

R&D of the Test Device of CMS-GEM Electronics Board

Zihan Liang, Zhihua Xue

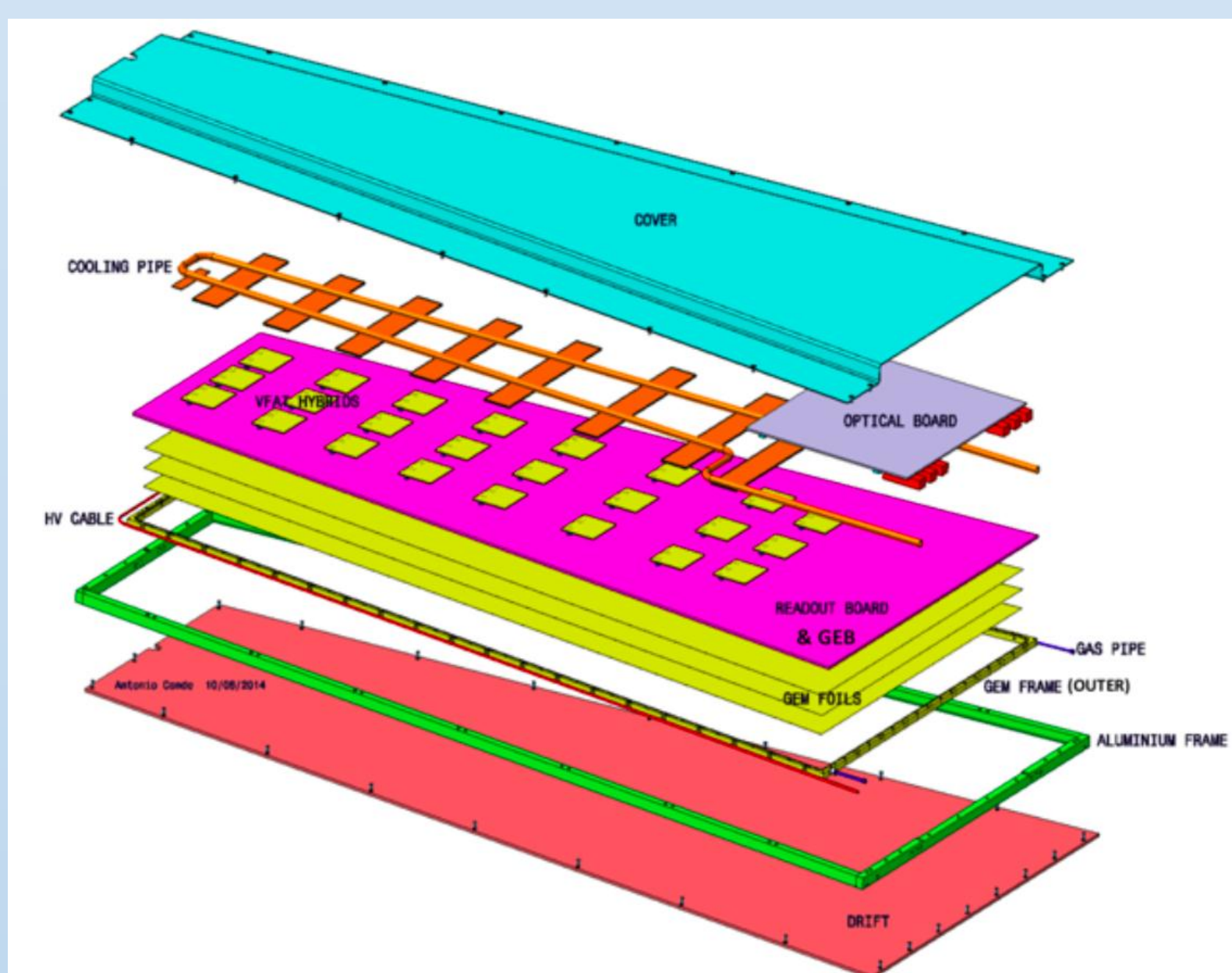
State Key Laboratory of Nuclear Physics and Technology, School of Physics, Peking University, Beijing 100871, China



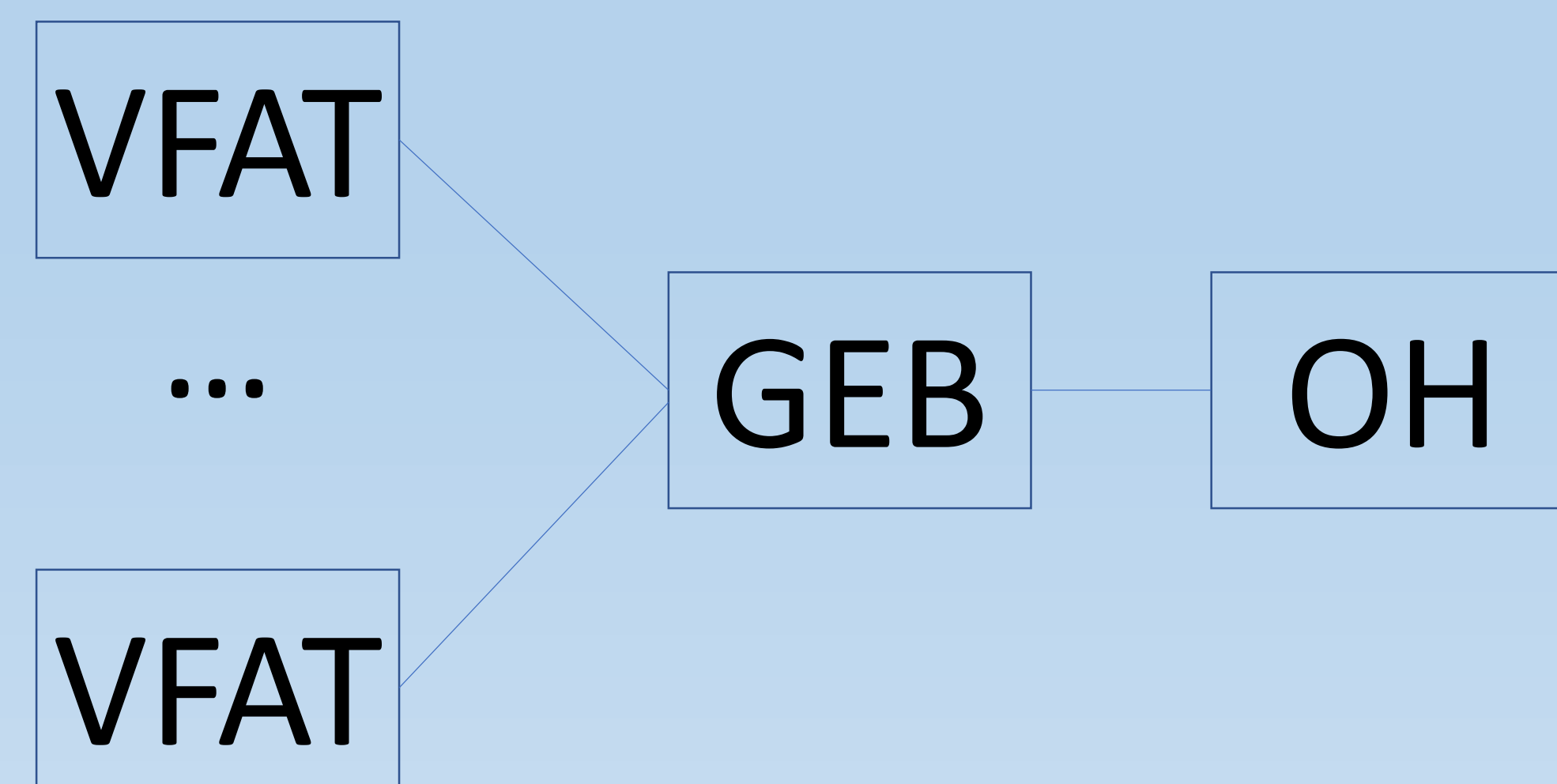
Introduction

- CMS-GEM Electronics Board(GEB) is a component of CMS-GEM detector. PKU HEP group designed and produced GE2/1 GEB for CMS
- Designed a new test device by Xilinx FPGA to automatically test the connectivity.
- The new test device has the function of Bit Error Test in 200MHz differential signal.

GEM Electronics Board

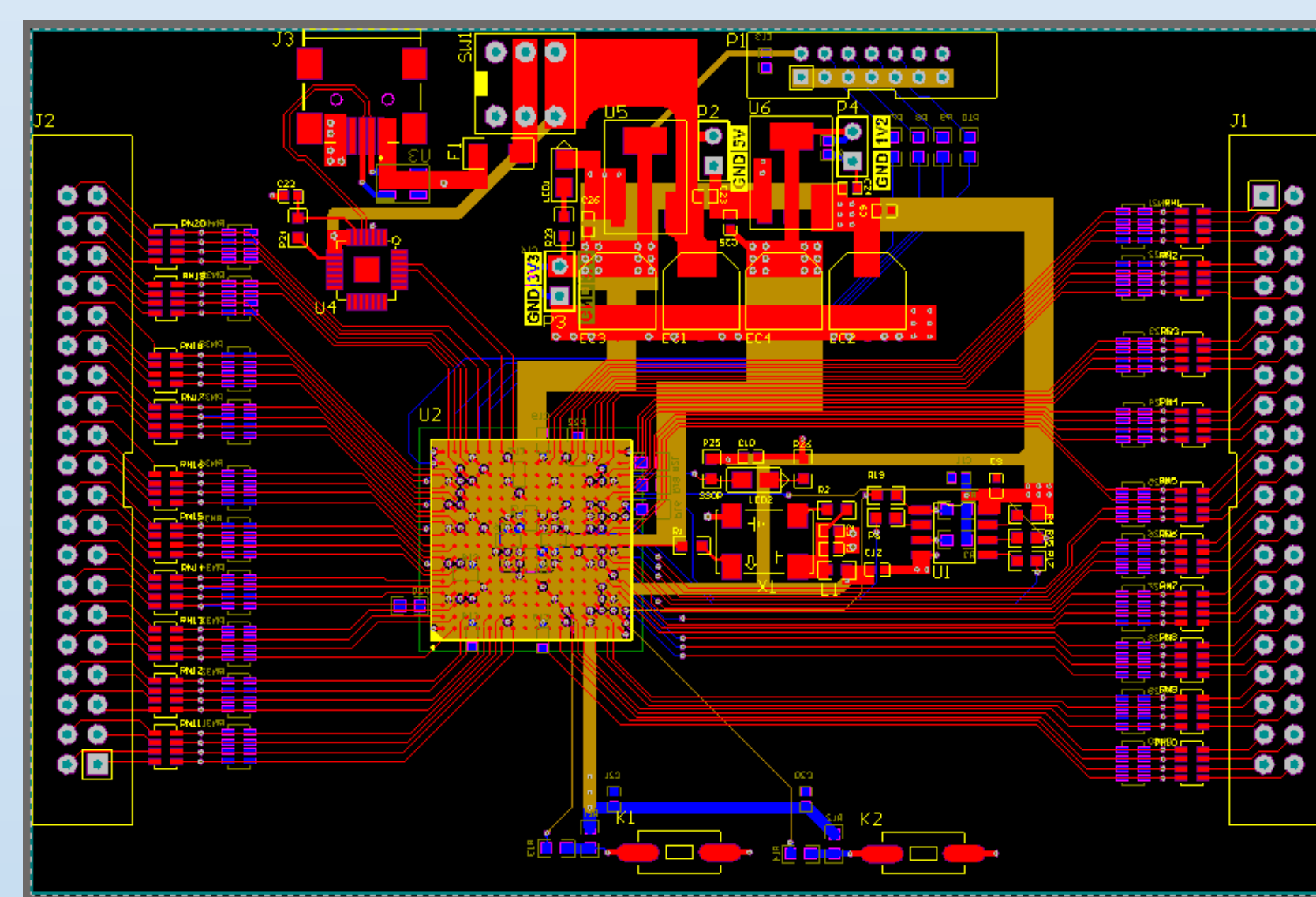


VFAT3 chips work as amplifiers to collect electric signal from readout board. Electronics Board transfers data between VFAT3 chips and OptHybrid board, and provides power supply. One OptHybrid board collects data from many VFAT3 chips and sends to CMS-DAQ.

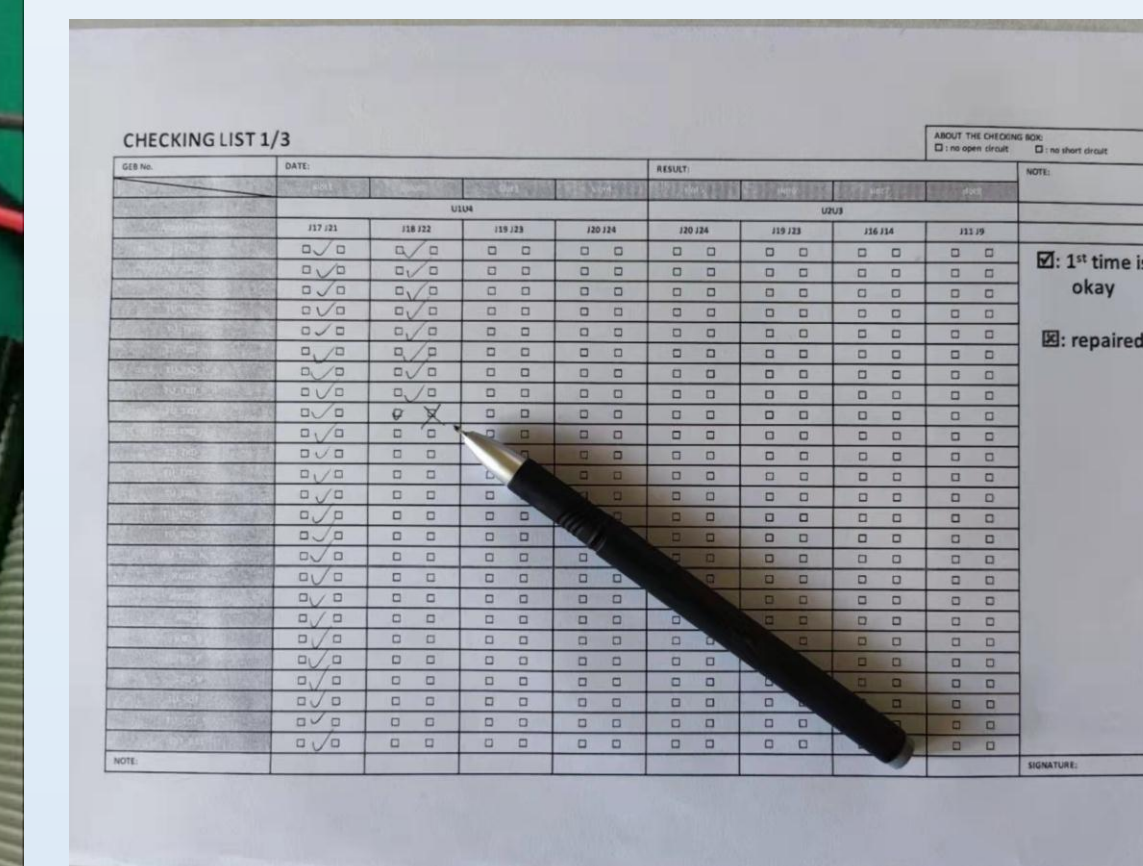


Test Device

Each Electronics Board has more than 270 high speed differential signal circuits. We have to test all circuits on every boards.
A new test device based on Spartan-6 FPGA is designed. PCB design, FPGA program and PC program are all independently developed.

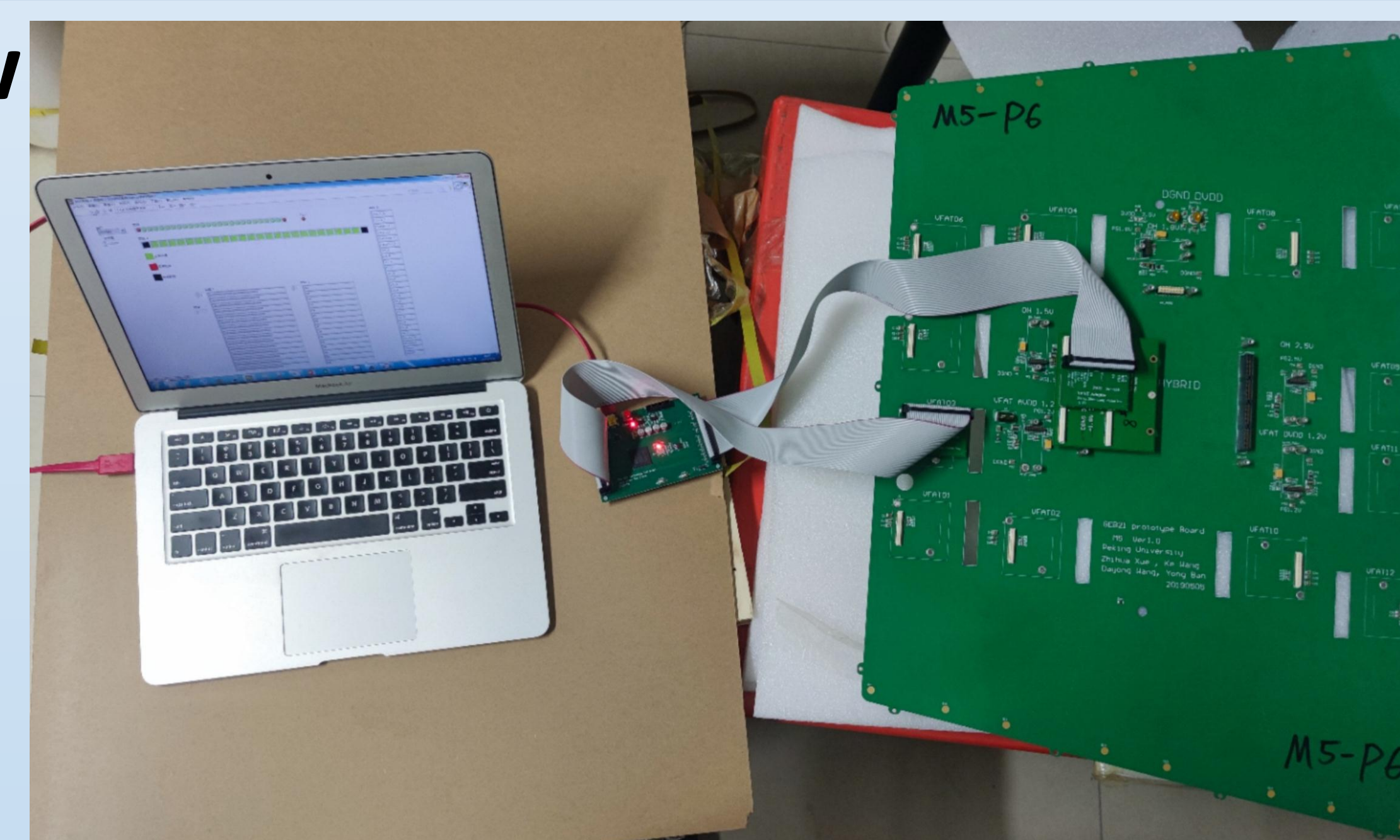


Old



Look at LED bulbs by eye, to check the circuit.
Record the result on paper.

New

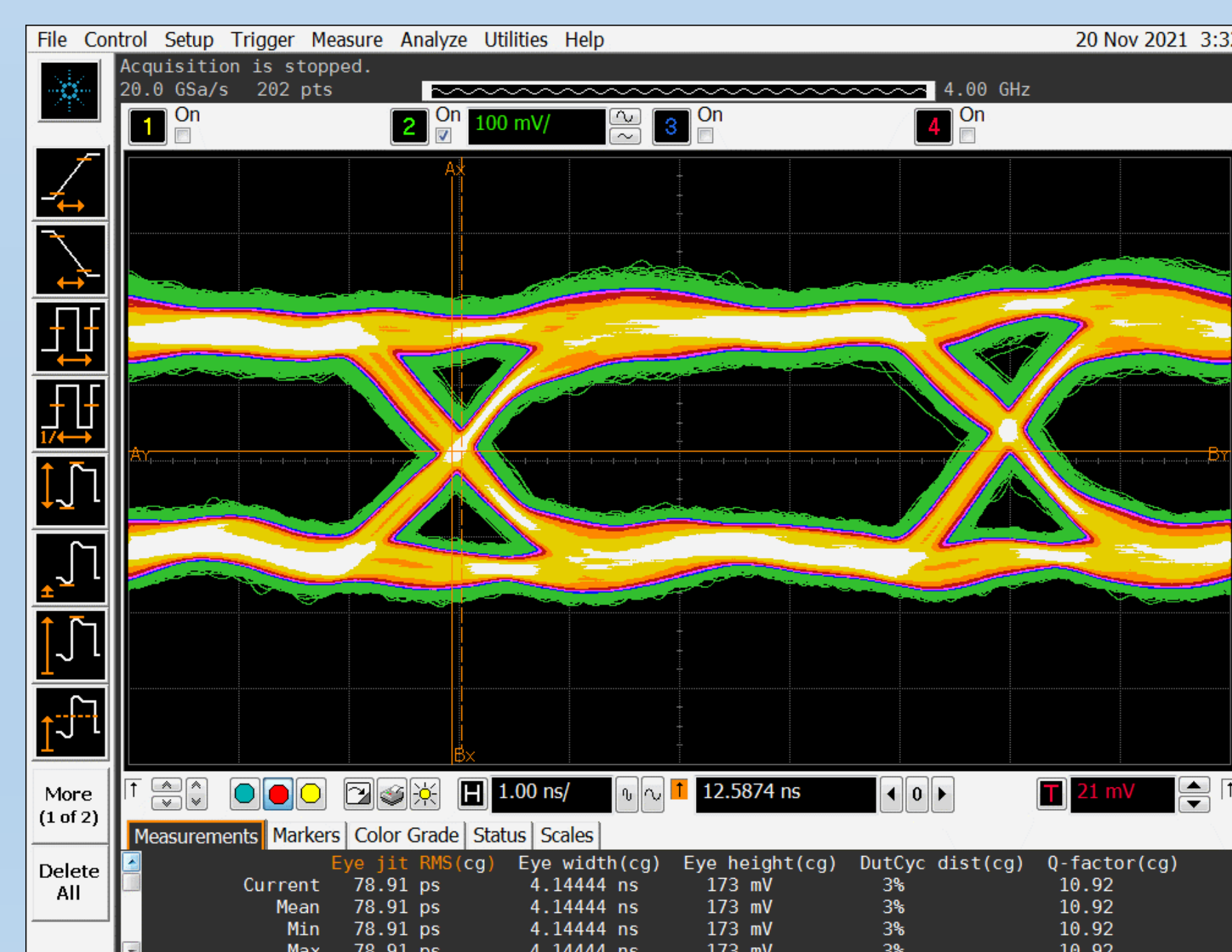


Auto-Check the circuit by FPGA, and send the result to PC.
Use LabView to display and record the result on digital format.

Bit Error Rate Test & Eye Graph

The new test device have an additional function of Bit Error Rate test in 200MHz differential signal by PRBS. Use the same PCB design and change some matching resistance.

This device can take Bit Error Rate test in 200MHz differential signal. Also send result to PC.



Eye graph of GEB prototype tested by this device and oscilloscope

Result

The new Test Device can improve the speed and accuracy of circuit connectivity test, and record the test result in digital format. Take Bit Error Rate test on GEB prototype and get the result of BER<10⁻¹², and take the eye graph with oscilloscope. The mass production of GE2/1 Electronics Board is ongoing. The new test device will be used in the GEB test.

More Information

Email: liangzh@pku.edu.cn