

# UbiNetics

## HSDPA Multi-UE Option

**AEROFLEX**  
A passion for performance.



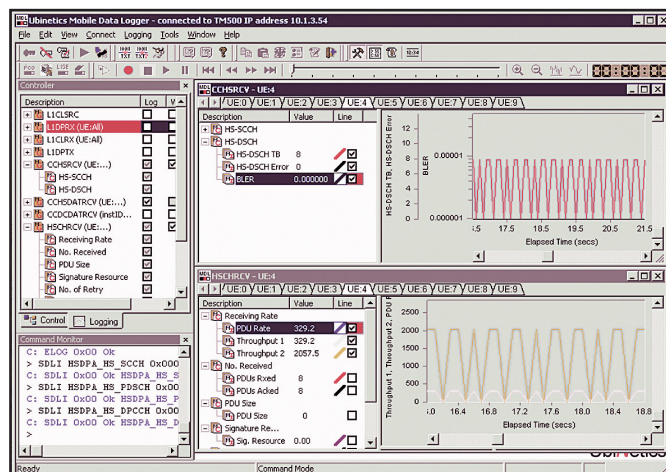
The HSDPA Multi-UE Option provides developers and operators of evolved 3G systems with a comprehensive test environment for performance evaluation, stress testing and benchmarking of a Node B and its scheduling algorithms.

- Node B scheduler testing, verification and optimization
- Real-time simulation of 32 HSDPA mobiles
- Independent mobility models representing real-time fading channel scenarios
- Full Layer 1 support of all UE capability classes
- Supports data rates up to 13.97 Mbps
- Real-time simultaneous decode of HS-SCCH and HS-DSCH for all UEs
- Full MAC-hs and HARQ and re-ordering capability for all UEs
- Deterministic and repeatable channel behavior
- Advanced measurement logging and charting capabilities for all UEs
- Scalable system architecture to provide advanced test configurations

The introduction of High Speed Downlink Packet Access (HSDPA) into Release 5 of the 3GPP specifications provides enhanced support for packet data services with reduced latencies and a peak data rate up to 13.97 Mbps. These features enable improved data service quality and enhanced cell capacity.

The key functionality to achieve these improvements is in the Node B and includes downlink packet scheduling, fast re-transmission and link adaptation techniques.

Efficient operation of this complex functionality depends on the real-time downlink channel conditions, QoS and terminal capability class of each HSDPA mobile in the cell. This makes integration, test and verification difficult, especially in the early stages when real HSDPA mobiles are unavailable.



## Taking the TM500 further

Available as an upgrade to the TM500, the first commercial 13.97 Mbps capable Test Mobile platform, the HSDPA Multi-UE Option simulates the operation of 32 UEs in fading channel conditions, providing:

- Real-time feedback of channel quality, downlink power control and HARQ response
- Ability to configure combinations of UEs from all capability classes
- Independent downlink channel environments for each UE
- Data integrity verification through full simultaneous decode of all HSDPA signalling and data channels on the cell
- Node B stress testing by cascading several Multi-UEs
- Interoperability with the TM500 test mobile for AS/NAS protocol or TCP/IP service demonstrations in a high-load environment

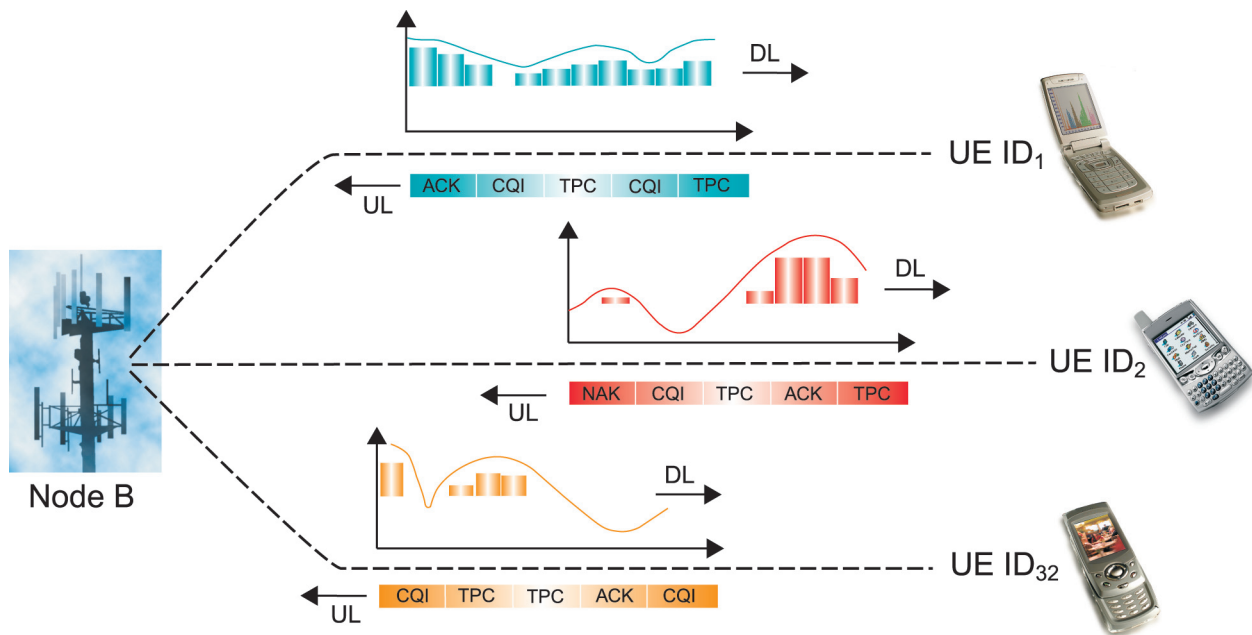
## Up and running

Existing users of the TM500 HSDPA test mobile will be immediately familiar with the Multi-UE control and measurement environment.

**Multi-UE Script Editor** – provides a graphical user interface to help in generating control scripts for Multi-UE operation. In addition, Layer 1 scripts from TM500 testing may be imported directly to run in the Multi-UE test environment.

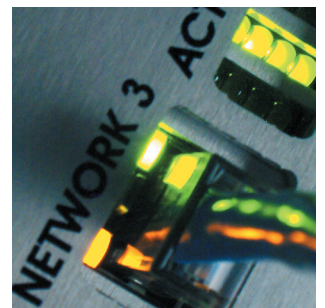
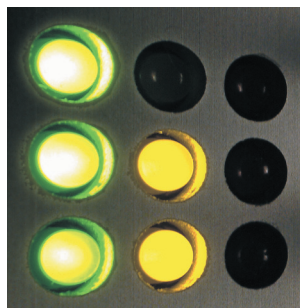
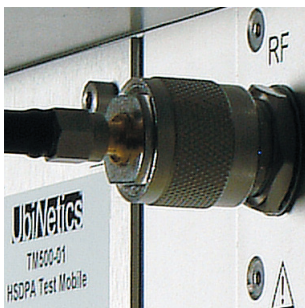
**Multi-UE Data Logger** – provides graphical control and measurement for the Multi-UE. A comprehensive suite of measurement capabilities is provided with values logged to file for offline analysis or displayed in real-time charts. Measurements may apply to individual, multiple or all UEs in the system.

**Channel Model Editor** – a graphical tool for generating the downlink propagation conditions for each mobile. The fading channel profiles may be derived directly from the TM500 logs or calculated by specifying a path loss profile and mobility conditions.



*In a real world scenario, each mobile will experience its own independent fading channel conditions. The quality of the received signal at the mobile will depend upon factors such as path loss, multipath and cell interference and the mobile's velocity. This received signal quality will determine the mobile's ability to decode the HSDPA data and the channel quality information that it reports to the Node B.*

*Aeroflex has introduced the concept of mobility models to the TM500 Multi-UE to represent downlink channel behavior. Each mobile monitors the downlink channel conditions and generates responses based upon the simulated environment. The Node B receives consistent information from each of the 32 mobiles, with mobiles experiencing good simulated channel conditions reporting high CQI channel quality and high data throughput.*



## SPECIFICATION

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### MULTI-UE FEATURES

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#### 32 Simulated HSDPA UEs

HS-SCCH: up to 4 codes

HS-PDSCH: up to 15 multicodes. Multiple UE HS-DSCH decodes supported in the same sub-frame

### SUPPORTED DATA RATES

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#### HSDPA channels

HSDPA DL: decode up to 13.97Mbps

HSDPA UL: HS-DPCCH per UE

#### R99 channels

R99 DL: decode up to 384 kbps on one CCTrCH

R99 UL: one 64 kbps CCTrCH is encoded (the DPDCH information is duplicated across all uplinks)

Independent Td offsets may be specified per UE

### UE CATEGORY

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#### HSDPA category

All categories (1 – 12) supported

Each simulated UE may be configured with its own independent capability class.

### 3GPP SPECIFICATION

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#### Specification version

3GPP Release 5

#### Operational modes

HSDPA WCDMA FDD

### RF SPECIFICATION

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#### Transmit

1920 MHz–1980 MHz

#### Receive

2110 MHz–2170 MHz

#### Duplex

Variable duplex

#### Power class

3 (+24 dBm)

### AIR INTERFACE FEATURES

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#### Chip Rate

3.84 Mcps

#### Bandwidth

< 5 MHz (compliant with 3GPP specifications)

#### Modulation

Downlink: QPSK, 16-QAM

Uplink: Dual-BPSK

## LAYER 1 FEATURES

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#### Transmit diversity

STTD Open Loop Diversity

#### Power control

Simulated DL Power Control requests (values derived from UE Mobility Model)

#### Scrambling Codes

R99 DCH: Primary or Secondary Scrambling Code

HSDPA: Primary or Secondary Scrambling Code

#### HS-SCCH detection/decode algorithms

Y1 algorithm with Part 1/ Part 2 CRC verification

## LAYER 2 CAPABILITIES

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#### MAC-hs

Up to 8 HARQ processes per UE

Full MAC-hs re-ordering capability

MAC-d PDU evaluator provides termination for the MAC-hs

Sequence number extraction from RLC UM header for use in latency measurements

## USER INTERFACE

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#### Mobile Data Logger

Application for the control of the Multi-UE Simulator and display of logged data

#### Multi-UE Script Editor

Application for creating and editing Multi-UE scripts

#### Channel Model Editor

Application for generating downlink mobility models from TM500 test logging or path loss profiles

## TEST FUNCTIONS

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#### Open interfaces

Scripted control of the Multi-UE Simulator at L1 for use with automated test configurations

Modelled mobility mode DL channel conditions, allowing channels to be defined from 3rd party software

#### Error Forcing Features

Failed HS-SCCH detection

Forced multiple HARQ retransmissions

Inconsistent CQI, ACK/NACK and TPC feedback

Independent BERs on CQI, ACK/NACK and TPC feedback

#### Pre-defined mobility models

DL channel conditions based upon standard 3GPP conformance test scenarios

## SYSTEM MEASUREMENTS

Data throughput for all UEs

### MEASUREMENT PER UE

#### Cell Reception Measurement

Timestamp (SFN, Slot Number), Cell ID, Rake Metric Signal Power (PCPICH), Interference Power (PCPICH), Receiving SIR

#### DPCH Transmission Measurement

Timestamp (CFN, Slot Number), Pilot Transmission Power, Received TPC bit (after RL combining)

#### HS-DSCH Reception Data Measurement

Timestamp (SFN), HS-DSCH CRC result, UE Detection HS-SCCH (1-4) (Code, Detection Result, CRC result, Viterbi metric, Flag)

#### HS-DSCH Transmission Data Measurement

Timestamp (SFN), H-ARQ ACK/NACK, CQI

### MEASUREMENTS FOR DECODED CCTRCH

#### DPCH Reception Measurement

Timestamp (CFN, Slot Number), Signal Power (DPCH), Interference Power (PCPICH), Receiving SIR, DL Target SIR, Transmitted TPC bit

#### DCH Reception Data Measurement

Timestamp (CFN), No. of TB received, No. of CRC fail, BLER, DL Target SIR

## L2 MAC-HS MEASUREMENTS

### HS-DSCH Reception Measurement

MAC-hs PDU Receive Rate,  
MAC-hs PDU Remaining Error Rate,  
No. MAC-hs PDUs received,  
No. MAC-hs PDUs acknowledged,  
MAC-hs PDU average size,  
HS-PDSCH average no. of codes used,  
MAC-hs PDU discarded,  
BLER of retransmitted PDUs,  
CQI Value Distribution,  
CQI Value Average

### HS-DSCH Reception Data Measurement

Timestamp (SFN),  
HS-SCCH Reception data  
(Channel Code Set, Modulation, TB Size, HARQ info,  
Constellation Version, New Data Flag)  
MAC-hs header (TSN, Queue ID)  
Signature resource  
(HS-SCCH code, No. of HS-PDSCH code used)  
MAC-hs PDU size, No. of MAC-hs PDU retries,  
TB CRC result

### MAC-d Reception Measurement

No. of MAC-d PDUs received,  
MAC-d PDU reception rate

### MAC-d Transmission Measurement

No. of MAC-d PDUs transmitted,  
MAC-d PDU transmission rate

## VERSIONS, OPTIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

### Ordering

#### Numbers

TX204

SA071

#### Versions

TM500 HSDPA Multi-UE Option

TM500 Multi-UE Support Package

#### CHINA Beijing

Tel: [+86] (10) 6539 1166  
Fax: [+86] (10) 6539 1778

#### CHINA Shanghai

Tel: [+86] (21) 5109 5128  
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