

Network connectivity – Base Station and mobiles at UHF frequencies – scenario 7a

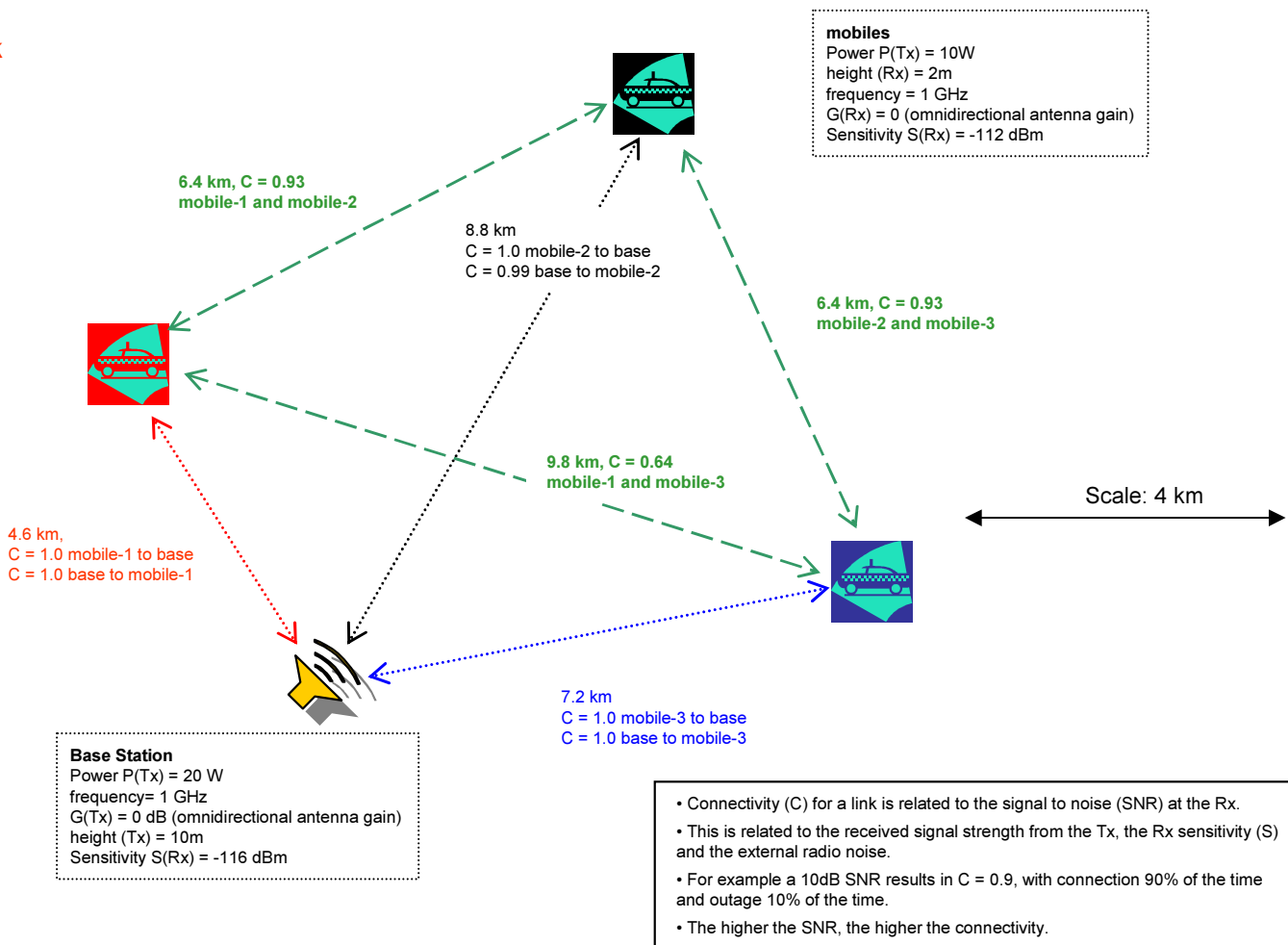
Baseline obstruction version (flat terrain <1m undulations, minimal buildings, no significant vegetation – forest/jungle)

All units using basic radios – Base station has better (higher power P(Tx), better sensitivity S(Rx)) than mobiles

Benign radio environment – Environmental noise < S(Rx) at 'Rural' level.

Examine the effect of higher terrain on the network

- To establish a baseline system to examine the effects of higher terrain, parameters will be set to establish workable connectivity.
- The mobiles have been given a transmitter power of 10W and antenna mountings of 2m height to establish a reasonable level of connectivity across all the links.
- The noise background has been set at 'rural', below the sensitivity of the receivers at this 1 GHz frequency and 200kHz bandwidth, so the more sensitive base station receiver advantages are realised.
- Usually the terrain across which line-of-sight (LOS) communications takes place is not flat and featureless and will be disadvantageous to radio propagation.
- Scenarios 1 to 5 assumed very mild terrain fluctuations and scenario 6 reasonably high undulations, but now a higher obstruction will be placed in the network area to examine the effect.



Baseline Network Connectivity

- For the 'centralised - duplex' (between mobiles and base station) sub-net, the connectivity is 5.99 across the 6 links (99.8%).
- For the 'full' net the connectivity is 10.99 across the 12 links (91.6%), the 'centralised - duplex' sub-net (between mobiles and base station) provides 55% of that connectivity and the 'mobile to mobile' sub-net provides the remaining 45%.



Network connectivity – Base Station and mobiles at UHF frequencies – scenario 7b

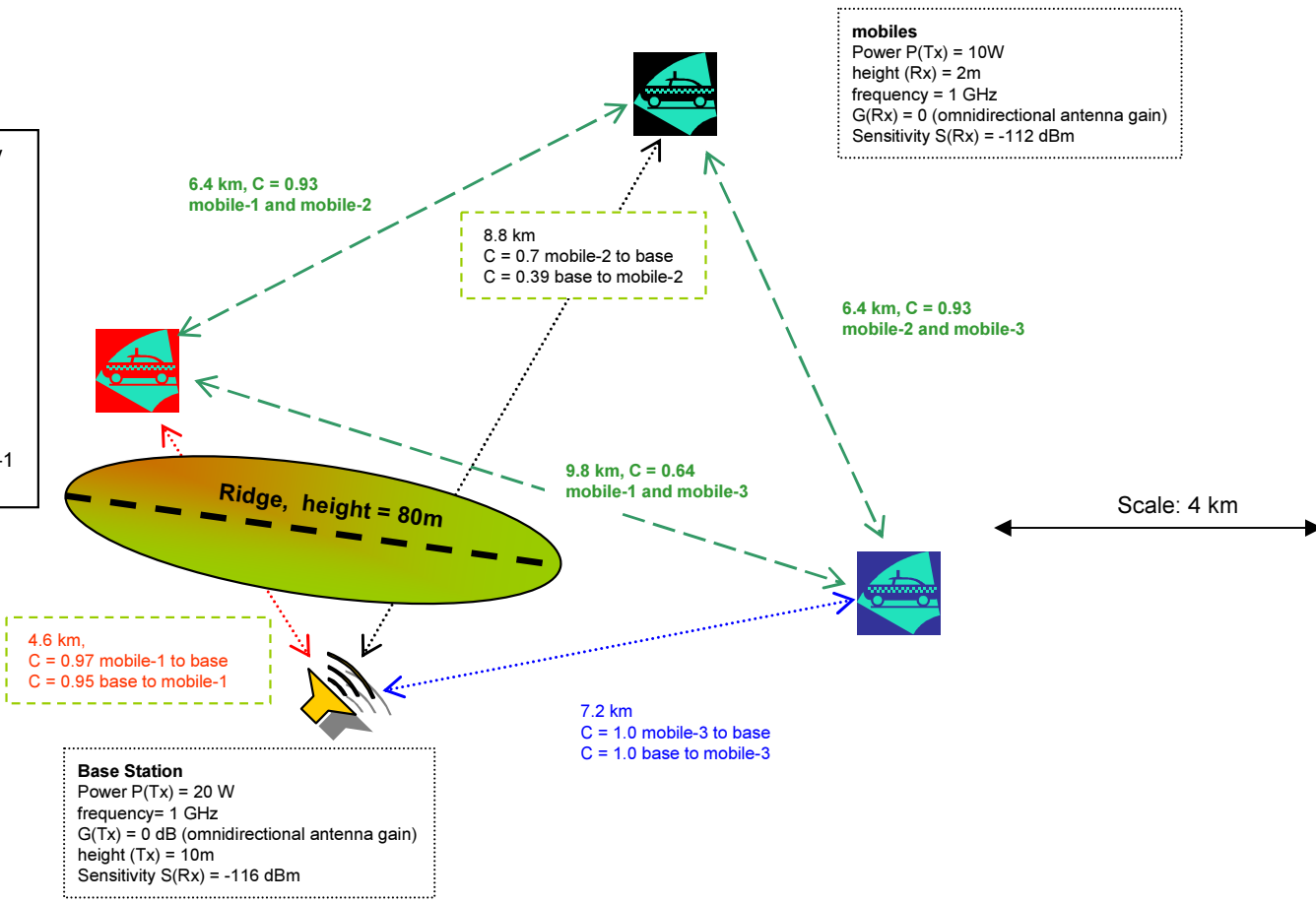
Modified obstruction version (80m high ridge, minimal buildings, no significant vegetation – forest/jungle)

All units using basic radios – Base station has better (higher power P(Tx), better sensitivity S(Rx)) than mobiles

Benign radio environment – Environmental noise < S(Rx) at 'Rural' level.

Examine the effect of higher terrain on the network

- A sharp ridge is a common approximation for real terrain that can be very effective.
- An 80m high ridge has been placed between the base station and two of the mobiles. It does not interdict any of the inter-mobile links.
- The shorter links between the base station and mobile-1 are not greatly affected as there were high SNR margins, but the longer links to mobile-2 have had connectivity significantly reduced.
- It can be seen that the strong links between the base station and mobiles can be affected by a relatively modest high hill or ridge. A similar height ridge would affect the weaker inter-mobile links even more.
- A ridge that is high enough will disrupt even the strongest links. A ridge 300m high in the same location would reduce the connectivity from mobile-1 to the base station to 0.33.



Modified Network Connectivity

- For the 'centralised - duplex' (between mobiles and base station) sub-net, the connectivity is 5.01 (reduced from 5.99) across the 6 links (83.5%, reduced from 99.8%).
- For the 'full' net the connectivity is 10.01 (reduced from 10.99) across the 12 links (83.4%, down from 91.6%), the 'centralised - duplex' sub-net (between mobiles and base station) provides 50% of that connectivity (down from 55%) and the 'mobile to mobile' sub-net provides the remaining 50% (up from 45%).

