

New Features of APV-SRS-LabVIEW Data Acquisition Program

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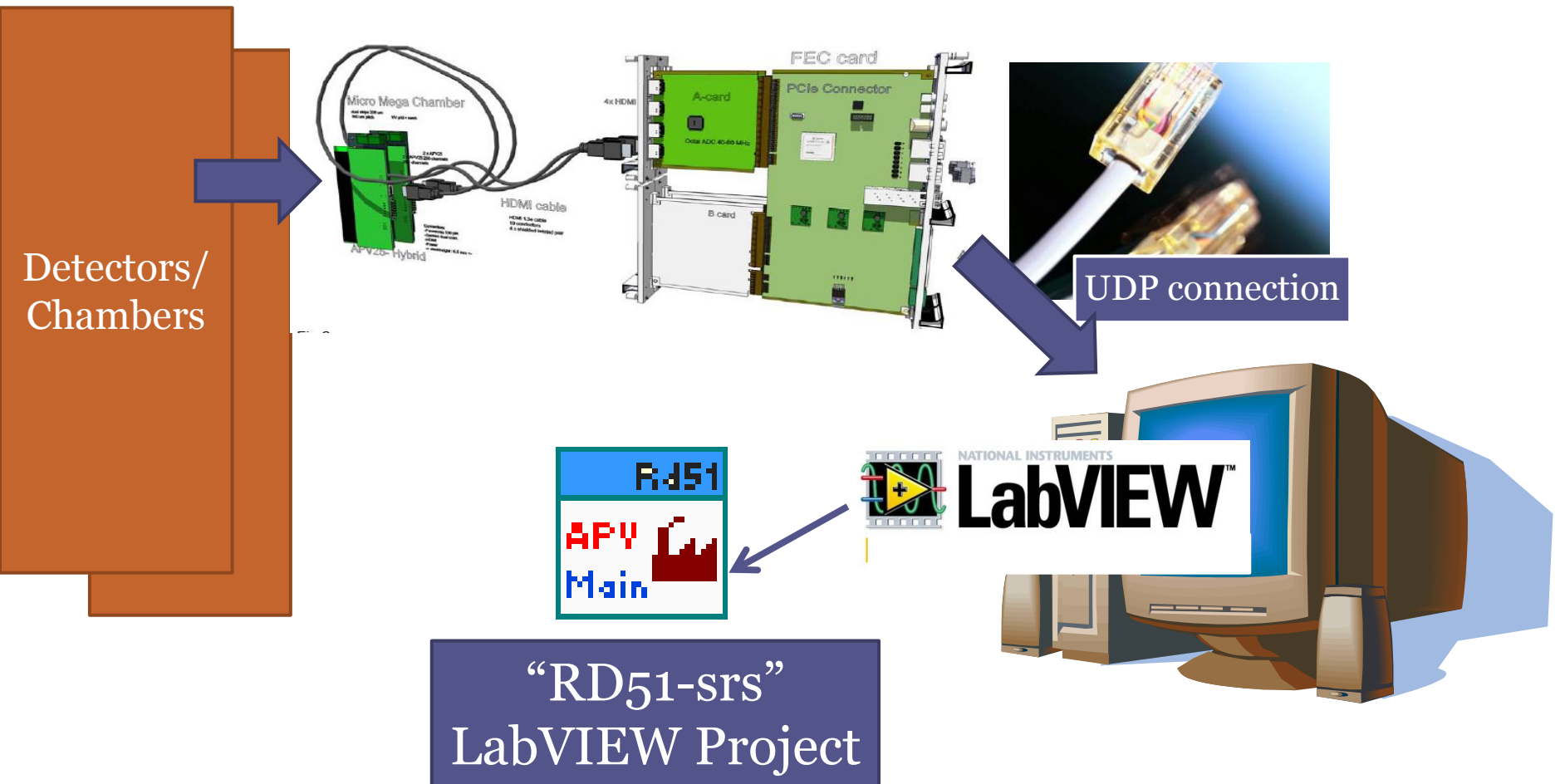
NYC, Sept. 2012



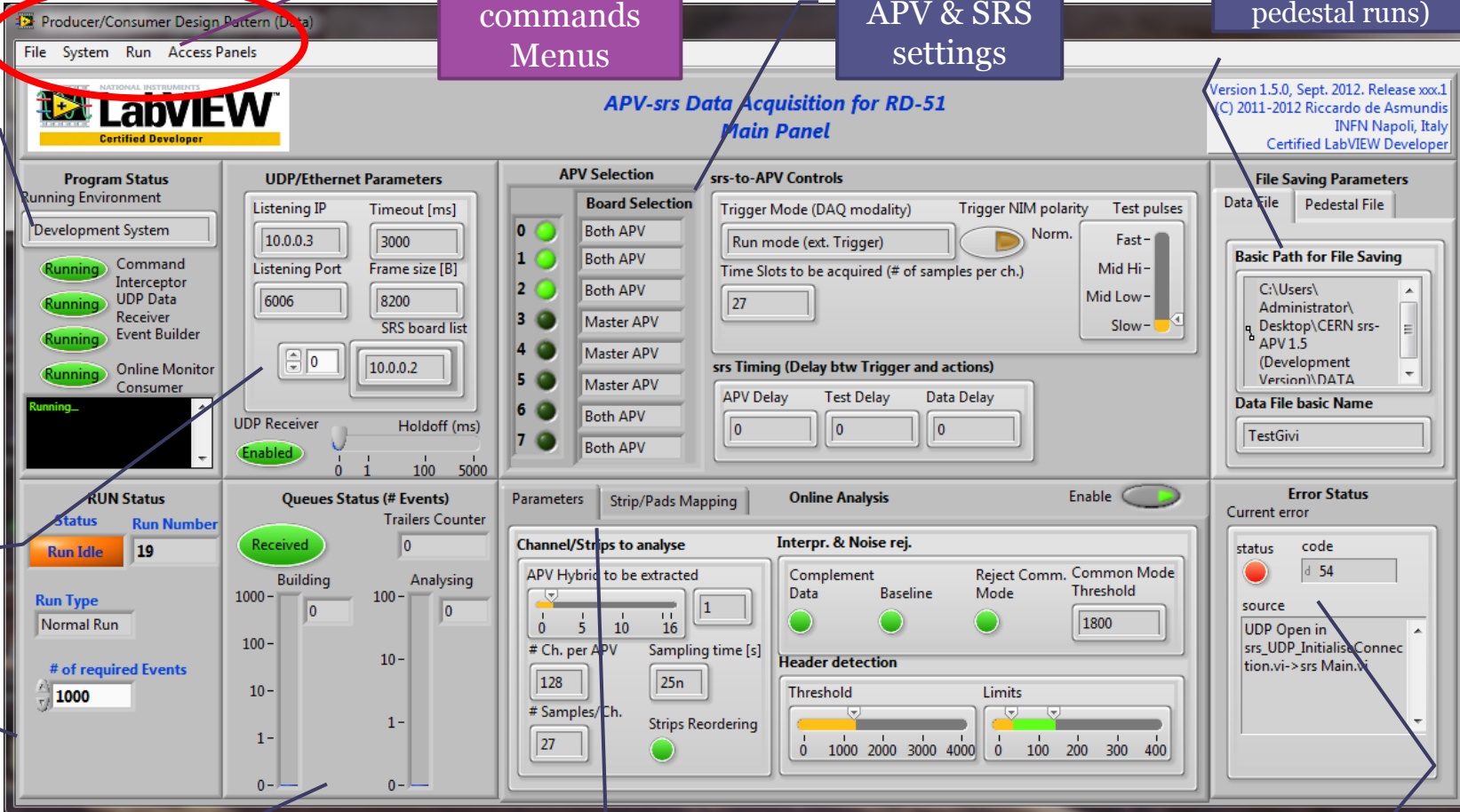
Srs-LabVIEW

- Easy to use software for SRS data acquisition
 - APV-Hybrid ADCs modules
- Needs a PC
 - with Gigabit Ethernet only
- Compiled (.exe) release available
 - need of the LabVIEW Runtime Engine only (from NI, (unless already installed))
- User friendly GUI **with Real time features for interactive Setup of SRS (trigger/timing windowing)**

Remind: The LV Project for srs-DAQ



The appearance: main panel



Processes Running control

User commands Menus

APV & SRS settings

Data Files paths & Naming (for normal and pedestal runs)

UDP Parameters

RUN status display

Internal queues occupancy

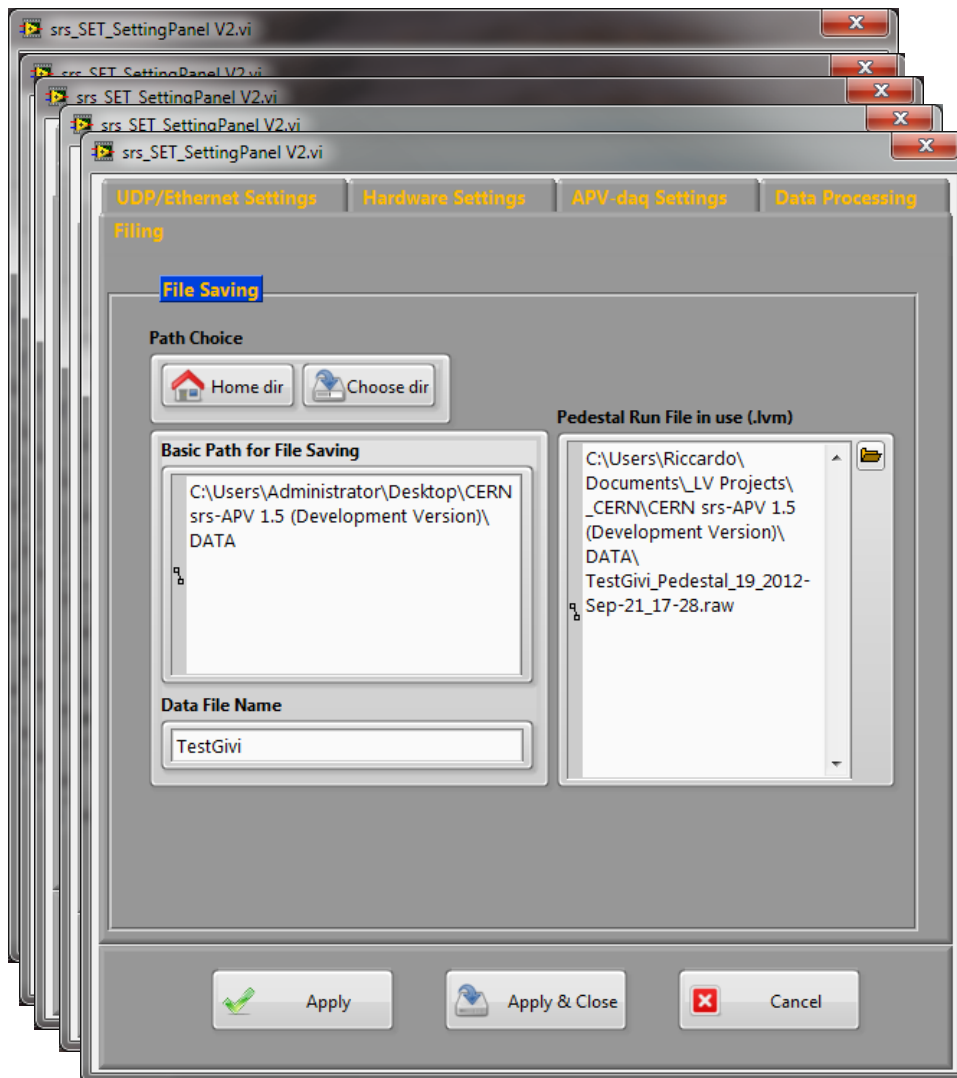
Online analysis settings & Detectors MAP definition

Current Error status

LabVIEW RD51-srs: summary of current features

- Fully integrated with SRS (slow) control
 - Based on the old Sorin's «SRS Slow Control» project for data exchange with SRS
 - SRS settings obtainable via high level GUI
- UDP Connection & data flow monitoring
- Build events monitor with integrity-based events filter
- Automatic RUN handling
 - Normal RUNs
 - Pedestal RUNs
- Powerful and scalable Online Data Monitor

Setting Operative Parameters via high level GUI



UDP Communication settings

SRS hardware interactive settings

APV hardware settings

Data Processing

File settings

Detector Channels Map settings

Current Map

APV pin:	APV0->Ch	1->Ch	2->Ch	3->Ch	4->Ch	5->Ch
0	0	128	256	384	512	640
1	1	129	257	385	513	641
2	2	130	258	386	514	642
3	3	131	259	387	515	643
4	4	132	260	388	516	644
5	5	133	261	389	517	645
6	6	134	262	390	518	646
7	7	135	263	391	519	647
8	8	136	264	392	520	648
9	9	137	265	393	521	649
10	10	138	266	394	522	650
11	11	139	267	395	523	651
12	12	140	268	396	524	652

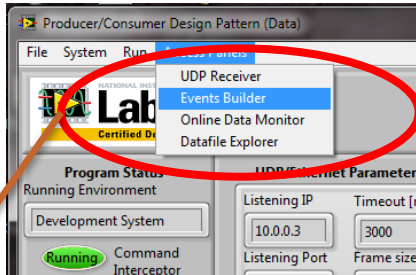
Mapping Definition

Number of APV: 6 # of Strips/Pads per APV: 128

Current Map Definition (Input Table)

APV pin:	APV0->Ch	1->Ch	2->Ch	3->Ch	4->Ch	5->Ch
0	1	129	257	385	513	641
1	3	131	259	387	515	643
2	5	133	261	389	517	645
3	7	135	263	391	519	647
4	9	137	265	393	521	649
5	11	139	267	395	523	651
6	13	141	269	397	525	653
7	15	143	271	399	527	655
8	17	145	273	401	529	657
9	19	147	275	403	531	659
10	21	149	277	405	533	661
11	23	151	279	407	535	663
12	25	153	281	409	537	665
13	27	155	283	411	539	667
14	29	157	285	413	541	669
15	31	159	287	415	543	671
16	33	161	289	417	545	673

Event builder panel



UDP data frame in graphical representation: different channels in color

The screenshot shows the 'srs_Event_Builder.vi' interface. It is divided into several sections:

- INPUTS:** Includes 'Event Filter' (green indicator), 'Time out' (12), 'Initial index in' (12), 'Read Param. in', 'Iterations in' (7), 'UDP timeout' (3000), and 'Buffer size' (8200).
- INTERNALS:** A table showing statistics:

# of incoming good Events	# of Events Corrected	# of Events Rejected	Timeout & Null events	Total Number of calls
4885	1352	17	133	6387
- UPD Data Cluster in:** Shows 'Received IP' as 167772162 and a list of 'UDP Frames' in hexadecimal.
- Incoming Event Frame:** A waveform plot showing 'Value' (0 to 3500) vs 'Position in stream' (0 to 4099). Multiple colored lines represent different channels.
- OUTPUTS:** Shows 'Talking Channels List' (0, 1, 2, 3, 4, 5), 'Source IP of event' (10.0.0.2), 'subevent size' (3904), and 'Total # of Trailers' (6237). It also shows 'Formatted Event out' with 'Event Accepted' (green indicator), 'Header' (0000C074), and 'Payload' (00000C60).

Incoming Event

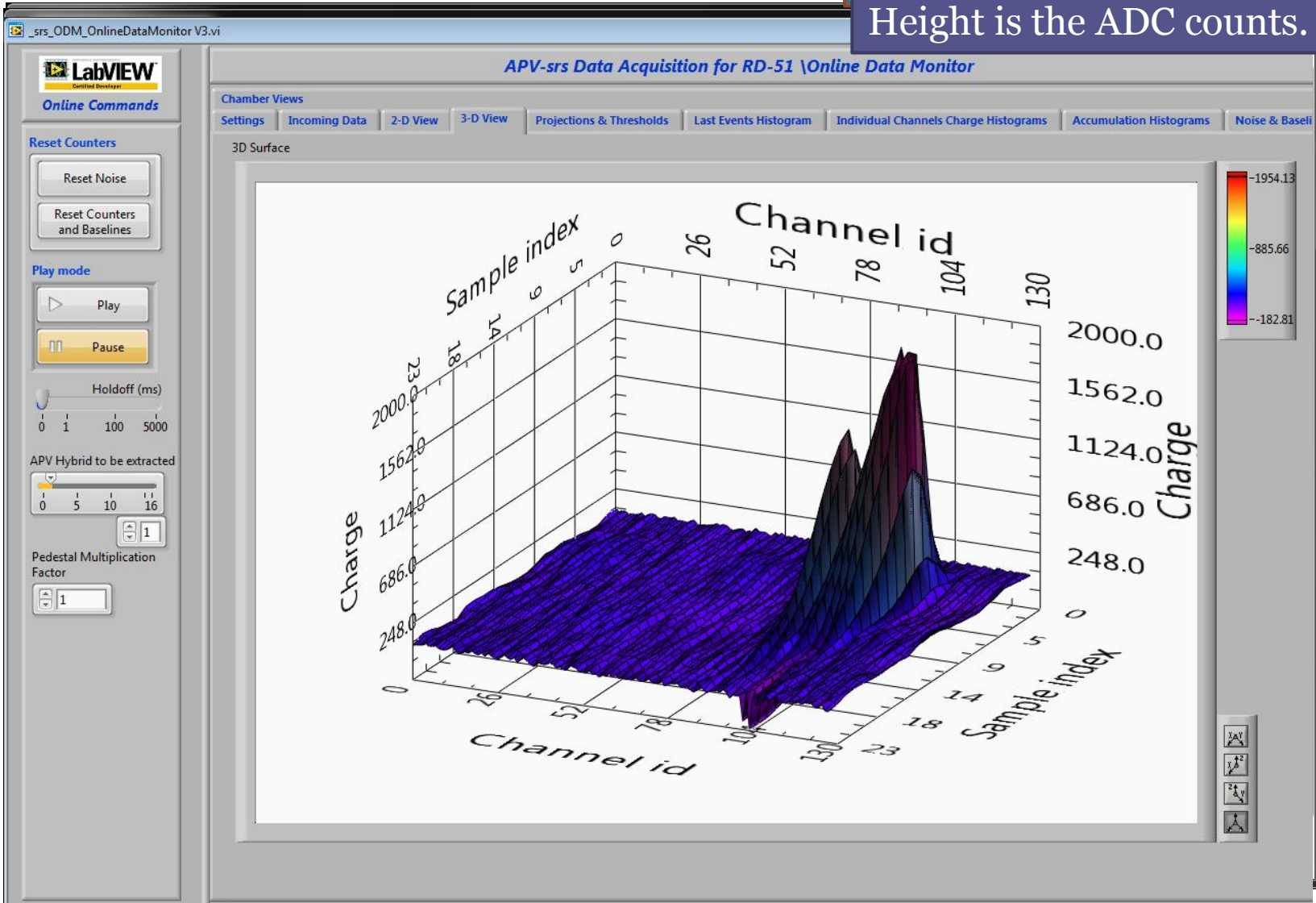
Formatted Event

Online Data Quality Monitor

- “Internal” (i.e. for data monitor) flexible settings
- Raw data view (incoming frames)
- Two ways:
 - A. individual APV analysis
 - B. all APV analysis
- 2-D and 3-D views of fired strips or pads on the detector
- Main projections:
 - Amplitude vs. Channel (multiplot on ADC Samples)
 - Amplitude vs. ADC Samples (multiplot on Channels)
- Efficiency and Channels multiplicity calculations

2-D, 3-D, Projections

3-D view of a significant Event: APV "Channel" vs Sample. Height is the ADC counts.

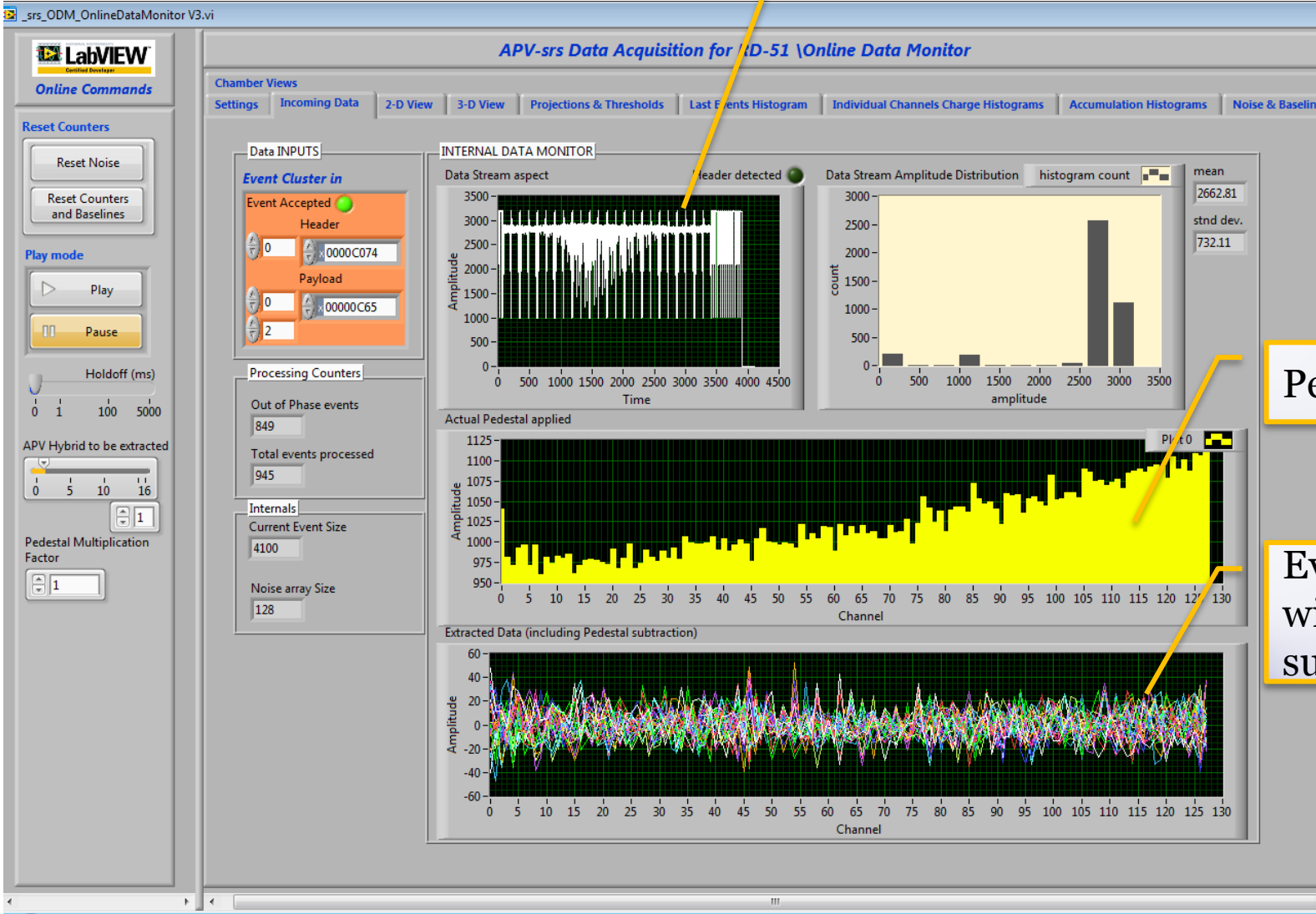


Online Data Quality Monitor

- Pedestals
 - Pedestal data visible
- Long term histogramming
 - Hit profiles
 - Time distribution
 - Amplitude distribution
 - Local Noise and Baseline
- “Chamber View” plots:
 - Chamber hit profile on separate components (X, Y)
 - “Strips” or “Pads” vision (the latter to be developed...)
 - Y vs X strip profile

Incoming events

Incoming event frame



Pedestal data

Events data with Pedestal subtraction

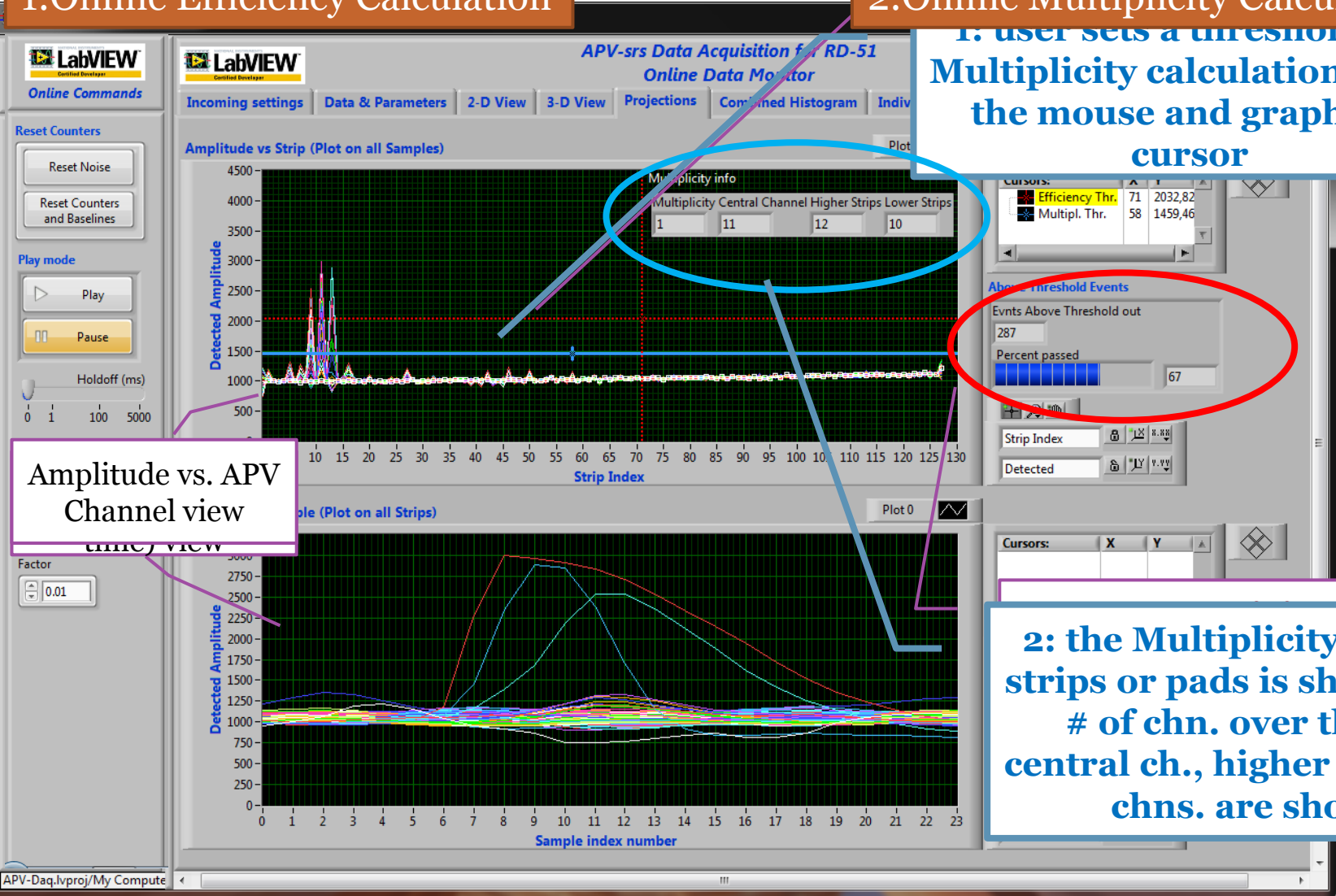
Online Data Monitor: some samples II

Example of Efficiency tracing and Multiplicity calculation

1: Online Efficiency Calculation

2: Online Multiplicity Calculation

1: user sets a threshold for Multiplicity calculation using the mouse and graphical cursor

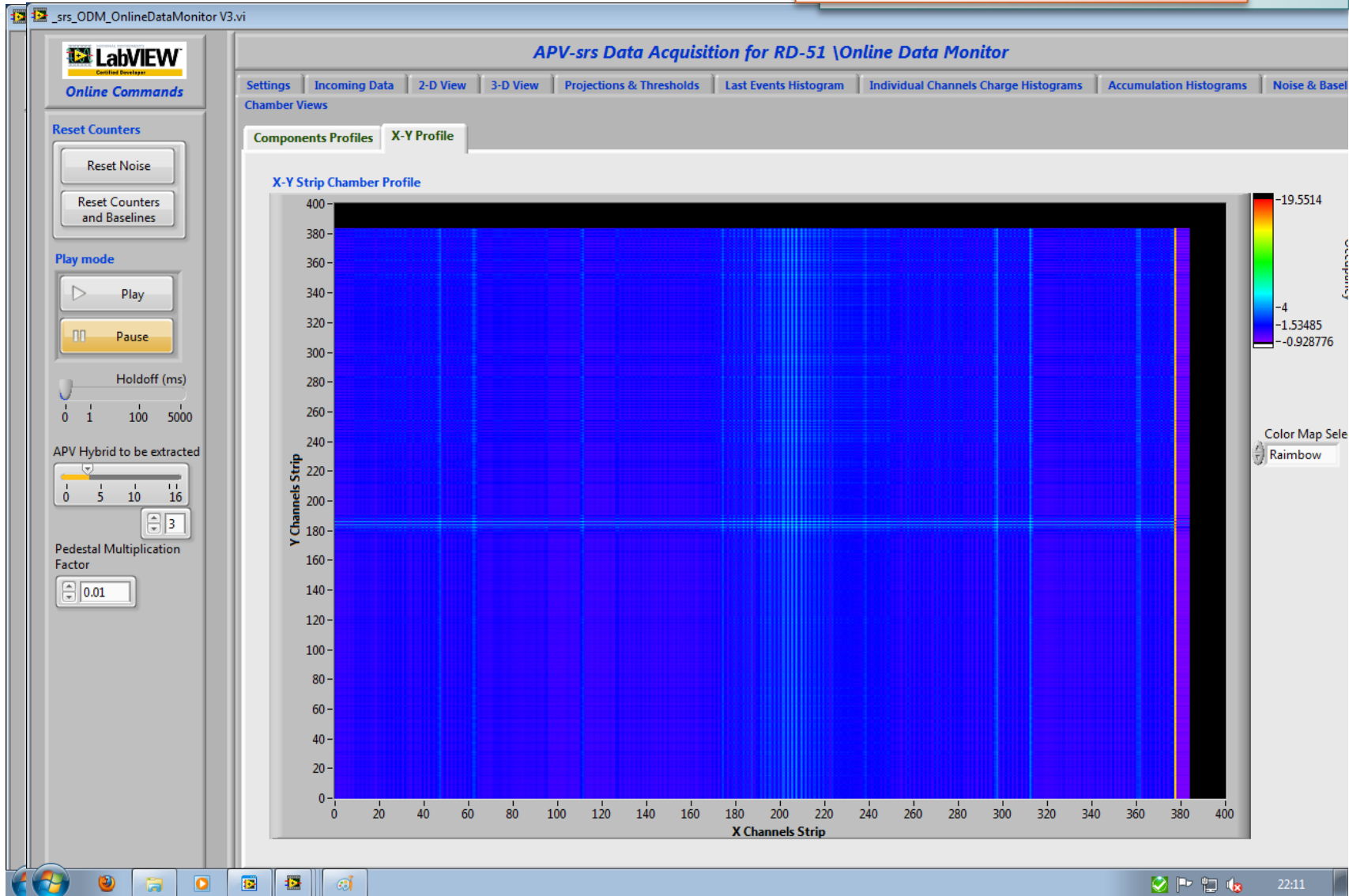


Amplitude vs. APV Channel view

2: the Multiplicity of hitted strips or pads is shown here. # of chn. over thresh., central ch., higher and lower chns. are shown.

Chamber View

X and Y profiles
X and Y strips occupancy geometry



Datafile Dump

- Saved files can be inspected thanks to a specific subprogram.
- Accessible from the Main Panel
- Very interactive, “recorder” style
- Graphical representation of data

“Recorder” control

Data file under inspection

Event Header

Event Dump

The screenshot shows the 'srs_FILE_DatafileBrowser.vi' window with the following sections:

- COMMANDS:** Open New File, Close File, Recorder Control (|< < > >|), QUIT.
- File Parameters:** File Size (14576204), Record Index, Position Before Reading (7404), Record Length (7268), Last # of Words read (1800), Last # of bytes read (7200).
- INTERNALS:** Explored File Positions History (0), Header (4), Contents (7).
- OUTPUT:** Sequence of indexes for Pattern found (0 1 0), Corresponding Event Header/Last header.
- Event Dump Table:**

Event Size (Bytes)	Magic Number	Header Size	Version
x00001C64	xDA1E5AFE	x00000044	x00030009
Event Type	Run Number	Ev ID (1)	Ev ID (2)
x7	x00000062	x00000002	x00000000
Trigger Pattern (1)	Trigger Pattern (2)	Detector Pattern	Ev Attribute (1)
x00000000	x00000000	x00000000	x00000000
Ev Attribute (2)	Ev Attribute (3)	Ldc id	Gdc id
x00000000	x00000003	x00000001	xFFFFFFFF
Timestamp	1332258345		

Time Stamp Correction: 0.59,59,000 / 01/01/1970
Corresponding Time Stamp: 16.45,44,000 / 20/03/2012

Frame Contents: A graph showing signal amplitude over Stream Position (0 to 2000).

Documentation

- A Word «White Paper» is under writing.
 - Conceived as both User Manual and System Reference Manual
 - From “getting started” to details of program structure and data file format.
- to be completed...

srs-LabVIEW Documentation V1.4 July2012.docx - Microsoft Word

File Home Inserisci Layout di pagina Riferimenti Lettere Revisione Visualizza Sviluppo Acrobat Progettazione Layout

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Strumenti tabella

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

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Figure 4: The program start command.

The main panel will take the aspect reported in the Figure 5.

Figure 5: Aspect of the main panel once the program has started. Remark the green lights indicating process running.

All indicators remarked in the Figure 5 must be in a Green status, reporting that the relative process is running. If only one of these indicators is in Red status, an error has occurred and program cannot run. You must fix the error before continuing.

You may experience an error like the one reported in the Figure 6 (error code 24). Such a condition indicates a lack in the communication on the UDP port or the impossibility in using the port. Here is a possible list of sequences for this error, which must be checked if this situation occurs.

- 1) Be sure you disabled the NI Variable Engine service in the System Service Panel of Administrative tools (see paragraph "Preparing for running")
- 2) Be sure the Ethernet card is a Gigabit Ethernet, and it is correctly configured, with the IP address 10.0.0.3 selected as usual before.
- 3) Check for the correct cable (1-40-1, ordinary Ethernet) connecting the Gigabit card to the SRS card.
- 4) Check for power on on the SRS Controller (or Mainframe).

Fix these points before, then stop and restart the program, by selecting File = Quit Program menu item and the running arrow again.

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Some of messages, texts and boolean indicators showed in the Figure 5 can be different from what you see on your actual system. Most of the indicators, in fact, require specific settings of the program, SRS, data taking and online Data Analysis, which, all, need individual settings and customization.

Figure 6: A possible starting error, indicating a lack in communication on the UDP Port.

Once the status is ok, as reported in the Figure 5, enable the UDP channel activity by selecting, in the user menu, Run = Enable UDP Receiving item, as indicated in the Figure 7.

Figure 7: Enable UDP Receiving. A program operation to be done.

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Configuring the SRS

SRS must be installed and configured before data can be taken. This operation must be performed at beginning, and is mandatory in particular in the case of a Power ON of the SRS. Configuration of SRS and of different Program settings are all accessible from the main Configuration Panel. Go on the menu item System = Program and Hardware Setting, as shown in the Figure 8.

Figure 8: How to open the Configuration Panel

Which opens the Configuration panel of the Figure 9.

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LabVIEW RD51-srs:conclusions & perspectives

- Smart
 - Not big in Files and Modules occupancy
 - Standalone version available (pen drive transportable, ~25 MB)
- Flexible
 - Able to acquire a full FEC (16 APV). Scalable to more FECs (to be developed).
- Portable
 - Portable on different machines and Operating System (standalone versions are platform dependent and must be recompiled)
- Scalable
 - Relatively easy for developing of new features
- Fast
 - Able to handle different parallel processes with fine priorities tuning
- Compatible
 - Data file format compatible with existing analysis

Available from now for daily laboratory usage or Test Beams.
Looking for Beta tester !