

DAPHNE

Voltage monitoring

JAVIER CASTAÑO

UAN

On Behalf of DUNE-PDS



VOLTAGE MONITORING

```

Untitled_0*
File Edit Connection Macros View Remote Window Help
New Open Save Connect Disconnect Clear Data Options View Hex Help
. TEMP(Celsius)= 38.00

DAPHNE>
DAPHNE> WR AFE 1 BIASSET V 500

Executing command 8 ...CMD Write AFE1 BIASSET success

DAPHNE>
DAPHNE> RD VM ALL

Executing command 9 .... VBIAS0= 0.170
. VBIAS1= 11.185
. VBIAS2= 0.695
. VBIAS3= 0.903
. VBIAS4= 0.195
. POWER (-5v)= -4.884
. POWER (+2.5v)= 2.522
. POWER (+CE)= 3.280
. TEMP(Celsius)= 38.00

DAPHNE>
DAPHNE>

Type a command here. Terminate by pressing ENTER.

COM4 / 921600 8-N-1
Connected 00:18:04, 6580 / 593 bytes
TX RTS DTR DCD
RX CTS DSR RI
  
```

WR VBIASCTRL V xx: set the General Bias to XX (from 0 to 1000), referred to DAC output from 0 to 1 V (DC-DC converter)

WR AFE X BIASSET V YY: set voltage on AFE X (from 0 to 4) to YY (from 0 to 4095 referred to DAC output),

RD VM ALL: measurement of the VBias (from 0 to 4) in volts, power supplies (-5V, 2,5 V, Cold electronics) and microcontroller temperature

EXPERIMENTAL RESULTS/V2

The screenshot shows the DAPHNE GUI TOOL interface. The top window title is "DAPHNE GUI TOOL". Below the title bar, there are tabs for "Tools" and "Configuration". The main area is labeled "Messages" and contains the following text:

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Executing command 9 ... VBIAS0= 0.882
VBIAS1= 0.604
VBIAS2= 0.143
VBIAS3= 0.146
VBIAS4= 0.488
POWER(-5v)= -4.942
POWER(+2.5v)= 2.534
POWER(+CE)= 3.278
TEMP(Celsius)= 30.00

DAPHNE>
DAPHNE>
DAPHNE>
DAPHNE>
Internal GUI error: Command Failed: retry n. 4
Internal GUI error: Reached maximun command retries.
Aborting sending further commands to DAPHNE
  
```

Below the messages, there are sections for "Communications" and "Commands".

Communications: Select Serial Port: ttyUSB0, Refresh, BaudRate: 921600, Connect, Disconnect.

Commands: Channel: 24, AFE: 3, All AFEs, GET CONFIG, SET CONFIG, RD FPGA. Bias Voltage: Value: 0,00 V, Trim: 0 mV, Only Trim, Apply. Gain: LNA: 12dB, PGA: 24dB, Integrator (HPF): LNA, PGA. Active Termination: Enable, Impedance: 50, Cut-off freq: 10 Mhz. ADC Format: 2' complement, LSB First, Offset binary, MSB First.

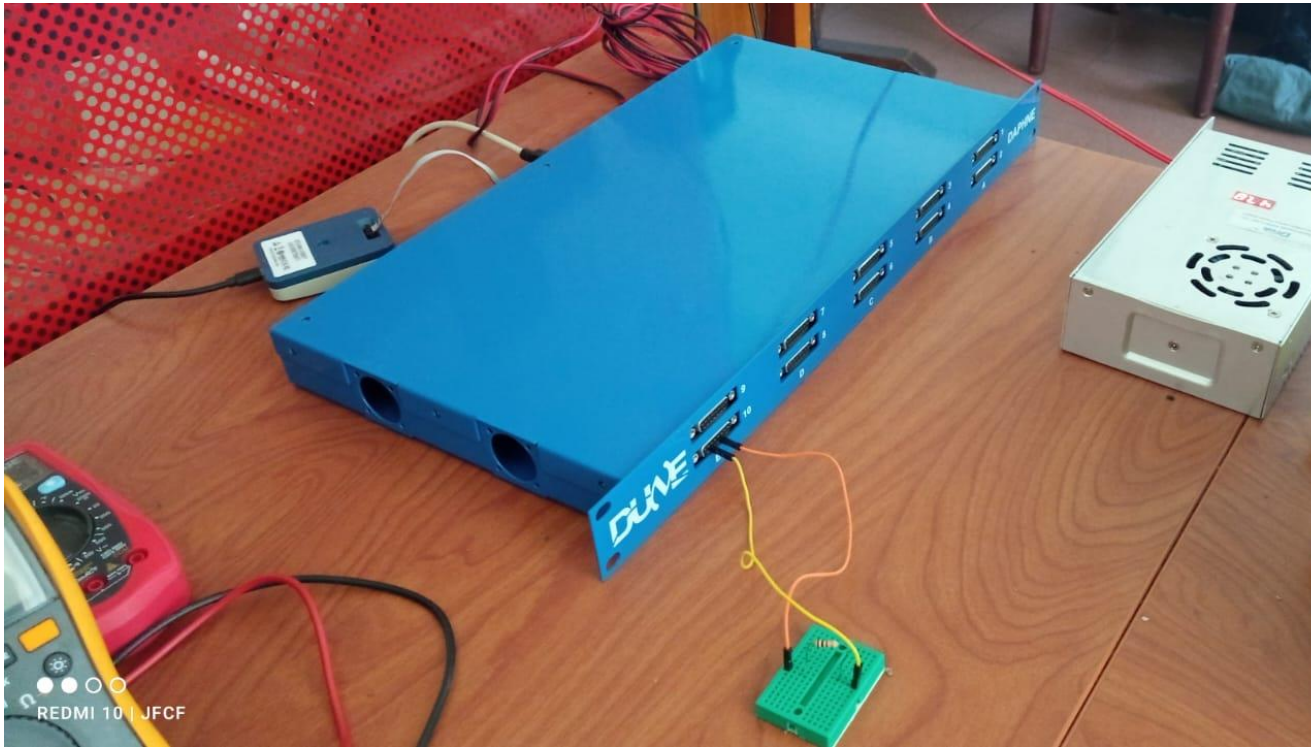
Tested all the options: set general Bias, set AFE Bias to different values followed by a RD VM ALL command

ONGOING WORK

- Calibration of the Voltage monitoring
- Improvement of the uC temperature measurement (calibration, mathematical model, etc) according to the uC datasheet
- Verification and calibration of the CM analog multiplexing circuit (originally designed by Sten H. for Mu2E FEB)
- Calibration of the PGA-ADC by using the internal ADS1259 modules
- Suggestions from Esteban (Milano): commands for each measurement in the VM, microcontroller control to generate I-V curves and measurements (with a command)

THANKS

CURRENT MONITORING



Tests performed on DAPHNE V1 at UAN and Fermilab

Firmware: last version of V2 (GitHub)

1k resistor connected between Trimm 2 (pin 11) and AGND (using the Cold Electronics VR pin 14), E-10 connector

EXPERIMENTAL RESULTS/V1

```

Untitled_0*
File Edit Connection Macros View Remote Window Help
New Open Save Connect Disconnect Clear Data Options View Hex Help
No Header magic word at 00000000 Quitting.
[ OK ] Current Monitoring Init
DAPHNE> WR TRIM CH 2 V 0

Executing command 8 ...CMD Write TRIM Channel 2 success

DAPHNE>
DAPHNE> RD CM CH 2

Executing command 9 ...CMD Read CM success
CM CH = 2 Current(mA)= 0.000885

DAPHNE>
DAPHNE> WR TRIM CH 2 V 4095

Executing command 8 ...CMD Write TRIM Channel 2 success

DAPHNE>
DAPHNE> RD CM CH 2

Executing command 9 ...CMD Read CM success
CM CH = 2 Current(mA)= 1.369874

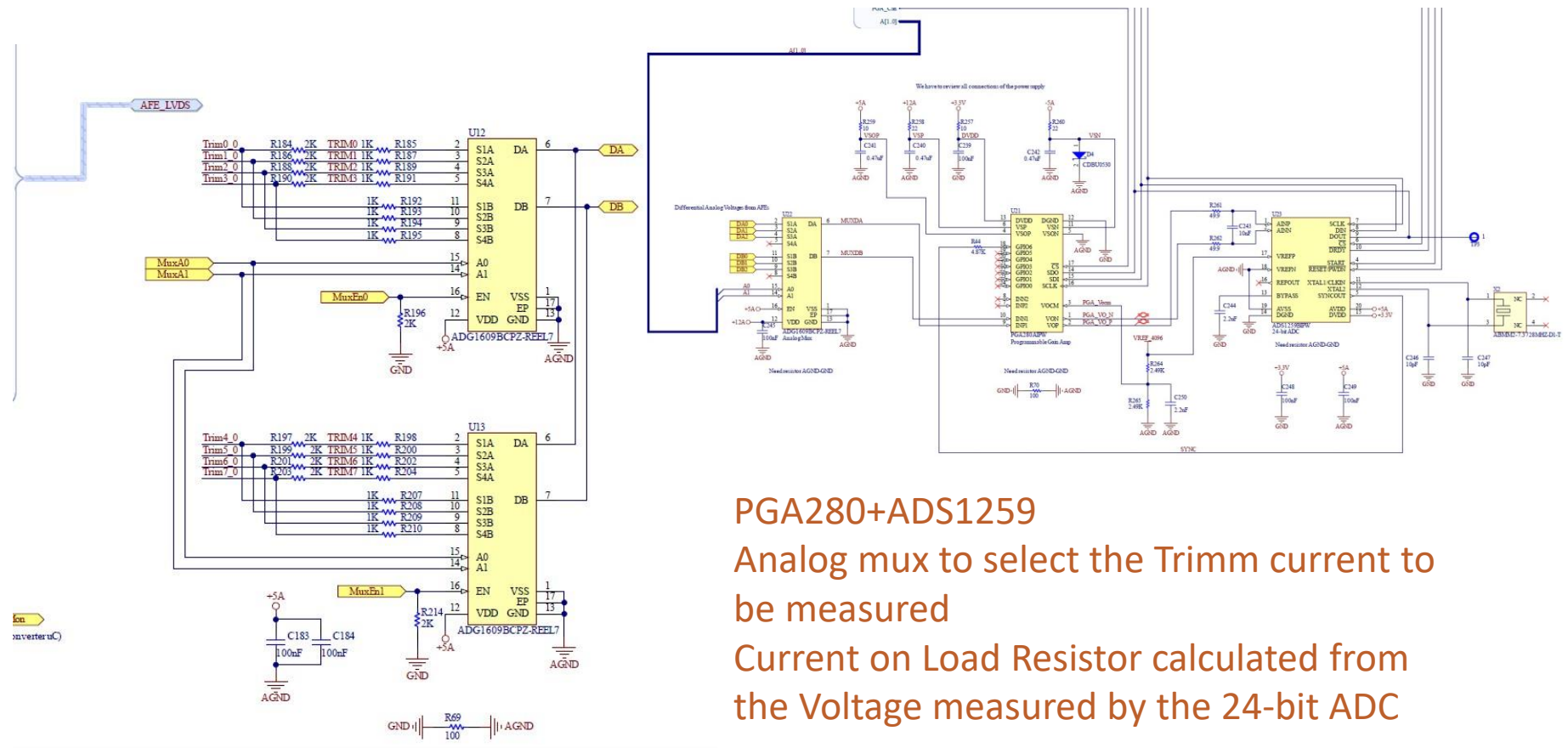
Type a command here. Terminate by pressing ENTER.

COM4 / 921600 8-N-1 Display Paused TX RTS DTR DCD
Connected 01:38:28, 4005 / 462 bytes RX CTS DSR RI
  
```

WR TRIM CH xx V yy: set Trimm Voltage on channel xx to yy value (from 0 to 4095 referred to DAC output). We will implement a command that take this value in Volts

RD CM CH X:
measurement of the current on channel X (in mA)

CURRENT MONITORING



PGA280+ADS1259

Analog mux to select the Trimm current to be measured

Current on Load Resistor calculated from the Voltage measured by the 24-bit ADC

EXPERIMENTAL RESULTS/V2

The screenshot shows the DAPHNE GUI TOOL interface. The 'Messages' window displays the following text:

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Executing command 8 ...CMD write TRIM Channel 24 success
DAPHNE>
DAPHNE>
DAPHNE>
RD CM CH 24

RD CM CH 24

Executing command 9 ...CMD Read CM success
CM CH = 24 Current(mA)= 0.504911

DAPHNE>
DAPHNE>
DAPHNE>
DAPHNE>

```

The 'Commands' section shows the following configuration:

- Channel: 24, AFE: 3, All AFEs
- Bias Voltage: Value: 3,00 V, Trim: 1500 mV
- Gain: LNA: 12dB, PGA: 24dB
- Active Termination: Enable, Impedance: 50
- Integrator (HPF): LNA, PGA
- ADC Format: 2' complement, Offset binary, LSB First, MSB First
- V GAIN: Value: 0,80 V, All AFE
- LNA Clamp: Level: AUTO
- PGA Clamp: Level: -2 dBFS
- Ethernet: Enable

The 'Communications' section shows:

- Select Serial Port: ttyUSB0
- BaudRate: 921600
- Send Raw Command: RD CM CH 24
- Take Multiple Waveforms: 10000, Save, Cont.

Working Directory: /home/ecristal/Documents/PHD/daphne_data/V2/hpk_12122023/1u/50_pde/cal2

1K resistor connected to
CH24

Current monitoring
reports 0.504911 mA

Voltage measured with
multimeter on the
resistor: 500 mV