Thomas Nilsson, TU Darmstadt
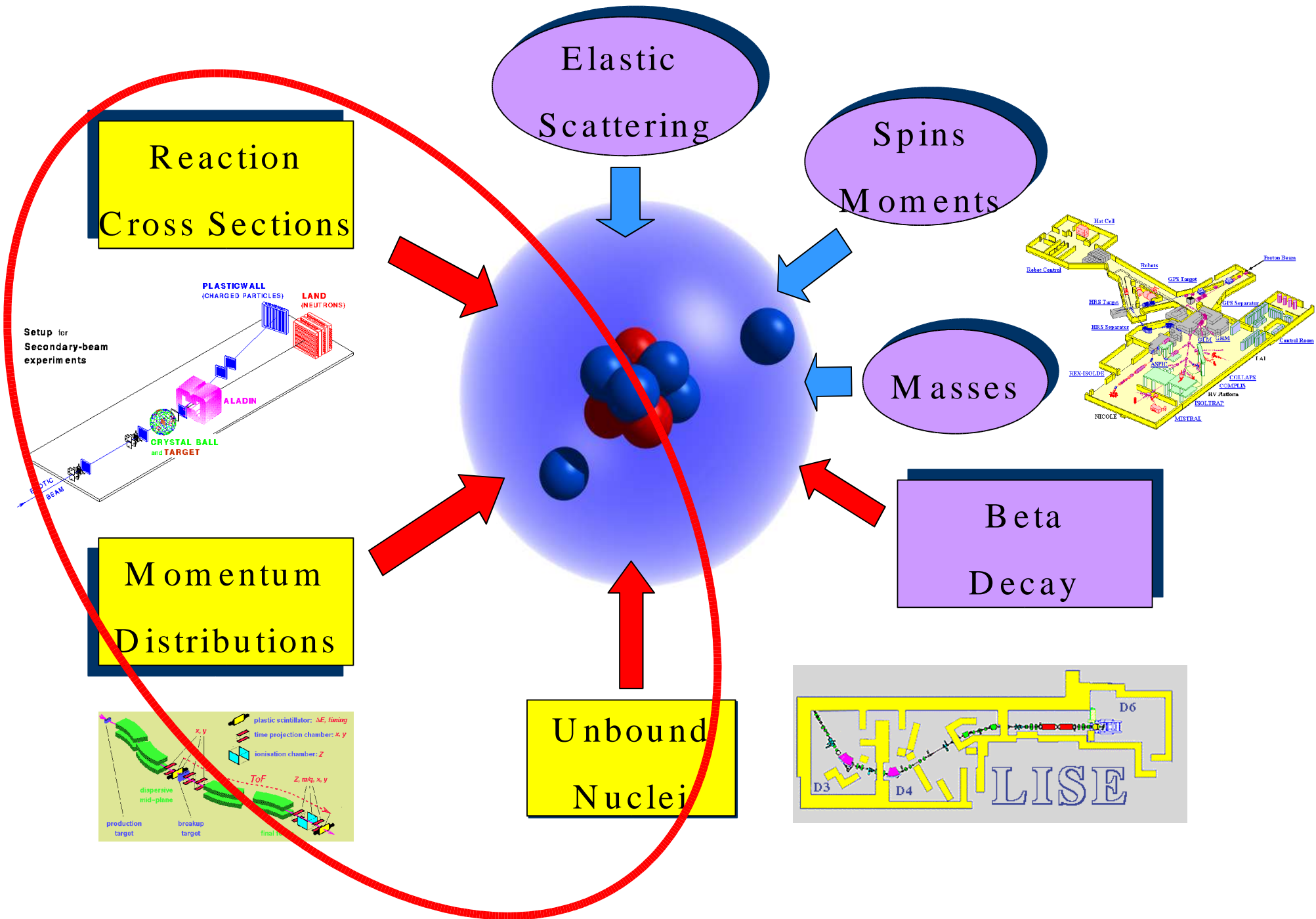
S245 - Clustering in drip-line nuclei
EXL meeting, Liverpool June 23 2004

- **Motivation**
- **Set-up**
- **Reaction channel identification**
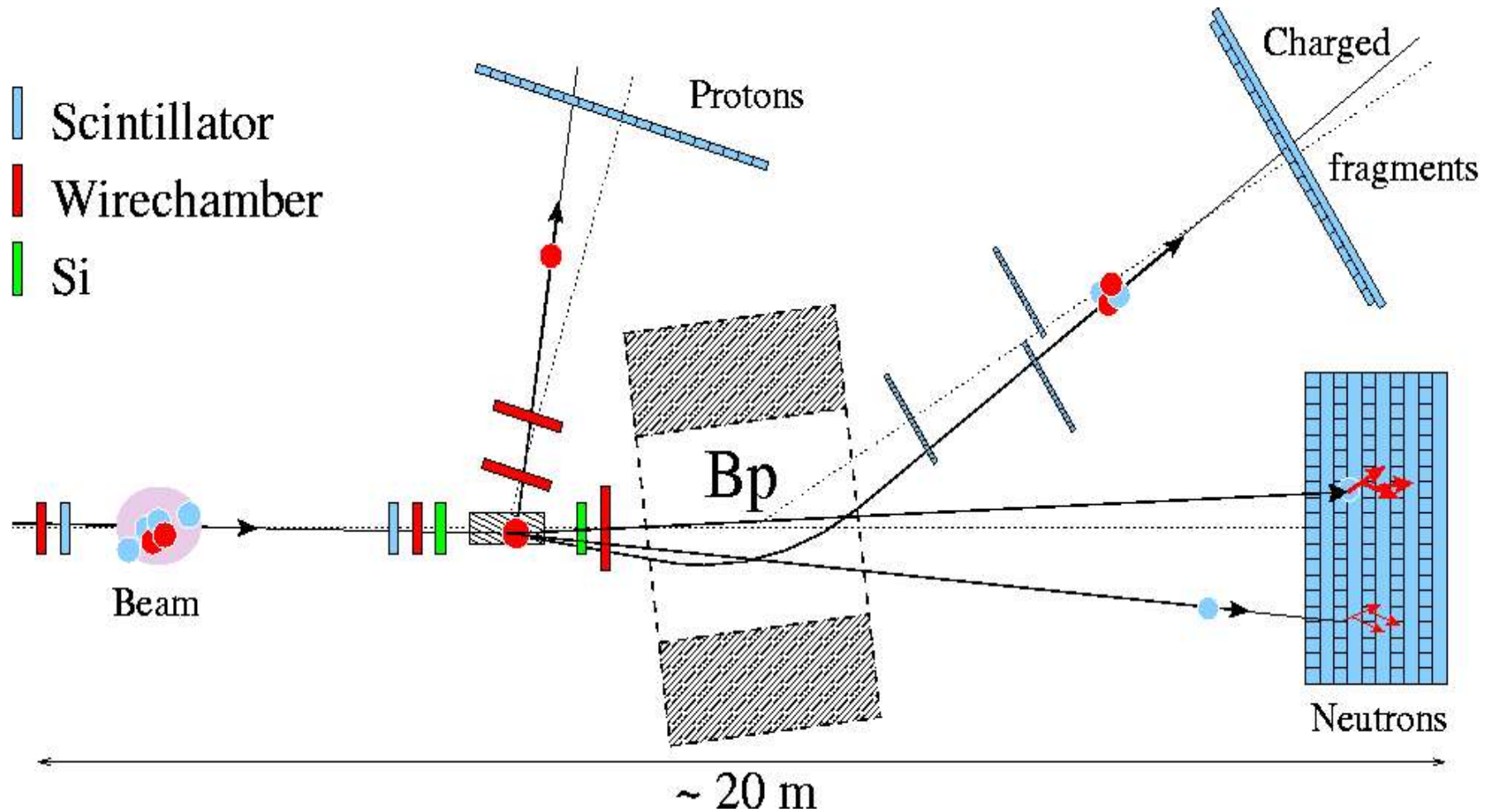 **and first prel. results**
- **Outlook**

Quasi-free scattering

- Planned: (p,2p), (p,pn), (p,2n), (p,α), ... with RIB in inverse kinematics
- Earlier: Peripheral reactions (mainly 1n-, 2n-removal) with RIB (halo nuclei) in inverse and complete kinematics
- Now: (p,X) with RIB in inverse and (more or less) complete kinematics
  - Nuclear clustering at the drip-lines and testing ground for future QFS exp.
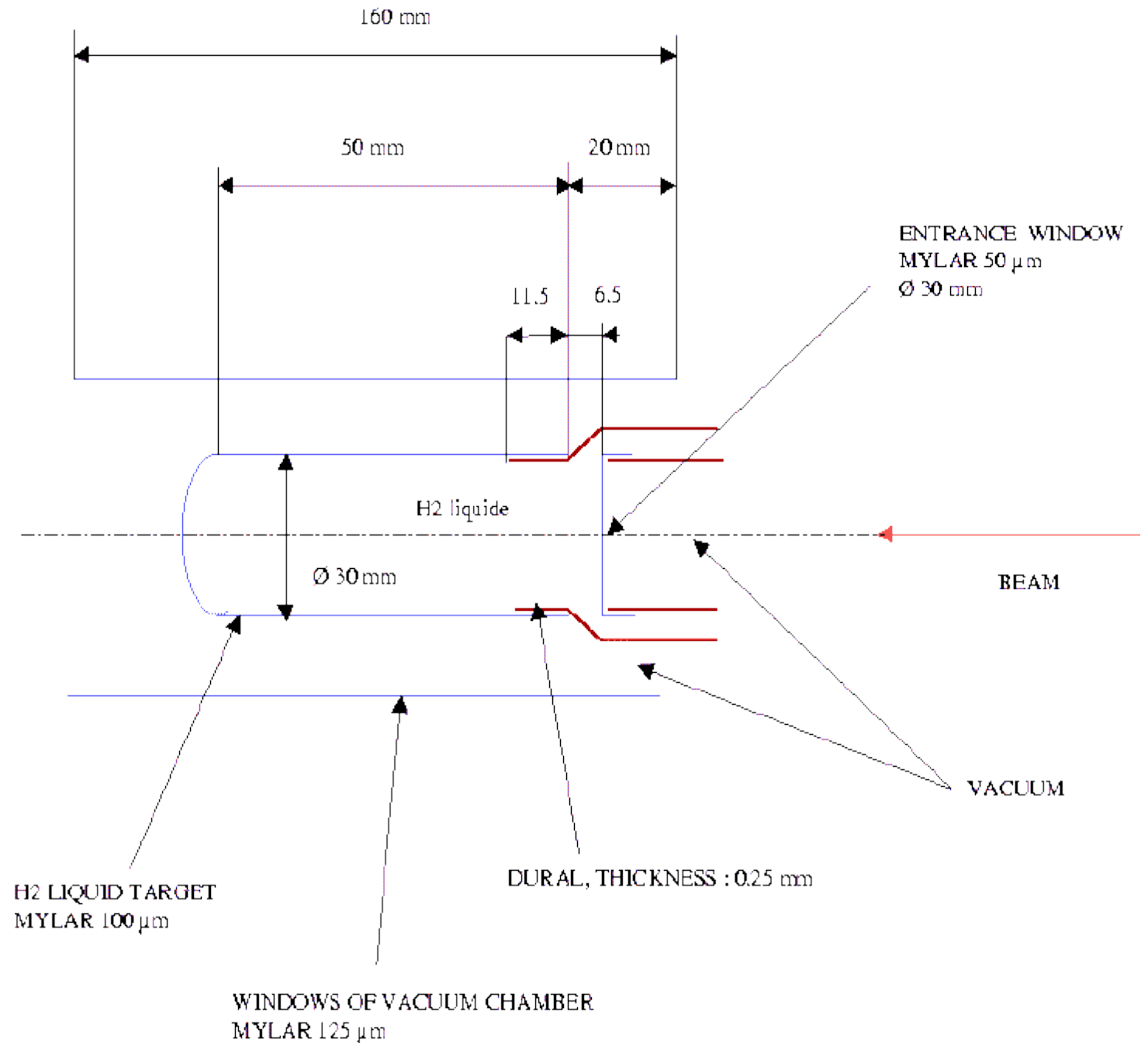
Experimental Studies of Halo Nuclei
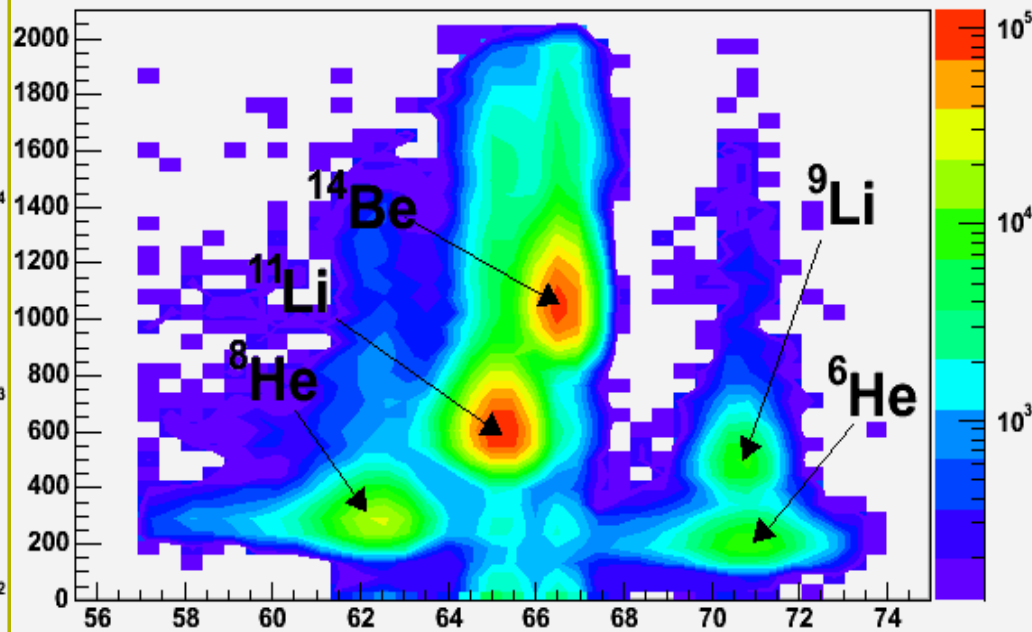
Experimental set-up

Liquid H target

SCHEMA OF THE 50 mm TARGET

160 mm

50 mm

20 mm

11.5   6.5

ENTRANCE WINDOW
MYLAR 50 μm
Ø 30 mm

H2 liquide

Ø 30 mm

BEAM

VACUUM

H2 LIQUID TARGET
MYLAR 100 μm

DURAL, THICKNESS : 0.25 mm

WINDOWS OF VACUUM CHAMBER
MYLAR 125 μm

Incoming cocktail beam ID
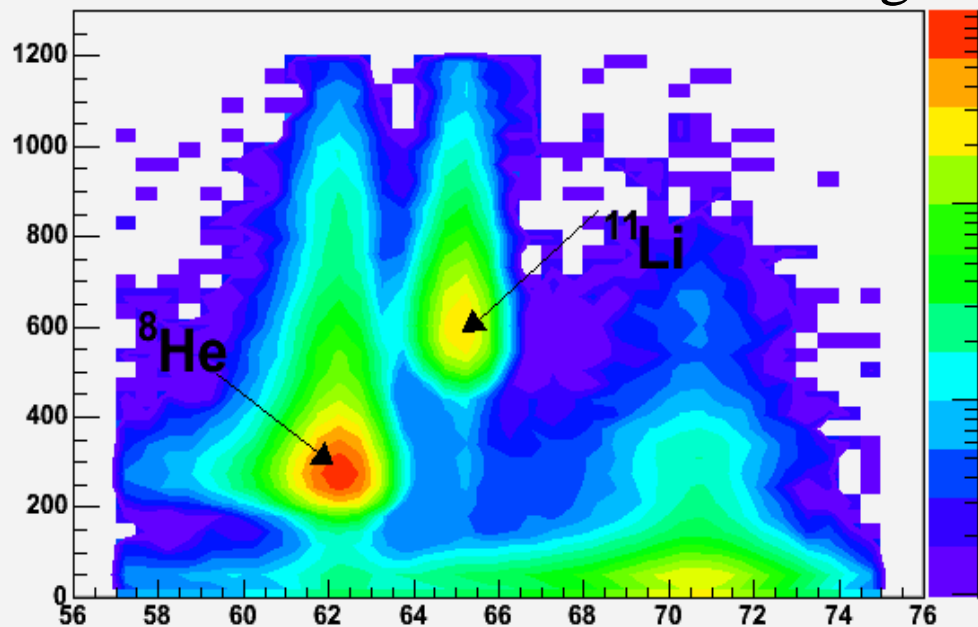
Pre- and post-target Z

Mass ID

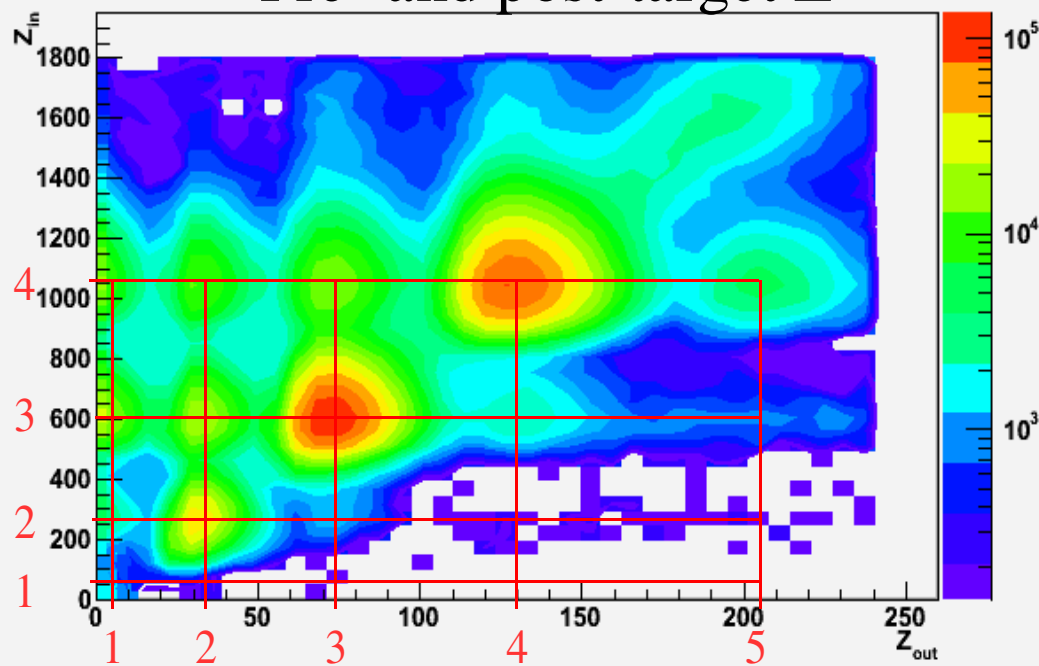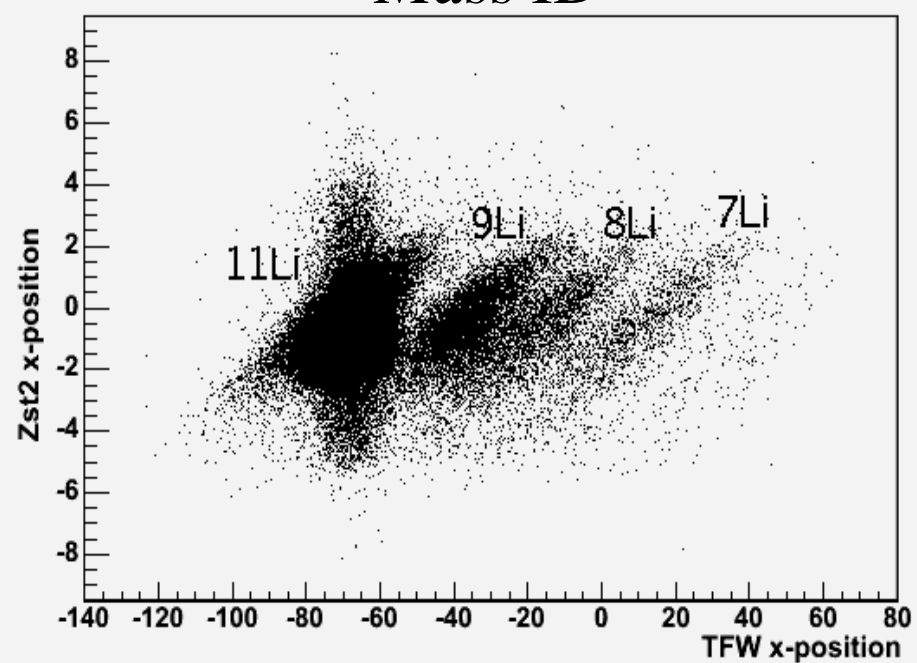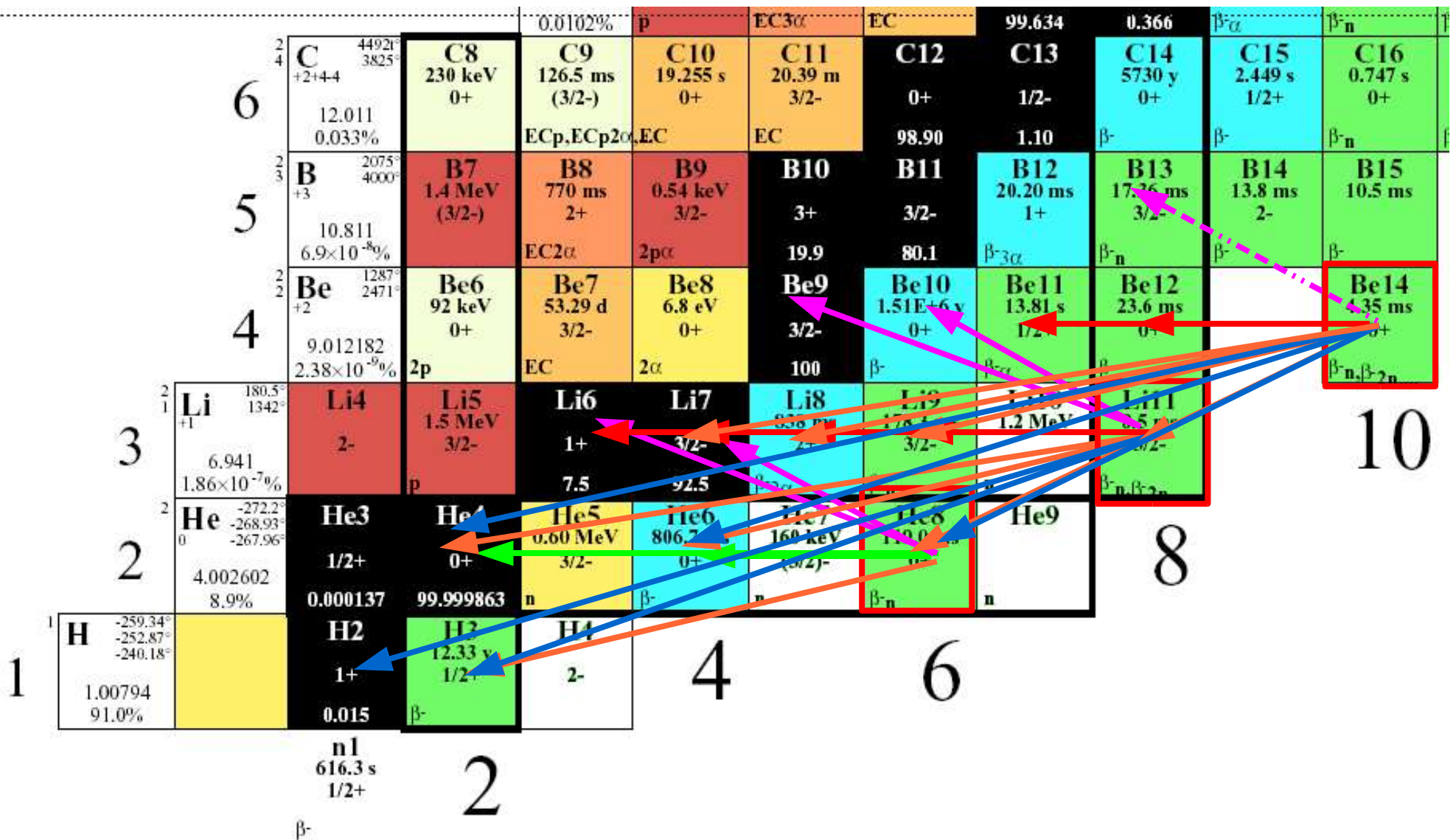# S245 beams and identified reaction products

Numbers (EXTREMELY PREL.)

		Counts		X-sect mb	N_int_n
14Be+p -> X	12Be	84223	11948	56.44	0.97
	11Be	36032	5112	24.14	1.62
	13B	4129	108	3.53	1.82
	11Li	7690	651	5.86	1.44
	9Li	11092	781	8.70	2.21
	8Li	10133	815	7.79	2.38
	7Li	10058	1198	7.11	2.43
	8He	2806	323	2.00	1.72
	6He	7498	1029	5.08	2.22
	4He	8946	1435	5.73	2.66
8He+p -> X	6He	35111	41292	20.62	1.14
	4He	7400	5655	6.50	1.67
	3H	1585	2488	0.49	1.92
	7Li	411	807	0.01	0.81
	6Li	224	61	0.27	1.06

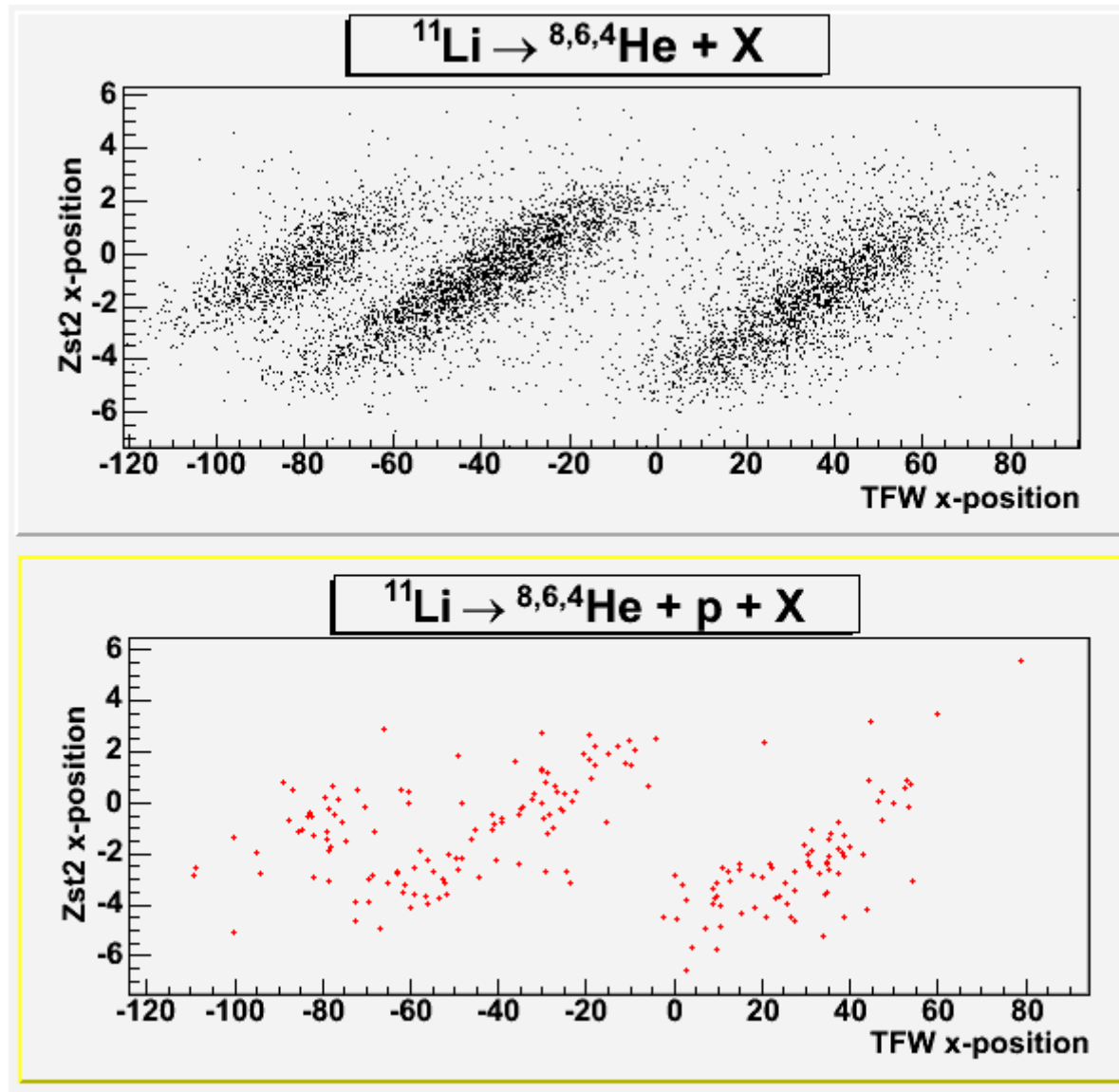# Numbers (EXTREMELY PREL.) cont.

	Counts		X-sect	N_int_n
11Li+p -> X9Li	82175	18662	42.44	0.9
8Li	50633	10022	28.54	1.4
7Li	29951	6716	15.61	1.58
6Li	10877	3232	4.39	1.36
8He	7803	1226	4.91	1.25
6He	17051	2864	10.44	1.78
4He	14996	2510	9.19	2.17
3H	3777	921	1.85	1.58
2H	1952	562	0.82	1.2
10Be	793	19	0.67	0.58
9Be	539	16	0.45	0.98

How about (p,xp)?

$^{11}Li \rightarrow ^{8,6,4}He + X$

$^{11}Li \rightarrow ^{8,6,4}He + p + X$

Outlook

- S245
  - Calibration/reaction identification phase to be concluded – multiple hits
  - Invariant mass analysis, acceptance corrections
  - Interpretation...
- QFS
  - Shows feasability of experiments also with relatively weak beams
  - (p,xp) statistics penalized by limited acceptance – tracking detector!
  - (p,xn) statistics better – also for exotic channels