

ANNEX TO QUALCOMM COMMENTS ON THE DRAFT IMT ROADMAP

2.2 IMT700

2.2.1 The Authority invites industry views on Option 1 (ITU Region 3)

Note: This comment is valid for both IMT700 and IMT800 (From 2.2.1 to 2.2.5 and from 2.4.1 to 2.4.3)

The African Region, including South Africa will be the first region in the world to have access to both 700MHz and 800MHz (694-862MHz) bands for allocation and assignment to Mobile (IMT). This will be as a result of the completion of Digital Migration (deadline of 17 June 2015), and the successful implementation of the African Telecommunications Union (ATU)-led regional replanning of GE-06 Broadcasting plan, which essentially segments the UHF band into two sub-bands (470-694MHz for Broadcasting and 694-862MHz for Mobile/IMT).

As observed in the IMT Roadmap the 12 MHz overlap of the 3GPP Band 28 and Band 20 (in the frequency range 791-803 MHz) means that key decisions must be made by South Africa and African countries in general on the most appropriate way to combine the two bands. This can be considered as a unique opportunity and responsibility for these developing countries to define spectrum usage based on regional/national needs and priorities. The significant paradigm shift should not be surprising recalling that African and Middle Eastern countries were the prime movers behind the WRC-12 allocation of 700 MHz to Mobile for Region 1.

Qualcomm concurs with the Authority that the analysis of these two bands should not be done in isolation. This view is consistent with the recommendations from the 3rd ATU Digital Migration and Spectrum Policy Summit, a forum which has been instrumental in shaping and progressing a harmonized African regional approach to successful digital migration and optimized utilization of the resulting Digital Dividend spectrum.

The comments below highlight some critical considerations that may aid in making choices of channelization plans in the UHF band:

- In general all the options described and discussed in the IMT Roadmap for IMT700/IMT800 are considered viable. As noted by the Authority they provide similar amounts of IMT spectrum and coverage. Therefore the ultimate choice taken by South Africa choice will be informed by additional factors, including, for example, ecosystem and economies of scale, market structure, target market/user needs, and national objectives as elaborated in South Africa Connect and the Broadband Plan etc.
- With regards to the ecosystem we provide the following information which we believe to be noteworthy and valuable to support decision making and selection of options under consideration:

- Today 3GPP Band 28 is standardized to include the entire 2X45 MHz (i.e. both duplexers). The concept of partial support was not considered and hence there is currently no signaling mechanism for UE to indicate partial support (e.g. of only one duplexer).
- Multi-band, multi-mode and RF support for all 3GPP bands exist at chipset level. Thus both Band 20 and Band 28, among others can be supported on the same device, noting however that these are distinct bands that will require separate RF front-end components. This means that the selection of the combination of bands to be supported in a device will be done at the level of the Device Manufacturers. Such selection may be dictated by other factors such as demand, but also by the practical limit due to area constraints on the phone.
- It is expected that initially the majority of the volume of Band 28 devices will support the whole band (2X45 MHz), leading to cost reductions as is usual. However this does not preclude any special arrangements that may be agreed between Device Manufacturers and operators, for example, to meet specific requirements such as those envisaged in Europe. Any cost implications of such arrangements are not easily discernible at this time, and will clearly depend on the Device Manufacturer and the volumes involved.
- While operators may decide to provide waivers to Device Manufacturers to populate only one Band 28 duplexer (as suggested in some options in the Roadmap), the device would not be compliant to the 3GPP specification, and may not be able to roam fully in other Band 28 networks. For example, Japan will primarily use the upper part (duplexer) of the band, and Europe plans to use only the lower part (duplexer) of the band. A device that supports one but not the other duplexer will not be able to work across these two regions in this band.
- The IMT roadmap makes mention of the need to minimize cross border interference co-ordination. Indeed this is a key consideration and a subject that concerns many African countries which adopted and implemented Frequency Arrangement A1/3GPP2 Band Class 0 in the 850MHz band. This creates a challenge to countries as they seek to transition to 4G (LTE) in the 800MHz Band due to the overlap.

ITU WP-5D recognized this challenge, along with the acknowledgement that some African countries may opt to adopt the full Band 28. Consequently WP-5D initiated Coexistence Studies in order to provide guidance to Administrations on interference mitigation in overlapping/bordering frequencies. This work is ongoing and is expected to be completed ahead of the WRC-15.

Regarding the potential for cross-border interference if two neighbouring countries adopt different plans (e.g. full Band 28 in one country and full Band 20 in another) the ***“Draft Working Document towards a Preliminary Draft New Report Addressing Coexistence between Different IMT Systems in the UHF Band”***¹ states the following:

"In Africa, where regional initiatives are underway to release the band 694-862 MHz for mobile services, the adoption of the full A5 (2x45 MHz Band 28) is under consideration as an option. Although this scenario would result in the 791-803 MHz overlap between the upper part of A5 (3GPP Band 28) and the lower part of A3 (3GPP Band 20), there is no need to consider sharing issues associated with this overlap because both bands would provide downlink operations."

Thus the issue of cross border interference does not appear to be a significant limiting factor in the selection of options.

- The anticipated availability of over 100 MHz of new UHF spectrum for IMT in South Africa represents a rare opportunity to harness the transformative power of Mobile Broadband, ICTs and the internet for the benefit of all inhabitants. In particular these lower frequencies in a contiguous large swathe of spectrum could play a critical role in serving rural communities economically. Thus market realities and national objectives should be key drivers behind the selection of the channeling option(s) to be adopted. Some relevant factors are listed below:
 - Market structure, including the number and nature of licenses/licensees of the 700/800MHz will influence the option adopted. For example if the intention is to assign the spectrum to a wholesale operator as envisaged by South Africa Connect then larger bands such as 2x20 MHz or even 2x40 MHz may be considered.
 - Target market and characteristics of users to be served using the spectrum is another factor. Availability of suitable devices at affordable cost is critical in achieving the kind of access called for in the SA Connect. Technological advancement at chipset level has provided a menu of possibilities, capabilities and price points enabling operators and device manufacturers to tailor devices to serve specified markets. Evaluation of the aspects below could be valuable in shaping the decision on the ultimate choice of channeling for the 700/800MHz:
 - Characteristics of target users to determine the nature of devices that would be most appropriate.
 - Characteristics of devices and services envisaged for the 700/800MHz
 - One size fits all; High end; low tier, entry level and willingness to pay
 - Tradeoffs between capability/complexity/costs
 - Rural users vs urban international travelers

¹ [5D/441\(Att.4.15\)](#)

- Importance of roaming: what percentage of customers need to roam (using these bands specifically).
- Where will economies of scale for the kinds of usage/market segment targeted (e.g. emerging vs developed regions use and needs) be found?
- Willingness to be an early adopter of any special arrangements, providing the necessary waivers given the anticipated lead time in accessing the 700 MHz spectrum unique to African timelines
- Views of Device Manufacturers

In view of the foregoing Qualcomm believes that a final decision on the preferred channeling of 700/800MHz Bands should be taken when there is total clarity and certainty on all relevant aspects, such as the ones cited above. Furthermore the selection of one of the three options may not be critical at this time, as some of the determinants are related to implementation and business considerations.

Maintaining all options under consideration for now while gaining clarity of the implications of options on actual implementation should not necessarily cause delay in the ultimate deployments (note that the 700MHz allocation becomes valid at the end of WRC-15). It may in fact provide valuable opportunity for prospective licensees to engage in in-depth consultations on matters such as ecosystem availability, maturity and adaptability.

One other justification for postponing a final decision on channeling is the fact that ITU-R has not completed its work on WRC-15 Agenda Item 1.2 which is expected to ultimately confirm the allocation of 694-790MHz to Mobile/IMT in Region1. Finer details such as channeling for 700MHz allocation are still subject to additional proceedings at the ITU-R (WP-5D).

2.2.2 The Authority invites industry views on Option 2 (ITU Region 1)

Please refer to comments on 2.2.1

2.2.3 The Authority invites industry views on Option 3 (ITU Region 1)

Please refer to comments on 2.2.1

2.2.4 The Authority invites industry views on 2×3 MHz IMT band of ITU Region 1 solution

Please refer to comments on 2.2.1

2.2.5 The Authority invites industry views on other ITU Region 1 based suggestions

Please refer to comments on 2.2.1

2.3 IMT750

2.3.1 The Authority invites industry views on IMT unpaired spectrum in the coverage band of 750 MHz

Recalling that current Band 28 is standardized to include both duplexers, the inclusion of TDD in the center gap of the lower duplexer represents a departure that may require some technical evaluation on compatibility.

We would like to draw attention to the following activities within the ITU-R which could have a bearing on the South Africa's deployment in the IMT 750 band as envisioned in the Roadmap:

- Draft CPM Text for AI 1.2² contains the following suggestions:

“Taking into account the desire of harmonization across Regions, ITU-R has developed an IMT channeling arrangement based on a common baseline arrangement: 2x30 MHz frequency division duplexing (FDD) (uplink (UL): 703-733 MHz, and downlink (DL): 758-788 MHz), which is the lower duplexer of A5 channeling arrangement in Recommendation ITU-R M.1036-4 and with maximum possible utilization of center gap for IMT.

With regard to possible additions to the baseline arrangement, no consensus was reached and two views were expressed:

View 1:

ITU-R is also studying possible additions to the baseline arrangement, which may be reflected in the new revision of Recommendation ITU-R M.1036, namely:

Up to 20 MHz supplemental down-link (SDL) within the centre gap (738-758 MHz);

2x3 MHz FDD (UL: 733-736 MHz, DL: 788-791 MHz), which could be used for IMT applications;

2x5 MHz FDD (UL: 698-703 MHz, DL: 753-758 MHz), which could be used for IMT applications subject to protection of BS below 694 MHz in Region 1.

View 2:

These possible additions have not been studied in ITU-R and some of them are out of the scope of AI 1.2.

- The 20th Meeting of ITU WP-5D, 15th -22nd October 2014, Geneva, plans to complete considerations of any additional channeling arrangements to be added to the working document towards a preliminary draft revision of Recommendation ITU-R M.1036-4. A frequency arrangement A7 to Table 3 based on 20MHz of SDL in the centre gap of the A5 lower duplexer has been proposed by CEPT. Thus if South Africa intends to deploy TDD in the centre gap it would be necessary to engage in the upcoming WP-5D discussions to ensure that this option is not precluded. Engagement at the CPM is also critical if this option is to be included in the CPM text.

² [4-5-6-7/715\(Annex 04\)](#)

2.4 IMT800

2.4.1 The Authority invites industry views on Option 1 (ITU Region 3).

The same comments as for IMT700 are relevant. Please refer to 2.2.1

2.4.2 The Authority invites industry views on the 2×3 MHz IMT band of Option 1 (ITU Region 3)

Please refer to comments on 2.4.1

2.4.3 The Authority invites industry views on Option 2 and 3 (ITU Region 1)

Please refer to comments on 2.4.1

2.5 IMT850

2.5.1 The Authority invites industry views on the migration of incumbents (Neotel, etc.) out of the band

Qualcomm notes that the proposed Neotel in- band migration is primarily targeted at eliminating the overlap with the planned GSM-R allocation. If done successfully, this migration should also allow Neotel to maintain existing CDMA services. It is desirable that any change of plan should make business sense for a licensee whose license validity is still current.

We further note that the proposed new assignment would be contained within the centre gap of the IMT 800 (3GPP Band 20) band. In this regard we draw attention to the ***“Draft Working Document towards a Preliminary Draft New Report Addressing Coexistence between Different IMT Systems in the UHF Band”¹*** which has identified the following possible frequency overlap issues arising from this proposal:

- 791-821 MHz A3 downlink and the 758-803 MHz A5 downlink;
- 832-862 MHz A3 uplink band (3GPP Band Class 20) and the 824-849 MHz A1 uplink band (assumed to be CDMA-MC uplink) where CDMA-MC networks currently exist;
- possible uplink compatibility issues between bands A1 and A3 in the 832-849 MHz frequency range;
- possible downlink /uplink interference at the LTE downlink/CDMA-MC uplink A3/A1 boundary at the 821-824 MHz boundary; and
- possible uplink /downlink interference at the LTE uplink/CDMA-MC downlink A3/A1 boundary at 862-869 MHz.

Qualcomm’s preliminary studies indicate that coexistence between CDMA (850MHz) and LTE (800) is possible with precautionary measures such as extra filtering at both LTE and CDMA Base Stations:

- At 821-824 MHz boundary, to avoid any uplink performance degradation of the CDMA 850 MHz network, extra filtering in the LTE eNode-B Transmit path for additional suppression of Out-Of-Band-Emission (i.e., additional Adjacent Channel Leakage Ratio) is required only if enough

isolation is not available through antenna separation. Extra filtering in the CDMA BTS Receive path for additional suppression of Adjacent Channel Interference (i.e., additional Adjacent Channel Selectivity) is required, only if there is not enough isolation available through antenna separation

- At 862-869 MHz boundary, to avoid any uplink performance degradation of the LTE 800 MHz network extra filtering in the CDMA BTS Transmit path for additional suppression of OOB (i.e., additional ACLR) is required in case enough isolation is not available through antenna separation. Extra filtering in the LTE e-NodeB Receive path for additional suppression of ACI (i.e., additional ACS) is required, only if there is not enough isolation available through antenna separation.
- Note that the burden of the additional (extra) filtering gets reduced if the isolation from the physical separation of antennas is increased.
- Field measurements and cooperation between the two parties involved are required in order to take appropriate measures to mitigate these interference issues.