Appendix 3.2 – Reasons for the proposed amendment

In terms of section 3(2) of Form A of Annexure A of the Radio Frequency Spectrum Regulations, 2015, in this appendix, Telkom provides reasons for the proposed amendments to its 2300/2400 MHz spectrum licence.

Summary of reasons for proposed amendment

Telkom's application for amendment of its 2300/2400 MHz spectrum licence is supported by the following:

- In accordance with the principle of technology neutrality, licensees can use spectrum assigned to them for any technology. Spectrum refarming increases the efficient use of spectrum and improves service delivery to customers and promotes competition in the mobile market. Further, both FDD and TDD systems can be deployed in the 2300 MHz band and there are therefore no technical difficulties with refarming this band.
- Telkom refarmed or repurposed the use of the radio frequency band 2360-2385 MHz, which was initially used for point-to-multipoint fixed wireless access (PTMP FWA) systems, in order to be used for LTE.
- As part of the refarming of the band, affected customers were moved to alternative technologies and PTMP FWA systems terminated. As part of this licence amendment process, Telkom will surrender the upper part of the 2400 MHz band, i.e. the band 2401-2481 MHz, as the upper band was only used for PTMP FWA systems while LTE TDD systems use only the lower part of the 2400 MHz band. This reduces the administrative burden on the Authority in terms of resolution of harmful interferences in the ISM band.
- Telkom is the de facto exclusive user of the 2300-2387 MHz band, as the band is no longer used for outside broadcasting (OB) links.
- The band 2300-2387 MHz (as well as 2401-2484 MHz) is licensed to Telkom and has been used efficiently for the delivery of fixed and mobile services for many years.
- Telkom's refarming of the band is consistent with the objects of the ECA including technology neutrality, efficient use of spectrum, increased competition, etc.
- No interference is caused to any other licensee or user within or adjacent to the refarmed band.
- The refarming is to the benefit of consumers and there are no reported cases of harmful interference to users or licensees either below 2300 MHz or above 2387 MHz, and Telkom is also not aware of any other licensees operating within the 2300 MHz to 2387 MHz band.

- Accordingly, the need for a feasibility study, contemplated by the Authority over 8 years ago and required for complex migrations, has been overtaken by events.
- The refarming is in line with international norms, preparing the band for subsequent 5G deployment.

Approach taken in this Appendix

Section 1 canvasses the historical licensing of the implicated radio frequency spectrum to Telkom. In section 2, Telkom explains how it became the de-facto exclusive user of the 2300 MHz band. Section 3 details the implementation and use of the FDD part of the license. Sections 4 and 5 deal with the regulatory developments leading up to the identification of the 2300 MHz band for IMT application. Sections 6, 7 and 8 describe the refarming of the 2300 MHz band by Telkom. The document concludes by summarising the achievement of refarming objectives in section 9, and the implications of this refarming on the pending regulatory processes such as radio frequency spectrum migration.

1. Historical overview of the licensing and use of the 2400 MHz band

Since 1994, Telkom, through the then Department of Posts and Telecommunications, used the 2400 MHz frequency band (2307 – 2387 MHz paired with 2401-2481 MHz or 2x80 MHz FDD) to provide basic voice and data services, especially in rural areas. The first networks operating on the 2400 MHz radio frequency spectrum were deployed for the 1994 general elections to provide voice services to voting stations during South Africa's first democratic elections.

The 2400 MHz frequency band was used nationally to deploy PTMP FWA (point-to-multipoint Fixed Wireless Access) systems. Telkom deployed PTMP FWA systems from a range of vendors including Rurtel, DRMASS, Alcatel A9800 (with DECT tails), IRT2000 and IRT4000 (also with DECT tails) and SRT500.

On 7 May 1997, Telkom was issued a Radio Frequency and Radio Station licence (Government Gazette 17984, Notice 768 of 1997), which included the use of the 2400 MHz frequency band. The specific frequency bands licensed to Telkom was recorded in the Register of Assignments maintained by the Authority, as stipulated in Telkom's spectrum licence. These frequency bands incorporated the 2300/2400 MHz.

On 31 October 2016, ICASA issued Telkom with the spectrum licence in 2300/2400 bands which reflected the spectrum that was already issued to Telkom in terms of the Register of Assignments (Licence No 00-536-928-2).

2. De facto exclusive use of the 2400 MHz band

Telkom used to share the 2400 MHz frequency band with outside broadcasting links (OB links). These OB links were occasional point-to-point links used to feed broadcasting content from a broadcasting location or venue (e.g. sporting stadiums) to a broadcasting studio where the content was edited and then broadcasted. These deployments typically had a duration of a few hours or at most a few days.

As per the National Table of Frequency Allocations, specific channels are allocated for OB links in the 2400 MHz frequency band (in both the upper and lower half of the band) on either a secondary or primary basis.[1] Coordination with Telkom's networks and systems was mandatory before OB links were deployed, for both primary and secondary channels.

The use of these channels for OB links diminished over time with the last known coordination request around the year 2000 for an OB link used for the Comrades marathon. Telkom has not received any requests for coordination of these OB links since. Telkom is currently the de facto exclusive licensee in the 2400 MHz band.

3. Unlicensed and ISM use of the upper part of the 2400 MHz band

The upper part of the 2400 MHz FDD band, i.e. the band 2400 – 2500 MHz, is also designated for industrial, scientific and medical (ISM) applications in the National Table of Frequency Allocations[2]. A typical example of ISM applications is microwave ovens. According to the ITU Regulations, which are also adopted in the National Table of Frequency Allocations, radiocommunication systems operating in this band must accept harmful interference from ISM devices. Telkom successfully managed to deploy its PTMP FWA network in the presence of ISM devices. Telkom addressed cases of harmful interference by, for example, swapping the uplink and downlink of the PTMP FWA systems around.

The sub-band 2400 – 2483.5 MHz is also used for WLAN (Wireless Local Area Networks or, for example, Wi-Fi) on a licence exempted but regulated basis. During the 30 years of use of

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1 Primary basis: 2377 MHz and 2471 MHz; Secondary basis: 2321 MHz, 2349 MHz, 2415 MHz and 2443 MHz (all 28 MHz channels)

2 Latest version published on 25 May 2018 in Government Gazette 41650, Notice 266 of 2018

the 2400 MHz band for PTMP FWA systems, Telkom encountered many cases of harmful interference from wireless operators such as ISPs (Internet Service Providers) using Wi-Fi equipment not adhering to the Authority's regulated power levels and therefore causing harmful interference to Telkom's 2400 MHz networks and systems. ICASA is aware of this as it has assisted Telkom many times[3] to resolve such harmful interferences. The level of interference to Telkom's PTMP FWA systems contributed significantly in the 2400 MHz being unusable to the point that Telkom was forced to refarm parts of its PTMP FWA systems in order to resolve harmful interference from unauthorised use. This was needed to address the harmful interference from unauthorised users that deployed links in the upper part of the 2400 MHz band.

Due to the ongoing harmful interference from unauthorised users in the upper part of the 2400 MHz band, Telkom will not refarm the band 2401-2481 MHz. This portion of the 2400 MHz band is surrendered as part of this application for amendment of Telkom's 2300/2400 MHz licence.

4. International and national regulatory developments pertaining to the 2300 MHz band

In 2007, the ITU World Radiocommunication Conference 2007 (WRC-07) held in Geneva identified the frequency band 2300 – 2400 MHz for IMT (International Mobile Telecommunication). South Africa supported this position. As a result of the international harmonisation of the band for IMT, technologies such as LTE (Long Term Evolution), which can be used for mobile and FWA services, started to become available in the market. Initially, the user equipment was limited to fixed devices such as modems and routers, followed later by mobile devices such as mobile phones.

On 30 July 2010, through Government Gazette 33409, Notice 727 of 2010, the Authority gave local effect to the WRC-07 decision by updating the National Table of Frequency Allocations to enable the use of the 2300 MHz band for TDD technologies. The Authority also enabled the use of this band for IMT while protecting the existing fixed services (including Telkom's PTMP FWA systems).

On 3 April 2013, the Authority prescribed the Radio Frequency Migration Regulations and Radio Frequency Migration Plan ("2013 Migration Plan"). The Authority indicated that it planned to carry out a feasibility study to consider the use of this band for IMT, the migration

[3] Telkom experienced on average around 85 cases of harmful interference in the 2400 MHz band between 2001 and 2015; the Authority was involved in many of these.

of fixed links and OB links and current users and uses in the band. The process for migration is described in section 3.2 of the 2013 Migration Plan. According to the process, a “complex” migration requires a feasibility study to be carried out, before the Authority develops a Radio Frequency Spectrum Assignment Plan for the band in question. A “simple” migration does not require a feasibility study; in such case, the Authority will develop a Radio Frequency Spectrum Assignment Plan for the band in question.

On 1 April 2017, notwithstanding prior plans to carry out a feasibility study for the 2300 MHz band, the Authority prescribed the Radio Frequency Spectrum Assignment Plan for IMT2300 (Government Gazette 38640, Notice 76 of 2015) (“IMT2300 assignment plan”). According to the IMT2300 assignment plan, the scope for “new assignments” in the IMT2300 band will be identified through a feasibility study to be carried out. As indicated in section 10 below, there is no need for a feasibility study for the band 2300-2387 MHz at this stage.

On 29 March 2019, the Authority prescribed the final Radio Frequency Migration Plan, 2019 (Government Gazette 42337, Notice 166 of 2019) (“2019 Migration Plan”). In this plan, the Authority states that OB links operating in the 2400 MHz band should be migrated to the band 1518 – 1525 MHz. It reiterated the need for a feasibility study for the 2300 MHz band. Telkom addresses this matter in section 10 below.

5. Licensing of the 60 MHz of TDD in the 2300 MHz band

In 1997, Telkom was authorised the use of several frequency bands as part of the Telkom/Thintana/SBC/Telecom Malaysia agreement (“Thintana agreement”) including 60 MHz TDD spectrum in the 2300 MHz band (2300 – 2360 MHz) on an exclusive basis. At the time however, there was no TDD equipment available for operation in the band. Also, the 2300 MHz band, which is paired with the 2400 MHz band, was used extensively for PTMP FWA systems. Within the same geographic area, co-frequency use is not possible and the introduction of TDD based systems would have required that the PTMP FWA systems be terminated.

Telkom deployed 4G LTE services using its 60 MHz TDD assignment in 2011/2012. The use of the 2300 MHz TDD LTE systems on a shared basis with the FDD FWA systems was done through internal coordination, as explained further below.

On 31 October 2016, the Authority issued a combined 2300/2400 MHz Radio Frequency Spectrum licence (No 00-536-928-2) to Telkom. This licence, which is still in force, is on a technology and service neutral basis in line with the Electronic Communication Act (“ECA”). Therefore, Telkom can deploy either fixed or mobile systems using any technology (including

LTE) in these bands, which is also supported by the allocations in the National Table of Frequency Allocations.

In this licence, the TDD portion (2300 – 2360 MHz) is licenced on an exclusive national basis whereas the FDD portion not overlapping the TDD portion is on a shared national basis (as mentioned earlier in section 2, this is shared with OB links, however in effect, Telkom has a de-facto exclusive use due to non-use for OB links over many years). Telkom's spectrum licences, including the 2300/2400 MHz licence, is linked to Telkom's service licences and is therefore valid until 14 January 2029. Telkom is currently paying around R27.5mil annually for the use of the 2300/2400 MHz frequency bands.

6. Introducing 2300 MHz LTE TDD systems

Telkom deployed three (3) x 20 MHz LTE carriers in the 2300 MHz band (i.e. 2300-2320 MHz, 2320-2340 MHz and 2340-2360 MHz). All these LTE carriers overlap the PTMP FDD systems, which starts at 2307 MHz. All deployments of LTE therefore require coordination with PTMP FDD systems, as explained below.

In order to deploy TDD LTE systems in the 2300 MHz band, Telkom had to refarm the mentioned PTMP FWA systems overlapping the 2300 – 2360 MHz band and which are located within the same deployment geographic area. In areas where Telkom deployed its TDD network, Telkom terminated its FDD network and moved the affected customers to alternative technologies, namely either to the FDD part of its assignment not affected by the TDD systems or to the LTE TDD network (or alternative technologies where needed).

Since both FDD and TDD networks are deployed by Telkom, frequency coordination and management of interference between these networks could be controlled internally. No frequency coordination with external parties was therefore required.

The PTMP FWA systems operate in FDD mode, i.e. separate frequencies are used for the uplinks (user terminal to base station) and downlinks (base station to user terminal). Therefore, clearing the band 2300 – 2360 MHz (or a portion thereof) for LTE TDD systems, also clears the associated upper portion of the FDD band as those upper bands are not required to provide TDD services in the 2300 MHz band.

The deployment of TDD systems within FDD paired spectrum in this case therefore does not create any knock-on regulatory issues. Since both the FDD and TDD networks are deployed and operated by Telkom, and since both fixed and mobile services are allowed in terms of Telkom's 2300/2400 MHz spectrum licence as well as the National Table of Frequency

Allocations, the refarming of the FDD systems to deploy TDD systems does not need any regulatory intervention. Also, Telkom's refarming of the band does not create any harmful interference to 3rd parties, which is the main concern for regulators in cases of refarming.

No harmful interference has been reported to Telkom from other users or licensees either below 2300 MHz or above 2387 MHz. The band immediately below 2300 MHz, i.e. 2290-2300 MHz, is allocated to fixed, mobile and space research services with only BFWA (Broadband Fixed Wireless Access) indicated in the National Table of Frequency Allocations as the typical application (within the band 2285-2300 MHz). It is also indicated that coordination is expected prior to implementation; Telkom is neither aware of any assignments done within this band nor has been approach for coordination as indicated in the National Table of Frequency Allocations. With regards to the band immediately above 2387 MHz, i.e. 2387-2400 MHz, there is no indication in the National Table of Frequency Allocations of any typical applications within the band 2387-2400 MHz. Telkom is also not aware of any harmful interference to other licensees within this portion of the band.

The deployment of TDD systems within paired spectrum is also acknowledged by the ITU. ITU-R Recommendation F.1519 (05/2001) ("*Guidance on frequency arrangements based on frequency blocks for systems in the fixed service*"). This recommendation provides guidance on the deployment of TDD systems in FDD paired spectrum. Although the recommendation was written in the context of fixed services, the principle equally applies in Telkom's case as the 2300 MHz band is allocated to both fixed and mobile services. This is similar to the case where Neotel deployed WiMAX TDD systems within their FDD paired spectrum assignments in the 3500 MHz band. In the Neotel case, the Authority was only concerned that harmful interference is not caused to other users of the band.

7. Refarming in South Africa

The Authority provides definitions of "migration" and "refarming" in the 2019 Migration Plan as follows:

> "***Radio frequency spectrum migration****" …means the movement of users or uses of radio frequency spectrum from their existing radio frequency spectrum location to another*"[4].
>
> *"**Radio Frequency Spectrum Re-farming**" means the process by which the use of a Radio Frequency Spectrum band is changed following a change in allocation, this may*

[4] See section 1.2.2

include change in the specified technology and does not necessarily mean that the licensed user has to vacate the frequency"[5].

The ICT Policy White Paper, 2016[6] observes that the 1800 MHz band was re-farmed by licensees from 2G GSM services to 4G LTE due to the South African licensing regime being technology neutral, which gives licensees the right to use the spectrum assigned to them for any technology.[7]

ICASA also notes in the 2019 Migration Plan the importance of refarming, through a change in allocation (e.g. a change from fixed to mobile services) or technical conditions, to better serve its customers:

"…in some cases, such spectrum re-farming may also be in the interest of the current licensee (e.g. the operator) since it allows him to change the allocation/ technical conditions in order to better serve his customer base" (own emphasis).[8]

A key aim for spectrum use is to maximise efficiency of use of spectrum. Telkom's refarming of the band from legacy analogue PTMP FWA systems to new mobile LTE 4G systems allows the band to be use efficiently and optimally. LTE 4G and 4.5G provides improved high-speed data access services to Telkom's customers.

According to the GSMA Mobile Policy Handbook published in 2019,[9] "Technology neutrality is a policy approach that allows the use of any non-interfering technology in any frequency band". The GSMA further supports a licensing approach that allows any compatible, non-interfering technology to be used in mobile frequency bands. Therefore, for example, the use of TDD technology in FDD bands could be allowed, if interference is not caused to existing licensees.

The refarming of an assignment from, for example, 2G to 3G under technology neutrality is standard practice in South Africa and has been done for many years. Changing a PTMP FWA network operating in the FDD frequency arrangements to an LTE FWA network operating in TDD is a technology change and therefore falls within the description of refarming. This change improves spectrum use efficiency and improves services to Telkom's customers while harmful interference between the two technologies are managed internally by Telkom, who is the de-facto exclusive user of the band. Use of the frequency band remains as per the National Table of Frequency Allocations.

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5 See section 1.2.3
6 Government Gazette 4035, Notice 1212 of 2016
7 See section 9.2.5.3, page 84 of the ICT Policy
8 Section 4.12.3, third bullet
9 https://www.gsma.com/publicpolicy/mobilepolicyhandbook/

It is common course that refarming in South Africa is not regulated. Several examples of refarming took place over the years such as refarming of the 900 MHz from 2G to 3G, 1800 MHz refarmed from 2G to 4G and 2100 MHz refarmed from 3G to 4G.

Vodacom and MTN were licenced in 1993 to provide national mobile cellular telecommunication services ("MCTS") and were assigned spectrum in the 900 MHz band to deploy GSM (Global System for Mobile Communications). The use of the 900 MHz spectrum assigned to Vodacom and MTN was limited at the time to the deployment of a GSM network. ICASA issued Vodacom and MTN new 900 MHz radio frequency spectrum licences on 17 July 2009, which were technology neutral. On the same day, ICASA also issued to Vodacom and MTN spectrum licences in the 1800 MHz and 2100 MHz bands, which were also on a technology neutral basis. In the updated 900 MHz spectrum licences, references to GSM as a technology were removed, which paved the way for licensees to refarm the spectrum for alternative technologies as and when needed. Around June 2010, Vodacom indicated that they will not refarm their 900 MHz spectrum for 3G, especially not in urban areas, due to insufficient spectrum being available.[10] MTN indicated around November 2010 that they will refarm a portion of their 900 MHz spectrum for 3G.[11]

Telkom received its 1800 MHz spectrum assignment based on the amendment to Telecommunication Act of 1996 (2001 Amendment Act).[12] Telkom's 1800 MHz spectrum licence allowed Telkom to deploy only the GSM technology.[13] At the time, refarming to another technology was therefore not an option. This spectrum licence was converted in 2016.[14] All references to technology such as GSM were removed, illustrating the move towards technology neutrality. Telkom is therefore authorised to utilize the frequencies in accordance with the technical parameters set out in Schedule C of the licence.[15] Technical parameters are limited to the frequency blocks and indicate that deployment can be on a national basis.

Telkom received its 2100 MHz FDD assignment based on the amendment to Telecommunication Act of 1996 (2001 Amendment Act).[16] In terms of s.30B of the 2001 Amendment Act, Telkom was deemed to be a holder of a "third generation telecommunication radio frequency spectrum licence", to provide public switched telecommunication services as Telkom was licenced to provide. In this case, the Act was specific in limiting the use of this

10 https://techcentral.co.za/vodacom-wont-refarm-spectrum-for-3g/15124/
11 https://techcentral.co.za/mtn-to-refarm-spectrum-in-cities/18614/
12 Telecommunications Amendment Act 64 of 2001
13 1800 MHz spectrum licence issued 9 February 2009
14 Licence No. 00-509-972-6, issued 31 October 2016
15 Section 5 of the licence
16 2100 MHz spectrum licence issued 9 February 2009

band to 3G services. Based on the 2001 Amendment Act, Telkom received its "3G/UMTS" spectrum licence, which licence was specific for the deployment of a Fixed mobile network and using the 3G/UMTS technology (FDD).[17] This licence included a specific reference to 3G/UMTS as part of the general conditions of the licence.[18] Deployment of technologies other than 3G/UMTS, and therefore refarming of the spectrum, were not possible at the time. Telkom's 2100 MHz spectrum licence was converted in 2016.[19] As with the 1800 MHz spectrum licence, all references to technology were removed from the licence. Telkom launched 3G services when Telkom Mobile was launched in 2010 and thereafter re-farmed both its 1800 MHz and 2100 MHz bands to deploy LTE based on its business requirements. ICASA was not involved in these refarming exercises.

In the case of 3500 MHz, Telkom and Neotel (now Liquid Telecom) were initially licenced to deploy WiMAX systems. Both Telkom and Neotel were assigned 2x28 MHz (FDD) in this band. Telkom's original licence[20] was specifically for the deployment of PTMP FWA. Further, the use of these frequencies was restricted to the technical characterization set out in the application form, which application was incorporated into and formed part of the licence. Telkom deployed the IEEE 802.16d (fixed WiMAX) technology (from around 2007), which was based on FDD while Neotel deployed IEEE802.16e, which was mobile WiMAX based on TDD (started deploying after Telkom). The TDD based technology was deployed in the FDD frequency arrangement. Telkom deployed the IEEE 802.16d (fixed WiMAX) technology, which was based on FDD, while Neotel deployed IEEE802.16e, which was mobile WiMAX based on TDD. Neotel deployed the TDD based technology in their FDD frequency arrangement. The deployment of TDD within its FDD frequency assignment was allowed by the Authority with the provision that harmful interference with other licensees should be managed. To manage inter-operator interference, the Authority established a Committee in 2007 on 3.5 GHz frequency coordination (ICASA created 1st Draft Terms of Reference document for the Committee in July 2007). The primary role of the Committee was to coordinate and facilitate inter-operator coexistence in the 3.5 GHz band. Telkom and Neotel as licensees in the 3.5 GHz band were included in this Committee. The first meeting on frequency coordination in the 3.5 GHz band was held on 11 July 2007 chaired by Telkom. The meeting was attended by Neotel and Tellumat, a potential supplier to Neotel WiMAX equipment. The main aim of the sharing studies was to determine the need and size of guardbands between Neotel's TDD and Telkom's FDD WiMAX systems in order to manage the inter-operator interference. As an

17 1800 MHz spectrum licence issued 9 February 2009
18 Section 7.2 of the 2100 MHz spectrum licence
19 Licence no. 00-509-981-3 issued 31 October 2016
20 Licence issued 21 November 2005

interim measure, Telkom and Neotel agreed to a 14 MHz guardband between the deployments of Telkom and Neotel in order to manage interference between the two networks, which was the only concern for the Authority. Several months after the first coordination meeting, Neotel had still not provided WiMAX TDD equipment parameters from their elected vendor, which parameters were needed to facilitate the coordination study between the FDD and TDD WiMAX systems. Since Neotel never supplied the equipment parameters, and due to limited WiMAX deployments, the work of the Committee ended with deployments according to the agreed guard band. No further work pertaining to the Committee can be recalled.

Telkom around that time decided to abandon WiMAX in exchange for 3GPP technologies (i.e. 2G and 3G), which were deployed when Telkom Mobile launched its mobile services. In 2015, the Authority changed the FDD frequency arrangement in the 3.5 GHz band to a TDD arrangement in the prescribed IMT3500 Radio Frequency Spectrum Assignment Plan.[21] Telkom decommissioned its WiMAX systems thereafter and in 2019, Telkom requested the Authority to amend its 3.5 GHz spectrum licence from an FDD to TDD assignment in line with the IMT3500 Radio Frequency Spectrum Assignment Plan (licence issued November 2019).

8. Telkom's refarming of an extra 27 MHz of FDD spectrum for TDD LTE

Telkom uses the 2360-2387 MHz in 2300 MHz band for TDD according to the National Table of Frequency Allocations. Telkom is the de-facto exclusive user of the band as described in section 2, which allows for a simplified internal management (only) of harmful interference between FDD and TDD networks. Refarming in this band is technically feasible and competent in terms of the applicable regulations.

Telkom's refarming in the 2360-2387 MHz band for TDD systems is an extension of the refarming done in the lower part of the band (i.e. 2300 – 2360 MHz), where Telkom deployed both TDD and FDD systems. The Regulatory environment for the 2300 MHz band enables the use of TDD in the band and the refarming of legacy PTMP FWA systems and networks. Like the refarming of the bottom 60 MHz in the band, Telkom migrated its customers from the PTMP network, performed frequency coordination between FDD and TDD systems, and then terminated FDD systems in the areas where TDD systems are to be deployed.

The extra refarmed 27 MHz spectrum can be used very effectively as it is synchronised or aligned with the 60 MHz TDD deployed in the lower part of the band. Also, since the 2300 MHz

[21] Government Gazette 38640, Notice 278 of 2015 dated 30 March 2015

to 2385 MHz is used within a single network, there is no need for a guardband between the 60 MHz and 25 MHz refarmed spectrum, which further improves the efficient use of the band.

Telkom refarmed 2360-2385MHz from FDD to TDD for LTE deployment. This allows Telkom to deploy a fourth 20 MHz LTE carrier as well as a 5 MHz LTE carrier. All customers on Telkom's PTMP FWA networks have been migrated to alternative networks including the 2300 MHz LTE network and as such, the top part of the 2400 MHz band is surrendered as part of this process.

The fourth carrier (20 MHz in 2360 MHz – 2380 MHz) spectrum is deployed at ~1331 sites (2433 sectors) nationally and the 5 MHz carrier (2380 MHz – 2385 MHz) at ~191 sites (257 sectors). In total Telkom has deployed various combinations of 2300 MHz carriers, according to subscriber traffic demands, at ~5342 sites (16010 sectors) nationally. This has assisted Telkom to address the increased in demand for bandwidth as its mobile business grows.

9. The refarming is consistent with the objects of the ECA

Telkom's refarming of the 2300 MHz band is in line with the objectives in the ECA. These include:

- technology neutrality: Telkom changed its legacy PTMP FWA systems operating in FDD paired spectrum by deploying LTE TDD systems within its licenced spectrum;
- efficient use of spectrum: LTE systems makes more efficient use of spectrum; the bandwidth throughput per MHz for LTE is much higher than the legacy PTMP/TDMA systems. TDD systems also provide flexibility in terms of uplink and downlink bandwidth requirements, which is ideal for asymmetric transmissions such as data services and use spectrum more efficiently since there is no need for a guard band between uplink and downlink channels.
- promotion of competition: Telkom's access to an extra 25 MHz for LTE in the 2300 MHz band allows Telkom to compete more effectively in the market by providing a more efficient network that can transport large quantities of bandwidth through less hardware. In future, this band could also be used for 5G services.
- encouragement of investment: The refarming of Telkom's legacy systems facilitated the deployment of a new digital mobile network providing advanced 4G services. In total, Telkom has deployed various combinations of refarmed TDD LTE carriers, according to subscriber traffic demands, at ~5342 sites (16010 sectors) nationally.

10. Feasibility study is no longer needed considering the current use of the band

The Authority contemplated a feasibility study to be conducted in the band 2300 – 2450 MHz over eight years ago mainly for migration purposes. The feasibility study was not conducted and has been overtaken by events.

As indicated above, there are no reported cases of harmful interference to users or licensees either below 2300 MHz or above 2387 MHz. Telkom is also not aware of any other licensees operating within the band 2300 MHz to 2387 MHz. In respect of the OB links, Telkom cannot recall any requests for coordination of OB links since around 2000. This may be attributed to the use of alternative bands for these OB links, for example the use of the 1518 – 1525 MHz as indicated in the 2019 Migration Plan or the 2 GHz band (i.e. 2025-2110 MHz paired with 2200-2285 MHz) or alternative technologies such as satellite and fibre. The implication of the cessation of requests for coordination is that the OBs no longer use this band. Based on the above, Telkom is the de facto exclusive user of the band 2300 – 2387 MHz.

Telkom has been decommissioning its PTMP FWA systems and replacing them with LTE 4G systems, which operate in the TDD portion of the 2300/2400 MHz band. As at the date of this application there are no PTMP FWA systems that remain in the 2400 MHz band. As a result of this and the fact that Telkom through this licence amendment process will also be surrendering the 2400 MHz band, the migration process will be simplified and will not require a feasibility study.

Furthermore, Telkom's application to amendment its 2300/2400 MHz spectrum licence is not dependent on the outcome of the feasibility study to be conducted by the Authority – this is due to the practical manifestation of refarming as described in section 6 where it was indicated how Telkom, as the de facto exclusive user of the 2300 MHz spectrum band, cleared the band 2300 – 2360 MHz on an area basis for deployment of LTE TDD systems, and in effect also cleared the associated upper portion of the FDD band as those upper bands are not technically required to provide TDD services in the 2300 MHz band.

Telkom refarmed its legacy PTMP FWA systems and deployed LTE systems, all within its current spectrum assignments and without impact on any other entities. Hence, there has been a practical demonstration that this change does not cause interference to other users, and so no need for a theoretical study to come to the same conclusion. Since Telkom refarmed the PTMP FDD systems, it will surrender the upper portion on the 2400 MHz band (i.e. 80 MHz), which is part of the licence amendment application.

As indicated in section 4 above, a "complex" migration requires a feasibility study to be carried out, before the Authority develops a Radio Frequency Spectrum Assignment Plan for the band

in question (the Authority prescribed the IMT2300 assignment plan on 30 March 2015). A "simple" migration does not require a feasibility study; in such case, the Authority will develop a Radio Frequency Spectrum Assignment Plan for the band in question. Although the Authority does not define what constitutes a complex versus simple migration process, Telkom assumes that the difference is based on the number of services and/or licensees in the band that would require migration either to other bands or within the band. For example, the IMT450 band could be considered a "complex" migration considering the number of licensees and different services that are in the band.

Noting the current status of the band 2300-2400 MHz, where Telkom is the de facto exclusive user, the fact that the band 2401-2481 MHz is being surrendered, and since Telkom has refarmed its PTMP FWA systems for IMT systems in line with the prevailing regulations, the need for a feasibility study for this band is no longer required. In a feasibility study, it is expected that the Authority will obtain from the licensees in the band information pertaining to their current use of the band, the extend of the deployment of these systems, efficiency in use of the spectrum, services provided to customers, effect on competition in the use of the band, the economic lifetime of the deployed equipment, etc. These issues have been addressed in this submission. At most, therefore, the Authority should verify the current status of the use of the band 2300-2387 MHz to confirm Telkom's de facto exclusive use of the band for LTE systems.

The Assignment Plan for IMT2300 envisages the amendment of existing licences to be subject to the results of the feasibility study in line with the Migration Plan. With what has been stated above relating to the de facto exclusive use of the 2300 MHz band by Telkom and the surrender of the 2400 MHz band, the migration has been simplified. Telkom, as the de facto exclusive licensee in the 2300 MHz band is efficiently utilising the spectrum with no harmful interference. There don't appear to be any concerns therefore that would indicate the need for any feasibility study.

11. The legislative and regulatory environment enables instead of prohibiting refarming

a. The legislative and regulatory environment enable refarming

In South Africa, refarming is not regulated but promoted by the ECA by implication. Section 2 of the ECA dealing with the objects of the Act promotes technology neutrality, efficient use of spectrum, promotion of competition and therefore promote refarming. Similarly, the National Table of Frequency Allocations, which allocated the 2300 MHz band for both fixed and mobile services and accommodates both FDD and TDD use of spectrum.

Operator led refarming is also acknowledged in the 2019 Migration Plan as well as in the 2016 ICT Policy White Paper. The 2019 Migration Plan acknowledges that refarming may be in the interest of the current licensee since it allows him to change the allocation/technical conditions in order to better serve his customer base[22].

The National Integrated ICT Policy White Paper, 2016 also confirms that South Africa has a technology neutral licensing regime thus giving licensees the right to use the spectrum assigned to them for any technology.[23]

The IMT2300 assignment plan promotes the use of the 2300 MHz for IMT systems.

b. The applicable regulatory instruments do not prohibit or limit refarming

The Authority indicated since 2013 in the 2013 Migration Plan that a feasibility study is needed for the band 2300 – 2483.5 MHz. The purpose of this feasibility study was never clearly defined although it was indicated that same will be carried out with consideration of the use of the band for IMT, the migration of fixed and OB links and current users and uses.[24] In the 2019 Migration Plan, the Authority indicated that existing fixed links could be migrated above 3 GHz and that that OB links be migrated to the band 1518 – 1525 MHz. The Authority also reconfirm that a feasibility study is to be conducted.[25]

According to section 8.1 of the IMT2300 assignment plan, the scope for "new assignments" in the IMT2300 band will be identified in the feasibility study to be carried out. Through refarming, Telkom is using the band 2300-2385 MHz for LTE services without causing harmful interference to other users or licensees within or adjacent to this band. A feasibility study pertaining to this portion of the band is therefore not required.

In section 9 of the IMT2300 RFSAP, the reference to "*amendment of existing licences*" is relevant, if needed, following the feasibility study to be carried out. Telkom's application to amend its spectrum licence to, amongst others, surrender the upper part of the 2400 MHz FDD band, is however not subject to the planned feasibility study. This section does not prohibit but envisages that the feasibility study may occasion a need for a licence amendment.

According to the prevailing regulations, including the 2019 Migration Plan and the 2018 National Table of Frequency Allocations, refarming is not prohibited but enabled. Telkom therefore refarmed its PTMP FDD systems to deploy TDD LTE systems in the 2300 MHz band.

22 Section 4.12.3 of the 2019 Migration Plan
23 See section 9.2.5.3, page 84 of the ICT Policy
24 Section 3.1.23 of the 2013 Migration Plan
25 Section 4.10.29 of the 2019 Migration Plan

12. Conclusion

Spectrum refarming is allowed in accordance with the current legislative and regulatory environment and has been applied in South Africa since the adoption of a technology neutral licensing regime. The Authority endorses spectrum refarming as a market-led approach as it increases efficient use of spectrum and improves services to customers. Telkom's refarming of the 2300 MHz band also promotes competition within the mobile market. Having a contiguous 87 MHz of TDD spectrum assigned to Telkom in the 2300 MHz band not only supports the efficient use of the band for 4G services in the short to medium term but will also support future use of the band for 5G services where between 80-100 MHz of contiguous spectrum is required. Surrendering the upper part of the 2400 MHz band, also reduces the administrative burden on the Authority in terms of resolution of harmful interferences in the ISM band, which has been ongoing for many years. Telkom's request to amend its spectrum licence is not dependent on the planned feasibility study but reflects the refarming done by Telkom and the surrendering of the upper part of the 2400 MHz band.