

X-RAY PRESENTATION

BNC - Princeton Division
Berkeley Nucleonics

X-Ray Innovations

- **First multi-elemental detector arrays.**
- **First lithium-drifted silicon (Si(Li)) x-ray detector interfaced to a scanning electron microscope (SEM).**
- **First digital beam control of a SEM for energy dispersive spectroscopy (EDS).**
- **First computer-based microanalysis system.**
- **First digital processor for microanalysis.**
- **First hardware-based spectrum imaging.**
- **First light-element silicon drift detector (SDD).**

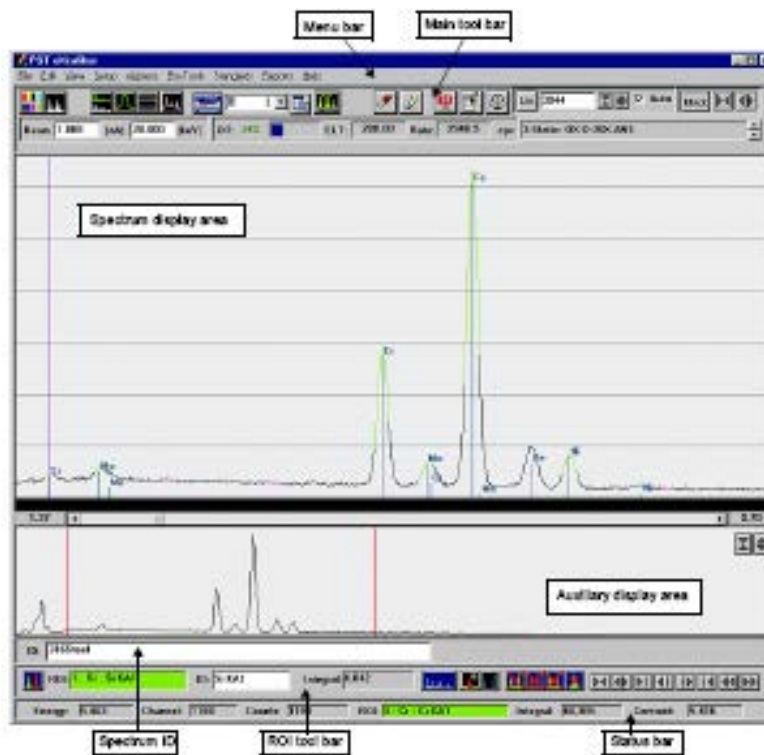
Products



Detectors

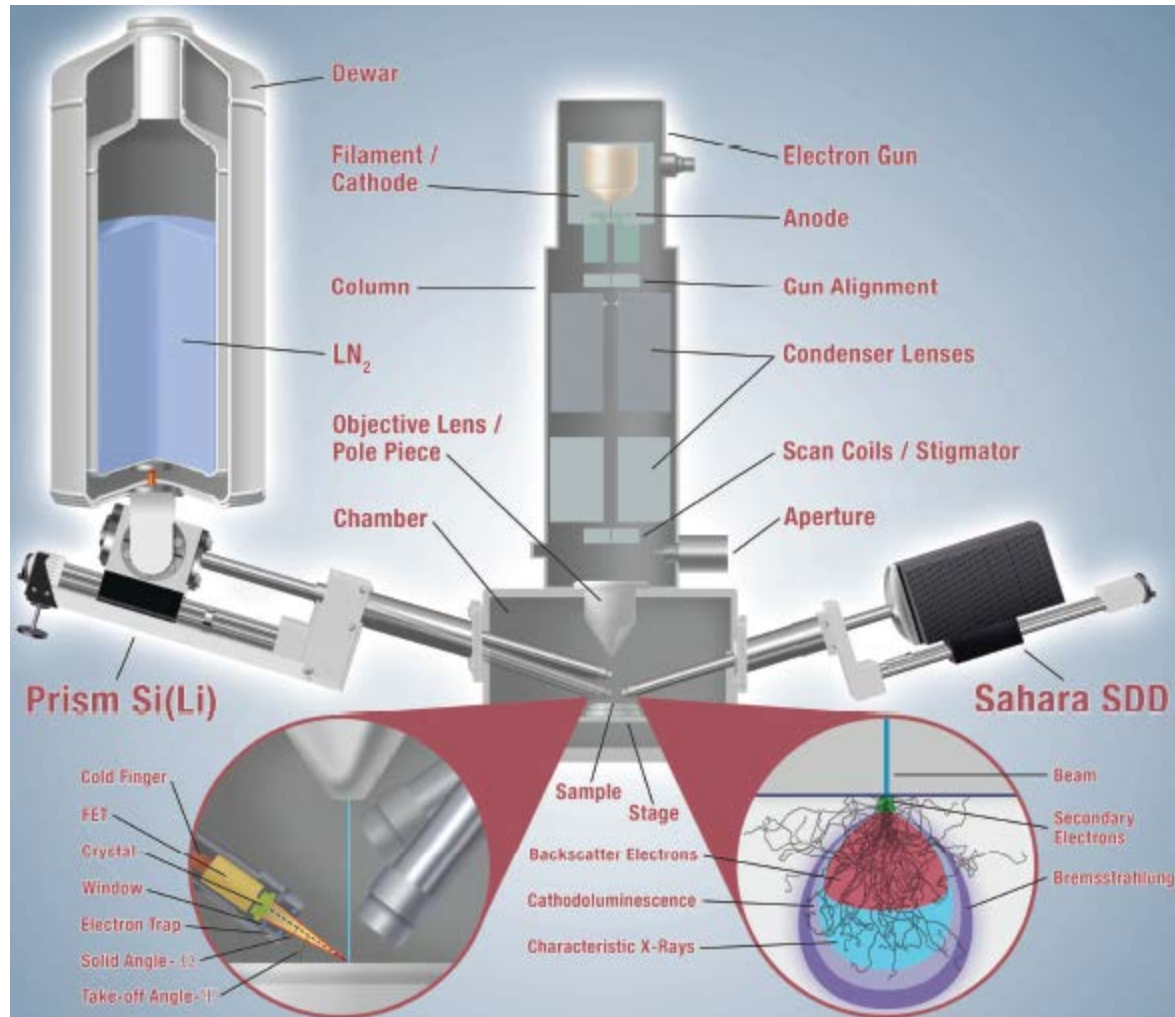


Electronics



Software

X-Ray Microanalysis

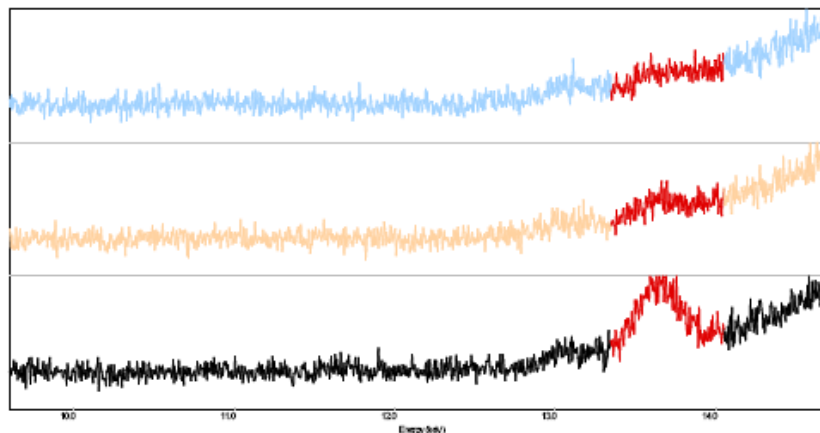
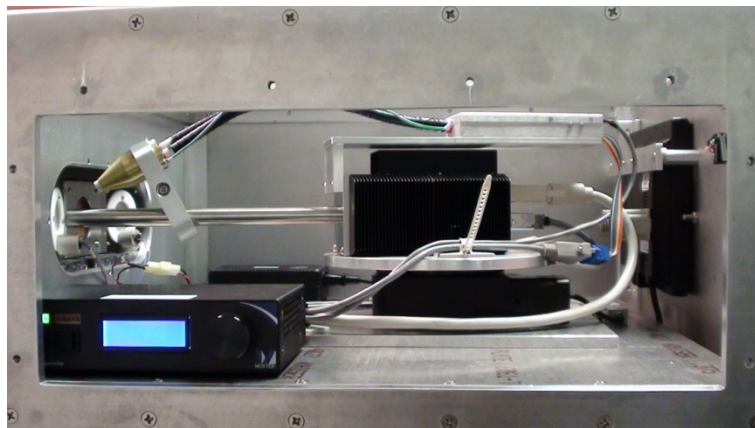


Berkeley Nucleonics

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X-Ray Fluorescence



**XRF analysis of processed ores from
uranium refinery**

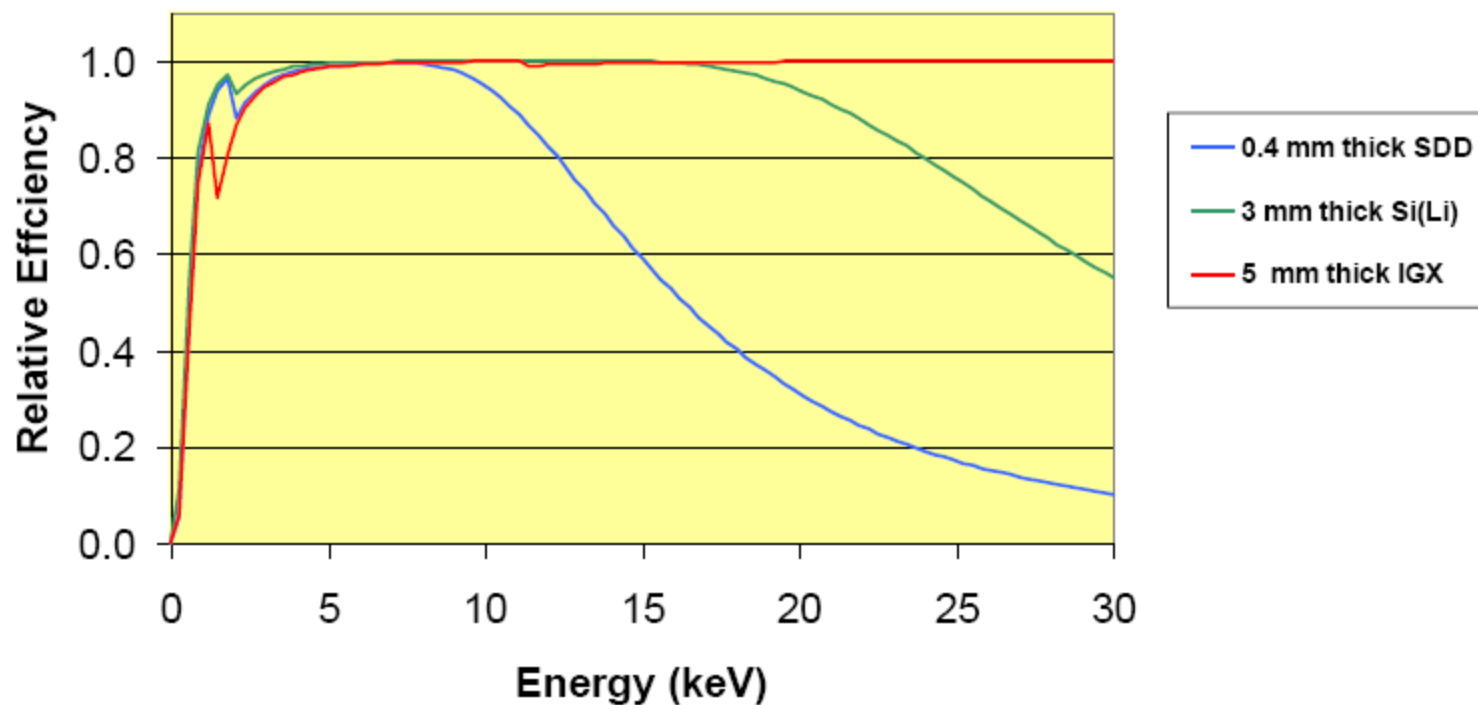
Zero uranium levels

1 part-per-million

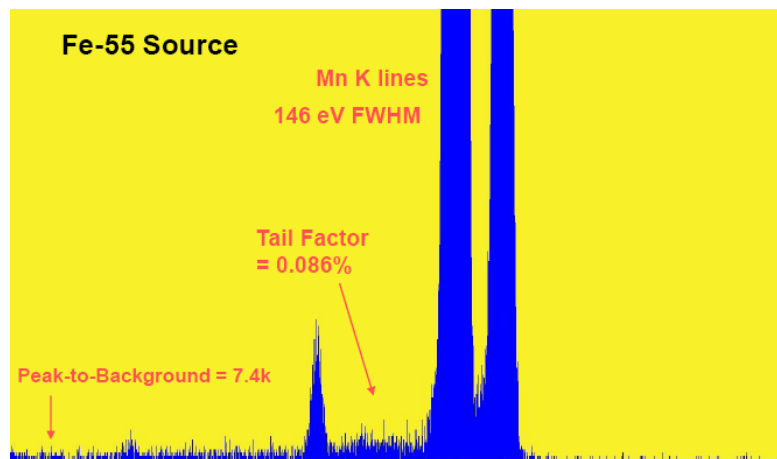
10 parts-per-million

*Results taken with 30mm² SDD x-ray
detector with Ag-targeted x-ray tube*

Detectors

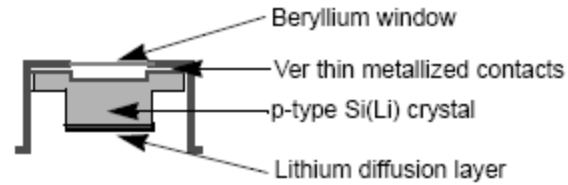


X-Ray Spectra



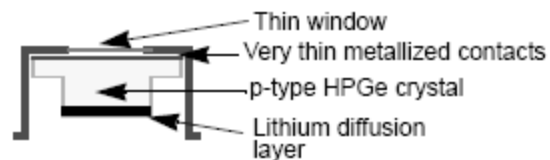
Specifications	Si(Li)	IGx	SDD
Area	10mm ²	10mm ²	10mm ²
Temperature	-196°C	-196°C	-20°C
Resolution	129eV	115eV	129eV
PB Ratio	5,000	7,000	10,000

Lithium-Drifted Silicon



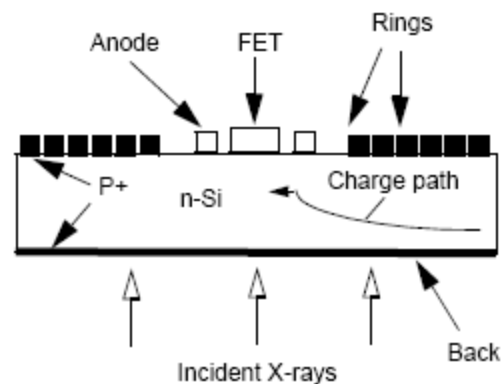
Area (mm ²)	Thickness (mm)	Resolution (eV)
10	3	129
30	5	135
60	3	148
80	3	155

Intrinsic Germanium



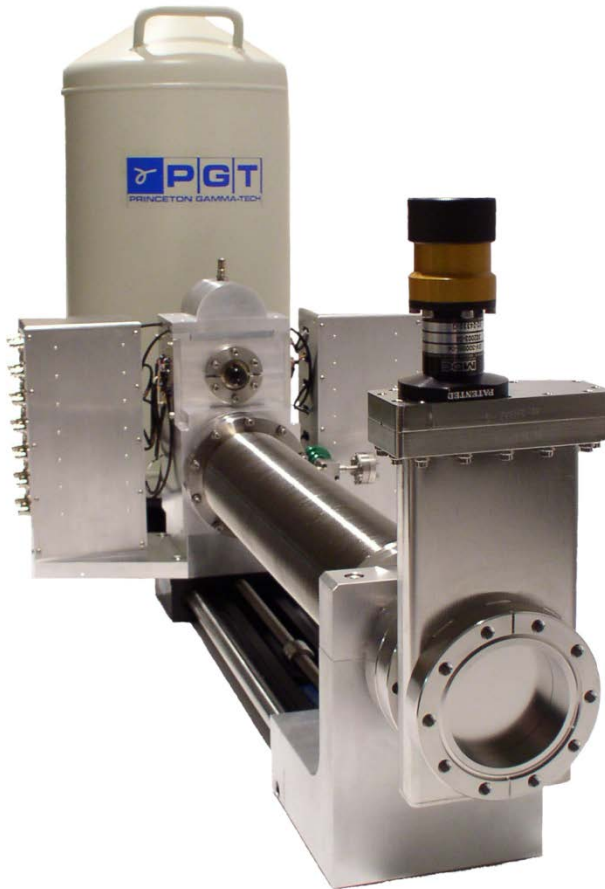
Area (mm ²)	Thickness (mm)	Resolution (eV)
10	3	115
30	5	125
50	5	129
100	10	138

Silicon Drifted Detector



Area (mm ²)	Thickness (mm)	Resolution (eV)
10	0.4	129
30	0.4	135
100	0.4	145

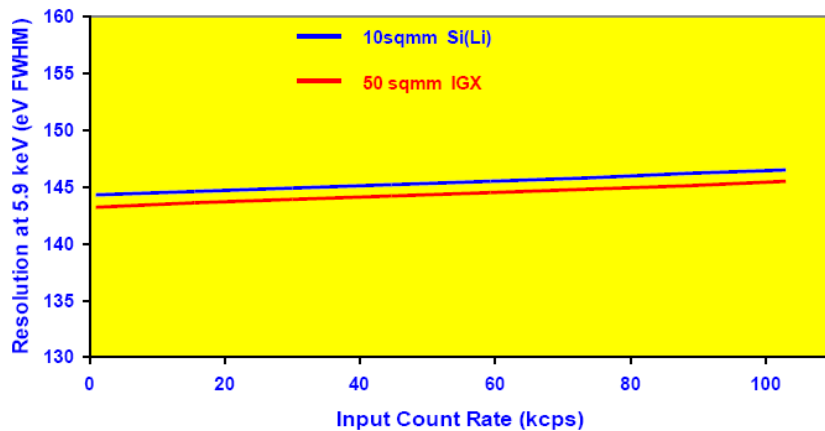
Multi-Element Array



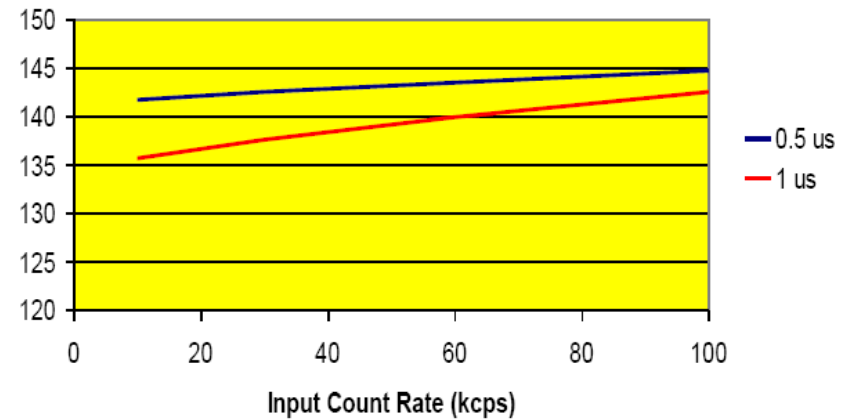
- Custom configured from individual Si(Li), IGx and SDD elements.
- Shielded internal wiring to reduce electrical cross-talk interference.
- Preamp circuits for each detector elements.

Throughput Resolutions

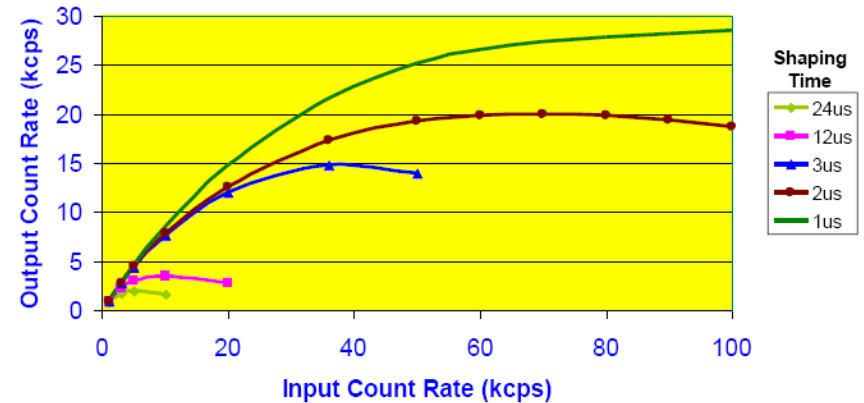
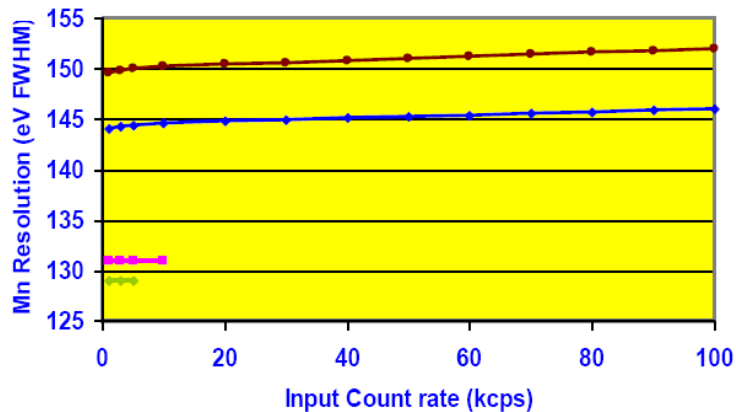
Resolution vs Input Count Rate at 3 μ s shaping
for 50 sqmm IGX compared to 10 sqmm Si(Li)



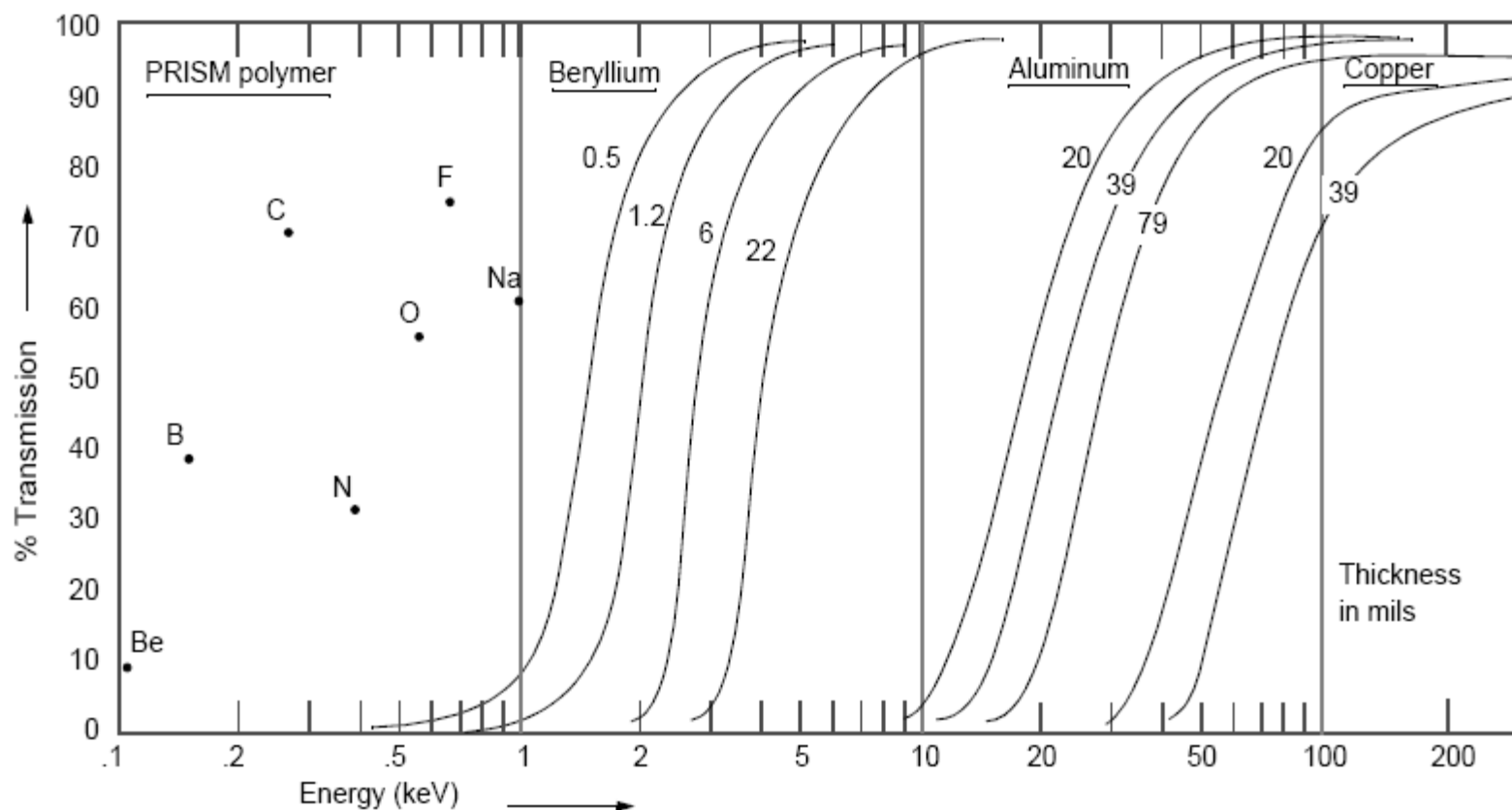
10 mm² Standard SDD
Resolution vs Input Count Rate



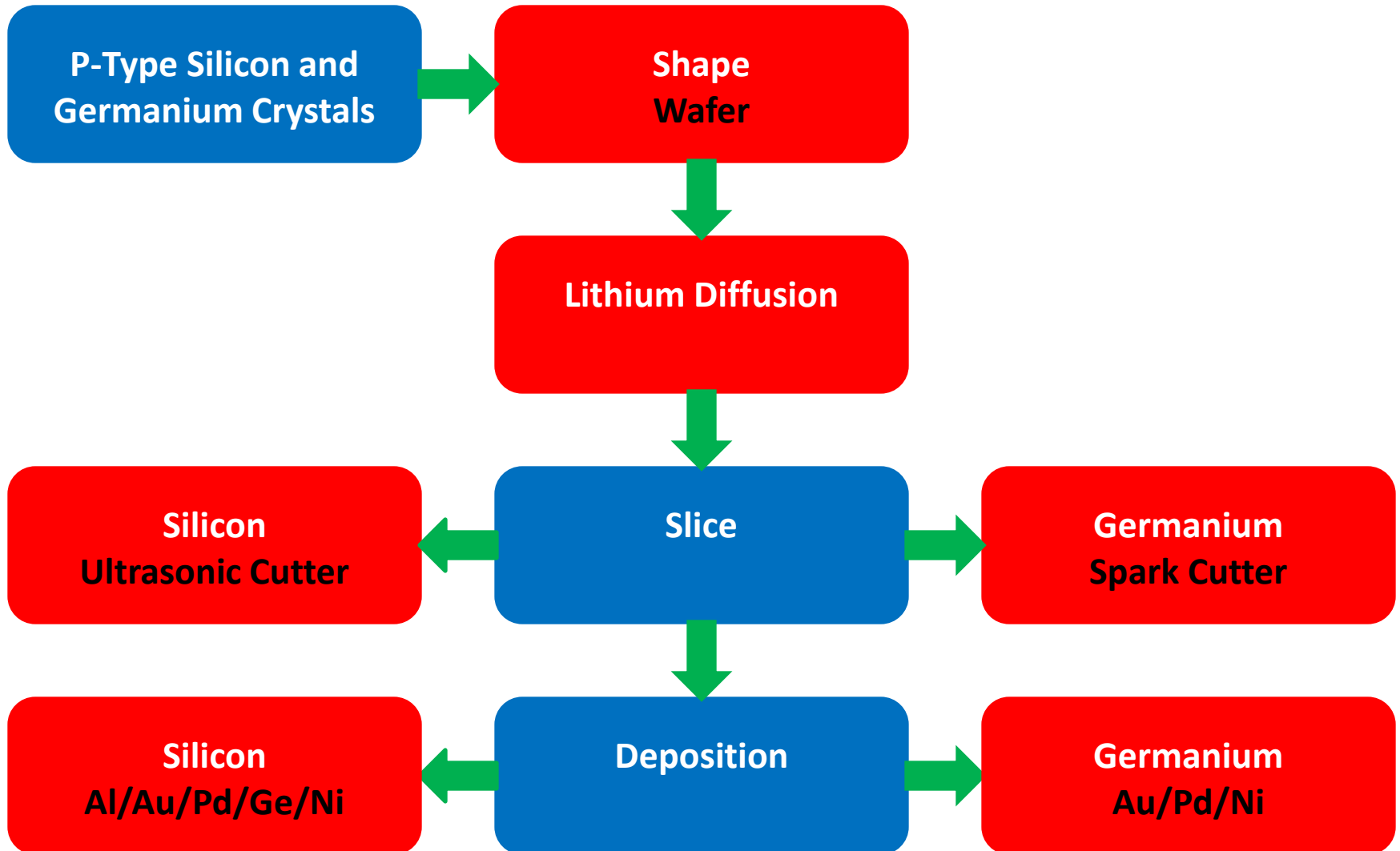
Pulse Processor Performance



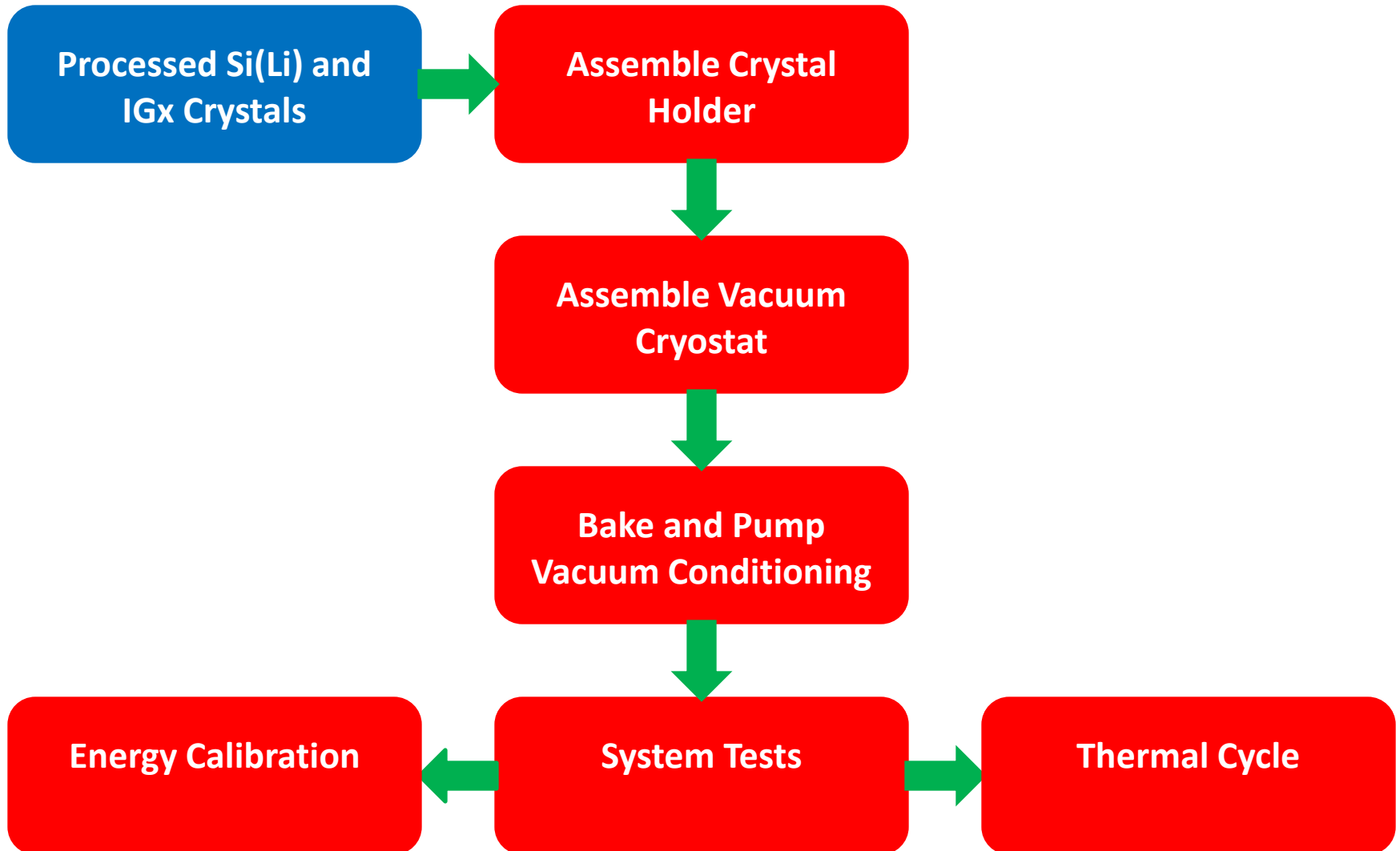
Window Transmission



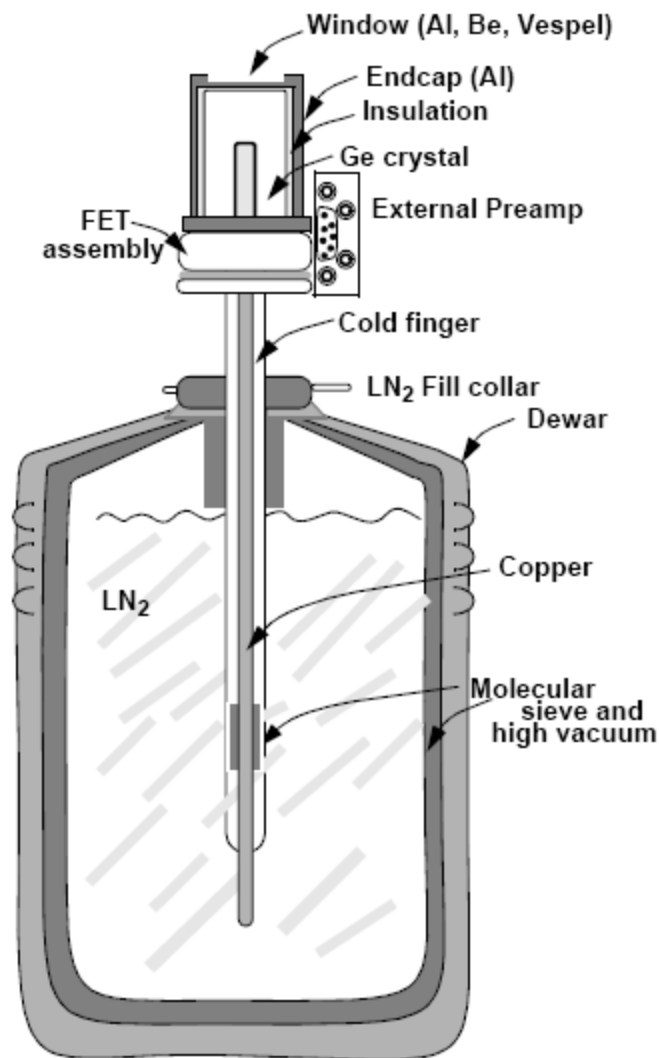
Crystal Processing



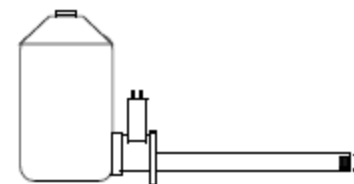
Detector Production



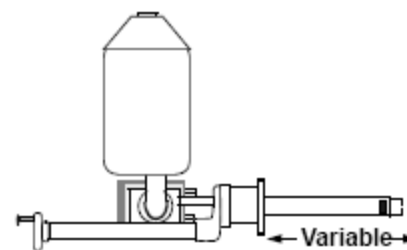
Cryostats



Vertical Dipstick



Horizontal Fixed



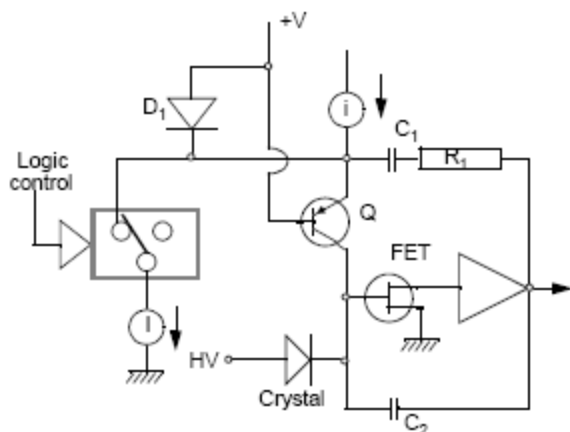
Horizontal Variable

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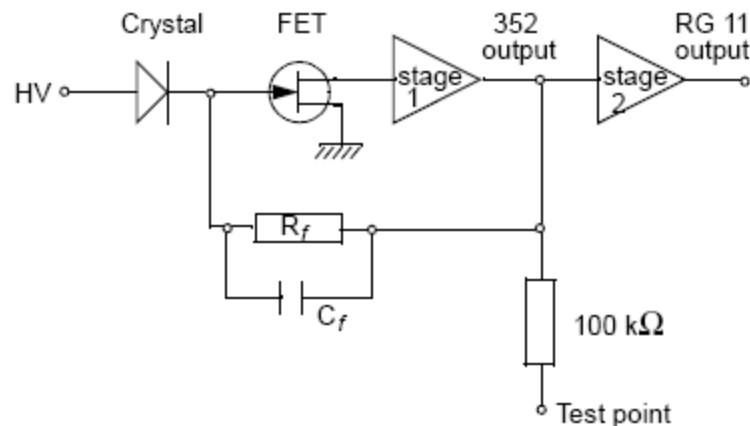
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Preamplifiers



Transistor Reset



Resistive Feedback

Specifications	Transistor Reset	Resistive Feedback
Sensitivity	0.01 mV/MeV	100 mV/MeV
Gain	20,000	20,000
Impedance	50 ohms	93 ohms
Count Rate	200,000 MeV/s	60,000 MeV/s

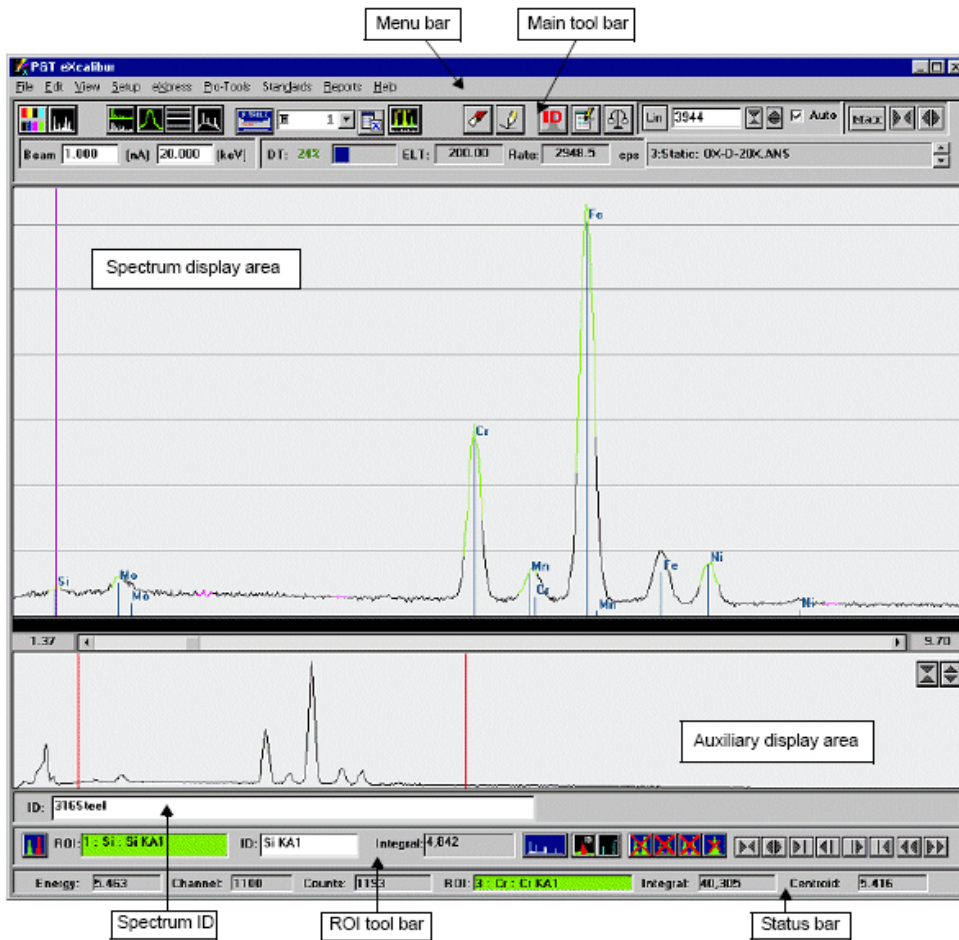
Electronics



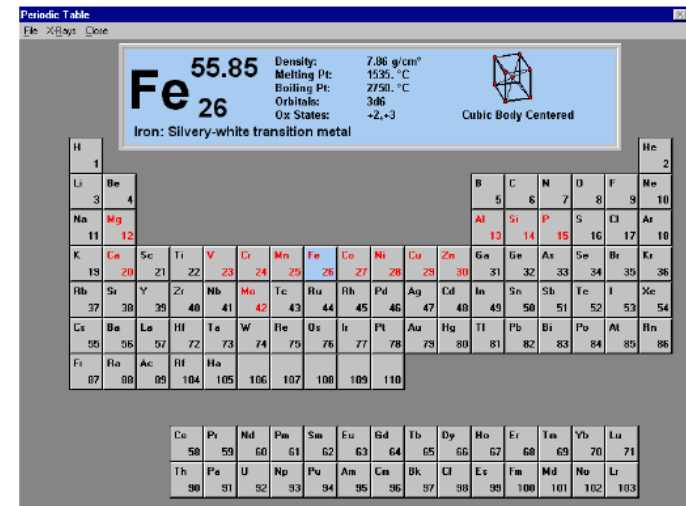
8004X System

- X-ray spectroscopic analysis system
- $\pm 1\text{kV}$ bias voltage
- 2 to $24\mu\text{s}$ amplifier shaping times
- 4,000 channels of spectrum memory
- Ethernet and RS232 interfaces

Software



eXcalibur



X-Ray Library