Director General Telecommunications Policy Branch,
Industry Canada,
300 Slater Street,
Ottawa, Ontario, K1A 0C8.

Comments of Nortel Networks
to
Canada Gazette Notice DGTP-004-04 (April 30, 2004)
“Revisions to Allocations in the Band 2500-2690 MHz and
Consultation on Spectrum Utilization”

Dear Mr. Larry Shaw:

Nortel Networks thanks Industry Canada for the opportunity to participate in this consultation on the 2500-2690 MHz band. As a global manufacturer, headquartered in Canada, and supplier of mobile and fixed wireless access network telecommunications equipment, particularly wireless mesh networks, wireless backhaul and base stations for cellular, PCS and third-generation mobile equipment using TDMA, IS-95, CDMA2000 (1x, 1xEV-DO, 1xEV-DV), GSM and UMTS technologies, Nortel Networks is extremely interested in the potential use of this band for mobile and fixed services.

The communications needs of many Canadians already depend on wireless services and the penetration of mobile use is continuing to increase. Nortel Networks believes that a cornerstone of the Department’s policy for Canada must continue to be built on the international consensus that is developing for the global usage of mobile service in this band together with supporting backhaul applications.

Summary:

Nortel Networks believes that the band 2500-2690 MHz is one of the last bands available, capable of supporting mobile and fixed service below 3 GHz and it has the significant promise of offering global compatibility, unlike the current cellular and PCS bands. We believe this industry has major promise and this new band will help develop the industry. “Spectrum” is the key “real estate” of the wireless communications industry and spectrum availability is an important enabler.

Nortel Networks is supportive of many of the proposals in DGTP-004-04, especially the intent to allocate this band as co-primary for both mobile and fixed services, but we have significant reservations on some of the proposed use of international footnotes, specifically, the proposed footnotes in relation to BSS, which we believe to be unnecessary for Canada.
Nortel Networks believes that the new wireless technology, which will likely be deployed in the band, will have significant frequency agility (carrier frequency can be selected on a 50 kHz or 200 kHz granularity) and thus these technologies can operate efficiently with different license block sizes.

Nortel Networks kindly requests the Department to:
- Maximize the possibility of global harmonization of the band.
- Prepare rules which will facilitate the use of global equipment and maximise economies of scale.
- Designate channels in such a manner as to facilitate national, regional and international roaming of terminals and installation of common global network equipment (mobile or fixed).
- Work towards the alignment of Canadian policy with proposals for this band from CEPT, the USA and ITU-R WP 8F.
- Adopt a fixed duplex separation of 120 MHz and/or 122 MHz, preferably according to international harmonization agreements (e.g., in ITU-R WP 8F) even if only part of the band is initially released.
- For FDD applications, ensure base transmit in the upper sub-band and mobile transmit in the lower sub-band.
- Consider requiring low transmit power operation in the lower sub-band to mitigate possible coexistence issues.
- Not regulate the specific carrier frequencies.
- Consider spectrum allocations suitable for both FDD and TDD technologies.

As usual, Nortel Networks is ready to work together with the Department and other Canadian industries to develop a policy and detailed technical regulations that are suited for the Canadian conditions.

Nortel Networks’ more detailed concerns are discussed in the following pages. These have been keyed to specific sections in the Gazette Notice.

Nortel Networks hopes that these comments will assist the Department in the development of its continuing policy of supporting communications services for Canadians.

Yours truly,

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Section 1 Intent

Nortel Networks is strongly supportive of the intent to add mobile and fixed co-primary allocations in the band.

Section 3 Table of Frequency Allocations

Nortel Networks supports the proposed updating of the Table of Frequency Allocations consistent with WRC-03 decisions. Nortel Networks supports the following proposed allocation changes in the Policy:

- Entering the fixed service as co-primary in the sub-band 2596-2686 MHz.
- Entering the mobile service as co-primary in the sub-band 2596-2686 MHz and suppressing the previous secondary mobile allocation.
- Entering a new Canadian footnote relating to the mobile service.
- Incorporating international footnotes adopted at WRC-2000 and WRC-03 for mobile and fixed services.
- Suppressing Canadian footnote C39, since there is no interest in Canada for potential mobile-satellite service allocations.

Nortel Networks makes the following detailed comments on the proposed changes to the Canadian Table of Frequency Allocations with regards to the footnotes in the band 2500-2690 MHz.

Section 3.1 Proposed Modifications

Nortel Networks supports the proposed updating of the Table of Frequency Allocations with respect to mobile and fixed co-primary status. Nortel Networks also supports the adoption of relevant footnotes, but has some concern over the specifics of some of the proposals as outlined below.

Section 3.2 International Footnotes

Nortel Networks notes that International footnote 5.149 cautions against the use of the band 2655-2690 MHz by space-borne or airborne emissions and concurs that this is an important restriction for Canada. Nortel Networks supports the addition of International footnote 5.384A commensurate with the addition of the MOBILE service to the Allocation Table.

Nortel Networks notes that International footnote 5.416 deals only with use of the band by the broadcasting satellite service and the footnote should be deleted from the proposed Canadian Table of Frequency Allocations, which does not have an allocation for BSS. Nortel Networks believes that BSS applications in the band will significantly impact the deployment of mobile and other services. Due to the large geographic footprint of BSS, it may cause interference to terrestrial services significantly beyond the intended coverage. Nortel Networks has customers in the USA operating in this band, who are very concerned about interference from BSS emissions.
Nortel Networks also notes that International footnote 5.417A is applicable to Region 3 only and does not appear in the ITU Region 2 table. Therefore the footnote cannot be adopted in Canada, except possibly as a domestic footnote, under a “C” designation, which is not desirable. Since the footnote is specifically applicable only to the named countries, Korea and Japan, it would be inappropriate to create a new Canadian footnote.

Nortel Networks further notes that International footnote 5.418 is, like 5.417A above, applicable to Region 3 only and does not appear in the ITU Region 2 table. As such, the same comments apply, except that in this case, the countries involved are Korea, India, Japan, Pakistan and Thailand.

Nortel Networks thus recommends that references to footnotes 5.416, 5.417A and 5.418 be removed as they are inappropriate.

Section 3.3 Canadian Footnotes
Nortel Networks notes the addition of footnote CXX and looks forward to participating in the future mobile spectrum policy and licensing consultation.

Section 3.4 Discussion
Nortel Networks supports the designation of FIXED as primary throughout the 2500-2690 MHz band. This designation is fully consistent with the Region 2 Allocation in the ITU Radio Regulations.

Nortel Networks supports the designation of MOBILE as primary throughout the 2500-2690 MHz band. This designation is consistent with the United States allocation, with the Region 2 International Allocation and is aligned with ITU footnote 5.384A. We also concur with the intent (in footnote CXX) of a future spectrum policy and licensing considerations. We also concur that deletion of footnote C5 is appropriate.

As stated above in Section 3.2, application of International footnote 5.416 is inappropriate, because there is no allocation to BSS in Canada. Similarly footnotes 5.417A and 5.418 are not applicable in Canada or in the Region 2 table. If there were to be any future allocation to these services in this band, the details would need to be carefully considered, to avoid problems with existing and proposed allocated services not only in Canada, but also in neighbouring Region 2 countries.

Nortel Networks notes International footnote 5.347A regarding Radio Astronomy and Active Space Services and concurs that this is an important restriction for Canada.

Nortel Networks supports suppression of footnote C39 for the reasons stated.
Section 4 Background on Service Implementation

Given the proposed allocation of the band as co-primary to MOBILE and FIXED service, Nortel Networks urges the Department to facilitate the rapid transition of parts of the band to newer MOBILE or FIXED applications.

Section 4.1 Current MDS Broadcasting Service Licensing (2596-2686 MHz)

Nortel Networks notes the current MDS allocation and the potential conflict with the use of the spectrum for new mobile and fixed services for paired band allocations – for example pairing part of the MDS spectrum with part of the MCS spectrum for the terrestrial component of IMT-2000 as per footnote 5.384A.

Nortel Networks supports the use of the spectrum for data services (including internet access) by new spectrally efficient technologies (e.g., IMT-2000, WiMAX, IEEE 802.16). Nortel Networks concurs with the requests by industry that Industry Canada and the CRTC grant increased flexibility to allow for the use of more MDS broadcast spectrum for high-speed Internet access.

Section 4.2 Current MCS Fixed Service Licensing (2500-2596 MHz)

Nortel Networks notes the current MCS allocation and the potential conflict with the use of the spectrum for new mobile and fixed services for paired band allocations – for example pairing part of the MDS spectrum with part of the MCS spectrum for the terrestrial component of IMT-2000 as per footnote 5.384A.

Nortel Networks supports the use of the spectrum for data services (including internet access) by new spectrally efficient technologies (e.g., IMT-2000, WiMAX, IEEE 802.16).

Section 4.3 Recent Developments in the US

Nortel Networks has noted the similar historical allocations in the United States and the recent actions by the FCC in this band (e.g. FCC-04-135 Report and Order). Nortel Networks believes there is a strong likelihood that advanced mobile and fixed applications will be deployed in the US and it is desirable that roaming subscribers can obtain service in Canada. Due to the synergy between North American telecommunication networks, Nortel Networks urges the Department to give very serious consideration to the re-channelization proposed by the FCC, so as to maintain maximum synergy for equipment offering mobile and fixed services for deployment on either side of the border so as to maximise economies of scale.

We note that FCC-04-135 creates 16.5 MHz blocks in the upper and lower sub-bands, but permits sub-channelization and super-channelization, so we do not believe it important that Industry Canada follows the 16.5 MHz license blocks in detail. The various new mobile technologies, which may be deployed in the band, will have different channel sizes (e.g., 1.25 MHz, 5 MHz, etc.). These systems have significant frequency agility (i.e. carrier frequency can be selected on a 50 kHz or 200 kHz granularity) and
thus these technologies can operate efficiently with different license block sizes as long as regulation does not artificially constrain their carrier frequencies.

Section 4.4 Return Spectrum and Promoting New Technologies

Nortel Networks supports the recent AWS activity in clearing spectrum in the 1700 and 2100 bands. Nortel Networks supports inclusion of both upstream and downstream spectrum within the 2500-2690 MHz band, in such a manner that it can be used by either mobile or fixed services as required by market-place dynamics.

Considering the mix of technologies envisaged in the band and the flexibility required going forward, Nortel Networks concurs with the Department that this may require that a channelling plan be developed which can accommodate both paired and unpaired channels, and for both high and low power transmissions so that operators may select the technology that best suits their needs. Nortel Networks encourages the Department together with the industry develop a frequency plan that is technology neutral and allows for flexibility of future system designs.

To support the various mobile technologies, we believe that the allocation should consider spectrum allocations appropriate to both FDD and TDD technologies. Nortel Networks notes that activities on designation of channels for IMT-2000 are ongoing around the world to facilitate harmonization and economies of scale, Nortel Networks urges the Department to designate channels in such a manner as to facilitate national, regional and international roaming of terminals (mobile or fixed).

Section 4.5 Alternate Frequency arrangements

Nortel Networks is an active participant in several international & regional forums. We note that ITU-R WP 8F, CEPT countries and CITEL either have adopted or are in the process of adopting guidelines for mobile use in this band. We recommend that the Department carefully review those arrangements and, as far as possible, maximize global harmonization.

Nortel Networks supports the working assumptions and background concepts described in ITU-R Doc. 8F/266, Annex 5, Section 5.3-Annex 4, especially the following allocation layout.

<table>
<thead>
<tr>
<th>2500 MHz</th>
<th>2690 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>G</strong></td>
</tr>
<tr>
<td>FDD UL (internal)</td>
<td>FDD DL (external) or TDD</td>
</tr>
<tr>
<td><strong>B + C</strong></td>
<td><strong>G</strong></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td></td>
</tr>
<tr>
<td>FDD DL (internal)</td>
<td></td>
</tr>
</tbody>
</table>

We note that recent CEPT documents are proposing a frequency arrangement that would likely lead to a 120 MHz duplex separation between channels in the “A” sub-band and corresponding channels in the “D” sub-band, if used for FDD technologies (i.e., duplex separation defined as separation between paired carrier centre frequencies).
An initial analysis of the FCC-04-135 appears to be consistent with a 122 MHz duplex separation, rather than 120 MHz. We note however that FCC-04-135 suggests dynamic duplex separation (this, however, does not preclude a constant separation in deployed equipment). Nortel Networks acknowledges that while fully flexible dynamic duplex separation is technically possible, we believe that there are significant complexity, cost and/or performance degradation trade-offs on both terminal and base station equipment versus similar equipment which has a fixed duplex separation. We therefore recommend that Industry Canada adopt a fixed duplex separation. We believe that, if necessary, dual support of a 120 MHz separation and a 122 MHz separation could be implemented with little cost/performance impact. If only parts of the “A” and “D” bands are released initially, then we propose that the spectrum bands released comply with this duplex separation, so that future expansion can proceed without the need for special equipment.

As noted above in the response to Section 4.3, the new wireless technology for this band will have significant frequency agility (the carrier frequency can be selected on a 50 kHz or 200 kHz granularity) and thus these technologies can operate efficiently with different license block sizes as long as regulation does not artificially constrain carrier frequencies.

For FDD applications, the conventional duplex direction should be followed i.e., base transmit in the upper sub-band “D” and mobile transmit in the lower sub-band “A”. For PCS (see SRSP 510), Canada required low transmit power in the lower band. Nortel Networks believes that a similar rule for equipment operating in the mobile service in the “A” sub-band would help with possible coexistence issues and Nortel Networks recommends that Industry Canada adopt such a rule for this band.

For future licensed blocks, the operator should preferentially use his spectrum in such a way that any unused spectrum can be later used by potentially FDD systems. For example if an operator is allocated a 15 MHz block in both the upper and lower bands, then he should start using both bands from the lower allocated edge, so as to preserve unused spectrum near to the upper edge for future (possibly FDD) applications.

Any change to the current bandplan would require channel re-arrangement – any such re-arrangement should be built on the comments in this section.

Nortel Networks notes that a major use being proposed for the 2500 MHz band is for the backhaul linking of the base-stations for new broadband services including access to the Internet. Such base stations, when deployed for mini-cell coverage, are most economically connected to a network using wireless links. The propagation characteristics of the band are well suited to such linkages in a cluttered urban environment where there may not be “line-of-sight” between stations. New technology (such as MIMO\(^1\)) permits very high efficiency

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\(^1\) MIMO – Multiple Input Multiple Output – a method of sending several data streams within a multipath radio channel.
of radio transmission and is expected to be key to facilitating broadband wireless network access. The newly developed IEEE 802.16 radio standard, for example, is designed for operation in this band for point-to-multipoint and point-to-point linkages of broadband wireless access nodes. The use of the band for such backhaul functions however, does require careful organisation to mitigate possible interference among high power, low power, mobile and fixed systems. As an example, if an operator is using their channels for micro-base station backhaul (FDD) from lampposts or buildings in the streets, and another operator is providing a mobile service (also FDD) in an adjacent set of channels in the same area, there is the possibility that the mobile transmitter may cause blocking to the fixed receiver (or the fixed transmitter may block the mobile receiver) if they are in adjacent channels. To prevent this interference would require adjacent channel isolation (almost) equivalent to that achieved by the FDD duplex separation and filtering. Technically this is very difficult to do, perhaps impossible at reasonable cost. To support the flexibility required for both services, a channelling plan may need to be developed between the industry and the Department which can accommodate both mobile and fixed applications so that operators may select the technology that best suits their business.

**Section 5 Prospective Use of the 2500 MHz Band for Mobile Services**

Nortel Networks notes the comments on international proposals for land mobile use of the band (especially IMT-2000). Nortel Networks notes that first and second generation spectrum is currently not harmonized around the world, however Nortel Networks is encouraged by the partial harmonization of the AWS spectrum at 2110-21xx around the world. It is possible that total harmonization, within most of the 2500-2690 MHz band, can be achieved globally and this should be encouraged, where possible.

Nortel Networks supports the identification of both upstream and downstream spectrum within the 2500-2690 MHz band, in such a manner that it can be used by either mobile or fixed services as required by market-place dynamics. Such an allocation should consider spectrum appropriate to FDD technologies as well as to possible TDD technologies or unidirectional services.

**Section 6 Unassigned MDS Spectrum in the band 2596-2686 MHz**

Nortel Networks supports the current moratorium on new use of the band, until the final Policy is determined. Nortel Networks acknowledges that re-channelization may be required commensurate with the goals for the complete 2500-2690 MHz band.
Section 7 Internet Access Using MDS Broadcasting Spectrum

Nortel Networks acknowledges that re-channelization may be required commensurate with the goals for the complete 2500-2690 MHz band.

Nortel Networks concurs with the intent of the Department’s proposals to allow MDS operators, already providing broadcasting distribution services, to more flexibly allocate their MDS spectrum for non-broadcasting services and to allow MDS operators the flexibility to offer a range of services in this spectrum under their fixed allocation by removing conditions that make Internet access services secondary in this band.

Summary

Nortel Networks believes that the band 2500-2690 MHz is one of the last bands available, capable of supporting mobile and fixed service below 3 GHz and it has the significant promise of offering global compatibility, unlike the current cellular and PCS bands. We believe this industry has major promise and this new band will help develop the industry. “Spectrum” is the key “real estate” of the wireless communications industry and spectrum availability is an important enabler.

Nortel Networks is supportive of many of the proposals in DGTP-004-04, especially the intent to allocate this band as co-primary for both mobile and fixed services, but we have significant reservations on some of the proposed use of international footnotes, specifically, the proposed footnotes in relation to BSS, which we believe to be unnecessary for Canada.

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- Consider requiring low transmit power operation in the lower sub-band would help with possible coexistence issues.
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As usual, Nortel Networks is ready to work together with the Department and other Canadian industries to develop a policy and detailed technical regulations that are suited for the Canadian conditions.

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