increased, the gains from spatial prediction increase rapidly. However, the overall detection probability remains low. As the number of prediction points is increased (corresponding to the right panel of Figure 2) the spatial prediction approach starts to perform very well, over tripling the detection probability for coverage holes compared to the measurements only-approach. We also see that the false alarm probability remains stable.

Figure 3 shows the results for the urban scenario where measurements and predictions are carried out in the annulus with $d_{\min} = 265\,\mathrm{m}$ and $d_{\max} = 335\,\mathrm{m}$. This corresponds to drive tests carried out specifically at the cell edge, where coverage holes are most likely to occur. We see that especially for larger ratio of number of prediction points to measurement points the spatial prediction scheme yields approximately 90% detection probability for coverage holes, with significantly improved performance compared to measurements only approach.

Figure 4 shows the results for the rural scenario focusing on the annulus with $d_{\min} = 400\,\mathrm{m}$ and $d_{\max} = 800\,\mathrm{m}$. The overall detection probabilities are lower than for the urban case (due to the same number of measurement points being used to cover much larger area compared to the urban case), but the gains from the spatial prediction approach are still very clear.

5. CONCLUSIONS

In this paper we studied the use of a spatial Bayesian prediction framework for improving coverage estimates for cellular networks based on measurements. Our results indicate that the use of techniques from modern spatial statistics can significantly increase the accuracy of coverage predictions from drive test data. We are currently extending our evaluation work with additional scenarios, including measurements from live cellular systems.

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