Leidos Submission

in Response to the ACMA's Five Year Spectrum Outlook 2024-29 and 2024-25 Work Program

Request for Expansion of Licensing Authority to Allow Operation of New Generation Millimeter Wave Security Scanners

19 April 2024

1 Executive Summary

1.1 The Leidos group (**Leidos**) welcomes the opportunity to provide a submission on the Australian Communications and Media Authority (**ACMA**) draft Five Year Spectrum Outlook 2024-29 and 2024-25 Work Program.

1.2 Leidos requests that the ACMA includes consideration of a variation to the current licensing arrangements for airport body scanners in its final 2024-25 Work Program to facilitate the use of new generation scanners that are not currently eligible to operate under the existing class licensing arrangements.

1.3 Last year, Leidos introduced these issues in its comments submitted in response to the ACMA's consultation on the draft Five Year Spectrum Outlook 2023–28 published in March 2023.[1] Leidos' request for inclusion in the work program was supported by a number of other interested parties.

1.4 In the ACMA's "Response to submissions - Draft FYSO 2023–28 (OCTOBER 2023), the ACMA committed to "undertake deeper consideration of requests to review the existing arrangements when preparing our 2024–25 work program."[2]

1.5 Therefore**,** and in light of ACMA's statement that *"We recognise that body scanners play an important role in aviation security*",[3] Leidos seeks formal inclusion of these issues in the 2024–25 work program*.*

1.6 The new generation scanners are an innovation that would meaningfully enhance the security of airports and are suitable for a range of indoor applications in other sectors. In comparison to the current generation of scanners, they offer significantly improved detection of metallic and non-metallic objects, decreased false alarm rates, faster processing times, and a more private experience. This offers improved security and processing efficiency at premises where the new generation scanners are deployed, as well as an improved overall experience for users of those premises. Leidos therefore contends that its request for inclusion of these issues in the 2024-25 Work Program is in the public interest and consistent with the objectives of the following laws and policies:

(a) the *Radiocommunications Act 1992* (Cth) (**Radcomms Act**), in terms of facilitating the use of spectrum for national security, public safety and commercial purposes, to enable the operation of the new generation scanners in Australia;

(b) the ACMA's Statement of Intent and the Ministerial Statement of Expectations which include the objectives of promoting innovation and the adoption of new technologies;[4]

(c) the ACMA's stated intention to consider and foster international harmonisation of spectrum policy in the previous FYSO and Work Program;

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[1] *Leidos Submission in Response to the ACMA's Five Year Spectrum Outlook 2023-28 and 2023-24 Work Program - Request for Expansion of Licensing Authority to Allow Operation of New Generation Millimeter Wave Security Scanners, submitted 02 May 2023*.

[2] ACMA "Response to submissions - Draft FYSO 2023–28", p.27 (October 2023). ("ACMA Draft 2023 Response")

[3] ACMA Draft 2023 Response, p.27.

[4] *Statement of Intent*, Australian Communications and Media Authority, February 2023 and *Australian Communications and Media Authority Statement of Expectations*, the Hon. Michelle Rowland, Minister for Communications, 7 December 2022.

(d) the Australian Government's commitment to promote growth and innovation in the aviation sector by improving passenger screening processes, as discussed in the Aviation Green Paper[5]; and

(e) the *Security of Critical Infrastructure Act 2018* (Cth) (**SOCI Act**), in terms of supporting responsible entities for critical infrastructure in their obligations to implement heightened security measures and maintain risk management programs under the *Critical Infrastructure Risk Management Program Rules 2023* (Cth) (**CIRMP Rules**).

1.7 Leidos acknowledges that consideration of any change to the current regulatory arrangements for body scanners may raise a range of potentially complex technical and regulatory matters. In that context, including this issue in the final 2024-25 Work Program would only be a precursor to the detailed analysis and stakeholder consultation that would be required to assess the implications for the Australian spectrum environment and the appropriate operating parameters.

1.8 Subject to appropriate operating parameters being determined, Leidos submits that there is no risk of harmful interference from new generation scanners operating in indoor locations.

1.9 Leidos is happy to provide any additional information which would assist the ACMA in its consideration.

2 Background

2.1 Leidos, is an American defence, aviation security, information technology, and biomedical research company headquartered in Reston, Virginia, that provides scientific, engineering, systems integration, and technical services.[6]

2.2 Amongst other things, Leidos produces current generation (PV2) millimeter wave security scanners (**MMW Scanners**) that operate within the existing class licence for airport body scanners, *Radiocommunications (Body Scanning – Aviation Security) Class Licence 2018* (Cth) (**Body Scanner Class Licence**), which permits operation within the frequency ranges 24.25 – 30 GHz or 67 – 80GHz.

2.3 These MMW Scanners are currently used at several Australian airports and are an integral part of security screening processes. Leidos has current generation MMW Scanners operating within 24.25-30 GHz pursuant to the Body Scanner Class Licence, deployed in the following locations: Adelaide Airport, Albury Airport, Brisbane Airport, Darwin Airport, Devonport Airport, Dubbo Airport, Geraldton Airport, Hobart Airport, Kalgoorlie Airport,

[5] Australian Department of Infrastructure, Transport, Regional Development, Communications and the Arts, Aviation Green Paper (7 September 2023), 147.

[6] https://www.leidos.com

Kununarra Airport, Launceston Airport, Melbourne Airport, Onslow Airport and Sydney Airport.

2.4 The Western Australian Police also operate a Leidos current generation MMW Scanner under an apparatus licence.

2.5 In addition to Leidos, there are several suppliers that have existing deployments of current generation MMW Scanners in Australia pursuant to the Body Scanner Class Licence.

2.6 Leidos has developed a new generation (PV3) MMW Scanner that operates over the 20 – 40 GHz frequency range (**New Generation MMW Scanner**) that is currently not eligible to operate under the existing Body Scanner Class Licence because of its expanded operating frequency range and an increase in peak power. These devices have a range of benefits in comparison to current generation MMW Scanners, including increased resolution (by a factor of more than three) which enables better detection of security threats that are hidden on a person's body and improved detection of non-metallic threats which are becoming increasingly common.

3 Request for Inclusion in Final 2024-25 Work Program

3.1 The policies underlying the ACMA's spectrum planning are expressly designed to dynamically respond to improvements in technology to further the public interest. As recently confirmed by the ACMA:

> "… when there is evidence that the use of spectrum is no longer considered to be optimal, we may implement arrangements to enable a new optimal use of the spectrum or arrangements to better support the existing use of the spectrum."

3.2 While the ACMA's spectrum allocations and licensing scheme governing MMW Scanners have, to date, adequately addressed current generation systems operating in the 24.25 – 30 GHz and 67 – 80GHz frequency ranges, the technology of systems deployed as the front line of defence in aviation security has improved substantially in recent years and now provides greatly improved threat detection albeit within some different operating parameters. In addition, there are a range of deployments in areas other than airports for which New Generation MMW Scanners are ideally suited.

3.3 Accordingly, for the reasons outlined in this submission, Leidos requests that the ACMA include consideration of a variation to the current licensing arrangements for MMW Scanners in its final 2024-25 Work Program to facilitate the operation of New Generation MMW Scanners:

(a) in an expanded frequency range of 20-40 GHz;

(b) at an increased peak power level (compared to the existing class license) - peak EIRP of 0 dBm;

(c) subject to appropriate parameters to avoid the risk of harmful interference, at an expanded range of controlled indoor locations such as prisons, courts, government facilities, or secure data centres, other locations where commercially sensitive activities are undertaken, and public indoor spaces that may face elevated security threats; and

(d) by an expanded range of suitably trained personnel in addition to the existing class of authorised persons,

together referred to as the **Requested Changes**.

4 Timing

4.1 While the ACMA's band-planning process is made up of 4 stages: monitoring, initial investigation, preliminary planning and implementation, the ACMA's policy allows for accelerated consideration of issues if circumstances warrant it. This approach has proven to be a "*flexible and responsive way of addressing changes in spectrum demand and ensuring the timely delivery of spectrum to market*."[7]

4.2 Leidos therefore requests that the ACMA adopts an approach that will see the issue considered and addressed as early as possible, ideally by including it as a work item in the initial investigation stage of the final 2024-25 Work Program, having regard to the following considerations:

(a) **(International harmonisation)** Adopting arrangements that reflect the Requested Changes is consistent with the policy objectives of international harmonisation and technology standardisation.[8] The United States Federal Communications Commission (**FCC**) has approved operation of New Generation MMW Scanners in the 20-40 GHz range and at peak EIRP of 0 dBm since 2016. They are also approved for use in Korea and Thailand.

(b) **(Public interest)** Implementing the Requested Changes will "*contribute to promoting the long-term public interest*"[9] because these technology improvements will, when approved for operation, provide immediate security enhancements for hundreds of thousands of passengers utilising Australia's airports.

(c) **(Supporting new technologies)** Review of the existing arrangements is consistent with the ACMA's approach of continuing "*to review class-licensing arrangements to assess whether regulatory settings can be changed to support new technologies*".[10]

(d) **(No risk of harmful interference)** Importantly we believe that, operating indoors within appropriate parameters, the New Generation MMW Scanners present no risk of harmful interference to the existing domestic spectrum environment (set out in more detail in section 7 below).

5 Millimeter Wave Security Scanner Technology

5.1 System function and configuration:

(a) MMW Scanner technology is well-recognised and accepted in the area of airport passenger screening. The technology, capable of detecting both metallic and non-metallic threat objects, has become the standard in aviation checkpoint passenger screening.

(b) These whole-body security scanning systems use radio frequency (**RF**) imaging technology to detect weapons or contraband carried on a person, including non-

[7] FYSO 2023-28 and 2023-24 Work Program, at 7; *Radiocommunications Act 1992* (Cth) s 3.

[8] FYSO 2023-28 and 2023-24 Work Program, at 41.

[9] FYSO 2023-28 and 2023-24 Work Program, at 41; and *Radiocommunications Act 1992* (Cth) s 3.

[10] FYSO 2023-28 and 2023-24 Work Program, at 24.

metallic objects or explosives, which might otherwise require intrusive manual searches or be missed entirely by existing metal detectors.

(c) While this technology has been optimised for aviation applications, it may be widely implemented in any facilities with security needs, such as prisons, courts, and government, or secure commercial premises, such as data centres.

(d) The New Generation MMW Scanner technology discussed in this document is intended for indoor applications exclusively.

(e) As a general matter, the New Generation MMW Scanners described in this submission incorporate two identical vertical antenna masts with circularly polarized transmitting and receiving elements distributed along the two-meter vertical height. The masts are enclosed within a transparent upright cylinder (or portal) measuring approximately 2.4 meters high by 1.5 meters in diameter. Once a passenger or subject steps into the cylinder, the masts rotate around them, triggering a sequence of mmWave samples (see Figure 1 below). The operator (security agent) is typically outside the system, standing at a distance from the exterior of the enclosure. The occupant is interior to the scanner and is required to be in the centre of the interior space in order to obtain accurate scans (see Figure 1 below). The device measures reflections of the radio signals from the subject by taking the large number of spatial sampling points and reconstructing a 3-D holographic dataset. Algorithms are applied to the 3-D dataset to detect objects concealed on the body. The detection results are presented on a generic human figure for the security officer operating the system. During peak operating levels, one unit can scan several hundred passengers per hour.

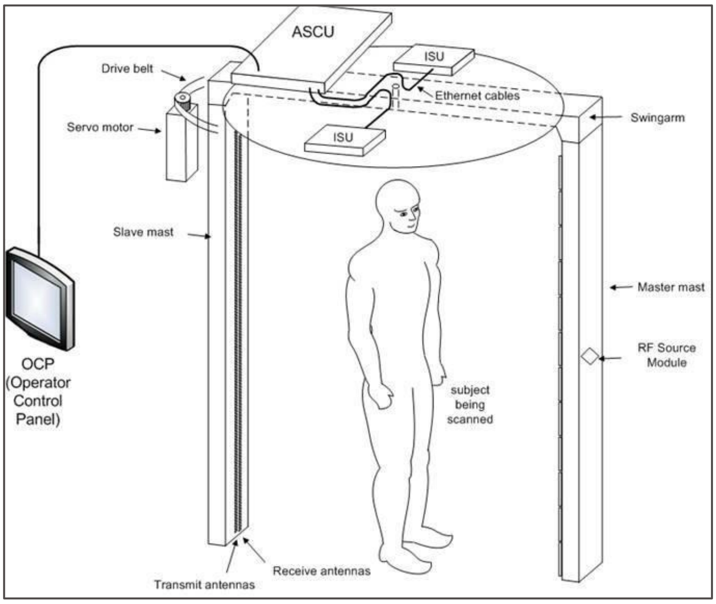

Figure 1. Diagram of System and typical operator and occupant configuration

5.2 Signal Characteristics

The New Generation MMW Scanners described in this document repeatedly sweep a chirped unmodulated sine-wave frequency modulated continuous wave (**FMCW**) signal over the frequency range 20-40 GHz. Figure 2 below depicts timing of sweeps and transmission of the wave. As shown:

(a) The minimum possible time between scans is approximately 4 seconds but, depending upon checkpoint loading and the time required by the operator to clear alarms, the time between scans is typically 10 seconds or more as shown in Figure 2a.

(b) As the antenna mast rotates through the nominal 110-degree mechanical travel, vertical scan lines are triggered at equidistant intervals around the circumference of the mast path, as shown in Figure 2b. The system remains idle with the transmitter disabled until the system operator initiates the next scan sequence.

(c) A full subject scan data capture sequence takes 1.3 seconds, followed by a pause to process the image and analyse the results.

(d) The chirped FMCW signal is repeatedly swept over the frequency range 20-40 GHz at a rate of 1.46 MHz/nanosecond as shown in Figure 2c. This chirp is repeated at each of the transmit antenna sampling positions along the height of the mast during a vertical scan line data capture sequence, also shown in Figure 2c.

(e) The transmitted waveform, or chirp, over the 20-40 GHz band takes 13.7 microseconds.

(f) There is a 0.5 microsecond period with the transmitter disabled between chirps to switch to the next sampling point on the mast resulting in a total chirp repetition period of 14.2 microseconds, as shown in Figure 2d.

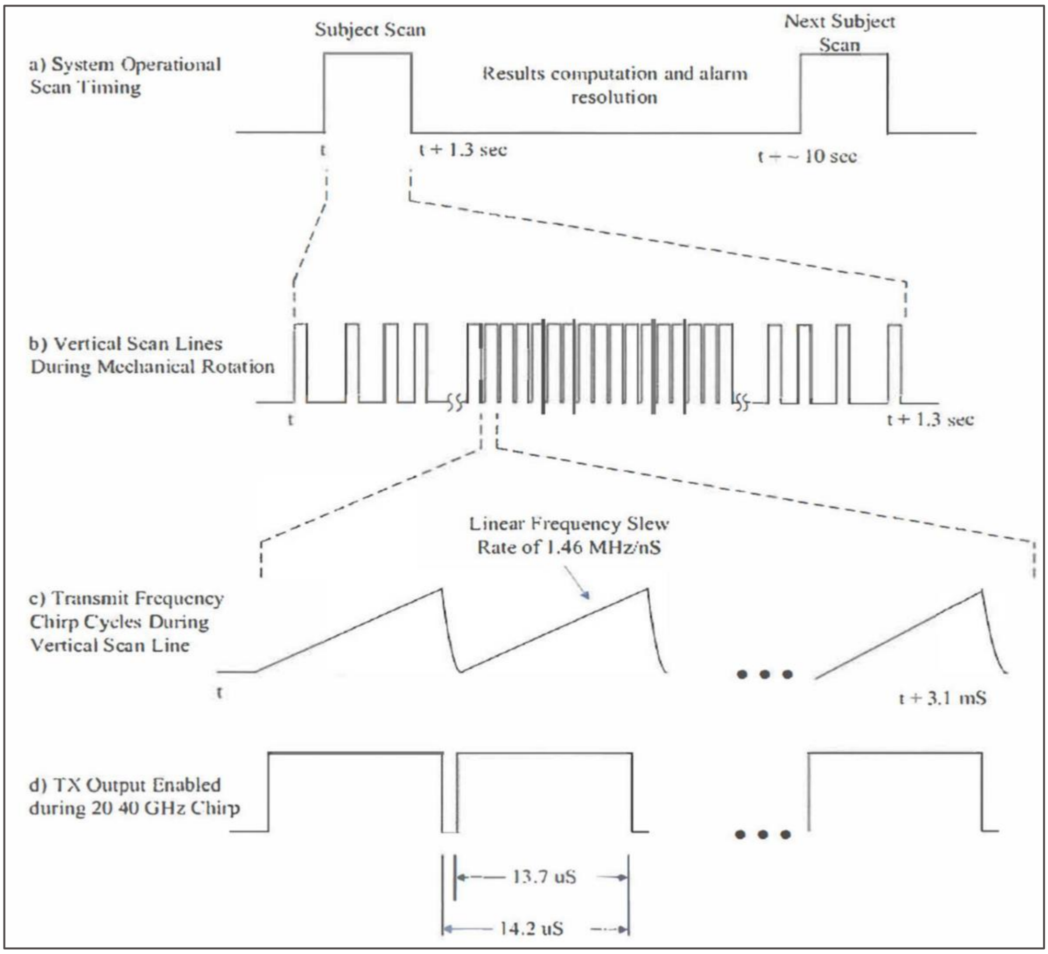

Figure 2. Scanning and Transmission Timings

6 Factors that Support the Requested Changes

Continuous improvements to aviation security are an express objective of the Australian Government

6.1 In recent years, the aviation security industry has responded to the global imperative of continuously improving aviation security, including Leidos via the development of its New Generation MMW Scanners to provide substantial threat detection enhancements.

6.2 The Australian Government has declared that the technology underlying aviation security must remain state-of-the-art, in order to stay ahead of "*[t]errorist groups [that] are knowledgeable about aviation operations, seek to identify vulnerabilities, and have the capability to mount sophisticated attacks with catastrophic consequences*."[11] This objective was made explicit when body scanners were first introduced into airports:

> "*Australia's aviation security regime has protected travellers and the general public from major incidents to date. However **the system must continue to improve and evolve** to meet a growing and changing airline industry and ongoing security threats*."[12] (emphasis added)

6.3 In addition, the Australian government is currently devising strategies to promote growth and innovation in the aviation sector. The Australian government's Aviation Green Paper (published as a discussion paper ahead of the release of the Aviation White Paper) highlights that passenger screening processes need to become more efficient to accommodate long-term passenger and freight growth.[13]

6.4 Due to their innovative technology, New Generation MMW Scanners offers a range of passenger benefits and efficiencies to streamline the passenger screening process.

Delivery of substantial safety and performance benefits for a range of sectors

6.5 While MMW Scanner technology was initially developed for aviation applications, it may be usefully deployed in any indoor facilities where security is a priority, such as prisons, courts, government buildings, secure data centres and other indoor locations where commercially sensitive activities are undertaken or indoor public spaces subject to elevated threat levels.

6.6 For all of these use cases, updating the existing arrangements to accommodate New Generation MMW Scanners and implementing the Requested Changes offers numerous substantial benefits to Australia's security systems, including improving personal safety and ensuring secure operating environments for enterprise and government.

6.7 For example, New Generation MMW Scanners:

(a) provide optimal resolution with minimal data distortion, ensuring improved detection of concealed objects;

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[11] Australian Department of Infrastructure and Transport, "The use of body scanners for aviation security screening in Australia: Privacy Impact Assessment" (**PIA**), accessed at: https://www.homeaffairs.gov.au/travelsecure-subsite/files/airport-body-scanners-privacy-impact-assessment.pdf, at 8.

[12] PIA, at 8.

[13] Australian Department of Infrastructure, Transport, Regional Development, Communications and the Arts, *Aviation Green Paper* (7 September 2023), 147.

(b) decrease false alarm rates, thereby reducing unnecessary manual inspections and delay for customers and the general public;

(c) have a faster processing time, allowing airports and other secure premises to optimise their operational capacity;

(d) reduce calibration requirements to further reduce delay for customers and the general public;

(e) provide improved (gender-neutral) privacy; and

(f) allow a more comfortable arms down pose for persons in the scanner.

6.8 The expanded 20-40 GHz range is ideal for security screening of humans because the operating wavelength of the transmitted signals can easily pass through clothing while reflecting from the skin, providing the resolution necessary to enable robust threat detection algorithms without concern for harmful RF energy. Reliability enhancements not only protect the public safety, but also enable performance of these screenings without causing undue operational delay, which can otherwise occur if manual searches are required to clear uncertain results.

6.9 The 20-40 GHz range has also been identified as the "sweet spot" with respect to frequency selection for these types of security scanners. Higher frequencies above the 20 to 40 GHz range produce a stronger clothing signature that distorts the reconstructed data. This in turn compromises the effectiveness of the detection algorithms. Operating at frequencies lower than 20 GHz, where there are correspondingly longer wavelengths, will reduce the spatial resolution, which compromises the ability to detect some threat objects.

Expanding MMW Scanner operating parameters is consistent with and promotes the objectives of Australia's security and spectrum policies

6.10 Adopting the Requested Changes would directly support the policies of the Australian Government in numerous ways.

6.11 First, making the Requested Changes is consistent with the Australian Government's objective of proactively updating its aviation security requirements to protect Australian citizens. As confirmed by the Australian Department of Infrastructure and Transport:

> "*New and emerging techniques employed by terrorists to target the aviation industry mean that the* ***Government must frequently review and revise aviation security measures*** *to ensure these measures adequately address the threat environment.*" [14] (emphasis added)

6.12 Second, the Requested Changes are consistent with the goals set forth in the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020* (**Modernisation Act**), and the objects of the Radcomms Act as amended by the Modernisation Act. The ACMA's decision making regarding the management of radiofrequency spectrum must be consistent with and promote the objects of the Radcomms Act which include facilitating the use of spectrum for "*defence purposes, national security*

[14] PIA, at 9 (emphasis added).

purposes and other non-commercial purposes (including public safety and community purposes)."[15]

6.13 Third, the Requested Changes are consistent with the ACMA's stated intention to consider and foster international harmonisation of spectrum policy. As described by the ACMA:

> "*In setting our spectrum management priorities, we consider a range of relevant matters, including:*
>
> *> domestic and international trends in spectrum uses*
>
> *> developments in international spectrum harmonisation and technology standardization*
>
> *> evolution of communications technology*
>
> *> the lowest cost and least restrictive approach to achieve policy objectives*."[16]

6.14 With respect to international harmonisation, indoor operation of the New Generation MMW Scanner has been approved in the United States by the spectrum regulator, the FCC and, more recently, by Korean and Thai regulators.[17]

6.15 As such, the ACMA is presented with an opportunity to ensure the same security benefits enjoyed in US are approved for travellers in Australian airports and persons at other indoor venues requiring heightened security.

6.16 Fourth, the Requested Changes would directly support the Australian government's strategy to bolster the security of critical infrastructure with an 'all hazards' regulatory approach.[18]

6.17 Entities which are responsible for critical infrastructure assets (including airports and certain data centres) have positive obligations under the SOCI Act to maintain risk management programs under the CIRMP Rules.

6.18 Amongst other obligations, the CIRMP Rules require responsible entities to maintain processes and systems for physical security, including to protect against any unauthorised access and to detect and respond to physical security breaches.[19] Leidos submits that the deployment of New Generation MMW Scanner to indoor environments beyond aviation contexts could therefore play a significant role in enhancing the security of Australia's critical infrastructure.

6.19 Inclusion of these matters in the ACMA's final 2024-25 Work Program, therefore, is precisely the type of rapid response to international developments that the ACMA can and should offer to Australian citizens as part of its core mission.

The Requested Changes are in the Public Interest

6.20 Adopting the Requested Changes and allowing the use of New Generation MMW Scanners is in the public interest as it will enable more comprehensive security measures to be taken

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[15] *Radiocommunications Act 1992* (Cth) s 3; 2022-23 Work Program, at 6.

[16] FYSO 2023-28 and 2023-24 Work Program, at 29.

[17] See FCC certification granted under FCC ID No. "TUZ-PV3" (Date of Grant: September 7, 2021).

[18] Australian Department of Infrastructure, Transport, Regional Development, Communications and the Arts, *Aviation Green Paper* (7 September 2023), 142.

[19] CIRMP Rules, r 11.

in critical areas. Australia is still at a "possible" threat level from terrorism across the nation and,[20] in order to protect Australians, advances in security must be continually made with the objective of improving public safety.[21] In addition, enhancing security of critical infrastructure assets would also improve supply security and service continuity, as any disruption to critical infrastructure could have serious implications for the community.[22]

7 The Requested Changes Pose No Risk of Harmful Interference

7.1 Leidos acknowledges that any process to assess the Requested Changes would raise a range of potentially complex technical and regulatory matters and require detailed analysis and stakeholder consultation. However, subject to the appropriate operating parameters being determined, Leidos believes that there is no risk of harmful interference from New Generation MMW Scanners operating indoors within the proposed frequency range and power level.

Both existing and New Generation MMW Scanners operate at very low power levels

7.2 For scanners operating in Australia within 24.25-30 GHz pursuant to the Body Scanner Class Licence, a radiated power that does not exceed a maximum instantaneous EIRP of - 10 dBm and a maximum power spectral density of -10 dBm per 4 MHz.[23] is permitted. As the Australian Department of Infrastructure and Transport has noted:

> "*Millimetre-wave body scanners operate at very low power levels within the radio frequency spectrum. The energy projected by one of these body scanners is 10,000 times less than a mobile phone transmission..."*[24]

7.3 The New Generation MMW Scanners operate at higher power levels than the current generation MMW Scanners, that is 0 dBm Peak EIRP and an EIRP average of -41 dBm/MHz (approximately -35 dBm per 4 MHz). However, Leidos submits that the overall impact of this increase would be immaterial where New Generation MMW Scanners operate indoors within appropriate parameters.

Indoor Operation Only

7.4 Similar to existing deployments of MMW Scanners, the New Generation MMW Scanners operating in the 20-40 GHz frequency range at the specified power level will be deployed exclusively indoors. In most cases, a receiver located outside of the building will be protected by attenuation from the building walls. At locations constructed with concrete block, for example, the walls will attenuate signals by at least 35 dB at 20 GHz, and more at higher frequencies.

7.5 As referenced above, indoor operation of the New Generation MMW Scanners has been approved in the United States by the FCC. In the 2016 Order granting permission for such

[20] https://www.nationalsecurity.gov.au/national-threat-level/current-national-terrorism-threat-level.

[21] *Radiocommunications Act 1992* (Cth) s 3.

[22] Commonwealth of Australia, *Australian Counter-Terrorism Strategy 2022*, 20.

[23] *Radiocommunications (Body Scanning – Aviation Security) Class Licence 2018* (Cth) s 7(2).

[24] PIA, at 18-19.

operation, the FCC concluded as follows with respect to this technology and its exclusive indoor use:

> *"Based on the information submitted with the waiver request, and the lack of any reported interference from the current generation of [this] equipment, we conclude that the [equipment] poses very little potential for causing harmful interference to authorized operations. We find that the [equipment] when operated in fixed indoor locations would pose very little, if any, potential for harmful interference to licensed operations that are located either outdoors or indoors ….At frequencies in the [equipment's] operating range, free space loss is significant. We concur with [the applicant] that this factor, added to building attenuation, can prevent harmful interference to licensed devices operating outdoors."*[25]

Very Short Duty Cycle

7.6 A short and efficient duty cycle is desirable in order to reduce risk of any RF interference. Given the 20 GHz operating bandwidth and the system's high sweep speed, the signal will be present in a receiver passband for only 0.005% of the time per MHz of passband (only 0.7 nanoseconds per MHz of receiver bandwidth). For example, a 10 MHz victim receiver will see a worst-case duty cycle of –33 dB during the active scan with this being further reduced by the intermittent scanning utilisation inherent in the operational use of the system. See "Annexure 1 – Duty Cycle Calculations".

7.7 In granting authority for the New Generation MMW Scanners, the FCC confirmed that:

> *"Also, the [equipment's] very low duty cycle signals and fast sweep speeds would further mitigate any potential interference to licensed receivers that operate at much longer transmission time periods in the affected frequency bands. Moreover, the [equipment] would have a faster sweep than the current device. This characteristic will reduce the time that a signal occupies any given frequency band and will further reduce the likelihood of harmful interference."*[26]

Revolving Antenna

7.8 The device antennas are directional and in rotary motion when transmitting, so any victim receiver will be in the beamwidth for only a fraction of the rotation. This further reduces the

[25] See FCC Order, ET Docket No. 16-45, DA 16-1075, ¶10 (Rel. November 22, 2016).

[26] See FCC Order, ET Docket No. 16-45, DA 16-1075, ¶10 (Rel. November 22, 2016).

energy reaching the receiver. During most use, a subject standing within the portal would further diffuse transmitted energy.

Expansion of MMW Scanner licensing arrangements could be implemented with conditions to further ensure no harmful interference

7.9 Additional conditions could also be imposed to further ensure there is no risk of harmful interference with other spectrum users. For example: (i) permitting use only on a no interference basis; and (ii) excluding outdoor use.

7.10 This approach is similar to the approach of the FCC, which granted approval for the New Generation MMW Scanner in the United States subject to the conditions listed at Annexure 2.

Previous Interference Analyses

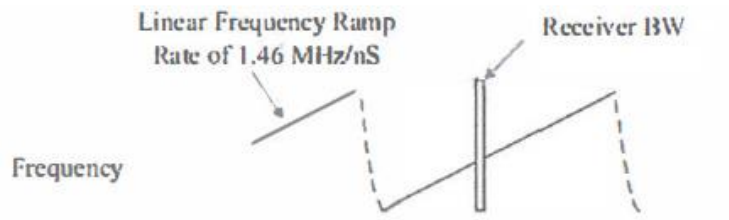
Leidos previously prepared a range of interference analyses, including those provided to the FCC, which demonstrated that there would be no anticipated harmful risk of interference from New Generation MMW Scanners. This material may also assist the ACMA in considering Leidos' request in the context of the Australian spectrum environment and can be provided upon request.

ANNEXURES

Annexure 1 - Duty Cycle Calculations[27]

Based on the details from Figure 2,[28] a duty cycle calculation can be derived as a function of receiver bandwidth.[29] The input parameters include the linear slew rate of the transmitter and the TX output timing for a given mast. Since the masts are directed toward each other, contributions of both masts are insignificant due to the angular separation. The perceived duty cycle of a receiver is visualized in figure 3 below. Since there is no correlation or synchronization with external receivers, both the ramp rate and chirp period affect the duty cycle incident to an external receiver.

$$\textit{Perceived Duty Cycle} = 10 \cdot LOG\ \left(\frac{\textit{Bandwidth of Receiver}}{\textit{TX Tamp Rate} \cdot \textit{Chirp Period}}\right)$$



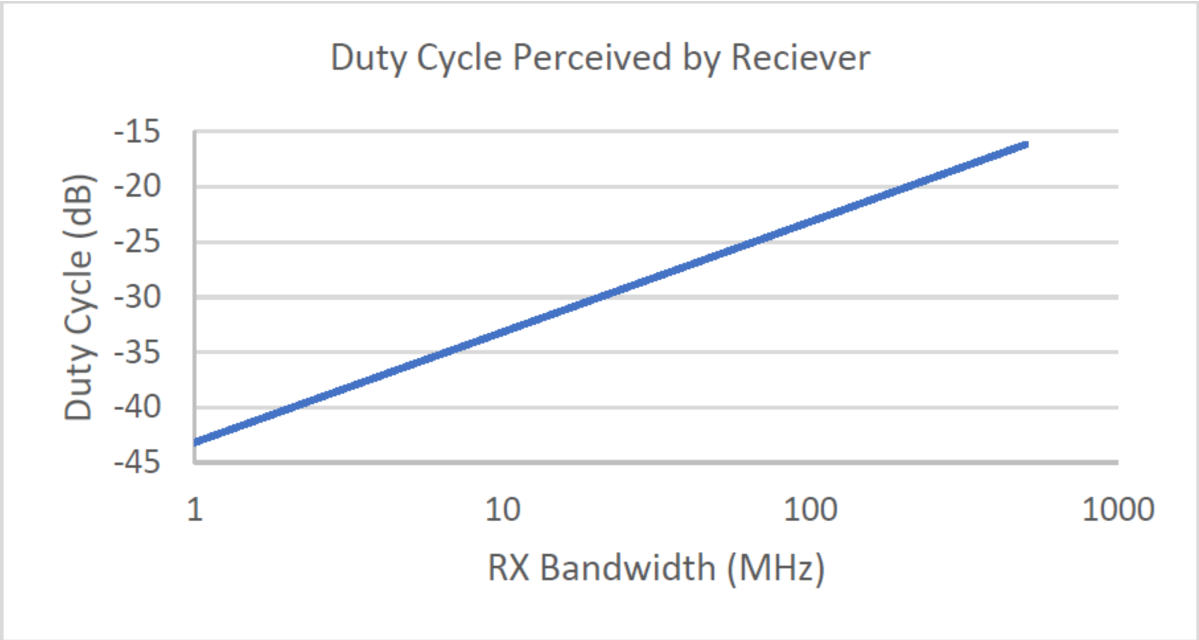


Figure 3. Duty Cycle

Note this calculation is a conservative assumption because it presumes the PV3 system transmits continuously and in the exact direction of the external receiver. The effects of mechanical sweeping and occupant loading are not included in this calculation and would only serve to further decrease the duty cycle.

[27] Source: Excerpted from CKC Certification Services, LLC, “Leidos Interference Analysis” (May 2022 – updated January 2023), noting that figure numbering reflects numbering in source document.

[28] This reference to ‘Figure 2’ equates to Figure 2 in the main body of the submission.

[29] L-3 Communications (now Leidos) FCC Waiver Request (2016).

Annexure 2 – Conditions Imposed by the FCC

"15. Accordingly, pursuant to the delegated authority in Sections 0.31 and 0.241 of the Commission's rules, we waive the requirements of Sections 15.31(c), 15.35(b) and Section 15.205(a) of our rules to permit the certification and marketing of the Next Gen ProVision device. This waiver is subject to the following conditions:

1) The Next Gen ProVision imaging device shall be certified by the Commission and must comply with the technical specifications applicable to operation under Part 15 of 47 C.F.R.[27] However, for this particular swept frequency device, compliance with the average power level need not be demonstrated under the requirement of 47 C.F.R. § 15.31(c) and the requirement of §15.35(b) is relaxed to allow a total radiated peak power level up to 41 dB above the maximum permitted average power in Section 15.209(a) when measured as specified herein.

2) The intentional emissions generated by the Next Gen ProVision imaging device must be completely contained within the 20 to 40 GHz frequency range.

3) All installations of the Next Gen ProVision imaging devices operated under this waiver shall be restricted to indoor use.

4) L-3 shall create and maintain a record of installations of all devices operating under this waiver, including the identity of the customer, type of location (e.g., airport or government building), and street address and/or coordinates. This list shall be made available to the Commission and to NTIA upon request.

5) L-3 shall inform purchasers that Next Gen ProVision imaging devices may not be resold to third parties for use at another installation in the United States unless appropriate arrangements are made to meet all of the conditions of this waiver.

6) This waiver shall apply to the Next Gen ProVision imaging device produced by L-3 as described herein and provided no major changes are made to the transmitter circuitry or to the housing and position of the antenna masts that would increase the devices radiated power or bandwidth.

7) L-3 shall follow the same measurement procedures for determining the average radiated power and the peak radiated power as specified in the initial waiver grant.[28] These measurement procedures are specific to the Next Gen ProVision imaging device and are not generally applicable to all swept frequency transmitting systems.

8) L-3 shall coordinate operation of its Next Gen Provision imaging system with any radio astronomy facilities within 50 kilometers that receive signals in the 20-40 GHz band, and shall coordinate any installation which is within line of sight of the observatory at Kitt Peak."

Source: FCC Order, ET Docket No. 16-45, DA 16-1075, ¶15 (Rel. November 22, 2016), footnotes not reproduced.