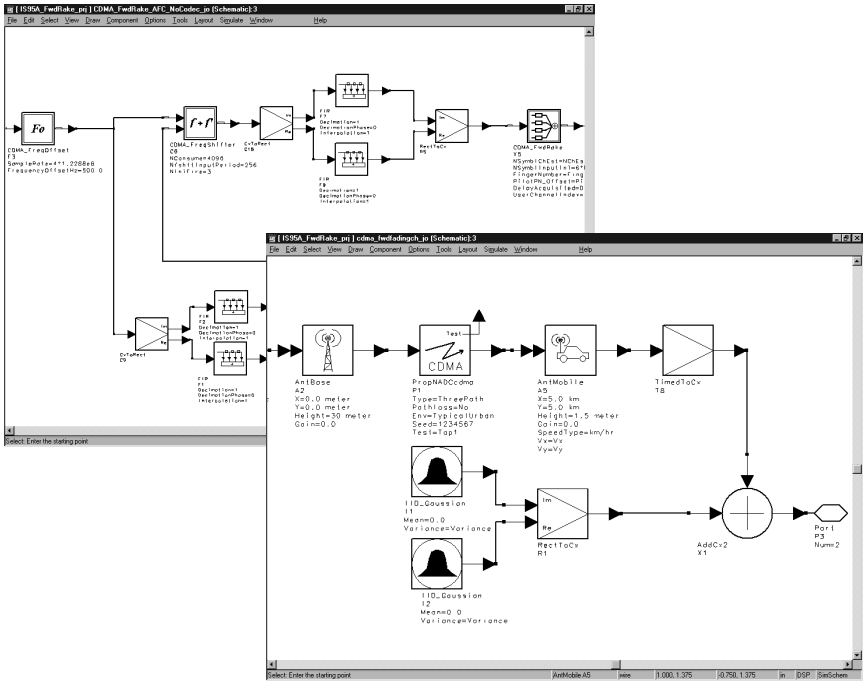
Agilent E8857A/AN
Agilent CDMA Design Library

Solutions from Agilent EEsof EDA



Ensure CDMA Design Success

The Code Division Multiple Access (CDMA) Design Library from Agilent EEsof EDA is designed to enable you to efficiently develop successful CDMA communications products based on the TIA/EIA-95 standards.

With this library, you can develop and refine specification-compliant algorithms at the system level where design choices have the greatest impact. Using integrated electronic design automation (EDA) software tools within the Advanced Design System from Agilent EEsof EDA, your CDMA system-level designs, signal processing algorithms, analog circuits, and RF circuits move quickly from concept to implementation.

Incorporating the CDMA Design Library into your design flow will:

- Minimize time-to-market for your CDMA products
- Increase your chances of first-time hardware success
- Optimize your existing designs for higher performance

A Comprehensive CDMA Design Solution from RF to Baseband

CDMA product development is a competitive market where a month can make the difference in your success. CDMA Design Library includes a complete set of specification-compliant behavioral models, pre-built CDMA system descriptions, and application examples that can save you months of development time.

The Agilent CDMA Design Library is part of Advanced Design System, a comprehensive EDA environment. Advanced Design System gives you access to a wide array of analog, DSP, and RF design capability in a user-friendly, integrated design environment. It enables quick and accurate modifications to CDMA system implementations so you can build your own integrated “top-down” CDMA design infrastructure.

The Advanced Design System development environment provides a variety of integrated design and simulation tools for DSP, RF, and system-level design such as: Ptolemy, Circuit Envelope, SPICE, or MATLAB®. In addition, you can link your test equipment, such as signal generators or vector signal analyzers, with your design. This lets you comprehensively refine your CDMA design at the system level and then replace behavioral models with actual circuit designs or measured signals. Once your design is partitioned into analog, digital, and RF sections, you can use the synthesis tool in DSP Designer to generate optimized register transfer level HDL for subsequent logic synthesis and implementation into FPGAs or ASICs.

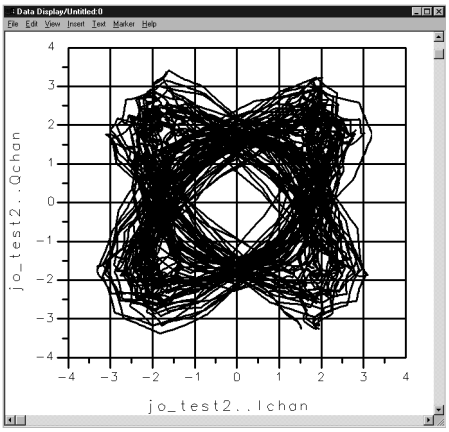
Agilent Technologies

Pre-Built Algorithmic Models and Systems

- Reverse link Rake receiver with one user, with or without codec
- Reverse link Rake receiver with one user and Transmission Power Control
- Reverse link Rake receiver with three users, with or without codec
- Reverse link Rake receiver with three users and Transmission Power Control
- End-to-End Forward link Rake receiver with or without AFC
- Forward link channel codec
- Reverse link channel codec
- Sync channel codec
- Paging channel codec
- Access channel codec
- CELP (IS-96/IS-733) codec
- Complete RF transmitter and receiver design capability, including nonlinear components, phase noise, and intermodulation distortion

System Parameters and Measurements

- Number of users: unlimited (dependent on hardware resources)
- Bandwidths: 1.25 MHz (TIA/EIA-95A)
- Data rates: 1.2 to 9.6 kbps (TIA/EIA-95A) Rate set 1:9.6 up to 76.8 kbps (TIA/EIA-95B) Rate set 2:14.4 up to 115.2 kbps (TIA/EIA-95B)
- Bit Error Rate (BER)
- Frame Error Rate (FER)
- Signal-to-interference and noise ratio (SINR)

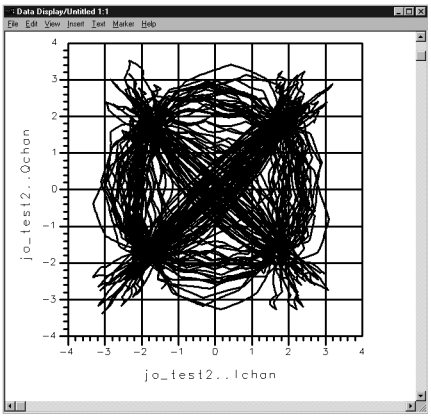


Accurate System-Level Design in CDMA

To reduce your development costs and time to market, the CDMA Design Library provides system-level design capabilities needed to quickly complete architectural design and partitioning.

The library includes models of the traffic channel, which employs adaptive transmission power control to achieve the maximum link capacity. An accurate channel model is an essential CDMA system design tool. This is because the CDMA propagation channel with its added distortions is one of the main challenges of wireless system design and simulation due to difficult conditions such as multi-path delay, multi-user interference, and environment noise. The channel model in Agilent's library is the most comprehensive and widely accepted. The tap delay adheres to the IS-97 specifications and employs Jake's algorithm to simulate the Doppler frequency shift and fading, while the simplified Okumura model calculates the path loss.

The CDMA Design Library also includes models that conform to the TIA/EIA-95B specifications that support multiple users and variable data rates, so you can design and develop new CDMA features such as voice activity detection.



CDMA simulation results can be analyzed with a flexible set of mathematical expressions and displayed in a variety of formats including eye diagrams, constellations, spectrums, and more.

Flexible and Versatile Spread Spectrum Design

Using the CDMA Library, you can design CDMA base stations and handsets for voice communication based on the TIA/EIA-95 standards. Additional models conforming to the latest TIA/EIA-95B specification enable you to design higher data rate wireless equipment including PDAs with wireless modems or multimedia terminals that can be connected to the Internet. It is also possible to implement such advanced features as adaptive antenna array diversity or interference cancellations by adding the W-CDMA Design Library.

Hardware Implementation

Once your partitioned system-level design meets performance requirements, you can move the design to implementation.

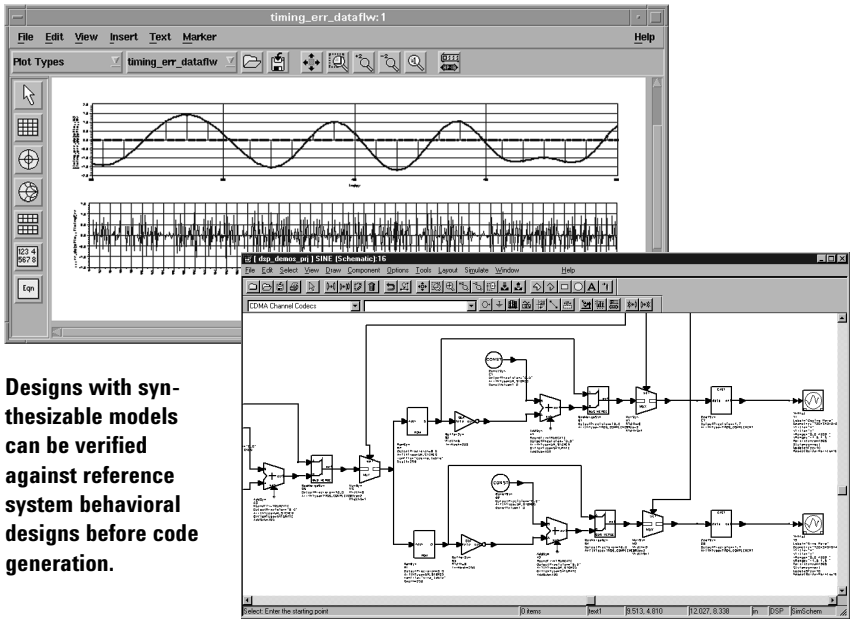
The Agilent Advanced Design System includes a full range of technologies to help you design the analog, RF, and DSP portions of your wireless product. DSP algorithms are transitioned to implementation using HDL code generation models, HDL simulation, and DSP behavioral synthesis; all part of the Agilent Advanced Design System.

The Advanced Design System HDL generator outputs either VHDL or Verilog and automatically creates test benches from system level test vectors. This reduces the need for hand coding and for translating test vectors. In addition, you can export signals to the Agilent ESG-D signal generator to eliminate the bottleneck between design and prototype testing. The reduction of hand coding helps to minimize mistakes commonly found during the integration and test phase of development.

The Advanced Design System RFIC Designer and RF Board Designer modules include the technologies needed to implement analog and RF circuit designs. The modules' simulation technologies include SPICE, Harmonic Balance, and Circuit Envelope to allow the widest range of RF design capabilities. They also include physical design capabilities and links to back-end tools to move your IC or board designs into your company-wide design framework. Contact your local Agilent sales office for more information on how CDMA Design Library and other products in the Agilent Advanced Design System integrated EDA environment can help you quickly deliver competitive CDMA products.

CDMA Design Library Specifications

Bandwidth (MHz)	1.25 (TIA/EIA-95A and TIA/EIA-95B)
Chip rate (M chips/second)	1.2288
Transmission power control	SIR-based closed-loop adaptive
Diversity	Mobile station 3-fingers coherent Rake receiver, base station 4-fingers non-coherent Rake receiver
Modulation and demodulation	QPSK modulation and coherent detection (forward link); OQPSK modulation and non-coherent detection (reverse link)
Error correction	Convolutional coding and Viterbi decoding with soft decision
Data transmission rates	Maximum 115.2 kbps for 1.25 MHz bandwidth



Designs with synthesizable models can be verified against reference system behavioral designs before code generation.

CDMA algorithms can easily be implemented with synthesizable models that allow you to automatically generate HDL code.

Product Configuration

The Agilent CDMA Design Library (E8857A/AN) works directly with DSP Designer Pro (E8821A/AN) and Communication Systems Designer Pro or Premier (E8851A/AN or E8852A/AN) within the Agilent Advanced Design System family of EDA products. For other possible product configurations, please consult your local Agilent representative.

Comprehensive Components and Test Benches

Agilent CDMA Design Library Components and Test Bench Highlights

CDMA Receiver Design:
- Forward Channel Sounder
- Frequency Error Estimator
- Frequency Shifter
- Base Station Rake Receiver
- Base Station Rake Rate Detection
- 4-to-1 Sample Combiner
- PN Code Acquisition
- PN Code Track
- Rake Output Converter
- Reverse Rake Normal

CDMA Channel Codec Design:
- Access Interleaver/Deinterleaver
- Add/Erase Tail Bits
- Error Rate
- Forward Packager
- Forward Traffic
- Interleaver/Deinterleaver
- Repeater
- 1-in-4 Selector
- Traffic Frame Generator/Recovery
- Variable Rate CC/DCC
- Convolutional Encoder/Viterbi Decoder

CDMA Transmitter Design:

For Base station transmitter
- Data Randomizer
- Long Code Generator
- *M*-ary Modulator

For Mobile station transmitter
- Multiplexer
- TPC Bit Extraction
- PN I Code/Q Code
- Power Allocation
- Reverse Power Control
- Walsh Modulator

CDMA IS-96/IS-733/IS-719 (EVRC) Codec Design:
- Autocorrelation
- Data Pack/Unpack
- Durbin Recursion
- Formant Filter/GainPost Filter/Pitch Filter
- Hamming Window
- LPC-to-LSP/LSP-to-LPC
- Pitch Cdbk Selector
- Quantizer Wi/Unquantizer
- Remove DC
- Scaled Cdbk Vector

Additional Models:
- Levinson-Durbin
- PCB Check
- Read/Write Signal File
- Test Source/Inc Source
- AWGN Channel
- Test Error Rate on Traffic Channel
- Multi-Rate Packager
- Cyclic Code Encoder
- Time Average
- BER Measurement

CDMA Sub-Network Designs:
- IS-96/IS-733/IS-719 (EVRC) CELP Sub-Coder and Sub-Decoder
- Forward Viterbi DCC
- One-Way VD
- Forward Channel Encoder/Decoder
- Reverse Channel Encoder/Decoder
- Traffic ER
- Forward Rake
- Forward Receiver with/without AFC

CDMA Reverse Link Transmitter:
- Reverse Transmitter PCB
- OQPSK Modulator/Demodulator
- Propagation Channel
- Gaussian Noise
- PN Code Generator

For more information about Agilent EEsof EDA visit:

www.agilent.com/eesof-eda

For more assistance with your test and measurement needs visit:

www.agilent.com/find/assist

Phone or Fax

United States:
(tel) 1 800 452 4844

Canada:
(tel) 1 877 894 4414
(fax) (905) 282-6495

China:
(tel) 800-810-0189
(fax) 1-0800-650-0121

Europe:
(tel) (31 20) 547 2323
(fax) (31 20) 547 2390

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Korea:
(tel) (82-2) 2004-5004
(fax) (82-2) 2004-5115

Latin America:
(tel) (305) 269 7500
(fax) (305) 269 7599

Taiwan:
(tel) 080-004-7866
(fax) (886-2) 2545-6723

Other Asia Pacific Countries:
(tel) (65) 375-8100
(fax) (65) 836-0252
Email: tm_asia@agilent.com

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Advanced Design System bundled suites such as DSP Designer Pro (E8821) or Communication Systems Designer Pro (E8851) come with a variety of standard model libraries. These include a broad range of basic system-level components (such as signal generators, delays, signal converters, digital filters, modulators and demodulators, and sinks) and analog/RF system models and components (such as resistors, capacitors, amplifiers, mixers, and filters).

* MATLAB® is a registered trademark of the Mathworks, Inc.

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