Keysight W1916
3G Baseband Verification Library

Data Sheet

Baseband algorithm reference library for 2G/3G mobility standards, for use with Keysight SystemVue simulation and test instruments

KEYSIGHT TECHNOLOGIES

Typical application

The W1916 3G Baseband Verification Library is an optional simulation reference library for Keysight Technologies SystemVue. It is intended for design and system-level verification of the physical layer (PHY) of 2G and 3G wireless commercial mobility standards. It consists of several sub-libraries with simulation blocks for baseband signal encoding (TX), decoding (RX), channel, and measurement, along with pre-configured test benches for many PHY specifications in the standards, as well as other common measurements.

- Simulation-based verification of legacy 2G/3G standards performance for 4G/LTE equipment
- "Multi-Standard Radio" (MSR) validation related to the Third Generation Partnership Project (3GPP) Rel.9 TS36-104 and TS36-147
- Custom PHY modifications for military, medical and commercial wireless
- Reference test vectors for baseband DSP/FPGA and RF component validation (both simulation and test equipment)
- Reference signal generation for the SystemVue W1716 Digital Pre-Distortion (DPD) Builder

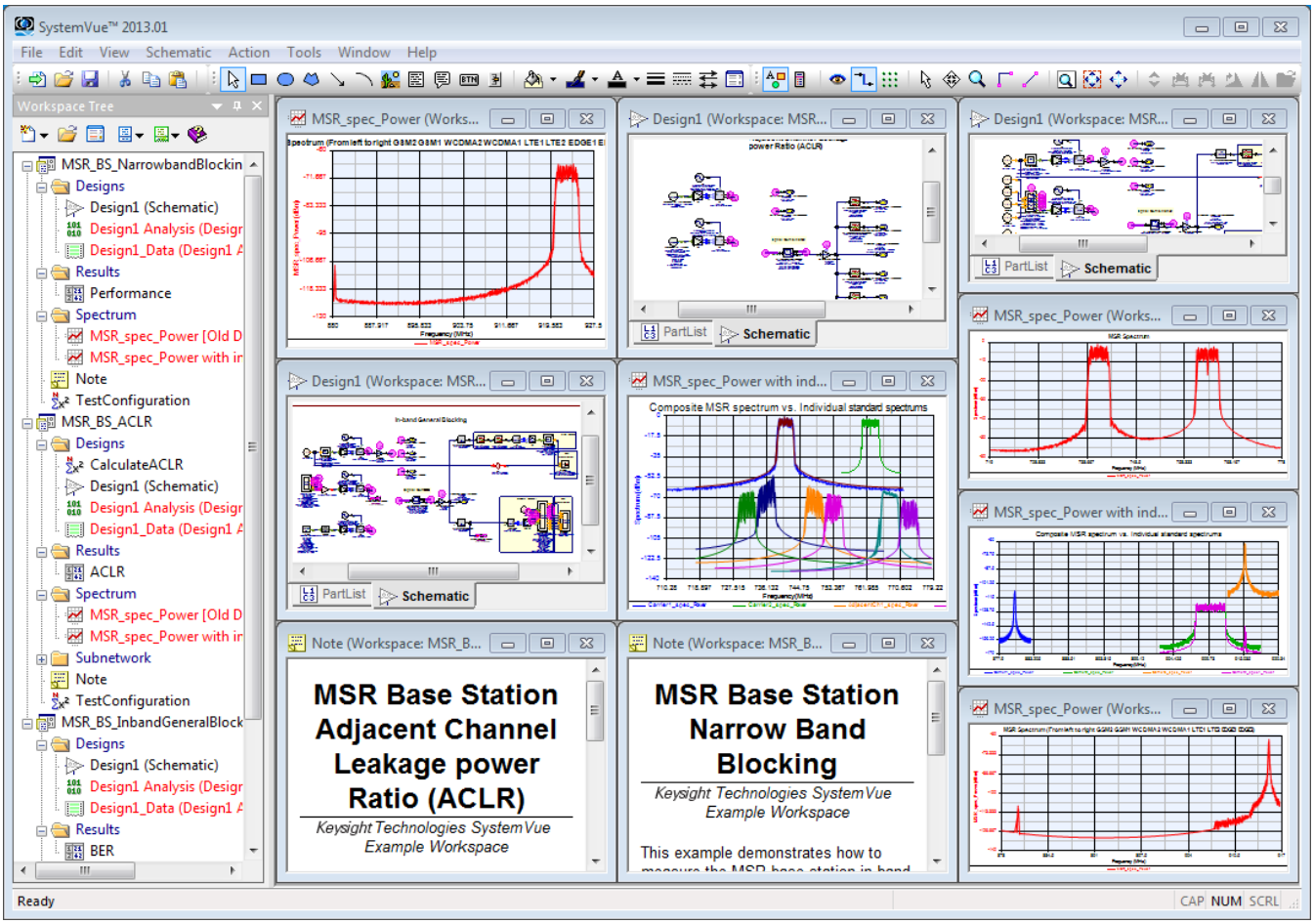


Figure 1. MSR testing in 3GPP Release 9 validates that 2G/3G formats will continue to operate within 4G networks. The W1916 library provides essential 2G/3G simulation blocks and measurements to supplement 4G capabilities in the W1910 (LTE) and W1918 (LTE-Advanced) libraries.

GSM/EDGE

The GSM/EDGE portion of the W1916 3G Baseband Library was developed according to 3GPP GSM Release 10 (updated March 2012). The library provides a total of 61 models and subnets, including several top-level GSM/EDGE sources and receivers.

Highlights

GSM/EDGE uncoded source

- Each timeslot of a TDMA frame (consisting of 8 timeslots) can be turned on or off independently
- Supports two kinds of timeslot timing: 156.25 symbols*8 timeslots; 157 symbols*2 timeslots and 156 symbols*6 timeslots
- Supports GMSK, 8PSK, 16QAM, 32QAM, and QPSK
- The oversampling ratio (samples per symbol) can be selected from 4, 8 and 16
- The Training Sequence Code (TSC) of each timeslot can be configured
- The Stealing Flag of each timeslot can be set separately
- Supports linear and cosine ramp

GSM/EDGE coded source

- Supports three multi-frame structure types: Not framed, 13 multi-frame with idle frame and multi-frame without idle frame
- Supports the following channel types: TCH FS, TCH F9.6, TCH F4.8, TCH F2.4, downlink MCS1~9, uplink MCS1~9, UAS-11, UBS-6, UBS-8, and UBS-11. The puncture scheme can be selected from the valid set
- The allocated timeslot for the current user can be configured

GSM/EDGE receiver

- Demodulates all GSM multi-frame types supported by the GSM sources (above), and outputs the decoded bits
- The equalization algorithm can be selected from MLSE and RSSE

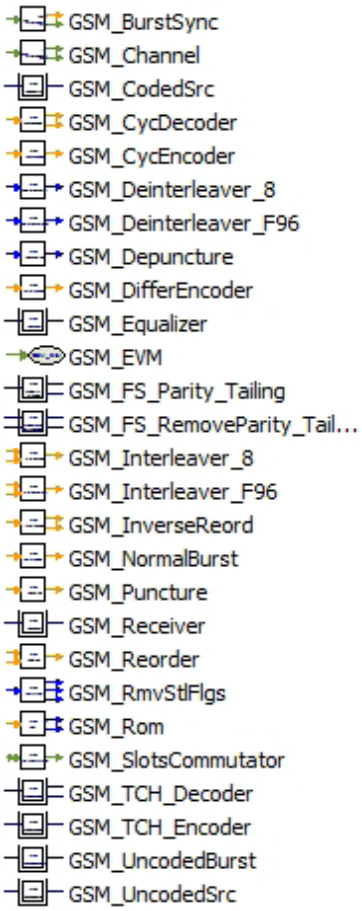
GSM/EDGE channel

- Simulates radio channel effects, including multipath fading and pathloss on the transmitted signal. The coordinates and gain of the antennas can also be specified

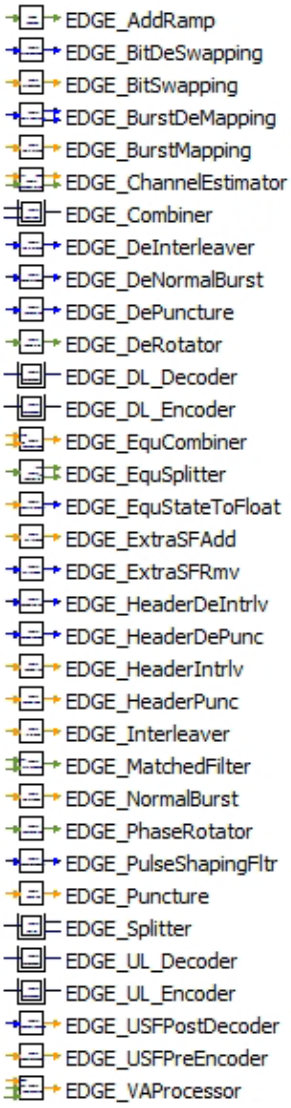
GSM/EDGE EVM

- Measures the EVM of GSM signals

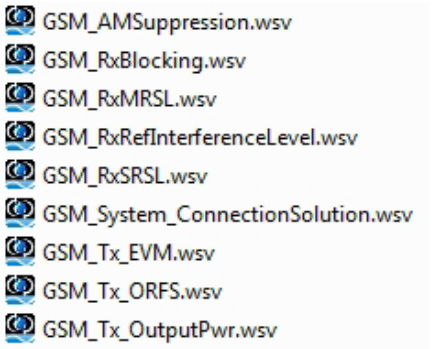
EDGE Block Set (34 simulation blocks)



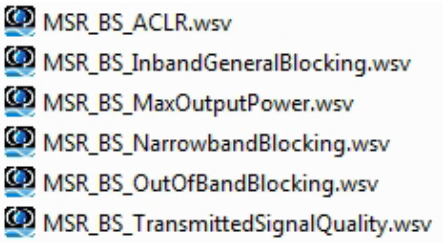
GSM Block Set (27 simulation blocks)



Workspaces and Test Benches (9 total)



MSR Test Benches (6 total)



CDMA/CDMA2000®

The CDMA/CDMA2000 portion of the W1916 3G Baseband Verification Library helps communication and RF system designers perform system-level tradeoffs, requirement partitioning and performance verification based on the TIA IS-95, IS-96A and IS-2000 standards.

The library allows the simulation of key transmitter and receiver measurements such as Error Vector Magnitude (EVM), Adjacent Channel Power Ratio (ACPR), Bit Error Rate (BER), and Frame Error Rate (FER). The library also helps component designers validate the performance of their subsystem against CDMA/CDMA2000 specifications.

The CDMA/CDMA2000 portion of the W1916 3G Baseband Verification Library includes advanced features such as hybrid phase-shift keying (HPSK) spreading (reverse link), pilot-aided coherent demodulation (reverse link); channel coding including turbo codes, mapping and de-mapping schemes for rate matching; and orthogonal transmit diversity (OTD).

Highlights

Complete end-to-end system performance for EVM, Rho, CCDF, ACP, and code-domain power

Configurable signal sources for both forward and reverse links, a new forward link receiver and new channel coders and decoders.

Base and mobile station transmitter

- Code-domain power measurement
- Total mean transmit power
- Relative mean output power of code to pilot channel (reverse link)
- Pilot power
- Waveform quality (Rho)
- Conducted spurious emission

Base and mobile station receiver

- Adjacent channel selectivity
- Reverse demodulation performance in AWGN channel
- Receiver spurious response attenuation
- Intermodulation spurious response attenuation
- Single-tone desensitization
- Single-tone desensitization (with Tx leakage)

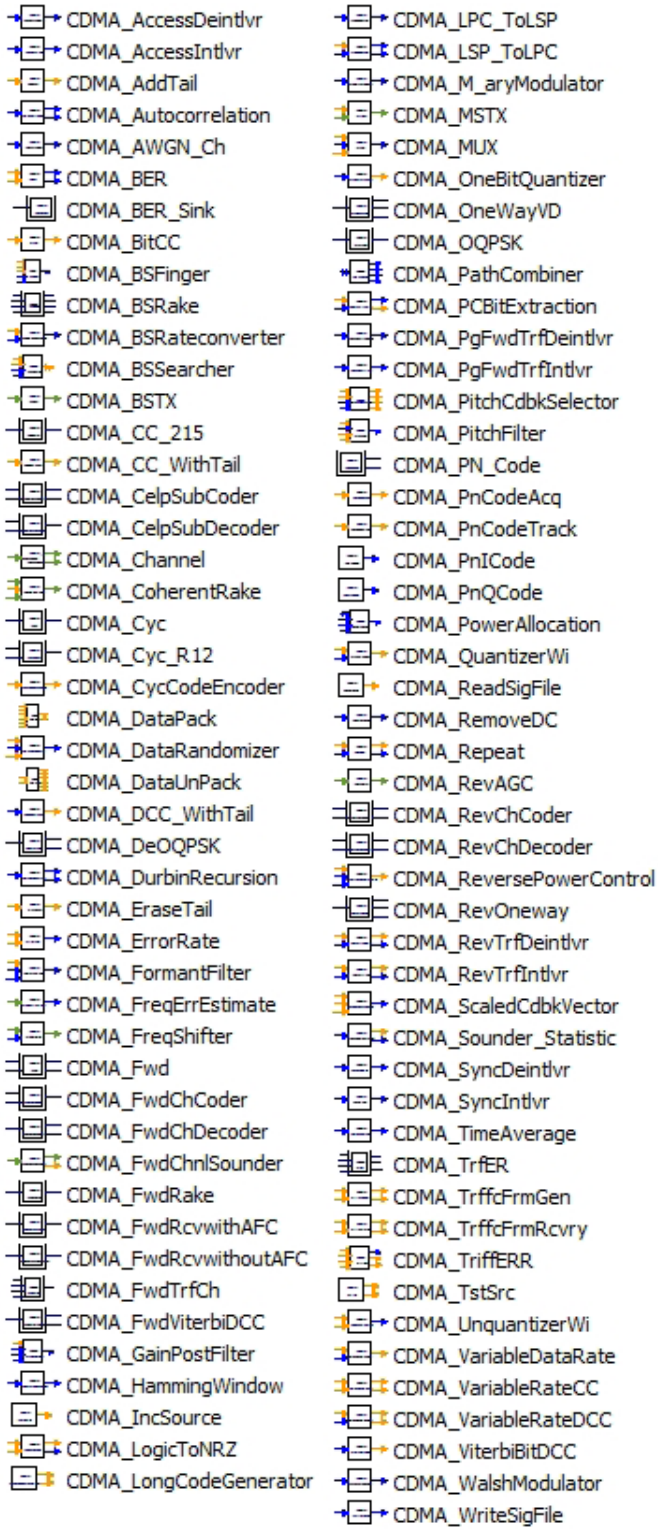
Signal source

- Transmit power spectrum and Rho of forward pilot source
- Transmit power spectrum and the CCDF of the forward pilot source
- Transmit power spectrum, rho and the CCDF of reverse source

BER validation

- FER performance for reverse traffic channel RC3 in AWGN channel

CDMA Block Set (95 simulation blocks)



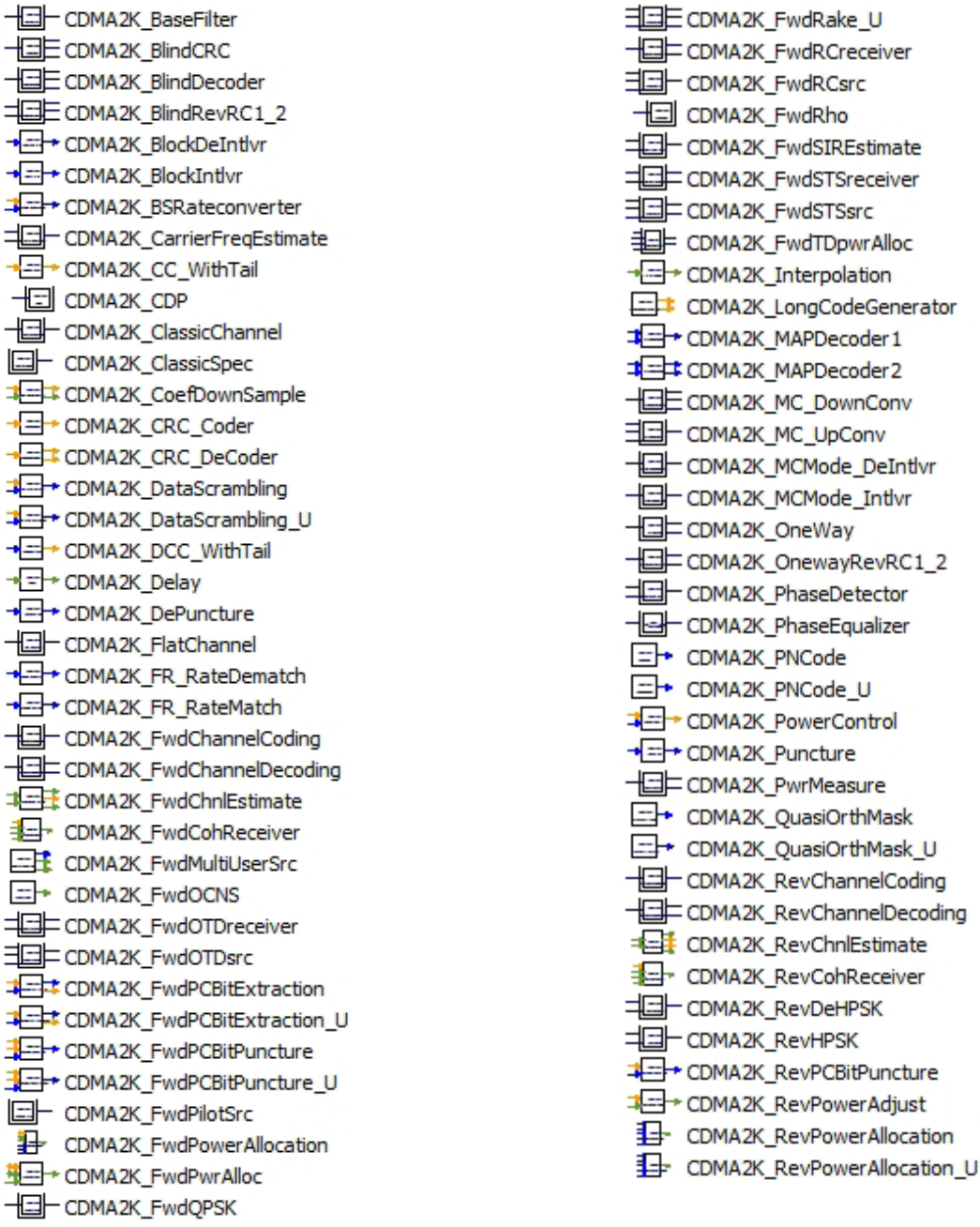
CDMA Example Workspaces and Test Benches (17 total)

- CDMA_AccesssChannelCodec.wsv
- CDMA_CelpCodecDemo1.wsv
- CDMA_CelpCodecDemo2.wsv
- CDMA_ForwardChannelCodec.wsv
- CDMA_ForwardLink.wsv
- CDMA_FwdRake_AFC_NoCodec.wsv
- CDMA_FwdRake_NoAFC_NoCodec.wsv
- CDMA_PagingChannelCodec.wsv
- CDMA_ReverseChannelCodec.wsv
- CDMA_RevMeasure.wsv
- CDMA_RevRake_1user_codec.wsv
- CDMA_RevRake_1user_NoCodec.wsv
- CDMA_RevRake_1user_PC.wsv
- CDMA_RevRake_3user_codec.wsv
- CDMA_RevRake_3user_NoCodec.wsv
- CDMA_RevRake_3user_PC.wsv
- CDMA_SyncChannelCodec.wsv

CDMA2000 Example Workspaces and Test Benches (18 total)

- BS_TX_CDP_RC3.wsv
- BS_TX_MeanPower.wsv
- BS_TX_Rho.wsv
- BS_TX_SR1.wsv
- BS_TX_VSA.wsv
- Forward_AWGN_RC3.wsv
- Forward_MultiCarrier_RC8.wsv
- Forward_Rake.wsv
- Forward_RC3_OTD.wsv
- HPSK_QPSK_PAPR.wsv
- MS_RX_AdjacentSelectivity_RC3.wsv
- MS_RX_DynamicRange_RC3.wsv
- MS_RX_Intermodulation_RC3.wsv
- MS_TX_SR1.wsv
- Reverse_AWGN_RC3.wsv
- Reverse_HPSK_SR1.wsv
- Reverse_Rake.wsv
- TurboCoding.wsv

CDMA2000 Block Set (105 simulation blocks)



W-CDMA

The 3GPP FDD (or W-CDMA) portion of the W1916 3G Baseband Verification Library enables design and validation against the specifications from the 3GPP Frequency Division Duplexing (FDD) Wideband Code Division Multiple Access (W-CDMA) standard. The library provides baseband functionality such as framing, encoding, interleaving, and spreading to model the physical channel in the 3GPP FDD W-CDMA system.

Highlights

- Variable rate services
- Standard slot format including TPC, TFCI, FBI, and pilot bits multiplexing
- Standard frame format
- Turbo coding/decoding and convolutional coding/decoding
- Multiplexing of different transport channels (TrCHs) onto one coded composite transport channel (CCTrCH)
- Support of fixed and flexible positions of TrCHs in one CCTrCH frame
- Support of transport format detection with transport format combination indicator (TFCI)
- Support of space time transmit diversity (STTD) encoding
- Synchronization based on common pilot channel
- Multipath searching
- Standard Rake receiver with maximum ratio combining (MRC)
- Linear channel estimation with interpolation
- Coherent QPSK demodulation
- Power control

W-CDMA Block Set (105 simulation blocks)

- 3GPPFDD_ChannelCoding
- 3GPPFDD_ChannelDecoding
- 3GPPFDD_CodeBlkDeSeg
- 3GPPFDD_CodeBlkSeg
- 3GPPFDD_CPICH
- 3GPPFDD_CRCDecoder
- 3GPPFDD_CRCEncoder
- 3GPPFDD_DataPattern
- 3GPPFDD_Distort
- 3GPPFDD_DL_Rake
- 3GPPFDD_DL_Receiver
- 3GPPFDD_DL_RefCh
- 3GPPFDD_DL_Source
- 3GPPFDD_DLDeFirDTXInser
- 3GPPFDD_DLDeFirInterLv
- 3GPPFDD_DLDePhyCHMap
- 3GPPFDD_DLDePhyCHSeg
- 3GPPFDD_DLDeRadioSeg
- 3GPPFDD_DLDeRateMatch
- 3GPPFDD_DLDeSecDTXInser
- 3GPPFDD_DLDeSecInterLv
- 3GPPFDD_DLDeTrCHMulti
- 3GPPFDD_DLFirDTXInser
- 3GPPFDD_DLFirInterLv
- 3GPPFDD_DLPhyCHMap
- 3GPPFDD_DLPhyCHSeg
- 3GPPFDD_DLRadioSeg
- 3GPPFDD_DLRateMatch
- 3GPPFDD_DLScrmb
- 3GPPFDD_DLSecDTXInser
- 3GPPFDD_DLSecInterLv
- 3GPPFDD_DLTrCHMulti
- 3GPPFDD_Downlink_BER
- 3GPPFDD_DPCCH
- 3GPPFDD_DPCCHDeMux
- 3GPPFDD_DPCCHMux
- 3GPPFDD_DPCH
- 3GPPFDD_DPCHDeMux
- 3GPPFDD_DPCHMux
- 3GPPFDD_DPCHs
- 3GPPFDD_DPDCH
- 3GPPFDD_HS_CQI_Decoder
- 3GPPFDD_HS_CQI_Encoder
- 3GPPFDD_HS_UL_Rake
- 3GPPFDD_HS_ULSpread
- 3GPPFDD_Interpolator
- 3GPPFDD_OCNS
- 3GPPFDD_OVSF
- 3GPPFDD_PCCPCH
- 3GPPFDD_PCCPCHDeMux
- 3GPPFDD_PCCPCHMux
- 3GPPFDD_PCPCHMux
- 3GPPFDD_PCPCHPrmbl
- 3GPPFDD_PCPCHSprd
- 3GPPFDD_PICH
- 3GPPFDD_PRACHDeMux
- 3GPPFDD_PRACHMux
- 3GPPFDD_PRACHPrmbl
- 3GPPFDD_PRACHScrmb
- 3GPPFDD_PRACHSprd
- 3GPPFDD_SCCPCHDeMux
- 3GPPFDD_SCCPCHMux
- 3GPPFDD_SCH
- 3GPPFDD_StdOCNS
- 3GPPFDD_Synch
- 3GPPFDD_TestModel1
- 3GPPFDD_TestModel2
- 3GPPFDD_TestModel3
- 3GPPFDD_TestModel4
- 3GPPFDD_TestModel5
- 3GPPFDD_TestModel6
- 3GPPFDD_TFCIComb
- 3GPPFDD_TFCIDecoder
- 3GPPFDD_TFCIDeComb
- 3GPPFDD_TFCIEncoder
- 3GPPFDD_TFIGenerator
- 3GPPFDD_TrCHBER
- 3GPPFDD_TrCHSrc
- 3GPPFDD_TrCHSrcWithTFIin
- 3GPPFDD_UL_RACH
- 3GPPFDD_UL_Rake
- 3GPPFDD_UL_Receiver
- 3GPPFDD_UL_Source
- 3GPPFDD_ULDeFirInterLv
- 3GPPFDD_ULDePhyCHMap
- 3GPPFDD_ULDePhyCHSeg
- 3GPPFDD_ULDeRadioEqual
- 3GPPFDD_ULDeRadioSeg
- 3GPPFDD_ULDeRateMatch
- 3GPPFDD_ULDeSecInterLv
- 3GPPFDD_ULDeTrCHMulti
- 3GPPFDD_ULFirInterLv
- 3GPPFDD_ULGainFactor
- 3GPPFDD_ULLongScrmb
- 3GPPFDD_ULPhyCHMap
- 3GPPFDD_ULPhyCHSeg
- 3GPPFDD_ULRadioEqual
- 3GPPFDD_ULRadioSeg
- 3GPPFDD_ULRateMatch
- 3GPPFDD_ULSecInterLv
- 3GPPFDD_ULShortScrmb
- 3GPPFDD_ULSpread
- 3GPPFDD_ULTrCHMulti
- 3GPPFDD_Uplink_BER
- 3GPPFDD_UpLk

W-CDMA Example Workspaces and Test Benches (17 total)

- 3GPPFDD_BS_Rx_ACS.wsv
- 3GPPFDD_BS_Rx_AWGN.wsv
- 3GPPFDD_BS_Rx_Blocking.wsv
- 3GPPFDD_BS_Rx_DynamicRange.wsv
- 3GPPFDD_BS_Rx_Intermod.wsv
- 3GPPFDD_BS_Rx_RefLevel.wsv
- 3GPPFDD_BS_Tx_ACLR.wsv
- 3GPPFDD_BS_Tx_EVM.wsv
- 3GPPFDD_ConvCode_BER.wsv
- 3GPPFDD_DL_2fingers_Rake.wsv
- 3GPPFDD_Spread_Despread.wsv
- 3GPPFDD_TurboCode_BER.wsv
- 3GPPFDD_UE_Rx_RefLevel.wsv
- 3GPPFDD_UE_Tx_ACLR.wsv
- 3GPPFDD_UE_Tx_EVM.wsv

HSPA

The HSPA portion of the W1916 3G Baseband Verification Library is designed for High Speed Packet Access plus (HSPA+), an enhancement to the 3GPP downlink/uplink defined in release 7 of the 3GPP specification. This design library focuses on the physical layer aspects of High-Speed Downlink Packet Access (HSDPA) systems. It is intended to serve as a baseline for designers to get an idea of what would be the nominal or ideal system performance. Evaluations can be made regarding degraded system performance due to system impairments that may include non-ideal component performance.

The transport channels and physical channels defined in previous versions of the 3GPP specification are also supported by the HSDPA design library. They are treated as accessory channels because the HSDPA design library focuses on the modeling and test of channels defined in Release 5, say HSDPA. The test for the scenario with only 3GPP FDD and without HSDPA can be implemented by the 3GPP design library.

Highlights

Signal source components

- Bit signal source with HARQ and AMC functionality
- HS-PDSCH signal source with FEC
- HS-PDSCH signal source without FEC
- HS-SCCH signal source
- HSDPA baseband signal source
- HSDPA RF signal source

Multiplexers and coders

- CRC
- Bit scrambling
- Turbo coding for HS-DSCH
- Convolutional coding for HS-SCCH
- Rate matching
- Interleaving
- STTD encoding
- Physical channel mapping
- Spreading
- CRC decoding

Signal source components

- Rake receiver for HSDPA downlink
- Baseband receiver for HSDPA downlink
- RF receiver for HSDPA downlink

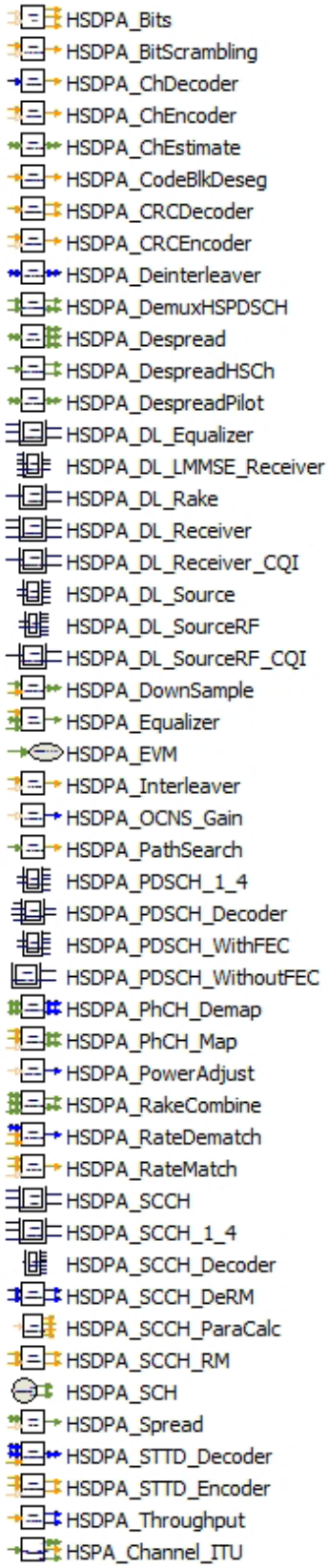
Multiplexers and coders

- Physical channel demapping
- STTD decoding
- Turbo decoding
- Deinterleaving

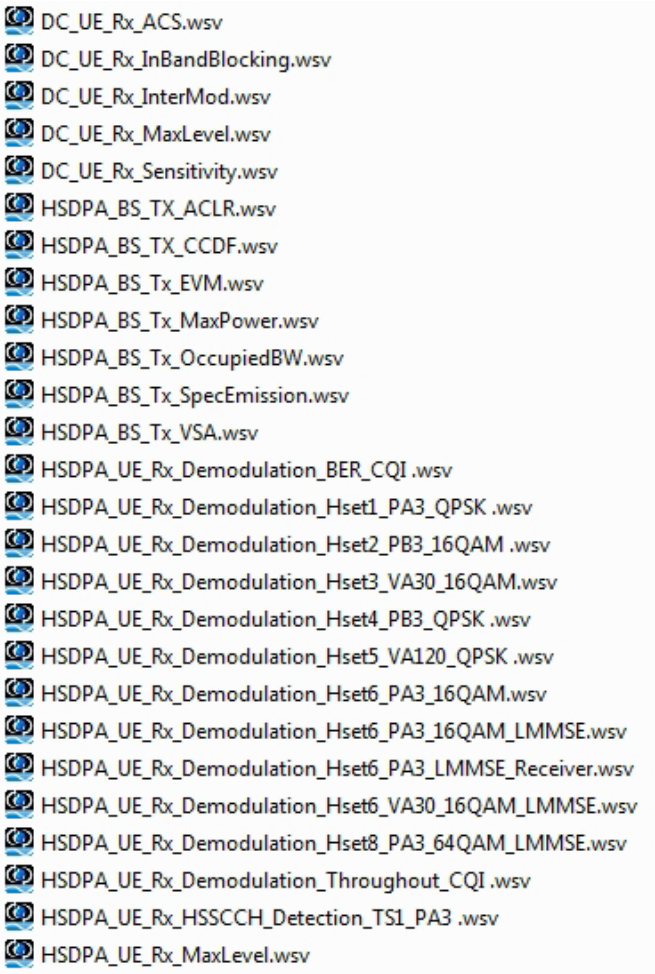
Measurement components

- Throughput measurement
- EVM measurement

HSDPA Block Set (49 simulation blocks)

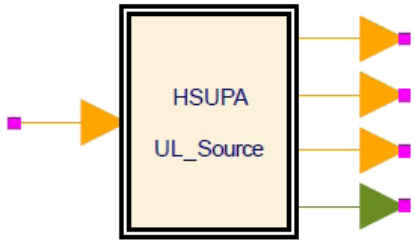


HSDPA Test Benches (17 total)



HSUPA Block Set (30 simulation blocks)

- HSUPA_BER_Throughput
- HSUPA_Bits
- HSUPA_ChDecode
- HSUPA_ChEncode
- HSUPA_CodeBlkDeseg
- HSUPA_CodeBlkSeg
- HSUPA_CubicMetric
- HSUPA_DC_CubicMetric
- HSUPA_Deinterleaver
- HSUPA_DL_Rake
- HSUPA_EAGCH_DeRM
- HSUPA_EAGCH_RM
- HSUPA_EDPCCH_ChDecode
- HSUPA_EDPCCH_ChEncode
- HSUPA_EHICH_ERGCH_Decode
- HSUPA_EVM
- HSUPA_EVM_H
- HSUPA_FRC
- HSUPA_FRC_Receiver
- HSUPA_Interleaver
- HSUPA_OCNS
- HSUPA_ParamCalc
- HSUPA_PhCH_Demap
- HSUPA_PhCH_Map
- HSUPA_RateDematch
- HSUPA_RateMatch
- HSUPA_SignatureSqn
- HSUPA_Spread
- HSUPA_UL_Rake
- HSUPA_UL_Source



HSUPA_UL_Source_1 {HSUPA_UL_Source@HSUPA Models}
EDCH_Category=Category 6
TransBlockSize=2706
TTI=TTI 2ms
PuncLimit=0.468
RV_Mode=Calculated using RSN
MaxRSN=3
DataPattern=Random
GainED=12.04 [[12.04]]
GainEC=6.02 [[6.02]]
Scramble=normal
ScrambleCode=0

HSUPA and HSPA+ Example Workspaces and Test Benches (17 total)

- DC_UE_Tx_ACLR.wsv
- DC_UE_Tx_EVM.wsv
- DC_UE_Tx_InBandEmission.wsv
- DC_UE_Tx_Max_Power.wsv
- DC_UE_Tx_SpecEmission.wsv
- HSUPA_BS_Rx_Demodulation_AWGN.wsv
- HSUPA_BS_Rx_Demodulation_Fading.wsv
- HSUPA_BS_Rx_Demodulation_Fading_FRC8.wsv
- HSUPA_BS_Rx_FalseAlarm_AWGN.wsv
- HSUPA_BS_Rx_FalseAlarm_Fading.wsv
- HSUPA_BS_Rx_MissedDetection_AWGN.wsv
- HSUPA_BS_Rx_MissedDetection_Fading.wsv
- HSUPA_UE_Tx_ACLR.wsv
- HSUPA_UE_Tx_CCDF.wsv
- HSUPA_UE_Tx_EVM.wsv
- HSUPA_UE_Tx_MaxPower.wsv
- HSUPA_UE_Tx_SpecEmission.wsv

Summary of Standards Supported by The W1916 3G Baseband Verification Library

Standard	Version supported	Simulation blocks	Test benches
GSM/EDGE	3GPP GSM Release 10 (March 2012 version) technical specifications TS 45.002 v10.3.0, "Multiplexing and multiple access on the radio path," March 2012 TS 45.003 v10.0.0, "Channel Coding," March 2011 TS 45.004 v10.0.0, "Modulation," March 2011	61	9
CDMA (IS-95)	TIA/EIA/IS-95-A, Mobile Station-Base Station Compatibility Standard for Dual-Mode Wide-band Spread Spectrum Cellular System, May 1995	95	17
CDMA2000	3GPP2 C.S0002_A_1, "Physical Layer Standard for cdma2000 Spread Spectrum Systems Release A-Addendum 1," October 27, 2000	105	18
W-CDMA	3GPP Release 5 technical specifications 1. TS 25.211, "Physical channels and mapping of transport channels onto physical channels (FDD)," September 2002, Release 5 2. TS 25.213, "Spreading and modulation (FDD)," September 2002, Release 5 3. TS 25.141, "Base station conformance test," September 2002, Release 5 3GPP Release 1999 specifications 1. TS 25.211, "Physical channels and mapping of transport channels onto physical channels (FDD)," March 2000/December 2000/March 2002, Release 1999 2. TS 25.212, "Multiplexing and channel coding (FDD)," March 2000/December 2000/March 2002, Release 1999 3. TS 25.213, "Spreading and modulation (FDD)," March 2000/December 2000/March 2002, Release 1999 4. TS 25.214, "Physical layer procedures (FDD)," March 2000/December 2000/March 2002, Release 1999 5. TS 25.101, "UE Radio transmission and Reception (FDD)," April 2000/December 2000/March 2002, Release 1999 6. TS 25.104, "UTRA (BS) FDD: Radio transmission and Reception," March 2000/December 2000/March 2002, Release 1999 7. TS 25.141, "Base station conformance test," March 2000/December 2000/March 2002, Release 1999 8. TS 34.121, "Radio transmission and reception (FDD)," March 2000/December 2000/March 2002, Release 1999	105	17
HSPA	3GPP Release 7 technical specifications 1. TS 25.211, "Physical channels and mapping of transport channels onto physical channels (FDD)," Version 7.10.0, May 2008 2. TS 25.212, "Multiplexing and channel coding (FDD)," Version 7.9.0, September 2008 3. TS 25.213, "Spreading and modulation (FDD)," Version 7.6.0, September 2008 4. TS 25.214, "Physical layer procedures (FDD)," Version 7.9.0, May 2008 5. TS 25.101, "UE Radio transmission and Reception (FDD)," Version 7.13.0, September 2008 6. TS 25.104, "UTRA (BS) FDD: Radio transmission and Reception," Version 7.10.0, March 2008 7. TS 25.141, "Base station conformance test," Version 7.11.0, March 2008 8. TS 34.121, "Radio transmission and reception (FDD)," Version 7.5.0, June 2007 9. TS 25.306, "UE Radio Access capabilities," Version 7.8.0, September 2008 10. TS 25.321, "Medium Access Control (MAC) protocol specification," Version 7.7.0, December 2008	79	34
MSR	Multi-Standard Radio – 3GPP TS 37.104 and TS 37.141 Note: The W1916 library does not provide the LTE or LTE-Advanced signals required for the full MSR specification. Please refer to the W1910 LTE or W1918 LTE-Advanced libraries for these 4G signals.		6

Configuration

The W1916 3G Baseband Verification Library can be added as an option to any SystemVue environment or bundle. It can also be combined with the W1910 LTE and W1918 LTE-Advanced libraries to provide more extensive coverage of the 3GPP communications standards. It is often used with the W1716 DPD module for 4G infrastructure design.

For more information, visit:

Product Information
www.keysight.com/find/eesof-systemvue-3g-library

Evaluation
www.keysight.com/find/eesof-systemvue-evaluation

Helpful Videos
www.keysight.com/find/eesof-systemvue-videos

myKeysight

myKeysight

www.keysight.com/find/mykeysight
A personalized view into the information most relevant to you.

www.axiestandard.org
AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA for general purpose and semiconductor test. Keysight is a founding member of the AXIe consortium. ATCA®, AdvancedTCA®, and the ATCA logo are registered US trademarks of the PCI Industrial Computer Manufacturers Group.

www.lxistandard.org
LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Keysight is a founding member of the LXI consortium.

www.pxisa.org
PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

Three-Year Warranty
www.keysight.com/find/ThreeYearWarranty
Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.

Keysight Assurance Plans
www.keysight.com/find/AssurancePlans
Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.

www.keysight.com/quality
Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2008
Quality Management System

Keysight Channel Partners
www.keysight.com/find/channelpartners
Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

cdma2000 is a US registered certification mark of the Telecommunications Industry Association.

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:
www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	0800 000154
Sweden	0200 882255
Switzerland	0800 805353 Opt. 1 (DE) Opt. 2 (FR) Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-07-10-14)

KEYSIGHT TECHNOLOGIES

Published in USA, August 3, 2014
5991-2113EN
www.keysight.com