Status of the Slow Extraction at the PS

The sextupole travel story

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Thanks to:

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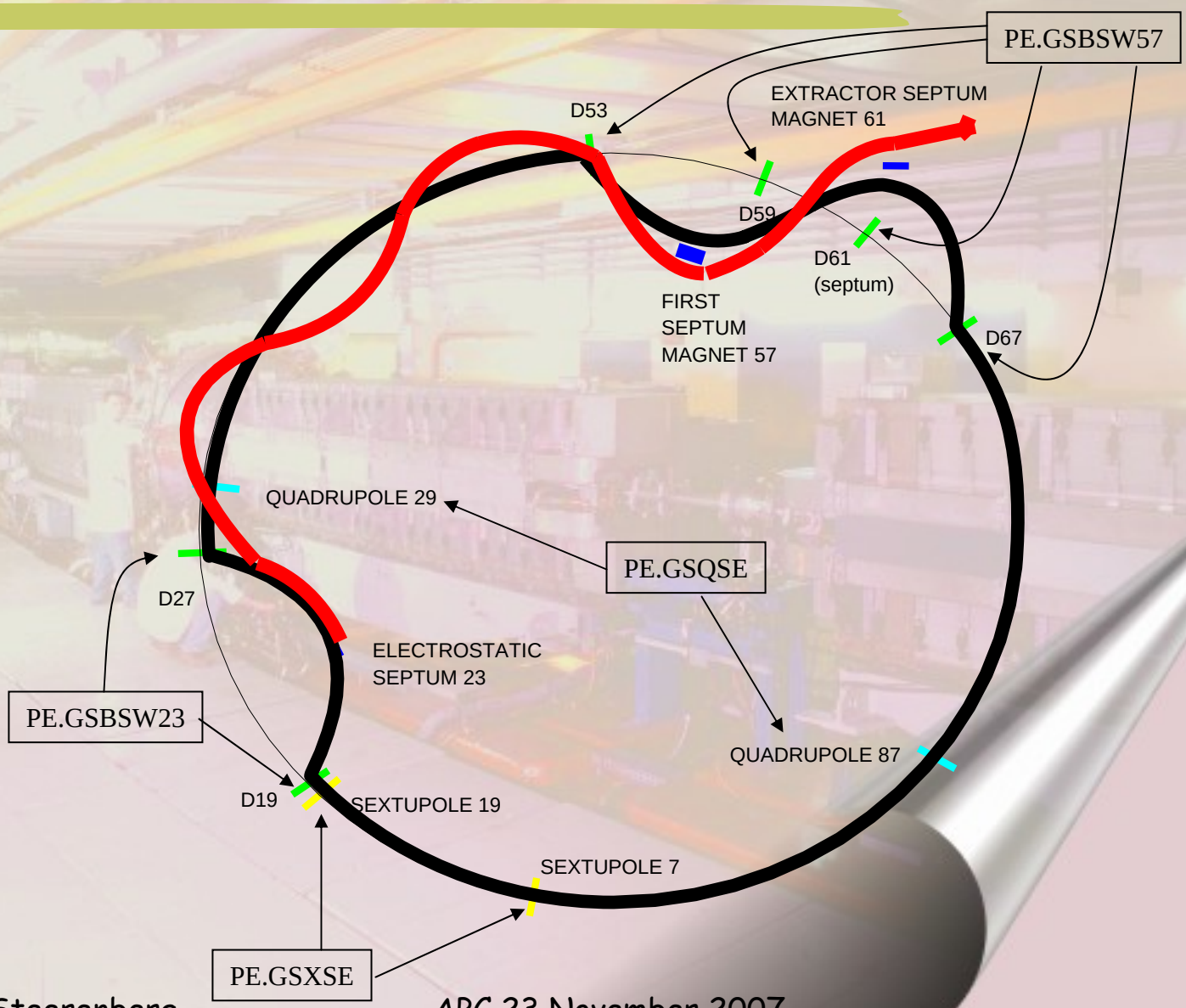
PS 24 GeV/c Slow extraction



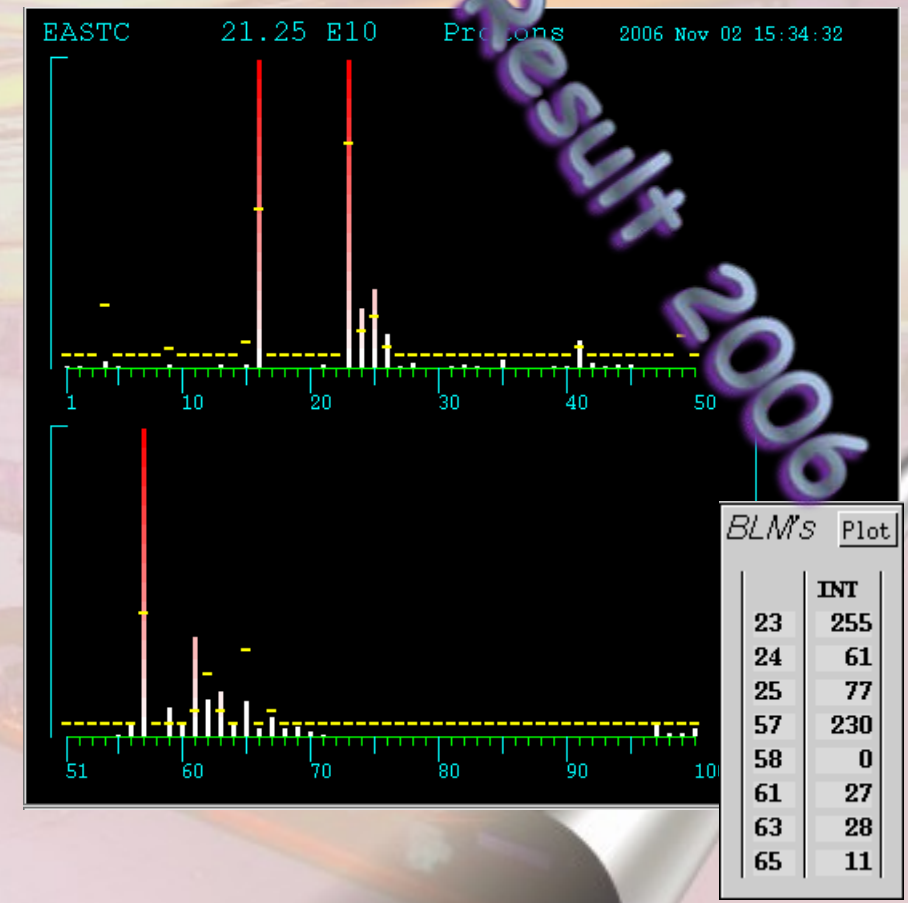
Motivation for the change

- The **vacuum chamber** in **SS19** needed to be **enlarged** for the **MTE**.
- The **sextupoles do not fit** around the enlarged vacuum chamber.
- The **new position** for the sextupoles was determined to be **SS03**.
- This was made operational in May 2006.
- However, the **extraction efficiency** was **lower** than in the old configuration.

SE with XSE in SS03 & SS07

- **More losses** during extraction, low extraction efficiency (~80%).

		Aquisition	Losses	Eff (%)	
1	Ring 3 acc	21.69			
2	BTP.TRA	14.75			
3	Injected	20.88	-6	141.6	2
4	Bef.Trans	20.15	1	96.5	3
5	Aft.Trans	20.02	0	99.4	4
6	Bef.Eject	20.51	0	98.2	3
7	F61.MSC01	16.58	4	80.8	5
8	F61N.MSC01	14.54	2	87.7	7
9	ZT7.MSC01	0.01	17	0.1	7
10	ZT8.MSC01	0.00	17	0.0	7
11	ZT8.MSC02	0.00	17	0.0	7
12	F61.TFA	0.11			



- BLM septum 23 is saturated and septum 57 is nearly saturated

Octupole study

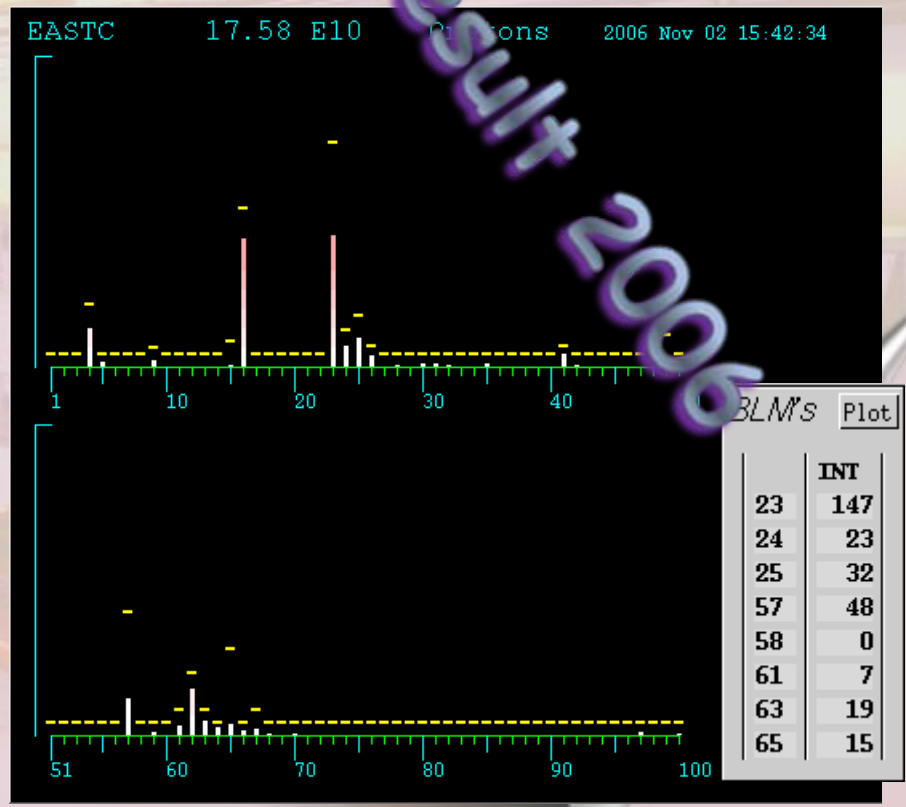
- A.Franchi, S. Gilardoni and M. Giovannozzi. made **simulations** based on our findings.
- The **shape of the separatrix** was found **not** to be **the same** as for the XSE in SS19.
- The use of **Octupoles could correct this**.
- During an **MD** we added **Octupoles** and re-adjusted the slow extraction with **good results**.
- See APC presentation of 3 November 2006.
- The **extraction efficiency** was **back to normal**.

SE with XSE in SS03 and ODE on

- **Losses reduced** by adding the octupole string at -200A.

		Aquisition	Losses	Eff (%)	
1	Ring 3 acc	24.33			
2	BTP.TRA	16.75			
3	Injected	23.20	-6	138.5	2
4	Bef.Trans	23.57	-0	101.6	3
5	Aft.Trans	23.57	0	100.0	4
6	Bef.Eject	22.95	0	98.9	3
7	F61.MSC01	22.49	0	98.0	6
8	F61N.MSC01	19.18	3	85.3	7
9	ZT7.MSC01	0.01	22	0.0	7
10	ZT8.MSC01	0.00	22	0.0	7
11	ZT8.MSC02	0.00	22	0.0	7
12	F61.TFA	-0.12			

Result 2006



- None of the BLM's is saturated

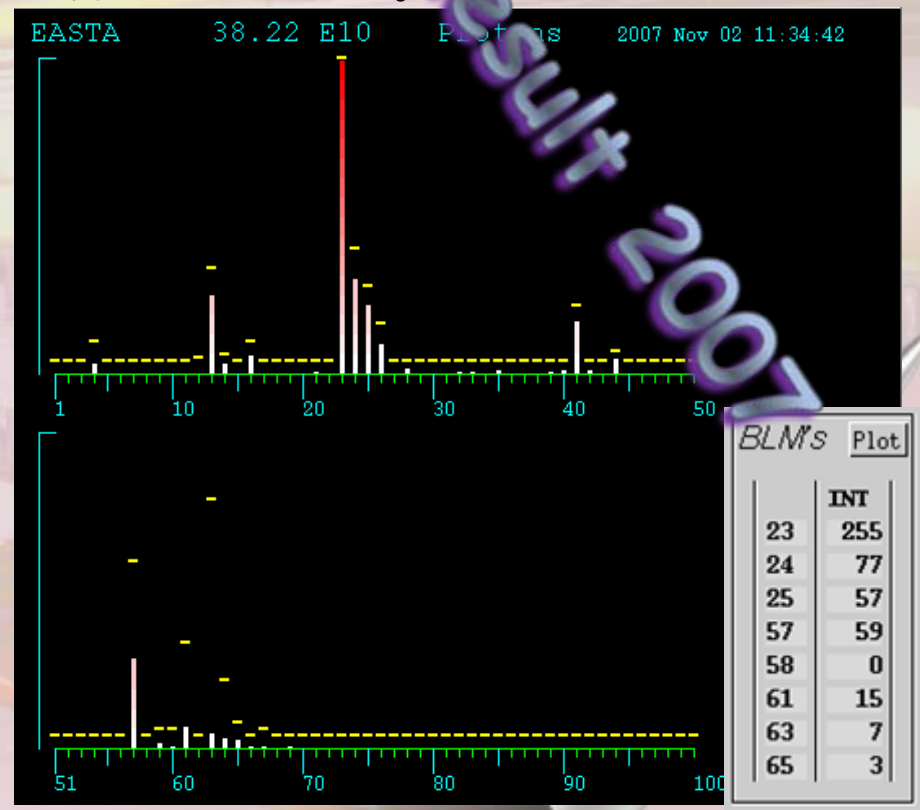
Keeping slow extraction simple

- The **preference** is to keep the **slow extraction as simple as possible** and thus avoiding the use of octupoles.
- A **new position** for the sextupoles was identified and during the 2006/2007 shutdown the sextupoles of SS19 were installed in **SS01**.
- The **2007 start-up** was done in the **2006 configuration** with XSE in SS03 and the Octupoles on.
- The switch over was tried on May 31st but hampered by a vacuum leak on a vacuum pump feed through in SS24, next to the section of the electro static septum.
- On **28 August a final attempt** was made and in one morning we **switch successfully from XSE03 to XSE 01 without octupoles**.

SE with XSE in SS01 and ODE off

- Similar extraction efficiency as for XSE is SS03 and octupoles at -200A.

		Aquisition	Losses	Eff (%)	
1	Ring 3 acc	39.76			
2	Ring 3 ej	39.76	0	100.0	1
3	BT.TRA	33.62	6	84.6	1
4	BTP.TRA	42.50	-3	106.9	1
5	Injected	38.46	1	96.7	1
6	Bef.Trans	38.22	0	99.4	5
7	Aft.Trans	38.22	0	100.0	6
8	Bef.Eject	38.34	0	99.7	5
9	F61.MSC01	37.54	1	97.9	5
10	F61N.MSC01	30.23	8	78.8	8
11	ZT7.MSC01	3.52	35	9.2	8
12	ZT8.MSC01	0.00	38	0.0	8
13	ZT8.MSC02	0.00	38	0.0	8
14	F61.TFA	-0.03			



Result 2007

- Similar beam loss pattern.

- Note: The intensity is 70% higher than for the XSE in SS03 and octupoles string at -200A case.

Main changes in the settings

- The **phase advance** between SS07 and SS19 or SS03 and SS07 are **not the same** as for the present situation with the XSE in SS01 and SS07.
- Therefore the **current** in the **sextupoles** had to be **changed**.

XSE Configuration	XSE current
SS07 & SS19	240 A
SS03 & SS07 + Octupoles	175 A
SS01 & SS07	290 A

- As a consequence the **chromaticity** had to be **corrected** too.

Conclusions

- At present the slow extraction is using:
  - 2 sextupoles in SS01 and 1 sextupole in SS07.
  - no octupoles.
- This configuration has successfully been used in operation during the last 2.5 months of the 2007 run.
- The extraction efficiencies and loss patterns are similar to the previous configurations.
- The slightly higher currents in the sextupoles are no problem for the hardware concerned.
- Next run we will start up as we stopped last run.