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**ICP MS measurements of
ss steel for GERDA
experiment**

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Milano

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Samples of ss steel ICP MS measurements

- Samples were first **etched** with a mixture of HNO₃ and HCl acids during 5 min, then **washed** by DI water and dried.
- Samples have been **weighed**.
- The samples were **dissolved** by a mixture of HNO₃ and HCl acids and the volume of the solutions were adjusted in several steps to have concentration of samples around of **1.0 – 1.3 g/L**.
- **Blank solutions** were prepared in the same way.



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13 – 15 of November 2006

Typical mode of the MS Spectrometer' operation

Inductively Coupled-Mass Spectrometer
ICP MS ELAN DRC II was used.

ICP RF Power	120 W
Plasma	15 L/min
Auxiliary Gas Flow	1,2 L/min
Scan Mode	Peak hopping
Dwell time	40 msec
Sweeps/Reading	250
Replicate	6 – 10



Calibration and internal standard

- Calibration of the set up was made with standard solution from Perkin-Elmer, concentration of ^{238}U is $1 \mu\text{g/L}$ and ^{232}Th is $1 \mu\text{g/L}$.
- These solution were diluted to concentration of $0, 1 \mu\text{g/L}$ ($0,01 \mu\text{g/L}$), using one of blank solutions.
- **Calibration** were made by the blank and the solution with $c = 0, 1 \mu\text{g/L}$ ($0,01 \mu\text{g/L}$).
- **Bi** was used as internal **standard**.



Milano

13 – 15 of November 2006

Measurement of bkg and standard

Isotope (0,1 $\mu\text{g/L}$)	Intensity of bkg (HNO_3) pulse/sec	Intensity of standard pulse/sec*	Intensity of blank pulse/sec*
^{209}Bi	952	929	1092
^{238}U	4	1978	5
^{232}Th	6	1627	11

* - without reduction of bkg



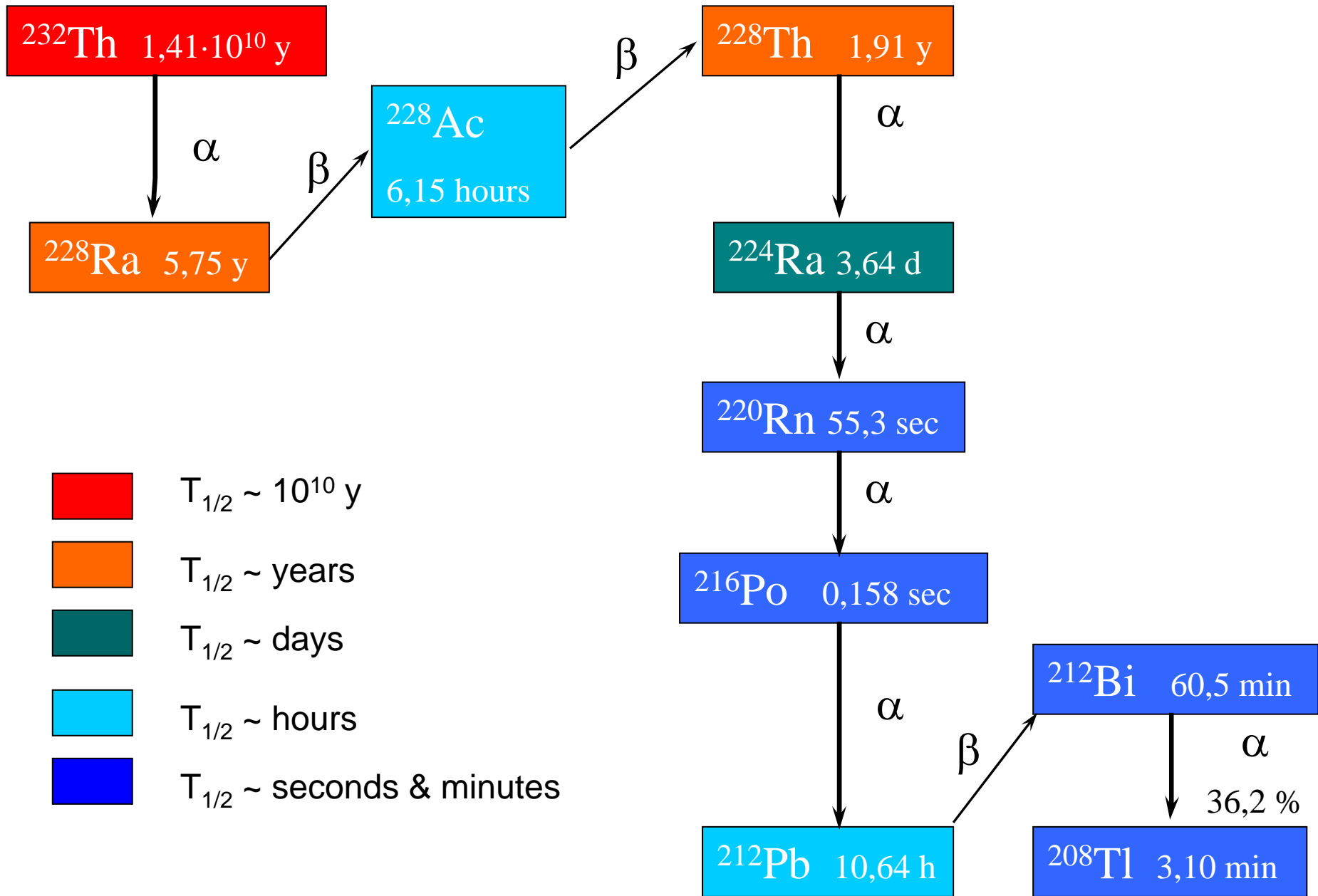
ICP MS measurements ss steel type 1.4571

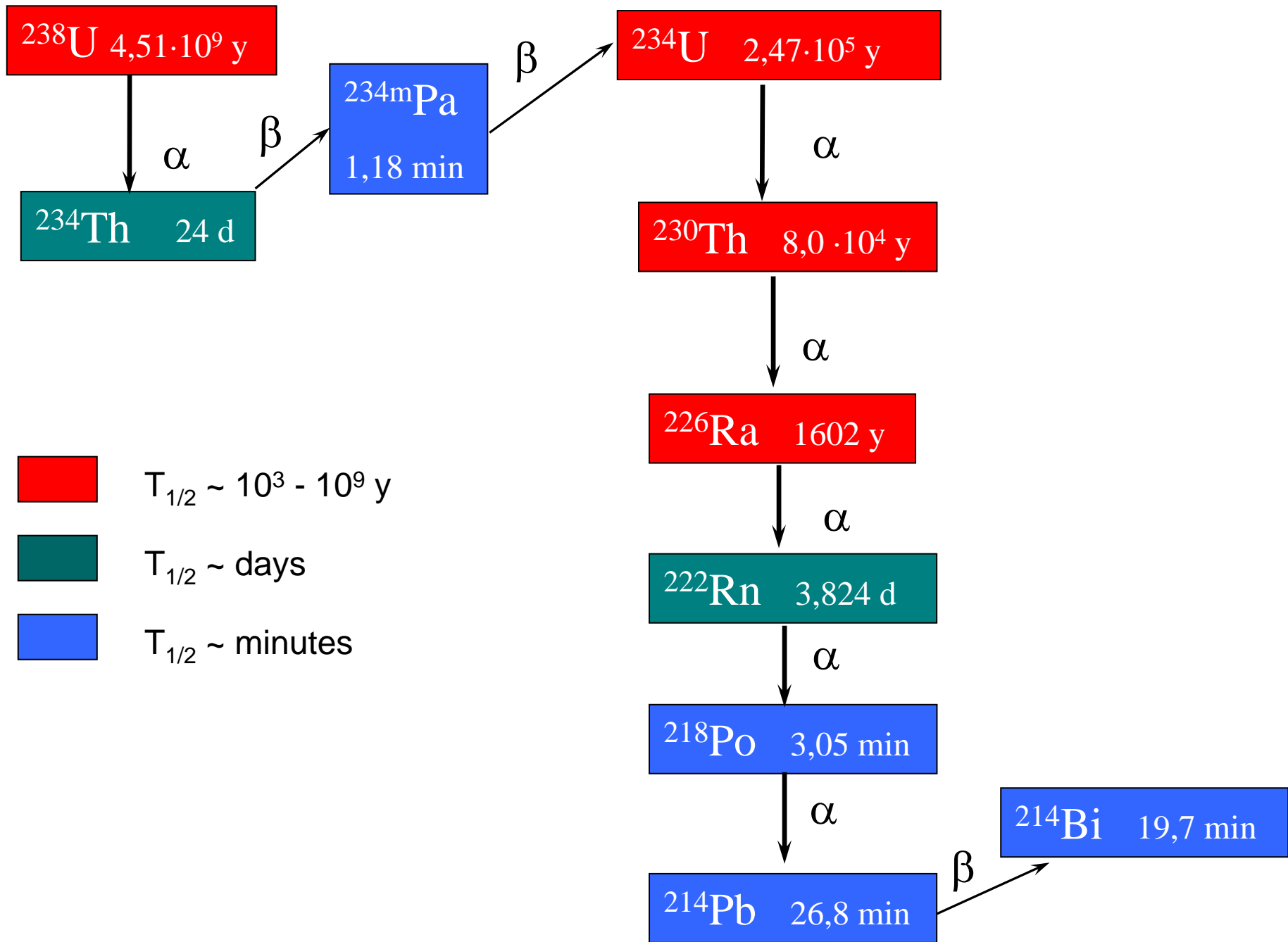
Sample	Element	Concentration Content in solution μg/L	Activity in sample g/g	Th-232 Ra228/Th228 mBq/kg (HPGe)	
				Th-232	Ra228/Th228
1 494257	U	0,000826	$5,1 \cdot 10^{-10}$		
	Th	0,001651	$1,0 \cdot 10^{-9}$	<4,0	< 0, 86/0,11
2 493553	U	0,001788	$1,2 \cdot 10^{-9}$		
	Th	0,001319	$8,5 \cdot 10^{-10}$	< 3,4	<u><3,3/=1,1</u>
3 254533	U	0,001354	$1,0 \cdot 10^{-9}$		
	Th	0,001485	$9,5 \cdot 10^{-10}$	< 3,8	= 1,0/1,5
4 255455	U	0,000423	$2,9 \cdot 10^{-10}$		
	Th	0,001230	$8,3 \cdot 10^{-10}$	< 3,3	<3,0/=5,1
5 50609522	U	0,000590	$3,9 \cdot 10^{-10}$		
	Th	0,001192	$8,0 \cdot 10^{-10}$	< 3,2	<1,0/0,41
6 charge #5991	U	0,002035	$1,5 \cdot 10^{-9}$		
	Th	0,000836	$6,1 \cdot 10^{-10}$	< 2,4	<u><2,9/=5,1</u>



Conclusion

1. Six samples of ss steel type 1.4571 were measured with ICP MS ELAN DRC II.
2. Content of Th-232 was defined at level of
 $\leq 2.4 - 4.0$ mBq/kg (limit).
3. Such a level of Th-232 requires application of internal Cu passive shielding with modest thickness (in the cryostat design).
4. These samples will be re-measured with another MS set up, X7 ICP MS.







Milano

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Ra-228 and Th-228 activity

