**EIA 2022 entry – Embedded Solution Product of the Year**

**CEVA PentaG2**

*Note: please also refer to accompanying materials including The Linley Group’s Microprocessor Report, Product Notes for PentaG2 Max and PentaG2 Lite, and the Powerpoint presentation on PentaG2*

**PentaG2™ Next Generation 5G NR IP Platform**

**Executive summary**

PentaG2 is the only 5GNR baseband IP platform in the market. PentaG2 can dramatically jumpstart new modem development, improve time to market and reduce risk.

PentaG2 is a comprehensive hardware/software IP platform that combines advanced DSPs with special purpose accelerators, to deliver a 4X improvement in power efficiency versus its predecessor, and dramatic power consumption improvement over SDR-based solutions.

PentaG2 is both scalable and flexible, and serves a wide range of 4G and 5G use cases. It is also the first IP platform targeting cost effective 5G RedCap (reduced capability).

**Comprehensive platform saves power**

PentaG2 is CEVA’s second generation 5G platform architecture aimed at accelerating the proliferation of new usage models for mobile broadband and IoT, and to reduce the entry barriers for OEMs looking to handle 5G modem design themselves.

PentaG2 is a comprehensive hardware/software IP platform that combines advanced DSPs with special purpose accelerators, to deliver a 4X improvement in power efficiency versus its predecessor. PentaG2 includes a complete set of programmable accelerators and coprocessors, constituting end-to-end in-line signal processing chains.

PentaG2’s main innovation comes from CEVA's deep understanding of 5G workloads in various applications, which resulted in an architecture that combines hardware acceleration for stable 5G baseband modules, with programable DSPs for optimal flexibility of varying 5G algorithms.

PentaG2 builds on CEVA’s first-generation PentaG platform, which has shipped in millions of 5G NR smartphones and mobile broadband devices to date.

In terms of originality, PentaG2 provides not just a hardware design, but also a complete software reference implementation of Upload and Download processing chains (for both data and control), using a Wireless Platform Simulator (WPS) prototyping tool.

This makes PentaG2 the only 5G baseband platform IP in the market that supports all the latest 5G use-cases, from IoT up to high-end eMBB. Comparisons with any incumbent products are difficult, because there are no real competitors to PentaG2, as it is the only complete IP platform for 5G baseband.

The most common competition to PentaG2 in any particular customer application is likely to be an in-house solution, developed by a customer who can only externally license the DSP component and needs to develop the range of accelerators itself. By offering two versions – Max and Lite – and a full software implementation for down/up chains, the PentaG2 offers flexibility beyond what such in-house solutions can offer. PentaG2 also provides a flexible, lower-cost alternative to buying an off-the-shelf 5G chip from a modem supplier.

PentaG2 is the industry's most comprehensive 5G baseband platform IP for mobile broadband and IoT. It is a known fact that 5G modem design is complex and requires expert knowhow. Chip companies and market leaders such as Qualcomm and Mediatek have their own in-house designs, while other 5G chip makers must invest years of effort to develop (like Apple is rumoured to do) or license 3rd party IP. CEVA is the only IP option in the market, given CEVA’s 20+ years of incumbency in cellular modem solutions.

The secret sauce is in the balanced partitioning of hardware and software to achieve optimal low power solutions, while still offering the flexibility of software customizable design.

**Third-party testimonial**

Quotes from the Linley Group Microprocessor report, 28th March 2022, by Linley Gwennap:

* "PentaG and the new PentaG2 are the only licensable 5G basebands on the market. CEVA's main competition is in-house designs."
* "PentaG2-Max brings major improvements to CEVA's smartphone customers, adding Release 16 features while greatly reducing power consumption. It represents a major redesign from the original PentaG, moving many dataplane features from software to hardware to save power. Yet it still retains flexibility for customer differentiation and future Release 17 extensions."
* "PentaG2-Lite brings an opportunity to broaden CEVA's IoT customer base among both existing LTE licensees and new companies. As a complete but customizable design, PentaG2-Lite is well suited to these customers."

**Customer impact**

PentaG2 substantially lowers the high entry barriers for semiconductor companies and OEMs who wish to address the huge market opportunities in mobile broadband and IoT, or to be self-sufficient in the 5G handset SoC, by providing a comprehensive platform with the key building blocks required for full LTE/5G modem design.

The PentaG2 5G modem architecture facilitates rapid development of 5G SoCs, dramatically reducing the time-to-market, risk, effort and cost for customers. The scalable PentaG2 platform addresses a full gamut of use cases, from RedCap, NR-Sidelink and C-V2X, through to high end eMBB for handsets, CPE/FWA Terminals and mmWave and URLLC for XR headsets.

Looking ahead to what additional applications or markets that PentaG2 might open up, we can see opportunities for 5G deployment in AR/VR, URLLC (low latency applications like remote surgery), C-V2X, wearables and industrial. These new verticals open the door to semiconductor companies and OEMs to develop application-specific 5G modems in-house rather than relying on traditional, costly cellular modems from incumbent cellular vendors.

**Product configurations**

PentaG2 platforms will initially be offered in the following configurations:

• PentaG2-Max – targeting eMBB use cases in handsets and CPE/FWA Terminals and mmWave, NR-Sidelink and cellular V2X (C-V2X), as well as URLLC enabled AR/VR use cases. PentaG2-Max is the world's only complete IP offering able to efficiently process the immense workloads required for 3GPP releases 16 and 17, looking forward to 5G advanced, for both Sub-6 and mmWave 5G broadband, with a 4X performance/area improvement in data-path processing.

• PentaG2-Lite – supports a range of reduced capacity use cases, including LTE Cat1 and future 3GPP Rel-17/18 NR RedCap (Reduced Capability, aka NR-Lite). PentaG2-Lite is an extremely efficient and lean baseband implementation with complete processing chain acceleration and utilizing a small footprint scalar DSP controller, to meet the most stringent power budgets.

Crucially, both configurations offer the flexibility to allow customers combine their own proprietary algorithms and IP, such as channel estimation or advanced equalization with the PentaG2 platform via standard interfaces.