its third-party contractor(s), will provide all reasonable technical support and assistance required by C-band User and all End Users necessary to implement the transition.
- 5.4 Warranty of Work. Telesat will complete all documentation required to ensure that any Telesat provided Filters and additional equipment is registered with the manufacturer, if required, and covered by manufacturer warranty. To the extent that any of the work performed by Telesat, or any vendor or contractor retained by Telesat to perform work, to effectuate the transition fails during the one year period following the installation date due solely to the actions of Telesat or a vendor or contractor retained by Telesat, Telesat will take such corrective action as Telesat reasonably deems necessary.
- 5.5 Extended Spares Program. Telesat will make arrangements to ensure a pool of up to 10% spares for the Filters deployed at Qualified Earth Stations. This spares pool will be maintained for a one year period following the completion of the Filter deployments to ensure rapid access to a replacement Filter in the event of Filter malfunction.

6. General

- 6.1 Additional Conditions. The Additional Conditions are:
- a) provision by C-band User and End Users to Telesat of the information set forth in this Attachment A;
 - b) Telesat and the C-band User entering into a definitive written agreement, containing terms and conditions that are customary for the products and services to be provided or arranged by Telesat, prior to the start of transition of C-band User's **Service(s)**; and
 - c) co-operation by C-band User, the satellite operator(s) providing service to C-band User and End Users as set forth herein and as required to carry out the transition plan.
- 6.2 ISED Oversight. Telesat will carry out the clearing plan at its own expense and will cooperate with ISED to enable whatever degree of oversight of the clearing process that ISED considers appropriate. Furthermore, Telesat has proposed that ISED play a role in mediating disputes that might arise between Telesat and a C-band User during the clearing process, as ISED has previously done in connection with interference complaints. Should the ISED Decision accept such a role, Telesat will revise the Commitment, as required, to incorporate the relevant portions of the ISED Decision that define that process.

ATTACHMENT A

SCHEDULE OF REIMBURSABLE ACTIVITIES
COVERED BY TELESAT

This Attachment A identifies the details of reimbursable cost categories under the Telesat Commitment to Canadian C-band Users and End Users.

1. Installation Programs Available

Telesat agrees to undertake, manage, and complete all necessary actions to effectuate the transition of Services as identified in this Attachment A. For efficiency and consistency, Telesat intends to utilize the services of third-party contractors to manage many aspects of the transition. There are two programs planned for the remediation of potential impacts to C-band Users and End Users:

- 1.1 Telesat-led Program. Telesat will qualify and engage independent third parties as technicians to implement the transition under its coordination and for which Telesat will remain ultimately responsible. These professional technicians will be hired by Telesat to remediate any of the six impacts noted in Section II below. Telesat will work with each C-band User/End User to schedule a time for the technician to complete a job. It is anticipated that most C-band Users/End Users will use this service, in particular those with a single antenna per site.
- 1.2 C-band User/End user-led Program. For those C-band Users and End Users who have skilled resources on site and would like to perform the remediation activities themselves, Telesat will compensate reasonable expenses incurred as outlined below. It is anticipated that more complex, regularly staffed sites, such as satellite resellers, satellite-based ISPs and broadcasters and cable sites, will opt for this program.

2 Potential Impacts to C-band Users and End Users

Telesat has identified six categories of potential impact:

- 2.1 Filter Installation. **All End Users' receive antennas operating in non-satellite-dependent regions of Canada operating in the 4000-4200 MHz band will require a filter to be installed on the receive ports for each polarization in use by each feed on every antenna. Both 120 MHz and 300 MHz filters will be procured and distributed by Telesat. The 120 MHz filters will be required for earth stations operating in the 3820-4000 MHz band between December 2023 and December 2025 where 5G is deployed. Post 2025 all earth stations operating outside of the satellite dependent areas will be equipped with 300 MHz filters.**
- 2.2 Frequency Change. Some C-band Users will remain on the same satellite, but will require a change in frequency to move their transmission out of the lower 300 MHz or as part of a repacking effort. This will require the C-band User or End Users who receive that C-band User's signal to **change frequency on their satellite receiver or modem to lock onto the new signal frequency.**
- 2.3 Polarization Change. Some C-band Users will remain on the same satellite, but will be moved to transponders on a different polarization than they use today. This will require some End Users who receive this signal to rotate their feed to lock into the new frequency range and polarization. If the antenna already has a 2-port feed downlinking feeds from this satellite, then they can already receive both polarizations. In this case, a feed rotation is not necessary but the receiver or modem will need to be physically disconnected from one polarization and reconnected to the other. A polarization change will also require a frequency change. In the case where access to the original polarization is required to receive services, a two-port feed, LNB and cabling will be provided to support the new polarization.
- 2.4 Satellite Change. Some C-band Users will be required to change the satellites from which they currently receive their feed. This will require the End Users who receive their signal to re-point their antenna to an entirely new orbital position to lock into the signal at the new orbital location. In cases where users are unable to reuse existing antenna equipment, new equipment will be provided or reimbursed by Telesat.

- 2.5 Satellite Uplink/Downlink/Hub Move to a Protected Gateway. Some C-band Users may be required to move their Uplink/downlink/hub facilities located in non-satellite-dependent areas to a protected Gateway Facility to continue receive operations on the C -band in the frequency range 3700-4000 MHz.
- 2.6 International Program Rerouting. Some foreign (non-U.S.) satellite companies not bound by clearing activities in the U.S or Canada are expected to continue to provide C -band services to Canada in the lower 300 MHz part of the band during and after the transition is complete. These programs will need to be received at a protected gateway and backhauled to a terrestrial interface point where they can be picked up those companies that had been receiving those signals prior to transition.

Each of these changes requires labour, and in some cases, equipment expenses on the part of the C-band User or End User. **Under Telesat’s proposal, all reasonable costs resulting from the need to clear spectrum and mitigation expenses to prevent 5G interference, will either be incurred or reimbursed by Telesat, as described below.**

3 Telesat-Led Clearing

3.1 Telesat-Led Filter Implementations

Some C-band Users may be required to move their Uplink/downlink/hub facilities located in non-satellite-dependent areas to a protected Gateway Facility to continue receive operations on the C -band in the frequency range 3700-4000 MHz.

All C-Band receive antennas in non-satellite-dependent areas of Canada should install one band pass filter for every port/polarization on every receive feed on an existing fixed or transportable antenna. The purpose of this filter is to suppress all signals being received in the 3700-3820 MHz range initially in large urban centres post December 2021 and 3700-4000 MHz frequency range post December 2023. 5G signals will operate in this range and given the strength of the 5G signal, this band pass filter will protect End Users from interference caused by the 5G operators in range of the antenna.

To ensure consistency and reliability of the filter, Telesat will provide all filters under both installation programs. One filter per receive feed polarity per antenna will be provided free of charge to the owner of the receive antennas.

All installations will be scheduled with the End Users by Telesat’s scheduling group. The following labour will be provided, and tasks performed, free of charge during the installation of a filter.

Item	Description
1	Benchmark test of antenna performance
2	Labour to remove the low noise block downconverter (“LNBS”) without removing the coax cable, to install the filter, and to return the antenna to working condition
3	Installation of 1 or 2 filters (2 filters per single feed antenna, one for each polarization if needed)
4	Reinstalling old LNBS (replacing the existing LNB with a new one in cases where required)
5	Post installation test to verify link margin is within threshold

6	Provide nuts, bolts, and miscellaneous hardware required to secure the filter to the feed and re-secure it to the antenna
7	Documentation
8	Travel to and from the site
9	Sign-off from End User that work has been completed

Where travel is required the costs are dependent upon the region in the country that the earth station is in. Attachment E shows the installation zones map of Canada. Travel to more remote areas are more expensive than to urban areas.

3.2 Telesat-Led Frequency Changes

The frequency repacking exercise may require frequency changes for many C-band Users in order to clear the lower 300 MHz of C-band in non-satellite-dependent areas. Such changes are a standard part of earth station operations and generally require little effort or technical expertise. In many cases a change in frequency can be initiated at the uplink and the satellite receivers or modems associated with the receive antennas will change frequency automatically. In cases where the satellite receivers cannot handle an automatic frequency change, a manual intervention with a site visit will be needed to make the frequency change. In these cases, contractors will perform the frequency change whether it occurs at the time of filter installation or needs to be performed on a separate visit. Any circumstances that necessitate additional consideration should be submitted through a review process.

Item	Description
1	Benchmark test of antenna performance
2	Change the frequency on the satellite receiver for a given service and verify lock on the signal on the new transponder
3	Sign-off from End User that work has been completed

3.3 Telesat-Led Polarity Changes

The frequency repacking exercise may require polarization changes. In many cases, receive antenna are typically capable of receiving both polarizations, and in such cases, the changes will be limited to ensuring that the satellite receiver is connected to the right polarization and tuned to the right frequency. As such, expenses related to polarization changes for antenna already equipped to receive both polarizations are not covered under the Telesat proposal, unless travel to the site is required to make the change.

In cases where an antenna is only equipped with a single polarization feed, a change in the orientation of the feedhorn may be necessary. In such cases, Telesat will send a technician to make the necessary changes. In some cases, Telesat may retrofit the antenna with 2-port feedhorns, as required, to make them capable of receiving both polarizations simultaneously. All activities to support a polarization change will be scheduled **with the end user by the Telesat’s scheduling group**. The scheduling group will determine if a filter can be installed at the same time.

Item	Description
1	Benchmark test of antenna performance
2	Labour to reposition feed or remove and replace it with a new feed suited to the new polarization and to return the antenna to working condition
3	Post installation test of antenna performance to ensure service is functioning to specification
4	Documentation
5	Travel to and from the site
6	Sign-off from end user that work has been completed

3.4 Telesat-Led Satellite Changes

The frequency repacking exercise may require content that is currently on one satellite to be moved to a different satellite at a different orbital location. This will require the C - band User and their End Users who receive said content via a particular satellite to re-point their antenna to the new orbital position to lock into the signal on an alternate satellite.

Item	Description
1	Benchmark test of antenna performance
2	Labour to re-point the antenna, adjust the polarization, retune the frequency and to return the antenna to working condition
3	Post installation test of antenna performance to ensure service is functioning to specification
4	Documentation
5	Travel to and from the site
6	Sign-off from End User that work has been completed

In cases where the End User does not have the ability to re-point the receive antenna to the new satellite, Telesat will provide contractors to re-point them free of charge.

3.5 Satellite Uplink/Downlink/Hub Move to a Protected Gateway (Allan Park, ON)

Some C-band Users may be required to move their Uplink/downlink/hub facilities located in non-satellite-dependent areas to a protected Gateway Facility to continue receive operations on the C-band in the frequency range 3700-4000 MHz.

Item	Description
1	New RF uplink and downlink
2	New RF to IP equipment conversion acquisition; or alternatively, relocation of hub to protected gateway and labour to install, commission and test the system

3	New Backhauls connecting Hub Site to Point of Interface (POI) at Toronto Carrier Hotel
4	Nuts, bolts and miscellaneous hardware and tools required complete installation
5	Documentation
6	Sign-off from End User that work has been completed

3.6 International Program Rerouting at Protected Gateway (Allan Park, ON)

Some foreign (non-U.S.) satellite companies not bound by clearing activities in the U.S or Canada are expected to continue to provide C-band services to Canada in the lower 300 MHz part of the band during and after the transition is complete. These programs will need to be received at a protected gateway and backhauled to a terrestrial interface point where they can be picked up those companies that had been receiving those signals prior to transition.

Item	Description
1	New RF downlink
2	New RF to IP equipment conversion acquisition and labour to install, commission and test the system
3	New Backhauls connecting Hub Site to Point of Interface (POI) at Toronto Carrier Hotel
4	Nuts, bolts and miscellaneous hardware and tools required complete installation
5	Documentation
6	Sign-off from End User that work has been completed

4 End User-Led Clearing; Reimbursable Costs by Impact Type

C-band Users and End Users may elect to manage and/or perform work themselves. The following sections set out the types of activities for which reimbursement will be provided. Telesat will publish cost ranges for these elements. Reimbursement requests that fall within these ranges will be presumed reasonable. If a C-band User or an End User anticipates that costs will exceed the amounts **published by Telesat for a category of work, they must discuss with Telesat and receive Telesat’s** approval, not to be unreasonably withheld, conditioned or delayed, prior to making the expenditure. Once the work is completed, the C-band User/End User shall submit appropriate documentation to support any such costs within 90 days of the completion of the transition. The required documentation shall be reasonably satisfactory to Telesat.

4.1 C-band User or End User Led Filter Implementations

For those C-band Users or End Users who have the knowledge and willingness to install filters themselves, Telesat will reimburse them for filter installation. The End Users will need to provide antenna and site information to Telesat to order the required filters. Telesat will create a C-band clearing portal/email to be used for this purpose.

The information required will include, but not be limited to, the number of antennas at the specific C-band site, single or dual polarization, site address or lat/long coordinates, the satellite the antenna is receiving signals from, and the specific signal reception (“content”) frequency detail for each antenna, so that Telesat can identify the correct filter and, if necessary, other equipment required for each antenna and site. Once the information is received and complete, Telesat will be responsible for shipping the filter kits to the sites in advance of the installation windows.

In addition to equipment, the End Users will be provided details about the timing of content migrations to new frequencies (where applicable) and the timing of required filter installations. The antenna owner is responsible for executing the filter implementations within the windows provided for each content provider.

End Users will be reimbursed for related expenses by way of a stipend per antenna. The schedule below sets out the items for which reimbursement will be provided. Reimbursements will be sent once evidence of the installation is uploaded to the C-band User portal referenced above.

Single-Feed Receive-only Antenna Filter Installation (1 rx port)	
Item	Description
1	Benchmark test of antenna performance
2	Labour to remove the LNB without removing the coax cable, to install the filter, and to return the antenna to working condition
3	Labour to install filters (1 filter per single feed antenna). Filters will be provided free of charge by Telesat
4	Post installation test of antenna performance to ensure link performance is within threshold
5	Nuts, bolts, gaskets and miscellaneous hardware and tools required to secure the filter to the feed and re-secure it to the antenna
6	Documentation of installation, sign-off of work and submission to Telesat
7	Travel to and from the site. Note 1: installation Zones found in Attachment E
8	Contingency – intended to cover incidental expenses - replace an IFL cable (as required)
9	Contingency – intended to cover incidental expenses - rental equipment, ladders, lifts, etc. (as required)

Dual-feed Receive-only Antenna Filter Installation (2 rx ports)	
Item	Description
1	Benchmark test of antenna performance
2	Labour to remove the LNB without removing the coax cable, to install the filter, and to return the antenna to working condition
3	Labour to install filters (2 filters per single feed antenna, one for each polarization). Filters will be provided free of charge by Telesat
4	Post installation test of antenna performance to ensure link performance is within threshold
5	Nuts, bolts, gaskets and miscellaneous hardware and tools required to secure the filter to the feed and re-secure it to the antenna.
6	Documentation of installation, sign-off of work and submission to Telesat
7	Travel to and from the site. Note 1: installation Zones found in Attachment E
8	Contingency – intended to cover incidental expenses - replace an IFL cable (as required)
9	Contingency – intended to cover incidental expenses - rental equipment, ladders, lifts, etc. (as required)

Multi-feed Receive-only Antenna Filter Installation (>2 rx ports)	
Item	Description
1	Benchmark test of antenna performance
2	Labour to remove the LNB without removing the coax cable, to install the filter, and to return the antenna to working condition
3	Labour to install filters (2 filters per single feed antenna, one for each polarization). Filters will be provided free of charge by Telesat
4	Post installation test of antenna performance to ensure link performance is within threshold
5	Nuts, bolts, gaskets and miscellaneous hardware and tools required to secure the filter to the feed and re-secure it to the antenna.
6	Documentation of installation, sign-off of work and submission to Telesat
7	Travel to and from the site. Note 1: installation Zones found in Attachment E
8	Contingency – intended to cover incidental expenses - replace an IFL cable (as required)
9	Contingency – intended to cover incidental expenses - rental equipment, ladders, lifts, etc. (as required)

Transmit/Receive Antenna (1 or 2 rx ports)	
Item	Description
1	Benchmark test of antenna performance
2	Labour to remove the LNB without removing the coax cable, to install the filter, and to return the antenna to working condition
3	Labour to install filters (2 filters per single feed antenna, one for each polarization). Filters will be provided free of charge by Telesat
4	Post installation test of antenna performance to ensure link performance is within threshold
5	Nuts, bolts, gaskets and miscellaneous hardware and tools required to secure the filter to the feed and re-secure it to the antenna.
6	Documentation of installation, sign-off of work and submission to Telesat
7	Travel to and from the site. Note 1: installation Zones found in Attachment E
8	Contingency – intended to cover incidental expenses - replace an IFL cable or modify waveguide for fit (as required)
9	Contingency – intended to cover incidental expenses - rental equipment, ladders, lifts, etc. (as required)

4.2 End User-Led Frequency Changes

The frequency repacking exercise may require frequency changes for many End Users in order to clear the lower 300 MHz of C-band.

For End User-led frequency changes, labour required to adjust the equipment settings and verify that the equipment locks onto the new signal will be required, whether it occurs at the time of filter installation or needs to be performed at a different time due to programming migration timelines. The schedule below sets out the items for which reimbursement will be provided.

One or More Frequency Retunes per Antenna on same Polarization (1 or 2 rx ports on rx-only or on tx/rx)	
Item	Description
1	Benchmark test of antenna performance
2	Change the frequency on the satellite receiver for a given service and verify that lock on the new signal occurs
3	Sign-off of work and submission to Telesat
4	MICS run for new transponder
5	Contingency - travel to and from the site. Note 1: Installation Zones found in Attachment E (as required)

4.3 End User-Led Polarization Changes

Many broadcasters and cable head ends have performed polarization changes in the past and Telesat expects many will choose to perform this work with internal resources. Telesat will provide a stipend for those who perform the work themselves to offset the cost of equipment and labour involved in making polarization changes.

The schedule below sets out the items for which reimbursement will be provided.

Polarization Change on Receive-only Antenna (1 or 2 port rx)	
Item	Description
1	Benchmark test of antenna performance
2	Labour to reposition feed or remove and replace it with a new feed suited to the new polarization, re-point the antenna and to return the antenna to working condition
3	Post install testing of the signal levels to ensure service is functional
4	Sign-off of work and submission to Telesat
5	Travel to and from the site. Note 1: installation Zones found in Attachment E
6	Contingency – intended to cover incidental expenses - replace an IFL cable or waveguide modifications for fit (as required)
7	Contingency – intended to cover incidental expenses - rental equipment, ladders, lifts, etc. (as required)

4.4 End User-Led Satellite Changes

In most cases, when a service is moved from one satellite to another, the filter will be installed at the same time. In those cases, the incremental work and costs associated with the satellite change will be reimbursed. The schedule below sets out the items for which reimbursement will be provided.

Satellite Changes on Antenna (1 or 2 rx port)	
Item	Description
1	Benchmark test of antenna performance
2	Labour to re-point the antenna to the new orbital location and make adjustments to frequency or polarity to receive the signal and return the antenna to working condition
3	Post install testing of the signal levels to ensure service is functional
4	Nuts, bolts and miscellaneous hardware and tools required to secure antenna and cables once it has been re-pointed
5	Documentation of installation, sign-off of work and submission to Telesat
6	Travel to and from the site. Note 1: installation Zones found in Attachment E
7	Contingency – intended to cover incidental expenses - replace an IFL cable (as required)
8	Contingency – intended to cover incidental expenses - rental equipment, ladders, lifts, etc. (as required)
9	Contingency - intended to cover incidental expenses - tree trimming/removal
10	Contingency - intended to cover incidental expenses - move antenna to achieve satellite visibility around obstructions that cannot be moved, removed or trimmed (new foundation, labour, IFL runs, trenching for cable reruns, mount modifications) (as required)

4.5 Uplink/Downlink/Hub Move to Protected Gateway

In circumstances where satellite service cannot be accommodated in the upper 200 MHz of the C - band, some C-band Users may be required to move the uplink/downlink/hub facilities located in non-satellite-dependent areas to a protected gateway facility, to continue receive operations on the C-band in the frequency range 3700-4000 MHz. This applies to certain TVRO services or a “north-to-south”

inbound signal associated with two-way transmissions where an earth station is located outside of protected, satellite dependent areas. Refer to Attachment D for the definition of protected satellite region. The costs of moving the hub and/or RF uplink/downlink facilities to the protected gateway facility with all supporting baseband equipment, as required, and backhauls back to the original hub facility will be reimbursed for the Post-Transition Period. The schedule below sets out the items for which reimbursement will be provided.

Hub or North-South Inbound Link Moves to Protected Gateway (Allan Park, ON)	
Item	Description
1	New RF uplink and downlink
2	New RF to IP equipment conversion acquisition and labour to install, commission and test the system; or alternatively relocation of hub to protected gateway
3	New Backhauls connecting Hub Site to Point of Interface (POI) at Toronto Carrier Hotel
4	Nuts, bolts and miscellaneous hardware and tools required complete installation
5	Travel to and from the site. Note 1: installation Zones found in Attachment E
6	Documentation of installation, sign-off of work and submission to Telesat

4.6 International Program Rerouting

Some foreign (non-U.S.) satellite companies not bound by clearing activities are expected to continue to provide C-band services to Canada in the lower 300 MHz part of the band during and after the transition is complete. These programs will need to be received at a protected gateway and backhauled to a terrestrial interface point where they can be picked up those companies that had been receiving those signals prior to transition.

Rerouting of International Programming at Protected Gateway (Allan Park, ON)	
Item	Description
1	New RF downlink installed at protected gateway
2	New RF to IP equipment conversion acquisition and labour to install, commission and test the system
3	New Backhauls connecting protected gateway to Point of Interface (POI) at Toronto Carrier Hotel
4	Nuts, bolts and miscellaneous hardware and tools required complete installation
5	New IP to RF equipment at Broadcaster premise
6	Travel to and from the site. Note 1: installation Zones found in Attachment E
7	Documentation of installation, sign-off of work and submission to Telesat

ATTACHMENT B

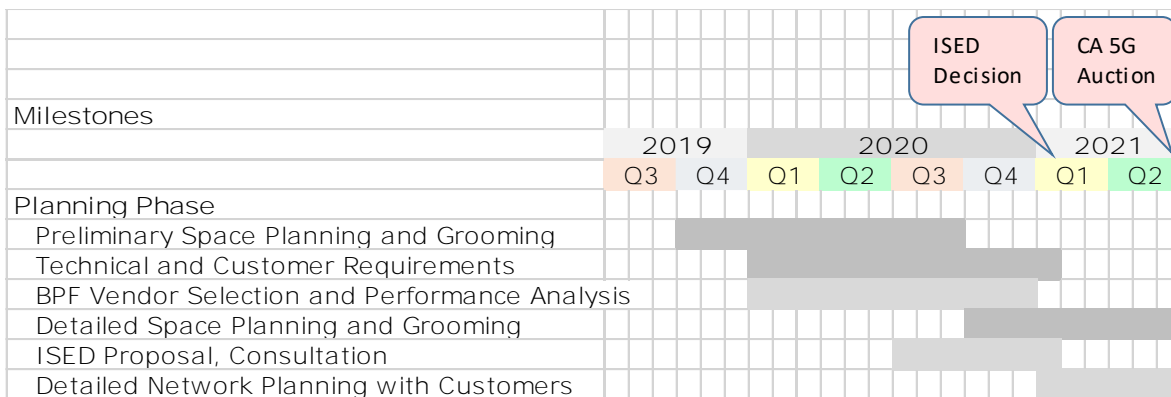
C-BAND USER SPECIFIC PROJECT PLANS

Telesat has conducted a preliminary plan for C-band clearing based on available information. The detailed planning phase of the C-band clearing will begin following the ISED Decision and the release of the list of Qualified Earth Stations and will include holding detailed discussions with C-band Users about their individual clearing plans. Careful planning and preparation will be required in order to orchestrate the satellite traffic plans with the associated C-band User network transitions.

The satellite traffic moves and the required changes to C-band User earth stations will begin in Q2 2021 in order to meet the initial clearing milestone of December 2021. Therefore, the initial focus will be on clearing the first 120 MHz in large urban centres, which will include the deployment of the 120 MHz filters. This will be accomplished by moving C-band Users with services delivered in large urban centres up in the band and those C-band Users with services targeted in satellite dependent regions of Canada down in the band. The satellite repacking activity will require networks to retune, re-point, change polarization, or move to a protected gateway facility or any combination thereof. To the extent the 300 MHz filters can be deployed in this phase, that will be done.

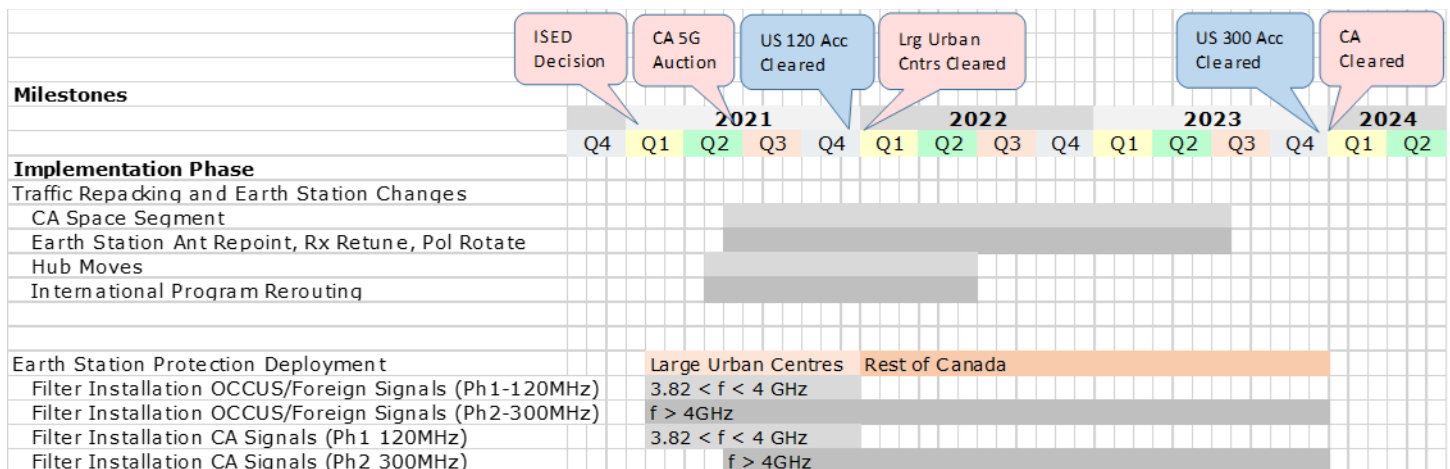
The next phase will involve clearing all 300 MHz (3700-4000 MHz) in all non-satellite dependent areas of the country. The same repacking and network changes will be required in this phase as well. The planning timelines are shown below. The process is highly complex requiring close and intricate coordination between Telesat and the C-band Users to successfully complete the clearing activities right up to the end of 2023.

C-band Users will be provided with individualized traffic plans, a proposed schedule and identification of the changes required to their network ground infrastructure. During this phase, Telesat will confirm the exact count of antennas and their configuration, the specific location and whether the C-band User will effectuate the work themselves and seek reimbursement or whether they will engage Telesat to manage and implement all required changes to their network.



The overall implementation timelines are shown in the next figure. The large urban centres are defined in ISED Annex D Table D1 of the Mid-band Consultation as a city with population greater than 100,000 people.

Clearing these areas require that all Canadian traffic being received in the non-satellite-dependent areas is in the upper 200 MHz of C-band (4000-4200 MHz). To accomplish this it will be necessary to move traffic for some signals received in the satellite-dependent regions as well as part of the satellite grooming activity. Although filters are not required in the satellite-dependent areas, it will be necessary to perform antenna transitions for some networks where earth stations are re-pointed, retuned, and feeds rotated to continue to receive the signals that have been transitioned.



1.1 Antennas Pointed at Anik Satellites

The vast majority of the work required to clear 300 MHz of spectrum in Canada involves satellite **services carried on Telesat’s Anik F1R, Anik F2 and Anik F3** satellites as the majority of satellite services received in Canada from foreign satellites have been addressed as part of the FCC satellite services repacking process.

The Telesat satellites are fully utilized therefore the satellite loading plans must occur on an orchestrated and sequential basis. Each move must be complete before the next move can take place, this includes any required changes to every antenna considered to be part of the C-band User’s network. In addition to the traffic and network changes, the deployment of filters is required. 120 MHz filters will be deployed initially followed by 300 MHz filters installed on every earth stations located in non-satellite-dependent areas across the country by the end of 2023.

1.2 Antennas Pointed at Foreign Operators’ Satellites

As indicated above, all U.S. broadcast programming will be transitioned to the upper bands as part of the FCC clearing process and on the same timelines as **in Telesat’s Revised Proposal**. The only requirement to protect these earth stations from 5G emissions in Canada is the installation of **band pass filters**. **By the end of 2021, the earth stations receiving signals from foreign satellite operators’** satellites and that are located in large urban centres will be equipped with 120 MHz band pass filters and by 2023 all earth stations located in non-satellite dependent areas will be equipped with 300 MHz filters.

In the event that some signals received from foreign satellites would remain in the 3700-4000 MHz part of the band, then those signals will be rerouted via protected gateway facilities and be delivered terrestrially.

ATTACHMENT C

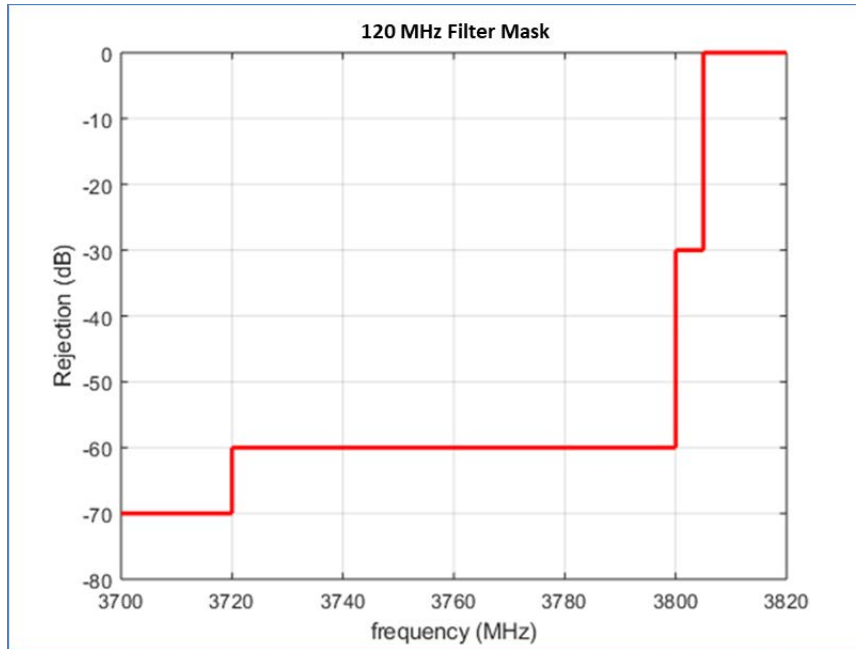
5G Rejection Filters Specifications

Filters that meet the below specification will provide the 60 dB of 5G in-band emissions rejection described in the mobile terrestrial operating rules proposed by Telesat. The filters proposed by Telesat meet the required 5G in-band rejection:

- a) In 3700-3820 MHz (120 MHz Filter-Phase 1) and minimizes the amount of signal loss anywhere within 3820-4200 MHz; and
- b) In 3700-4000 MHz (300 MHz Filter-Phase 2) and minimizes the amount of signal loss anywhere within 4000-4200 MHz.

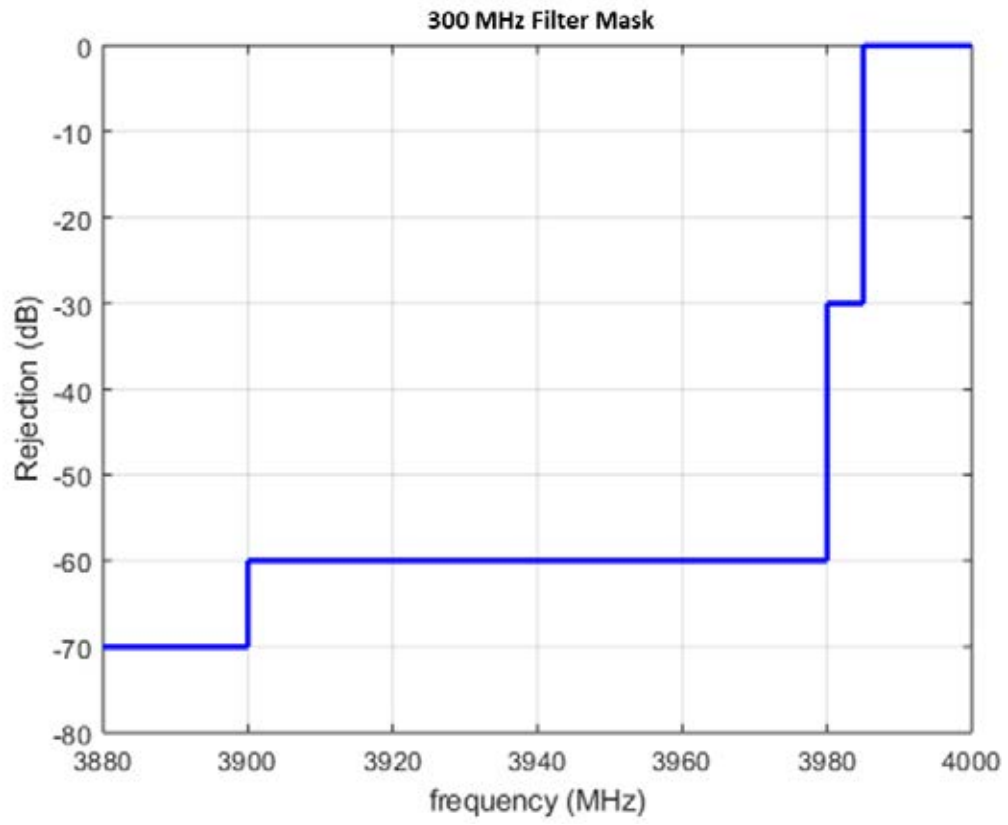
A. 120 MHz Filter (Phase 1)

120 MHz Filter Requirements (100+20 MHz)		
Electrical Characteristics	Pass Band	3820 - 4200 MHz
	Group delay variation within +/- 0.5 MHz	1.45 nsec Max
	Insertion Loss in Pass Band	1.3 dB Max
	Return Loss	20 dB Min
	Rejection from 3700 MHz to 3720 MHz	70 dB min
	Rejection from 3720 MHz to 3800 MHz	60 dB min
	Rejection from 3800 MHz to 3805 MHz	30 dB min
	Rejection from 3805 MHz to 3820 MHz	0 dB min
	Rejection above 4230 MHz	25 dB min
Mechanical Characteristics	Interfaces	CPR-229G & CPR-229F Through holes both ends
	Operating Temperature	-40° C to +50° C



B. 300 MHz Filter (Phase 2)

300 MHz Filter Requirements (280 + 20 MHz)		
Electrical Characteristics	Pass Band	4000 - 4200 MHz
	Group delay variation within +/- 0.5 MHz	1.45 nsec Max
	Insertion Loss in Pass Band	1.3 dB Max
	Return Loss	20 dB Min
	Rejection from 3700 MHz to 3900 MHz	70 dB min
	Rejection from 3900 MHz to 3980 MHz	60 dB min
	Rejection from 3980 MHz to 3985 MHz	30 dB min
	Rejection from 3985 MHz to 4000 MHz	0 dB min
	Rejection above 4230 MHz	25 dB min
Mechanical Characteristics	Interfaces	CPR-229G & CPR-229F Through holes both ends
	Operating Temperature	-40° C to +50° C



ATTACHMENT E

Installation Zones

The cost of travel, living and shipping vary by installation zone. Zone 1 is the least costly while Zone 3 is the highest cost. Many locations in Zone 3 are constrained by seasonal availability of access for shipping.

Zone 1 Locations:

C-band User sites located within 100 km from City Hall, and accessible using all-season paved public highways or roads from the following Canadian Cities:

City Name	Province
Barrie	ON
Calgary	AB
Charlottetown	PE
Chicoutimi	QC
Corner Brook	NL
Edmonton	AB
Fredericton	NB
Halifax	NS
Kamloops	BC
Kanata	ON
Kingston	ON
London	ON
Moncton	NB
Montréal	QC
North Bay	ON
Ottawa	ON
Prince George	BC
Québec	QC
Red Deer	AB
Regina	SK
Saint John	NB
Saskatoon	SK
Sault Ste. Marie	ON
Scarborough	ON
St. John's	NL
Stratford	ON
Sudbury	ON
Sydney	NS
Thunder Bay	ON
Toronto	ON
Val-D'or	QC
Vancouver	BC
Victoria	BC
Windsor	ON
Winnipeg	MB

Zone 2:

C-band User sites that are outside of Zone 1 boundaries, but south of the 50th parallel in Eastern Canada, south of the 55th parallel in central/western Canada, south of the 57th parallel in Alberta, and accessible using all-season paved public highways or roads.

Zone 3:

Includes any site located outside of a Zone 2 boundary. Other Zone 3 examples include locations that cannot be reached using all-season paved public highways, or where a ferry or air transport must be used, including, but not limited to: bush camps, mining sites, oil exploration sites and isolated communities.

