

Source: Motorola Mobility LLC, Sony
Title: UTRA BHH TRP/TRS performance requirements proposal for Bands I, II, V and VIII
Agenda Item: 6.1
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1. Introduction [R4-125719](#)

At the end of the 3GPP RAN4 #78 the TP to TS 37.144 [1] was approved without UE UTRA or E-UTRA BHH performance requirement values. This outcome was due to a lack of agreement on band VIII TRP, and bands V and VIII TRS. Discussions since have highlighted [2][3] some fundamental issues with the current methodology, which impede compromise and finalization of limits, and have recommended that OEMs and Operators bridge the final gap by a good-faith effort to propose final specifications that they can actually support. This submission provides that final limits proposal from Motorola and Sony's perspective.

2. Background

The RAN4 TRP/TIS data pool and post-processing method have served to bring all parties' proposed limits to within about 2 dB, but it should be noted that the final values offered here are not based on further manipulation or post-processing of those data. Rather, these final values are based on Motorola's analysis, considering all products we make in all bands and modes, to offer *the most performance that we can support across all bands and modes, with acceptable industrial design and cost compromises*. The latter include considerations such as growing dimensions of the phone to enlarge antenna keepouts, limitation of use of metal exterior elements of the phone, and expense of antenna tuner devices of varying performance capabilities, for example.

Additionally, we offer a complete set of final specifications, for all UTRA and E-UTRA bands. These are based on an extension to other bands/modes of the final values specified in UTRA bands I, II, V, and VIII, via a principle of equivalent antenna system efficiency and known conducted values for TX power and RX sensitivity. Aside from the obvious value to industry of a complete specification for all bands and modes, we believe it is also important for participants in the current discussion to view such a complete set of implied limits, since once the UTRA limits are set in four bands, it will be natural to extend them to all other bands and modes in such fashion. In other words, the likely ramifications of any agreed limits on all other future bands/modes should be considered up-front when those first limits are being agreed.

3. Performance Requirements proposal for Bands I, II, V and VIII

Adhering to the rational approach shown in [3] the following performance requirements are here proposed:

Band	TX/RX	New Motorola/Sony Proposal
I	TRP	13.0
	TRS	-100.5
II	TRP	13.0
	TRS	-100.5
V	TRP	9.0
	TRS	-97.0
VIII	TRP	9.0
	TRS	-97.0

These final limits are offered with these specific provisos:

1. All values are dBm, avg across L-M-H channels and left-right sides, with both receivers active, per 3GPP TS 34.114.
2. Applicable to devices up to 72 mm wide, that fit in CTIA PDA hand phantom
3. Exclude devices supporting Carrier Aggregation (or consider CA relaxation for future study)
4. Exclude devices supporting CDMA (or consider CDMA relaxation for future study)
5. Include multi-band/multi-mode devices, and apply either to core or roaming bands
6. Exclude Test Tolerance. Specifically, these limits are acceptable only if Test Tolerances of 0.7 dB TRP and 0.9 dB TRS are taken as a relaxation from the limits to generate the final drop-dead pass/fail thresholds for certification in e.g. GCF. This would follow the same practice as has been taken with the current TS 34.114 head-only limits.

3. Extended Requirements Proposal for All UTRA and E-UTRA Bands

As described above, it will be natural to extend these limits to all bands and modes, based on an equivalent antenna system efficiency calculation and known conducted power and sensitivity values for other bands and modes. The authors have performed that calculation based on real conducted values (which are known often to exceed 3GPP Refsens values, for example), and assuming in all cases the device employs diversity/MIMO. The only additional manipulation was to apply a 1 dB relaxation to the calculated antenna efficiency for ultra-low bands (bands in 700 – 800 MHz), to account for known reduction in antenna performance as the device becomes electrically small in this frequency range. For simplicity, all LTE bands' limits are given for an assumed bandwidth of 10 MHz; these can be adjusted if desired for any other BW based on simple known calculations.

These extended final limit values are here proposed:

Band & Mode	BW	TRP Spec	TRS Spec
W1	3.8	13.0	-100.50
W2	3.8	13.0	-100.50
W3	3.8	13.0	-100.50
W4	3.8	13.0	-100.50
W5	3.8	9.0	-97.00
W8	3.8	9.0	-97.00
L1	10.0	13.0	-88.50
L2	10.0	13.0	-87.50
L3	10.0	13.0	-88.00
L4	10.0	13.0	-88.50
L5	10.0	9.0	-85.50
L7	10.0	13.0	-88.50
L8	10.0	9.0	-85.00
L12	10.0	8.0	-84.00
L13	10.0	8.0	-82.50
L17	10.0	8.0	-84.00
L20	10.0	8.0	-83.00
L25	10.0	13.0	-87.50
L26	10.0	9.0	-84.50
L28	10.0	8.0	-83.50
L29	10.0		-84.50
L30	10.0	13.0	-87.50
L39	10.0	13.0	-88.50
L40	10.0	13.0	-87.50
L41	10.0	13.0	-87.00

All of the same conditions given above for the UTRA limits are also applicable to these extended limits.

Motorola and Sony urge other stakeholders to similarly consider all bands’ performance limits, as they might be extrapolated from any first set of limits for just a few bands. Motorola will provide the spreadsheet with complete explanation of the process taken for these data, to make it easy for other companies to investigate these trade-offs.

Finally, we emphasize that these limits represent our view of a final limit set that we can possibly support from a business and technical perspective. We have not left in any sort of padding for negotiation, rather stated in good faith what we think we can support. Without saying there can be no further compromise, we would say that it would be wrong to consider these proposed final limits as merely a “starting point” for negotiation.

4. References

- [1] R4-161467, TP for TS 37.144 Introduction of new TRP/TRS requirements
- [2] R4-157939, Framework analysis of TRP and TRS data for multi-band mobile devices
- [3] R4-161506, UTRA BHH TRP/TRS performance requirements