Message ID: **188** Entry time: **Tue Nov 7 09:19:19 2023**

Experiment Date:	2023 11 06
Duration (Days):	5
User:	Anja Miokovic, Stjepko Fazinic, Iva Bozicevic Mihalic
Accelerator:	Tandetron
Beam Line:	Old uProbe
Project:	Hi-REXS (HRZZ projekt)
Experiment Title:	HR PIXE Detection limit
Beam:	2MeV H
Method:	HR PIXE, PIXE, RBS

Beam deflection was connected to the horizontal deflector with -700 V.

GreatControl: X Binning = OFF, Y Binning = OFF, Readout Speed = 500 kHz, Gain = Max Sensitivity, Correct Bias = UNCHECKED, T_{ccd}= -70 ºC, T_{back}= 23 ºC, Chiller at 18 ºC

Chamber positioned according to the black marks on the floor that were drawn in February.

PIXE: Coarse gain=1 k; Fine gain=3; Shaping time=2 us; covered with Al (1 mm thick) mask with hole of 2r=1.7 mm

RBS: Bias=+50 V; Coarse gain=200; Fine gain=4.85; Shaping time=1 us; covered with teflon mask with hole of 2r=3 mm

6.11.2023.

Beam: 2 MeV H^+ TDT

Focus: Me 16.2 A, Ox 34.4 A

I~4 nA on the metal before the measurement

Samples: Ti foil (position 1), IAEA Soil 7 (position 2), NIST 620 glass (position 4)

Measuring only PIXE and RBS spectra first.

FILE	DETECTOR	SAMPLE	COMMENT
2311082	PIXE, RBS	NIST 620 glass	
2311083	PIXE, RBS	Ti foil	
2311084	PIXE, RBS	IAEA Soil 7	

We realised that motors are making noise in RBS signal. To remove that noise completely motors need to be disconnected from the chamber.
In order to not have that noise as a peak in RBS spectrum it is enough to just increase shaping time on RBS amplifier. So we changed it from 2 us (how it was in September) to 1 us.

7.11.2023.

Beam: 2 MeV H^+ TDT

Focus: Me 16.6 A, Ox 34.8 A

I~2 nA on the metal before the measurement

Measurements of Al in standards:

Samples: IAEA XRFPT08 Natural soil (position 1), IAEA Soil-7 (position 2), NIST 2710 Montana soil (position 3), NIST 620 glass (position 4), MgO (position 6)

Diffraction crystal: ADP(101) at 9.9 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311085	CCD	Al	1	5	$AlKa_{1,2}$ line is visible in Vista on ch~550
2311086	CCD	IAEA Natural soil	1	20	- || -
2311087	CCD	IAEA Natural soil	1	5	we want to reduce t_{exp} even more
2311088	CCD	DARK	10	3	
2311089	CCD, PIXE, RBS	IAEA Natural soil	240	3	
2311090	CCD, PIXE, RBS	IAEA Soil 7	1	6	I~4 nA
2311091	CCD	DARK	10	6	
2311092	CCD, PIXE, RBS	IAEA Soil 7	103	6	stopped beacause current fell
2311093	CCD, PIXE, RBS	IAEA Soil 7	200	6	
2311094	CCD	NIST Glass 620	1	10	$AlKa_{1,2}$ line is not visible in Vista for this low Al concentration
2311095	CCD	DARK	10	10	
2311096	CCD, PIXE, RBS	NIST Glass 620	16	10	current increased so we decided to reduce t_{exp} and stopped
2311097	CCD, PIXE, RBS	NIST Glass 620	250	6	I~5 nA
2311098	CCD, PIXE, RBS	NIST Glass 620	250	6	- || -

EW used in Matlab analysis = [320, 450]

Measurements of Mg in standards:

Samples and crystal are the same as for Al. Only position of crystal is changed.

Diffraction crystal: ADP(101) at 9.9 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311099	CCD	MgO	1	6	$MgKa_{1,2}$ line visible in Vista on ch~500
2311100	CCD	NIST Glass 620	1	8	$MgKa_{1,2}$ line is not visible in Vista for this low Mg concentration
2311101	CCD, PIXE, RBS	NIST Glass 620	250	6	I~6 nA
2311102	CCD	DARK	10	8	
2311103	CCD, PIXE, RBS	IAEA Soil 7	180	8	- || -

EW used in Matlab analysis = [240, 380]

Measurements of Na in standards:

Samples: IAEA XRFPT08 Natural soil (position 1), IAEA Soil-7 (position 2), NIST 2710 Montana soil (position 3), NIST 620 glass (position 4), NaCl (position 6)

Diffraction crystal: Beryl(1010) at 10.5 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311104	CCD	NaCl	1	5	I~5 nA, $NaKa_{1,2}$ line visible in Vista on ch~ 550
2311105	CCD, PIXE, RBS	NIST Glass 620	360	3	
2311106	CCD, PIXE, RBS	NIST Montana soil	360	3	
2311107	CCD, PIXE, RBS	NIST Montana soil	720	3	

EW used in Matlab analysis = [200, 300]

8.11.2023.

Beam: 2 MeV H^+ TDT

Focus: Me 16.7 A, Ox 34.9 A

I~5 nA on the metal before the measurement

Measurements of K in standards:

Samples: IAEA XRFPT08 Natural soil (position 1), IAEA Soil-7 (position 2), NIST 2710 Montana soil (position 3), NIST 620 glass (position 4), KCl (position 6)

Diffraction crystal: Si(111) at 11.6 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311108	CCD	KCl	1	10	$KKa_{1,2}$ line visible in Vista on ch~ 520
2311109	CCD	NIST Montana soil	1	6	
2311110	CCD	DARK	10	6	
2311111	CCD, PIXE, RBS	NIST Montana soil	203	6	I~4 nA but unstable, we collected enough statistics so we stopped at frame 202?
2311112	CCD, PIXE, RBS	IAEA Soil 7	225	6	
2311113	CCD	DARK	10	4	
2311114	CCD, PIXE, RBS	NIST Glass 620	600	4	

EW used in Matlab analysis = [790, 920]

Measurements of Ca in standards:

Samples: IAEA SL-1 Lake sediment (position 1), ISE 952 Clay (position 2), NIST 2710 Montana soil (position 3), NIST 620 glass (position 4), CaO (position 6)

Diffraction crystal: Ge(220) at 9.0 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311115	CCD	CaO	1	6	$CaKa_{1,2}$ line visible in Vista on ch~ 520
2311116	CCD, PIXE, RBS	NIST Montana soil	300	4	I~4 nA
2311117	CCD, PIXE, RBS	ISE 952 Clay	300	4	
2311118	CCD, PIXE, RBS	IAEA Lake sediment	450	6	
2311119	CCD	DARK			
2311120	CCD, PIXE, RBS	NIST Glass 620	225	2	

EW used in Matlab analysis = [920, 1050]

9.11.2023.

Beam: 2 MeV H^+ TDT

Focus: Me 16.6 A, Ox 34.8 A

I~2 nA on the metal before the measurements

Measurements of Ti in standards:

Samples: IAEA SL-1 Lake sediment (position 1), IAEA XRFPT08 Natural soil (position 2), NIST 2710 Montana soil (position 3), NIST 620 glass (position 4), CaO (position 6), Ti foil (sticked on the holder)

Diffraction crystal: Ge(220) at 10.9 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311121	CCD	Ti foil	1	10	$TiKa_{1,2}$ line visible in Vista on ch~ 420
2311122	CCD	DARK	10	6	
2311123	CCD, PIXE, RBS	IAEA Natural soil	225	6	I~1-2 nA
2311124	CCD	DARK	10	10	
2311125	CCD, PIXE, RBS	IAEA Lake sediment	200	10	I~1.5-1.8 nA
2311126	CCD, PIXE, RBS	NIST Montana soil	600	6	I~2.5 nA

EW used in Matlab analysis = [1100, 1300]

Measurements of S in standards:

Samples: IAEA SL-1 Lake sediment (position 1), IAEA A-13 Animal blood (position 2), NIST 2710 Montana soil (position 3), Bowen's kale (position 4), FeS (position 6)

Diffraction crystal: Si(111) at 8.6 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311127	CCD	FeS	1	10	$SKa_{1,2}$ line visible in Vista on ch~ 530
2311128	CCD	FeS	1	5	crystal moved to the front so that $SKa_{1,2}$ line in on ch~ 370 and then PbMa line can be visible in the same frame when needed
2311129	CCD, PIXE, RBS	IAEA Lake sediment	250	6	I~4 nA
2311130	CCD, PIXE, RBS	IAEA Lake sediment	250	6	
2311131	CCD, PIXE, RBS	IAEA Lake sediment	114	6	
2311132	CCD	DARK	10	4	
2311133	CCD, PIXE, RBS	NIST Montana soil	1200	4	I~6 nA
2311134	PIXE	IAEA Lake sediment	/	/	SS=1x0.1, in order to check the homogenity of the sample we chose random part of the sample and inspect it -> it looks homogeneous
2311135	CCD, PIXE, RBS	IAEA Lake sediment	150	4	
2311136	CCD, PIXE, RBS	IAEA Animal blood	150	4	I~3 nA

EW used in Matlab analysis = [550, 700]

10.11.2023.

Beam: 2 MeV H^+ TDT

Focus: Me 16.7 A, Ox 34.8 A

I~2 nA on the metal before the measurements

Measurements of P in standards:

Samples: IAEA SL-1 Lake sediment (position 1), IAEA A-13 Animal blood (position 2), NIST 2710 Montana soil (position 3), Bowen's kale (position 4), $AlPO_4$ (position 6)

Diffraction crystal: PET(002) at 10.6 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT
2311137	CCD	$AlPO_4$	1	10	$PKa_{1,2}$ line visible in Vista on ch~ 540
2311138	CCD	DARK	10	10	
2311139	CCD, PIXE, RBS	Bowen's kale	150	10	I~2 nA but unstable
2311140	CCD, PIXE, RBS	Bowen's kale	37	10	stopped because the beam was lost
2311141	CCD, PIXE, RBS	NIST Montana soil	300	10	I~2.2 nA
Andro's slits opened to increase the current -> I~5 nA					
2311142	CCD	DARK	10	4	
2311143	CCD, PIXE, RBS	NIST Montana soil	450	4	I~5-5.4 nA
2311144	CCD, PIXE, RBS	Bowen's kale	106	4	I~5.4 nA

EW used in Matlab analysis = [480, 560]

Measurements of Cr in standards:

Samples: IAEA SL-1 Lake sediment (position 1), IAEA A-13 Animal blood (position 2), NIST 2710 Montana soil (position 3), Bowen's kale (position 4), BCR CRM 38 (position 6), Cr foil (sticked on the holder)

Diffraction crystal: LiF(220) at 9.7 cm, peeking out of holder for 3 mm, with marked dot facing the main door

FILE	DETECTOR	SAMPLE	N_{frames}	t_{exp}/s	COMMENT

2311145	CCD	Cr foil	1	2	$CrKa_{1,2}$ line visible in Vista on ch~ 510
2311146	PIXE, RBS	Cr foil	/	/	only for 1 min
2311147	CCD	DARK	10	6	
2311148	CCD, PIXE, RBS	CRM 38	104	6	I~5-6 nA, we see only noise in Matlab analysis
2311149	CCD	DARK	10	1	
2311150	CCD	Cr foil	20	1	I~1 nA (Andro's slits closed only for this measurement because otherwise we have too many events in one fram), checking if we are using correct energy window in Matlab analysis -> we do
2311151	CCD, PIXE, RBS	CRM 38	350	6	I~6 nA; still no defined peak, only noise -> we conclude that w(Cr, CRM 38) is too low for our detector to see signal from Cr

EW used in Matlab analysis = [1350, 1520]