TM500 Multi–UE
TM500 Extended Multi-UE
EAST500
FDD & TDD LTE
Functionality Delivery List

AAS-0865

Issue F

Company Confidential

	Name	Signature	Date
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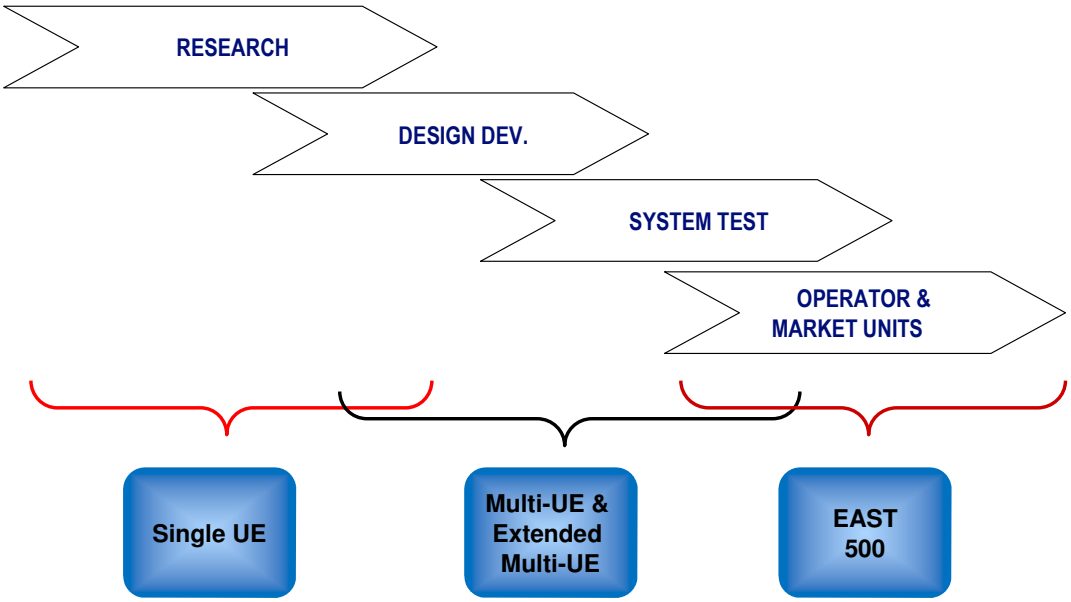
CHANGE HISTORY

Document Version	Date	Name	Change Description

OVERVIEW

This document defines the supported functionality and delivery schedule for the Aeroflex TM500 LTE Multi-UE, Extended Multi-UE and EAST500 test mobile products. The document covers FDD and TDD.

The TM500 product family supports eNB and infrastructure testing at each stage of development, from proof-of-concept field trials and research through system test to real world end to end performance testing. The TM500 flexible hardware platform is re-usable at each stage, providing backwards compatibility, option for hardware sharing between different groups and the ability to use the very latest LTE features in a system or capacity test environment.



The functionality of the baseline TM500 LTE Multi-UE may be enhanced through the addition of product options as shown in Figure 1.

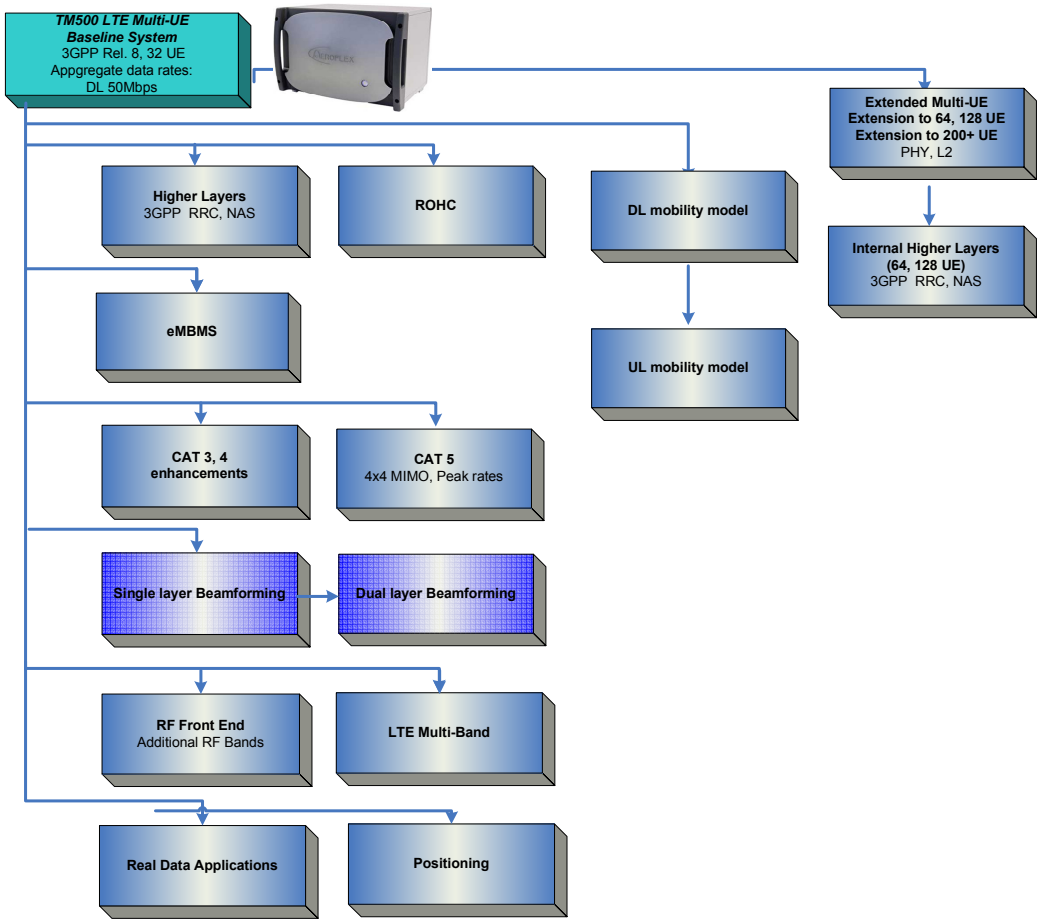
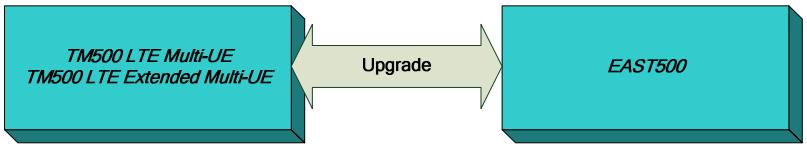


Figure 1: TM500 Multi-UE option structure

'Real World' LTE Capacity Testing

EAST500 is a highly flexible and scalable system designed for LTE network load and stress testing via the eNodeB. User can create easily test scenarios for multiple cells and hundreds or thousands of UEs. Independent fading and traffic models per UE provide a realistic real world system simulation in a lab environment. The post analysis tools give comprehensive measurements across all LTE layers with an unprecedented insight of the system that let the user evaluate and troubleshoot the overall performance of the eNodeB and LTE network.



EAST500 builds on the Aeroflex TM500 multiple UE simulator and the EXFO EAST network simulator. The system is offered with two hardware options:

- In a cabinet as shown in Figure 2 below *or*
- Using Benchtop Capacity TM500s plus separate EAST controller

Figure 2: EAST500 cabinet hardware

1. ROADMAP FUNCTIONALITY

Item	Functionality Description		32-UE Multi-UE		ext MUE	EAST500	Comments
			FDD	TDD	FDD/TDD	FDD/TDD	
1.		3GPP revisions selectable in latest release	Release 8: Mar'09, June'09, Sept'09, Dec'09, Mar'10, June'10, Sept'10, Dec'10 Release 9: Sept'09, Dec.09, Mar'10, June'10, Sept.'10, Dec'10		As Multi-UE	Dec'10	
2.		200 UE support per TM	N/A	N/A	Oct'11	✓	
3.		300 UE support per TM	N/A	N/A	Dec'11	Jan'12 Up to 1800 UE per system	Product option
4.		420 UE support per TM	N/A	N/A	Q1'12	Q1'12	Product option
5.		600 UE support per TM	N/A	N/A	Q2'12	Q2'12	Product option
6.		2-cell LTE Handover	✓	✓	-	✓	Two TM500 are required for HO unless MUE HO Option purchased.
7.		Multi-Cell LTE Handover (2+ Cells)	-	-	Nov'11	Jan12	200 UE HO in initial release. Product OPTION
8.		Inter-frequency HO between different bands	✓	✓	Nov'11	✓	
9.		1.4 MHz support	✓	Q2'12	✓/Q4'12	✓/Q4'12	
10.		Mobility models: DL slow fading	✓	✓	32 UE : ✓ All UE: Oct'11	32 UE : ✓ All UE: Oct'11	Product OPTION Fast fading for > 32 UE is

11.		Mobility models: DL fast fading	✓	✓	Up to 32 UE	Up to 32 UE	scheduled for Q1'12
12.		Mobility models: UL slow fading	✓	✓	✓	✓	Product OPTION Fast fading for > 32 UE is scheduled for Q1'12
13.		Mobility models: UL fast fading	Oct'11	Oct'11	Up to 32 UE: Nov'11	Up to 32 UE: Nov'11	
14.		Frequency selective UL interference	Jan'12	Jan'12	Feb'12	Feb'12	Available with the UL mobility model
15.		8 DRBs per UE	✓	✓	✓	Nov'11	Provided that the total number of DRBs is less than 800
16.	**Real data apps**	HTTP, FTP	✓	✓	✓	✓	Product OPTION.
17.		VoIP	Oct'11	Oct'11	Oct'11	Oct'11	
18.		Video streaming	Oct'11	Oct'11	Oct'11	Oct'11	
19.		Ping	Nov'11	Nov'11	Nov'11	Jan12	
20.		Extended Cyclic Prefix	✓	Nov'11	Q1'12	Q1'12	
21.		TTI bundling	✓	Dec'11	✓/Q1'12	Oct'11/Q1'12	
22.		DRX	✓	✓	Oct'11/Nov'11	Nov'11	
23.		Semi Persistent Scheduling	✓	Q1'12	✓/Q1'12	✓/Q1'12	
24.		Advanced logging for failure analysis (aids analysis for large number of UEs)	Q1'12	Q1'12	Q1'12	Q1'12	
25.		DL 4x2 support	Q3'12	Q3'12	Q3'12	Q3'12	Product OPTION
26.		UL 64QAM (CAT-4 data rates)	✓	✓	Nov'11	Q1'12	
27.	**CAT-5**	UL 64 QAM; (CAT-5 data rates)	✓	✓	Nov'11	Q1'12	Product OPTION (Cat-5) Requires two radio cards per TM
28.		Up to 4 Rx in DL	Q3'12	Q3'12	Q3'12	Q3'12	
29.		DL: 4x4 @ [5,10] MHz (limited data rates)	Q3'12	Q3'12	Q3'12	Q3'12	

30.		DL: 4x4 @ 20 MHz; 300 Mbps DL	Q3'12	Q3'12	Q3'12	Q3'12	
31.	**Rel-9 BF 10 MHz**	Rel-9 Beamforming – 10 MHz (Dual Layer RS on ports 7 & 8)	-	✓	-	-	Product OPTION (Rel-9 BF)
32.	**Rel-9 BF 20 MHz**	Rel-9 Beamforming – 20 MHz (Dual Layer RS on ports 7 & 8)	Q2'12	Dec'11	Q3'12/Q1'12	Q1'12	
33.	**Rel-9 eMBMS**	eMBMS (15KHz) (PHY, L2 & HL)	Q1'12	Q1'12	Q2'12	Q2'12	Product OPTION
34.	**Rel-9**	CMAS	Oct'11	Oct'11	Nov'11	Jan'12	
35.		UE Information procedure (RLF report)	Oct'11	Oct'11	Nov'11	-	
36.		Enhanced CS Fallback	Oct'11	Oct'11	Nov'11	Q2'12	
37.		Rel-9 March '11 and June '11 CRs	Oct'11	Oct'11	Nov'11	Q1 12	
38.		VoLTE	Oct'11	Oct'11	Nov'11	Q1 12	
39.		R9 full reconfiguration	Q4'11	Q4'11	Q4'11	-	
40.		Handover for SRVCC	Q4'11	Q4'11	Q4'11	Q2 12	
41.		P-CSCF discovery					
42.		• Via DHCP/DNS	Oct'11	Oct'11	Nov'11	-	
43.		• Via IP-CAN procedures	Oct'11	Oct'11	Nov'11	-	
44.		• Via pre-defined address	supported	supported	supported	-	
45.		ISIM support	Nov'11	Nov'11	Nov'11	-	

46.		IMS Authentication procedure	Nov'11	Nov'11	Nov'11	-	
47.		NOTIFICATION to request IMS re-establishment	Nov'11	Nov'11	Nov'11	-	

2. TM500 MULTI-UE PHY AND LAYER 2 FUNCTIONALITY

For recent features, the first release supporting the feature is also shown.

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
1.	**General**	LTE test mobile compliant with 3GPP specifications.	Tracking 3GPP	Tracking 3GPP	Tracking 3GPP	Tracking 3GPP	SW switchable between 3GPP baselines
2.		Max number of UEs on PDCP mode	32	32	64 (Option),128 (Option) ✓ 200: roadmap option* 300, 420:roadmap option*		Subject to license. Ext MUE supports 200+ UEs in Layer1&2 modes
3.		LTE UE Category 2	✓ (Baseline)	✓ (Baseline)	✓	✓	UE categories defined in 3GPP 36.306.
4.		LTE UE Category 3	✓ (OPTION)	✓ (OPTION)	✓	✓ (Baseline)	
5.		LTE UE Category 4	✓ (OPTION)	✓ (OPTION)	✓	✓ (OPTION)	
6.		Cells per system	1 or 2 cells per TMA	1 or 2 cells per TMA	1 cell per TMA or multiple cells with Handover Option	1 - 6 cells	TMA (Test Mobile Application) is the Aeroflex control GUI. Each cell requires a baseband hardware unit. EAST500 is controlled by EAST
7.		Handover support (intra-frequency)	✓	✓	With HO Option	With HO Option	
8.		Handover support (inter-frequency)	✓	✓	With HO Option	With HO Option	
9.		Layer 1/2 functionality: PHY/MAC/RLC/PDCP	✓	✓	✓	✓	
10.		Test modes	HARQ, (RLC), PDCP, NAS	HARQ, (RLC), PDCP, NAS	(RLC), PDCP, NAS	NAS	(RLC) mode by using transparent PDCP. MUE/eMUE: NAS included with Higher Layer OPTION.
11.		Comprehensive range of Layer 1/2 measurements and loggings	✓	✓	✓	✓	Support of real-time graphical charting for on-line monitoring and detailed text-based logging for off-line analysis.
12.		Independent control per UE	✓	✓	✓	✓	

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
13.		Lab-based, cabled only operation	✓	✓	✓	✓	
14.	TDD specific	Special sub-frame configuration	n/a	✓	✓	✓	n/a to FDD
15.		UL/DL configuration	n/a	✓	✓	✓	n/a to FDD
16.		TDD specific PRACH format	n/a	✓	✓	✓	n/a to FDD
17.		Rel-8 Beamforming (Single Layer)	n/a	✓	✓	✓	Product option
18.		Rel-9 Beamforming (Dual Layer)	n/a	✓ S3.2.0	✓	Roadmap*	Product option
19.	RF	RF Frequency Band Support: 3GPP Band 1 & Band 9	✓	✓	✓	✓	Other bands are available as product options.
20.		2 radio cards support (extra RF bands)	✓	✓	✓	✓	
21.		RF bandwidth	1.4 MHz 3MHz 5MHz 10MHz 15MHz 20MHz	3MHz 5MHz 10MHz 15MHz 20MHz	3MHz 5MHz 10MHz 15MHz 20MHz	3MHz 5MHz 10MHz 15MHz 20MHz	
22.		Duplexed Rx/Tx connector	✓	✓	✓	✓	
23.		10MHz external reference	✓	✓	✓	✓	
24.		OFDM DL / SC-FDMA UL	✓	✓	✓	✓	Unicast traffic reception as per 3GPP.
25.	PHY	Cyclic Prefix	Normal	Normal	Normal	Normal	Extended Cyclic prefix is a roadmap function
26.		DL Modulation: QPSK, 16QAM, 64QAM	✓	✓	✓	✓	
27.		UL Modulation: QPSK, 16QAM	✓	✓	✓	✓	

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
28.		Downlink Transmission Modes: 1. Single-antenna port; port 0 2. Transmit diversity 3. Open-loop spatial mux 4. Closed-loop spatial mux 5. Multi-user MIMO 6. Closed-loop Rank=1 precoding	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	Single-antenna port 5 is a PRODUCT OPTION
29.		Maximum aggregate DL throughput (across all UEs)	100 Mbps Cat 4 Option: 150 Mbps	100 Mbps Cat 4 Option: 150 Mbps	100 Mbps Cat 4 Option: 150 Mbps	100 Mbps Cat 4 Option: 150 Mbps	300 Mbps is a roadmap option with Cat. 5
30.		Maximum aggregate UL throughput (across all UEs)	50 Mbps	50 Mbps	50 Mbps	50 Mbps	75 Mbps is a roadmap option with Cat. 5
31.		Independent DL/UL link adaptation per UE	✓	✓	✓	✓	Adaptive MCS, bandwidth and power.
32.		DCI formats	0, 1, 1A, 2, 2A, 1C,3, 3A	0, 1, 1A, 2, 2A, 1C,3, 3A	0, 1, 1A, 2, 2A, 1C,3, 3A	0, 1, 1A, 2, 2A, 1C,3, 3A	Other L12 control formats are roadmap items
33.		P-SCH / S-SCH / DLRS /PBCH PDSCH / PUSCH	✓	✓	✓	✓	Synchronisation channel and pilots as per 3GPP.
34.		PHICH	✓	✓	✓	✓	Carries UL-HARQ (ACK/NACK for UL-SCH),
35.		UL signals: SRS, DMRS	✓	✓	✓	✓	Signals for UL channel estimation and scheduling.
36.		SRS HL configuration (all params)	✓	✓	✓	Roadmap*	
37.		PRACH (all formats)	✓	✓	✓	✓	Initiates RACH procedures, as per 3GPP.
38.	L2	UL / DL HARQ procedures LCH Prioritization, MUX	✓	✓	✓	✓	HARQ error protection. Simultaneous UL and DL data transfer.
39.		RLC	✓	✓	✓	✓	Data transfer, error correction through ARQ, concatenation, segmentation, in sequence delivery etc
40.		PDCP	✓	✓	✓	✓	Sequence numbering, reordering and detection and discard of duplicated PDU.
41.		RACH , BCH / D-BCH / PCH	✓	✓	✓	✓	Multiple UE on RACH procedure.
42.		UL-SCH	✓	✓	✓	✓	Configurable PN sequence, fixed frame or user defined payloads.

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
43.		DL-SCH	✓	✓	✓	✓	Supports BER/BLER measurement per UE for PN sequence, fixed frame payload user provided patterns.
44.	**Procedures**	Cell search UL closed loop power control Random access procedures PUSCH / SRS frequency hopping PDCCH initiated RACH	✓	✓	✓	✓	
45.		UL power headroom reports HL params configuration	✓	✓	✓	Roadmap*	
46.		UL Control Information (CQI, PMI, RI)	✓	✓	✓	✓	
47.		Automatic UL Timing Adjustment	✓	✓	✓	✓	
48.		Group & sequence RS hopping	✓	✓	✓	✓	
49.	**Logging & measurements**	OFDM / MIMO Rx signal SC-FDMA Tx signal	✓	✓	✓	✓	RSSI, RSRP, SIR per antenna UL Tx signal power per UE
50.		Detailed high volume DL PHY logging per TTI per UE - Control signalling - Decoder logging	✓	✓	-	-	PCFICH, PHICH, PDCCH (DCI) contents, DL resources assignment, UL scheduling grant, HARQ signalling, PUSCH hopping trigger, control symbols per sub-frame, PDU counters, CRC result, RV, RSN, Decoded transport block size etc
51.		UL information logging	✓	✓	✓	✓	CQI, RI, PMI, scheduling information, DL-HARQ per UE
52.		Filtered logging	✓	✓	✓	✓	System or per UE logging. Ability to filter desired information.
53.		PHY & Decoder statistics per UE	✓	✓	✓	✓	BLER, throughput, retransmission statistics, RB usage per UE, MCS, average number of control symbols, PDCCH aggregation level, average transport block size etc

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
54.		Detailed L2 (MAC/RLC/PDCP) logging per UE, per TTI	✓	✓	-	-	MAC control elements, MAC PDU, PDU, SDU counters, status & polling PDU etc
55.		L2 (MAC/RLC/PDCP) statistics per UE	✓	✓	✓	✓	Overhead due to padding ratio, average PDU size, throughput etc RLC throughput and RTT, reordering queue statistics, PDCP information etc
56.		System statistics	✓	✓	✓	✓ See detailed document*	Examples: Aggregate & peak cell throughput, allocated BW, mean UE throughput, #UE signalled per TTI. Measurements may also include radio interface latency, spectrum efficiency, coding rate statistics etc
57.		Transport Monitoring Interface (downlink/uplink) Test points include receiver RLC and PDCP outputs	✓	✓	✓	✓	Payload data extraction from specific points within the Layer 1 and 2 encoder / decoder chain.
58.		Event driven logging on PHY measurements	✓	✓	✓	Roadmap*	Options may include RACH contention, throughput, BLER, latency or RSSI crossing a threshold. User defined events flexibility.
59.		Alarms on unexpected eNodeB behaviour	✓	✓	✓	-	UL/DL resources overlapping, grant that exceeds UE category, time advance commands exceed a threshold eNodeB signals UE during DRX
60.	**Charts, Test features**	PN sequence and fixed frame data generators and evaluators	✓	✓	✓	-	Support of bit and block error rate measurements.
61.		Cell watch	✓	✓	✓	-	Display of system statistics include Rx/Tx power, aggregate UL/DL throughput, spectrum efficiency, BW allocated, #UEs signalled per TTI, latencies, out/in sync etc Run-time display.
62.		Per UE watch	✓	✓	✓	-	UE displayed statistics include, DL/UL BW allocation, UL/DL BLER, CQI reported, UE status, throughput (e.g. RACH, DL-SCH), MCS etc Run-time display.
63.		Run time throughput graphs	✓	✓	✓	Roadmap*	Cell aggregate throughput, UE selectable throughput, mean UE throughput etc
64.		Path loss and UE Tx power	✓	✓	✓	-	UL power and path loss versus time

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
65.		RB usage histogram and reported CQIs	✓	✓	✓	-	Cell and UE RB usage histogram combined with the average CQI reported per RB enables trouble shooting on scheduler performance.
66.		3D charts e.g. throughput vs time per UE	✓	✓	✓	-	Options may include colour coded UE RB allocation against time, throughput per UE etc
67.		DL-HARQ table driven override (FEC result)	✓	✓	-	-	Table driven ACK/NACK override / BLER % configuration per UE.
68.		DL-HARQ override BLER %	✓	✓	✓	-	
69.		Dynamic BLER based on channel model	✓	✓	✓	✓	Enables UL retransmissions.
70.		UL-HARQ: Table driven forced UL retransmissions	✓	✓	-	-	Multiple UE on RACH procedures. Up to 2 UEs can transmit overlapping PRACH with user configured path delay (time offset). Enables contention resolution tests
71.		UL-HARQ: BLER % forced UL retransmissions	✓	✓	✓	✓	
72.		PRACH collision	✓	✓	✓	-	Enables PRACH transmissions with full or partial overlapping.
73.		Path delay on PRACH per UE	✓	✓	-	-	Simulates different path delay per UE.
74.		Scripted path loss	✓	✓	✓	✓	Enables CQI, PMI, RI link adaptation testing Emulates slow fading
75.		CQI, PMI, RI UL feedback per UE	Scripted & Table driven & Modelled	Scripted & Table driven & Modelled	Slow & fast fading model	Slow & fast fading model	User selected UEs ignore TPC commands. Fast fading is a product OPTION
76.		UL power control disable	✓	✓	-	-	DL channel models stimulate modeled UE feedback and BLER
77.		DL type approval channel models & BLER due to modeled channel conditions (e.g. EPA, EVA, etc)	✓	✓	✓	✓	UL frequency selectivity (CIR).OPTION
78.		UL interference generation	Wideband	Wideband	Wideband	Wideband	User defined HO scenarios
79.		Scripted RSRP, RSRQ	✓	✓	✓	✓	Based on path loss and channel type

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
80.		Modelled RSRP, RSRQ	-	-	-	-	Provides straight forward configuration of test scripts via a PC-based graphical user interface
81.	Data entities	Fixed frame data entities	✓	✓	✓	✓	
82.		PN9 (and inverted PN9) sequence	✓	✓	✓	✓	
83.		PN15 (and inverted PN15) sequence	✓	✓	-	-	
84.		PN32 (and inverted PN32) sequence	✓	✓	-	-	
85.		TMA data services generator User defined payloads & patterns	✓	✓	✓	-	
86.	Real data applications	HTTP, FTP	✓	✓	✓	✓	
87.		VoIP	**Roadmap***	**Roadmap***	**Roadmap***	**Roadmap***	
88.		Video streaming	**Roadmap***	**Roadmap***	**Roadmap***	**Roadmap***	
89.	Control	Script Editor	✓	✓	✓	✓	Provides interactive control of TM500 plus measurement configuration and real time logging with graphical charting features
90.		Test Mobile Application	✓	✓	✓	-	Ability to group UEs and their configuration
91.		Group UE configuration	✓	✓	✓	✓	Independent semi-static dedicated parameter configuration per UE.
92.		L1 & 2 configuration: Independent dedicated parameters per UE	✓	✓	✓	✓	Display of broadcasted parameters for quick cell-specific parameters configuration.
93.		L1 & 2 configuration: Broadcasted parameters	✓	✓	✓	✓	
94.		Dynamic creation and deletion of UEs	✓	✓	✓	✓	TM500 may be incorporated into an automated regression test system via proxy monitoring and control interface
95.		Automated test control	✓	✓	✓	✓	
96.		Machine to machine interface: ASN.1 configuration interface	✓	✓	✓	-	
97.		EDIP+ for SRBs and DRBs	✓	✓	✓	n/a	For host PC interface

ref	PHY and Layer 2 Functionality Description		32 UE Multi-UE FDD	32 UE Multi-UE TDD	ext MUE FDD/TDD	EAST500 FDD/TDD	Remarks
98.		1000Base-T (Gigabit Ethernet) interface	✓	✓	✓	✓	
99.		Power supply AC input voltage range 100V to 250V AC input frequency range 50Hz to 60Hz	✓	✓	✓	✓ With some product configuration restrictions at lower supply voltages.	The S1/X2 simulation option for EAST500 must be supported in a separate chassis for 100/110V operation.
100.		User manuals	✓	✓	✓	✓	

Roadmap*: refer to section 1 *"Roadmap functionality"* for delivery time of the item

3. TM500 MULTI-UE HIGHER LAYERS FUNCTIONALITY

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
101.	**General**	LTE test mobile compliant with 3GPP specifications	**Tracking 3GPP**	**Tracking 3GPP**	**Tracking 3GPP**	
102.		Max number of UEs full stack (NAS mode)	**32, 64, 128**	**32, 64, 128**	**32, 200, 300, 420: roadmap***	
103.		State-machined based Layer 3	✓	✓	✓	Layer 3 and procedures compliant to 3GPP specifications
104.		Scripted Layer 3 option	✓	✓	✓	PC-based application to support scripting of RRC and NAS messages and procedures.
105.		Layer 3 access stratum – RRC	✓	✓	✓	ASN.1 from Rel-9 Dec 2010 specification.
106.		Layer 3 Non Access Stratum	✓	✓	✓	Currently 3GPP Rel-9 (Dec '10).
107.		Release 8 feature support	✓	✓	✓	
108.		Release 9 feature support	Partial	Partial	Partial	
109.		Lab-based cabled operation	✓	✓	✓	
110.		Drive testing	-	-	-	
111.	**Layer 1/Layer 2 Functionality**	Layer 1 and layer 2 aligned to TM500 LTE L1L2 option	✓	✓	✓	
112.		PDCP Robust header compression (ROHC)	✓	✓	✓	Available as a product option. See below for profile details
113.	**RRC Functionality**	Paging (Idle mode)	✓ (see comments)	✓* (see comments)	✓	* System Information Modification is supported in 32 UE MUE. Roadmap for Ext MUE.
114.		Paging (Connected mode)	✓	✓	✓	For ETWS Indication or System Information Modification
115.		RRC Connection Establishment	✓	✓	✓	
116.		RRC Connection Reconfiguration	✓	✓	✓	
117.		RRC Connection Re-establishment	✓	✓	Nov 11	
118.		RRC Connection Release	✓	✓	✓	

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
119.		Radio Resource Configuration	✓	✓	✓	
120.		SRB addition / modification	✓	✓	✓	
121.		DRB release / addition	✓	✓	✓	
122.		DRB modification	✓	✓	Roadmap*	
123.		RRC Security Mode procedure	✓	✓	✓	
124.		System Information decode	SIB1-11	SIB1-11	SIB1-2 Other: Roadmap*	SIB1 and scheduled SIs will be decoded and logged. Use of the signalled information depends on the underlying feature support
125.		UE Capability procedure	✓	✓	✓	
126.		RSRP/RSRQ Measurements report: Scripted	✓	✓	✓	
127.		RSRP/RSRQ Measurements report: Modelled	Roadmap*	Roadmap*	Roadmap*	Modelled: inline with mobility model
128.		ETWS	✓	✓	Roadmap*	
129.		RRC Counter Check procedure	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap*	
130.		RRC reconfiguration failure	✓	✓	✓	RRC reconfiguration failure
131.		RRC Security mode Procedure	✓	✓	✓	RRC Security mode Procedure
132.		UE Capabilities procedure	✓	✓	✓	UE Capabilities procedure
133.		Measurement reports	✓	✓	✓	Measurement reports
134.		Radio Link Failure report (UE Information_procedure)	Roadmap	Roadmap	✓	
135.	**Mobility**	PLMN selection	✓	✓	✓	
136.		Shared Network Support	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0		

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
137.		Cell selection – Rel-8	✓	✓	✓	
138.		Cell selection – Rel-9	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap*	
139.		Cell reselection: intra-frequency	✓*	✓*	Roadmap*	* Currently 32 UE MUE only. Ext MUE support is on the roadmap
140.		Cell reselection: inter-frequency	✓*	✓*	Roadmap*	* Currently 32 UE MUE only. Ext MUE support is on the roadmap
141.		Handover: Intra-frequency (Single UE)	✓*	✓*	Roadmap*	* Currently 32 UE MUE only. Ext MUE support is on the roadmap
142.		Handover: Inter-frequency (Single UE)	✓*	✓*	Roadmap*	* Currently 32 UE MUE only. Ext MUE support is on the roadmap
143.		PDCP Status Reports (Handover)	✓*	✓*	Roadmap*	* Currently 32 UE MUE only. Ext MUE support is on the roadmap
144.		Handover: Inter-RAT signalling only	✓	✓	Roadmap*	signalling support includes scripted measurements and mobility commands
145.		Release with redirect	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap*	
146.		SON/ANR (Rel-8)	✓	✓	Roadmap*	Requires scripted configuration of CGI values
147.		CS Fallback to CDMA2000 1xRTT	✓*	✓*	Roadmap*	* LTE-side signalling via test feature
148.		CS Fallback to GERAN/UTRAN	✓*	✓*	Roadmap*	* LTE-side signalling via test feature
149.		Handover: Inter-RAT	✓*	✓*	Roadmap*	* LTE-side signalling via test feature
150.	**Inter-RAT signalling**	Handover: Inter-RAT signalling only	✓	✓	Roadmap*	Signalling support includes scripted measurements and mobility commands
151.		Release with Redirect to GERAN, UTRAN, CDMA2000, TD-SCDMA	✓	✓	Roadmap*	
152.		Mobility from E-UTRAN	✓	✓	Roadmap*	
153.		Cell Change Order with/without NACC to GERAN	✓	✓	Roadmap*	
154.		Return to LTE	✓	✓	Roadmap*	
155.	**CSFB**	CSFB to CDMA 2000	✓	✓	Roadmap*	LTE-side signalling

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
156.		Handover from E-UTRA preparation request (CDMA2000)	✓	✓	Roadmap*	
157.		UL handover preparation transfer (CDMA2000)	✓	✓	Roadmap*	
158.		CSFB to GERAN/UTRAN	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap*	
159.		CSFB Emergency call	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap*	
160.	**NAS**	Attach/detach	✓	✓	✓	
161.		Combined Attach (for GSM/UMTS)	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	✓	
162.		Tracking area update – periodic	✓	✓	Roadmap	
163.		Tracking area update – due to TA change in idle mode	✓	✓	Roadmap*	
164.		Tracking area update – due to TA change in connected mode	✓	✓	✓	
165.		Tracking area update – other causes	✓	✓	Roadmap*	
166.		Combined Tracking Area Update	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap*	
167.		Service Request	✓	✓	✓	
168.		Authentication	✓	✓	✓	
169.		Security mode procedures	✓	✓	✓	
170.		GUTI reallocation procedure	✓	✓	Roadmap*	
171.		EMM Information Procedure	✓	✓	✓	
172.		PDN connectivity procedures (stand-alone)	✓	✓	Roadmap*	To configure more than one default bearer
173.		Protocol Configuration Options	✓	✓	Roadmap*	

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
174.		Identity procedures	✓	✓	✓	IMSI supported and IMEI, IMEI-SV , STMSI will be 2.3
175.		EPS bearer context procedures	✓	✓	✓	
176.		EPS bearer context allocation procedures	✓	✓	✓	
177.		EPS bearer context modification	✓	✓	Roadmap*	
178.		UE initiated bearer context release	✓	✓	Roadmap*	
179.		Network initiated bearer	✓	✓	✓	
180.		EPS mobility management timers on network side.			Roadmap*	
181.		PLMN selection	✓	✓	Roadmap*	
182.		PLMN reselection	✓	✓	Roadmap*	
183.	**IMS**	IMS Emergency call	✓	✓	Roadmap*	
184.		Connection to IP-CAN (IP Connectivity access network)	✓	✓	Roadmap*	
185.		SIP signalling	✓	✓	Roadmap*	
186.	**Security**	PDCP Integrity protection (AES, SNOW 3G)	✓	✓	✓	
187.		PDCP ciphering (NULL, AES, SNOW 3G)	✓	✓	✓	
188.		NAS integrity protection (AES, SNOW 3G)	✓	✓	✓	
189.		NAS ciphering (NULL, AES, SNOW 3G)	✓	✓	✓	
190.		User-configured keys	✓	✓	✓	
191.	**Robust Header Compression**	0x0000 No compression (RFC 4995)	✓	✓	✓	
192.		0x0001 RTP/UDP/IP (RFC 3095, RFC 4815)	✓	✓	✓	

Comment [t1]: This is network side. What's the requirement on the UE side?

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
193.		0x0002 UDP/IP (RFC 3095, RFC 4815)	✓	✓	✓	
194.		0x0003 ESP/IP (RFC 3095, RFC 4815)	✓	✓	✓	
195.		0x0004 IP (RFC 3843, RFC 4815)	✓	✓	✓	
196.		0x0006 TCP/IP (RFC 4996)	✓	✓	✓	
197.		0x0101 RTP/UDP/IP (RFC 5225) – ROHCv2	✓	✓	✓	
198.		0x0102 UDP/IP (RFC 5225) – ROHCv2	✓	✓	✓	
199.		0x0103 ESP/IP (RFC 5225) – ROHCv2	✓	✓	✓	
200.		0x0104 IP (RFC 5225) – ROHCv2	✓	✓	✓	
201.	**USIM**	Simulated USIM	✓	✓	✓	Based on test USIM defined in 3GPP TS 34.108. User defined IMSI.
202.		Milenage algorithm in simulated USIM	✓	✓	✓	
203.		Support for real USIM	✓*	✓*	✓	* 32 UE MUE only (for one UE).
204.	**Test Modes**	Higher layer Interface	✓	✓		RLC or PDCP mode + EDIP to support external L3
205.		NAS mode	✓	✓		Internal RRC+NAS, driven by a NAS API
206.	**Measurements / Logging**	Layer 1 logging as per TM500 LTE L1/L2 product	✓	✓		
207.		MAC/RLC logging as per T M500 LTE L1/L2 product	✓	✓		
208.		Protocol trace logging (message sequence charts)	✓	✓		
209.		Protocol status display	✓	✓		Displays current RRC and NAS states, plus active bearers
210.		Event-triggered logging	✓	✓		
211.		UE based statistics on EAST500	-	-	Roadmap*	Existing information with Periodic Wideband CQI Periodic Sub-band CQI

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
						BSR – Buffer Status Report HARQ SRS - Sounding Reference Signal PMI - Precoding Matrix Indicator RI - Rank Indicator Periodic Power Headroom Report Aperiodic Power Headroom Report Jitter and Latency
212.	**Configuration and Control**	Protocol Script Editor	✓	✓	✓	Provides straight forward configuration of NAS-mode test scripts via a PC-based graphical user interface
213.		Automated test control	✓	✓	✓	
214.	**Test Features**	Manual cell selection	✓	✓	-	User-configured cell selection
215.		On-demand attach/detach	✓	✓	✓	
216.		Authentication and Security Mode override	✓	✓	✓	Select between Authentication on or off, and Security Mode procedure on/off/ignore (independently for RRC and NAS)
217.		Security override	✓	✓	✓	User-defined indication of security algorithms.
218.		Configuration override features	Scripted L3	Scripted L3	-	Can be scripted via Scripted Layer 3
219.		On-demand TAU	✓	✓	Roadmap	
220.		RRC Re-establishment test features	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap	Trigger RRC Re-establishment on demand and set reconfiguration cause value. Force selected cell. 32 UE MUE only
221.		On-demand measurement reports	✓	✓	-	
222.		Scripted inter-RAT measurement reports	✓	✓	Roadmap	
223.		Scripted CGI values on neighbour cells	✓	✓	Roadmap	
224.		Set APN for initial Attach	✓ V2.13.0, LMA2.1.0	✓ S3.2.0, LMB2.1.0	Roadmap	
225.		User-defined IMEI	✓	✓	✓	
226.		User-defined IMEI-SV	✓	✓	✓	

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
227.		Simulate UE battery removal	✓	✓	roadmap	Enables reattach without signalled detach
228.		Scripted UE parameters	Scripted L3	Scripted L3	✓	Can be done via Scripted Layer 3
229.	**Customer Documentation**	Higher layers user guide	✓	✓	✓	
230.		Higher layers API reference manual	✓	✓	✓	API above RLC/PDCP for connecting external higher layers or wrap-around tester (standard CRM including EDIP interface)
231.		NAS API reference manual	✓	✓	✓	API above NAS for controlling TM500 (separate from AT command interface)
232.	**User data**	Support for single network-assigned IP address	✓	✓	✓	Via a PPPoE connection
233.		Support for multiple network-assigned IP addresses	✓	✓	✓	
234.		Support for external data	✓	✓	✓	Requires customer integration.
235.		Support for real Data Application integration	Roadmap	Roadmap	✓	OPTION. See section 1.
236.		Support for Traffic Flow Templates	✓	✓	✓	
237.		Support for dedicated Bearer setup during Attach	✓	✓	✓	
238.		IPv4	✓	✓	✓	
239.		IPv6	✓	✓	✓ supported using PPPoE.	
240.		3GPP test loops	-	-		As defined in 3GPP TS 36.309
241.		Internal fixed-frame data generators/evaluators	✓	✓	✓ Dummy	
242.		Internal PN sequence generators/evaluators	✓*	✓*	✓ PRBS	* 32-UE MUE only.
243.		Max. number of DRB	128 MUE 800 ext MUE	128 MUE 800 ext MUE	800 per TM Up to 4800 per system	Support for larger DRB pools is roadmap item.
244.		Number of Data Radio Bearers per UE	8	8	4	Support for more DRBs per UE in Ext MUE is on the roadmap (see section 1)
245.		SMS	Roadmap	Roadmap		

ref		Higher Layers Functionality Description	Multi-UE/ Ext MUE FDD	Multi-UE/ Ext MUE TDD	EAST500 FDD/TDD	Remarks
246.		e-Mail	Roadmap	Roadmap		
247.		Graphical testcase modification	✓	✓	✓	
250		UE specific context handling	✓	✓	✓	
251		Traffic modelling	Roadmap	Roadmap	✓	
252		Call modelling	Roadmap	Roadmap	✓	
253		Multiuser functionality	-	-	✓	

Roadmap*: refer to section 1 *"Roadmap functionality"* for delivery time of the item