

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren
TE-VSC

30 June 2009

SPSU-team (G.Arduini, F.Caspers, S. Calatroni, P. Chiggiato, K. Cornelis, B. Henrist, E. Mahner, E. Metral, G. Rumolo, E. Shaposhnikova, M. Taborelli, F. Zimmermann), P. Costa Pinto, E. Benedetto

Outline

Overview of
SPS MD runs

Overview of
carbon coated
liners inserted
in SPS

Overview of
carbon coated
magnets
inserted in
SPS

Conclusions
and Future
plans

- 1 Overview of SPS MD runs
- 2 Overview of carbon coated liners inserted in SPS
- 3 Overview of carbon coated magnets inserted in SPS
- 4 Conclusions and Future plans

SPS scrubbing run

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren
TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

- Monday 15/6 (18:00) - Tuesday 16/6 (05:00) : 1-3 batches with 48 bunches
- Tuesday 16/6 (19:00) - Wednesday 17/6 (10:00): 2-3 batches with 72 bunches
- Thursday 17/6 (00:00) - Thursday 18/6 (08:30): 2-3 batches with 72 bunches, with acceleration

The nominal LHC cycle of 21.6 s.

Liners used for E-cloud monitoring

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin
Vallgren
TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

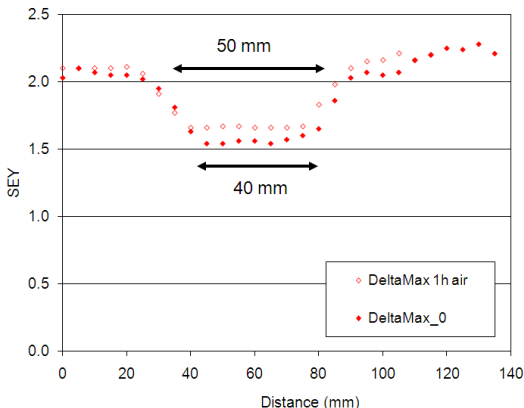
Conclusions and Future plans

- ① Stainless Steel (ref): SEMCLOUD1, channel 1-48, XSD1
 - ② a-C stripe (width: 40mm): SEMCLOUD1, channel 49-96, SDneg
 - ③ a-C on Zr (rough surface): SEMCLOUD2, channel 1-48, EcEx
 - ④ a-C (CNe13, been in SPS since last year): SEMCLOUD2, channel 49-96, XSD2
- All the tests were done in the magnets at a field of 1.2 kGauss.
 - The beam energy in the scrubbing run was 450 GeV/c

Carbon Coatings

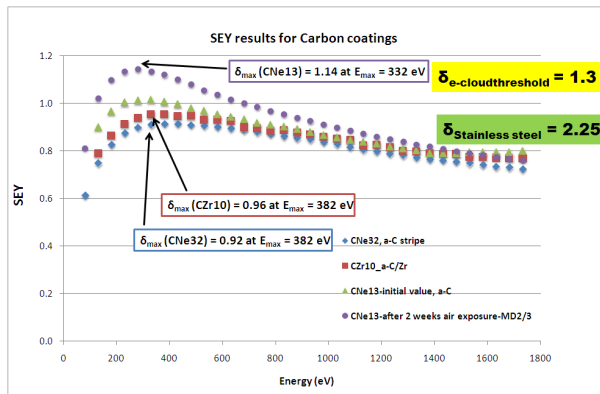
- a-C stripe/CNe32 - width 40 mm

Previous experiment (2008) in C-magnet with StSt reference sample



Carbon Coatings

- a-C/Zr: CNeZr run 10 Rough surface.
- a-C: CNe13, been in SPS since last year.



Results from FBCT

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin
Vallgren
TE-VSC

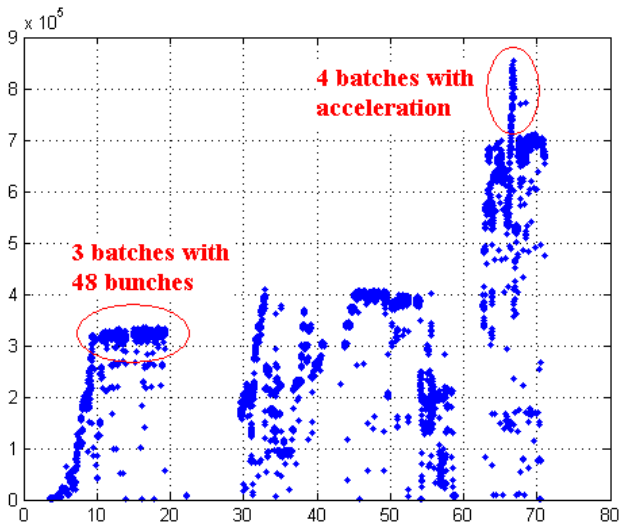
Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

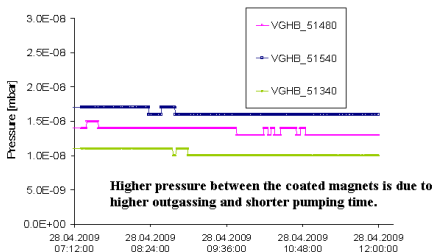
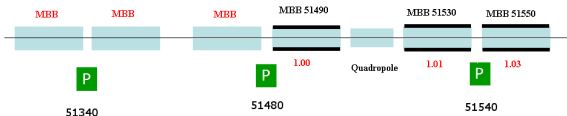
Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans



Schematic drawing of the magnets

Pressure reading before the MD run (Background pressure).
The pressure between the two coated magnet is twice higher than the one between the uncoated magnets.



Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Pressure reading - Before the scrubbing run

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

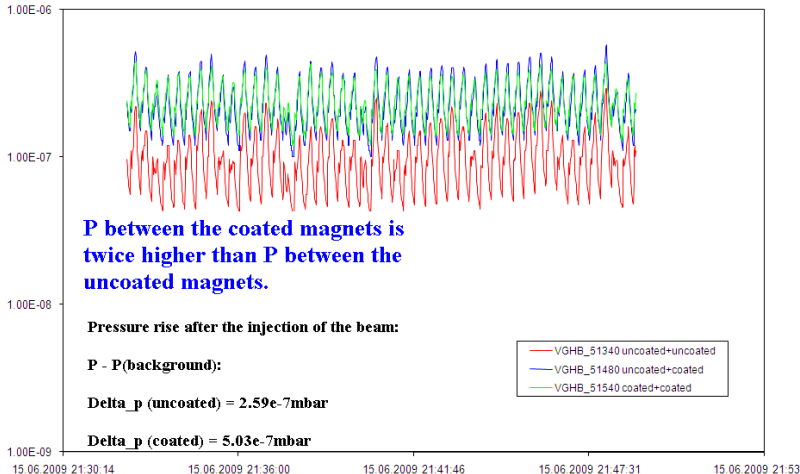
Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans



Pressure reading - Maximum of the pressures

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

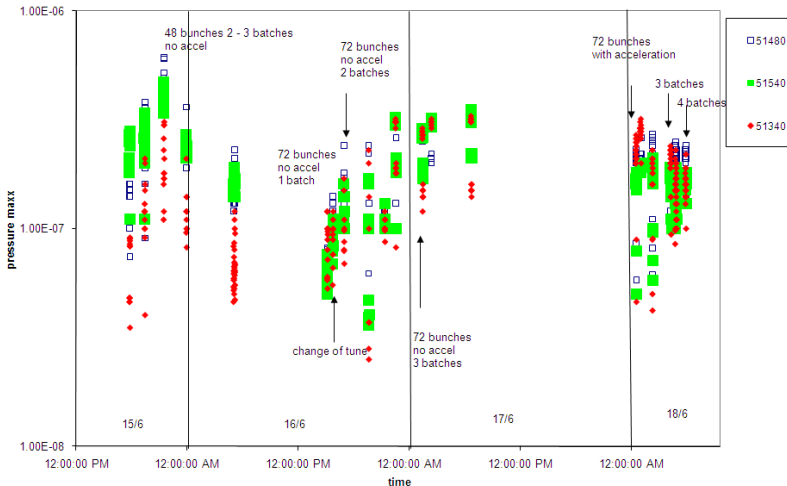
Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans



Pressure reading - Maximum of the pressures

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

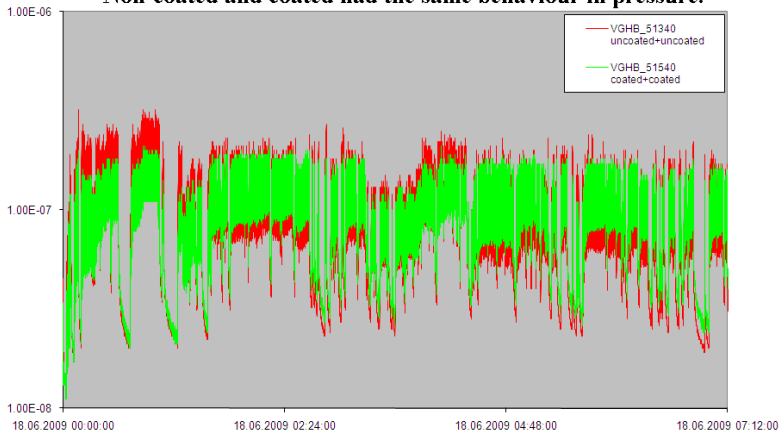
Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

magnets: uncoated and coated only, last night of MD (4 batches 72 bunches with acceleration)

Non-coated and coated had the same behaviour in pressure.



Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: StSt

- $\delta_{max} = 2.25$, higher than $\delta_{threshold} = 1.3$
- Normalized E-Cloud Current/FBCT started at -0.35, the same as from the previous run.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly 30%.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: StSt

- $\delta_{max} = 2.25$, higher than $\delta_{threshold} = 1.3$
- Normalized E-Cloud Current/FBCT started at -0.35, the same as from the previous run.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly 30%.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: StSt

- $\delta_{max} = 2.25$, higher than $\delta_{threshold} = 1.3$
- Normalized E-Cloud Current/FBCT started at -0.35, the same as from the previous run.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly 30%.

Scrubbing Run: a-C strip

- $\delta_{max} = 0.92$, lower than $\delta_{threshold} = 1.3$
- IT WORKS! BUT, the width of 40mm is a bit too low.
- It gives 350 times lower E-Cloud compared to StSt.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly a factor of 2.

Scrubbing Run: a-C strip

- $\delta_{max} = 0.92$, lower than $\delta_{threshold} = 1.3$
- **IT WORKS! BUT**, the width of 40mm is a bit too low.
- It gives 350 times lower E-Cloud compared to StSt.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly a factor of 2.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: a-C strip

- $\delta_{max} = 0.92$, lower than $\delta_{threshold} = 1.3$
- IT WORKS! BUT, the width of 40mm is a bit too low.
- It gives 350 times lower E-Cloud compared to StSt.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly a factor of 2.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: a-C strip

- $\delta_{max} = 0.92$, lower than $\delta_{threshold} = 1.3$
- IT WORKS! BUT, the width of 40mm is a bit too low.
- It gives 350 times lower E-Cloud compared to StSt.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly a factor of 2.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: a-C on Zr

- $\delta_{max} = 0.96$, lower than $\delta_{threshold} = 1.3$
- It started at the same level as a-C strip.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly a factor of 10.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: a-C on Zr

- $\delta_{max} = 0.96$, lower than $\delta_{threshold} = 1.3$
- It started at the same level as a-C strip.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly a factor of 10.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: a-C on Zr

- $\delta_{max} = 0.96$, lower than $\delta_{threshold} = 1.3$
- It started at the same level as a-C strip.
- After 3 nights scrubbing, E-Cloud has been reduced by nearly a factor of 10.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: a-C CNe13

- **Initial $\delta_{max} = 1.0$**
- Has been in the SPS since last year. It gives 4 times lower e-cloud from the start than the new carbon coatings.
- After 3 nights scrubbing, almost no E-Cloud effect can be detected.

Scrubbing Run: a-C CNe13

- **Initial $\delta_{max} = 1.0$**
- **Has been in the SPS since last year. It gives 4 times lower e-cloud from the start than the new carbon coatings.**
- After 3 nights scrubbing, almost no E-Cloud effect can be detected.

Conclusions

Studies with carbon coatings in the SPS - MD run, week 25

Christina Yin Vallgren TE-VSC

Outline

Overview of SPS MD runs

Overview of carbon coated liners inserted in SPS

Overview of carbon coated magnets inserted in SPS

Conclusions and Future plans

Scrubbing Run: a-C CNe13

- **Initial $\delta_{max} = 1.0$**
- Has been in the SPS since last year. It gives 4 times lower e-cloud from the start than the new carbon coatings.
- **After 3 nights scrubbing, almost no E-Cloud effect can be detected.**

Conclusions

Pressure reading in the magnets

- Before the injection of the beam, the background pressure between the coated magnets was 2 times higher than the pressure between uncoated magnets. \Rightarrow Due to the higher outgassing in the carbon film and shorter pumping time.
- With acceleration, the pressure between the coated magnets became as high as the pressure between the uncoated magnets.
- The gauges for measuring the pressure between two coated magnets are close to a quadrupole. \Leftarrow High degassing in the quadrupole? Not really comparable with the gauge we took between the two uncoated magnets.

Conclusions

Pressure reading in the magnets

- Before the injection of the beam, the background pressure between the coated magnets was 2 times higher than the pressure between uncoated magnets. \Rightarrow Due to the higher outgassing in the carbon film and shorter pumping time.
- **With acceleration, the pressure between the coated magnets became as high as the pressure between the uncoated magnets.**
- The gauges for measuring the pressure between two coated magnets are close to a quadrupole. \Leftarrow High degassing in the quadrupole? Not really comparable with the gauge we took between the two uncoated magnets.

Conclusions

Pressure reading in the magnets

- Before the injection of the beam, the background pressure between the coated magnets was 2 times higher than the pressure between uncoated magnets. \Rightarrow Due to the higher outgassing in the carbon film and shorter pumping time.
- With acceleration, the pressure between the coated magnets became as high as the pressure between the uncoated magnets.
- The gauges for measuring the pressure between two coated magnets are close to a quadrupole. \Leftarrow High degassing in the quadrupole? Not really comparable with the gauge we took between the two uncoated magnets.

Plans for the next MD

- 1 Read the pressure close to liners
- 2 Find a gauge between two uncoated magnets close to a quadrupole.

Thanks

Studies with
carbon
coatings in
the SPS
- MD run,
week 25

Christina Yin
Vallgren
TE-VSC

Outline

Overview of
SPS MD runs

Overview of
carbon coated
liners inserted
in SPS

Overview of
carbon coated
magnets
inserted in
SPS

Conclusions
and Future
plans

Thanks a lot for your attention!

Questions???