

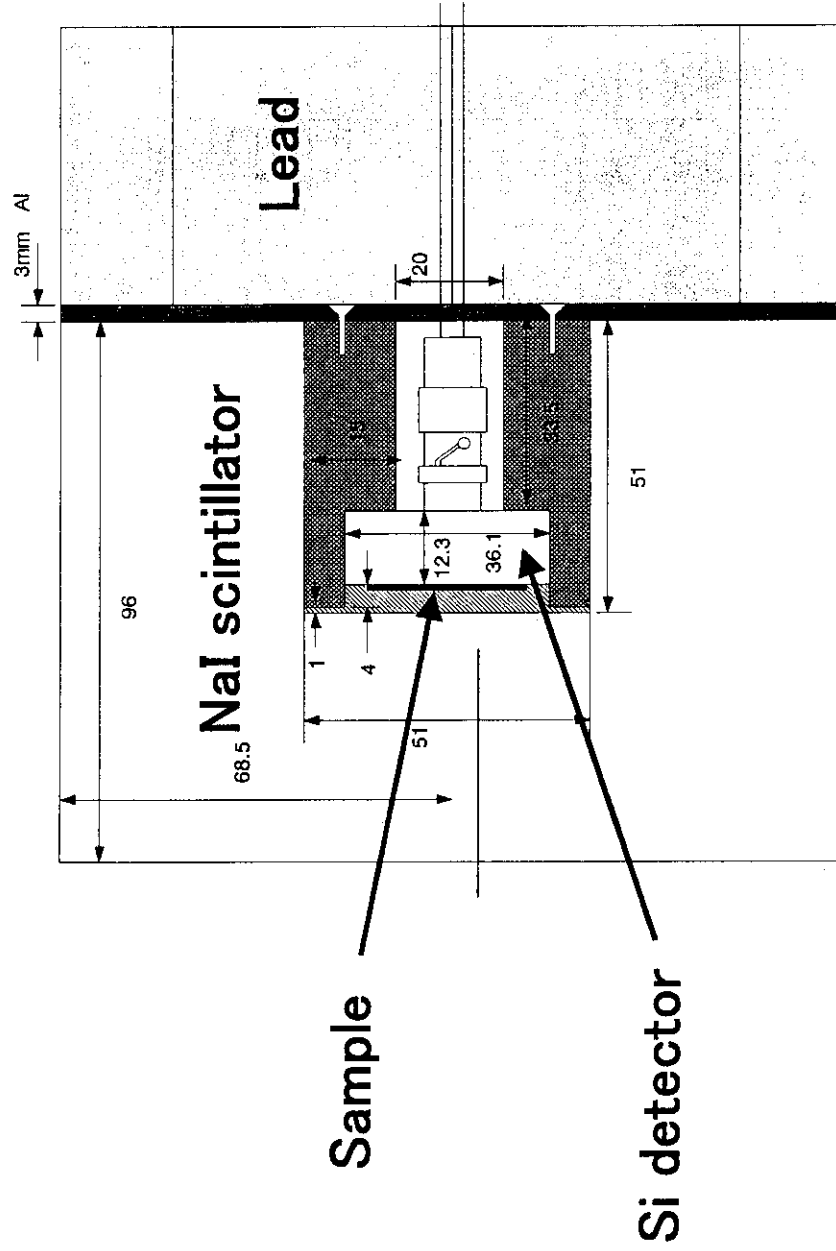
**^{63}Ni measurement in copper by a Si-NaI
anticoincidence spectrometer**

K. Shizuma (Hiroshima Univ.)

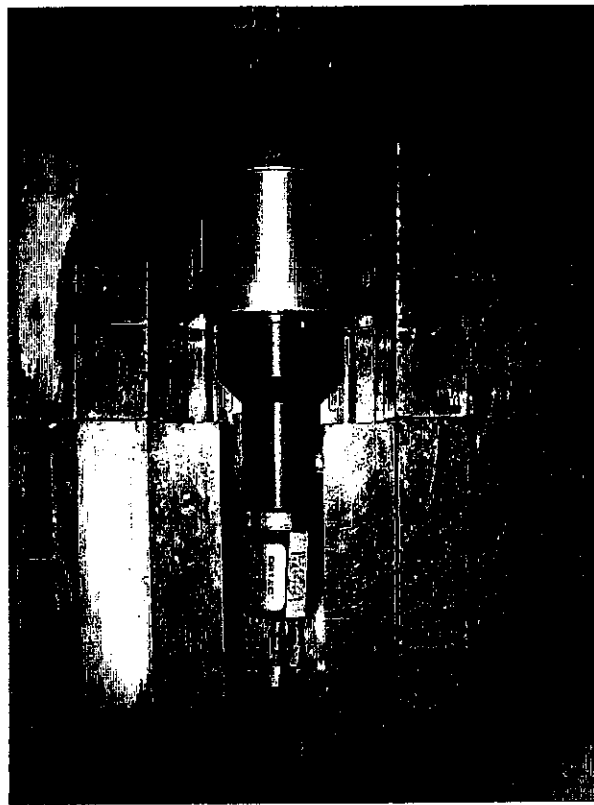
- AMS ····· Dr. T. Straume, Dr. W. Rühm
- Liquid scintillation ····· Dr. T. Shibata
- Present work → Si surface barrier detector

Si-NaI ACS system

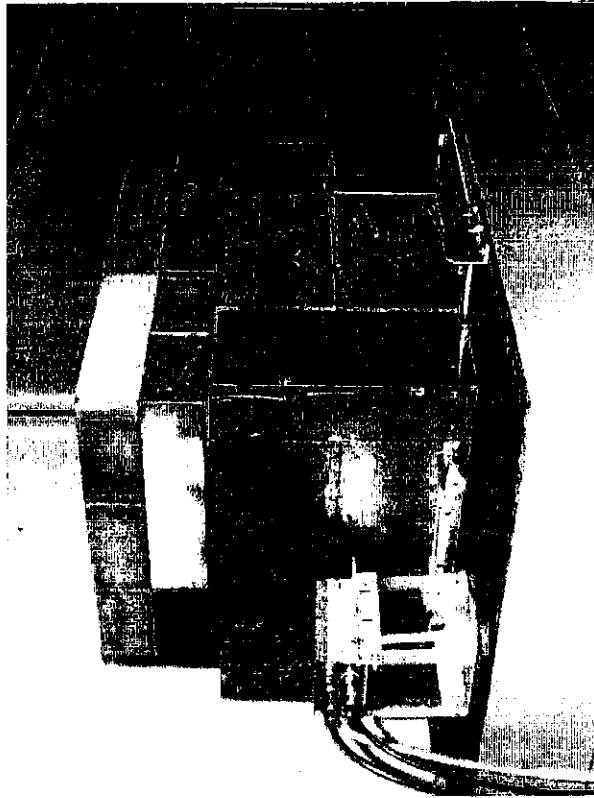
Si-SSD : CU-22-600-100
(600 mm² , $\phi=27.6$ mm)



Si-NaI anticoincidence system

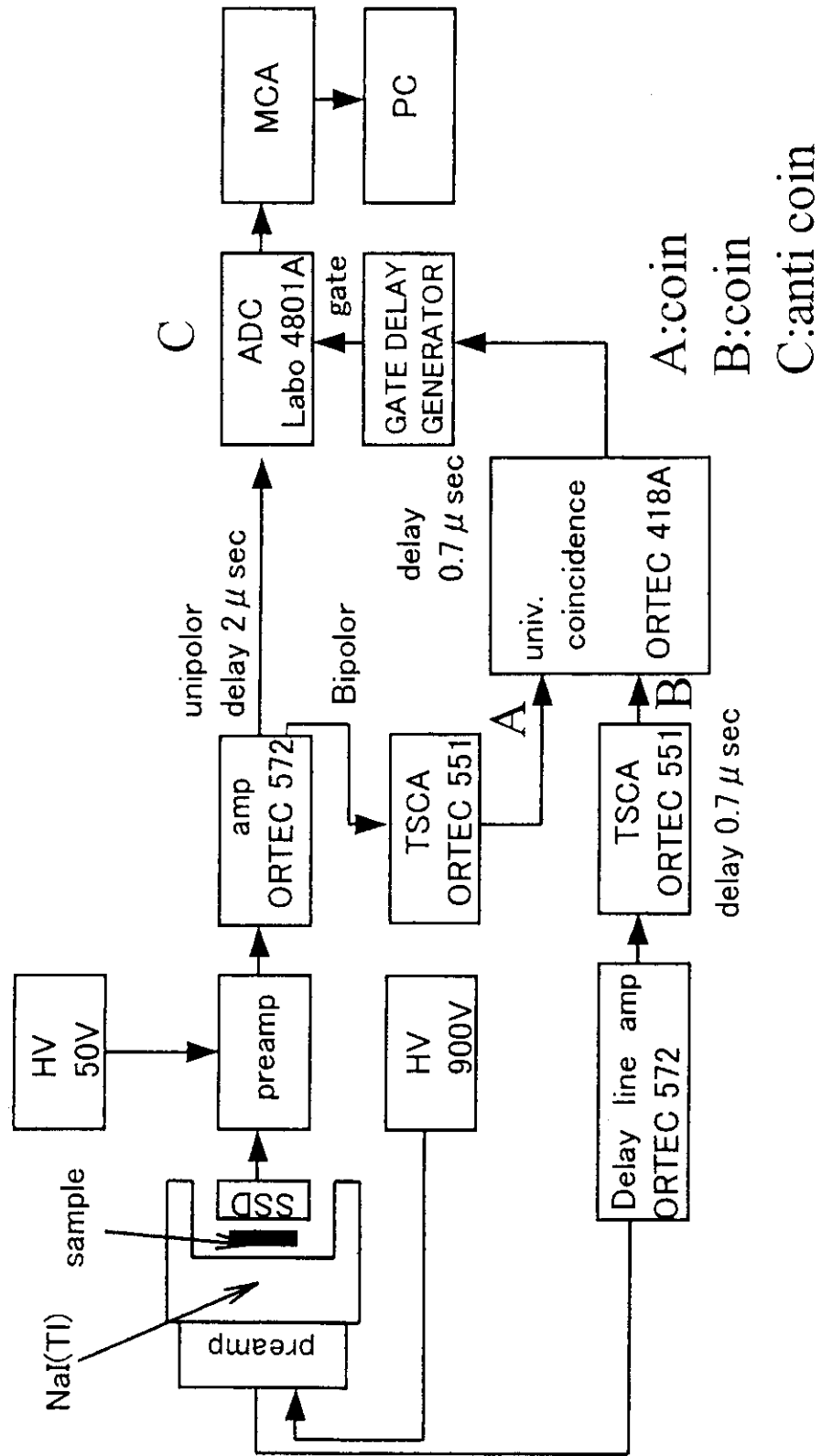


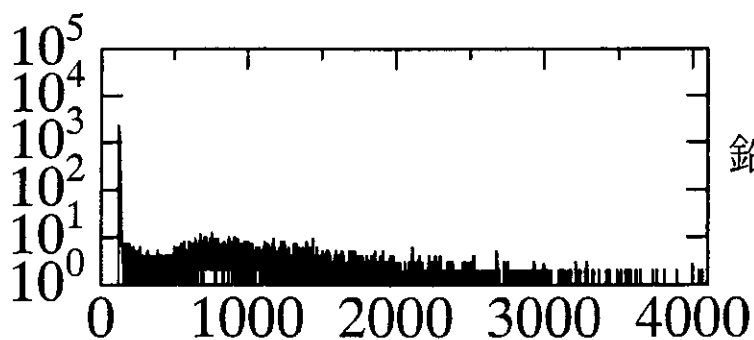
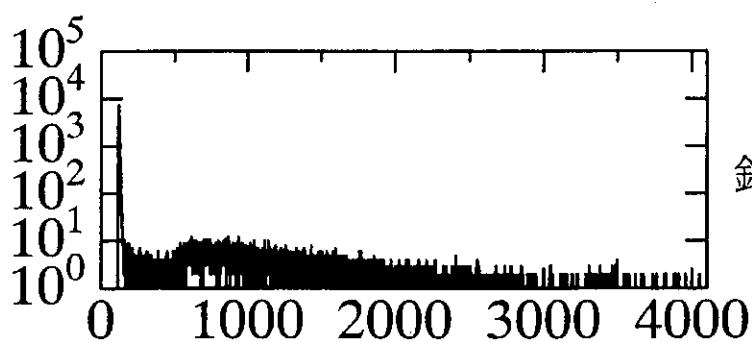
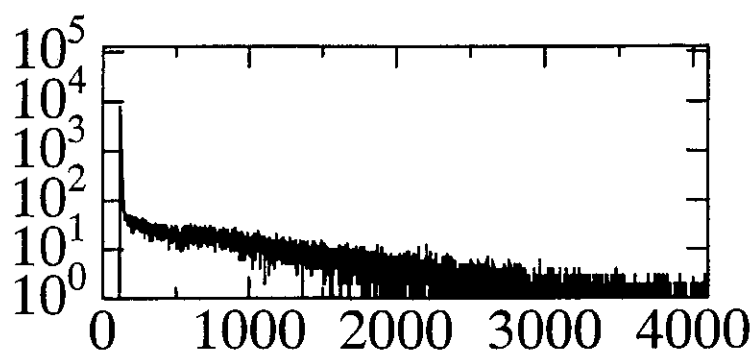
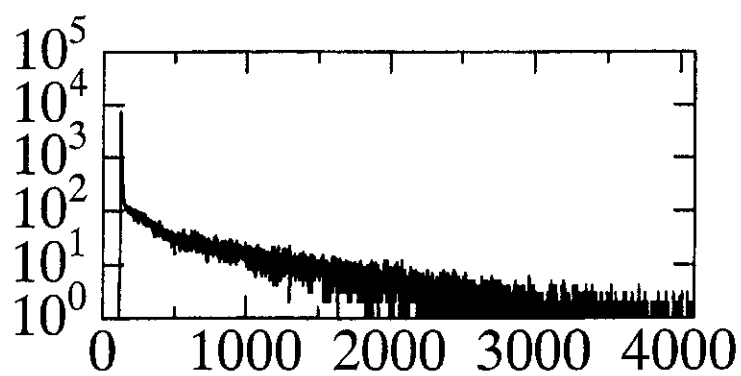
Well-type NaI scintillator



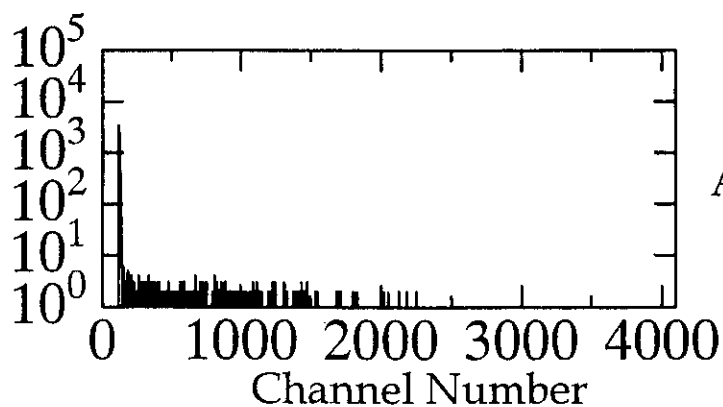
Lead shielding (10 cm)

Si-NaI Anticoincidence circuit

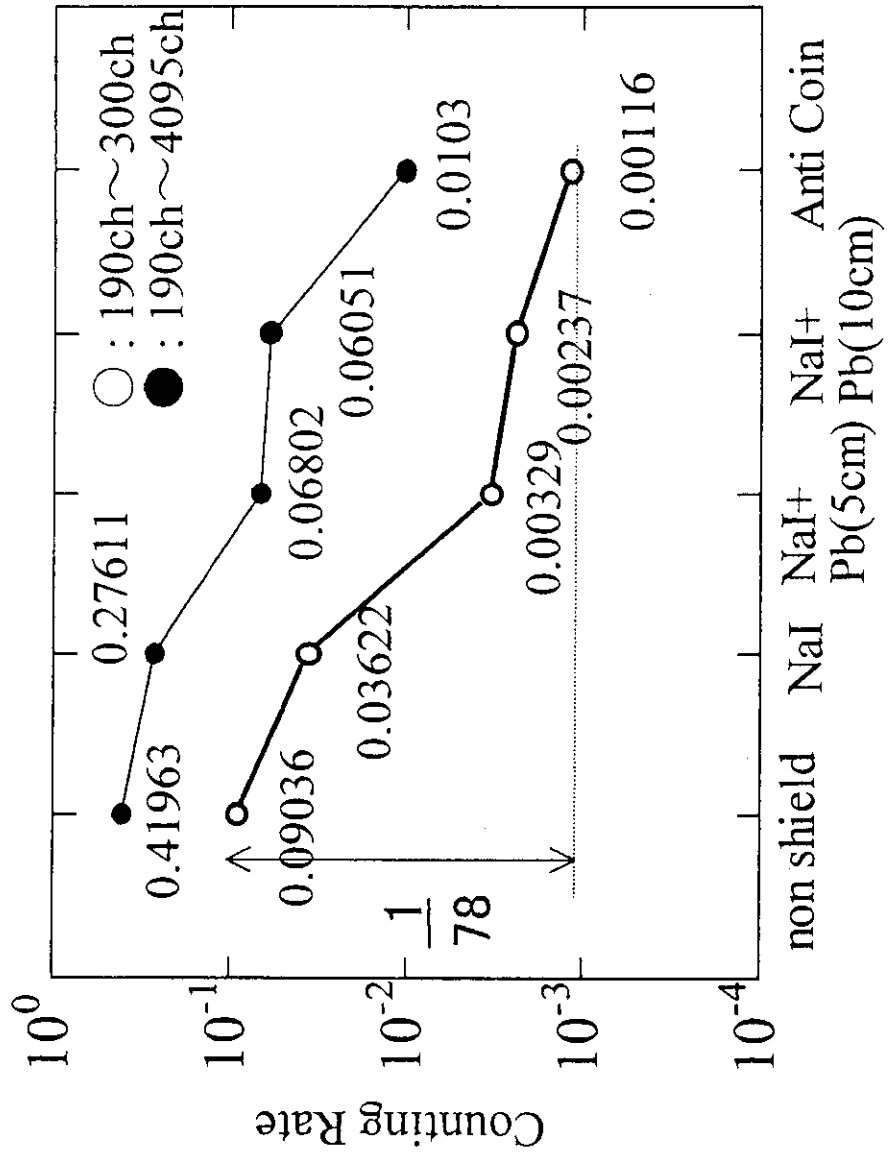




Counts per Channel

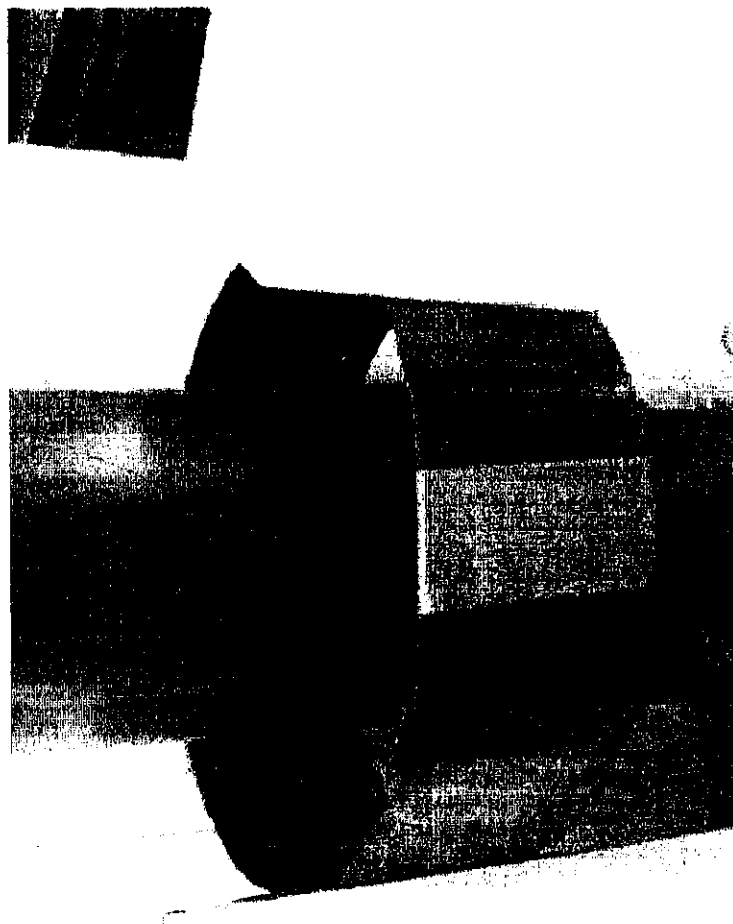


Background reduction

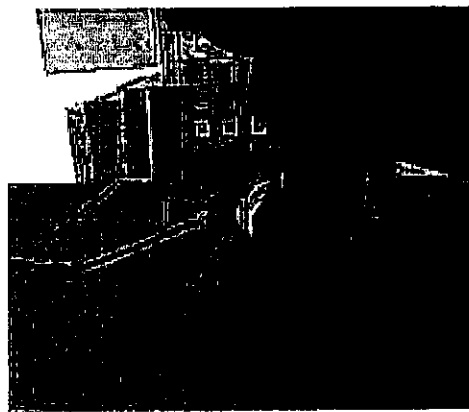
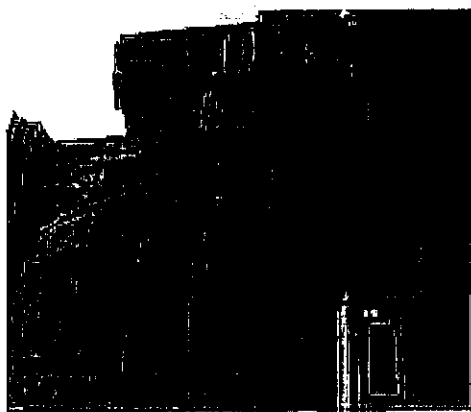
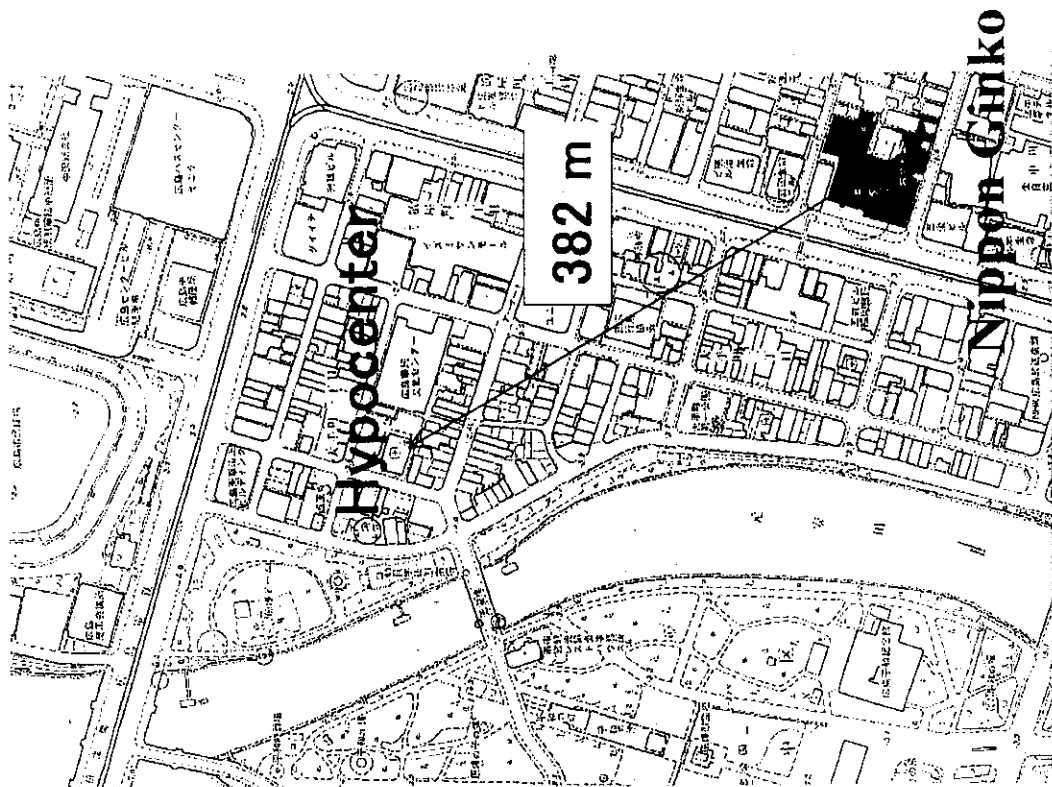


^{252}Cf neutron irradiated copper sample

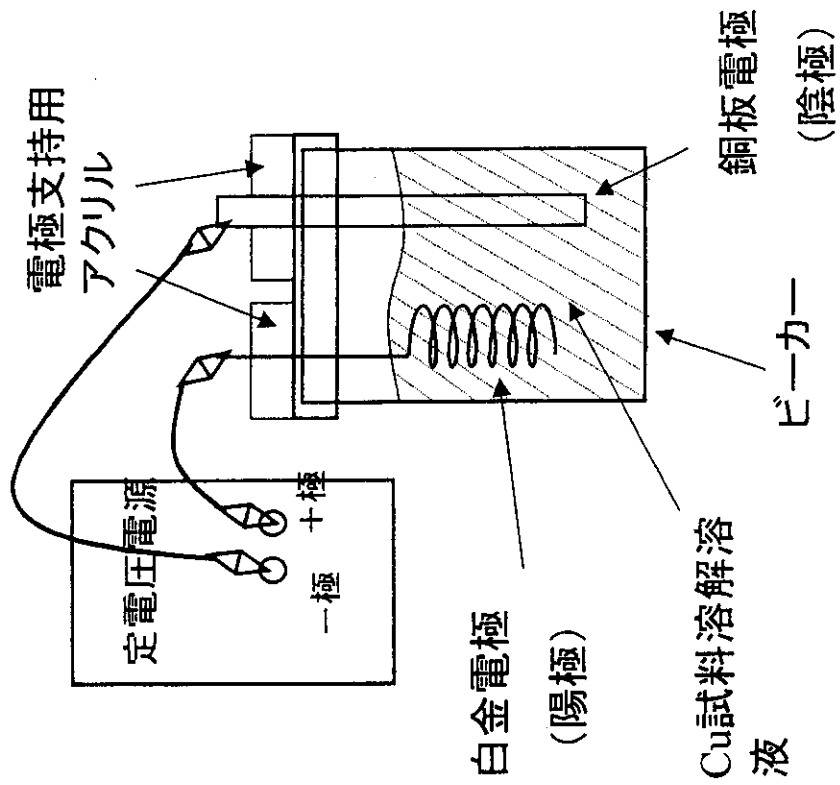
- ◆ ^{252}Cf source : 22.6GBq (RIRBM Hiroshima Univ.)
- ◆ Irradiation time : 3.6 days at 8 cm
- ◆ Fast neutron activation :
 $^{63}\text{Cu}(n,p)^{63}\text{Ni}$, $^{63}\text{Cu}(n,\alpha)^{60}\text{Co}$



Copper Sample



Chemical separation : Electrolysis method



Current : 1~2 A

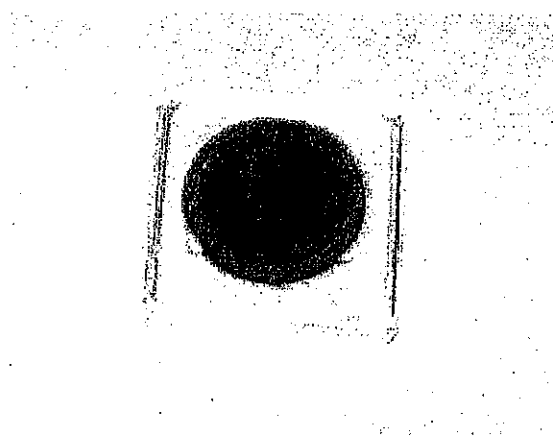
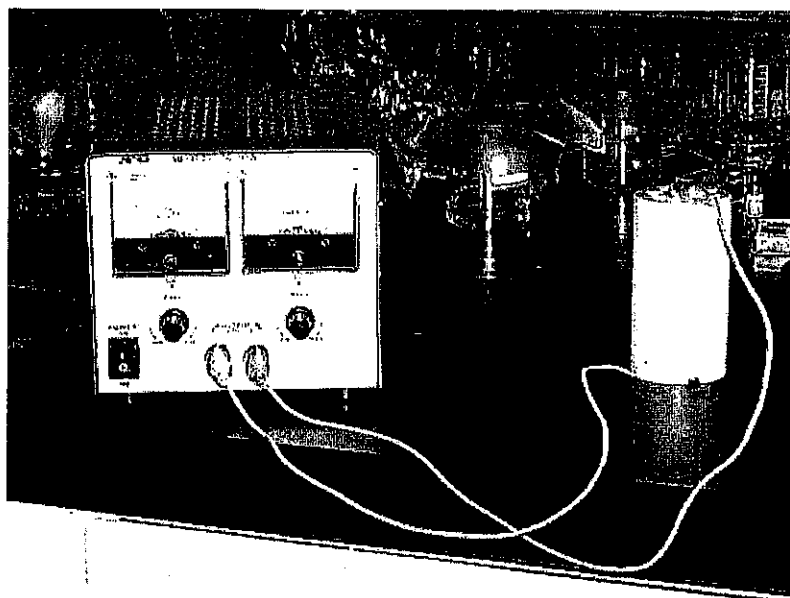
Voltage : 2~4 V

Time : ~30 h

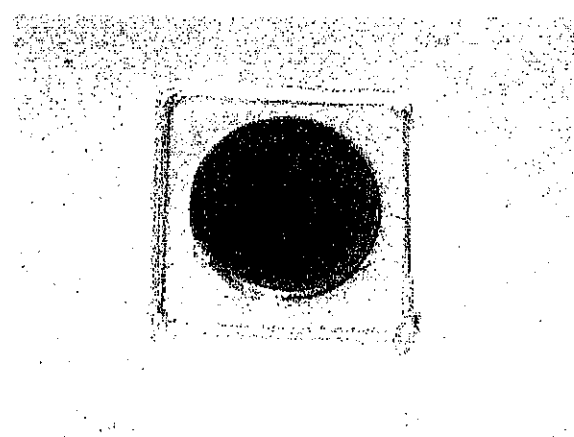
Electrodeposition Method

Current : $\sim 200\text{mA}$, Voltage : 10V

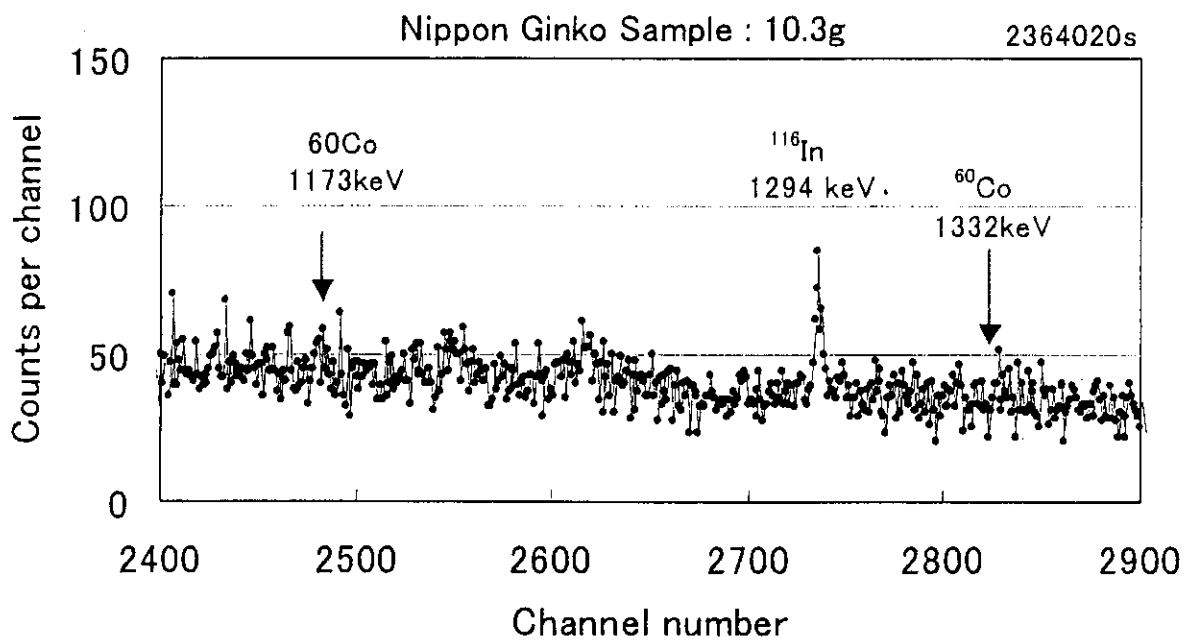
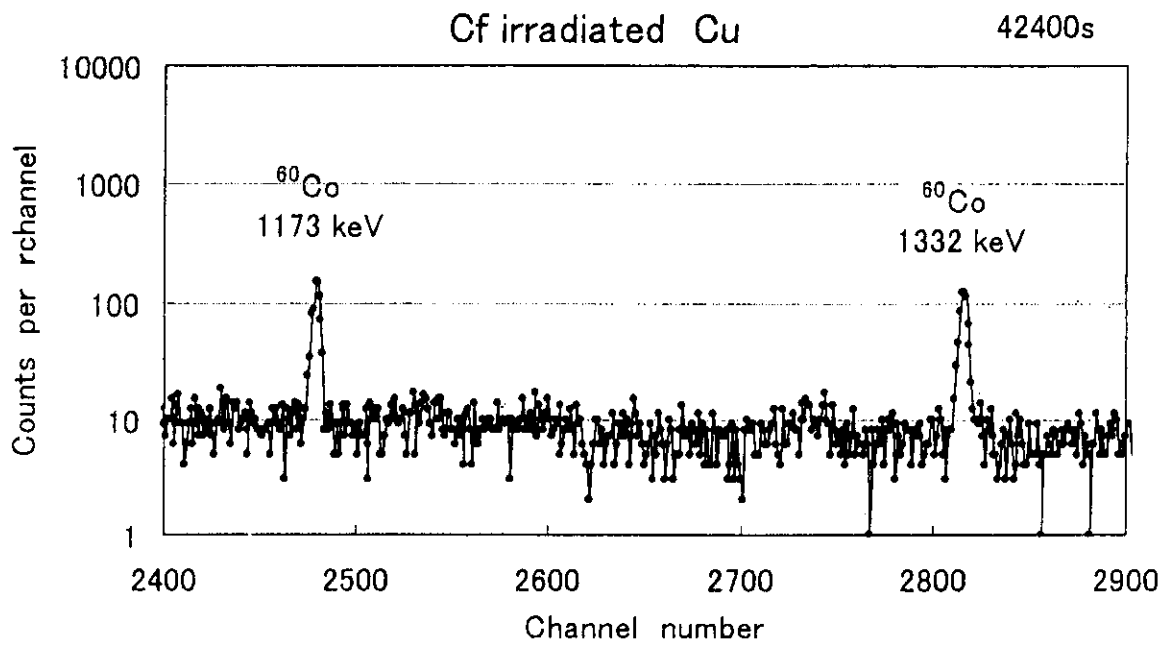
Time : $\sim 1\text{ h}$

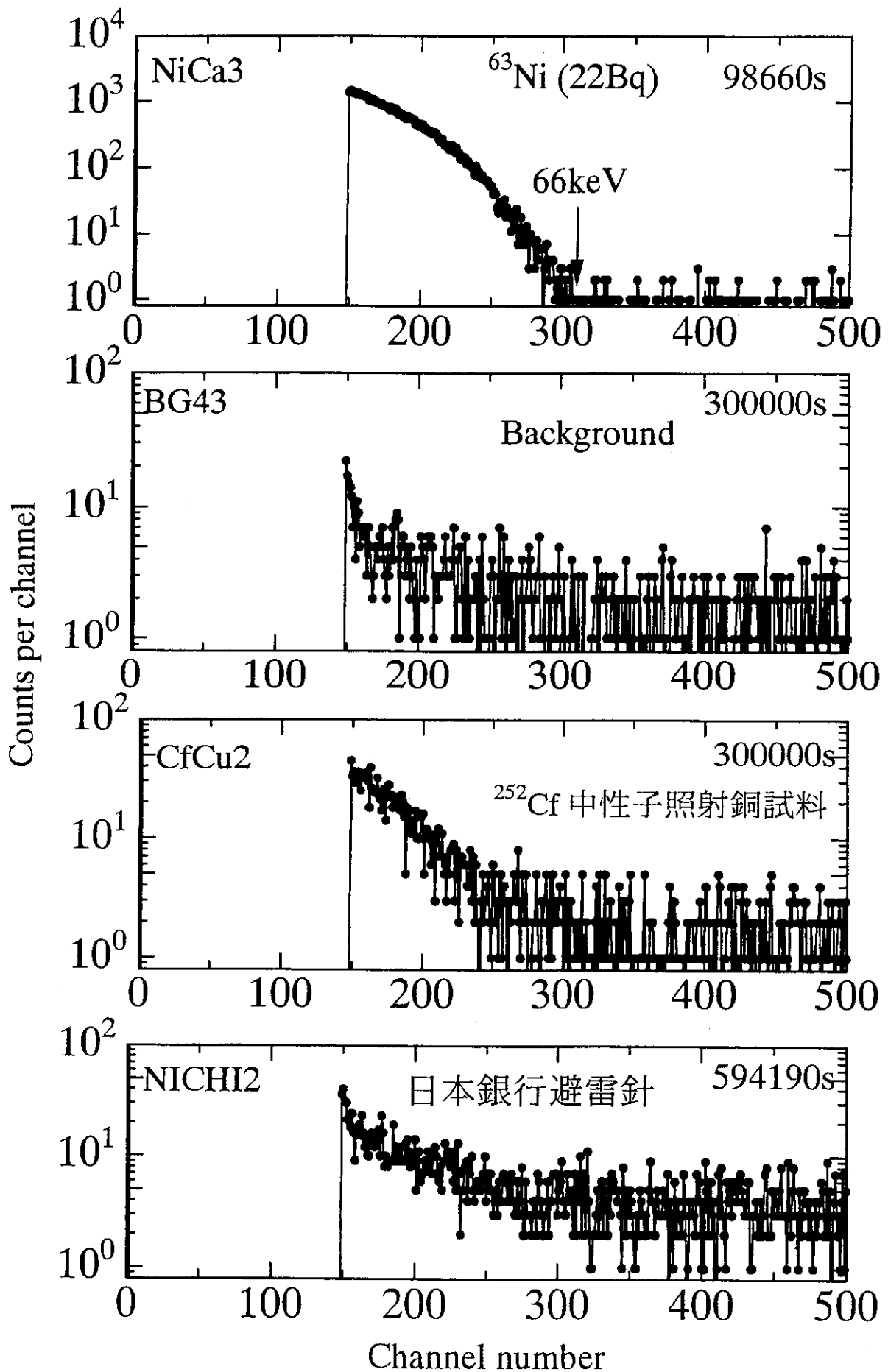


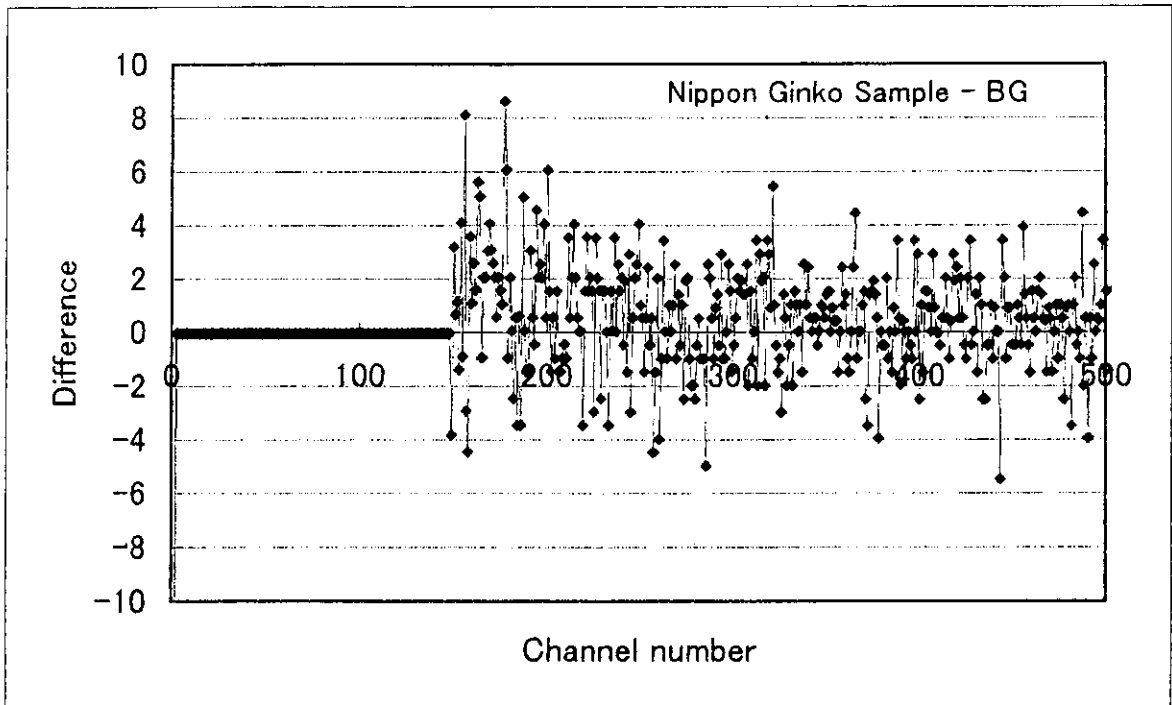
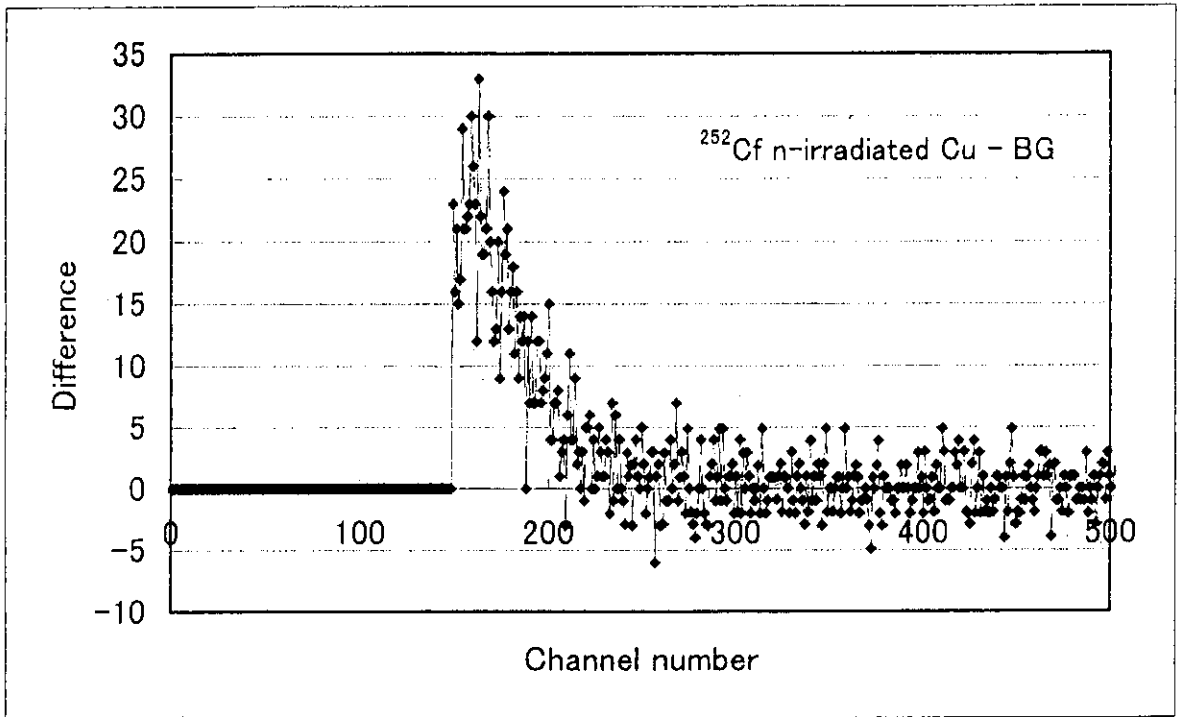
Nippon Ginko Sample



^{252}Cf n-irradiated sample







Results - 1

Sample	Counting rate (cps)	Radioactivity (Bq)
²⁵² Cf n-irradiated	0.001923±0.000080	0.1255±0.0160
Nippon Ginko	0.001209±0.000025	0.0259±0.0090
Background	0.001023±0.000058	

Efficiency $\epsilon_{Ni} = 0.00717 \pm 0.000043$

Detection limit $L_d = 2.33\sigma_b = 0.000135$ cps

$A_d = 0.0188$ Bq

Results -2 (Specific activity)

1. ^{252}Cf n-irradiated copper sample

· Recovery

$$\eta_{\text{Ni}} = 16.3 \pm 3.7 \% \quad \eta_{\text{Co}} = 9.9 \pm 1.0 \%$$

· Efficiency

$$\epsilon_{\text{Ni}} = 0.00717 \pm 0.00043 \text{ cps/Bq} \quad \epsilon_{\text{Co}} = 0.08412 \pm 0.00088 \text{ cps/Bq}$$

· Radioactivity

$$A(^{63}\text{Ni}) = 0.126 \pm 0.016 \text{ Bq} \quad A(^{60}\text{Co}) = 0.0434 \pm 0.0018 \text{ Bq}$$

· Specific activity (at the bomb explosion)

$$S(^{63}\text{Ni}) = 0.0385 \pm 0.0090 \text{ Bq/gCu}$$

$$S(^{60}\text{Co}) = 0.0226 \pm 0.0025 \text{ Bq/gCu}$$

· Calculation

$$S(^{63}\text{Ni}) = 0.0435 \text{ Bq/gCu}$$

$$S(^{60}\text{Co}) = 0.0247 \text{ Bq/gCu}$$