Update on Bremsstrahlung studies

F. Oliva on behalf of the PADME Lecce group

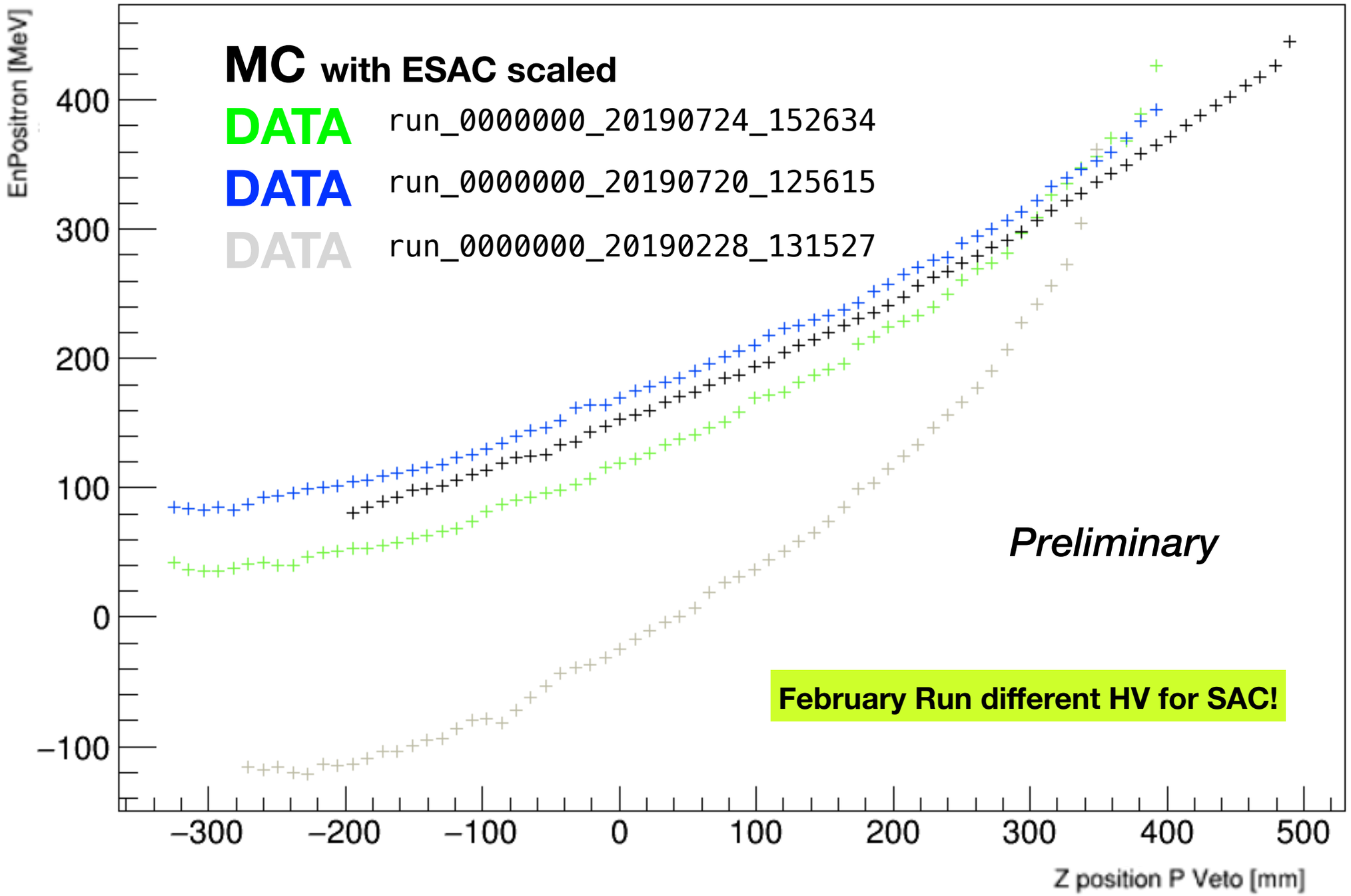
PADME internal Meeting, 20th December 2019

Exercise done with run_0000000_20190228_131527

Primary beam
Npot Mean ~ 18k
Bunch Length 100 ns

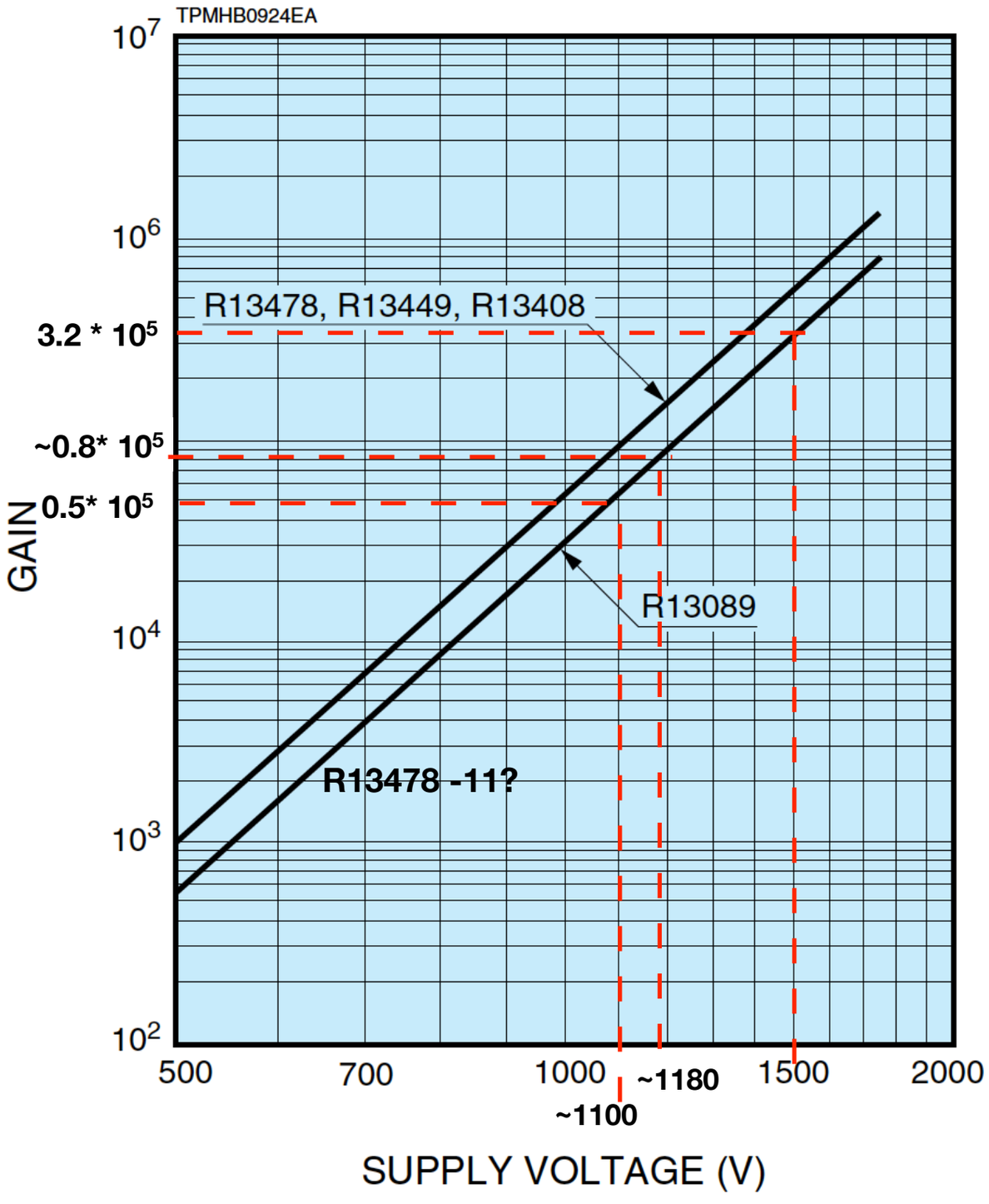
$E_{e+} = E_{beam} - E_{\gamma SAC}$

MomentumPVetoCalibration



PHOTOMULTIPLIER TUBE from Hamamatsu R13478 -11

Figure 3: Typical gain characteristics



HV applied to crystal 22 SAC (the central one) 1180 V

Gain $3.2*10^5$ for **HV 1500 V**
Gain $0.5*10^5$ for **HV 1100 V**
Gain $0.8*10^5$ for **HV 1180 V**

R13478 Simple Assembly with Standard Ratio Type: **R13478-10**
R13478 Simple Assembly with Tapered Ratio Type: **R13478-11**

R13478-10 and R13478-11 CHARACTERISTICS (at 25 °C)

Parameter		Min.		Typ.		Max.		Unit
Assembly Type		R13478-10	R13478-11	R13478-10	R13478-11	R13478-10	R13478-11	–
Cathode Sensitivity	Luminous (2856 K)	-		95		-		µA/lm
Cathode Blue Sensitivity Index (Cs 5-58)		9		10		-		-
Anode Sensitivity	Luminous (2856 K)	-		50	30	-		A/lm
Gain		-		$5.3x10^5$	$3.2x10^5$	-		-
Anode Dark Current (After 30 min storage in darkness)		-		3		30		nA
Anode Pulse Rise Time		-		1.9		-		ns
Electron Transit Time		-		9.1	9.5	-		ns
Transit Time Spread (FWHM)		-		130	150	-		ps
Pulse Linearity (+/-2 % deviation)		-		10	70	-		mA
Pulse Linearity (+/-5% deviation)		-		25	150	-		mA

How is it possible to rescale February Run? Some details..

DigitizerChannelSAC

pCMeV = 2 * gainPMT(1500V) * 1.67 * 10^{-7}

Energy = charge/pcMeV

Single Positron Run and July Run

All HVs set to 1100 V

Constant Calibration for SAC in develop checked for single positron run!

February Run

HV applied to crystal 22 SAC (the central one)1180 V

Constant Calibration for SAC need to be rescaled for February Run

CC (dev) ~ 1/gain(1100 V)

CC (feb) ~ 1/gain(1180 V)

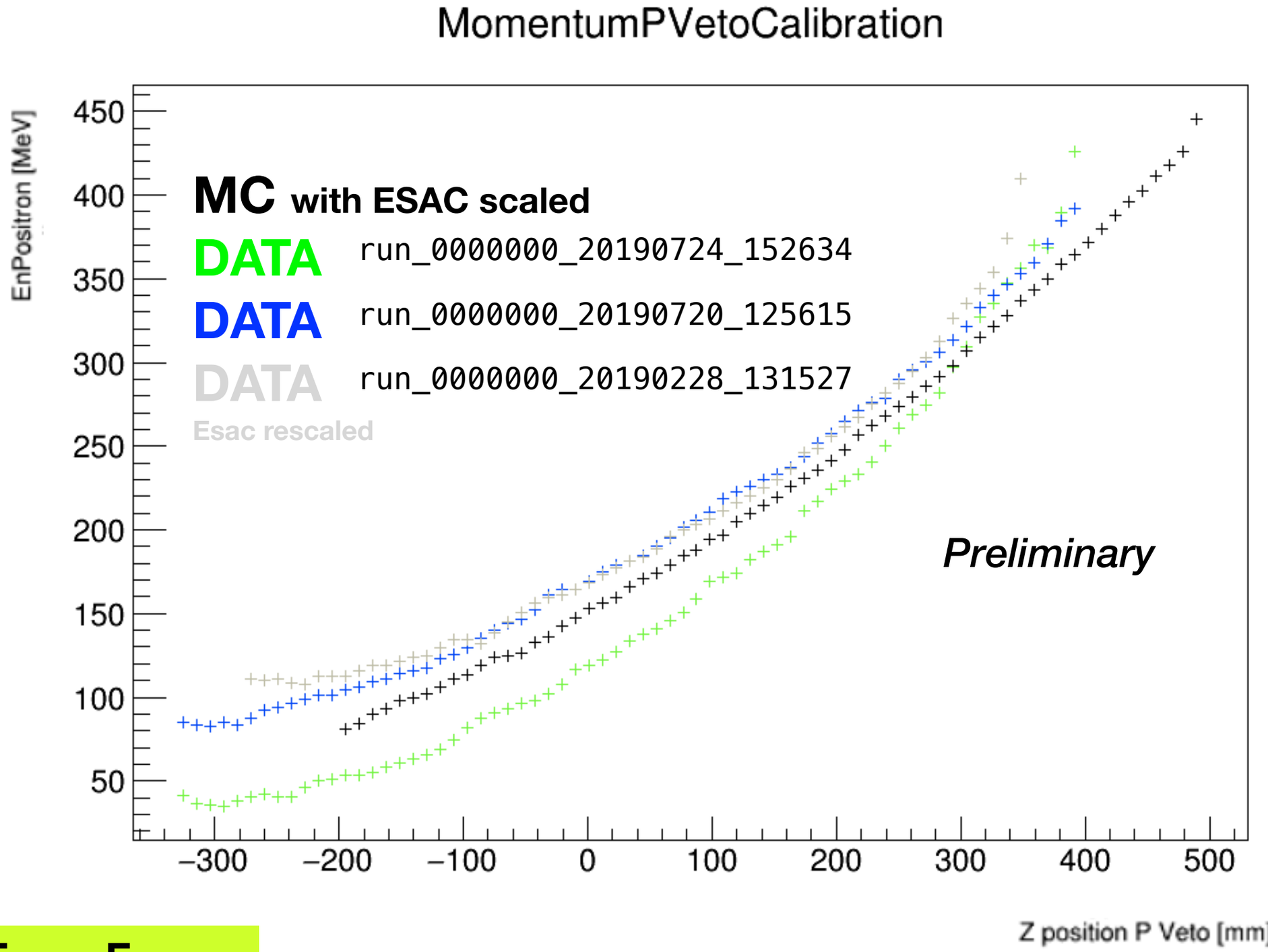
CC(dev) / CC(feb) ~ gain(1180 V)/gain(1100 V)

CC(feb) = CC(dev) * 0.625

ESAC(feb) = ESAC(dev) * 0.625

Rescaling the 28th February Run for the gain..

ESAC(feb) = ESAC(dev) * 0.625



$E_{e+} = E_{beam} - E_{\gamma SACfeb}$

..it seems to match with 20th July 2019 Run