

Product Brief

Overview: optimal LTE PHY performance

hellaPHY[®] CE is the industry’s most advanced LTE channel estimation IP core. Upgrading your receiver to *hellaPHY*[®] CE allows for optimal LTE PHY performance. In many cases, *hellaPHY*[®] CE increases the operational modulation-coding-set (MCS) by one or more levels. This increases spectral efficiency by up to 60% and beyond. The *hellaPHY*[®] CE IP Core is a mix of flexible software and low-power optimized hardware accelerators. With its carefully crafted interface, *hellaPHY*[®] CE is ready to be integrated into your design today with minimal effort.

Key features and benefits

- Near-perfect-CSI performance
- One or more MCS level improvement
- Greater than 60% spectral efficiency gain
- Robustness against cyclic prefix violations
- Optimized for all 3GPP R11+ antenna ports
- Massive cell edge noise/interference rejection

- Optimized for LTE Broadcast eMBMS
- Integrated timing, Doppler, SNR estimation
- Enables accurate OTDOA-based location applications
- Optimized software/hardware architecture
- Maximizes the number of concurrent VoLTE users
- Advanced channel tracking

Acorn Technologies is proud to announce its latest product in the field of advanced OFDM receiver technology: *hellaPHY*[®] CE is the new implementation paradigm providing optimal PHY performance in mobile chipsets. Designed for LTE—and applicable to any OFDM standard—*hellaPHY*[®] CE consistently provides differentiating performance against known channel estimation solutions. Dramatic performance gains with *hellaPHY*[®] CE are observed under challenging channel conditions beyond LTE standard testing. These conditions are expected to significantly affect network capacity.

Advanced receiver technologies maximizing spectral efficiency are central to the 1000x *Data Challenge*. The advanced channel estimation that comes with *hellaPHY*[®] CE provides a solid foundation to build other advanced receiver components such as interference cancellation, massive MIMO, etc.

Figure 1 depicts a receiver upgraded with *hellaPHY*[®] CE. Besides providing industry-leading channel estimation, *hellaPHY*[®] CE outputs other modem-critical components such as timing, SNR, delay spread and Doppler estimation. *hellaPHY*[®] CE timing estimates not only improve performance by avoiding inter-symbol/inter-carrier interference, but also enable fully spec compliant LTE OTDOA-based positioning features.

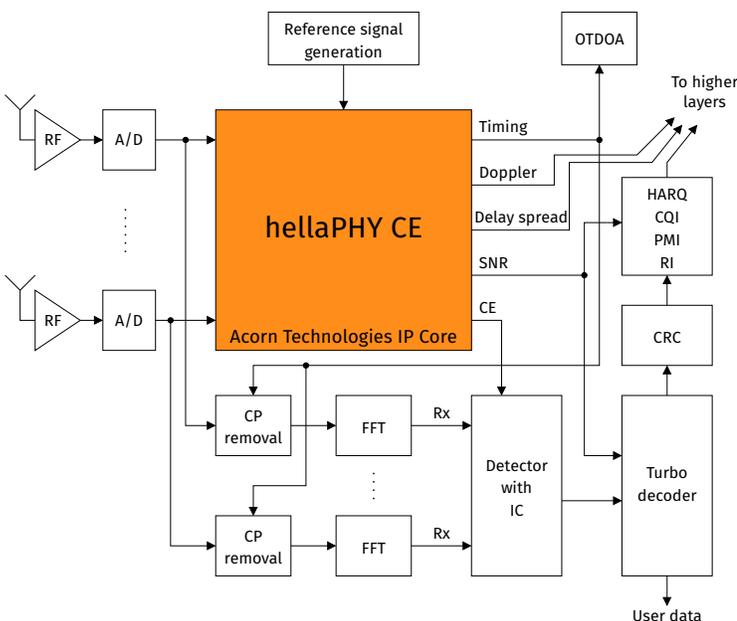


Figure 1 – A receiver upgraded with *hellaPHY*[®] CE.

What is included

DSP and RTL source Documentation Matlab functional model Integration support	Verification test benches FPGA/ASIC synthesis scripts Matlab fixed-point bit-exact model Tapeout support
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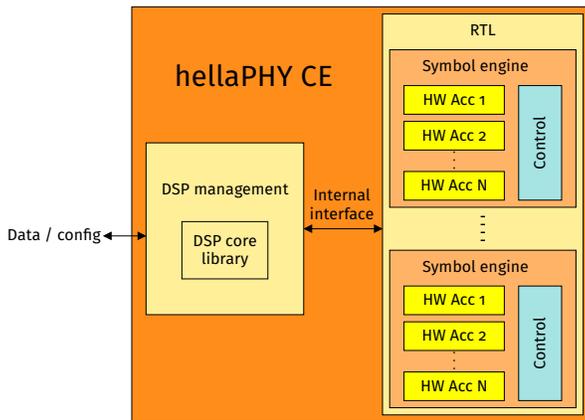


Figure 2 – hellaPHY[®] CE IP Core symbol engine cluster.

The *hellaPHY[®] CE* IP Core consists of a *symbol engine cluster* optimized to the *hellaPHY[®]* algorithms. The cluster is controlled by a software layer that interfaces to the host system. This modular design allows for custom tailoring to the target platform. See Figure 2.

The *hellaPHY[®] CE* IP Core has a clean interface designed for simple integration. Acorn Technologies offers support in the integration process, including verification test benches, synthesis scripts, documentation, Matlab functional and bit-true fixed-point models. The impact to tapeout schedule is minimal, particularly when considering the broad capabilities that *hellaPHY[®] CE* offers the modem.

Algorithm-wise, *hellaPHY[®] CE* is unlike anything on the market. State-of-the-art solutions are based on frequency-domain pilot filtering with Wiener optimizations. However, in practice, these schemes are suboptimal from statistical model mismatch. Moreover, complexity constraints (filter length) limit how well these schemes exploit available pilot information. *hellaPHY[®] CE* is a radical departure from traditional approaches. Drawing inspiration from the latest in machine learning, *hellaPHY[®] CE* intelligently computes the time-domain *channel impulse response*. This leads to a final channel estimate of unparalleled quality. *hellaPHY[®] CE* completely sidesteps the traditional complexities involved with filtering, allowing it to make use of 100% of available pilot energy. *hellaPHY[®] CE* dynamically optimizes itself to the channel on a per-symbol basis, requiring no channel statistics, thereby avoiding classic model mismatch issues.

hellaPHY[®] CE is available today. Please contact Acorn Technologies for more information.

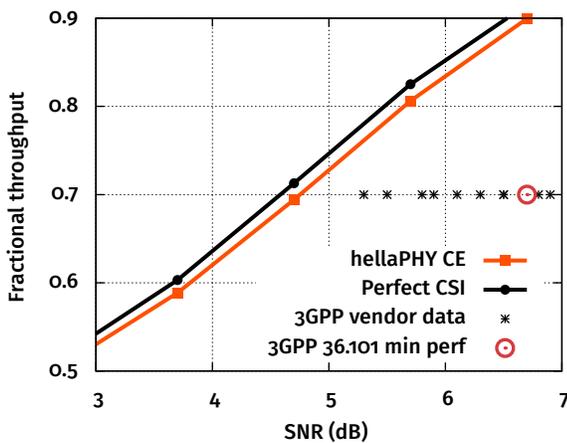


Figure 3 – hellaPHY[®] CE achieves near-perfect-CSI performance.

About Acorn Technologies

Acorn Technologies engages in the invention and development of advanced technologies for wireless telecommunications for 4G and beyond. In the field of semiconductors, Acorn is developing nanotechnologies focused on performance and scaling.