Comparison of multipath channel models for IEEE 802.16j

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:
IEEE S802.16j-06/044
Date Submitted:
2006-07-17
Source:
Wendy C Wong, Timothy F Cox, I-Kang Fu, David Chen, Mike Hart, Peter Wang

Venue:
San Diego, U.S.A
Base Document:
IEEE C802.16j-06/044r1
Purpose:
The purpose of this document is to summarize the multipath channel model comparison results described in IEEE C802.16j-06/044.

Contents

- Multipath channel characteristics
  - Mean and RMS delay spread;
  - Coherence bandwidth;
  - Coherence time.
- Three channel models compared
  - 802.16 (SUI);
  - ITU;
  - WINNER.

Mean & RMS Delay Spread

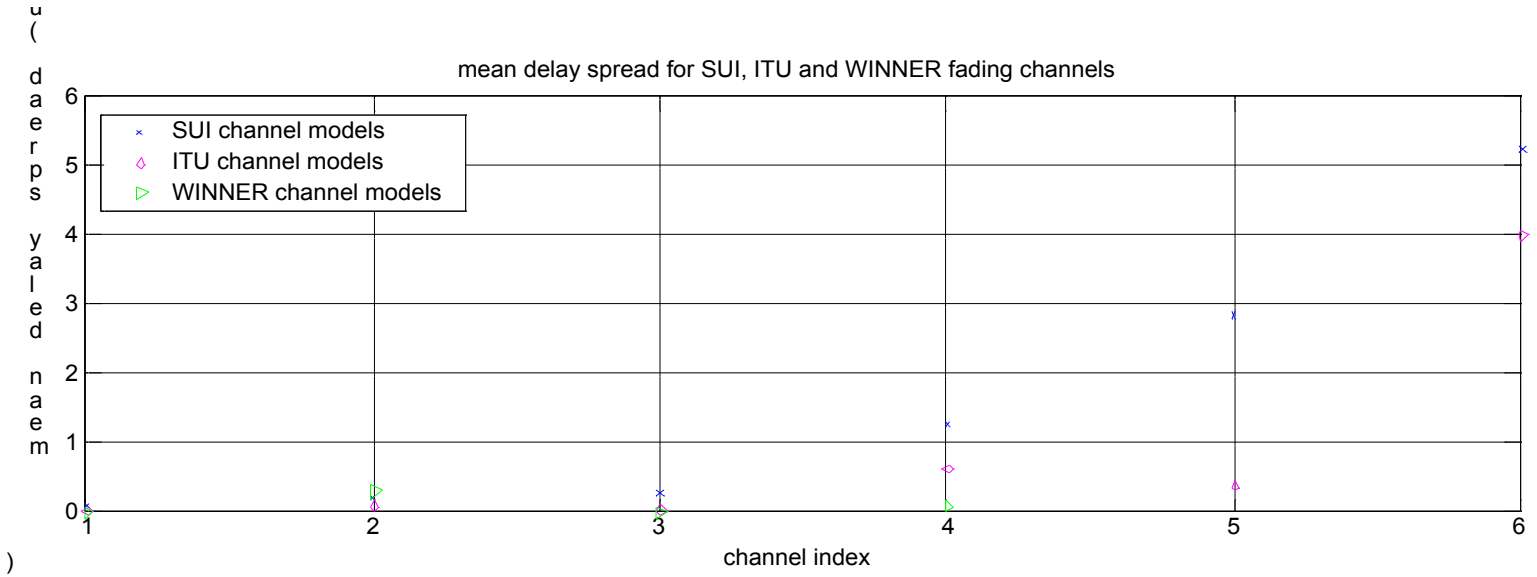
- RMS delay spread is defined as

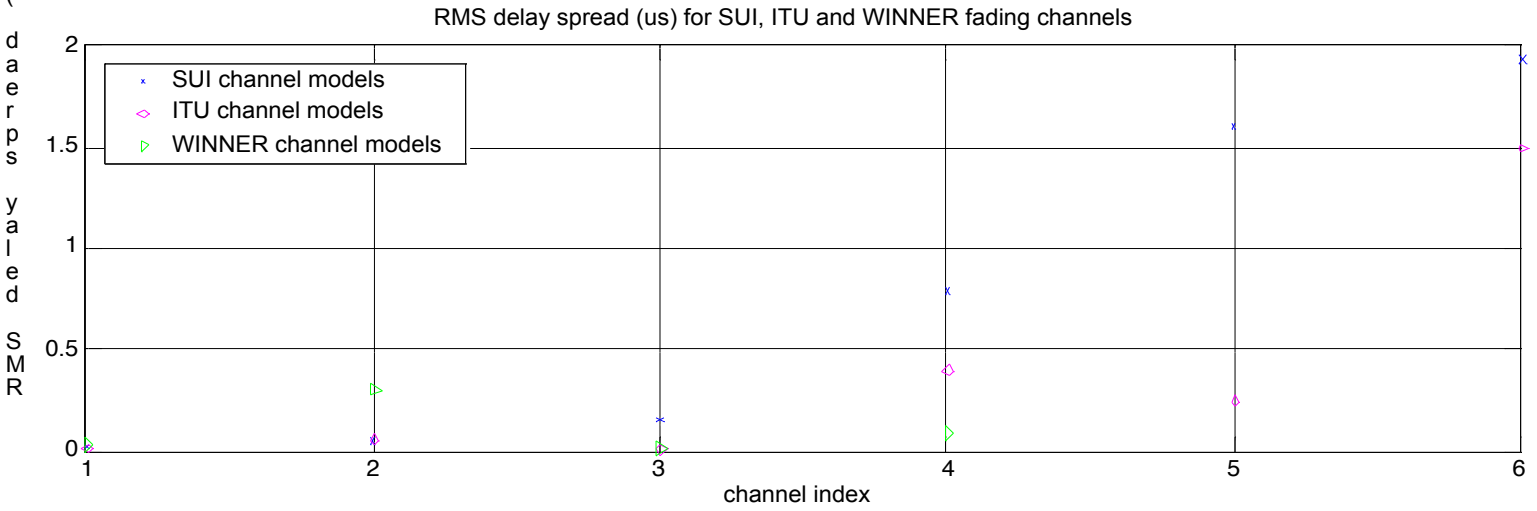
$$t_{rms}^{2} = \sum_{j} P_j t_j^{2} - \left(t_{mean}\right)^{2}$$

  - is the mean delay spread
  - is the delay of the j^{th} delay component and

    P_j = (power in the j^{th} delay component) / (total power of all components).
- 802.16 SUI channel 6 has worst RMS delay spread followed by ITU vehicular channel B.
- WINNER channels have the smallest RMS delay spread.

Mean & RMS Delay Spread Results

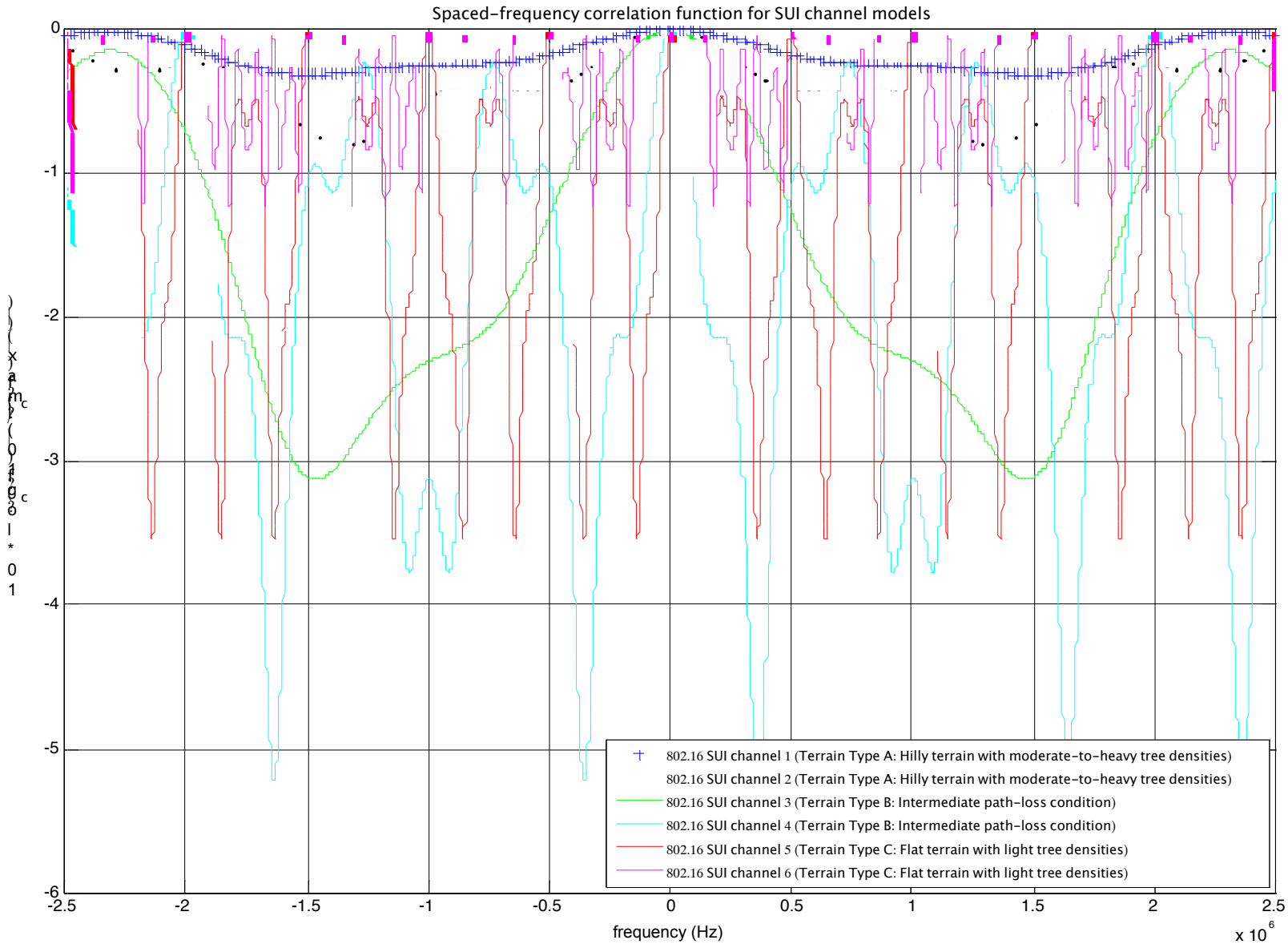




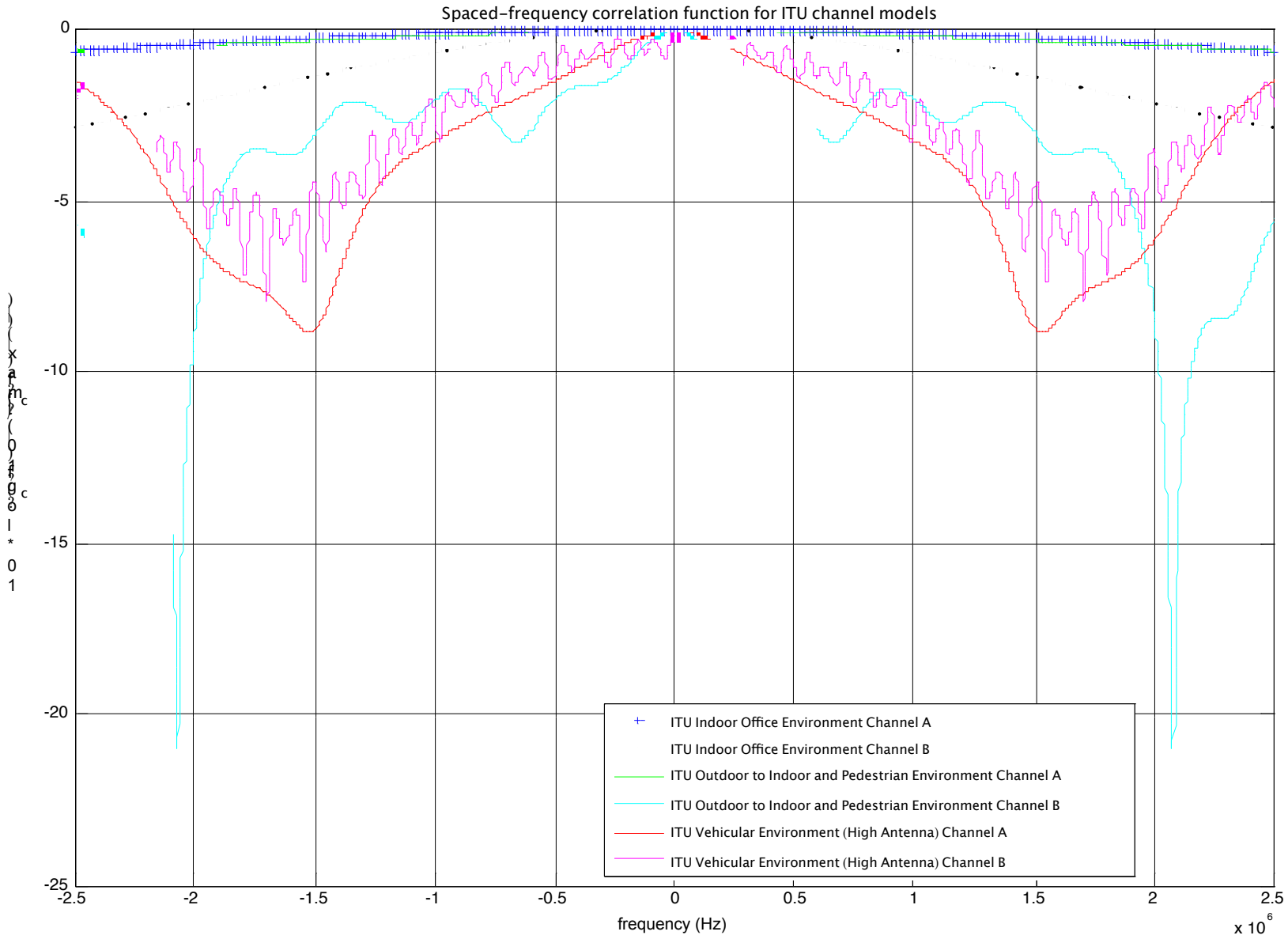
Coherence Bandwidth

- Coherence BW characterizes the channel responses.
  - Frequency flat or selective fading.
- 802.16 (SUI) channels have the narrowest coherence BW while ITU channels generate deeper fades.
- WINNER channels have wider coherence BW and mild fades.

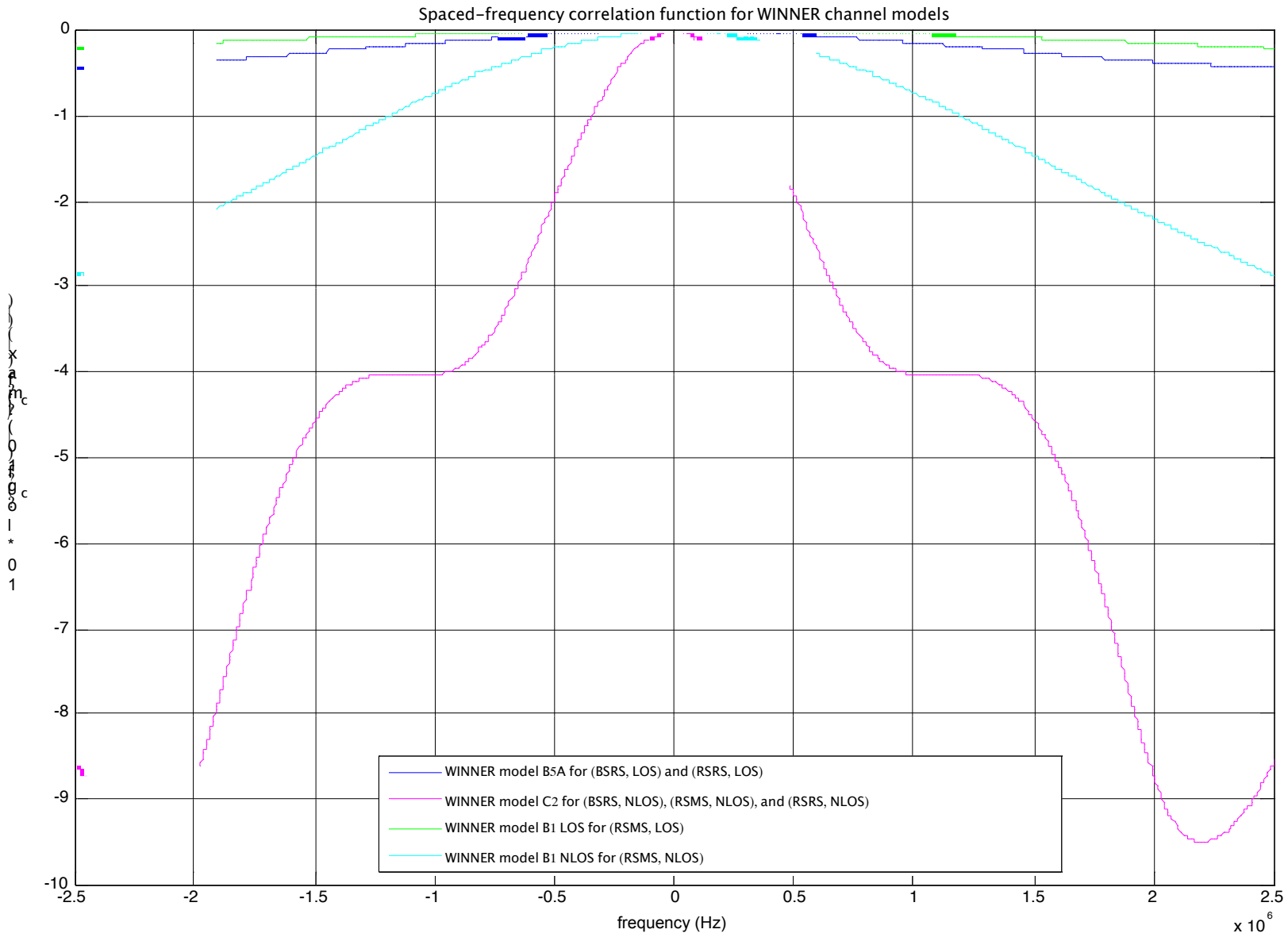
Coherence BW - 802.16 (SUI)



Coherence BW - ITU



Coherence BW - WINNER



Coherence Time

- Coherence time characterizes the channel responses.
  - Slow or fast fading.
- It is affected by the Doppler spread & the Doppler spectrum.
- ITU model provides the shortest coherence time while the 802.16/WINNER models provides longer coherence time.

Coherence time comparison result

Speed (km/h)	Doppler Spectrum					
	802.16		ITU Flat		ITU Classical	
	Channel Coherence time (ms)	Number of OFDMA symbol durations assuming a CP of 1/8	Channel Coherence time (ms)	Number of OFDMA symbol durations assuming a CP of 1/8	Channel Coherence time (ms)	Number of OFDMA symbol durations assuming a CP of 1/8
20	6.4795	57.8295	4.6282	41.3067	3.7026	36.7174
40	3.2402	28.9188	2.3145	20.6569	1.8516	18.3617
60	2.1600	19.2780	1.5429	13.7704	1.2343	12.2401
80	1.6200	14.4585	1.1571	10.3271	0.9257	9.1799
100	1.2960	11.5668	0.9257	8.2619	0.7406	7.3443
120	1.0800	9.6390	0.7714	6.8847	0.6172	6.1206
140	0.9257	8.2619	0.6612	5.9012	0.5290	5.2459
160	0.8100	7.2293	0.5786	5.1640	0.4629	4.5904
180	0.7200	6.4260	0.5143	4.5901	0.4114	4.0797
200	0.6480	5.7834	0.4629	4.1314	0.3703	3.6721
220	0.5891	5.2577	0.4208	3.7556	0.3366	3.3379
240	0.5400	4.8195	0.3857	3.4424	0.3086	3.0603
260	0.4985	4.4491	0.3560	3.1773	0.2848	2.8243
280	0.4629	4.1314	0.3306	2.9506	0.2645	2.6230

Summary

- Three channel models compared
  - 802.16 (SUI), ITU and WINNER.
  - If OFDMA PHY parameters can satisfy the worst case of 802.16 (SUI) models, they can satisfy ITU & WINNER models.
- Plan to add more channel models & compare them in the future.
- Channel model chosen for 802.16j shall reflect the propagation environment expected.