ZAP board development for TexAT

E. Uberseder, E. Koshchiy, G.V. Rogachev, and E. Pollacco[1]
[1]*IRFU, CEA Saclay,Gif-Sur-Ivette, France*

The Texas Active Target (TexAT) detector for nuclear reaction studies with rare isotope beams at low energies is currently under development at the Cyclotron Institute [1]. It combines a highly segmented Time Projection Chamber (TPC) surrounded by two layer of solid state detectors – Si semiconductor and CsI(Tl) scintillation detectors, a total of about 1300 channels. Readout electronics for all these detectors is based on GET ASICs chips of 64 channels each, loaded into single AsAd card. To attach detectors to the AsAd cards, a special "ZAP"/Adapter boards have been designed. ZAP- board allows to read-out signals from detectors, to bias them (individual or group), and to protect AsAd cards from the electrical breakdown.

The board-to-board concept was used to reduce noise and to avoid eventual connection problems with high density cables between electronic components. The same basic schematic diagram [2] is utilized for all detectors of TexAT, but specific components are different for different detectors. The electronic schematic of ZAP- board for Si- detectors is shown in Fig.1. Every Si detector (16 per AGET chip) is biased from MPOD Power supply unit separately (group of 4 quadrance) through the serial circuit of 1M - 10M resistors. Signals from detectors go through SAMTEC connector to the internal AGET preamplfier. The protection circuitry, based on diode bridge is also implemented on ZAP board.

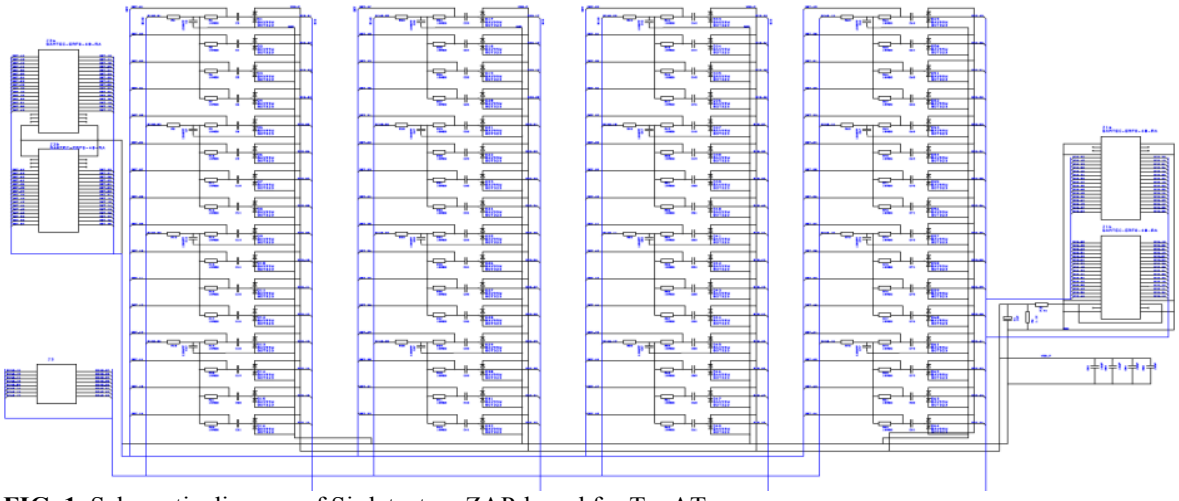

FIG. 1. Schematic diagram of Si-detectors ZAP-board for TexAT.

The PCB design was made using electronics rapid prototyping software Design Spark PCB 7.1 [3]. The board has 4 layers and all elements are surface mounted. Two factors were taken into account in the design: a) it was decided to place all electronic components outside of TexAT scattering chamber to simplify the replacement in case of electronic failures; b) Instead of making one common ZAP- board for AsAd-card (256 channels/64 detectors), we use separate ZAP- board for each of four AGET- chips (64 channels/16 detectors). The form-factor of AsAd card limits the maximal width of ZAP board to the 1.8in, which is practically the width of SAMTEC ERF-8-40 connectors. It appears to be difficult to place

all electronic components at the board so an additional "Offset" board (9.2in x 1.6in) was designed to match ZAP board to AsAd. It expands spacing for single ZAP- board to the acceptable level. The final dimensions of Si ZAP- board is 2.2in x 4.0in.

An additional Si- "Transition" (2.2 in x 8.0 in) board was also designed to provide all signals inside the scattering chamber. The board does not have any electronic components, only the connectors. "Transition"- board is epoxi-sealed to the custom vacuum flange, making a signal feed-through to the TexAT scattering chamber. The general view of Si- boards assembly is shown at Fig.2. Each board serves one AGET2 chip (64 channels).

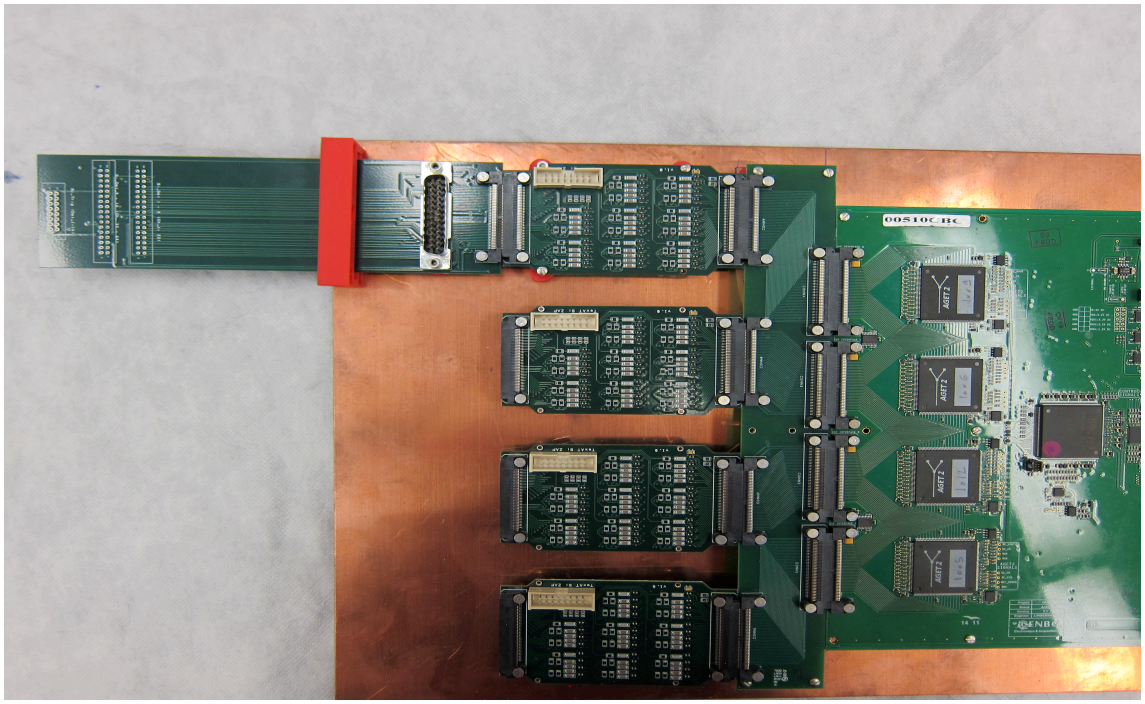

FIG. 2. Image of the Board-to-Board Front End connections of Si-detectors for TexAT. From right to left: AsAd card; "Offset"- board; "ZAP"- board; "Transition"- board**.**

All PC boards were fabricated and assembled by Advanced Circuit Co. They were tested and now they are ready for use now. The final design of Micromegas ZAP-board will be made after getting of Micromegas PCB board (expected at the end of June, 2016). The design of ZAP- board for scintillator detectors is now under development.

[1] E. Koshchiy *et al.*, *Progress in Research*, Cyclotron Institute, Texas A&M University (2014-2015), p. IV-42; E. Uberseder et al., *Progress in Research*, Cyclotron Institute, Texas A&M University (2014-2015), p. IV-47; E. Uberseder et al., *Progress in Research*, Cyclotron Institute, Texas A&M University (2014-2015), p. IV-51.

[2] E.Pollacco *et al*. Phys. Procedia **37**, 1799 (2012).

[3] http://www.designspark.com/pcb