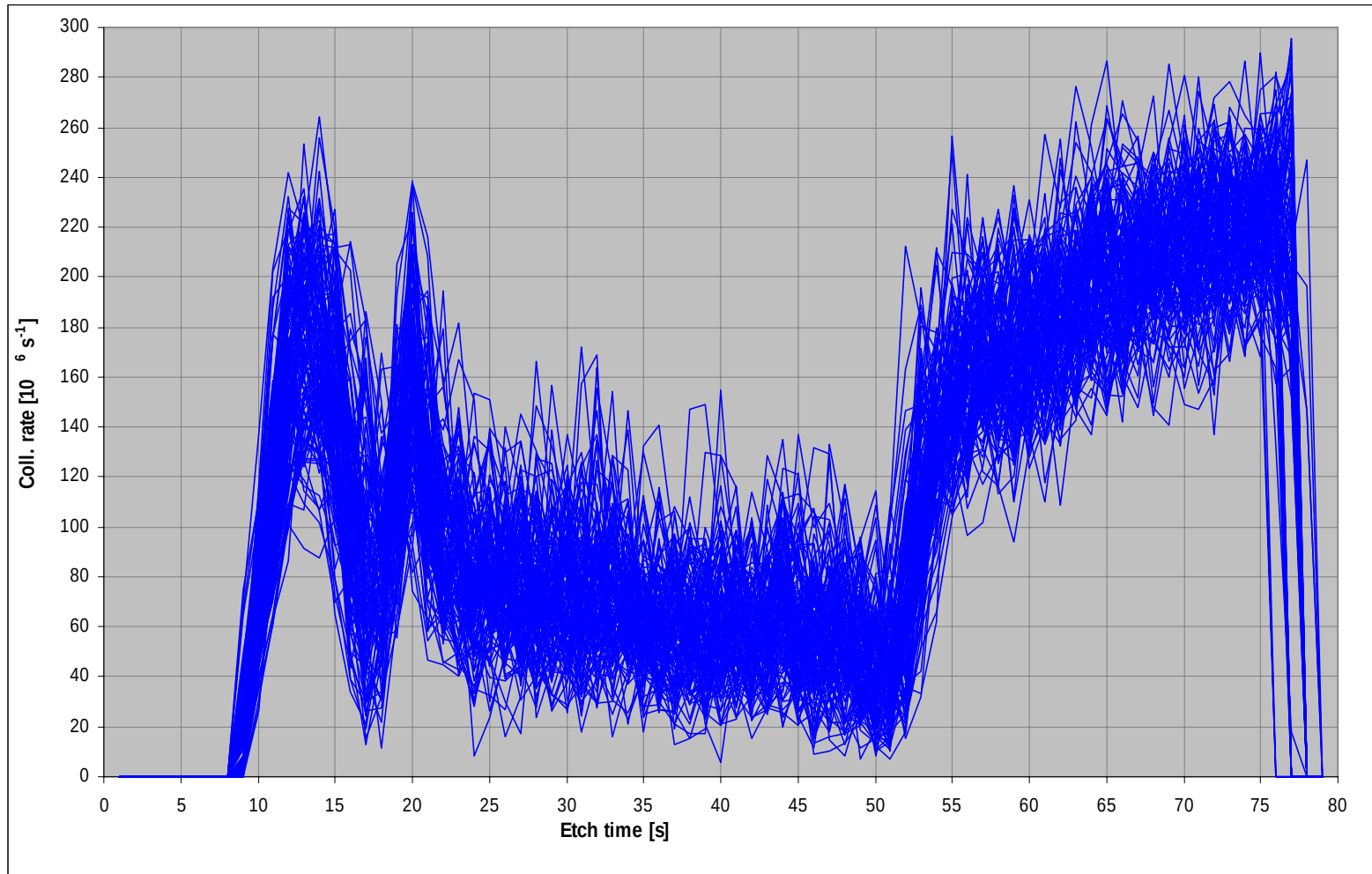

Detection of process faults by using Hercules plasma sensor

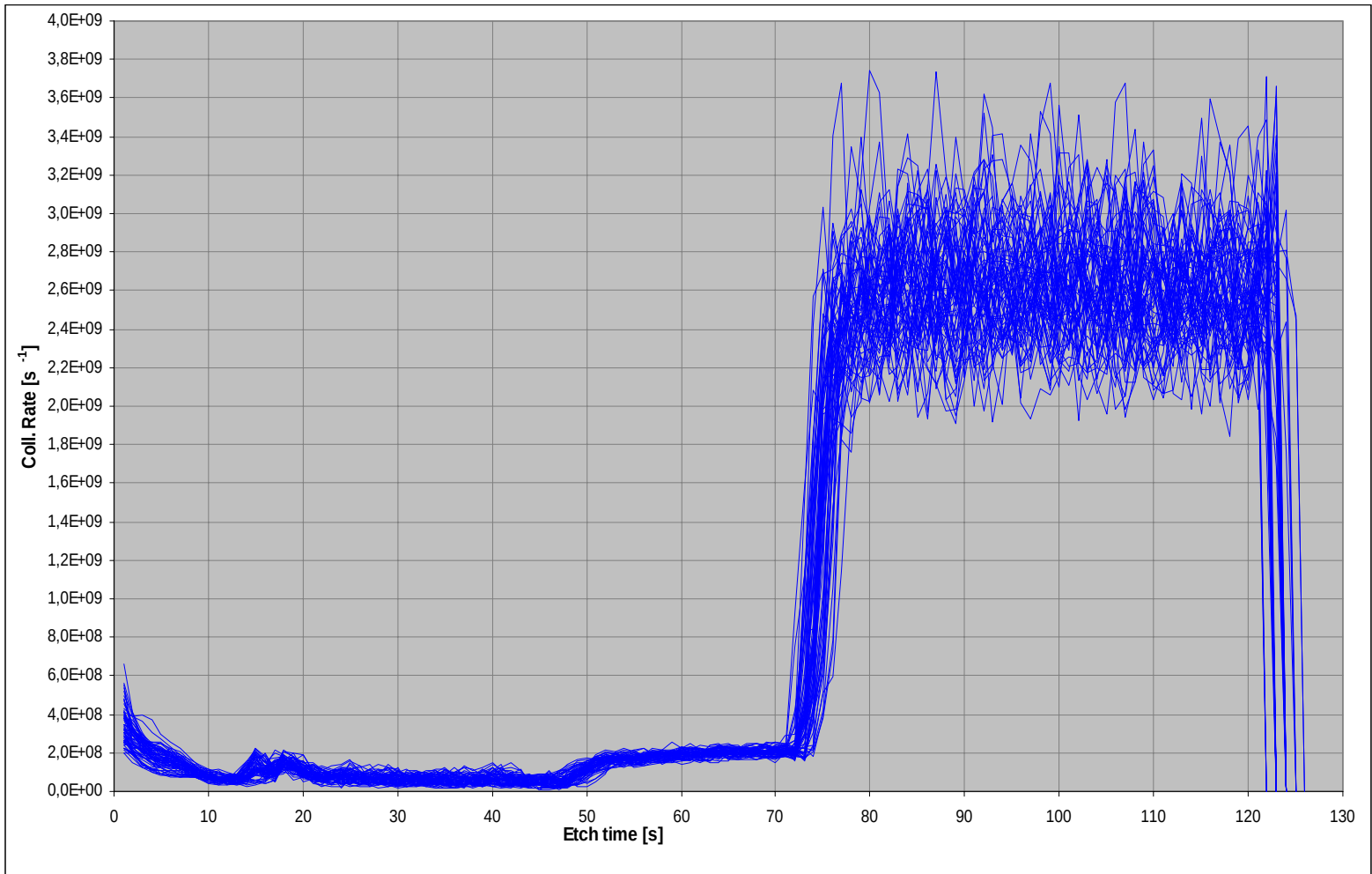
Mark Laqua
Daniel Zschäbitz
Dr. Volker Tegeder

Collision Rate vs. Etch time



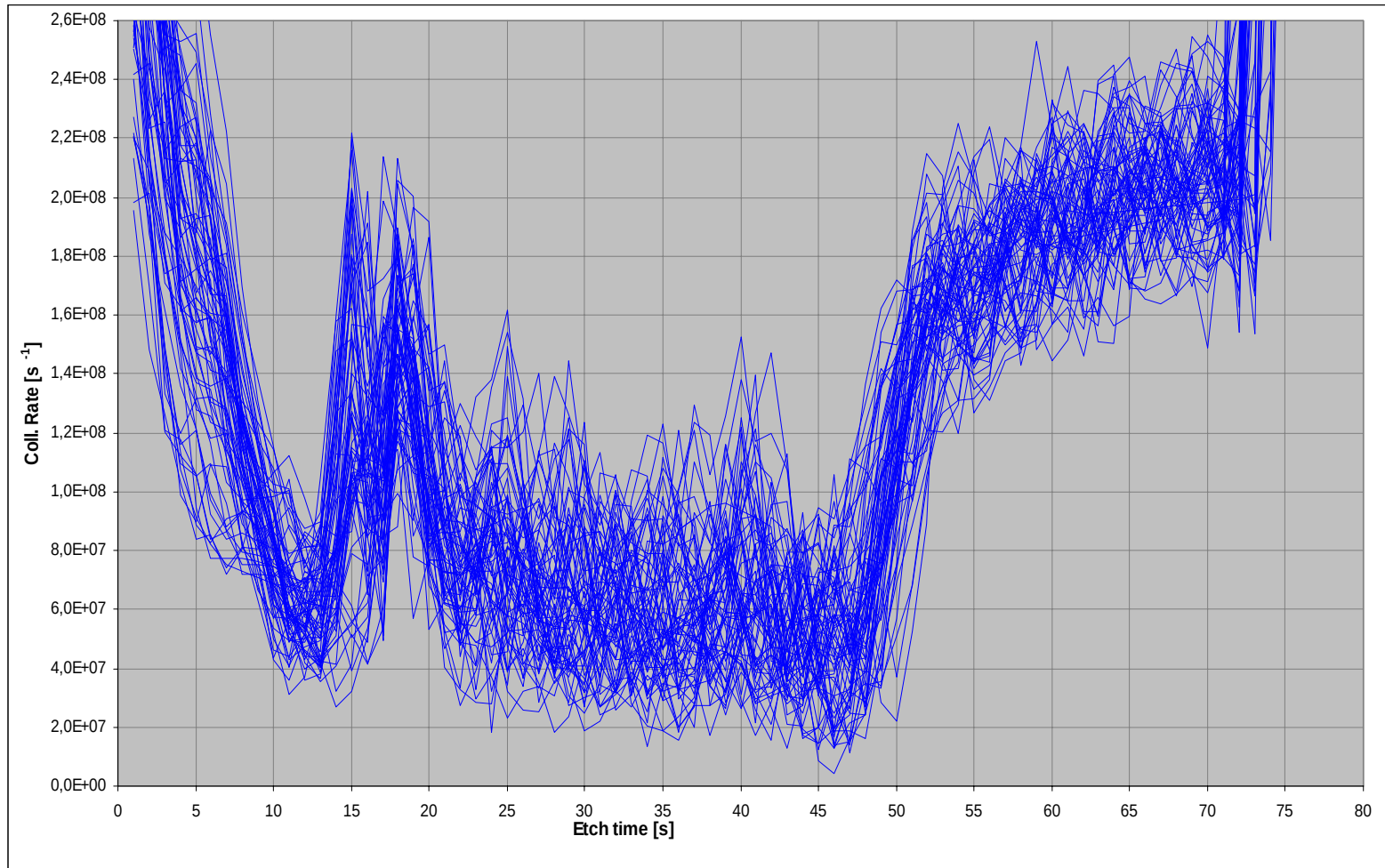
Process Fingerprint metal etch with original HERCULES ini-settings

Collision Rate vs. Etch time



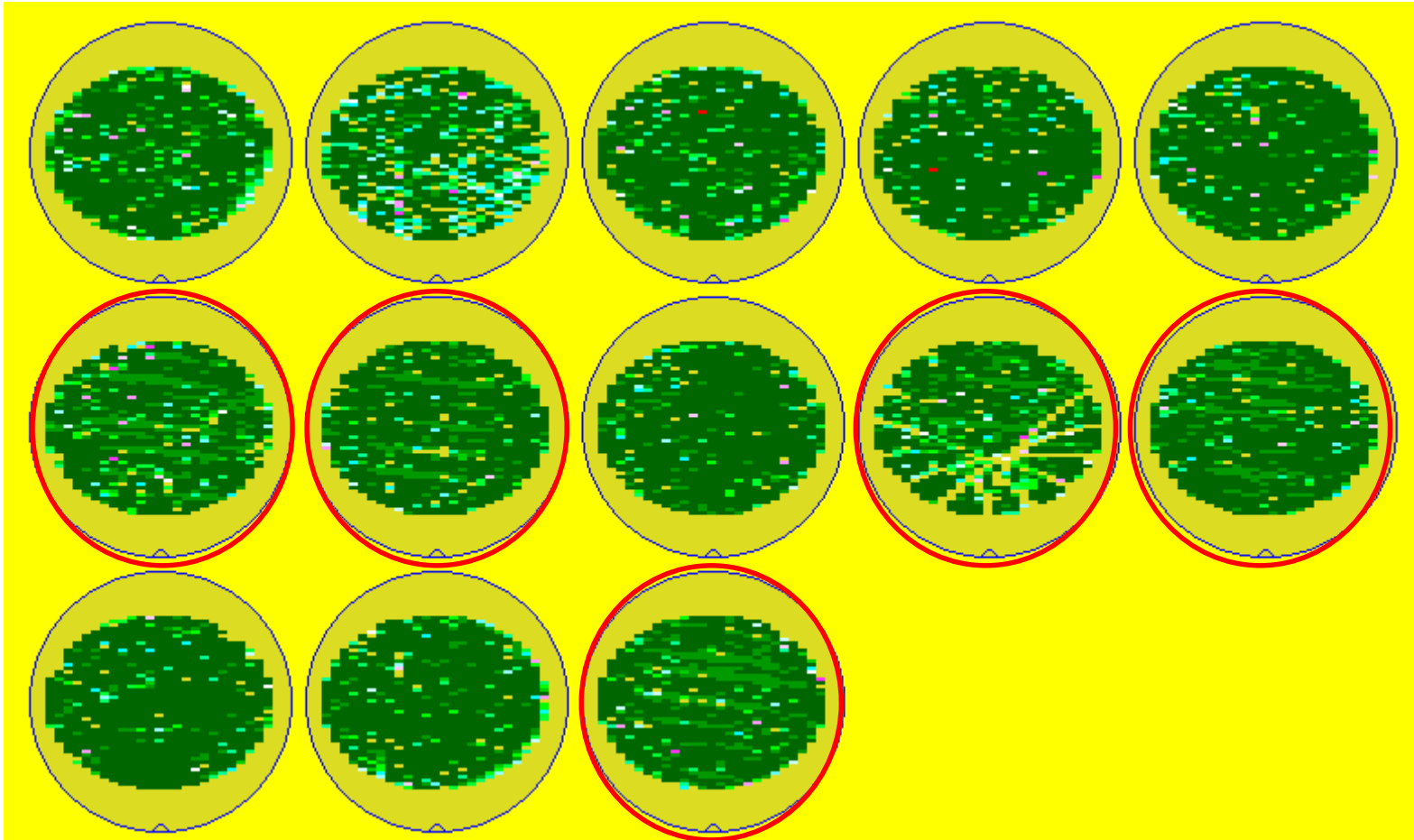
Changed fingerprint by using new HERCULES ini-settings (sensitivity)

Collision Rate vs. Etch time



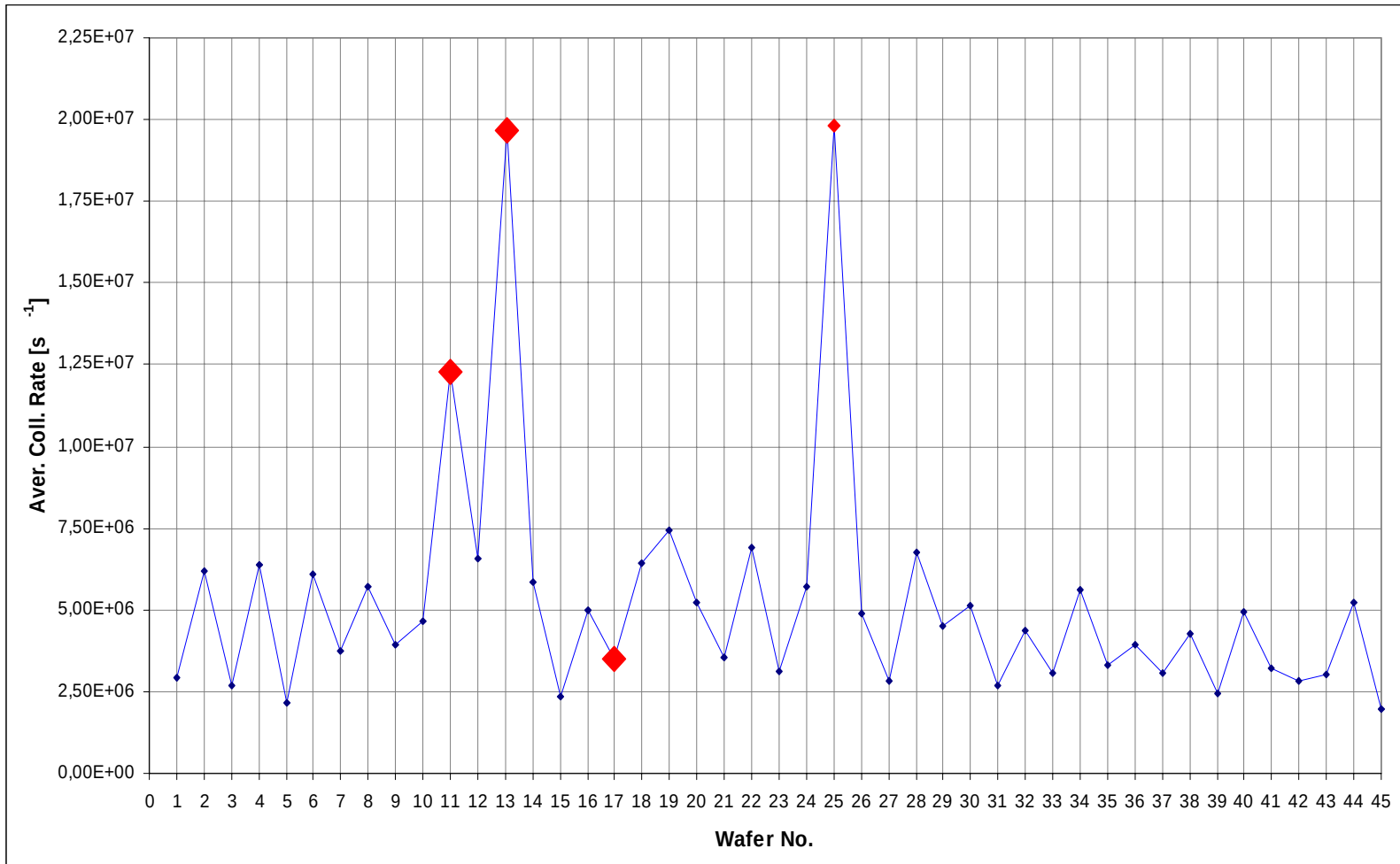
Section of previous fingerprint for comparison with original settings fingerprint

Fogbanks (red marked wafer)



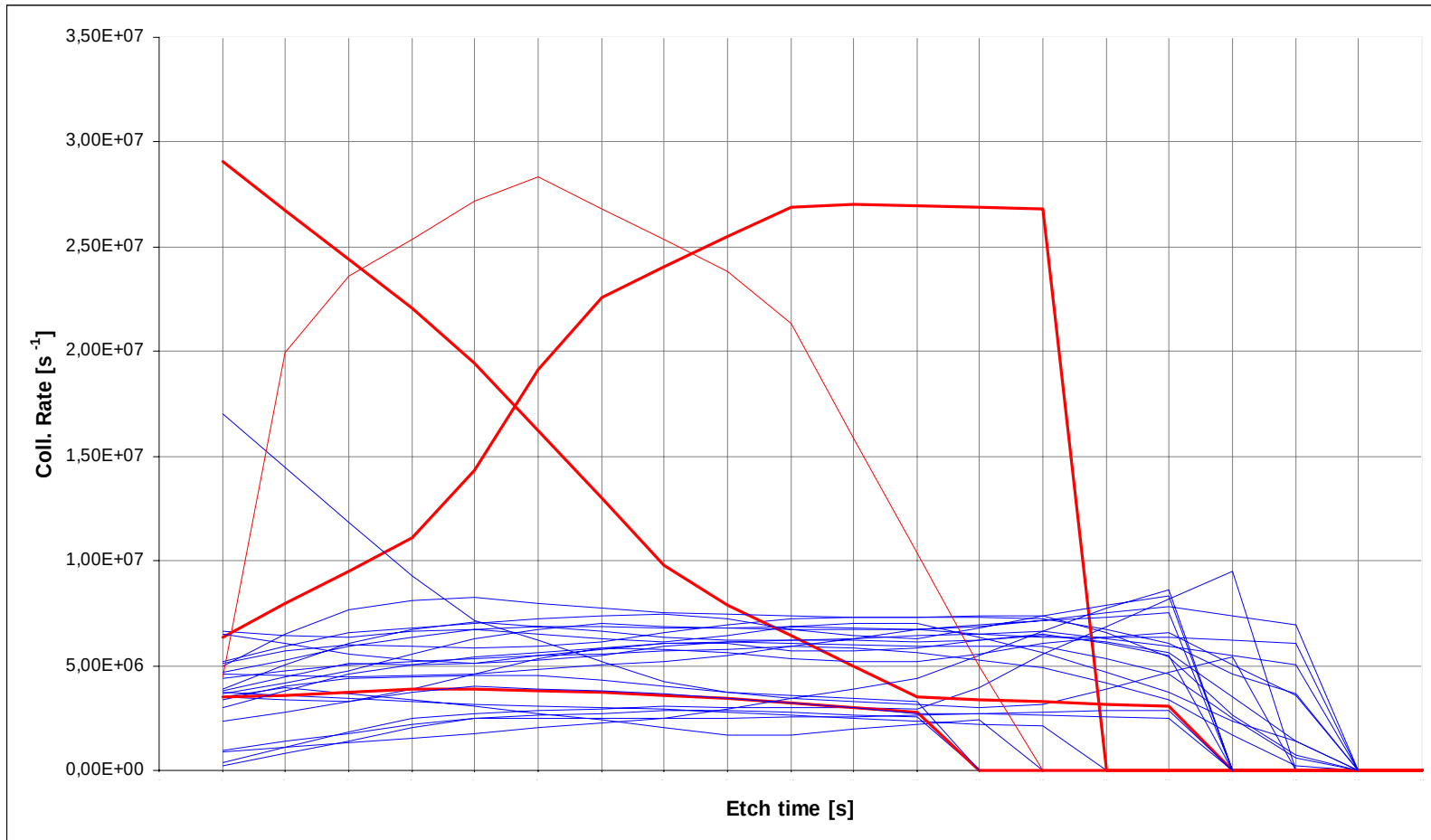
Typical process error pattern

Average Collision Rate vs. Wafer No.



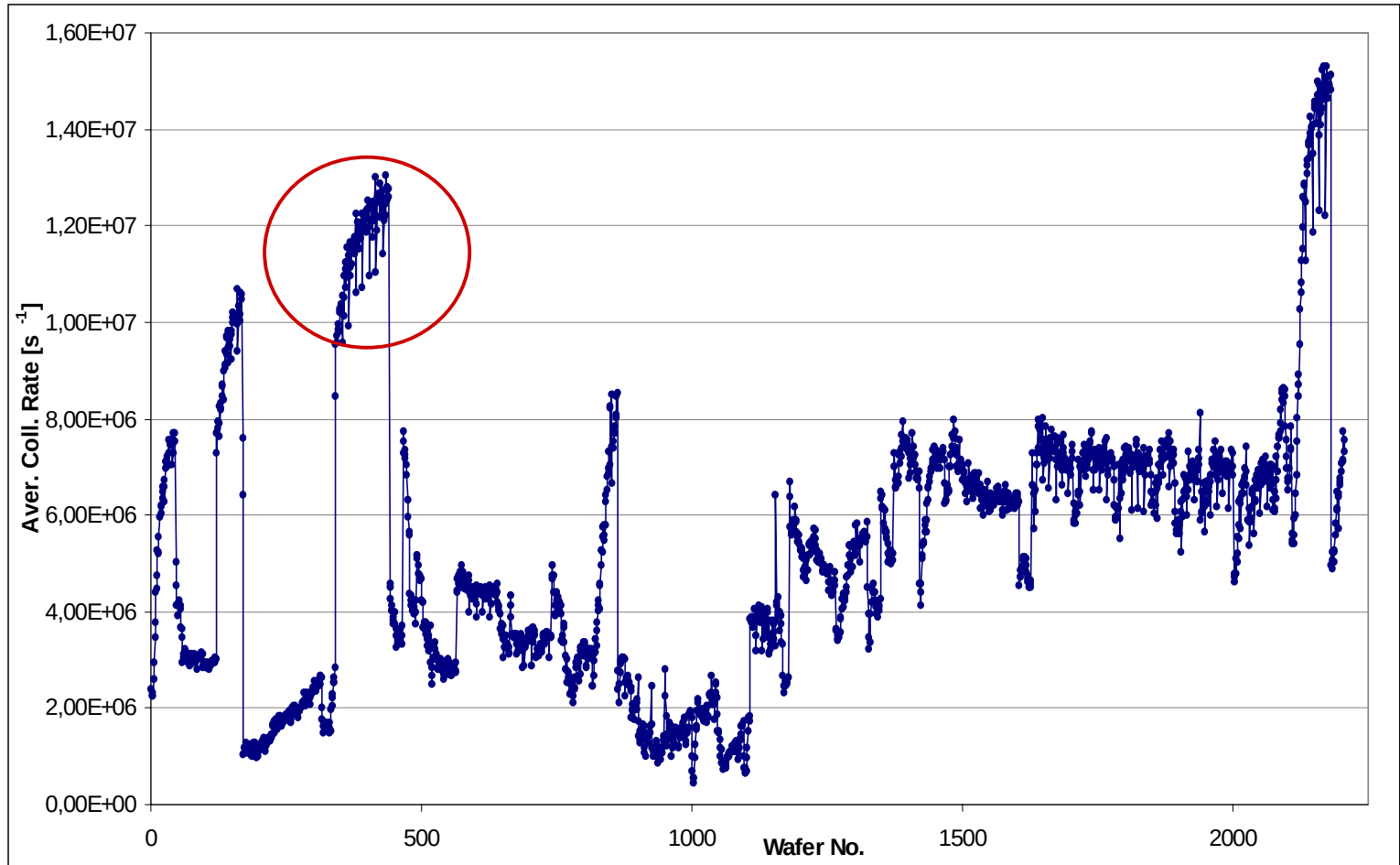
Three out of four process errors detected by changes in average collision rate

Collision Rate vs. Etch time



Three out of four process errors detected by changes in fingerprint

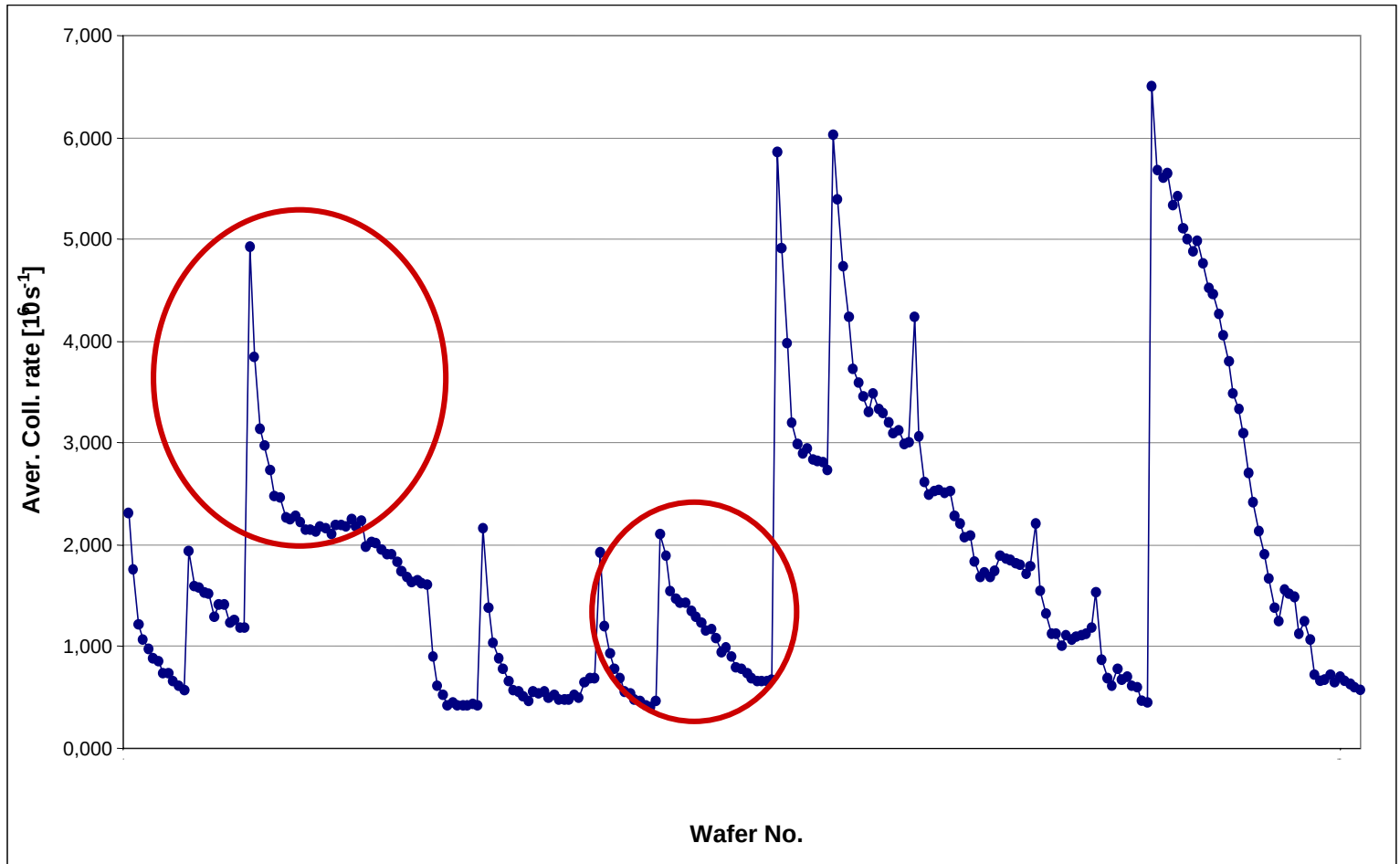
Average Collision Rate vs. Wafer No. (64M)



Measurement over several weeks of one process on a AMAT-Etch Tool

There are untypical „First wafer effects“ (red marked)

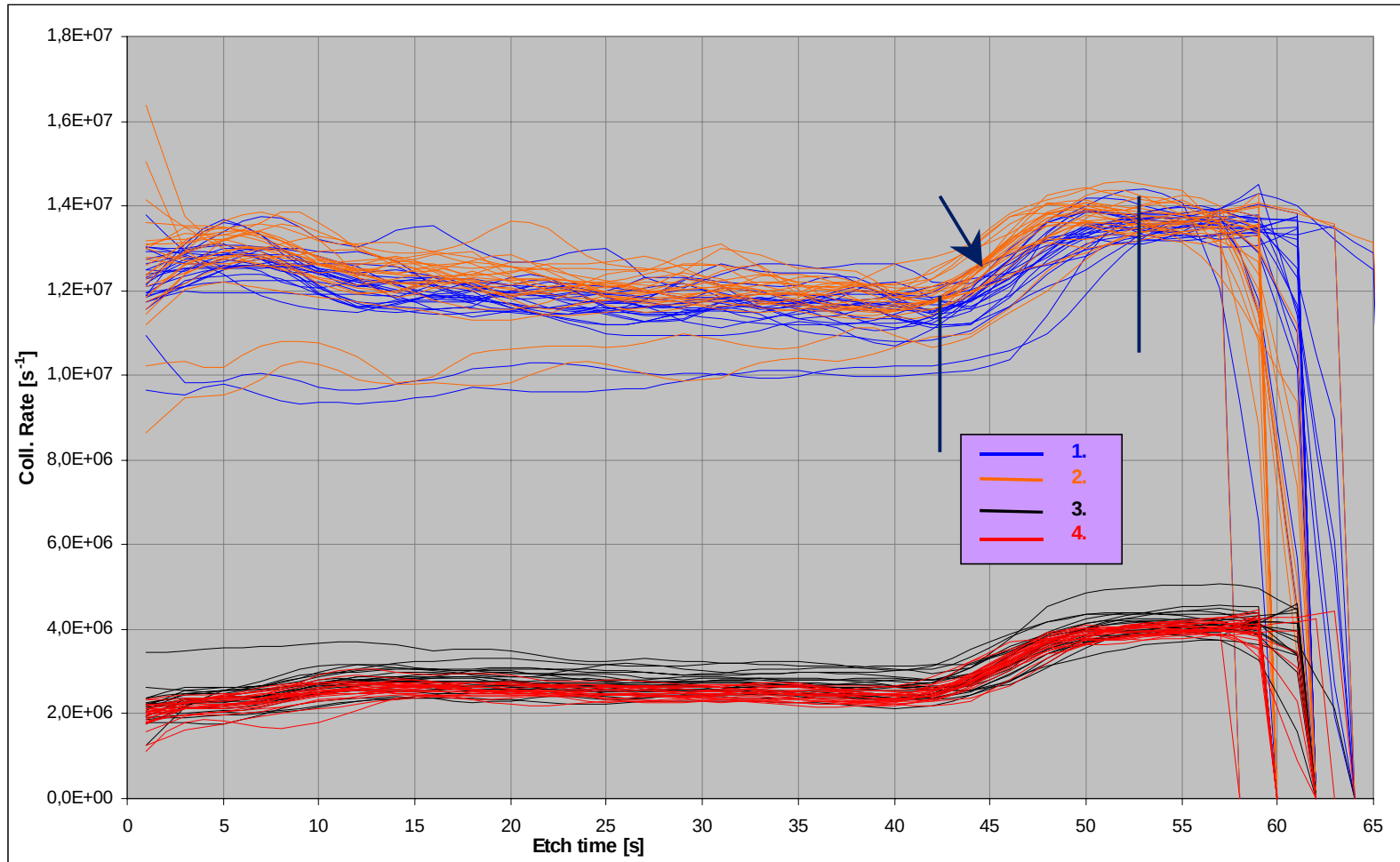
Average Collision Rate vs. Wafer No. (64M)



Measurement over several weeks (1999) of the same process and on the same AMAT-etch Tool

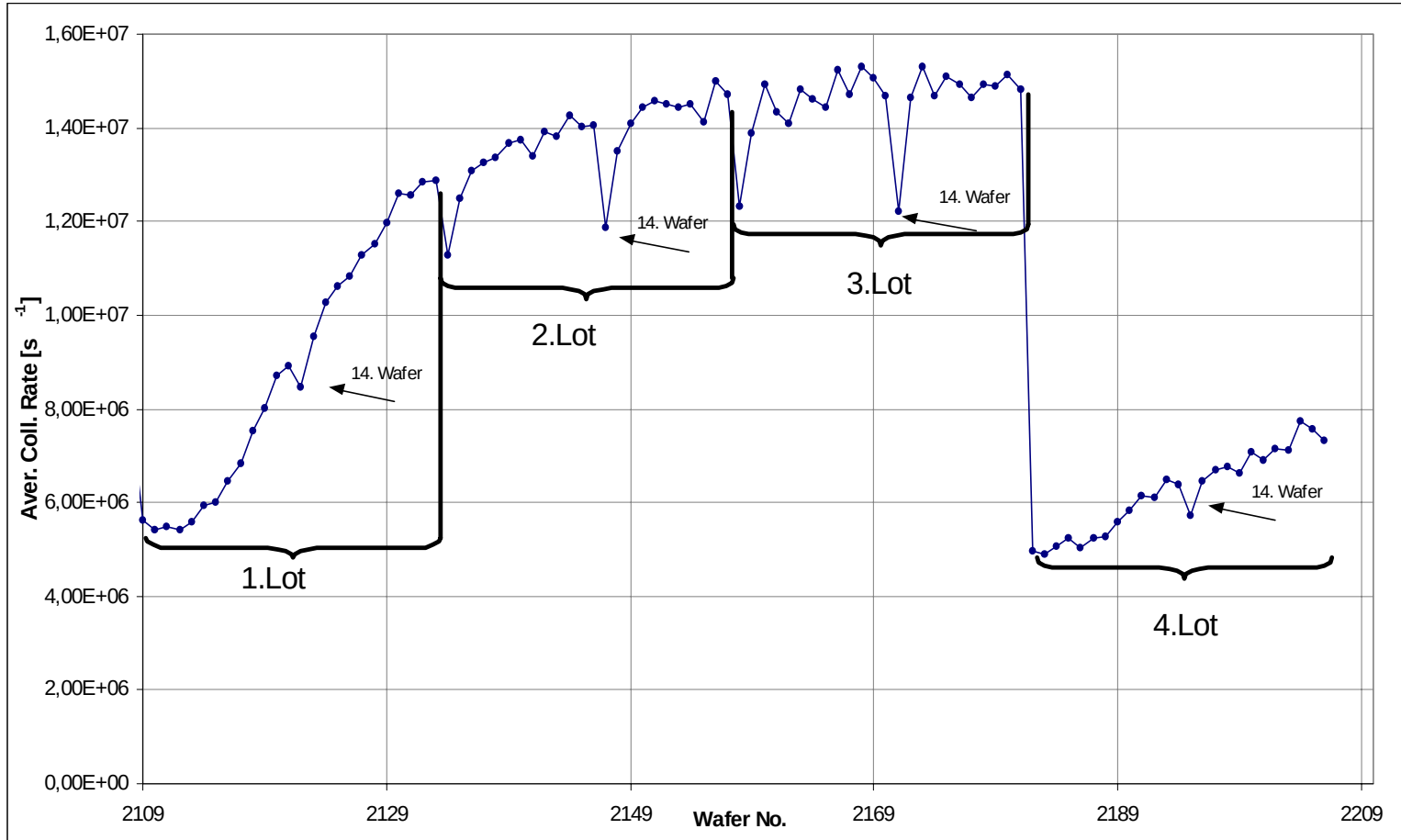
Normal „First Wafer effects“ (red marked)

Collision rate vs. Etch time



Two lots (1,2) on a high and two lots (3,4) on a low level in Collision rate
 One can see a breakthrough from one layer to another in one recipe step (EP)

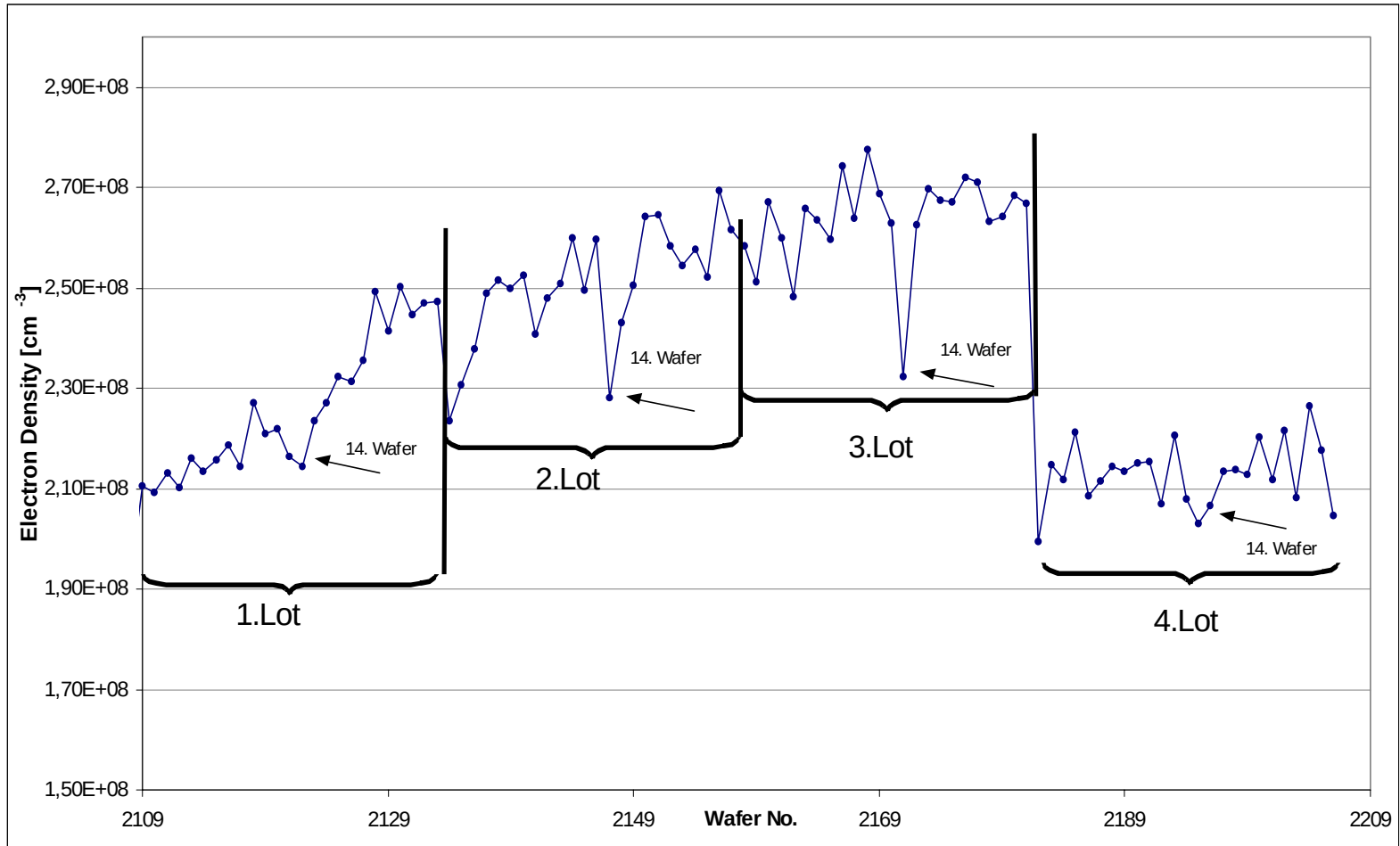
Average Collision Rate vs. Wafer No. (64M)



Collision Rate of an unknown „First Wafer effect“ on 3 lots

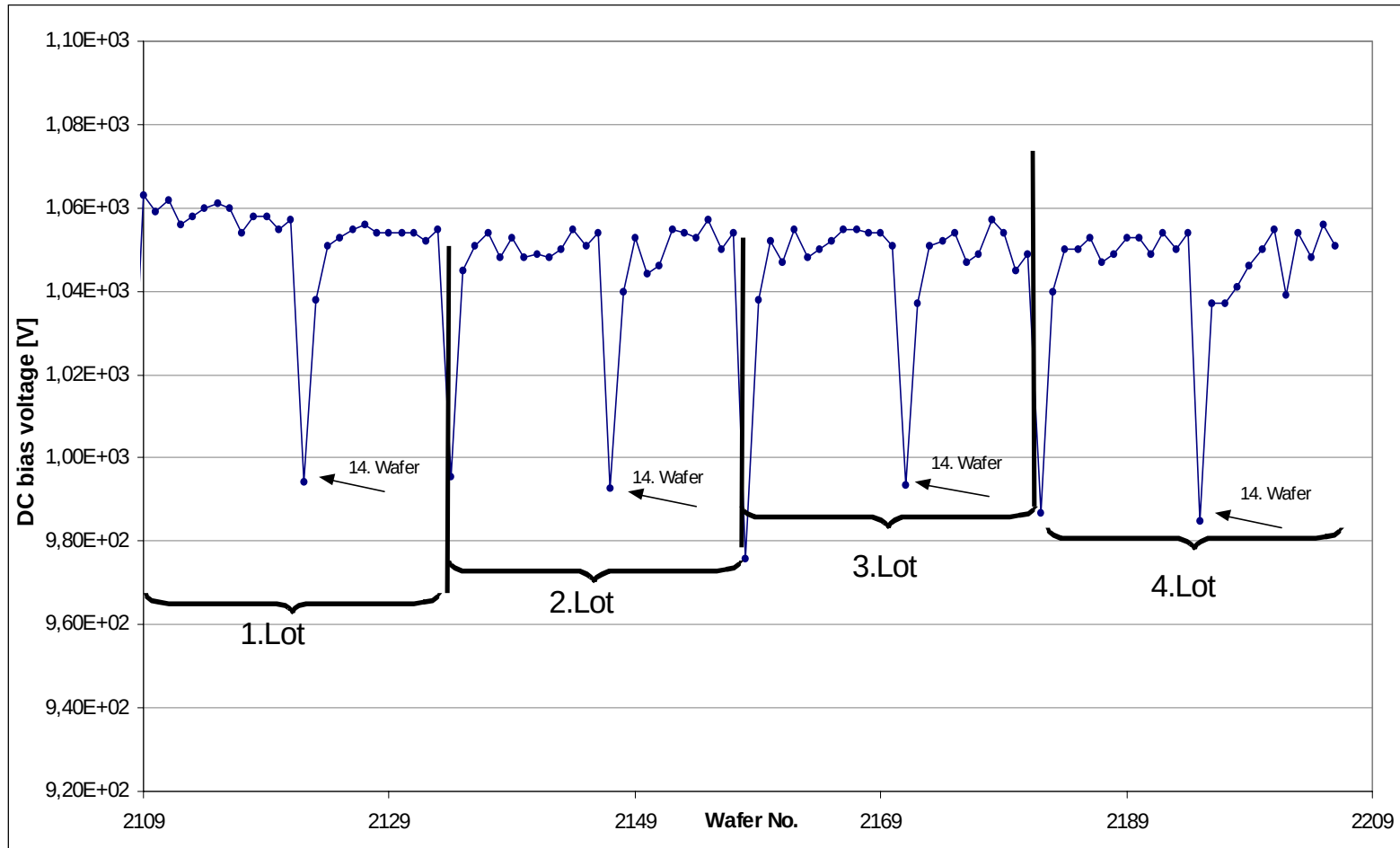
The “peaks” of the 14th Wafer originates by different processing
(13 Wafer, break, remaining Wafer)

Electron Density vs. Wafer No. (64M)



There is also a rise in Electron Density on the first 3 lots

DC bias voltage vs. Wafer No. (64M)



Every 1st and 14th Wafer shows a strong peak