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DESIGN AND ANALYSIS OF 2.56 GBPS CML CMOS TRANSCEIVER WITH SPECIFIC LOAD FOR PHYSICAL INSTRUMENTATION APPLICATIONS

Serazetdinov A.R.[1], Atkin E.V.[1], Khokhlov K.O.[2]
[1)] National Research Nuclear University MEPhI
[2)] Ural Federal University
E-mail: mrsuglikov@gmail.com

In the work we describe the process of designing 2.56 Gbps CML receiver and 1.28 Gbps CML transmitter with specific transmission line properties. The blocks have been designed for the specific need of high speed data transmission in the radiation environment. Signal integrity is also analyzed.

A number of physical experiments conducted under specific environmental conditions, like at FAIR, Darmstadt, or NICA at Dubna - radiation, high temperatures, etc. - does not allow to place both data acquisition and processing systems in the measurement area. Whenever possible, data processing is conducted outside unfavorable conditions. However in this case high speed data transmission from read-out electronics to processing units is needed. In current work we describe the process of design and implementation of CMOS CML IP block, capable of receiving data from front-end detectors at a rate of 2.56 Gbps and transmit at 1.28 Gbps with specific load.

The problem arises with the need to transmit data via specific coaxial cable of 50 pF parasitic capacitance. On the other hand, the use of LQFP IC package with high parasitic inductance lead to the need of specific balancing. Since the reflection coefficient in the transmission line with such frequencies have to be contained, additional design steps have to be provided to the transmitter's output buffer. On the receiver side the need to balance parasitics of the built-in ESD protection circuit arises. Several approaches have been analyzed and optimal decision was presented. In both blocks several techniques to improve radiation hardness of the blocks were implemented.

In the work significant attention is provided to signal integrity issues and methods to evaluate and design the IC interface blocks with signal integrity considerations on the earliest stages of the design route.

The prototype chips including CML IP blocks are currently under manufacturing in the TSMC 65 nm LP design process and are expected to arrive to be tested in May-June 2021.

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DEVELOPMENT OF A DEVICE FOR GENERATION OF LOW CONCENTRATIONS OF VAPORS

Shchapov I.E.[1], Chuvashov R.D.[1], Baranova A.A.[1], Khokhlov K.O.[1]
[1)] Ural Federal University, Ekaterinburg, Russian Federation
E-mail: quemedaganas@gmail.com

The article is devoted to the problem of dilution of the concentration of saturated vapors of various substances. The principle of operation of the device and its technical features are described.

На текущий момент существуют виды деятельности, требующие использования газов определенной концентрации. Один из них – тестирование способностей детекторов различных газообразных веществ [1, 2, 3]. Для оценки пределов обнаружения детектируемых газов необходимо создание как можно меньших концентраций газов.

Для этих целей был разработан аппаратно-программный комплекс, генерирующий малые концентрации паров веществ благодаря размешиванию насыщенных паров. В данной работе описаны конструкция и принцип работы данного устройства.

Установка состоит из рабочего объёма, термостата, применяемого для перемещения паров манипулятора шприца и программного кода к нему. Исходные насыщенные пары настаиваются в шприце Жане. В качестве источника паров используется инертный носитель, на который помещён раствор аналита или аналит в твёрдом виде. Разбавление паров производится в две стадии. Разбавление вплоть до 0,1 от насыщенной концентрации можно провести путём добавления объёма к внутреннему объёму шприца. На второй стадии часть паров из шприца подаётся в 3л рабочий объём, позволяя получить концентрацию равную $5*10^{-4}$ от концентрации насыщенных паров.