Project	**IEEE 802.20 Working Group on Mobile Broadband Wireless Access** <**http://grouper.ieee.org/groups/802/20/**>	
Title	**MBTDD 625k-MC Mode (BEST-WINE) Performance Report 2 Presentation**	
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Re:	MBWA Call for Proposal	
Abstract	This document presents the **Technology Performance and Evaluation Criteria Report 2** of the Technology Proposal MBTDD 625k-MC for IEEE 802. 20 MBWA	
Purpose	To discus and Adopt MBTDD 625kHz MC Mode for Draft Specifications of IEEE802.20 MBWA	
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MBTDD 625k-MC Mode (BEST-WINE: Broadband MobilE SpaTial Wireless InterNet AccEss) Performance Report 2 Presentation

IEEE 802.20 Plenary Meeting

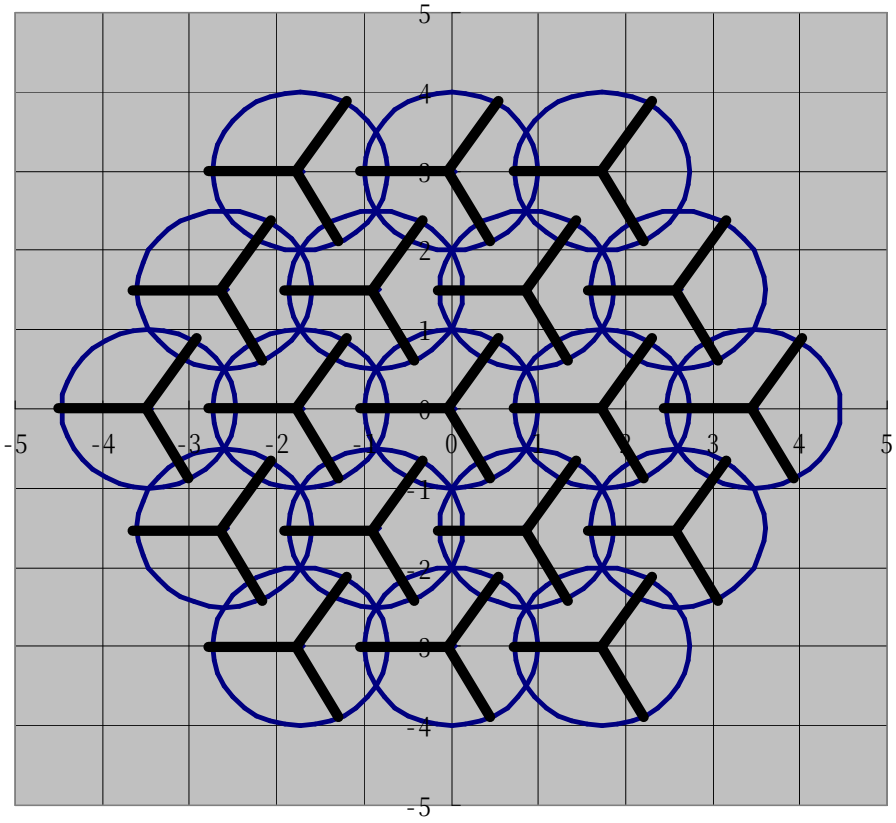
Hawaii

January 16-19, 2006

Outline of Presentation

- System Model
- Link level Simulation
- System Level Simulation
- Traffic
  - Traffic Calibration
  - Traffic Mix and Channel Mix
  - Traffic Mix and Channel Mix
- Mobility-Handover Performance
- Overhead Channels
- Practical System results

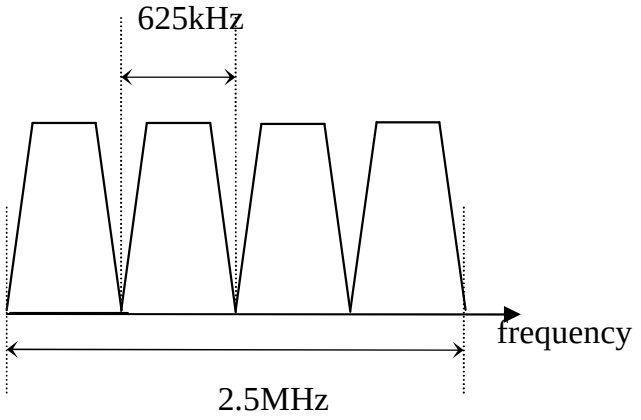
System Model



PHY and MAC Layer information

- Channel Configuration

Items		Specification
Duplexing		TDD
Mutiple Access		TDMA •SDMA
Carrier space		625 kHz
Frame Lenght		5 ms
symbol duration		2usec
Uplink Time Slot	slots	3
	Length	545 us
	Payload	182 symbols
Downlink Time Slot	slots	3
	Length	1090 us
	Payload	494 symbols
Symbol rate		500 ksps



Link Level simulation

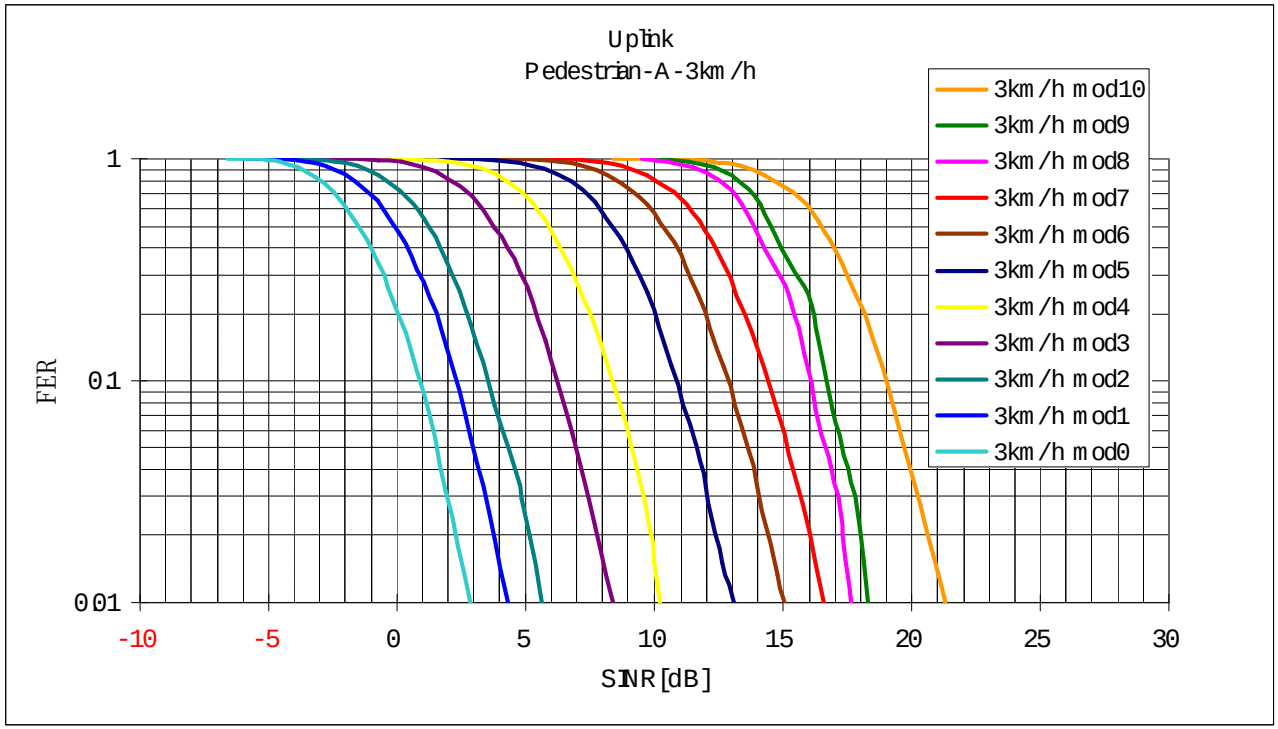
- Modulation Coding Class

ModClass	Modulation Method	Down Link(Kbps)		Up Link(Kbps)	
		Data Rate /Slot	Data Rate /Carrier	Data Rate /Slot	Data Rate /Carrier
0	BPSK	35	106	6	19
1	BPSK	50	149	13	38
2	QPSK	82	245	26	77
3	QPSK	126	379	43	130
4	8PSK	162	485	58	173
5	8PSK	198	595	72	216
6	12QAM	262	787	98	293
7	16QAM	307	922	115	346
8	24QAM	354	1061	133	398
9	32QAM	378	1133	142	427
10	64QAM	498	1493	190	571

Basic PHY layer (link level) information

- Link Level simulation Parameters
  - TDD /TDMA system with 3 timeslot structure
  - BS antenna number 12antennas
  - UT antenna numbers
    - Antennas used for transmission :1
    - Antennas used of receiving: 4
  - Adaptive Array Antenna Algorithm : MMSE

Pedestrian A – 3km/hr (Uplink)



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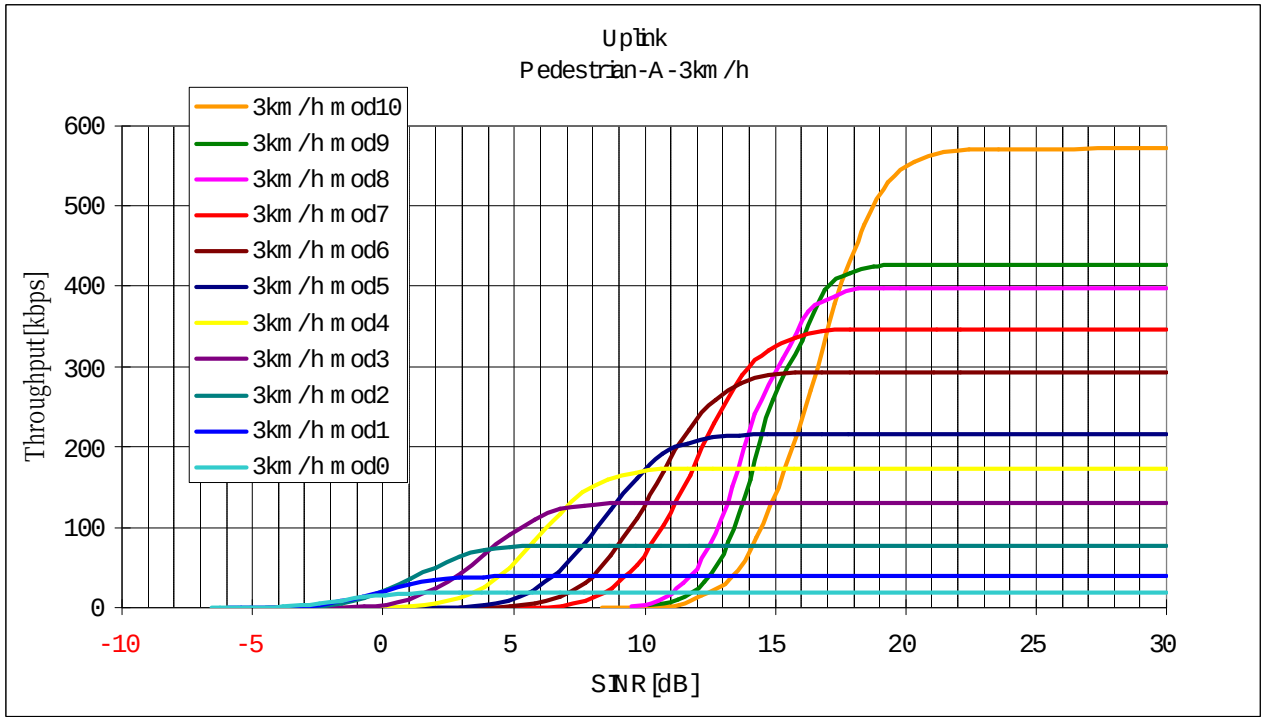

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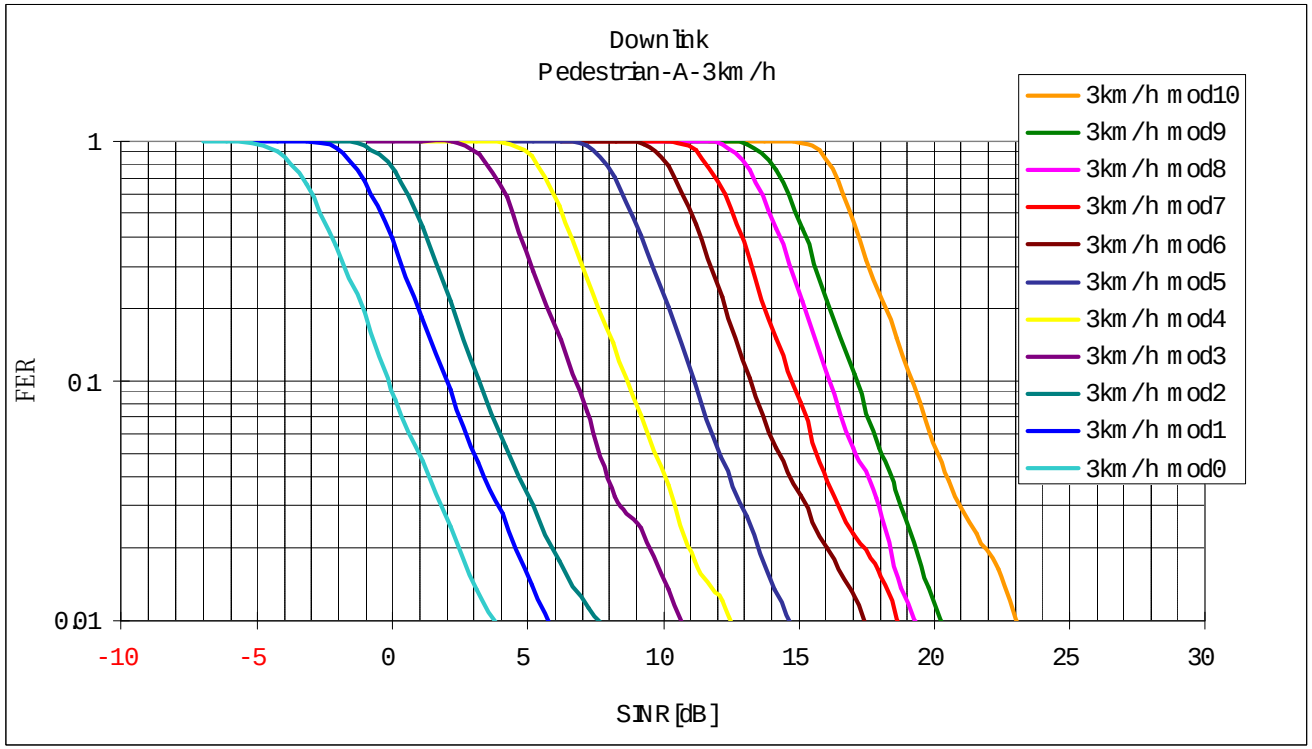

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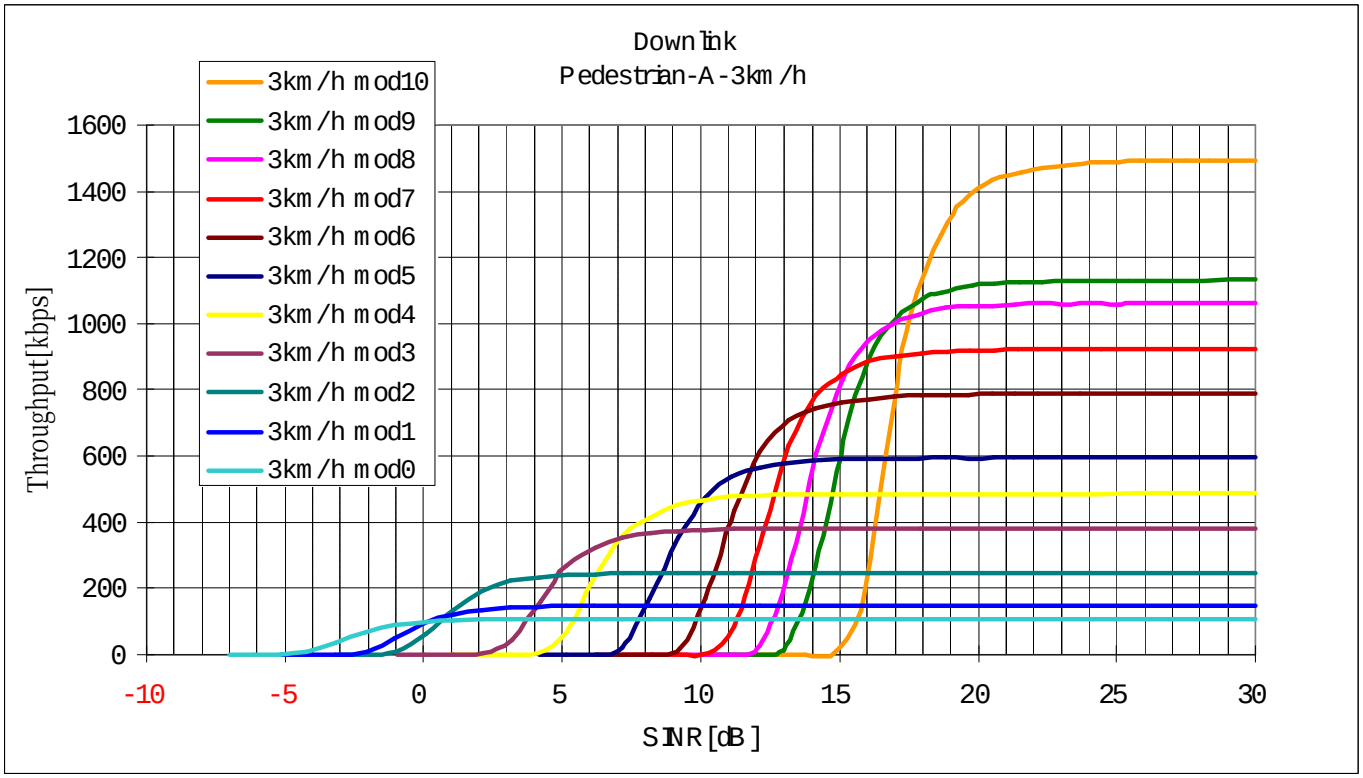
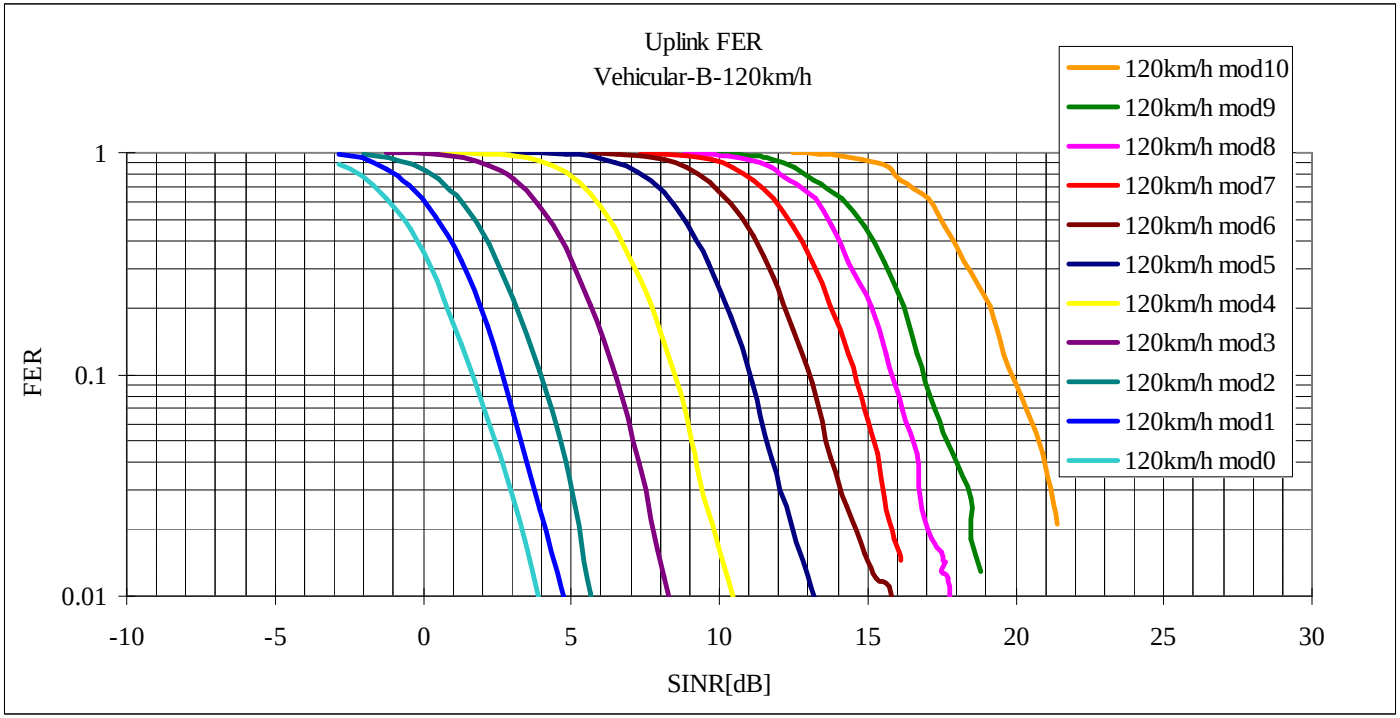


Vehicular B – 120km/hr (Uplink)



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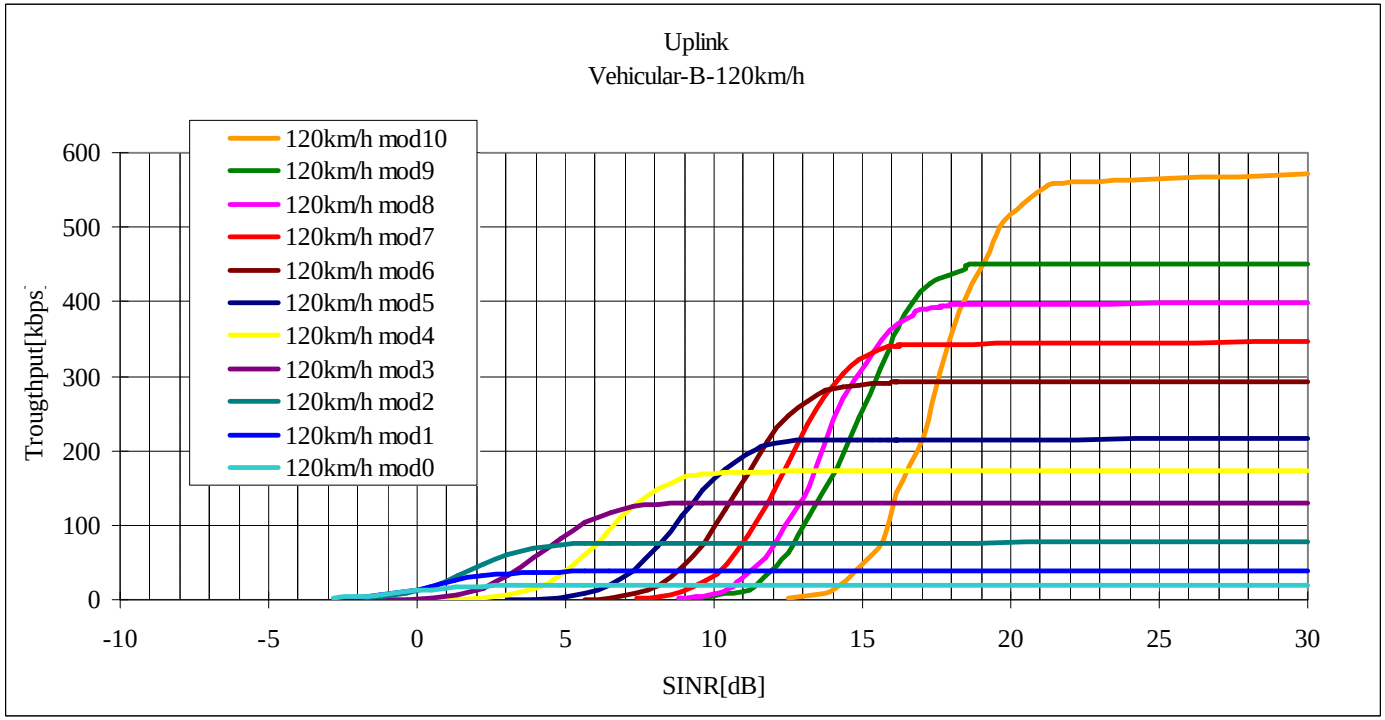

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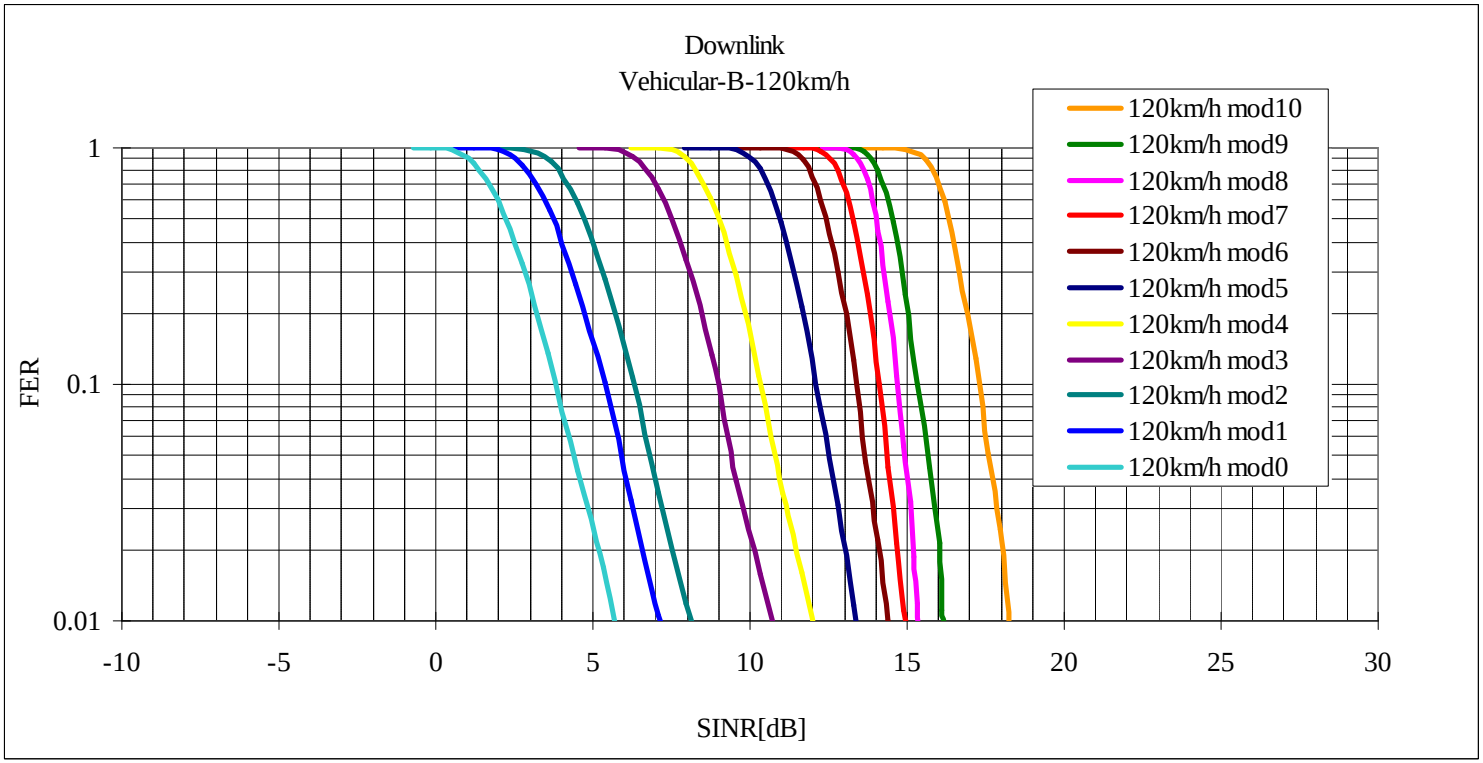

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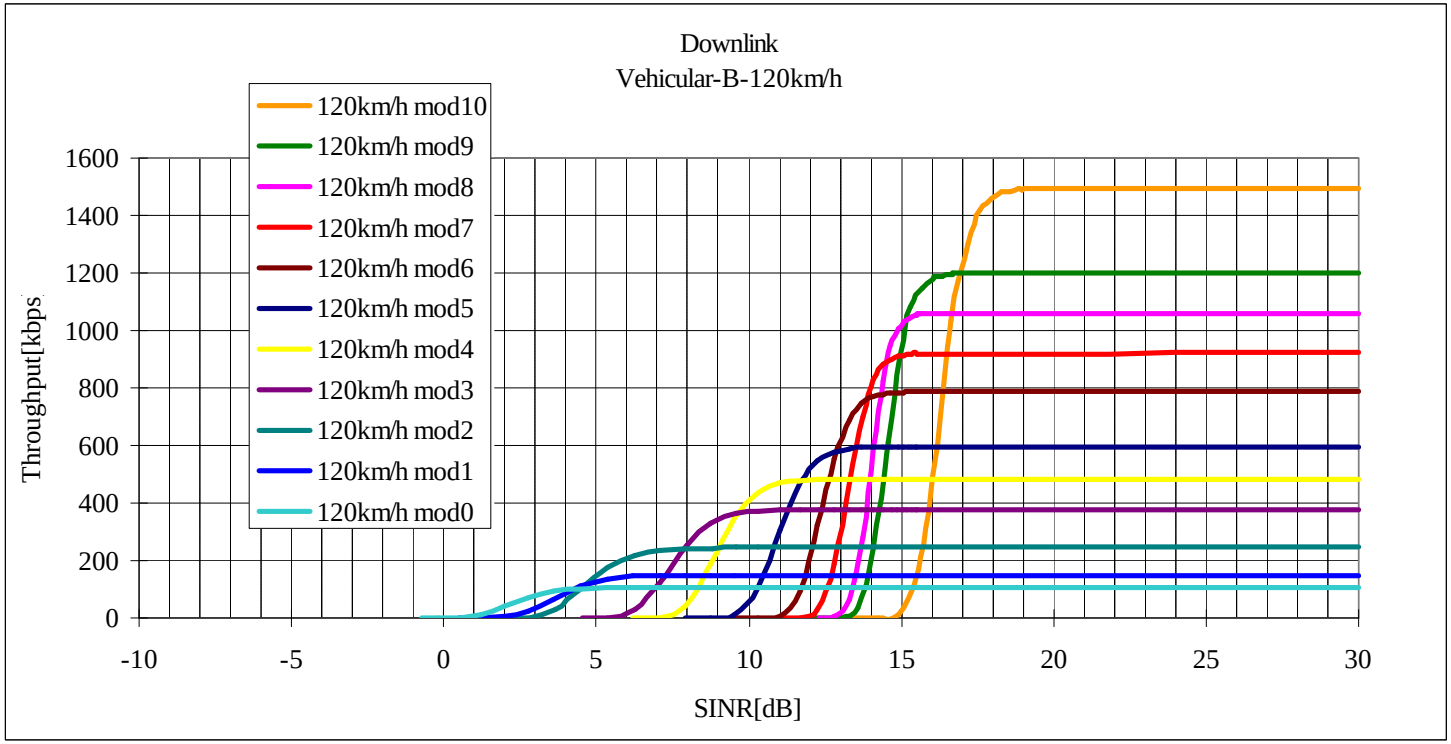

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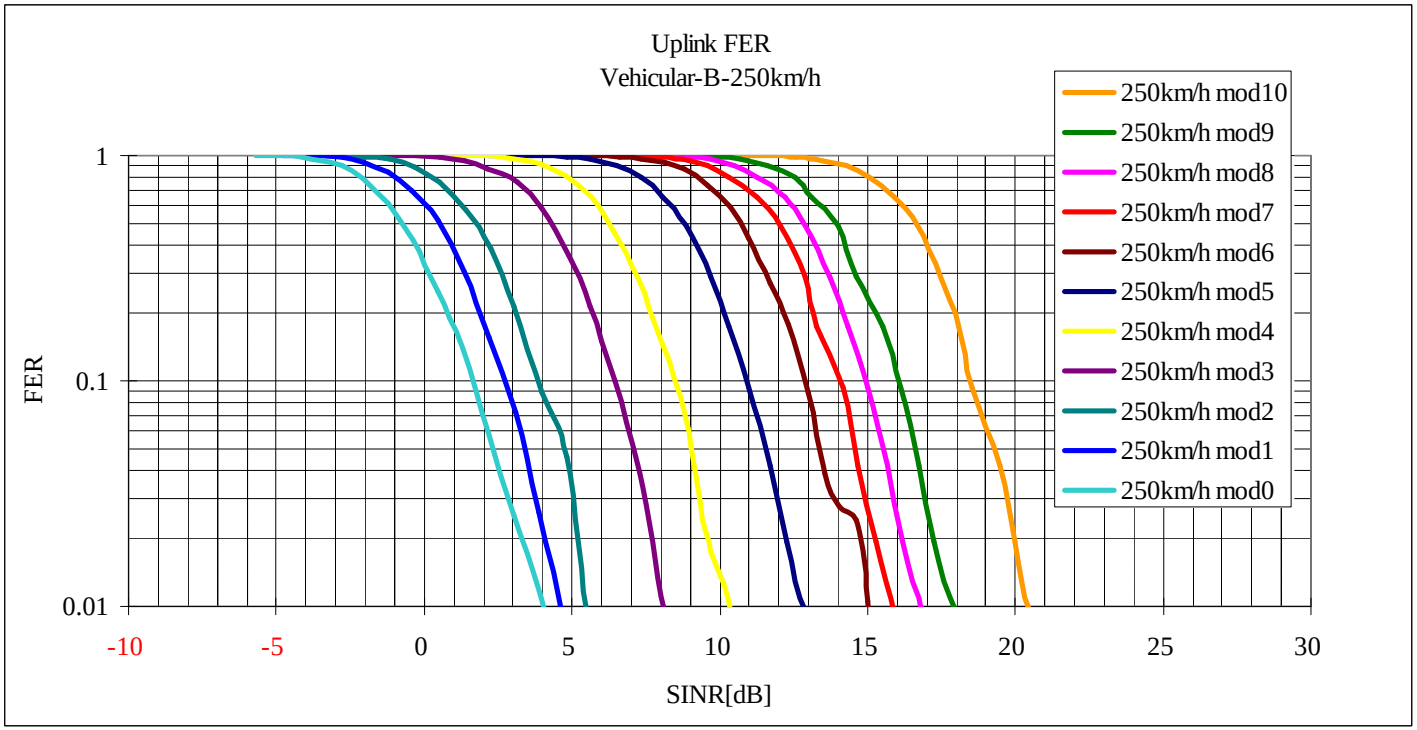

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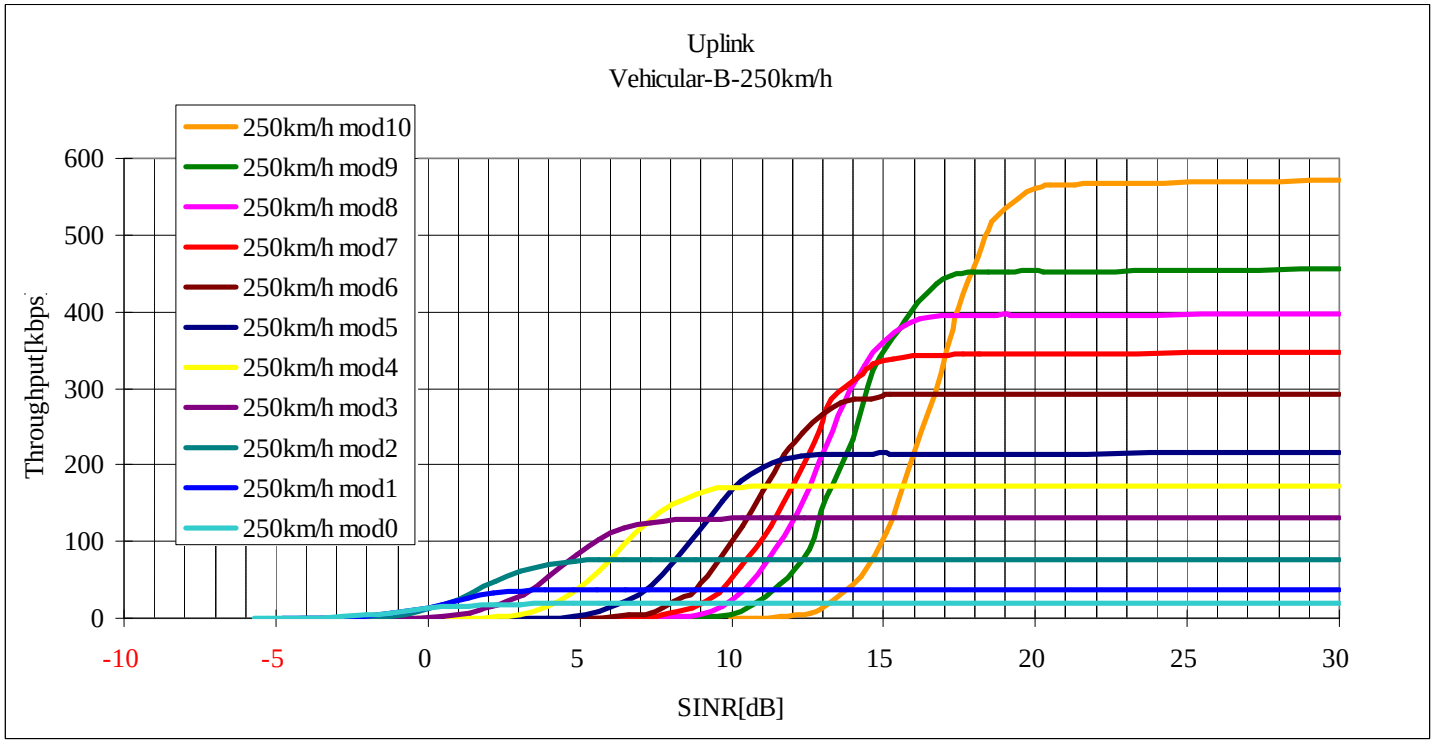

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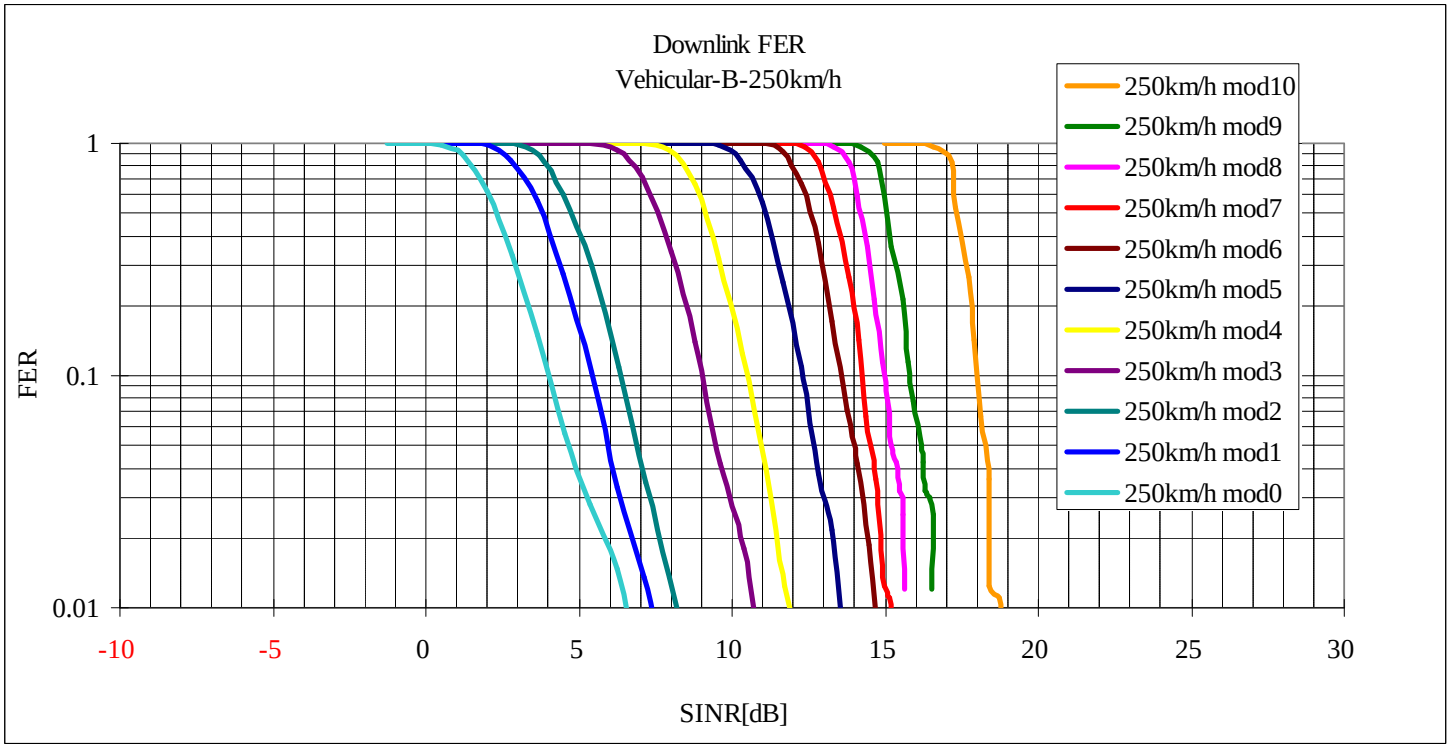

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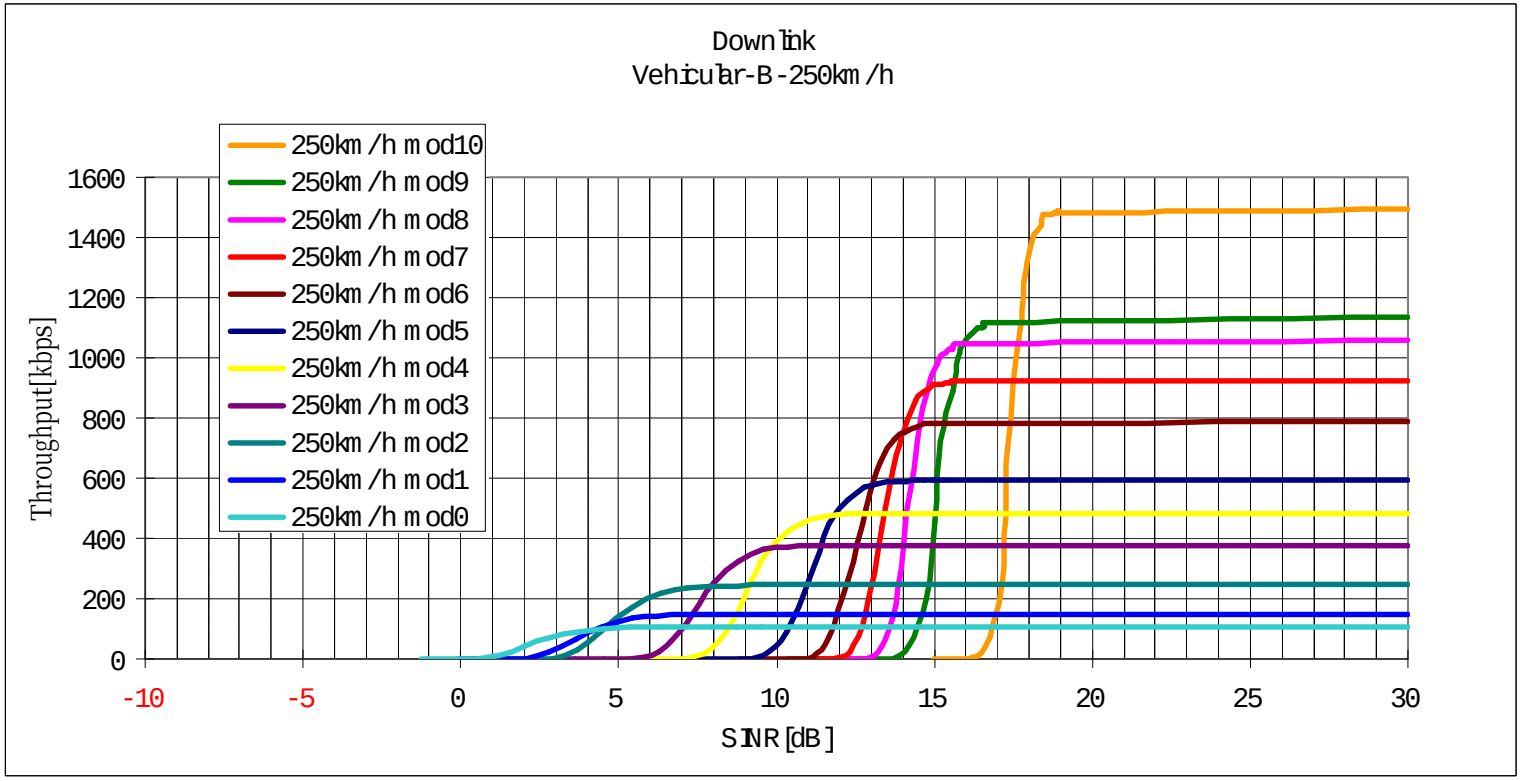
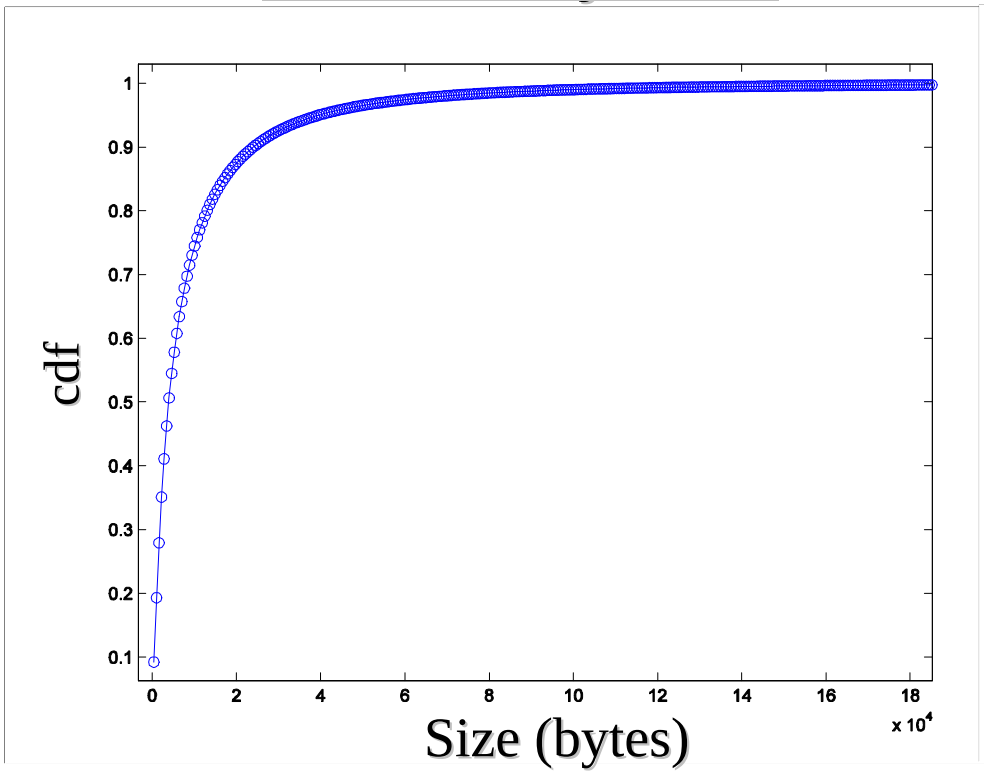


System Level Simulations

Traffic Performance in System Level Simulation

Traffic Model Calibration - HTTP

Main File Object Size



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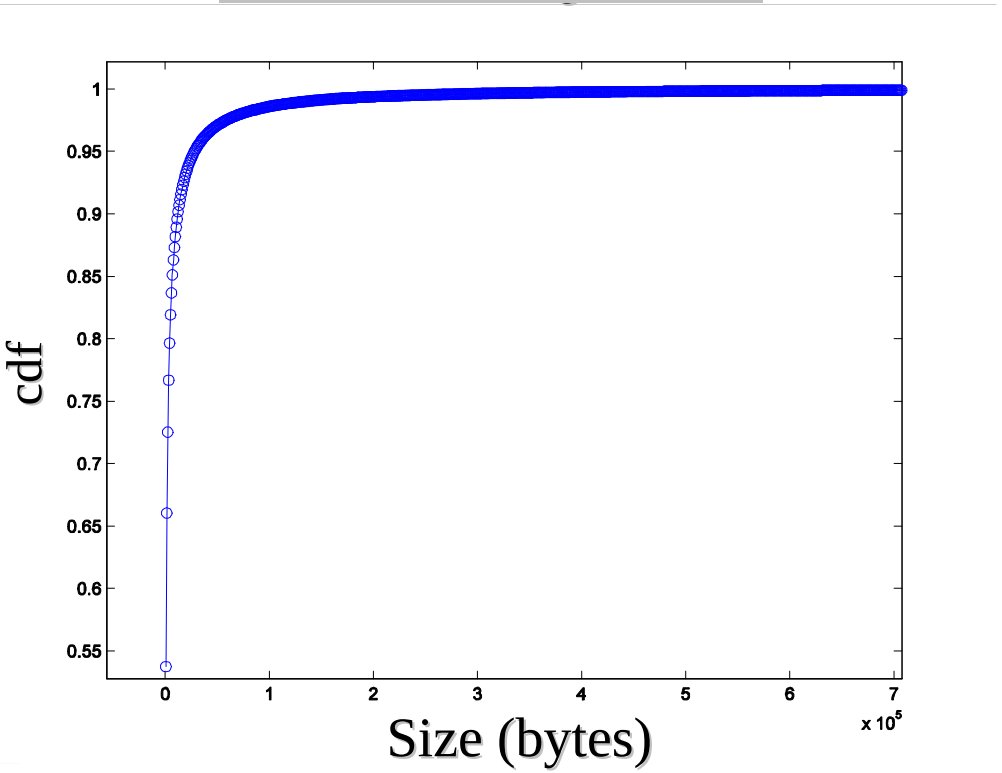

Traffic Model Calibration - HTTP

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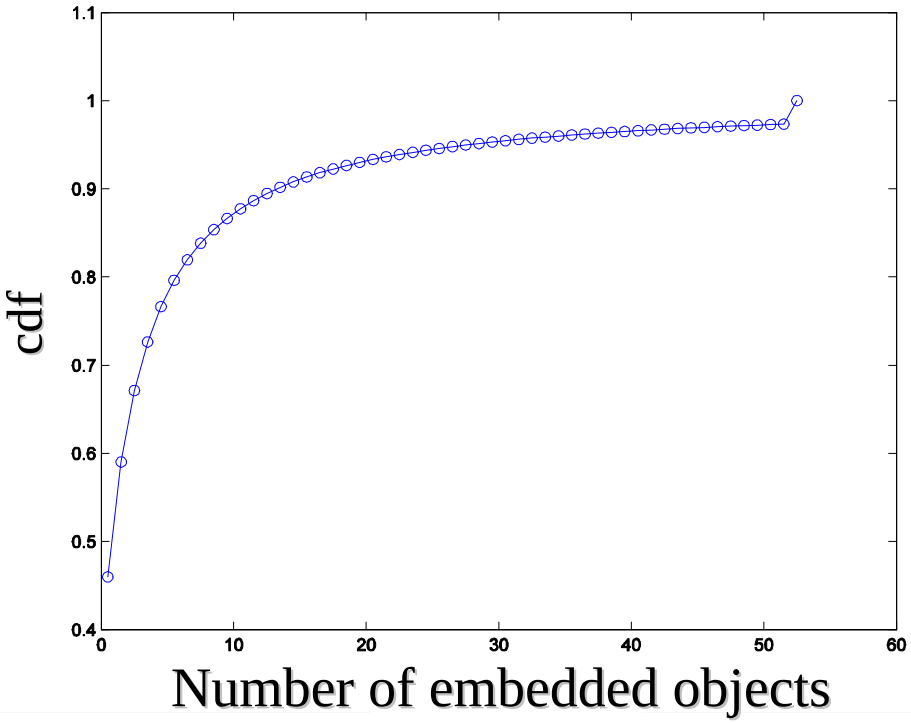

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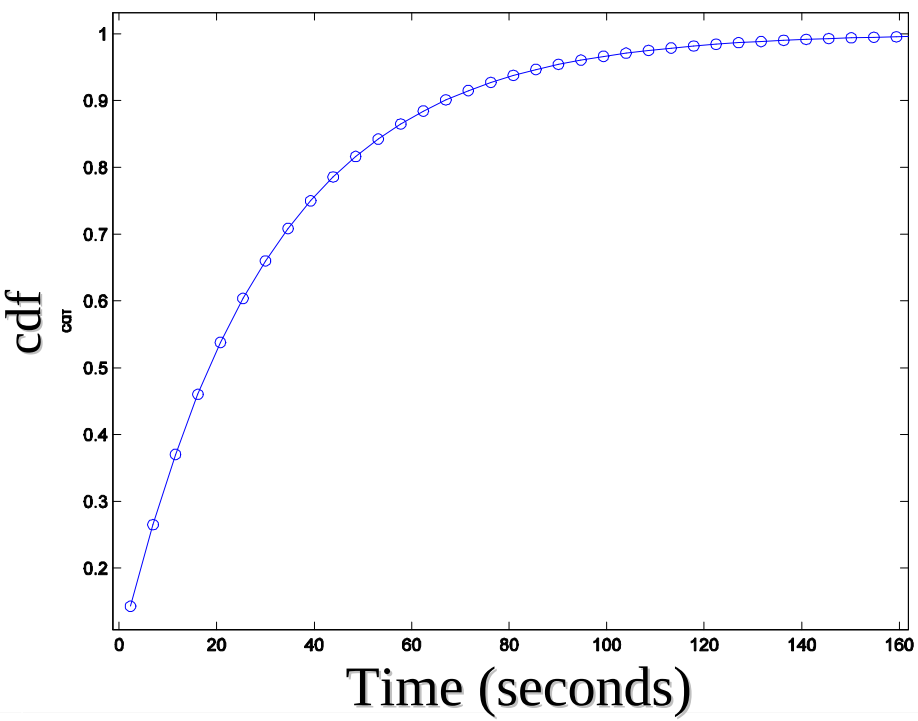
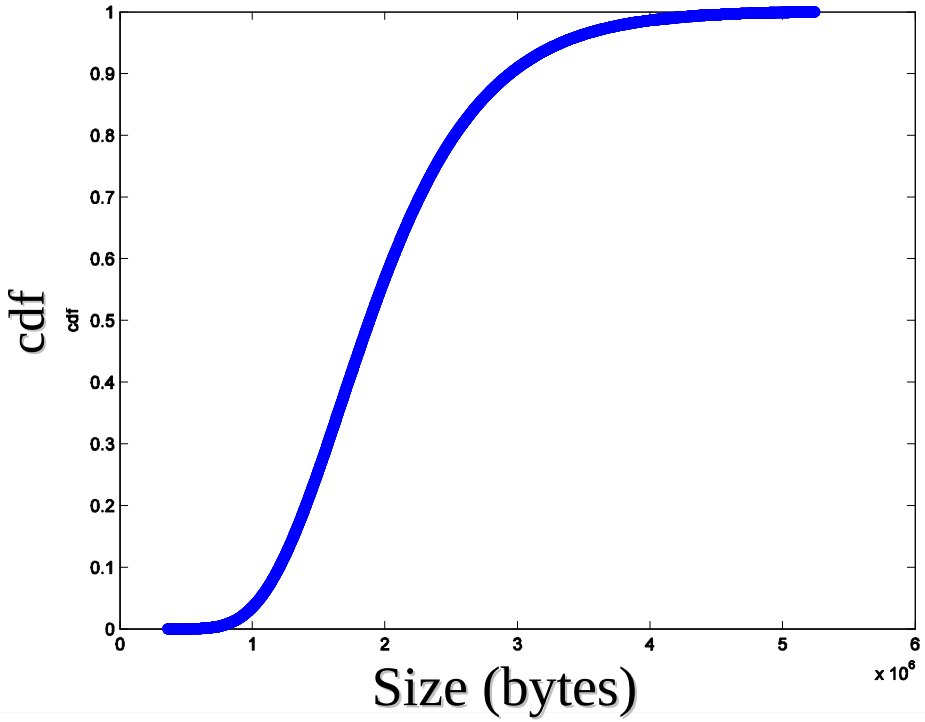


Traffic Model Calibration - FTP

File size



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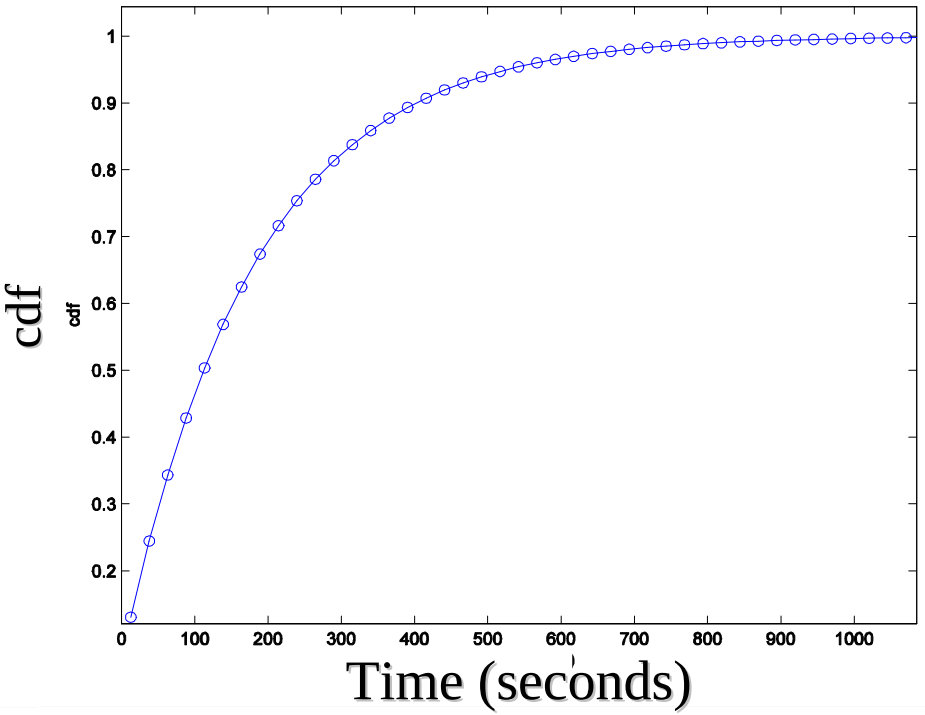
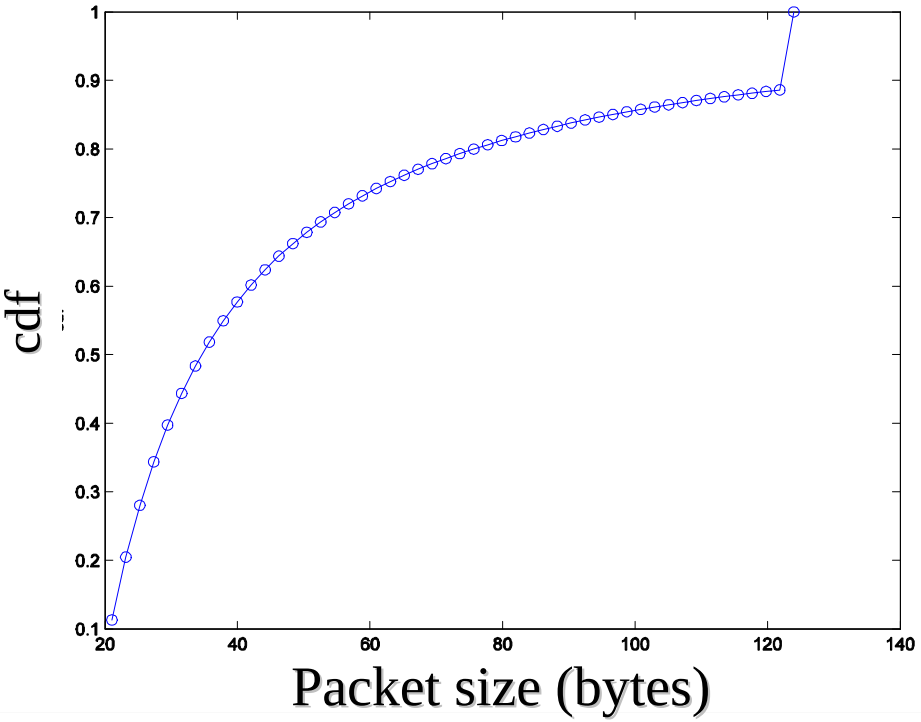
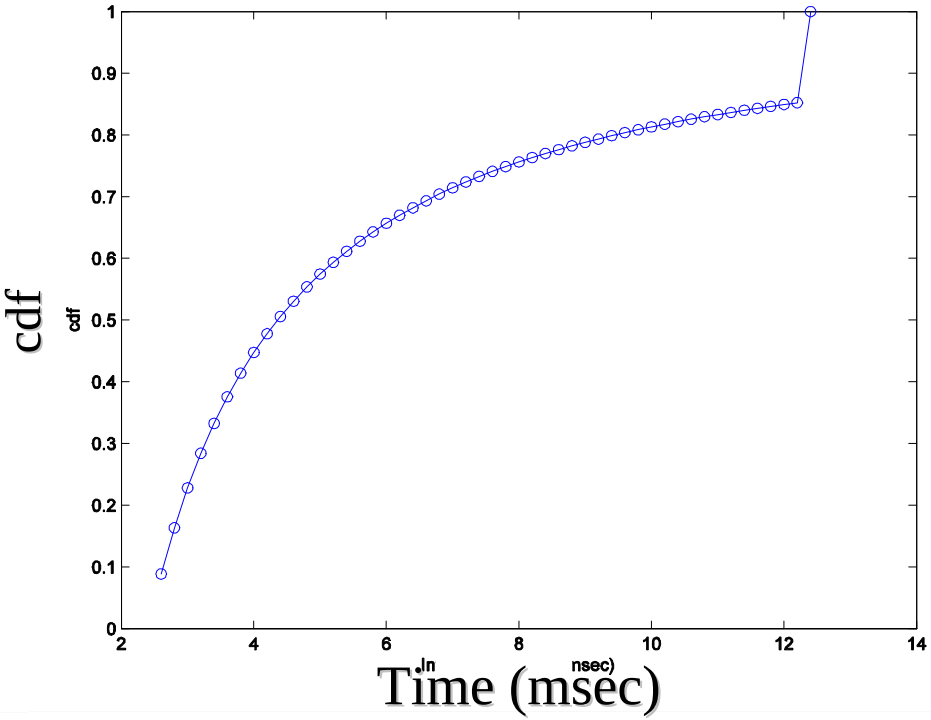


Traffic Model Calibration - NRTV

File size

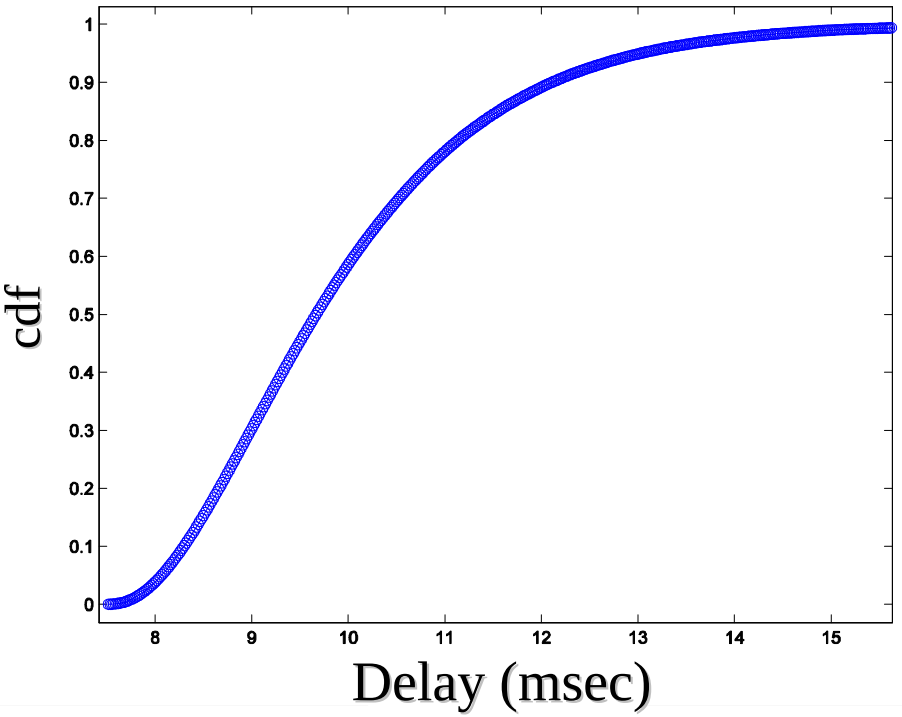


Interarrival time

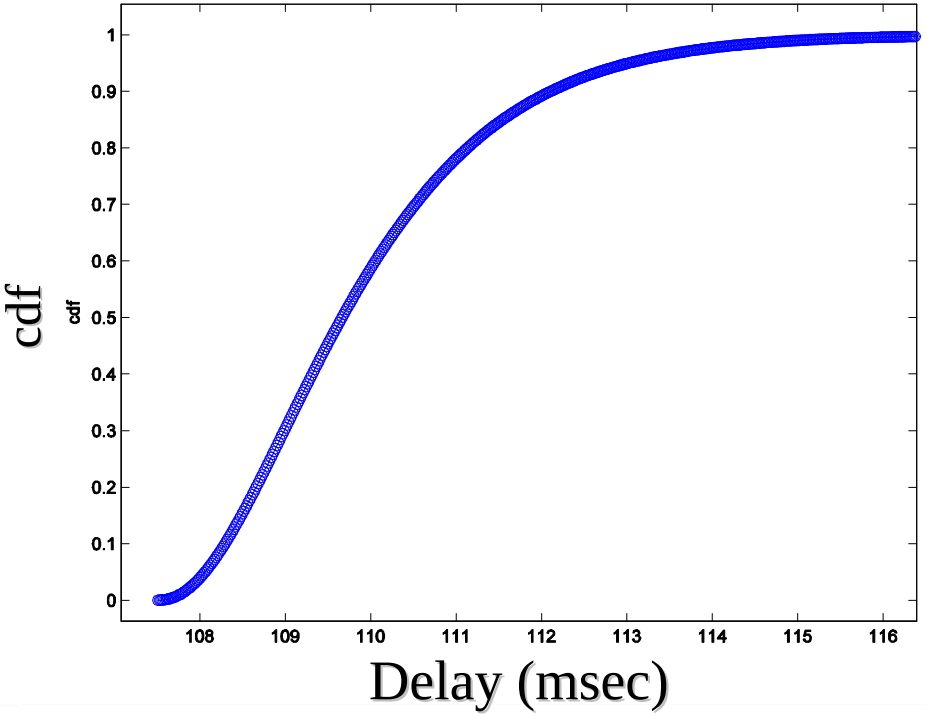


Traffic Model Calibration - NRTV

Domestic Network delay



International Network delay



Traffic Model Calibration - HTTP

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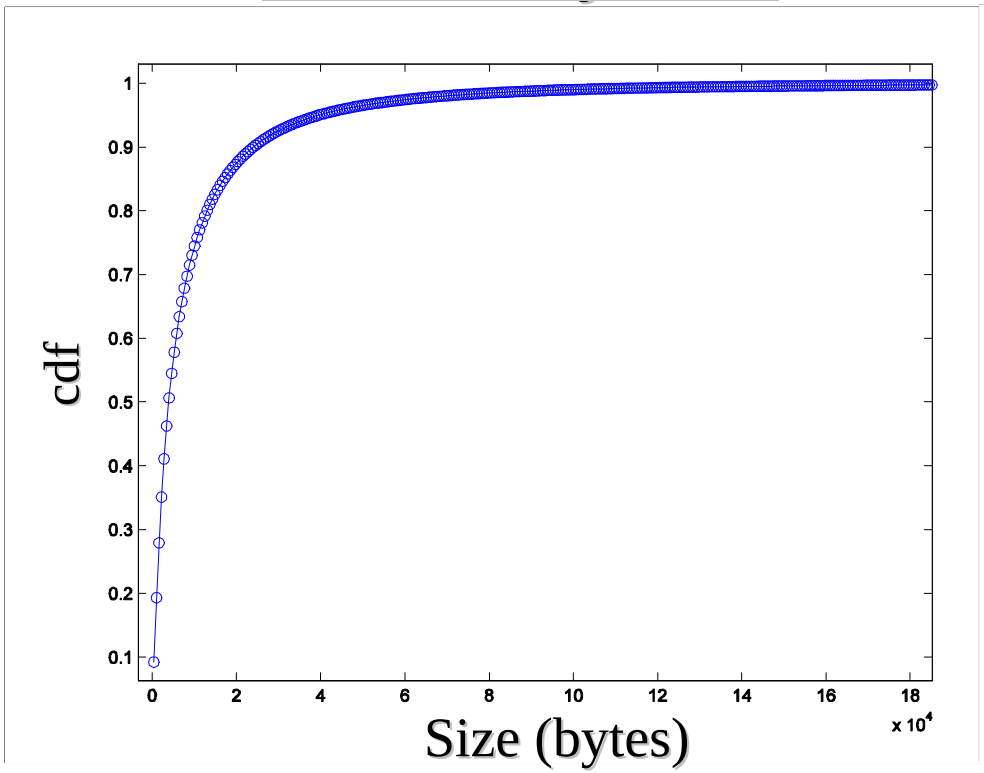

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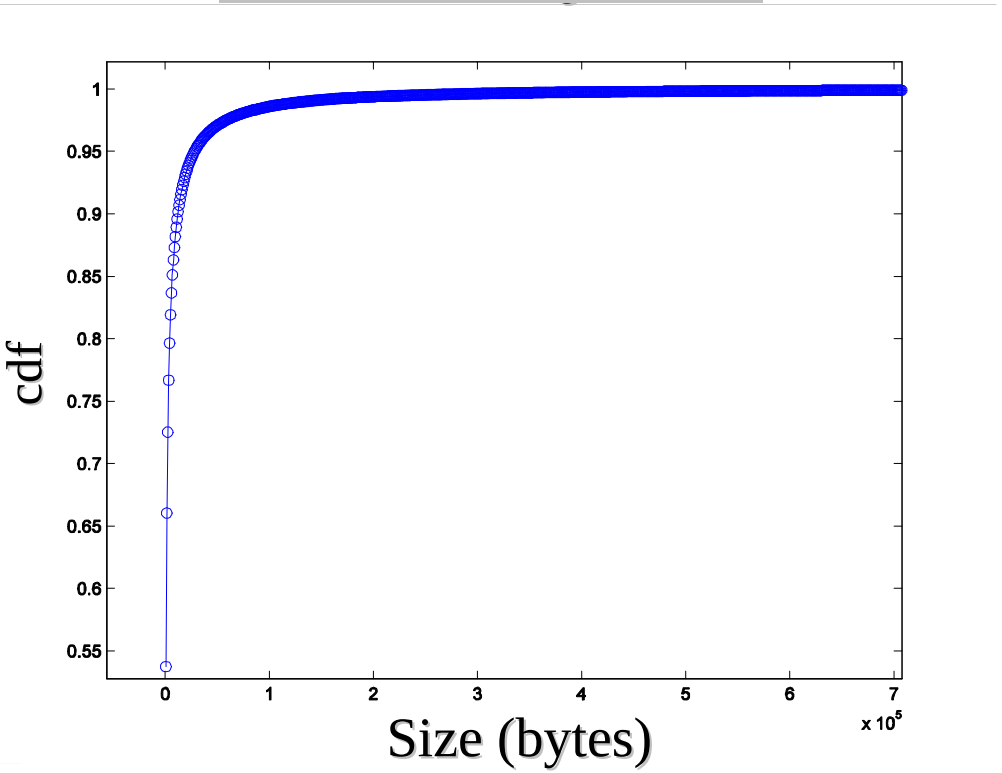
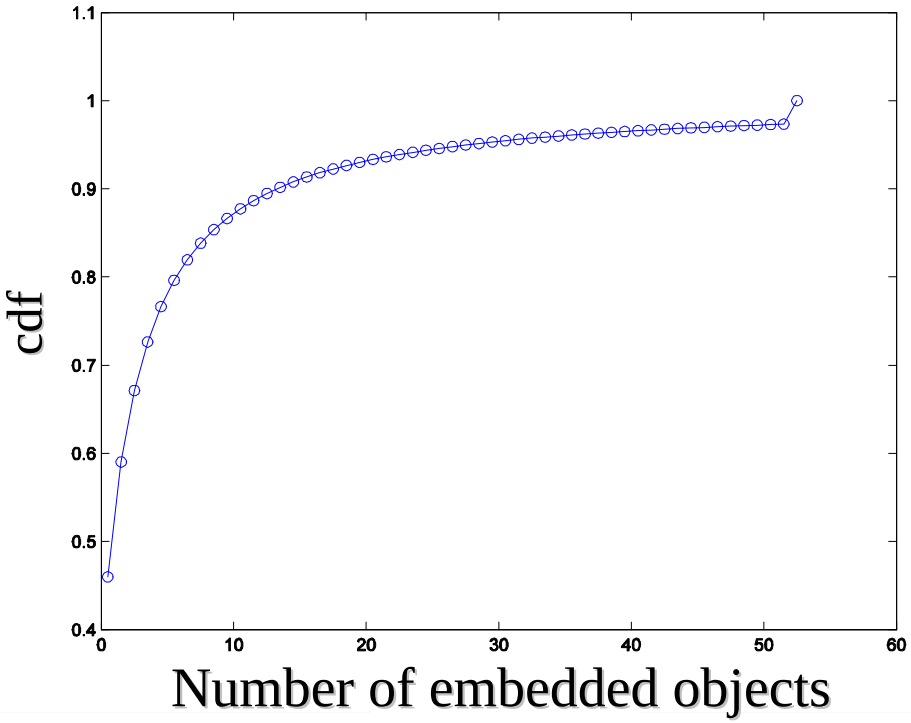


Traffic Model Calibration - HTTP

Embedded objects per page



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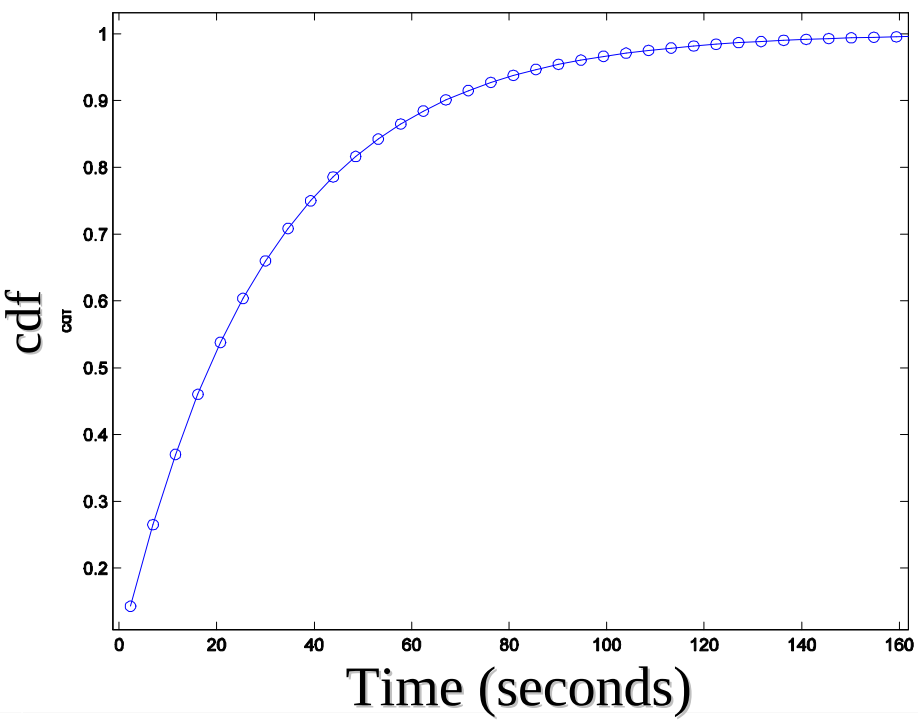
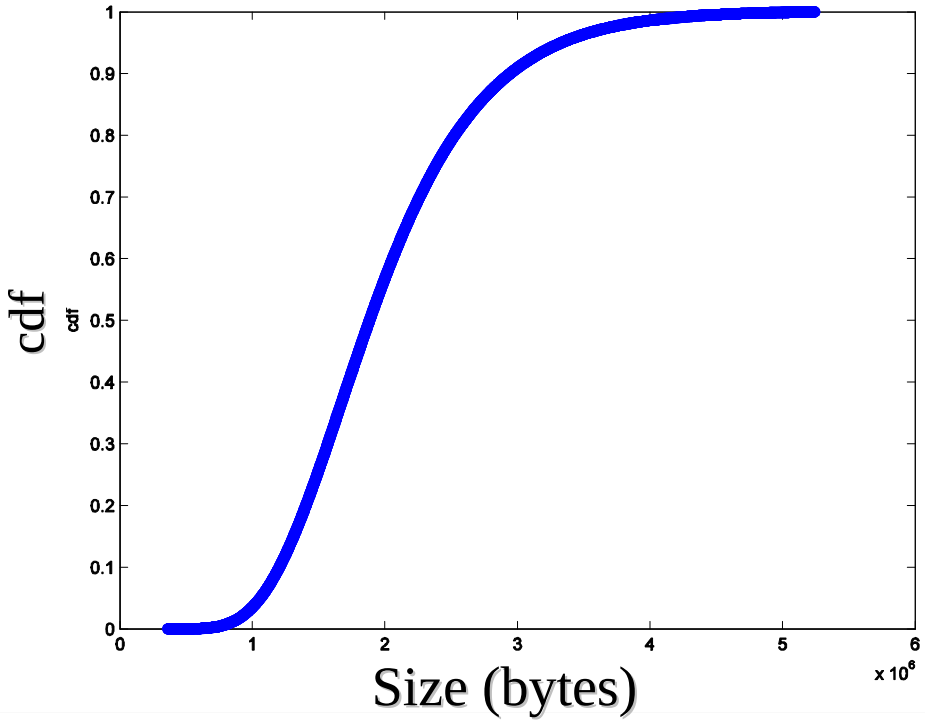


Traffic Model Calibration - FTP

File size



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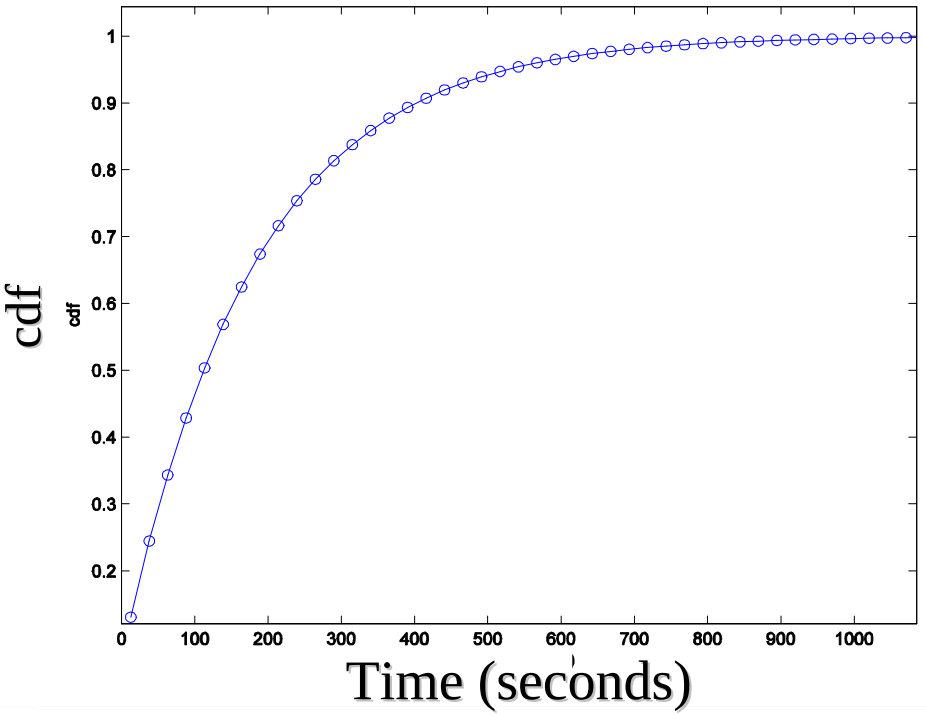
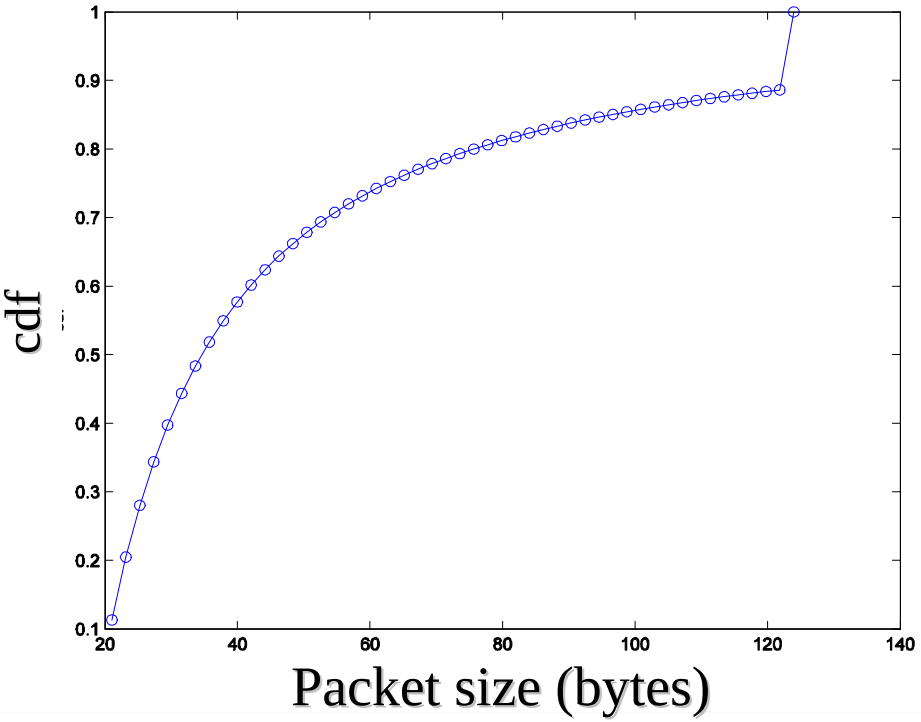
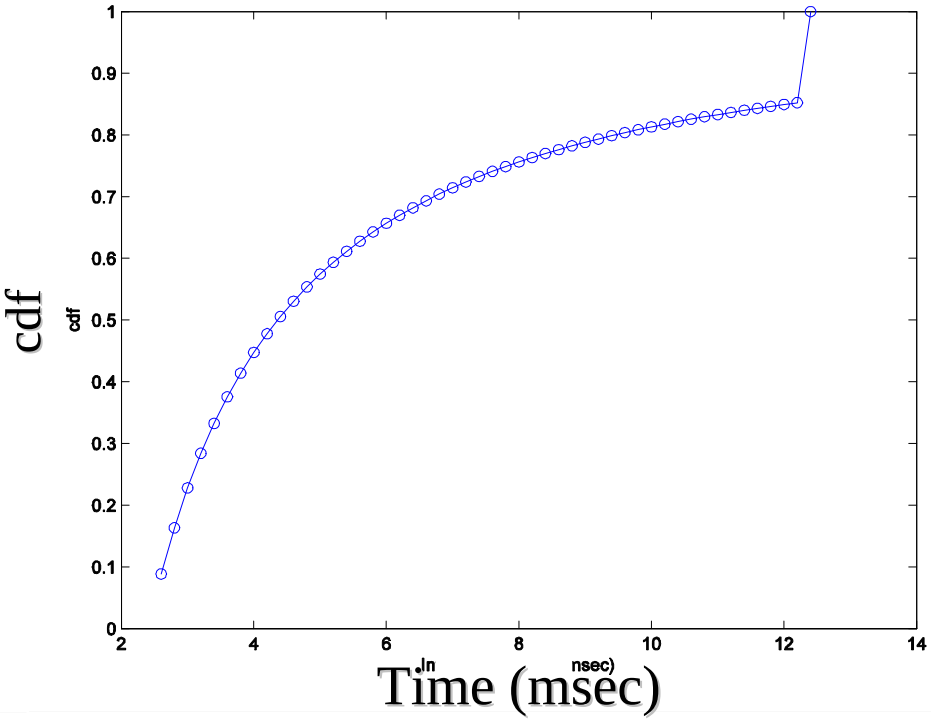


Traffic Model Calibration - NRTV

File size

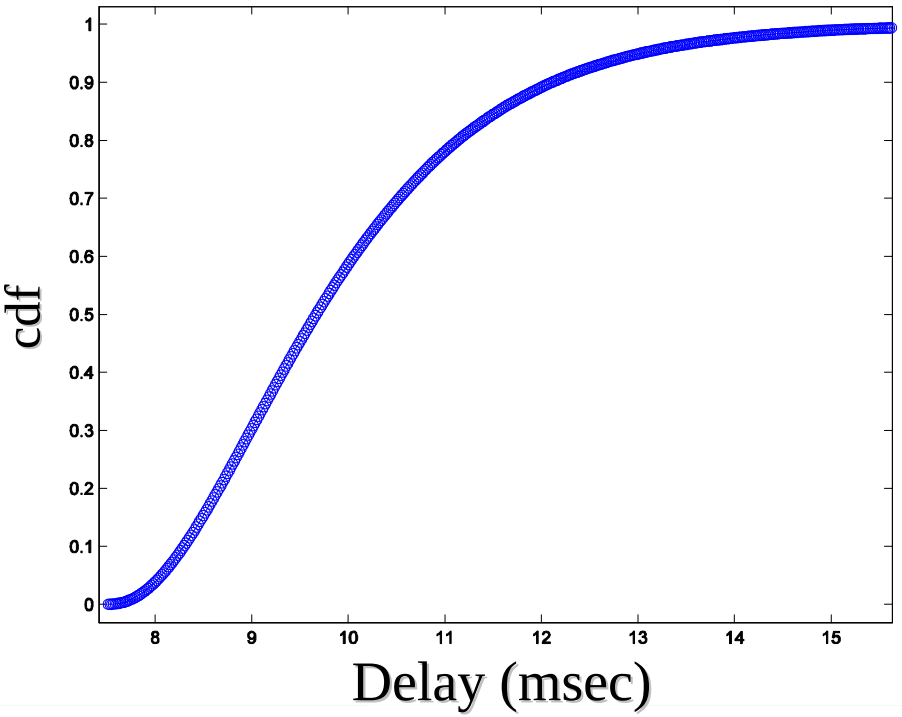


Interarrival time

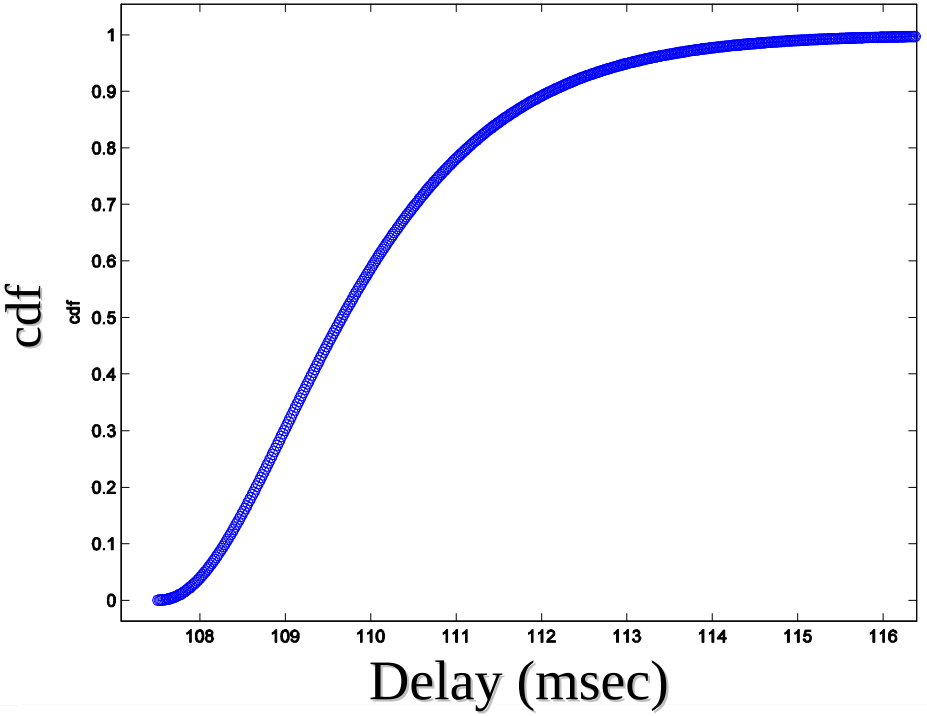


Traffic Model Calibration - NRTV

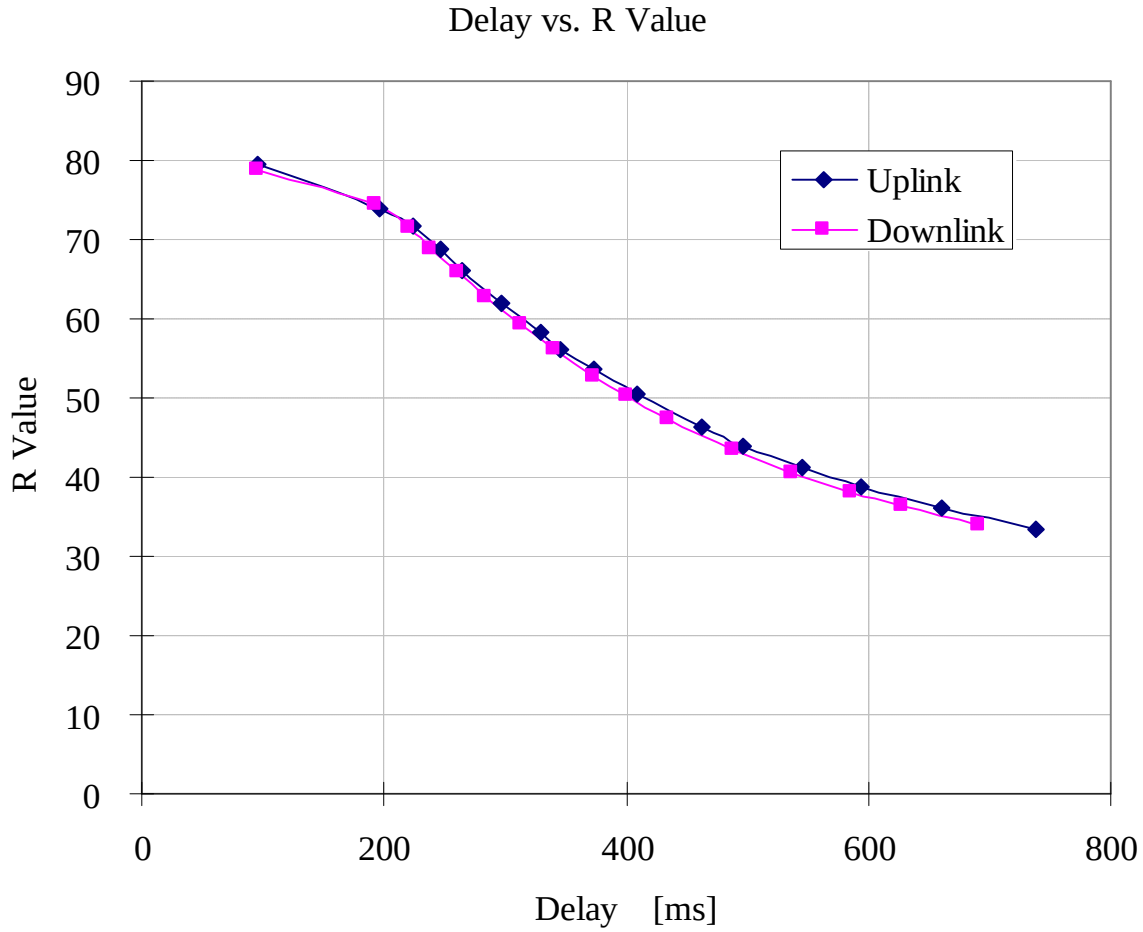
Domestic Network delay



International Network delay

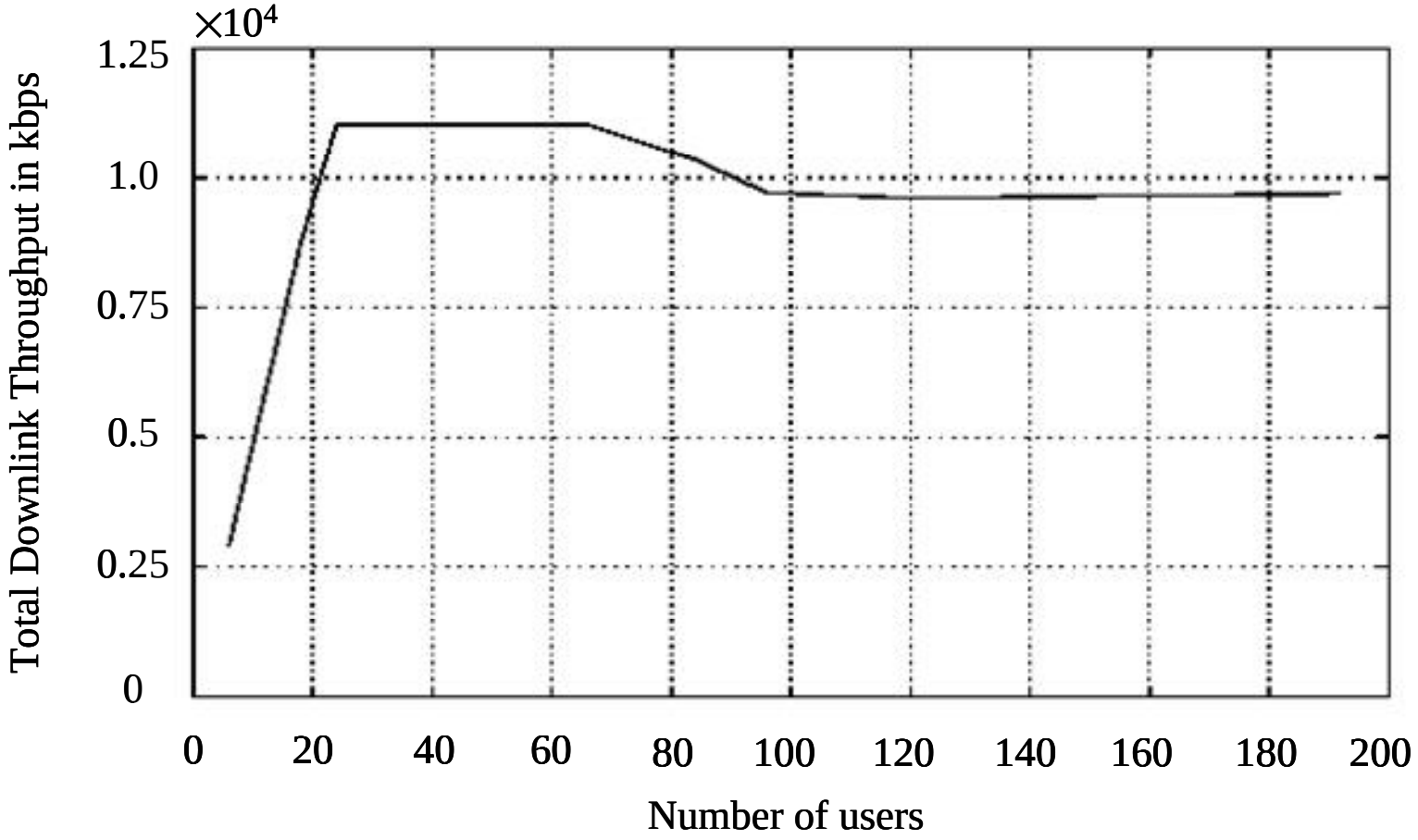


VoIP Performance – Delay vs. R-value



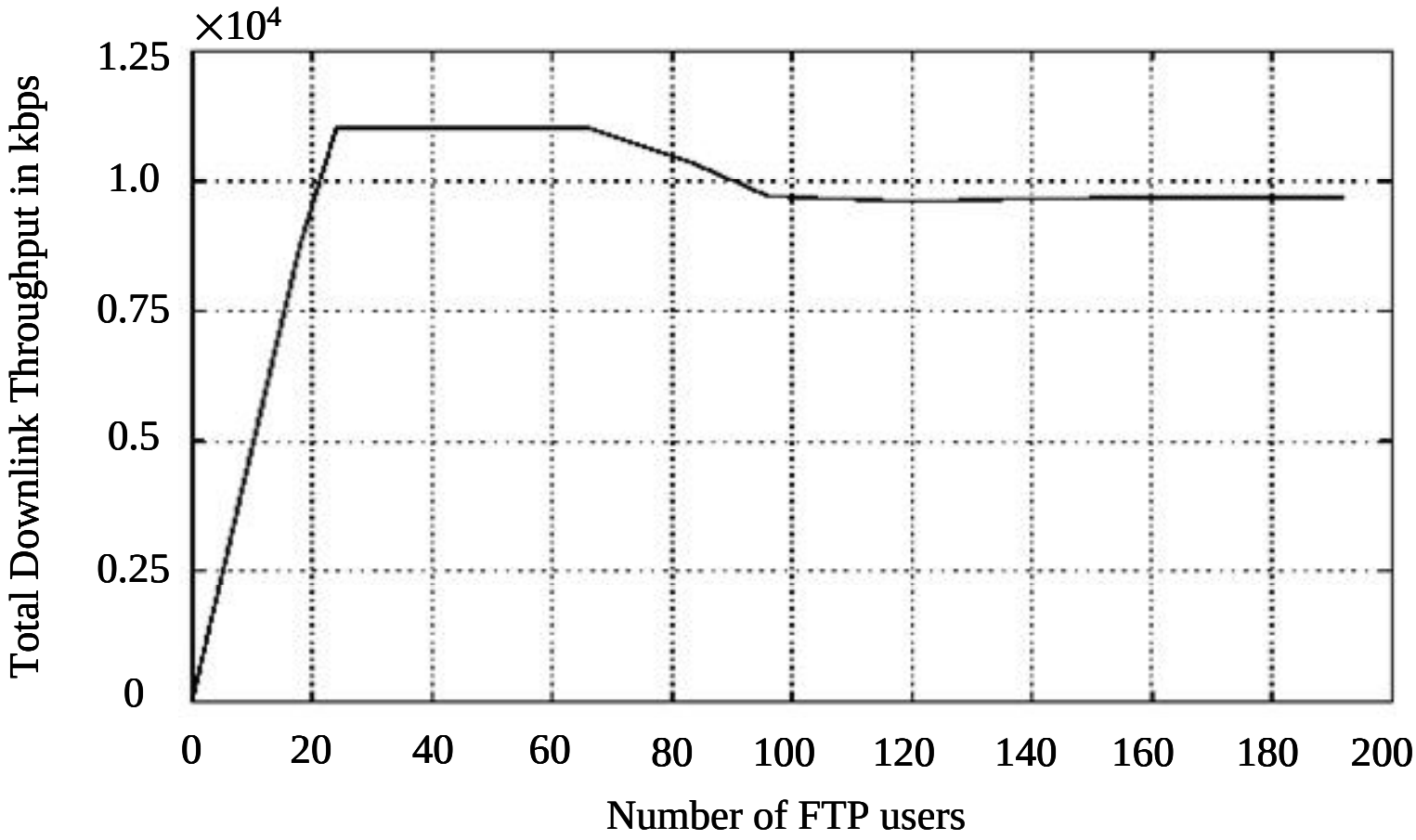
FTP Performance

FTP Traffic Scenario (3 traffic spatial channels per conventional channel)



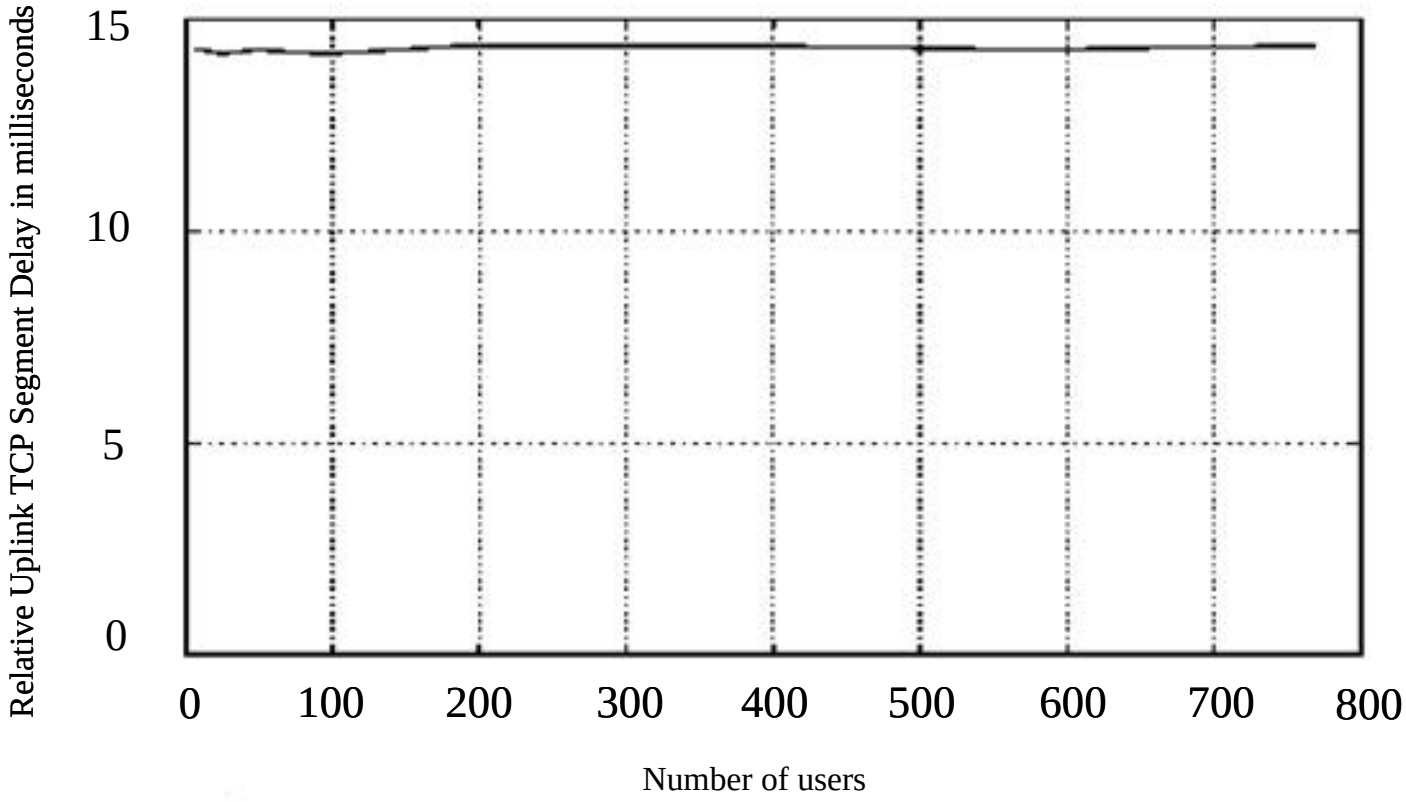
FTP-HTTP Performance

Mixed Traffic (FTP and HTTP) Scenario – (3 traffic spatial channels per conventional channel)



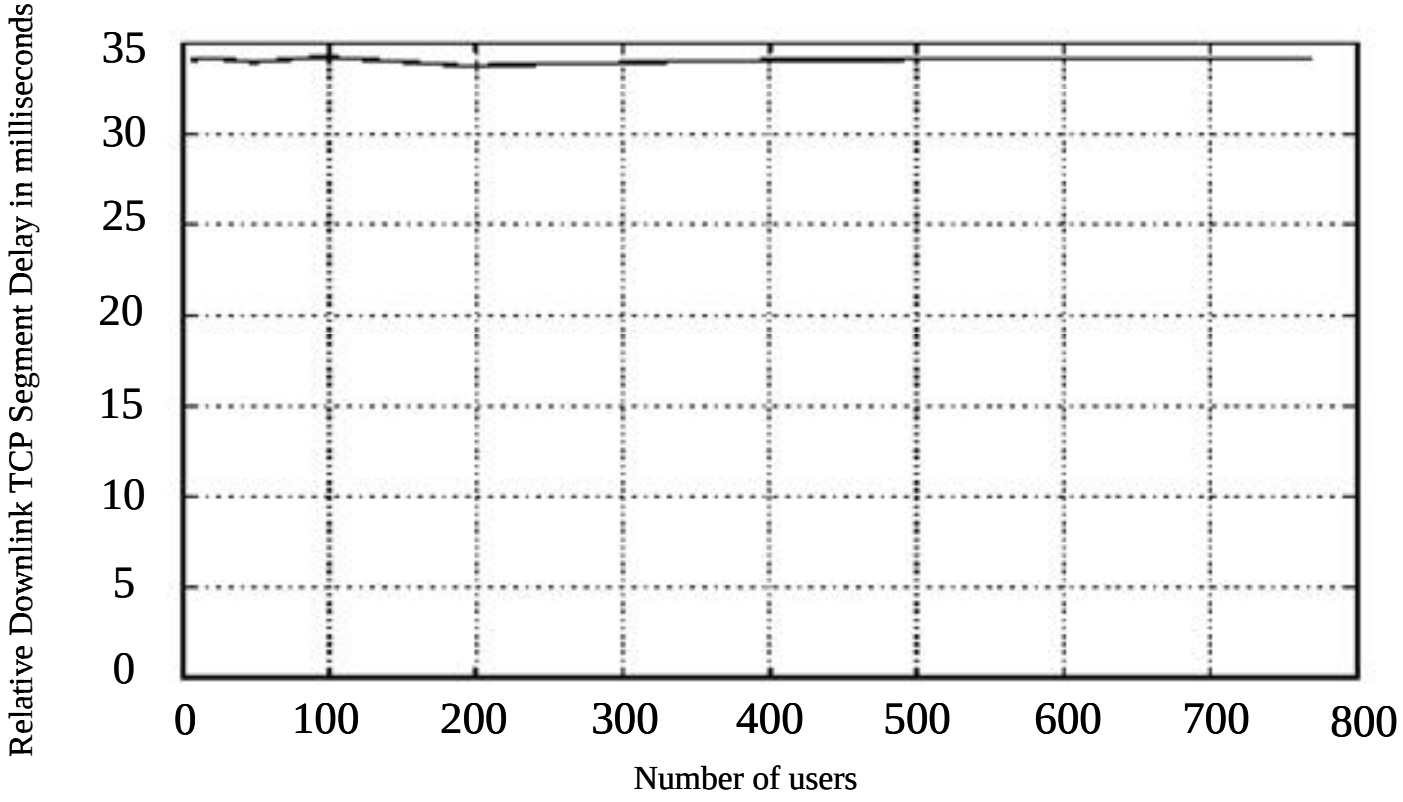
TCP-HTTP Uplink Performance

HTTP scenario—(3 traffic spatial channels per conventional channel)

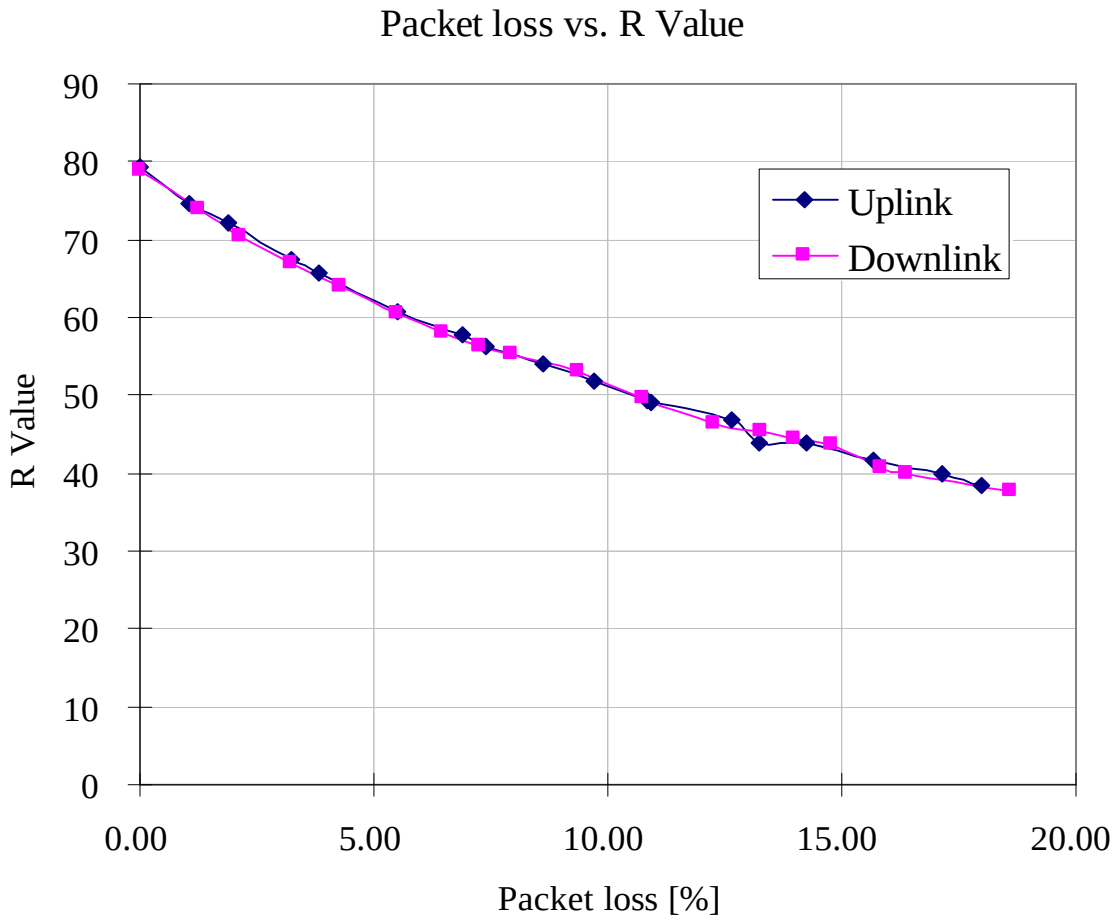


TCP-HTTP Downlink Performance

HTTP scenario—(3 traffic spatial channels per conventional channel)

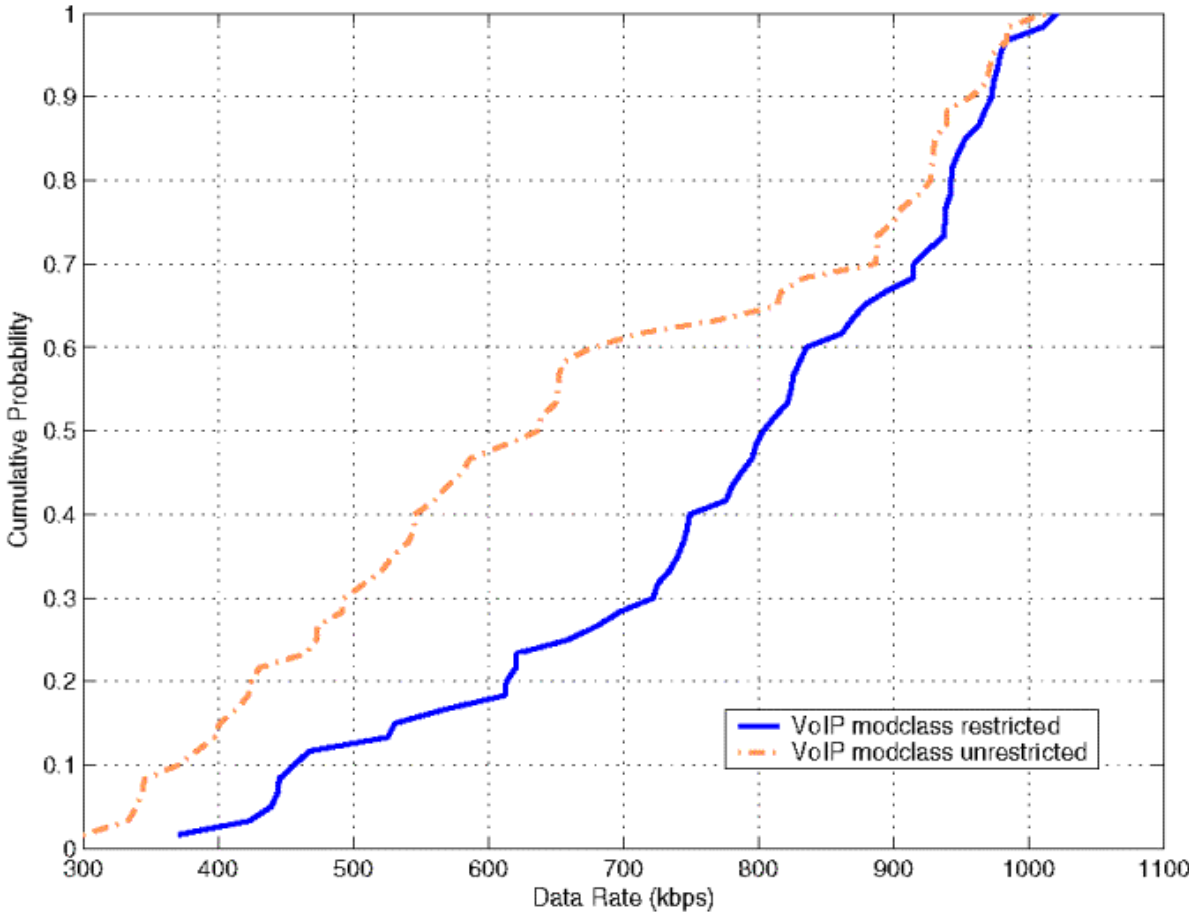


VoIP Performance – R-value vs. Packet loss



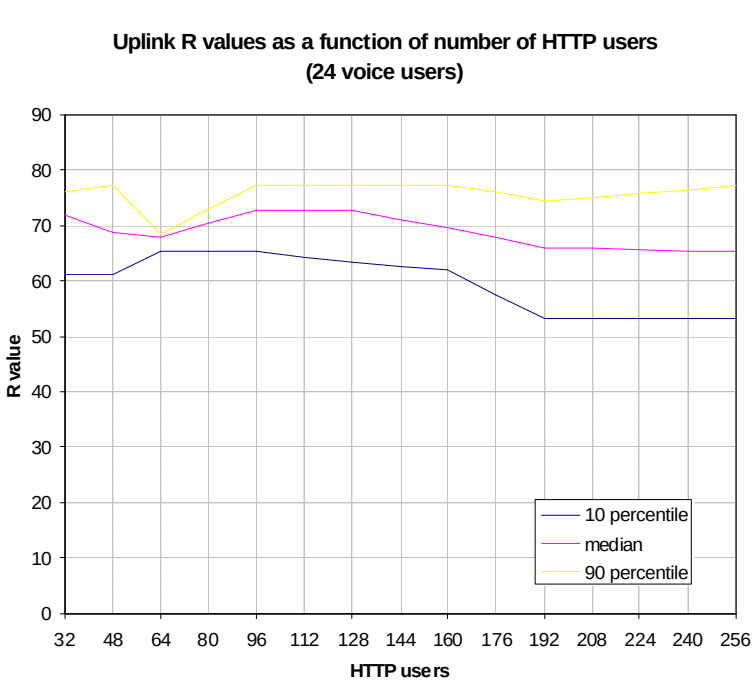
HTTP and VoIP users

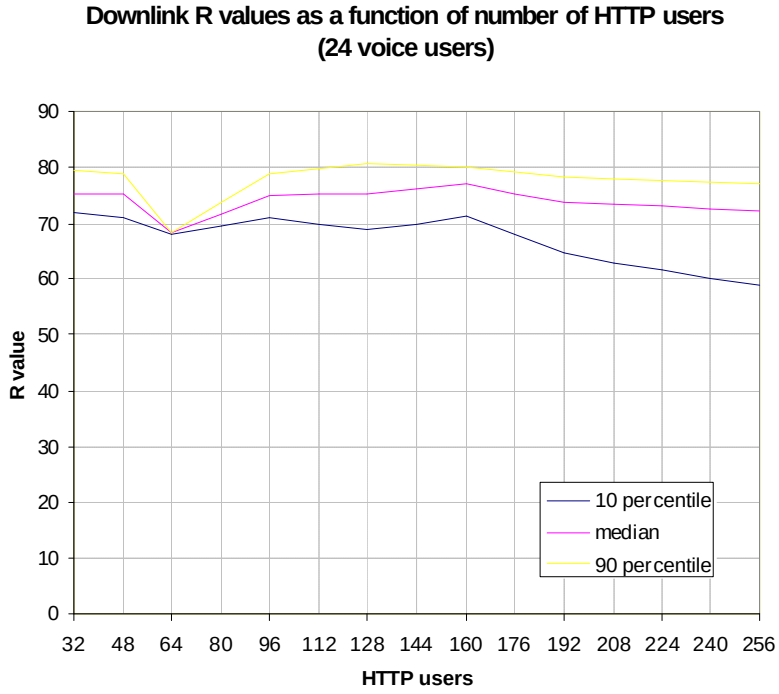
Data rate of HTTP users



HTTP and VoIP users

Voice quality with varying HTTP users





Traffic Mix

Traffic Category	Application	Percentage (%)
Best Effort	FTP	30
Interactive	Web browsing	30
Streaming	Video streaming	30
Real-time	VoIP	10

System Level Simulation Parameters

BS antenna	Number of antennas	12
	Antenna separation	0.5 λ
UT antenna	Number of antennas	4
	Antenna separation	0.5 λ
Layout		19BS with 3sector each
max Tx power at BS		39dBm/12ant
max Tx power at UT		27dBm
BS antenna gain		17dBi
UT antenna gain		0dBi
BS NF		5dB
UT NF		10dB
Temperature		15°C
BS cable loss		3dB
UT body loss		3dB
Simulation bandwidth		2.5MHz (4 carriers) (1 carrier= 625kHz)

Channel Mix

Suburban macro channel mix

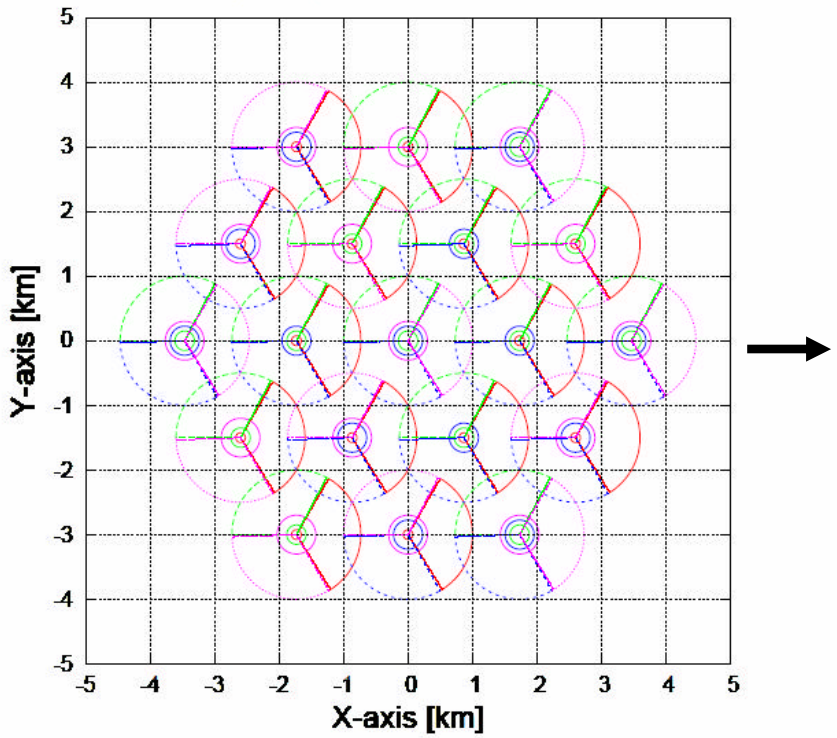
Channel PDP Models	I			II			III	IV		
User speed (km/h)	3	30	120	30	120	250	3	30	120	250
Probability	0.20	0.12	0.08	0.12	0.08	0.0	0.20	0.12	0.08	0.0

Urban micro channel mix

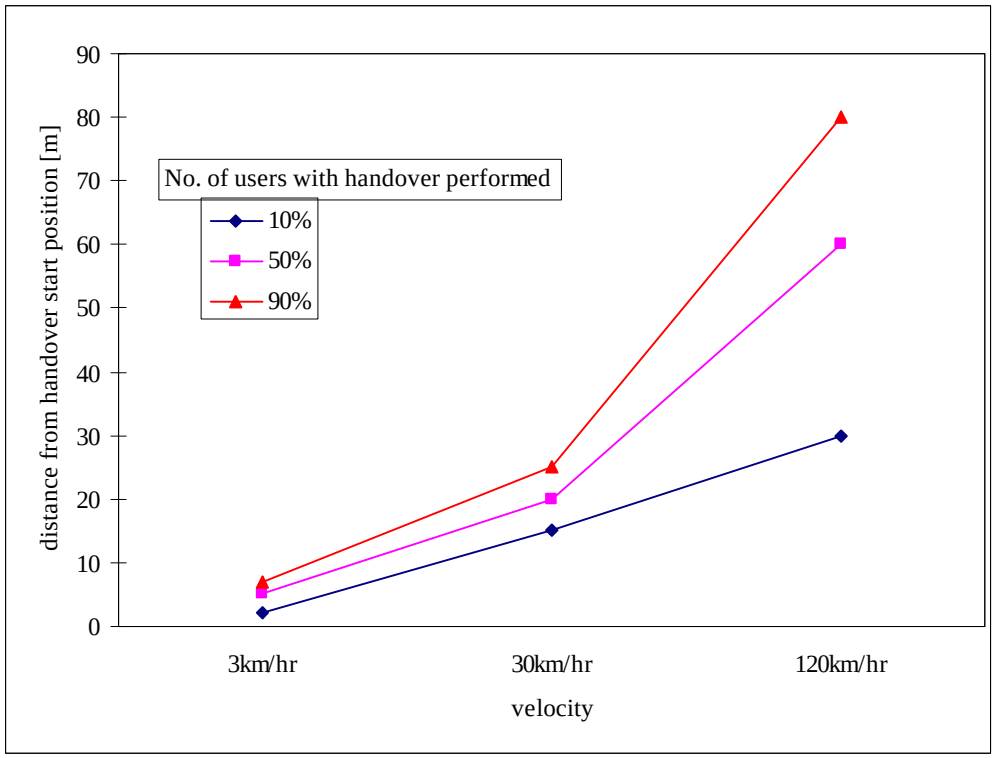
Channel PDP Models	I			II			III	IV		
User speed (km/h)	3	30	120	30	120	250	3	30	120	250
Probability	0.29	0.14	0	0.14	0	0	0.29	0.14	0	0

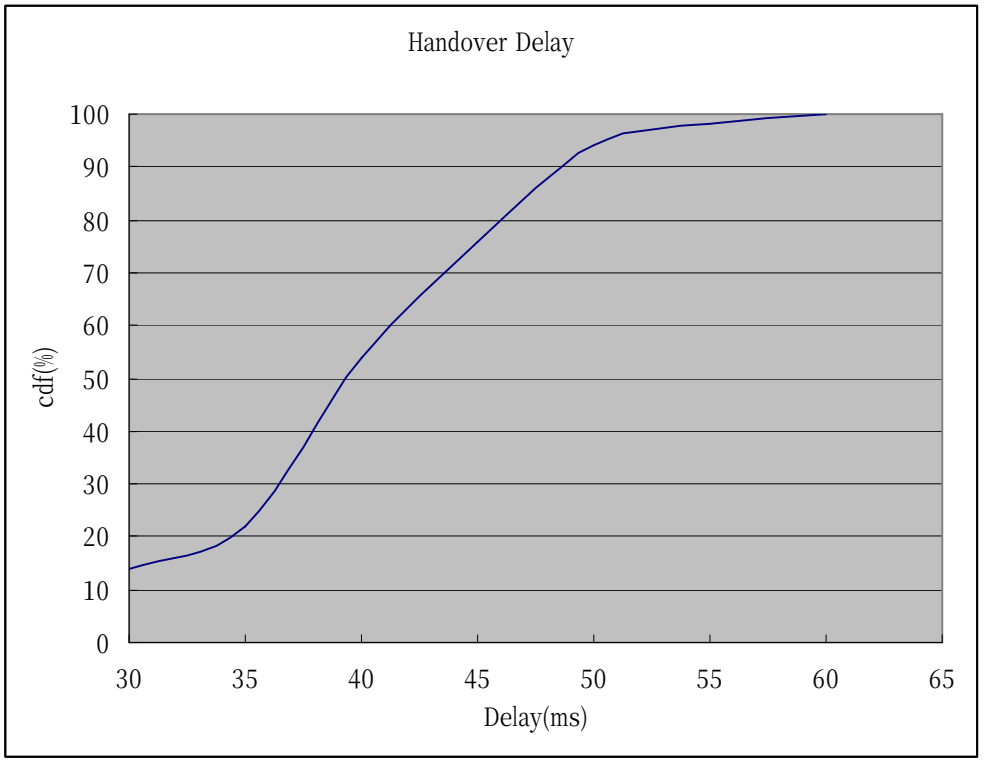
Mobility Model-Handoff performance

- One mobile moving in a straight line from a location close to one BS to a location close to destination BS

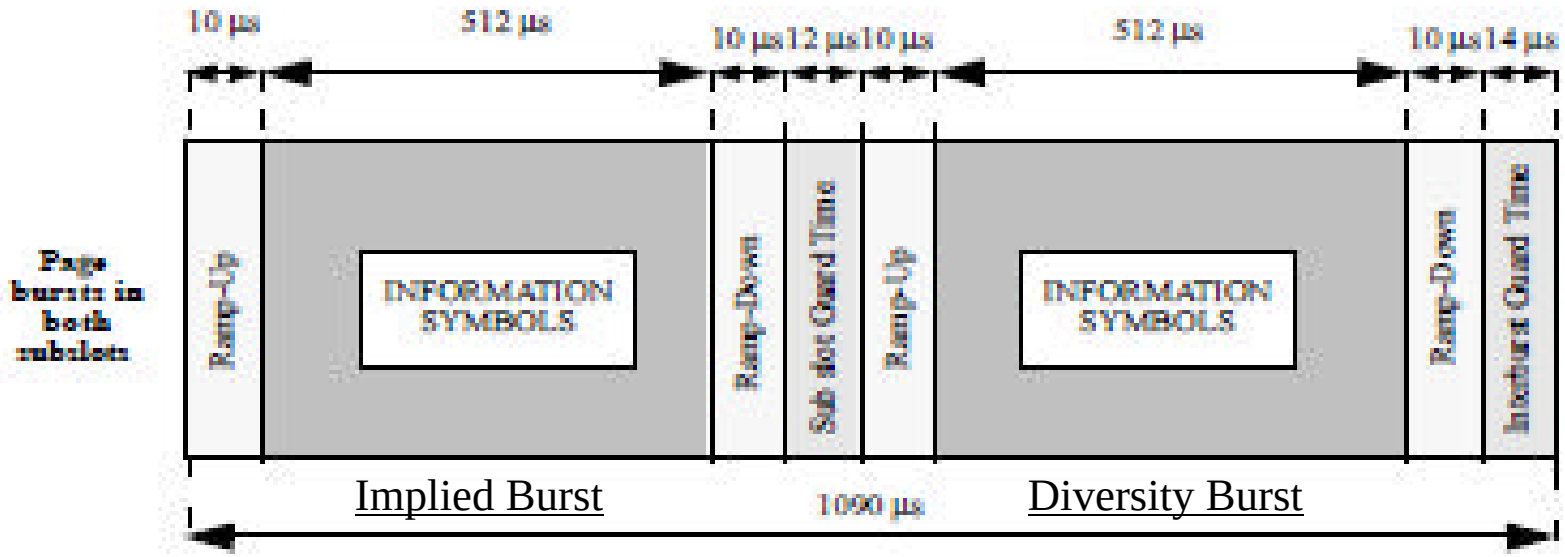


Handoff distance and Handoff delay

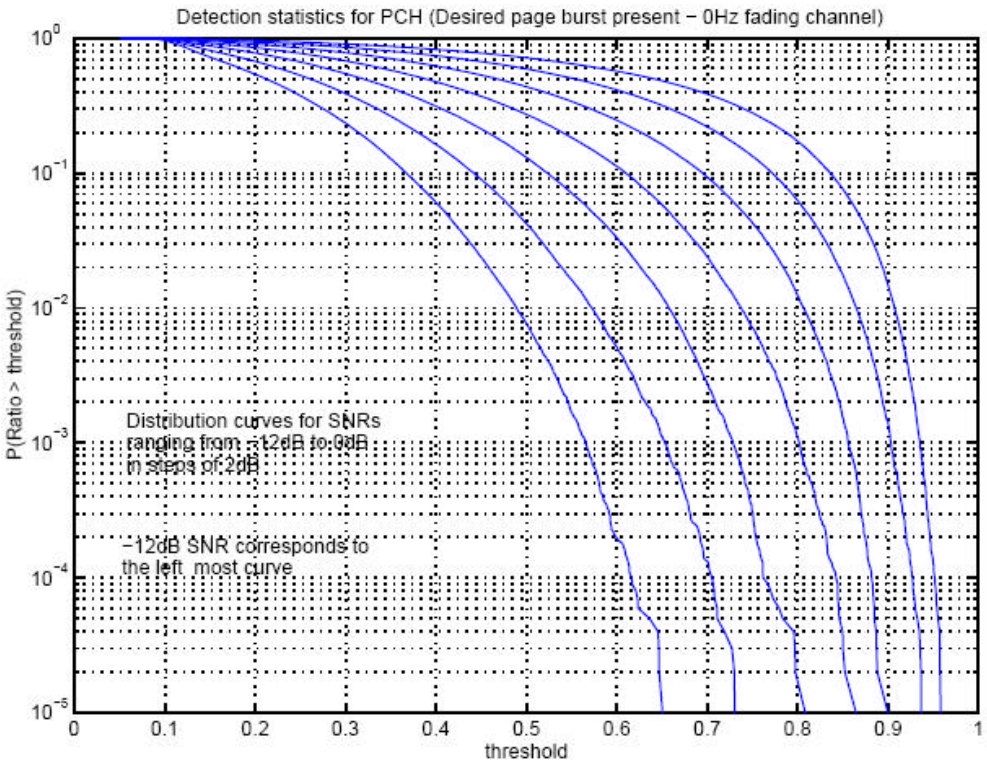


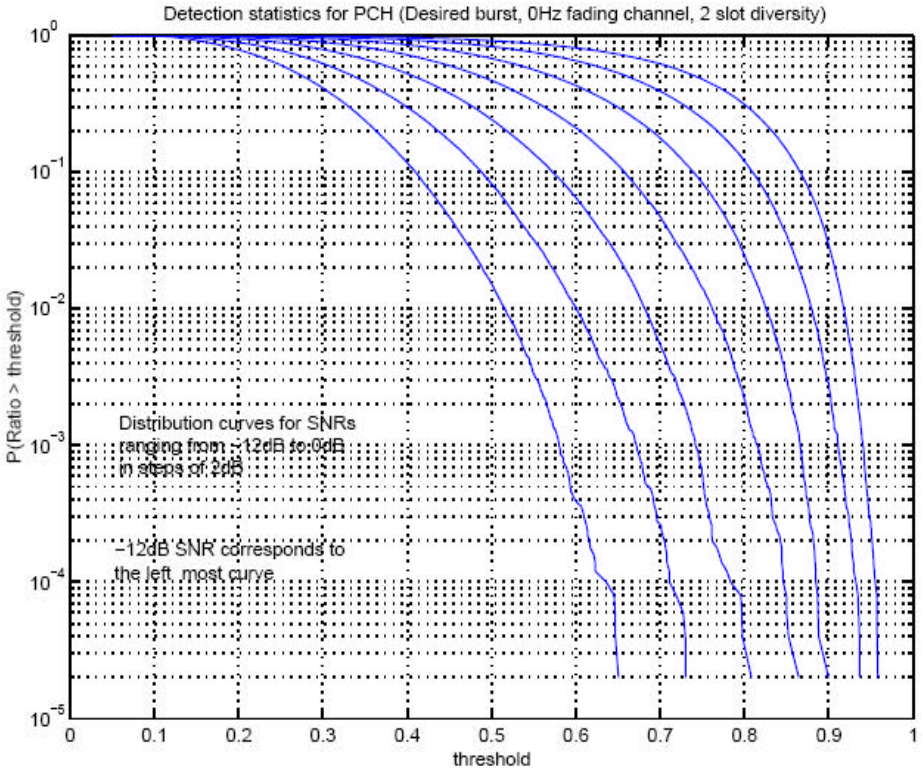


Overhead channels-Paging Channel



Overhead channels-Paging Channel

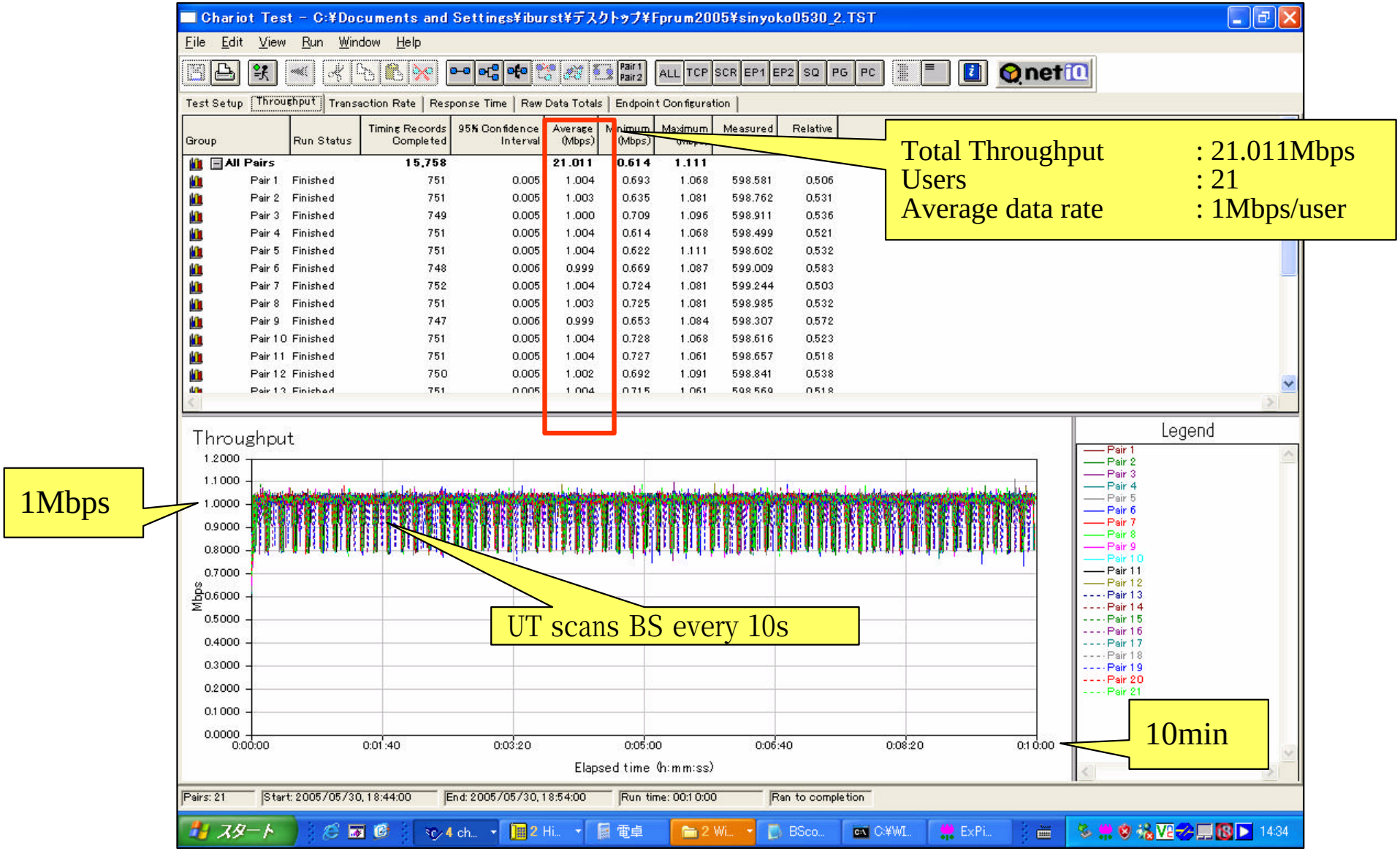




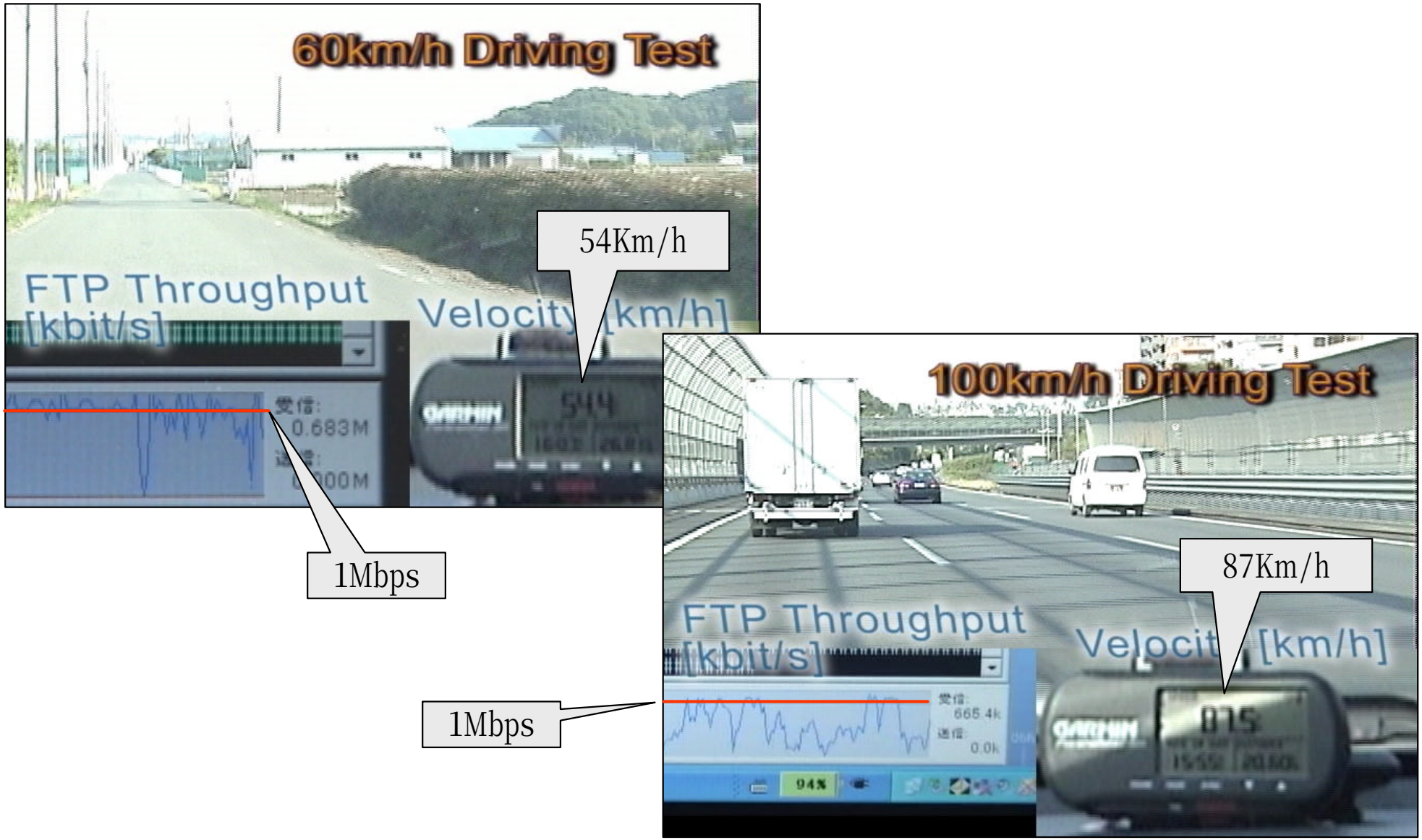
Appendix

Practical System Results

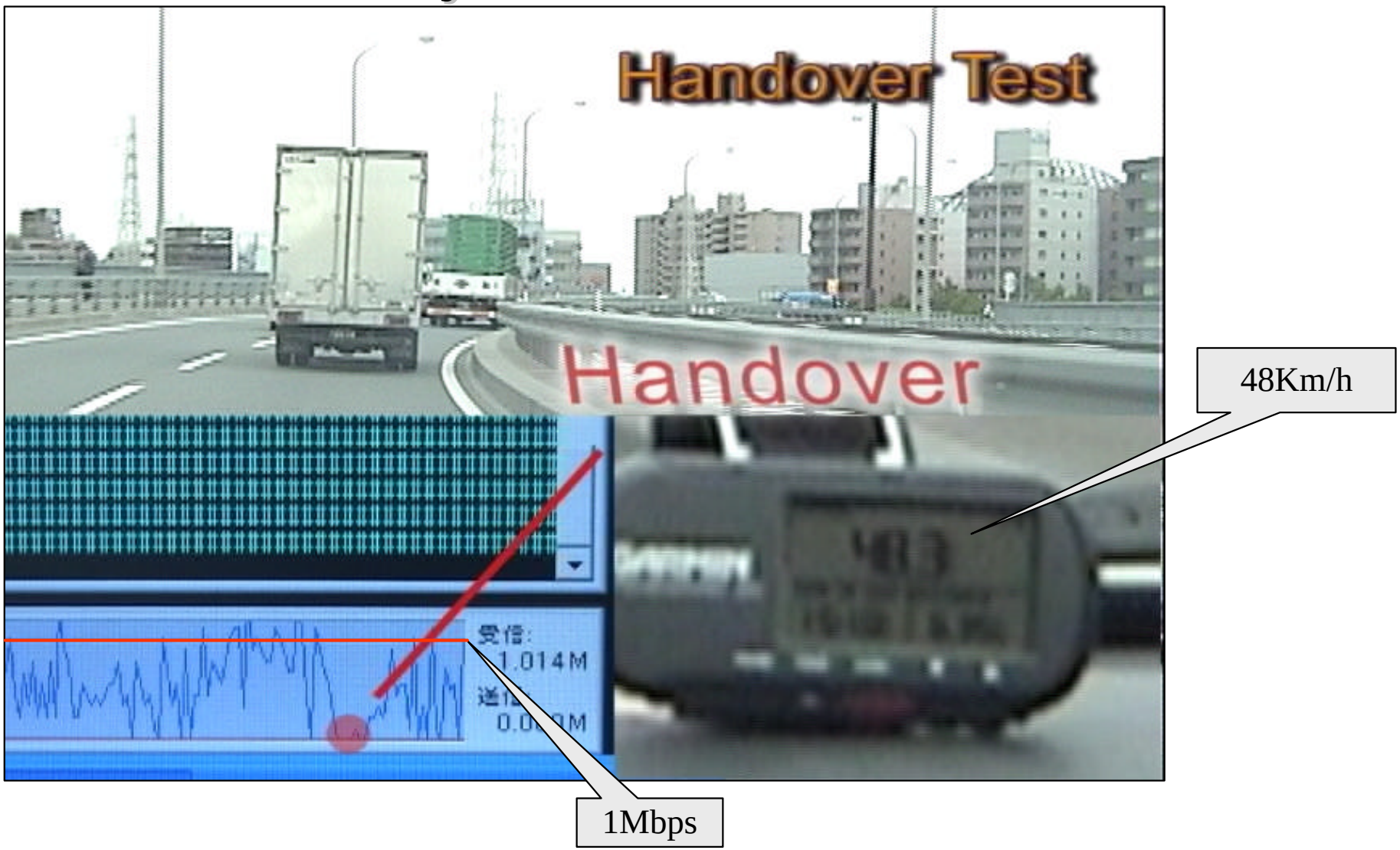
Practical System Results -Yokohama



Practical System Results -Yokohama



Practical System Results -Yokohama



Practical System Results -Yokohama

Traffic Mix

Carrier: **4 (with 3 spatial channels)**
BS: **1 (2.5MHz)**
UT: **34 → FTP 10 users**
Video Streaming 10 users
HTTP 10 users
VoIP 4 users

- Ftp: Data of 100Mbyte was continuously downloaded.
- Video: 5 mins of content requiring a data rate more than 450kbps was repeated viewed using real player.
- HTTP: 22 pages were viewed repeatedly. Each page was viewed for 6secs after being displayed.

Practical System Results -Yokohama

Traffic Mix