



An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

ComReg Outdoor Mobile Coverage Map

A study by Plum Consulting on 5G Outdoor
Mobile Coverage Thresholds

Information Notice

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Commission for Communications Regulation

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1 Introduction

1. As the communications regulator, the Commission for Communications Regulation (“ComReg”) has an important role to play in facilitating consumers with information which allows informed choices to be made.
2. In 2019, ComReg launched a consumer focussed online outdoor mobile coverage mapping tool (“outdoor mobile coverage map”)¹.
3. The outdoor mobile coverage map allows consumers to view the level of outdoor mobile coverage throughout the country, at specific locations or addresses, as defined by the user. The outdoor mobile coverage map, on average, receives 8,000 views per week. It is generated using network data provided by the mobile network operators (“MNOs”): Eir, Three Ireland and Vodafone.
4. ComReg checks this network data before the application of a propagation model to generate independent outdoor mobile coverage predictions. Coverage predictions are generated using the Forsk ‘Atoll’ radio planning tool, together with the ‘Crosswave’ radio propagation model from Orange Labs.
5. The outdoor mobile coverage map:
 - (a) displays outdoor mobile coverage for both MNOs and mobile virtual network providers (“MVNOs”). These MVNOs include: 48, Clear Mobile, GoMo, LycaMobile, An Post mobile, Tesco Mobile and Virgin Media;
 - (b) shows 2G, 3G and 4G mobile technology platforms for MNOs and MVNOs; and
 - (c) is presented in a colour-coded format showing Very Good, Good, Fair, Fringe and No coverage². This format, also referred to as “coverage thresholds”, facilitate consumers’ understanding of outdoor 2G, 3G and 4G mobile coverage.
6. With the launch of 5G services in Ireland, there is a requirement for consumers to also view the level of outdoor 5G mobile coverage in a similar vein. Consequently, ComReg initiated a project to develop and define appropriate coverage thresholds for the mapping of 5G outdoor mobile coverage.
7. To this end, ComReg commissioned a study to consider and provide recommendations for appropriate 5G outdoor mobile coverage thresholds. ComReg is pleased to publish the results of this study today, which it is minded to adopt, and

¹ <https://coveragemap.comreg.ie/map>

² <https://coveragemap.comreg.ie/faq>

which is available on our website. The report is “*Coverage Thresholds for 5G Services*” – a report (Document 21/118a) from Plum Consulting (“Plum Report”).

8. Interested parties are encouraged to read and consider this report, which will help inform interested parties’ views of the wider 5G outdoor mobile coverage thresholds discussion, including information on the impact of existing 5G use cases on the definition of coverage thresholds.
9. To further assist the reader, the remainder of this document outlines the key messages contained in this report.

2 Plum's study on 5G Outdoor Mobile Coverage Thresholds

10. The Plum Report provides an informative analysis of key technical aspects and considerations, which are inputs to the development of the recommended 5G outdoor mobile coverage thresholds.
11. The definition of appropriate 5G outdoor mobile coverage thresholds, as is the case with 2G, 3G, and 4G, includes appropriate consideration and definition of specific ranges of signal strength associated with each coverage threshold category.
12. Plum observes that technology differences between 4G and 5G are important factors to consider in the determination of appropriate 5G outdoor mobile coverage thresholds. For example, whereas coverage limits for 4G are generally expressed in terms of 'Reference Signal Received Power' ("RSRP"), those for 5G New Radio ("NR") use 'Synchronisation Signal Reference Signal Received Power' ("SS-RSRP"). The relationship between these parameters to the overall LTE and NR signal structure is summarised within the Plum Report.
13. Plum considers that if a coverage criterion is to be useful to consumers, it must relate, in some manner, to an expectation of service quality (however defined). In that regard, Plum observes that, in the process of 5G standardisation and promotion, a very wide range of potential use cases for 5G have been defined, each with a specific set of requirements in terms of coverage, reliability, bit rate, latency etc.
14. The section of the Plum Report entitled '*5G use cases and performance expectations*' provides an overview of 5G network performance metrics and potential use case scenarios and recommends an appropriate baseline performance limit.
15. Based on currently expected 5G use cases, Plum recommends that the public facing outdoor mobile coverage predications of 5G should relate to a minimum downlink bit rate requirement of 50 Mbit/s. In that regard, Plum also observes that 5G use cases and expectations are still evolving and, therefore, likely to undergo further change. Consequently, there would likely be a need to revisit this minimum downlink bit rate assumption when patterns of user behaviour are more established.
16. Plum notes that the proposed download speed of 50 Mbits/s, which represents a reasonable minimum expectation with which to define the edge of a 5G service area, would need to be expressed in terms of SS-RSRP levels to allow for coverage mapping.
17. In the section entitled '*Determination of appropriate levels*', Plum details modelling scenarios, determination of RSRP for single user throughput, SINR calculation and

transformation of SINR to SS-RSRP.

18. Plum further notes that, given the uncertainty in 5G use cases (and therefore in appropriate thresholds) and likely variations in bandwidth and technical configuration between different operators, it seems inappropriate to apply a high level of granularity to the SS-RSRP thresholds. Therefore, it recommends simplifying the thresholds by taking average values of SS-RSRP for some pairs of modelling scenarios³ as captured in Table 5.4 of the Plum Report.
19. Plum's recommendations for outdoor mobile coverage thresholds for 5G consider, to some degree, the different bandwidth and technical configurations used in each band.
20. Given the evolutionary status of 5G use cases, Plum considers that it would be inappropriate to imply that any thresholds correspond to precise quality of service definitions.
21. Plum recommends the display of the outdoor mobile coverage mapping data for 5G on a technology basis, rather than display per individual spectrum band.
22. Plum's recommended 5G outdoor coverage thresholds are set out in Table 6.1 of its report.

³ The modelling scenarios correlate to individual frequency bands where, for example, Plum recommend pairing the 1.8 GHz and 2.1 GHz band and using one SS-RSRP level to represent both bands.

3 Submitting Comments and Next Steps

23. ComReg is happy to receive written comments on matters outlined in this information notice and the associated Plum Report. ComReg would however wish to receive such comments no later than 5.30pm on the 23rd December 2021.
24. It would make the task analysing responses easier if comments were referenced to the relevant section/paragraph number of this Information Notice or the associated Plum Report. Please also set out your reasoning and all supporting information for any view expressed.
25. Responses must be submitted in written format (post or email) to the following recipient, clearly marked *Comments on ComReg Information Notice 21/118*

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26. We request that where there are electronic submissions, they be submitted in an unprotected format so that they can be readily included in the ComReg submissions document for electronic publication.
27. ComReg appreciates that respondents may wish to provide confidential information if their comments are to be meaningful. In order to promote openness and transparency, ComReg will publish all submissions received, subject to the provisions of ComReg's guidelines on the treatment of confidential information (Document 05/24).
28. In this regard, any respondents should submit views in accordance with the instructions set out below. If submitting a response to this information notice that contains confidential information, respondents must choose one of the following options:

- A. Preferably, submit both a non-confidential version and a confidential version of the response. The confidential version must have all confidential information clearly marked and highlighted in accordance with the instruction set out below and include the reasons as to why they consider any particular material to be confidential. The separate non-confidential version must have actually redacted all items that were marked and highlighted in the confidential version.

OR

- B. Submit only a confidential version and the reasons as to why they consider any particular material to be confidential, and ComReg will perform the required redaction to create a non-confidential version for publication. With this option, respondents must ensure that confidential information has been marked and highlighted in accordance with the instructions set out below. Where confidential information has not been marked as per our instructions below, then ComReg will not create the non-confidential redacted version and the respondent will have to provide the redacted non-confidential version in accordance with option A above.

29. For ComReg to perform the redactions under Option B above, respondents must mark and highlight all confidential information in their submission as follows:
- a. Confidential information contained within a paragraph must be highlighted with a chosen particular colour,
 - b. Square brackets must be included around the confidential text (one at the start and one at the end of the relevant highlighted confidential information),
 - c. A Scissors symbol (Symbol code: Wingdings 2:38) must be included after the first square bracket.
30. For example, “Redtelecom has a market share of [✂ 25% ✂].”