NOKIA

Nokia Networks
Customer & Market Operations

COVER LETTER
Response to IDA
Public consultation paper
20th May 2004

Dear Sir/Madam

DEPLOYMENT OF WIRELESS BROADBAND TECHNOLOGIES IN SINGAPORE

On behalf of Nokia Networks, I would like to thank IDA for the opportunity to share our views on the topic of wireless broadband deployment in Singapore.

In this paper, we would like to offer our views to help contribute to Singapore's wireless services market development in the interest of consumers, operators and other players.

Given our background as the world's leader in mobile communications and a leading global supplier of wireless network infrastructure, service platforms and terminals, we would like to answer frequency and technology related questions, where global developments and implications have relevance to the Singapore market. In our view, the other questions raised would be best answered by the operators who are providing wireless services to consumers.

Please do feel free to contact me if you require any clarification on the material presented here. We will also be happy to be of any further assistance.

Best Regards

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Response to IDA's consultation paper: "DEPLOYMENT OF WIRELESS BROADBAND TECHNOLOGIES IN SINGAPORE"

Question (b)

Views and comments on the allocation of the 2.3 GHz and 2.5 GHz bands for wireless broadband technologies and the harmonization of spectrum at the border areas. What are the coexistence issues that need to be considered with regards to the deployment of systems (FDD & TDD) in the same geographical area in adjacent frequency blocks, and the deployment of systems across geographic boundaries in the same frequency blocks? What are the technical assessment and methodology to be used for the deployment and coordination of systems, including separation distances, power spectral flux density limits, out-of-band-emission limits, frequency guard bands etc, to ensure coexistence of system operations? What are the mitigation techniques that could be employed in case of co-channel interference between systems operating in adjacent geographical areas?

Does the 5 MHz, 5.5 MHz or 6 MHz channeling plan for the 2.3 GHz band and the 2.5 GHz band meet industry requirements? What is the appropriate duplex separation (Transmit/Receive) for the FDD wireless broadband technologies in the 2.3 GHz and 2.5 GHz bands respectively? What is the minimum, as well as optimal amount of spectrum required by an operator for specific geographical deployment or nationwide deployment? Please provide supporting reasons for each comment and proposal made.

Response to question (b)

Currently ITU (ITU-R WP8F) is discussing on the detailed frequency arrangement 2.5 GHz (2500-2690MHz) band. Nokia participates actively in ITU-R work on this band plan and welcomes all ITU efforts to make a globally agreed harmonized band plan for 2.5 GHz. ITU-R WP8F has also made a report of mitigation aspects between FDD and TDD modes of IMT-2000 and the main conclusions are that there is no simple agreed way to mitigate interference between FDD and TDD modes. This can be handled but only using different means case-by-case.

Nokia is a strong proponent of open, globally standardized technologies beneficial for consumers. These benefits include for example the following:

- Cost reduction due to increased competition & economies of scale
- Greater interoperability
- Increased customer choice
- More innovation
- Global roaming

The above aspects are particularly relevant considerations in Singapore, which has one of the world's highest levels of interactivity with other countries. Regarding the 2.5 GHz frequency band, these aspects are relevant, since the benefits of global scale and adoption will be available, should the ITU recommendations be followed in Singapore.

When one looks at the Singapore mobile services market, it is easy to conclude that the past decisions by IDA have benefited the consumer. The level of competition is high: voice and data tariffs, and prices of terminals are among the lowest in the world. A wide range of data services is also already in the mass market. There is also impressive variety in the mobile terminals, with hundreds of models from dozens of suppliers. Yet, at the same time, the operators are able to produce healthy financial results and are able to invest in high-quality, next-generation of service platforms.

These consumer-benefits have been enabled by IDA's decisions to support the globally standardised GSM platform – first in the entry phase and later, in the capacity expansion phase. The situation now is thus very similar to the situation with GSM a decade ago.

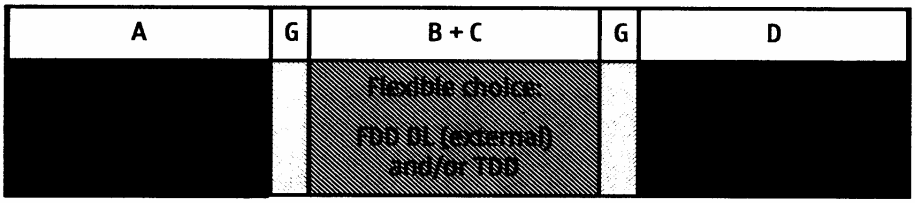
- In the early 1990s IDA allocated GSM frequencies for 900 MHz band.
  In early 2000s, IDA allocated IMT-2000 3G frequencies in 2.1 GHz band.
- Later in the 1990s IDA allocated GSM 1800 MHz band to support GSM expansions.
  Now, IDA can reserve 3G expansion frequencies in the 2.5 GHz band.

While ITU is progressing with the global harmonisation of the 2.5 GHz band, the band plan has been also recently discussed in Europe (in CEPT PT1). We list here the existing agreed working assumptions of PT1 regarding the 2.5 GHz band plan. It has been contributed to ITU-R WP8F (doc 8F/198) and can be found from ITU-web-pages.

These working assumptions have been done together with CEPT administrations and industry operators. The PT1 working assumptions answer some of the sub-questions in the above question b). Nokia supports these assumptions, which are listed here:

- The whole band 2 500-2 690 MHz will be designated for the IMT-2000 terrestrial component (not for satellite)
- FDD pairing is required within the band and will occupy blocks at the outer-most parts of the band and FDD paired blocks will be of equal size. In order to have sufficient paired capacity, the size of the FDD paired blocks will each be in the range [60-80 MHz].
- The minimum duplex gap between the FDD pairing that is technically feasible is 30 MHz. (NOTE: This assumption is based on 3GPP studies)
- The asymmetry ratio within offered traffic is typically 2.3:1 (DL:UL), which does not necessarily imply the need for asymmetric spectrum requirements (NOTE: This assumption is based on UMTS Forum studies)
- Conventional duplex direction should be adopted for FDD internal spectrum
- In order to provide sufficient certainty for standardization of equipment operating in the FDD internal paired blocks, any guard band which would be necessary at the different internal borders, will be taken inside the unpaired blocks.

- CEPT has indicated some preference for Option 5



The 2.3 GHz is not a globally identified band. As a result, the aspects of global harmonisation are less relevant. Due to this, in our answer we covered only the aspects related to the 2.5 GHz frequency band.

Question e)
Views and comments on the deployment of wireless broadband technologies in the 3G spectrum bands. Are there any technical considerations that IDA should consider? Please provide detailed supporting reasons for each comment and proposal made.

Response:

With regards to using wireless broadband technologies in 3G spectrum bands, Nokia sees that the 3G spectrum band (IMT-2000 band) is most efficiently utilized when only IMT-2000 standardized system is deployed within the band. The Wireless broadband capability is available in the IMT-2000 3GPP system evolution through the HSDPA (High Speed Downlink Packet Access) feature that will be deployed in the existing IMT-2000 band as natural evolution. This evolution step provides up to 10.7 Mbps bit rates for the consumer, approaching the theoretical limits for a maximum utilization of radio spectrum.

HSDPA technology is already standardized by 3GPP and is under development by all leading 3G system and 3G terminal manufacturers. As a result of the global adoption, HSDPA will enjoy similar scale economies that are available in GSM today.

A further consideration is that IMT-2000 3GPP systems and terminals have been specified to take into account only IMT-2000 technologies, but not technologies using different standards. Mixing technologies within the band may lead to inter-system interference causing performance degradation. Such degradation would mean lower quality for consumers and requirement for additional cell sites to be implemented by the operators.

The above considerations are relevant in Singapore today in the 2.1 GHz band (1920-1980MHz, 2110-2170 MHz). In the event IDA decides to enable the globally harmonised evolution path for IMT-2000 3G operators in the 2.5 GHz band, the same considerations will become relevant in that frequency band as well.

End.