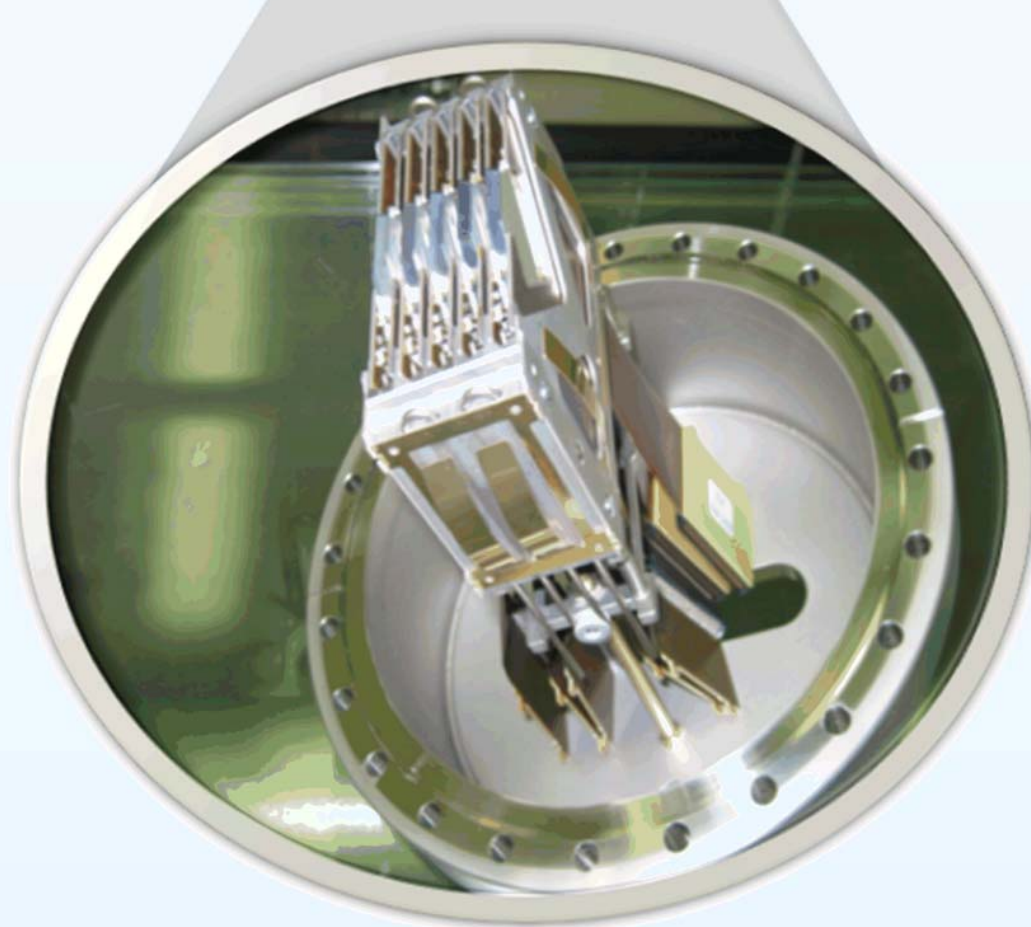# The TOTEM Roman Pot Motherboard

Gueorgui Antchev CERN PH-TOT / INRNE-BAS
**on behalf of TOTEM collaboration**

Introduction

The TOTEM [1] experiment has three sub-detectors: Roman Pots (RP) with silicon edgeless microstrip silicon detector, T1 with Cathode Strip Chambers (CSC) and T2 with Gas Electron Multiplier detectors (GEM). All detectors use the VFAT [2] chip for tracking and trigger generation mounted on different hybrids. A Roman Pot hybrid contains four VFAT chips. The set of ten hybrids is stacked and inserted in every Roman Pot.

The Roman Pot Motherboard (RPMB) is connected to this set via flex connections and glued to the vacuum flange. Next is described the design and functionality of the RPMB and its components as part of the front-end electronics [3] in Roman Pot of the TOTEM experiment.

Block Diagram

The TOTEM Roman Pot Motherboard is the main component of the Roman Pot front-end electronic system.
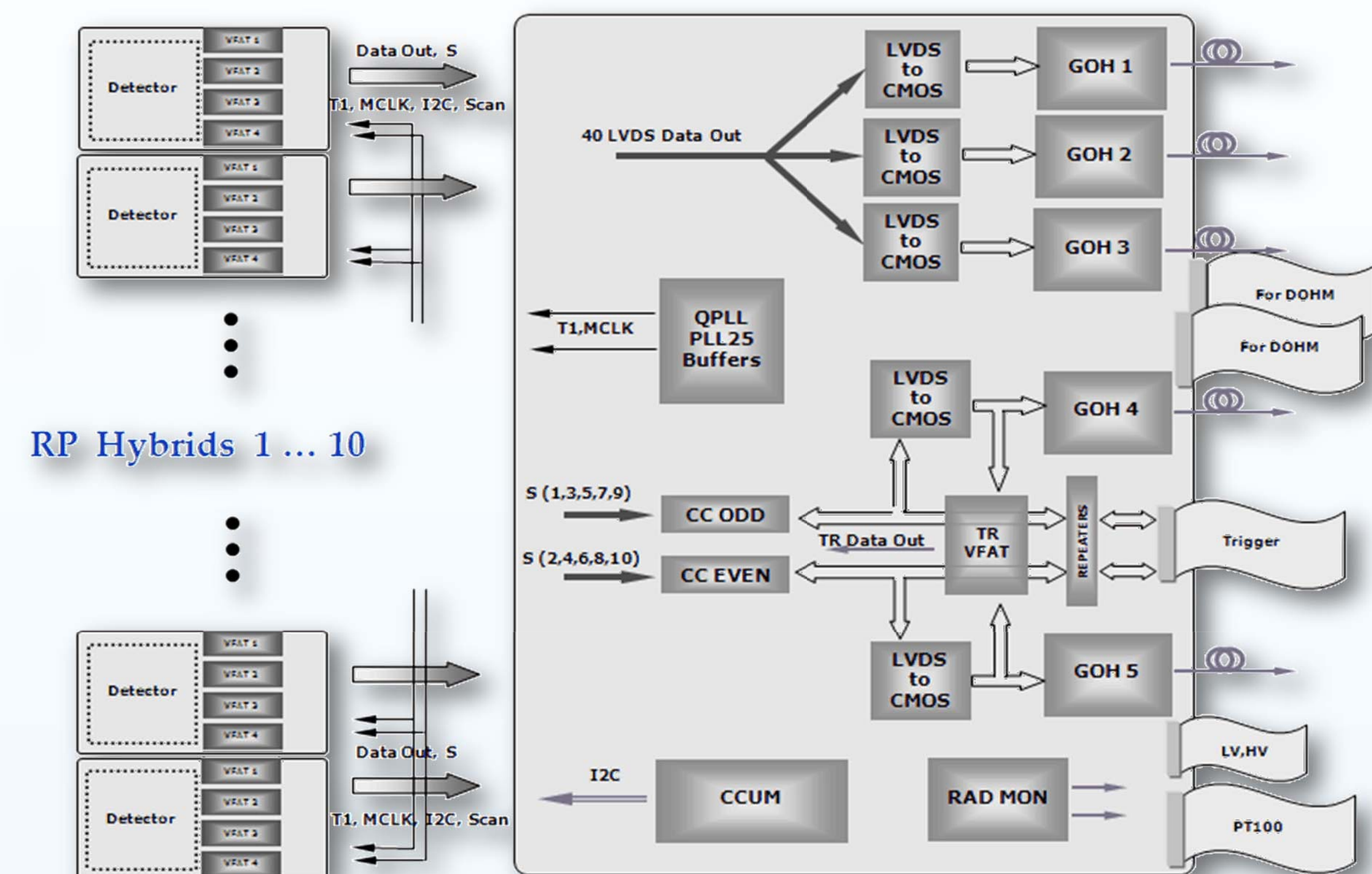
The RPMB main objectives are to acquire on-detector data and trigger from up to 10 hybrids, to perform data conversion from electrical to optical format and to transfer it to the next level of the system. It also distributes the control information to the hybrids and collects different detector and board parameters.

Components

The RPMB accepts several mezzanine modules and contains the following general building blocks with many standard CMS components:

Control Logic Block – based on CERN common used Communication and Control Unit CCUM mezzanine. This module is connected to the control loop (DOHM and FEC-CCS) via two 20pins 3M high speed connectors placed on the front panel. Control logic block provides 16 I2C interface channels and one 8 bit parallel control port;

Clock and Commands Distribution Block – based on PLL25 chip, QPLL and a number of clocks and commands distribution circuitry. It delivers synchronous clock and commands to every component on the board including the VFAT chips on the RP Hybrids;

Trigger Transmission Block – based on Coincidence chip mezzanine, LVDS to CMOS converters, Trigger VFAT mezzanine and two GOH modules. To transmit trigger bits to the counting room, two ways have been selected: optical fibers are used for the 150m RP station and in TOTEM standalone runs also for the 220m station.

Data Conversion and Transmission Block – based on LVDS to CMOS converters and gigabit optical hybrids GOH modules. Three GOH modules are used to send data from 40 VFAT chips to the counting room;
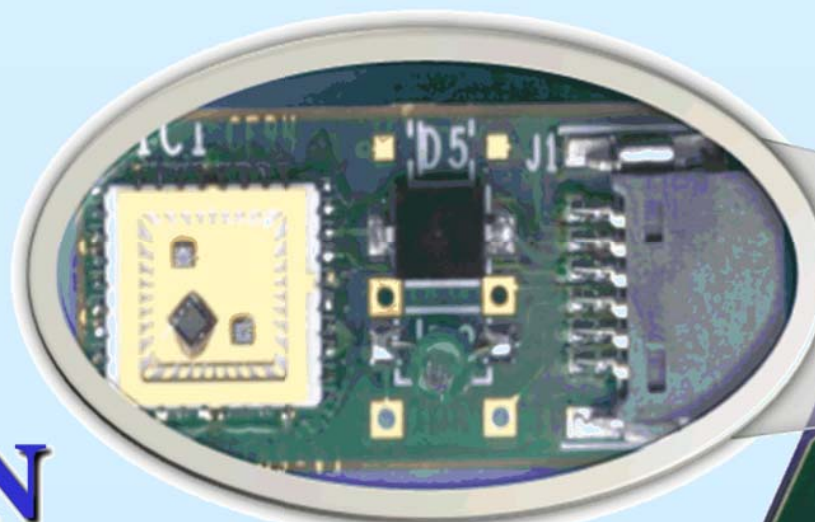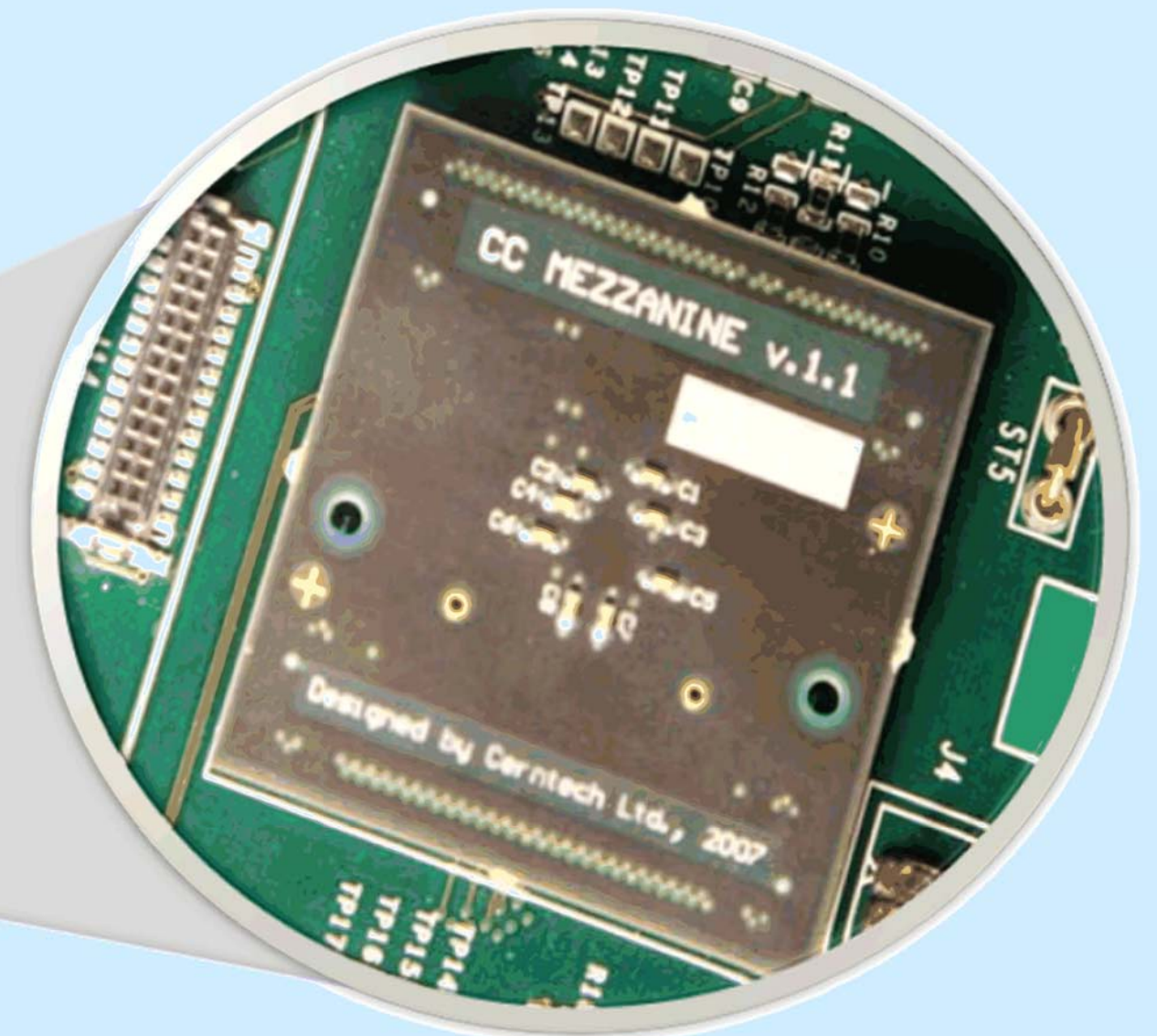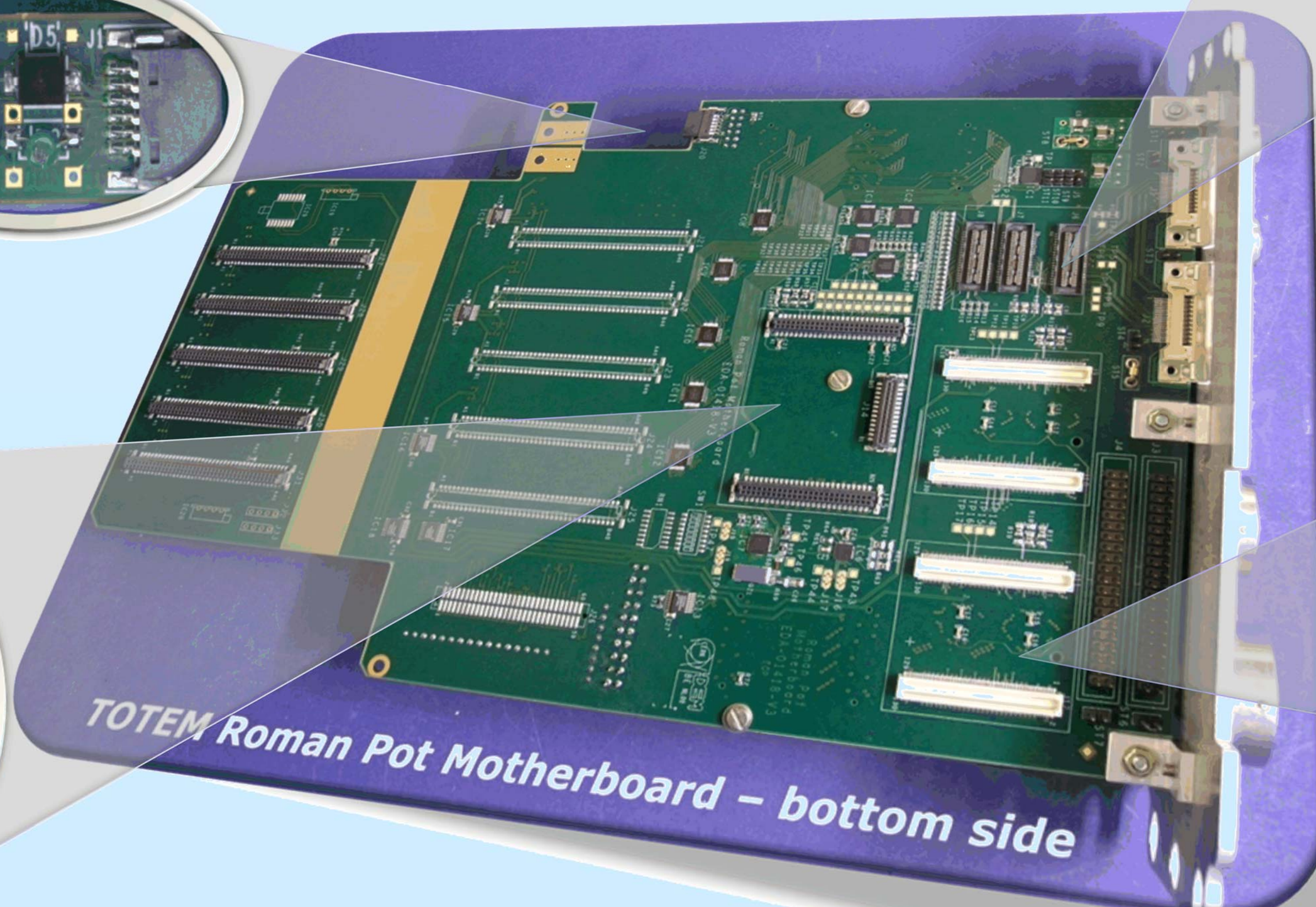
CCUM
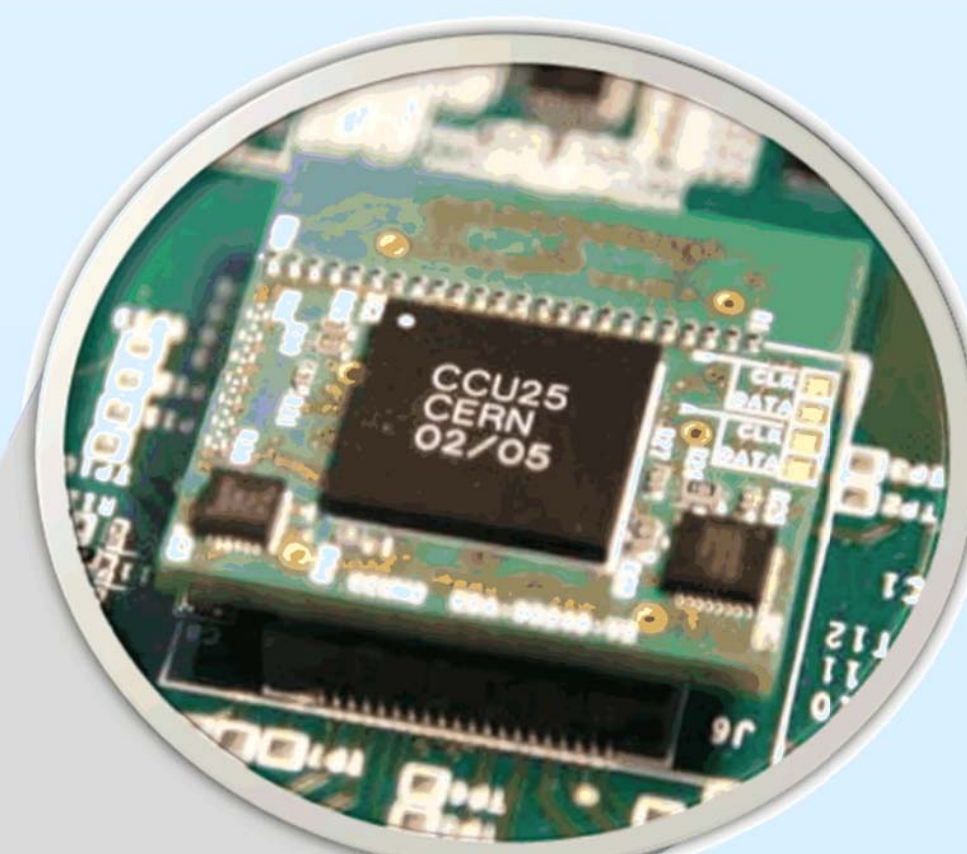
Slow Control Block includes digital/analog LV and HV power distribution, temperature, pressure and radiation monitoring.

RADMON

Coincidence Chip Mezzanine

Trigger VFAT Mezzanine

Contact information - Gueorgui Antchev CERN PH-TOT / INRNE-BAS
☎ +41 22 764871906 Gueorgui.Antchev@cern.ch

References:
[1] "The TOTEM Experiment at the CERN Large Hadron Collider" - IOPP
[2] "VFAT2: A front-end system…" - TWEPP2007
[3] "The TOTEM electronics system" - TWEPP2007