



Jadepix3 Test System

Sheng Dong

s.dong@mails.ccnu.edu.cn

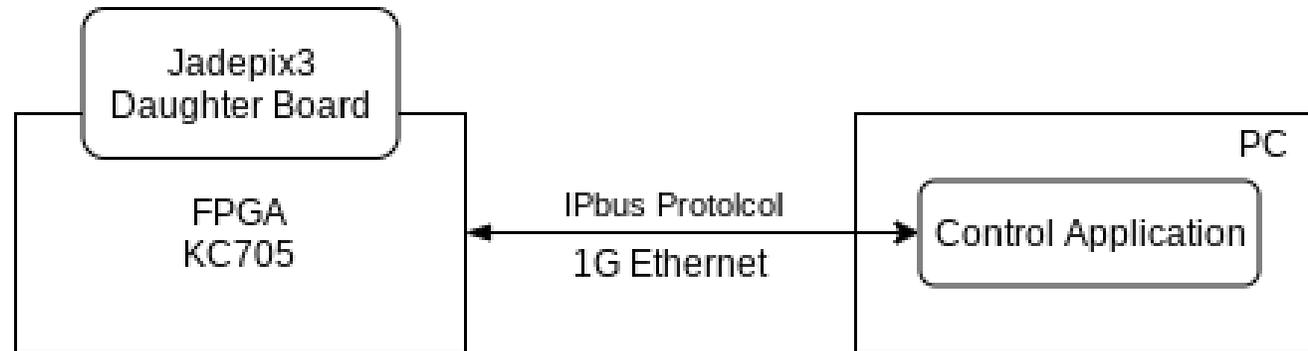
Central China Normal University

Friday, January 29, 2021

Contents

- Introduce the test setup.
- How to use it.
- How to contribute code or a new idea.

The test setup



- IPbus: 1G ethernet control framework
- Control application:
 1. Send one command or a lot of commands to FPGA via IPbus.
 2. Ask data in FPGA, then save it and analysis it.
- FPGA:
 1. Retrieve command from PC and generate sequence in time on IO for chip.
 2. Retrieve data from chip and send to PC.

The test setup - IPbus

- A Flexible Ethernet-based Control System for xTCA Hardware.
- A simple IP-based control protocol:
 - Read & write (single register, block RAM, FIFOs).
 - Atomic read-modify-write.
 - A32/D32.
- Reference:
 - <https://ipbus.web.cern.ch/>
 - https://indico.cern.ch/event/299180/contributions/1659676/attachments/563129/775787/IPbus_TWEPP_20140924_v1.pdf

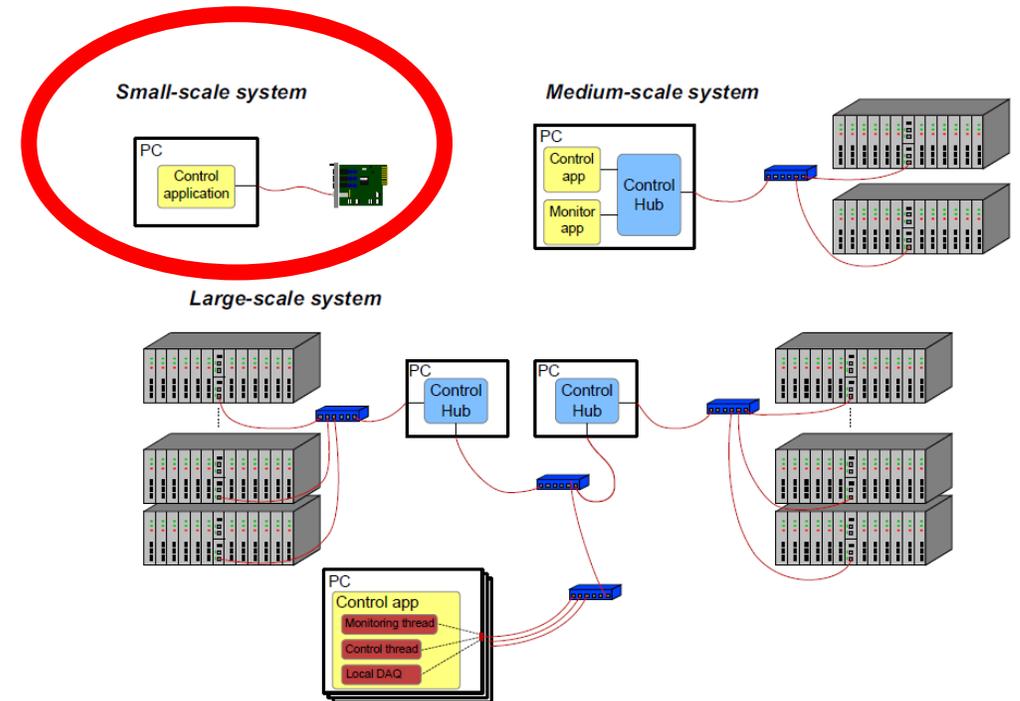
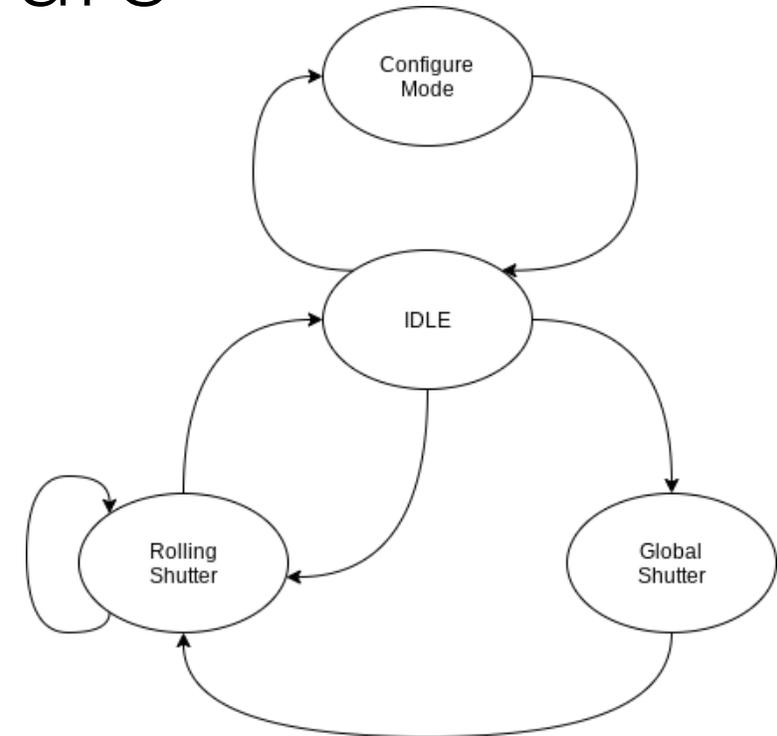
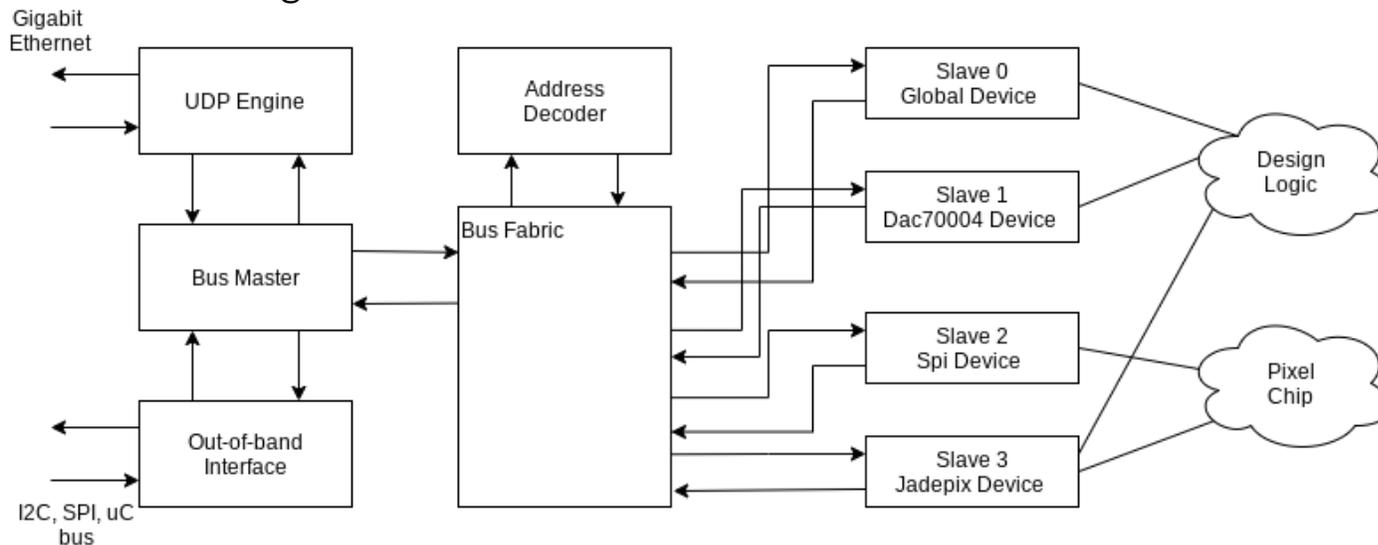


Figure 1. Example topologies of IPbus control systems involving μ TCA hardware, from small to large scale.

The test setup - Firmware

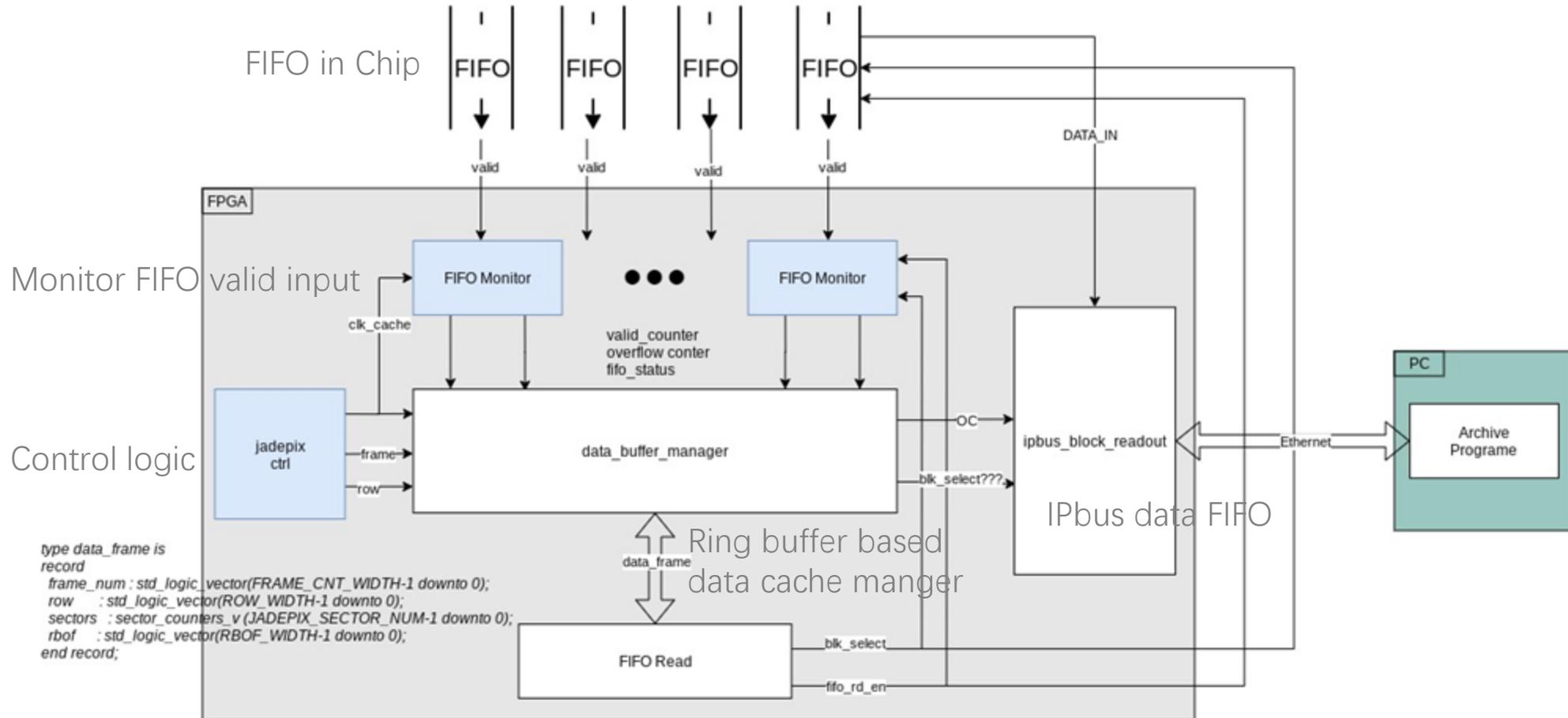
- DAC70004
 - The reference for the voltage of test pulse, two reset signals.
- SPI
 - 200bit control register in chip.
 - DAC in chip.
 - Band gap reference source, RSDS, PLL.
- Jadepix3
 - The configuration for each pixel (PULSE, MASK).
 - Global Shutter.
 - Rolling Shutter.



Jadepix3 Control FSM

Jadepix3 Firmware Structure

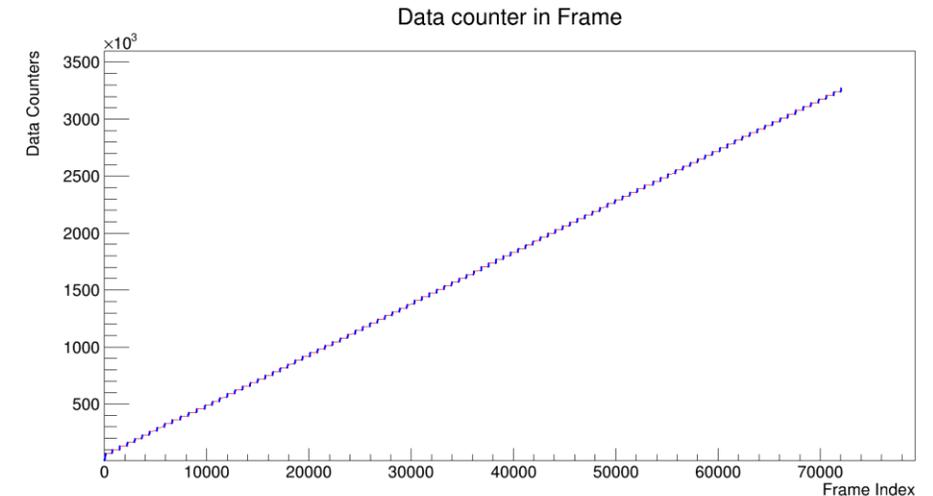
The test setup - Data acquisition



Verison v1.0.0 Released based on the version tested @IHEP.

The test setup - Software

- The jadepix-software is developed based on uHAL API.
 - Object-oriented design. One module, one class. (Jadepix chip, dac70004, s-curve, spi, etc)
 - Configure and control logic.
 - Data save to .txt and .root.
 - Data analysis by ROOT.
 - Run one script, run.py.
 - Documenting in code, based on reStructuredText. (<https://jadepix3-software.readthedocs.io/en/latest/README.html>)
- Verison v1.0.0 Released based on the version tested @IHEP.



The data number plot in rolling shutter.

`cmd(wr, cmd, chn, din, mode)` [\[source\]](#)

DAC commands, 32 bits.

D31-D29: Don't cares.

- Parameters:
- **wr** - D28: R/W. 0 = Write, 1 = Read.
 - **cmd** - D27-D24: Command Bits
 - **chn** - D23-D20: Channel Address Bits
 - **din** - D19-D04: 16/14/12-Bit DAC Data left aligned/Power Down Bits/Device Ready bit
 - **mode** - D03-D00: Mode Bits

Returns:

How to use the code

- The firmware and software are managed by Git, and open-source on github.com.
 - https://github.com/habrade/JadePix3_Software
 - https://github.com/habrade/JadePix3_Firmware
- Read the code.
- Read the readme file in each repository.
- Read the document:
 - <https://jadepix3-software.readthedocs.io/>
- Contact me.

How to contribute

- **USE GIT!!!**

- If you did some modification:
 - please create a pull requests :
 - I will merge or drop the code.
- elif you have a question or an idea or an demand:
 - please create a issue.
- elif you are the boss:
 - please contact with me directly.
 - :)
- else:
 - pass



Issue Page @github

habrade commented 21 hours ago • edited

Owner Author

- ✓ Page 2中提到的增加曝光时间结束判断，以及增加预设超时退出的步骤
 - i. lib.jadepix_dev.start_gs()里面增加了曝光时间结束的判断;
 - ii. IPbus FIFO block read, 添加了空读次数限制, 超过次数则退出。默认值为100。

```
def read_ipb_data_fifo(self, reg_name_base, fifo_name, num, safe_mode, try_time=100):
```

- ✓ run.py里面实现上述循环和判断步骤 (测试人员应该逐步学会修改run.py来实现自己的想法)
 - i. 新增了SCurve类, 实现Pulse_Low 递增测试要求;
 - ii. 请在run.py的main_config中设置是否启动s-curve, 以及main()中设置相关参数;
 - iii. 进行s-curve测试时, 数据文件会保存在**data/scurve/data_pulse_low_test/**目录下, 文件名格式为: [pulse_hi]/[pulse_lo]/[lo_step]_[time].txt, eg: 1700_1400_0005_1.txt。

Conclusion

- The test system is working generally so far, at least at configuration mode and global shutter mode.
- Some bug need to be fixed.
 - The timing of *blk_select* signal and *fifo_rd_en* signal
 - The timing at row 512.
- Test rolling shutter and update the FW and the SW.
- Something I want/will/may to do
 - Bug fix in firmware.
 - Make configuration faster.
 - Update software: New demand and new bug...
 - A GUI based on EPICS (Experimental Physics and Industrial Control System), monitor, control, alarm, archive. It will make life easier.

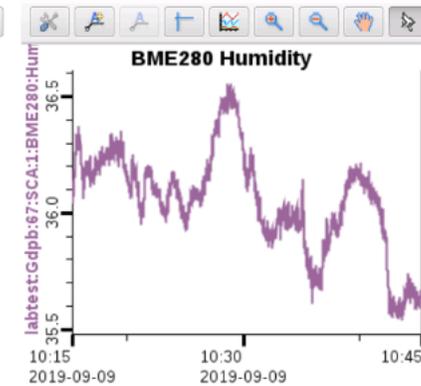
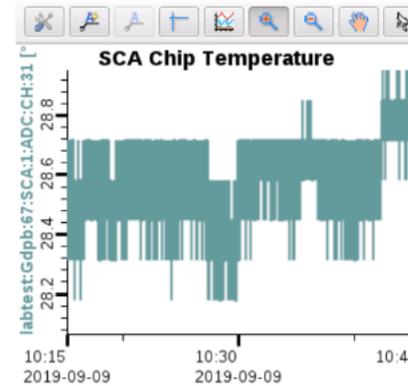
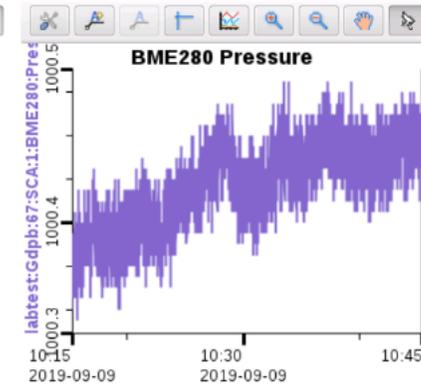
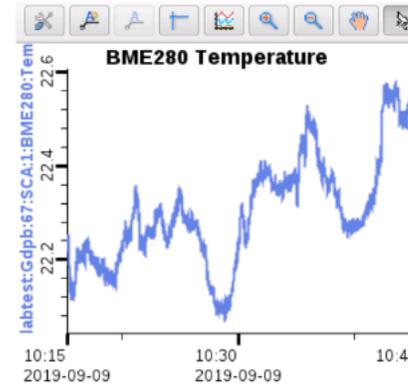
GBT-SCA Lab Test

AFCK 67 LINK 1

BME280				SCA ID	
Temperature	22.5 °C	Pressure	1000.5 hPa	Humidity	35.7 %

ADC							
RSSI	15.63 mV	V1_5	1.46 V	FLOAT	340.90 mV	FLOAT	360.93 mV
VIN_3_3_PADI	3.59 V	V_ext	11.72 V	FLOAT	286.94 mV	FLOAT	355.31 mV
VIN_3_3	3.56 V	FLOAT	381.93 mV	FLOAT	303.05 mV	FLOAT	358.24 mV
V3_3	3.26 V	FLOAT	282.54 mV	FLOAT	267.89 mV	FLOAT	401.22 mV
VIN_2_5	2.83 V	FLOAT	286.69 mV	FLOAT	309.16 mV	FLOAT	402.44 mV
V2_5	2.47 V	FLOAT	300.86 mV	FLOAT	361.17 mV	FLOAT	399.51 mV
VIN_2	2.34 V	FLOAT	297.44 mV	FLOAT	402.20 mV	FLOAT	343.35 mV
VIN_1_5	1.77 V	FLOAT	378.75 mV	FLOAT	439.56 mV	Sensor	28.85 °C

GPIO											
PIN	Direction	Set	Get	PIN	Direction	Set	Get	PIN	Direction	Set	Get
0	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	8	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	16	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	9	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	17	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	18	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	11	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	19	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	12	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	20	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	13	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	21	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	14	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	22	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	15	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	23	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



The EPICS GUI in mCBM experiment.

Thank you!