Leoni transfers 200 G via copper with passive QSFP connectors

Innovative solution with NRZ modulation provides big savings potential for network operators

Friesoythe, 30 January 2017 – As one of the first manufacturers of QSFP copper cable systems, Leoni, the leading European provider of cables and cable systems to the automotive sector and other industries, has now succeeded in transferring 56 Gb/s per channel across passive DACs with NRZ modulation. Prototypes with 1, 2 & 3 m transmission lengths have shown outstanding electrical properties in tests up to 56 GHz.

Leoni’s solution promises major cost-saving potential for network operators and their equipment suppliers: NRZ-modulated 56 Gb/s systems allow a passive infrastructure to be retained in computer centres. There is no need for active strengthening of switches and servers with additional electronics, making it possible to save a lot of energy. Furthermore, tests and simulations can be run with existing equipment. And 200 G is only the beginning. Many computer centre operators and component manufacturers are going for active components with additional electronics in the connectors when it comes to next generation-wiring up to 400 G across short distances.

With an innovative Leoni solution, it is now possible to keep a passive network structure at 200 G: Leoni’s Business Unit Telecommunication Systems has succeeded in providing a stable-frequency system solution up to 3 m for the QSFP form factor and passive 56 Gb/s. With the use of a specially developed high-speed cable and a complex PCB, Leoni can increase the NRZ modulation for a data rate of 56 Gb/s, which simultaneously also means providing the bandwidth of the entire system with corresponding SI performance of 56 GHz. With four data pairs (QSFP), 200 G can be securely transferred across these passive cables.

Active vs. passive or PAM-4 vs. NRZ

There are only two ways to execute the generational change from 100 G to 200 G or 400 G: either further data pairs must be added or the actual data rate per data pair must be raised. Such raising of the data rate is being normatively discussed right now because of the high frequency. In technical terms, this is only possible to achieve with great difficulty when using existing passive components. A data rate increase by changing the modulation method from NRZ to PAM4 was therefore incorporated in the standard. PAM4 makes it possible, with the same bandwidth, to send twice the data rate in the same time across a connection than with NRZ. However, existing networks must be upgraded to use this active technology.

The switch from passive NRZ to active PAM4 modulation at data rates of up to 56 Gb/s per channel therefore presents new challenges in terms of design, measurability, test methods and ways of simulating transmission systems. These are currently being researched and developed.

200 G and what then?

Leoni provides solutions for both active and passive methods with different data rates and transceiver connectors. 200 G with NRZ via a QSFP assembly is the latest innovative solution. Yet the focus is already on the next objective: the feasibility study and prototype development for 400 G with NRZ across eight data pairs are currently under way. That equates to a data volume of nearly 12 DVDs per second, which in technical language is known as ‘double density’ (abbreviated DD) and is another milestone in the evolution of high-frequency data transfer in computer centres.

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☞ *Related illustration material can be downloaded next to this release at* [*www.leoni.com/en/press/releases/details/leoni-transfers-200-g-via-copper-with-passive-qsfp-connectors/*](http://www.leoni.com/en/press/releases/details/leoni-transfers-200-g-via-copper-with-passive-qsfp-connectors/)

Glossary:

* QSFP (quad small form factor pluggable): connector design for high-frequency data transmission in computer centres with four data pairs, form factor 4X)
* DAC (direct attach copper): copper cable systems with such transceiver connectors as SFP+, SFP28, QSFP+, QSFP28)
* NRZ (non return to zero) refers to a form of digital data transmission in which the binary low and high states, represented by numerals 0 and 1, are transmitted by specific and constant DC (direct-current) voltage(s)
* PAM4 (pulse amplitude modulation, Level 4): data transmission with pulse amplitude modulation
* SI performance (signal integrity performance): signal quality
* Short-haul systems: short distance systems

About the Leoni Group

Leoni is a global supplier of wires, optical fibers, cables and cable systems as well as related services for the automotive sector and further industries. Leoni develops and produces technically sophisticated products from single-core automotive cables through to complete wiring systems. Leoni’s product range also comprises wires vand strands, standardised cables, special cables and cable system assemblies for various industrial markets. The group of companies, which is listed on the German MDAX, employs more than 79,000 people in 32 countries and generated consolidated sales of EUR 4.5 billion in 2015. In 2017, Leoni celebrates its 100 years anniversary.

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