



WP PWIE: SPE Report & Plans 2023

Post mortem studies of Tile 0 and 5 from JET

N. Catarino, R. Mateus, R. Silva, E. Alves



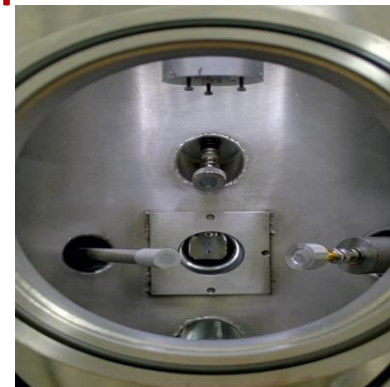
ipfn
INSTITUTO DE PLASMAS
E FUSÃO NUCLEAR



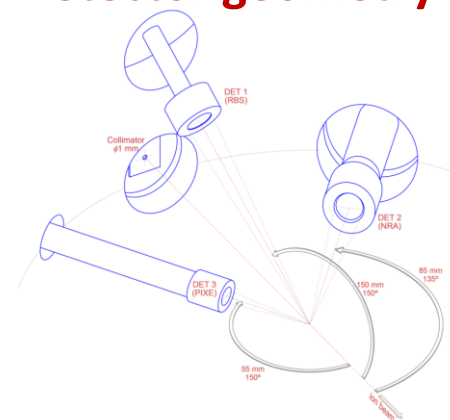
This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 — EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.



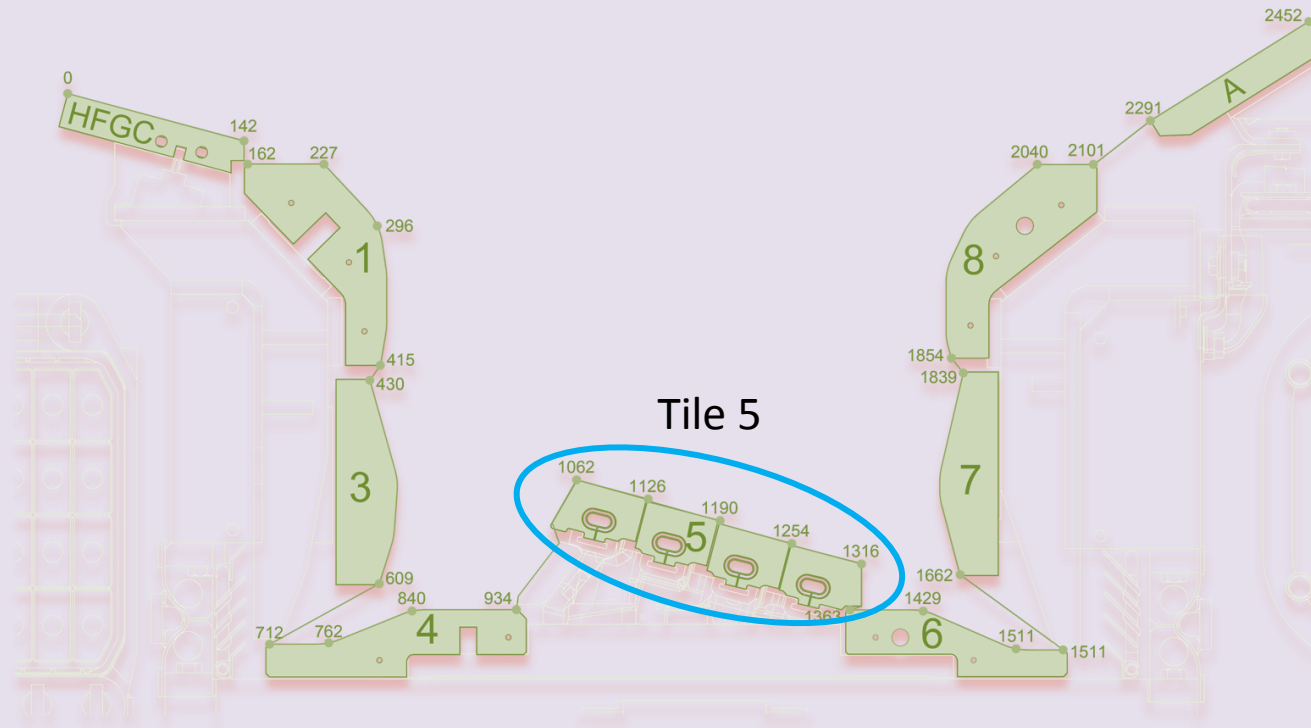
Experimental chamber

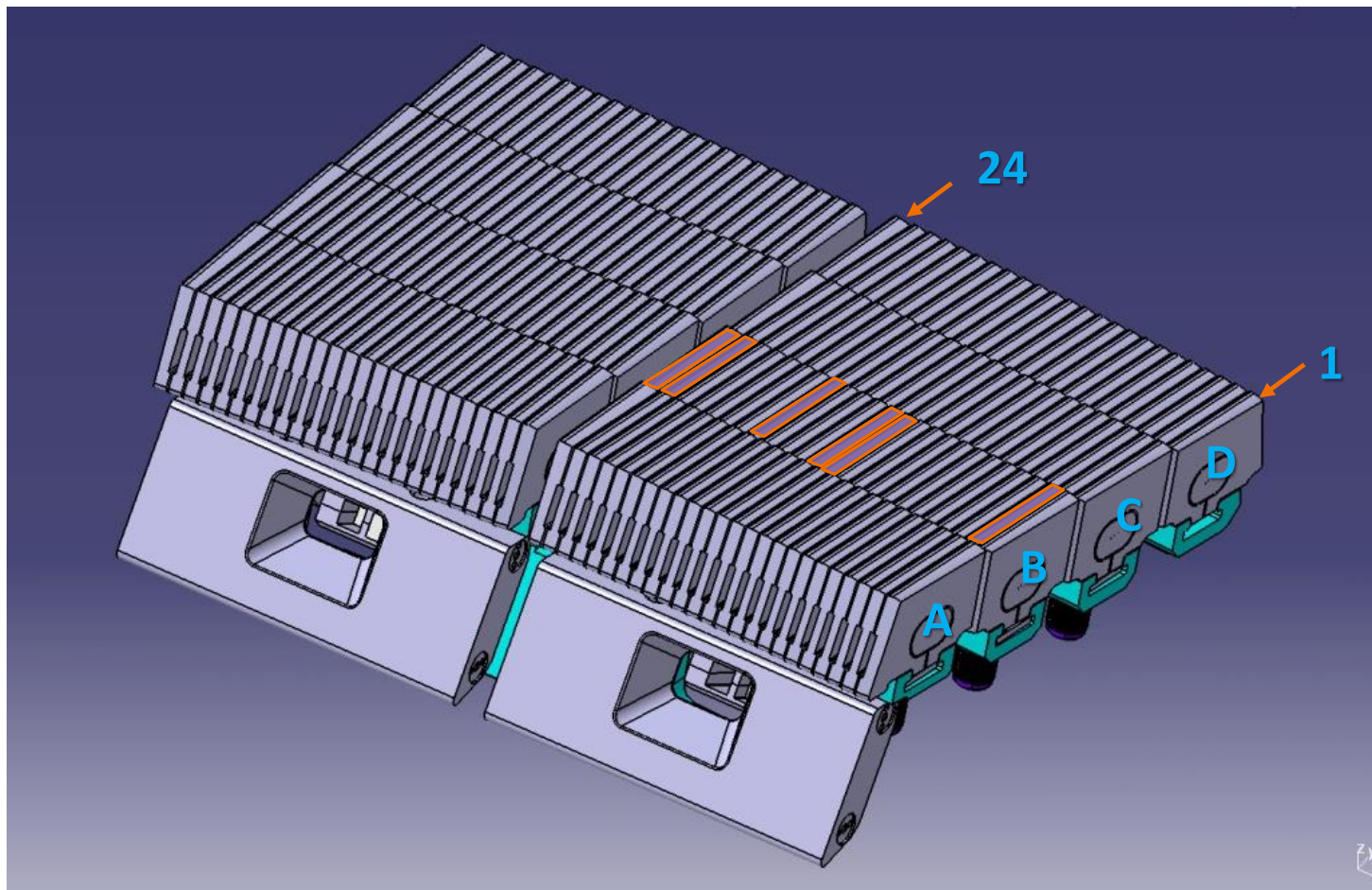


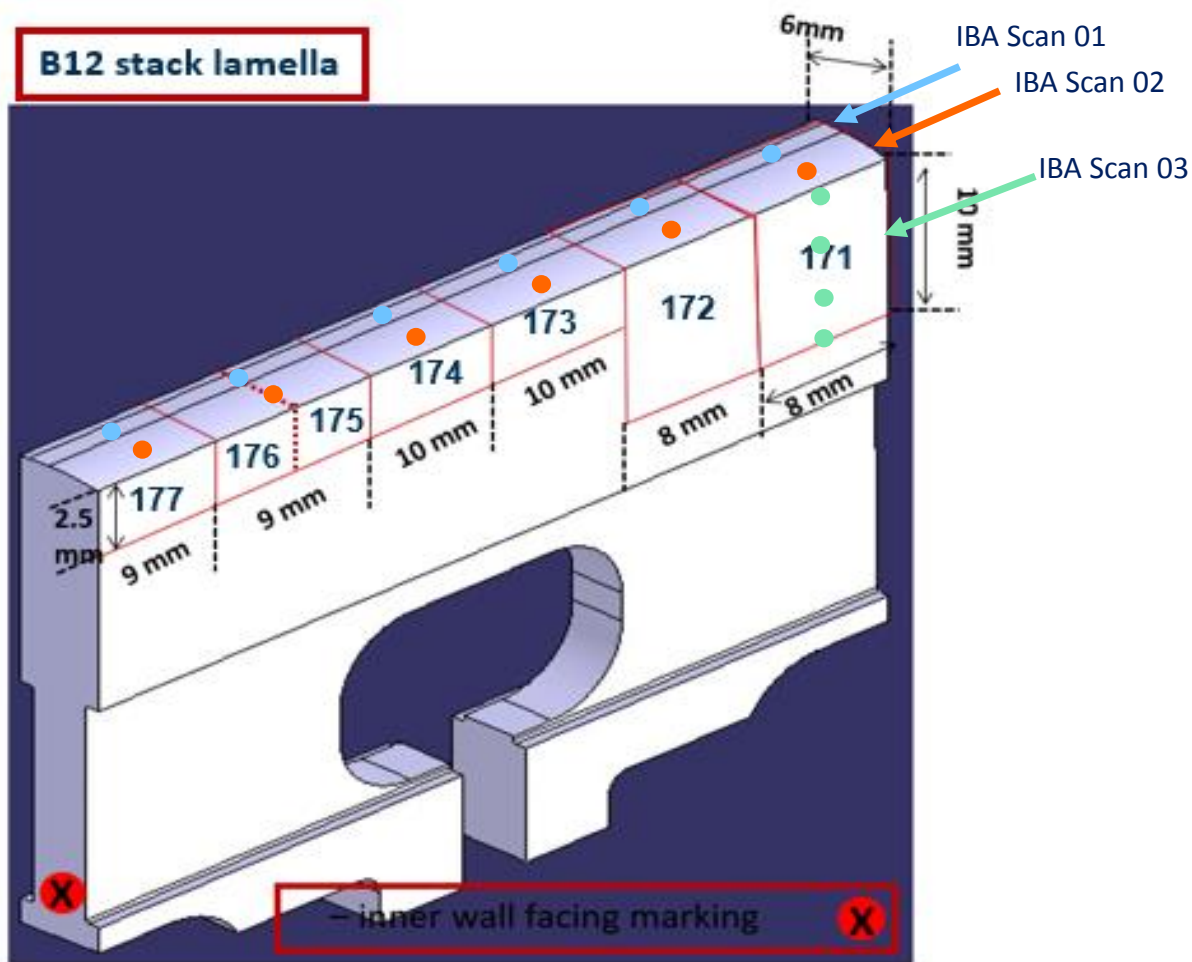
Detector geometry

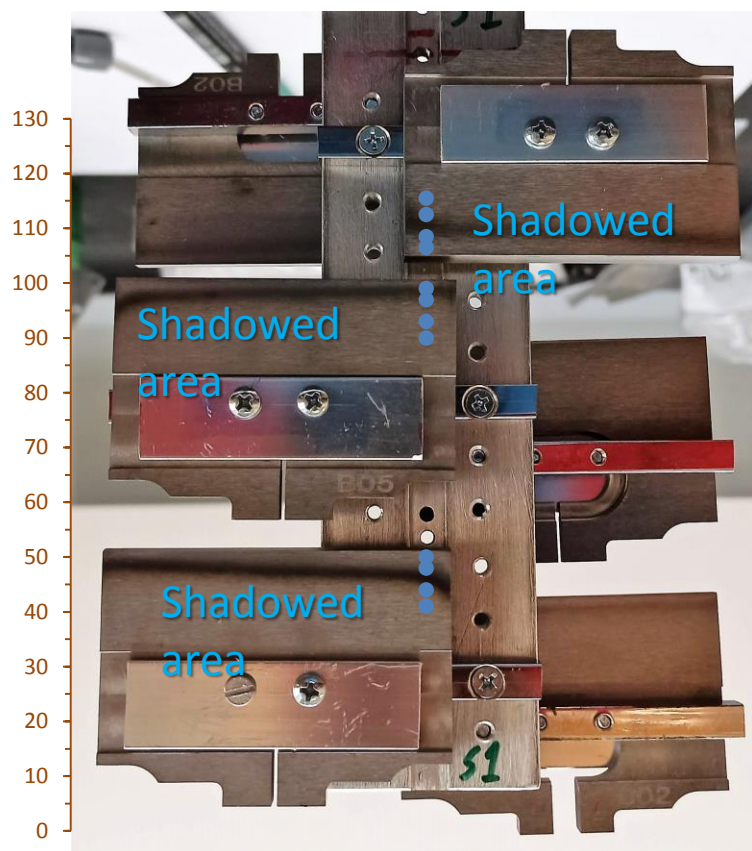


Beams: H^+ and $3He^+$
Techniques: NRA, EBS and PIXE



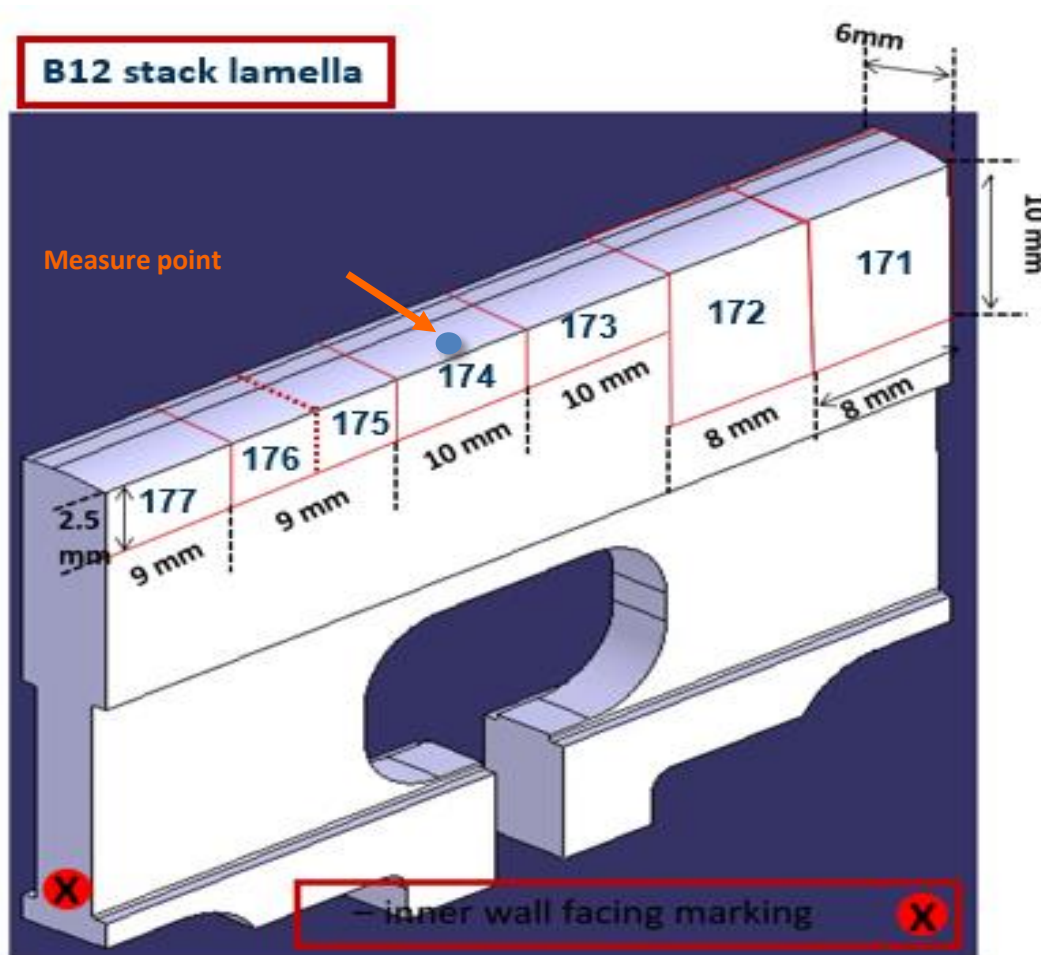






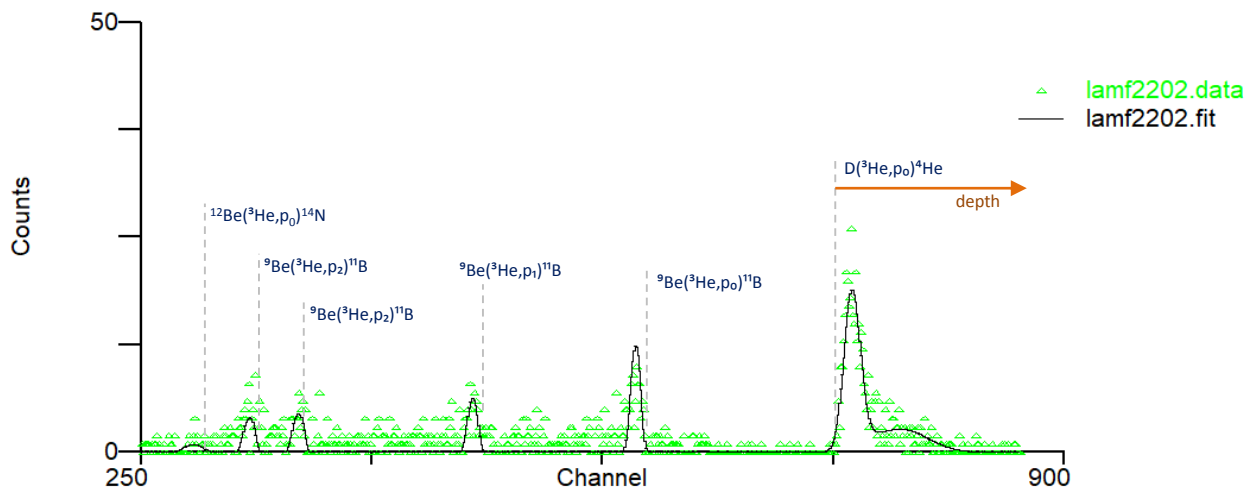
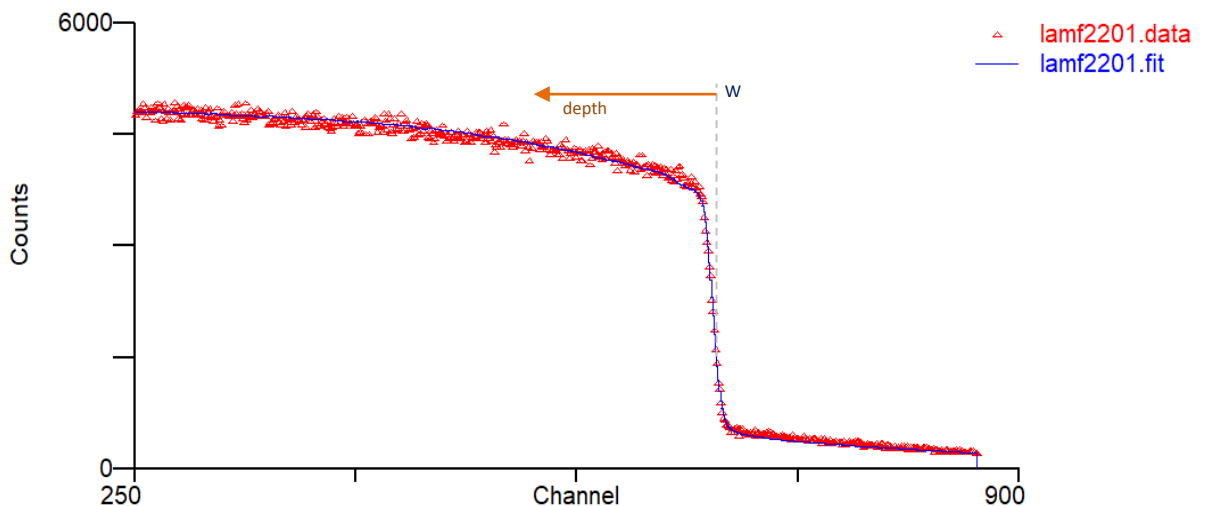
Stack B-12 (F71101144-B04)

Position area at 24.2 mm from the inner wall facing marking (sample nº 22 in NDF batch)



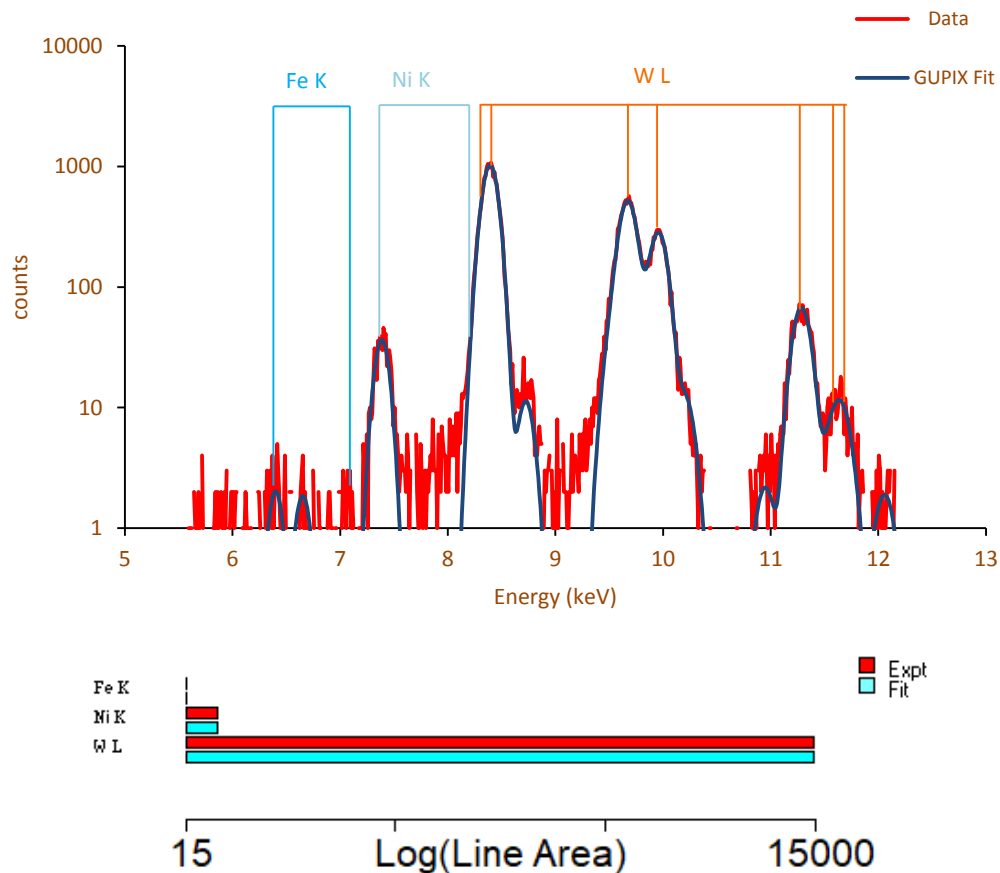
Stack B-12 (F71101144-B04)

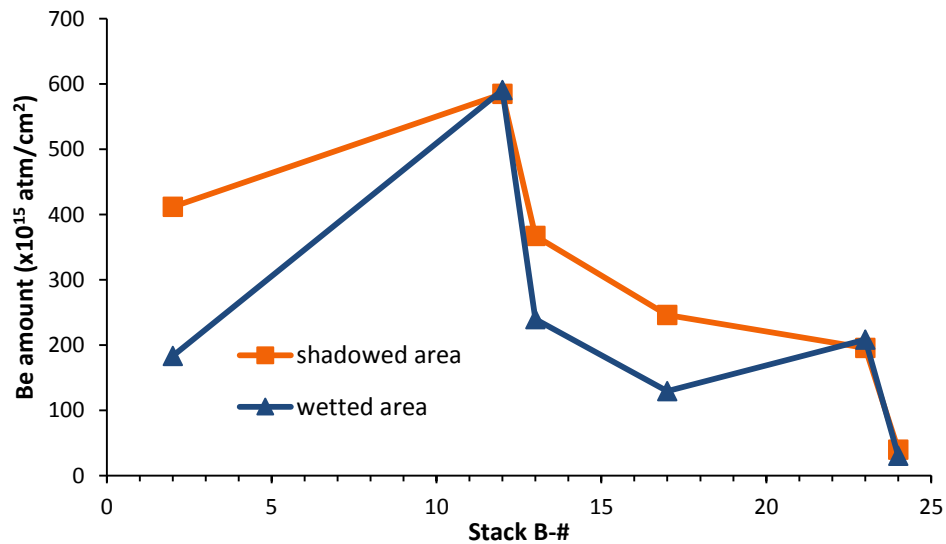
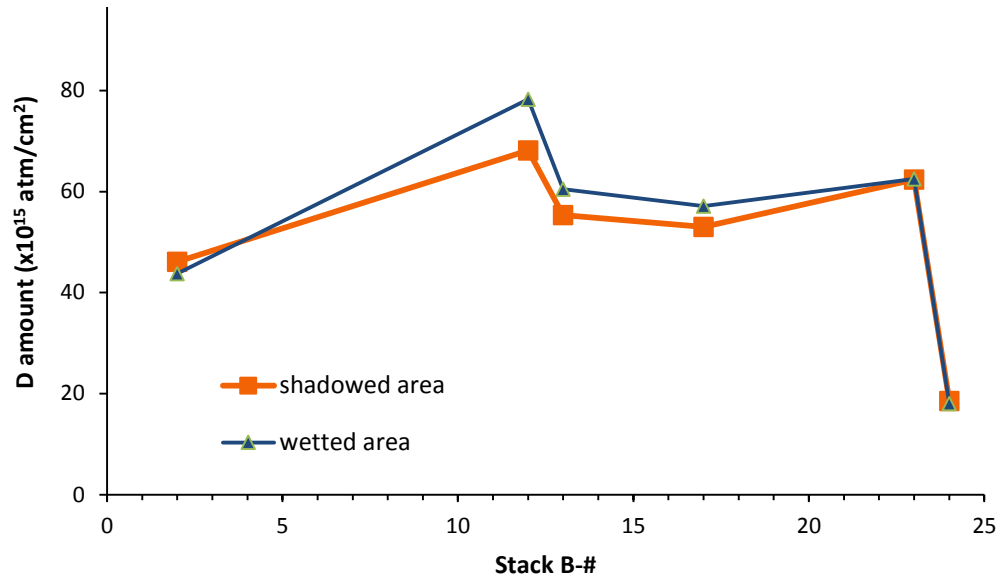
Position area at 24.2 mm from the inner wall facing marking (sample nº 22 in NDF batch)



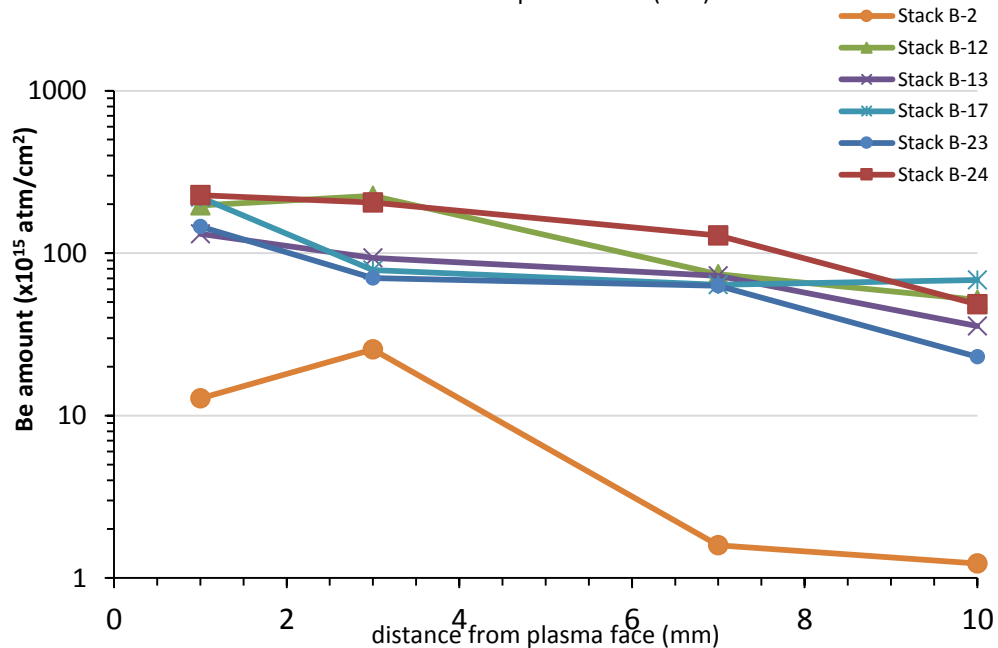
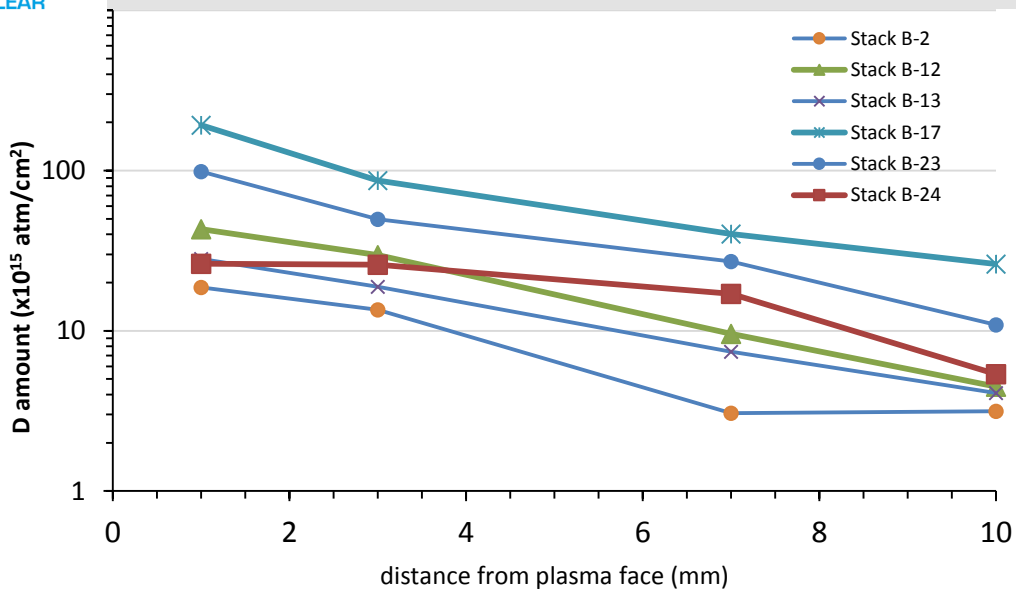
Stack B-12 (F71101144-B04)

Position area at 24.2 mm from the inner wall facing marking (sample nº 22 in NDF batch)

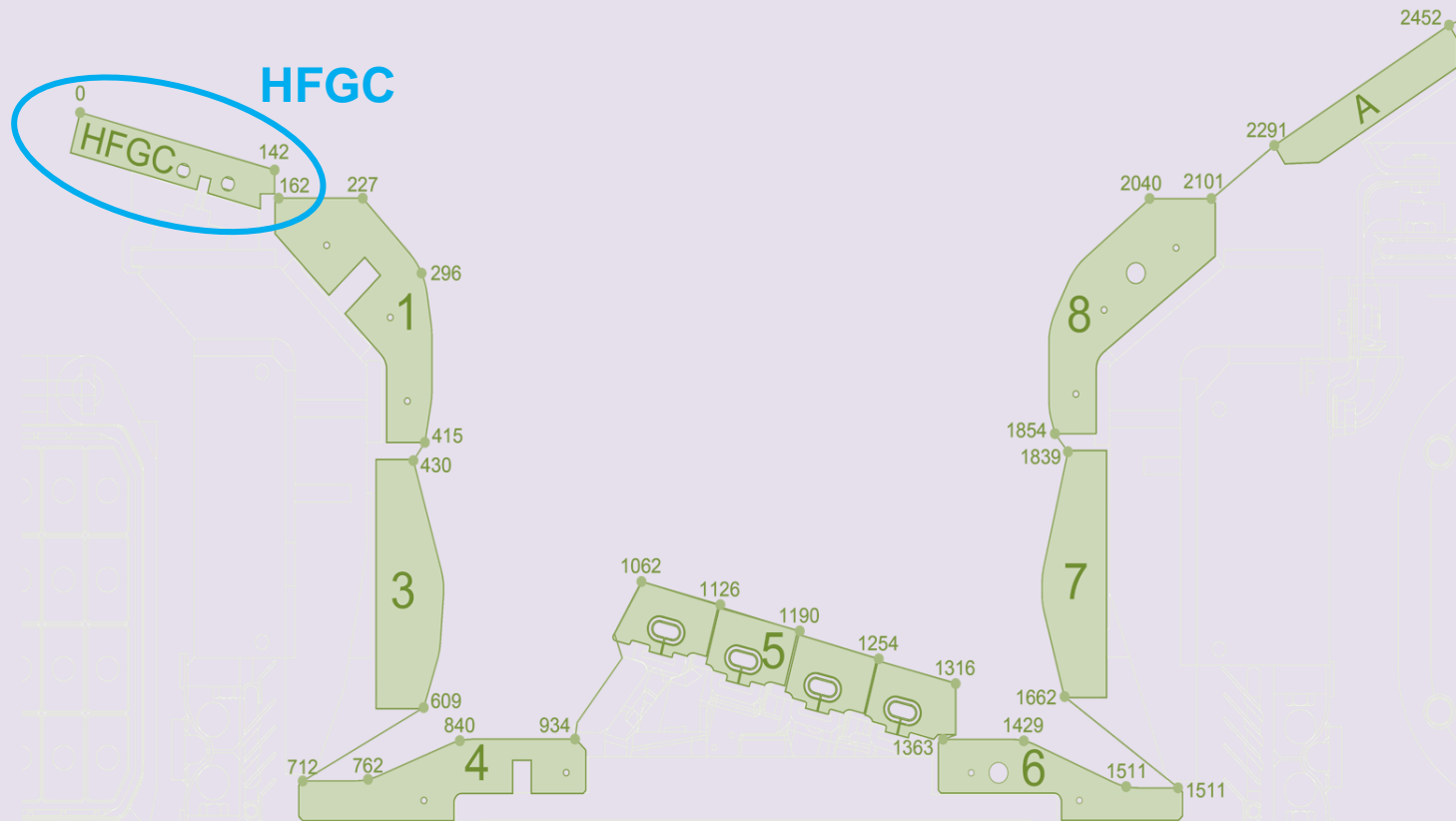




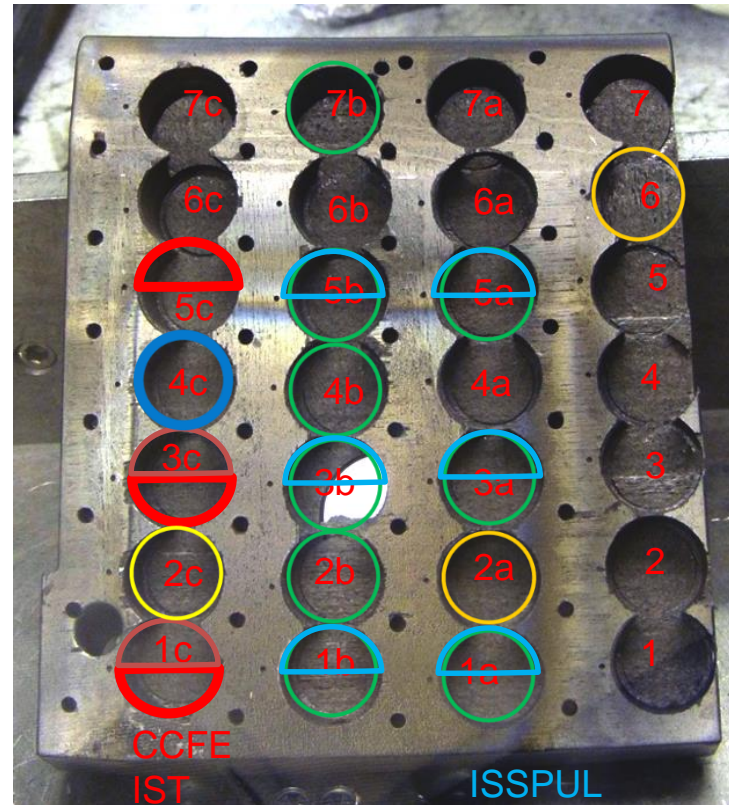
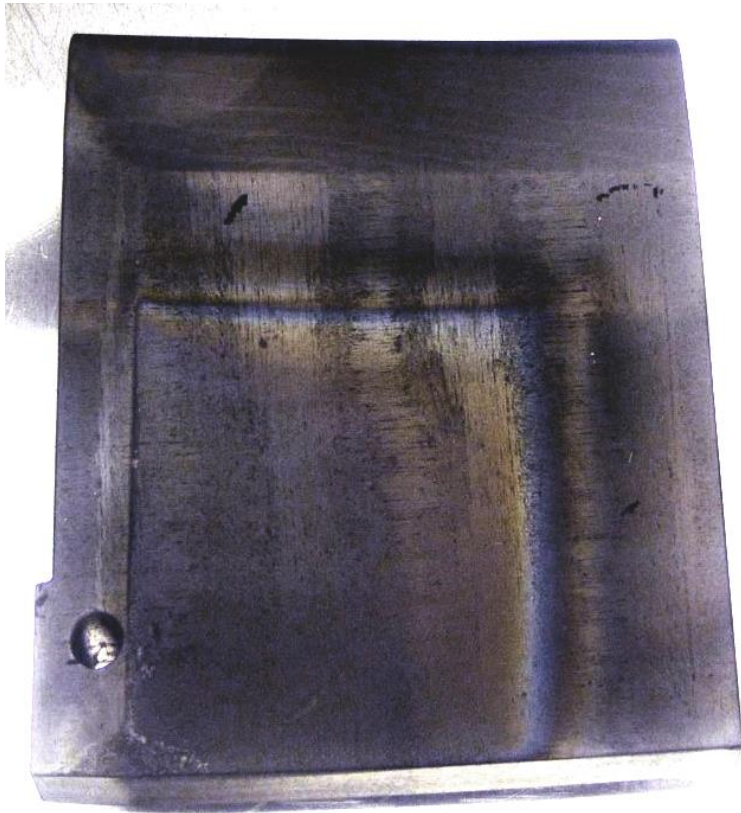
NRA Results













- 1. Although Fe is detected in the PIXE spectra, it is very close to the minimum detection limit, in this case only 18 counts were assigned to the Fe K lines, corresponding to 430 ppm (the LOD is 179 ppm).**
- 2. The same happens with Ni, in this case although the area attributed to the Ni K line is 48 counts, corresponding to about 989 ppm, since there is overlap with the W lines the detection limit is 933 ppm**
- 3. In the NRA spectra, Be is also in the limit of detection in the majority of the spots, especially in the side scans.
Using as reference the 20 μC of incident ^3He ions, which corresponds to approximately 20 min of acquisition per spot (for a total of 33h to acquire all the NRA spectra); a Be deposition of 1×10^{17} at/cm² corresponds to ~40 counts for the emissions assigned to p_0 .**
- 4. in the case of D the detection limit is one order of magnitude lower; 1×10^{16} at/cm² corresponds to ~45 counts for 20 μC of incident ^3He ions**



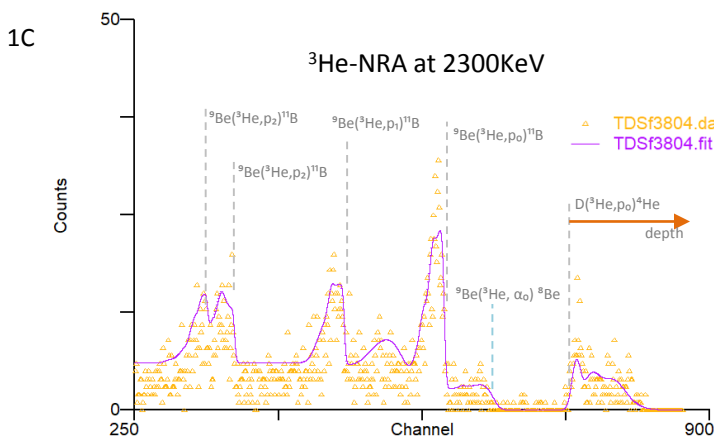
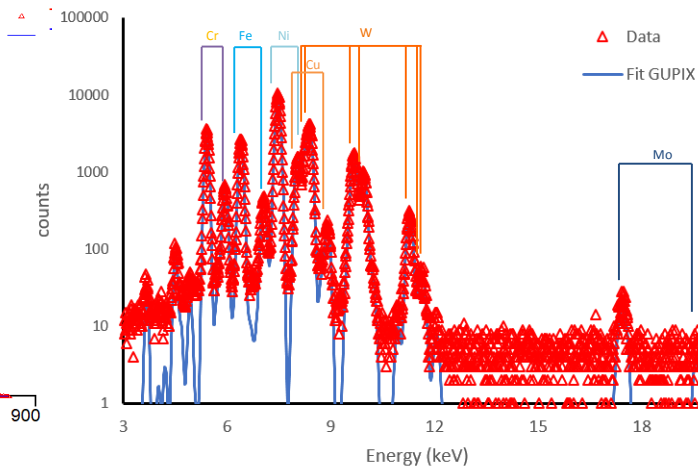
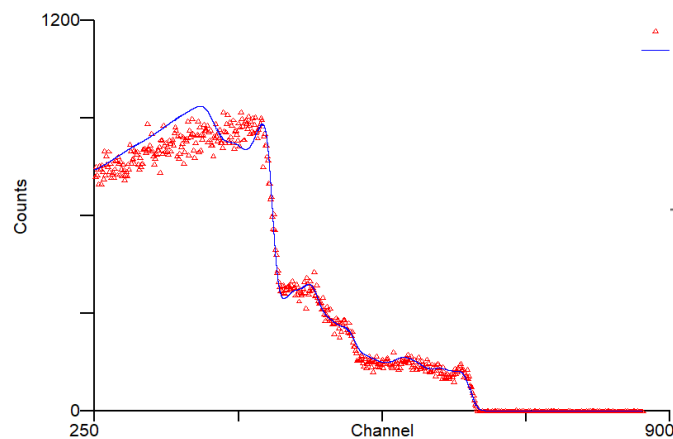
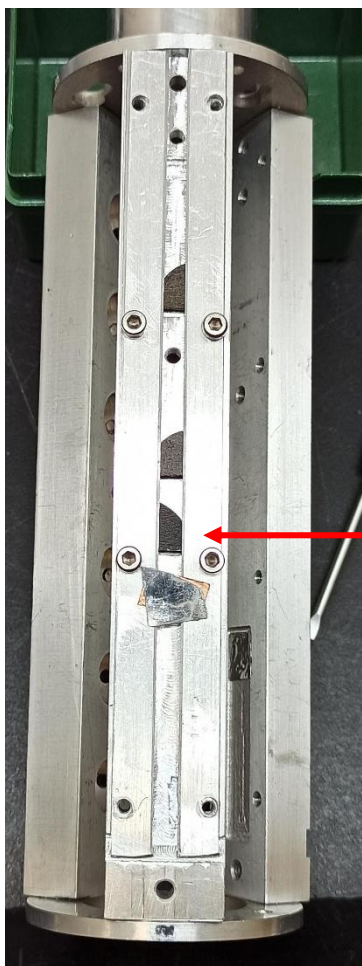
HFGC 14NRH (2011-2016)



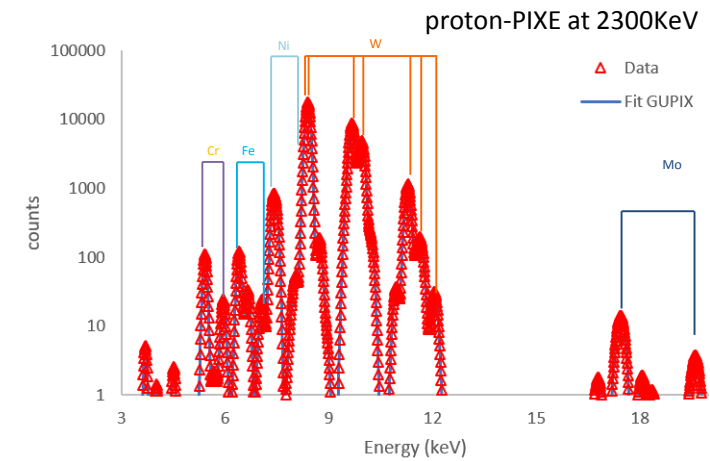
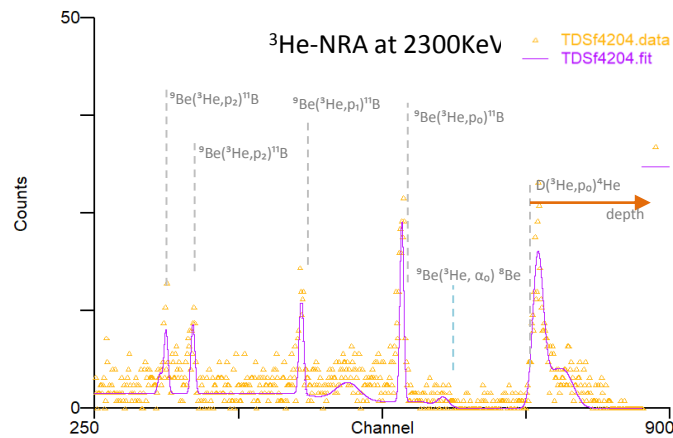
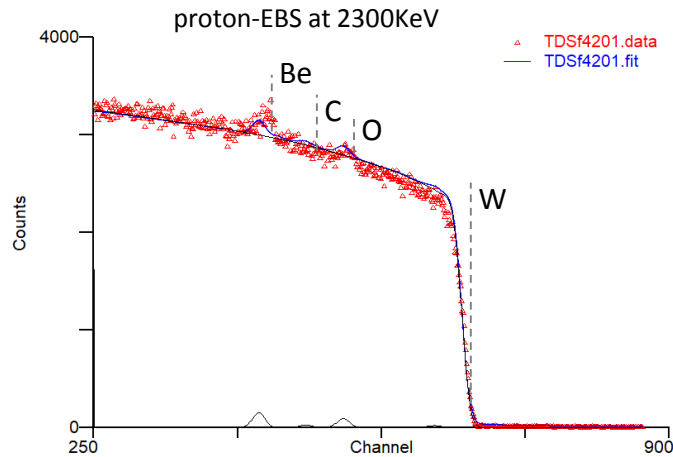
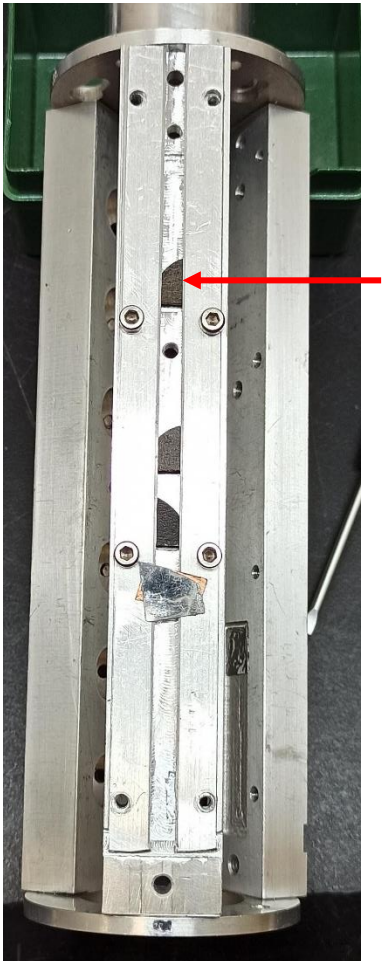
-  IBA
-  TDS
-  IBA
-  SIMS
-  Microscopy
-  CCFE
-  IBA
-  IAEA
-  ISSPUL
-  IAP

CCFE
IST
VTT

ISSPUL



- EBS spectrum seems to have two components, one corresponding to Be and the other to a Ni+W film.
- It appears to be detecting the interface of a Be film on Ni+W.
- D is mostly at the surface (~40% of the total) extending to the detection limit (~5.0 μm) with a concentration of less than 1%, for a total of 1.4×10^{18} at/cm²
- Similar spectra for samples 3C and core 4C



- W film with a thickness greater than 2.5 μm ,
- a deposit of Be, C, O on the surface
- D is mostly at the surface ($\sim 80\%$ of the total) extending up to $\sim 4.0\mu\text{m}$ concentration of less than 2%, for a total of $2.70 \times 10^{18} \text{ at/cm}^2$

Elementar amount integrated in the first 6×10^{19} at/cm² (~5 μm in Be or ~9.5 μm in W)

Sample	D	Be	C	O	Ca	Ti	Cr	Fe	Cu	Ni	W
1C	1387	50025	3290	3014	7	31	548	425	363	689	222
	1315	49635	3854	3380	4	17	387	273	242	682	211
3C	2207	50100	2761	3516	7	19	411	317	276	147	241
	2278	50196	2724	3410	6	19	420	303	268	154	221
5C	996	2804	471	1466	2	2	33	41	22	146	54018
	944	2813	422	1445	1	1	30	35	20	143	54145
4C	2815	50637	1905	3662	2	8	179	132	112	288	260
	2984	52153	1647	2105	3	9	209	187	134	281	290
	2494	51283	1559	3569	5	10	260	194	166	227	233

