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Title	**UMBFDD Evaluation Report 1**	
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Re:	MBWA Call for Proposals (802.20 - 07/02)	
Abstract	This contribution contains Technology Performance and Evaluation Criteria Report 1 for the UMBFDD proposal. It is part of the UMBFDD proposal package.	
Purpose	For consideration by 802.20 as it evaluates proposals for FDD MBWA.	
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1 Introduction

This document forms part of a proposal to adopt UMB™ (Ultra Mobile Broadband) as the FDD system for 802.20 MBWA. It documents performance evaluation criteria required by [i], [ii] and [iii].

Note that throughout the document the terms “Forward Link” and “Reverse Link” are synonymous with the terms “Downlink” and “Uplink” respectively. Also the term “Mobile throughput” is synonymous with the term “User Data Rate”.

2 RF Parameters

2.1 Evaluation Criteria RF Parameters

#	RF Parameter	Base Value 1 MHz Channel	5 MHz Ch BW
1	Transmitter Power -- **BS**	43 dBm/MHz	+50 dBm
2	Transmitter Power -- **MS**	27 dBm	+27 dBm
3	Out of Band emission limits – BS and MS (emission measured in 1 MHz resolution bandwidth)	Attenuation of the transmit power P by: 43 +10 log(P) dB	-13 dBm
4*	ACLR - Attenuation of emissions into an adjacent channel (same Ch BW) – **BS**	45 dB	56.4 dB
5*	ACLR - Attenuation of emissions into an adjacent channel (same Ch BW) – **MS**	33 dB	40.1dB
6	Receiver noise figure -- **BS**	5 dB	5 dB
7	Receiver noise figure -- **MS**	10 dB	10 dB
8	Receiver reference sensitivity (to be proposed by each technology)	Specify at BER of 0.1%	See Link Budget in Table 1~~Table 1~~
9*	Receiver Selectivity -- **BS**	63 dB	63 dB
10*	Receiver Selectivity -- **MS**	33 dB	33 dB

#	RF Parameter	Base Value 1 MHz Channel	5 MHz Ch BW
11	Receiver Blocking – **BS** (level of same technology blocking signal at frequency offset of 2 times Channel BW)	-40 dBm	-40 dBm
12	Receiver Blocking – **MS** (level of same technology blocking signal at frequency offset of 2 times Channel BW)	-56 dBm	-56 dBm

2.2 Out-of-Band Emissions

The spectral shape of the forward link transmitted modulated carrier is shown in Figure 1. A 5MHz carrier is demonstrated, consisting of 512 sub-carriers spaced 9600Hz center-to-center, including 16 guard sub-carriers on each side. The remaining 480 sub-carriers are modulated using QPSK. The shape results from using a zeroth-order hold digital-to-analog converter with 8x oversampling, followed by a feedforward power amplifier based on the Rapp model [iv]. An output backoff of 8dB was used.

The UMB spectrum meets FCC requirements.

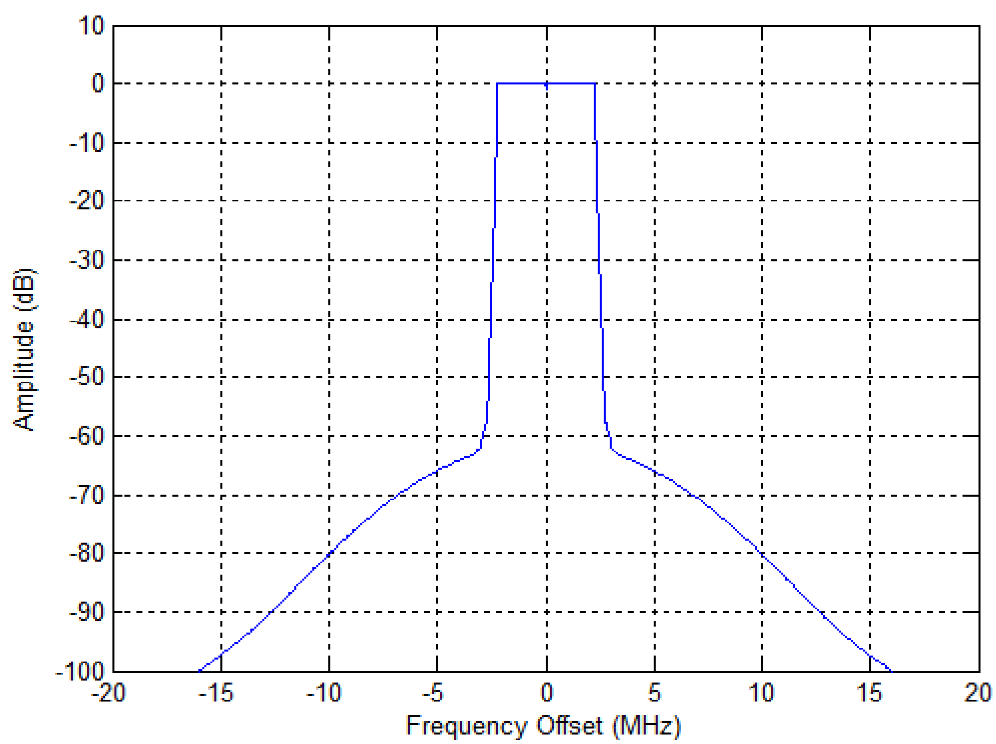


Figure 1: Spectral Shape of FL Transmitted Modulated Carrier

The spectral shape of a reverse link transmitted QPSK-modulated carrier is shown in Figure 2,with full band hopping and two tiles of subcarriers. A solid state power amplifier based on the Rapp model was used [iv] with an output backoff of 6.5dB.

The UMB spectrum meets FCC requirements.

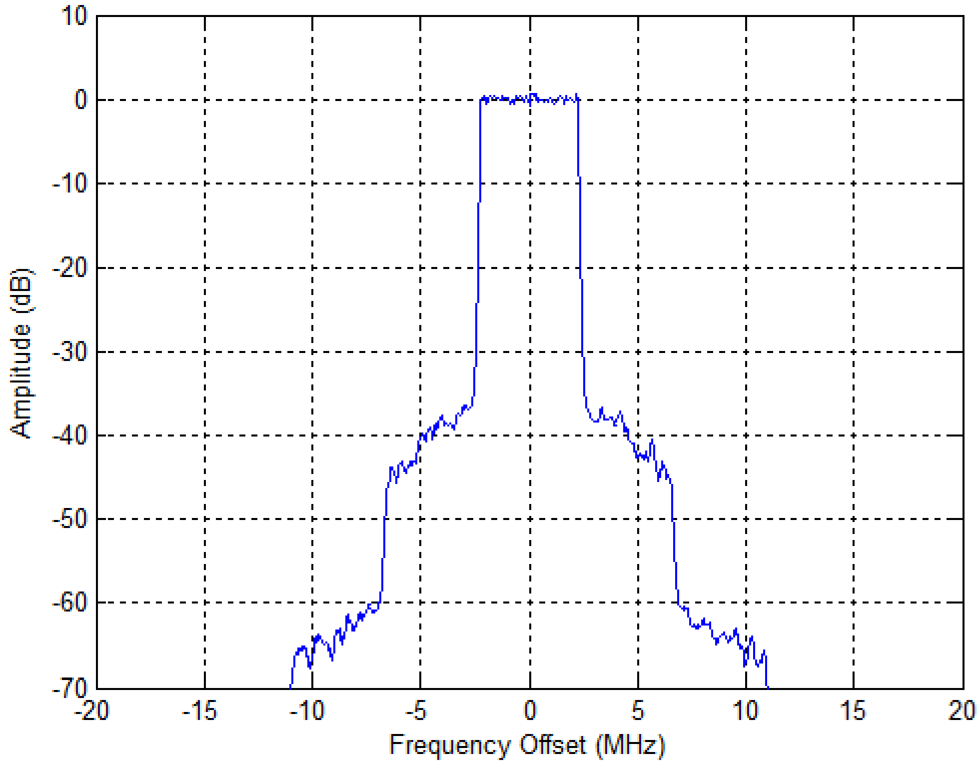


Figure 2: Spectral Shape of RL Transmitted Modulated Carrier

2.3 Link Budget

A link budget for a UMB downlink and uplink is given in Table 1 through Table 5~~Table 5~~

Item	Forward Link	Reverse Link	Units
Test Environment	Suburban/urban, macrocell/microcell	Suburban/urban, macrocell/microcell	-
Operating Frequency	1900	1900	MHz
Test service	-	-	-
Multipath Channel Class	See tables below	See tables below	-
(a0) Average transmitter power per traffic channel	49.64	27	dBm

(a1) Maximum transmitter power per traffic channel	49.64	27	dBm
(a2) Maximum local transmitter power	43	27	dBm, (dBm/MHz for FL)
(b) Cable, connector, and combiner losses	3	0	dB
Body Losses	0	3	dB
(c) Transmitter antenna gain	17	0	dBi
(d1) Transmitter EIRP per traffic channel = (a1-b+c)	63.64	27	dBm
(d2) Total transmitter power EIRP = (a2-b+c)	57	27	dBm
Penetration Loss	10 (vehicle) or 20 (in-building)	10 (vehicle) or 20 (in-building)	dB
(e) Receiver antenna gain	0	17	dBi
(f) Cable and connector losses	0	3	dB
Body Losses	3	0	dB
(g) Receiver noise figure	10	5	dB
(h) Thermal noise density	-174	-174	dBm/Hz
(I) linear Receiver interference density	0	0	mW/Hz
(j) Total effective noise plus interference density= 10log(10^((g+h)/10) + I)	-164	-169	dBm/Hz
Information rate	1.92	0.064	Mbps
(k) Information rate 10 log(Rb)	62.83	48.06	dB
(l) Required Eb/(No+Io)	Derived from EsNo	Derived from EsNo	dB
(m) Receiver Sensitivity = (j+k+l)	See tables below	See tables below	dBm
(n) Handoff gain	0	0	dB
(o) Explicit diversity gain	0	0	dB
(o') Other gain	0	0	dB
(p) Lognormal fade margin	6.9	6.9	dB
(q) Maximum Path loss =d1-m+(e-f)+o+n+o'-p)	See tables below	See tables below	dB
(r) Maximum range	See tables below	See tables below	m

Table 1: Link Budget for UMBFDD Downlink and Uplink

Reverse Link Budget for 8 RX 64 kbps (10 dB penetration loss + 3dB body loss)			
CHANNEL	EsNo per antenna (dB) (item l)	Maximum Path Loss (dB) (item q)	Maximum Range (m) (item r)
III (Ped-B)	-8.1	~~169.0~~146.3	~~8470~~1910
IV (Veh-B)	-7.5	~~168.4~~145.7	~~8142~~1836

Table 2 : Reverse Link Budget for 8 RX 64 kbps (10 dB penetration loss)

Reverse Link Budget for 8 RX 64 kbps (20 dB penetration loss + 3dB body loss)			
CHANNEL	EsNo per antenna (dB) (item l)	Maximum Path Loss (dB) (item q)	Maximum Range (m) (item r)
III (Ped-B)	-8.1	~~159.0~~136.3	~~4387~~989
IV (Veh-B)	-7.5	~~158.4~~135.7	~~4217~~951

Table 3: Reverse Link Budget for 8 RX 64 kbps (20 dB penetration loss)

Forward Link Budget for 4 RX 2 Mbps (10 dB penetration loss + 3dB body loss)			
CHANNEL	EsNo per antenna (dB) (item l)	Maximum Path Loss (dB) (item q)	Maximum Range (m) (item r)
III (Ped-B)	-5.4	~~166.3~~146.5	~~7092~~1931
IV (Veh-B)	-4.5	~~165.4~~145.6	~~6684~~1820

Table 4: Forward Link Budget for 4 RX 2 Mbps (1~~2~~0 dB penetration loss)

Forward Link Budget for 4 RX 2 Mbps (20 dB penetration loss + 3dB body loss)			
CHANNEL	EsNo per antenna (dB) (item l)	Maximum Path Loss (dB) (item q)	Maximum Range (m) (item r)
III (Ped-B)	-5.4	~~156.3~~136.5	~~3673~~1000
IV (Veh-B)	-4.5	~~155.4~~135.6	~~3462~~943

Table 5: Forward Link Budget for 4 RX 2 Mbps (20 dB penetration loss)

3 PAR Requirements

Table 6 captures the PAR values specified in the approved IEEE 802.20 PAR and the corresponding values of the proposed UMBFDD MBWA system for a 5 MHz deployment.

Characteristic	Target Value	Proposed MBWA System
Mobility	Vehicular mobility classes up to 250 km/hr (as defined in ITU-R M.1034-1)	Satisfies requirement. Maximum Spectral Efficiency for VehA 250 km/h on FL and RL are around 7 bps/Hz and 2.5 bps/Hz, respectively
Sustained spectral efficiency	> 1 b/s/Hz/cell	Satisfies requirement. > 4b/s/Hz/Sector on FL (pedestrian) > 1b/s/Hz/Sector on RL (pedestrian) Refer to Section 4.3
Peak user data rate (Forward link (FL))	> 1 Mbps*	Satisfies requirement. 67 Mbps Refer to Section 4.2

Peak user data rate (Reverse link (RL))	> 300 kbps*	Satisfies requirement. 21 Mbps Refer to Section 4.2
Peak aggregate data rate per cell (FL)	> 4 Mbps*	Satisfies requirement. 67 Mbps / Sector
Peak aggregate data rate per cell (RL)	> 800 kbps*	Satisfies requirement. 21 Mbps / Sector
Airlink MAC frame RTT	< 10 ms	Satisfies requirement. Approximately 5.5 ms
Bandwidth	e.g., 1.25 MHz, 5 MHz	Support different bandwidths from 1.25MHz to 20MHz
Cell Sizes	Appropriate for ubiquitous metropolitan area networks and capable of reusing existing infrastructure.	Satisfies requirement. Refer to link budget tables in Section 3.5.
Spectrum (Maximum operating frequency)	< 3.5 GHz	Satisfies requirement.
Spectrum (Frequency Arrangements)	Supports FDD and TDD frequency arrangements	Supports FDD
Spectrum Allocations	Licensed spectrum allocated to the mobile service	Satisfies requirement
Security Support	AES (Advanced Encryption Standard)	Satisfies requirement. Refer to [x].

* Targets for 1.25 MHz channel bandwidth. This represents 2 x 1.25 MHz (paired) channels for FDD. For other bandwidths, the data rates may change.

Table 6: Summary of PAR Requirements

4 Link Level Simulation Environment

In the link simulations, three channel models, AWGN, Pedestrian B at 3 km/hr and Vehicular B at 120 km/hr, were simulated.

5 Link Level Performance Results

5.1 FER vs SINR performance

FER vs SINR curves were produced using link simulations.

5.1.1 Forward Link

FER vs SINR curves for AWGN, for the 15 packet formats, are included in Appendix B. These are used to look up frame erasure rates for the forward link at the system level after the calculation of effective SINR.

Additionally, Figure 3 shows long-term results of FER vs. geometry for two models of the system with three levels of modulation and coding. Ideal channel estimation is used.

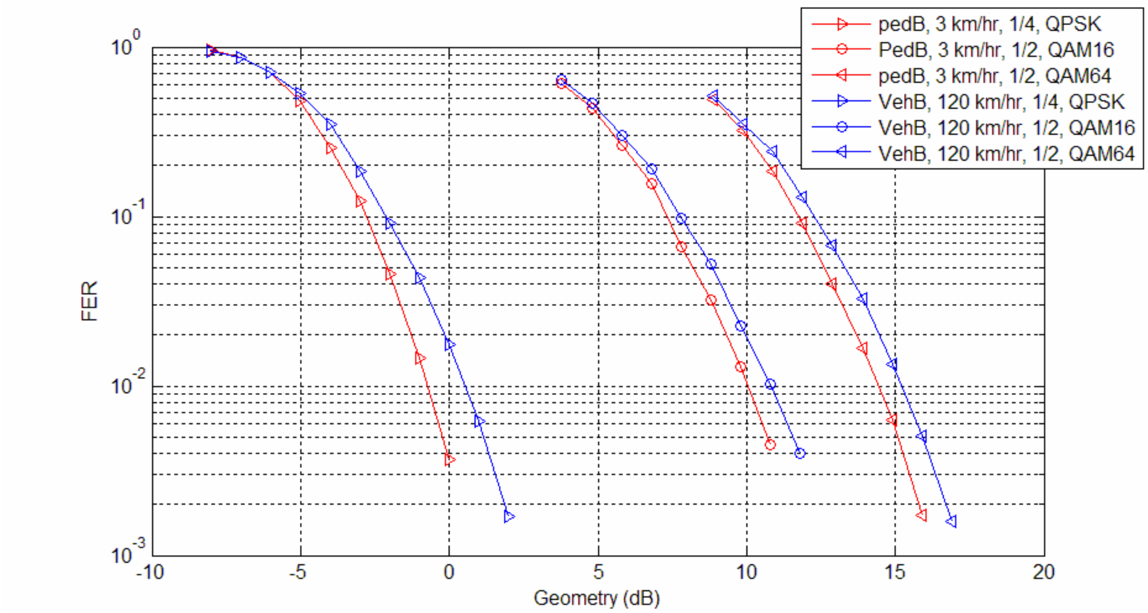


Figure 3: FER vs Geometry for Multiple Channel Models

5.1.2 Reverse Link

Link curves of FER vs. SINR for the reverse link are provided in Appendix C. These are used to look up frame erasure rates for the reverse link at the system level after the calculation of effective SINR.

5.2 Throughput vs SINR Performance

The throughput is calculated based on section 3.2 of [iii], being derived from FER vs. SINR shown in Appendix B. Each of the packet formats produces a particular throughput for a given number of required transmissions. All of these packet format throughputs are presented in the hull curves in Figure 4 on one graph. A packet in any given packet format may be sent with up to six transmissions. The figure contains fifteen packet formats times six transmissions per packet, for a total of 90 curves. Note that the actual sector throughput may be higher than shown here, when multiple FL beams are employed.

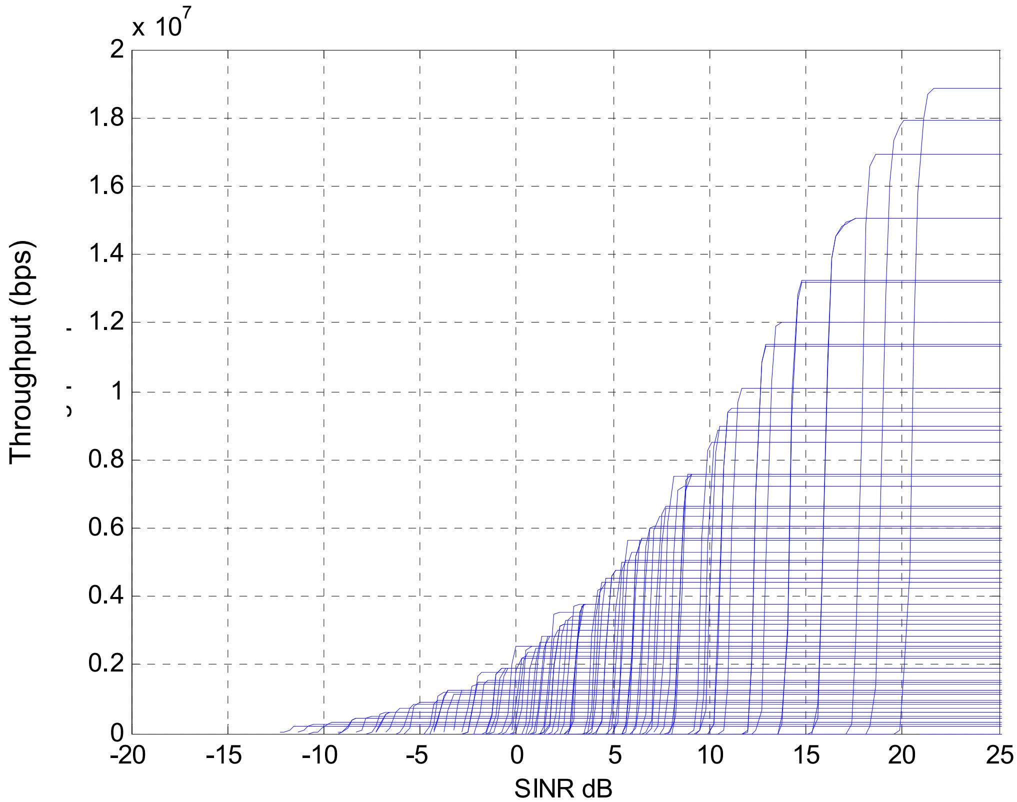


Figure 4: Hull Curve for UMBFDD Downlink

6 System Level Simulation Environment

6.1 Overview

The system consists of 19 hexagonal cells as detailed in Appendix B of [iii]. Each cell has three sectors. All users in the 19 cells use the same channel model and speed. Channel models of 3kph Pedestrian B and 120kph Vehicular B were used. A full buffer traffic model was used. A proportional fair scheduler ensures traffic fairness amongst ATs.

The Spatial Channel Model [v] was used for the FL multiple antenna system based on the suburban macro model, with ITU power delay profiles. A list of simulation assumptions is given in Section 6.4 below. FL system level simulation uses rate control in place of power control for the full buffer traffic scenario described in this document.

The mandated blocking signal was accounted for within the system simulator and is included in the results.

6.2 BTS Antenna System

A uniform linear 4-element array, which produces four fixed beams, is used for the FL antenna system, one in each sector. This arrangement was chosen because switched beams have been shown to be a good choice for achieving high capacity. Each of the elements has a Gaussian antenna pattern with a half-power beamwidth of 70 degrees, and a front-to-back ratio of 20dB. Figure 5 below shows the BTS antenna pattern.

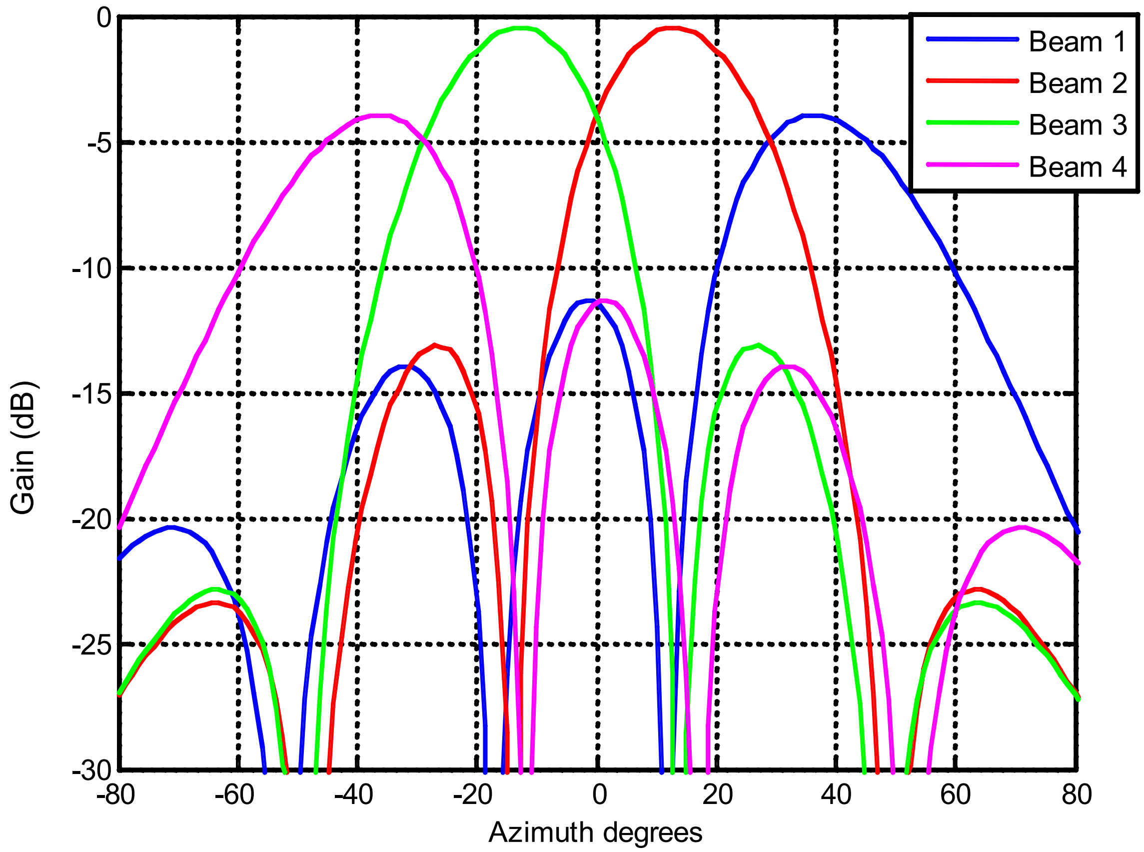


Figure 5: BTS Antenna Pattern

6.3 AT Antenna System

The AT antenna system is assumed, for the purpose of forward link simulation, to contain four receive elements.

6.4 Simulation Assumptions

A 5 MHz operating bandwidth was assumed for all simulations. Pedestrian B and Vehicular B channel models were simulated, with associated parameters in accordance with the 802.20 evaluation criteria. Table 7, Table 8, Table 9 and Table 10 provide the assumptions used in the system simulations for the downlink and uplink.

	Units	Downlink	Uplink
Carrier Frequency	Ghz	1.9	1.9
Bandwidth of Operation	MHz	5	5
Site Layout		19 cells/57 sector hex grid with wraparound	19 cells/57 sector hex grid with wraparound
Site separation	km	1, 2.5	1, 2.5
Minimum separation between AT and BTS	m	35	35

Table 7: System Simulation Parameters – Network

	Units	Downlink	Uplink
Subcarrier Spacing	kHz	9.6	9.6
Sampling Rate	Mcps	4.9152	4.9152
FFT size		512	512
Guardband	subcarriers	32	32
Cyclic Prefix	µs	6.51	6.51 (pedB) 13.02 (vehB)
OFDM symbol length	µs	113.93	113.93 (pedB) 120.44 (vehB)
# of OFDM symbols per frame		8	8
# of subcarriers per symbol per subchannel		16	16
# of HARQ Interlaces		8	8
Max Number of HARQ attempts		6	6

Table 8: System Simulation Parameters – Numerology

	Units	Downlink	Uplink
ITU Channel Model Usage		100% pedB/3 kph 100% vehB/120 kph (no mix)	100% pedB/3 kph 100% vehB/120 kph (no mix)
Propagation model		Hata, 31.5 intercept, 35 dB slope	Hata, 31.5 intercept, 35 dB slope
Lognormal Shadowing standard deviation	dB	10	10
Site-to-site correlation coefficient		0.5	0.5
Noise Floor	dBm/Hz	-174	-174
Receiver noise figure	dB	10	5
Max Tx Power	dBm	50	27
Penetration Loss	dB	10	10
Body Loss	dB	3	3
Antenna pattern - BTS - Horizontal		3dB bandwidth: 70 deg, 20 dB max atten	3dB bandwidth: 70 deg, 20 dB max atten
Antenna pattern - BTS - Vertical		not modeled	not modeled
Antenna height - BTS	m	32	32
Antenna height - AT	m	1.5	1.5
Antenna gain - BTS (including cable loss)	dBi	14	14
Antenna gain - AT	dBi	0	0
Maximum C/I per antenna	dB	30	30
# of Tx Antennas		4	1
# of Rx Antennas		4	2, 8

Table 9: System Simulation Parameters – RF

	Units	Downlink	Uplink
Source Model		Full Buffer	Full Buffer
Pilot Overhead	%	14.84	14.06
Control overhead	%	10.00	10.00
Scheduler		Proportional Fair	Proportional Fair

Table 10: System Simulation Parameters – Traffic

6.4.1 Additional Forward Link Assumptions

6.4.1.1 Overhead Channel Modeling

Overhead channels are accounted for in the system simulation using a fixed 10% of channel bandwidth and a fixed 10% of transmit power.

6.4.1.2 Overhead Channel Interference and Errors

The F-SSCH and F-ACKCH were modeled in the simulations using a constant bandwidth and power allocation identical to that of the traffic channels. Because of this, the power spectral density of the F-SSCH is the same as the F-DCH. The F-SSCH is designed to operate at an error rate of 1% or less.

For the purposes of forward link system simulation, reverse link ACK-to-NACK and NACK-to-ACK errors primarily impact delay performance, and hence were not modeled in full buffer simulations.

Reverse link CQICH errors were modeled using a 50% frame erasure rate.

6.4.1.3 Forward Link Packet Formats

Packet formats for the UMBFDD system are shown in Table 11 for the forward link. These tables are drawn from [vi].

Packet Format Index	Spectral Efficiency on First Transmission	Modulation Order For Each Transmission					
		1	2	3	4	5	6+
0	0.33	2	2	2	2	2	2
1	0.67	2	2	2	2	2	2
2	0.94	2	2	2	2	2	2
3	1.5	4	3	3	3	3	3
4	2.0	4	3	3	3	3	3
5	2.5	6	4	4	3	3	3
6	3.0	6	4	4	4	4	4
7	3.5	6	4	4	4	4	4
8	4.0	6	6	4	4	4	4
9	4.5	6	6	4	4	4	4
10	5.0	6	6	4	4	4	4
11	6.0	6	6	4	4	4	4
12	7.0	6	6	6	4	4	4
13	8.0	6	6	6	4	4	4
14	9.5	6	6	6	6	4	4
15	NULL						

Table 11: Forward Link Packet Formats

6.4.2 Additional Reverse Link Assumptions

6.4.2.1 Power Control

6.4.2.1.1 Reverse Link Control Channel Power Control

One sub-band (1.25 MHz) was assumed to be occupied by the CDM control interlace once every 8 frames. The power control mechanism was such that the targeted C/I per receive antenna was -17.6dB. The AT would increase its control PSD by 1dB in response to a power up command and would decrease its control PSD by 1dB in response to a power down command. The power control commands were assumed to be error free.

6.4.2.1.2 Reverse Link Traffic Channel Power Control

The reverse link traffic channel power control is as per the OSI based deterministic response approach outlined in [vi]. Only OSI values of 0 and 1 are modeled and the AT responds only to the OSI command from its strongest neighboring sector. The target IoT was set to 6dB.

6.4.2.2 Reverse Link Packet Formats

The packet formats that were simulated are shown in Table 12~~Table 12~~ (modulation step down was not implemented and the highest order modulation was limited to 16-QAM).

Packet Format Index	Spectral Efficiency on First Transmission	Modulation Order For Each Transmission					
		1	2	3	4	5	6
0	0.36	2	2	2	2	2	2
1	0.71	2	2	2	2	2	2
2	1.07	2	2	2	2	2	2
3	1.4	3	3	3	3	3	3
4	1.8	3	3	3	3	3	3
5	2.13	4	4	4	4	4	4
6	2.5	4	4	4	4	4	4
7	3.0	4	4	4	4	4	4

Table 12: Packet Formats used for RL Simulations

6.5 Link-to-System Mapping

The Equivalent SNR Method based on Convex Metric (ECM) is a link-to-system mapping technique that has been shown to produce accurate results for several cellular systems [vii][viii][ix]. This technique was employed for the link-to-system-interface in system simulations. This ECM mapping is effectively the same as one proposed to the 802.20 working group, called the Effective SNR mapping method [x],[xi].

To validate this mapping method, three channels, AWGN, Ped B and Veh B, have been simulated for SIMO transmissions. Figure 6 shows the result of these simulations and indicates that the mapping method is accurate: all channel models show near-identical results for FER vs. Effective SNR.

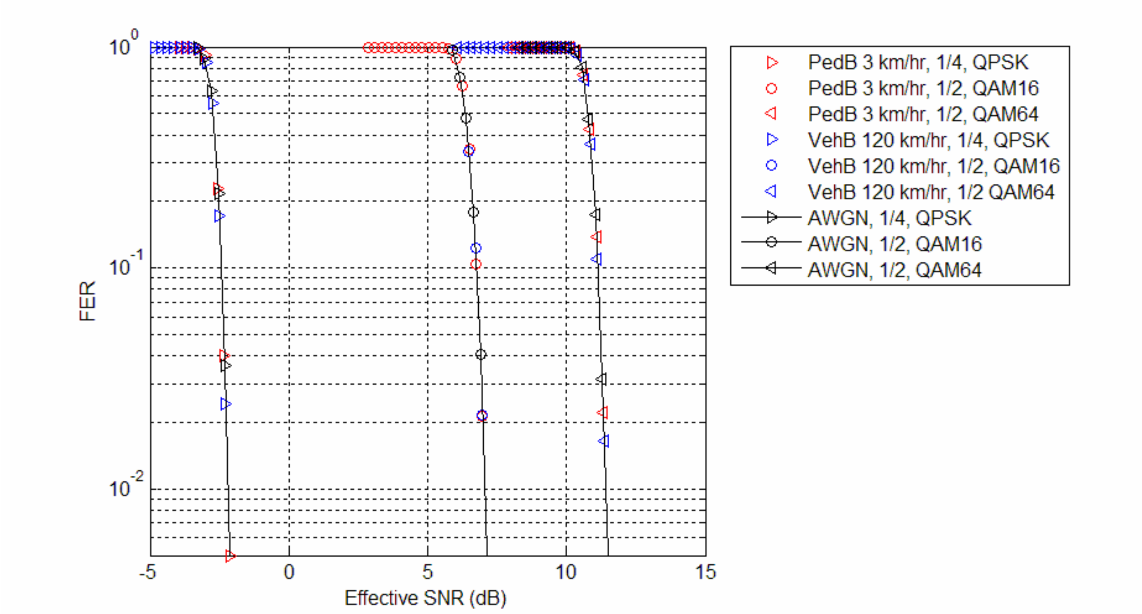


Figure 6: FER vs. Effective SNR for Multiple Channel Models

6.6 System Simulation Calibration

6.6.1 Location Calibration

Location calibration of the system simulator was performed in accordance with the procedures given in section 8.1 and Appendix C.2 of [iii]. This involved using the BS and AT locations provided in the spreadsheet included in [iii]. Based on this spreadsheet ten mobiles are placed in deterministic locations in each of 57 sectors. A single antenna is used at the BS and AT. The resulting C/I for each AT is tabulated in Appendix A. Note that the C/I values in Appendix A are dependent on random lognormal draws and so cannot be compared between proposals.

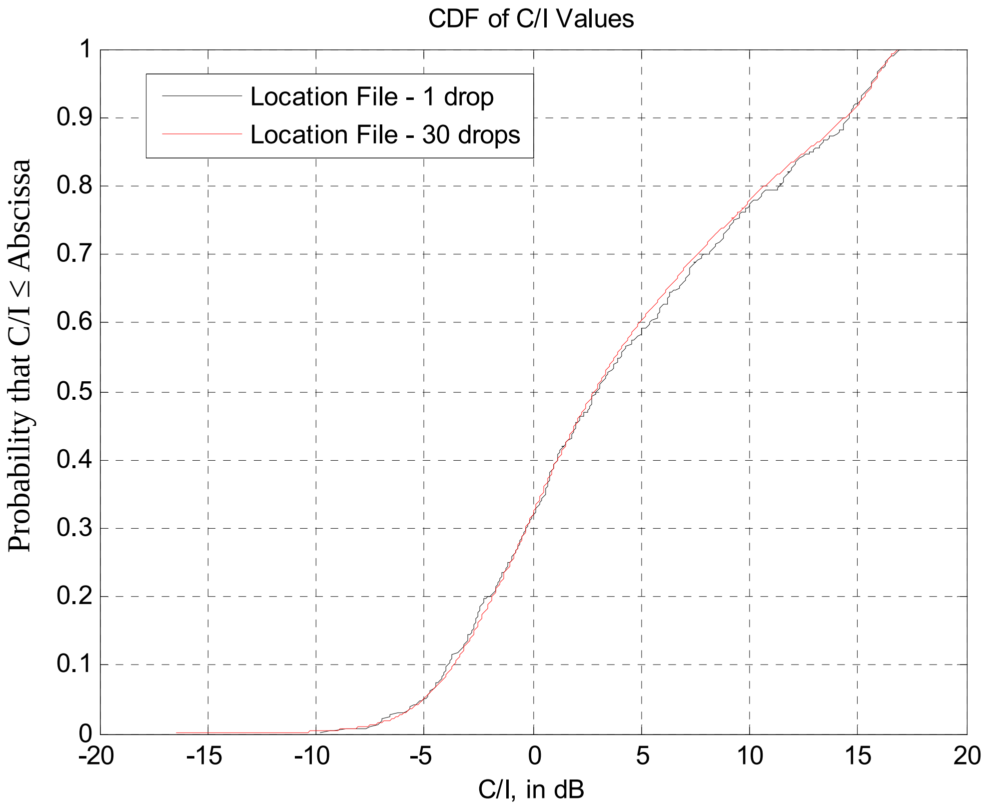


Figure 7: CDF of C/I values obtained using mobile location file in [1] for 1 drop and 30 drops

Figure 7~~Figure 7~~ plots the CDF of the C/I values for two cases: a single drop of 570 ATs (black line), and thirty such drops (red line). The smoother thirty-drop curve is a consequence of having many more random lognormal draws. These plots and those in Figure 1-6 of [xii] match reasonably well.

7 System Level Performance Results

7.1 Peak Data Rates

The peak data rates are calculated using the following assumptions.

Superframe duration = 20.73 ms
Frames per superframe = 25 (forward) or 26 (reverse)
Useful symbols per frame = 16*8 – 18 (pilot overhead) = 110
Maximum spectral efficiency = 6 bits/s/Hz
Number of guard tones = 32
Number of tiles in given bandwidth = 6 (in 1.25 MHz) or 30 (in 5 MHz)
Forward link control overhead = 10%
Reverse link control overhead = 6.25% in 1.25 MHz and 3.125% in 5 MHz
MIMO: 1 stream reverse link; 4 streams forward link

Parameter	***Bandwidth***			
	1.25 MHz		***5 MHz***	
	Downlink	***Uplink***	***Downlink***	***Uplink***
Peak User Data Rate Requirement	***4.5 Mbps***	***2.25 Mbps***	***18 Mbps***	***9 Mbps***
UMBFDD Peak User Data Rate Achieved	***13.4Mbps***	***4Mbps***	***67Mbps***	***21Mbps***

Table 13: Peak Data Rates

7.2 Aggregate Data Rates

Table 14 and Table 15 below provide average sector throughput statistics for the scenarios analyzed, assuming a 5MHz bandwidth allocation to the system.

7.2.1 Downlink

A system level simulation was used to produce the results shown in Table 14. Four fixed beams were used in each sector.

# of Antennas	Channel Model	# of Users/Sector	Site-to-Site Separation (km)	Sector Throughput (kbps)
4x4	3kph/PedB	8	1	16241
4x4	120kph/VehB	8	1	13111
4x4	3kph/PedB	16	1	19969
4x4	120kph/VehB	16	1	15431
4x4	3kph/PedB	8	2.5	15542
4x4	120kph/VehB	8	2.5	12687
4x4	3kph/PedB	16	2.5	18731
4x4	120kph/VehB	16	2.5	14354

Table 14: Downlink Aggregate Data Rate

7.2.2 Uplink

Table 15 provides the sector throughput results for the uplink. The antenna configurations simulated were 1 transmit antenna at the AT and either 2 receive antennas (1x2) or 8 receive antennas (1x8) at the AN. The method used for generating the correlation matrices at the AN (for the 1x8 antenna configuration) is described in Appendix D.

These results are conservative since packet formats beyond RL packet format index 7 and modulation order step down were not implemented. The purpose of these results is to illustrate that the SRD requirements can be achieved. The results with 8 receive antennas can be substantially improved if SDMA (multi-user MIMO) is used. Also optimizing the proportional fair scheduler parameters can results in higher throughputs.

# of Antennas	Channel Model	# of Users/Sector	Site-to-Site Separation (km)	Sector Throughput (kbps)
1x2	3kph/PedB	8	1	3701
1x2	120kph/VehB	8	1	3189
1x8	3kph/PedB	8	1	6095
1x8	120kph/VehB	8	1	5118
1x2	3kph/PedB	16	1	3641
1x2	120kph/VehB	16	1	3121
1x8	3kph/PedB	16	1	6173
1x8	120kph/VehB	16	1	5103
1x2	3kph/PedB	8	2.5	3163
1x2	120kph/VehB	8	2.5	2747
1x8	3kph/PedB	8	2.5	4781
1x8	120kph/VehB	8	2.5	4004
1x2	3kph/PedB	16	2.5	3063
1x2	120kph/VehB	16	2.5	2646
1x8	3kph/PedB	16	2.5	4806
1x8	120kph/VehB	16	2.5	3984

Table 15: Average Throughput per Sector

7.3 System Spectral Efficiency

Based on the SRD, the term "System Spectral Efficiency" is defined in the context of a full block assignment deployment and is calculated as the average aggregate throughput per sector (in bps/sector), divided by the spectrum block assignment size (in Hz).

Table 16 shows the minimum required spectral efficiency and the spectral efficiency achieved via simulation, assuming a 5 MHz bandwidth assignment. Values provided assume a 1km site separation.

Parameter	*Spectral Efficiency Requirements*			
	Downlink		*Uplink*	
	3 km/hr	*120 km/hr*	*3 km/hr*	*120 km/hr*
Spectral Efficiency-Minimum Requirement (b/s/Hz/sector)	*2.0*	*1.5*	*1.0*	*0.75*
UMBFDD Spectral Efficiency Achieved (b/s/Hz/sector)	*3.99*	*3.09*	*1.23*	*1.02*

Table 16: Spectral Efficiency Requirements

7.4 User Data Rate CDF

This section contains user data rate CDFs for a fixed specified load and base station separation. Note that user data rate and mobile throughput are synonymous. Separate curves are shown for 8 and 16 users, and site-to-site spacing of 1 and 2.5km, for Pedestrian B and Vehicular B models.

7.4.1 Downlink

7.4.1.1 CDF of Mobile Throughput (8 Users/Sector)

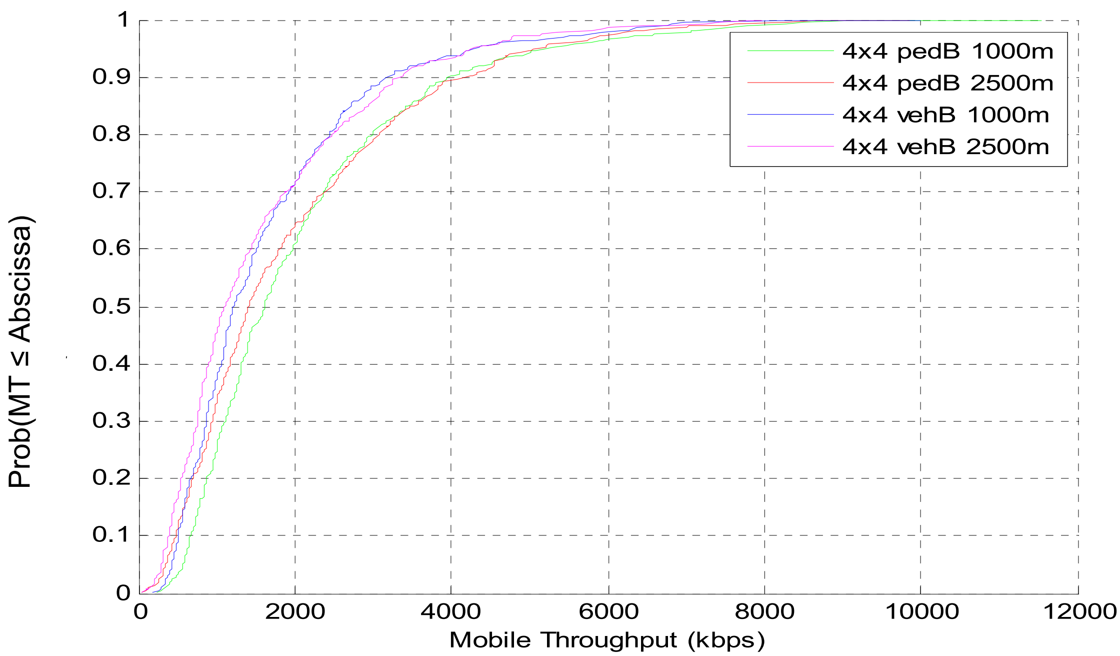


Figure 8: CDF of Mobile Throughput (8 Users/Sector)

7.4.1.2 CDF of Mobile Throughput (16 Users/Sector)

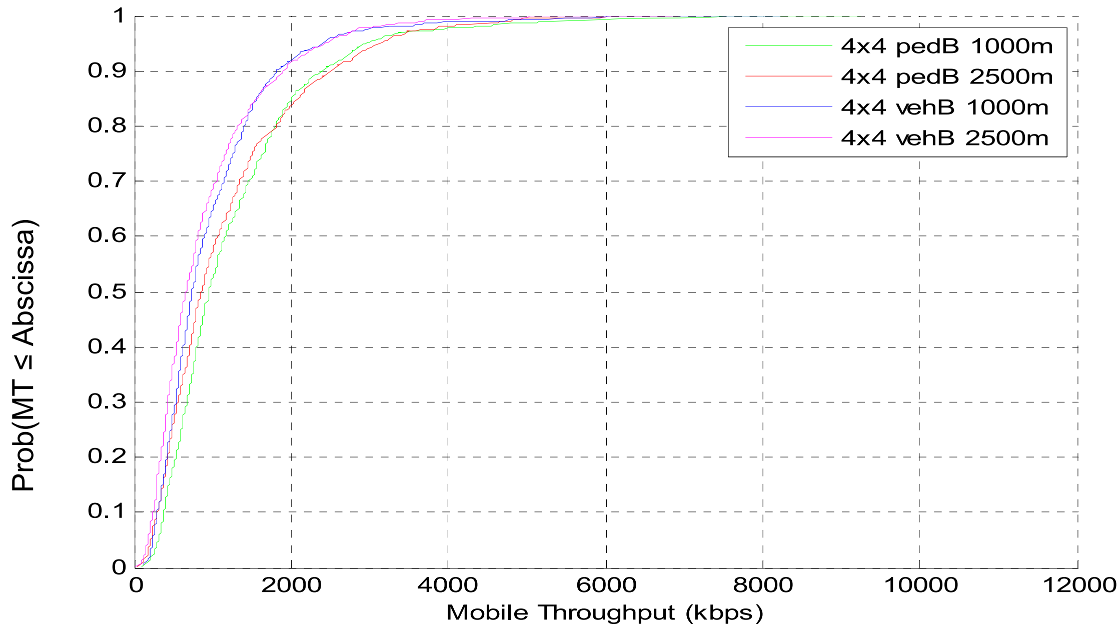


Figure 9: CDF of Mobile Throughput (16 Users/Sector)

7.4.2 Uplink

7.4.2.1 3kph/Pedestrian B

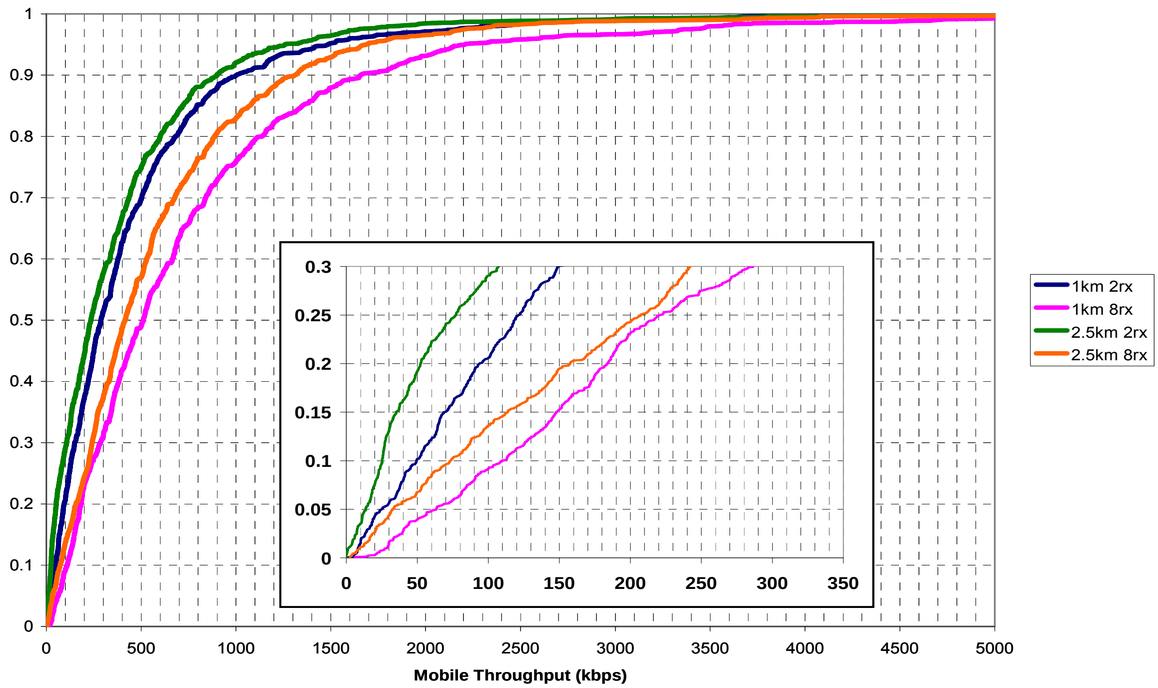


Figure 10: User Date Rate CDF – 8 users/sector, 3kph/PedB

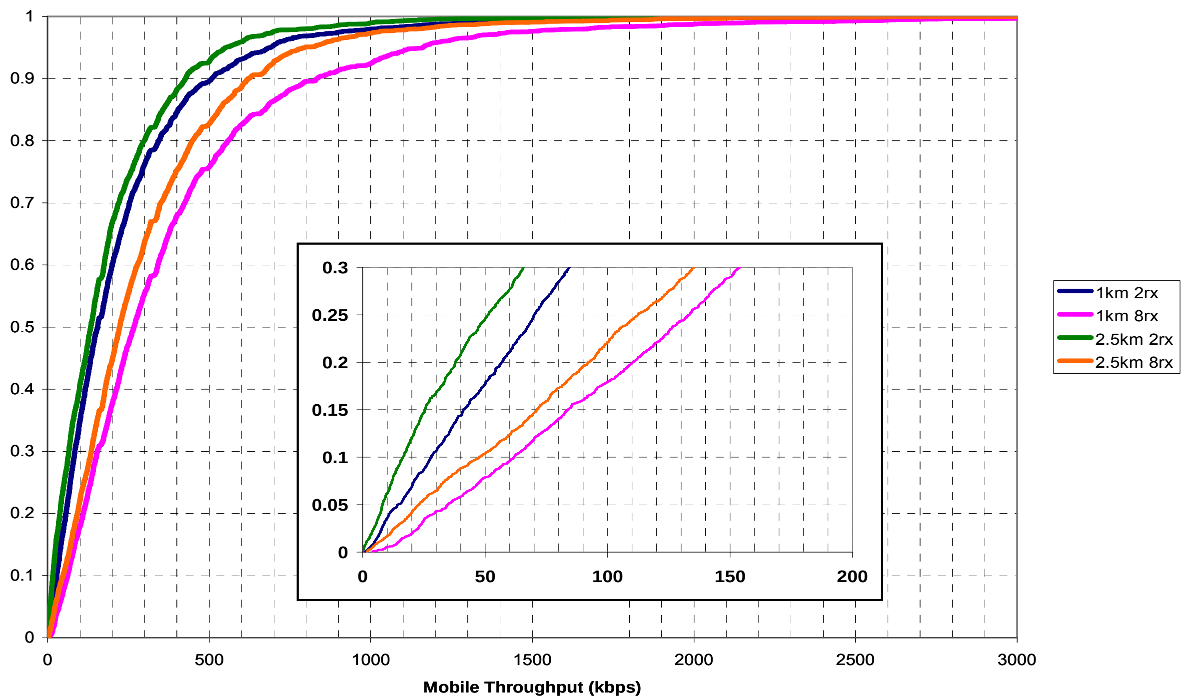


Figure 11: User Date Rate CDF – 16 users/sector, 3kph/PedB

7.4.2.2 120kph/Vehicular B

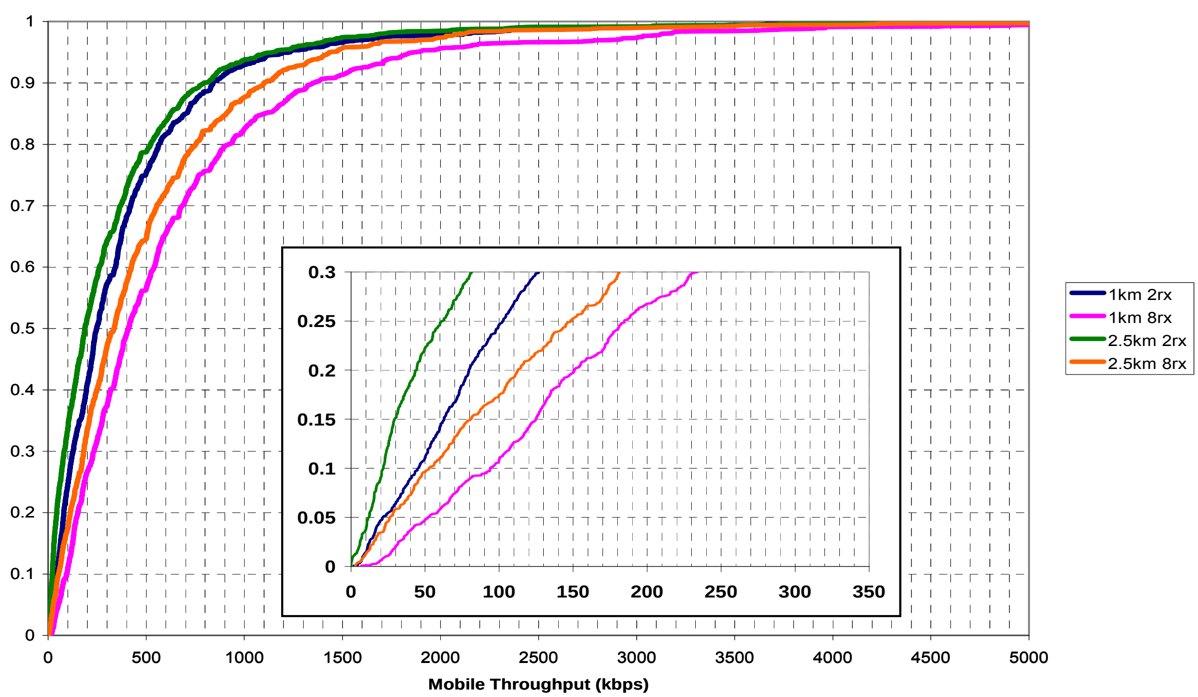


Figure 12: User Date Rate CDF – 8 users/sector, 120kph/VehB

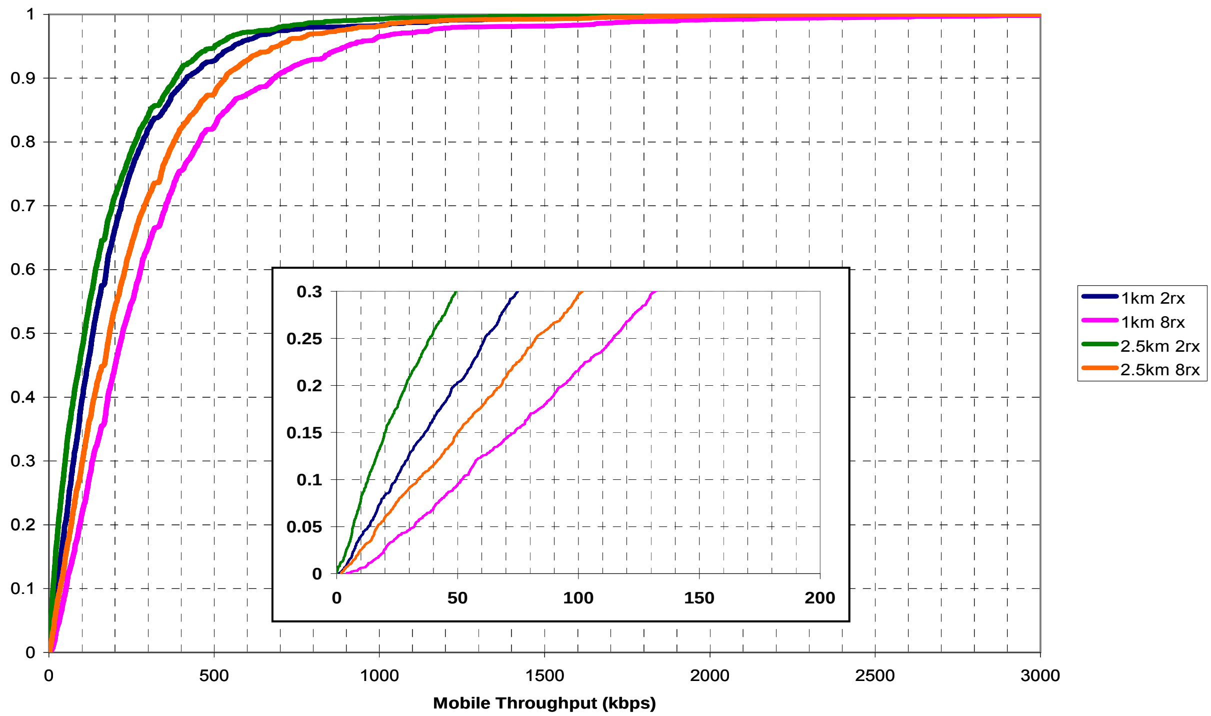


Figure 13: User Date Rate CDF – 16 users/sector, 120kph/VehB

7.5 Number of Users vs BTS separation at Minimum Service Level

Minimum service level is defined by the 802.20 evaluation criteria as the per user data rate which is exceeded a minimum percentage of the time. For the purposes of this analysis, the percentage associated with the minimum service level is 80%. The sections below provide minimum service level data rates at different coverage/capacity points for both downlink and uplink.

7.5.1 Downlink

7.5 3kph/Pedestrian B

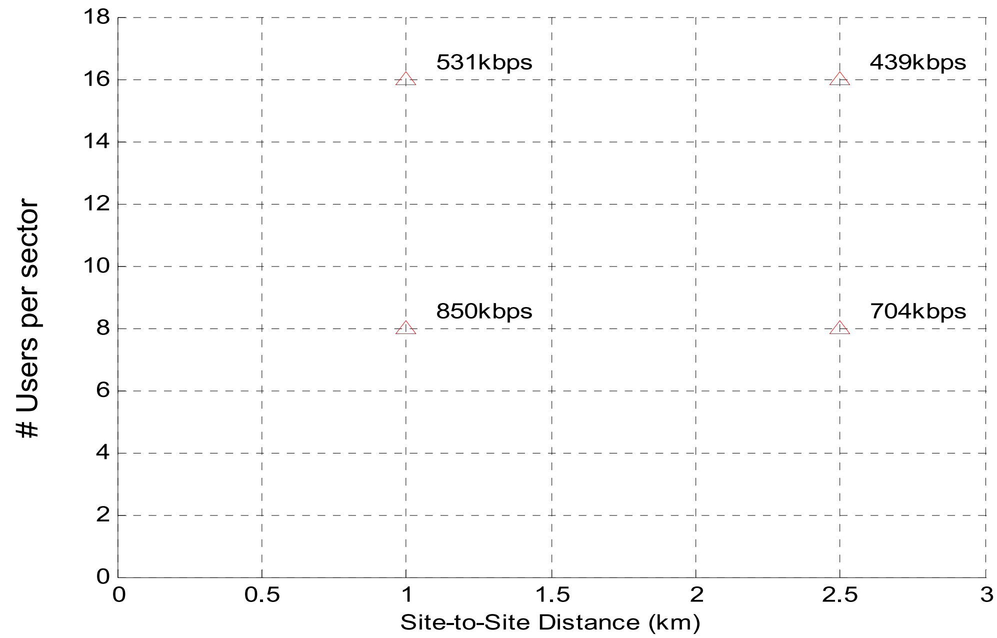


Figure 14: #Users vs BTS separation at Minimum Service Level, 3kph/Pedestrian B

7.5.1.2 120kph/Vehicular B

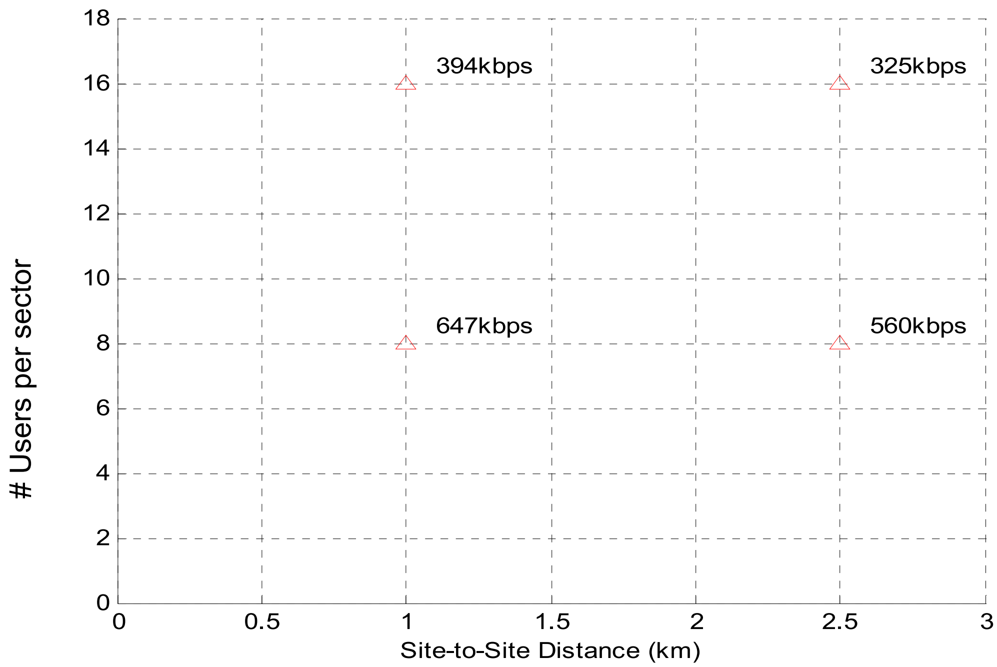


Figure 15: #Users vs BTS separation at Minimum Service Level, 120kph Veh-B

7.5.2 Uplink

7.5.2.1 3kph/Pedestrian B

Figure 16: Min Service Throughput vs. Load vs. Site Separation – 2 Rx, 3kph/PedB

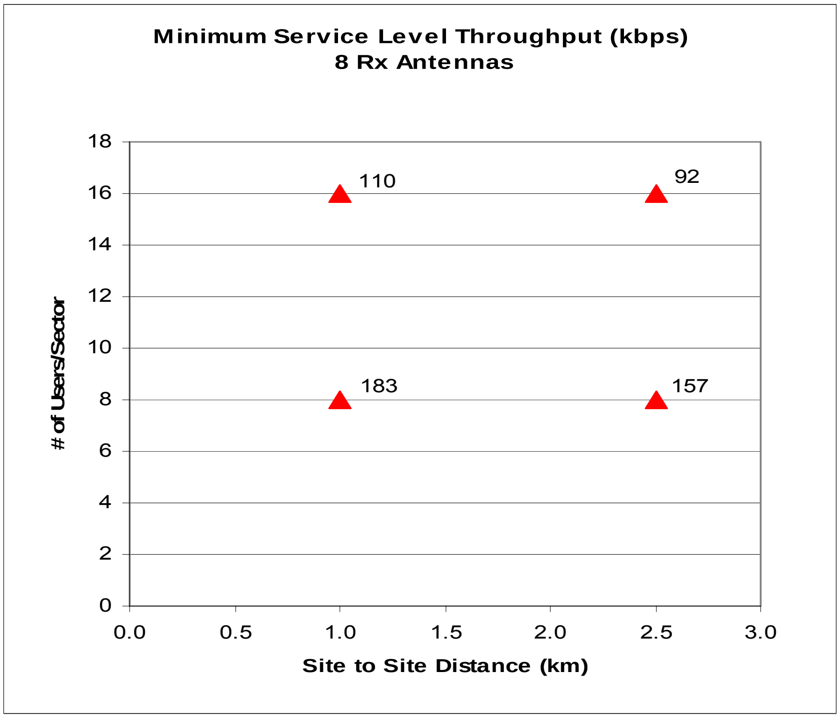


Figure 17: Min Service Throughput vs. Load vs. Site Separation – 8 Rx, 3kph/PedB

7.5.2.2 120kph/Vehicular B

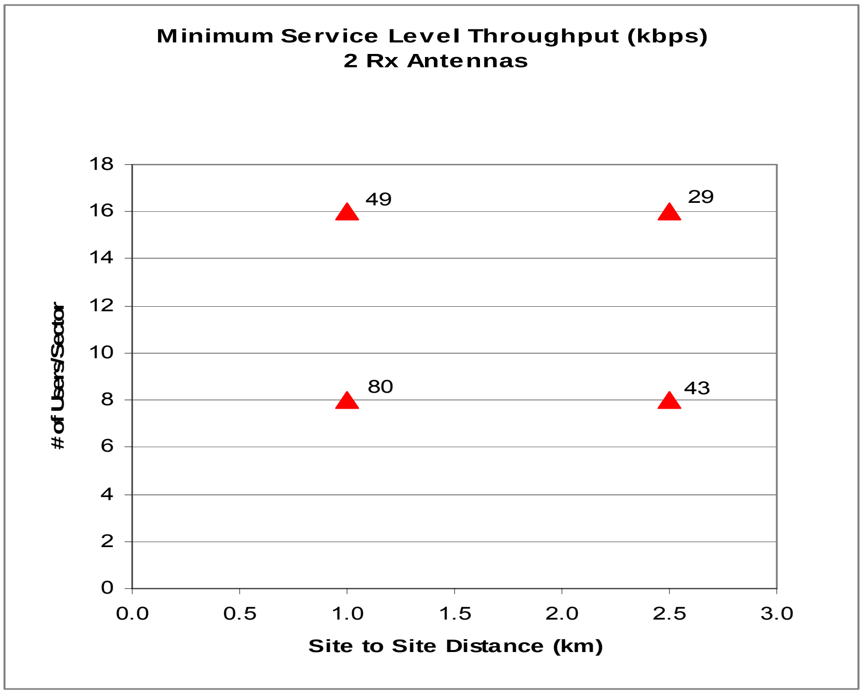


Figure 18: Min Service Throughput vs. Load vs. Site Separation - 2 Rx, 120kph/VehB

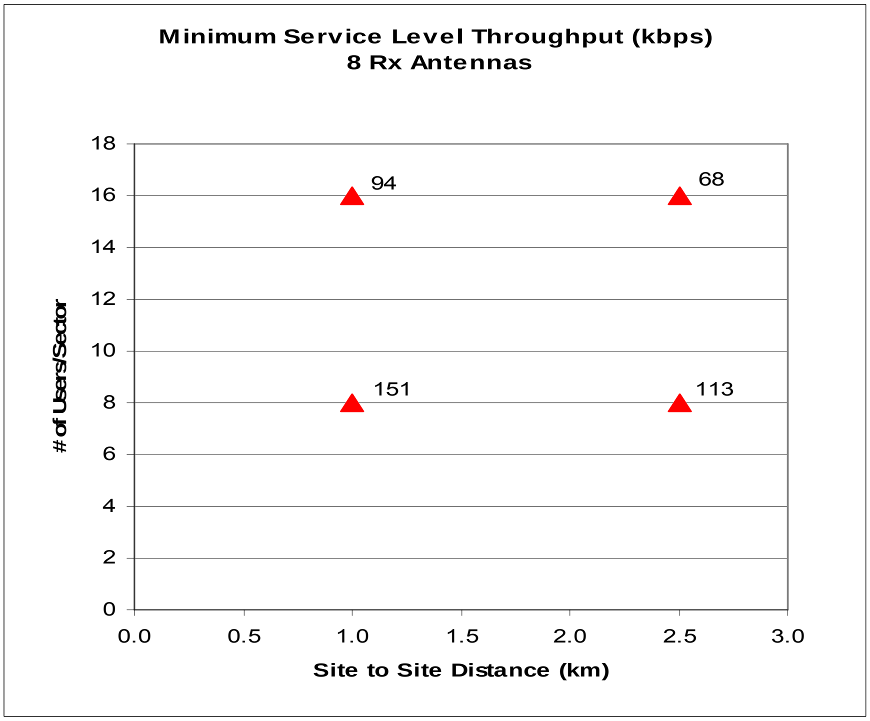


Figure 19: Min Service Throughput vs. Load vs. Site Separation - 8 Rx Antennas, 120kph/VehB

7.6 Aggregated Throughput vs. Base Station Separation at Minimum Service Level

Shown below is Minimum Service Throughput versus Aggregate Throughput.

7.6.1 Downlink

7.6.1.1 3kph/Pedestrian B

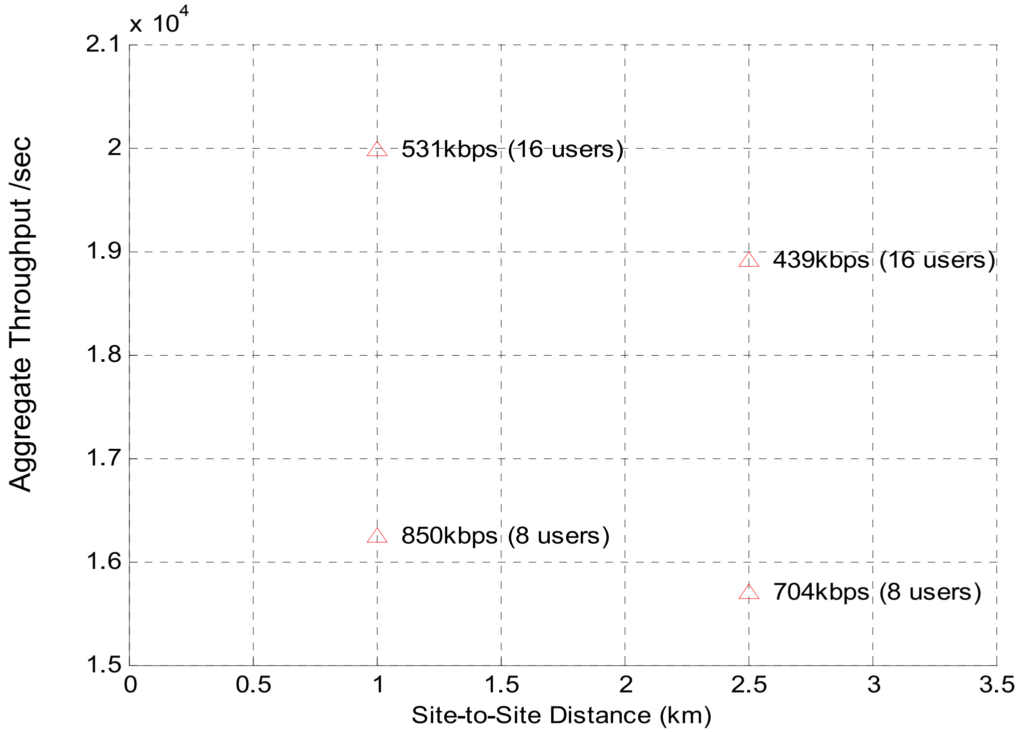


Figure 20: Downlink Aggregated Throughput for 3kph Ped-B

7.6.1.2 120kph/Vehicular B

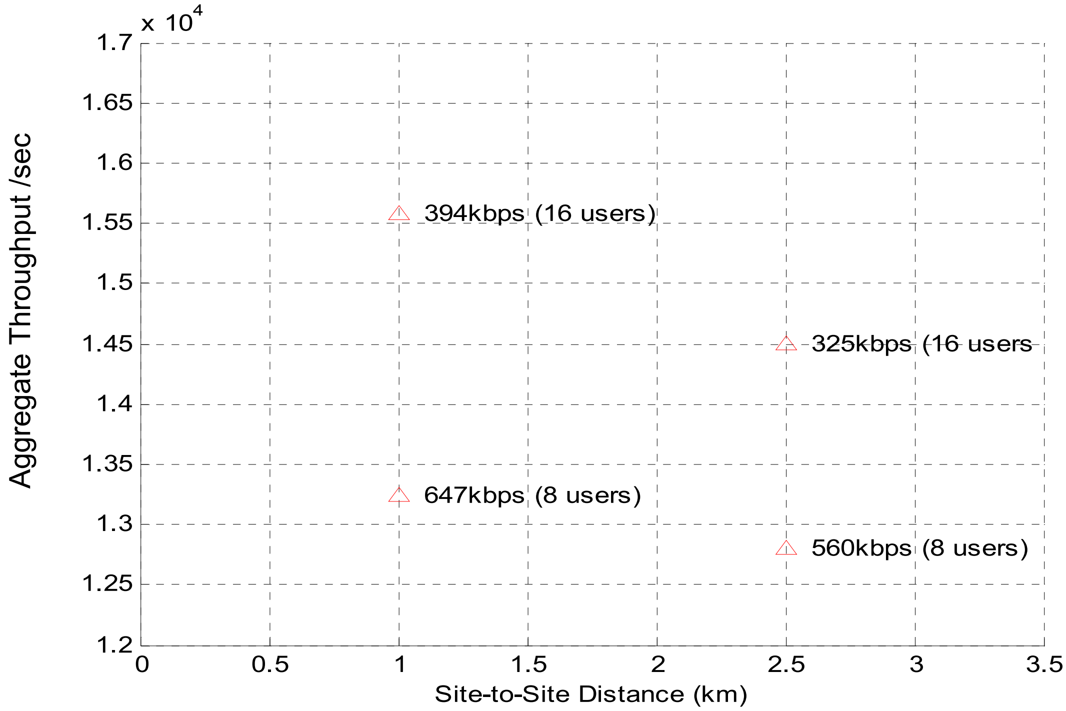


Figure 21: Downlink Aggregated Throughput for 120kph Veh-B

7.6.2 Uplink

7.6.2.1 3kph/Pedestrian B

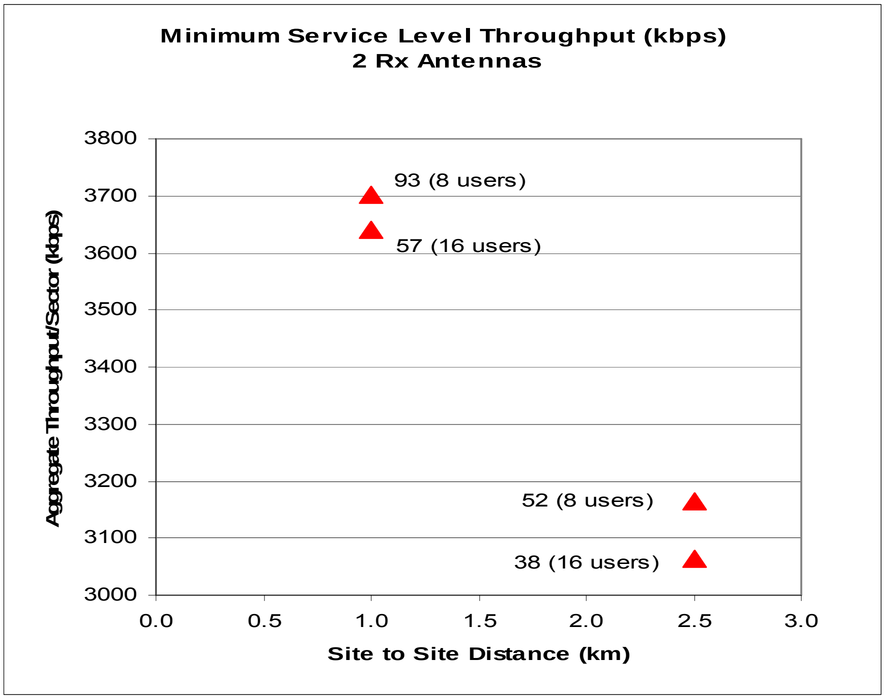


Figure 22: Min Service Throughput vs. Aggregate Sector Throughput vs. Site Separation – 2 Rx Antennas, 3kph/PedB

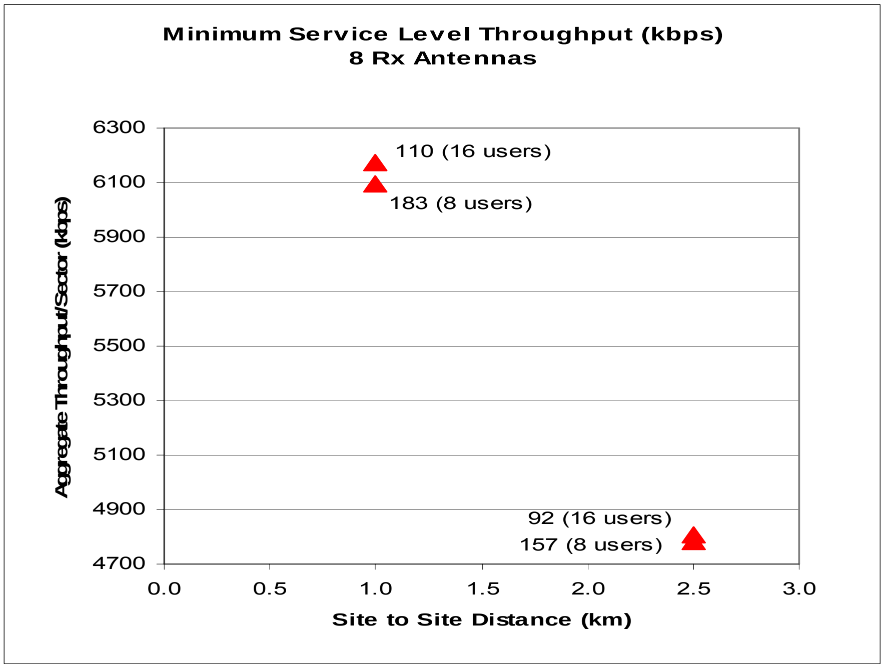


Figure 23: Min Service Throughput vs. Aggregate Sector Throughput vs. Site Separation – 8 Rx Antennas, 3kph/PedB

7.6.2.2 120kph/Vehicular B

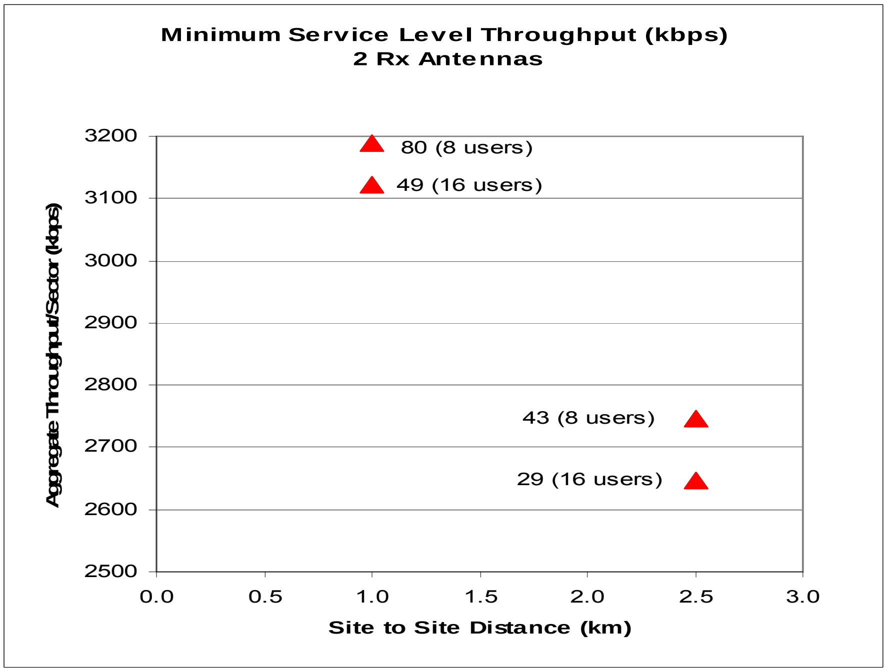


Figure 24: Min Service Throughput vs. Aggregate Sector Throughput vs. Site Separation – 2 Rx Antennas, 120kph/VehB

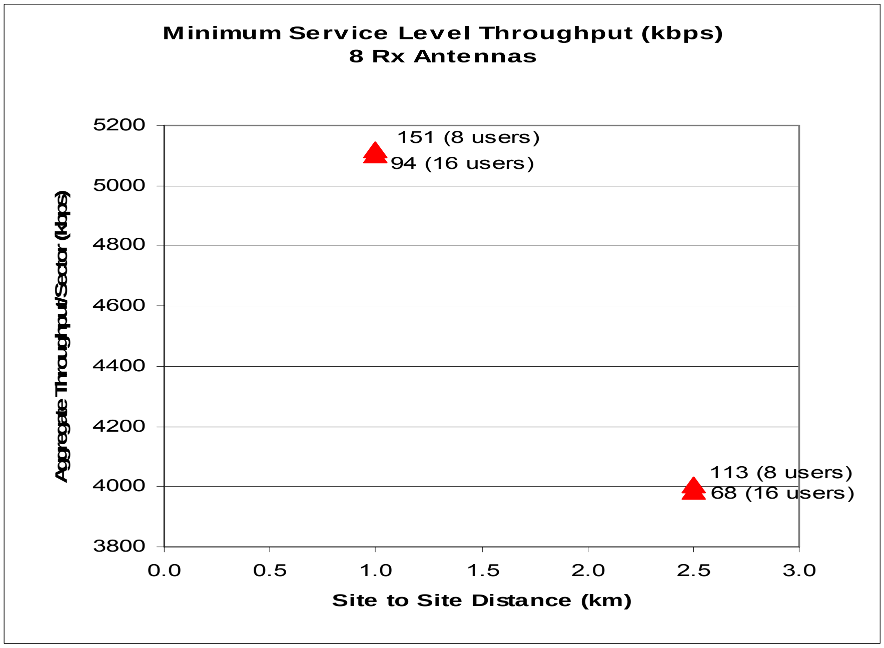


Figure 25: Min Service Throughput vs. Aggregate Sector Throughput vs. Site Separation – 8 Rx Antennas, 120kph/VehB

7.7 Spectral Efficiency vs. Base Station Separation at Minimum Service Level

Shown below are plots of Minimum Service Throughput versus Spectral Efficiency.

7.7.1 Downlink

7.7.1.1 3kph/Pedestrian B

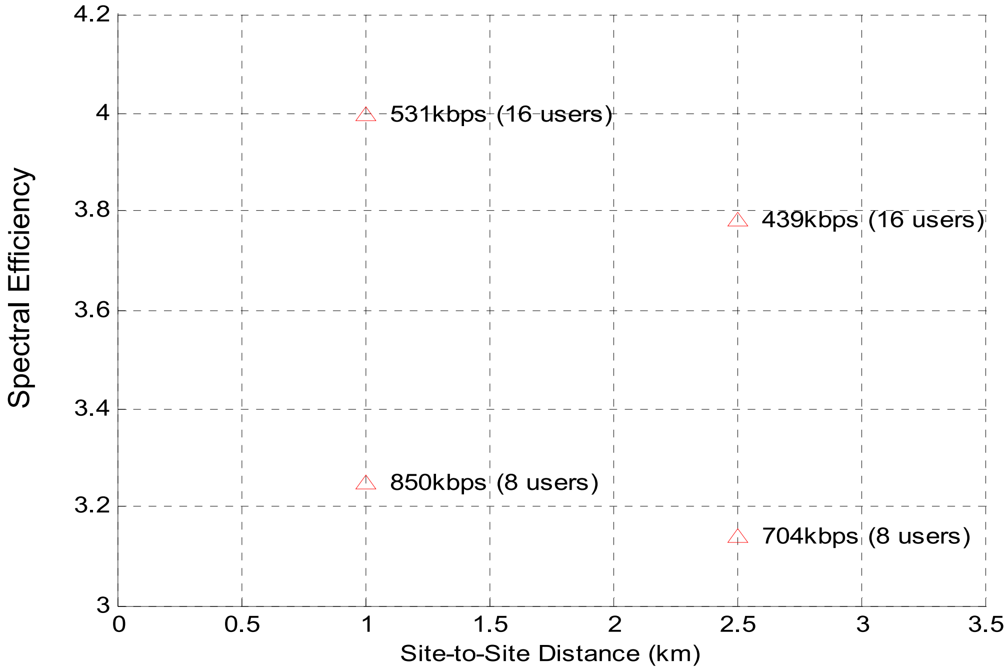


Figure 26: Downlink Spectral Efficiency, 3kph Ped-B

7.7.1.2 120kph/Vehicular B

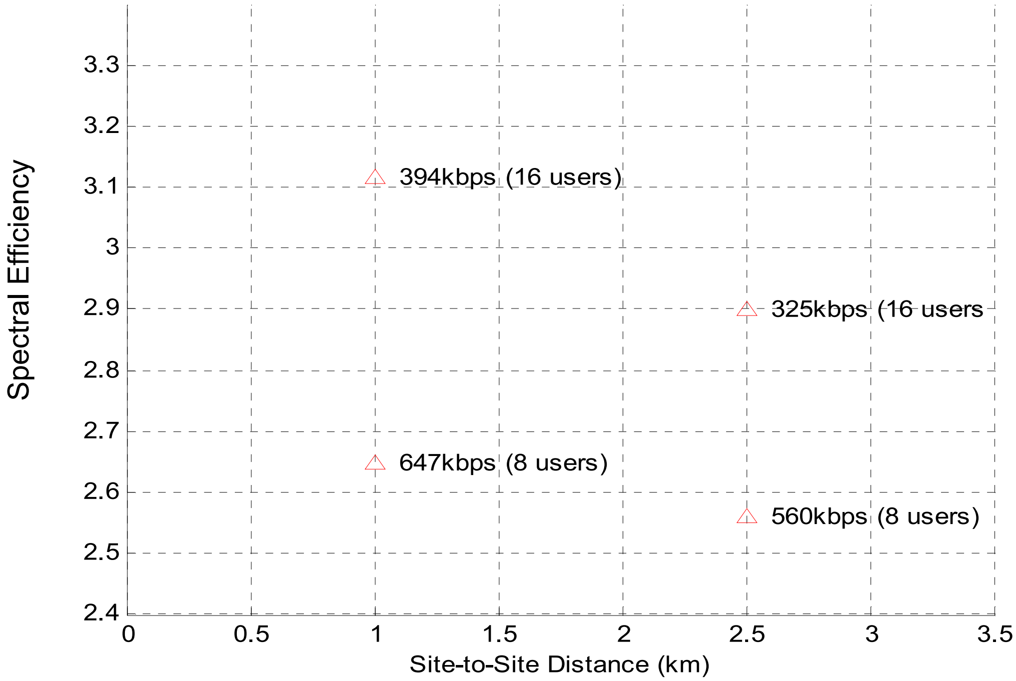


Figure 27: Downlink Spectral Efficiency, 120kph Veh-B

7.7.2 Uplink

7.7.2.1 3kph/Pedestrian B

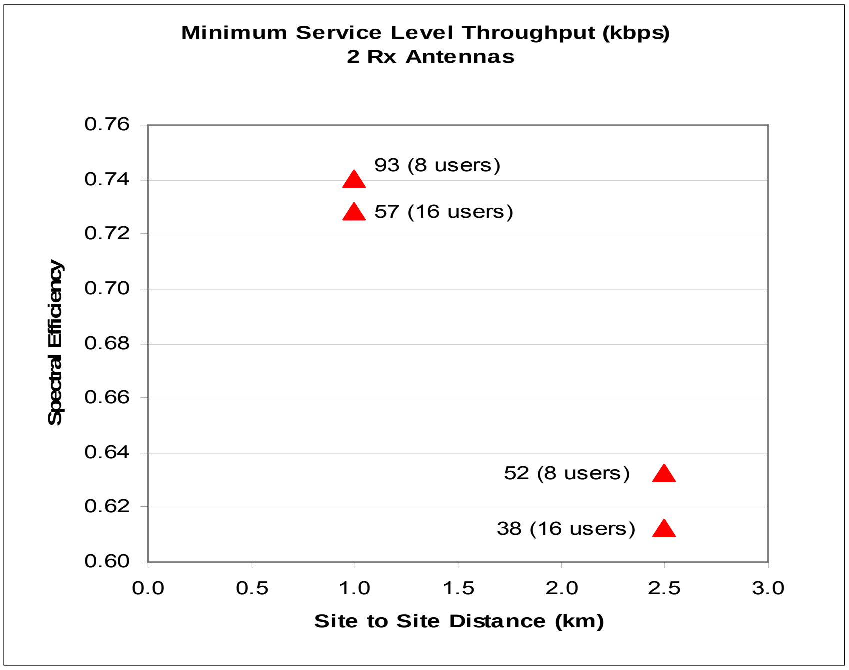


Figure 28: Min Service Throughput vs. Spectral Efficiency vs. Site Separation – 2 Rx Antennas, 3kph/PedB

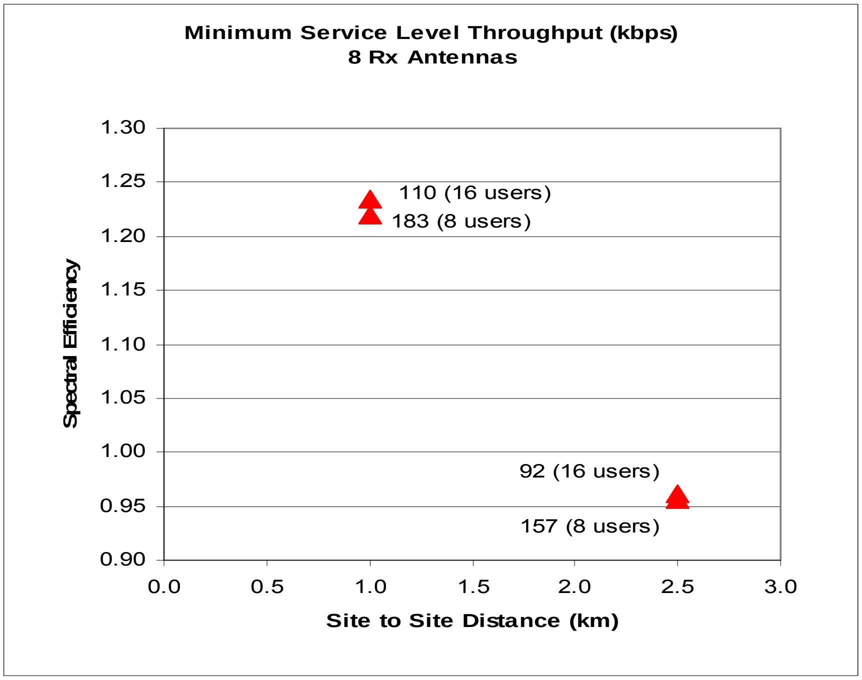


Figure 29: Min Service Throughput vs. Spectral Efficiency vs. Site Separation – 8 Rx Antennas, 3kph/PedB

7.7.2.2 120kph/Vehicular B

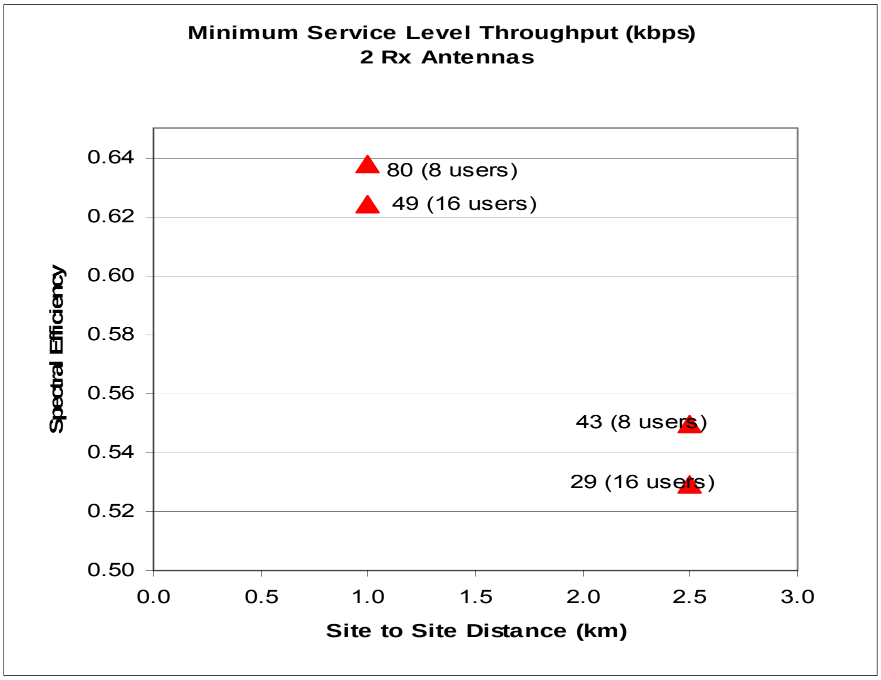


Figure 30: Min Service Throughput vs. Spectral Efficiency vs. Site Separation – 2 Rx Antennas, 120kph/VehB

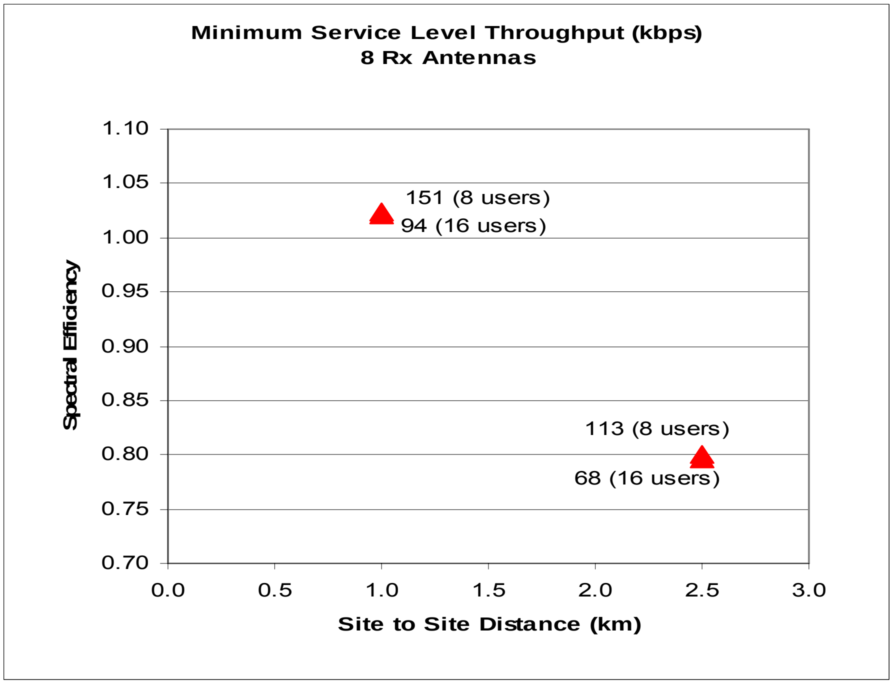


Figure 31: Min Service Throughput vs. Spectral Efficiency vs. Site Separation – 8 Rx Antennas, 120kph/VehB

7.8 *Fairness Criteria*

7.8.1 Downlink

The fairness criterion is shown in the normalized throughput figures below as a straight line. Throughput CDFs lying to the right of this line satisfy the fairness criteria. While all cases simulated satisfy the criteria, capacity could have been increased further by a more aggressive scheduling policy.

7.8.1.1 Normalized Mobile Throughput for 16 Users/Sector

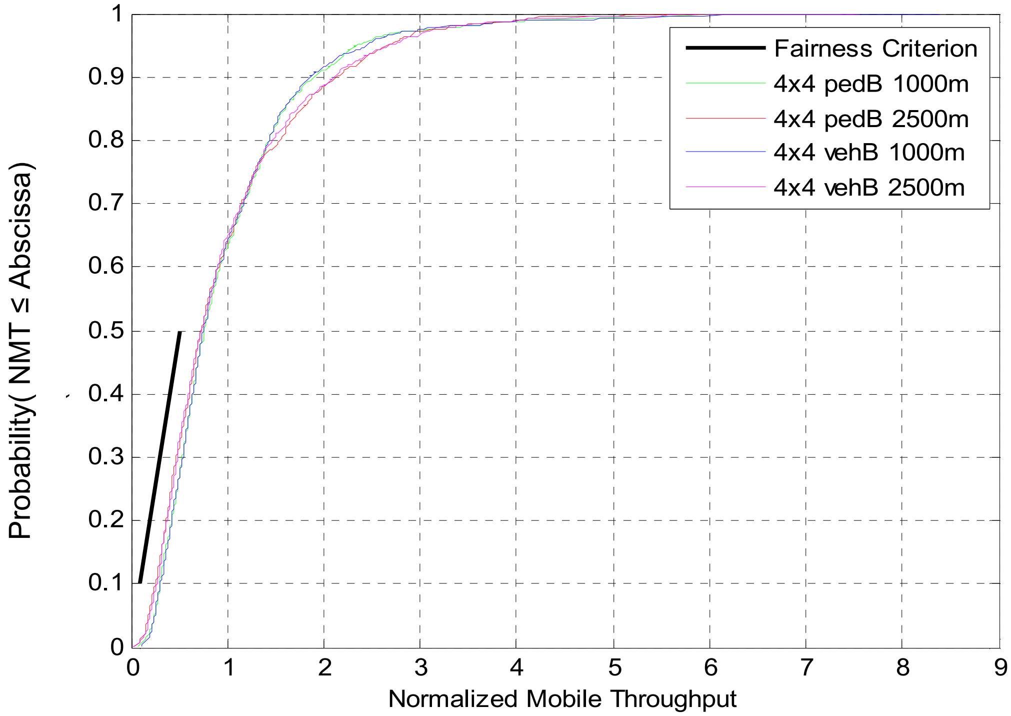


Figure 32: Normalized Mobile Throughput for 16 Users/Sector

7.8.1.2 Normalized Mobile Throughput for 8 Users/Sector

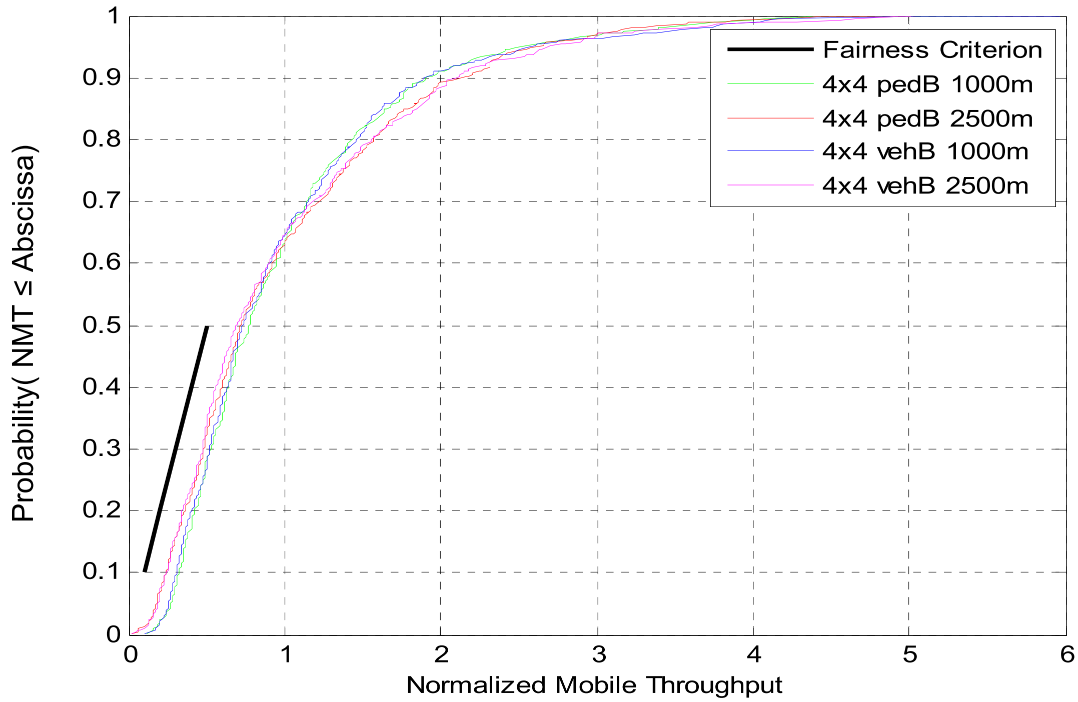


Figure 33: Normalized Mobile Throughput for 8 Users/Sector

7.8.2 Uplink

7.8.2.1 Normalized Mobile Throughput for 8 Users/Sector, 3kph/PedB

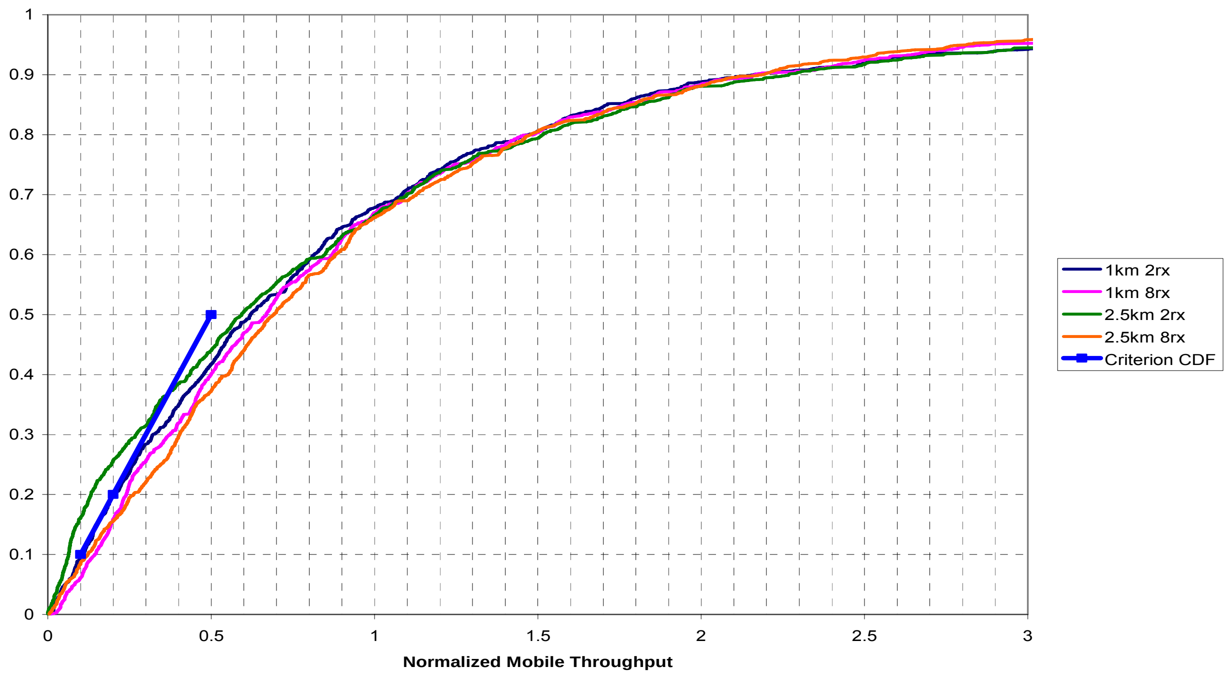


Figure 34: Normalized Mobile Throughput for 8 Users/Sector, 3kph/PedB

7.8.2.2 Normalized Mobile Throughput for 16 Users/Sector, 3kph/PedB

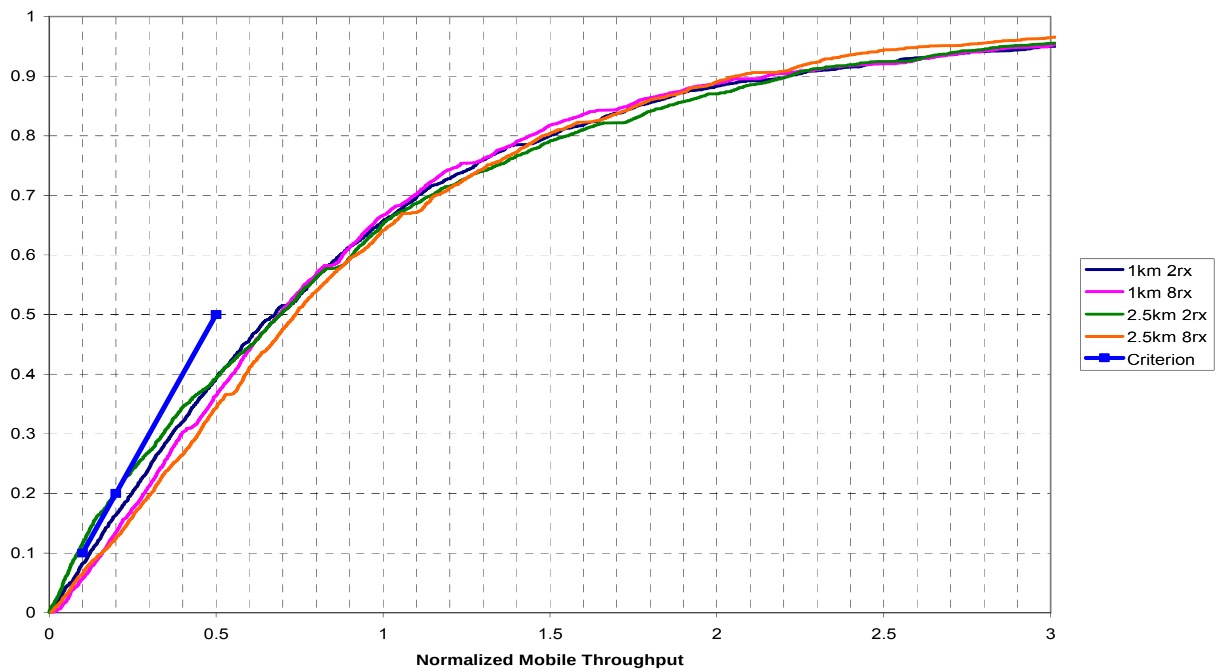


Figure 35: Normalized Mobile Throughput for 16 Users/Sector, 3kph/PedB

7.8.2.3 Normalized Mobile Throughput for 8 Users/Sector, 120kph/VehB

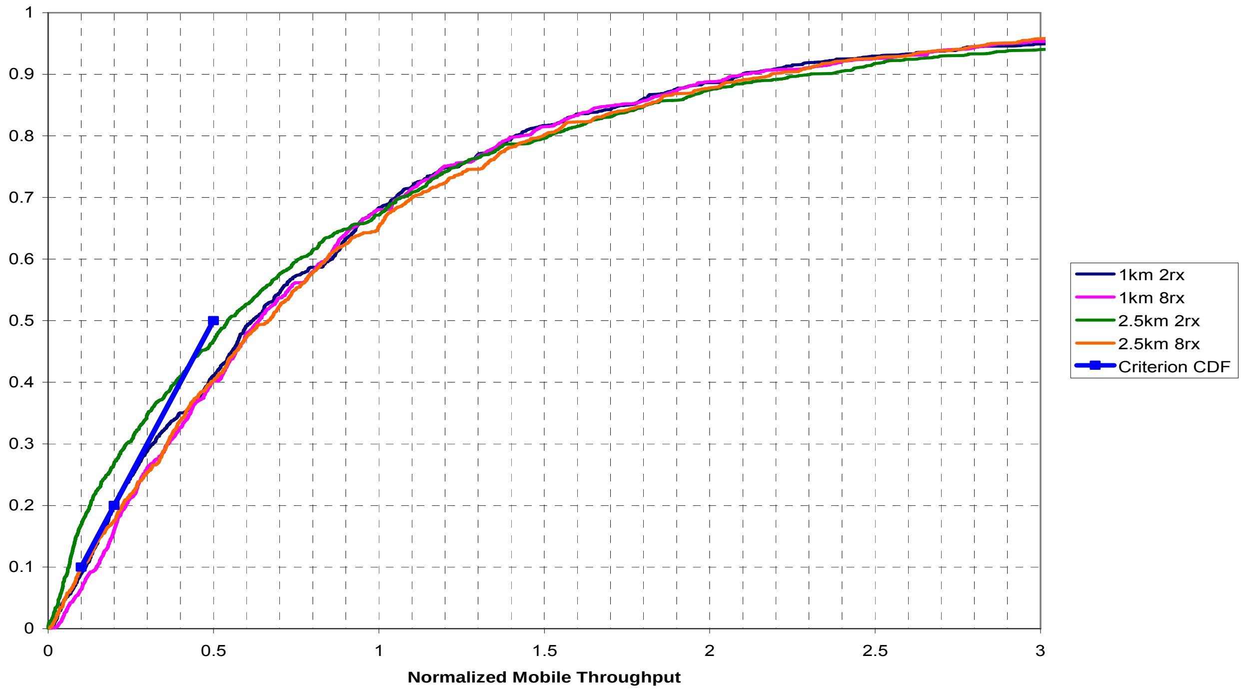


Figure 36: Normalized Mobile Throughput for 8 Users/Sector, 120kph/VehB

7.8.2.4 Normalized Mobile Throughput for 16 Users/Sector, 120kph/VehB

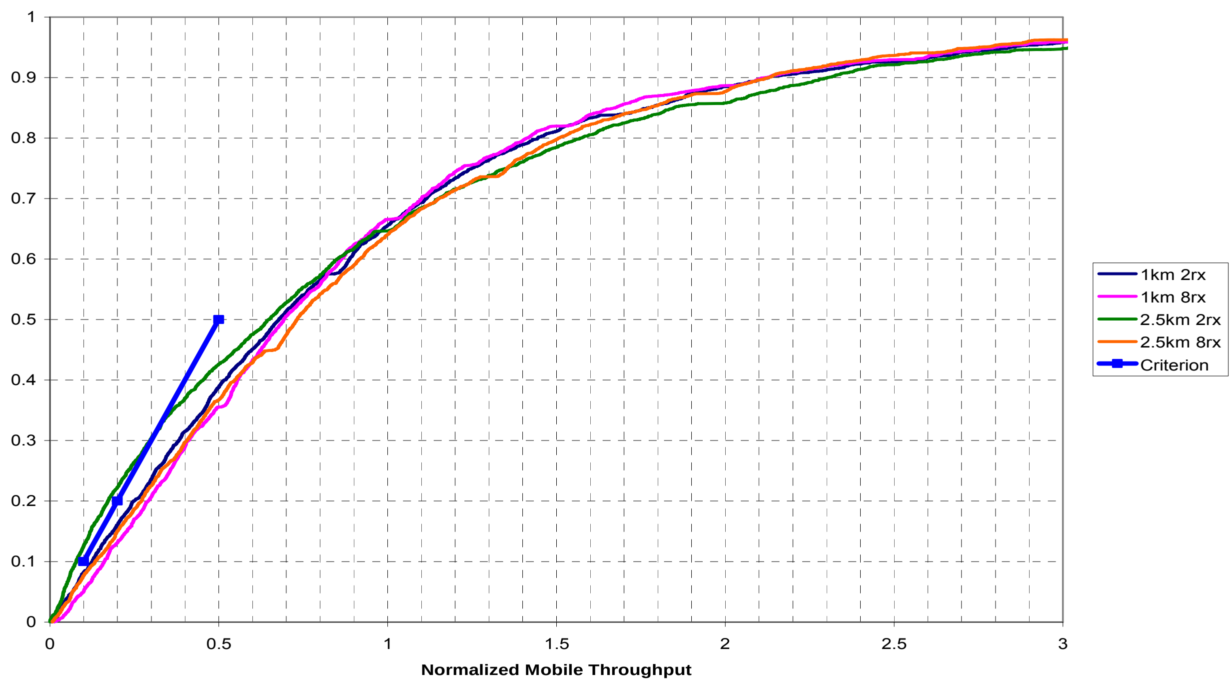


Figure 37: Normalized Mobile Throughput for 16 Users/Sector, 120kph/VehB

Appendix A: System Simulator Location Calibration

g.sc.id	l.ms.id	bs.loc.x (m)	bs.loc.y (m)	ms.loc.x (m)	ms.loc.y (m)	C/I (dB)
0	0	0.0	0.0	923.186	-821.784	6.315
0	1	0.0	0.0	1110.356	-66.758	1.136
0	2	0.0	0.0	362.184	359.549	8.913
0	3	0.0	0.0	129.483	201.019	1.003
0	4	0.0	0.0	319.792	-92.287	15.887
0	5	0.0	0.0	1054.627	533.284	1.206
0	6	0.0	0.0	997.349	-473.953	3.679
0	7	0.0	0.0	922.045	-449.127	4.33
0	8	0.0	0.0	367.909	135.223	15.884
0	9	0.0	0.0	641.612	524.285	-2.814
1	0	0.0	0.0	-62.664	518.898	2.02
1	1	0.0	0.0	254.396	447.737	-4.23
1	2	0.0	0.0	-432.835	36.299	1.133
1	3	0.0	0.0	-786.331	350.073	7.783
1	4	0.0	0.0	-15.66	108.668	15.515
1	5	0.0	0.0	-916.291	781.385	-1.194
1	6	0.0	0.0	-51.068	280.935	13.412
1	7	0.0	0.0	-668.559	587.471	-2.485
1	8	0.0	0.0	-746.416	125.984	1.77
1	9	0.0	0.0	-574.016	68.566	-6.214
2	0	0.0	0.0	-555.214	-1092.139	1.823
2	1	0.0	0.0	-124.703	-125.46	15.267
2	2	0.0	0.0	-76.544	-499.441	6.75
2	3	0.0	0.0	-440.678	-646.422	5.517
2	4	0.0	0.0	231.273	-490.612	1.997
2	5	0.0	0.0	-544.939	-991.515	-0.422
2	6	0.0	0.0	-529.258	-912.051	8.623
2	7	0.0	0.0	-873.75	-378.997	-1.795
2	8	0.0	0.0	-701.09	-1032.666	-1.018
2	9	0.0	0.0	-319.491	-345.003	15.461
3	0	2165.064	0.0	2813.238	198.643	-3.924
3	1	2165.064	0.0	3113.951	-19.502	7.056
3	2	2165.064	0.0	2849.724	107.676	-0.276
3	3	2165.064	0.0	2430.914	459.11	-1.462
3	4	2165.064	0.0	3151.596	-341.482	-2.697
3	5	2165.064	0.0	2382.451	123.585	14.607
3	6	2165.064	0.0	2755.978	-32.913	-4.538
3	7	2165.064	0.0	2891.392	-138.144	-1.247
3	8	2165.064	0.0	2433.837	-352.504	3.463
3	9	2165.064	0.0	2852.353	294.341	8.388
4	0	2165.064	0.0	1580.508	754.038	4.551
4	1	2165.064	0.0	1683.133	86.929	-3.002
4	2	2165.064	0.0	1920.734	890.108	2.366
4	3	2165.064	0.0	2071.205	948.422	-1.551
4	4	2165.064	0.0	1846.079	274.992	13.37
4	5	2165.064	0.0	1384.902	492.864	-2.296
4	6	2165.064	0.0	1897.183	510.433	14.482
4	7	2165.064	0.0	2126.786	354.395	15.018

4	8	2165.064	0.0	1701.31	210.56	12.197
4	9	2165.064	0.0	2031.886	601.995	-4.497
5	0	2165.064	0.0	1366.635	-584.462	-0.79
5	1	2165.064	0.0	2030.457	-139.734	16.485
5	2	2165.064	0.0	1357.25	-251.724	-1.856
5	3	2165.064	0.0	2335.386	-638.119	-4.818
5	4	2165.064	0.0	1994.359	-290.479	14.836
5	5	2165.064	0.0	1878.936	-1143.721	-7.722
5	6	2165.064	0.0	1888.376	-879.947	-2.516
5	7	2165.064	0.0	2570.726	-976.892	7.26
5	8	2165.064	0.0	1630.826	-675.119	-7.511
5	9	2165.064	0.0	1530.563	-18.986	-4.111
6	0	4330.127	0.0	5094.74	-720.449	2.33
6	1	4330.127	0.0	5500.737	313.313	3.117
6	2	4330.127	0.0	4900.546	-733.138	11.473
6	3	4330.127	0.0	4829.239	-826.475	-2.639
6	4	4330.127	0.0	5051.454	-128.66	-2.982
6	5	4330.127	0.0	4923.893	-61.492	8.341
6	6	4330.127	0.0	4482.365	35.873	16.444
6	7	4330.127	0.0	4640.798	82.492	15.659
6	8	4330.127	0.0	4631.296	119.14	14.705
6	9	4330.127	0.0	4743.273	-101.487	8.727
7	0	4330.127	0.0	4082.053	263.356	14.333
7	1	4330.127	0.0	4476.015	727.148	-0.711
7	2	4330.127	0.0	4523.355	450.057	-1.007
7	3	4330.127	0.0	4210.85	687.846	-4.56
7	4	4330.127	0.0	4183.234	363.777	11.787
7	5	4330.127	0.0	3753.109	51.996	-6.718
7	6	4330.127	0.0	4529.848	1202.126	-4.163
7	7	4330.127	0.0	4271.968	103.845	15.071
7	8	4330.127	0.0	4134.173	5.926	1.501
7	9	4330.127	0.0	4392.764	450.006	7.108
8	0	4330.127	0.0	3431.87	-64.934	2.179
8	1	4330.127	0.0	4258.635	-49.672	14.438
8	2	4330.127	0.0	3887.333	-170.29	-0.883
8	3	4330.127	0.0	4421.684	-158.886	0.628
8	4	4330.127	0.0	4230.507	-94.366	14.864
8	5	4330.127	0.0	3703.769	-385.744	3.886
8	6	4330.127	0.0	3736.384	-746.191	2.179
8	7	4330.127	0.0	4054.884	-55.629	4.983
8	8	4330.127	0.0	3967.102	-30.632	1.796
8	9	4330.127	0.0	3429.084	-862.527	0.36
9	0	3247.595	1875.0	3645.094	1405.343	5.054
9	1	3247.595	1875.0	4336.808	2149.508	1.994
9	2	3247.595	1875.0	4019.379	1542.779	0.576
9	3	3247.595	1875.0	3404.079	2093.873	3.492
9	4	3247.595	1875.0	3427.725	1848.156	16.861
9	5	3247.595	1875.0	3565.054	1866.12	6.325
9	6	3247.595	1875.0	4432.714	2114.643	3.916
9	7	3247.595	1875.0	3478.522	1841.445	12.068
9	8	3247.595	1875.0	4209.648	1570.112	-0.277
9	9	3247.595	1875.0	3459.693	1798.212	9.007

10	0	3247.595	1875.0	3469.451	2290.191	-0.719
10	1	3247.595	1875.0	2964.365	2387.695	4.244
10	2	3247.595	1875.0	2968.016	2135.161	9.583
10	3	3247.595	1875.0	3481.187	2475.652	-2.586
10	4	3247.595	1875.0	2810.534	2891.634	2.107
10	5	3247.595	1875.0	2078.927	1875.896	-1.627
10	6	3247.595	1875.0	2549.238	2050.552	2.347
10	7	3247.595	1875.0	3379.656	2245.959	5.001
10	8	3247.595	1875.0	3250.777	2736.837	4.172
10	9	3247.595	1875.0	2866.963	2534.517	-0.908
11	0	3247.595	1875.0	3341.305	1711.631	0.157
11	1	3247.595	1875.0	2940.518	1844.576	1.171
11	2	3247.595	1875.0	3028.162	967.123	0.667
11	3	3247.595	1875.0	2659.492	1367.545	0.973
11	4	3247.595	1875.0	2623.098	1142.329	3.898
11	5	3247.595	1875.0	3145.265	1780.967	16.146
11	6	3247.595	1875.0	3105.91	1325.244	6.421
11	7	3247.595	1875.0	3020.459	1592.114	13.621
11	8	3247.595	1875.0	3273.296	1723.775	8.381
11	9	3247.595	1875.0	2697.506	1621.712	11.965
12	0	1082.532	1875.0	1608.488	2053.788	9.25
12	1	1082.532	1875.0	1484.761	1966.286	9.104
12	2	1082.532	1875.0	1923.943	2146.101	4.595
12	3	1082.532	1875.0	1632.569	1607.426	9.954
12	4	1082.532	1875.0	1620.075	2231.833	10.138
12	5	1082.532	1875.0	1297.07	1952.78	9.539
12	6	1082.532	1875.0	1606.352	2758.131	-1.694
12	7	1082.532	1875.0	1623.971	1205.545	-5.65
12	8	1082.532	1875.0	1932.491	1949.975	8.278
12	9	1082.532	1875.0	1417.159	2364.95	3.11
13	0	1082.532	1875.0	853.014	2687.499	-2.428
13	1	1082.532	1875.0	960.329	1926.381	13.199
13	2	1082.532	1875.0	915.571	2276.232	7.025
13	3	1082.532	1875.0	492.092	2336.593	13.701
13	4	1082.532	1875.0	295.314	1878.422	-3.467
13	5	1082.532	1875.0	1285.964	2288.921	0.964
13	6	1082.532	1875.0	1442.19	2542.938	-4.216
13	7	1082.532	1875.0	646.264	2176.875	6.026
13	8	1082.532	1875.0	598.776	2378.857	9.965
13	9	1082.532	1875.0	-20.361	2406.516	4.761
14	0	1082.532	1875.0	803.184	1081.412	1.619
14	1	1082.532	1875.0	936.506	1830.325	12.286
14	2	1082.532	1875.0	673.097	1766.382	-3.888
14	3	1082.532	1875.0	539.834	1175.88	5.744
14	4	1082.532	1875.0	917.95	1367.278	3.776
14	5	1082.532	1875.0	976.757	1754.148	14.328
14	6	1082.532	1875.0	1013.383	1301.784	14.34
14	7	1082.532	1875.0	943.863	1844.306	6.742
14	8	1082.532	1875.0	1042.447	1765.284	16.766
14	9	1082.532	1875.0	803.061	1858.959	-0.014
15	0	2165.064	3750.0	3125.097	3861.472	7.141
15	1	2165.064	3750.0	2369.754	3864.882	13.247

15	2	2165.064	3750.0	2209.864	3777.062	13.826
15	3	2165.064	3750.0	2636.921	4547.035	-9.144
15	4	2165.064	3750.0	2577.893	3679.14	9.419
15	5	2165.064	3750.0	2285.947	3847.739	11.359
15	6	2165.064	3750.0	2952.167	3334.269	5.855
15	7	2165.064	3750.0	3106.942	4356.078	-3.77
15	8	2165.064	3750.0	2684.069	3750.581	3.259
15	9	2165.064	3750.0	2419.564	3832.233	11.978
16	0	2165.064	3750.0	2569.846	4476.295	-6.582
16	1	2165.064	3750.0	1860.692	3795.926	4.512
16	2	2165.064	3750.0	2263.961	4492.828	3.726
16	3	2165.064	3750.0	2057.172	4824.111	-4.101
16	4	2165.064	3750.0	2439.299	4658.445	0.747
16	5	2165.064	3750.0	2071.096	4076.812	16.389
16	6	2165.064	3750.0	2159.548	3788.017	15.724
16	7	2165.064	3750.0	2276.033	4669.642	-3.424
16	8	2165.064	3750.0	2403.462	4259.266	-2.371
16	9	2165.064	3750.0	2154.996	3854.04	14.367
17	0	2165.064	3750.0	1222.487	3544.272	-0.516
17	1	2165.064	3750.0	2119.324	3718.22	14.605
17	2	2165.064	3750.0	1952.457	3582.317	12.121
17	3	2165.064	3750.0	2043.535	3457.58	15.628
17	4	2165.064	3750.0	2084.438	3391.746	12.298
17	5	2165.064	3750.0	2502.44	2680.271	2.608
17	6	2165.064	3750.0	2198.714	3612.49	8.166
17	7	2165.064	3750.0	2549.385	2864.089	0.717
17	8	2165.064	3750.0	2056.211	3724.442	6.191
17	9	2165.064	3750.0	1109.183	3506.143	4.054
18	0	0.0	3750.0	303.375	4214.174	-7.1
18	1	0.0	3750.0	128.267	3857.199	9.088
18	2	0.0	3750.0	514.235	3762.608	6.337
18	3	0.0	3750.0	529.476	4298.697	-1.594
18	4	0.0	3750.0	455.279	4285.7	-6.981
18	5	0.0	3750.0	654.384	3902.431	2.725
18	6	0.0	3750.0	117.68	3627.861	7.746
18	7	0.0	3750.0	713.409	4116.545	3.059
18	8	0.0	3750.0	740.609	3075.999	1.484
18	9	0.0	3750.0	263.84	3846.246	15.795
19	0	0.0	3750.0	-435.882	4579.006	3.081
19	1	0.0	3750.0	139.073	4001.65	0.614
19	2	0.0	3750.0	94.204	4391.331	9.42
19	3	0.0	3750.0	518.581	4794.841	-0.64
19	4	0.0	3750.0	161.645	4307.421	5.837
19	5	0.0	3750.0	-510.48	3848.427	-1.21
19	6	0.0	3750.0	152.042	4061.063	1.825
19	7	0.0	3750.0	-410.912	4187.514	0.691
19	8	0.0	3750.0	-500.93	4021.272	1.114
19	9	0.0	3750.0	-196.312	3758.613	1.097
20	0	0.0	3750.0	-135.214	3633.945	15.558
20	1	0.0	3750.0	-577.153	3646.199	-5.374
20	2	0.0	3750.0	-222.067	3577.693	15.104
20	3	0.0	3750.0	-570.181	3265.84	7.084

20	4	0.0	3750.0	-137.701	3730.678	5.977
20	5	0.0	3750.0	-101.17	3636.226	16.348
20	6	0.0	3750.0	-82.387	3677.894	16.001
20	7	0.0	3750.0	-312.556	3259.652	15.195
20	8	0.0	3750.0	203.353	2950.936	0.383
20	9	0.0	3750.0	97.328	3472.569	1.901
21	0	-1082.532	1875.0	-218.731	1402.461	-3.179
21	1	-1082.532	1875.0	-435.128	2212.301	-0.326
21	2	-1082.532	1875.0	-769.886	1452.207	0.883
21	3	-1082.532	1875.0	-857.104	1634.44	4.833
21	4	-1082.532	1875.0	-882.332	1660.154	7.744
21	5	-1082.532	1875.0	-482.556	1604.6	3.387
21	6	-1082.532	1875.0	-112.609	1117.585	-1.968
21	7	-1082.532	1875.0	-718.42	1327.271	-1.347
21	8	-1082.532	1875.0	-820.639	2254.224	3.467
21	9	-1082.532	1875.0	-825.468	2272.91	-0.196
22	0	-1082.532	1875.0	-1179.784	2900.513	9.657
22	1	-1082.532	1875.0	-1069.439	2547.043	10.009
22	2	-1082.532	1875.0	-1264.542	1886.708	1.461
22	3	-1082.532	1875.0	-1410.825	2600.859	-4.267
22	4	-1082.532	1875.0	-1457.783	2090.701	10.421
22	5	-1082.532	1875.0	-1346.038	2395.884	14.449
22	6	-1082.532	1875.0	-692.056	2594.102	-2.85
22	7	-1082.532	1875.0	-1085.497	2157.395	14.179
22	8	-1082.532	1875.0	-1151.467	1923.137	15.2
22	9	-1082.532	1875.0	-1951.886	2098.506	5.8
23	0	-1082.532	1875.0	-871.548	1488.926	-2.065
23	1	-1082.532	1875.0	-1717.671	1382.765	2.912
23	2	-1082.532	1875.0	-2103.638	1363.533	-3.972
23	3	-1082.532	1875.0	-823.833	1121.123	0.371
23	4	-1082.532	1875.0	-1112.328	1341.108	12.038
23	5	-1082.532	1875.0	-1352.486	1780.677	10.368
23	6	-1082.532	1875.0	-740.011	1141.111	0.291
23	7	-1082.532	1875.0	-1030.502	1444.733	5.451
23	8	-1082.532	1875.0	-1262.784	1556.691	14.635
23	9	-1082.532	1875.0	-1107.189	1172.935	7.074
24	0	-2165.064	3750.0	-1643.826	3808.059	9.781
24	1	-2165.064	3750.0	-1417.546	4200.24	6.316
24	2	-2165.064	3750.0	-1960.3	3626.597	11.948
24	3	-2165.064	3750.0	-1220.368	4525.375	-1.746
24	4	-2165.064	3750.0	-1621.218	3837.383	6.792
24	5	-2165.064	3750.0	-1733.018	3867.088	8.969
24	6	-2165.064	3750.0	-1143.249	3167.888	1.291
24	7	-2165.064	3750.0	-1963.542	3576.775	8.829
24	8	-2165.064	3750.0	-1457.686	3066.986	-1.429
24	9	-2165.064	3750.0	-1820.697	3993.578	2.141
25	0	-2165.064	3750.0	-2031.808	4583.674	3.721
25	1	-2165.064	3750.0	-2176.251	3823.466	15.838
25	2	-2165.064	3750.0	-2254.651	3813.862	15.16
25	3	-2165.064	3750.0	-2567.47	4782.684	-0.567
25	4	-2165.064	3750.0	-2751.667	3959.474	-6.622
25	5	-2165.064	3750.0	-3010.791	4234.056	11.249

25	6	-2165.064	3750.0	-2234.92	4883.176	-0.194
25	7	-2165.064	3750.0	-1686.766	4856.409	0.248
25	8	-2165.064	3750.0	-2168.902	4030.248	14.103
25	9	-2165.064	3750.0	-2673.603	3981.6	-4.013
26	0	-2165.064	3750.0	-2084.028	3594.952	0.641
26	1	-2165.064	3750.0	-2210.74	3490.732	9.794
26	2	-2165.064	3750.0	-2175.832	3557.5	14.677
26	3	-2165.064	3750.0	-2566.915	3081.733	-3.36
26	4	-2165.064	3750.0	-2766.667	3560.506	-2.655
26	5	-2165.064	3750.0	-2245.995	3663.719	13.349
26	6	-2165.064	3750.0	-2537.355	3731.615	2.715
26	7	-2165.064	3750.0	-2335.955	3149.59	3.693
26	8	-2165.064	3750.0	-2938.231	3673.298	1.594
26	9	-2165.064	3750.0	-1921.886	3287.607	-2.629
27	0	-3247.595	1875.0	-2383.985	2614.566	-3.1
27	1	-3247.595	1875.0	-2485.162	1427.452	5.918
27	2	-3247.595	1875.0	-2912.491	2167.852	0.771
27	3	-3247.595	1875.0	-2698.085	1799.775	11.253
27	4	-3247.595	1875.0	-2539.335	1487.432	0.174
27	5	-3247.595	1875.0	-2303.415	1714.364	-5.23
27	6	-3247.595	1875.0	-2313.832	2202.366	-2.138
27	7	-3247.595	1875.0	-2524.109	2246.139	-4.727
27	8	-3247.595	1875.0	-2808.559	1823.055	4.088
27	9	-3247.595	1875.0	-3138.907	2022.887	2.513
28	0	-3247.595	1875.0	-4198.591	2282.96	-4.132
28	1	-3247.595	1875.0	-3355.004	1963.428	15.621
28	2	-3247.595	1875.0	-3391.057	2456.019	12.32
28	3	-3247.595	1875.0	-3463.865	3059.139	-4.009
28	4	-3247.595	1875.0	-3085.449	2351.977	2.893
28	5	-3247.595	1875.0	-3859.74	1983.802	-0.939
28	6	-3247.595	1875.0	-3354.126	1943.497	14.663
28	7	-3247.595	1875.0	-3587.282	1994.346	0.64
28	8	-3247.595	1875.0	-3294.054	2299.803	7.441
28	9	-3247.595	1875.0	-2889.46	2683.087	-9.804
29	0	-3247.595	1875.0	-2915.321	1207.995	-2.688
29	1	-3247.595	1875.0	-3277.79	1758.334	16.569
29	2	-3247.595	1875.0	-3226.178	840.186	-3.231
29	3	-3247.595	1875.0	-3217.244	1728.104	7.075
29	4	-3247.595	1875.0	-3971.318	985.002	6.208
29	5	-3247.595	1875.0	-4260.149	1649.315	-2.992
29	6	-3247.595	1875.0	-3871.35	1809.415	-5.9
29	7	-3247.595	1875.0	-3404.904	1301.769	6.907
29	8	-3247.595	1875.0	-3481.548	1281.577	2.526
29	9	-3247.595	1875.0	-3832.908	1428.11	14.626
30	0	-2165.064	0.0	-1992.953	150.138	2.924
30	1	-2165.064	0.0	-1745.243	214.312	-5.081
30	2	-2165.064	0.0	-1118.163	-123.39	6.262
30	3	-2165.064	0.0	-977.753	-14.458	-1.185
30	4	-2165.064	0.0	-1963.421	182.544	2.994
30	5	-2165.064	0.0	-1771.448	-348.896	9.08
30	6	-2165.064	0.0	-1637.764	-481.603	-0.969
30	7	-2165.064	0.0	-1739.81	274.141	-2.895

30	8	-2165.064	0.0	-1801.265	433.254	-4.711
30	9	-2165.064	0.0	-1092.496	-508.269	-0.655
31	0	-2165.064	0.0	-2361.185	347.419	16.241
31	1	-2165.064	0.0	-2697.938	61.408	-2.451
31	2	-2165.064	0.0	-2081.285	1035.734	-0.57
31	3	-2165.064	0.0	-2638.058	259.949	5.841
31	4	-2165.064	0.0	-2269.435	48.958	11.66
31	5	-2165.064	0.0	-2235.069	204.577	16.269
31	6	-2165.064	0.0	-2650.042	599.919	-3.778
31	7	-2165.064	0.0	-2383.74	539.26	11.808
31	8	-2165.064	0.0	-2485.097	221.931	14.807
31	9	-2165.064	0.0	-2084.582	968.026	-2.719
32	0	-2165.064	0.0	-2032.968	-271.09	2.014
32	1	-2165.064	0.0	-2394.98	-454.126	12.112
32	2	-2165.064	0.0	-2620.709	-378.706	11.598
32	3	-2165.064	0.0	-2512.431	-184.055	5.264
32	4	-2165.064	0.0	-3128.057	-105.302	-2.433
32	5	-2165.064	0.0	-2017.08	-767.83	-8.598
32	6	-2165.064	0.0	-2626.288	-293.236	11.268
32	7	-2165.064	0.0	-2402.68	-377.555	15.757
32	8	-2165.064	0.0	-2957.543	-811.278	-4.704
32	9	-2165.064	0.0	-2293.153	-106.101	15.913
33	0	-4330.127	0.0	-3413.816	-771.091	-1.748
33	1	-4330.127	0.0	-3754.51	-302.524	-2.856
33	2	-4330.127	0.0	-3334.401	-376.486	-2.492
33	3	-4330.127	0.0	-3843.967	-567.17	-1.54
33	4	-4330.127	0.0	-4292.75	0.787	16.951
33	5	-4330.127	0.0	-3623.01	-142.939	0.446
33	6	-4330.127	0.0	-3524.242	-30.225	7.391
33	7	-4330.127	0.0	-3758.146	509.812	-6.677
33	8	-4330.127	0.0	-4200.592	-22.405	15.684
33	9	-4330.127	0.0	-3354.345	-275.12	1.914
34	0	-4330.127	0.0	-5253.469	353.678	-4.0
34	1	-4330.127	0.0	-4175.045	679.259	-3.14
34	2	-4330.127	0.0	-5075.779	412.593	-0.947
34	3	-4330.127	0.0	-4216.923	234.293	2.742
34	4	-4330.127	0.0	-4491.774	1086.71	4.241
34	5	-4330.127	0.0	-5160.87	396.767	-4.502
34	6	-4330.127	0.0	-4864.116	654.619	4.185
34	7	-4330.127	0.0	-4732.266	643.797	0.855
34	8	-4330.127	0.0	-4425.696	849.234	7.61
34	9	-4330.127	0.0	-4490.77	123.711	12.734
35	0	-4330.127	0.0	-4026.25	-610.488	-0.236
35	1	-4330.127	0.0	-4666.514	-153.536	11.582
35	2	-4330.127	0.0	-4248.884	-327.1	1.32
35	3	-4330.127	0.0	-4236.69	-874.259	4.117
35	4	-4330.127	0.0	-4287.739	-889.788	-5.701
35	5	-4330.127	0.0	-4778.247	-404.348	7.332
35	6	-4330.127	0.0	-4630.211	-60.391	4.492
35	7	-4330.127	0.0	-4712.327	-263.02	10.656
35	8	-4330.127	0.0	-4296.289	-157.116	9.634
35	9	-4330.127	0.0	-4305.203	-495.223	3.258

36	0	-3247.595	-1875.0	-2455.62	-1986.978	14.295
36	1	-3247.595	-1875.0	-3007.065	-1719.854	12.464
36	2	-3247.595	-1875.0	-2666.235	-1832.096	13.083
36	3	-3247.595	-1875.0	-2395.272	-2034.851	14.141
36	4	-3247.595	-1875.0	-3114.813	-1708.965	4.621
36	5	-3247.595	-1875.0	-2678.159	-1135.939	-3.737
36	6	-3247.595	-1875.0	-3048.167	-1928.855	14.023
36	7	-3247.595	-1875.0	-2400.904	-1746.496	-5.329
36	8	-3247.595	-1875.0	-3198.222	-1827.333	8.696
36	9	-3247.595	-1875.0	-3162.463	-1830.756	15.234
37	0	-3247.595	-1875.0	-3919.38	-1185.695	2.727
37	1	-3247.595	-1875.0	-4193.263	-1760.629	12.796
37	2	-3247.595	-1875.0	-3289.279	-1872.952	1.481
37	3	-3247.595	-1875.0	-2956.918	-1100.876	7.771
37	4	-3247.595	-1875.0	-3833.532	-964.391	-2.264
37	5	-3247.595	-1875.0	-3655.245	-1269.237	7.504
37	6	-3247.595	-1875.0	-3213.357	-1738.972	8.212
37	7	-3247.595	-1875.0	-3488.473	-1853.667	4.584
37	8	-3247.595	-1875.0	-3664.655	-1634.663	0.095
37	9	-3247.595	-1875.0	-3817.533	-1070.625	-3.763
38	0	-3247.595	-1875.0	-3648.681	-2040.12	8.818
38	1	-3247.595	-1875.0	-3295.277	-1926.252	16.614
38	2	-3247.595	-1875.0	-3351.344	-2772.14	5.358
38	3	-3247.595	-1875.0	-2968.401	-2359.795	0.731
38	4	-3247.595	-1875.0	-3544.374	-3032.039	1.282
38	5	-3247.595	-1875.0	-3532.837	-2194.584	-0.795
38	6	-3247.595	-1875.0	-2774.304	-2916.573	0.591
38	7	-3247.595	-1875.0	-2848.266	-2581.915	-2.216
38	8	-3247.595	-1875.0	-3063.918	-2545.746	3.748
38	9	-3247.595	-1875.0	-2969.778	-2529.564	9.022
39	0	-1082.532	-1875.0	-649.947	-2179.817	6.51
39	1	-1082.532	-1875.0	-354.797	-1826.997	-7.004
39	2	-1082.532	-1875.0	-932.757	-2037.911	7.241
39	3	-1082.532	-1875.0	-873.199	-2065.702	7.334
39	4	-1082.532	-1875.0	-540.776	-2155.499	5.288
39	5	-1082.532	-1875.0	-608.396	-2310.667	0.506
39	6	-1082.532	-1875.0	-810.189	-2011.535	12.964
39	7	-1082.532	-1875.0	-501.427	-2682.323	-0.038
39	8	-1082.532	-1875.0	-731.253	-2183.256	1.138
39	9	-1082.532	-1875.0	-406.599	-2817.493	0.786
40	0	-1082.532	-1875.0	-1767.712	-1469.406	-3.958
40	1	-1082.532	-1875.0	-1112.614	-1717.86	13.252
40	2	-1082.532	-1875.0	-840.16	-1071.182	-3.228
40	3	-1082.532	-1875.0	-2233.504	-1438.175	-1.599
40	4	-1082.532	-1875.0	-1079.843	-1508.444	11.75
40	5	-1082.532	-1875.0	-1884.855	-1197.331	6.563
40	6	-1082.532	-1875.0	-1446.393	-713.665	-1.559
40	7	-1082.532	-1875.0	-1208.849	-1262.567	-1.465
40	8	-1082.532	-1875.0	-2160.521	-1700.696	-0.545
40	9	-1082.532	-1875.0	-2025.044	-1756.24	-4.919
41	0	-1082.532	-1875.0	-1793.286	-2725.36	-7.02
41	1	-1082.532	-1875.0	-1331.543	-2738.546	5.023

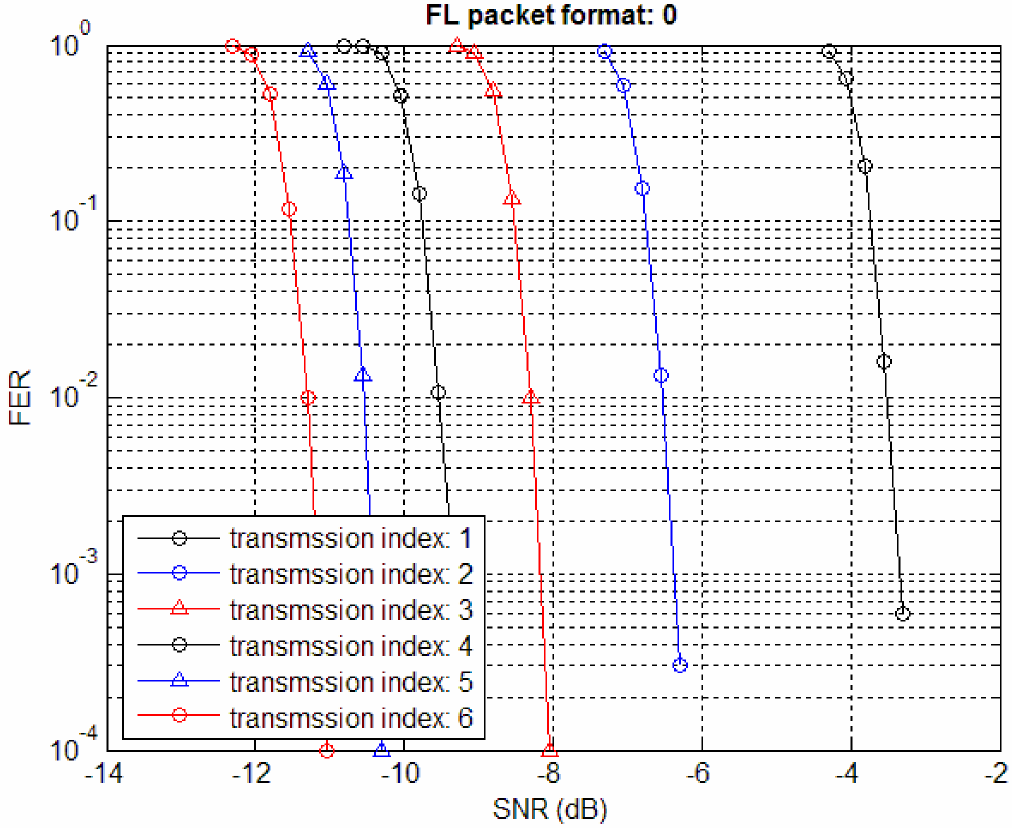
41	2	-1082.532	-1875.0	-1769.346	-2064.128	-2.705
41	3	-1082.532	-1875.0	-997.591	-2654.674	-4.863
41	4	-1082.532	-1875.0	-1301.395	-1921.452	6.981
41	5	-1082.532	-1875.0	-825.759	-2332.348	-5.703
41	6	-1082.532	-1875.0	-1213.767	-2899.49	8.133
41	7	-1082.532	-1875.0	-1457.434	-2282.757	10.212
41	8	-1082.532	-1875.0	-1317.43	-2682.425	3.171
41	9	-1082.532	-1875.0	-1249.757	-2395.297	10.516
42	0	-2165.064	-3750.0	-954.574	-3949.183	-2.218
42	1	-2165.064	-3750.0	-1976.895	-4019.073	-0.562
42	2	-2165.064	-3750.0	-1045.856	-3398.925	0.154
42	3	-2165.064	-3750.0	-1538.628	-3497.592	4.814
42	4	-2165.064	-3750.0	-1360.655	-3838.611	-1.158
42	5	-2165.064	-3750.0	-1535.609	-4611.653	0.782
42	6	-2165.064	-3750.0	-2026.263	-3965.302	0.825
42	7	-2165.064	-3750.0	-1624.344	-4393.45	5.719
42	8	-2165.064	-3750.0	-1839.932	-3724.041	16.857
42	9	-2165.064	-3750.0	-1561.952	-3200.426	-1.117
43	0	-2165.064	-3750.0	-3350.596	-3478.433	1.38
43	1	-2165.064	-3750.0	-2635.092	-3394.778	6.191
43	2	-2165.064	-3750.0	-1854.016	-2854.219	-3.71
43	3	-2165.064	-3750.0	-3078.394	-3212.422	-0.17
43	4	-2165.064	-3750.0	-2619.356	-2925.664	-0.179
43	5	-2165.064	-3750.0	-2735.915	-2760.161	-1.772
43	6	-2165.064	-3750.0	-2560.811	-3491.987	-0.57
43	7	-2165.064	-3750.0	-2212.883	-3020.609	1.977
43	8	-2165.064	-3750.0	-2869.008	-2827.186	8.476
43	9	-2165.064	-3750.0	-2177.328	-3643.047	15.377
44	0	-2165.064	-3750.0	-2525.039	-4383.98	9.221
44	1	-2165.064	-3750.0	-2483.925	-3946.484	11.599
44	2	-2165.064	-3750.0	-2804.127	-4426.872	0.765
44	3	-2165.064	-3750.0	-2259.849	-3753.091	1.789
44	4	-2165.064	-3750.0	-2154.379	-3894.875	12.13
44	5	-2165.064	-3750.0	-2318.191	-3907.484	16.09
44	6	-2165.064	-3750.0	-2467.162	-4181.371	6.245
44	7	-2165.064	-3750.0	-2548.082	-4932.617	-3.794
44	8	-2165.064	-3750.0	-2191.317	-3963.163	15.593
44	9	-2165.064	-3750.0	-2681.035	-4495.857	-7.027
45	0	0.0	-3750.0	428.028	-3513.497	10.199
45	1	0.0	-3750.0	142.656	-3703.523	16.245
45	2	0.0	-3750.0	714.847	-4252.618	-4.047
45	3	0.0	-3750.0	589.315	-3949.947	12.929
45	4	0.0	-3750.0	809.747	-3570.794	-2.574
45	5	0.0	-3750.0	206.927	-3718.703	11.702
45	6	0.0	-3750.0	685.631	-2976.713	2.738
45	7	0.0	-3750.0	1108.208	-4004.786	2.121
45	8	0.0	-3750.0	369.595	-3873.742	14.547
45	9	0.0	-3750.0	835.443	-3923.832	1.206
46	0	0.0	-3750.0	-36.785	-3233.447	7.22
46	1	0.0	-3750.0	-176.779	-3567.307	16.249
46	2	0.0	-3750.0	-24.183	-3643.023	16.093
46	3	0.0	-3750.0	-3.202	-3046.899	2.916

46	4	0.0	-3750.0	-795.051	-3308.81	4.081
46	5	0.0	-3750.0	-247.24	-3137.153	4.135
46	6	0.0	-3750.0	-194.52	-3709.39	8.469
46	7	0.0	-3750.0	-220.642	-2904.849	5.855
46	8	0.0	-3750.0	6.64	-3451.298	13.357
46	9	0.0	-3750.0	81.081	-3581.448	0.237
47	0	0.0	-3750.0	-527.7	-4845.288	-1.517
47	1	0.0	-3750.0	179.023	-4668.14	8.849
47	2	0.0	-3750.0	-498.51	-4232.542	-4.406
47	3	0.0	-3750.0	-638.352	-4481.705	-1.413
47	4	0.0	-3750.0	-292.567	-3833.712	9.23
47	5	0.0	-3750.0	-625.278	-4669.986	-0.793
47	6	0.0	-3750.0	-443.176	-3772.34	1.932
47	7	0.0	-3750.0	-1168.621	-3915.651	10.433
47	8	0.0	-3750.0	-306.157	-4367.193	-0.318
47	9	0.0	-3750.0	-1008.399	-4004.244	2.649
48	0	1082.532	-1875.0	1381.115	-1379.936	-3.014
48	1	1082.532	-1875.0	1754.304	-2457.164	0.79
48	2	1082.532	-1875.0	1802.558	-2762.594	0.659
48	3	1082.532	-1875.0	1827.509	-2164.158	11.755
48	4	1082.532	-1875.0	1147.516	-1777.569	0.931
48	5	1082.532	-1875.0	1414.859	-2099.297	5.778
48	6	1082.532	-1875.0	1730.011	-1773.511	3.902
48	7	1082.532	-1875.0	1170.157	-1739.27	1.027
48	8	1082.532	-1875.0	1661.285	-2169.467	7.248
48	9	1082.532	-1875.0	1618.704	-1979.608	8.77
49	0	1082.532	-1875.0	905.365	-1413.556	0.97
49	1	1082.532	-1875.0	414.352	-1161.465	0.035
49	2	1082.532	-1875.0	1107.619	-1594.74	10.524
49	3	1082.532	-1875.0	-47.201	-1841.991	-2.526
49	4	1082.532	-1875.0	1309.678	-1409.147	-2.414
49	5	1082.532	-1875.0	1167.426	-1664.122	2.51
49	6	1082.532	-1875.0	1363.692	-807.671	-0.903
49	7	1082.532	-1875.0	1365.979	-1317.221	-9.393
49	8	1082.532	-1875.0	1016.235	-1731.193	16.866
49	9	1082.532	-1875.0	1069.808	-1771.367	15.169
50	0	1082.532	-1875.0	875.751	-3044.798	2.721
50	1	1082.532	-1875.0	755.076	-2099.607	2.654
50	2	1082.532	-1875.0	913.521	-1938.527	10.781
50	3	1082.532	-1875.0	982.563	-1957.7	15.865
50	4	1082.532	-1875.0	-23.339	-2016.139	-4.205
50	5	1082.532	-1875.0	214.124	-2272.908	-2.364
50	6	1082.532	-1875.0	1186.103	-2080.141	1.982
50	7	1082.532	-1875.0	1040.284	-1895.936	11.414
50	8	1082.532	-1875.0	389.16	-2174.125	0.573
50	9	1082.532	-1875.0	1517.828	-2668.641	-7.173
51	0	2165.064	-3750.0	3102.937	-4097.572	-0.512
51	1	2165.064	-3750.0	2386.898	-3939.21	9.2
51	2	2165.064	-3750.0	3212.811	-4234.993	-0.156
51	3	2165.064	-3750.0	2697.935	-2861.474	3.453
51	4	2165.064	-3750.0	2657.232	-3213.703	-2.681
51	5	2165.064	-3750.0	2431.855	-3867.236	11.561

51	6	2165.064	-3750.0	2899.072	-3943.745	-4.443
51	7	2165.064	-3750.0	2861.506	-4550.095	5.398
51	8	2165.064	-3750.0	2867.926	-2892.563	12.626
51	9	2165.064	-3750.0	2232.268	-3694.725	9.493
52	0	2165.064	-3750.0	1460.845	-3684.409	-0.393
52	1	2165.064	-3750.0	2132.731	-3063.446	7.855
52	2	2165.064	-3750.0	1365.471	-3395.859	0.355
52	3	2165.064	-3750.0	1832.062	-3473.264	5.193
52	4	2165.064	-3750.0	1400.743	-3100.064	-2.54
52	5	2165.064	-3750.0	2050.492	-3710.477	7.421
52	6	2165.064	-3750.0	1445.353	-3265.284	-5.674
52	7	2165.064	-3750.0	2244.209	-2644.091	-5.801
52	8	2165.064	-3750.0	1734.037	-3214.584	-3.045
52	9	2165.064	-3750.0	2018.307	-2556.56	-4.802
53	0	2165.064	-3750.0	2413.001	-4410.429	-3.22
53	1	2165.064	-3750.0	2058.187	-4922.428	-1.728
53	2	2165.064	-3750.0	2116.957	-3907.303	13.667
53	3	2165.064	-3750.0	1308.596	-3888.317	-5.523
53	4	2165.064	-3750.0	2657.269	-4829.53	0.552
53	5	2165.064	-3750.0	1586.435	-4046.805	3.265
53	6	2165.064	-3750.0	1736.919	-4860.468	-0.53
53	7	2165.064	-3750.0	2182.03	-4767.88	2.694
53	8	2165.064	-3750.0	1853.401	-4268.36	10.517
53	9	2165.064	-3750.0	1359.515	-4438.015	2.714
54	0	3247.595	-1875.0	3841.354	-1398.428	-0.401
54	1	3247.595	-1875.0	3972.564	-2626.767	-3.288
54	2	3247.595	-1875.0	4205.84	-1120.373	-4.462
54	3	3247.595	-1875.0	4360.154	-2278.838	-0.038
54	4	3247.595	-1875.0	3412.213	-1862.83	9.917
54	5	3247.595	-1875.0	3735.18	-1736.079	0.071
54	6	3247.595	-1875.0	3799.09	-1187.829	-3.854
54	7	3247.595	-1875.0	3549.731	-2185.353	5.387
54	8	3247.595	-1875.0	3663.105	-1756.958	14.669
54	9	3247.595	-1875.0	3910.4	-1586.218	4.998
55	0	3247.595	-1875.0	3273.242	-812.998	-1.719
55	1	3247.595	-1875.0	2312.462	-1223.418	1.074
55	2	3247.595	-1875.0	3191.983	-1431.645	3.333
55	3	3247.595	-1875.0	3156.073	-1632.274	8.739
55	4	3247.595	-1875.0	3199.669	-1870.054	1.227
55	5	3247.595	-1875.0	3005.335	-902.139	5.775
55	6	3247.595	-1875.0	3270.718	-1660.976	5.005
55	7	3247.595	-1875.0	3436.8	-1323.981	3.754
55	8	3247.595	-1875.0	3108.55	-1198.235	9.803
55	9	3247.595	-1875.0	3358.347	-1350.001	-4.982
56	0	3247.595	-1875.0	2697.951	-2148.471	6.341
56	1	3247.595	-1875.0	3205.99	-2480.547	0.151
56	2	3247.595	-1875.0	2954.706	-2072.013	14.792
56	3	3247.595	-1875.0	3176.999	-2199.918	7.249
56	4	3247.595	-1875.0	3080.936	-1969.485	14.491
56	5	3247.595	-1875.0	3689.527	-2981.943	-1.284
56	6	3247.595	-1875.0	3060.947	-2014.546	15.46
56	7	3247.595	-1875.0	3675.766	-2830.378	-2.664

56	8	3247.595	-1875.0	3492.249	-2908.167	3.119
56	9	3247.595	-1875.0	2163.849	-2319.541	-2.95

Appendix B: FER vs SINR for Forward Link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SNR (dB)
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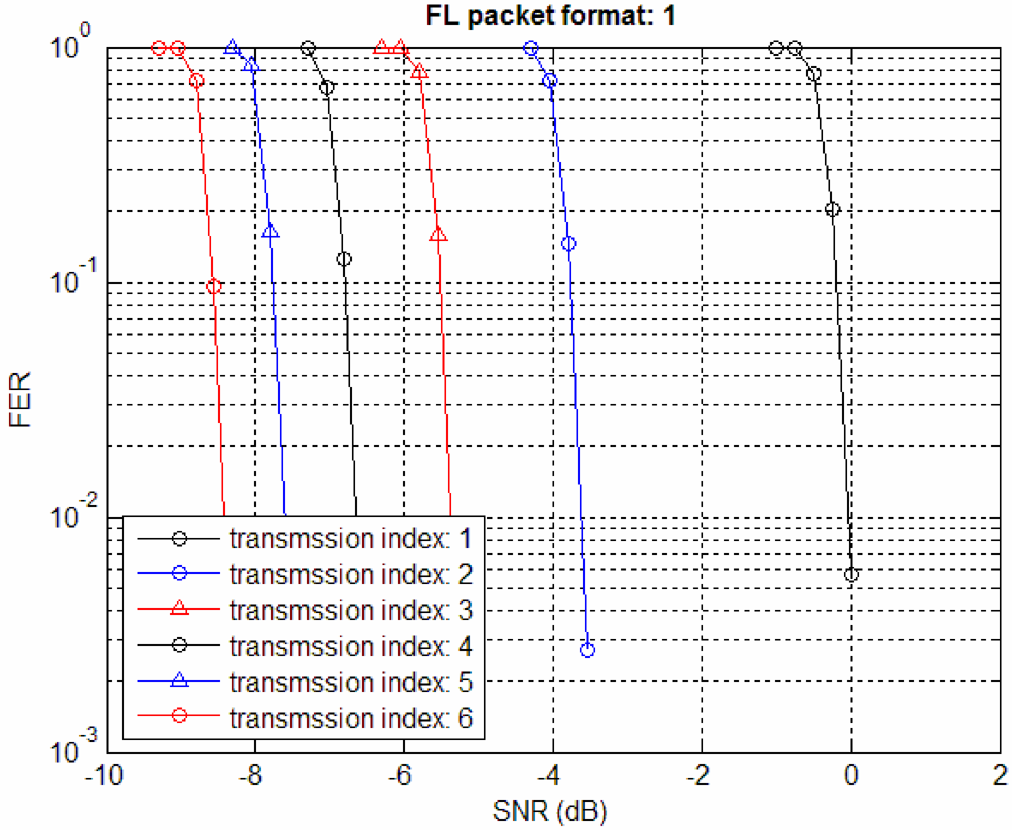
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6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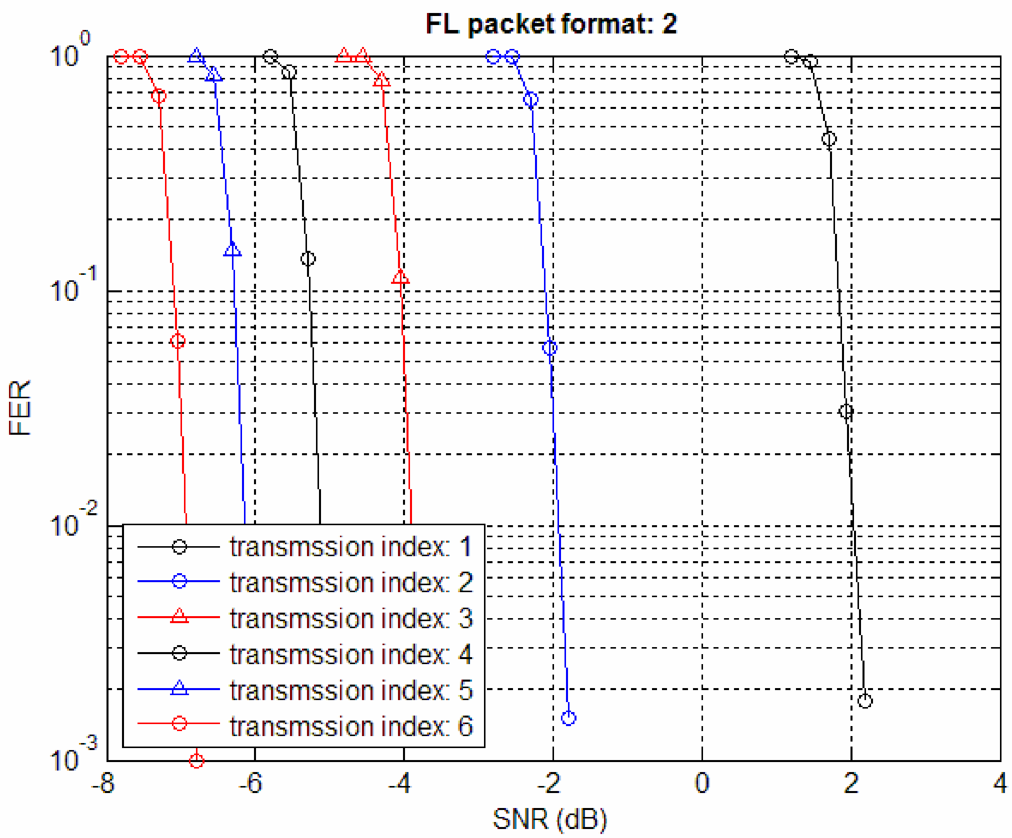
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SNR (dB)
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transmssion index: 2
transmssion index: 3
transmssion index: 4
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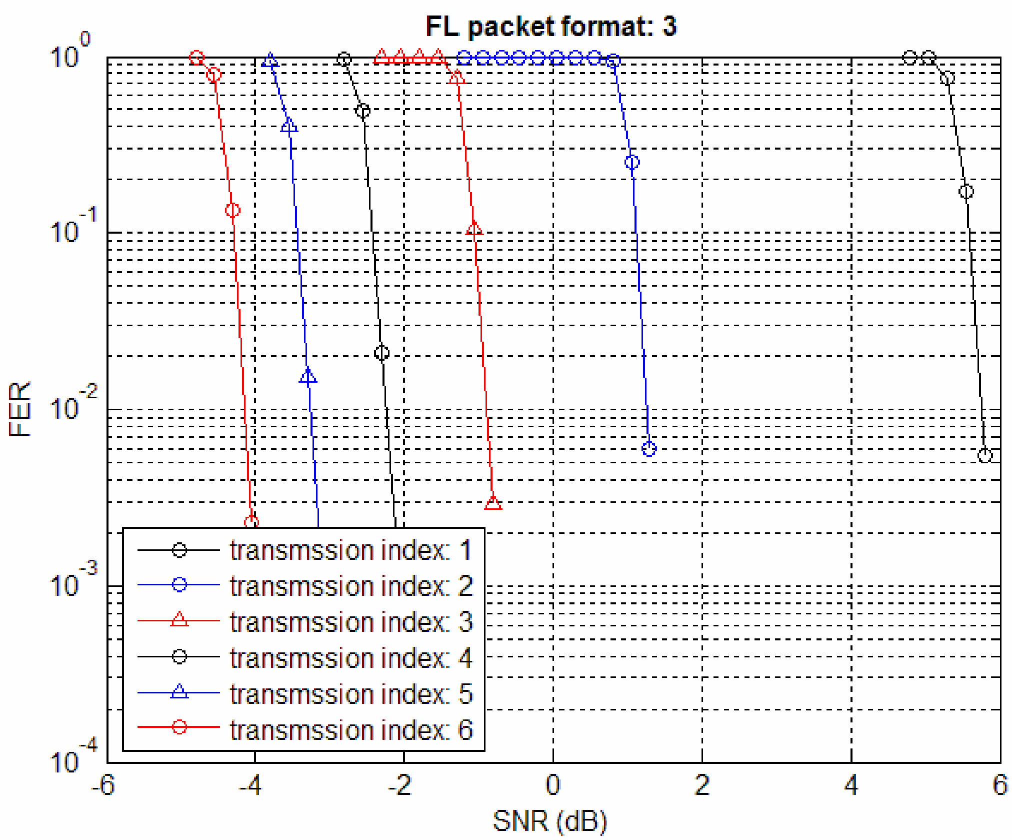
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SNR (dB)
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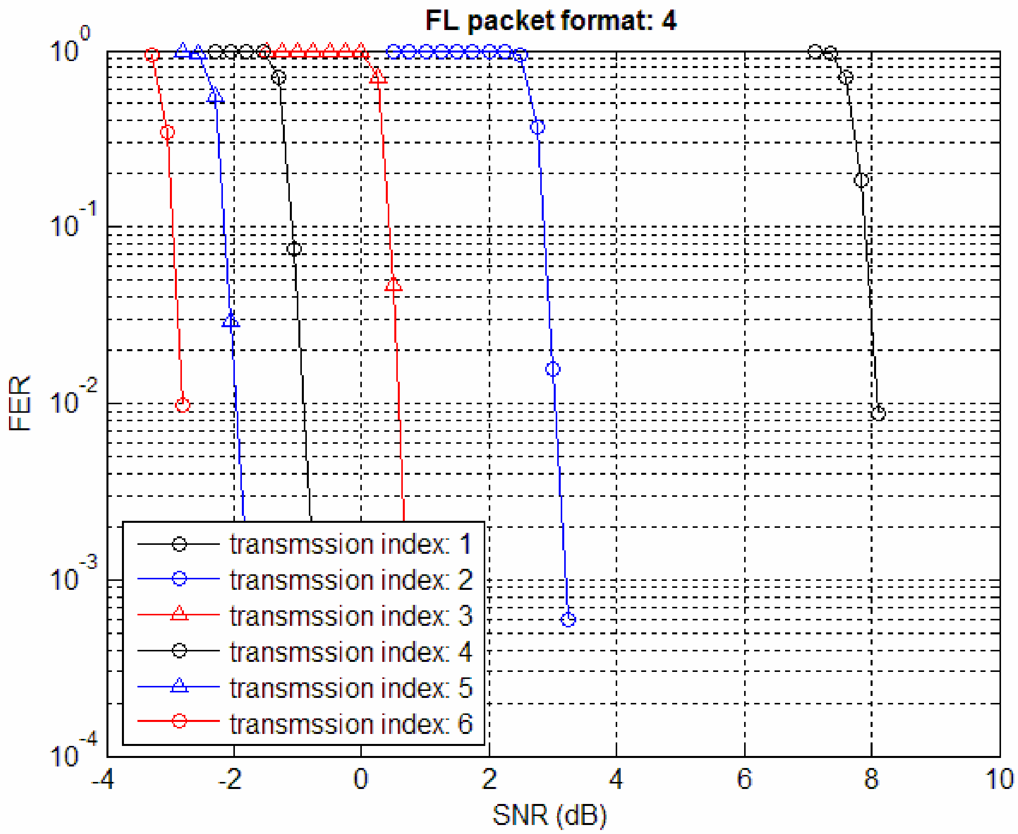
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6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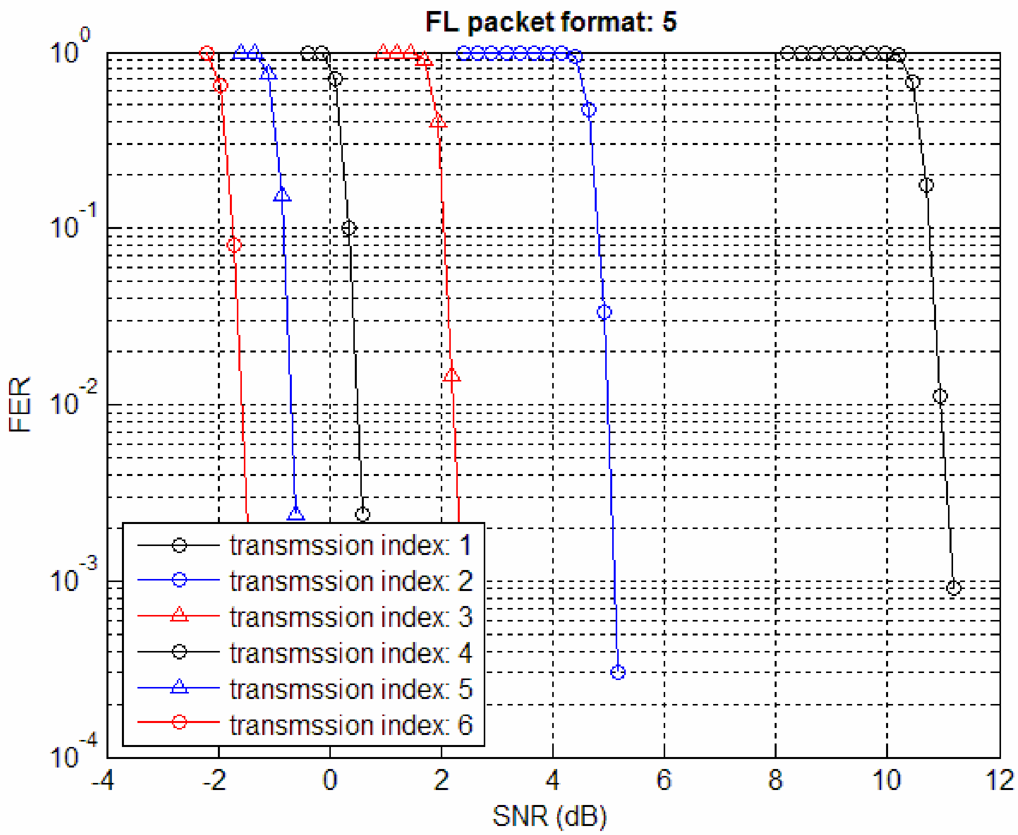
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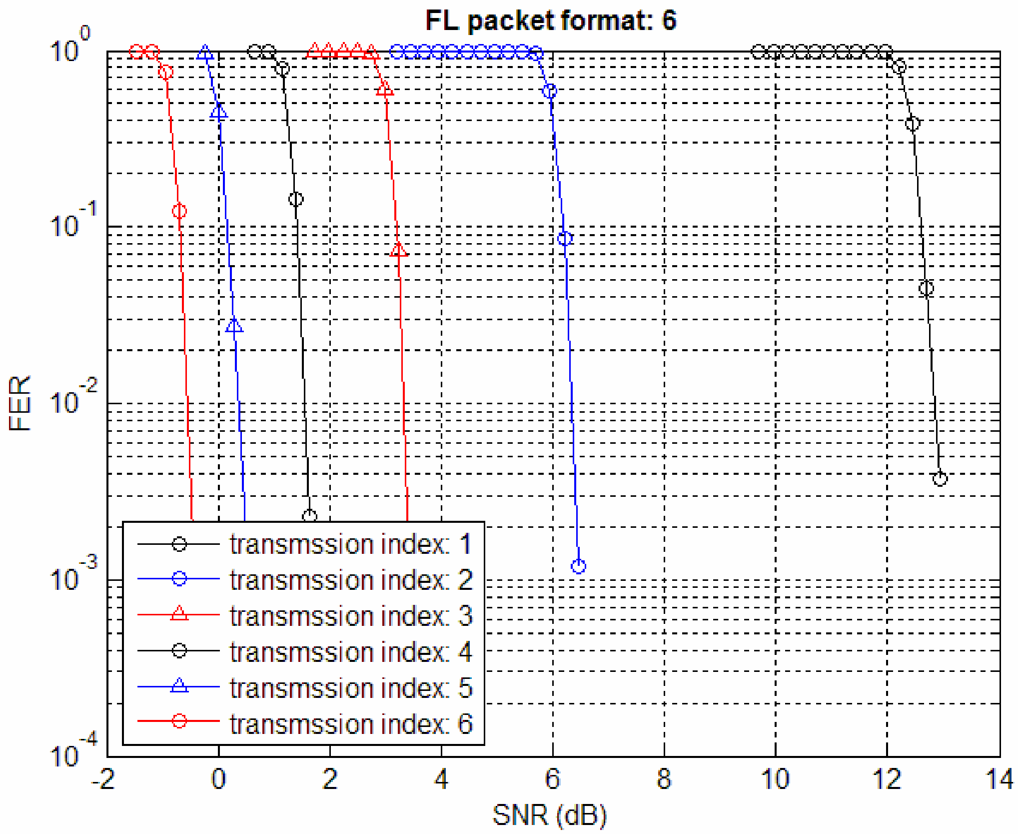
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SNR (dB)
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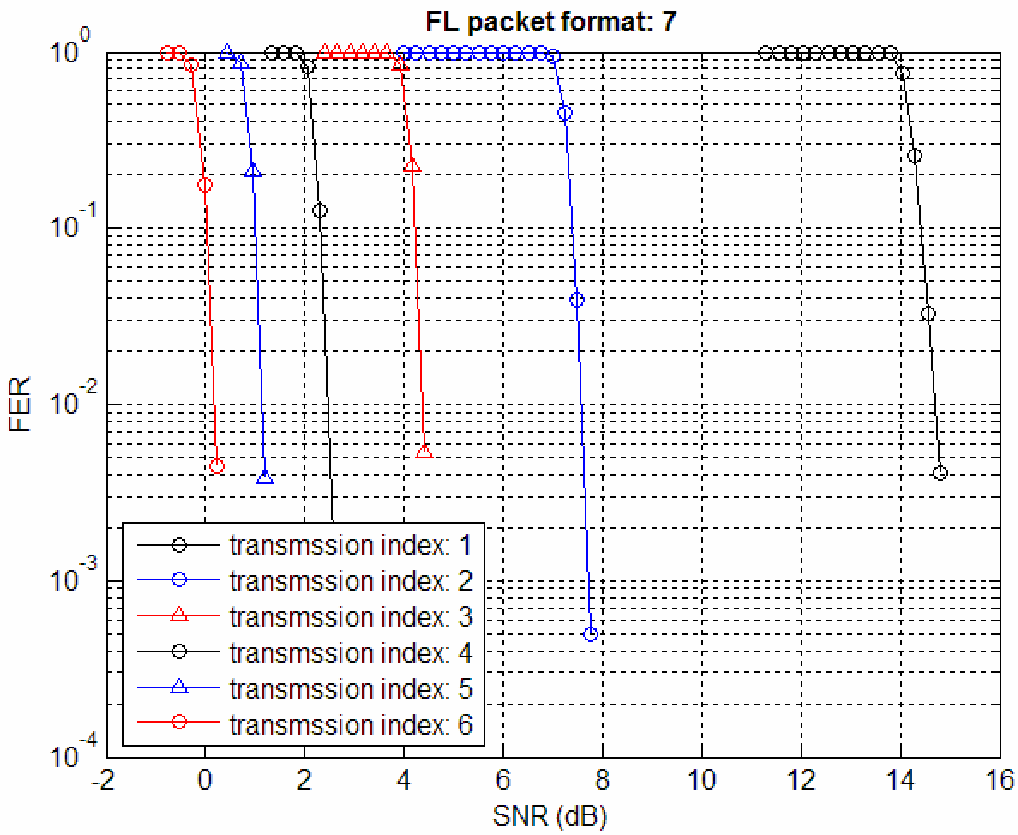
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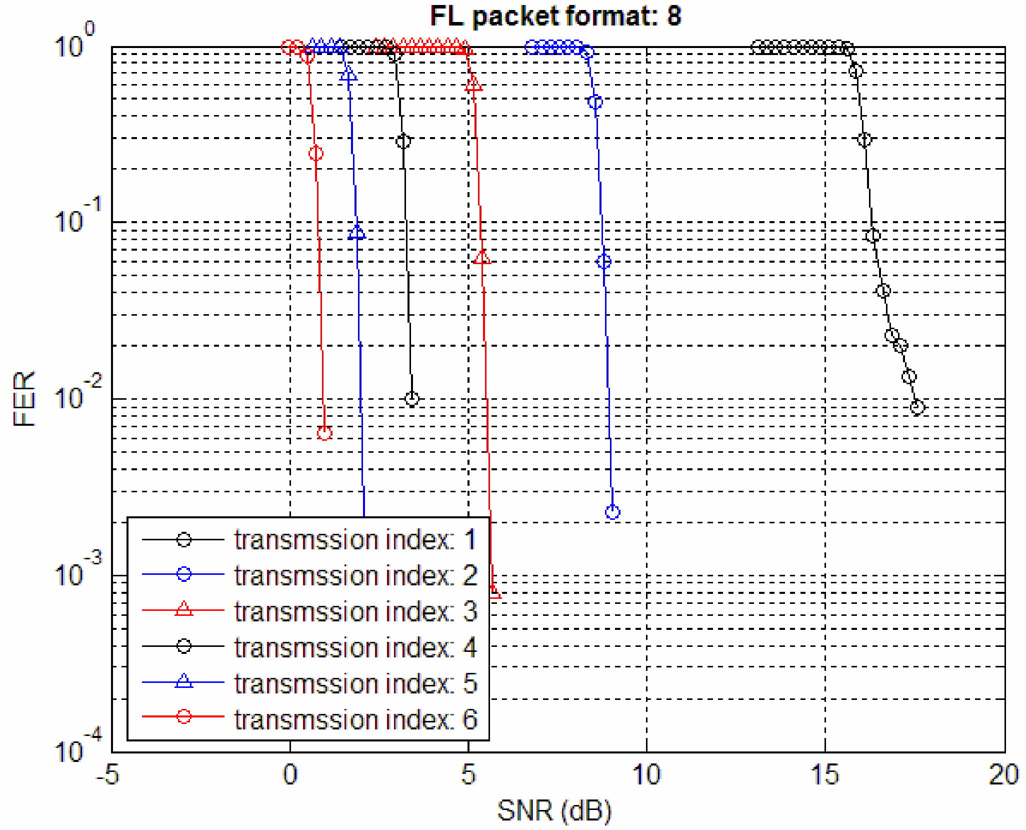
transmssion index: 6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SNR (dB)
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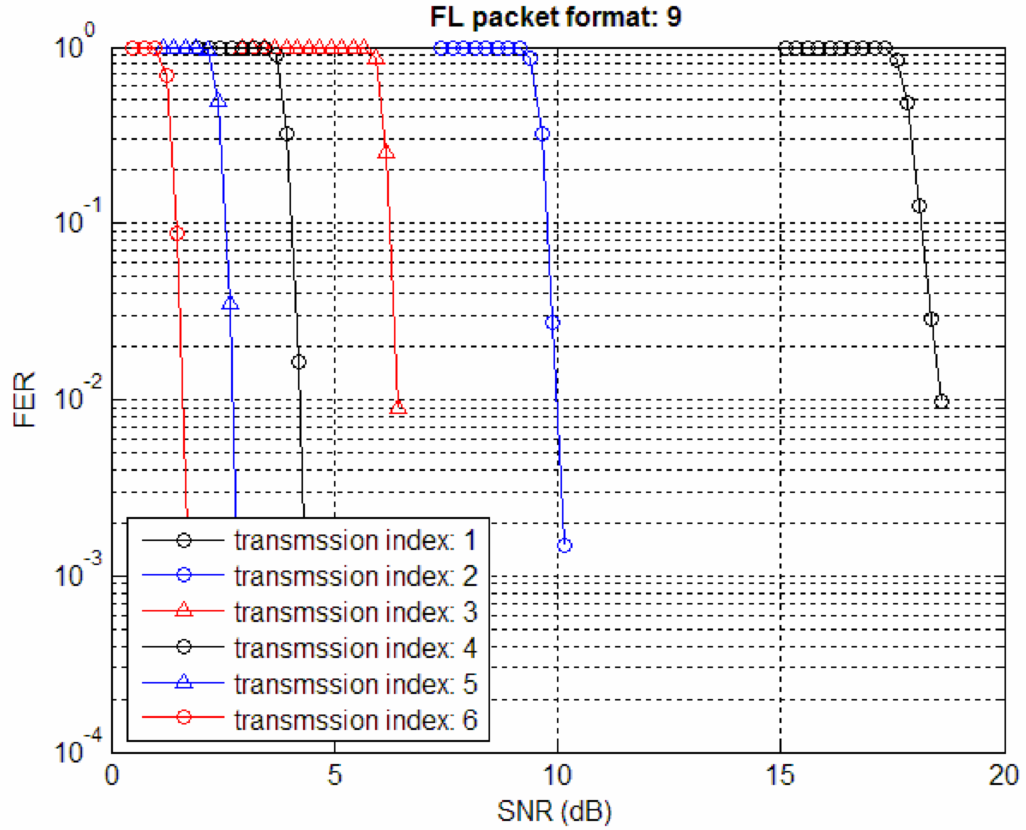
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6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SNR (dB)
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transmssion index: 4
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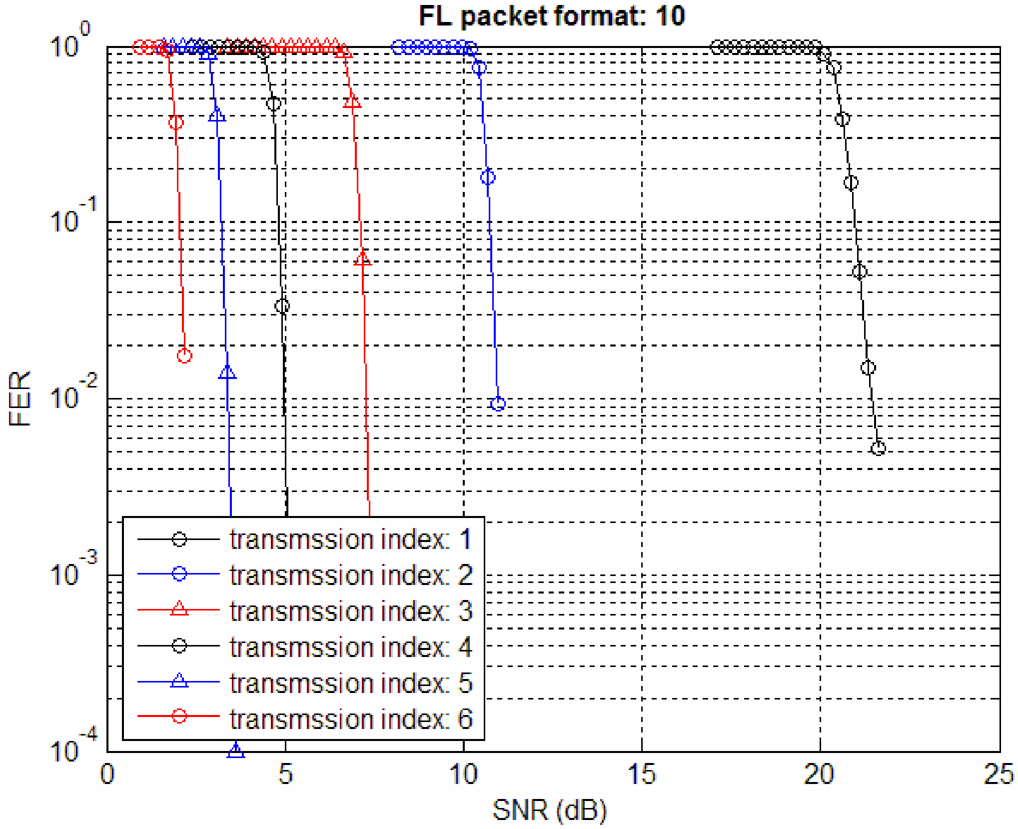
transmssion index: 6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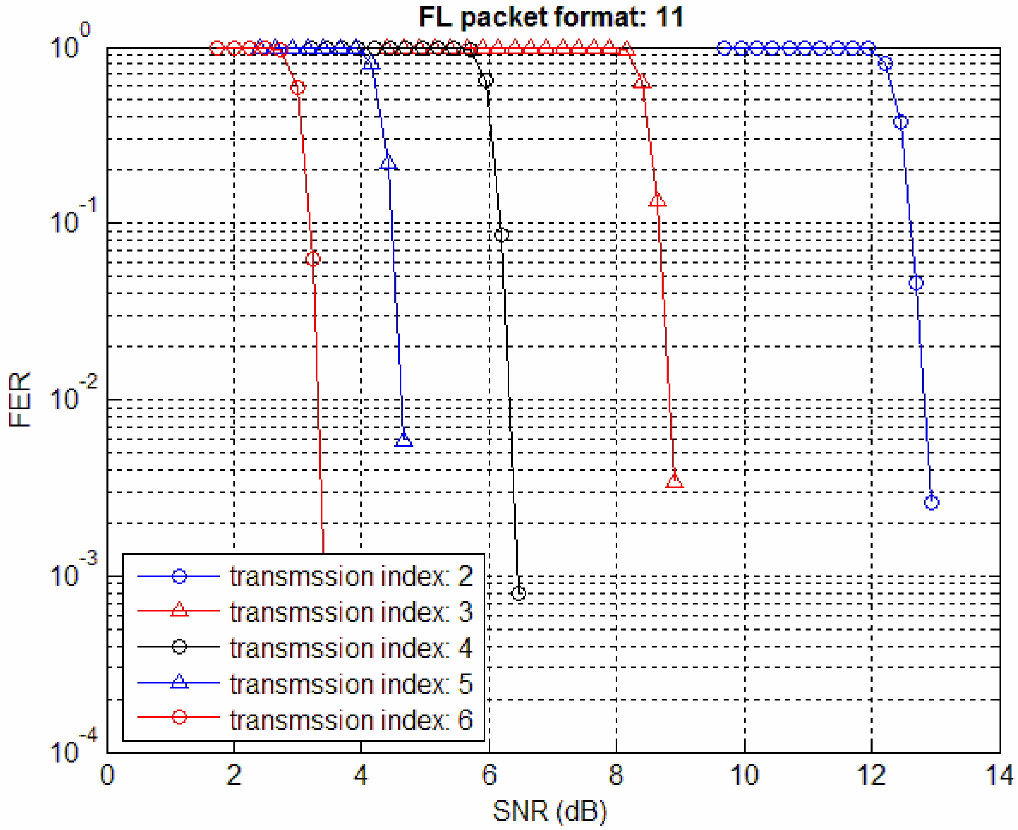
transmssion index: 6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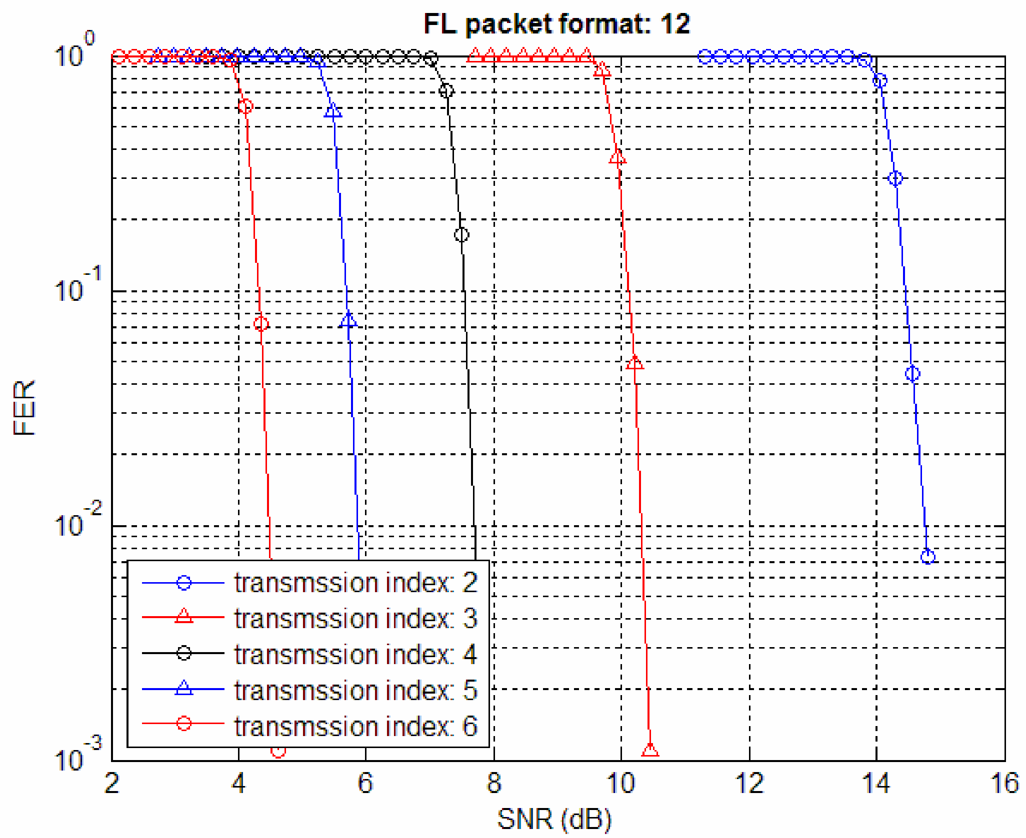
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SNR (dB)
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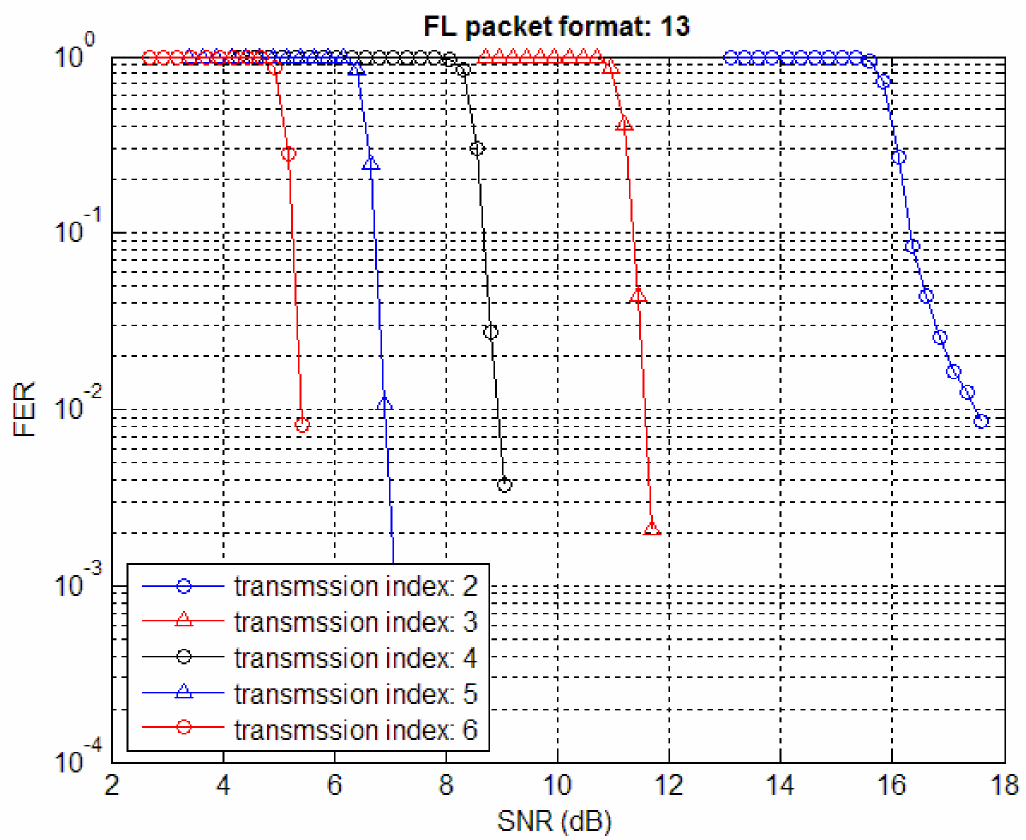
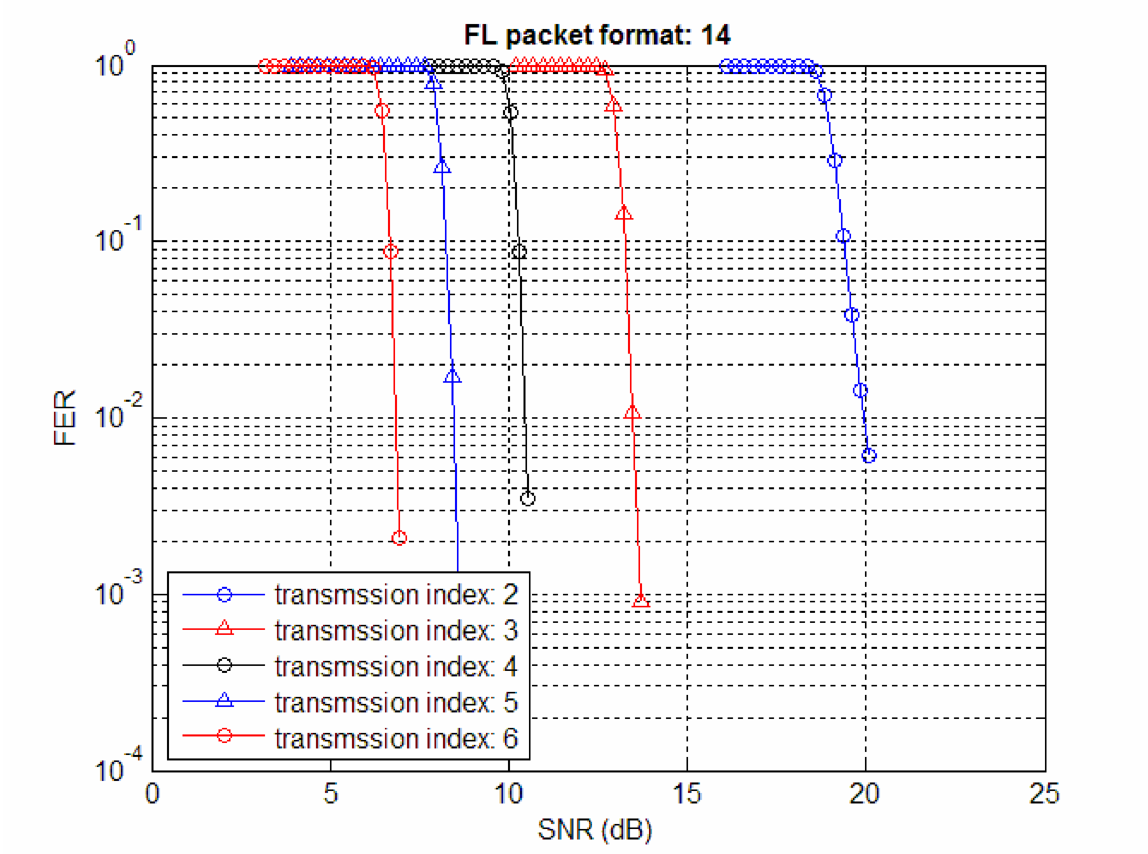
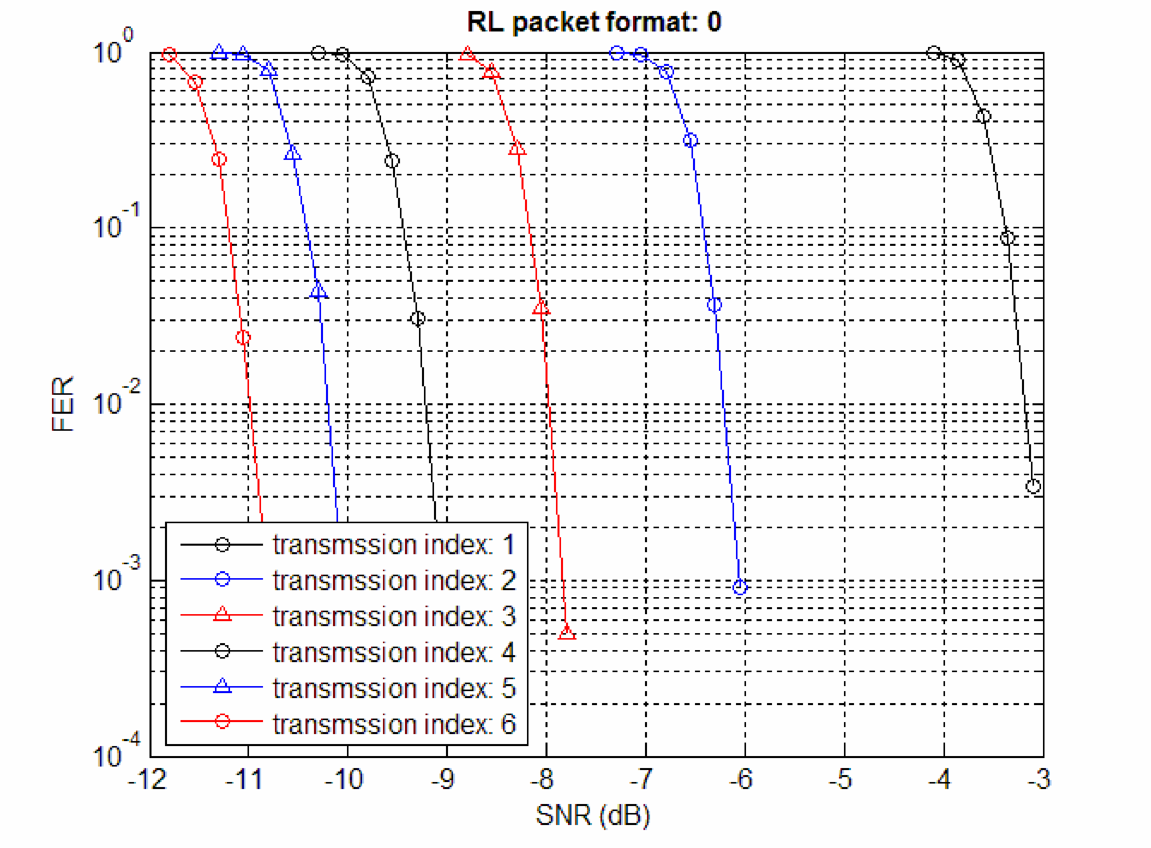
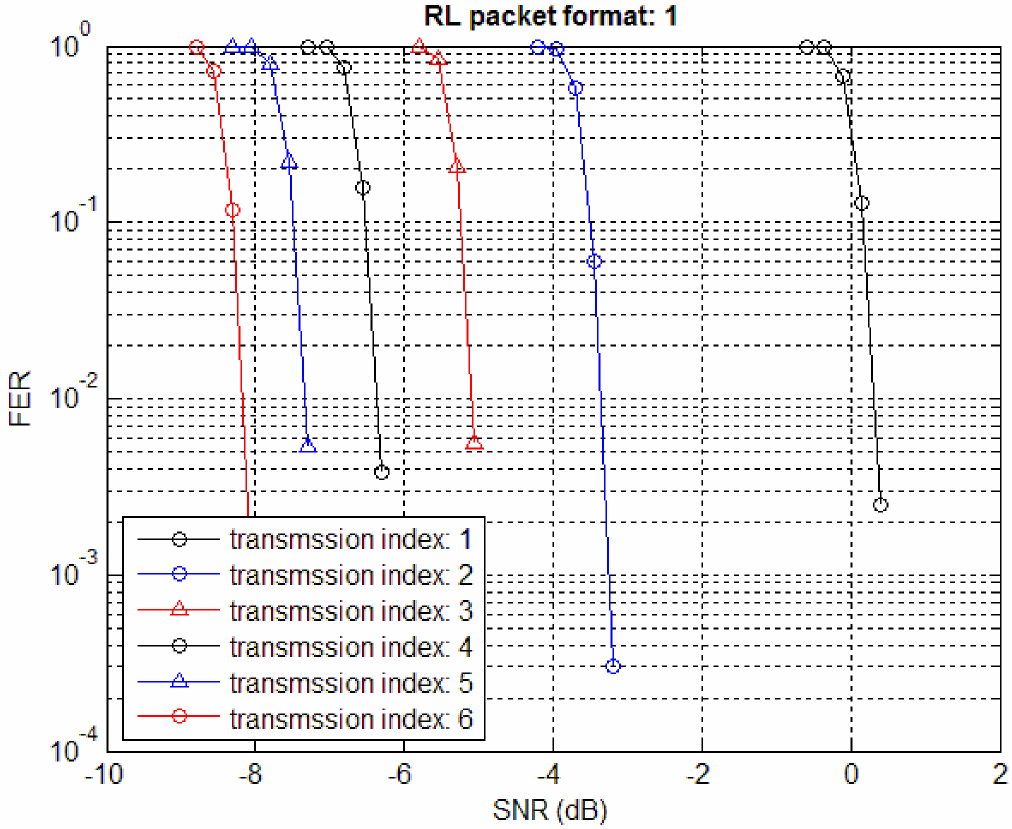
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

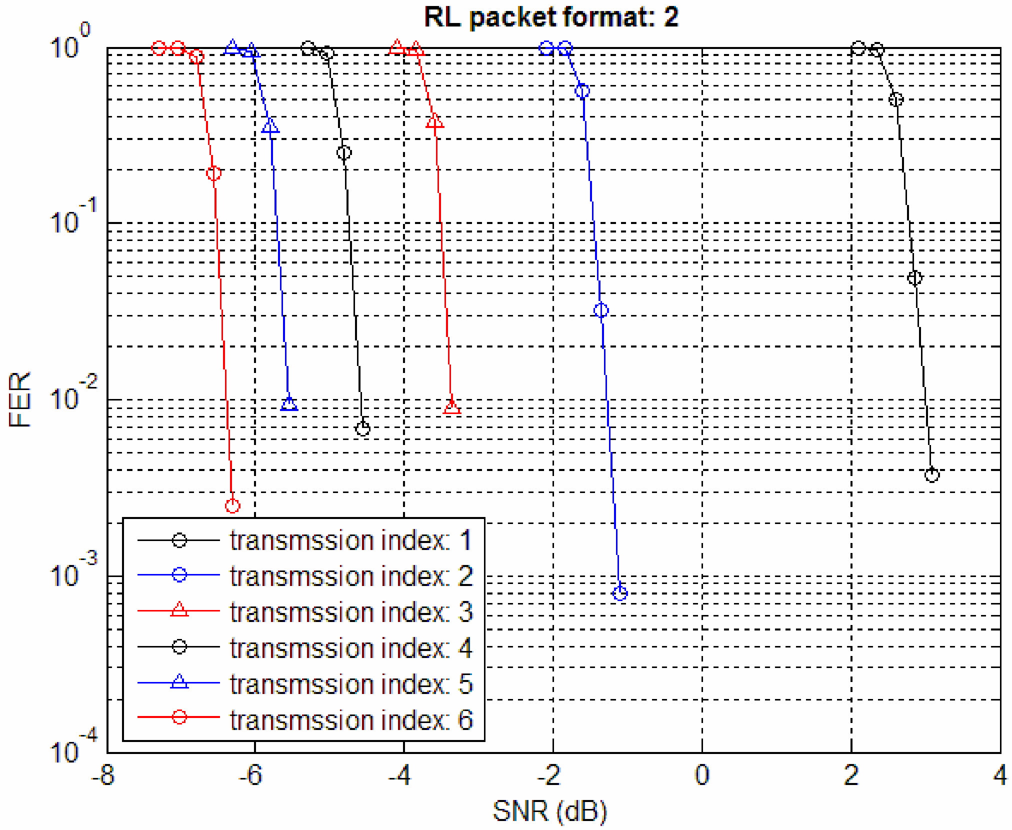

FL packet format: 13
FER
SNR (dB)
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

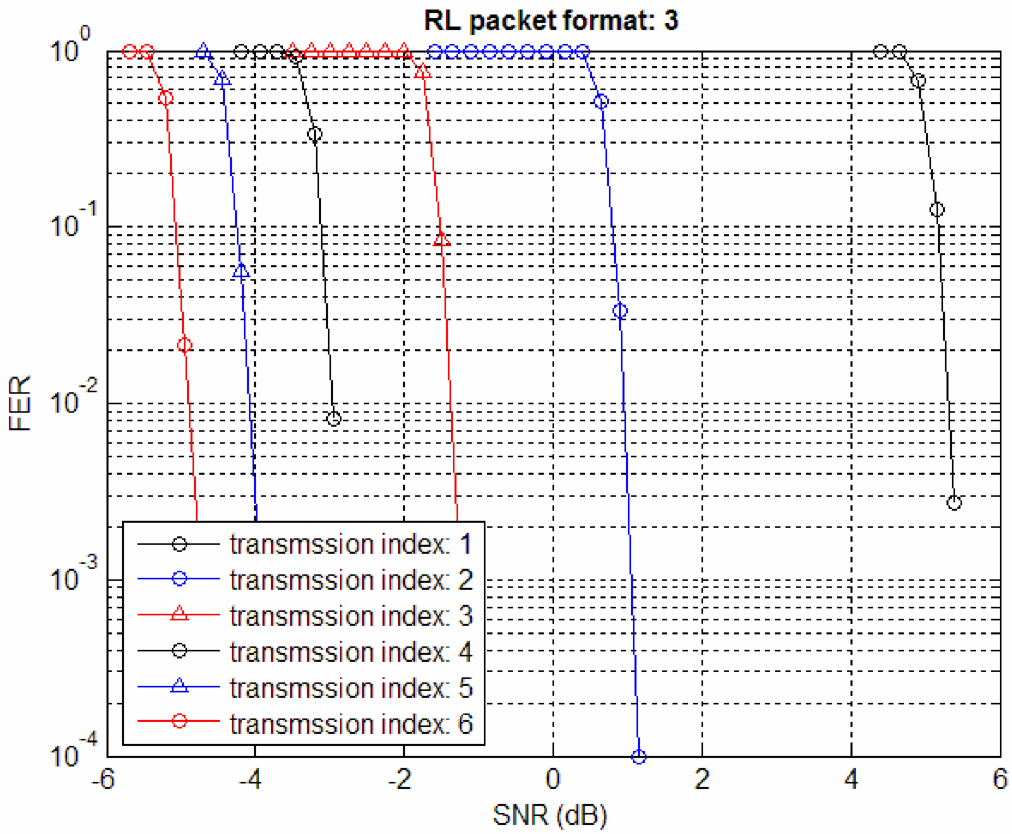

FL packet format: 14
FER
SNR (dB)
10^0
10^-1
10^-2
10^-3
10^-4
0
5
10
15
20
25
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

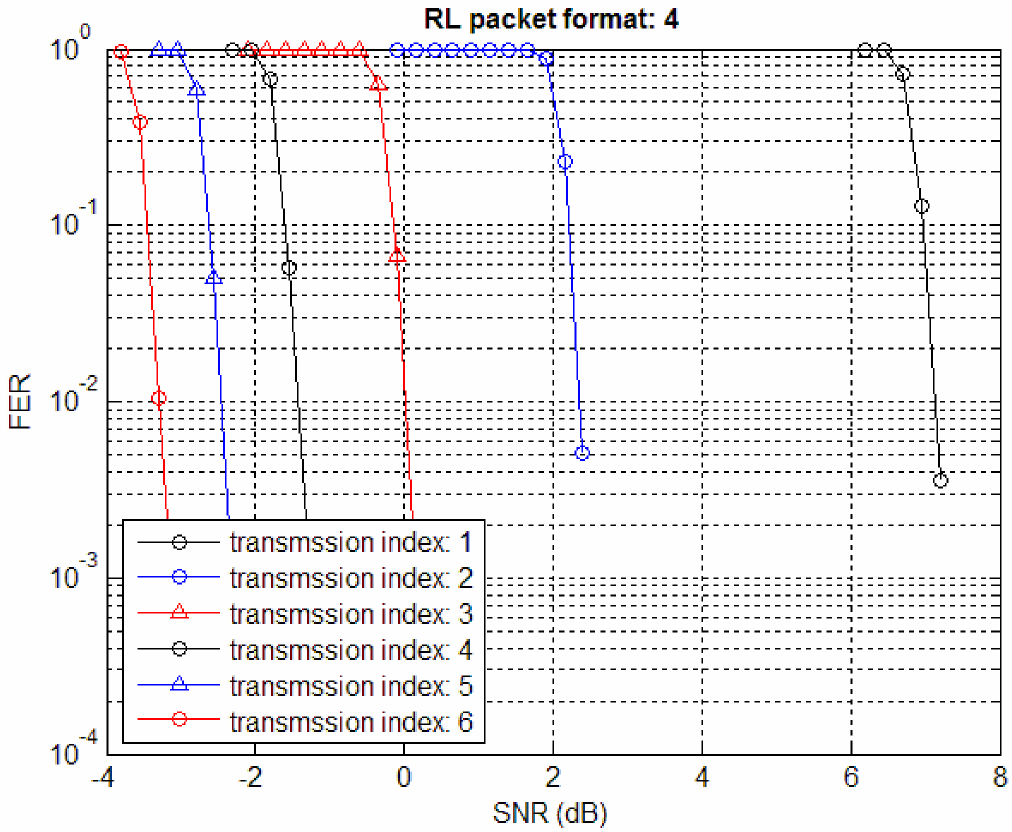
Appendix C: FER vs SINR for Reverse Link

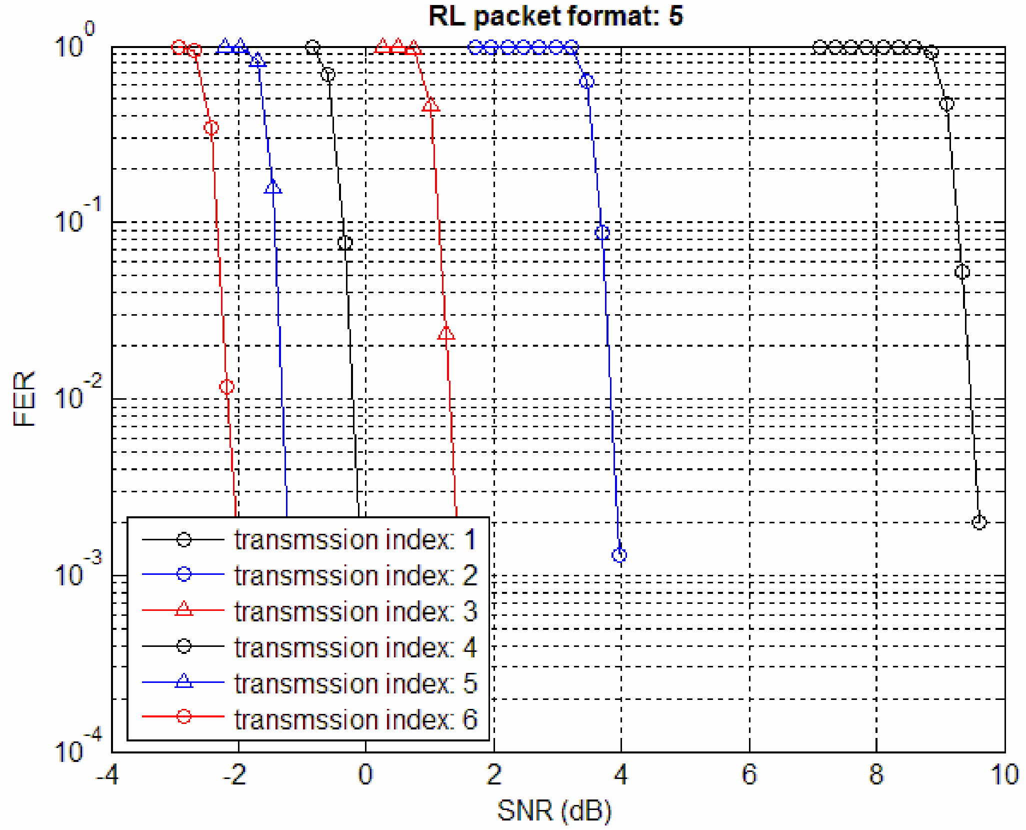


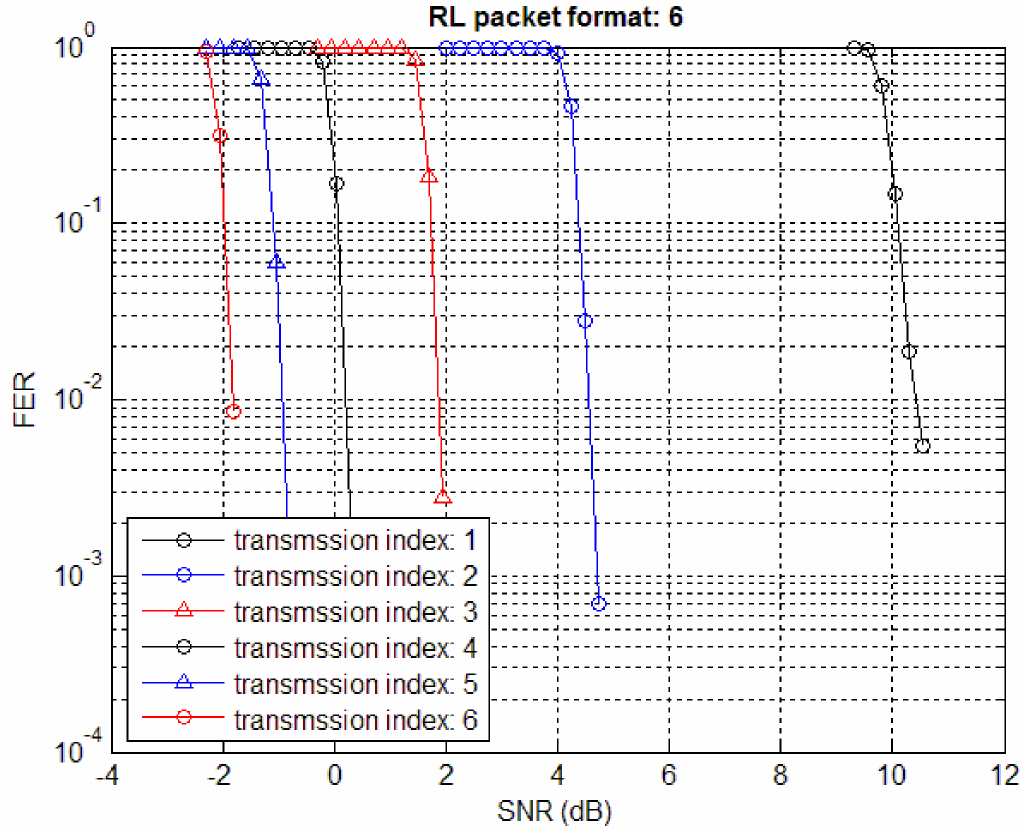

RL packet format: 1
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

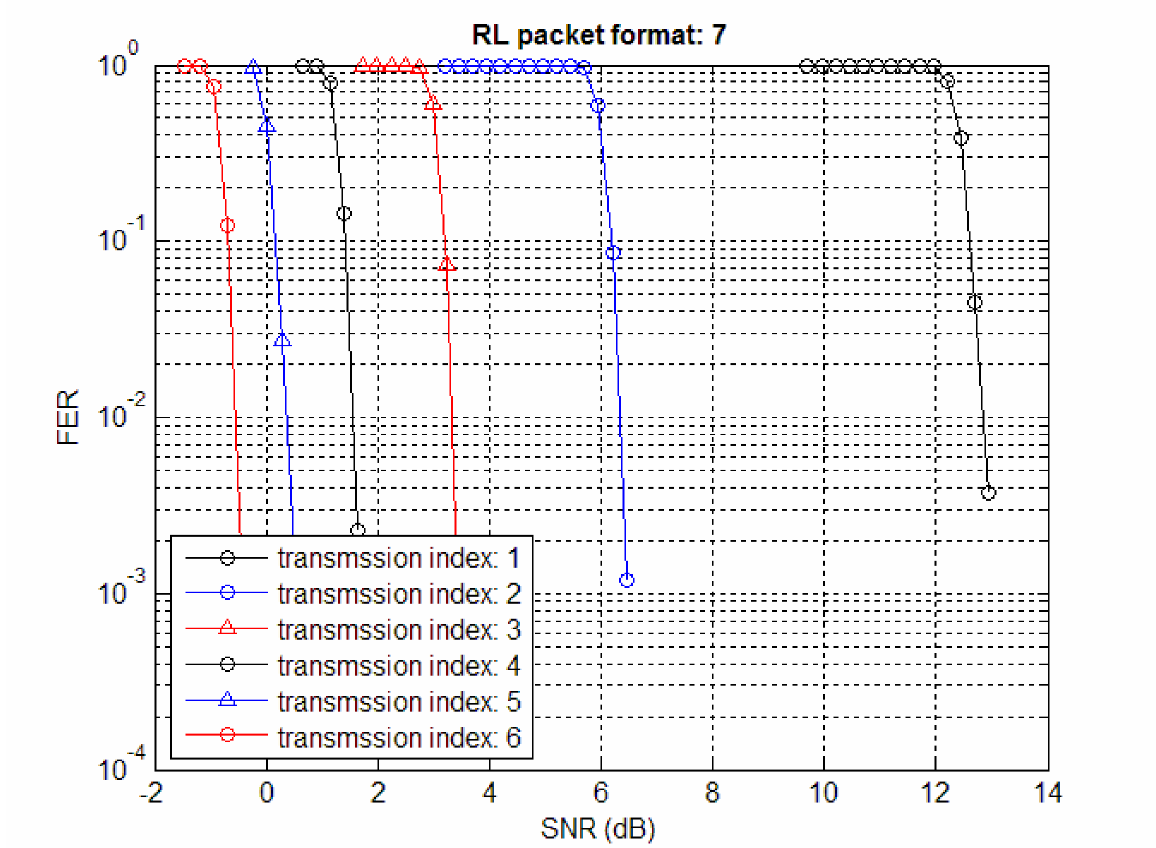

RL packet format: 2
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

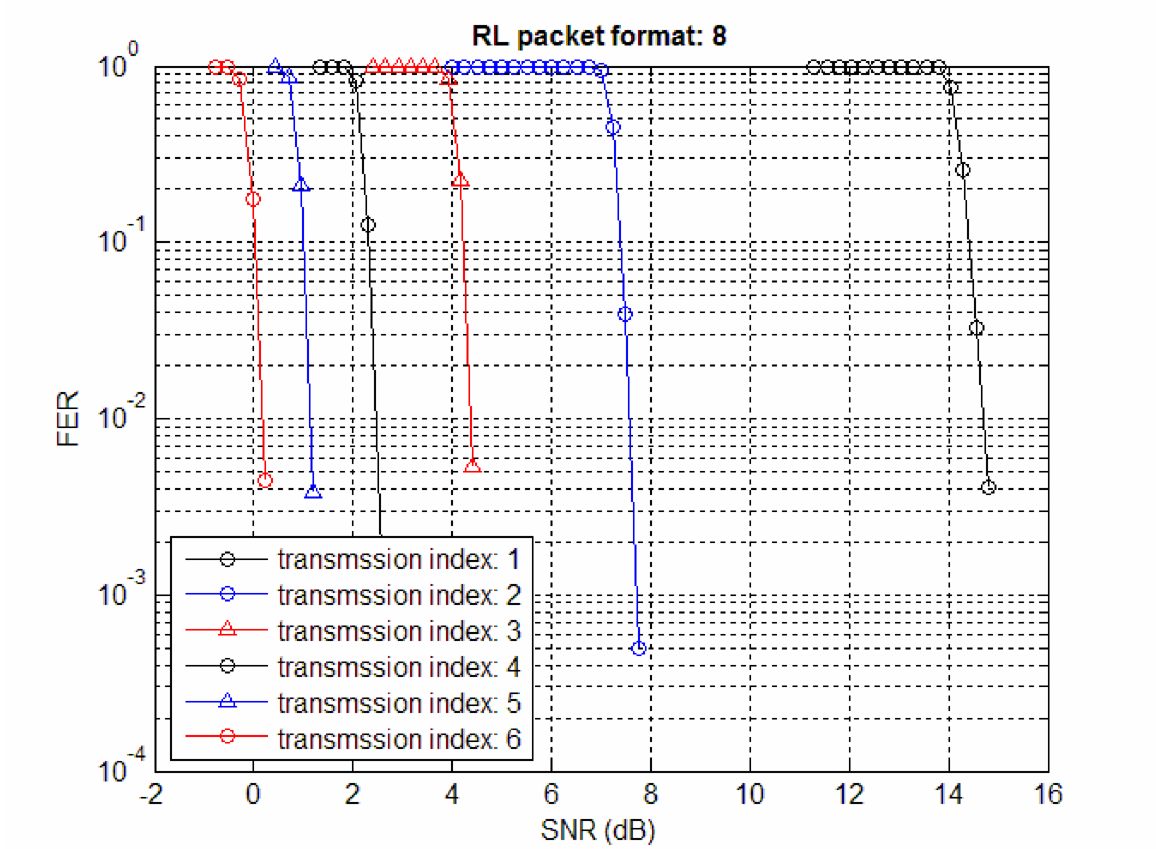

RL packet format: 3
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

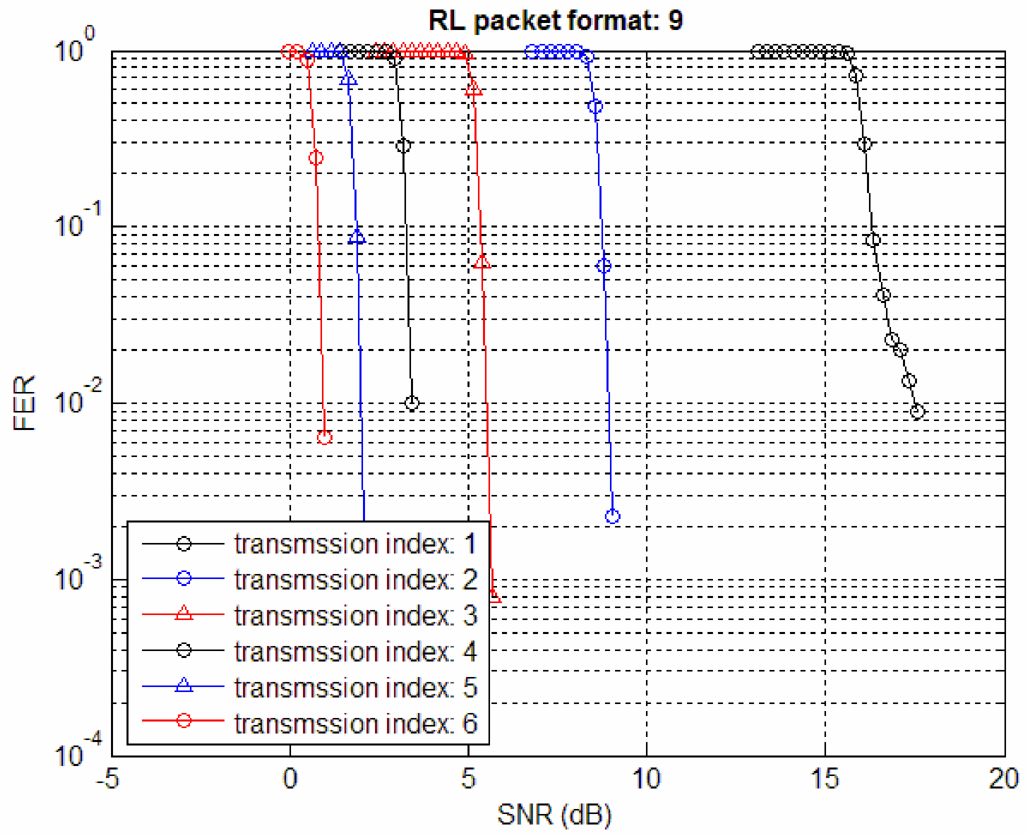

RL packet format: 4
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

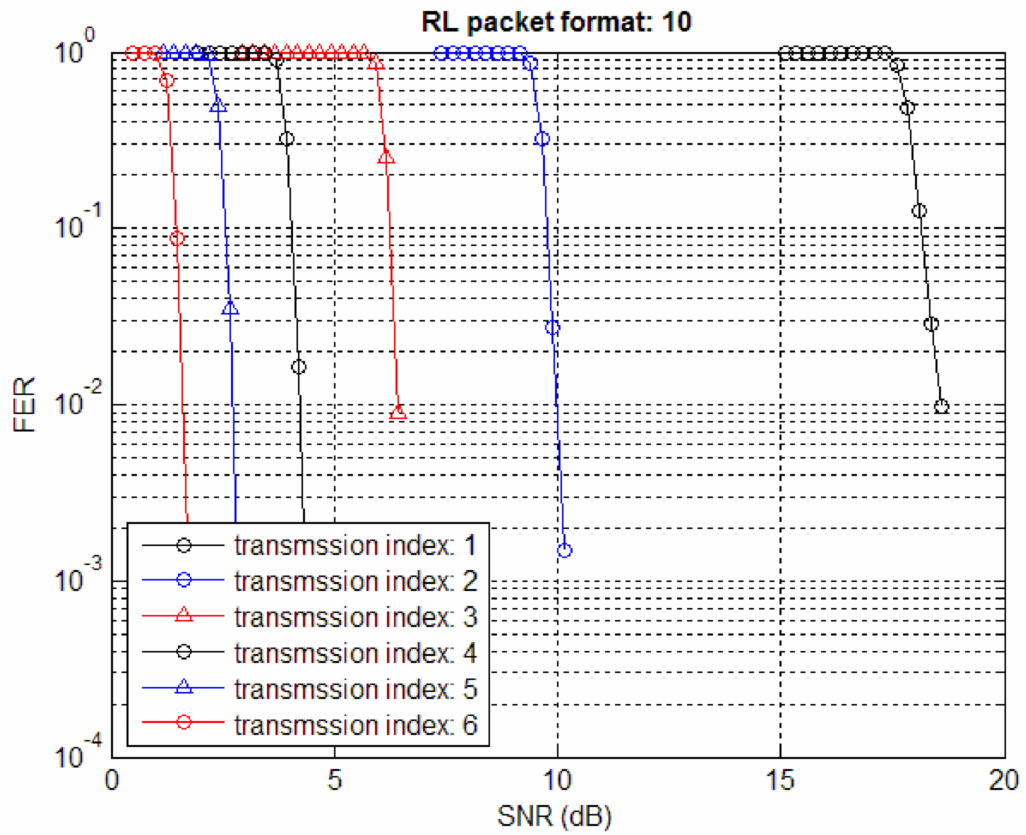

RL packet format: 5
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

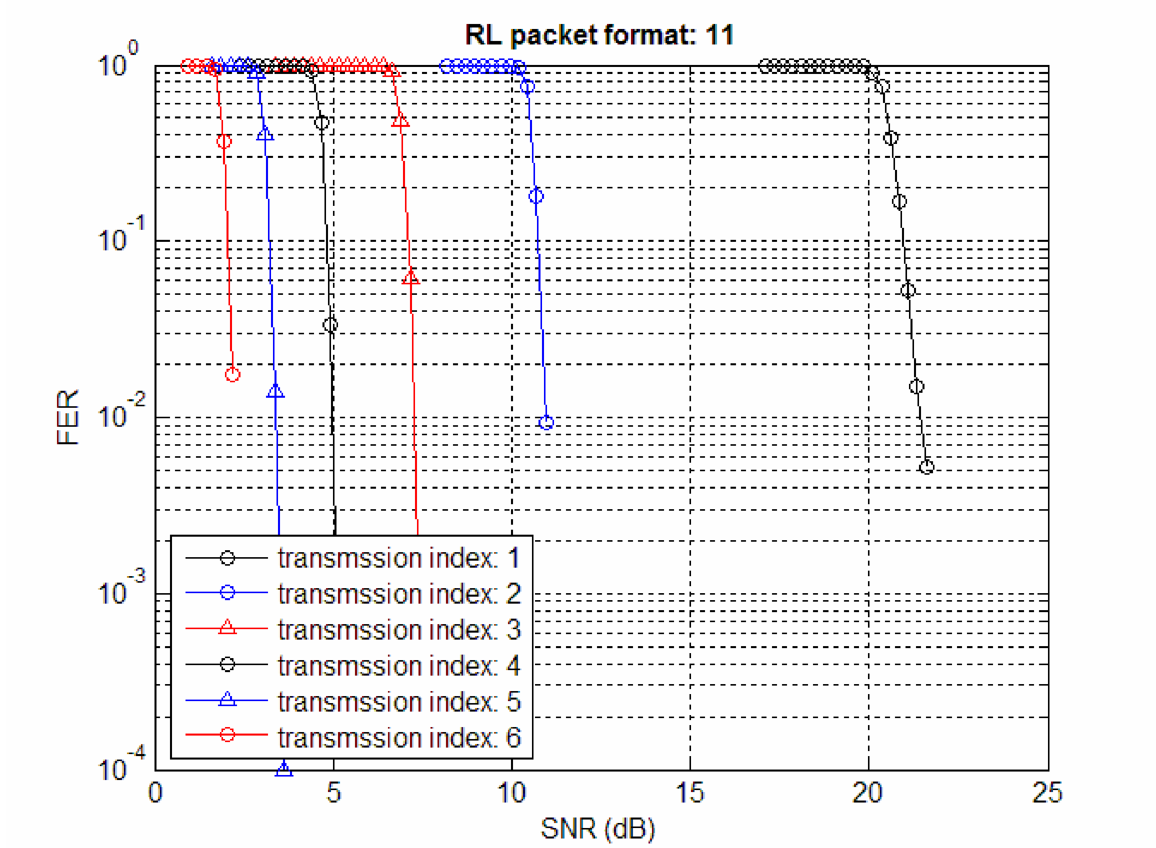

RL packet format: 6
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

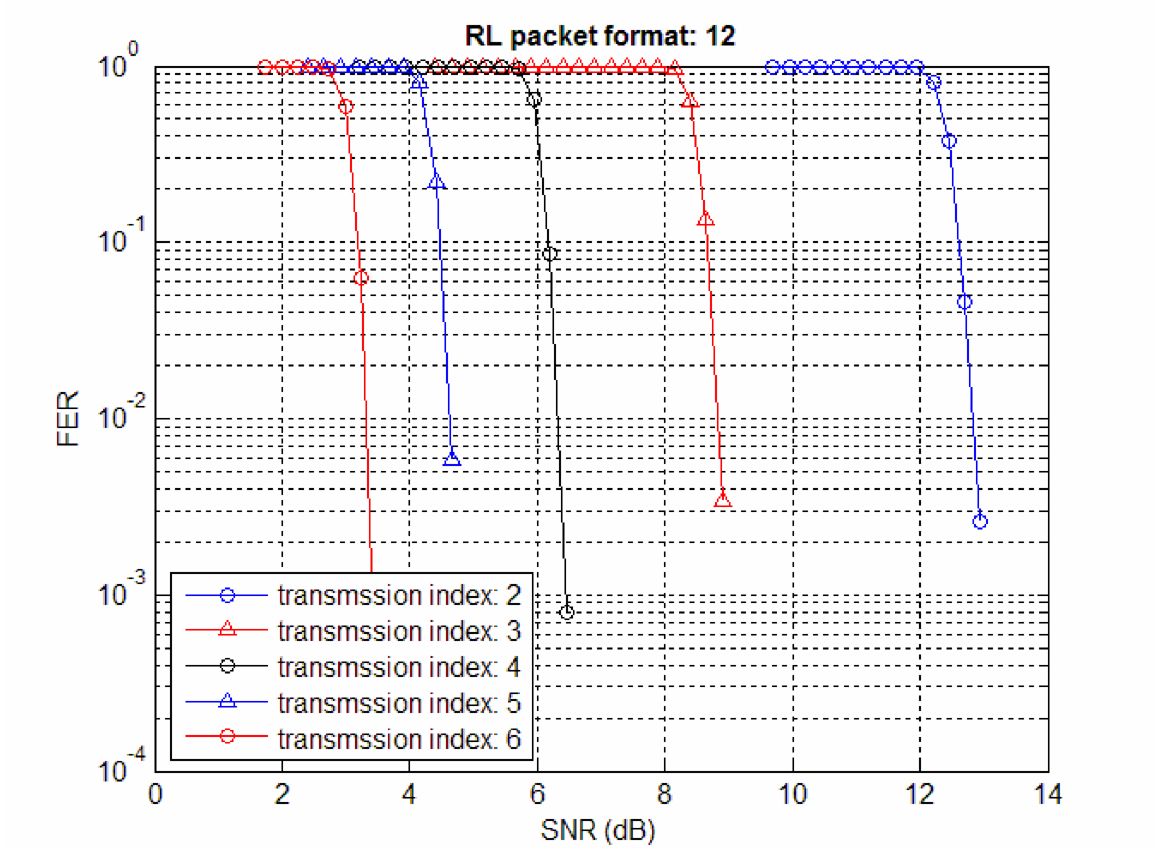

RL packet format: 7
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

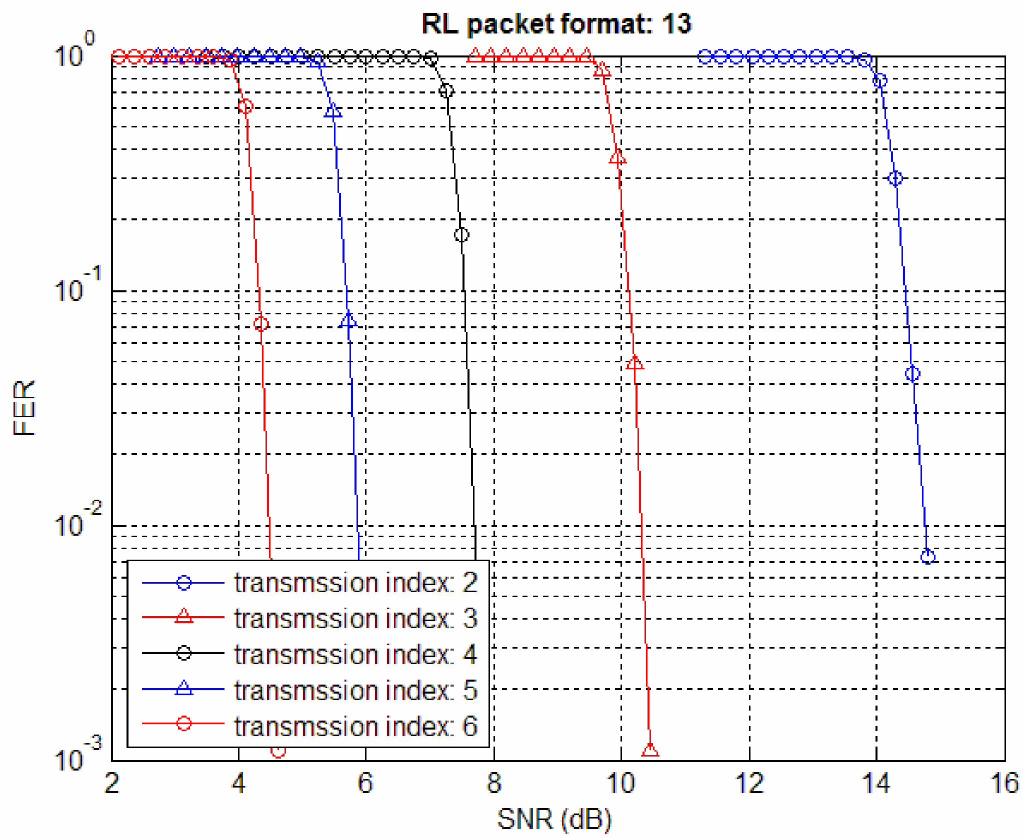

RL packet format: 8
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

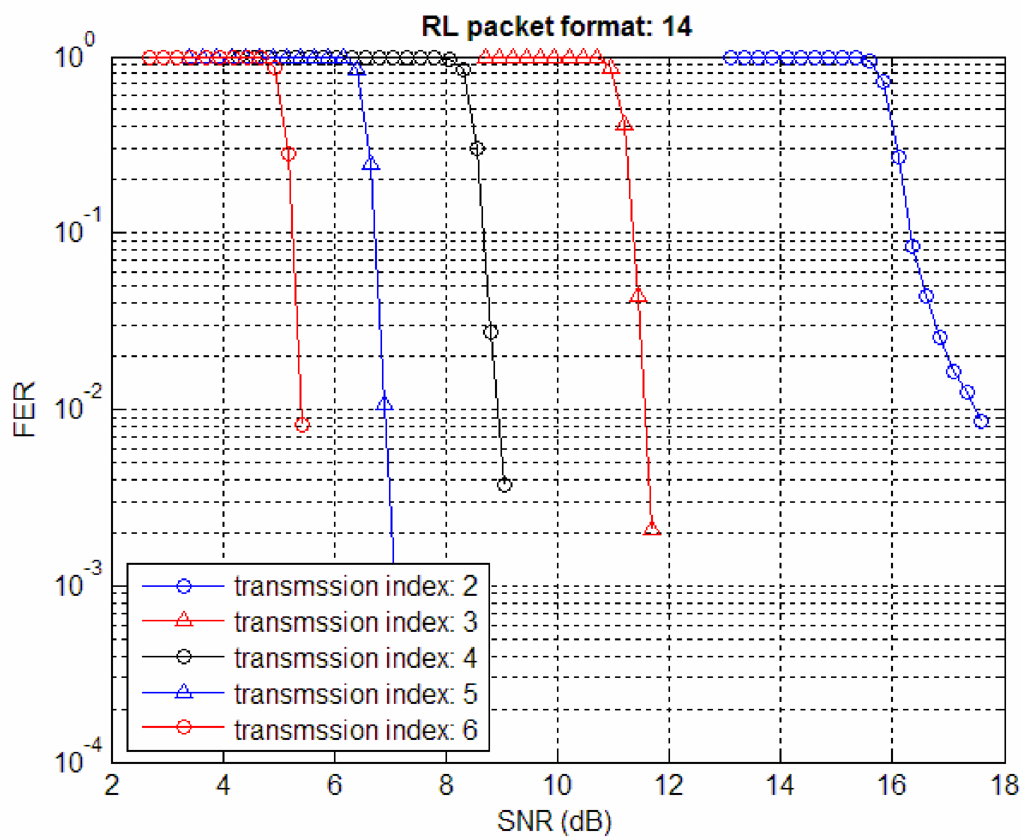

RL packet format: 9
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6


RL packet format: 10
FER
SNR (dB)
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6


RL packet format: 11
FER
SNR (dB)
10^0
10^-1
10^-2
10^-3
10^-4
0
5
10
15
20
25
transmssion index: 1
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6


RL packet format: 12
FER
SNR (dB)
10^0
10^-1
10^-2
10^-3
10^-4
0
2
4
6
8
10
12
14
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6


RL packet format: 13
FER
SNR (dB)
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6


RL packet format: 14
FER
SNR (dB)
transmssion index: 2
transmssion index: 3
transmssion index: 4
transmssion index: 5
transmssion index: 6

Appendix D: Method for generating Correlation Matrices at AN for Reverse Link 1x8 Antenna Configuration

The channel impulse response is simulated according to:

$$\mathbf{H}(t,\tau) = \mathbf{Q}_r \hat{\mathbf{H}}(t,\tau)$$

where $\hat{\mathbf{H}}(t,\tau)$ is the channel matrix modeling the temporal fading process. The elements of $\hat{\mathbf{H}}(t,\tau)$ are generated using independent ITU fading waveforms (Ped-B/VehB). $\mathbf{Q}_r$ is used to model the correlation between the elements of the receiver antenna array at the AN. It is generated using a spatial channel model (SCM). The SCM randomly generates 6 paths or scatterers based on the desired environment and angular spread. Each path consists of 20 subpaths or subscatters. A total of 120 subpaths are characterized by their angle of arrival (AOA), angle of departure (AOD), delay, amplitude, and phase.

The Urban macrocell environment with 15^o mean azimuth angular spread (σ_{AS}) at the AN is used. The delay, power and angle at the AN of the six main paths are first generated based on σ_{AS} . For each path, 20 subpaths are subsequently generated assuming that they have the same delay, equal power, uniformly distributed phase, and a 2^o inner angular spread w.r.t. the path angle at the AN.

Ten correlation matrices are generated for each of the 6 paths. The matrix assigned to a mobile for a path is a function of the absolute value of the angle of arrival of that path at the AN (which is taken to be the angle of arrival of the direct path from the AT to the AN). The 10 different matrices for each path correspond to 10 different bins for the absolute value of the angle of arrival at the AN (0^o to 90^o in 10^o increments). Values between 90^o and 180^o are assigned to use the matrix corresponding to the 90^o angle.

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