

## Results of $^{36}\text{Cl}$ Measurements

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### ❖ Samples

Granites for the inter-comparison measurement  
No.1 ~ No.16, No17, No18(No.1), No18(No.2,3)

### ❖ Measurements

Alternate measurement of sample and standard

std. – sample – std. (3 times)

$^{36}\text{Cl}$  standard, and Error estimation

### ❖ Results

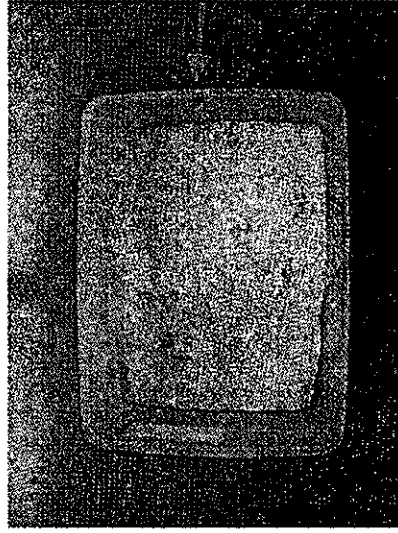
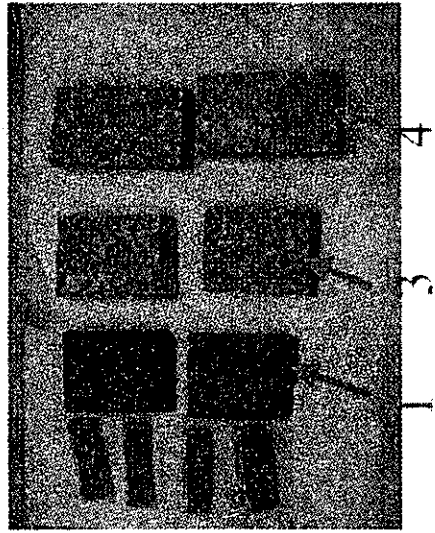
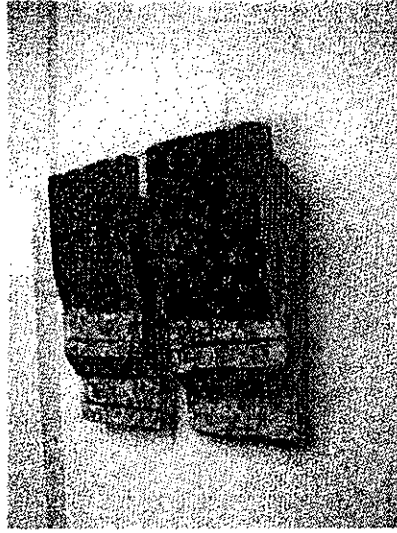
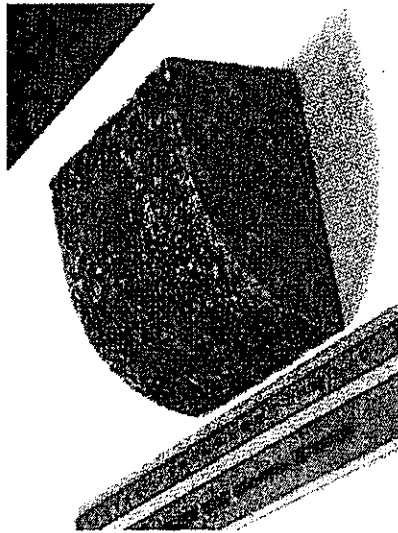
A-bomb samples, Background samples

### ❖ Summary

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# Granite Sample (Motoyasu Bridge)

①-3、No.1 Motoyasu Bridge 146m GR



2

4

3

1

# Method of Tsukuba AMS

☛ Control with molecular pilot beam



Rejection of pilot beam : Second C Foil

☛ Measurements

$^{36}\text{Cl}$  Number of  $^{36}\text{Cl}$  particles by AMS

$^{35}\text{Cl}$  Current of  $^{35}\text{Cl}^-$  with a F-cup at an ion source

☛  $^{36}\text{Cl}/\text{Cl}$  absolute ratio

Alternating measurements of sample and standard

$$\left( \frac{^{36}\text{Cl}}{^{35}\text{Cl}} \right)_{\text{sample}} = \frac{\left( \frac{^{36}\text{Cl}}{^{35}\text{Cl}} \right)_{\text{sample}}}{\left( \frac{^{36}\text{Cl}}{^{35}\text{Cl}} \right)_{\text{standard}}} \times 2.55 \times 10^{-11}$$

# Measurements

A sample and a standard have been measured alternately.

#3 (←12) 2.00E-12									
No	<sup>35</sup> Cl init	<sup>35</sup> Cl final	<sup>37</sup> Cl	<sup>36</sup> S	<sup>36</sup> Cl/ <sup>35</sup> Cl	<sup>36</sup> S/ <sup>35</sup> Cl			
48	16991	17184	1930	625	82505	0.324	42.749		
49	17193	17375	1820	569	89288	0.313	49.059		
50	17388	17566	1780	606	95214	0.340	53.491		
				average	0.326				
				stdev	0.014				
#20 No.3 教伝寺 (第2階)									
No	<sup>35</sup> Cl init	<sup>35</sup> Cl final	<sup>37</sup> Cl	<sup>36</sup> S	<sup>36</sup> Cl/ <sup>35</sup> Cl	<sup>36</sup> S/ <sup>35</sup> Cl			
51	17822	18079	2570	905	174658	0.352	67.960		
52	18092	18324	2320	848	226296	0.366	97.541		
53	18336	18551	2150	811	272814	0.377	126.890		
				average	0.365				
				stdev	0.013				
#3 (12) 2.00E-12									
No	<sup>35</sup> Cl init	<sup>35</sup> Cl final	<sup>37</sup> Cl	<sup>36</sup> S	<sup>36</sup> Cl/ <sup>35</sup> Cl	<sup>36</sup> S/ <sup>35</sup> Cl			
54	18765	18951	1860	628	79488	0.338	42.735		
55	18967	19134	1670	562	90779	0.337	54.359		
56	19143	19298	1550	511	105798	0.330	68.257		
				average	0.335				
				stdev	0.004				



# Error estimation

## Calculation of $^{36}\text{Cl}/\text{Cl}$ ratio

$$({}^{36}\text{Cl} / \text{Cl})_{(sample)} = \frac{({}^{36}\text{Cl}_{[N]} / {}^{35}\text{Cl}^{-}[c])_{(sample)}}{({}^{36}\text{Cl}_{[N]} / {}^{35}\text{Cl}^{-}[c])_{(std)}} \times ({}^{36}\text{Cl} / {}^{35}\text{Cl})_{(std)} \times 0.7577$$

Error has been estimated as the combination of the following errors.

- $^{36}\text{Cl}$  statistics error of the sample      No.1 ~ 1%      BG Samples ~ 20%
- $^{36}\text{Cl}$  statistics error of the standard      ~ 3%
- $^{35}\text{Cl}$  current integration error      < 1%
- Fluctuation of beam transportation      ~ 4% (2h)
- Estimation error of the standard sample      ~ 6% (~ 1%)

# Results (A-bombed granites)



筑波大学  
University of Tsukuba

Sample	$^{36}\text{Cl}/\text{Cl}$	Y-Error	GI (m)
No.1 Motoyasu Bridge (20-30mm)	2.50E-10	1.75E-11	146
No.1 Motoyasu Bridge (20-30mm)	2.45E-10	1.72E-11	146
No.1 Motoyasu Bridge (20-30mm)	2.22E-10	1.56E-11	146
No.1 Motoyasu Bridge (20-30mm)	2.00E-10	1.58E-11	146
No.1 Motoyasu Bridge (10-20mm)	1.81E-10	3.38E-11	146
No.2 Shirakami Shrine (20-30mm)	3.34E-11	4.13E-12	496
No.2 Shirakami Shrine (10-20mm)	2.60E-11	2.50E-12	496
No.2 Shirakami Shrine (10-20mm)	2.55E-11	2.09E-12	496
No.2 Shirakami Shrine (10-20mm)	2.27E-11	1.89E-12	496
No.3 Honkeiji Temple (10-20mm)	1.68E-12	1.41E-13	881
No.3 Honkeiji Temple (20-30mm)	1.49E-12	1.65E-13	881
No.4 Myochoji Temple (10-20mm)	1.25E-11	1.12E-12	654
No.5 Old Pref. Buld. (0-20mm)	3.02E-12	2.71E-13	881
No.5 Old Pref. Buld. (20-30mm)	2.87E-12	2.13E-13	881
No.5 Old Pref. Buld. (0-20mm)	2.82E-12	2.36E-13	881
No.5 Old Pref. Buld. (20-30mm)	2.72E-12	6.22E-13	881
No.6 Enryuji Temple (10-20mm)	2.09E-12	2.74E-13	912
No.7 Shingyoji Temple (10-20mm)	1.37E-12	1.66E-13	927
No.8 City Hall Pavement (10-20mm)	5.47E-13	6.91E-14	1016
No.8 City Hall Pavement (20-30mm)	4.76E-13	7.92E-14	1016
No.8 City Hall Pavement (10-20mm)	4.67E-13	3.97E-14	1016
No.8 City Hall Pavement (10-20mm)	4.24E-13	7.29E-14	1016
No.9 Kouzenji Temple (0-20mm)	2.50E-13	4.48E-14	1163
No.18-1 E-building (No.1)	2.47E-13	2.45E-14	1380
No.18-2 E-building (No.2,3)	2.12E-13	3.94E-14	1380
No.17 Kikkawa Ryokan (The whole)	1.41E-13	1.42E-14	1411

# Results (Background)

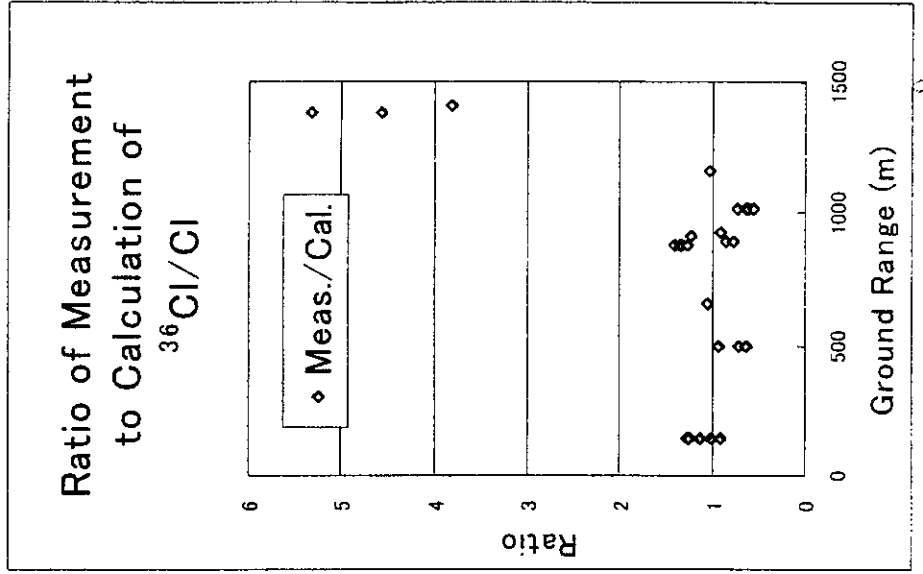
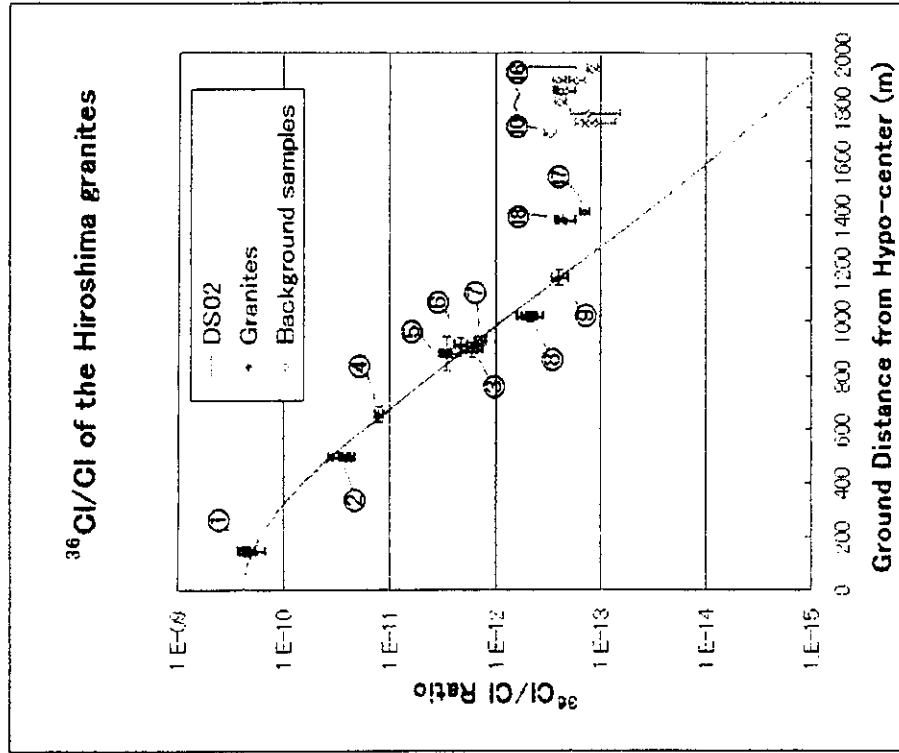
<sup>36</sup> Cl measurements of Hiroshima background samples		
Sample	<sup>36</sup> Cl/Cl	Error
No.10 Sengyoji Temple (10-20mm)	3.00E-13	3.71E-14
No.11 Kannonji Temple (10-20mm)	1.54E-13	2.22E-14
No.11 Kannonji Temple (20-30mm)	1.30E-13	1.99E-14
No.11 Kannonji Temple (10-20mm)	1.11E-13	3.80E-14
No.12 Senzoubou (20-30mm) Iyo	1.30E-13	6.51E-14
No.13 Senzoubou (20-30mm) Jiishi	2.44E-13	2.78E-14
No.14 Senzoubou (Half of block)	2.47E-13	3.76E-14
No.14 Senzoubou (Half of block)	2.39E-13	3.17E-14
No.14 Senzoubou (Half of block)	2.14E-13	3.98E-14
No.15 Myokenji Temple (The whole)	2.49E-13	3.53E-14
No.15 Myokenji Temple (The whole)	1.70E-13	2.95E-14
No.16 Myokenji Temple (20-30mm)	1.20E-13	1.39E-14

Average of the <sup>36</sup>Cl/Cl = 1.82E-13

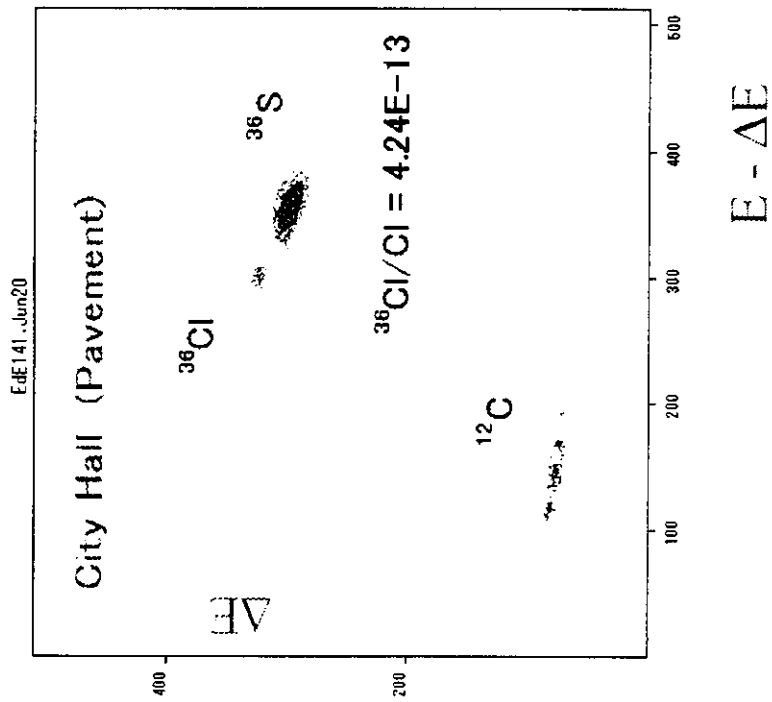
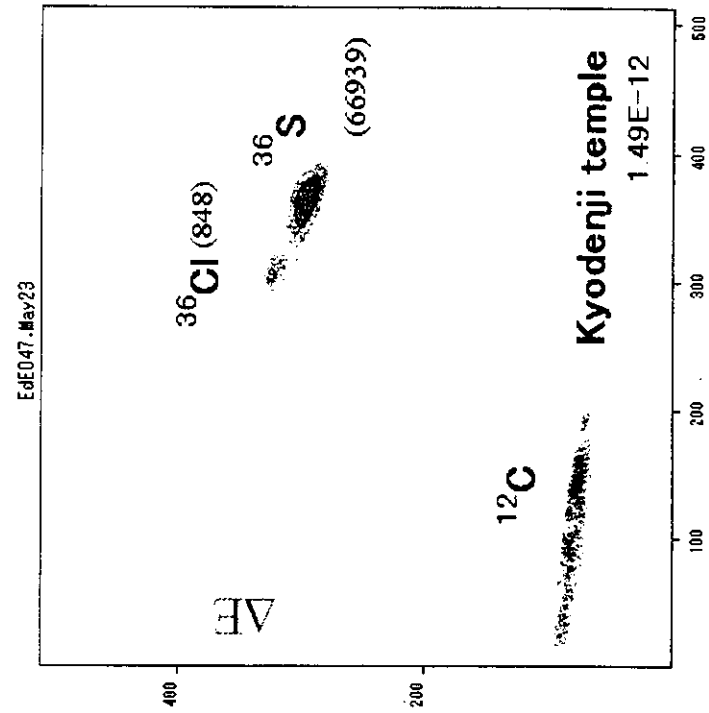
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# Results

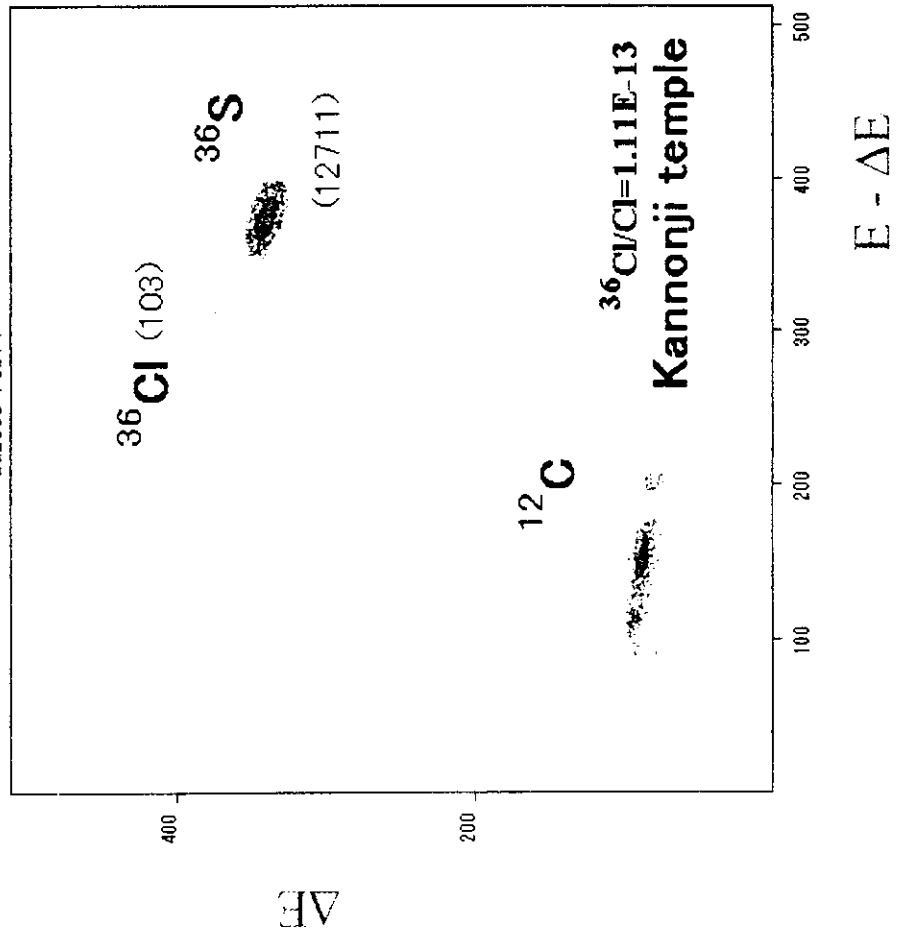


# Scatter plots

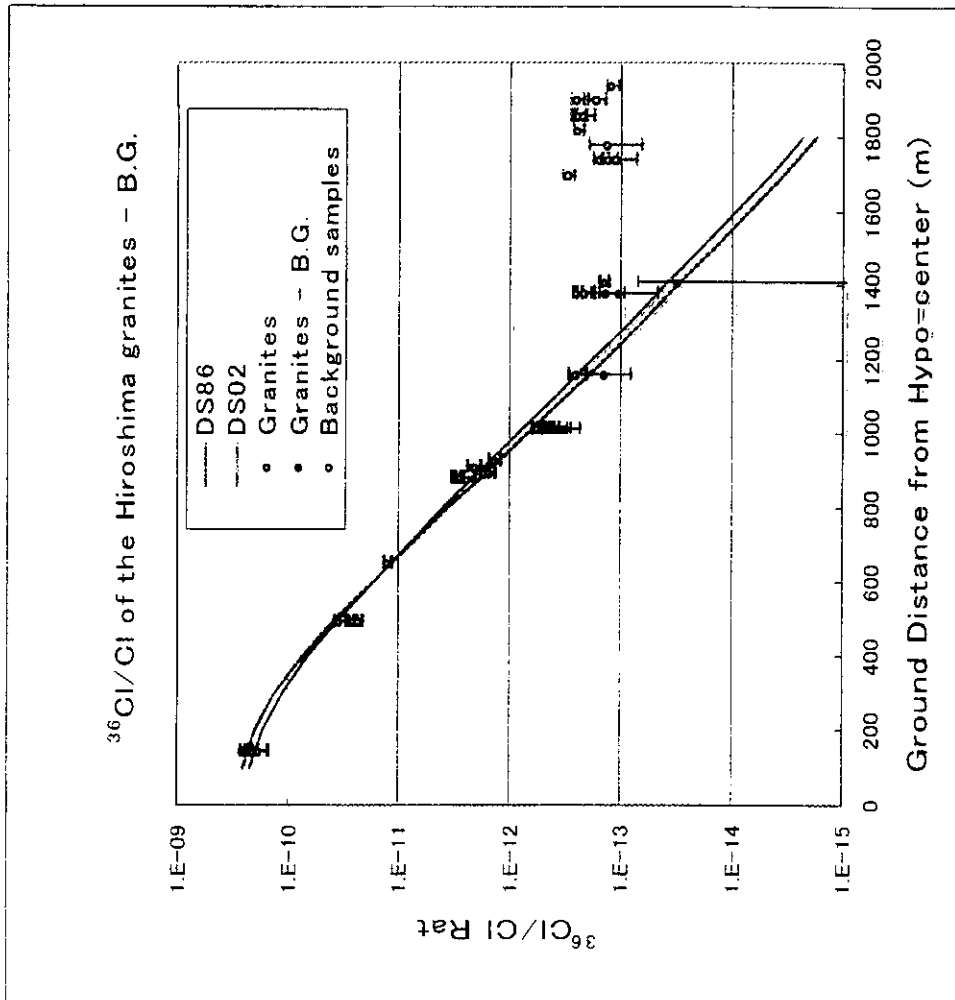


# Scatter plots (Background)

EdE030.Fab14



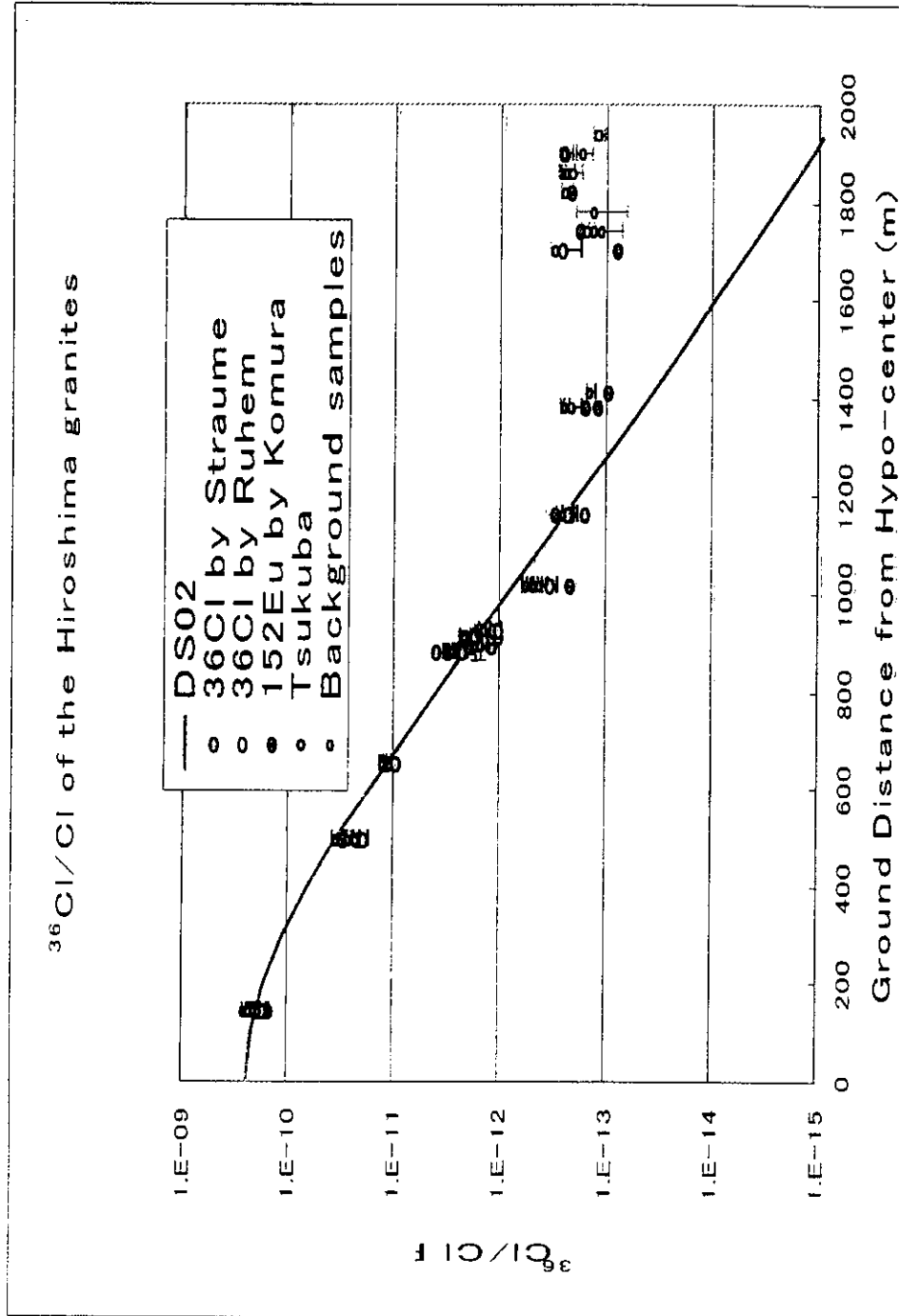
# Results with B.G. Sub.

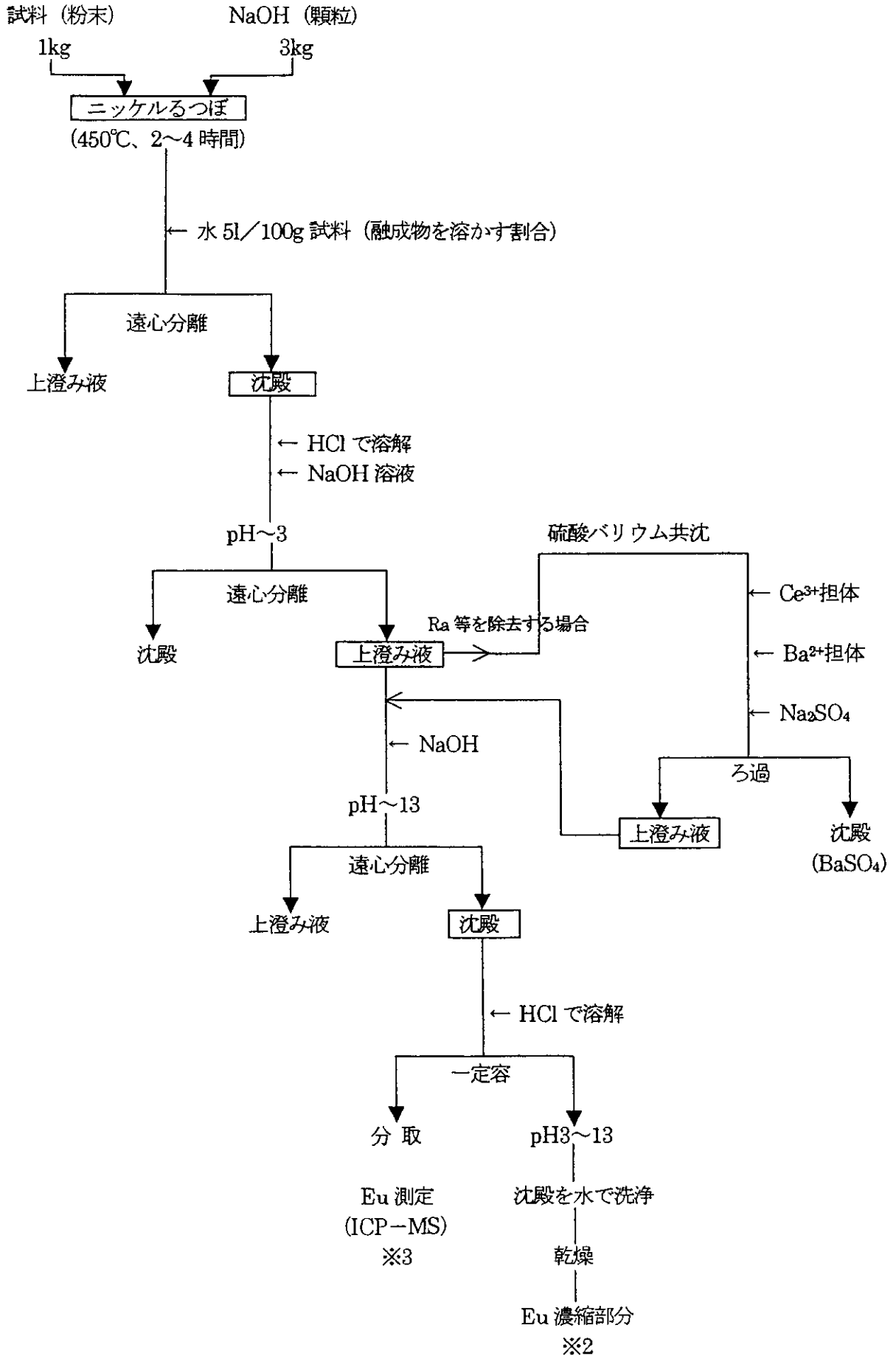


## Summary

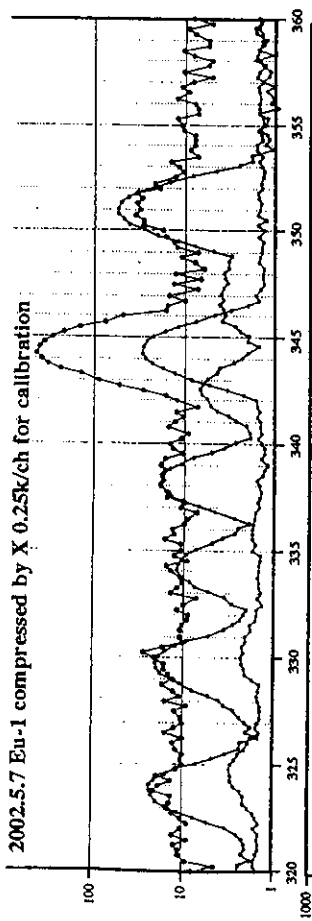
1. The  $^{36}\text{Cl}/\text{Cl}$  ratios of both samples, the A-bombed granites samples and the background samples, have been measured by means of the AMS method.
2. A good agreement with DS02 is clearly demonstrated within the range of  $\sim 1100\text{m GD}$ .
3. The  $^{36}\text{Cl}/\text{Cl}$  ratio of the background samples is shown  $1.8 \times 10^{-13}$  on the average.
4. It seems that No.3 sample itself has be re-assessed.

# The comparison

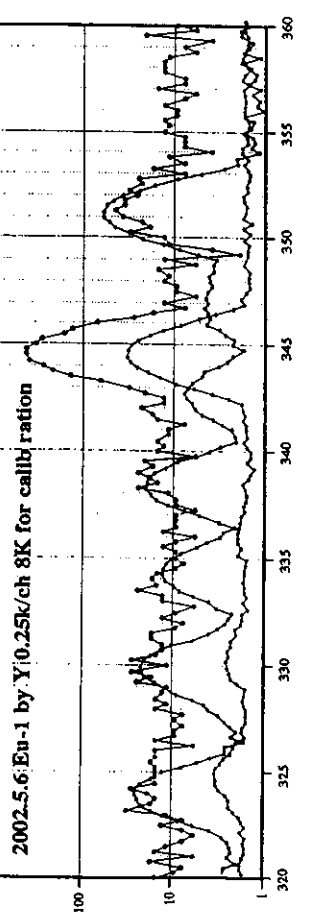




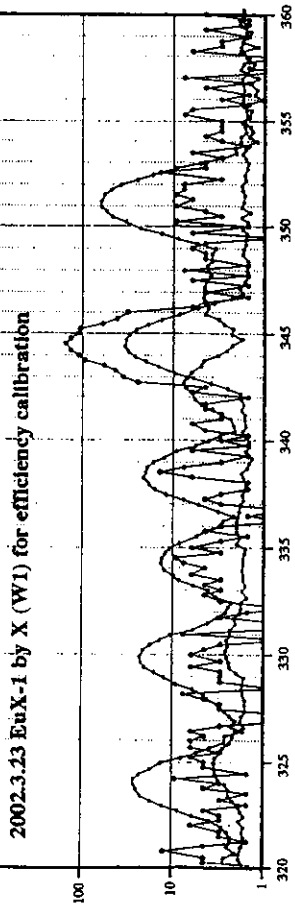
2002.5.7 Eu-1 compressed by X 0.25k/ch for callibration



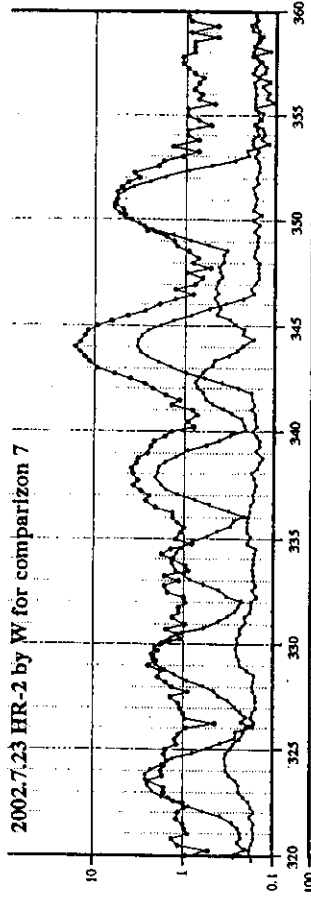
2002.5.6 Eu-1 by Y 0.25k/ch 8K for callb ration



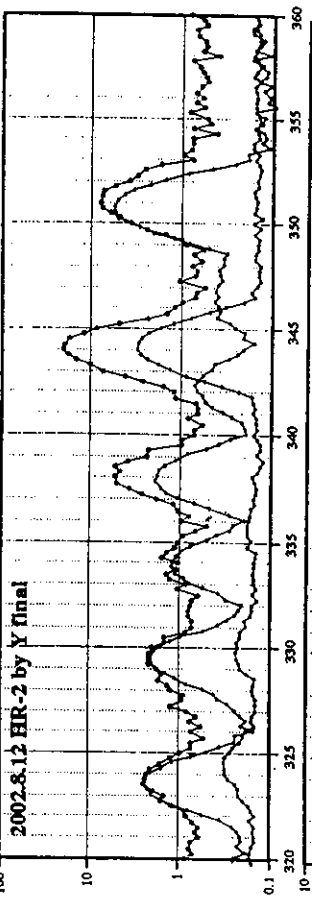
2002.3.23 EuX-1 by X (W1) for efficiency callibration



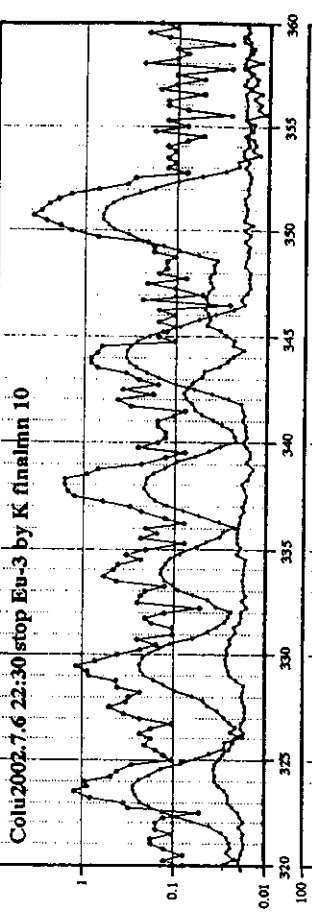
2002.7.23 HR-2 by W for comparizon 7



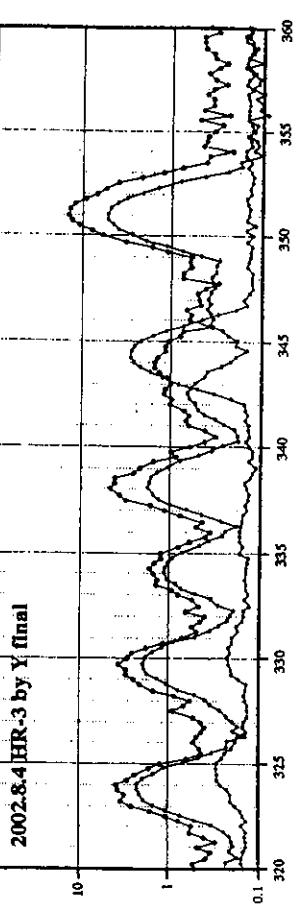
2002.8.12 HR-2 by Y final



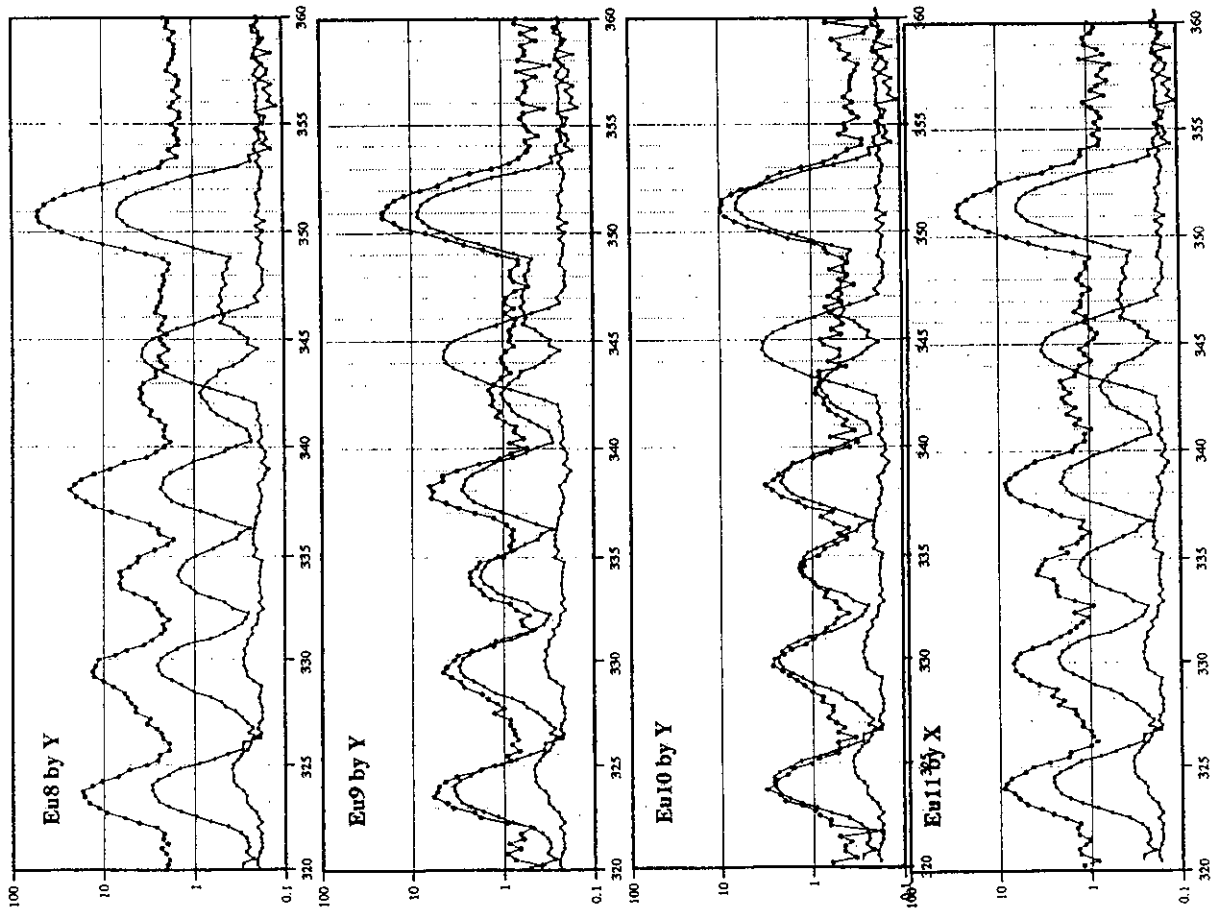
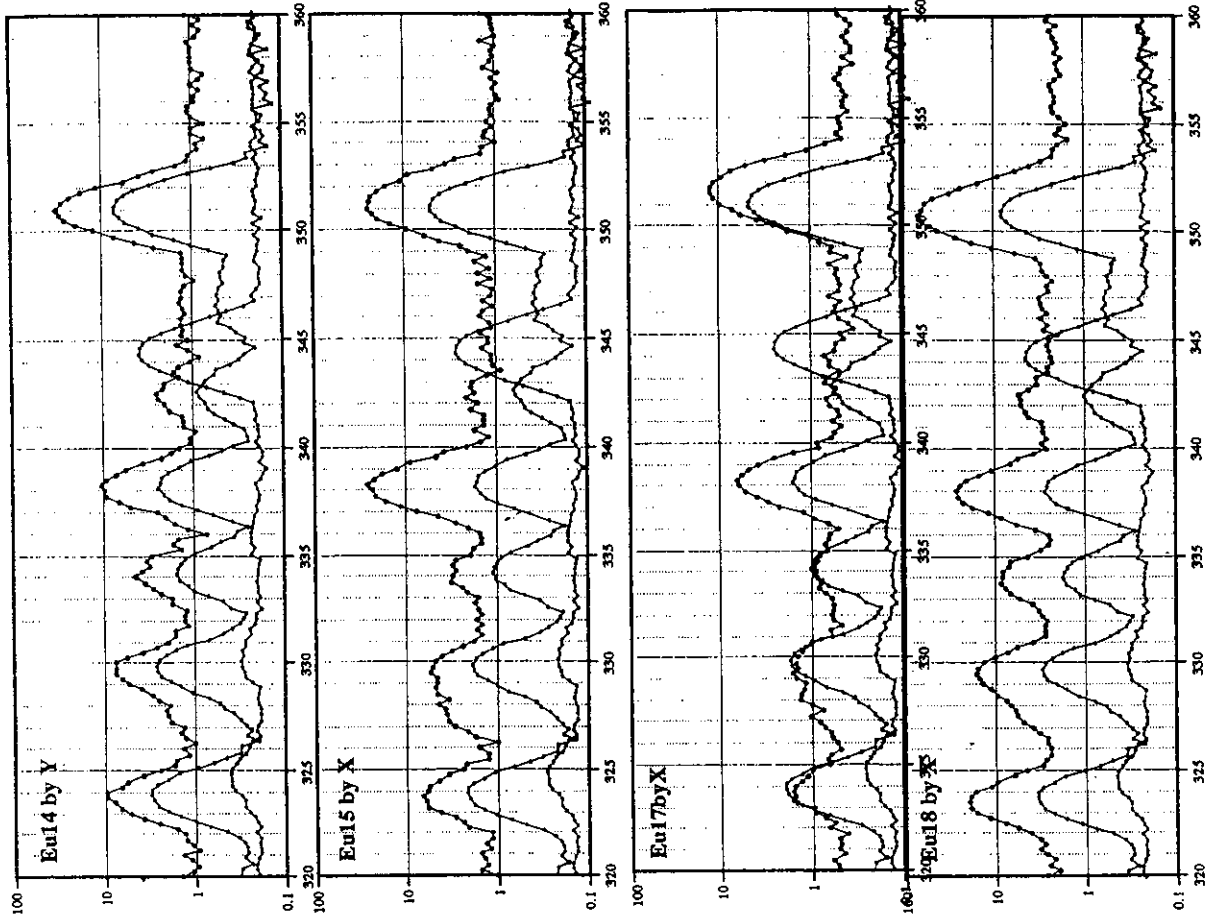
Colu2002.7.6 22:30 stop Eu-3 by K finalinn 10



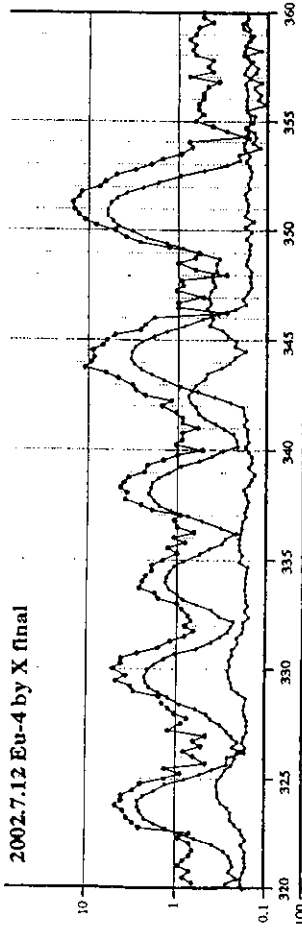
2002.8.4 HR-3 by Y final



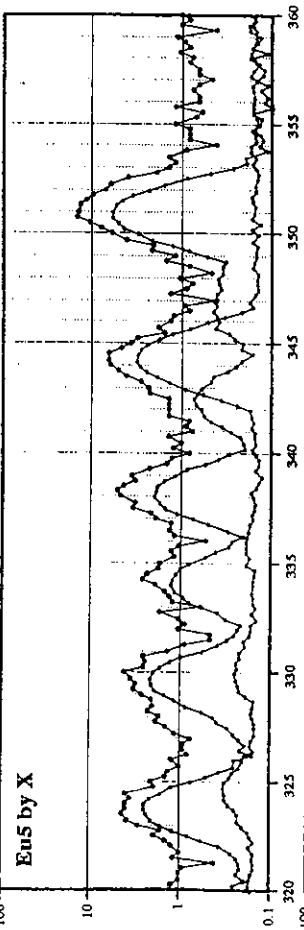




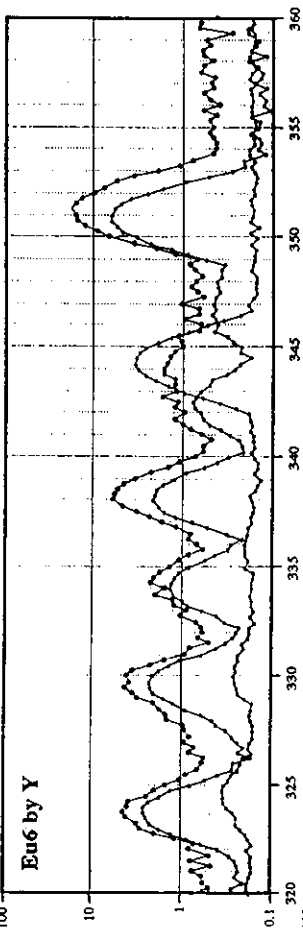
2002.7.12 Eu-4 by X final



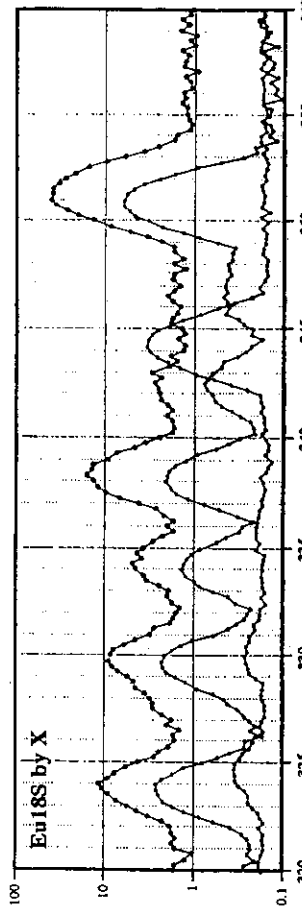
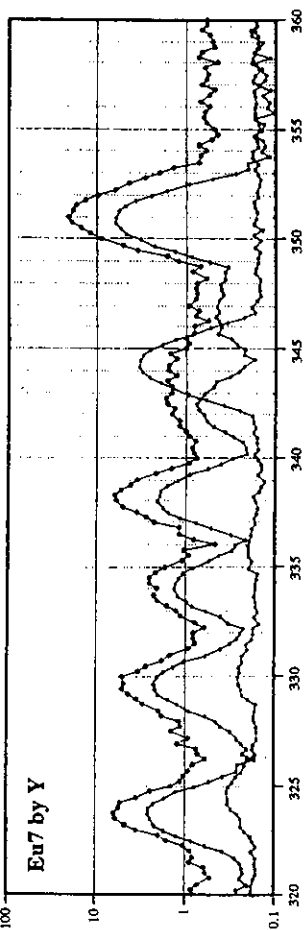
Eu5 by X



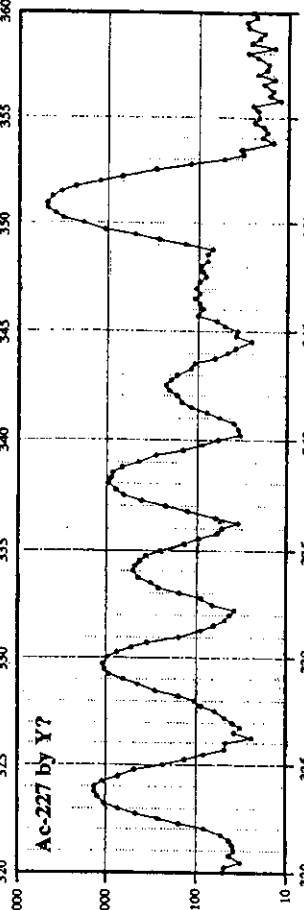
Eu6 by Y



Eu7 by Y



Ac-227 by Y?



Eu-152 std in well of Y

