CELLMetric

Intelligent infrastructure

Modus 6 & LTE Composer

LTE eNodeB Base Station RF Signal Source TDD & FDD

Easy to use

Portable

Light weight

Cost effective

CellMetric designs and manufactures innovative digital broadcast equipment.

Its products focus on reliability, ruggedness, modularity, intelligence and flexibility using leading edge digital technology.

CellMetric is based close to the centre of the historic university city of Cambridge, UK.

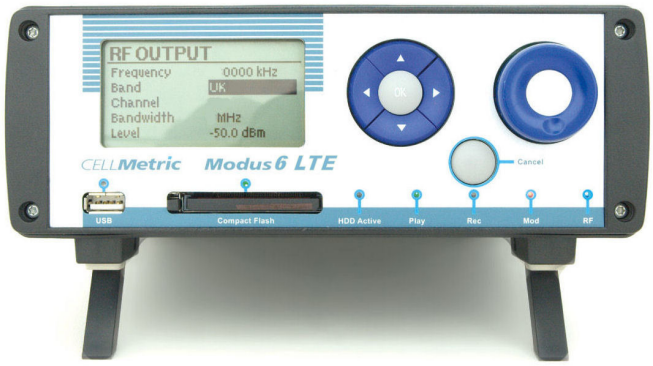
www.cellmetric.co.uk

CellMetric's Modus 6 RF network emulator combined with LTE Composer is designed to provide cost effective, simple to use digital modulation and RF channel simulation for LTE network operators, silicon and software developers, sales demonstration and production test systems.

CellMetric's LTE test solution is compliant with Release 8 of the Third Generation Partnership Project standard (3GPP) and supports both Time Domain Duplex (TDD) and Frequency Domain Duplex (FDD) modes.

CellMetric's LTE base station signal source consists of one or more Modus 6 air interface units providing the RF transmission and LTE Composer, a PC based application which generates the transmit protocol and RF transmission scenarios to simulate a base station transmission. A combination of the two tools provide a highly flexible, comprehensive and cost effective solution for LTE handset development and testing.

Modus 6 LTE tester provides a highly sophisticated RF and transmit protocol test environment in which LTE chipset companies and cellular handset developers can quickly test their solutions against a repeatable and deterministic transmit test stimulus over the air.



This capability includes RF channel emulation allowing the tester to generate a RF signal as seen at the output of the base station transmit antenna or the input from a handsets receive antenna. Both transmit and receive Multi Input Multi Output (MIMO) antenna configurations can also be emulated by using two synchronised Modus 6 air interfaces.

RF Output

Modus 6 supports LTE RF channel bandwidths of 1.4, 3, 5, 10 & 20 MHz in the band 710 MHz to 2155 MHz that is FDD bands I, II, III, IV, V, VI, VIII, IX and X and TDD bands a, b and c. A 3 GHz option will be available 3Q11.

Output RF levels of 0dBm to –110dBm can be set from the front panel or remotely.

Analogue I/Q output ports allow use of an external up-converter to cover other RF bands.

Features & Benefits

- ❒ Highly intuitive user Interface
- ❒ Cost effective for multiple unit deployment
- ❒ RF PHY testing and optimisation
- ❒ RF to demod testing and optimisation
- ❒ MIMO algorithm testing and optimisation
- ❒ RF channel modelling
- ❒ RF propagation testing
- ❒ Production test
- ❒ Training and technology evaluation

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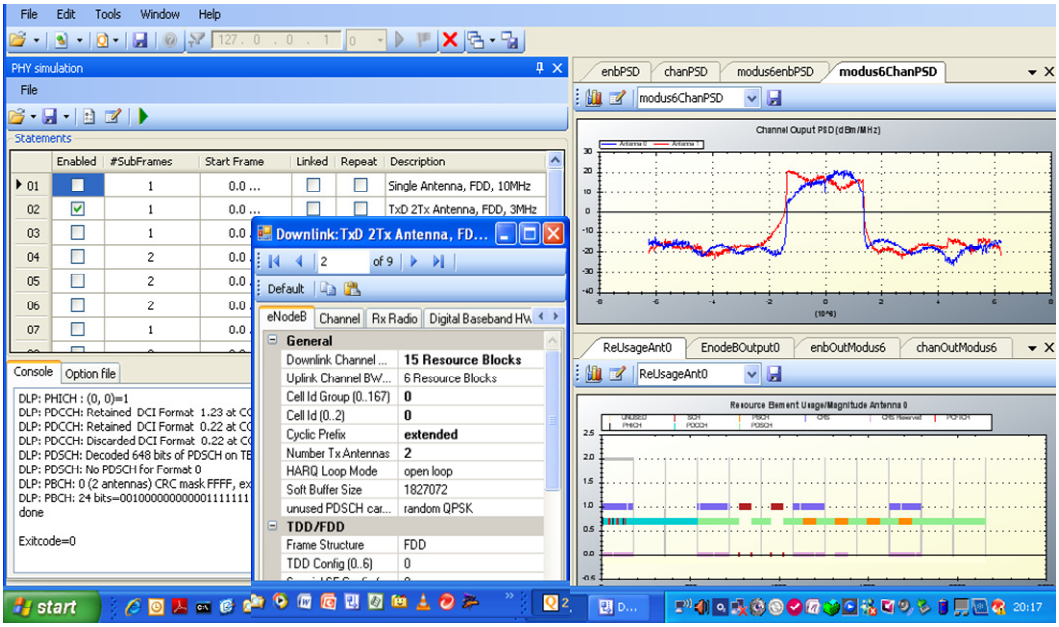
LTE Composer

LTE eNodeB Base Station PHY simulator



LTE Composer Functions

LTE Composer runs on a Windows XP PC to generate the I/Q test vectors which are played and up-converted by the Modus 6.

The user has complete control over the Physical Downlink Control Channel (PDCCH) with respect to Downlink Control Information (DCI) format types and search space locations. The following physical transport channels, synch signals and reference signal are supported:

PPCFICH	Physical Control Format Indicator Channel
PHICH	Physical Hybrid Automatic Repeat Request Indicator Channel
PDCCH	Physical Downlink Control Channel
PDSCH	Physical Downlink Shared Channel
PBCH	Physical Broadcast Channel
P-SCH	Primary Synchronization Channel
S-SCH	Secondary Synchronization Channel
CRS	Cell Specific Reference Symbols

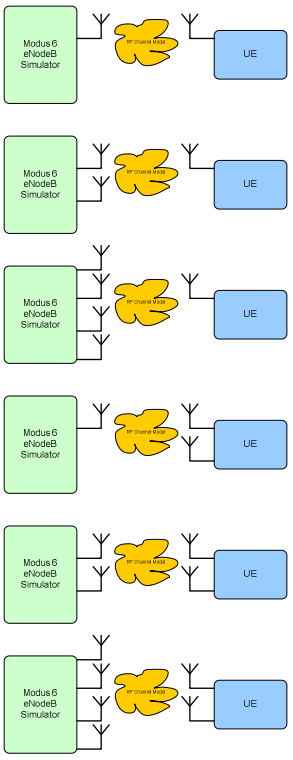
The following transmission modes are supported:

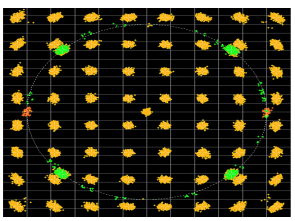
With one Modus 6 source:

- Single antenna port 0, Transmit diversity (2 or 4 Tx antennas, 1 Rx antenna)
- Close loop rank=1 precoding* (2 or 4 Tx antennas, 1 Rx antenna)

With two Modus 6 sources:

- Single antenna port 0, Transmit diversity (2 or 4 Tx antennas, 2 Rx antennas)
- Close loop rank=1 precoding*
- Open and closed loop Spatial Multiplexing (2 Tx antennas or 4 Tx antennas & rank=2, 2Rx antennas)*





* for closed loop spatial multiplexing modes the user defines the precoding matricies

LTE Composer

LTE Composer Features

LTE Composer has a highly intuitive graphical user interface which enables simple configuration and play out of LTE signals.

Physical Layer Simulation Selection

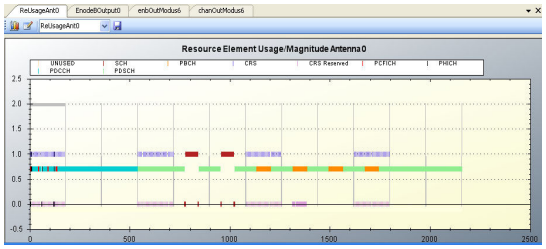
Test case configuration is selected and can be saved using a tabular tick box interface.

Downlink Configuration

Downlink Configuration is selected from a tabular menu which gives highly controllable transmission scenarios.

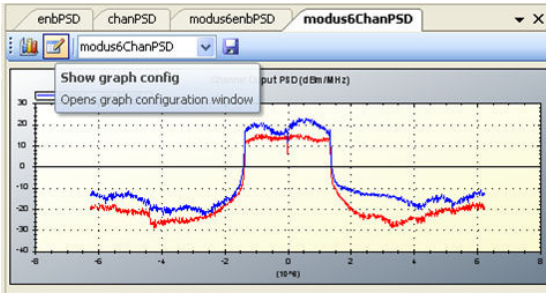
Resource Usage

Downlink Configuration and resource usage is shown graphically to provide confirmation of channel configuration.



RF Channel Output Plot

Output spectral plots of the transmitted RF signal are generated. These include both faded and un-faded outputs.



Fading Channel Model

The standard version of LTE Composer is provided with a simple AWGN based channel fading model. More sophisticated channel fading models with Doppler shift are available as an additional fading model option.

MIMO Modelling

Modelling of Multiple Input Multiple Output antenna systems is provided by LTE Composer. One Modus 6 unit can model two antenna systems, by adding a second synchronised Modus 6 four antenna systems can be simulated.

MIMO Channel Fading Model Option

LTE Composer offers the option to provide industry standard fading channel modeling for RF transmission as defined in TR36.803

This includes full Doppler capability and MIMO modeling including spatial correlation. A user defined 10 tap fading model is also provided.

Extended Pedestrian A Model (EPA)

Tap	Delay (nS)	Power (dB)
1	0	0.0
2	30	-1.0
3	70	-2.0
4	90	-3.0
5	110	-8.0
6	190	-17.2
7	410	-20.8

Extended Vehicular A Model (EVA)

Tap	Delay (nS)	Power (dB)
1	0	0.0
2	30	-1.5
3	150	-1.4
4	310	-3.6
5	370	-0.6
6	710	-9.1
7	1090	-7.0
8	1730	-12.0
9	2510	-16.9

Extended Typical Urban Model (ETU)

Tap	Delay (nS)	Power (dB)
1	0	-1.0
2	50	-1.0
3	120	-1.0
4	200	-0.0
5	230	-0.0
6	500	-0.0
7	1600	-3.0
8	2300	-5.0
9	5000	-7.0

Modus 6 LTE Digital Signal Source

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Modus 6

Modus 6 is a fast and very deep RF I/Q vector signal generator with both frequency agile RF output and 16 bit analogue I/Q baseband outputs.

RF output covers the band 710 MHz to 2.155 GHz enabling generation of LTE eNodeB cellular communications transmissions. A 3GHz output option is available from 3Q11.

Modus 6 has an extremely deep I/Q vector storage capability, an internal hard disk provides 32 GByte of storage, with a maximum playout size of 32Gbyte. Maximum play out sample rate is >12 complex (I&Q) Msamples per second, enabling support for 1.4, 3, 5, 10 and 20 MHz LTE cellular channels.

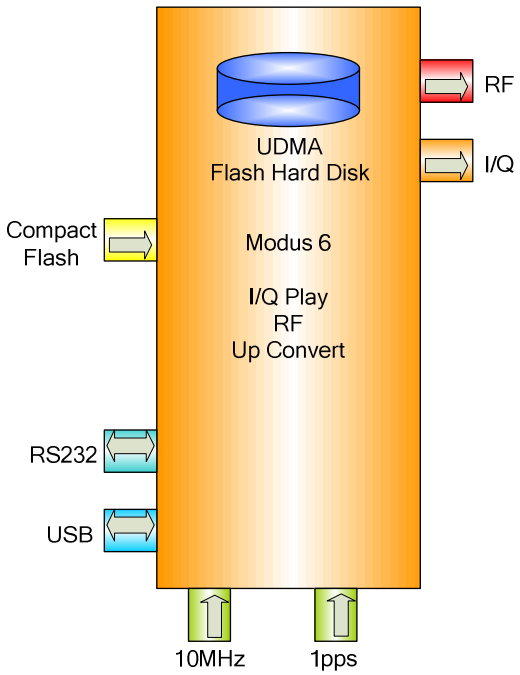
Intuitive user Interface

Modus 6 has a highly intuitive user interface making selection of play-out parameters simple.

Smart Start

Modus 6 supports non volatile configuration files associated with each I/Q data file. This XML file configures the Modus 6 with the correct bitrate and play out parameters for file play-out allowing auto play out on power up and greatly simplifying setup.

Remote Control



Technical Specification

Operating Conditions:

Power Supply voltage	100 to 260V 47-400 Hz AC
Operating Temperature range	0 to +40°C

Outputs:

Frequency Range	710MHz to 2155 MHz in 1KHz steps
	Optional 3 GHz band coverage HCH (4Q10)
Output frequency accuracy	Better than ± 3ppm over temperature range internal oscillator. 0.1ppm external oscillator
Signal output level	0dBm nominal to -110dBm
Output Impedance	50 Ω
Resolution	0.5 dB
Repeatability	±1dB
Output RLR	Better than 10dB
Spectral flatness	Better than ± 0.5dB across any 8MHz channel
Gain Taper	Better than ± 2dB across the band
Intermodulation products	Better than -45dBc in channel, -60dBc out of channel

Cellular Modulation

LTE

Channel Bandwidth	1.4, 3, 5 ,10 and 20 MHz
Spectral Polarity	Normal or inverted

I/Q Samples

Bit depth	8 or 16 bit I/Q samples
Maximum I/Q play rate	>12 Complex Msamples/s
Maximum sample rate	380Mbit/s
Maximum play file size	32 GByte

Interfaces:

External Frequency Ref.	10MHz SMA Connector
RF Out	SMA Connector 50Ω
I/Q Out	Differential ±I / ±Q Output
Serial	USB 2.0 Mass Storage Class (Slave) RS232
Internal Memory	32 GByte Flash Drive
Removable Memory	Compact Flash Memory Card

Installation:

Desk top case	210 W x 74mm H x 220mm D
Weight	2.5Kg

Ordering Information

LTE Modus 6		Modus 6 & LTE Composer
LTE Composer		Stand alone single seat SW Licence
Options		
	HCH	3GHz RF Output option (3Q11)
	FCH	Advanced channel fading model

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