Data set

- Signal

`/data/scratch/userspace/pretz/daqsim-reconstruction/output/daqsim-baseline-take4/gamma.xcd`

- Background (one run of real data)

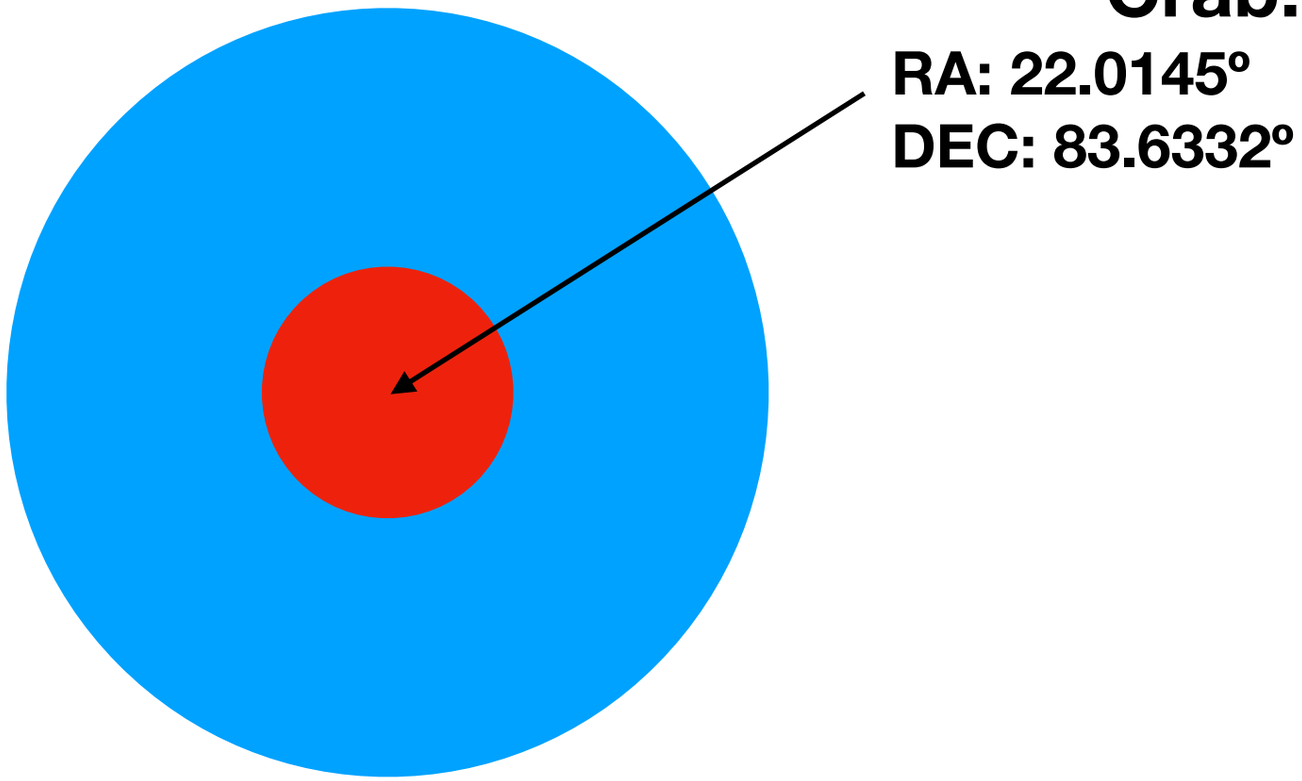
`/data/scratch/userspace/pretz/scrappy-platypus-optimization/datafiles/energy.dec20.run005481.xcd`

- RD

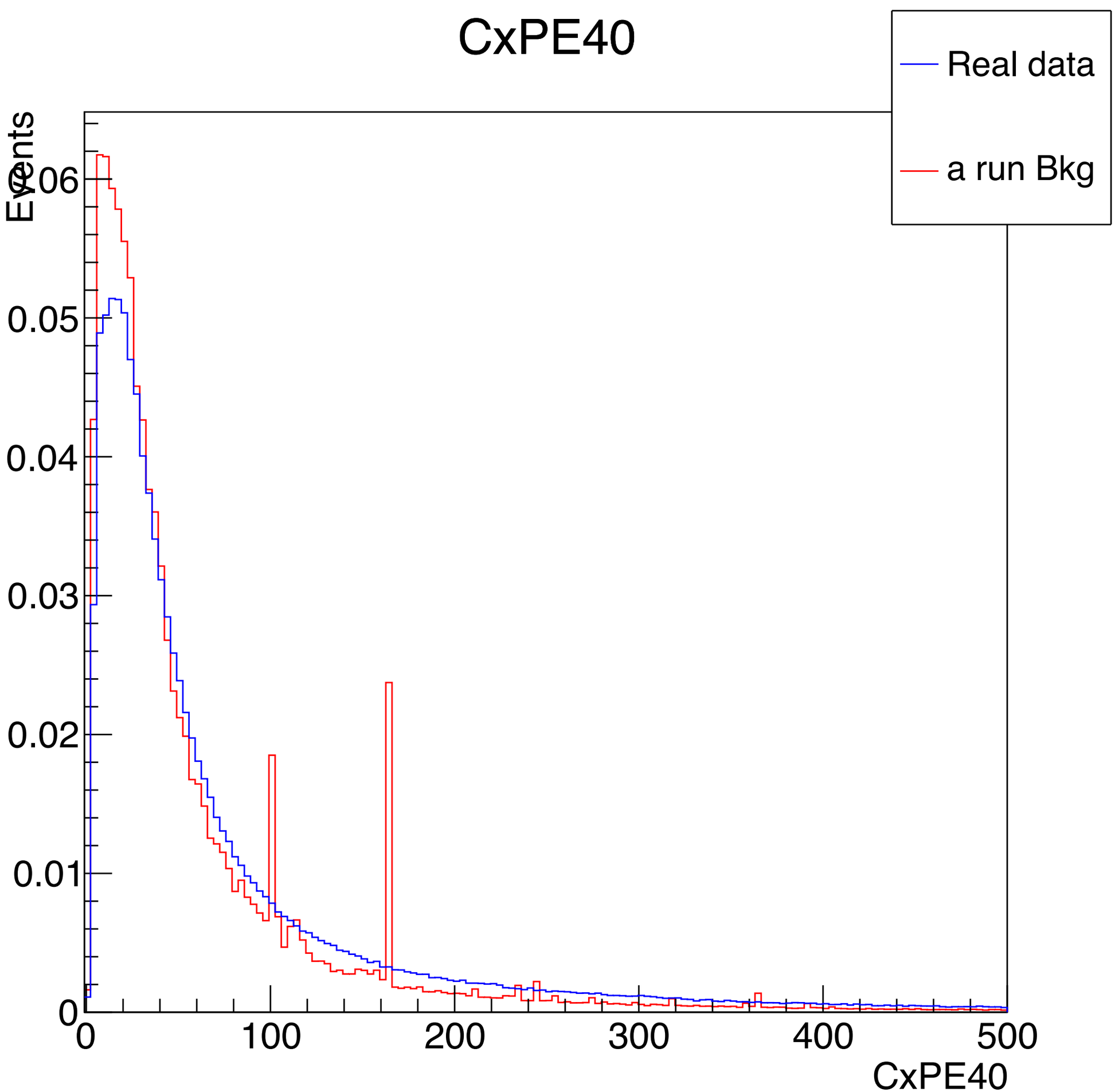
`/data/archive/hawcroot/data/hawc/reconstructed/hawcprod/v2.02.02/config*/reco_xcdf/2016/02-07` -- 212 runs

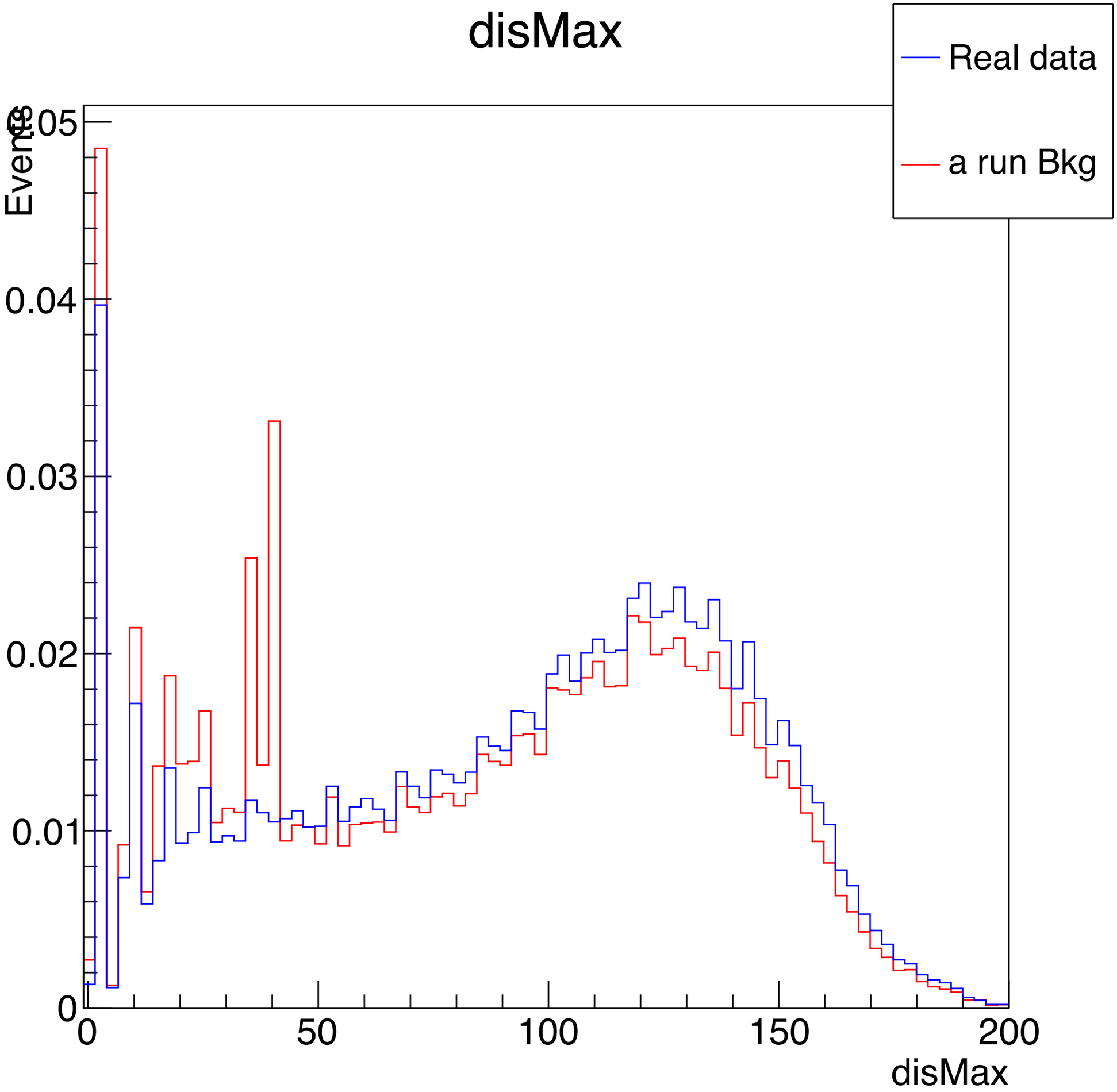
Bin definition:

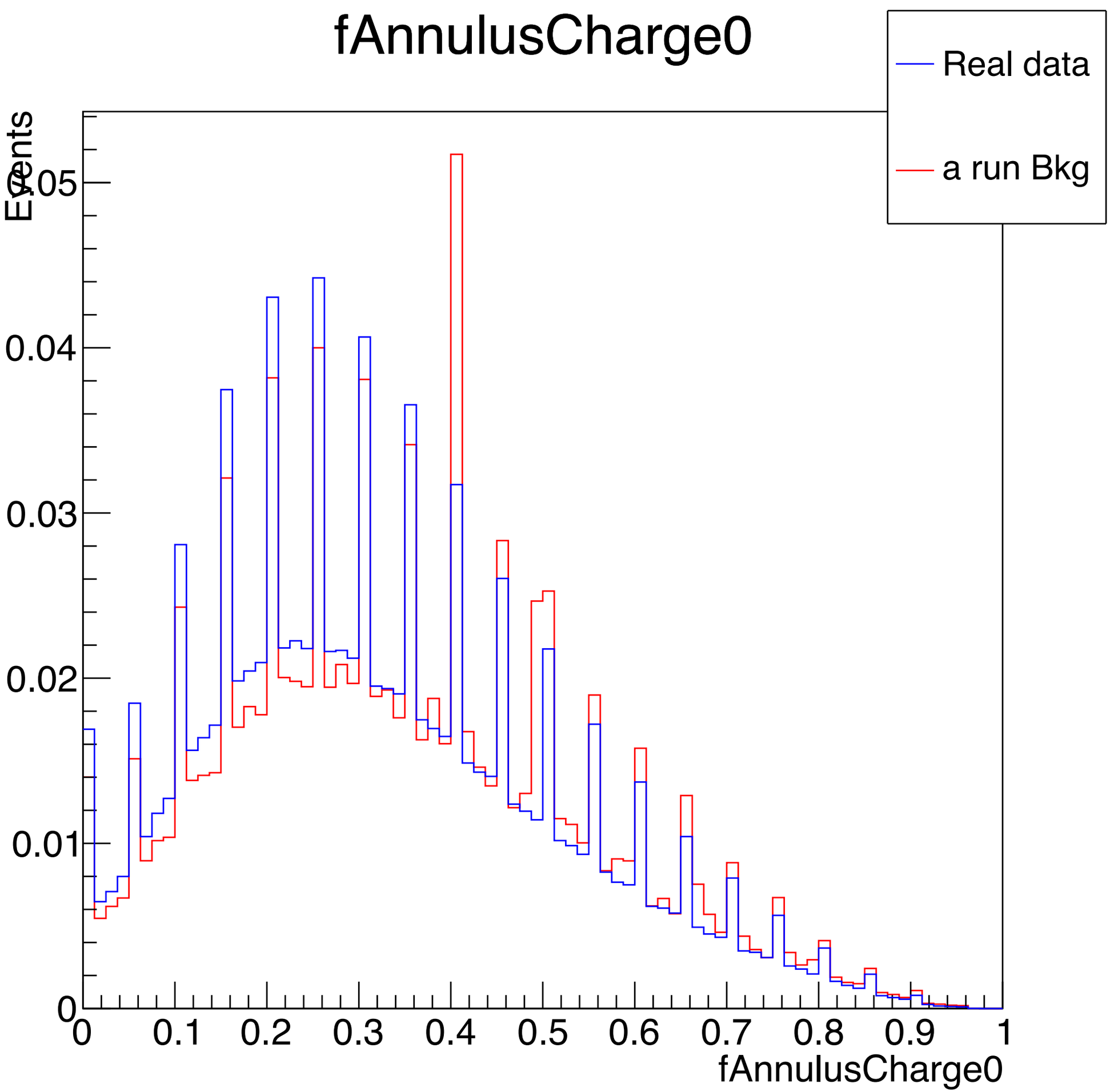
1. angre is predAngres in step of 0.05 from 0.0 to 0.50
2. ebin is log NNenergy in step of 0.25 from 10^2.5 - 10^5.50

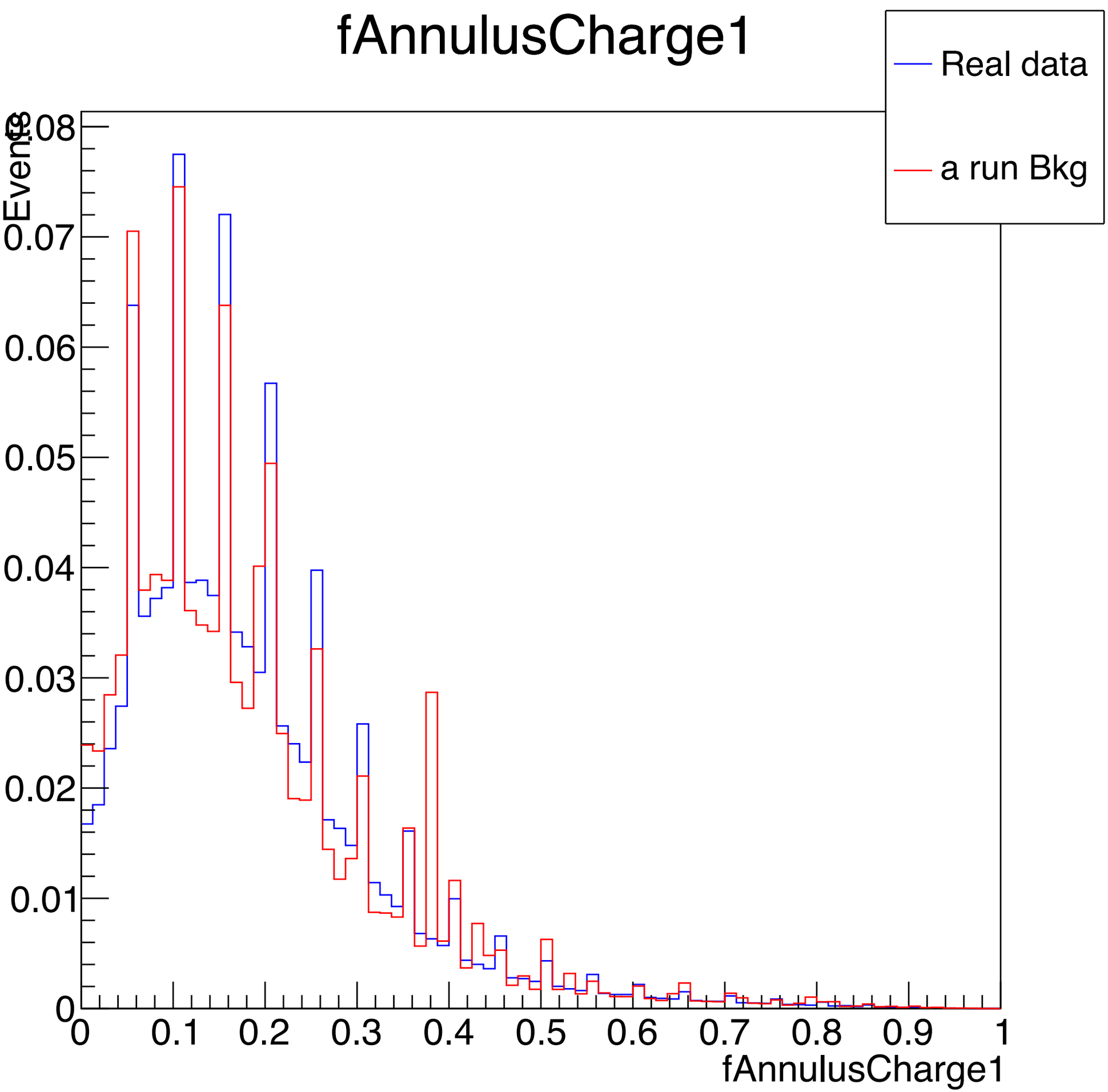


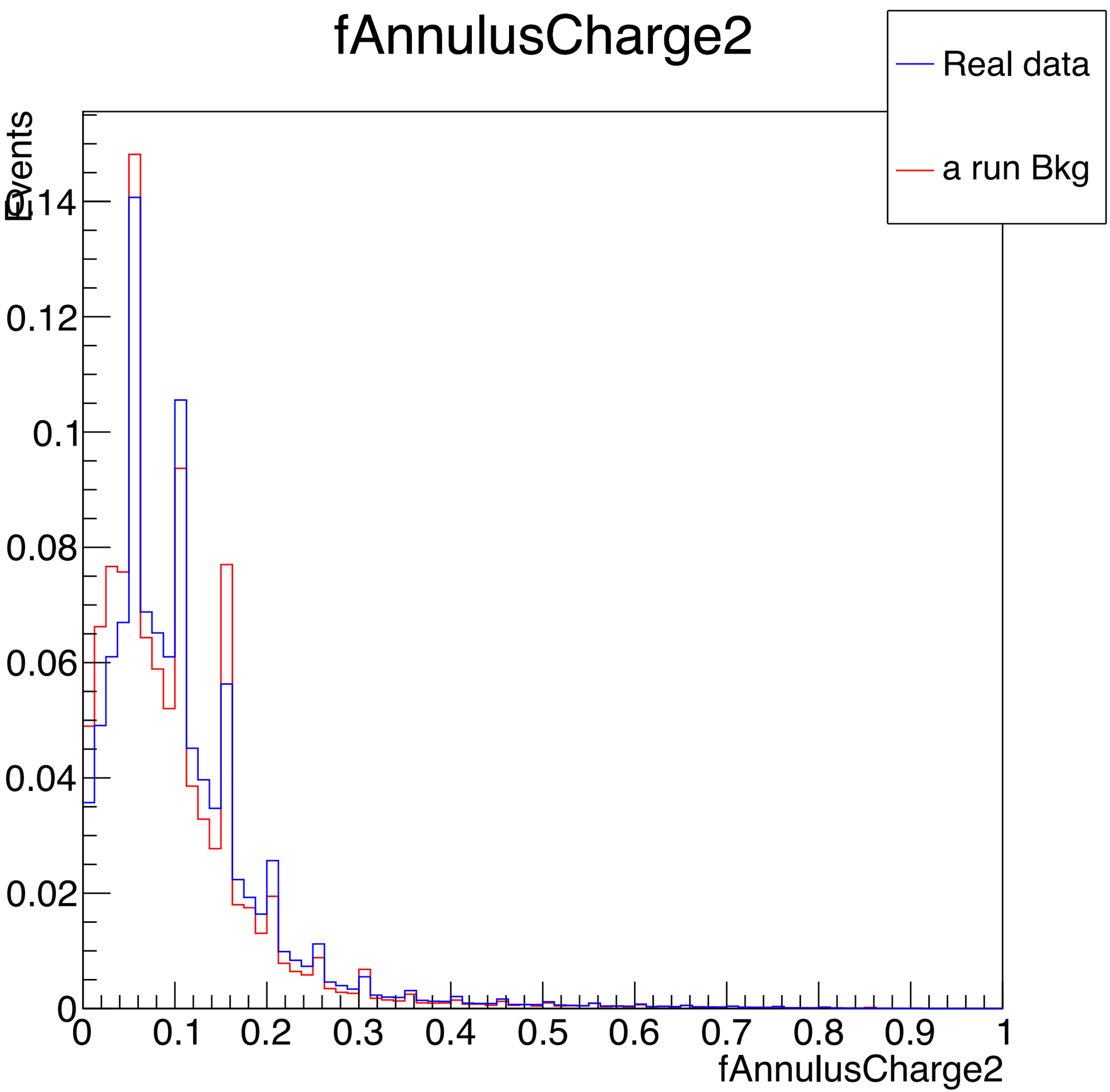
1. Red circle: signal + background
   radius: 0.5°
2. Blue circle: background (I hope)
   radius: 1.0°

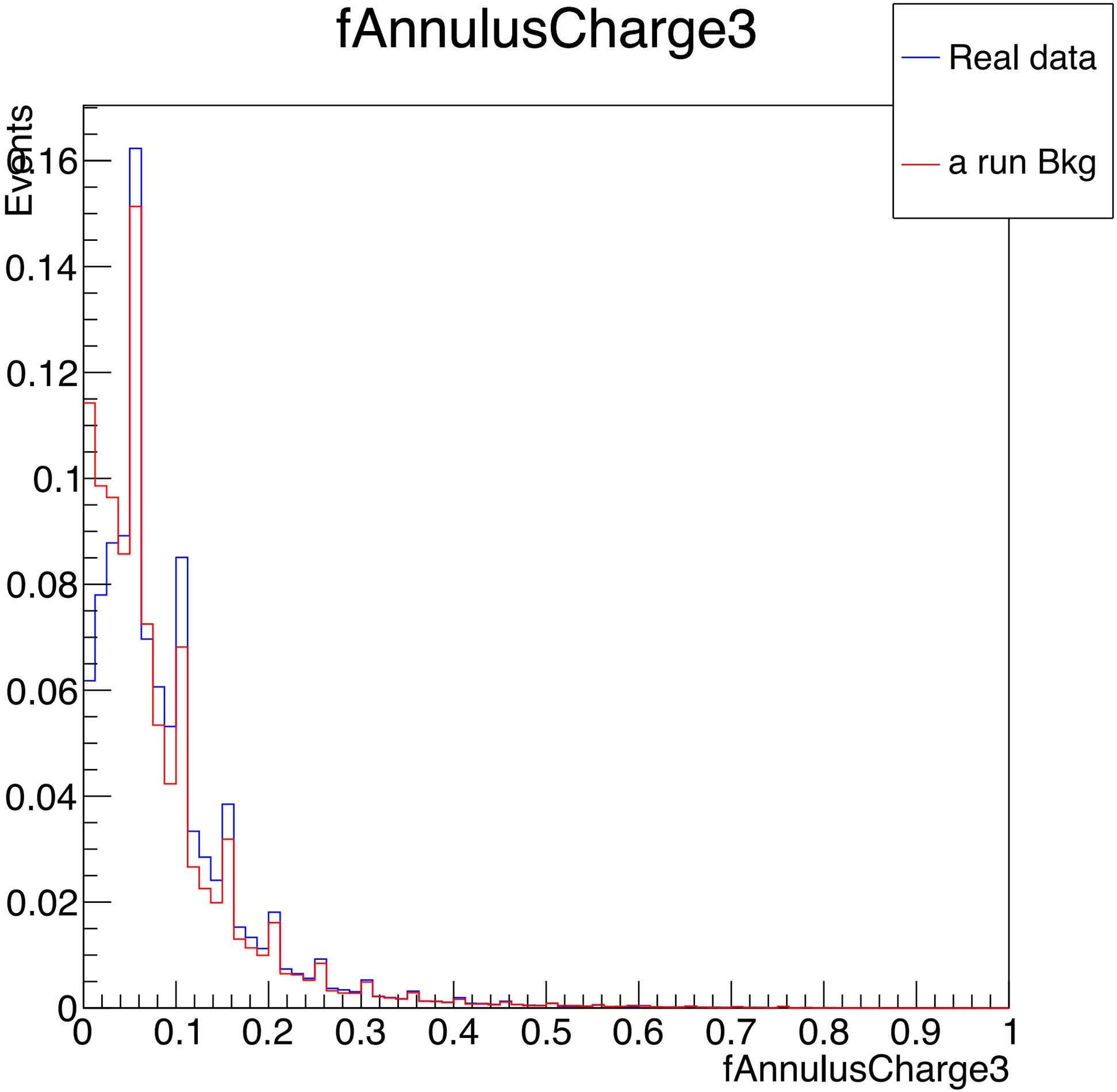

CxPE40
Real data
a run Bkg
Events
0.06
0.05
0.04
0.03
0.02
0.01
0
0
100
200
300
400
500
CxPE40

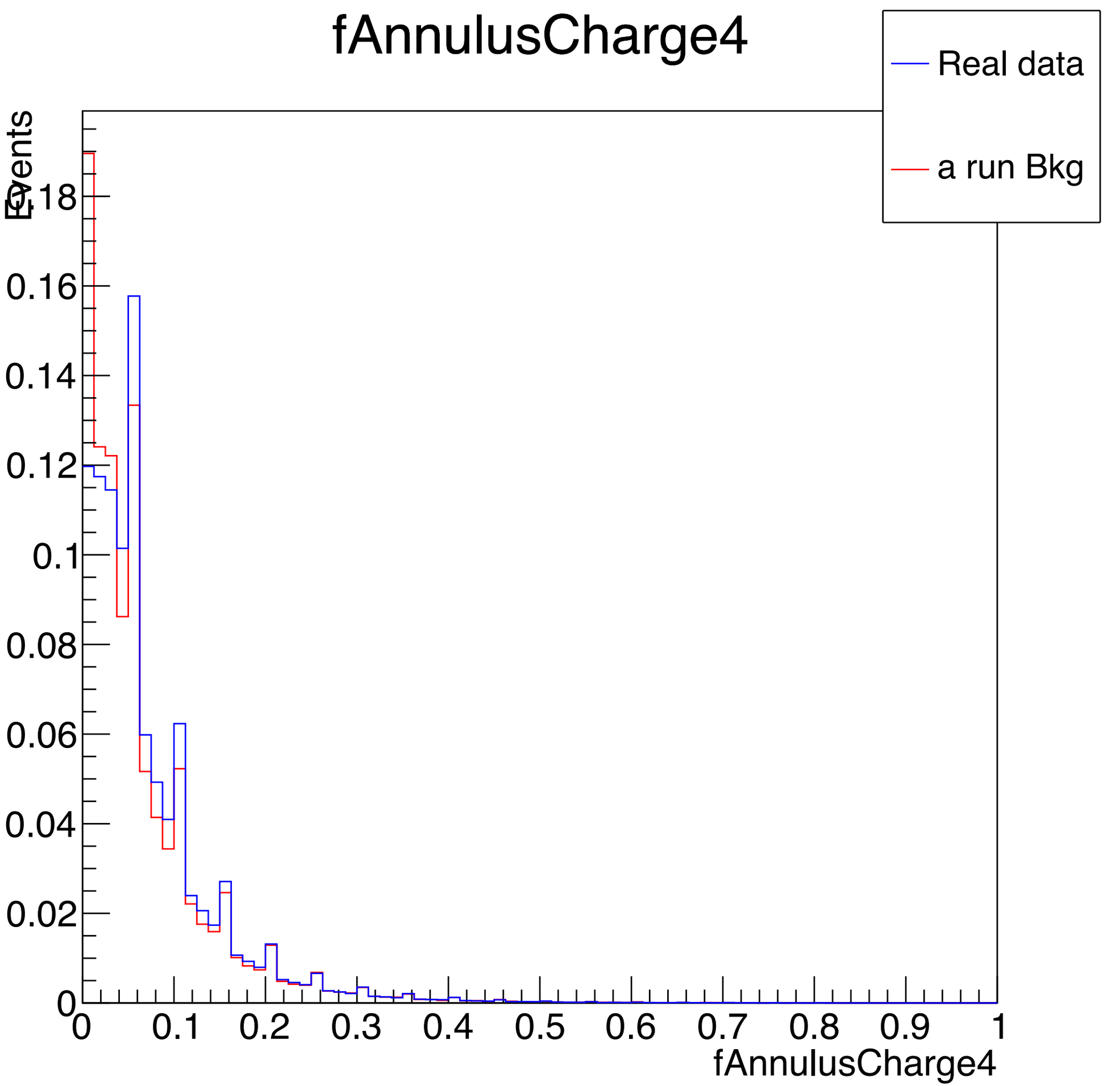

disMax
Real data
a run Bkg
Events
0.05
0.04
0.03
0.02
0.01
0
0
50
100
150
200
disMax

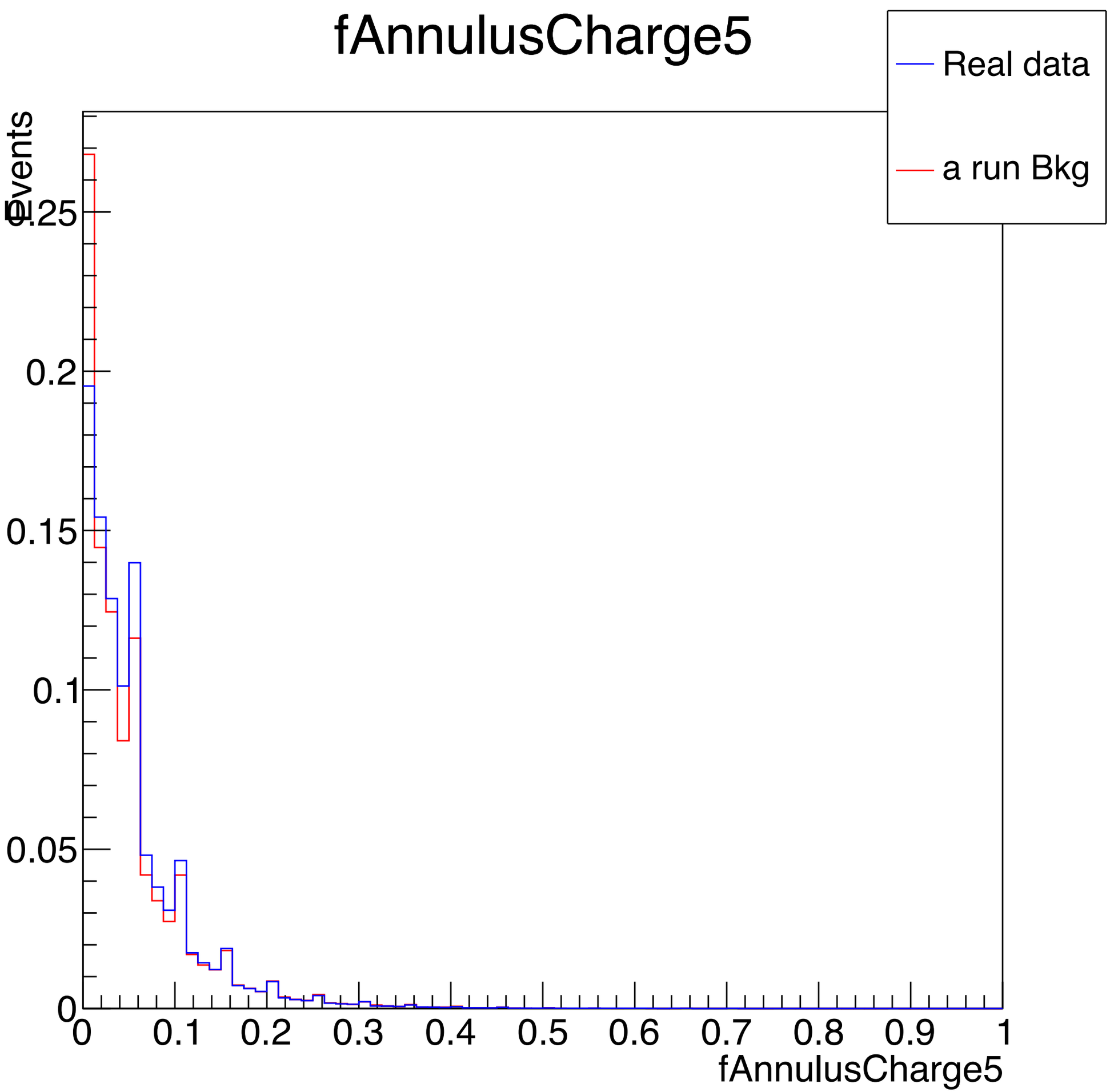

fAnnulusCharge0
Real data
a run Bkg
Events
0.05
0.04
0.03
0.02
0.01
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge0

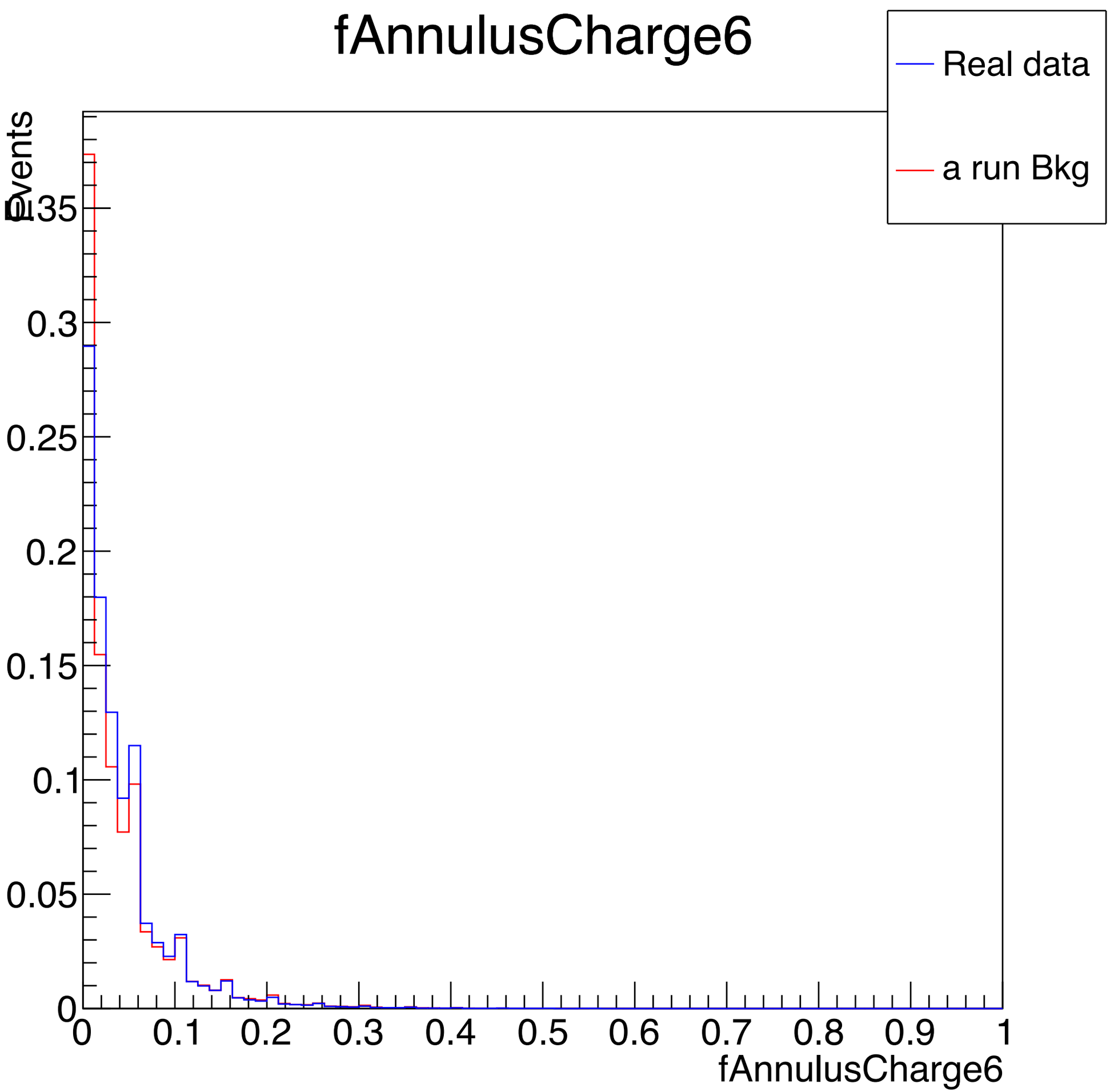

fAnnulusCharge1
Real data
a run Bkg
Events
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge1

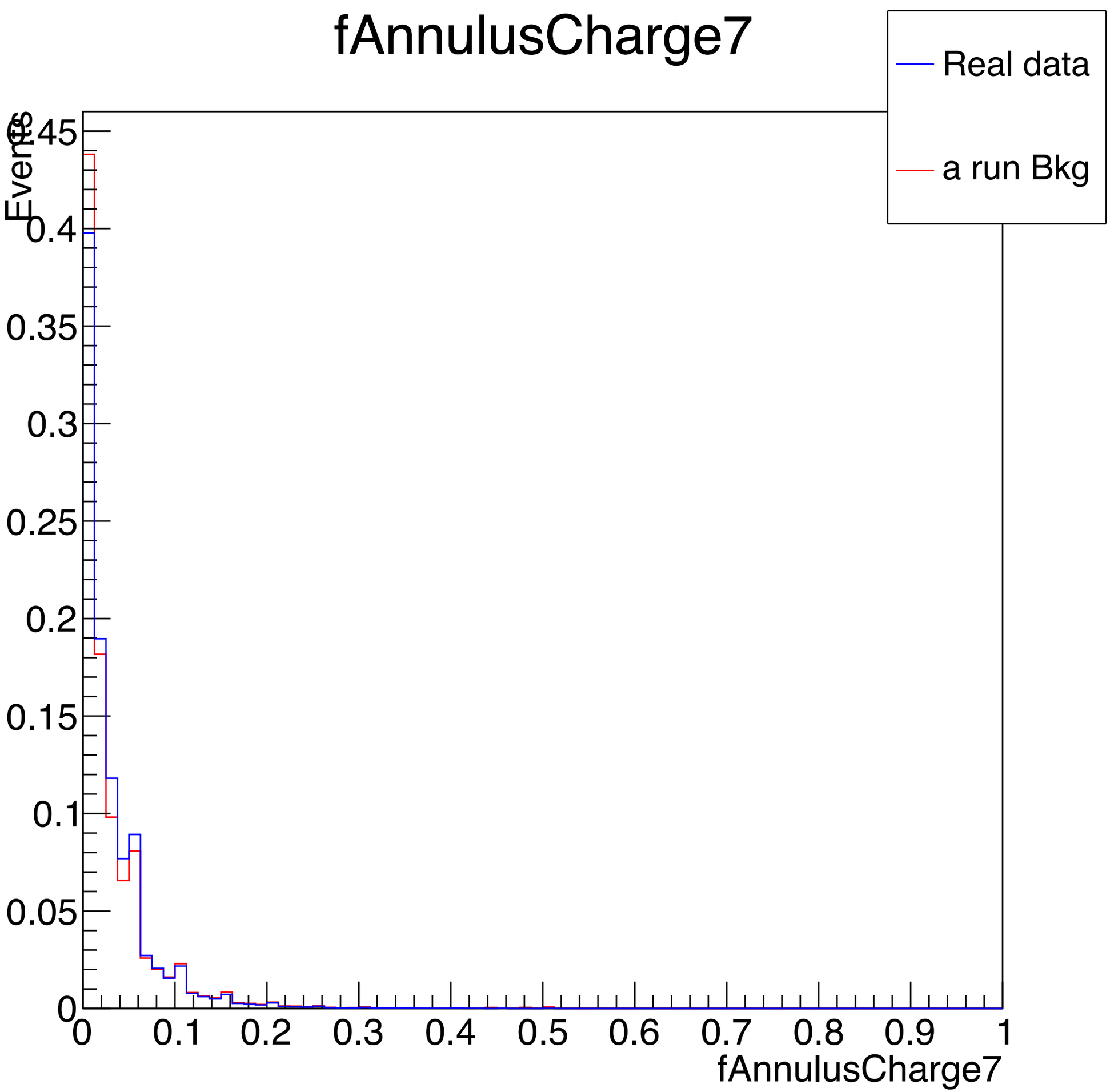

fAnnulusCharge2
Real data
a run Bkg
Events
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge2

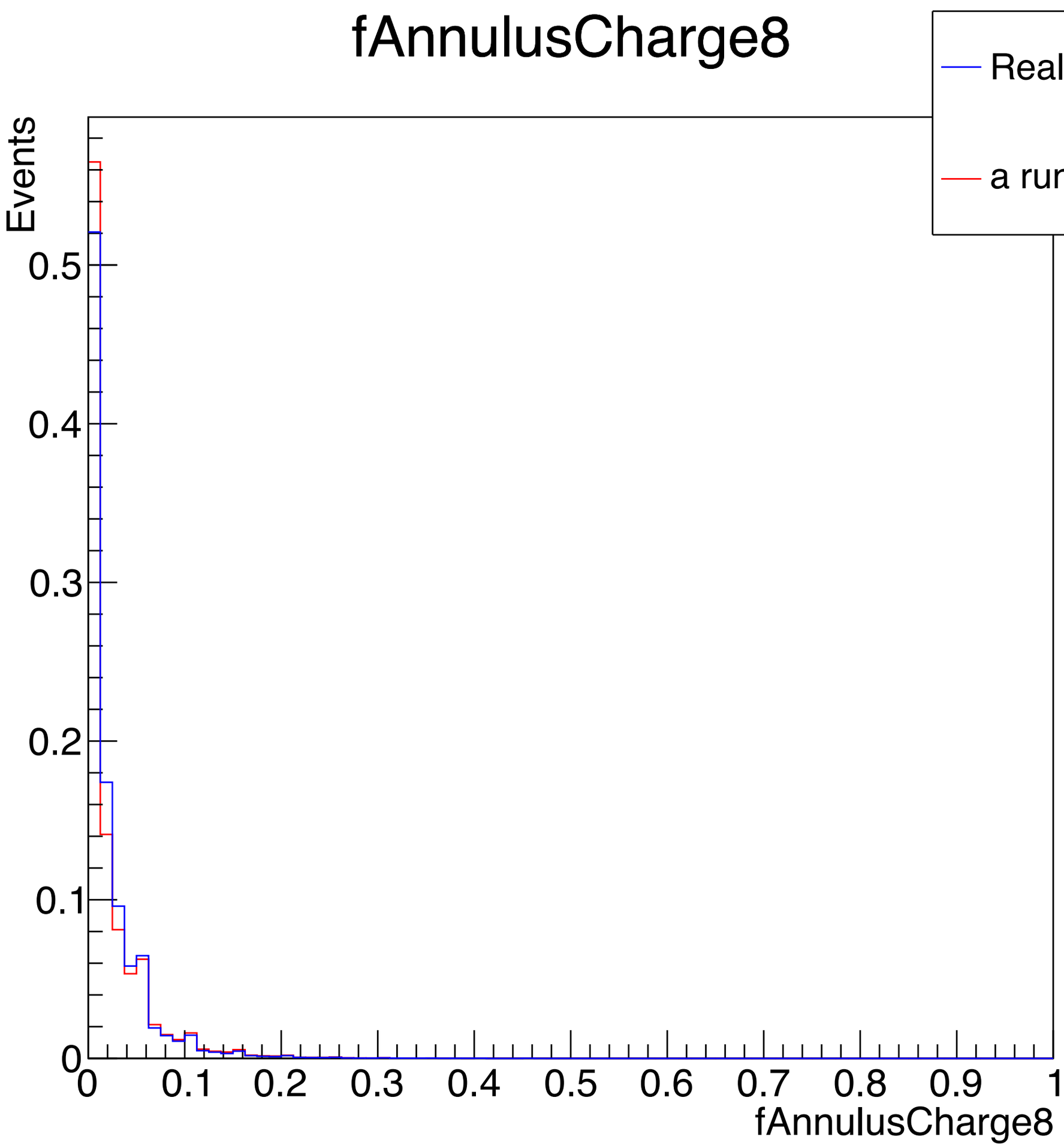

fAnnulusCharge3
Real data
a run Bkg
Events
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge3

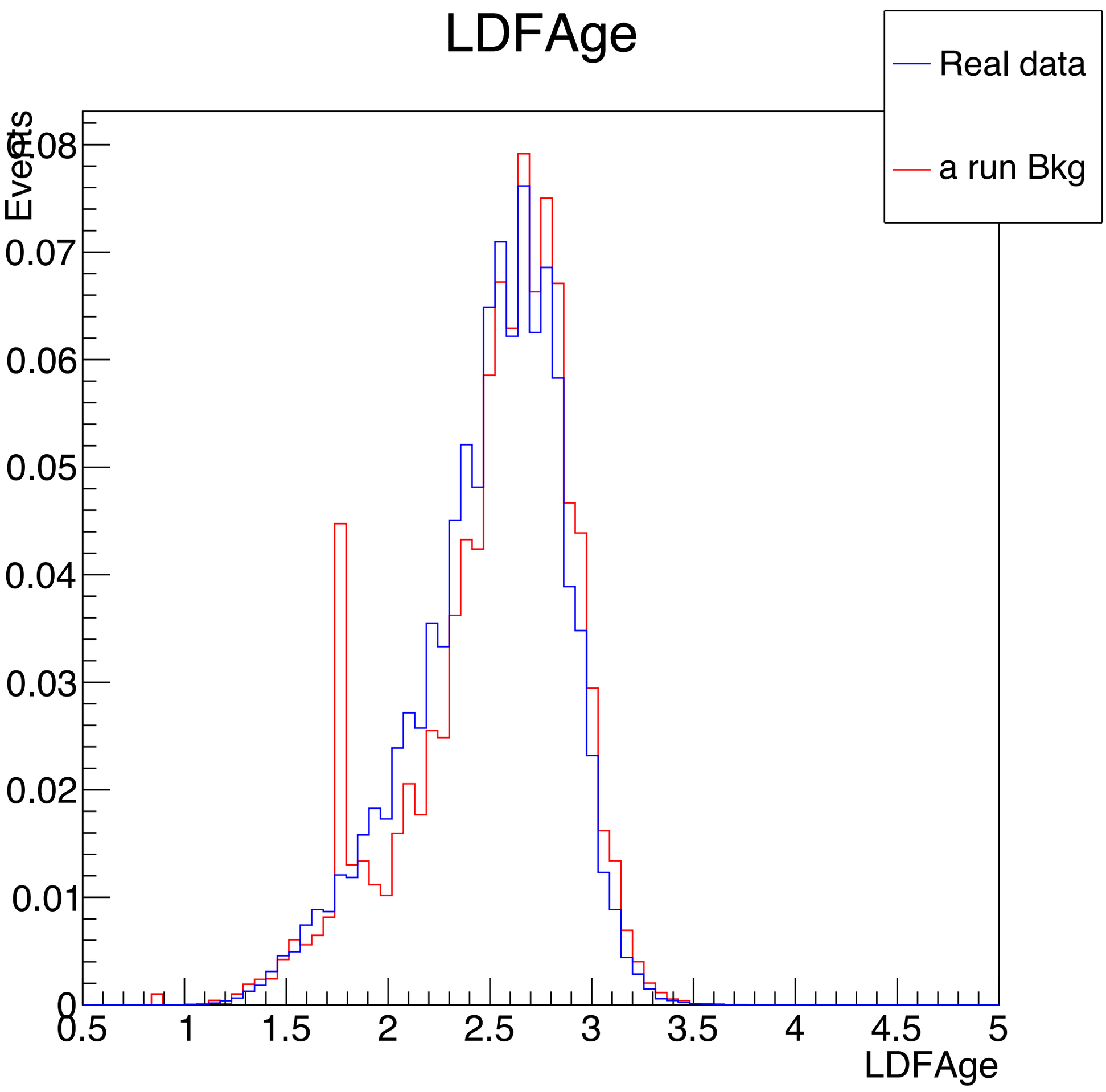

fAnnulusCharge4
Real data
a run Bkg
Events
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge4

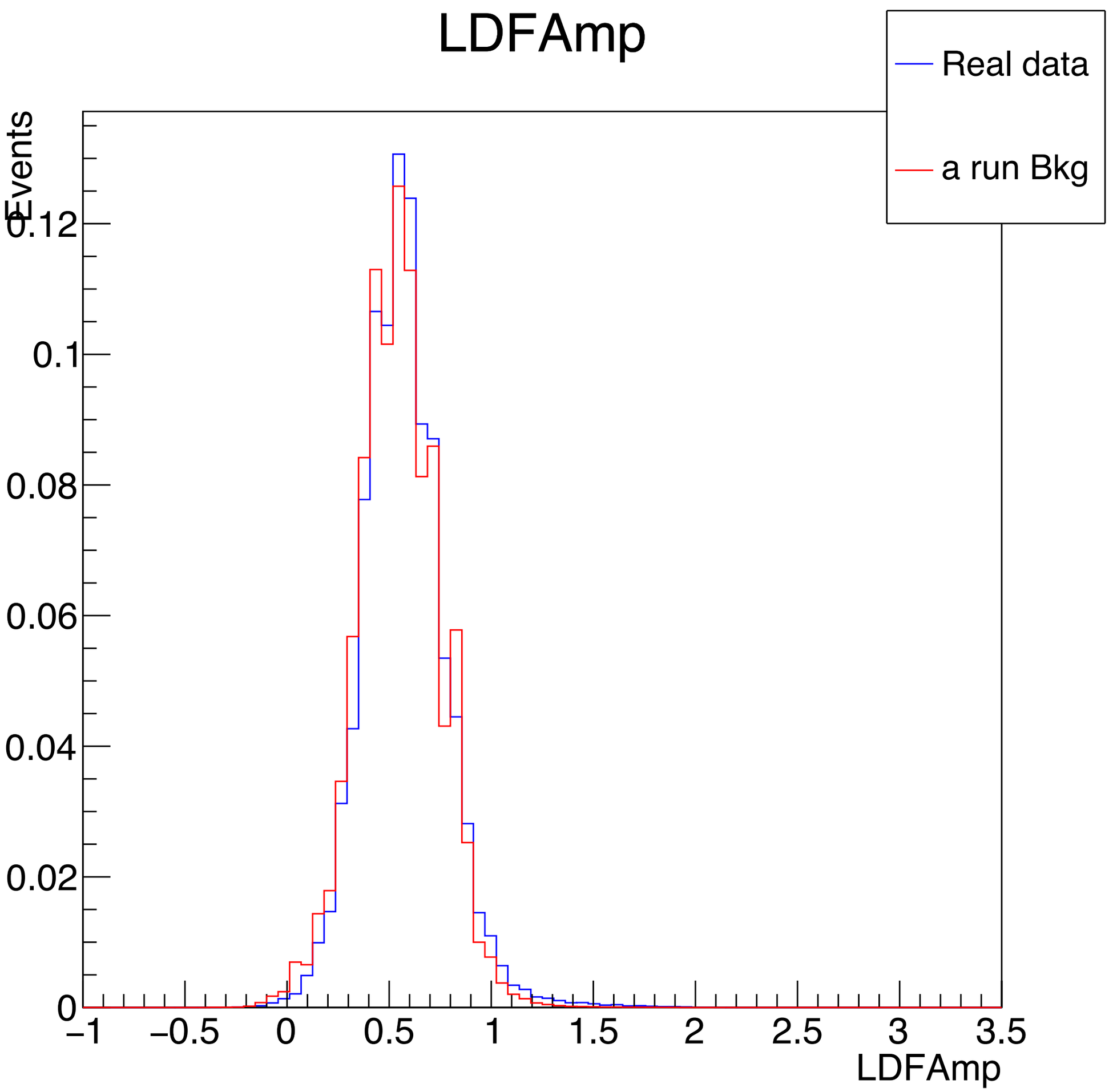

fAnnulusCharge5
Real data
a run Bkg
Events
0.25
0.2
0.15
0.1
0.05
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge5

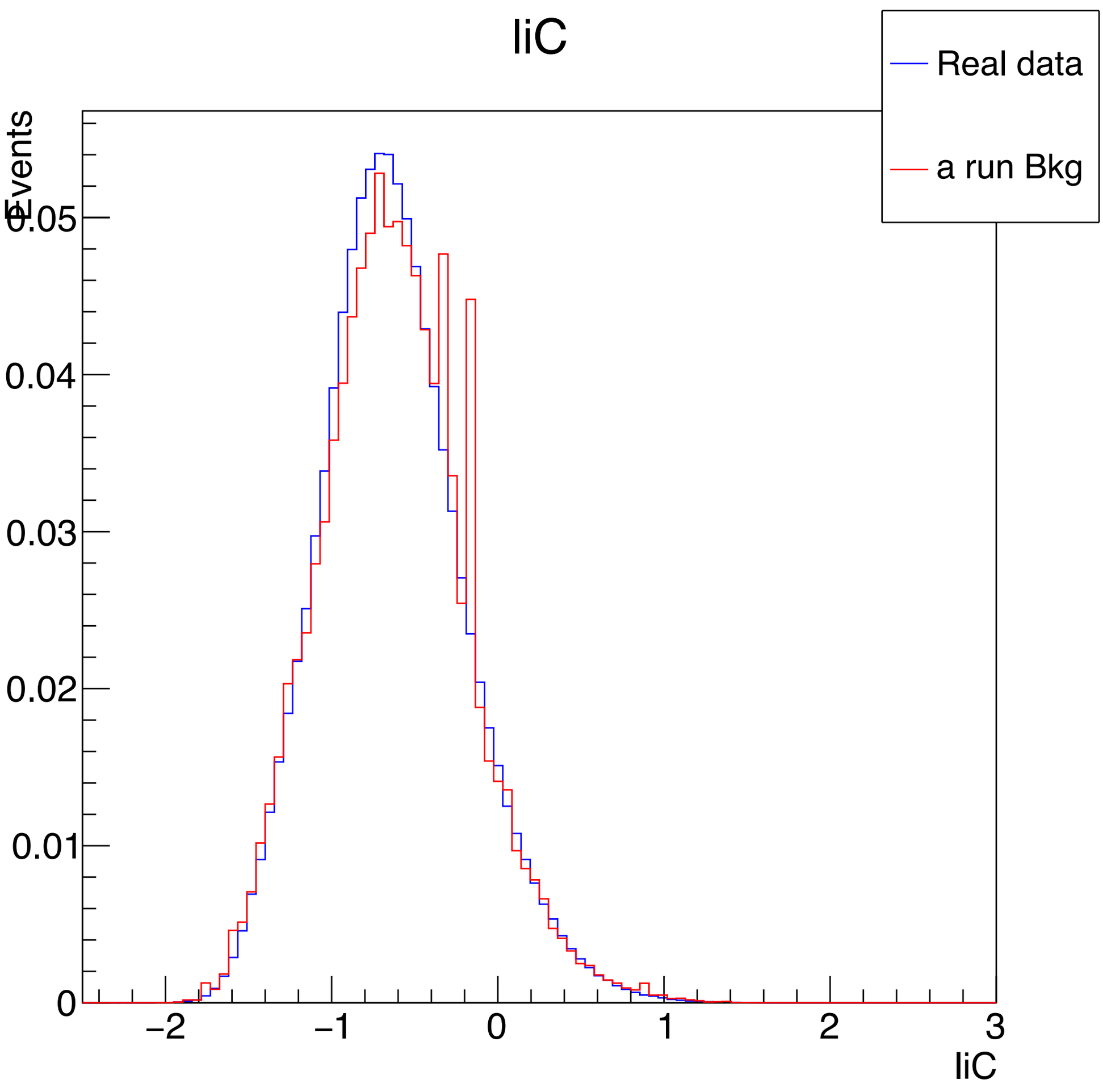

fAnnulusCharge6
Real data
a run Bkg
Events
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge6

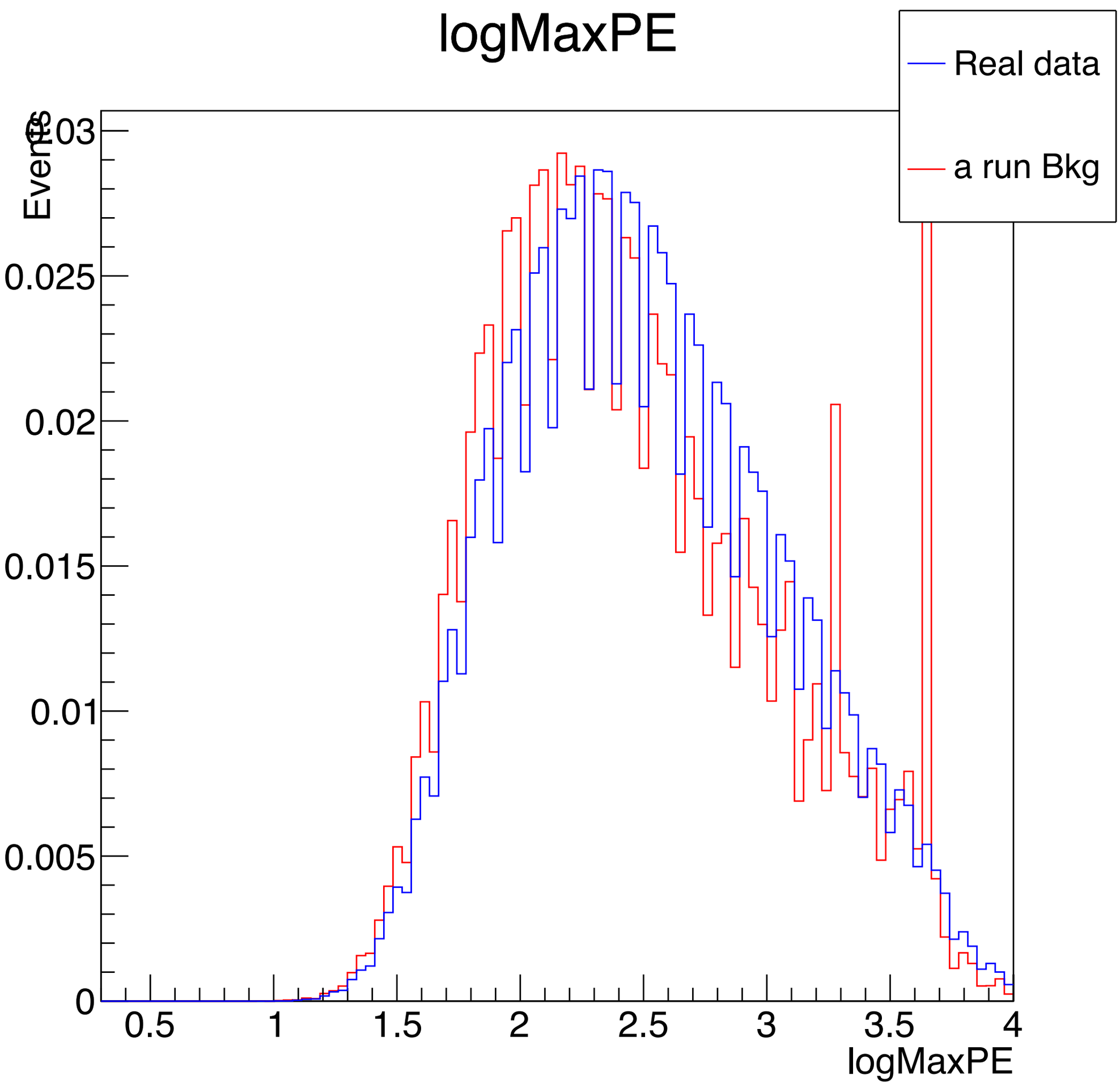

fAnnulusCharge7
Real data
a run Bkg
Events
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge7

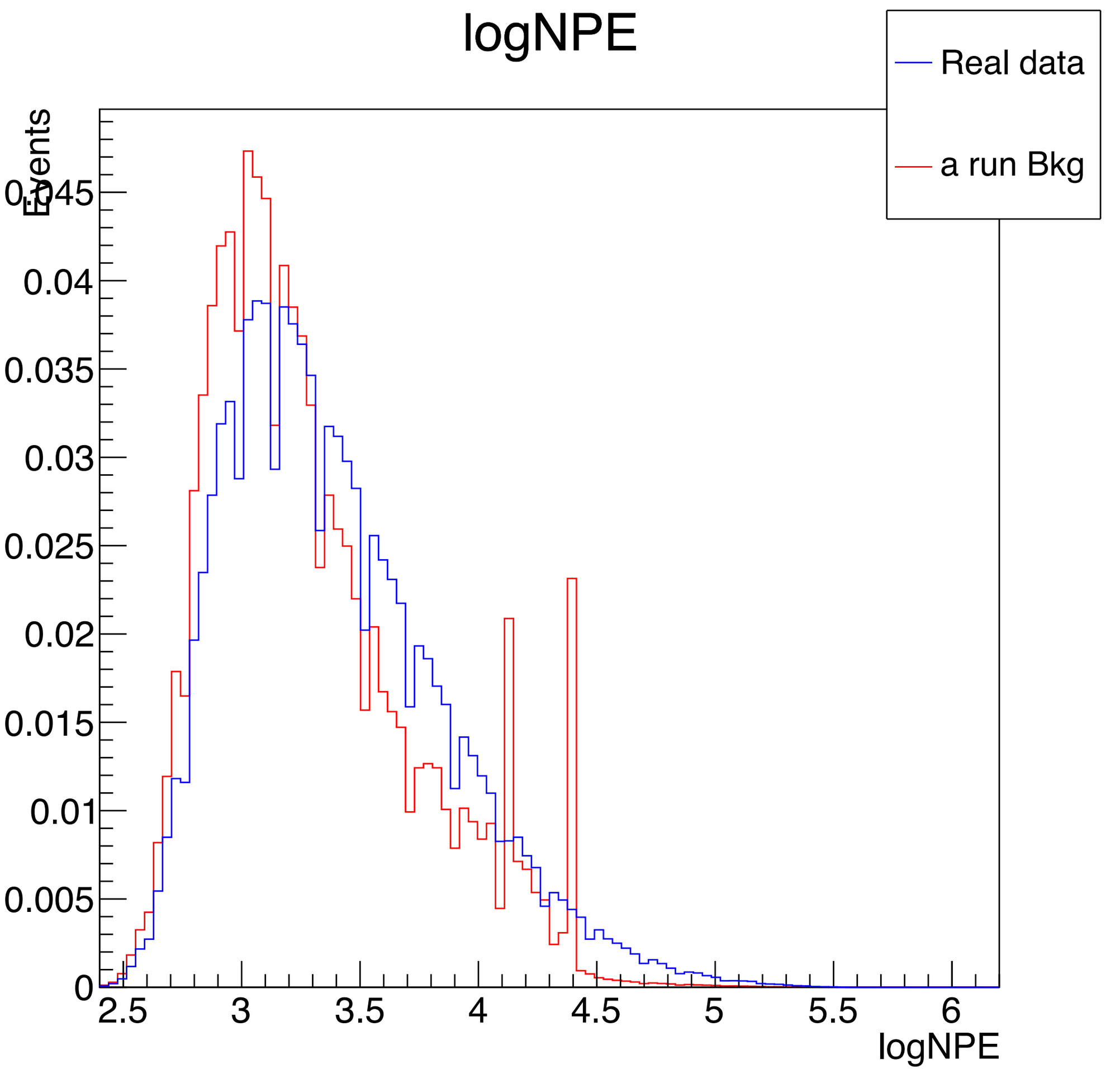

fAnnulusCharge8
Real data
a run Bkg
Events
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
fAnnulusCharge8

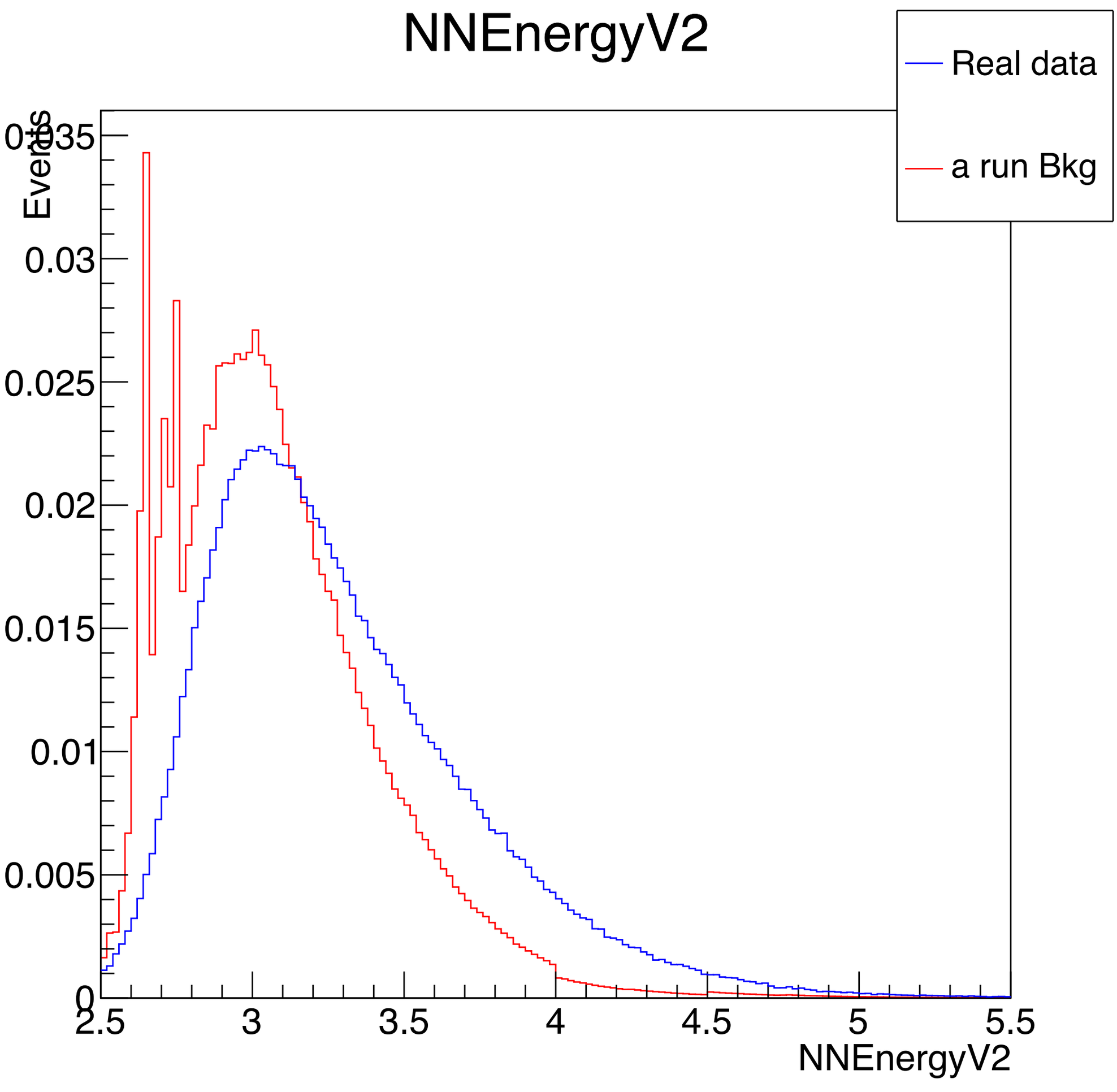

LDFAge
Real data
a run Bkg
Events
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
LDFAge

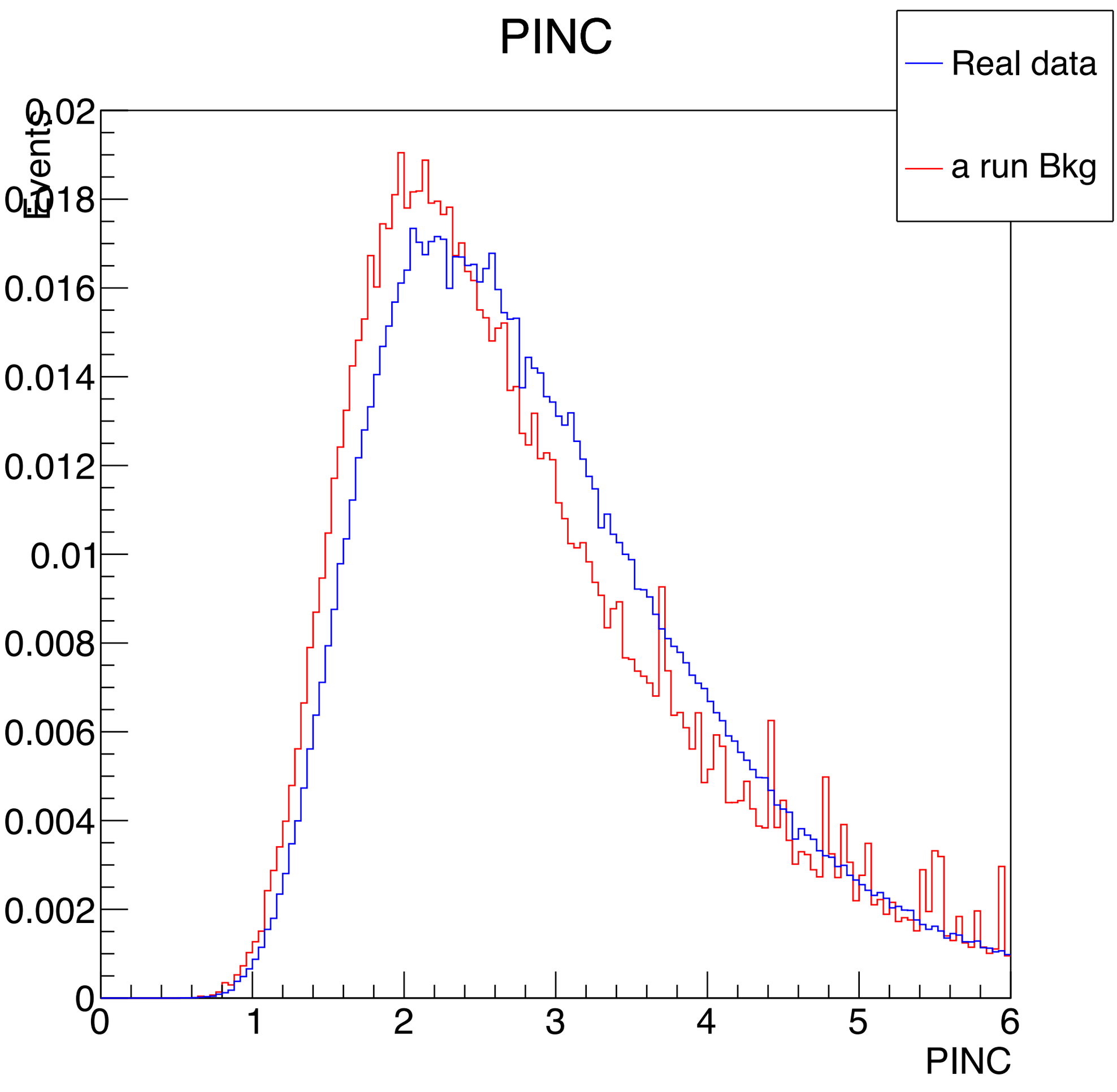

LDFAmp
Real data
a run Bkg
Events
0.12
0.1
0.08
0.06
0.04
0.02
0
−1
−0.5
0
0.5
1
1.5
2
2.5
3
3.5
LDFAmp

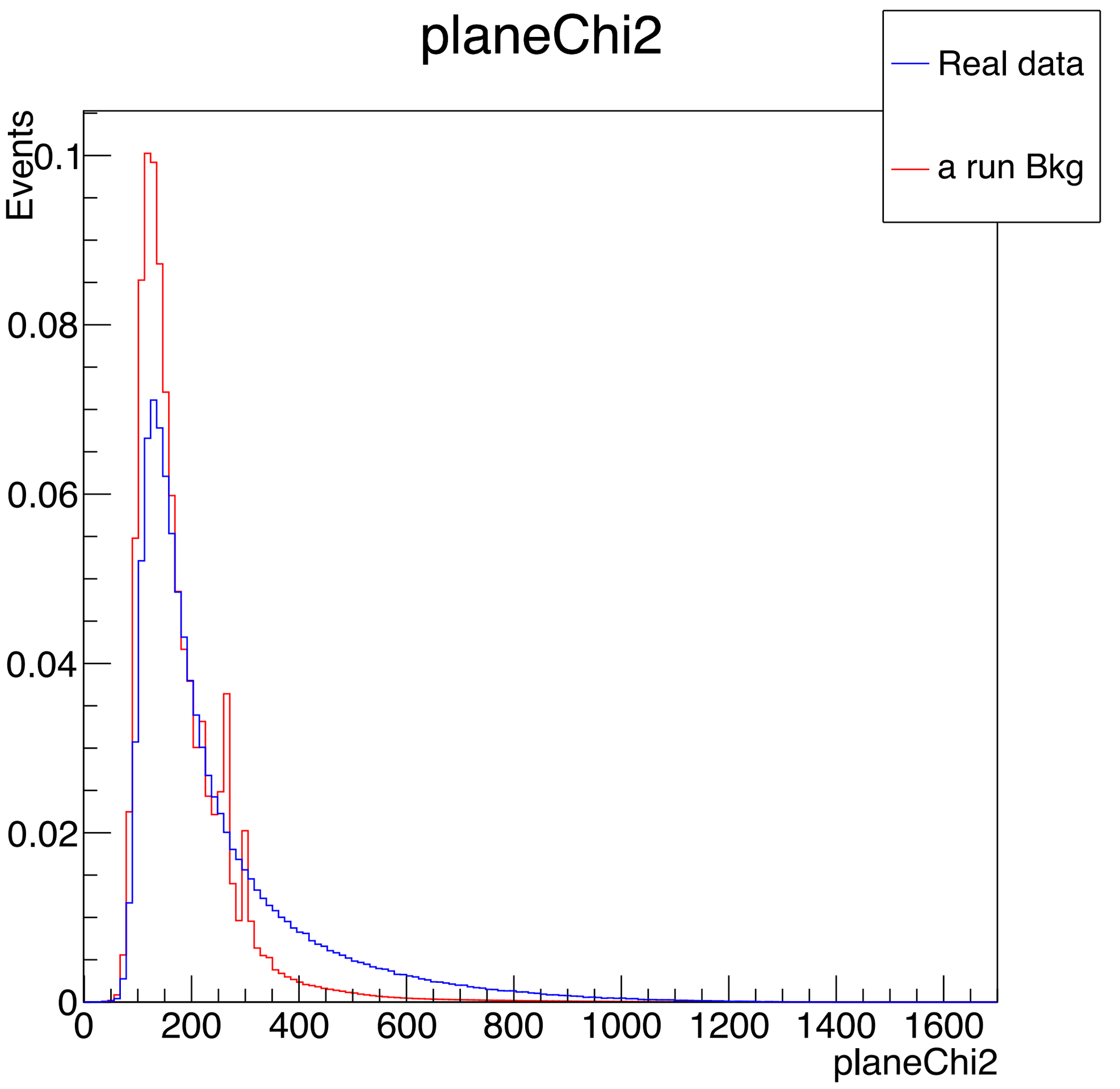

liC
Real data
a run Bkg
Events
0.05
0.04
0.03
0.02
0.01
0
−2
−1
0
1
2
3
liC

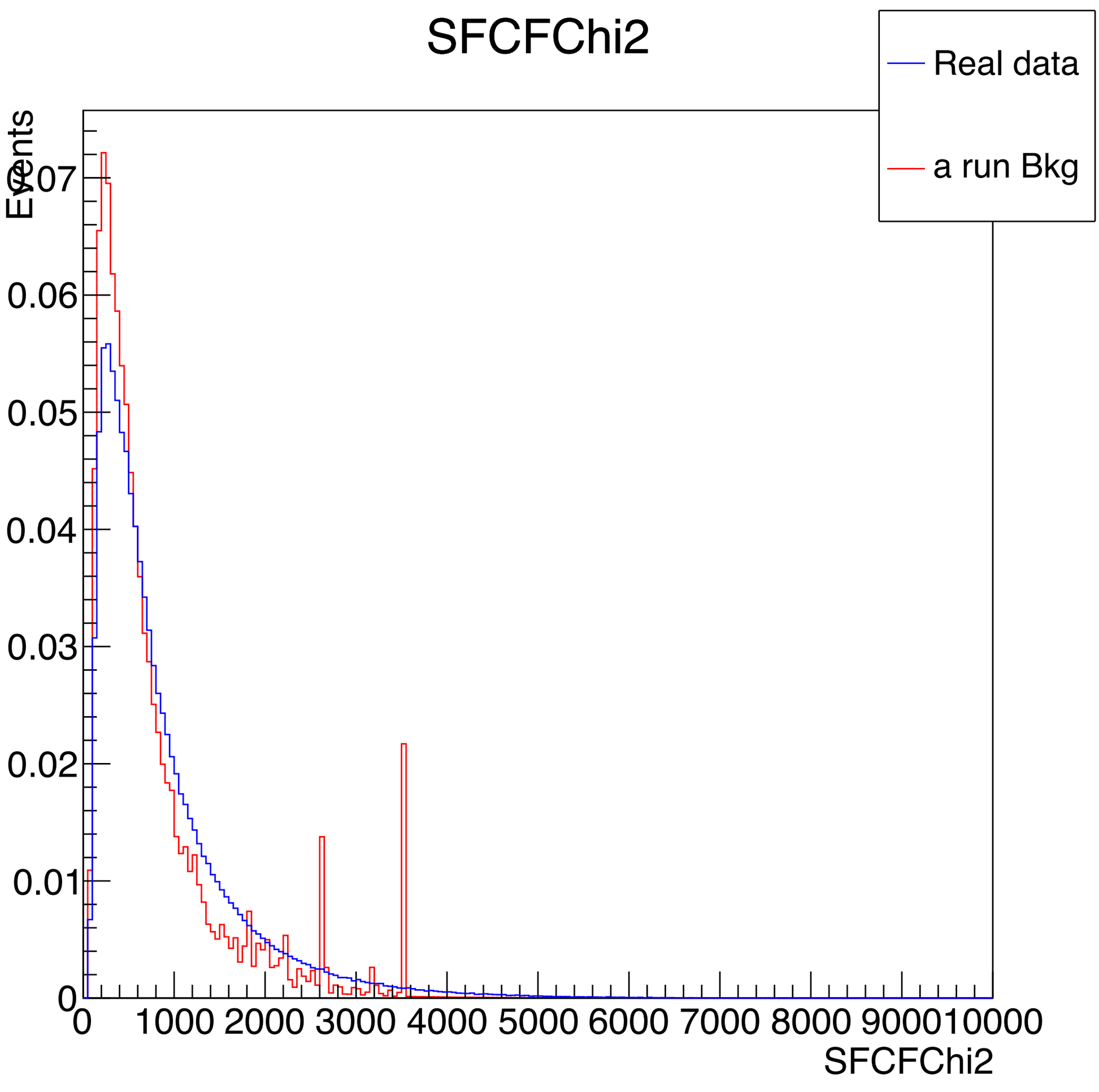

logMaxPE
Real data
a run Bkg
Events
0.03
0.025
0.02
0.015
0.01
0.005
0
0.5
1
1.5
2
2.5
3
3.5
4
logMaxPE

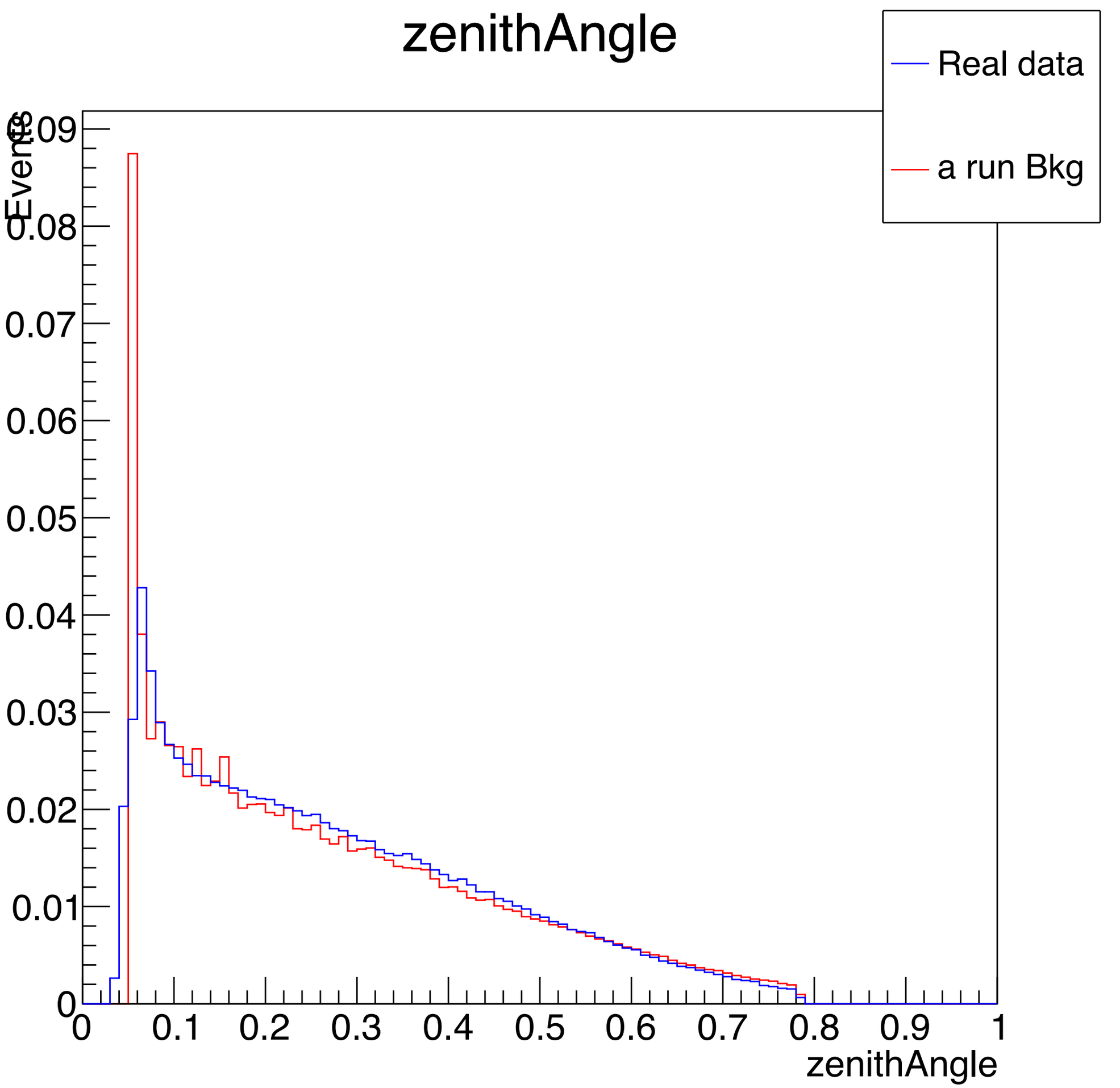

logNPE
Real data
a run Bkg
Events
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2.5
3
3.5
4
4.5
5
5.5
6
logNPE

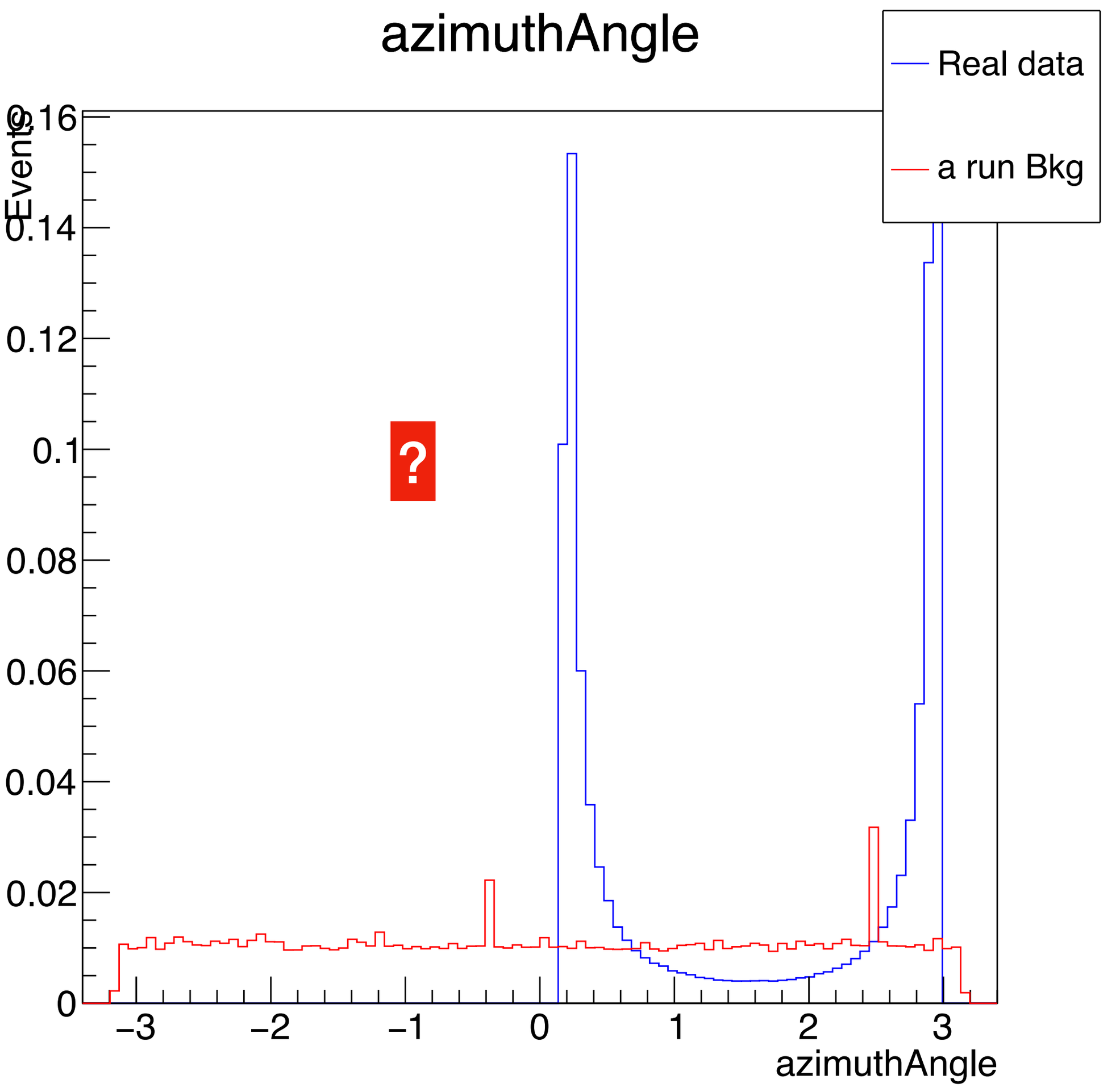

NNEnergyV2
Real data
a run Bkg
Events
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2.5
3
3.5
4
4.5
5
5.5
NNEnergyV2

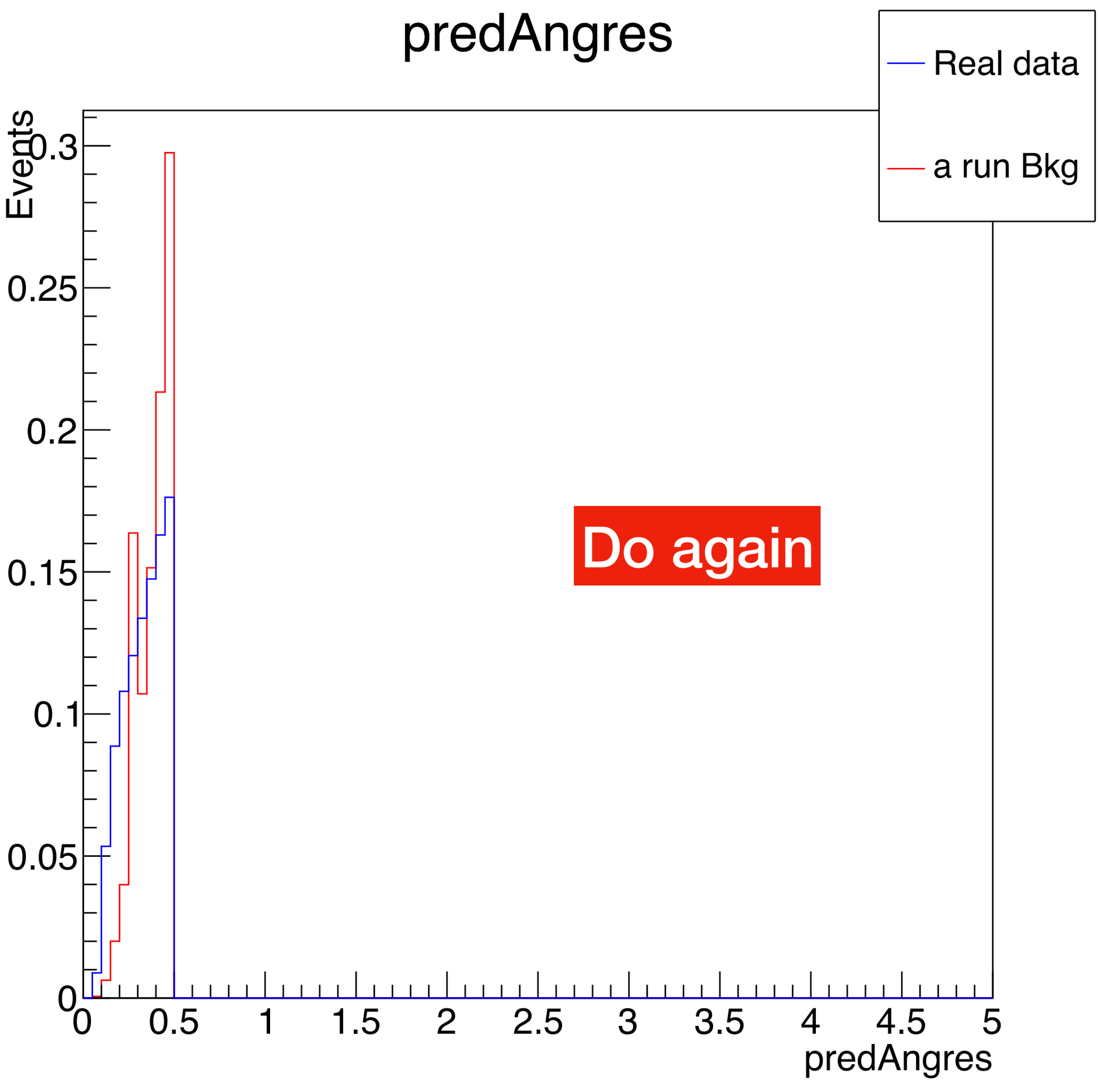

PINC
Real data
a run Bkg
Events
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0
1
2
3
4
5
6
PINC

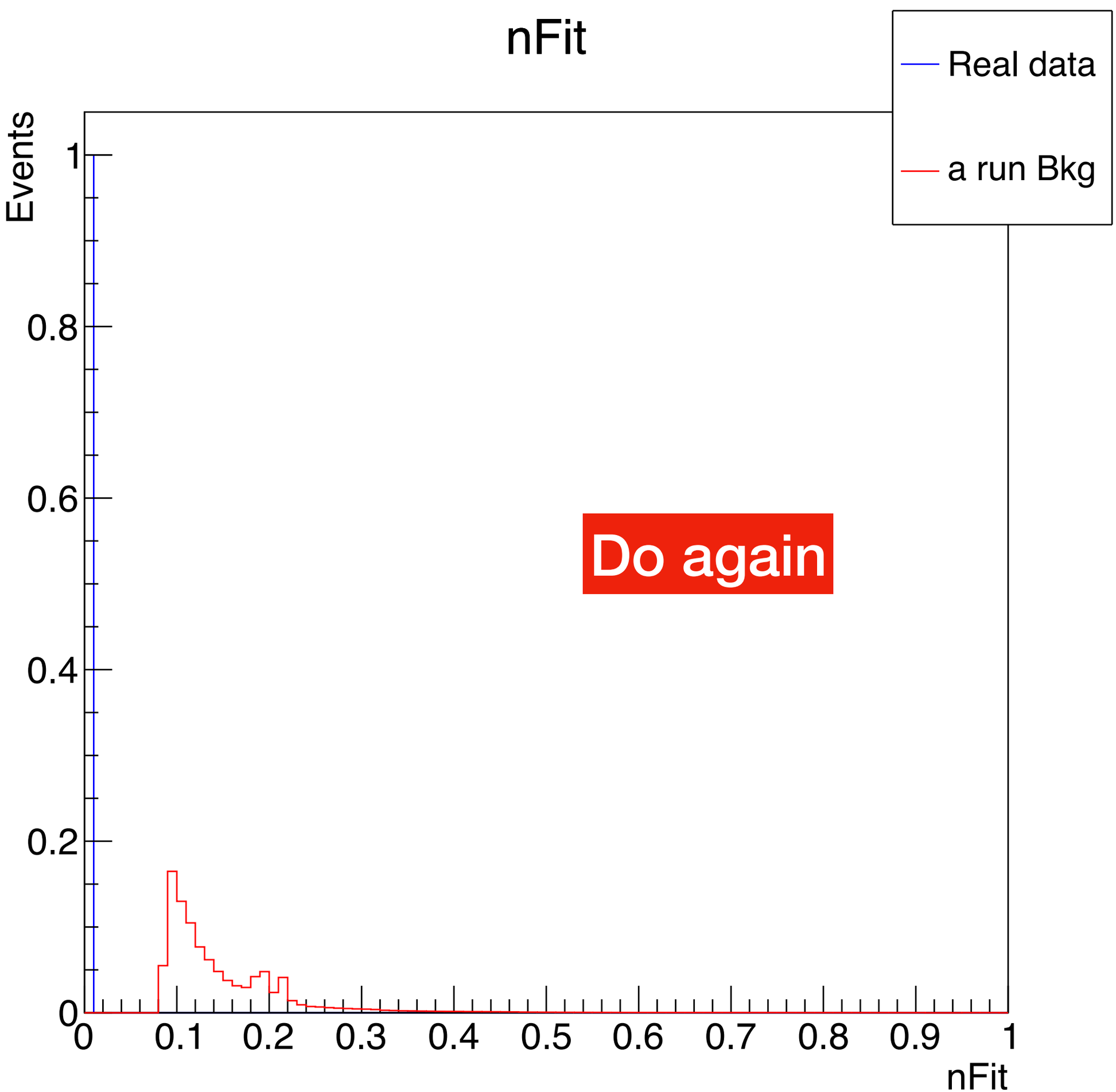

planeChi2
Real data
a run Bkg
Events
0.1
0.08
0.06
0.04
0.02
0
0
200
400
600
800
1000
1200
1400
1600
planeChi2


SFCFChi2
Real data
a run Bkg
Events
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0 1000 2000 3000 4000 5000 6000 7000 8000 900010000
SFCFChi2


zenithAngle
Real data
a run Bkg
Events
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
zenithAngle


azimuthAngle
Real data
a run Bkg
?
Events
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
−3
−2
−1
0
1
2
3
azimuthAngle


predAngres
Real data
a run Bkg
Events
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
predAngres
Do again


nFit
Real data
a run Bkg
Events
1
0.8
0.6
0.4
0.2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
nFit
Do again

Backslide:

Redefined the Bins:

1. angular resolution bin (rec.predAngres) in step of 0.05 from 0 to 0.5.
2. ebin is rec.logNNEnergyV2 in step of 0.25 from 10 ^2.5 - 10^5.25

ebin	min ebin	max ebin	min ebin (GeV)	max bin (Gev)
0	2.50	2.75	316.23	562.34
1	2.75	3.00	562.34	1000.00
2	3.00	3.25	1000.00	1778.28
3	3.25	3.50	1778.28	3162.28
4	3.50	3.75	3162.28	5623.41
5	3.75	4.00	5623.41	10000.00
6	4.00	4.25	10000.00	17782.79
7	4.25	4.50	17782.79	31622.78
8	4.50	4.75	31622.78	56234.13
9	4.75	5.00	56234.13	100000.00
10	5.00	5.25	100000.00	177827.94
11	5.25	5.50	177827.94	316227.77

angre	min	max
0	0.00	0.05
1	0.05	0.10
2	0.10	0.15
3	0.15	0.20
4	0.20	0.25
5	0.25	0.30
6	0.30	0.35
7	0.35	0.40
8	0.40	0.45
9	0.45	0.50

$\hat{E} = \log_{10}(E / 1\ \text{GeV})$

NN2INNWW optimal cuts

Angre bin	ebin											
	0	1	2	3	4	5	6	7	8	9	10	11
1							0.85	0.77	1.00	1.00	1.00	1.00
2					0.97	0.92	0.85	0.78	0.99	1.00	1.00	1.00
3			0.85	0.86	0.93	0.90	0.89	0.83	0.98	0.99	0.99	0.99
4			0.82	0.85	0.91	0.88	0.90	0.83	0.98	0.98	1.00	0.99
5		0.78	0.80	0.82	0.81	0.89	0.93	0.91	0.92	0.93	0.93	0.86
6	0.80	0.67	0.77	0.83	0.81	0.85	0.88	0.92	0.75	0.83	0.74	0.56
7	0.39	0.73	0.75	0.78	0.83	0.81	0.92	0.88				
8	0.60	0.66	0.76	0.75	0.81	0.84	0.91					
9	0.63	0.68	0.68	0.74	0.81	0.73						
1cut	0.74	0.66	0.78	0.85	0.92	0.93	0.91	0.78	1.00	1.00	1.00	1.00
BC-	0	0	0	0	1	1	1	1	2	2	2	2