

ITk pixel system test

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Thanks to contributions from:

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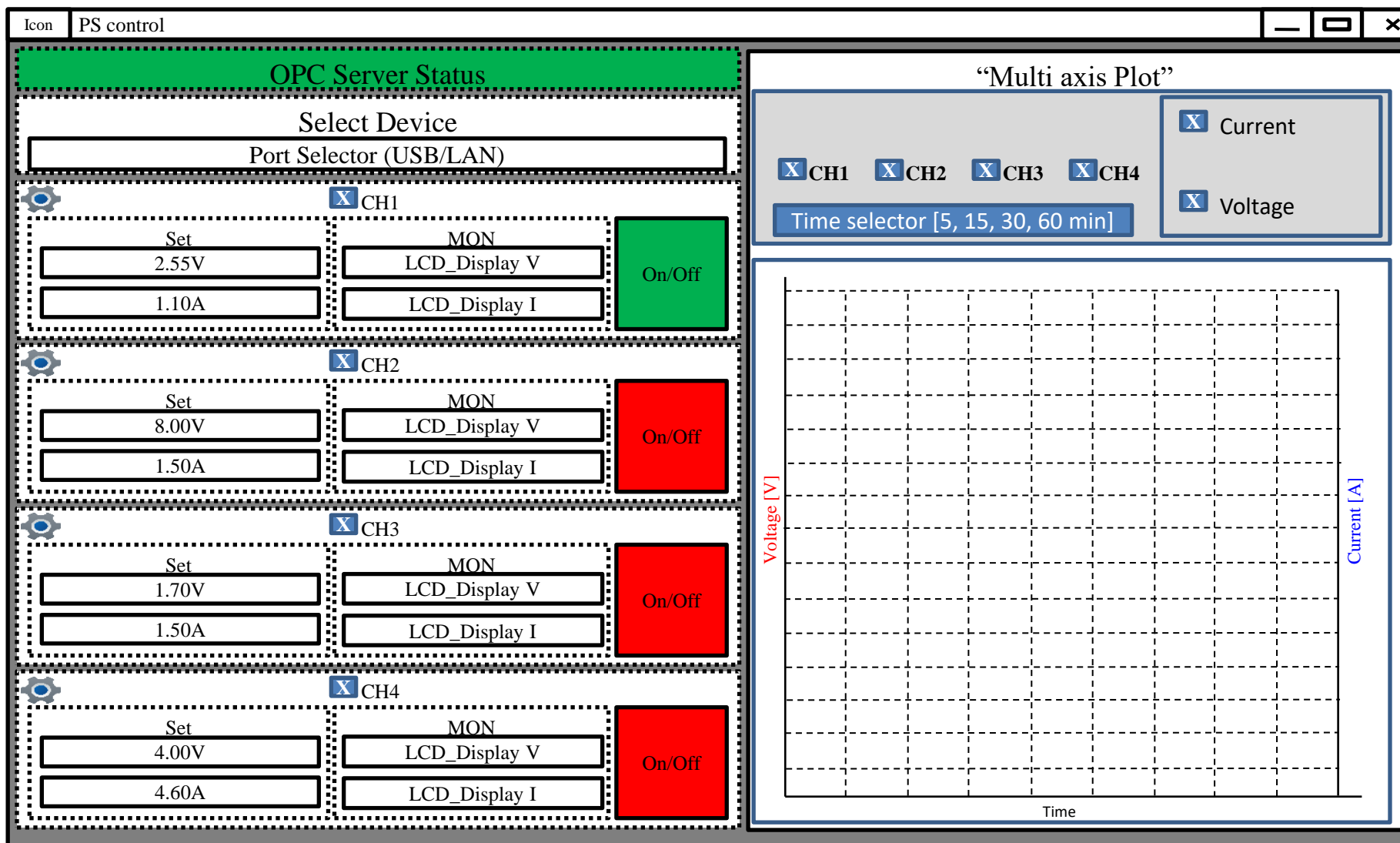


➤ Target:

System test scale up for EC integration.

- General DCS plans
- MOPS chips readout system
- Proposal of using MOPS board for HRs thermal test

DCS Power supply general use Panel

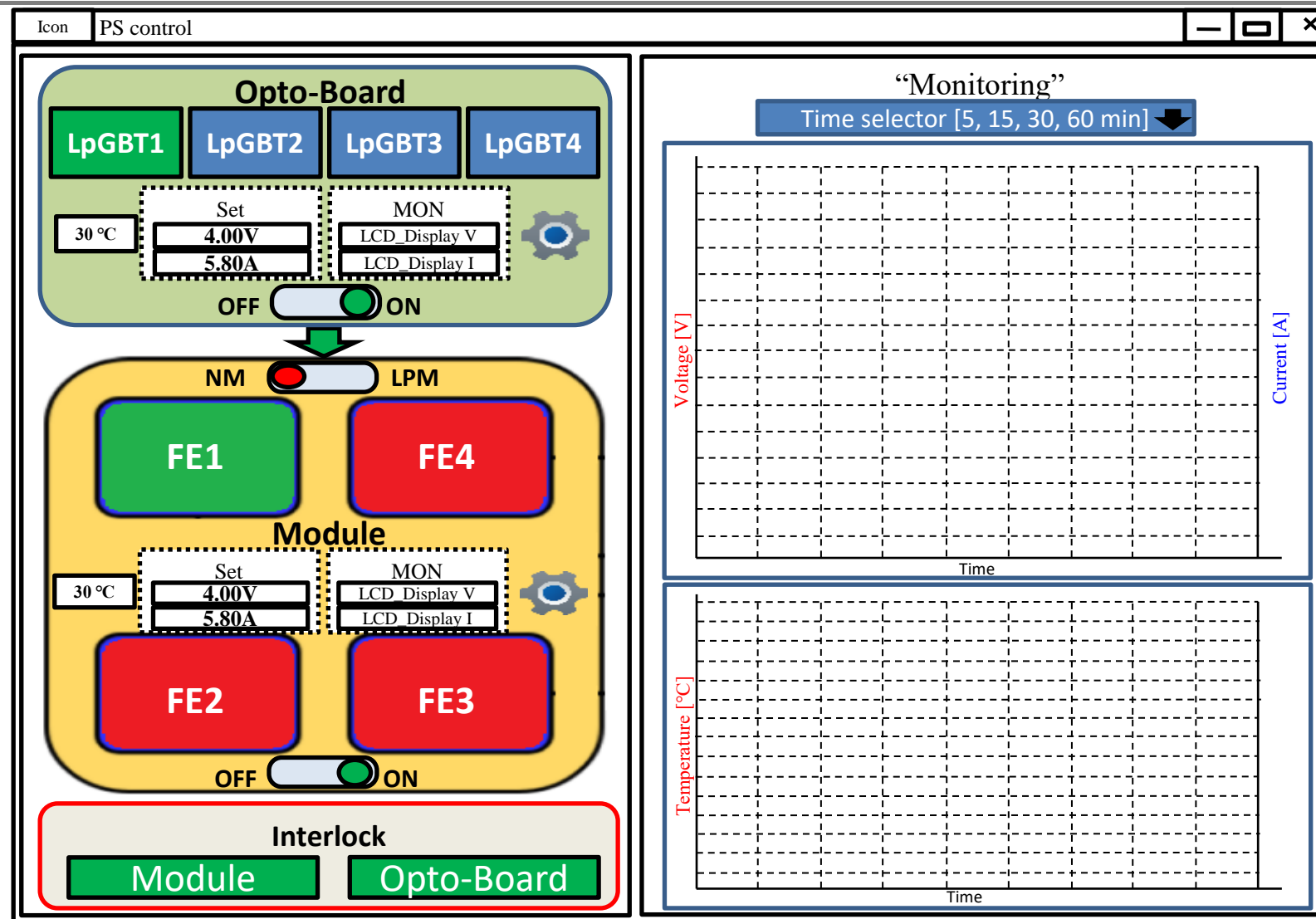


The screenshot shows a software interface titled "PS control" with a standard window title bar. The interface is divided into two main sections. On the left, there is a control panel for four channels (CH1 to CH4). At the top of this panel is a green header "OPC Server Status". Below it is a "Select Device" section with a "Port Selector (USB/LAN)" dropdown. Each channel (CH1-4) has a gear icon for settings, a "Set" section with voltage and current input fields, a "MON" section with "LCD_Display V" and "LCD_Display I" fields, and an "On/Off" button. CH1's On/Off button is green, while CH2, CH3, and CH4's are red. On the right, there is a "Multi axis Plot" window. It features a legend with checkboxes for "Current" and "Voltage", and a "Time selector [5, 15, 30, 60 min]" dropdown. Below the legend is a large grid for plotting, with "Voltage [V]" on the left y-axis and "Current [A]" on the right y-axis, and "Time" on the x-axis.

- PSU general use DCS panel important to use in different experimental purpose.

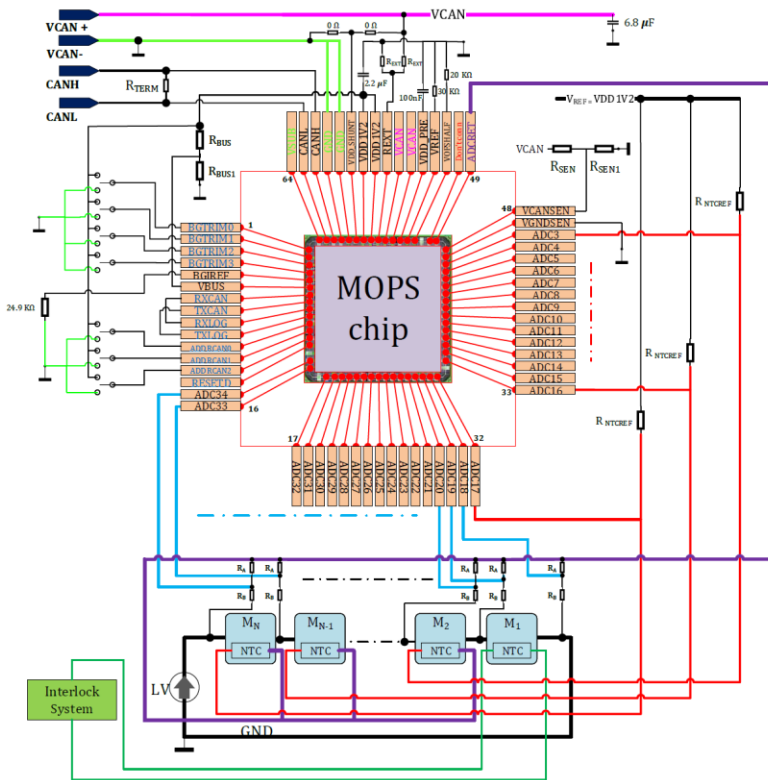
- Panel controls 4 channel metrics
- Panel monitors 4 channel metrics
- Flexible plotting with multi axis plot possibility.
- Each channel has settings windows to set PS channels settings.
- The device works with OPC sever which is controlled by DCS
- The panel shows OPC server active status
- The panel has PS device selection mode

DCS Panel of pixel module setup



- Pixel module setup DCS panel with PSU (HMP4040) and Opto-Board and Interlock visualization.
- Opto-board LpGBTs configuration statuses.
- Opto-Board power metrics.
- Module Chip electrical links alignment statuses.
- Module power metrics measuring.
- Real time monitoring of Opto-Board and Module metrics.
- Module Temperature monitoring by Interlock system.
- Interlock system status visualization.

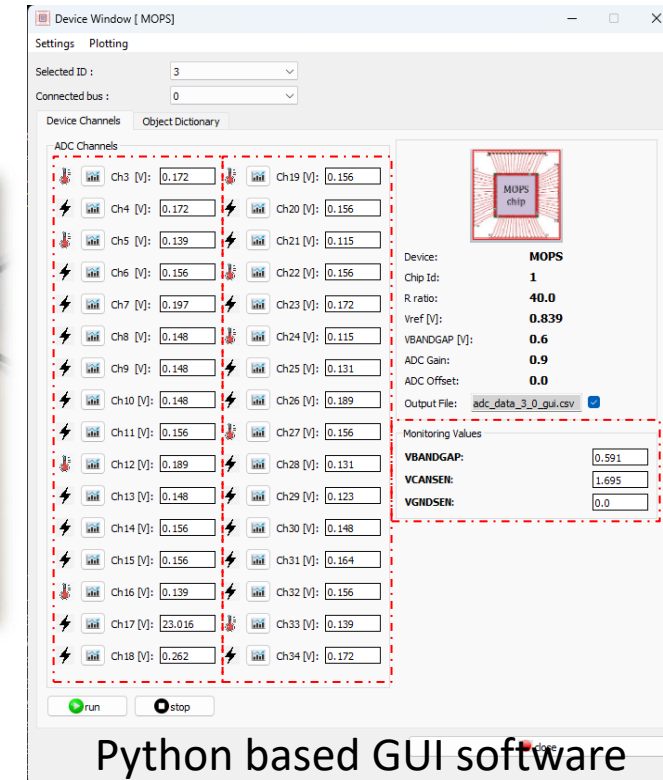
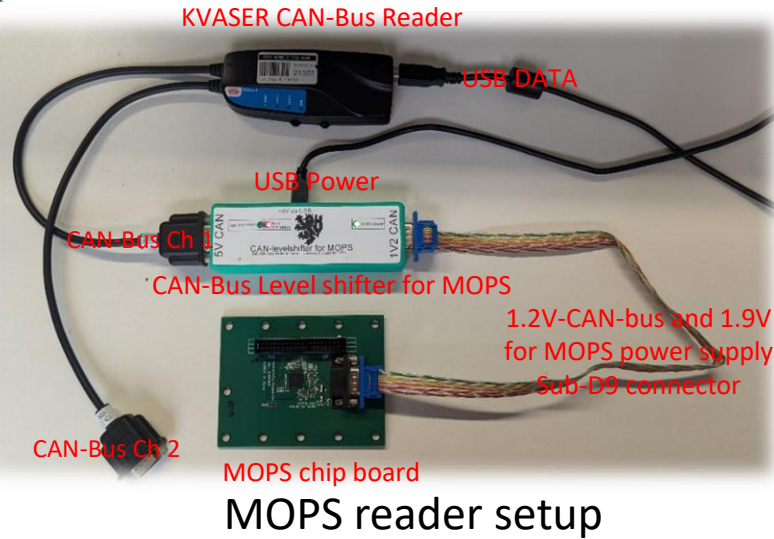
MOPS reader with Can-Bus



N = Number of modules
 Capacitors = 3
 Module voltage resistors = $2N + 2$
 NTC Reference resistors = $N - 1$
 Bandgap resistor = 1
 CAN Resistor = 1
 Pull down Resistor/S] = 2
 SPDT switches /S]s = 7
 VCAN sense resistors = 2
 VBUS resistors = 2
 SHULDO resistors = 4

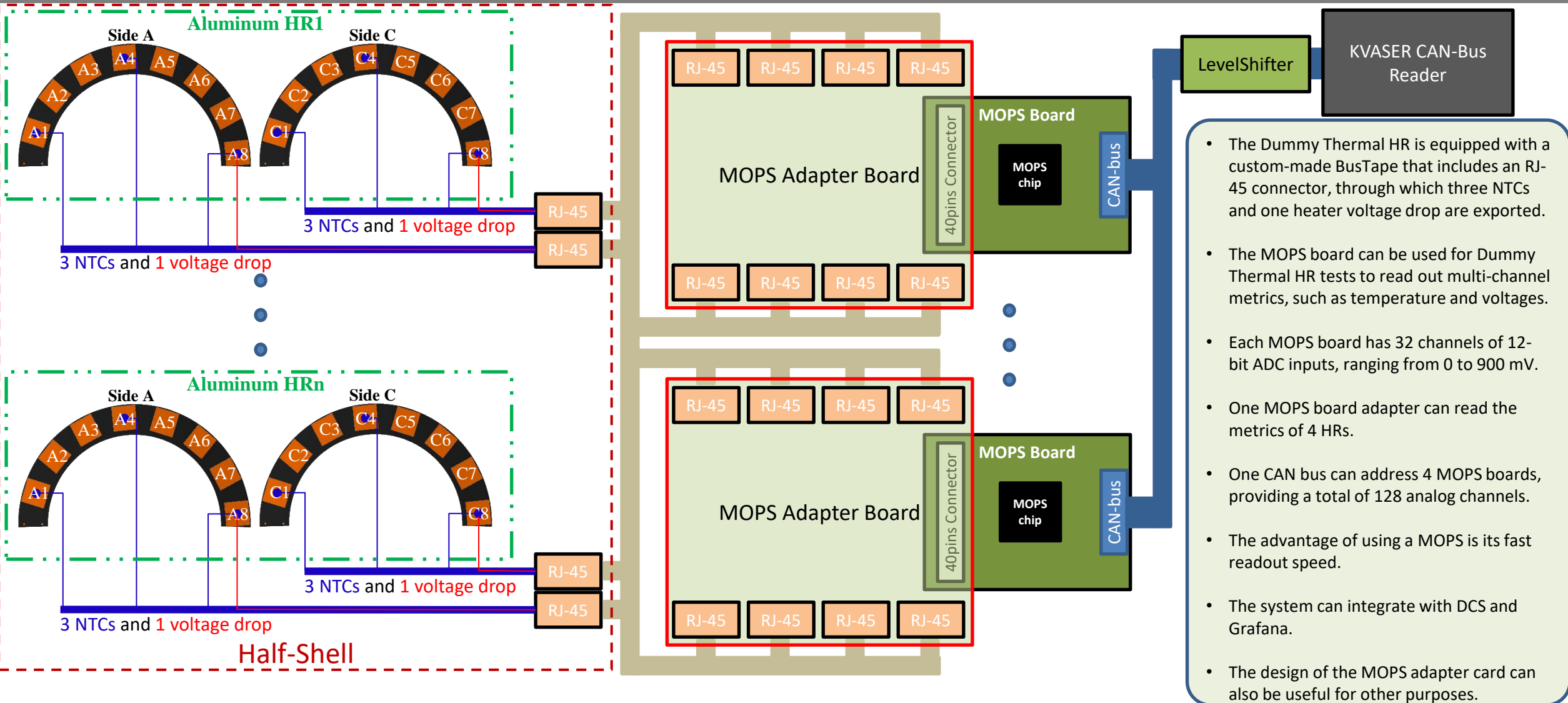
— Temperature Monitoring
— Voltage Monitoring
— Return line
 PPO/local ground
—> Outside connections

MOPS and CANBus reader software



- The MOPS chip provides 40 analog ADC channels with 12-bit resolution and a voltage range of 0 to 900 mV. Of these 40 channels, 8 are dedicated to measuring the internal metrics of the MOPS chip, while the remaining 32 are available for general use.
- The CAN level shifter is a custom-made small circuit that translates and isolates the CAN bus signals between the MOPS chip and a standard CAN physical layer. It features a D-SUB9 connector on both sides.
- The purpose of the CAN level shifter circuit is to isolate and translate signals between two CAN physical layers operating at different voltage levels. While a standard CAN physical layer works at 3.3 or 5 V, the MOPS physical layer operates at 1.2 V.
- The MOPS board is controlled and monitored using a Python-based GUI software, which displays the readings from all channels.

Proposal of MOPS board using for full loaded dummy HRs in HS thermal tests



- The Dummy Thermal HR is equipped with a custom-made BusTape that includes an RJ-45 connector, through which three NTCs and one heater voltage drop are exported.
- The MOPS board can be used for Dummy Thermal HR tests to read out multi-channel metrics, such as temperature and voltages.
- Each MOPS board has 32 channels of 12-bit ADC inputs, ranging from 0 to 900 mV.
- One MOPS board adapter can read the metrics of 4 HRs.
- One CAN bus can address 4 MOPS boards, providing a total of 128 analog channels.
- The advantage of using a MOPS is its fast readout speed.
- The system can integrate with DCS and Grafana.
- The design of the MOPS adapter card can also be useful for other purposes.

Thank You For Your Attention!
Any Questions?