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***Question 1**: IDA invites views and comments on the proposal to allow UWB devices to operate in the bands that are used for other radiocommunication services such as fixed satellite (FSS) fixed services (FS) and radio navigation.*

NXP believes that this question has already received a huge amount of attention, and public comment. The proceedings of the US FCC leading up to the 2002 Report and Order (02-48) are just one example, where the debate on both sides of the issue was lengthy and protracted. The FCC 02-48 report itself contains a representative sample of arguments put forth by various incumbent spectrum users including analyses of potential interference to GPS, various U.S. Government systems, and analyses of potential interference to PCS, MMDS, and XM satellite Digital Audio Radio Services (DARS). Moreover, extensive study has since taken place in such forums as the European CEPT ECC TG3, the Japanese MIC and other regional regulatory authorities in addition to the ITU-R studies already cited by the IDA.

While it is not practical to reproduce the full quantitative analyses in this response, it is intuitively clear that naturally occurring mitigation factors apply to the coexistence of UWB with the services mentioned in this question. Typically, satellite services benefit from the use of high-gain, highly directional antennas, making it highly unlikely for consumer UWB devices to be close to bore site alignment with a satellite receiving antenna. Other satellite services using hand-held, portable antennae such as GPS navigation and DARS operate at frequencies significantly below those envisioned for deliberate UWB transmissions at -41.3dBm/MHz and thus benefit from legally mandated low UWB PSD at their frequencies of operation. Regarding fixed services, these tend to be characterized by external, fixed antennae on the outside of buildings. It is difficult to imagine realistic use cases for UWB devices (especially indoors) that could result in significant RF coupling between the UWB antenna and the externally mounted fixed services antenna, when factors such as building wall attenuation and antenna directivity are considered.

***Question 2**: IDA also seeks views on the possible scenarios of harmful interference from UWB devices to other licensed bands and the possible measures to reduce the risk of interference.*

NXP's experience in this field has led to the conclusion that the most sensitive scenario is one where an indoor, mobile service such as WiMAX or future 4G cellular services share spectrum directly with the 'high PSD' portion of the UWB mask in a given country, where 'high PSD' is traditionally taken to equal -41.3dBm/MHz. In this case, none of the naturally occurring mitigation factors mentioned in the answer to question 1 is present (neither building attenuation, nor antenna directivity, nor frequency separation). Furthermore, the victim service may itself be operating at low signal strength due to building attenuation and distance from a remote cell site or base station. In such cases, another form of mitigation must be considered if UWB is to be allowed to operate at a sufficiently high power spectral density to be useful. The most widely considered approach is known as Detect and Avoid (DAA), which requires the UWB client to sense when spectrum is in use by a victim service and take automatically reduce the radiated power spectral density utilized by the UWB transmitter at nearby frequencies. Similar approaches are already taken to allow unlicensed WLAN devices to operate in the 5GHz bands in Europe as detailed in the IEEE 802.11h specification. However, the problems associated with creating an effective Detect and Avoid scheme for UWB are considerable. Although various UWB manufacturers have demonstrated forms of DAA prototype, a standardized DAA which simultaneously satisfies the needs of potential victim services, government regulators and the UWB industry is very challenging to achieve and may take some time to emerge.

***Question 3**: IDA welcomes views and comments on the proposal to adopt a licence-exempt approach for UWB consumer and business data communication systems which comply with the UWB technical specification and operate with peak emission within the 3400 MHz and 10600 MHz band.*

NXP believes that a license-exempt approach is fully justified and is an essential element to enabling the UWB market as a mass-market, consumer technology. Since a license-exempt approach has already been adopted in legislation enacted in several major regions of the world, NXP believes that Singapore would not be taking a significant risk in following suit. Furthermore, to do otherwise could risk diminishing Singapore's reputation as an adopter and promoter of high-tech innovation, which continues to be important for Singapore's economic growth.

***Question 4**: IDA further invites comments on the proposal to allow license-exempt UWB devices implemented with mitigation techniques to operate at a higher peak emission level within the 3400 to 4800 MHz band as compared to generic UWB devices without mitigation techniques*.

In adopting this approach, Singapore would be following the approach taken by several other key regulatory regions. In Europe, the concept of "Equivalent Protection" has been utilized in the initial UWB legislation, although the technical details of what constitutes equivalent protection are yet to be worked out and agreed. NXP believes that this approach is expedient as well as progressive, since it has the upside potential of enabling very efficient spectrum sharing while preserving the benefits of superior propagation for UWB services as compared to propagation in the bands above 6 GHz. Providing a legislative framework for such mitigation techniques to be utilized is a spur to innovation, and may produce results that point the way to innovative spectrum sharing techniques that could have wider application in the future (e.g., so-called cognitive radio).

The risk, however, is that there is not yet any convincing existence proof of a fully worked out mitigation technique that meets the requirements of all parties. However, this latter risk is one primarily borne by the UWB industry itself, since it will be up to the industry to develop and prove such techniques to the satisfaction of government regulators and other interested parties.

***Question 5**: IDA welcomes views and comments on the proposal to adopt licence-exemption approach for UWB vehicular radar devices that comply with the UWB technical specification and operate with peak emission within frequency bands 21650 – 29500 MHz and 77000 – 81000 MHz.*

NXP believes that this approach is appropriate and necessary to encourage adoption of the technology its public safety benefits. NXP is not aware of any significant disadvantage to adopting this approach.

***Question 6**: IDA welcomes views and comments on the decision to license, on a case-by-case basis, the use of UWB imaging systems with peak emission below the 960 MHz or in the 3400 to 10600 MHz band.*

NXP believes that the licensed approach is appropriate since this is not a mass-market consumer technology, and indeed the higher power and lower frequencies of operation will require closer case-by-case monitoring and on both these counts is well suited to a licensed model of deployment.

***Question 7**: IDA also seeks comments if licensing conditions are required as further safeguards to existing users in the abovementioned band. If so, please identify and explain the potential interference to the mobile and trunked services from the UWB imaging devices operating in the frequency band below 960 MHz. Please also explain what are the safeguard measures that could be adopted.*

NXP does not have a commercial interest in this type of application and therefore has not completed sufficient study to answer this question adequately.

***Question 8**: IDA welcomes views and comments on the proposed licensing fee structure for UWB devices. Please provide supporting reasons to justify your view.*

NXP does not have a commercial interest in this type of application and therefore believes it would be inappropriate to offer an opinion on the question of licensing fees.