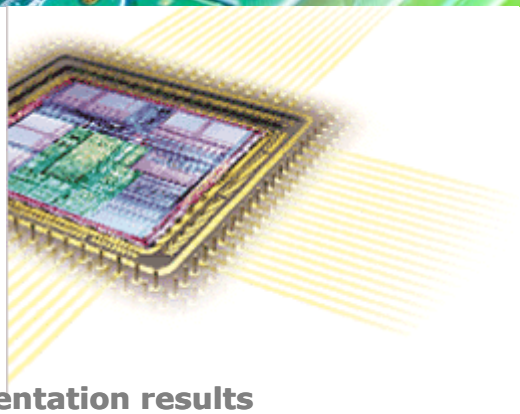
ntCH_EST

Programmable OFDM Channel Estimator



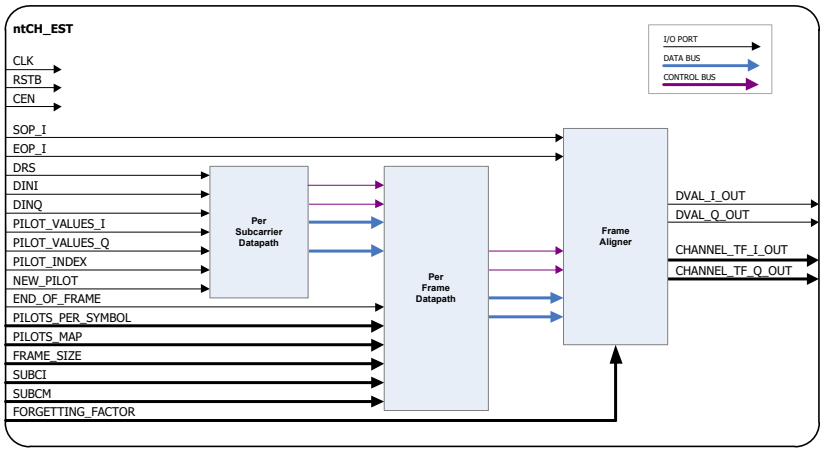
The wideband OFDM signal suffers from frequency selective fading. Therefore it is necessary to identify and invert the discrete transfer function of the channel. The accurate channel estimation is achieved with the exploitation of known reference signals and pilots into the OFDM frame. The ntCH_EST core uses the pilots to determine the channel impulse response in the frequency domain. Channel estimation is performed on a block-per-block basis, where one block is composed of a programmable number of OFDM symbols. The pilot allocation and the block size is fully programmable. The ntCH_EST implements estimation formulas based on Linear Least Squares (LS) and 1D linear interpolation algorithms for optimum trade-off between complexity and accuracy. Specifically the channel estimation performs the following block based operations:
- Computation of the expected pilot positions and the expected pilot modulation.
- Isolation of the pilot subcarriers from the incoming signal.
- Averaging of the pilot values for the selected channel estimation block to achieve better estimation results.
- Applying the channel estimation formula and calculating the discrete frequency transfer function value for each pilot.
- Interpolating, using linear interpolation techniques, the estimated values in the frequency domain to extract the transfer function for the data subcarriers.

The ntCH_EST supports programmable pilot patterns and programmable OFDM frame size. It is a fully synchronous design, using single clock. It is silicon proven in ASIC and FPGA technologies for a variety of applications.

Applications

The ntCH_EST core can be used in a variety of applications, including:

- Wireless broadband – IEEE 802.16.
- Digital Audio Broadcasting (DAB)
- DVB (ETS 300 421 – Satelite).
- DVB (ETS 300-429 – Cable).
- ADSL (ANSI T1.413, ETS 101 388).
- Wireless LAN (IEEE 802.11 WiFi, Hiperlan/2)
- Forth generation (4-G) wireless communications.
- Power line communications (ITU-T 9960 G.hn).



Features

- Fully configurable, high throughput, OFDM Channel Estimator.
- Programmable pilot patterns.
- Estimation based on Linear Least Squares (LS) and 1D linear interpolation algorithms for optimum trade-off between complexity and accuracy.
- Programmable OFDM frame size.
- Fully synchronous design, using single clock.
- Silicon proven in ASIC and FPGA technologies for a variety of applications.

Implementation results

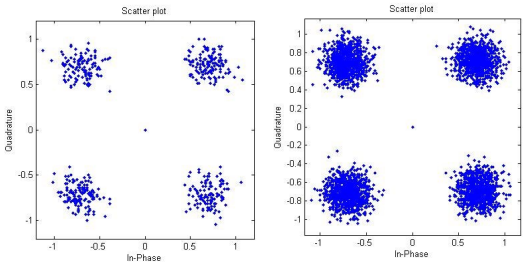
The core has been targeted to both ASIC and FPGA technologies for various applications. Noesis Technologies can also deliver netlist versions of the core optimized to specific area resources and performance requirements.

Silicon Vendor	Device	Resources [1]	Fmax (MHz)
Xilinx	Kintex-7	2495 CLB Slices / 8 Block RAMs / 44 DSP48 Blocks	100

1) Implementation data are for 256 subcarriers / OFDM symbol

Performance

The following figure illustrates typical constellation diagrams after channel estimation for a QPSK WiMAX signal with 2 and 16 active sub-channels per OFDM symbol with preamble and pilots based estimation respectively.



Deliverables

Noesis has engaged an "open" licensing philosophy in order to allow maximum technology transfer to our client's engineering teams and to facilitate the integration of our IP cores into our client's product. Various licensing models are available. The ntCH_EST core is available as a soft core (synthesizable HDL) or as a firm core (netlist for FPGA technologies). The following deliverables are included:

- Fully commented synthesizable VHDL or Verilog source code or FPGA netlist.
- VHDL or Verilog test benches and example configuration files.
- Matlab model.
- Comprehensive technical documentation.
- Technical support.

Support

Technical support by phone or email is included. First year of maintenance is also included. Additional support and annual maintenance options are available.

Ordering information

To purchase or make any further inquiries about our ntCH_EST core, or any other Noesis Technologies products or services, contact us at info@noesis-tech.com. Noesis Technologies products are purchased under a License Agreement, copies of which are available on request.

Noesis Technologies P.C.
Patras Science Park
Stadiou Rd, Platani Rion
GR-26504 - Patras
GREECE
Phone: +30 2610 911531
Email: info@noesis-tech.com

Copyright © 2016 Noesis Technologies P.C.

NOESIS TECHNOLOGIES

www.noesis-tech.com