

## **Studies on Nuclear-Reaction-in-Solid Using Plasma Electrolysis**

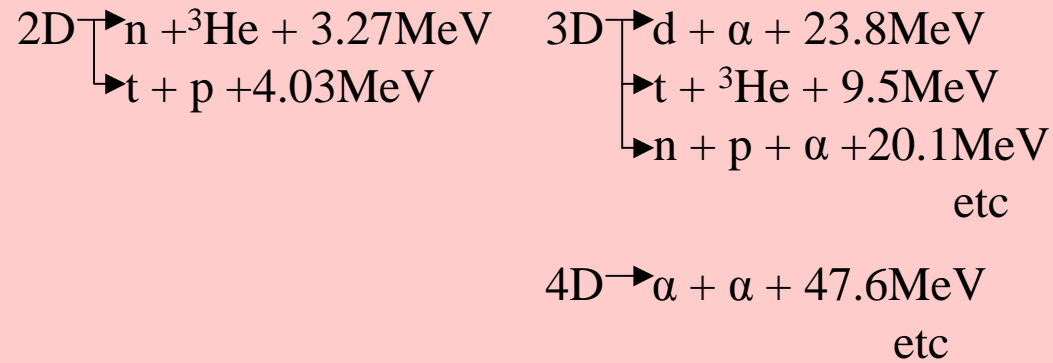
Tomoo Ohishi, Ryo Toshima ,Hiroyuki Miyamaru, and Akito Takahashi  
Department of Nuclear Engineering, Osaka University

“Coherent”-Multi-Body-Fusion (3D,4D,2D)

Cluster (3D,4D) of deuterons are formed in Palladium-deuteride (PdD<sub>x</sub>) by the lattice vibration

Induce

Jolting Palladium-lattice-structure by glow discharge in electrolyte



Characteristic X-rays of Pd  
Bremsstrahlung X-rays of charged Particles  
Neutrons  
Helium etc

## Experiments

### Foreground Run

Electrolyte :  $\text{K}_2\text{CO}_3$  - $\text{D}_2\text{O}$  (0.5mol/l)

	Power Supply	Electrodes
Type : A	D.C.	Anode : Ni-mesh
		Cathode : Hollow electrode of parallel dual Pd-Rh alloy sheets (Alloy of Pd-95% , Rh-5%)
Type : B	A.C.	Hollow electrode of parallel dual Pd-Rh alloy sheets (Alloy of Pd-95% , Rh-5%)
Type : C	D.C.	Anode : Pt-mesh
		Cathode : Pd-cylinder (Pure-Pd (99.95%))

### Background Run

Electrolyte :  $\text{K}_2\text{CO}_3$  - $\text{H}_2\text{O}$  (0.5mol/l)

Electrodes : Pure-Ni (99.7%)



### Hollow Electrode of Parallel Dual Sheets

>thermoionic emission activity is higher than flat-single-sheet -electrode.

\* Sheet : ~ 3mm x 2.5mm x 1mm

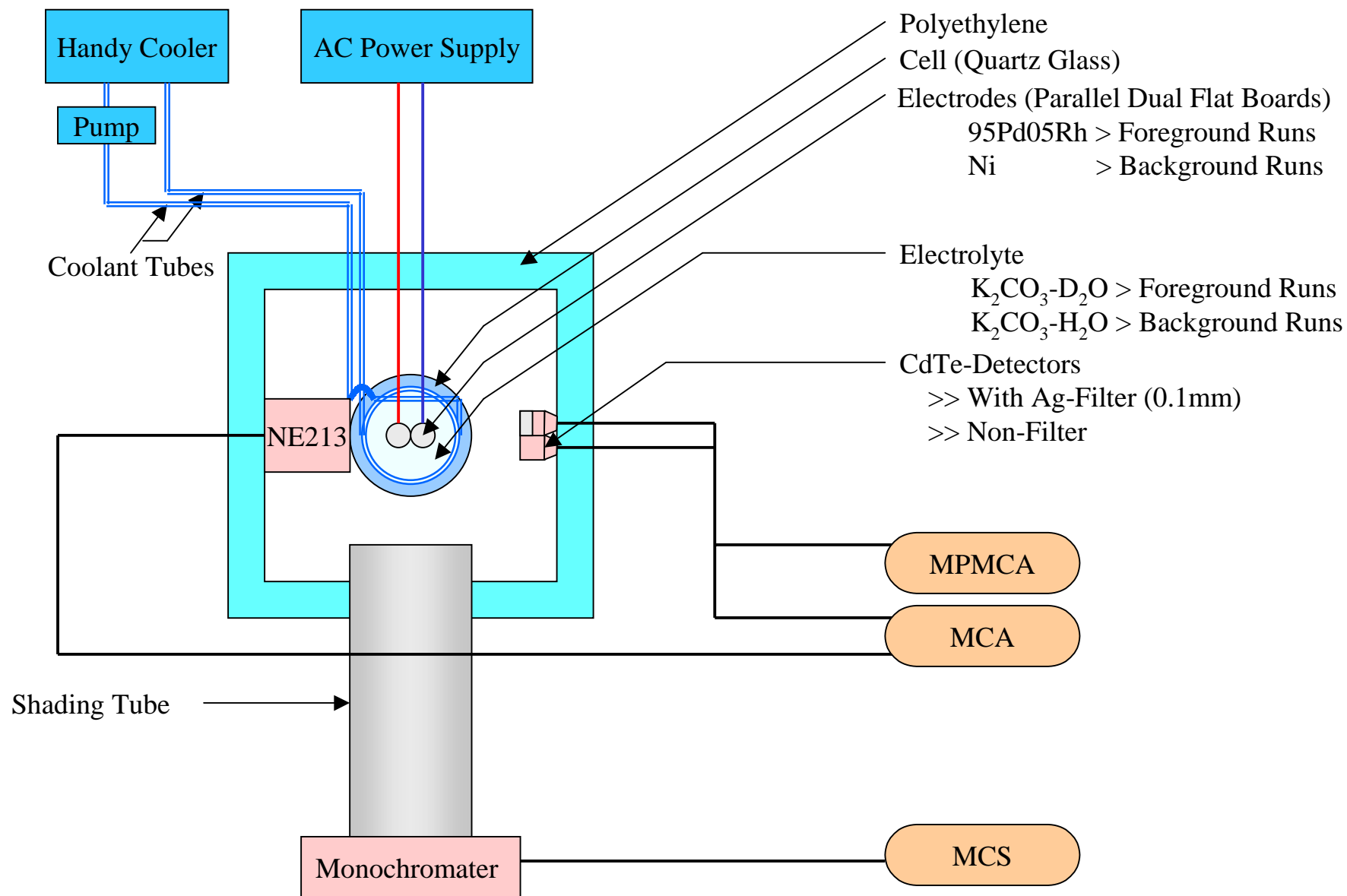


### Cylindrical Hollow Electrode

>Thermomonic emission activity is one of the most highest electrode.

	Detectors	Measurements
Characteristic and Bremsstrahlung X-rays	CdTe-Detector (Two Detectors * Type : B and C) One of the detectors is covered with Ag-film (0.1mm thickness). *Characteristic X-rays of Pd : 21.1keV *K-absorption edge of Ag : 22.1keV	*Pulse Shape *Energy
Neutrons	NE213-organic liquid scintillation counter	*Energy
Spectrophotometry of Light Under Electric Discharge	Monochromater (Shimazu Monochromater SPG-120S) *Wavelength range : 200nm~700nm	*Spectrum

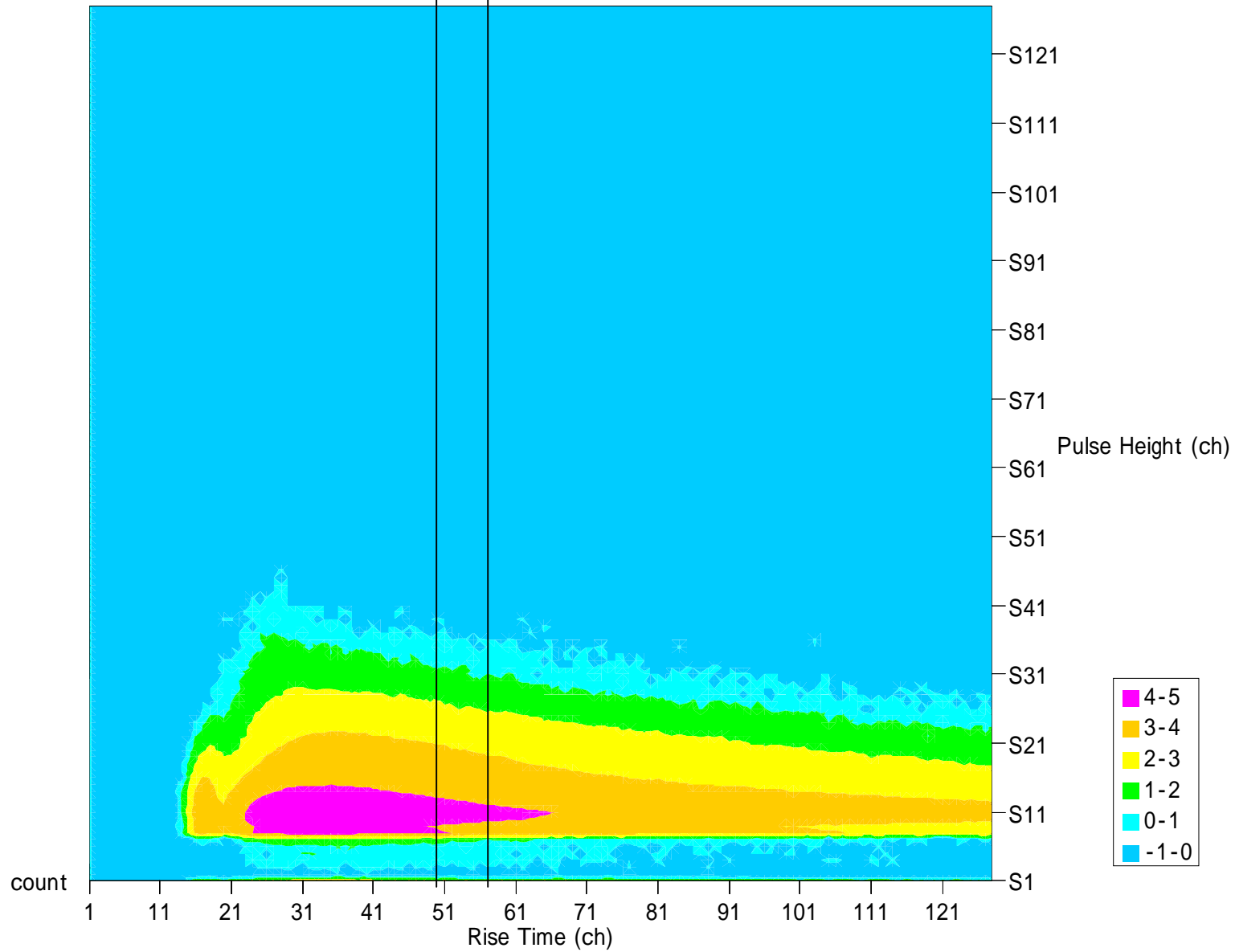
# The Figure of Experiment System



**Type A [Background Run]**

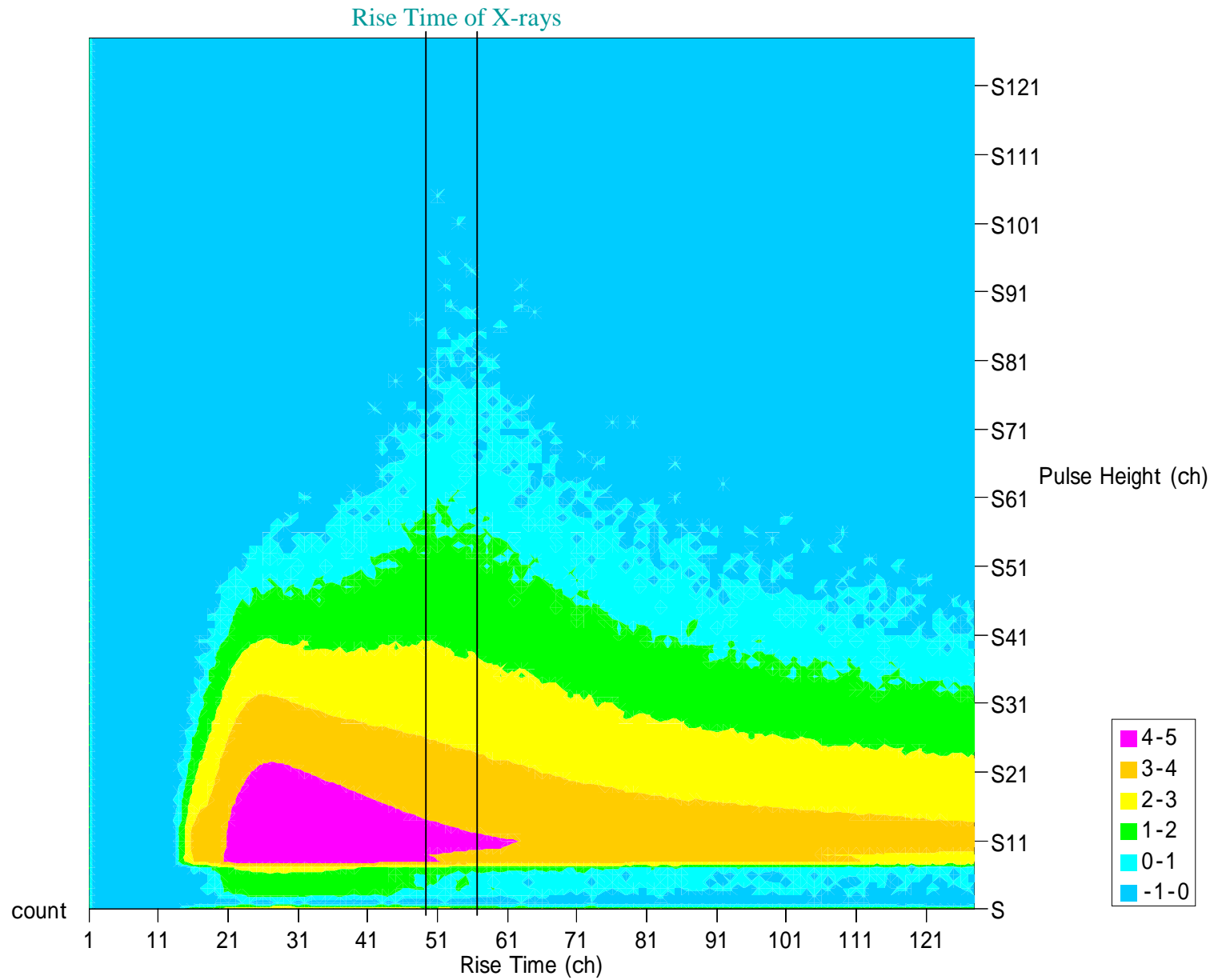
**X-rays** D.C. Discharge [Cathode: Hollow Electrode of Parallel Dual Ni Sheet] [UP 65V]

Rise Time of X-rays



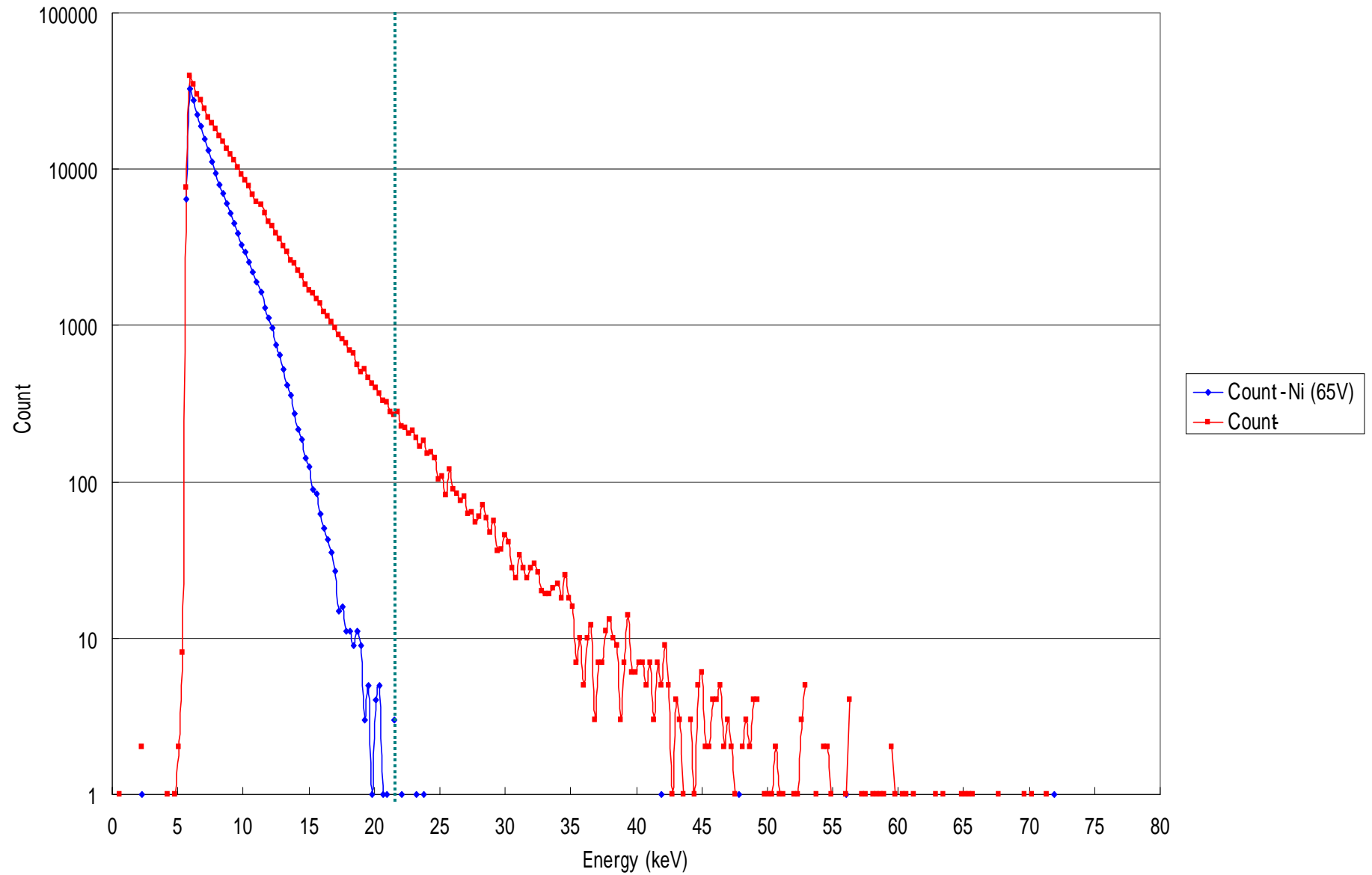
**Type A [Foreground Run]**

**X-rays** D.C. Discharge [Cathode: Hollow Electrode of Parallel Dual 95Pd05Rh Sheet] [UP 65V]



**Type A [Foreground Run : Red] [Background Run : Blue]**  
**X-rays (MCA Data)**

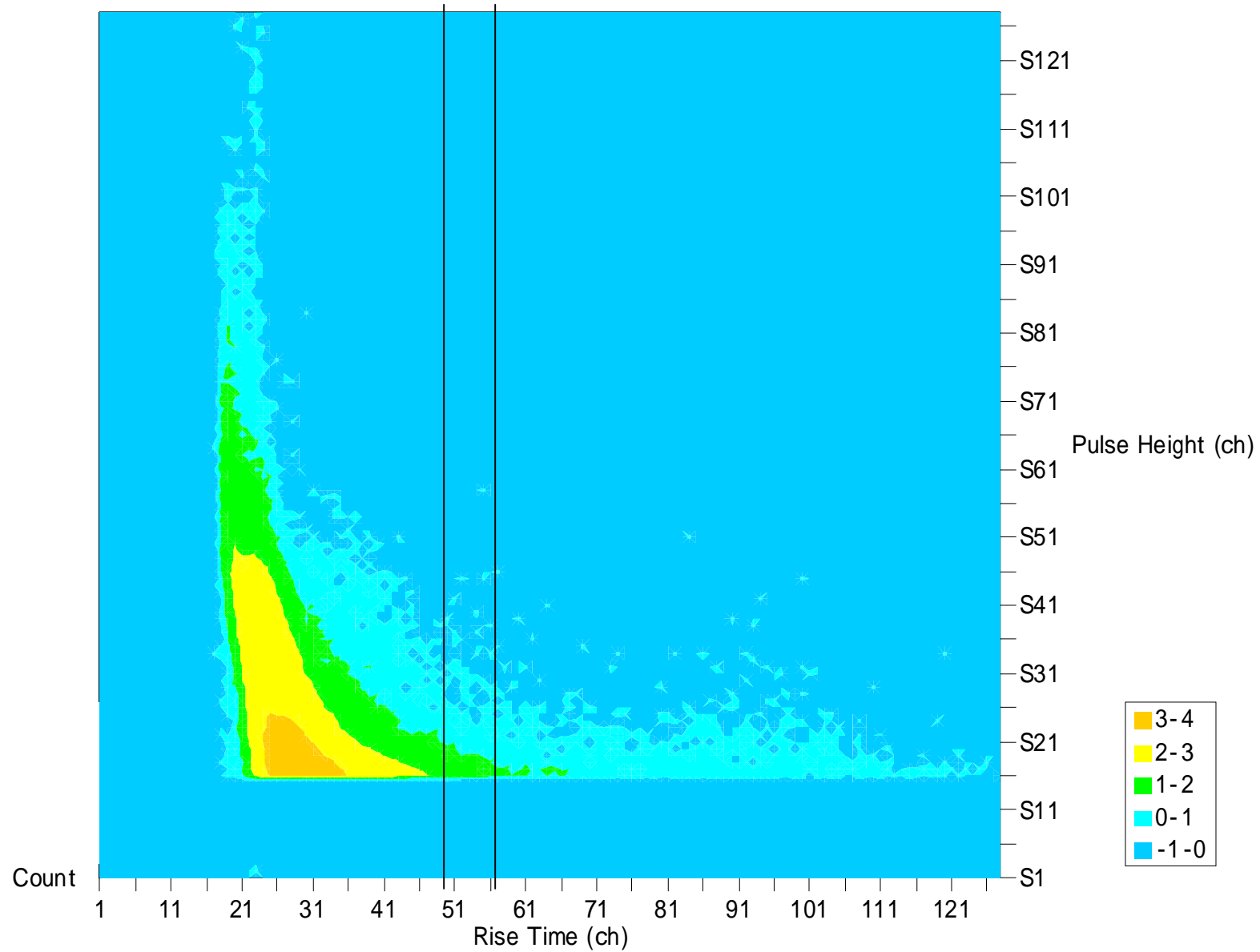
**Green broken line :**  
Characteristic X-rays of Pd (21.1keV).





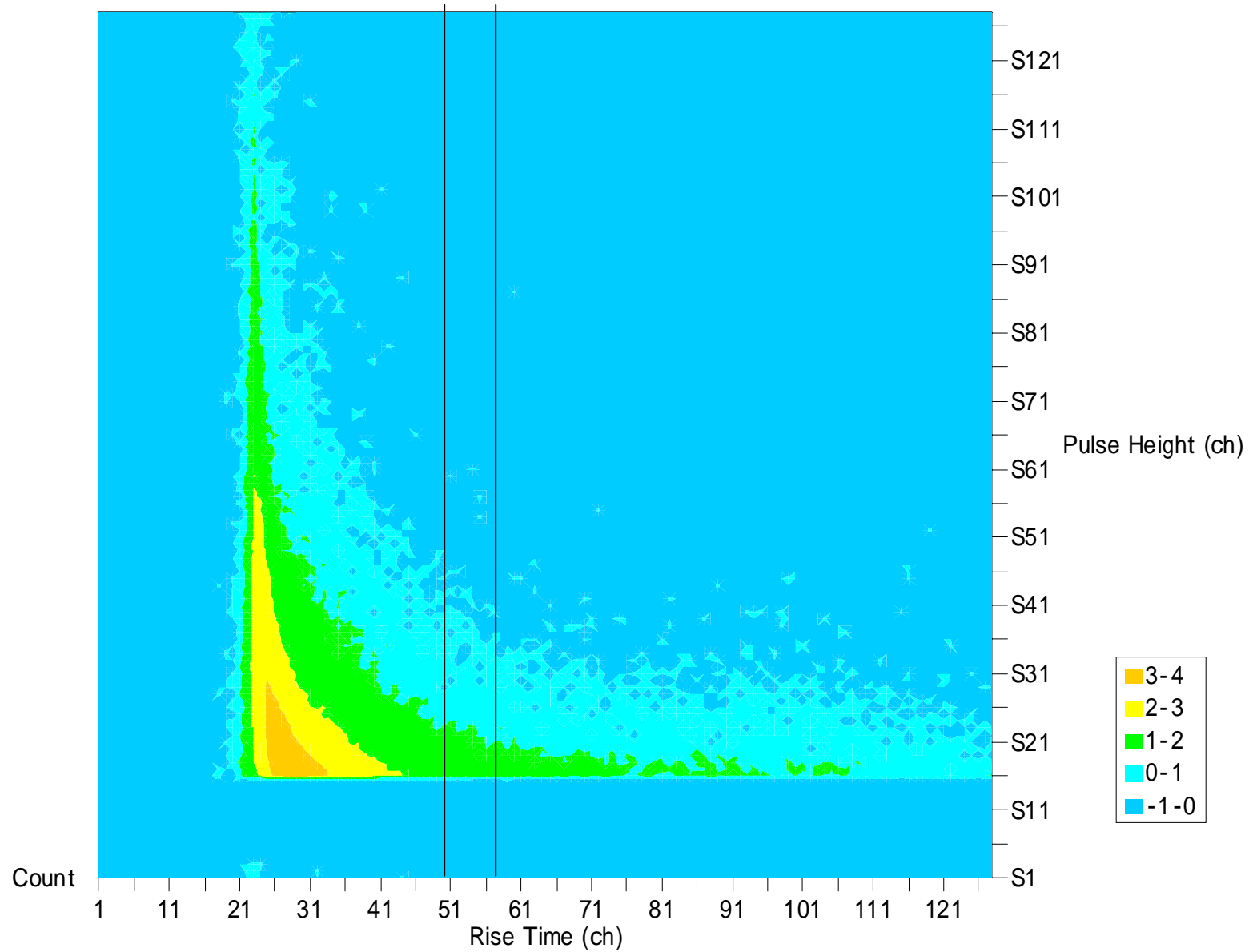
**Type B [Background Run]**

**X-rays** A.C. Discharge [Cathode: Hollow Electrode of Parallel Dual Ni Sheet] [UP 85V]



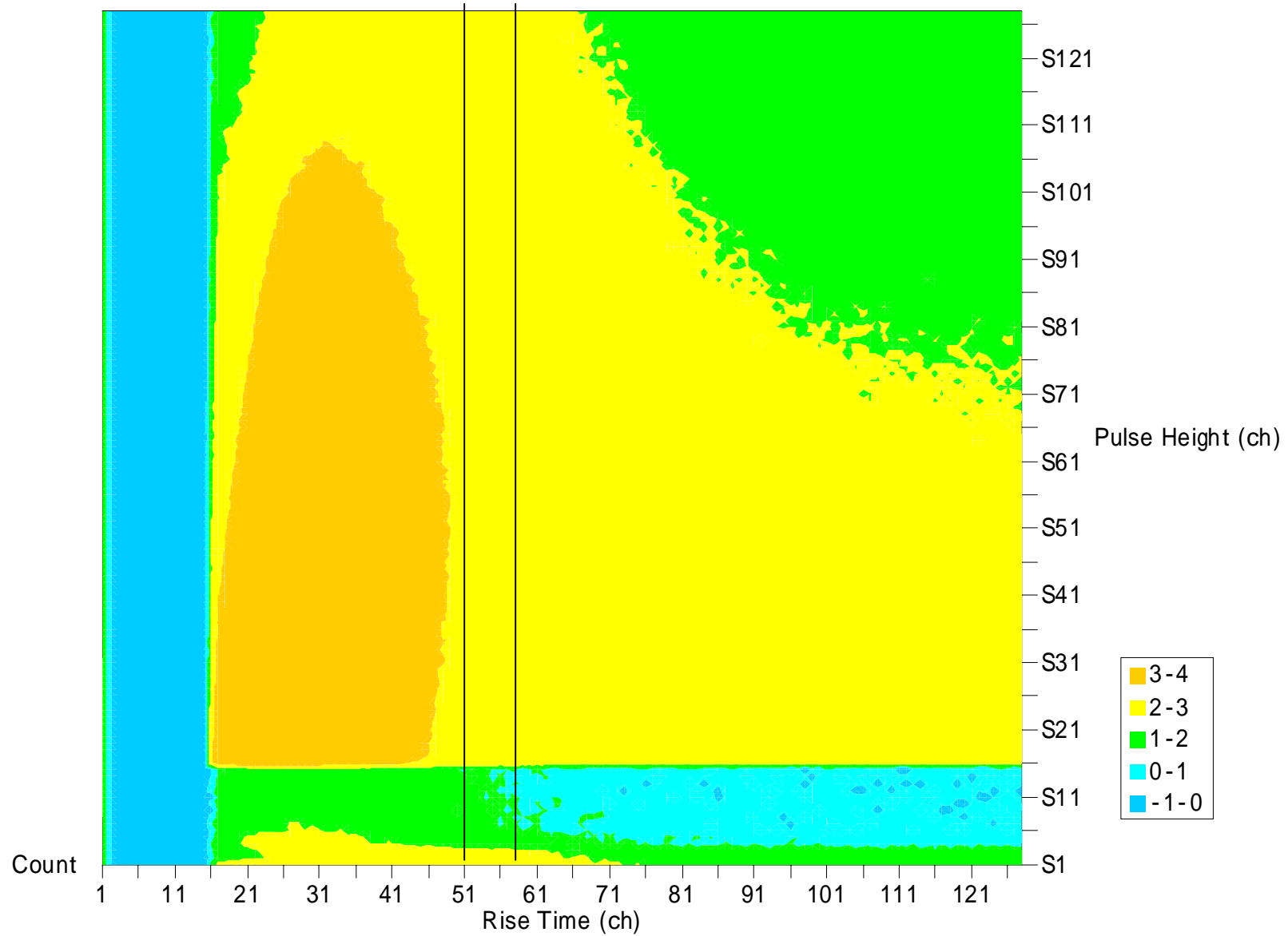
**Type B [Foreground Run]**

**X-rays** A.C. Discharge [Cathode: Hollow Electrode of Parallel Dual 95Pd05Rh Sheet] [UP 80V]



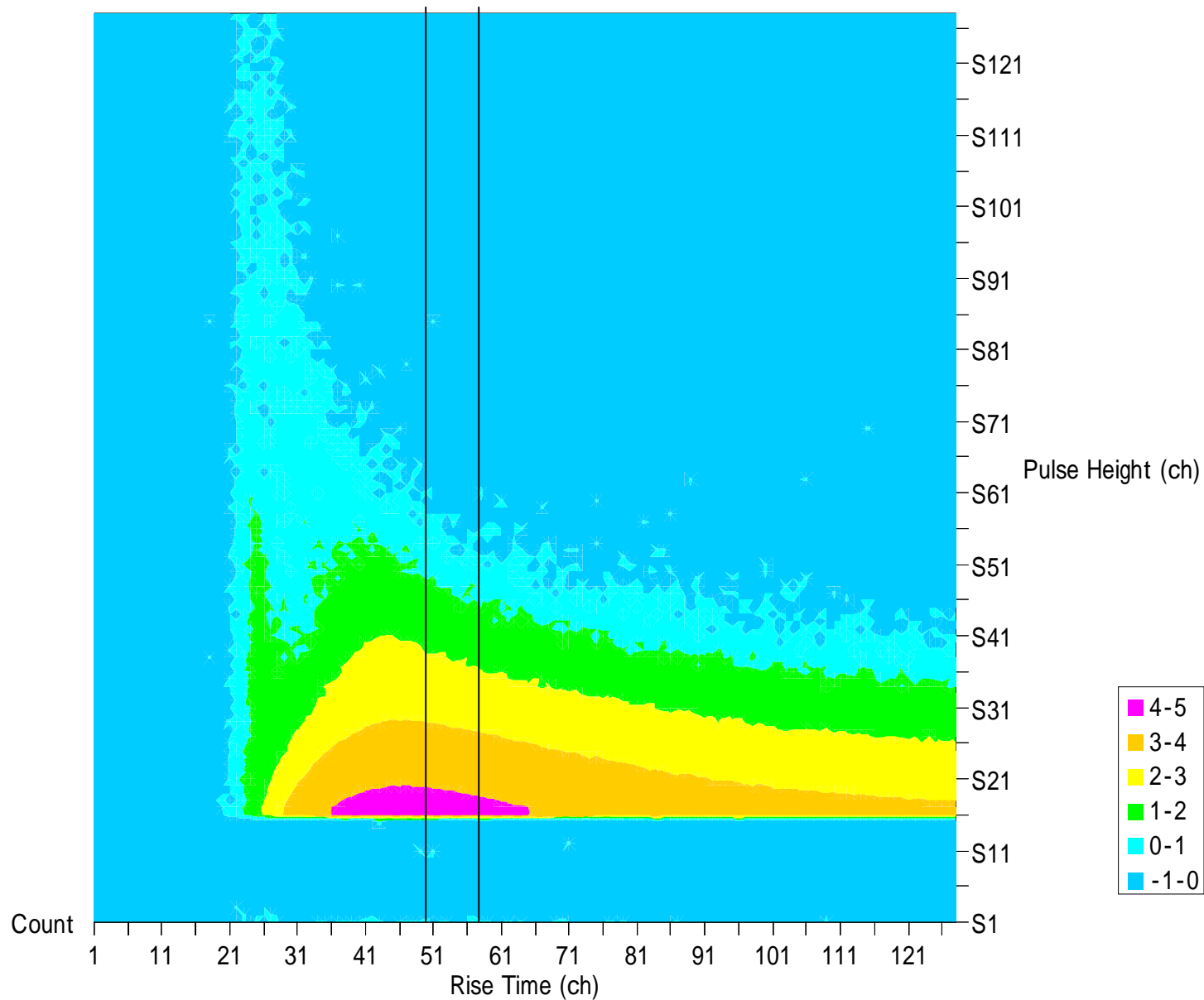
**Type C [Background Run]**

**X-rays** D.C. Discharge [Anode : Ni-mesh Cathode : Ni-cylinder] [UP 75V]



# Type C [Foreground]

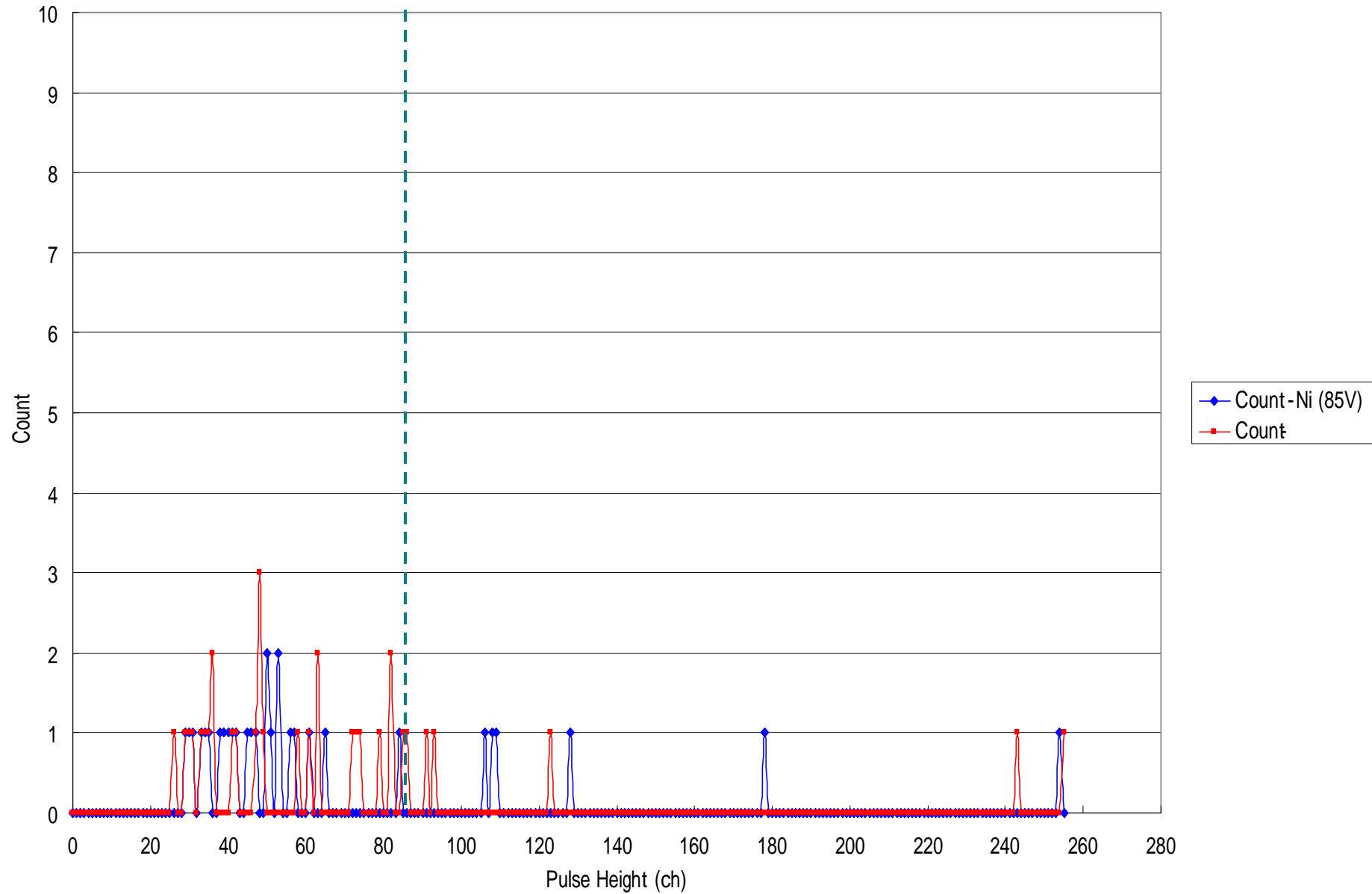
X-rays D.C. Discharge [Anode : Pt-mesh Cathode : Pd-cylinder][UP 80V]



### Type B

Neutrons : A.C. Discharge [ Hollow Electrode of Parallel Dual Sheet]

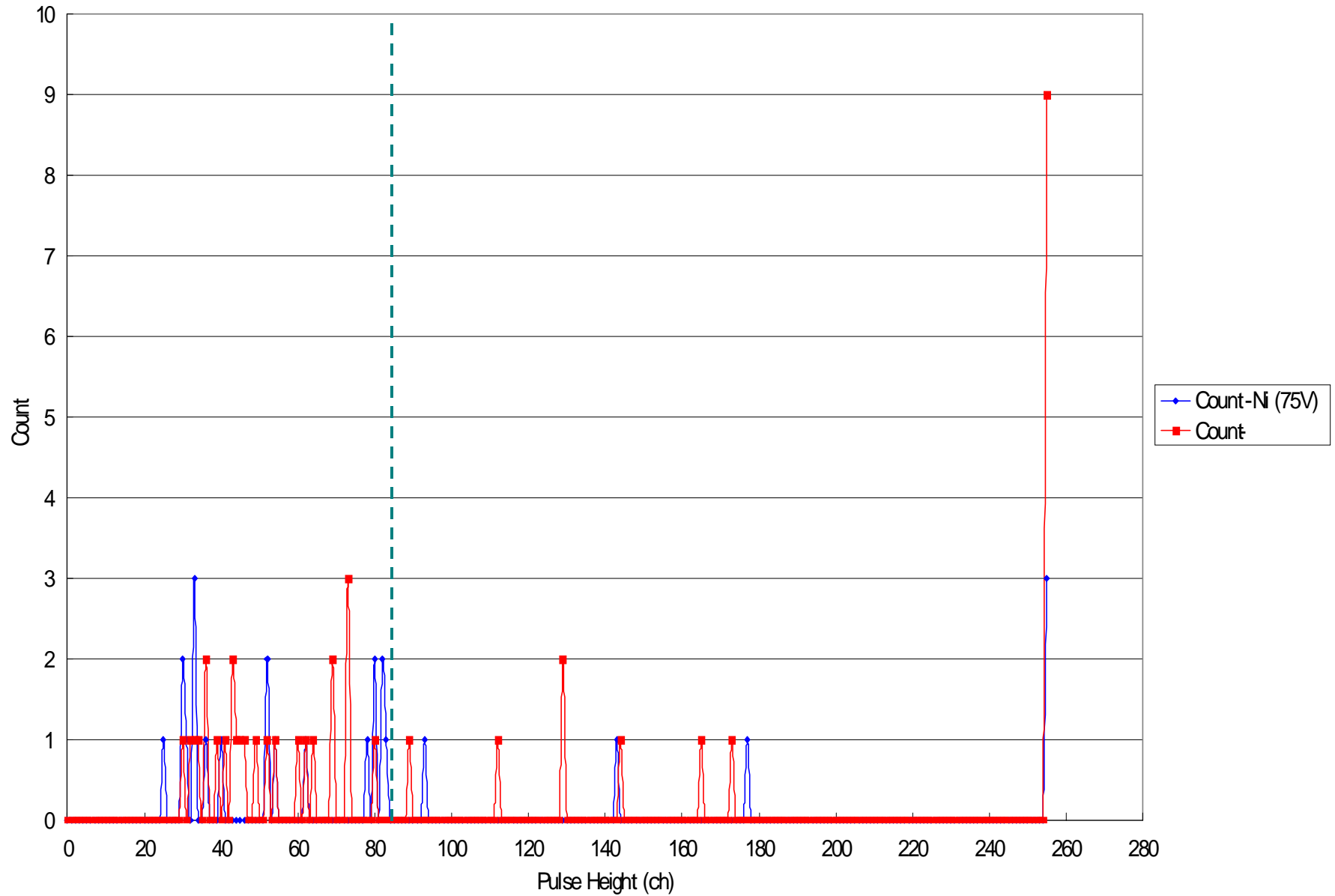
Green broken line : The edge of recoil protons of neutrons happened 2D reaction(2.45MeV).

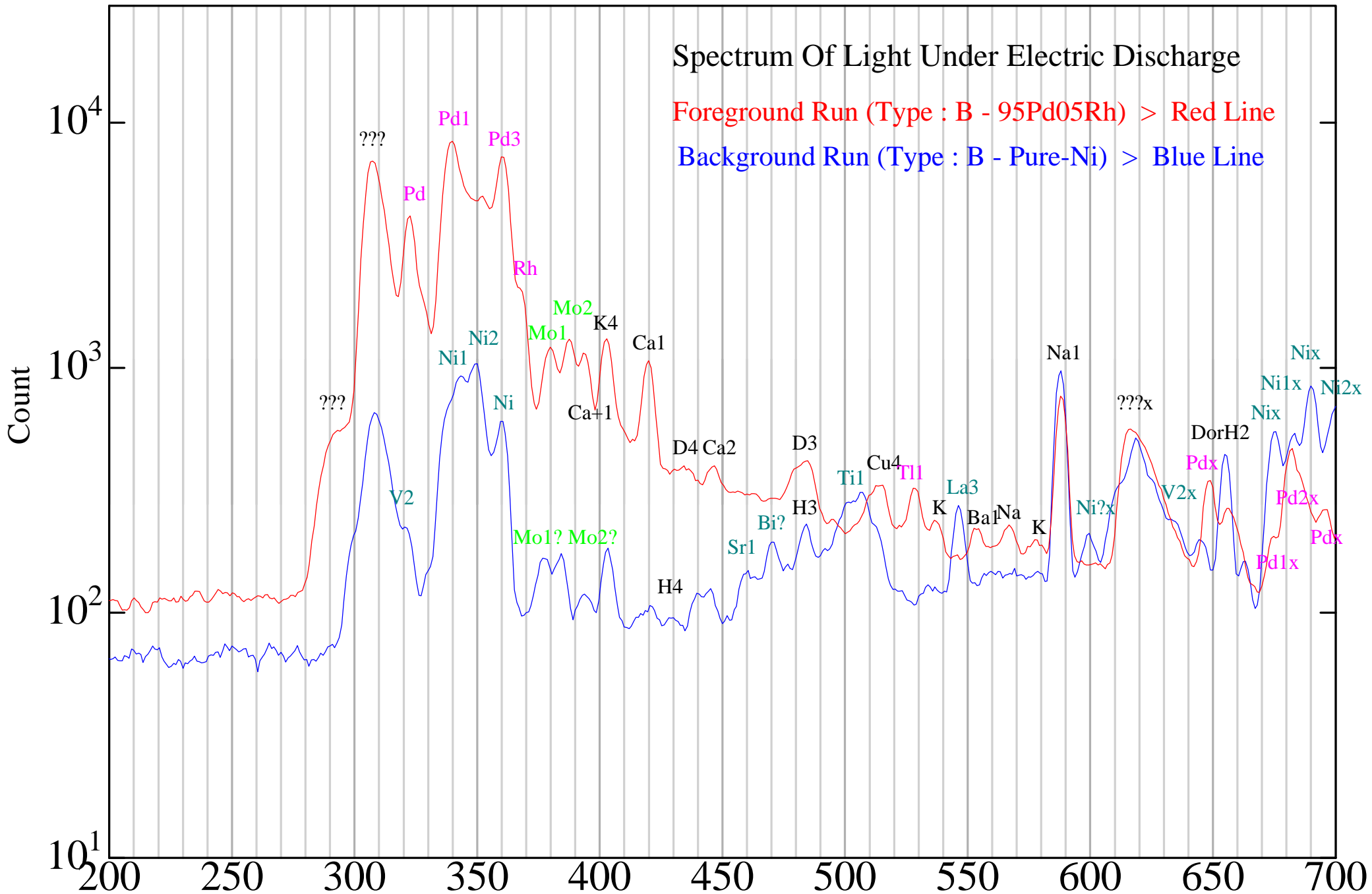


### Type C

Neutrons : D.C. Discharge [Anode : Mesh Cathode : Cylinder]

Green broken line : The edge of recoil protons of neutrons happened 2D reaction(2.45MeV).





## Results

Foreground Runs	Characteristic X-rays	Bremsstrahlung X-rays	Neutrons	Spectrophotometry
Type : A D.C ; Parallel Dual Sheets	Not observed	Observed (?) (Once for all)	/	He : Not observed
Type : B A.C ; Parallel dual Sheets	Not observed	Not observed	Not observed	He : Not observed
Type : C D.C. ; Cylinder	Not observed	Not observed	Not observed	He : Not observed

## The Future Experiments

- Reduction of noise from CdTe-detector
- Reappearance experiments of bremsstrahlung X-rays observed in “Type : A”-experiment
- Surface analysis of cathode

and so on