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Title: **Channel Model for SFN based E-MBMS**
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1. Introduction

In a single frequency network (SFN), transmissions from individual cells combine to construct a single multipath channel from the network to the mobile device. In [1], it was agreed to specify a set of SFN channel models in order to accurately compare different proposed downlink reference signal (RS) structures. This contribution presents multipath intensity profiles (MIPs) derived from system simulations for the worst 5% and 10% of users. These MIPs can be used to define the link level channel models needed for the comparison of reference signal structures.

2. Simulations

System parameters used in this contribution can be found below in Table 1. L1 parameters are detailed as the reference L1 parameters (RLP) in [2].

Parameter	Units	Value
Carrier Frequency	MHz	2000
Inter Site Distance	m	1732 (Case 3)
Bandwidth	MHz	5
Penetration Loss (PL)	dB	20
Cell Layout		Hexagonal grid, 37 cell sites, 3 sectors per site
Path Loss	dB	128.2 + 37.6log10(d(km))
Lognormal Std Dev.	dB	8
Inter-Site Shadow Corr. Coeff.		0.5
Intra-Site Shadow Corr. Coeff.		1
Channel Model		Typical Urban (TU)
BS transmit power	dBm	43
BS # Antennas		1
BS Ant. Pattern		LTE - R1-050669, Table 2
BS Ant. Gain	dBi	14
BS Ant. 3dB Beamwidth	degs	70
BS Ant. Front-Back Ratio	dB	20

Table 1 – System simulation parameters.

Figure 1 and Figure 2 show the average power of each arriving ray relative to the strongest arriving ray, versus delay in samples assuming a 7.68MHz sampling rate[1].

In order to obtain these figures 5000 users were dropped randomly within the inner two rings of the simulated network. Using the Mutual Information per Bit (MIB) for QPSK modulation as a ranking measure, the average power density profile was recorded for the worst 5% and 10% of users. Rays with average relative powers less than -30dB are assumed to be of negligible importance and were omitted.

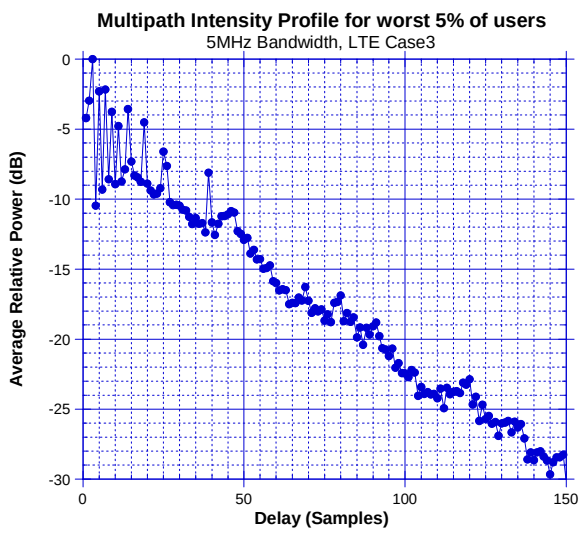

Figure 1- Multipath Intensity Profile for worst 5% of users.

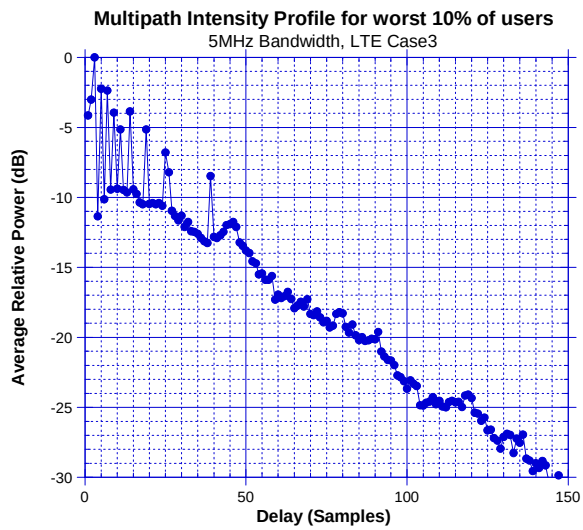

Figure 2 - Multipath Intensity Profile for worst 10% of users.

Figure 1 and Figure 2 indicate a similar MIP for both the 5% and 10% worst users. Not surprisingly, the calculated root mean square delay spread is also similar with 3.3us for the worst 5% of users and 3.2us samples for the worst 10% of users. It may therefore be sufficient to consider only a single MIP for SFN channel modeling.

3. Conclusion

The multipath intensity profiles for the worst 5% and 10% of users have been presented for the purpose of defining the channel model necessary for the comparison reference signal structures for E-MBMS SFN

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[1] *While chip spaced sampling does not allow full representation of the channel structure, the level of detail provided may be sufficient for sufficiently accurate comparison of downlink reference signal structures.*

modes. The generated profiles are quite similar, indicating only one profile may be needed for the assessment. Motorola is happy to provide one or both sets of MIP values in tabulated form.

4. References

[1] R1-06xxxx, Qualcomm Europe, Motorola, Ericsson, "Channel Models for SFN based E-MBMS", Cannes, France, June 27-30 2006

[2] R1-061998, Motorola, "Observations on Alternative L1 Parameters for E-MBMS", Tallinn, Estonia, Aug 28 – Oct 1, 2006