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Electronics

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PETsys TOF ASIC evaluation kit

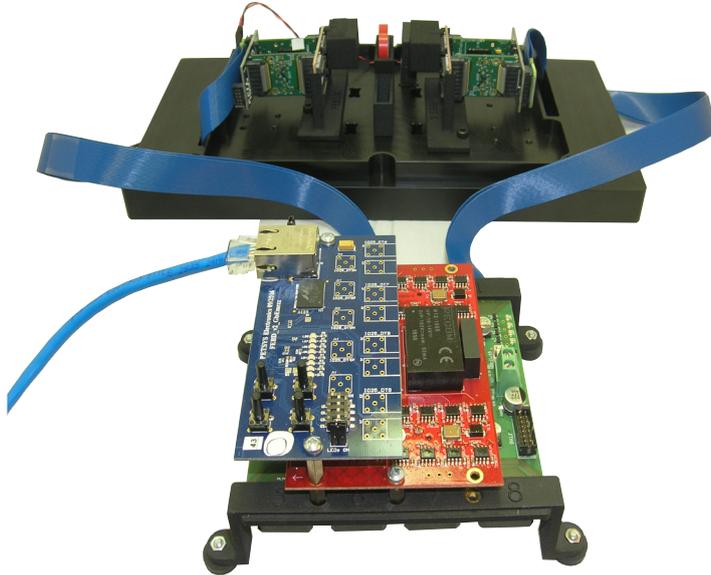


Figure 1: TOF ASIC evaluation kit.

The PETsys TOF ASIC evaluation kit consists of a FEB/D board (bottom) with Ethernet link to the computer, and a mechanical assembly (top) with two FEM64 front end modules, two KETEK SiPM pixels, two LYSO crystals and a holder for placing a ^{22}Na source in between.

The PETsys TOF ASIC evaluation kit (Fig. 1) is a complete readout kit allowing to read 128 SiPM channels. It can be used in applications where only a small number of channels needs to be read, and it provides an easy to use, and low cost, way for exploring the unique, powerful and versatile features of the PETsys TOFPET2 ASIC (Fig. 2) [1].

The e-kit comes with a FEB/D board with Ethernet link, and two FEM64 front end modules (Fig. 3). Each FEM64 has one ASIC reading 64 channels. The FEM64 have connectors that directly accept the Hamamatsu S13361-350Ax-08 8x8 MPPC array, or the KETEK PA3325-WB-0808 array. With some small adapter boards, the test boards will equally well read analog SiPMs from other vendors.

Flexible cables connect the FEM64 boards to the FEB/D board, providing great flexibility in the experiment setting.

We provide all the firmware and software needed for acquiring and analysing the signals of the two ASICs, thus enabling the simultaneous operation of up to 128 pixels. The source code of the DAQ software in the DAQ PC is provided, giving the user all freedom for exploring the performance of the system, or for adapting it to his particular needs.

For an easy start we supply the e-kit with two KETEK SiPM pixels mounted on a board that plugs in the connector on the TOFPET2 ASIC test board, two LYSO crystals of $3 \times 3 \times 5 \text{ mm}^2$, and a holder for placing a standard circular ^{22}Na source in between. We also provide a cooling box with two Peltier elements allowing reproducible measurements. The box also protects the measurement setup from ambient light.

Included in the price of the e-kit we provide a hands-on and individual training for one or two people. The training introduces the user to the use of the e-kit, the readout electronics and the software.



Figure 2: PETsys TOFPET2 ASIC.
The 64-channel ASIC is shown here in a BGA package.

[1] Experimental characterization of the TOFPET 2 ASIC, R. Bugalho et al. JINST_079P_0918

The evaluation kit contains the following items:

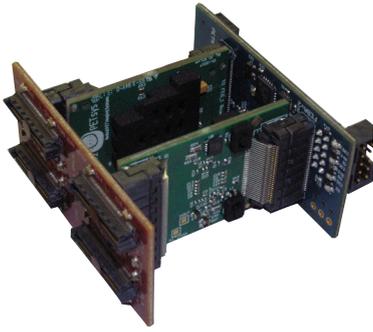


Figure 3: FEM128 & FEM64 modules.

The FEM128 module has two ASICs, and has connectors accepting a Hamamatsu S13361-3050Ax-08 MPPC 8x8 array, or a KETEK PA3325-WB-0808 array. With the e-kit we standard ship two FEM64. The FEM64 is identical to the FEM128, but has only one ASIC.

1. Two FEM64 modules (Fig. 3), and two cables for connecting the modules to the FEB/D board.
2. One FEB/D board reading the data and sending the data to the DAQ computer using a 1 Gbit Ethernet link. The FEB/D also provides regulated voltages, clock and reset signals to the ASICs, and bias voltages to the SiPMs.
3. Two SiPM pixels (KETEK 3x3mm) mounted on boards that plug into the FEM64 modules, two LYSO crystals and a radioactive source (^{22}Na) holder.
4. A cooling box with two Peltier elements providing protection against ambient light and allowing stable and reproducible temperature conditions (Fig. 4).
5. Firmware for the FEB/D board, allowing configuration of the ASICs, and readout of the data using Gigabit Ethernet. The FEB/D board is supplied with the firmware installed.
6. Application software for receiving the data in a PC.
7. One day training on the use of our readout electronics for one or two people.
8. Documentation.



Figure 4: Cooling box.

A box with two Peltier cooling elements provides protection against ambient light and allows stable and reproducible temperature conditions.

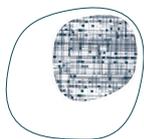
Not part of the standard evaluation kit package but needed:

1. Power supply: 12 Vdc, 4 A
2. PC computer running Linux RHEL/CentOS 6.x or 7.x, 64-bit.
3. A ^{22}Na source if the user wants to measure the coincidence time resolution with 511 keV gamma rays.

Possible options:

1. We can supply LYSO crystal arrays, BGO crystal arrays and SiPM arrays.
2. We can supply the DAQ computer with all application software installed.
3. We can provide the e-kit with two FEM128 instead of two FEM64. This allows reading 256 channels.
4. We can provide additional FEM128 modules. The e-kit can read up to 8 FEM128.

Reading more than 1'024 channels, requires a DAQ board and a clock&trigger module. See the flyer about the PETsys SiPM readout system for more information on possible options for reading a system with more than 1'024 channels.



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