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Radio Spectrum Management
Ministry of Business, Innovation and the Employment
New Zealand

Discussion document: 3.3 GHz Regional and Non-National Use

Response of: Cisco Systems, Inc.

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Cisco Systems, Inc. (Cisco) is pleased to respond to the Discussion Document on 3.3 GHz spectrum. Cisco is a global leader in enterprise, service provider and government networking technologies, including wireless technologies, that enable our customers in New Zealand to better deliver on their mission – whether that is educating students, treating patients, or improving government, manufacturing or business processes. Fundamentally, we agree with the view articulated by Radio Spectrum Management (RSM) that both enterprise networks and rural Wireless ISPs (WISPs) require access to spectrum, and we further agree that 3.3 – 3.4 GHz is a good choice to meet those needs.

Q1. Do you agree that the 10 MHz between 3.40 – 3.41 GHz should be included with the 3.41 - 3.80 GHz band (the 3.5 GHz band) that will be made available for national use?

Yes. The 5G technology that service providers will be implementing in the middle portion of the 3 GHz range typically utilizes channelization of 20 MHz. For that reason, RSM should make available the full 400 MHz under its proposal to add 10 MHz to the bottom portion of the existing 3.41 – 3.8 GHz band. This change will make service provider 3 GHz spectrum more usable.

Q2. What is your view on using the 3.3 - 3.4 GHz band for regional broadband and/or private networks? Are there other use cases of this band that should be considered?

RSM should consider putting the 3.3 – 3.4 GHz band to work for both rural broadband networks, with a focus on unserved or underserved areas, and for private networks. In doing so, RSM would best assure that networks complementary to future 5G service provider networks would have access to spectrum. A different approach would be to make spectrum available in the 3.8-4.2 GHz range for private networks and/or rural broadband networks, and open 3.3-3.4 GHz to national service providers so that national service providers have access to 3.3-3.8 GHz. This latter option aligns with some European nations that have opened 3.8-4.2 GHz for private network use. A third option is the Brazilian model of opening 3.3-3.7 GHz for service provider, and 3.7-3.8 GHz for private use. However, regardless of the option that RSM chooses, the salient issue is that mid-band spectrum needs to be made available in the 3 GHz range in a way that facilitates 5G technology. There is strong demand for 5G – from public service providers and their customers, for private networking and for rural broadband. Most importantly, 5G technology has been specified and standardized in the 3 GHz range, ensuring that RSM's allocation can be swiftly followed by utilization of the band.

Cisco further agrees with the discussion paper view that rural use is likely to be "regional" in nature, focusing on unserved or underserved communities and households with either a fixed 5G wireless offer (or potentially another radio technology), and that private network use should be tied to the geography of the enterprise premises. That premises could range in size from a large agricultural concern to a small manufacturing premises and the regulatory mechanisms should be flexible enough to accommodate all. Moreover, as RSM correctly notes, a single private network might be used to service the needs of multiple enterprise locations.

Q3. Do you agree with our assessment of current spectrum use and potential impacts?

Yes. The discussion paper correctly notes that the band is lightly used, and can be managed now or in the future to accommodate existing users or, if necessary, move them to other bands. To the extent 5G technologies are deployed in the band (as we predict they will be for private networks), Cisco agrees the most elegant solution to adjacent band operations (e.g., above 3.4 GHz) is synchronization. For rural ISPs that might use 3.3 - 3.4 GHz for other technologies, geographic separation may be possible. We urge RSM to avoid the application of a 40 MHz wide guard band, which will simply waste spectrum.

Q4. Do you agree with the assessment that regional and local use will not be able to co- exist in the same geographic area on the same frequency. If not, why?

Coexistence depends upon network topology and/or the geographic characteristics of the network. A rural WISP that deploys 5G in fixed link configurations to reach rural households may be able to coexist well with either an outdoor or indoor private network located nearby, provided that private network operates at lower power, using antennas that are lower in height, and optimized to cover the enterprise premises only or whose use is potentially all indoor. The issue for RSM is this – should regulatory policy prioritize allowing rural WISPs to point their fixed links in any direction, including a fixed link signal transiting an enterprise premises? If that is the priority, then we agree that the regional and local use cannot coexist in the same geographic area on the same frequency. If RSM wants to accommodate both rural regional broadband uses and rural local uses in the same area, then the networks either need to be on different frequencies, or the networks need to be coordinated to avoid interference.

Q5. Do you agree that both regional and indoor use as well as local and indoor use could be manageable in the same geographic area on the same frequency. If not, why?

Yes. Building Entry Loss, plus a reasonable power level (e.g., what is needed for indoor coverage), should make coexistence between indoor uses manageable. The concern here is that the most desirable regional uses by rural providers would be outdoor fixed links to reach households otherwise not accessible to the network. As a result, the coexistence case posed by the question does not yield a meaningful result from either a policy or a commercial perspective.

Q6. Do you agree that the most effective way to manage spectrum in this band is to have contiguous services with a common frame structure and timing (synchronisation)? If not, why not?

Yes. This is the most elegant way to ensure networks do not cause interference, and avoids wasting spectrum resources with a large guard band. That said, a rural ISP network or a network serving a remote industrial site may be so geographically removed from other networks in the band that synchronization is not a concern.

Q7. What are your preferred options for a band plan for the 3.3 - 3.4 GHz band? Are there other options we should consider, if so please explain what these are?

New Zealand should join a growing group of countries in authorizing private networks where private enterprise and government agencies have direct access to spectrum. If the 3.3-3.4 GHz band is not selected, the other obvious choice is in the 3.8-4.2 GHz range. Enterprises of all types (private and public) will need the option to deploy 5G technology directly as part of their own networks, along with the option of purchasing 5G services from service providers. Most major economies that have manufacturing as a key focus have already provided direct access to spectrum. Germany, Japan, the UK, Brazil, Sweden and Norway are examples of countries that have done so. In the US, the US Department of Defense is deploying 5G on spectrum it controls in the lower 3 GHz range. When enterprises deploy 5G directly, they will not construct the full suite of network core capabilities that a national mobile network operator will, but are likely to rely on core networking provided by a cloud-hosted service provider to reduce cost and simplify network operations.

In the case of New Zealand, where enterprises are geographically concentrated in a few areas of the country, it also makes sense to allow rural ISPs to use the same spectrum for broadband access.

Q8. How much spectrum is required for regional and uses and how much is needed for Local use?

For local uses, most countries are providing 100 MHz initially, although some are opting to provide up to 400 MHz or more. Local networks enable high spectrum re-use. It is also expected that local networks will be heterogenous in that many enterprises will continue to rely on Wi-Fi for some functions and 5G for others. For rural regional uses, the amount of spectrum depends upon the relative density of an area to be served (e.g., a rural village or town vs a remote farmhouse). An allocation of 100 MHz should address many needs but may not be able to address all. Further allocation of mmWave spectrum for local networks will help address additional high-bandwidth short range use-cases.

Q9. What equipment options and standards should we consider for the 3.3 GHz band?

RSM should flexibly license the 3.3 – 3.4 GHz band. The regulatory practice of associating a spectrum band with a particular generation of technology or a particular technology is becoming outmoded. RSM should choose power levels and emissions technical characteristics that facilitate 5G, and require licensees to synchronize with the 5G networks located adjacent to, or within, the band. That way, the band can seamlessly transition to 6G and beyond. Those seeking to use other technology can seek technical waivers and explain how they will protect adjacent 5G networks.

Q10. If we adopt multiple standards how should we manage interference issues while minimising inefficient use of spectrum?

As stated above, instead of selecting standards, RSM should adopt a power level and emissions rules that facilitate 5G. Networks should be required to synchronize with the service provider networks at 3.4-3.8 GHz, or explain how the 3.3-3.4 GHz network would otherwise protect service provider networks or other local and regional networks in the 3.3-3.4 GHz band.

Q11. Do you agree that we should seek to permit all three use cases, indoor, local and regional uses in the 3.3 GHz band? Do you agree with our mix of use? If not which cases should we permit?

Yes, all three use cases should be permitted.

Q12. What authorisation mechanisms should we use for indoor, local and regional use cases non-national access in the 3.3 – 3.4 GHz band? Are there any other mechanisms that should be considered?

For indoor use, a general authorization is likely to make subsequent coordination and use of the band more difficult, as RSM will not have a mechanism to track individual transmitters. A general

authorization should be reserved for bands where the likelihood of system-to-system interference is low, either due to the design of the radio (e.g., RLAN bands) or user characteristics (e.g., CB or Personal Radio Service devices).

RSM should instead consider one authorization mechanism that applies to all users that is simple for an enterprise user or rural WISP to obtain and is low cost. Rural regional authorization should be targeted to those areas unserved or underserved by carriers with the specific purpose of delivering high speed broadband and/or other advanced services to these areas. For local private networks, deployments should be limited to the enterprise's geographic footprint. Wide area services of the type normally provided by a mobile carrier should not be permitted.

A "first in time" principle is a reasonable way to begin utilizing the band. If demand exceeds supply, this principle can be revisited. In the future, RSM may want to consider other mechanisms for band sharing, such as automated databases that ensure multiple users to not interfere with one another. These solutions, however, are more complex, requiring an understanding not just of multiple transmitters and receivers, but also geolocation and an agreement on propagation models. RSM should be open to this approach, but it may not be necessary to open the band initially.

Q13. What are the sort of rules should be applied to the authorisation mechanisms to ensure compatibility and fair access?

Upper limits for power and emissions characteristics should be specified in the authorization. These should facilitate 5G New Radio. However, the emissions characteristics specified do not have to be completely uniform. A Regional authorization for fixed broadband serving rural areas should be distinguished from a local authorization that could, for example, be limited to an indoor enterprise deployment. These systems would have different emissions characteristics. For administrative purposes, this could be managed by designating "classes" of likely uses – fixed broadband, local outdoor/indoor, and local indoor uses – and specifying emissions characteristics for each.

Similarly, the geographic location of the transmitters should be specified, or if Regional, the area authorized should be specified.

Synchronization is needed to protect service providers in the adjacent band, and other users in the 3.3-3.4 GHz band.

An authorization should be granted for a period of time, with an expectation of renewal. This ensures that there is an opportunity for RSM to ensure authorization records are reasonably up to date. It also ensures that radio investments made by enterprises can be depreciated over the life of the equipment, and that any use of radio to operate manufacturing machinery will be available over the useful life of the manufacturing equipment (e.g., 20-30 years). Users who no longer require an authorization should be required to return an authorization promptly by filing a letter.

Finally, the authorization should include the name and contact information for the responsible party, should interference occur.

Q14. How should we prevent spectrum denial / hoarding/ speculating of licenses? Should we adopt one of the existing models that RSM already employs or what new model should we use in the 3.3 GHz band?

If regional licenses are limited to WISPs serving rural geographies to address rural broadband needs, and if eligibility for local licenses are linked to the premises that the entity controls, then hoarding is not an issue. For example, only the Port Authority can get a local license for the port. Moreover, with the right technical parameters, there should be significant spectrum re-use. Some countries have adopted a "use it or lose it" rule of 1 year, but such a rule may prove unnecessary. If there is

concern about licenses being issued followed by a long period of no network build out, then a “use it or lose it” rule could be adopted.

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