

## PiSpec Software & Digital Pulse Processors

PiSpec software is designed to control several optional Digital Pulse Processors (DPP) for spectral data acquisition. The optional DPPs include XIA DXP-MERCURY, XIA microDXP (uDXP) and AMPTEK DP5 which are integrated with the Vortex<sup>®</sup> Electronics constituting, along with the Vortex<sup>®</sup> detector, a complete energy dispersive X-ray spectrometer intended for laboratory or industrial x-ray applications. The Vortex<sup>®</sup> electronic box provides everything necessary for the Vortex<sup>®</sup> X-Ray Detectors, including detector bias voltages, preamplifier and thermoelectric cooler power supplies. The available peaking times of the DPPs range from 0.1 to 24  $\mu$ s. With 0.1  $\mu$ s peaking time one can achieve a very high throughput of up to  $\sim$ 1 Mcps OCR while long peaking times ensure excellent low energy performance. The PiSpec software offers complete computer controls over the system. The HITACHI Energy-Dispersive X-Ray Spectrometer offers very high throughput with virtually no deterioration of the performance compared to typical analog systems for comparable energy resolution, but at a lower cost.

### Hardware Specification

#### **Input (Analog)**

The signal input has been optimized for use with the Vortex<sup>®</sup> family of detectors.

#### **Interface**

USB: Version 2.0 up to 1.2 MB/s data transfer speed.

#### **Optional DPPs**

Refer to XIA and Amptek web-site for detailed specifications of the relevant DPPs.

#### **Detector Power & Controls**

Refer to specifications of the Vortex<sup>®</sup> electronic box.

#### **Data Outputs (via USB2.0 Port)**

Spectrum: Up to 8192 channels with 10 – 40 eV selectable channel size.

Livetime, realtime or fixed input / output counting with controllable pileup rejection.

#### **Spectrometer Performance**

Resolution: Comparable to best analog units with excellent light element performance.

Count Rate:  $\geq$  2,500,000 cps input rate (ICR),  $\sim$  1,000,000 cps output rate (OCR).

Pileup Inspection: Pulse-pair resolution typically better than 200 ns after tuning to optimize performance on an application specific basis.

### Features

User friendly software for spectral data acquisition and manipulation.

Single unit replaces shaping amplifier, multi-channel analyzer, and high voltage and preamplifier supplies at significantly reduced cost.

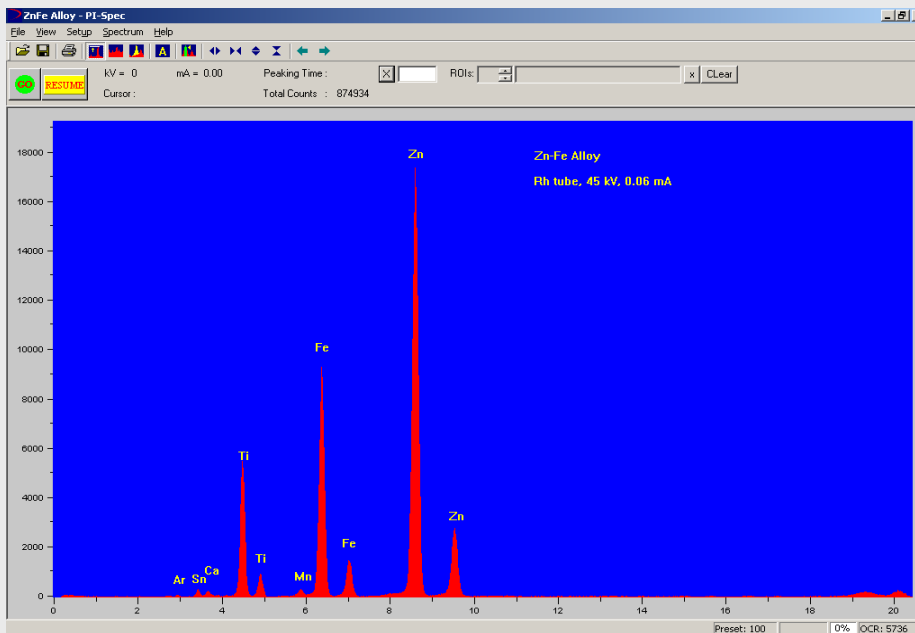
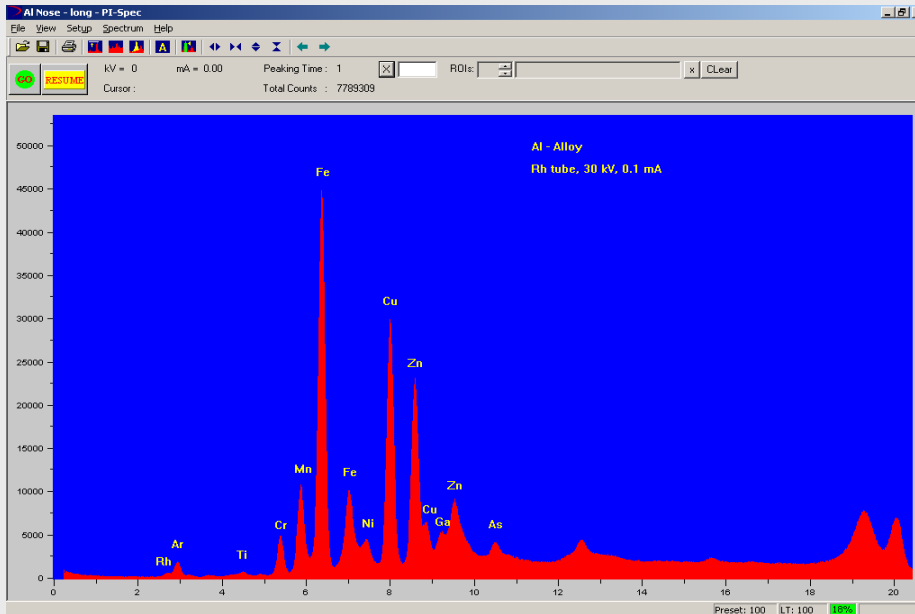
Digital trapezoidal filtering, with programmable peaking times between 0.1 and 24  $\mu$ s.

High precision, digital gain control and tight pileup inspection criteria.

Accurate input count rate (ICR) and livetime reporting with precise deadtime corrections.

All digital controls are achieved through a standard USB2.0 port.

The PiSpec interactive graphical user interface (GUI) is an intuitive window-style interface that provides the user with straightforward access to various functions to acquire or analyze the spectral data. A single window provides spectral display and acquisition controls with a tool bar at the top of the screen for instant access to the frequently used functions.



## Features

Basic spectrum acquisition software designed and optimized to work with the Vortex<sup>®</sup> detector and DPP.

- Can acquire, open/save, export/import, overlay and view spectra or manipulate, annotate, clipboard-copy and print a spectrum.

- Can evaluate peak resolutions and get ROI (region of interest) counts through manual or unattended operations. Up to 30 ROIs can be conveniently defined with mouse drags.

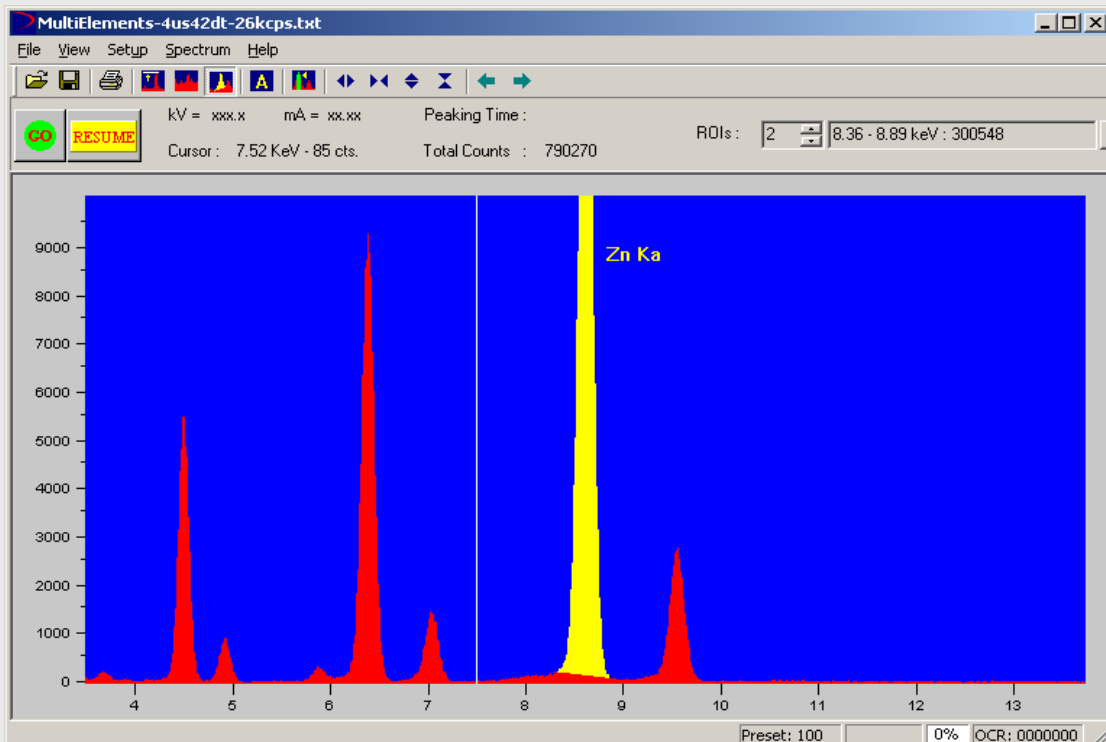
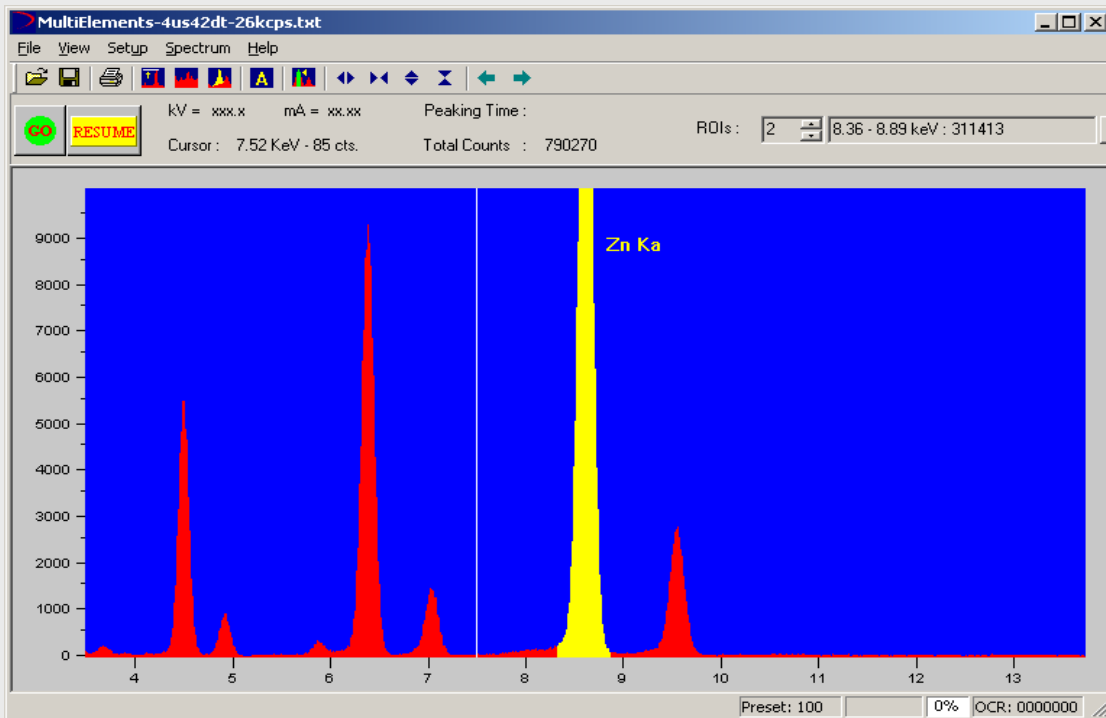
- Automatic energy calibration with a button click.

- Client software can control this software through simple Windows messages to set up acquisition parameters, start/stop acquisitions and save the acquired spectra.

- Export function saves the acquired spectrum in text (ASCII) format so that it can be opened by other software for further application specific processing.

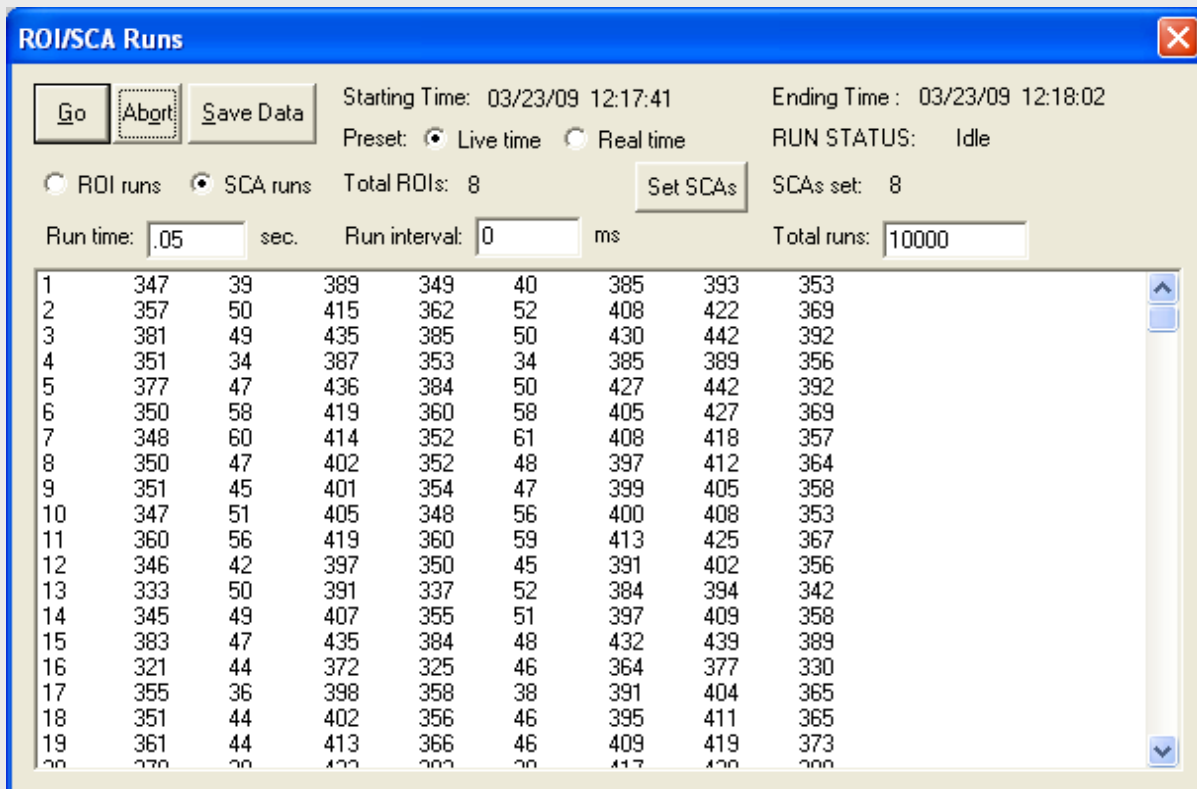
## CONVENIENT ROI HANDLING

Up to 30 ROIs can be conveniently defined using mouse drags. The user can edit and navigate through all the ROIs defined. All the relevant ROI information is displayed during the navigation. The ROI intensities can be displayed as raw or net. The net ROI intensity is background-subtracted intensities. The background correction uses the straight-line model through both the ROI bounds.



### CONTINUOUS ROI ACQUISITION

Raw or net intensity data of up to 30 predefined ROIs can be acquired simultaneously. The acquisition time can be as short as 0.01 second (10  $\mu$ s). This feature is especially useful in cases where a continuous scan using very short dwell time is needed. One can, for example, get multiple diffraction patterns in just one shot of scan. The use of high throughput Vortex<sup>®</sup> detectors makes this feature even more attractive. Below shows the user interface of this function, where 8 ROI intensity data are acquired every 0.05 second. The data acquired can be saved into a text file which can be opened and processed later with Microsoft Excel.



The screenshot shows the 'ROI/SCA Runs' window with the following controls and data:

- Buttons:** Go, Abort, Save Data, Set SCAs
- Timing:** Starting Time: 03/23/09 12:17:41, Ending Time: 03/23/09 12:18:02
- Preset:** Live time (selected), Real time
- Run Status:** Idle
- ROI/SCA Settings:** ROI runs (unselected), SCA runs (selected), Total ROIs: 8, SCAs set: 8
- Run Parameters:** Run time: .05 sec., Run interval: 0 ms, Total runs: 10000

1	347	39	389	349	40	385	393	353
2	357	50	415	362	52	408	422	369
3	381	49	435	385	50	430	442	392
4	351	34	387	353	34	385	389	356
5	377	47	436	384	50	427	442	392
6	350	58	419	360	58	405	427	369
7	348	60	414	352	61	408	418	357
8	350	47	402	352	48	397	412	364
9	351	45	401	354	47	399	405	358
10	347	51	405	348	56	400	408	353
11	360	56	419	360	59	413	425	367
12	346	42	397	350	45	391	402	356
13	333	50	391	337	52	384	394	342
14	345	49	407	355	51	397	409	358
15	383	47	435	384	48	432	439	389
16	321	44	372	325	46	364	377	330
17	355	36	398	358	38	391	404	365
18	351	44	402	356	46	395	411	365
19	361	44	413	366	46	409	419	373
20	370	50	422	375	50	417	428	380



## **VTXDLL DYNAMIC-LINK LIBRARY**

Dedicated Dynamic-Link Library serving as an interface between the user software and the optional Digital Pulse Processors.

The objectives are to encapsulate, or wrap up, the otherwise complicated DPP setup procedures, making the third party software transparent to the users. It handles all kinds of communication and spectrum acquisition needs through only ~20 functions.

This library also optimizes the DPP's performance under widely varying conditions especially with the Vortex® family detectors.

The DLL can assume a shortcut for the user to interfacing with the DPP without prior knowledge about the latter.

The source code of a sample host interface program (VTXDRV) is provided to help users in developing their own control software.