International Nuclear Physics Conference 2016

X-ray spectrum meter

APU101

Front

Rear

Stand-alone model

- Detector type: SDD, SSD
- Throughput: 1Mcps and more
- Power supply: HV(+/-4000V), Preamp
- Energy resolution
  [SSD]
  139eV@5.9keV PT6us
  250eV@5.9keV PT0.5us
  [SDD]
  125eV@5.9keV PT2μs
  145eV@5.9keV PT0.5μs
- Interface: TCP/IP

ALL-IN-ONE

HV Power Supply

Preamplifier Power Supply

Multi Channel Analyzer

***Images is for illustration purpose.**
***Please note that contents may change without prior notice.**

X-ray spectrum meter

APU101

Analog input	1CH, ±1V range, Input-Impedance1kΩ
Analog gain	Coarse Gain: x2, x4, x10, x20, Fine: x0.5 to x1.5
Sampling	100MSPS, (Resolution: 14Bit)
ADC Gain	8K, 4K, 2K, 1K, 512, 256ch
Digital Processing	Trapezoidal Filter 0.1 to 16μs, Baseline Restorer, Pileup Rejecter, Coarse Gain, Fine Gain
HV power supply	0V to ±4000V (Max: 1.0mA), Ripple: 20mVp-p(typ.) *Customizable up to ±5000V (Max: 0.67mA) Bias shut down input terminal equipped
Pre-amp power	±12V, ±24V (NIM-Standard)
Unit panel Switch Button Connector	【FRONT】 HV power supply monitor LED, Dead-time monitor LED Emergency Stop button, LAN Connector, POWER button 【BACK】 SHV connector for HV power supply D-sub9 pin-connector for pre-amp power BNC input connector for pre-amp output signal LEMO connector for output DAC MONITOR etc.
Interface	Ethernet TCP/IP
Dimension / Weight	210mm(W) x 45mm(H) x 275mm (D) (Without connector), Approx.. 1,800g
Operation system	Windows 7 (32/64bit) or more, Display WXGA or more
Electricity consumption	+12V(Approx. 1.0A)

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X-ray spectrum meter

APN101X

NIM model

- Detector type
  SDD, SSD
- Throughput
  over 1Mcps
- Power supply
  HV(+/-4000V), Preamp
- Energy resolution
  [SSD]
  139eV@5.9keV PT6us
  250eV@5.9keV PT0.5us
  [SDD]
  125eV@5.9keV PT2μs
  145eV@5.9keV PT0.5μs
- Interface
  TCP/IP

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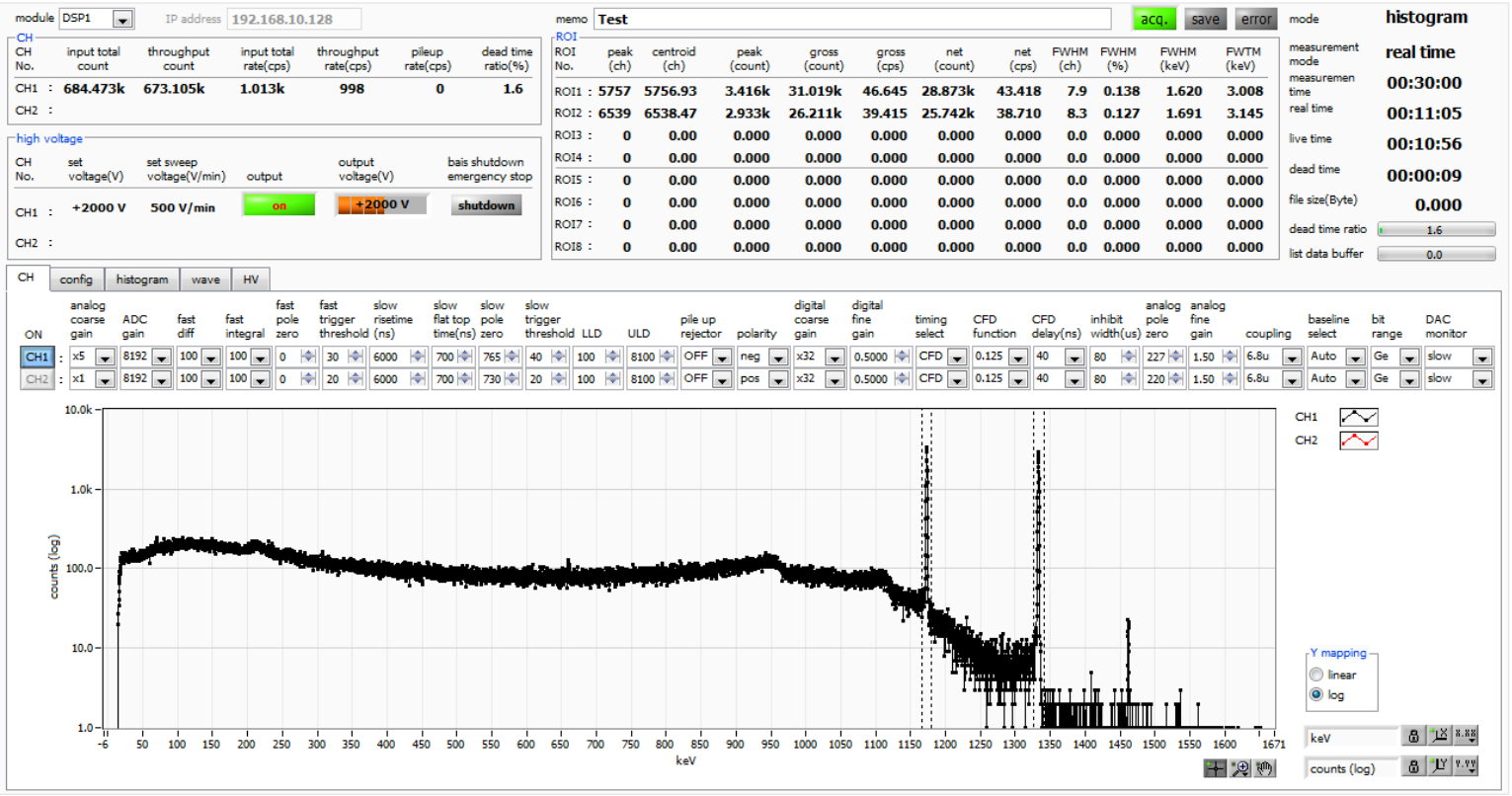
X-ray spectrum meter

NIM model

APN101X



Measurement Mode: Histogram

- **Detector**
  Semiconductor detector (Ge, CdTe, Si etc.)
  Scintillator (LaBr3(Ce), NaI (Tl), CsI (Tl) etc.)
- **Resolution**
  1.7keV@1.33MeV (Ge Semiconductor detector)
  2.8 to 3.5%@662keV (LaBr3(Ce) scintillator)
- **Measurement Mode**
  Histogram
- **Multi-function**
  Spectroscopy amp, Filter waveform output DAC

ALL-IN-ONE

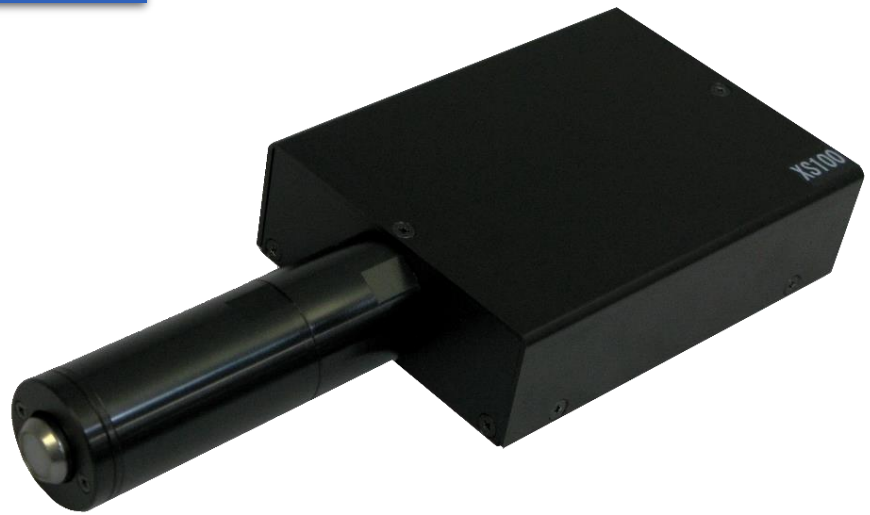
HV Power Supply

Preamplifier Power Supply

Multi Channel Analyzer

X-ray spectrum meter

XS100



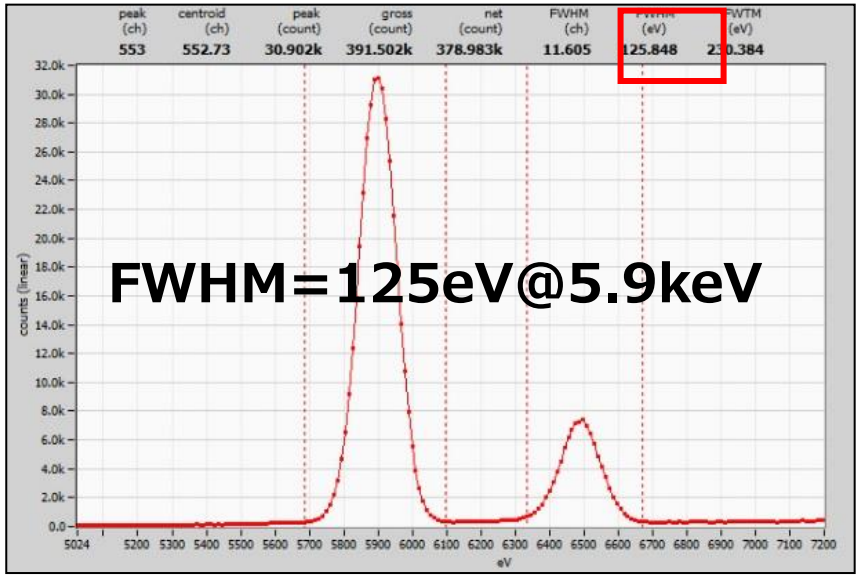
For X-ray fluorescence(XRF)

[Energy range]
2keV ～ 20keV

[Detector cooling]
Cooling by Peltier device

[Energy resolution]
125eV@5.9keV 2 us peaking time
150eV@5.9keV 0.15 us peaking time

The XS100 is X-ray spectrometer with SDD detector (30 mm^2), which is a high-resolution. XS100 was downsizing by integrated combination of SDD, DSP, high-voltage power supply and Peltier device. The pre-amplifier signal from SDD detector was carried out DSP processing by ADC (100 MHz, 14 bit) and FPGA. That data is transferred to a PC by USB connection. It was carried out transistor reset processing in an appropriate way. Therefore, it has substantially-improve the throughput.



Application (spectrum, Mn-Kα)

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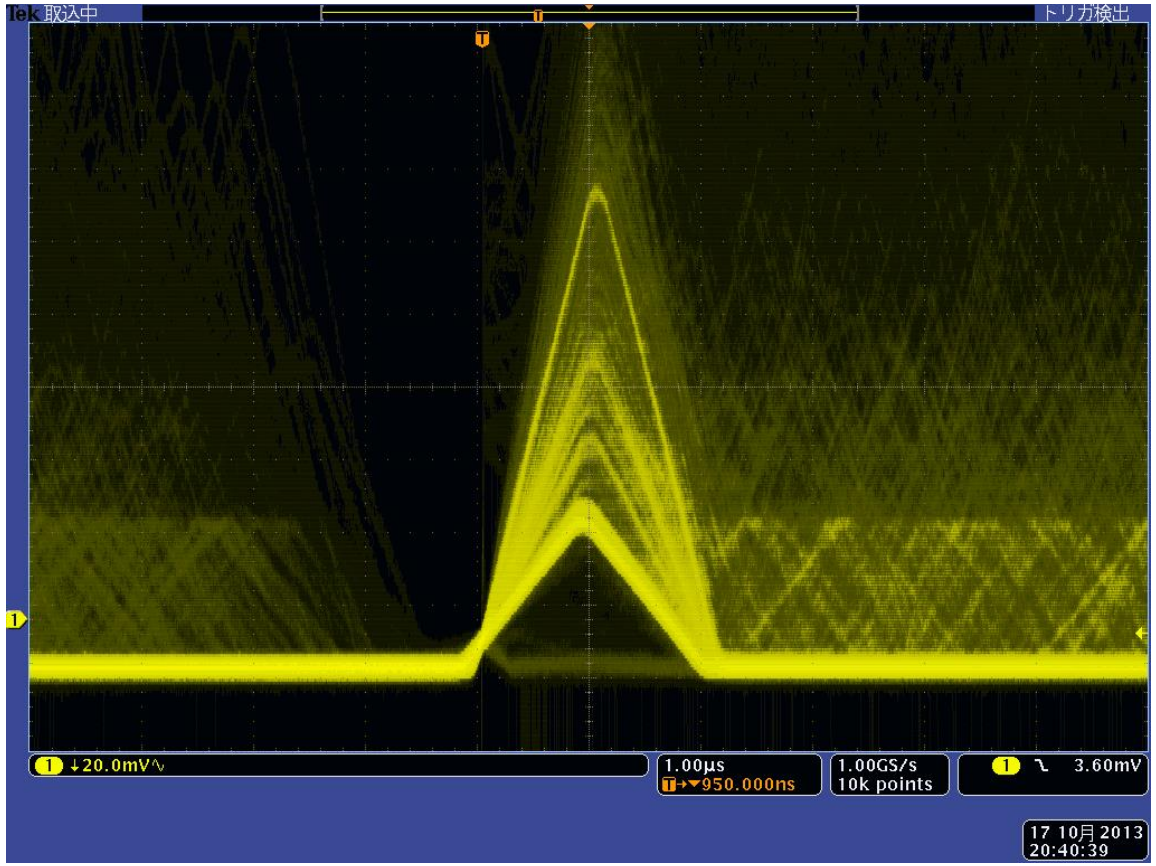
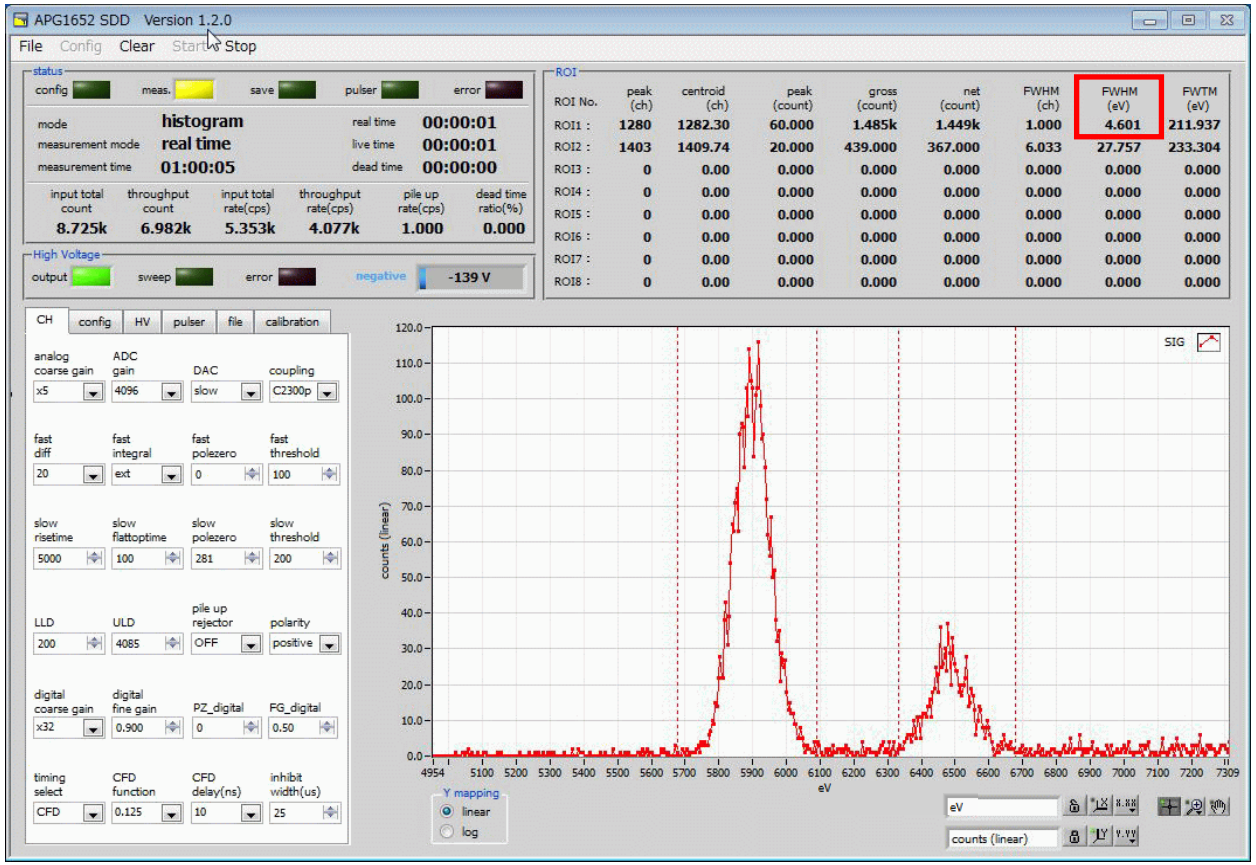
X-ray spectrum meter

XS100



DAC output of trapezoidal filter shaping
(Digital Signal Processing)



Application (spectrum, Mn-Kα)

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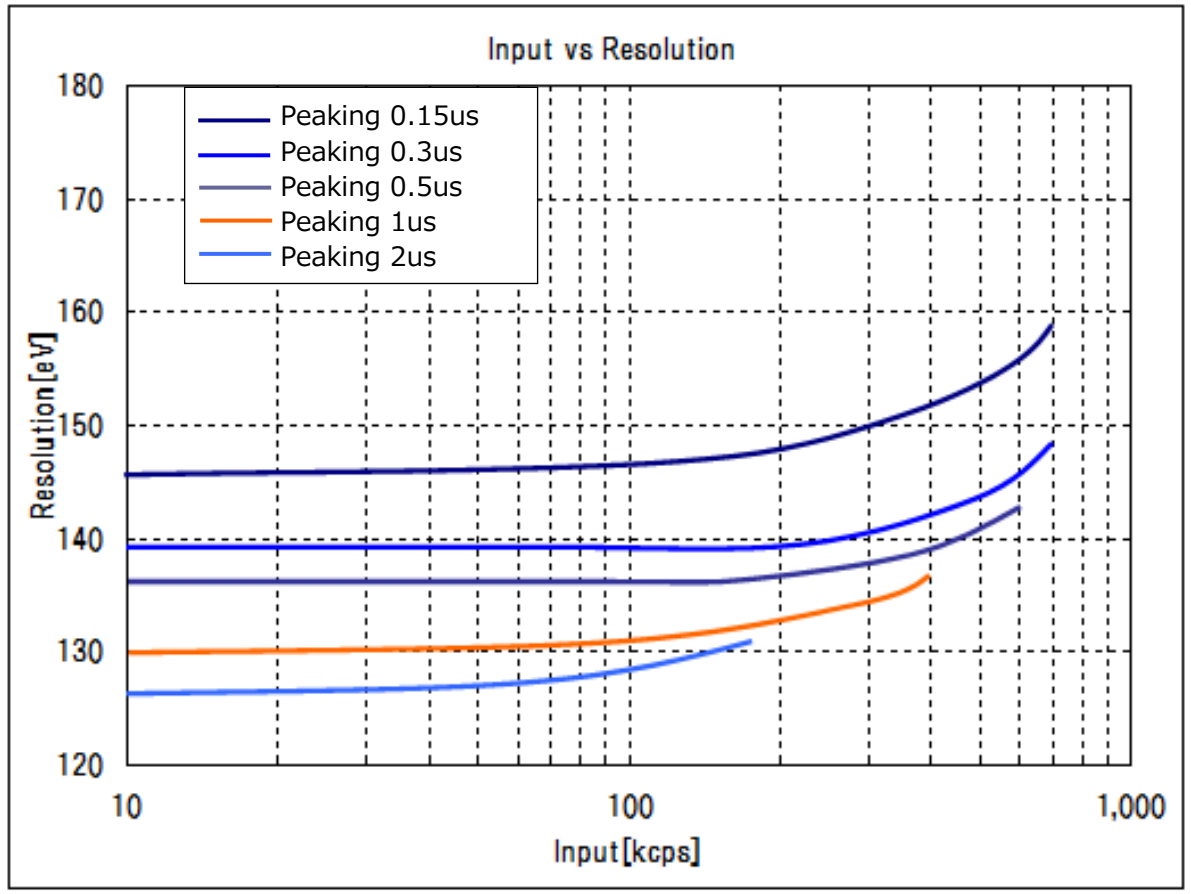
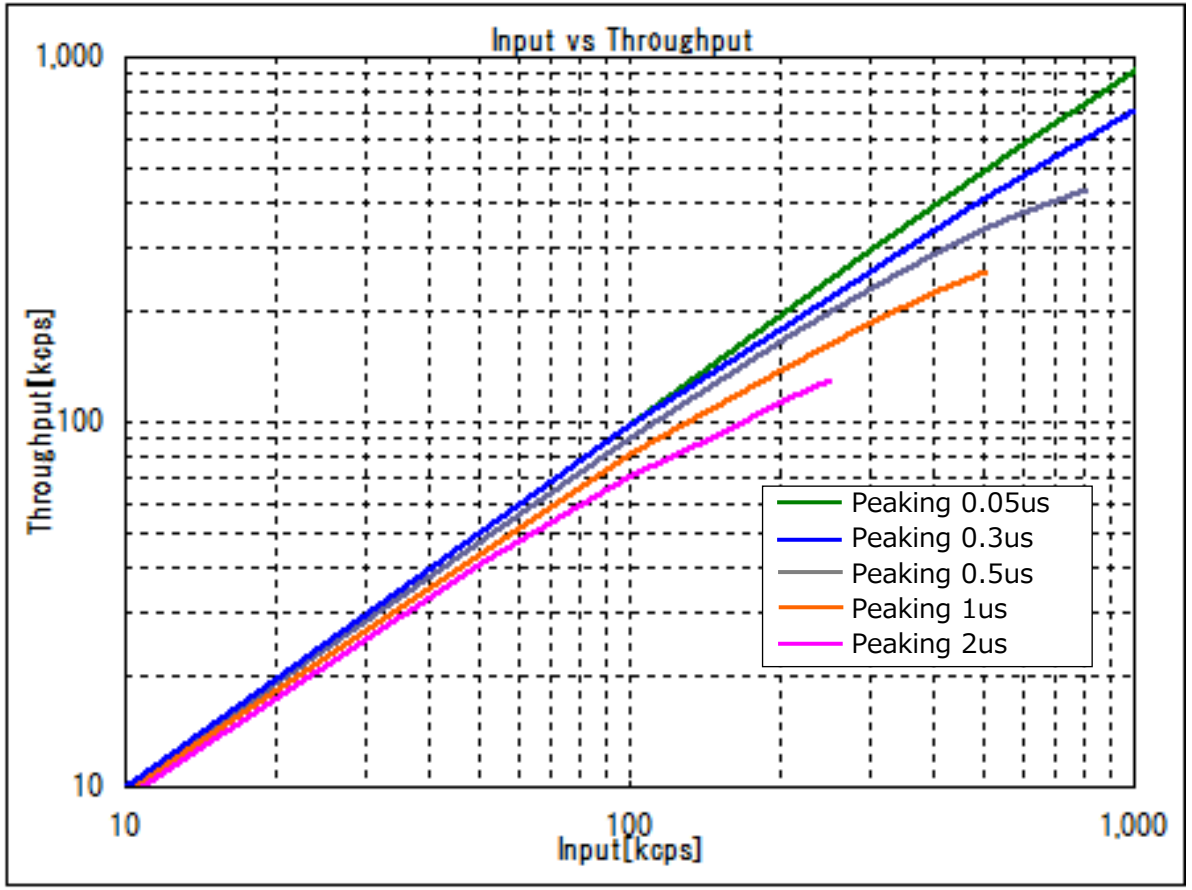
X-ray spectrum meter

XS100



Input vs Resolution



Input vs Throughput

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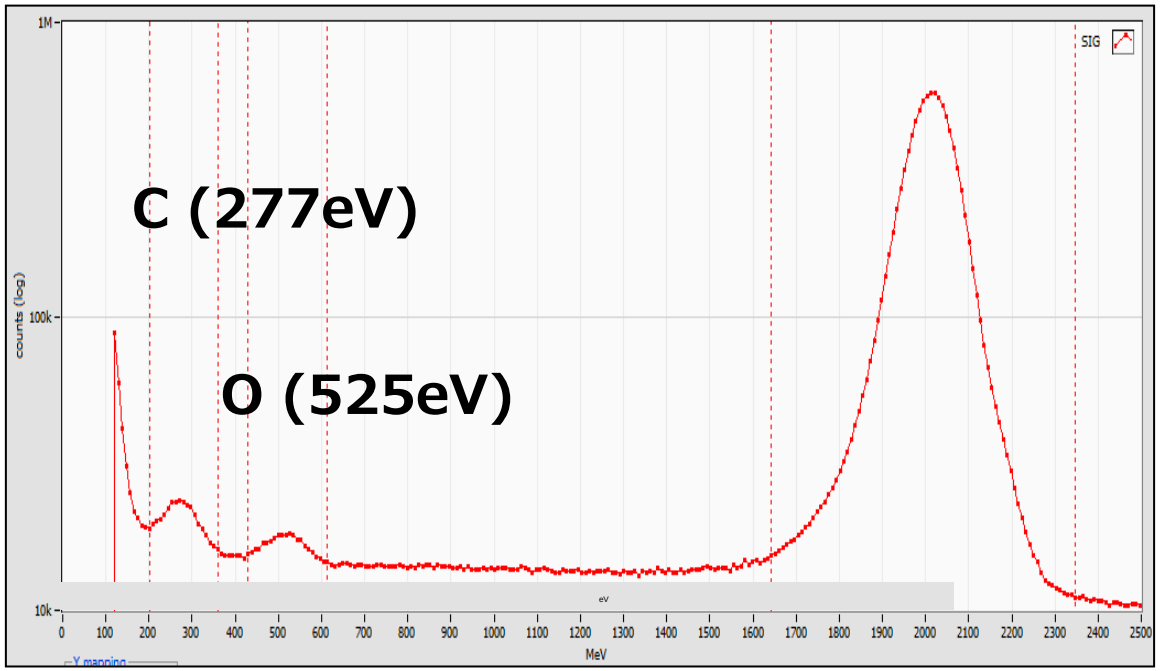
Soft X-ray spectrum meter

XS100V

For Soft X-ray measurement

CUSTOM MADE for your needs!

- Detector
  SDD (Windows less)
- Energy range
  C(277eV) ～
- Detector cooling
  Peltier device



Measurement of Soft x-ray(C & O)

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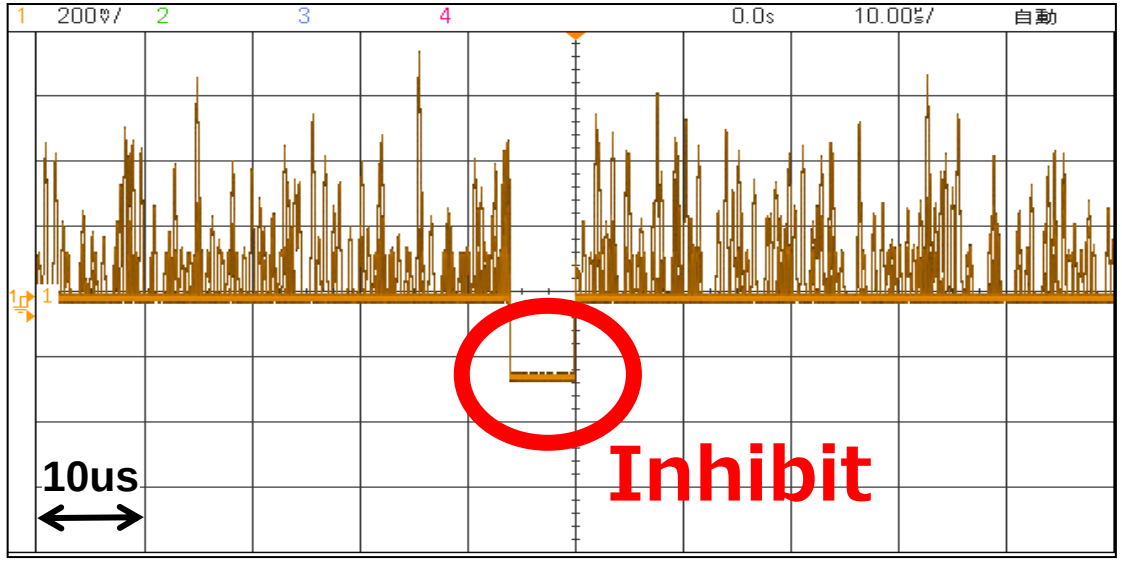
Soft X-ray spectrum meter

XS100V



Transistor Reset Processing

Detector	SDD 65mm^2 collimated to 50mm^2, Windows-less
Detector cooling	Cooling by Peltier device
ADC sampling	100MHz, 14bit
ADC gain	4096, 2048, 1024, 512, 256ch
Energy resolution	125eV@5.9keV MnKα 10kcps ： 2us Peaking time※1 150eV@5.9keV MnKα 300kcps ： 0.05us Peaking time※1
Throughput	Max. 150kcps ： 2us Peaking time Max. 1250kcps ： 0.05us Peaking time
Measurable Element	C (Carbon) ～
Vacuum Degree	10^{-5} Pa
Interface	USB2.0 or Ethernet
Back panel	Monitor output terminal, TTL（SCA） output terminal, VETO input terminal, DC power socket, miniUSB connector, Power LED monitor
External dimensions	80(W) × 400(D) × 40(H) *Unit: mm
Weight	About 1100g
Accessory	AC adapter, USB cable, Application

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Digital Signal Processor for X-ray Spectroscopy

APN504 GbE

Analog input	4CH, LEMO 00 series connector, Input impedance 1kΩ
Coarse Gain	x 2, x 4, x 10, x 20
Fine Gain	X 0.5 ～ x 1.5
ADC	Input signal ±1V, Sampling 100MSPS, Resolution 14bit
ADC Gain	4096, 2048, 1024, 512, 256ch
Trapezoidal Filter	0.05～12 μs
Digital Signal Processing	Baseline Restorer, Pileup Rejecter, CFD *All parameters setting by PC.
Quick scan mode	Minimum time distance 10ms Data Size: 32768byte (= 2byte × 4CH × 4096ch)
External terminal	Filter waveform output, Clock input, GATE (Trigger) input, VETO input, Clear input
Interface	Gigabit Ethernet (TCP/IP)
External Dimensions (Unit: mm)	NIM1U 34(W) x 221(H) x 249(T) (Without connector)
Weight	About 900g

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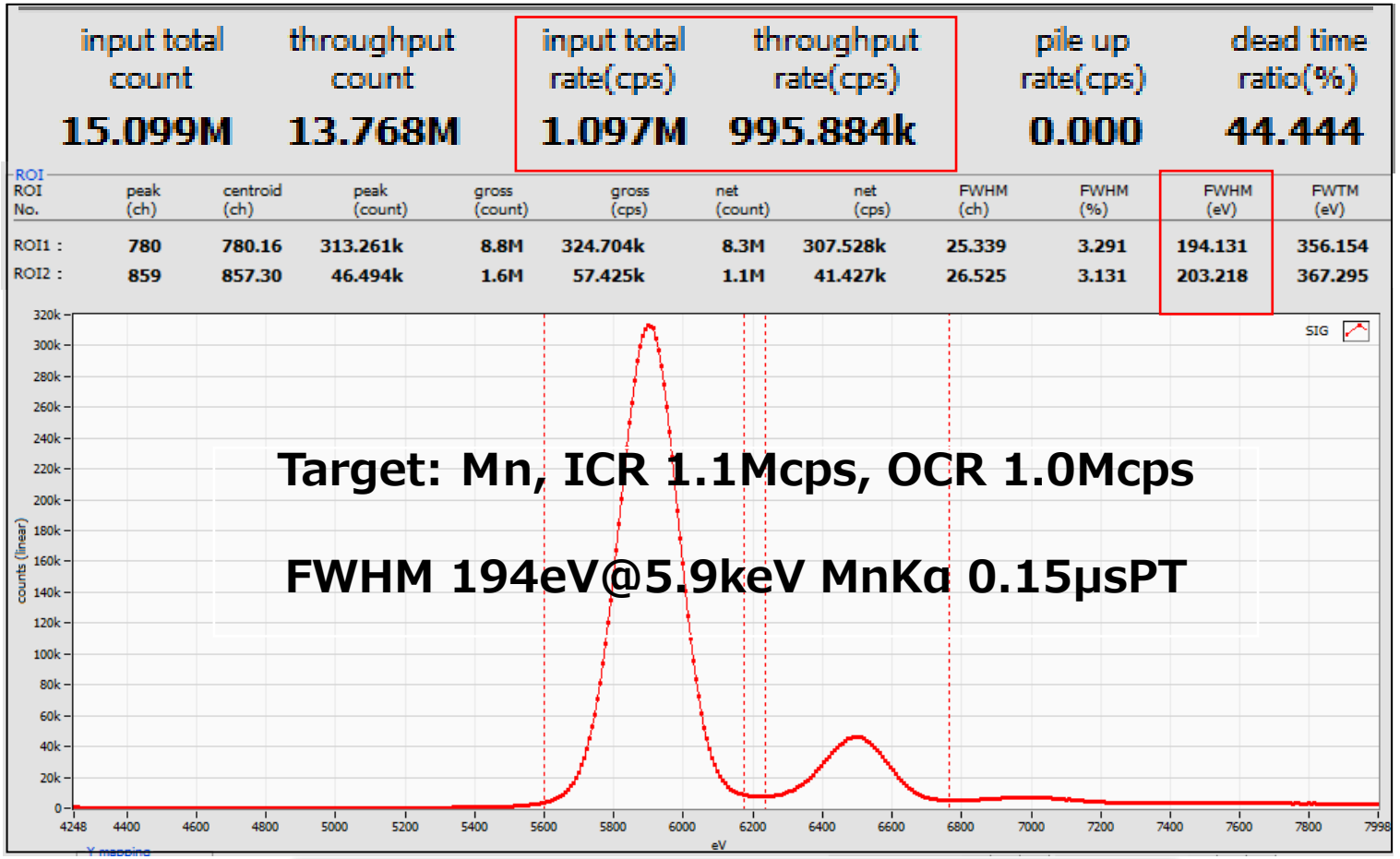
Digital Signal Processor for X-ray Spectroscopy

APN504 GbE

Quick XAFS



Emitted light exposure examination

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- Channel: 4CH simultaneous sampling
- Throughput: 1Mcps and more
- Measurement Mode: Histogram, List
- External: NIM1U
- Resolution

  [In the case of 19 elements SSD]

  @5.9keV 139 eV 6 μs Peaking time

  @250eV 0.5μs Peaking time

  *Comparable Analog 0.25μs

  [In the case of SDD] *High-resolution type

  125eV2μs Peaking time

  145eV 0.5μs Peaking time

  *Comparable Analog 0.25μs
- Multi function

  Spectroscopy amp, Timing filter amp, CFD,

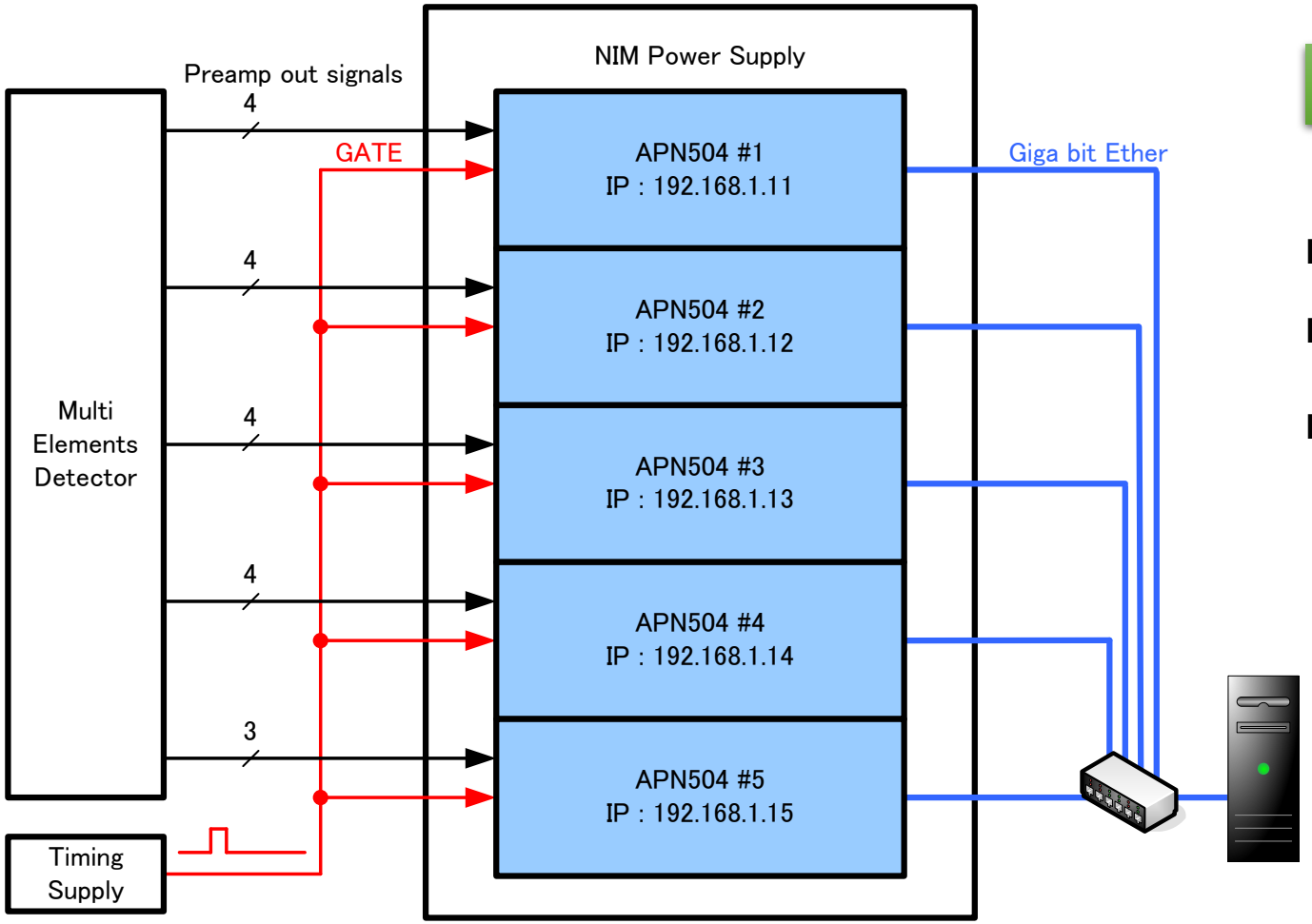
  Input and filter waveform output DAC
- Interface: TCP/IP, Gigabit Ethernet

  Data transfer 20MByte/sec and more

  *List mode

Digital Signal Processor for X-ray Spectroscopy

APN504 GbE



Quick scan data example

Event#1(10ms)	CH1 4096ch	CH2 4096ch	CH3 4096ch	CH4 4096ch
Event#2(20ms)	CH1 4096ch	CH2 4096ch	CH3 4096ch	CH4 4096ch
Event#N(10*Nms)	CH1 4096ch	CH2 4096ch	CH3 4096ch	CH4 4096ch

- Quick scan — 10ms(min.) interval
  4096ch *16bit *4CH / Event
- Interface — Giga bit Ether TCP/IP and UDP

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Digital Signal Processing for X-ray

APV8004X

- Energy resolution
  - [SSD with 19 elements]
    - 139eV@5.9keV: 6μs Peaking Time
    - 144eV@5.9keV: 4μs Peaking Time
    - 250eV@5.9keV: 0.25μs Peaking Time
  - [SDD]
    - 125eV@5.9keV: 2μs Peaking Time
- Throughput: 1Mcps and more
- Measurement Mode: Histogram, List
- Option: TTL output of ROI-SCA

For SSD with 19 elements

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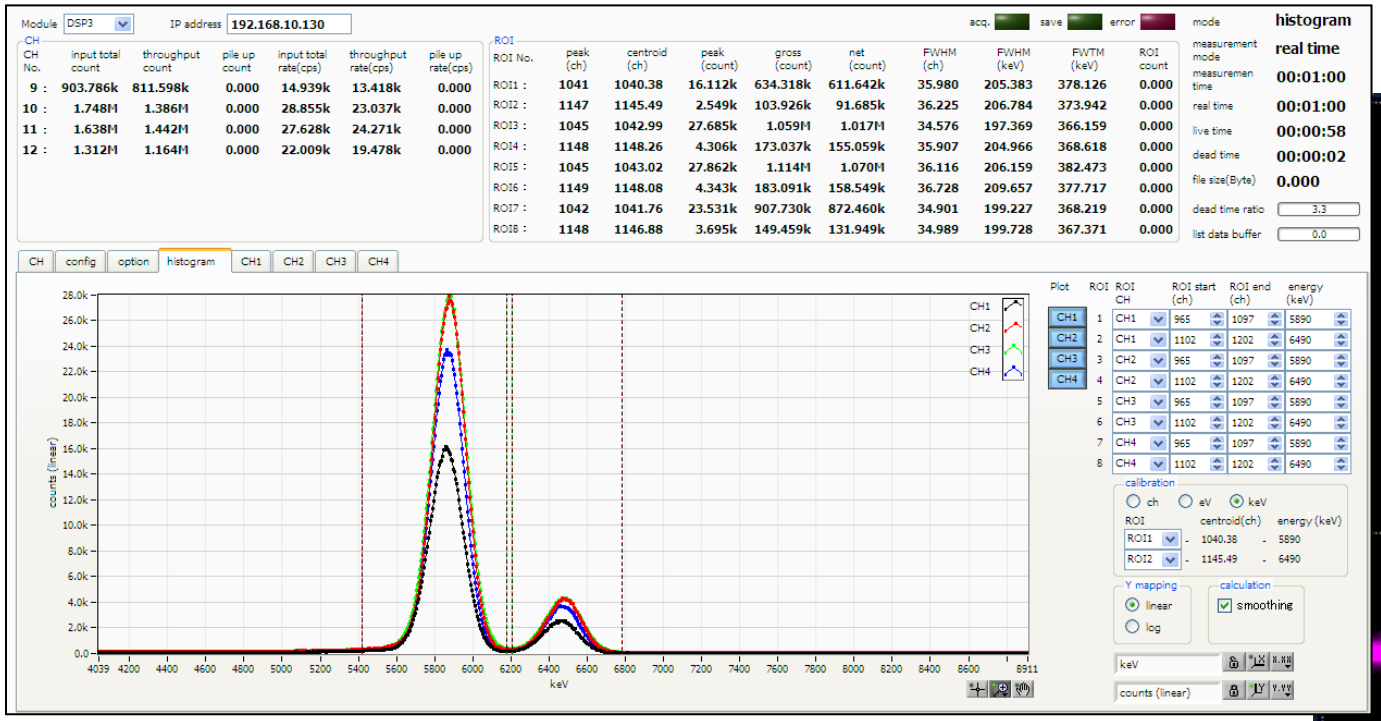
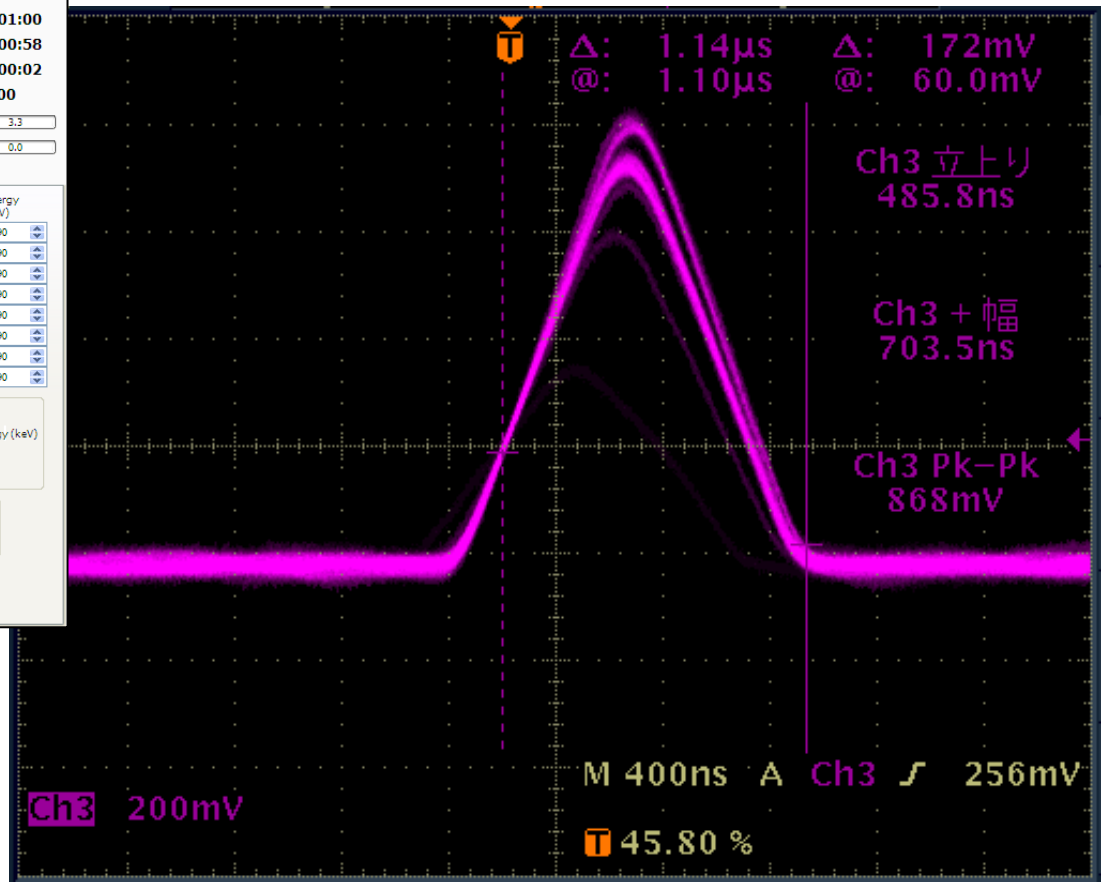
Digital Signal Processing for X-ray

APV8004X



Application



Monitor of Trapezoidal filter

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7 element **SDD** system for fluorescence X-ray

XSDD50-07

- Element area
  455mm² (65mm² x 7 elements)
- Effective area
  350mm² (65mm² Collimated to 50mm² x 7 elements)
- Function
  Histogram, List, Waveform, ROI-SCA
- ADC
  4CH 100Msps 14bit
- Energy Resolution
  244eV@5.9keV MnKα
  Peaking time 0.25μs, 1000kOCR
- Power Supply for SDD
  -200V, ±5V, +3.3V
- Interface
  Ethernet (TCP/IP)

DSP & Power supply

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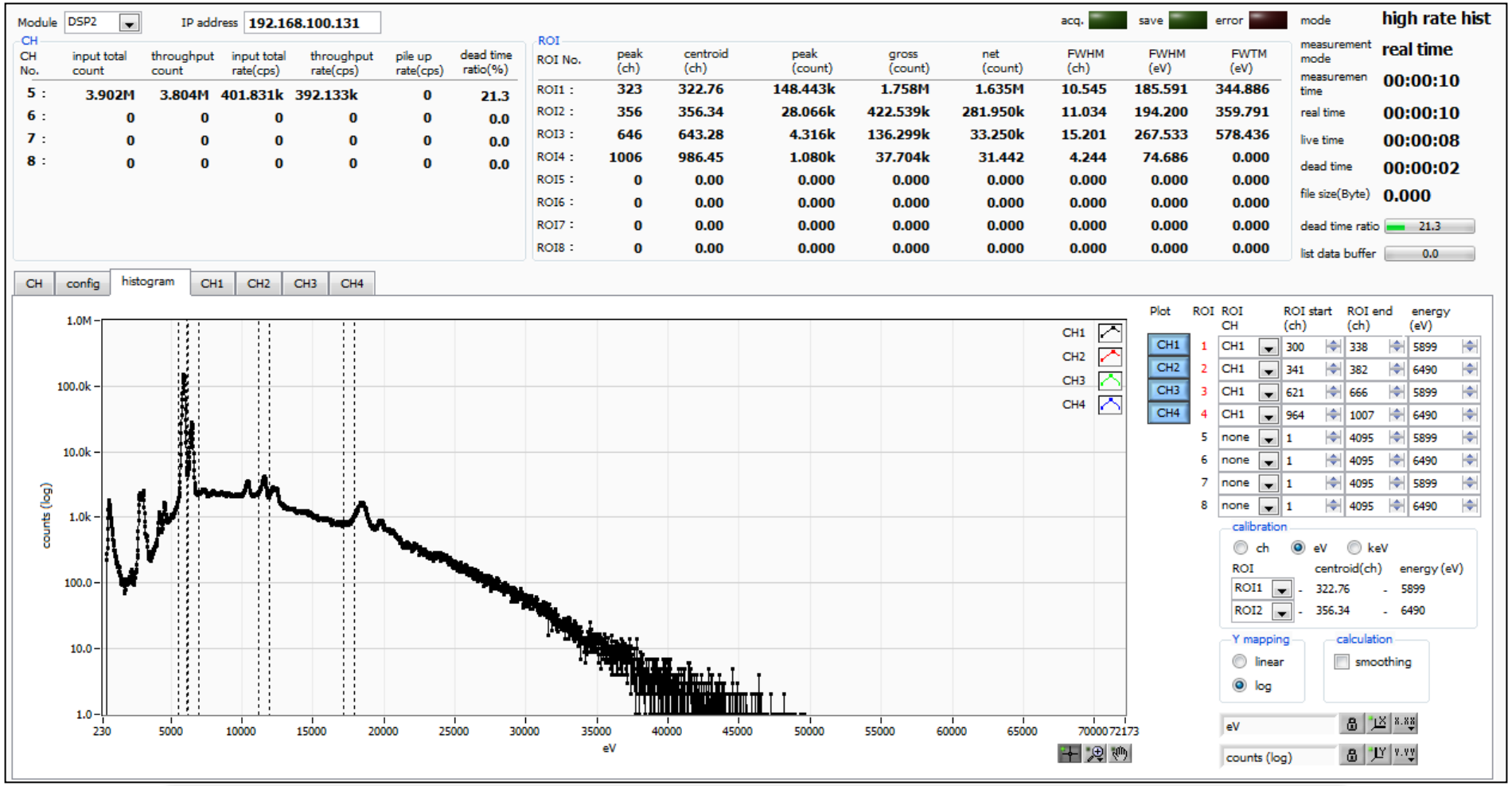
7 element **SDD** system for fluorescence X-ray

XSDD50-07



400k ICR 185eV@5.9keV 0.25μs Peaking Time

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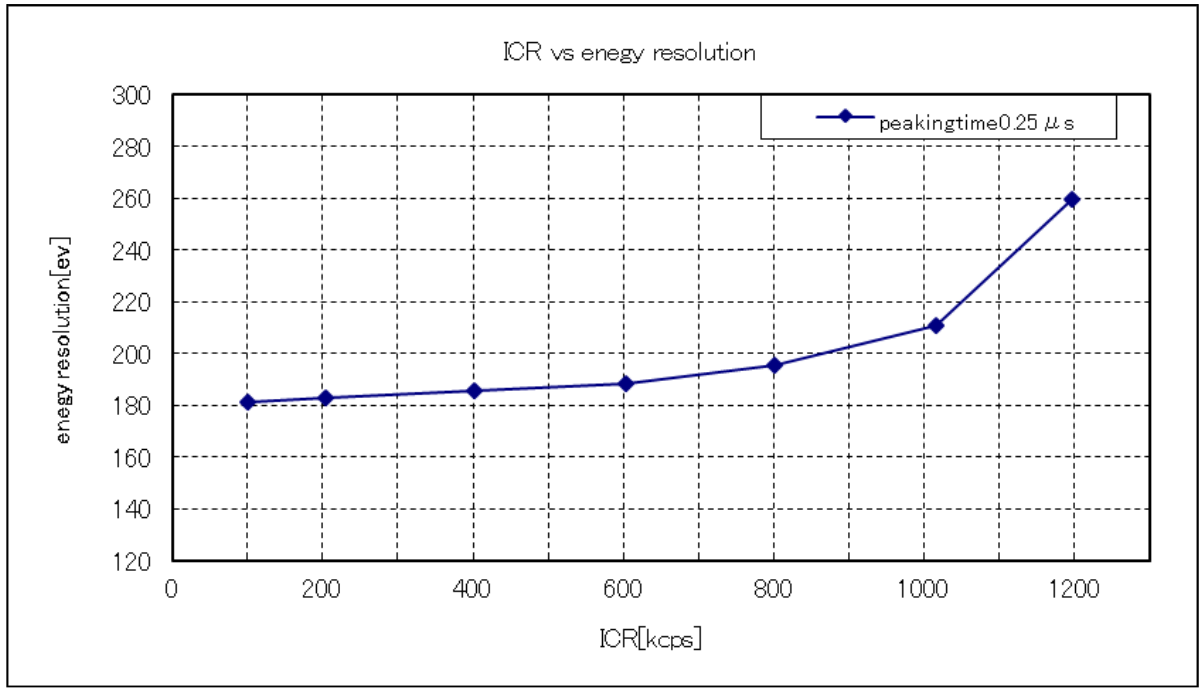
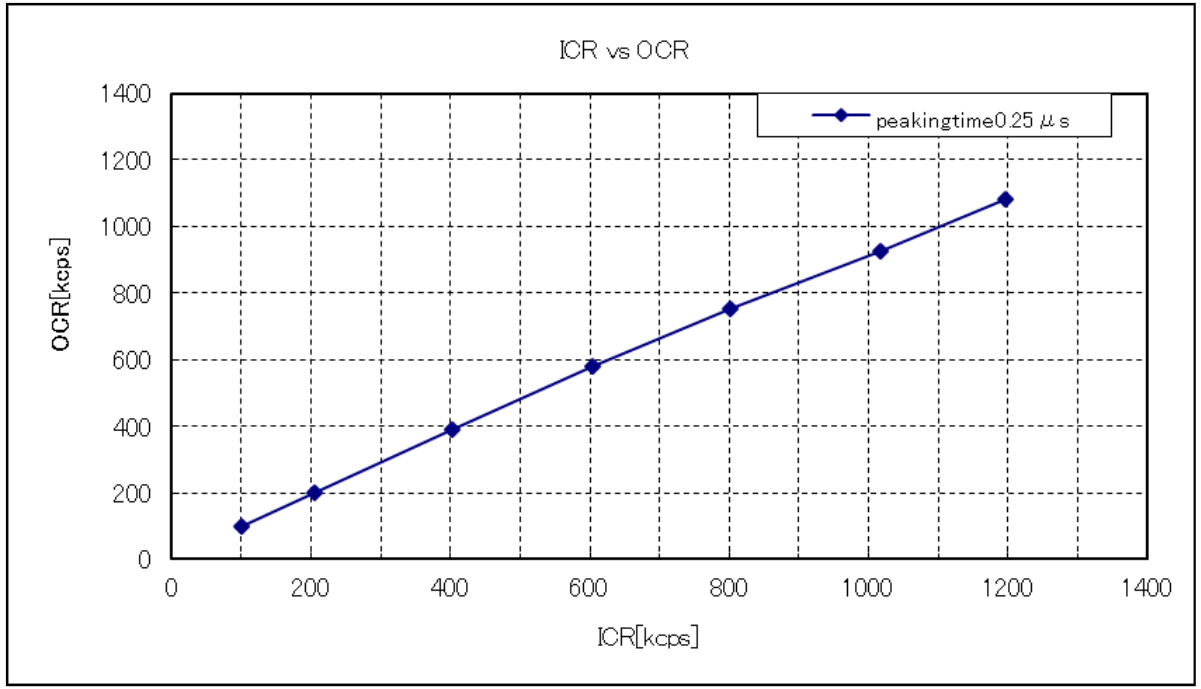
7 element **SDD** system for fluorescence X-ray

XSDD50-07



ICR vs Energy Resolution



ICR vs OCR

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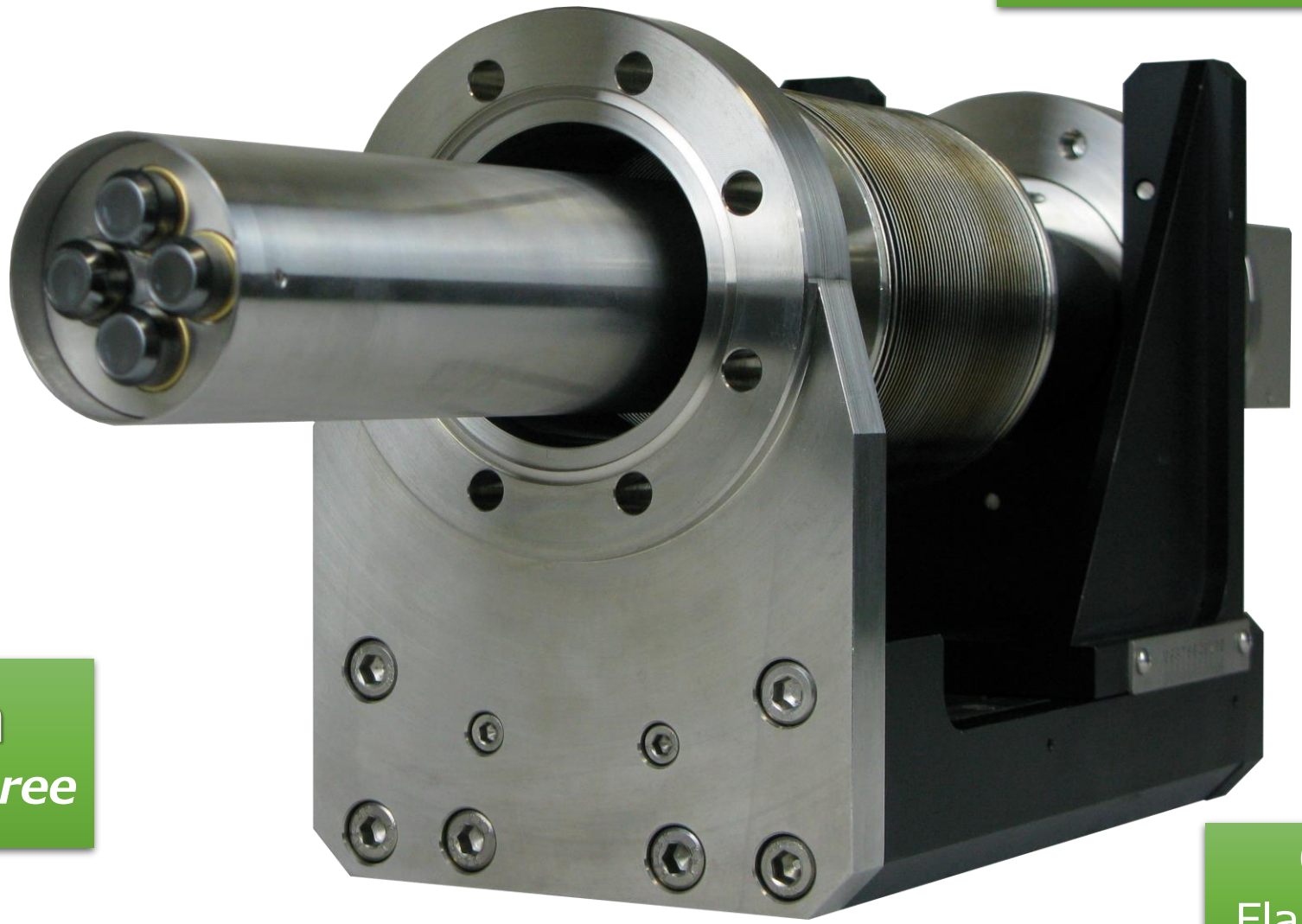
4 element **SDD** for X-ray

XSDD50-04

Selectable
Active Area: 30mm^2 / 50mm^2
Window: Be / AP3.3 / Window-less



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10^{-5} Pa
Vacuum Degree

Customizable
Flange type / Tube size

*Images is for illustration purpose.
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4 element **SDD** for X-ray

XSDD50-04

Detector	SDD 50mm^2, Window-less / AP3.3 / Be
Element area	260mm^2 (65mm^2 × 4 element)
Active area	200mm^2 (65mm^2 collimated to 50mm^2 × 4 element)
Measurement mode	Histogram / List / Waveform / ROI-SCA
ADC sampling	4CH 100Msps 14bit
Energy resolution (typ.)	244eV@5.9keV MnKα *Peaking time: 0.25μs, 1000kOCR
SDD power supply	-200V, ±5V, +3.3V
Throughput	Max. 150kcps : 2us Max. 1000kcps : 0.15us
Interface	Ethernet (TCP/IP)
Option	Z-axis movement mechanism, UHV valve
Vacuum capable	<10^{-5} Pa
Flange type	ICF114 (Standard)
Accessory	Software, Instruction Manual

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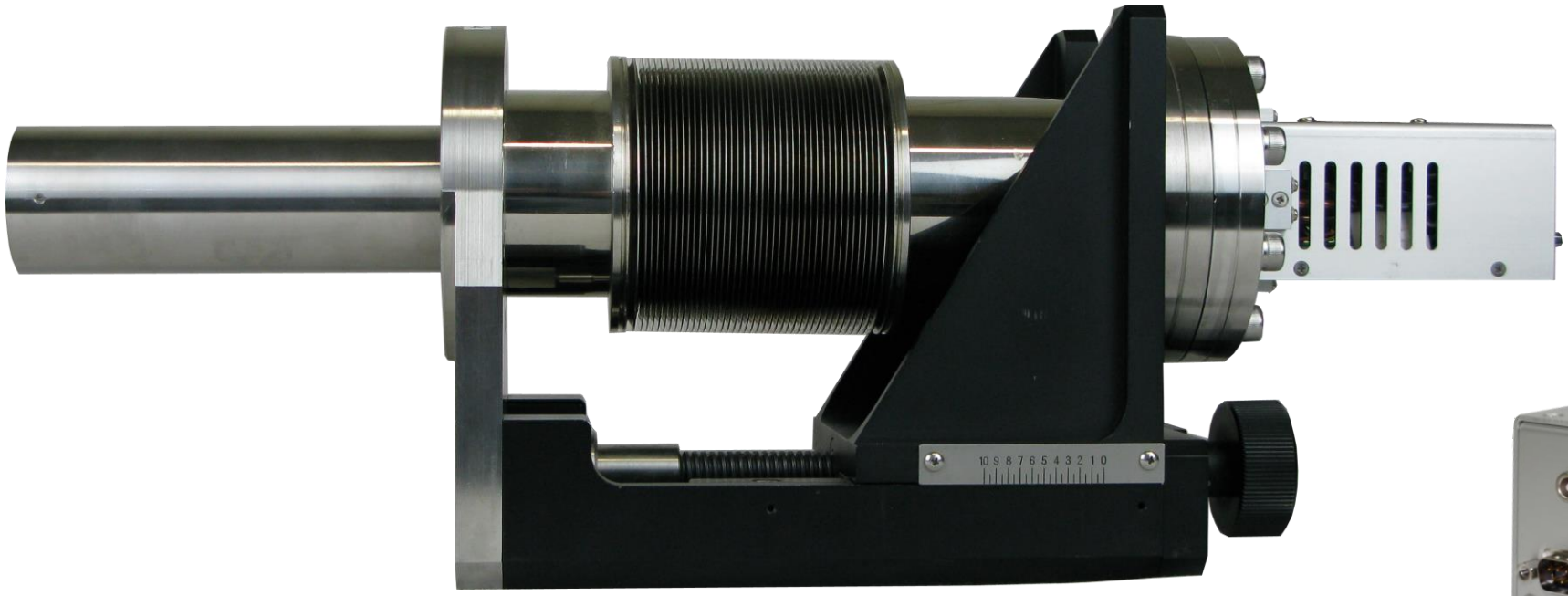
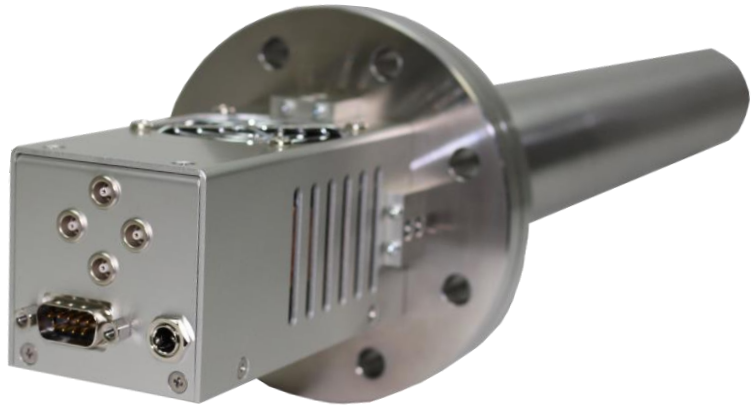
4 element **SDD** for X-ray

XSDD50-04

10^{-5} Pa
Vacuum Degree



Transport with bellows



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1 element **SDD** for X-ray

XSDD50-01

Selectable
Active Area: 30mm^2 / 50mm^2
Window: Be / AP3.3 / Window-less

10^{-5} Pa
Vacuum Degree

Customizable
Flange type / Tube size

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1 element **SDD** for X-ray

XSDD50-01

Detector	SDD 50mm^2, Window-less / AP3.3 / Be
Element area	65mm^2
Active area	65mm^2 collimated to 50mm^2
Measurement mode	Histogram / List / Waveform / ROI-SCA
ADC sampling	100Msps 14bit
Energy resolution (typ.)	125eV@5.9keV 2us 150eV@5.9keV 0.15us
SDD power supply	-200 V , ±5V, +3.3V
Throughput	Max. 150kcps: 2us Max. 1000kcps: 0.15us
Interface	Ethernet (TCP/IP)
Option	Z-axis movement mechanism, UHV valve
Vacuum capable	<10^{-5} Pa
Flange type	ICF70 （Standard）

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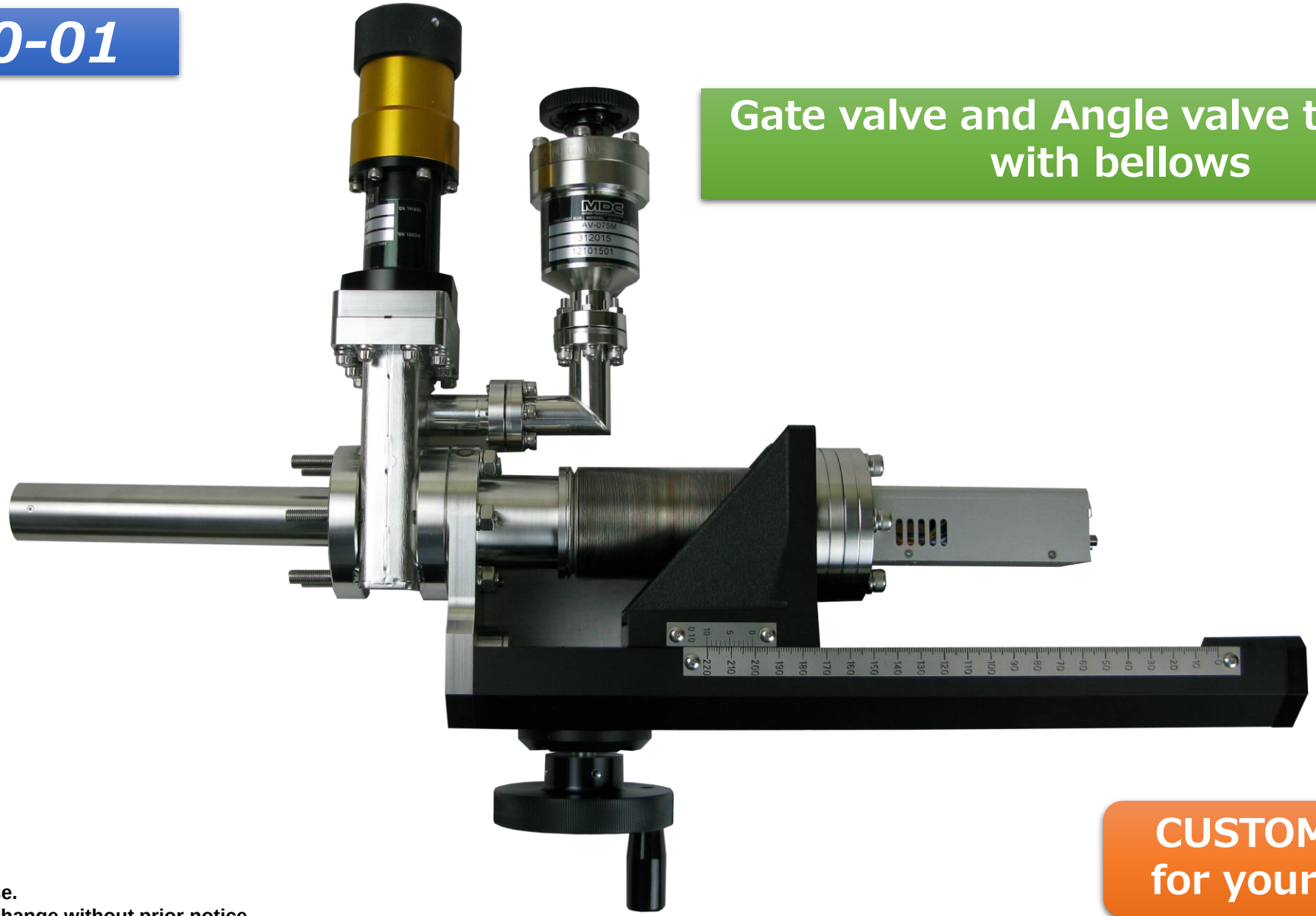
1 element **SDD** for X-ray

XSDD50-01



Gate valve and Angle valve transport with bellows

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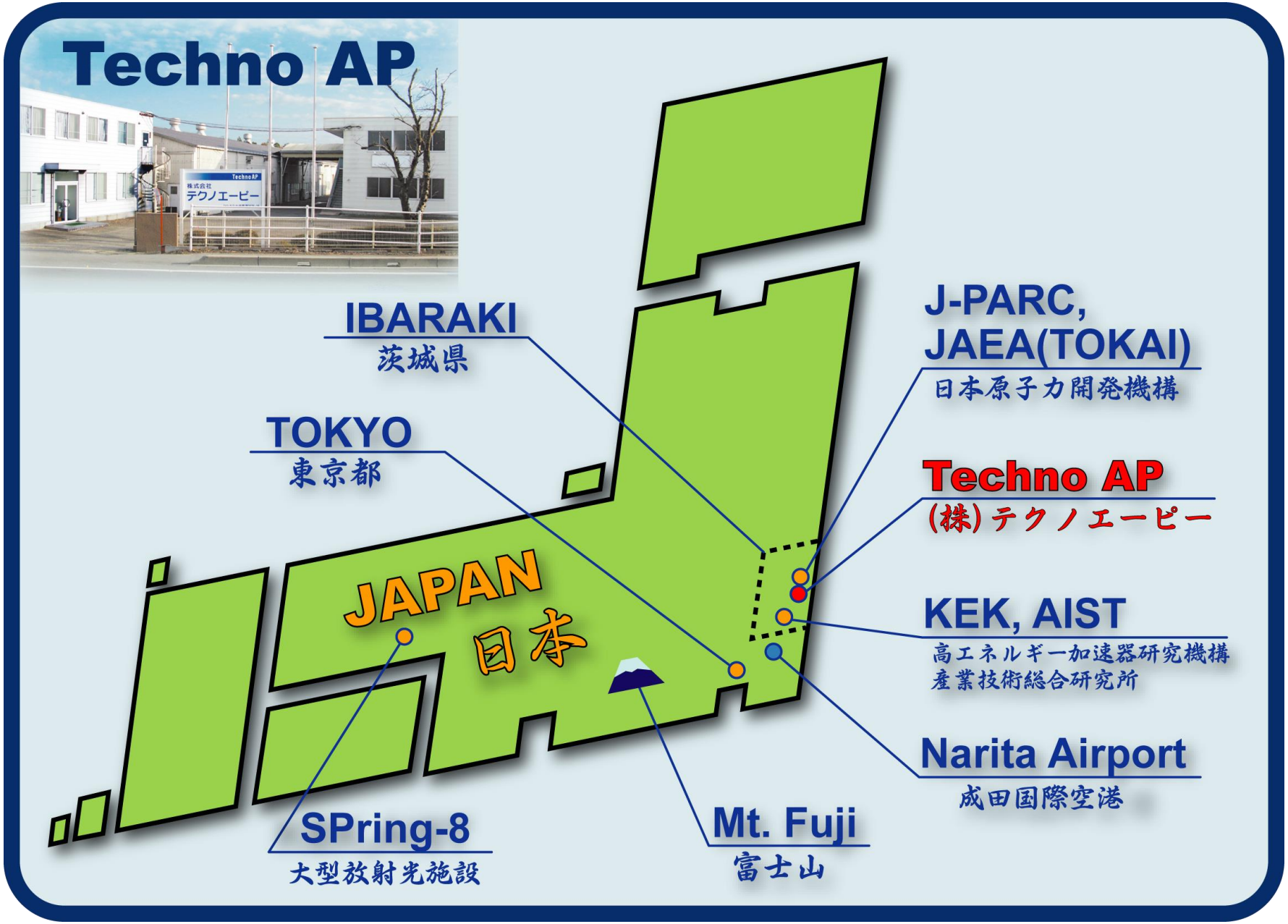
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