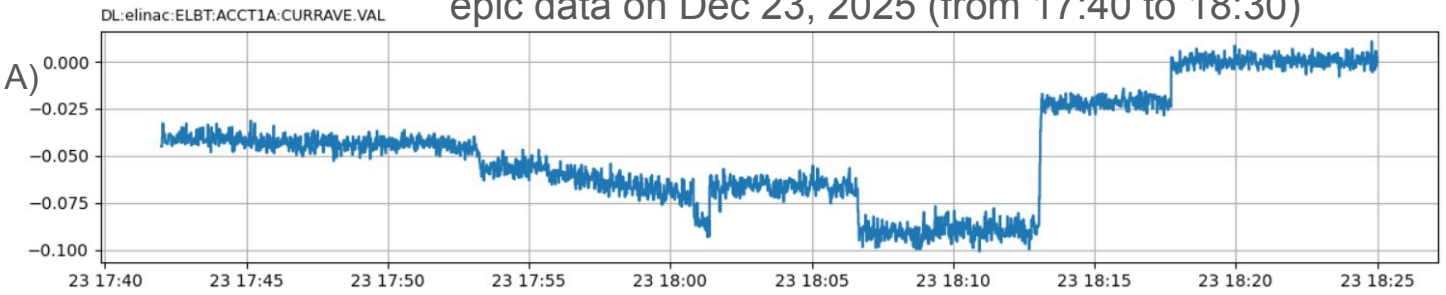
Beam Current Scan for DarkLight GEMs

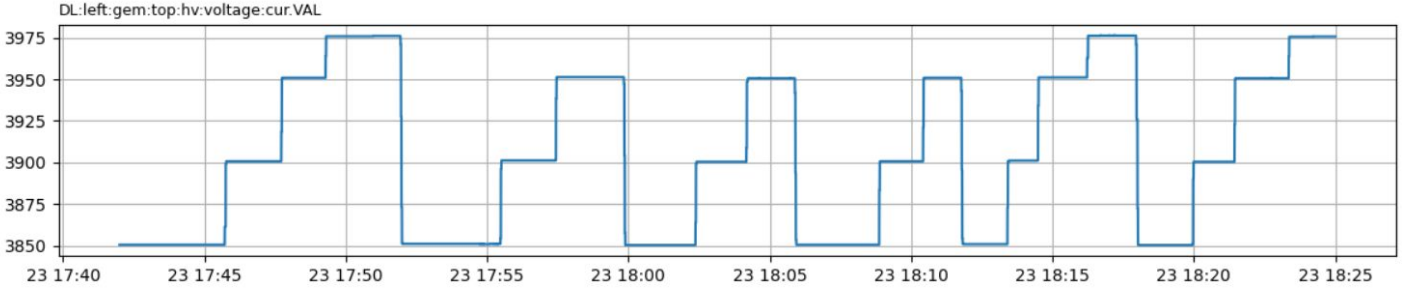
Beam current and HV were varied; we observed HV current

epic data on Dec 23, 2025 (from 17:40 to 18:30)

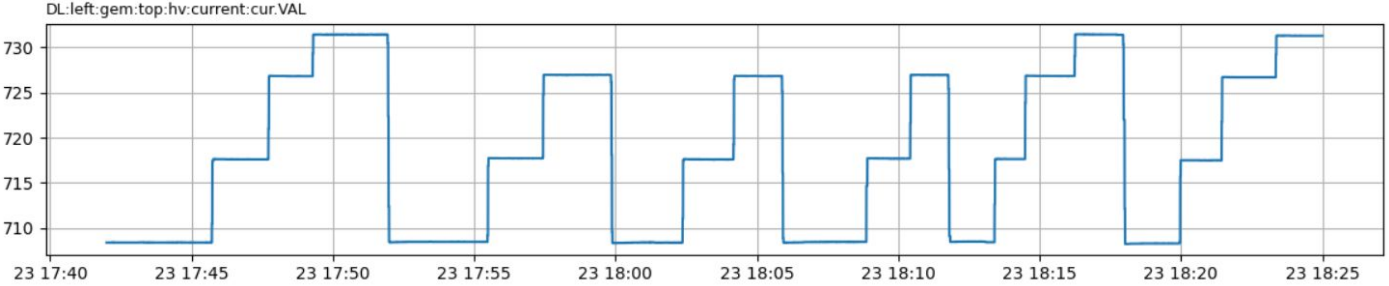
Beam current (ACCT1A)
(mA, -sign)



GEM HV (V)



GEM HV current (μA)

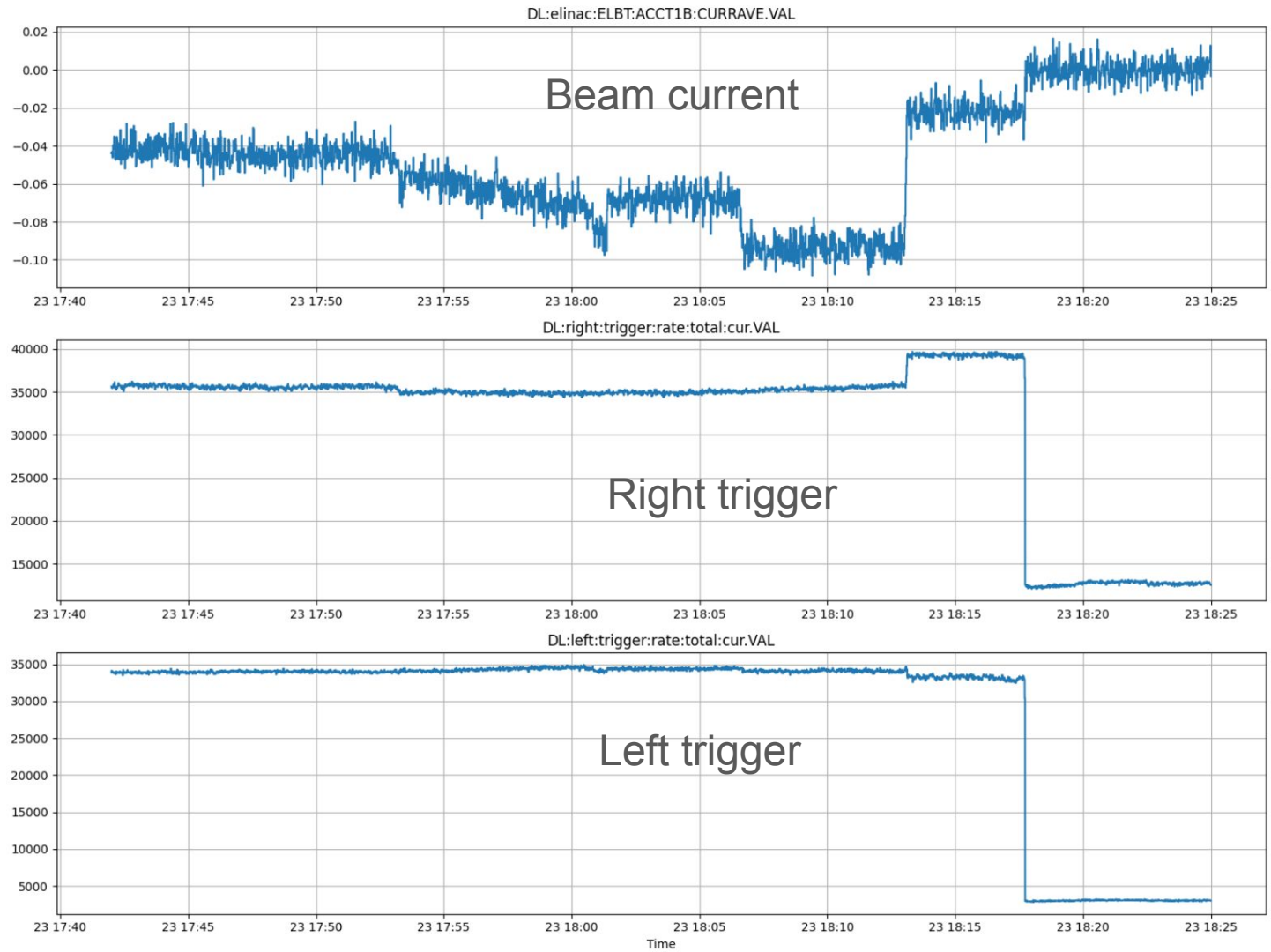


Duty Factor = 0.3%

Left dipole = 60 A
Right dipole = 60 A

Trigger rates saturate at higher currents.

The right arm gets higher rates compared to the left.

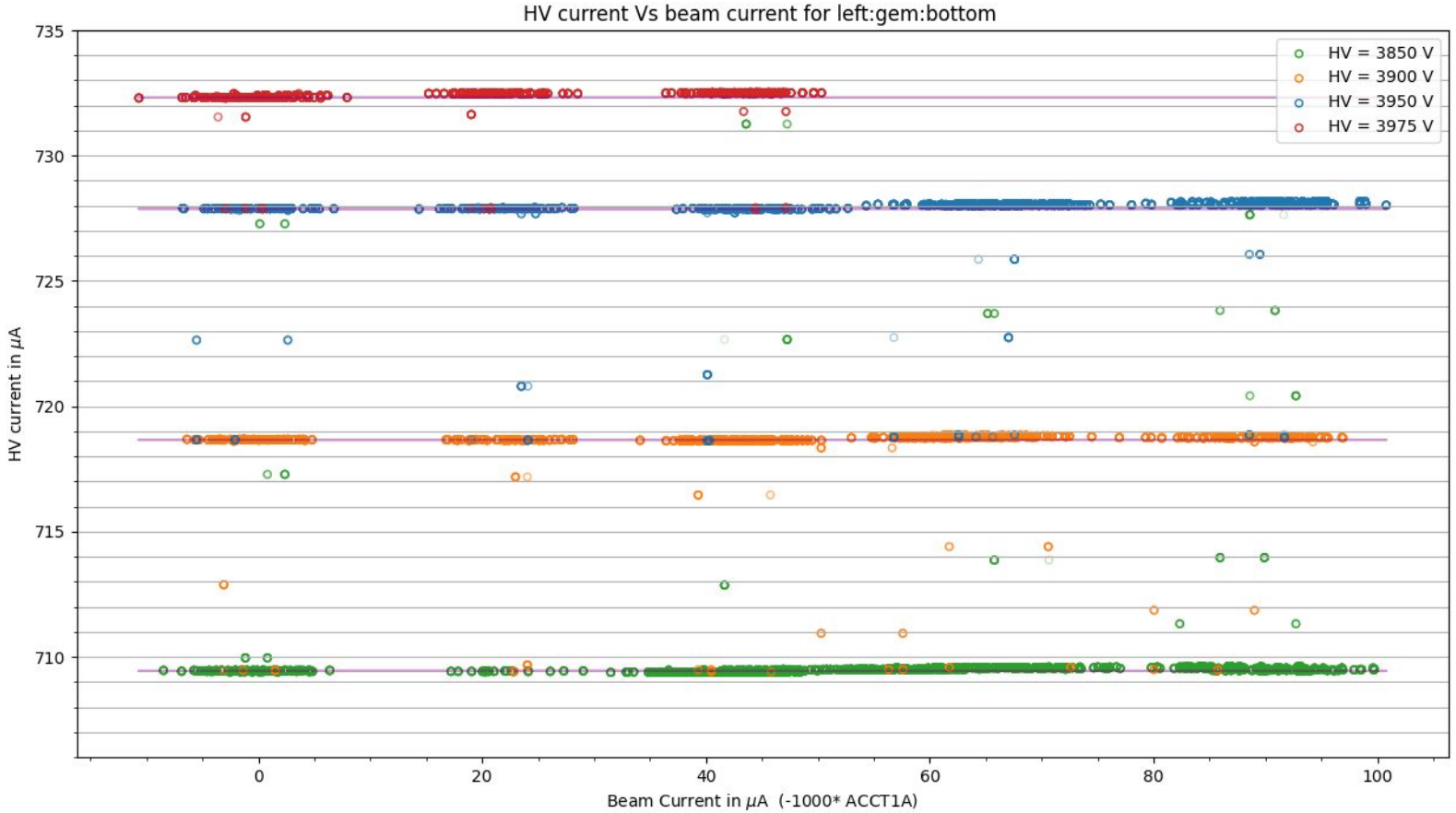


Peak vs Average Beam Current

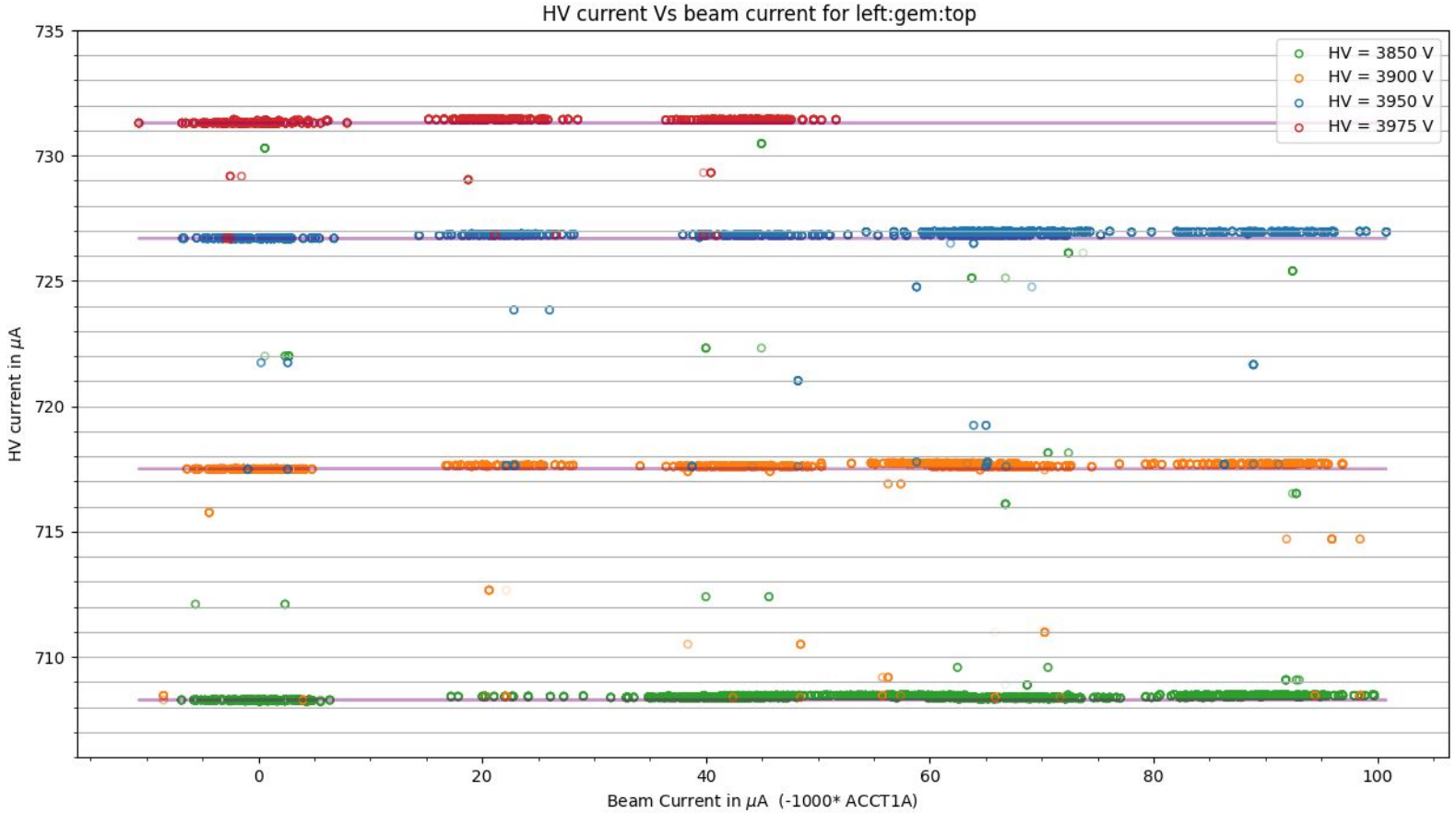
Since the Duty factor = 0.3%

Peak current = 100 μA -> avg current = 100 μA * (0.3/100) = 0.3 μA

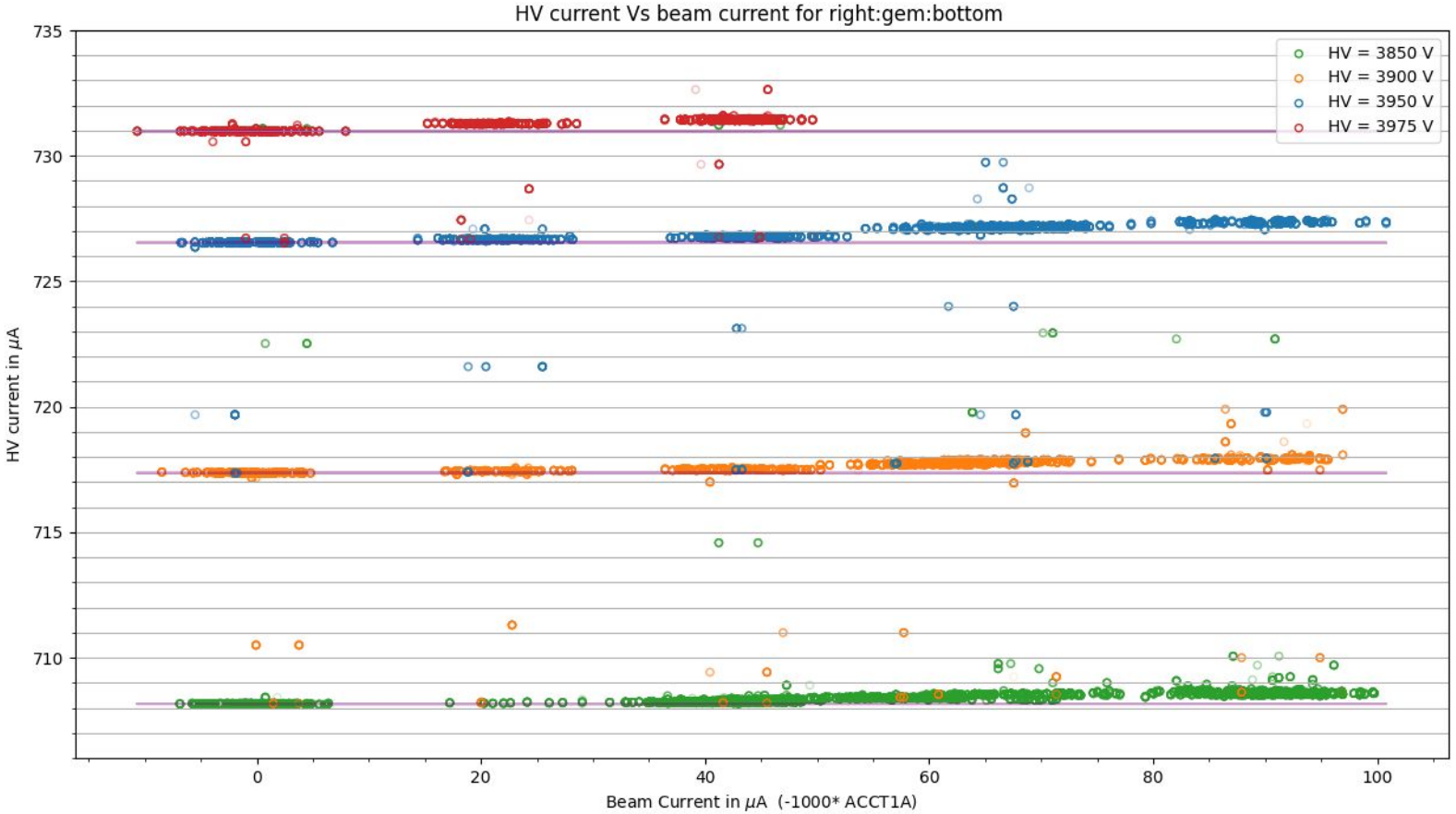
Left Bottom


HV current Vs beam current for left:gem:bottom
HV = 3850 V
HV = 3900 V
HV = 3950 V
HV = 3975 V
HV current in μA
Beam Current in μA (-1000* ACCT1A)
735
730
725
720
715
710
0
20
40
60
80
100

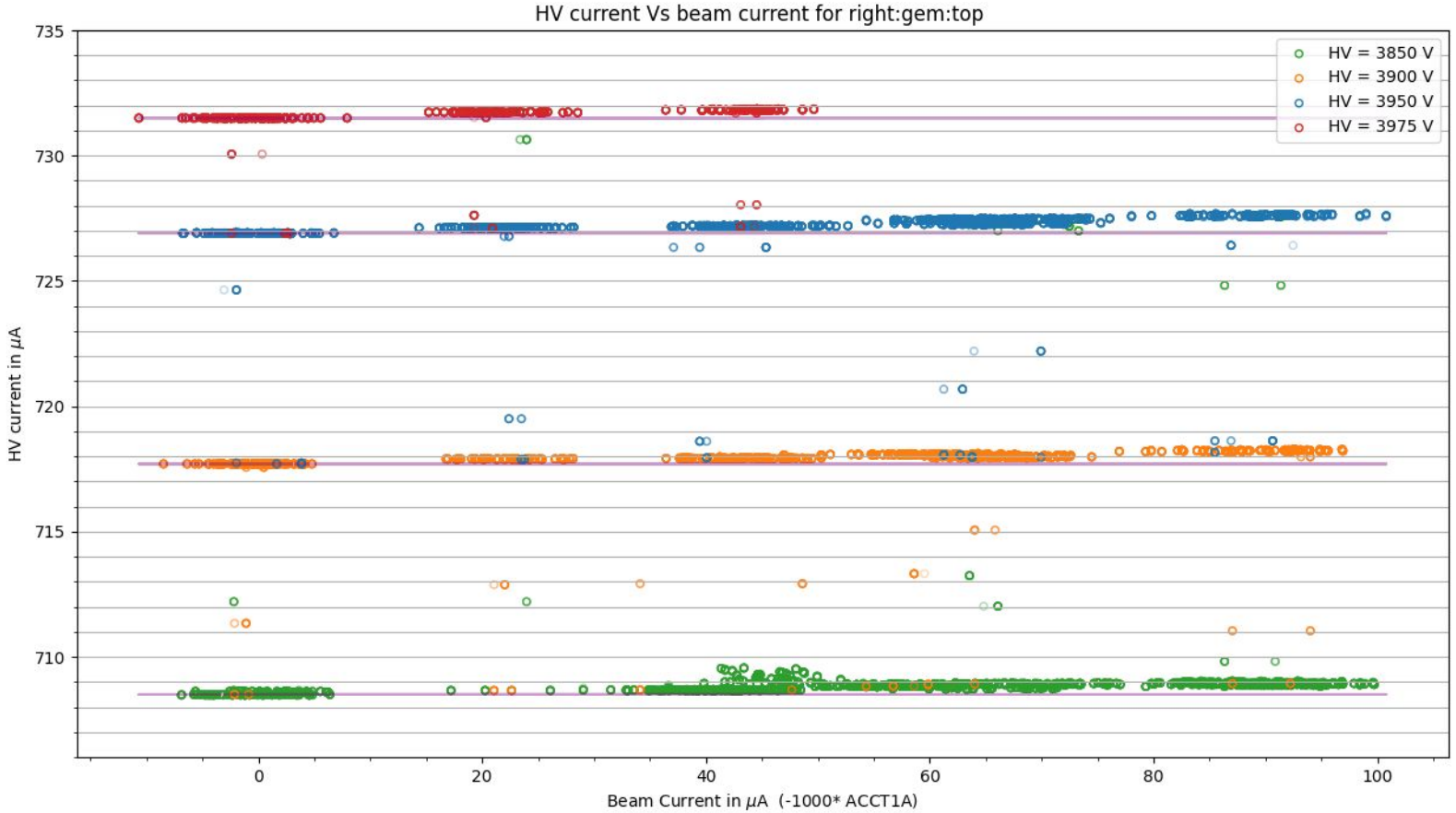
Left Top


HV current Vs beam current for left:gem:top
HV = 3850 V
HV = 3900 V
HV = 3950 V
HV = 3975 V
HV current in μA
Beam Current in μA (-1000* ACCT1A)
735
730
725
720
715
710
0
20
40
60
80
100

Right Bottom



Right Top


HV current Vs beam current for right:gem:top
HV = 3850 V
HV = 3900 V
HV = 3950 V
HV = 3975 V
HV current in μA
Beam Current in μA (-1000* ACCT1A)
735
730
725
720
715
710
0
20
40
60
80
100

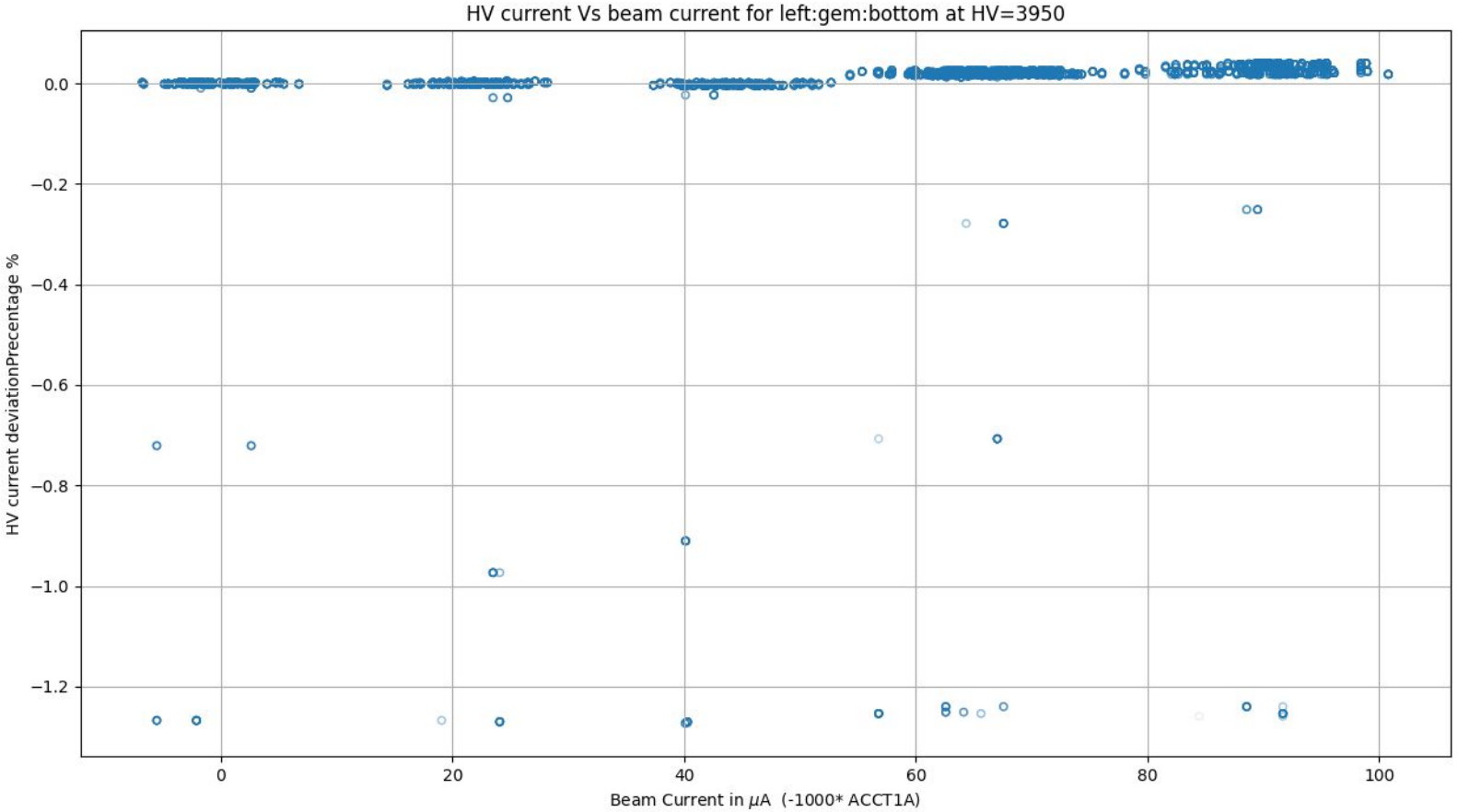
Deviation percentage plots (HV = 3950 V)

- deviationPercentage = (GEM_current * Rnominal/GEMHVnominal -1) *100%

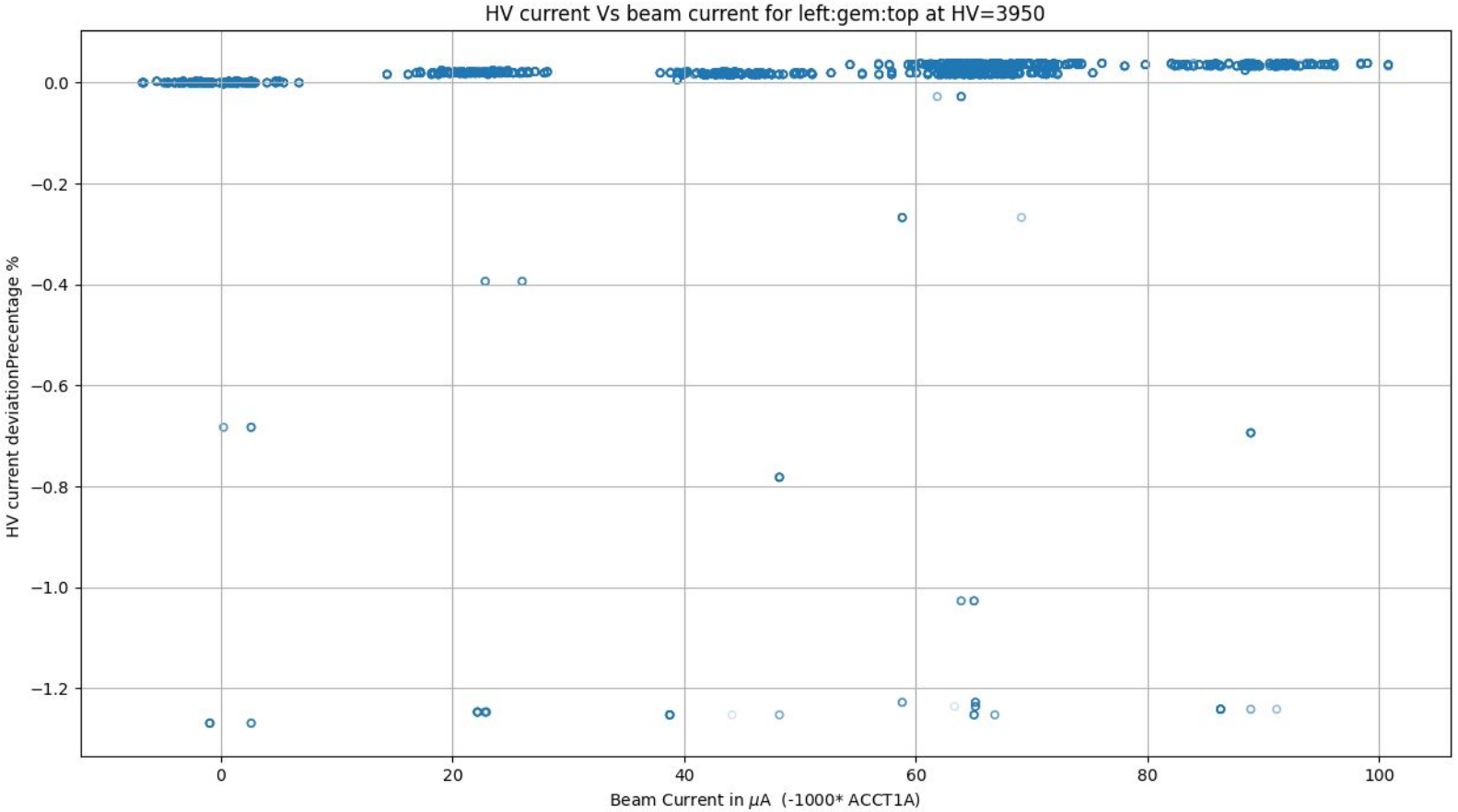
Where, Rnominal = GEMHVnominal /GEM_current_@**0**BeamCurrent

- deviationPercentage=(GEM_current /GEM_current_@**0**BeamCurrent -1) *100%

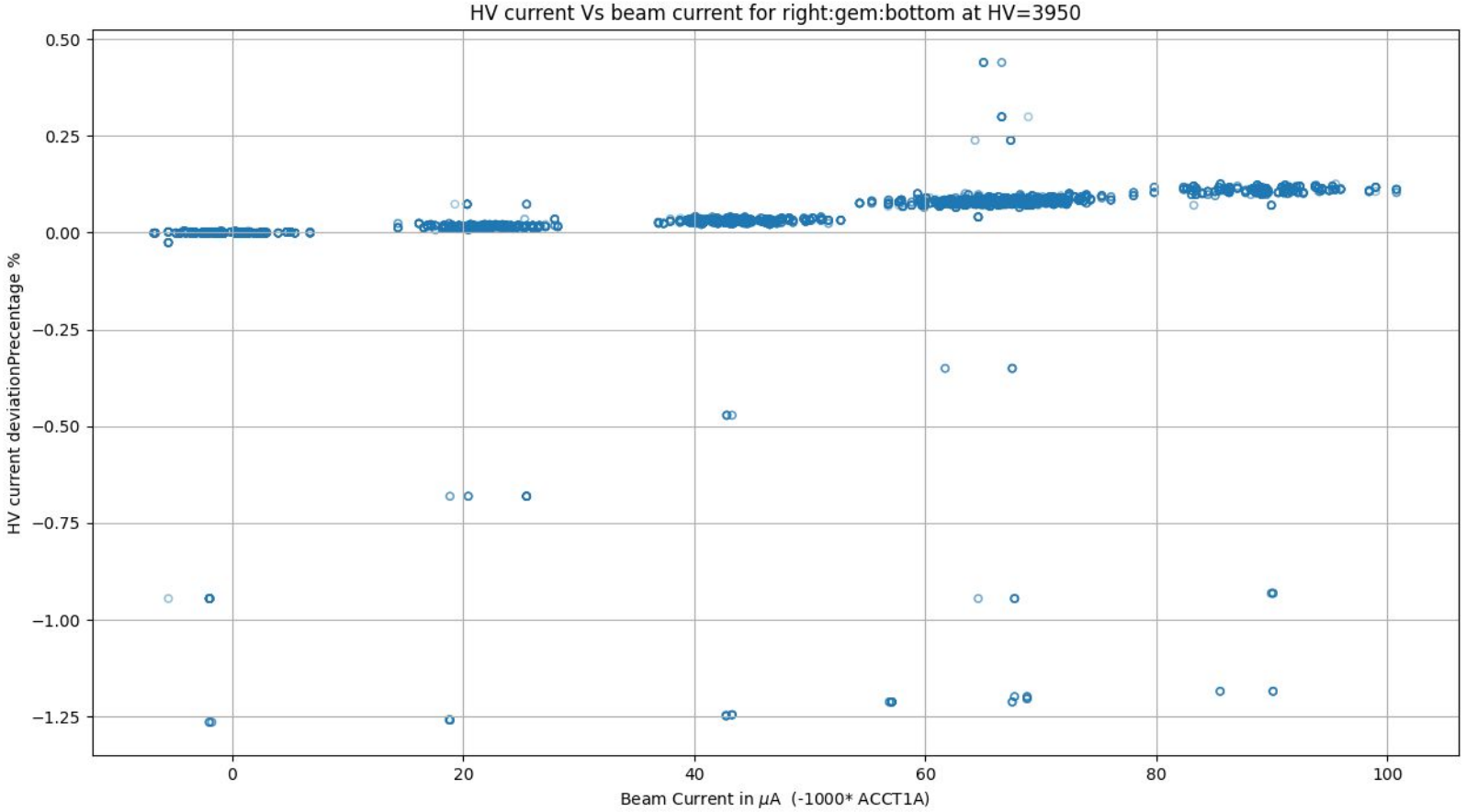
Left Bottom (deviationPercentage)



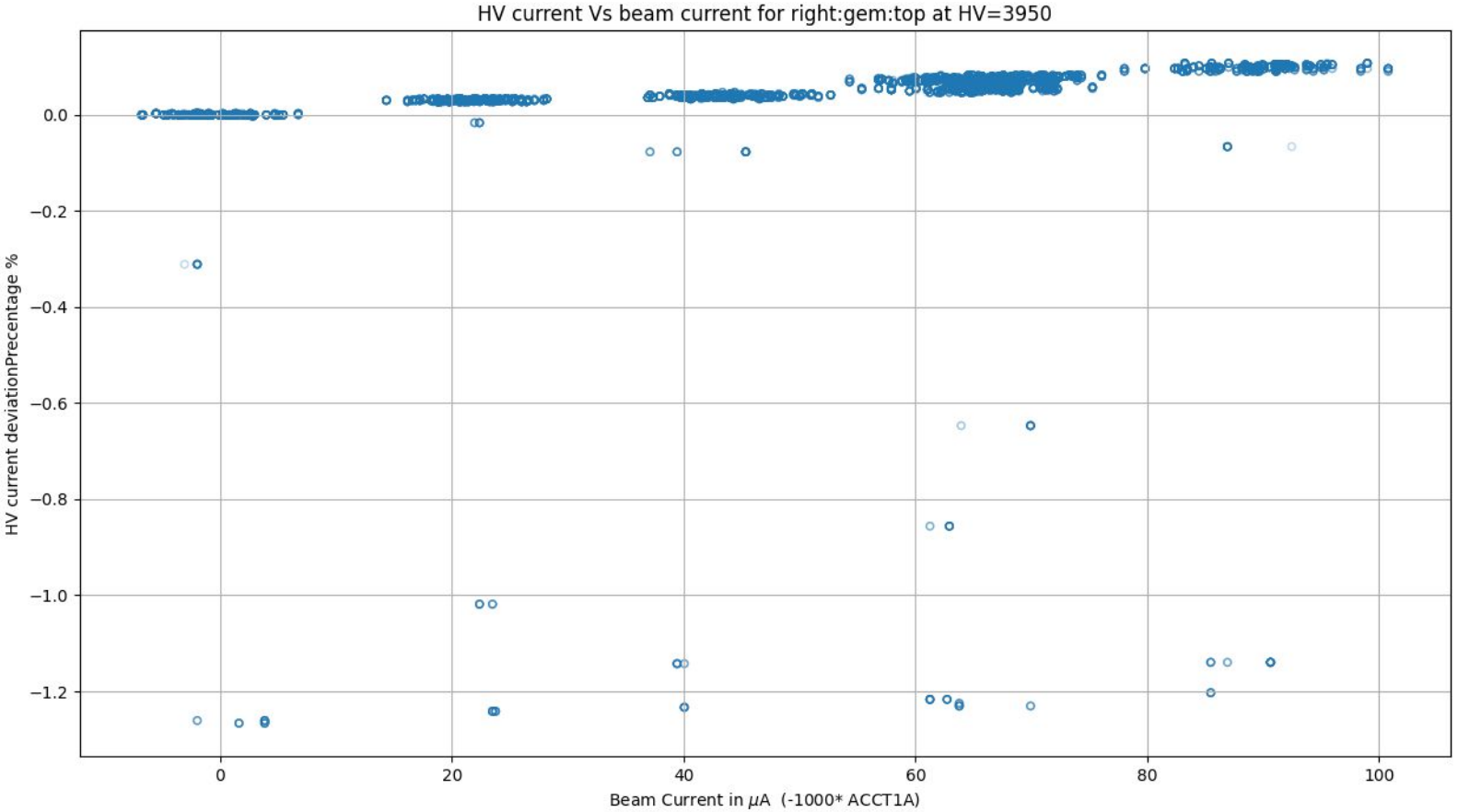
Left Top (deviationPercentage)



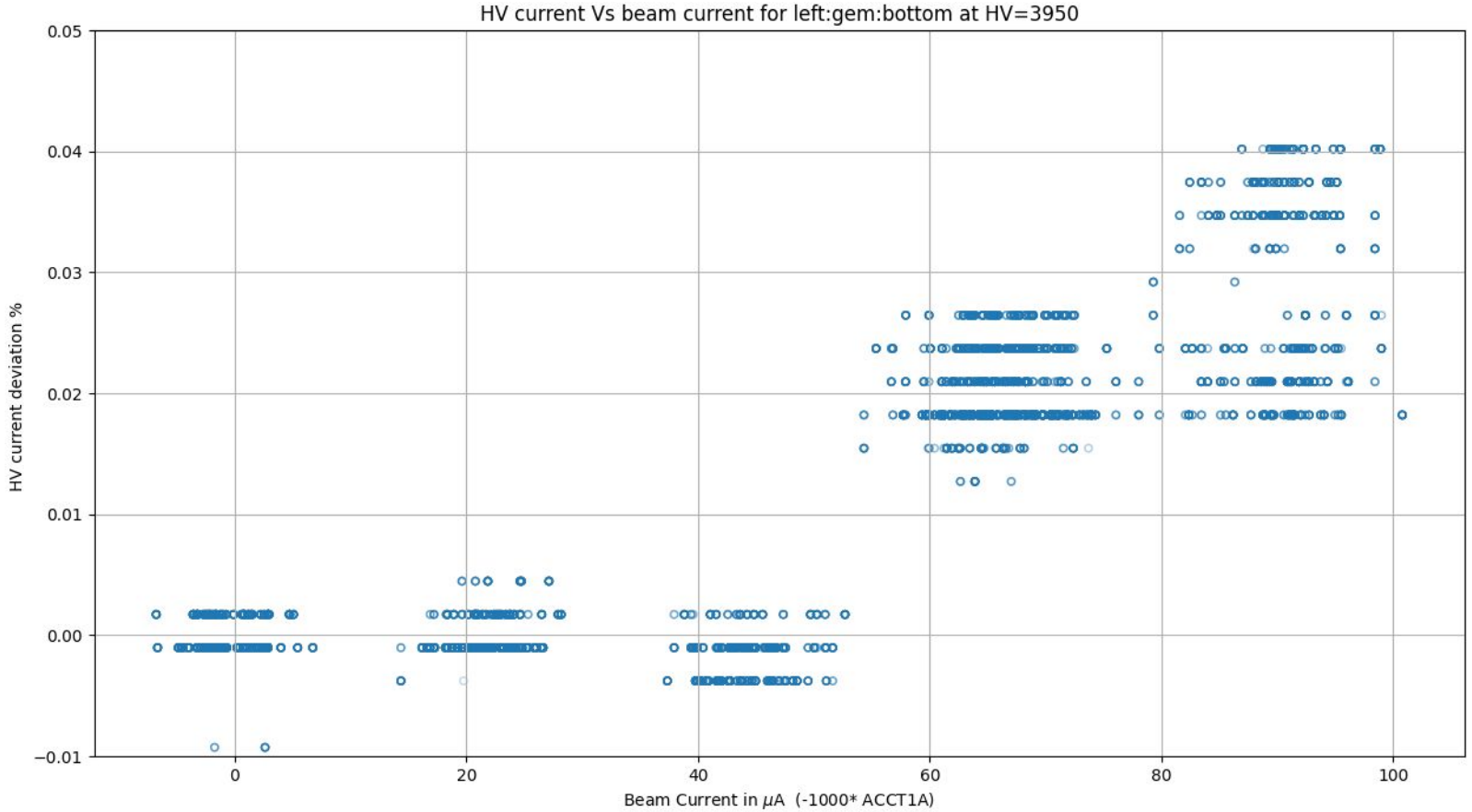
Right Bottom (deviationPercentage)



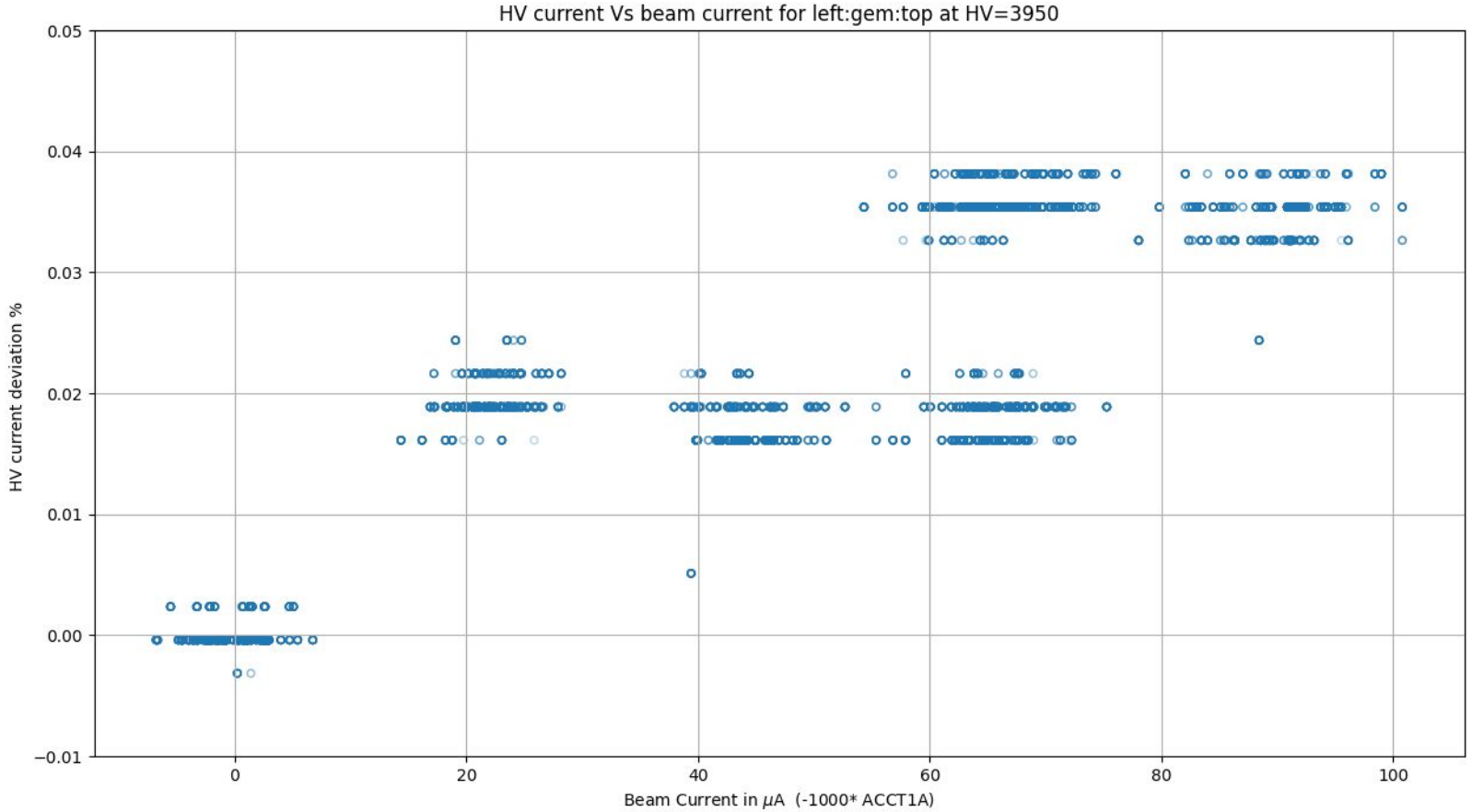
Right Top (deviationPercentage)



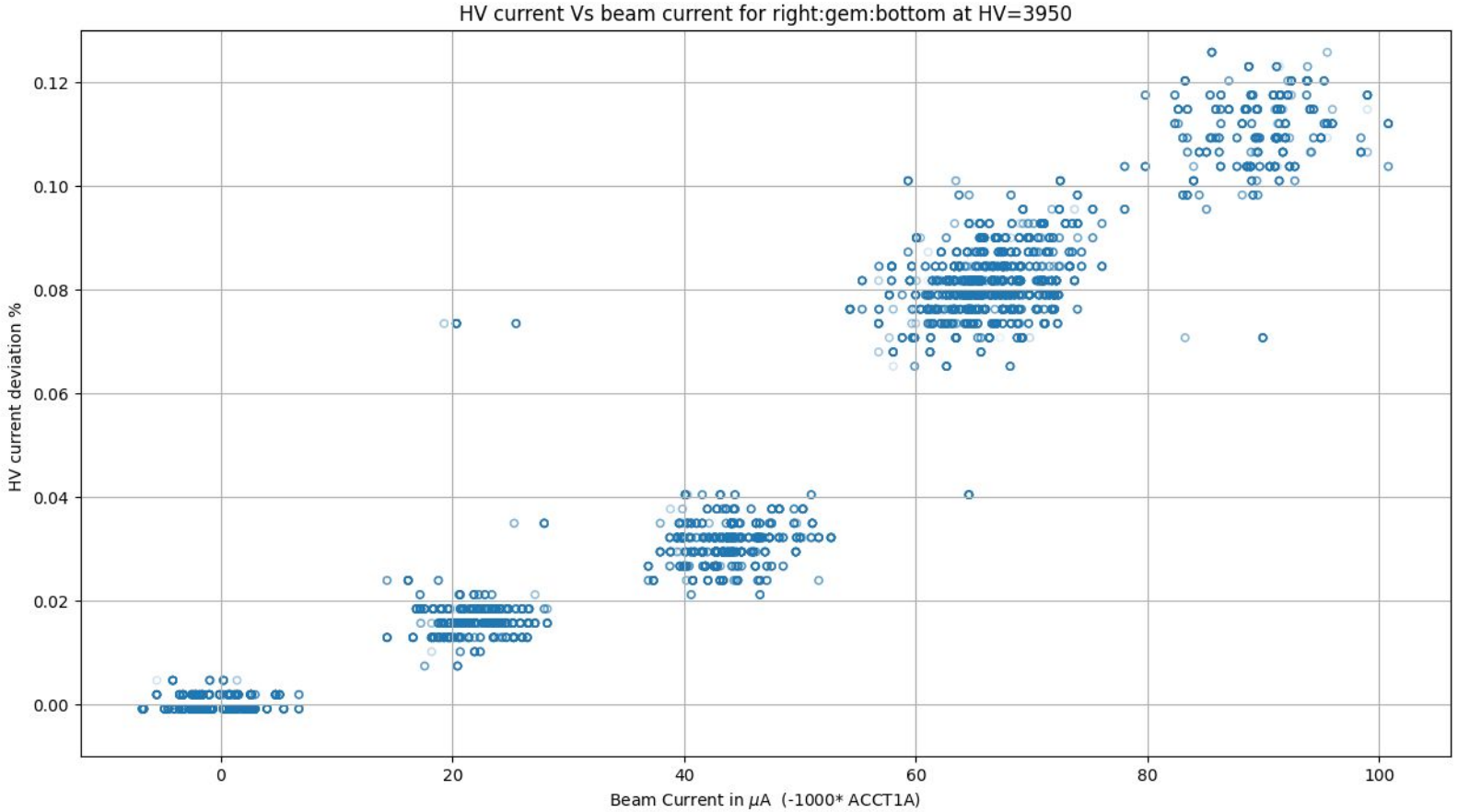
Left Bottom (deviationPercentage) zoomed



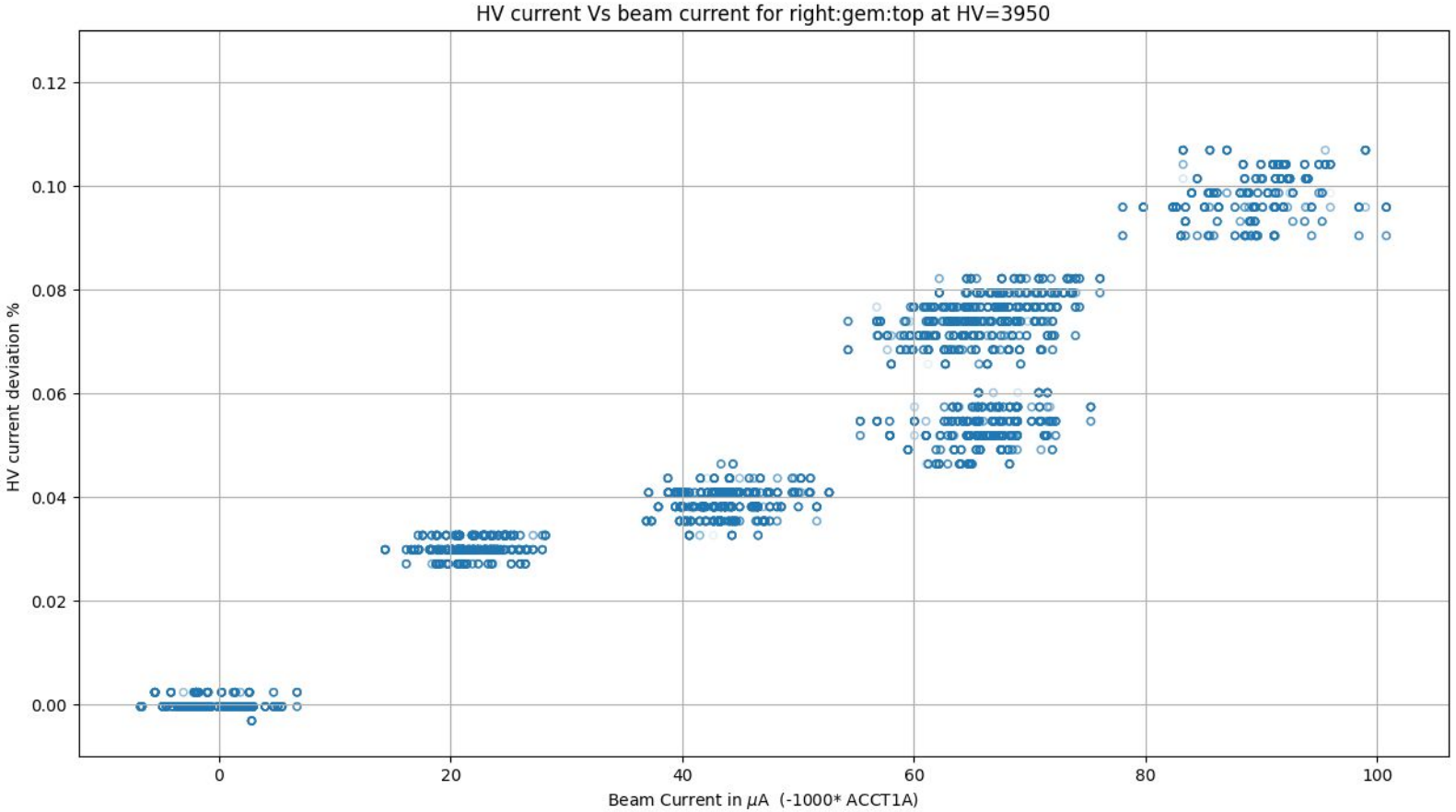
Left Top (deviationPercentage) zoomed



Right Bottom (deviationPercentage) zoomed



Right Top (deviationPercentage) zoomed



Summary and conclusions

- GEMs draw slightly more current (~1 μA) at higher beam rates
- This effect is more visible for high HV values
- It is not much prominent for the left arm (possibly due to low rates)
- Left Bottom current is always about 1 μA larger than the others
- Maximum deviationPercentage is about 0.12% (right bottom gem)
- We can repeat the test again for higher beam currents (max current?)