

Studies with carbon coatings in the SPS

Christina Yin Vallgren

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Outline

Overview of
the SPS MD
runs

Overview of
the carbon
coatings
inserted in
the SPS

Results from
the E-cloud
monitors

Conclusions

- 1 Overview of the SPS MD runs
- 2 Overview of the carbon coatings inserted in the SPS
- 3 Results from the E-cloud monitors
- 4 Conclusions

SPS MD runs

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- SPS Scrubbing run: 10 June - 12 June, 2008
- Injector MD with LHC beam: 8 July, 2008
- Injector MD: 12 August, 2008

Normally:

The beam consists of batches of 72 bunches with 25-ns bunch spacing.

- Injector MD: 6 October - 8 October, 2008

25-ns, 50-ns and 75-ns bunch spacing.

Liners used for E-cloud monitoring

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- 1 Stainless Steel
 - 2 NEG coating
 - 3 Carbon coating
- All the tests were done in the magnets at a field of 1.2 kGauss.
 - The beam energy in the scrubbing run was 26 GeV and in the other MD runs 450 GeV

Carbon Coatings

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- 1 SPS Scrubbing run: Carbon with Krypton as discharge gas (CKr4)
- 2 Injector MD with LHC beam: Carbon with Neon as discharge gas (CNe8)
- 3 Injector MD: Aged Carbon with Neon as discharge gas - 2 weeks venting in air before inserting (CNe13)
- 4 Injector MD: CNe13 - 2 months in SPS vacuum

Description of the carbon coatings can be found in the presentation of M. Taborelli, ECM'08 20/11/08

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SEY of Carbon coatings

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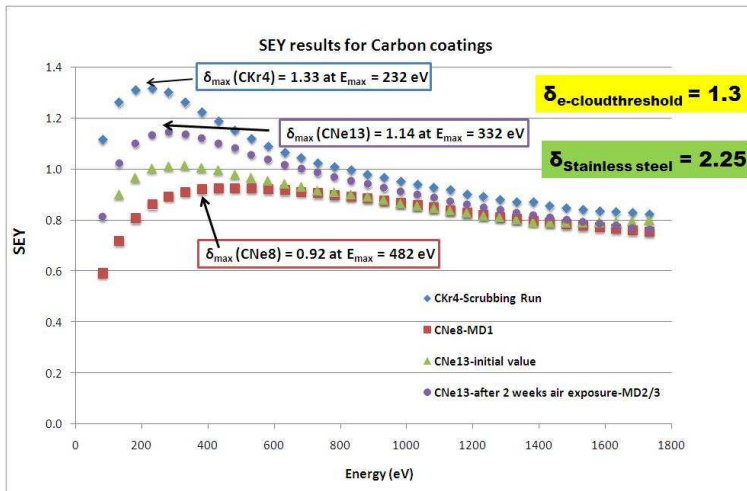
Outline

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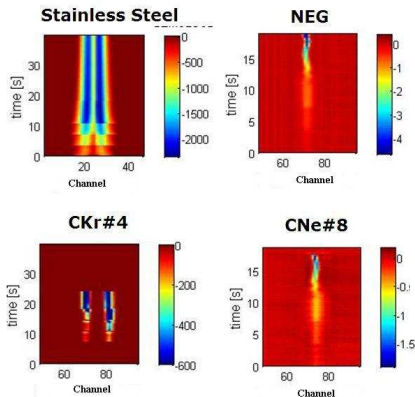
Results from the E-cloud monitors

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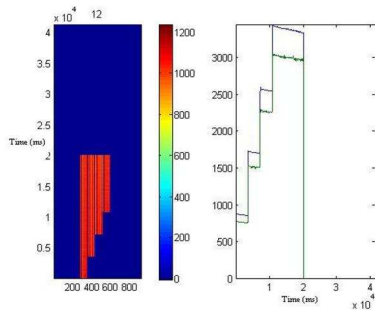


E-cloud Monitors

SEMCloud Monitors:



FBCT Monitor:



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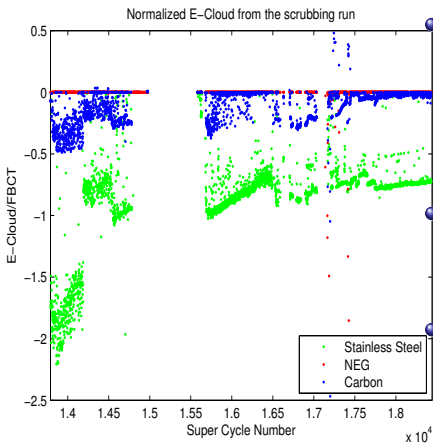
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Normalized EC v.s cycle number from the Scrubbing run with the beam of 25ns bunch spacing

Normalized EC:

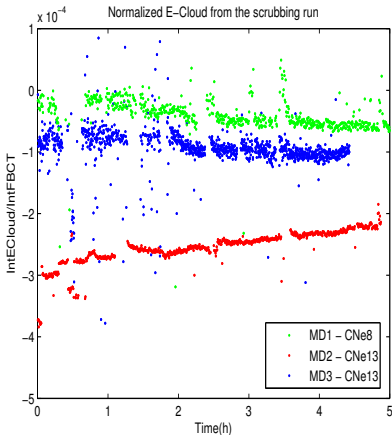


Conclusions:

- Stainless Steel ($\delta_{max} = 2.25$) - E-Cloud in Stainless Steel has been reduced by nearly a factor of 2.
- NEG ($\delta_{max} = 1.1$) - E-Cloud in NEG showed no activity.
- Carbon (CKr4) $\delta_{max} = 1.33$. - E-Cloud in Carbon was found to change by nearly a factor of 5.

Normalized EC v.s Time from the MD runs with the beam of 25ns bunch spacing

Normalized EC: EC has a magnitude of 10^{-4} .



Conclusions:

- 1 MD1 - Carbon (CNe8)
 - E-Cloud in Carbon showed no activity.
 - $\delta_{max} = 0.92$.
- 2 MD2 - Carbon (CNe13)
 - Aged in air for 2 weeks before inserting.
 - Initial $\delta_{max} = 1.0$.
 - Aged $\delta_{max} = 1.14$.
- 3 MD3 - Carbon (CNe13)
 - stayed in SPS vacuum for 2 months.

MD run 3

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Aim

- Aging effect of the carbon coating in SPS vacuum.
- Compare the difference in E-cloud effect for the beam with different bunch spacing.

Comparison of the normalized EC for different bunch spacing

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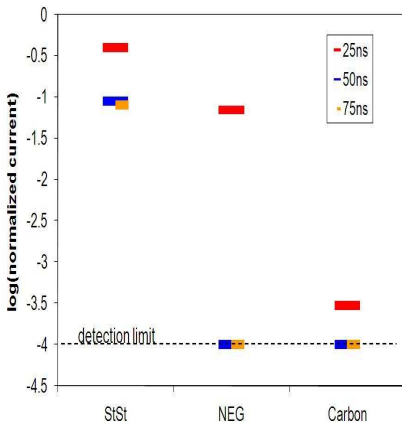
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Normalized EC:



Conclusions:

- 1 Stainless Steel
 - 5 times less current at 50 ns and 75 ns
- 2 NEG
 - No detectable current at 50 ns and 75 ns
- 3 MD3 - Carbon (CNe13)
 - No detectable current at 50 ns and 75 ns

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Scrubbing Run: CKr4

- $\delta_{max} = 1.33$, higher than $\delta_{threshold} = 1.3$
- It showed a quite strong effect of E-cloud
- After 3 days scrubbing, E-Cloud has been reduced by nearly a factor of 5.

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MD 1: CNe8

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MD 2/3: CNe13

- **Initial $\delta_{max} = 1.0$.**
After 2 weeks' air exposure, $\delta_{max} = 1.14$, lower than $\delta_{threshold} = 1.3$
- It showed no effect of E-cloud with the beam of 25 ns bunch spacing.
- No E-cloud with the beam of 50/75 ns bunch spacing.

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Thanks

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Thanks a lot for your attention!

Questions???