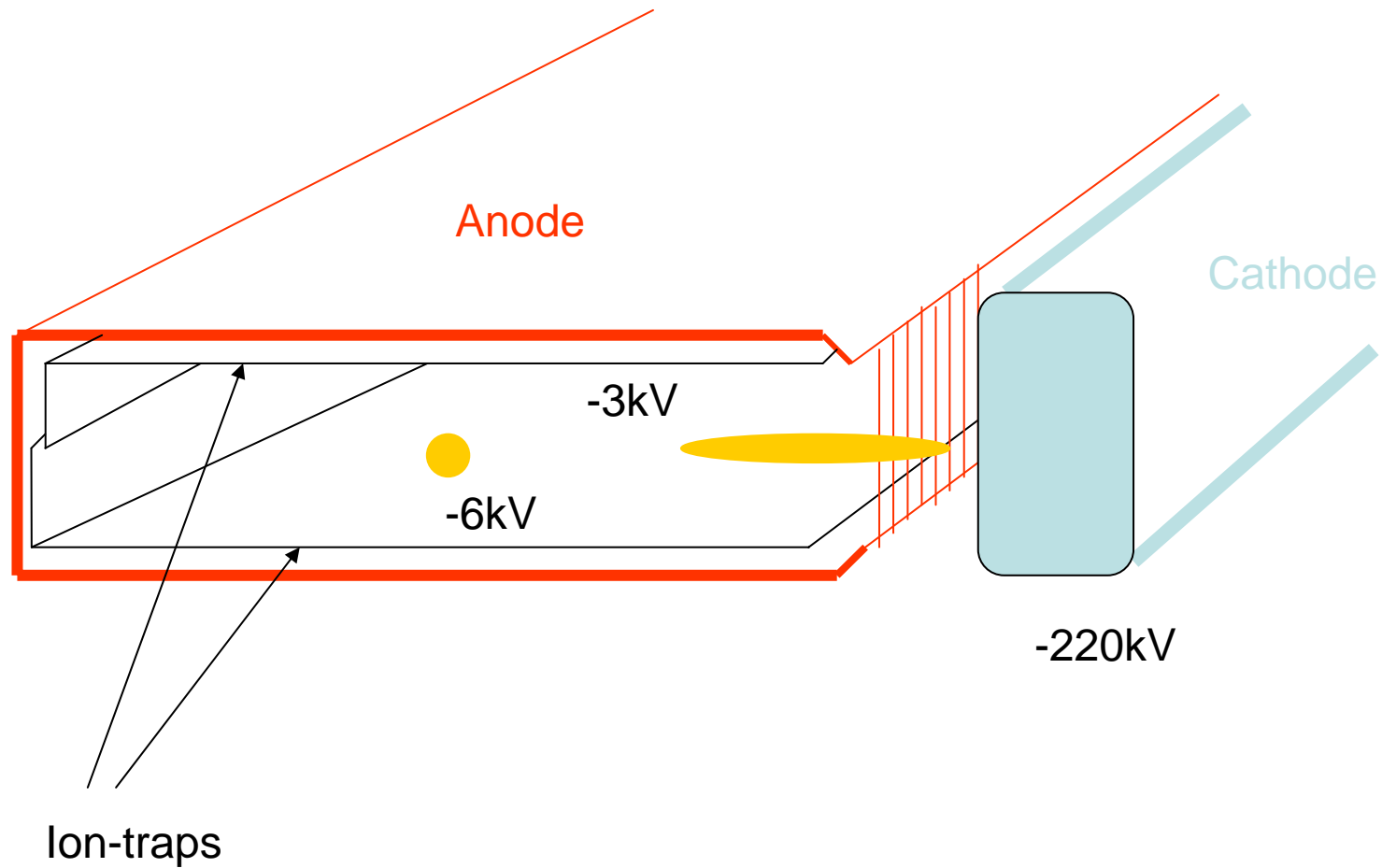


# **Sparking of SPS electrostatic septa in presence of e-cloud**

K. Cornelis  
CERN

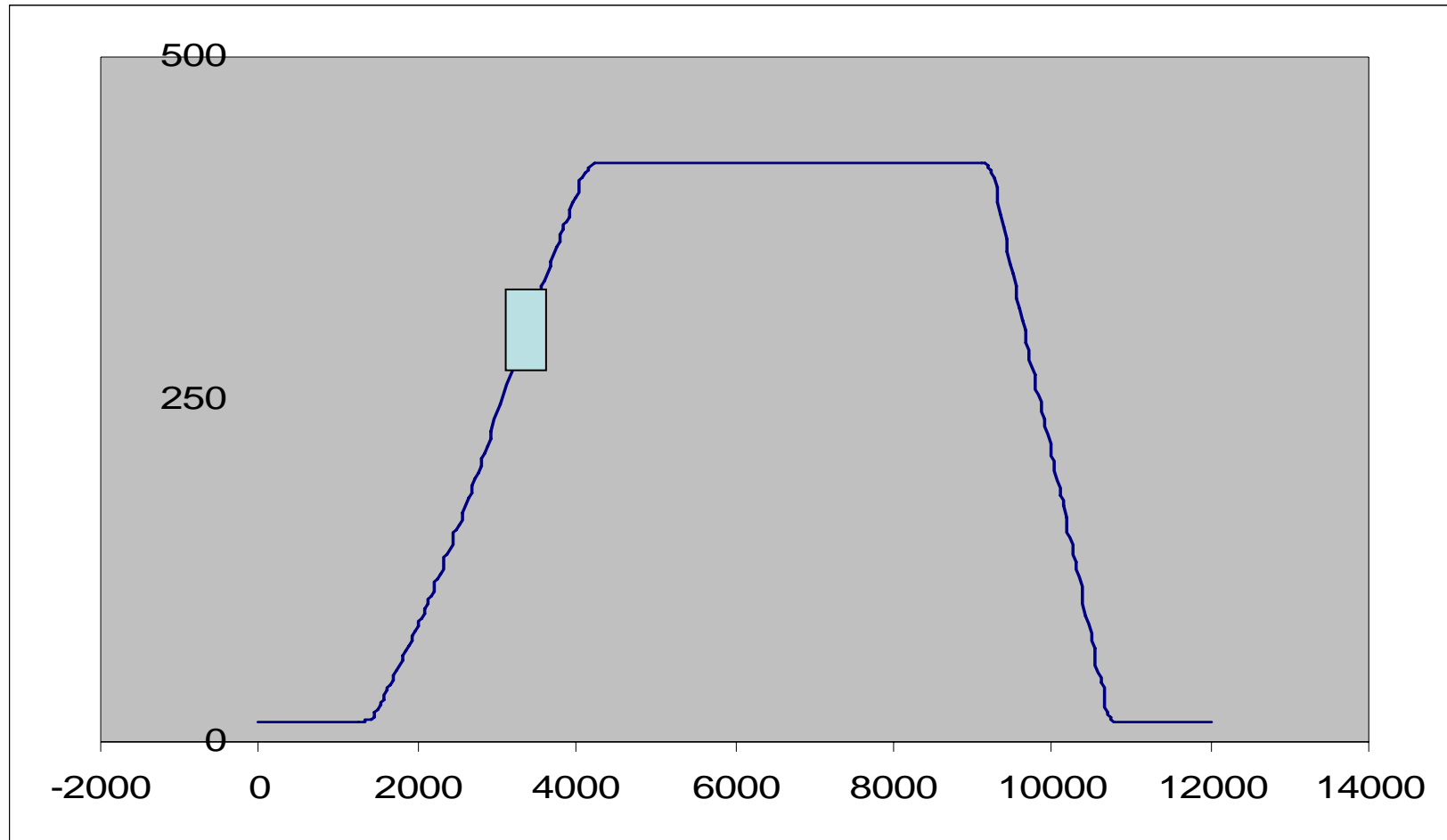
# The SPS electrostatic septum (ZS) : a simple view



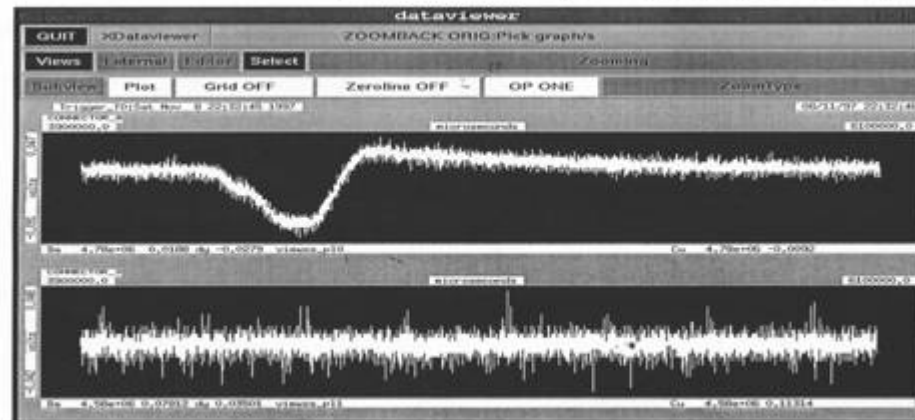
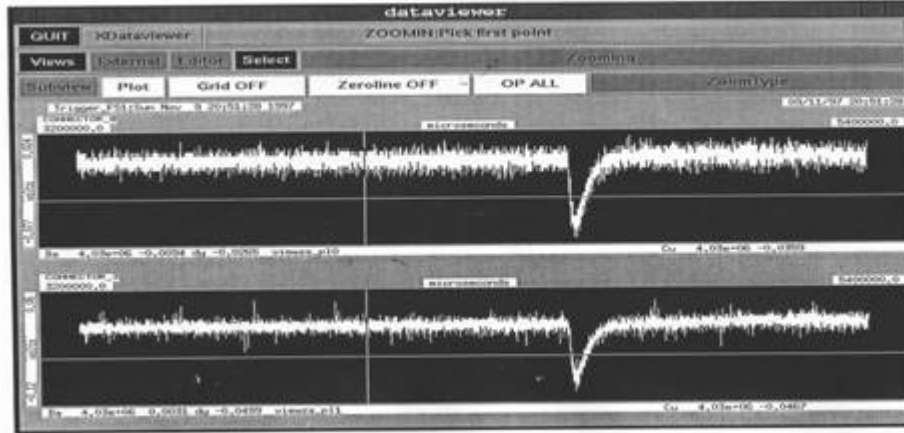
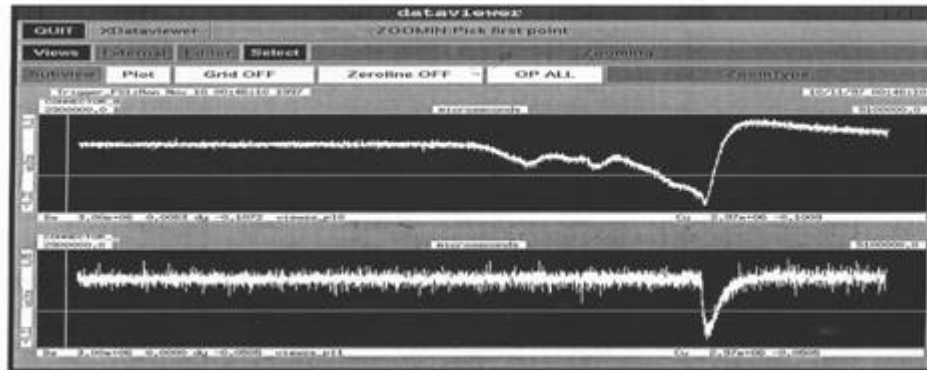
# Classical sparks

- During extractions : Ionization due to beam losses. (Ion-traps)
- Insulation fatigue (Protect insulation for radiation damage).
- Synchrotron radiation : (Masks)

# A mysterious spark problem



# ANODE CURRENTS



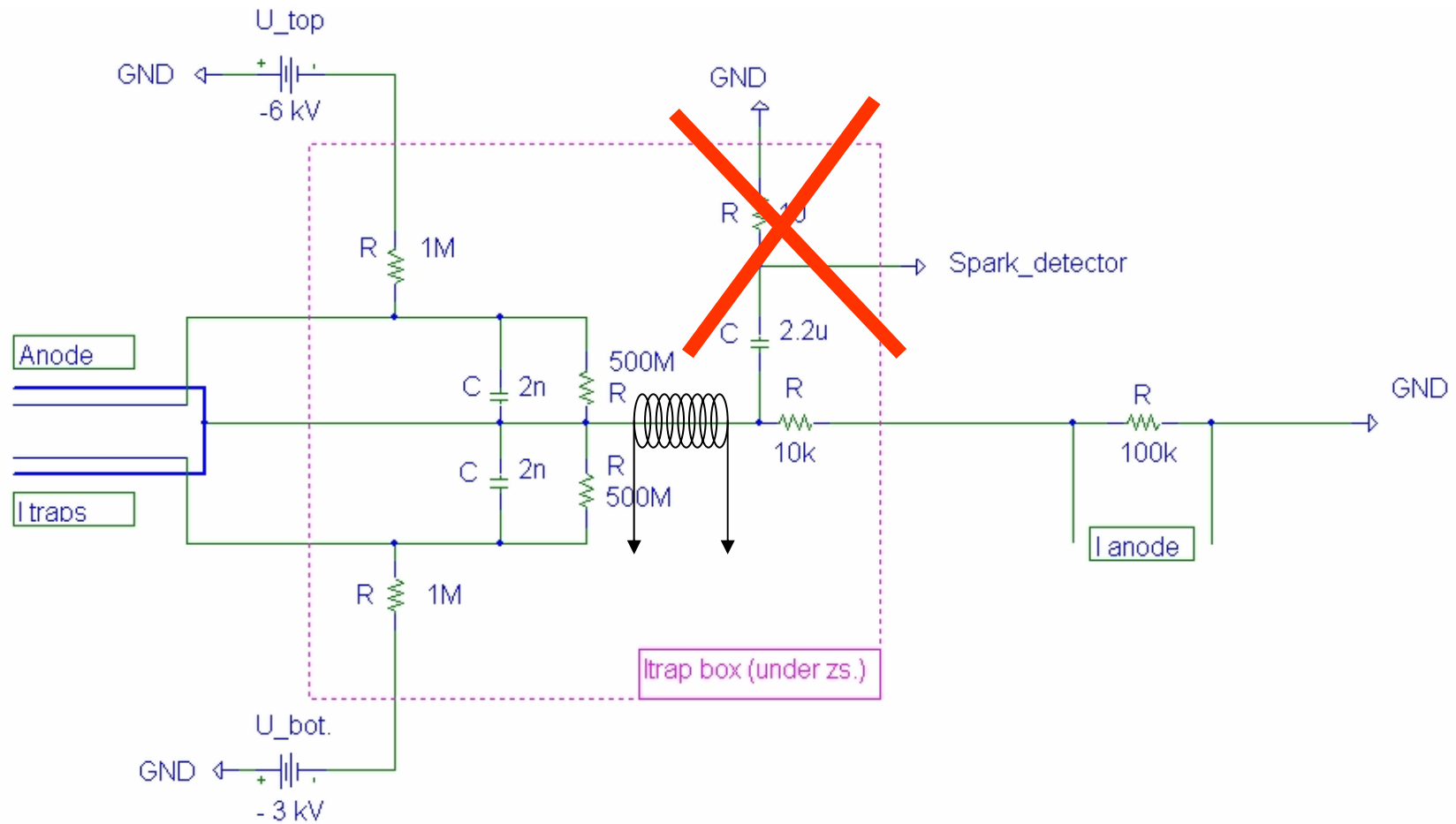
Lower intensity

No extraction

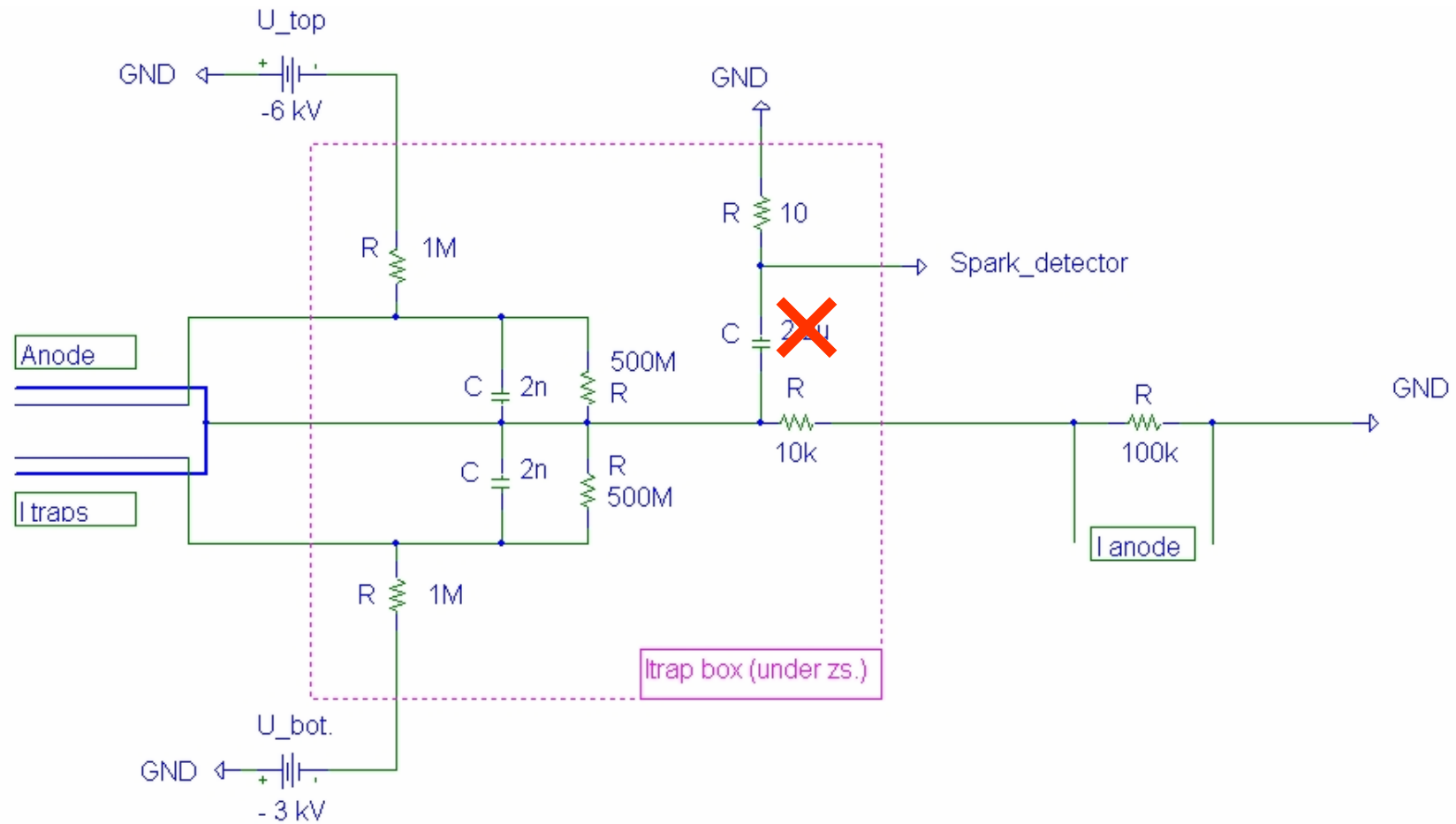
# Other observations

- Correlation of signals with bunch length
- Increasing the ion-trap voltages helped.
- Some changes in septum wiring gave bad results.

# Other observations



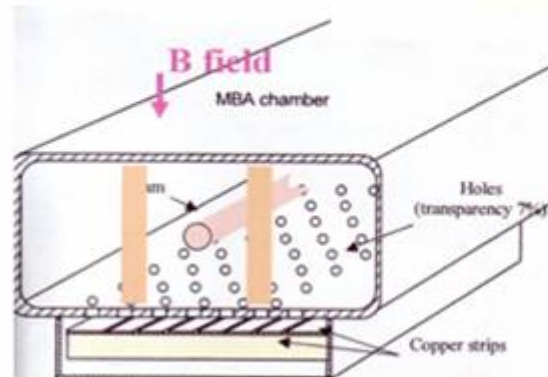
# Other observations



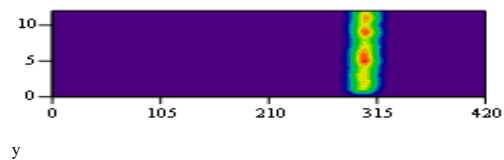
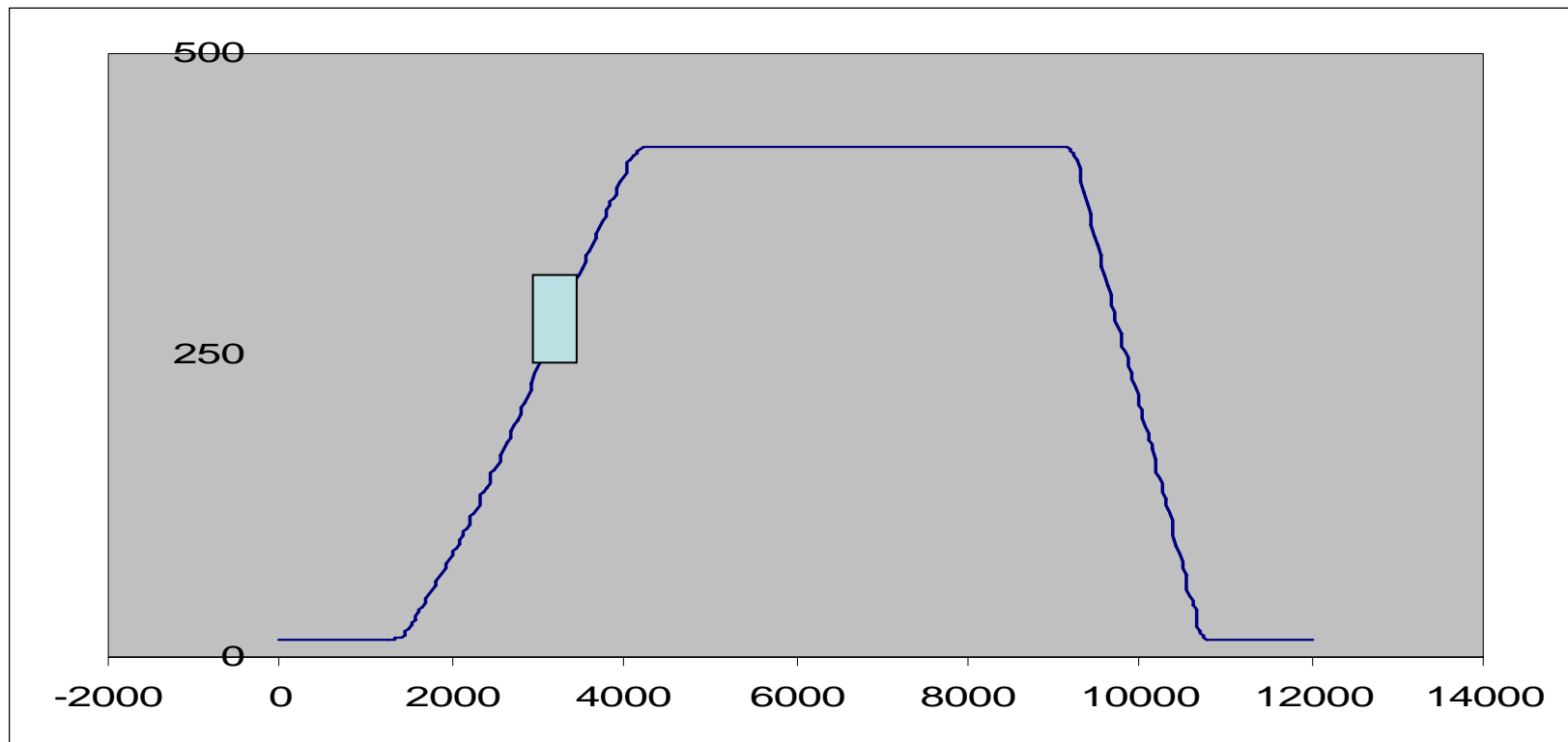


# Some years later

- A strip detector was installed in the SPS in order to study the electron-cloud problem with LHC-type beam (25 nsec. spacing)
- With high intensity and short bunches we could also observe electron activity with the fixed target type of beam.( 5 nsec spacing)



# E-cloud observed when bunch density highest in cycle



# Comments

- Although the e-cloud could be observed in the strip detector, the septum sparking stayed calm for a long time : the beam intensity was lower than in 1997 and we ran with systematic high ion traps. No indications of e-cloud in the septa.
- In order to have e-cloud on the FT-beam in the strip detector the e-cloud had to be provoked by an LHC-beam in a neighboring cycle.
- However, we think that the intensity in 1997 was high enough to provoke the cloud by itself and this in spite of the ion-traps.
- We also think that the ion-traps (connected to the outside world by a very high impedance) can be influenced by beam induced fields, reducing their effectiveness. Once multi-pacting sets on, they lose completely their efficiency.

# New incidents

- A septum was destroyed during a scrubbing run with LHC beam in 2002 while OFF.
- During a high intensity test in 2004 sparking reoccurred in one septum.

# Conclusions

- E-cloud has been observed in the SPS for high intensity FT beams.
- Multi-pacting phenomena have been responsible for sparking and/or damaging electrostatic septa.
- The ion-traps seem to lose their function as clearing electrodes under certain conditions.