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1 Introduction

In previous RAN4 meetings the OTA requirements for GSM has been discussed and measurement results of TRP and TRS performance has been presented. In RAN4 meeting #51 measurement results for GSM850, GSM900, DSC1800 and GSM1900 bands were presented [3]. At RAN4 meeting #51bis results for GSM900 and DCS1900 bands were presented. In this contribution we continue the discussion and present further evaluation of the total failure ratio accounting all afore mentioned GSM bands (850/900/1800/1900) and also impact of already agreed requirements for WCDMA bands I, II, V and VIII.

2 Measurement results

These results are based on several handset models from different manufacturers and total number of terminals was 133. These are from terminal models that have been on market less than two years.

As discussed in [3], when considering the requirements it should be understood that the requirements for a given band cannot be set as an isolated issue. In order to meet the GCF certification limits terminal naturally needs to meet the set minimum requirements for all the supported bands and modes. It would also be useful if requirements set for different systems would be balanced, preventing single system dominating the failures.

In this section we further evaluate the impact of applying requirements for the supported GSM bands in addition to the existing requirements for WCDMA. In this analysis the performance of each terminal is evaluated against the set minimum requirement for each metric and on all selected bands. Then the portion of terminals (of total terminals) failing to meet at one or more set limit on any band is counted as failure e.g. each terminal failing is accounted only once. The GSM limits are based on the requirement proposal made by group of UE vendors in [2]. The increase illustrated at x-axis of the figures is applied equally to each metric for the chosen bands. E.g. TRP and TRS requirements are made tighter by 0.5dB steps up to 2dB tighter either for all GSM bands or only <1GHz bands.

Figure 1 shows the portion of terminals failing to meet the minimum requirement when accounting all discussed GSM bands and WCDMA bands I, II, V and VIII. Firstly it can be seen that the portion of the over all terminal population failing the set requirements only due to existing WCDMA requirements is nearly 20% (green dashed line). Introducing the GSM requirements pushes the failure ratio to 24%. When the proposed requirement in [2] is made tighter, the total failure ratio is monotonically increasing, reaching over 40% at increase of 2dB.

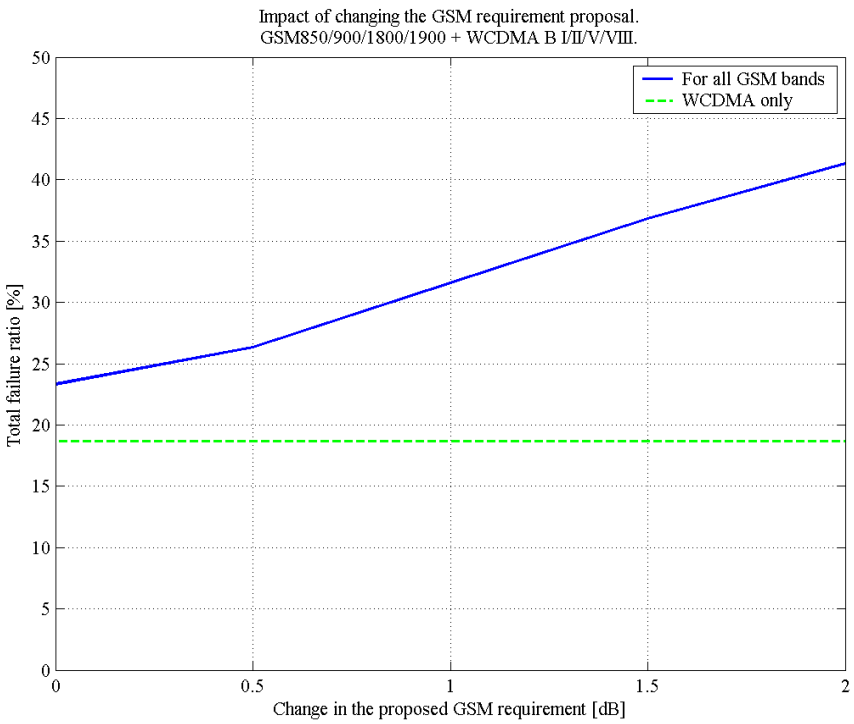

Figure 1. Portion of failed terminals as a function of change in proposed GSM requirement (850/900/1800/1900) when accounting existing WCDMA requirements for bands I, II, V and VIII.

As the amount of measurement samples for terminals supporting WCDMA Band II and Band V was lower in the data and the majority of the sample set was assumed to be more optimized for European bands, evaluation accounting WCDMA Bands I and VIII together with all GSM bands was carrier out. Figure 2 shows the total failure ratio for the terminal population when requirements for WCDMA bands I and VIII are accounted in addition to the GSM requirements. When applying only the existing WCDMA requirements, a failure ratio of 10% is seen. When applying also the GSM requirements proposed by a group of UE vendors in [2] the total failure ration raises to 20%. Thus a rather significant portion of the current terminal population would not be able to meet the requirements. Making the requirement more stringent leads to increased number of failed terminals, roughly 10%-units/dB.

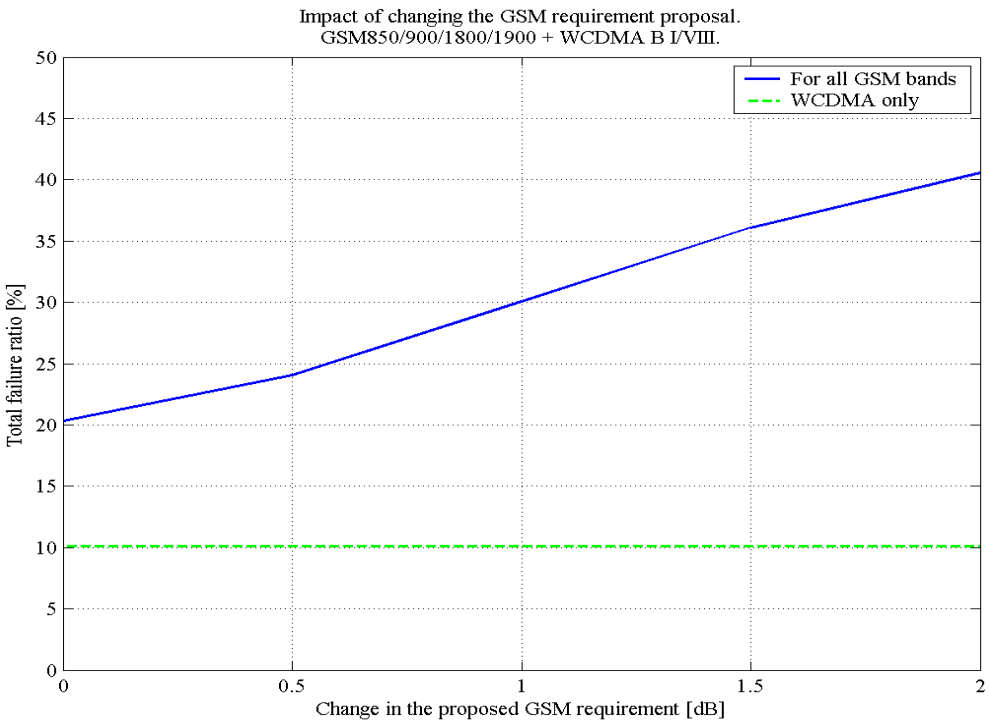

Figure 2. Portion of failed terminals as a function of change in proposed GSM requirement (850/900/1800/1900) when accounting existing WCDMA requirements for bands I and VIII.

Figure 3 shows the portion of failed terminals when only the GSM requirements are accounted. The proposal [2] gives a failure ratio of 17%. If looking the effect of changing the below and above 1GHz requirements separately, it can be seen that below 1GHz requirements results slightly more fails. Comparing to results show above in Figure 2, it can be seen that the GSM requirements would dominate the observed fails.

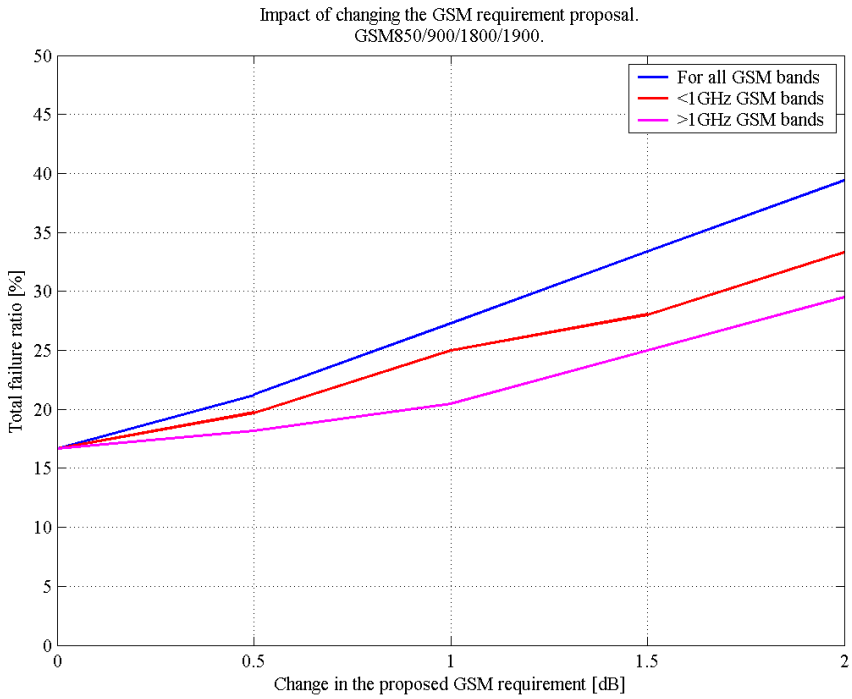

Figure 3. Portion of failed terminals as a function of change in proposed GSM requirement (850/900/1800/1900) when accounting only the GSM requirements

When using the proposal made by group of operators in [5] as a base line, the portion of failed terminals is significantly increased. When existing WCDMA requirements are accounted, only 53% of terminals would be able to meet the requirement and when only the GSM limits are accounted, 62% of the terminals would meet the requirement. Hence in both cases roughly half of the terminal population would not be able to meet the set requirement. It should be noted that in earlier discussions failure rates in the order of 50% were considered to correspond the recommended requirement levels.

3 Conclusion

In this contribution we have presented further analysis of the portion of terminals meeting the discussed GSM OTA requirements. In the analysis presented the performance of each terminal is evaluated against the set requirement for each metric and on all selected bands. Then the portion of terminals (of total terminals) failing to meet at one or more set limit on any band is counted as failure e.g. each terminal failing is accounted only once. It has been shown that the requirement levels proposed in [2] lead to 17% total failure ratio when requirements only to GSM bands are considered. Accounting the existing requirements for WCDMA, the failure ratio is increased above 20%. Considering the proposal made in [5], nearly 50% of terminals would fail to meet the set requirements.

4 References

[1] R4-090499, TRP and TRS OTA requirements for UTRA band below 1GHz (FDD), Orange et al

[2] R4-091472, TRP and TRS requirements for GSM 850, GSM 900, DCS 1800 and PCS 1900, Nokia et al

[3] R4-091985, GSM OTA (TRP and TRS) measurement results, Nokia

[4] R4-092318, OTA TRP and TRS requirements for GSM 900 and DCS1800, Orange

[5] R4-092543, OTA TRP and TRS requirements for GSM 900 and DCS1800, Orange et al