

Разработка перспективной системы сбора данных на основе TRB-3

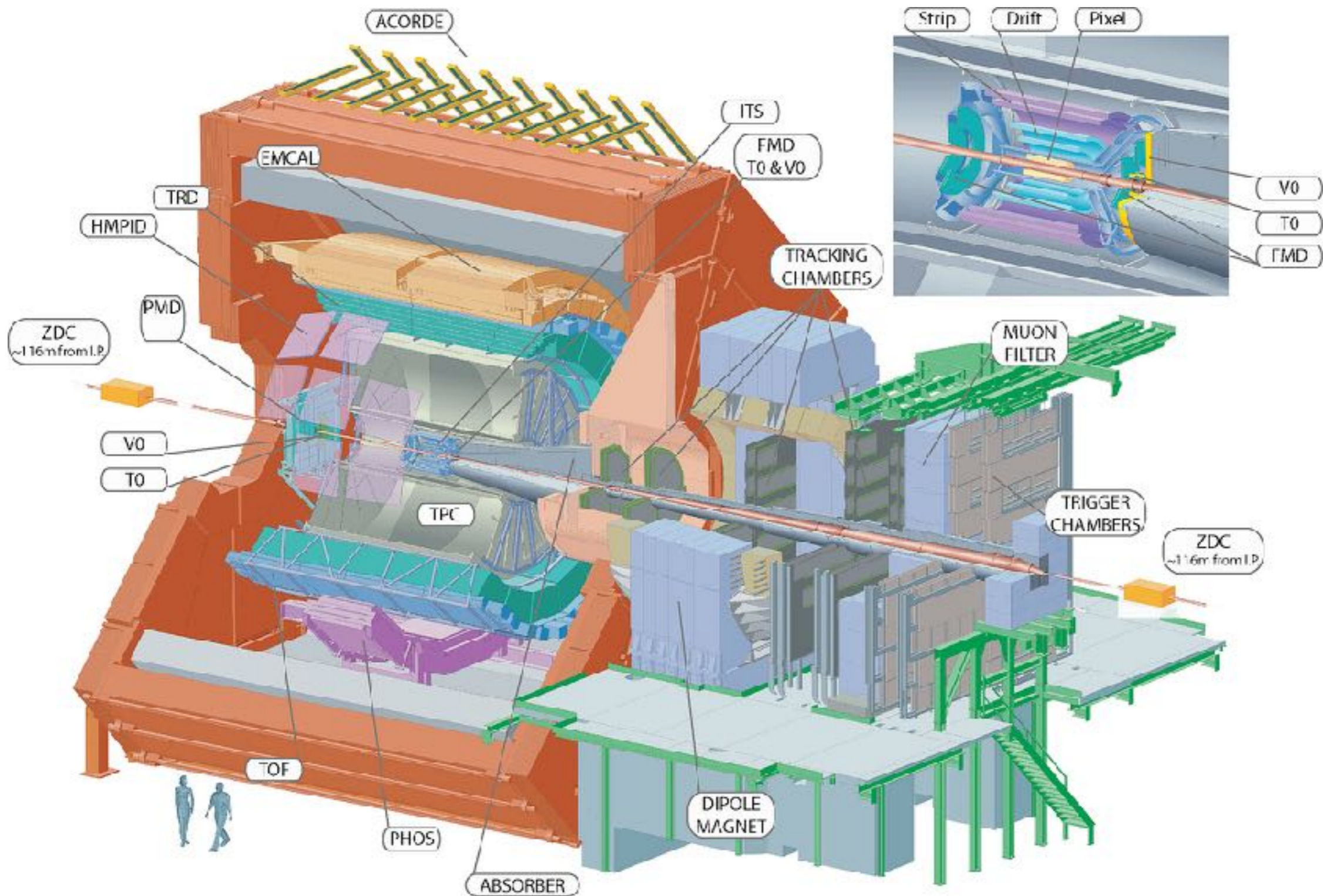
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ALICE - A Large Ion Collider Experiment

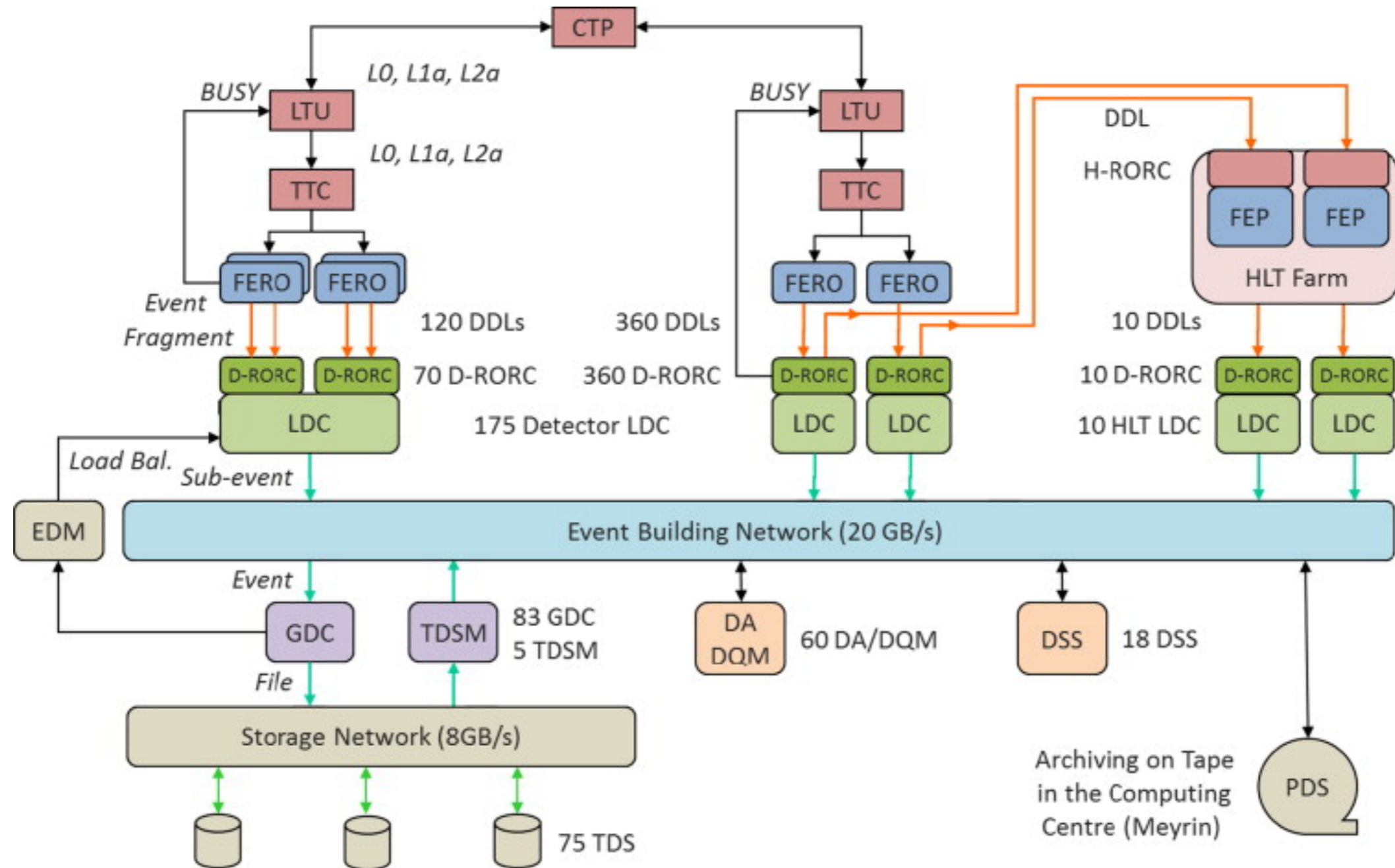


- Был основан для изучения взаимодействия тяжелых ионов, физики сильно взаимодействующей материи и кварк-глюонной плазмы в ядерных столкновениях.
- Накопил несколько десятков петабайт данных.
- Более 900 ученых ALICE из 28 стран мира ежедневно обращаются к этим данным для анализа
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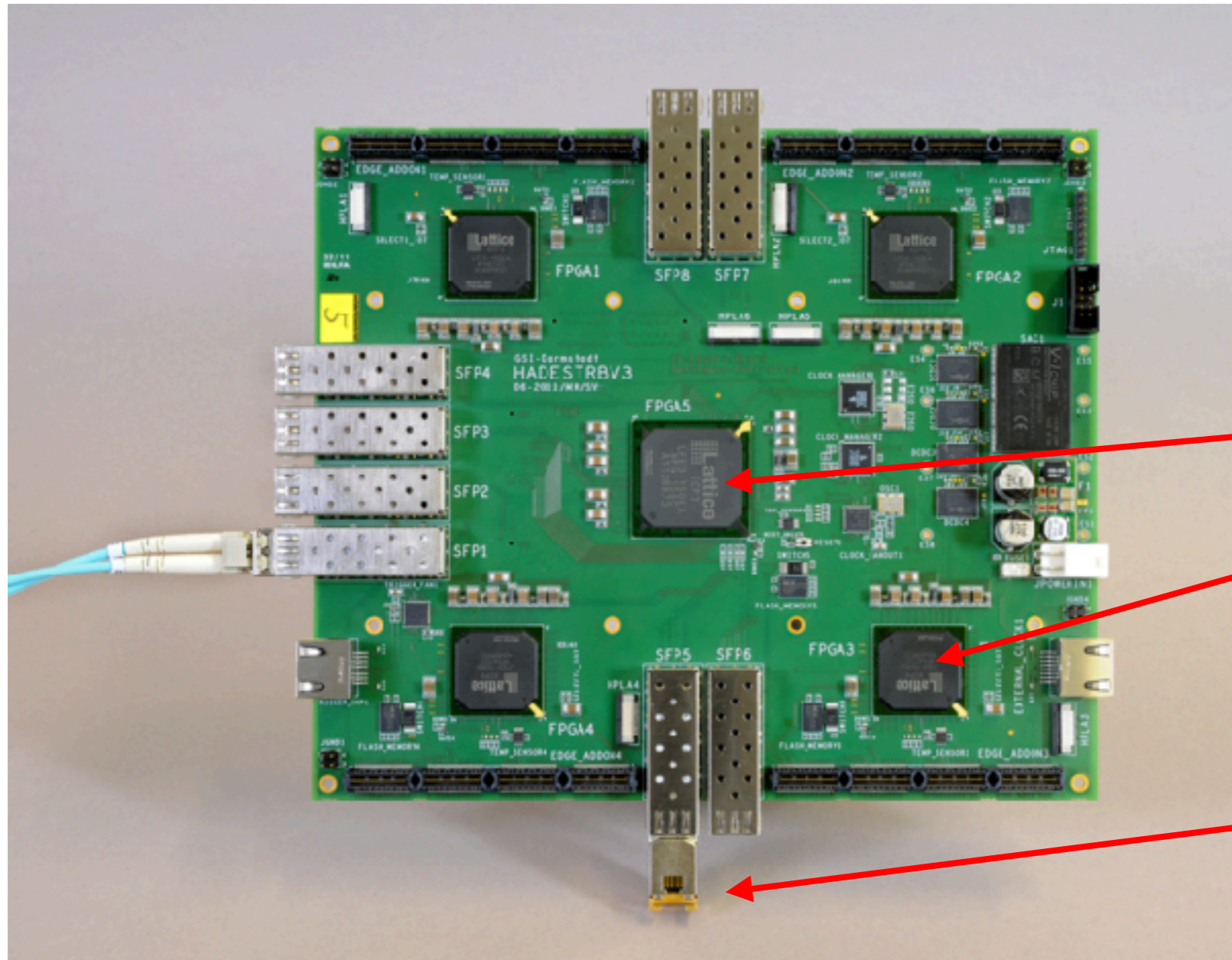
ALICE Detector



ALICE data acquisition system



TRB -3 board (1/2)



- Многоцелевая 4+1 FPGA(Field-Programmable Gate Array - программируемая логическая интегральная схема) плата
- Для сбора данных требуется 48 В и Gigabit Ethernet
- Центральная триггерная система (CTS - Central Trigger System);
- 64+1 FPGA - совместимых каналов TDC (Time-to-Digital Converter);
- Распределение триггеров через оптические линии связи;
- Высокая пропускная способность через 8 портов SFP(Small Form-factor Pluggable)

TRB -3 board (2/2)

quick view status indicators

Central Trigger System

- Status overview

Counter	Counts	Rate
Trigger asserted	82610320 events	1240.61 MHz
Trigger rising edges	673166321 edges	1240.61 MHz
Trigger accepted	874124517 events	8239.62 MHz

Last Idle Time: 1499280 ns
Last Dead Time: 1200 ns, 759.23 MHz

Threshold: Last trigger held to: 1 MHz
Full stop: ignore all events

Export CTS Configuration: as TriCard script | as shell script

- Trigger Channels

#	Enable	Trg. Cond.	Assignment	Trigger Type	Asserted	Edges
0	<input type="checkbox"/>	R. Edge	Ext. Logic - DSM	Or1_pysics_trigger	335.70 MHz	335.70 MHz
1	<input checked="" type="checkbox"/>	R. Edge	Periodical Pulser 0	Or1_pysics_trigger	306.57 MHz	306.57 MHz
2	<input type="checkbox"/>	R. Edge	Periodical Pulser 1	Or1_pysics_trigger	4.59 MHz	4.59 MHz
3	<input type="checkbox"/>	R. Edge	Periodical Pulser 2	Or1_pysics_trigger	0.00 MHz	0.00 MHz
4	<input type="checkbox"/>	R. Edge	Periodical Pulser 3	Or1_pysics_trigger	0.00 MHz	0.00 MHz
5	<input checked="" type="checkbox"/>	R. Edge	Random Pulser 0	Or1_pysics_trigger	1040.78 MHz	1040.78 MHz
6	<input type="checkbox"/>	R. Edge	Trigger Input 0	Or1_pysics_trigger	96.65 MHz	96.65 MHz
7	<input type="checkbox"/>	R. Edge	Trigger Input 1	Or1_pysics_trigger	0.00 MHz	0.00 MHz
8	<input type="checkbox"/>	R. Edge	Trigger Input 2	Or1_pysics_trigger	125.79 MHz	125.79 MHz
9	<input type="checkbox"/>	R. Edge	Trigger Input 3	Or1_pysics_trigger	0.00 MHz	0.00 MHz
10	<input type="checkbox"/>	R. Edge	Coincidence Module 0	Or1_pysics_trigger	100.00 MHz	0.00 MHz
11	<input type="checkbox"/>	R. Edge	Coincidence Module 1	Or1_pysics_trigger	100.00 MHz	0.00 MHz
12	<input type="checkbox"/>	R. Edge	Coincidence Module 2	Or1_pysics_trigger	100.00 MHz	0.00 MHz
13	<input type="checkbox"/>	R. Edge	Coincidence Module 3	Or1_pysics_trigger	100.00 MHz	0.00 MHz

- Trigger Input Configuration and Coincidence Detectors

Input Modules					Coincidence Detectors				
#	Inp. Rate	Invert	Delay	Spice Req.	Override	#	Window	Coinc. Mask (2:0)	Inhibit Mask (2:0)
0	306.57 MHz	<input type="checkbox"/>	0 ns	0 ns	bypass	0	150 ns	<input type="checkbox"/>	<input type="checkbox"/>
1	0.30 Hz	<input type="checkbox"/>	0 ns	0 ns	bypass	1	150 ns	<input type="checkbox"/>	<input type="checkbox"/>
2	125.79 MHz	<input type="checkbox"/>	0 ns	0 ns	bypass	2	150 ns	<input type="checkbox"/>	<input type="checkbox"/>
3	0.30 Hz	<input type="checkbox"/>	0 ns	0 ns	bypass	3	150 ns	<input type="checkbox"/>	<input type="checkbox"/>

- Pulsers

Periodical Pulsers			Random Pulsers	
#	Low Period	Frequency	#	Mean Frequency
0	200 ns	200.00 MHz, 10 MHz	0	1000 MHz
1				
2				
3				

These input formats are supported:
 1.) Enter the duration of the low period in clock cycles by appending a unit
 2.) Enter the duration of the low period in seconds by adding "s"
 3.) Enter the frequency by appending "Hz"

Optional unit prefixes: n, u, m, k, M, G, T. Example line = 1e-3s, 1 MHz = 1e6 Hz
 Press enter or save input to apply values. This might take a few moments and is completed as soon as the left column has changed

- CTS Details

Reset config: Trigger Channel Counter, External Counter, Trigger statistics, Testlamp

TD FSM Limit (debug only): disabled
 RD FSM Limit (debug only): disabled

STATUS: Design completed, Thu, 17 Jan 2013 11:00:30
 TD FSM State: TD_FSM_IDLE
 RD FSM State: RD_FSM_IDLE
 RD Queue: Empty, words engaged: 0
 Current Trigger (15:0): 0011 1100 0100 0000, not asserted
 Between Trigger (10:0): 0011 1100 0100 0010, Type 0x1

all CTS controls are arranged on a single web page. Updates each sec. without reloading the page

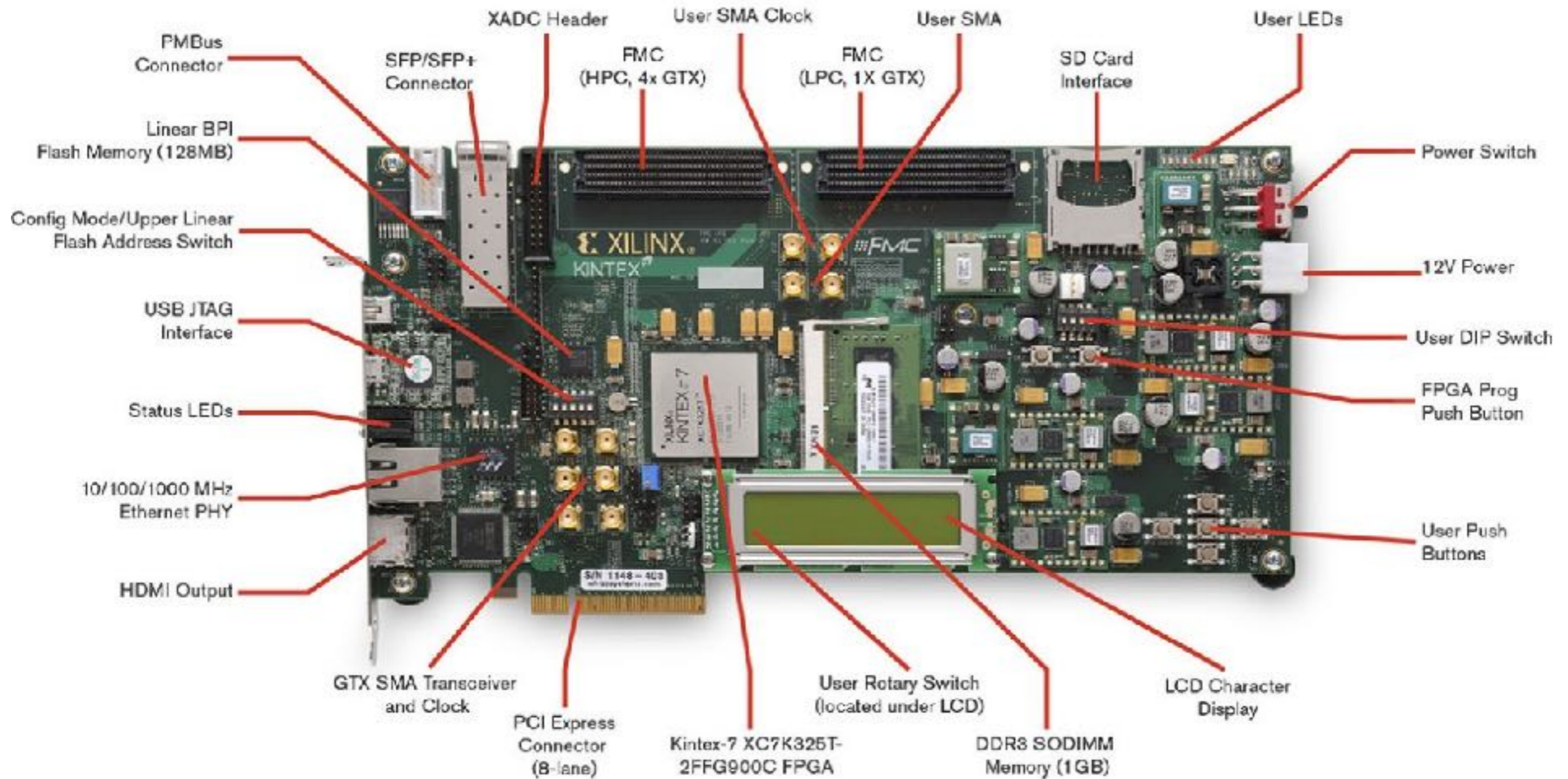
context-sensitive state information in direct proximity of controls

when adjusting a module, related information are highlighted (currently editing the pulser's period further down the page)

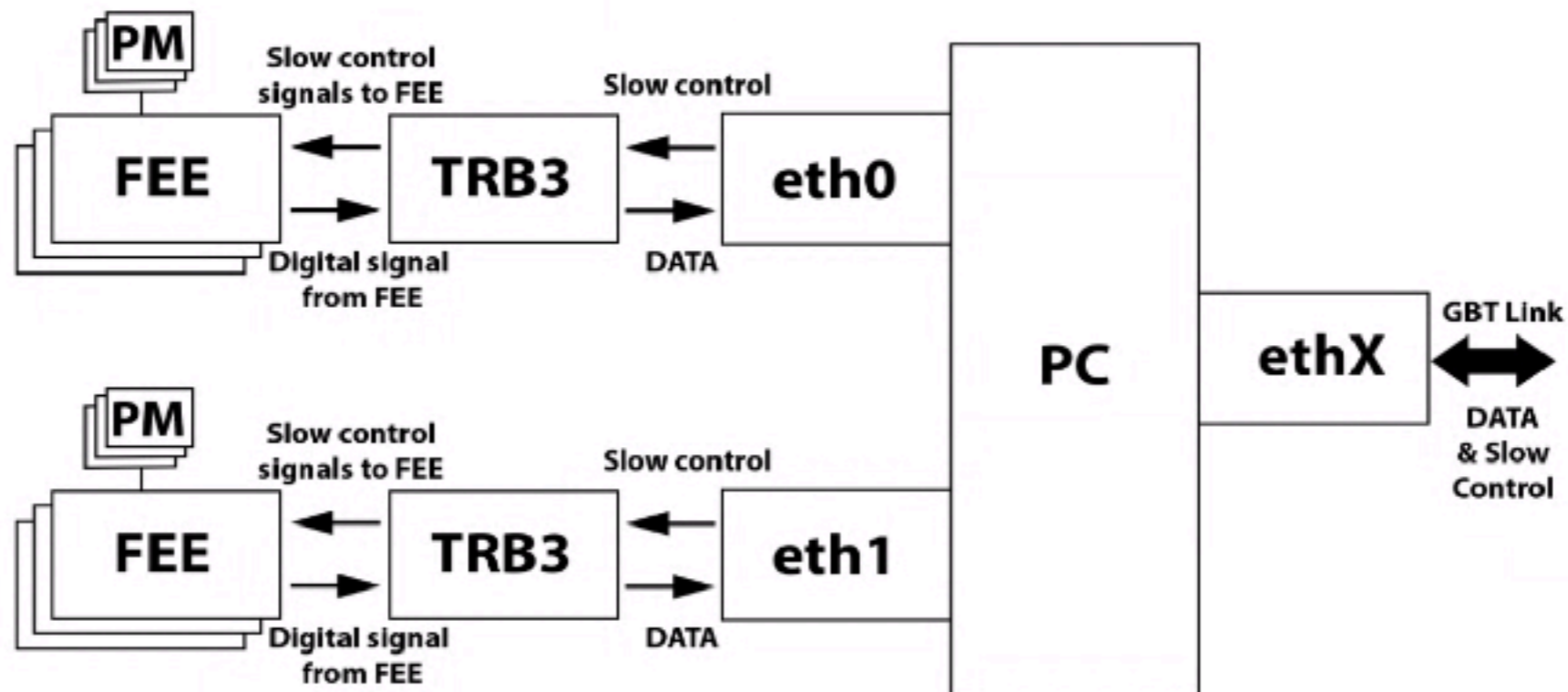
multi-unit support for comfortable user inputs

online help system to assist the user when editing controls

Xilinx Development Board Kintex KC705

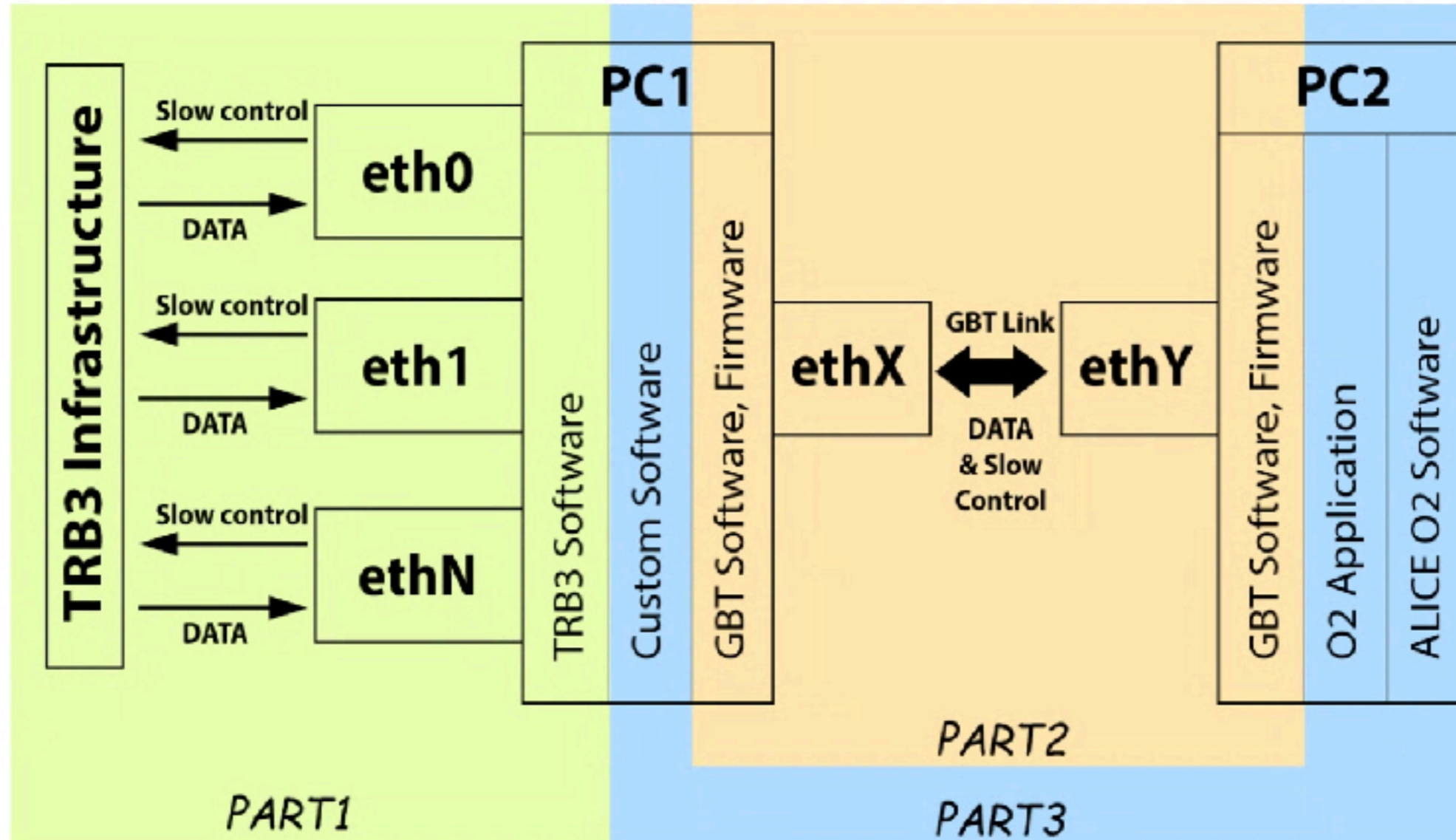


Hardware-software complex on the basis of TRB3 that support the GBT Protocol



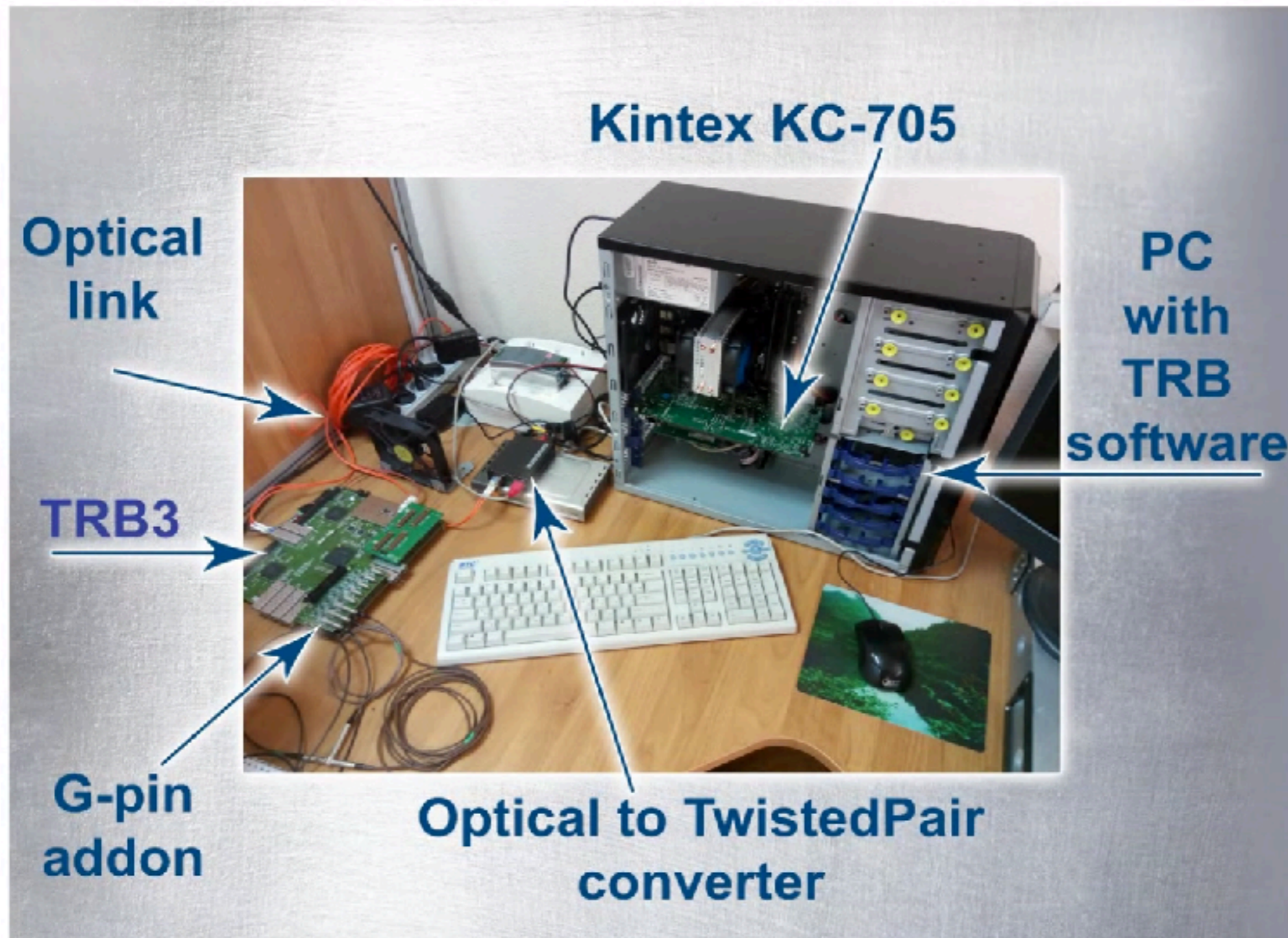
ethX – GBT link (KC705 dev board or C-RORC)
eth0,1 – ethernet link (optical or twisted pair)

TRB3-GBT-O2 Test Stend



ethX,Y – GBT link (KC705 dev board or C-RORC)
eth0,1,N – GBE (optical or twisted pair)

Тестовый стенд



Планы

- Проведение тестов с реальными данными.
- Создание математической модели прототипа.
- Стресс-тесты с использованием больших потоков данных.

**Спасибо за
внимание**