Muon bacground in PNN2 data analyses.

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The PNN2_SKIM set of 2002 data taking run has been used in this analysis. The total statistics in this set is 30.995.248 events. Fot muon background study all events were considered as the PNN2 trigger events.

Cut Name	Events(Rejection) for trigger type	
	PNN 2 if PNN1 cuts	PNN 2 if All cuts
COUNTER	30988095(1.0000)	30987143(1.0000)
BAD_RUN	30402729(1.0192)	30401777(1.0192)
FIX_ALL1	30402729(1.0000)	30401777(1.0000)
FIX_ALL2	30402729(1.0000)	30401777(1.0000)
RTOTGT42	26795349(1.1346)	30401777(1.0000)
RTOTLT33	5080148(5.2745)	30401777(1.0000)
BOXCUT	5080148(1.0000)	30401777(1.0000)
BOX2	5080148(1.0000)	30401777(1.0000)

Table 1: The PNN1 general run rejection branch cuts.

$$\left(\begin{array}{c} RTOTGT42 \rightarrow rtot > 42.0 \\ RTOTLT33 \rightarrow .not.(etot > 115.0.and.rtot > 33.0) \end{array} \right)$$

Cut Name	Events(Rejection) for trigger type	
	PNN 2 if PNN1 cuts	PNN 2 if All cuts
B4DEDX	4330544(1.1731)	24719369(1.2299)
BWTRS	2951681(1.4671)	15091903(1.6379)
B4TRS	2674126(1.1038)	13023456(1.1588)
B4ETCON	2642553(1.0119)	12865356(1.0123)
B4CCD	2618768(1.0091)	12731186(1.0105)
CKTRS	1358487(1.9277)	8524250(1.4935)
CKTAIL	1261408(1.0770)	8074791(1.0557)
CPITRS	1103380(1.1432)	7407508(1.0901)
CPITAIL	1102834(1.0005)	7404273(1.0004)
TIMCON	998472(1.1045)	5971192(1.2400)
PCUTS	998472(5.0879)	5971192(5.0914)

Table 2: The PNN1 and PNN2 PCUTS rejection branch cuts.

Cut Name	Events(Rejection) for trigger type	
	PNN 2 if PNN1 cuts	PNN 2 if All cuts
TGQUALT1	998472(1.0000)	5971192(1.0000)
TGQUALT0	945535(1.0560)	5549521(1.0760)
TGTCON	935905(1.0103)	5425989(1.0228)
B4TIM	935905(1.0000)	5425989(1.0000)
B4EKZ	748345(1.2506)	4326903(1.2540)
B4EKZ_IC	748345(1.0000)	4326903(1.0000)
TGZFOOL	748345(1.0000)	4326903(1.0000)
EPITG	741243(1.0096)	4262388(1.0151)
EPIMAXK	714375(1.0376)	4101870(1.0391)
TARGF	712192(1.0031)	4082364(1.0048)
TGER	679308(1.0484)	3843417(1.0622)
DTGTTP	679276(1.0001)	3843033(1.0001)
RTDIF	673512(1.0086)	3803105(1.0105)
DRP	671010(1.0037)	3780541(1.0060)
TGKTIM	671010(1.0000)	3618873(1.0447)
EIC	631733(1.0622)	3435301(1.0534)
TIC	631444(1.0005)	3433523(1.0005)
TGEDGE	623406(1.0129)	3359941(1.0219)
TGENR	623406(1.0000)	3238225(1.0376)
PIGAP	617990(1.0088)	3202938(1.0110)
TGLIKE	587595(1.0517)	3037967(1.0543)
TGB4	559808(1.0496)	2876080(1.0563)
PHIVTX	535549(1.0453)	2717527(1.0583)
OPSVETO	524082(1.0219)	2501402(1.0864)
TGPVCUT	524082(1.0000)	2405951(1.0397)
TIMKF	524082(1.0000)	1813827(1.3264)
CCDPUL	524082(1.0000)	805189(2.2527)
RVUPV	513952(1.0197)	791599(1.0172)
DELC	460768(1.1154)	776336(1.0197)
NPITG	460768(1.0000)	776336(1.0000)
VERRNG	460768(1.0000)	709625(1.0940)
ANGLI	460768(1.0000)	709240(1.0005)
ALLKFIT	460768(1.0000)	657801(1.0782)
TPICS	460768(1.0000)	657659(1.0002)
KIC	456215(1.0100)	653135(1.0069)
EPIONK	456215(1.0000)	652198(1.0014)
TGCUTS	456215(2.1886)	652198(9.1555)

Table 3: The PNN1 and PNN2 TGCUTS rejection branch cuts.

Cut Name	Events(Rejection) for trigger type	
	PNN 2 if PNN1 cuts	PNN 2 if All cuts
-RNGMOM	448955(1.0162)	485131(1.3444)
COS3D	411804(1.0902)	421768(1.1502)
ZFRF	327727(1.2566)	339929(1.2408)
ZUTOUT	327128(1.0018)	339188(1.0022)
RSDEDX	327128(1.0000)	110602(3.0667)
UTCQUAL	286792(1.1406)	96580(1.1452)
PRRF	119453(2.4009)	50759(1.9027)
LAYV4NN1	119453(1.0000)	50759(1.0000)
LAYV4	119453(1.0000)	50759(1.0000)
IPIFLG	64528(1.8512)	28173(1.8017)
TGGEO	57915(1.1142)	25145(1.1204)
TGDEDX	55015(1.0527)	24291(1.0352)
PVCUTnn1	55015(1.0000)	24291(1.0000)
PVCUTnn2	13596(4.0464)	3369(7.2101)
PTOT	13596(1.0000)	3369(1.0000)
CHIrm	13596(1.0000)	3369(1.0000)
SETUP770	13596(373.6500)	3369(9023.9800)
Cuts7-70	13596(373.6500)	3369(9023.9800)

Table 4: The PNN1 and PNN2 SETUP rejection branch cuts.

RNGMOM have been used in k051 (Left Tail and Band events):

$$\left(\textbf{ptot.lt.229.0.and.rngmom\_new3(0.).lt.2.2} \right)$$

Cut Name	Events(Rejection) for trigger type	
	PNN 2 if PNN1 cuts	PNN 2 if All cuts
SETUP	13596(373.6500)	3369(9023.9800)
EV5	6099(2.2292)	1708(1.9725)
ELVETO	3544(1.7209)	988(1.7287)
TDFOOL	3528(1.0045)	986(1.0020)
TDVARNN	34(103.7650)	8(123.2500)
TDCUT	34(399.8820)	8(421.1250)
ALL_CUTS	34(911415.0000)	8(3873393.0000)
ALL_CUTS	34(30988096)	8(30987144)
Estimated background is $\frac{3}{421.1250} \sim 3 \times 0.0024 = 0.0072$		

Table 5: The PNN1 and PNN2 TDCUT rejection branch cuts.

In Tables 2,3,4,5 are listed the cut names in rejection branch for PNN1 trigger type events.
The scatter plots Range vs Momentum after cuts:

$$\left(\begin{array}{lll} \text{1) for all PNN2\_SKIM data} & & \\ \text{2)EPION} & and & -RNGMOM \\ \text{3)ZUTOUT} & and & RSDEDX \\ \text{4)UTCQUAL} & and & PRRF \\ \text{5)TGDEDX} & and & PVCUTNEW \text{ for PNN2,} \\ & & \text{i.e. pvcut02\_new(0.)} \end{array}\right)$$

Cut name	Events(Rejection)			
	Range tail		Band	
	All	ER box	All	ER box
PNN2 Trigger 1/3 sample of PNN2_SKIM. All PNN2 cuts were applied.				
SETUP	1052(1.0000)	10(1.0000)	2317(1.0000)	158(1.0000)
EV5	526(2.0000)	4(2.5000)	1182(1.9602)	80(1.9750)
ELVETO	311(1.6913)	1(4.0000)	677(1.7459)	43(1.8605)
TDFOOL	310(1.0032)	1(1.0000)	676(1.0015)	43(1.0000)
TDVARNN	1(310 ± 310)	0(10)	7(96 ± 36)	1(43 ± 43)
TDCUTS	1052//' ±'//1052	10 ± 10	331 ± 125	158 ± 158
TDCUTS	0(1033)	0(103)	323 ± 122	338 ± 239
PNN2 Trigger 1/3 sample of PNN2_SKIM. All PNN1 cuts were applied.				
SETUP	6782(———)	3176(———)	6814(———)	3449(———)
EV5	2643(2.5660)	1271(2.4988)	3456(1.9716)	1758(1.9619)
ELVETO	1548(1.7074)	741(1.7152)	1996(1.7315)	995(1.7668)
TDFOOL	1545(1.0019)	741(1.0000)	1983(1.0066)	987(1.0081)
TDVARNN	16(96 ± 24)	9(82 ± 27)	18(110 ± 26)	8(123 ± 43)
TDCUTS	423 ± 106	352 ± 117	378 ± 89	431 ± 152
PNN1 Trigger 1/3 sample of PNN2_SKIM. PRRF not applied.				
SETUP	32085(———)	10460(———)	14362(———)	5291(———)
EV5	14797(2.17)	4593(2.28)	6986(2.06)	2680(1.97)
ELVETO	8757(1.69)	2696(1.70)	3957(1.77)	1520(1.76)
TDFOOL	8715(1.00)	2688(1.00)	3927(1.01)	1510(1.01)
TDVARNN	72(121 ± 14)	27(99 ± 19)	37(106 ± 17)	15(100 ± 26)
TDCUTS	445 ± 52	387 ± 74	388 ± 63	352 ± 91
PNN1 Trigger from Technote K054 - 2/3 sample				
SETUP	65712(-)	20292(-)	40383(-)	17976(-)
EV5	31432(2.09)	9453(2.15)	19926(2.03)	9081(1.98)
ELVETO	18603(1.69)	5510(1.72)	11335(1.76)	5115(1.78)
TDFOOL	18508(1.01)	5478(1.01)	11283(1.00)	5096(1.00)
TDVAR	137(135±11)	51(107±15)	75(150±17)	34(150±26)
Rej.	480±41	398±56	539±62	529±91

Table 6: Rejection branch and acceptance of the 2002 TD cuts using 1/3 sample from PNN2_SKIM

Band and Tail and ER box definitions for PNN1 rejection branch from technote K034:

$$\left(\begin{array}{lcl} \textbf{band} & = & ptot < 229.0 \\ \textbf{tail} & = & ptot > 229.0 \\ \textbf{erbox PNN1} & = & (edev > 2.35.and.etot \leq 135.0).and. \\ & & (rdev > 2.70.and.rtot \leq 40.0) \\ \textbf{erbox PNN2} & = & (etot.ge.60.0.and.etot.le.100.5).and. \\ & & (rtot.ge.12.0.and.rtot.le.28.0) \end{array}\right)$$

Cut name	Rejection				Acceptance
	Range tail		Band		
	All	ER box	All	ER box	
SETUP	65712(-)	20292(-)	40383(-)	17976(-)	192647(-)
EV5	31432(2.09)	9453(2.15)	19926(2.03)	9081(1.98)	160853(0.835)
ELVETO	18603(1.69)	5510(1.72)	11335(1.76)	5115(1.78)	150361(0.938)
TDFOOL	18508(1.01)	5478(1.01)	11283(1.00)	5096(1.00)	150098(0.998)
TDVAR	137(135±11)	51(107±15)	75(150±17)	34(150±26)	127016(0.846)
Rej.	480±41	398±56	539±62	529±91	0.659±0.001

Table 7: Rejection branch and acceptance of the 2002 TD cuts using 2/3 sample from technote K034

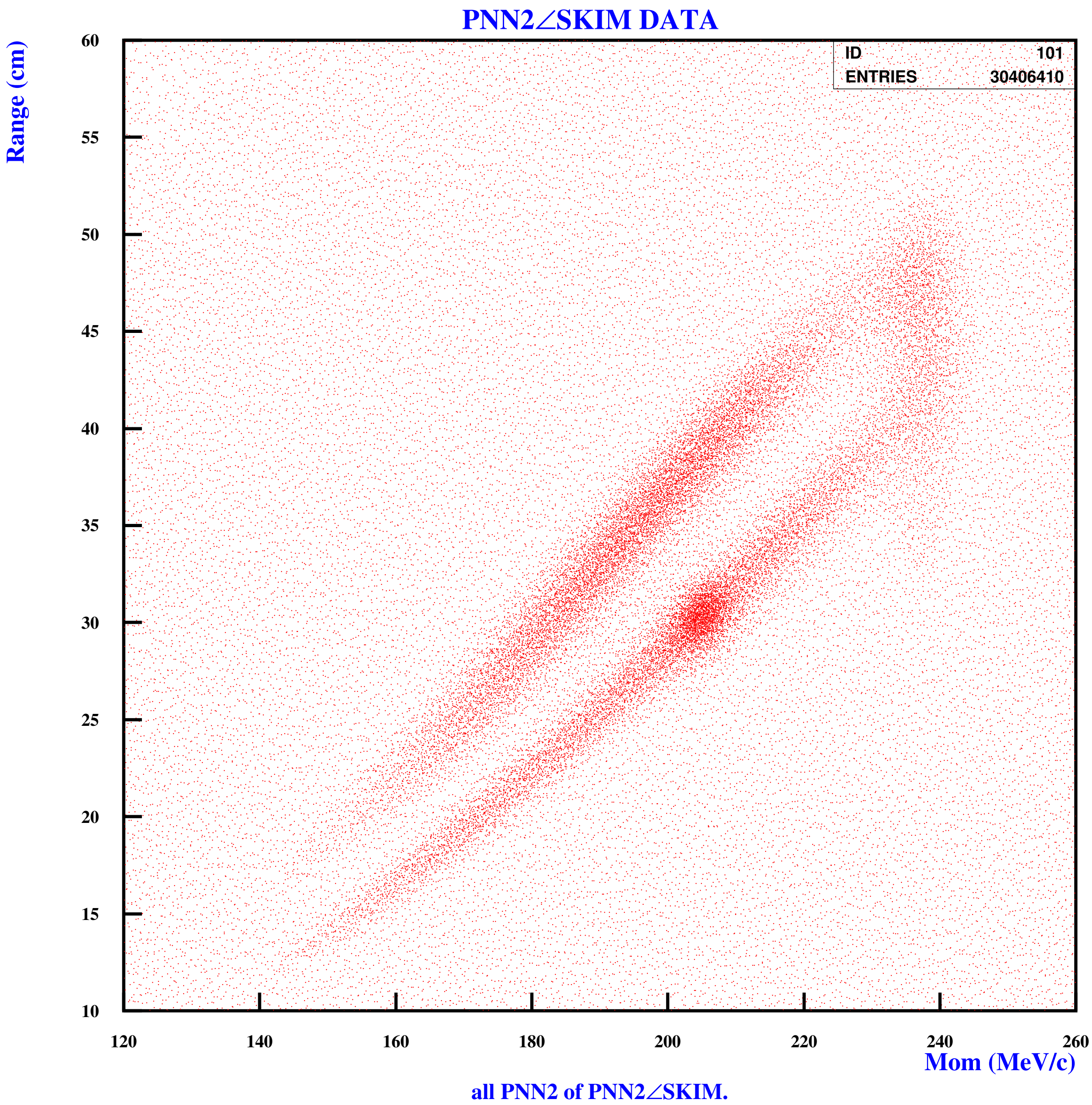


Figure 1: The muon background events range vs momentum

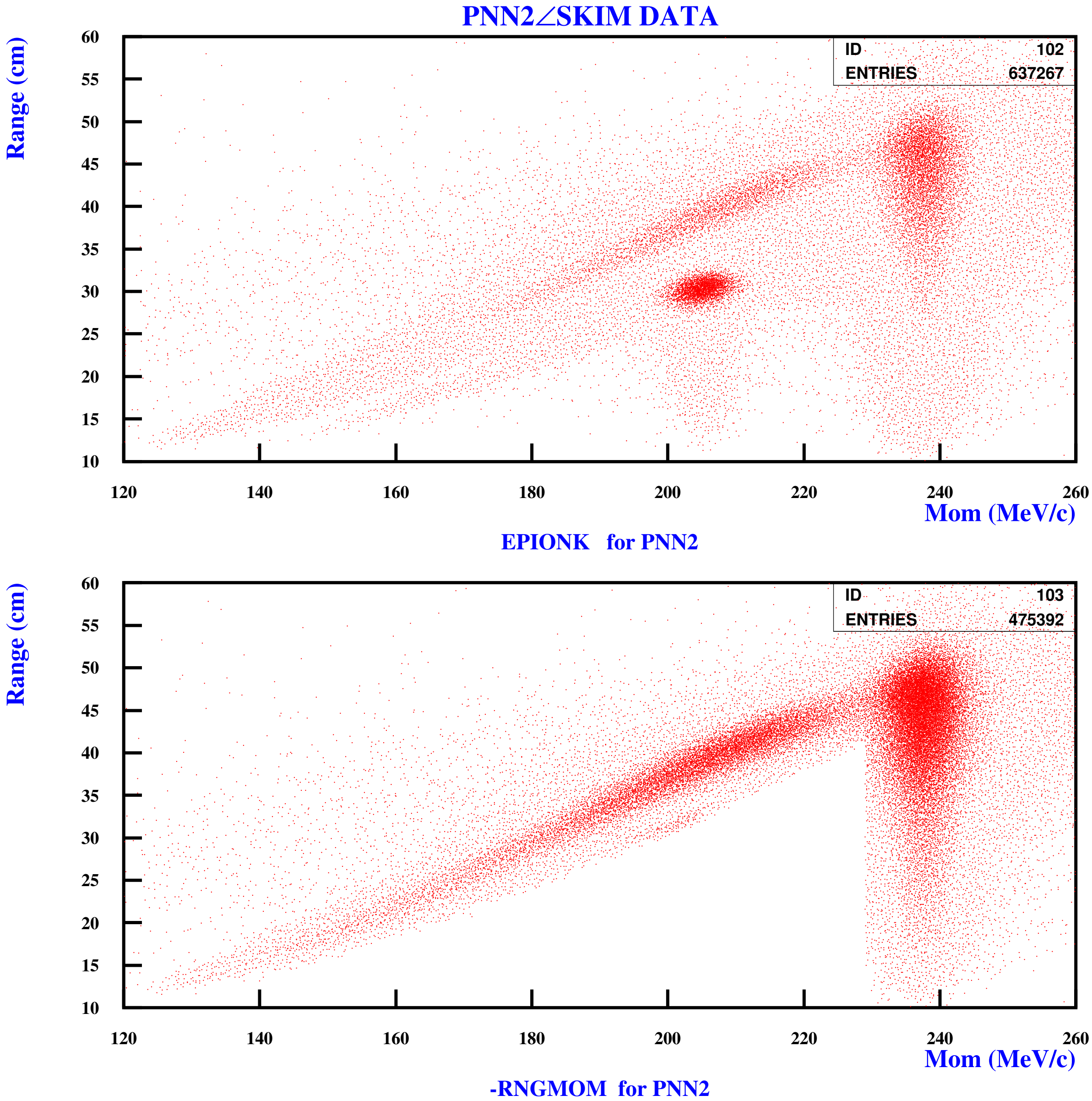


Figure 2: The muon background events range vs momentum after cut (see names of cuts under plots)

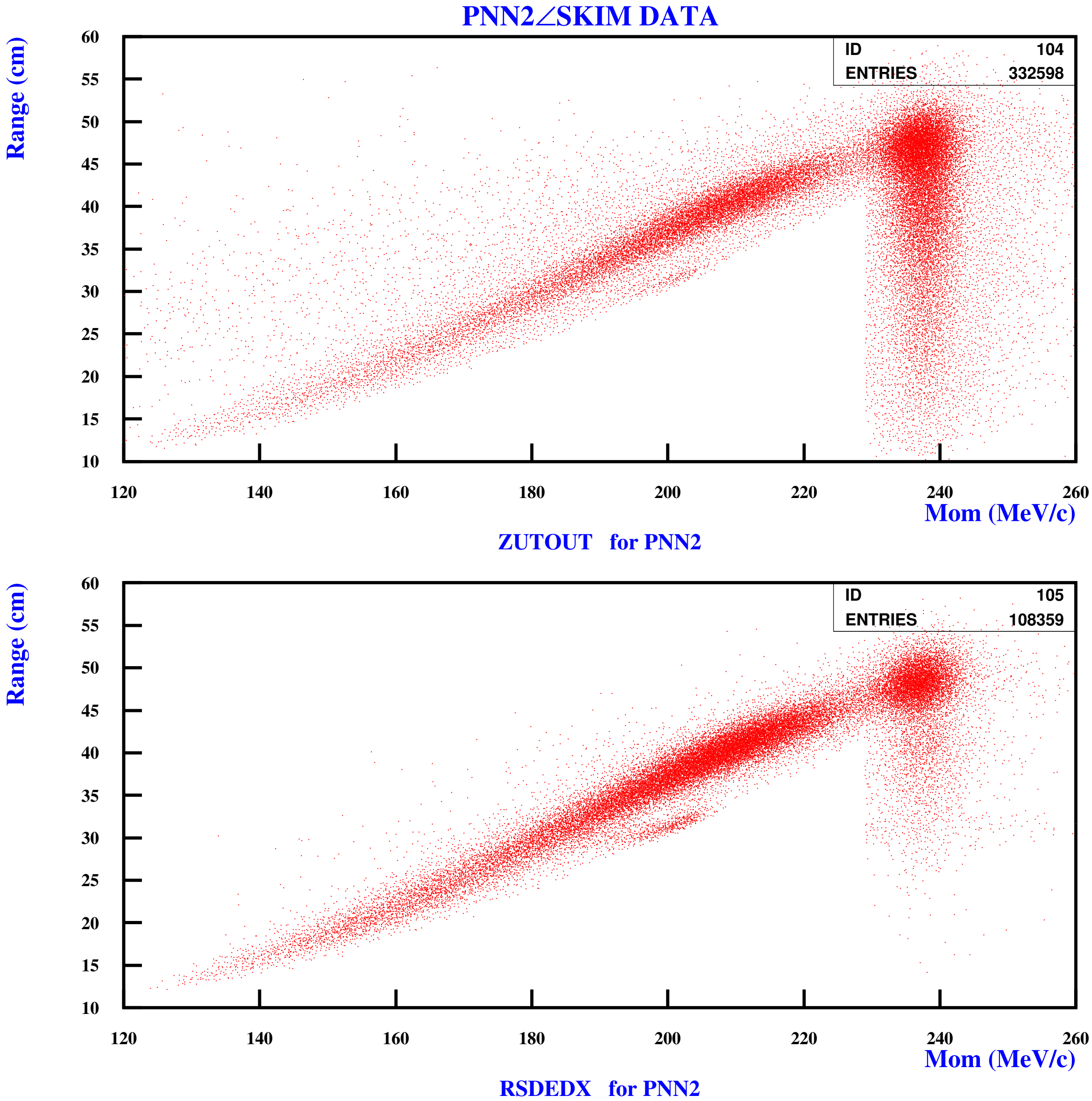
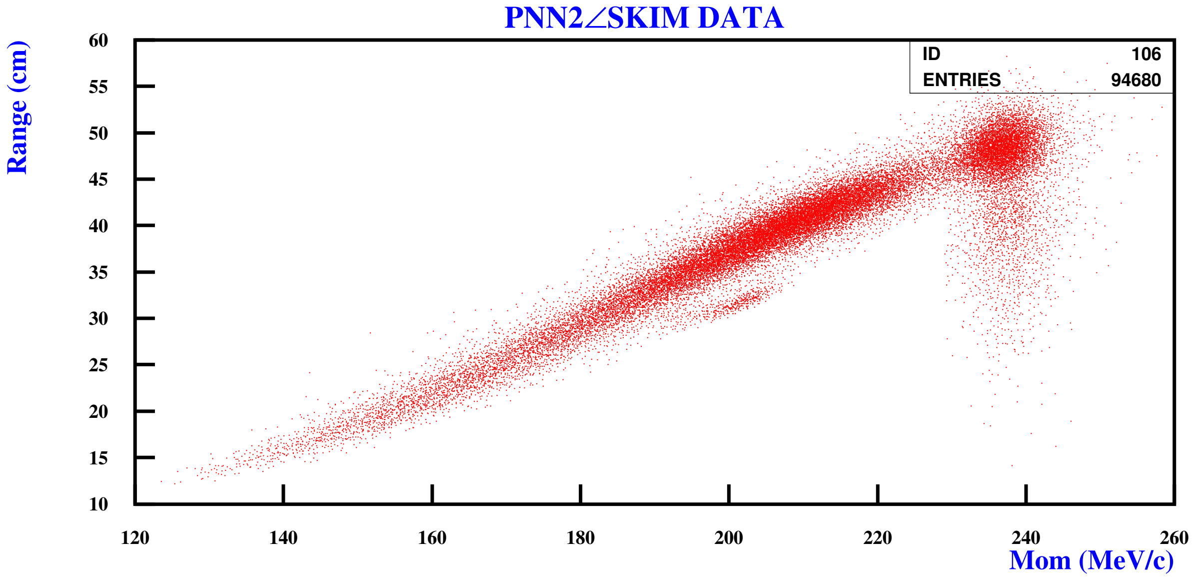
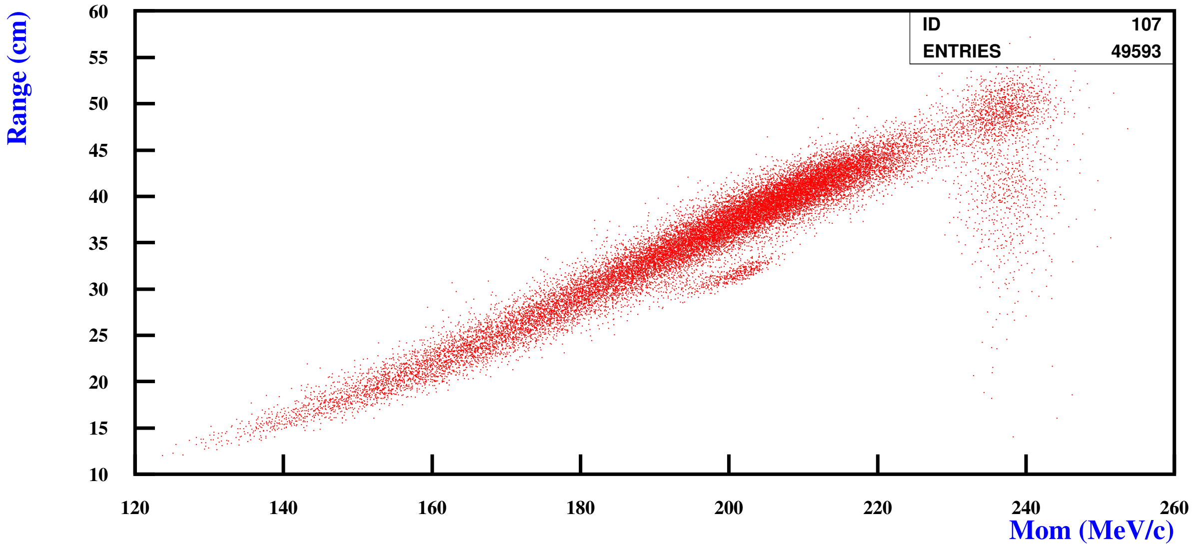


Figure 3: The muon background events range vs momentum after cut (see names of cuts under plots)



UTCQUAL for PNN2



PRRF for PNN2

Figure 4: The muon background events range vs momentum after cut (see names of cuts under plots)

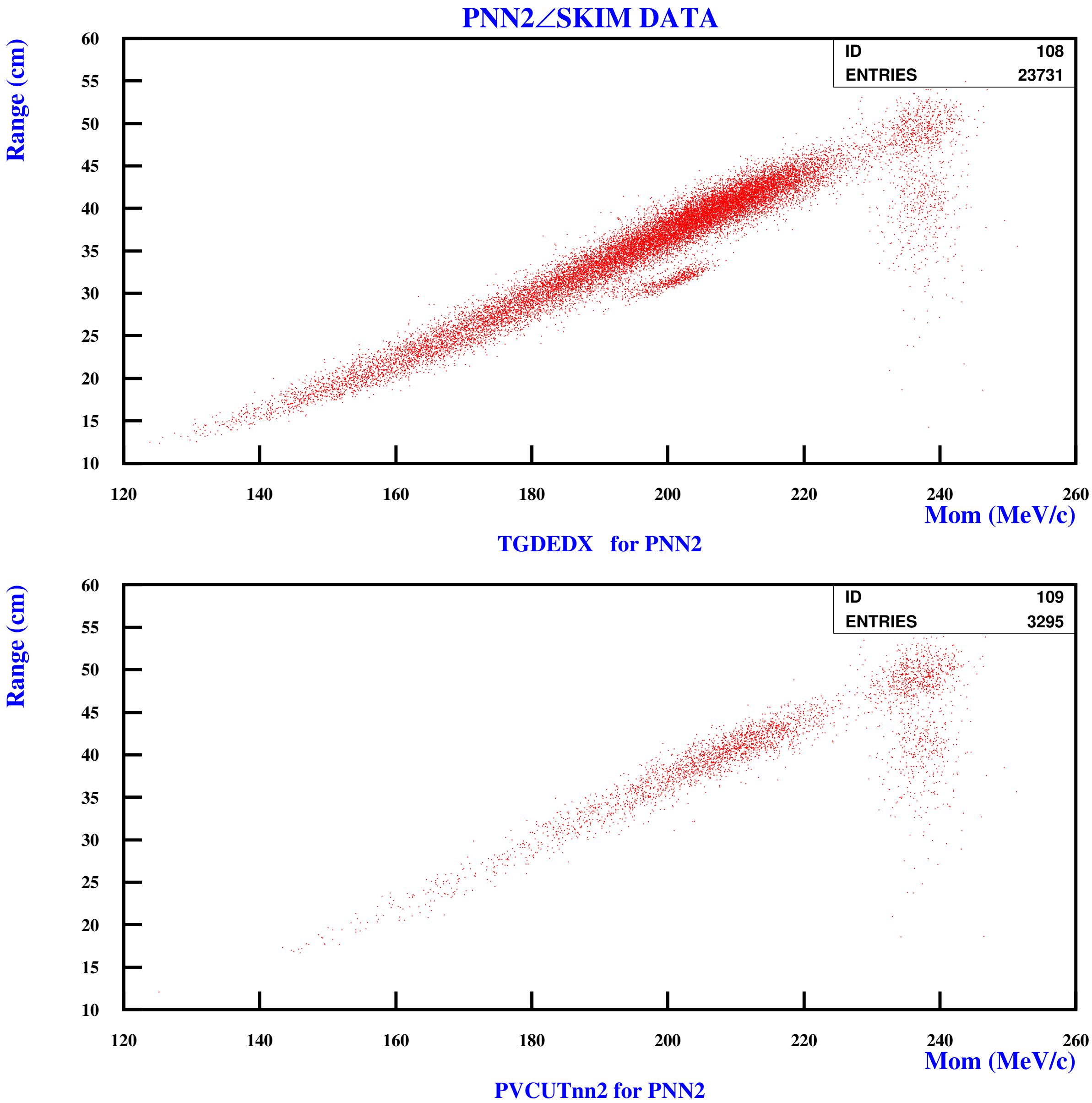


Figure 5: The muon background events range vs momentum after cut (see names of cuts under plots)