Electron cloud studies for MD4/MD5

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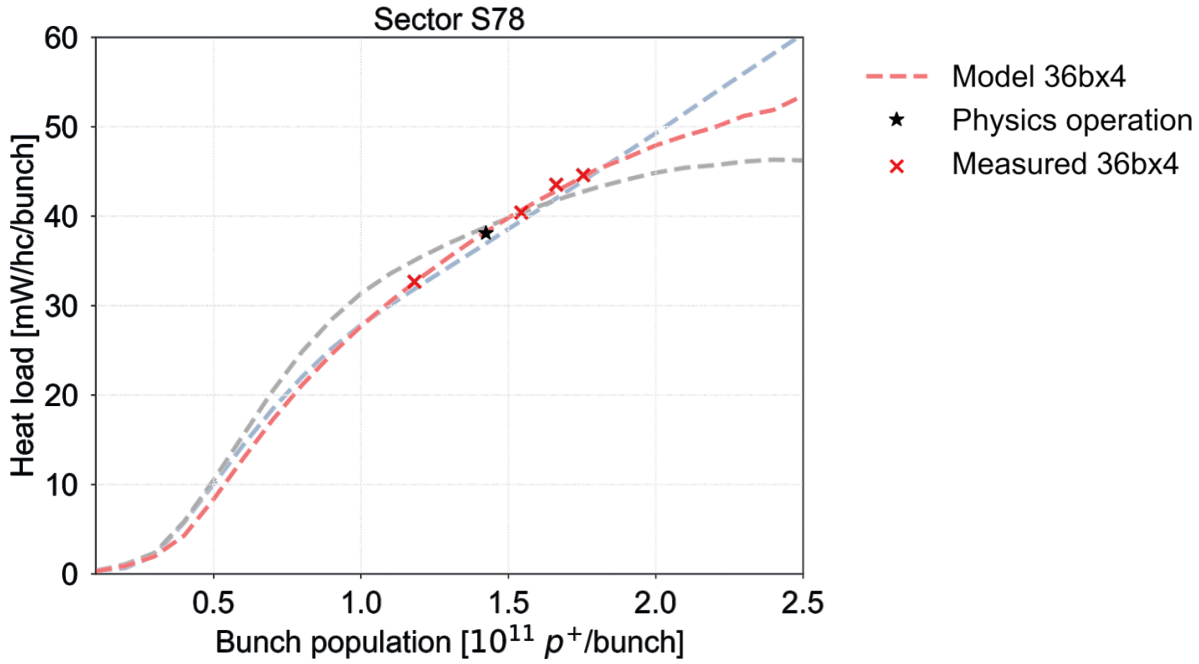
Motivation for heat load measurements

- The heat loads are currently the best available observable for a quantitative estimate of e-cloud around the LHC
  - Allow to deduce the Secondary Emission Yield (SEY) of the surface, which is then used to estimate the heat load for different intensities, filling schemes, energies etc.

- Model benchmarked with measurements in 2022 with up to ~1.8e11 ppb → so far good estimates for Run 3
  - Large uncertainty when extrapolating to 2.3e11 p/b, where slightly different models give quite different results



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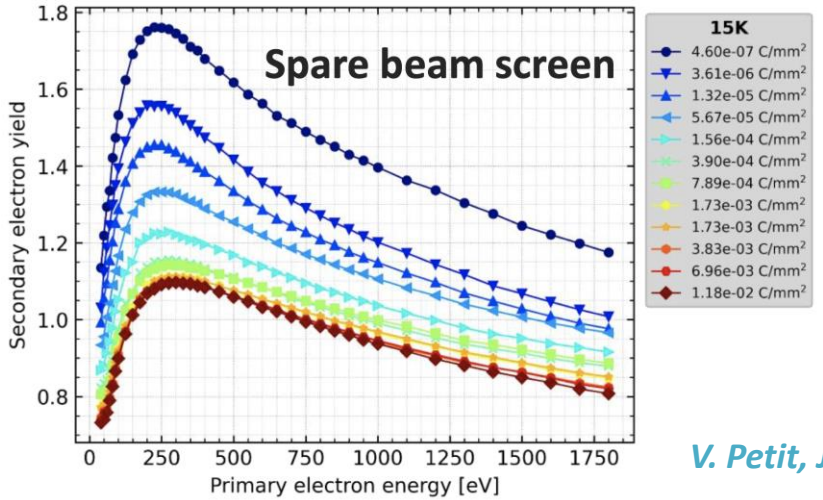
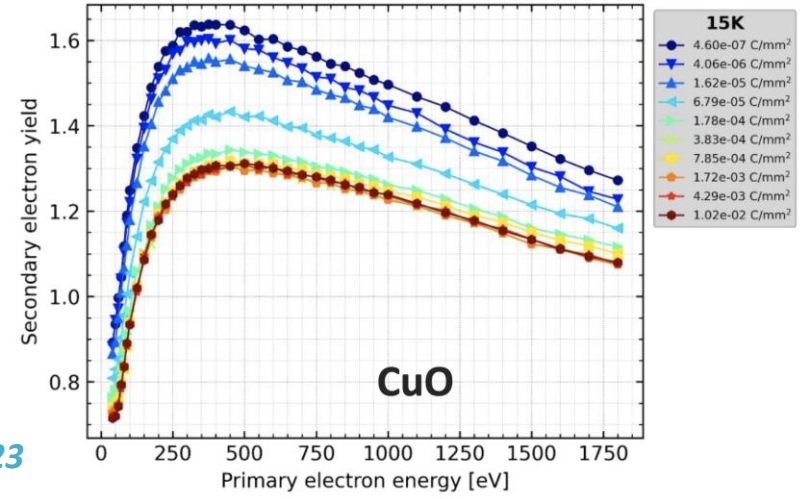
- Lab measurements indicate not only different SEY value, but different SEY curve for degraded surfaces (CuO)
  - Aiming to use both Cu_2O and CuO SEY curves to fit the machine status, but more data is needed to converge on fit



V. Petit, JAP23



MD9551: Heat load with high bunch intensity at injection

Motivation:

- Improve estimates of cell-by-cell heat loads for the HL-LHC era
  - Direct measurements give reliable data for selecting half-cells for BST and defining cryo margins in Run 4

Setup:

- Inject beam in trains of 2x48 bunches (96 bpi) and **~900 bunches per beam** with up to **2.3e11 ppb**
  - Measurements in 2022 with ~800b of 1.8e11 ppb at 450 GeV were poor due to low heat load

- Store beam for ~30 minutes for a reliable heat load estimate

- Repeat for lower intensities (e.g., **1.9e11, 1.5e11 1.1e11 ppb**) with the number of bunches increased to give similar heat load for 2.3e11 ppb (e.g., 1000b, 1200b, 1400b)

Time:

- 8h at **450 GeV**

MD12843: Heat load measurements

Motivation:

- Measurements to improve estimates of cell-by-cell heat loads and for direct comparison with Run 2 data

Setup:

- Inject and ramp (in cases 2-4) fills for the following heat load measurements:
  1. At injection
  2. At flat top
  3. At flat top with only B1
  4. At flat top with only B2

- Use trains of 2x48 bunches (96 bpi) and **~2400 bunches per beam** with **1.2e11 ppb**
  (~145 W/hc expected in S78 with both beams at 6.8 TeV)
  - If possible, set bunch length target at flat top shorter than in operation (ideally ~1.1 ns to match Run 2 conditions)

- Store beam for ~30 minutes for a reliable heat load estimate

Time:

- 10h at **450 and 6.8 GeV**