

Overview

3G Evolution Lab – LTE Library for Synopsys System Studio is a comprehensive physical layer simulation library for Release 8 of the 3GPP Evolved Universal Terrestrial Radio Access (E-UTRA) standard. The library will accelerate your algorithm and PHY development, support golden reference verification and enable custom test & measurement waveform generation.

The library features models to perform channel coding/decoding and modulation/demodulation operations implementing the full physical layer transmit/receive processing chain, from transport channels and control information to OFDM and SC-FDMA modulated waveforms. Receive models are offered to recover the transmitted signals.

Channel coding for transport channels and control information is available for uplink and downlink. The development roadmap includes tracking compliance with Release 8 into Release 9.

The following transport and physical channels and signals are supported:

Downlink		Uplink	
Transport Channels & Control Information		Transport Channels & Control Information	
DL-SCH	DCI	UL-SCH	UCI
PCH	HI		
BCH	CFI		
Physical Channels and Signals		Physical Channels and Signals	
PDSCH	PDCCH	PUSCH	SRS
PBCH	Reference signals	PUCCH	
PCFICH	PSS - SSS	DRS (PUCCH)	
PHICH		DRS (PUSCH)	

Features

- 3GPP Release 8 E-UTRA physical layer implementation conforming to TS36.211, TS36.212 and TS36.213
- Fully parameterisable models
- Downlink and uplink support
- FDD duplexing mode
- Complete support for 1, 2 and 4 antenna transmissions including all MIMO layering and precoding options
- DCI message creation and control region building and decoding
- Physical layer transmit/receive processing chain available:
 - Transport channel coding/decoding
 - Scrambling/descrambling
 - Symbol Modulation/demapping
 - Layer mapping and precoding
 - Resource element mapping
 - OFDM and SC-FDMA modulation

Library contents

Downlink

Block	Functionality
LteBCH	Broadcast transport channel coding
LteBCHDecode	Broadcast transport channel decoding
LteCellRS	Cell specific reference signal generation
LteCellRSIndices	Cell specific reference signal mapping indices generator
LteCFI	Control format indicator channel coding
LteDCI	DCI message channel coding
LteDCIDecode	DCI message channel decoding
LteDCIMessage	DCI message generation
LteDLSCH	Downlink shared transport channel coding
LteDLSCHDecode	Downlink shared transport channel decoding
LteDLSCHDims	Pre-turbo coding segmentation DL-SCH information
LteOFDM	OFDM modulation
LtePBCH	Physical broadcast channel generation
LtePBCHIndices	Physical broadcast channel mapping indices generator
LtePBCHPRBS	Physical broadcast channel PRBS scrambling sequence generation
LtePCFICH	Physical control format indicator channel generator
LtePCFICHDims	Physical control format indicator channel resource dimensions
LtePCFICHIndices	Physical control format indicator channel mapping indices generator
LtePCFICHPRBS	Physical control format indicator channel PRBS scrambling sequence generation
LtePDCCH	Physical downlink control channel generator
LtePDCCHDims	Physical downlink control channel resource dimensions
LtePDCCHIndices	Physical downlink control channel mapping indices generator
LtePDCCHPRBS	Physical downlink control channel PRBS scrambling sequence generation
LtePDCCHSpace	Candidates for the physical downlink control channel space
LtePDSCH	Physical downlink shared channel generator
LtePDSCHIndices	Physical downlink shared channel mapping indices generator
LtePDSCHPRBS	Physical downlink shared channel PRBS scrambling sequence generation
LtePUSCH	Physical uplink shared channel generator
LtePHICH	Physical hybrid channel generation
LtePHICHDims	Physical hybrid channel resource dimensions
LtePHICHIndices	Physical hybrid channel mapping indices generator
LtePHICHPRBS	Physical hybrid channel PRBS scrambling sequence generation
LtePSS	Primary synchronisation channel generator
LtePSSIndices	Primary synchronisation channel mapping indices generator
LteRBFromDCI	Calculates allocated resource blocks for a given DCI message
LteSSS	Secondary synchronisation channel generator
LteSSSIndices	Secondary synchronisation channel mapping indices generator

Uplink

Block	Functionality
LteDRSPUSCH	PUSCH demodulation reference signal generation
LteDRSPUSCH	PUSCH demodulation reference signal mapping indices generator
LteDRSPUCCH	PUCCH demodulation reference signal generation
LteDRSPUCCH	PUCCH demodulation reference signal mapping indices generator
LteSRS	Sounding reference signal generation
LteSRS	Sounding reference signal mapping indices generator
LteUCI	UCI message channel coding
LteUCIDecode	UCI message channel decoding
LteUCIMessage	UCI message generation
LteULSCH	Uplink shared transport channel coding
LteULSCHDecode	Uplink shared transport channel decoding
LteULSCHDims	Pre-turbo coding segmentation UL-SCH information
LteSCFDMA	SCFDMA modulation
LtePUCCH	Physical uplink control channel generator
LtePUCCHDims	Physical uplink control channel resource dimensions
LtePUCCHIndices	Physical uplink control channel mapping indices generator
LtePUCCHPRBS	Physical uplink control channel PRBS scrambling sequence generation
LtePUCCHSpace	Candidates for the physical uplink control channel space
LtePUSCH	Physical uplink shared channel generator
LtePUSCHIndices	Physical uplink shared channel mapping indices generator
LtePUSCHPRBS	Physical uplink shared channel PRBS scrambling sequence generation
LteRBFFromUCI	Calculates allocated resource blocks for a given UCI message

General

Block	Functionality
LteCRC	CRC bits generation
LtePRBS	PRBS sequence generator
LteResourceGrid	Creates an empty resource grid
LteResourceGridDims	Returns the dimensions of a resource grid
LteSymbolDemod	Constellation demodulation and symbols to bits mapping
LteSymbolMod	Bits to symbol mapping and constellation modulator

Further information on System Studio can be found in the [datasheet](#). Steepest Ascent Ltd. is a member of Synopsys System-Level Catalyst program.

