6 October 2008

The Commerce Commission
PO Box 2351
Wellington 6140

Attention: Matthew Bailey

CROSS SUBMISSION ON DRAFT MOBILE CO-LOCATION STANDARD TERMS DETERMINATION – INTERFERENCE MANAGEMENT

1. Kordia Limited™ lodged with the Commission:

   - a submission to the Commission on August 8,
   - a cross-submission on September 8, and
   - an e-mail to the Commission's Bruce Officer on September 19, in reply to the Commission's request for clarification on Interference Management.

2. Kordia now amends our previous position on the threshold for the acceptable level of receiver noise floor degradation (from 1.0dB), to 0.4dB.

   We also clarify the requirement to take account of the impacts of interference mitigation measures on the Link Budget.

3. Kordia's submission, cross submission and e-mail all argued that the 1.0 dB Link Budget loss, used in the draft determination to define the threshold of Unacceptable Performance Degradation, should be quantified as a 1.0 dB "receiver noise floor elevation" using the equation:

   10 * Log([N + I(ext)] / N) = 1.0 dB

   We refer to this as equation-1.

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4. Kordia's submissions also make the point that internal interference (I(int)) originating within the Access Provider's network, should not be included in the quantitative determination of the threshold for Unacceptable Performance Degradation, because I(int) varies from one network to another depending on engineering practices, as well as varying with time as a result of varying traffic loading on the network. The level of internal interference also changes as the network power levels change in response to changing external interference. I(int) is also not included in the methods that ITU-R reports describe for determining the threshold for Unacceptable Performance Degradation, such as Report ITU-R M.2039.

5. In our e-mail of September 19, we illustrated the Link Budget loss resulting from a 1 dB elevation in receiver noise floor, for cellular networks that are engineered to have I(int) at the same level as the receiver noise floor (N). In that example which is typical of a CDMA based "3G" network, that noise floor elevation of 1 dB using the above equation-1, is equivalent to a Link Budget loss of 0.51 dB or approximately 0.5 dB when internal interference is included as per equation-2, reproduced below.

   $10 * \text{Log}([N + I(\text{int}) I(\text{ext})] / [N + I(\text{int})] = 0.5 \text{ dB}$

   We calculated that Link Budget loss for illustrative purposes only. We do not intend the Unacceptable Performance Degradation threshold to be calculated using equation-2.

6. Kordia has considered the interference analysis methodology further and now wishes to amend our position on defining the threshold for Unacceptable Performance Degradation.

7. Kordia does continue to prefer to use equation-1 as the basis for quantifying the UPD. For clarity, in equation-1, (I(int)) is intentionally excluded from the calculation.

8. Kordia amends our previous position on the value for the acceptable receiver noise floor elevation calculated using equation-1, (from no more than 1.0 dB) to no more than 0.4 dB.

9. Kordia also recommends that the receiver noise floor elevation (NFE (dB)), calculated according to equation-1, needs to result in a Link Budget loss of less than 0.5 dB when the impacts of other interference mitigation measures are taken into account.

   For example, when an interference rejection filter is being added to the affected system, or

when an effective loss of antenna gain results from antenna changes, the loss (A (dB)) of the said filter and the incremental loss (B (dB)) due to the antenna changes, and any other changes (C (dB)) resulting from interference mitigation, when taken together with the noise floor elevation (NFE), should be less than 0.5 dB Link Budget loss:

NFE + A + B + C < 0.5 dB

For clarification, note that I(int) is not included in this calculation, and should not be. Also, in the above equation, losses: A, B and C are expressed as positive values.

10. We explain Kordia's change of position as being necessary to avoid excessive Link Budget loss for systems that have low internal interference, such as GSM where internal interference can be typically approximately 6 dB to 10 dB below the receiver noise floor. Further, the use by ITU-R of 1.0 dB receiver noise floor elevation, only applies when a single interferer is allowed for, and where interference affects a limited number of cells. In other cases ITU-R practice is to use a noise floor elevation of 0.4 dB for determining the threshold of Unacceptable Performance Degradation.

    For clarification, the 0.4 dB noise floor elevation corresponds to -10 dB I/N in the ITU-R literature.

Yours sincerely

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