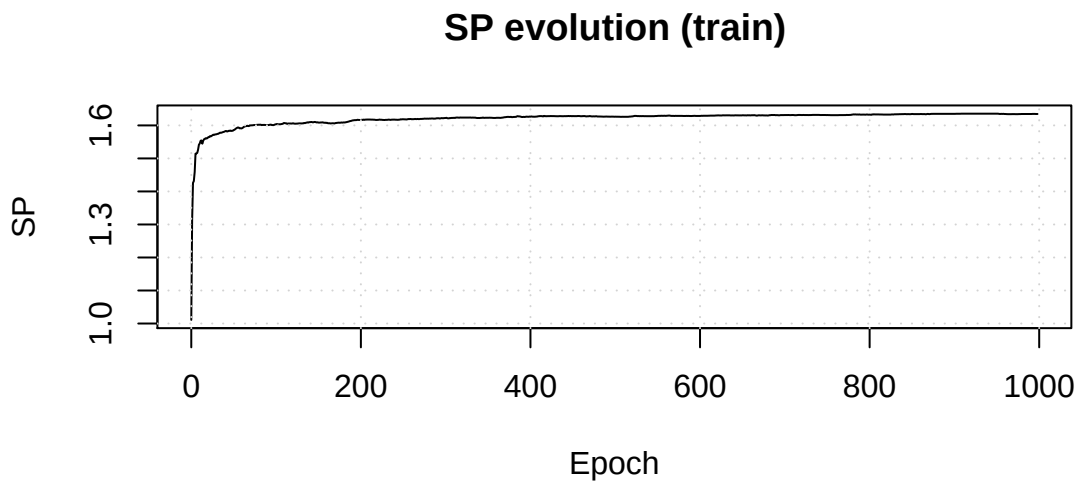
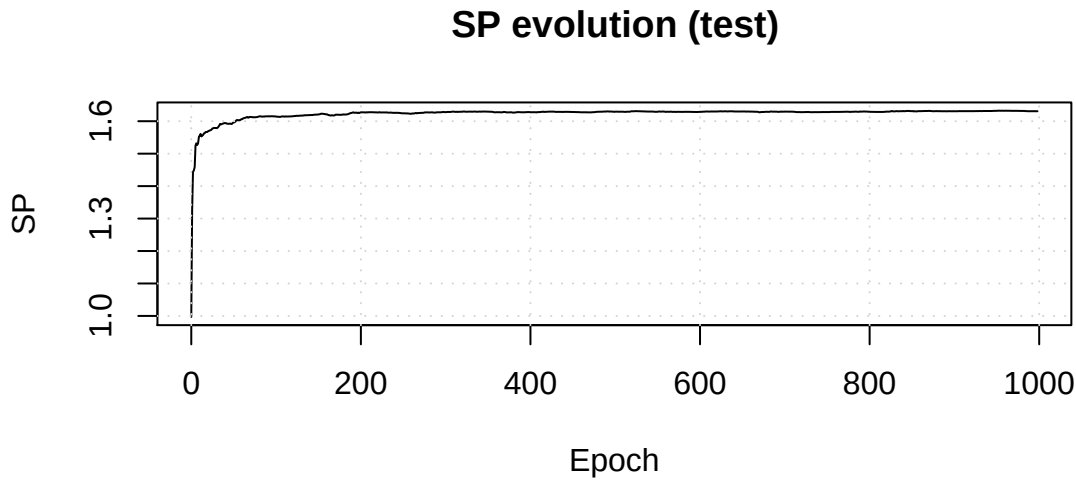
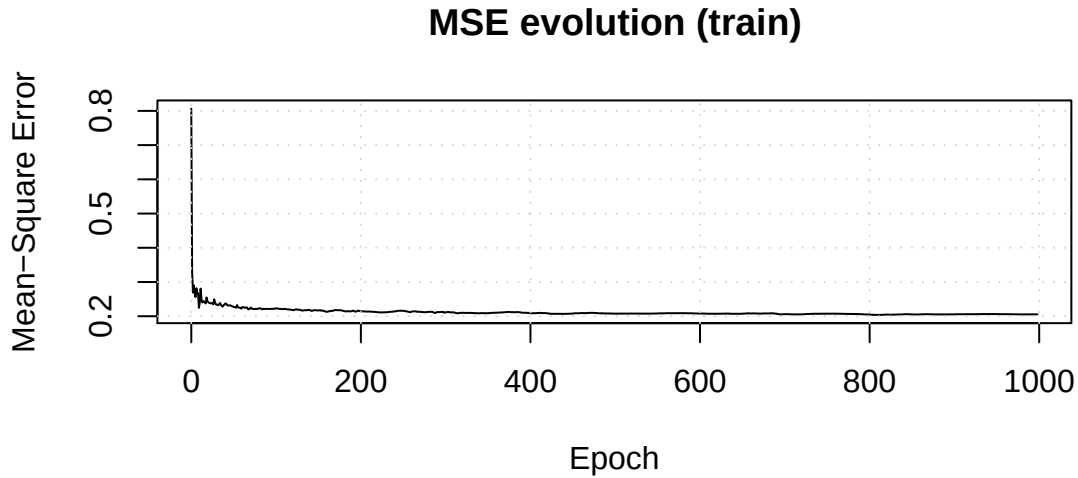
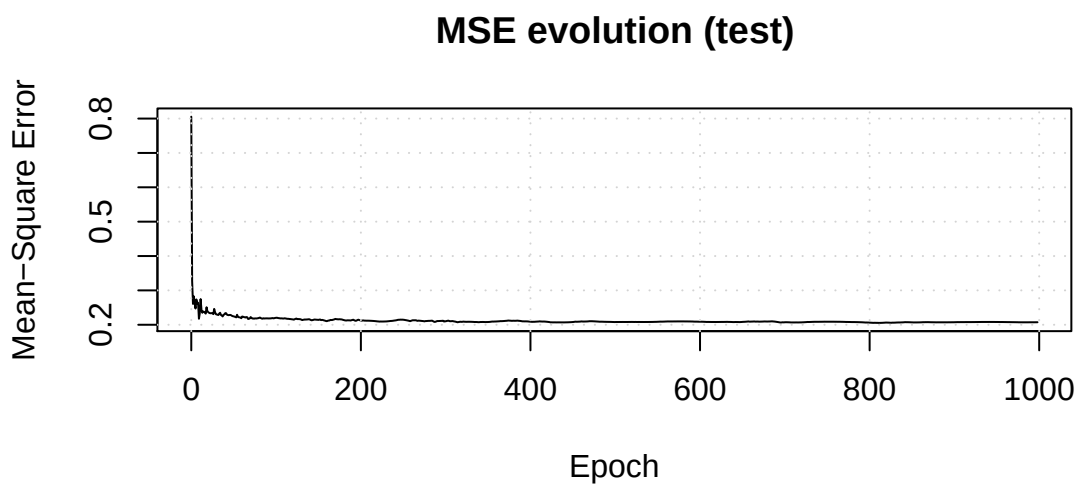
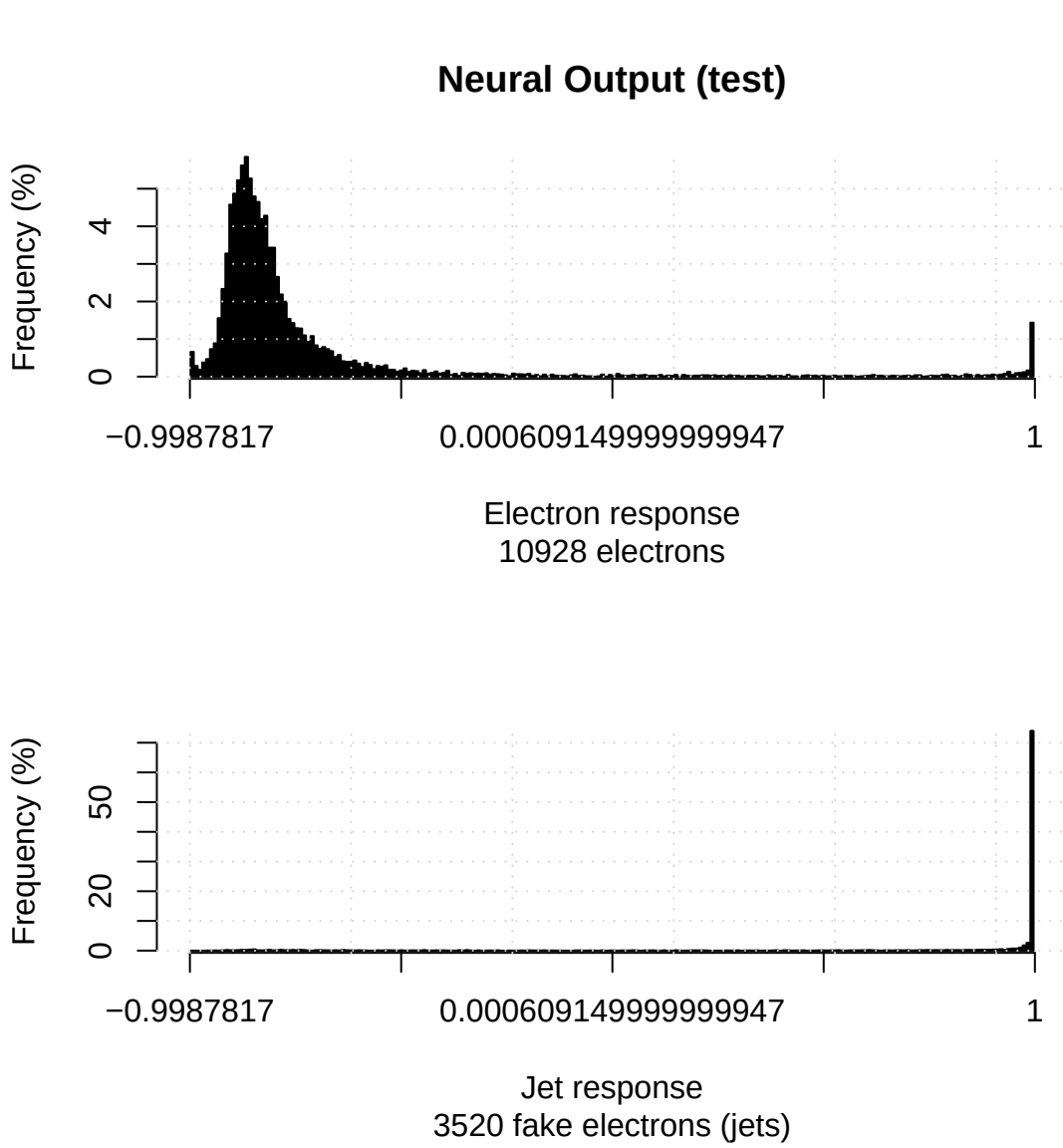
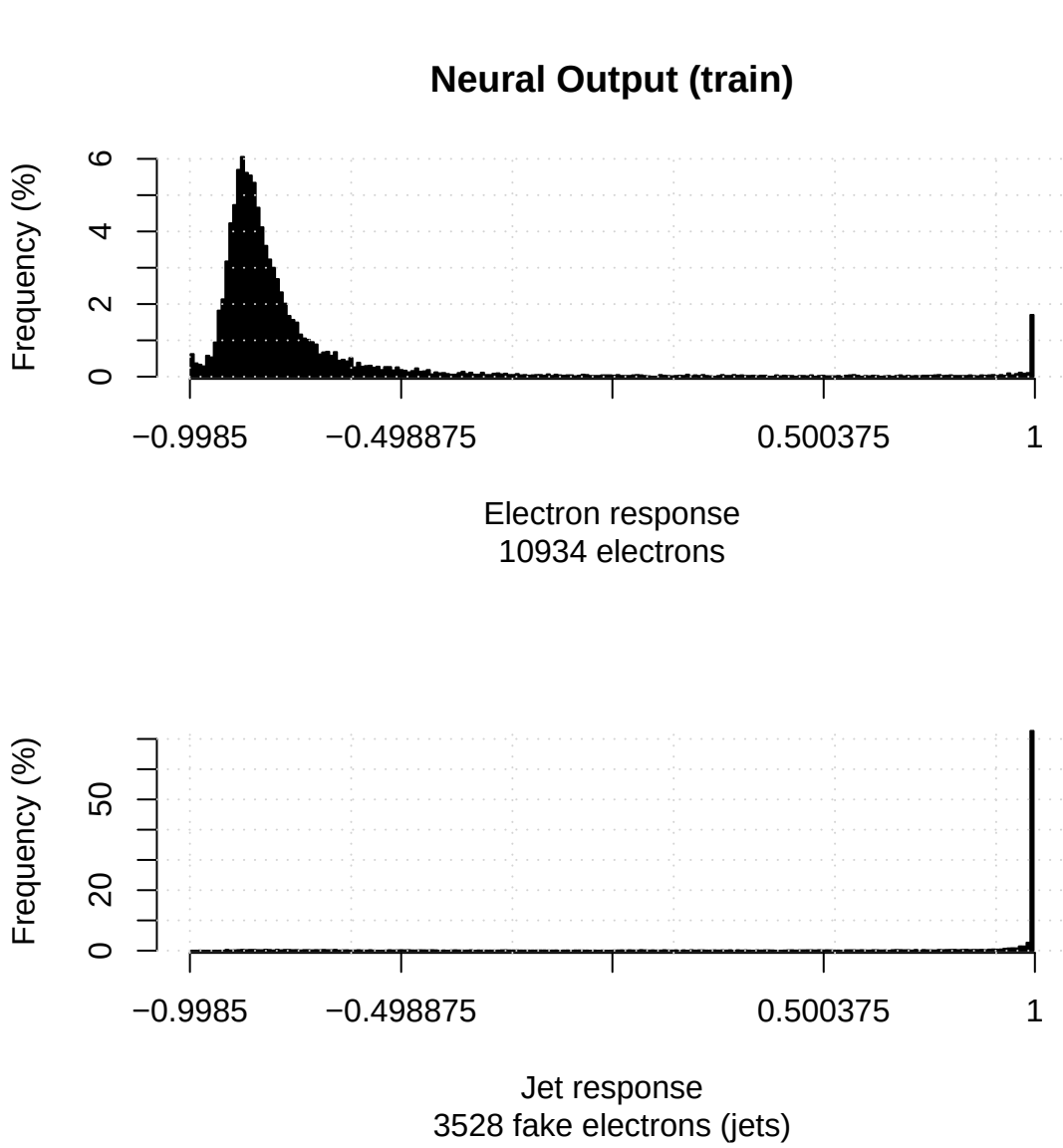

SP evolution (train)
SP
1.0
1.3
1.6
0
200
400
600
800
1000
Epoch

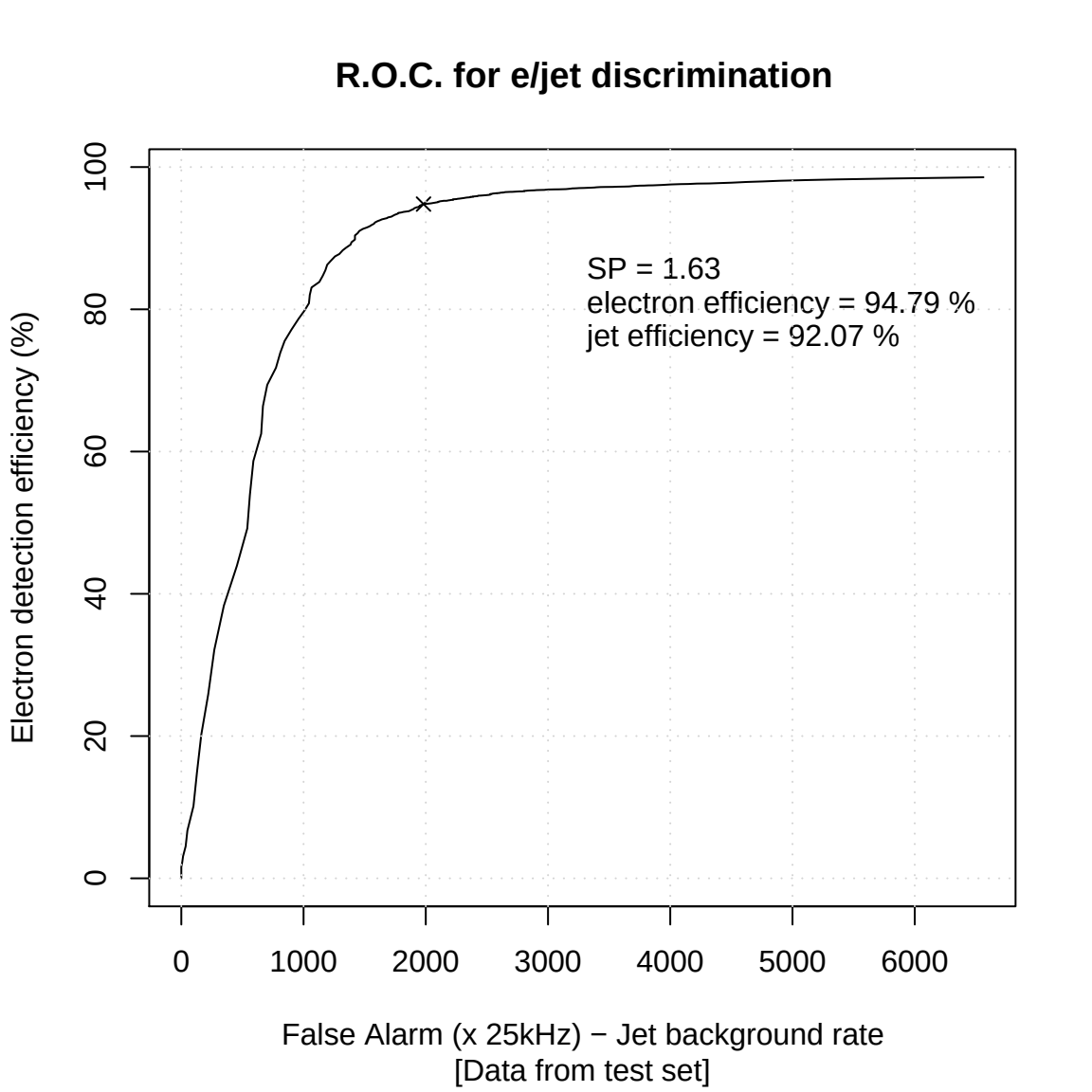

SP evolution (test)
SP
1.0
1.3
1.6
0
200
400
600
800
1000
Epoch

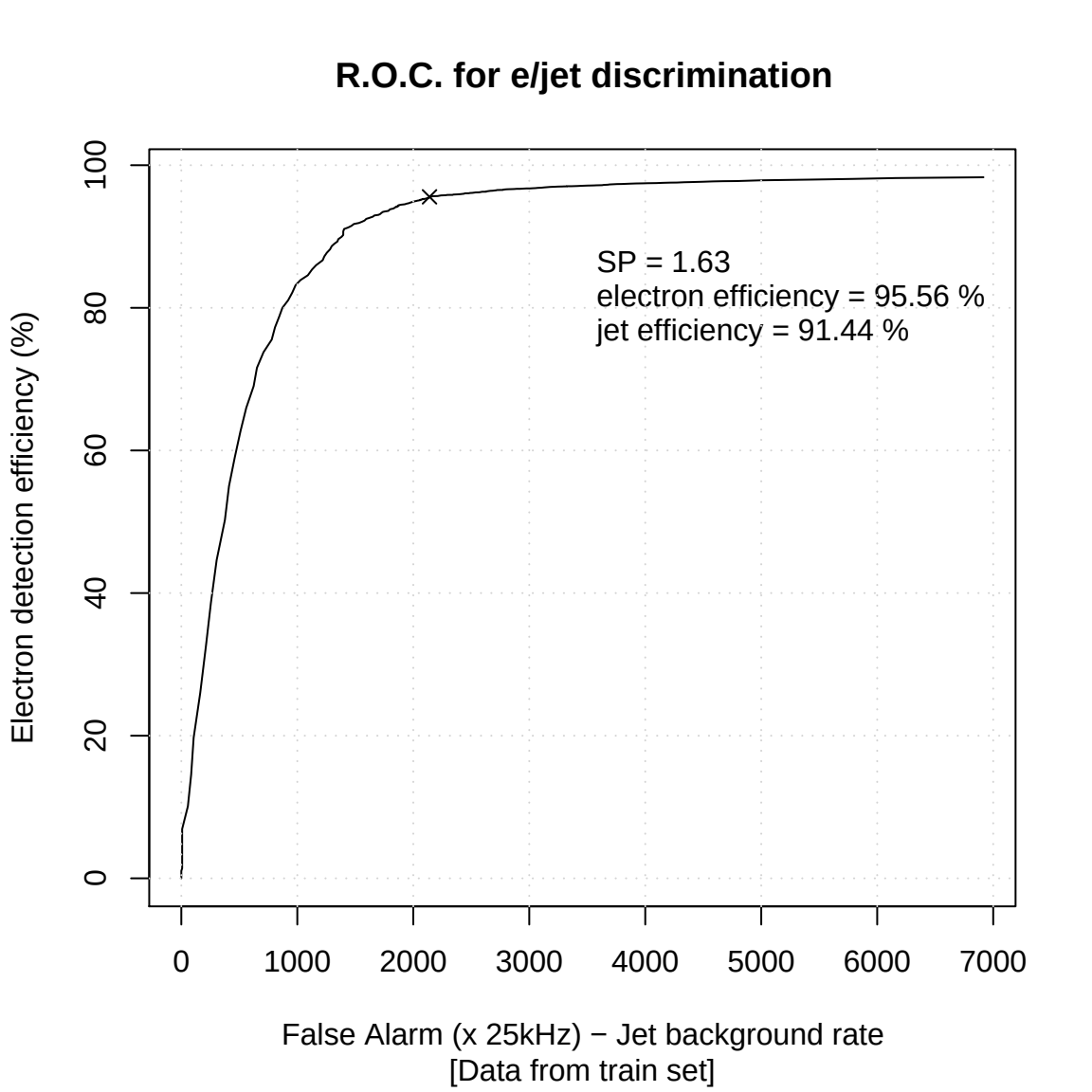

MSE evolution (train)
Mean−Square Error
0.2
0.5
0.8
0
200
400
600
800
1000
Epoch

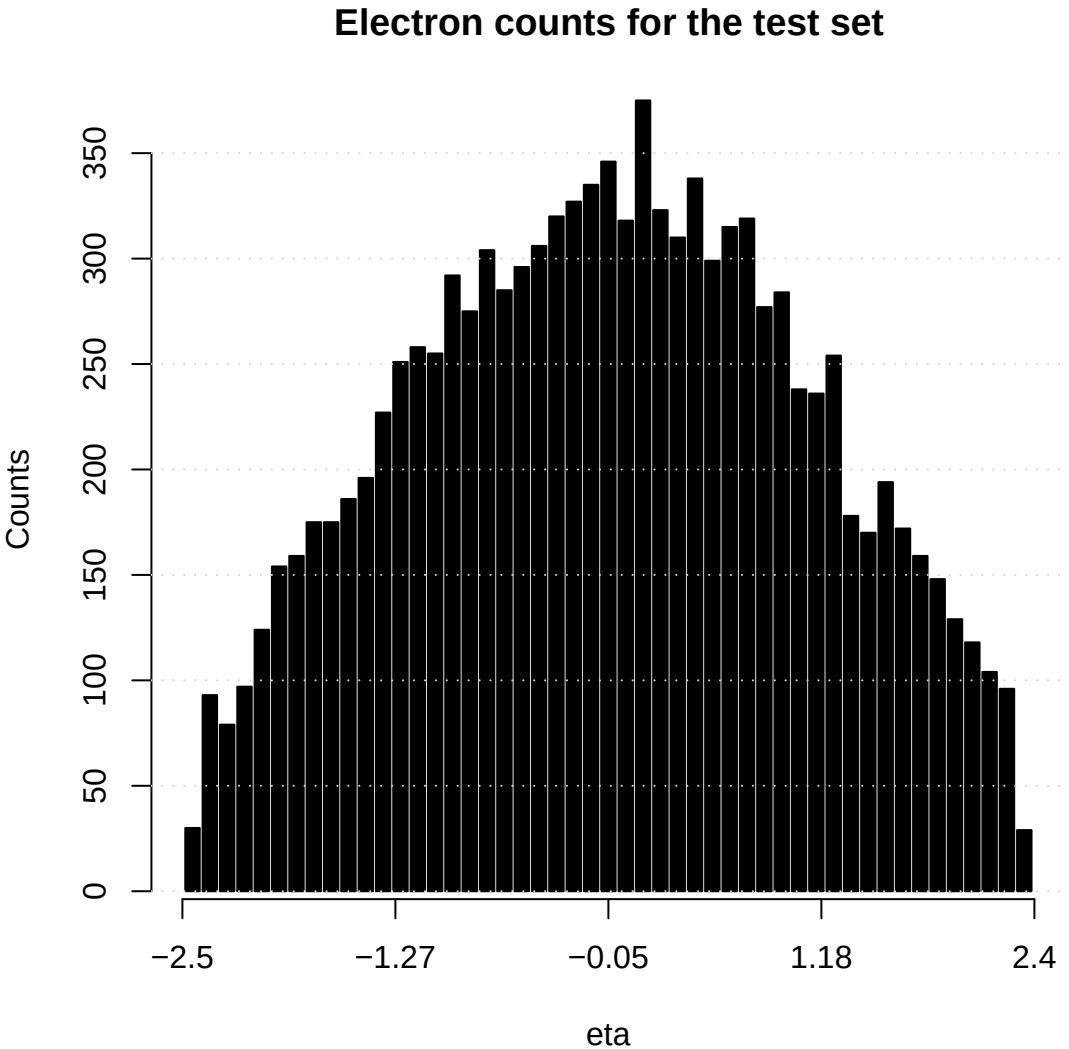

MSE evolution (test)
Mean−Square Error
0.2
0.5
0.8
0
200
400
600
800
1000
Epoch

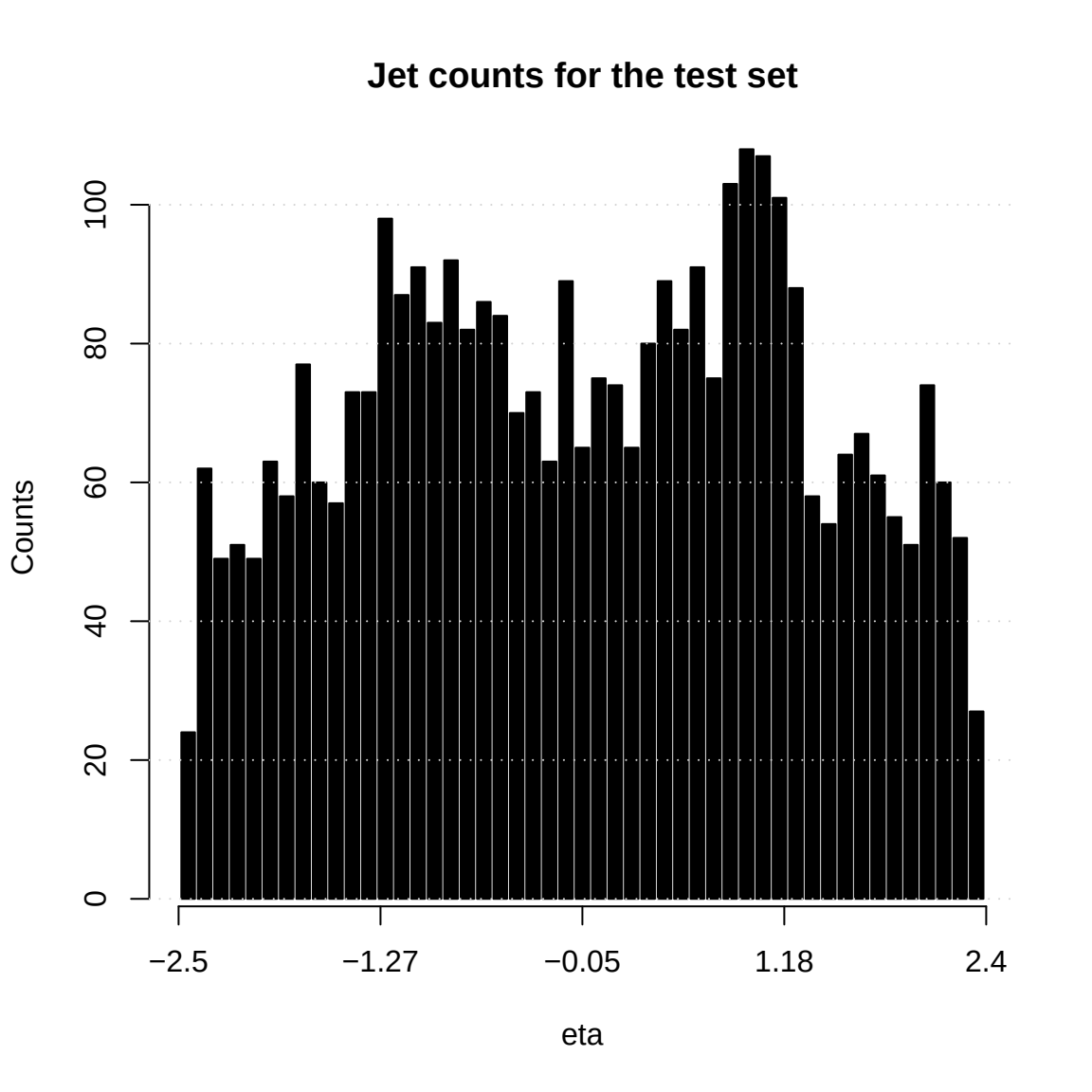

Neural Output (test)
Frequency (%)
0
2
4
−0.9987817
0.000609149999999947
1
Electron response
10928 electrons
Frequency (%)
0
20
50
−0.9987817
0.000609149999999947
1
Jet response
3520 fake electrons (jets)

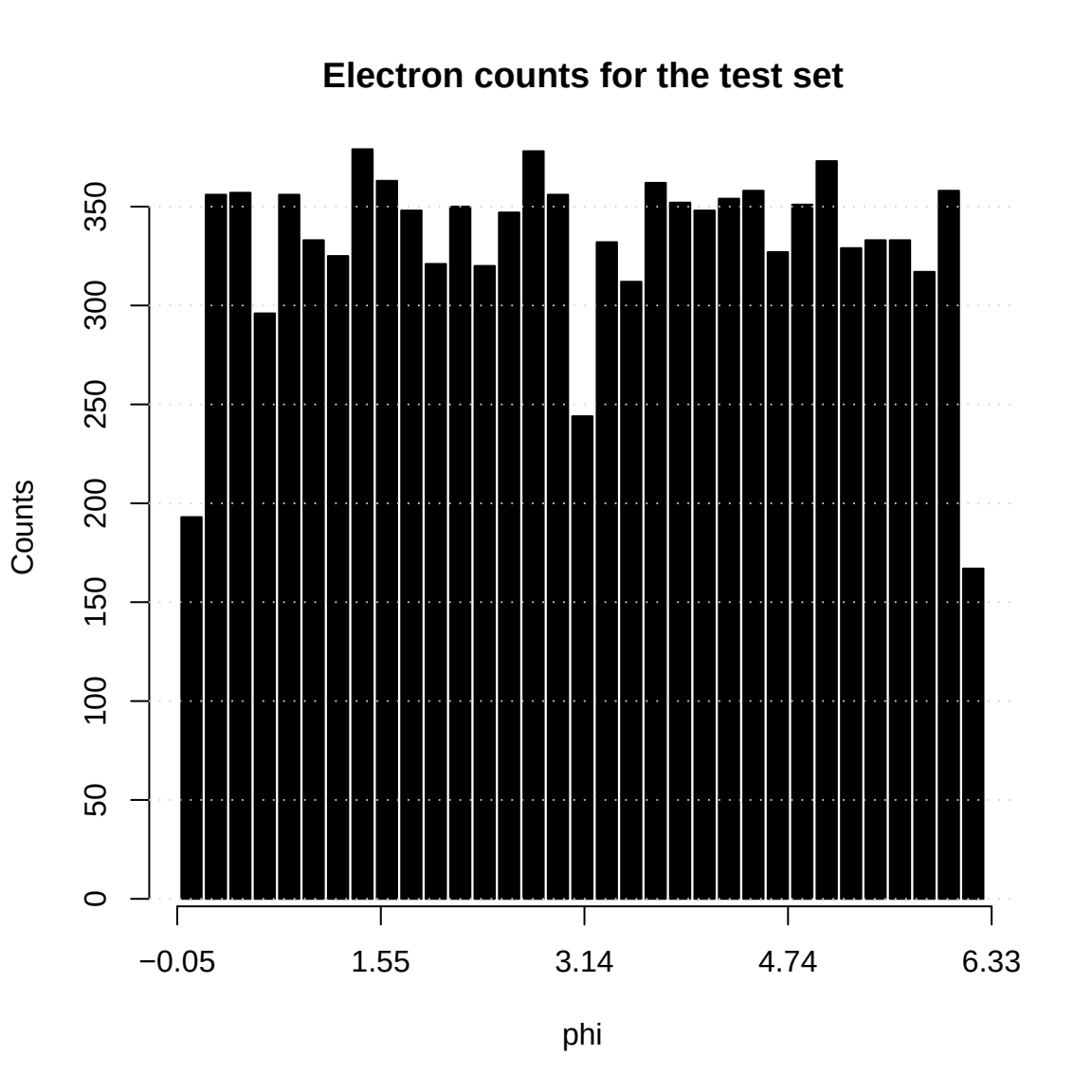

Neural Output (train)
Frequency (%)
0
2
4
6
−0.9985
−0.498875
0.500375
1
Electron response
10934 electrons
Frequency (%)
0
20
50
−0.9985
−0.498875
0.500375
1
Jet response
3528 fake electrons (jets)

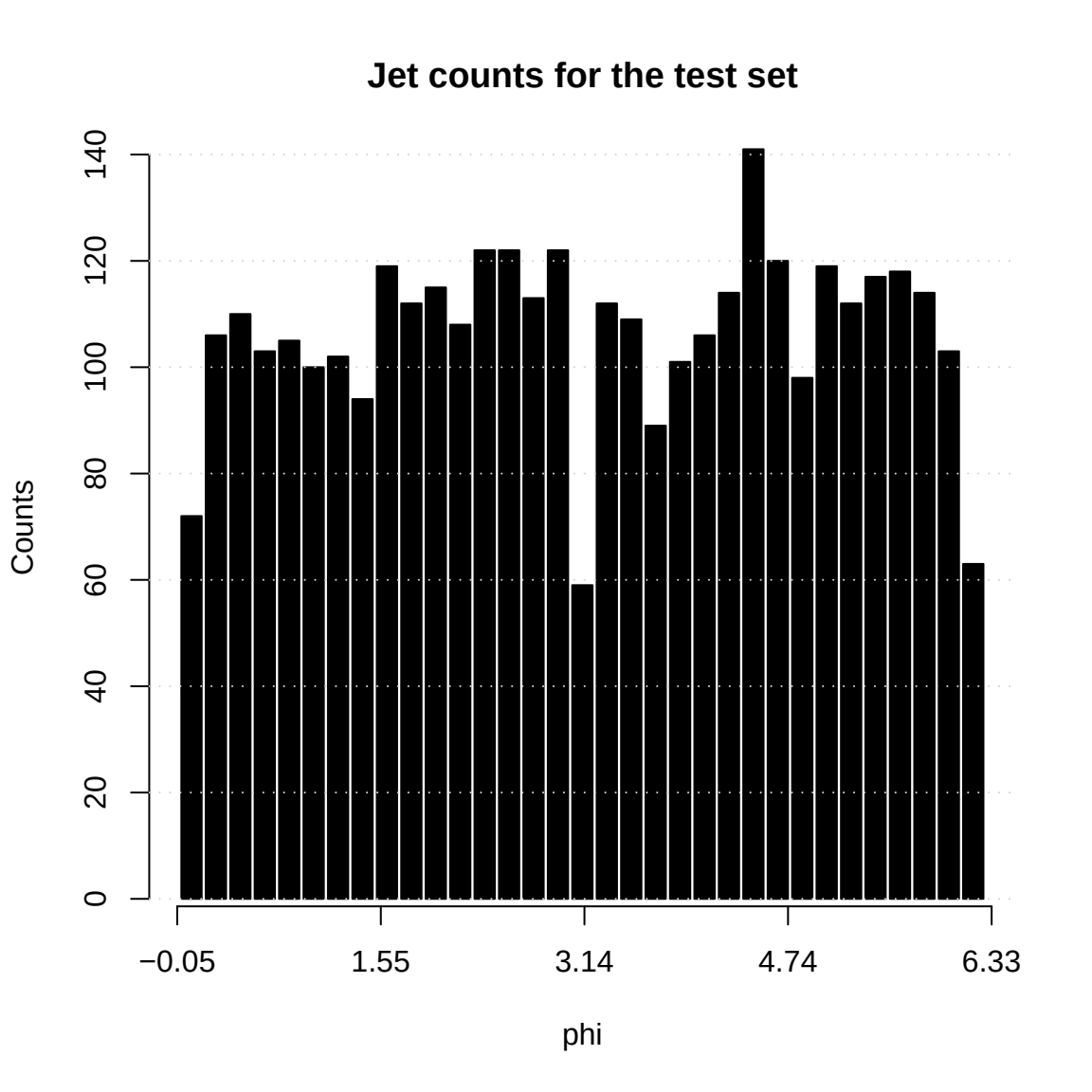

R.O.C. for e/jet discrimination
Electron detection efficiency (%)
0
20
40
60
80
100
0
1000
2000
3000
4000
5000
6000
SP = 1.63
electron efficiency = 94.79 %
jet efficiency = 92.07 %
False Alarm (x 25kHz) − Jet background rate
[Data from test set]

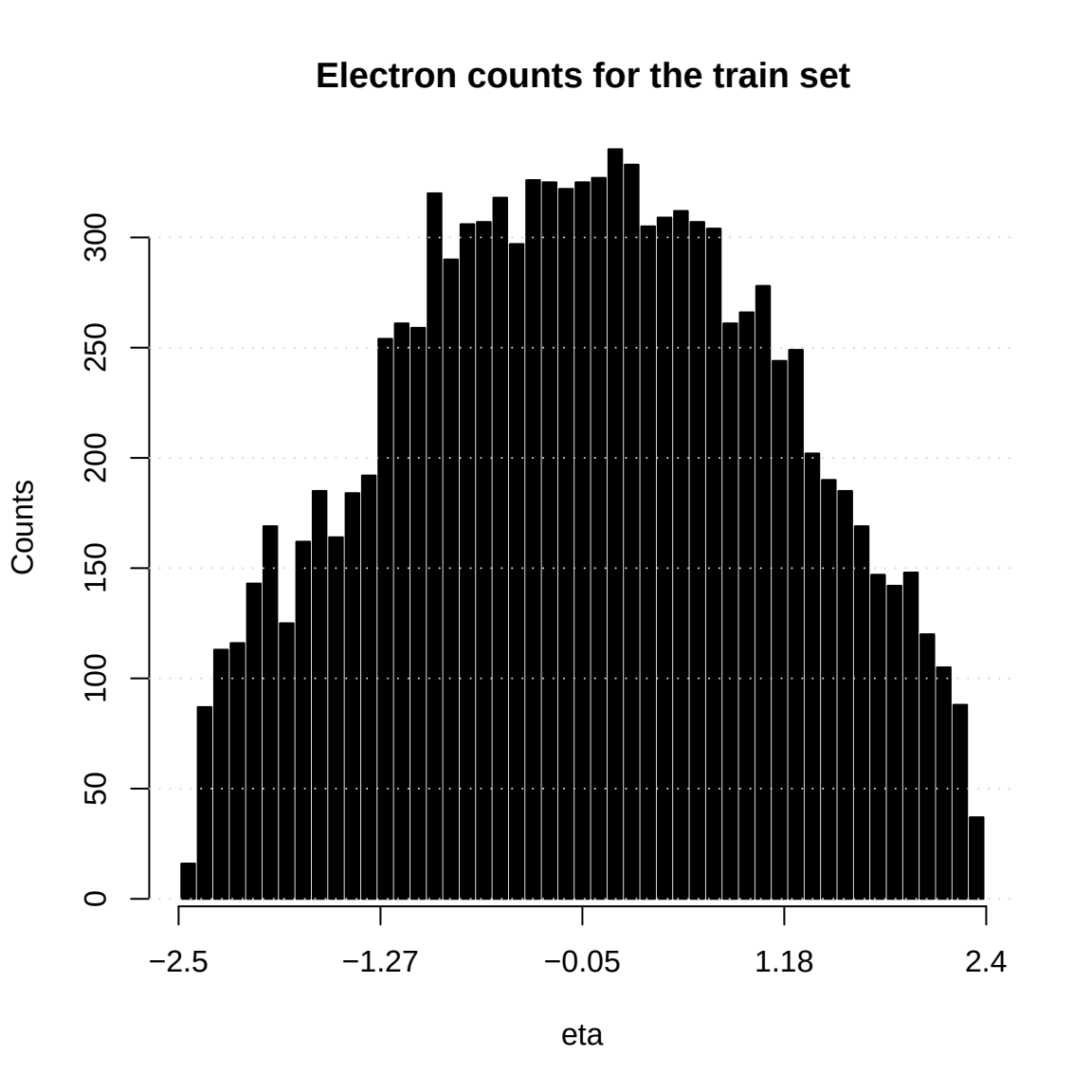

R.O.C. for e/jet discrimination
SP = 1.63
electron efficiency = 95.56 %
jet efficiency = 91.44 %
Electron detection efficiency (%)
0
20
40
60
80
100
0
1000
2000
3000
4000
5000
6000
7000
False Alarm (x 25kHz) − Jet background rate
[Data from train set]

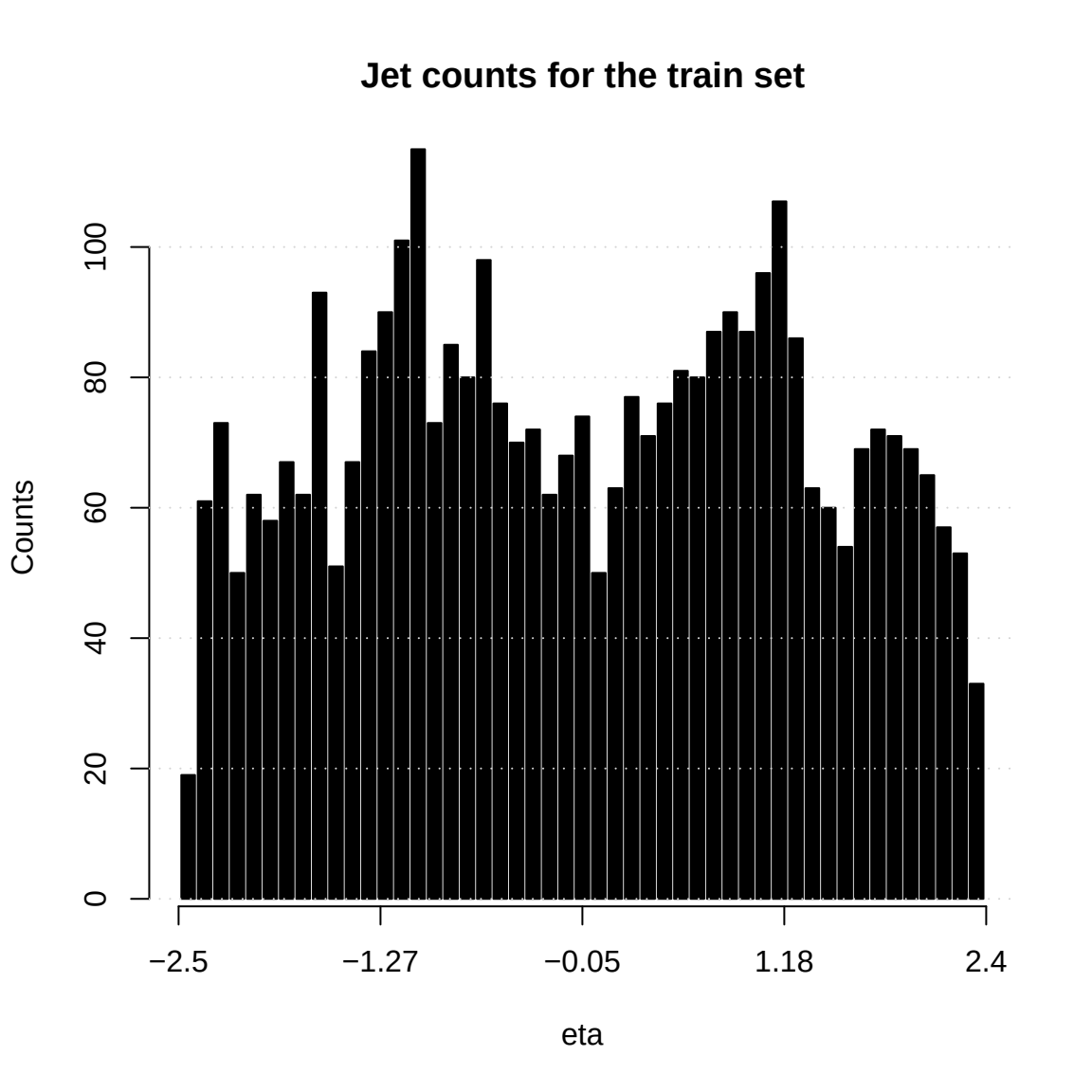

Electron counts for the test set
Counts
0
50
100
150
200
250
300
350
−2.5
−1.27
−0.05
1.18
2.4
eta

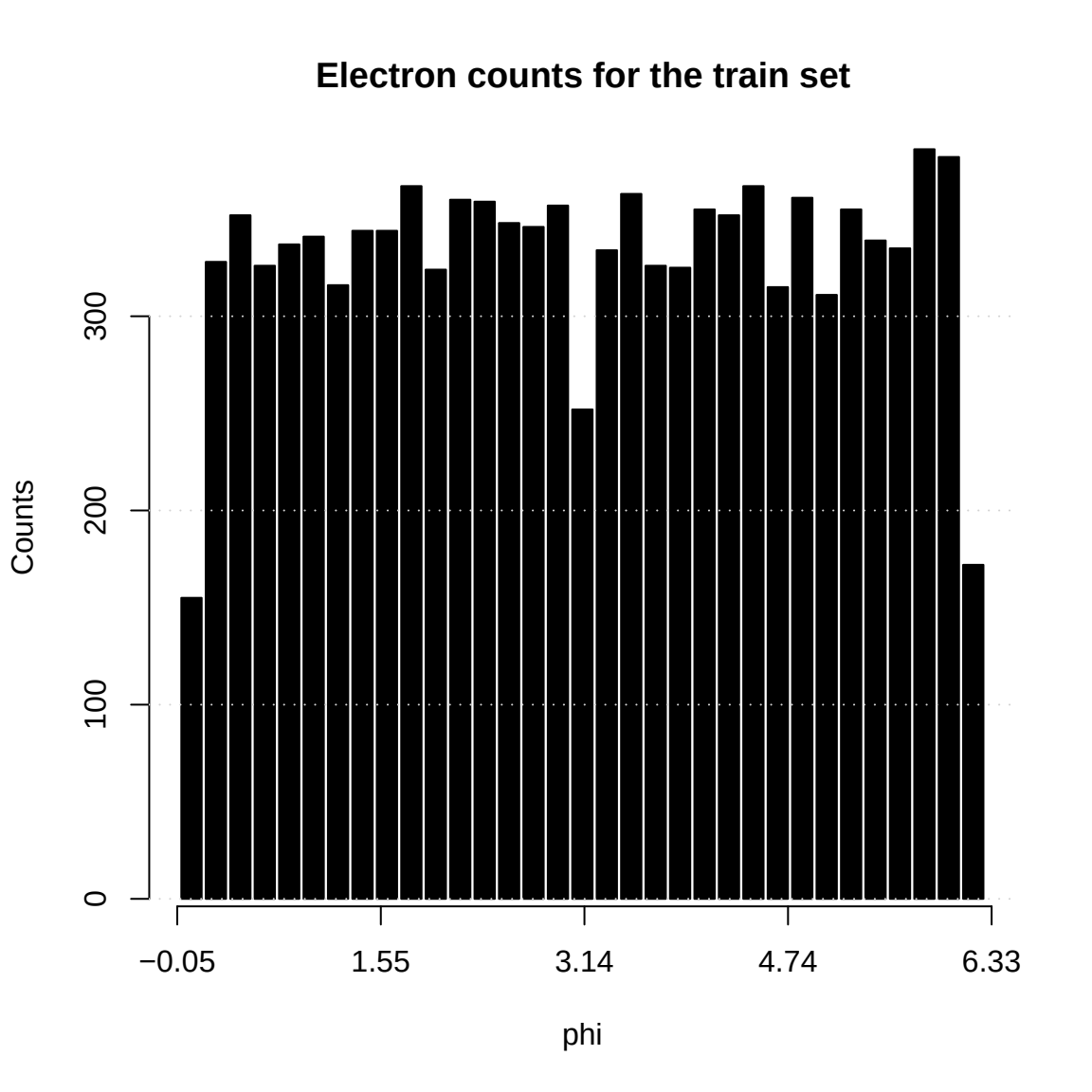

Jet counts for the test set
Counts
0
20
40
60
80
100
−2.5
−1.27
−0.05
1.18
2.4
eta

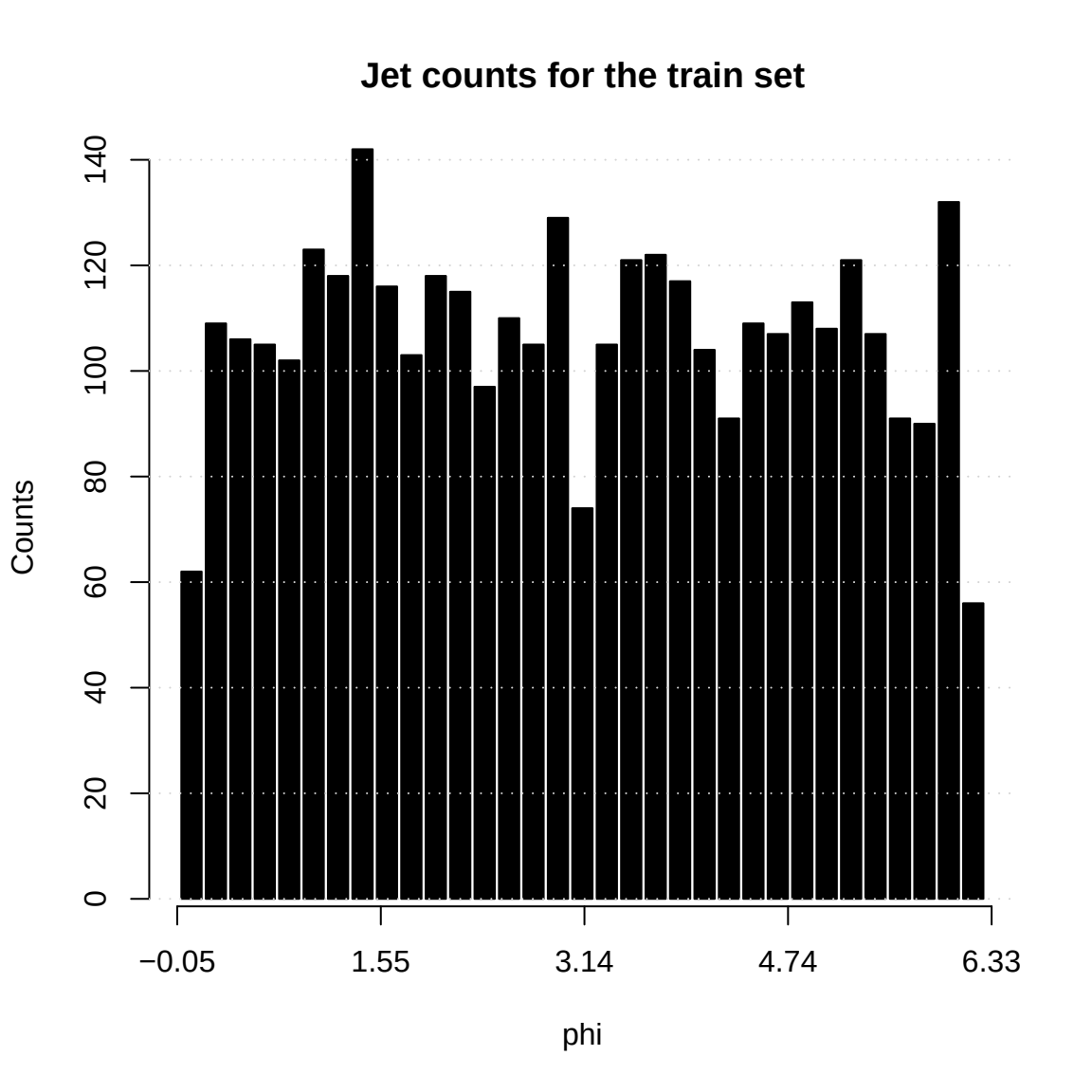

Electron counts for the test set
Counts
0
50
100
150
200
250
300
350
−0.05
1.55
3.14
4.74
6.33
phi

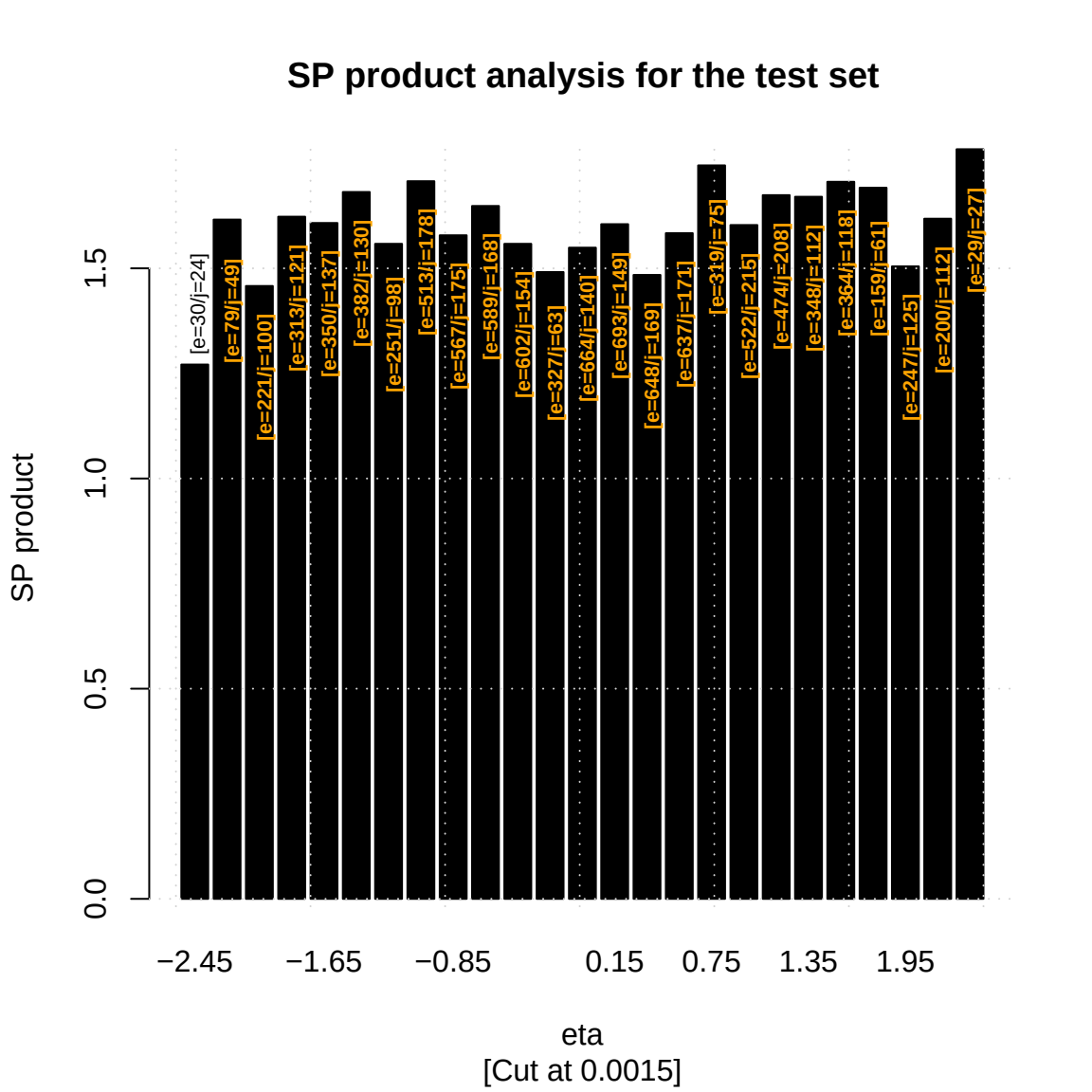

Jet counts for the test set
Counts
0
20
40
60
80
100
120
140
−0.05
1.55
3.14
4.74
6.33
phi

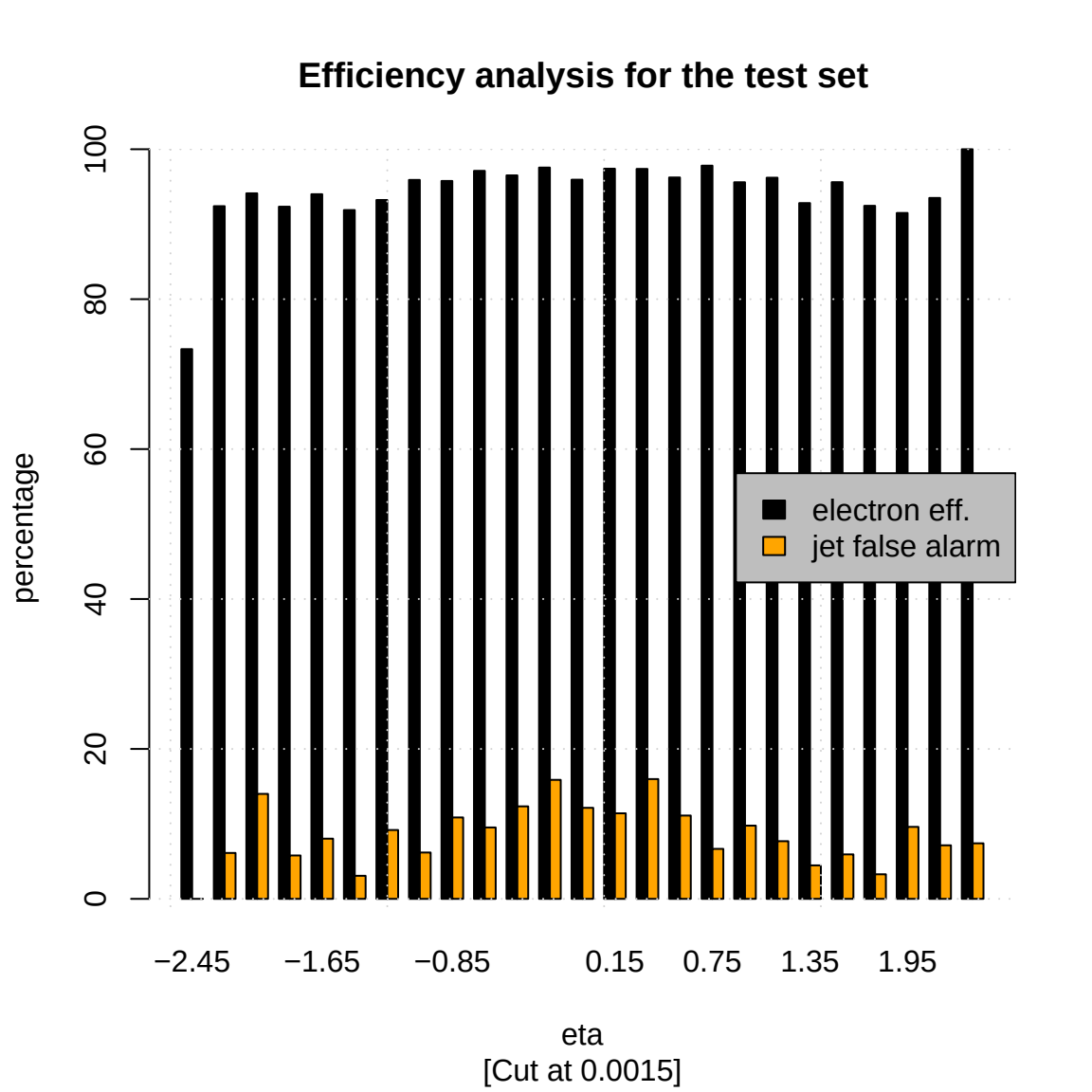

Electron counts for the train set
Counts
0
50
100
150
200
250
300
−2.5
−1.27
−0.05
1.18
2.4
eta


Jet counts for the train set
Counts
0
20
40
60
80
100
−2.5
−1.27
−0.05
1.18
2.4
eta

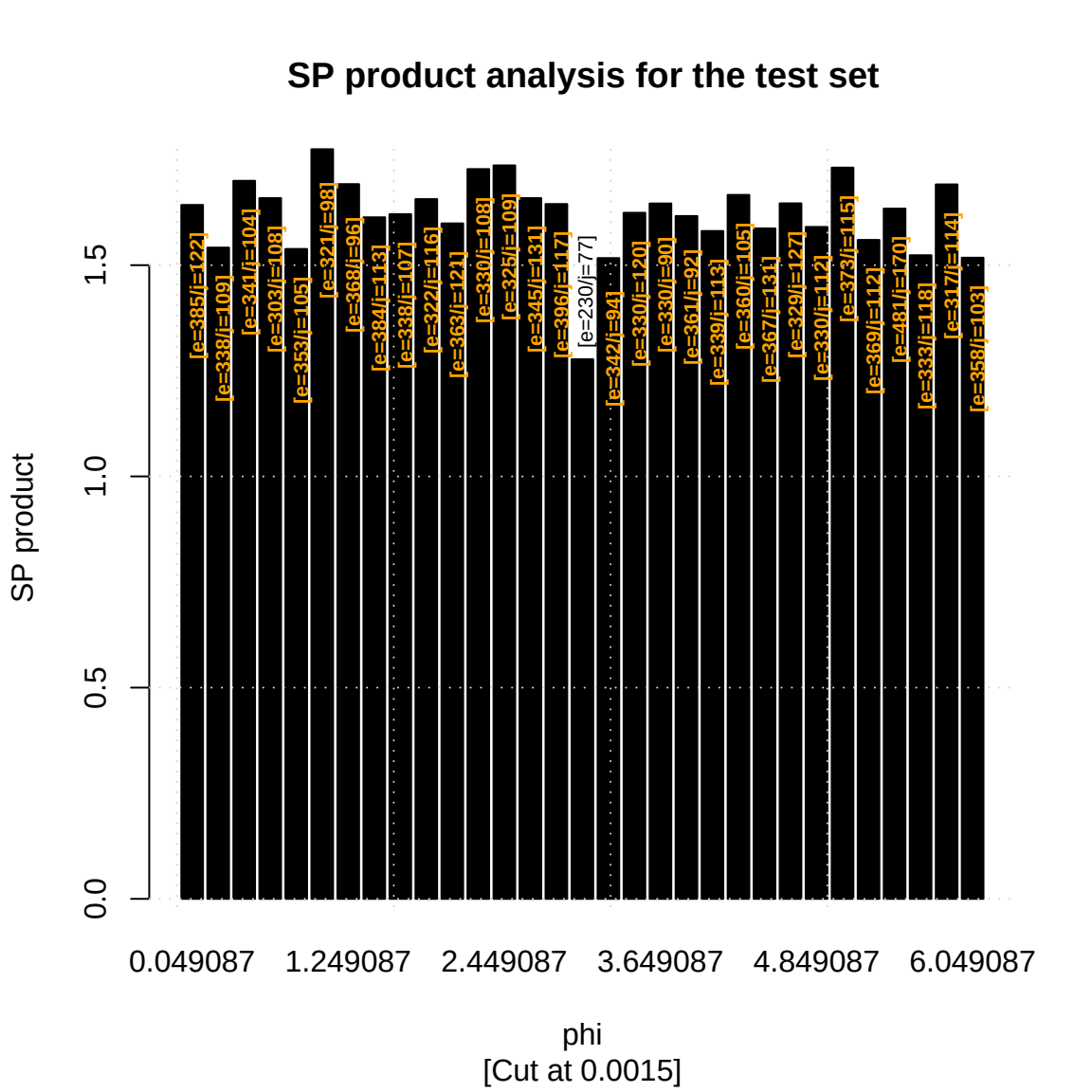

Electron counts for the train set
Counts
0
100
200
300
−0.05
1.55
3.14
4.74
6.33
phi

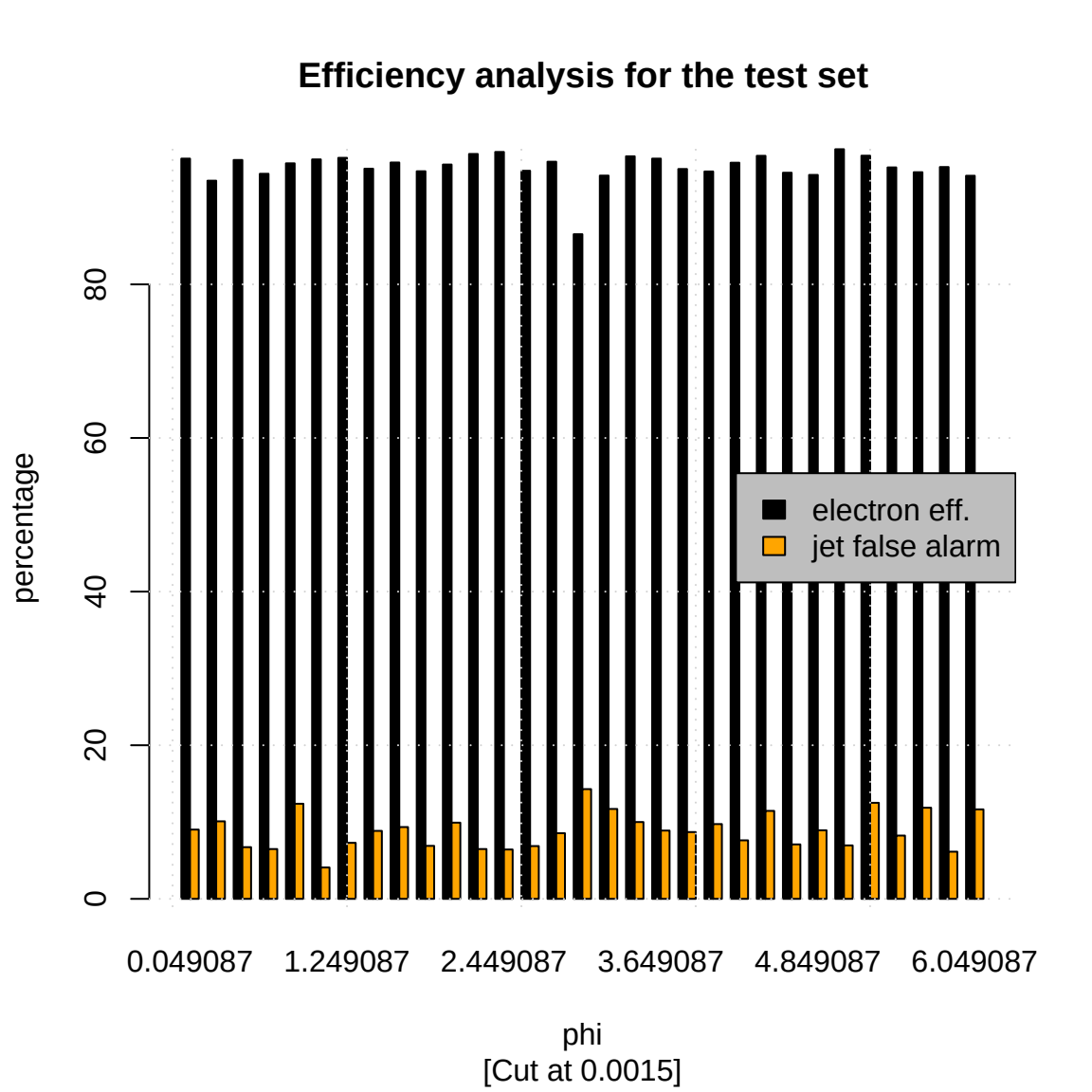

Jet counts for the train set
Counts
0
20
40
60
80
100
120
140
−0.05
1.55
3.14
4.74
6.33
phi

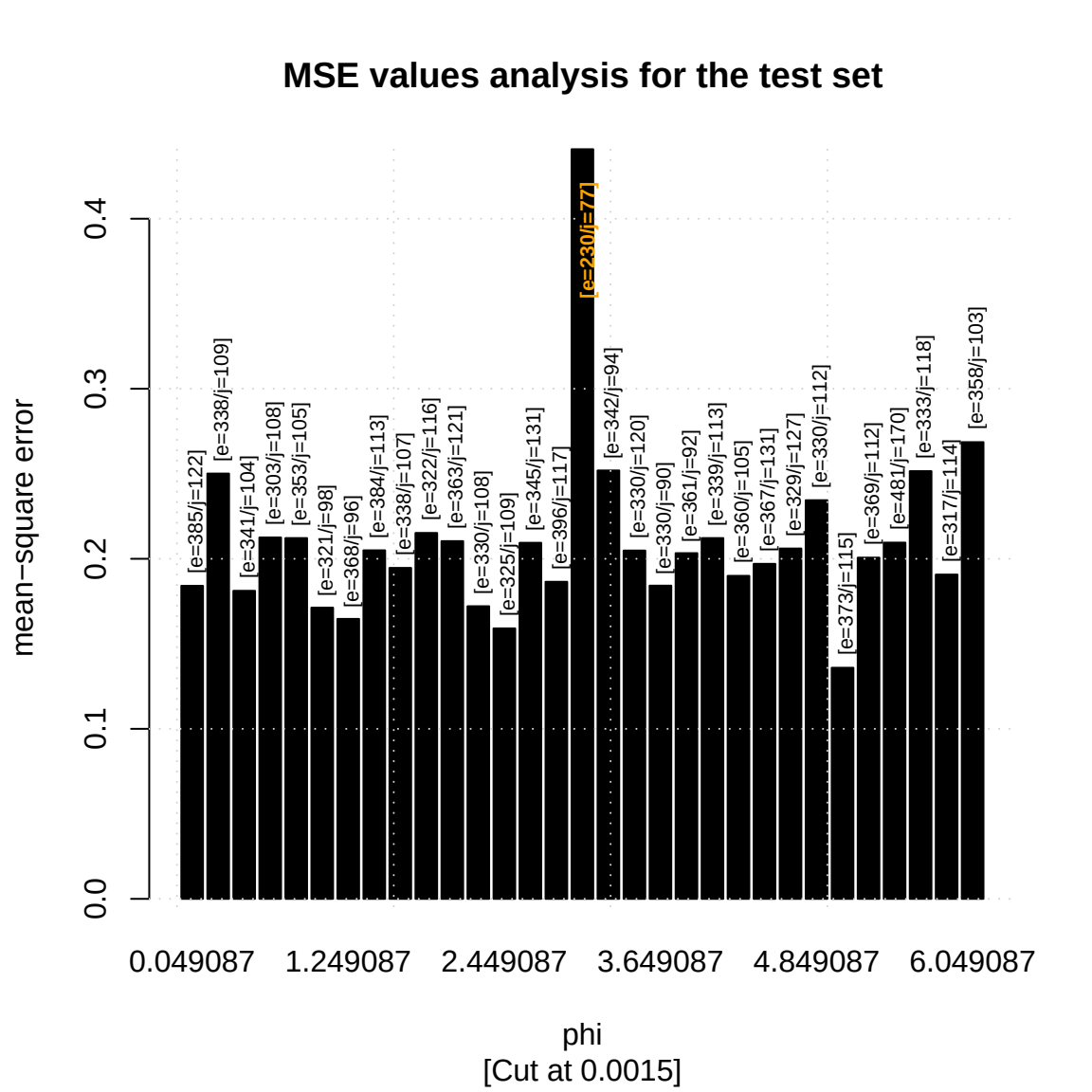

SP product analysis for the test set
SP product
0.0
0.5
1.0
1.5
[e=30/j=24]
[e=79/j=49]
[e=221/j=100]
[e=313/j=121]
[e=350/j=137]
[e=382/j=130]
[e=251/j=98]
[e=513/j=178]
[e=567/j=175]
[e=589/j=168]
[e=602/j=154]
[e=327/j=63]
[e=664/j=140]
[e=693/j=149]
[e=648/j=169]
[e=637/j=171]
[e=319/j=75]
[e=522/j=215]
[e=474/j=208]
[e=348/j=112]
[e=364/j=118]
[e=159/j=61]
[e=247/j=125]
[e=200/j=112]
[e=29/j=27]
−2.45
−1.65
−0.85
0.15
0.75
1.35
1.95
eta
[Cut at 0.0015]

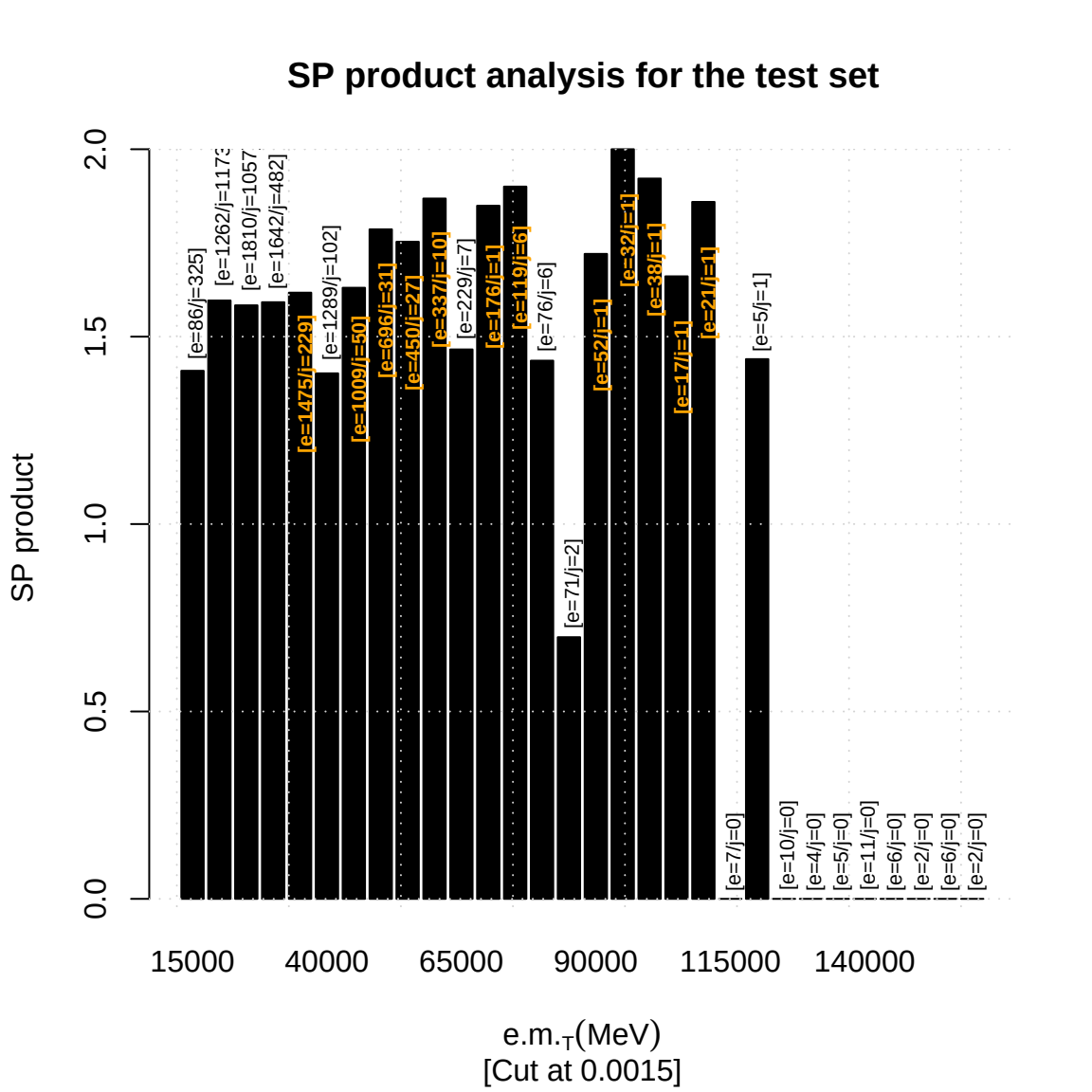

Efficiency analysis for the test set
percentage
0
20
40
60
80
100
electron eff.
jet false alarm
−2.45
−1.65
−0.85
0.15
0.75
1.35
1.95
eta
[Cut at 0.0015]

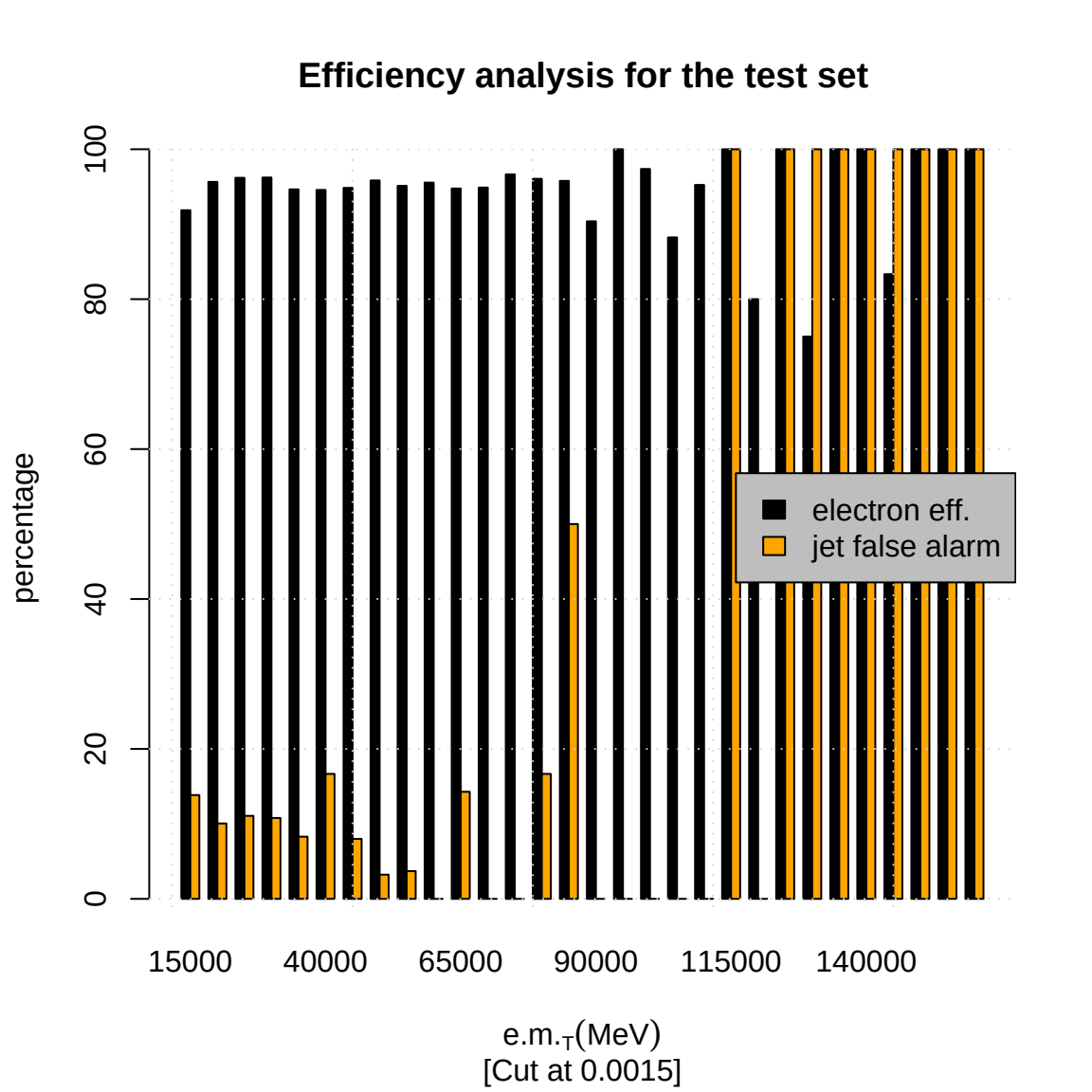
MSE values analysis for the test set
mean−square error
0.0
0.1
0.2
0.3
0.4
[e=30/j=24]
[e=79/j=49]
[e=221/j=100]
[e=313/j=121]
[e=350/j=137]
[e=382/j=130]
[e=251/j=98]
[e=513/j=178]
[e=567/j=175]
[e=589/j=168]
[e=602/j=154]
[e=327/j=63]
[e=664/j=140]
[e=693/j=149]
[e=648/j=169]
[e=637/j=171]
[e=319/j=75]
[e=522/j=215]
[e=474/j=208]
[e=348/j=112]
[e=364/j=118]
[e=159/j=61]
[e=247/j=125]
[e=200/j=112]
[e=29/j=27]
−2.45
−1.65
−0.85
0.15
0.75
1.35
1.95
eta
[Cut at 0.0015]

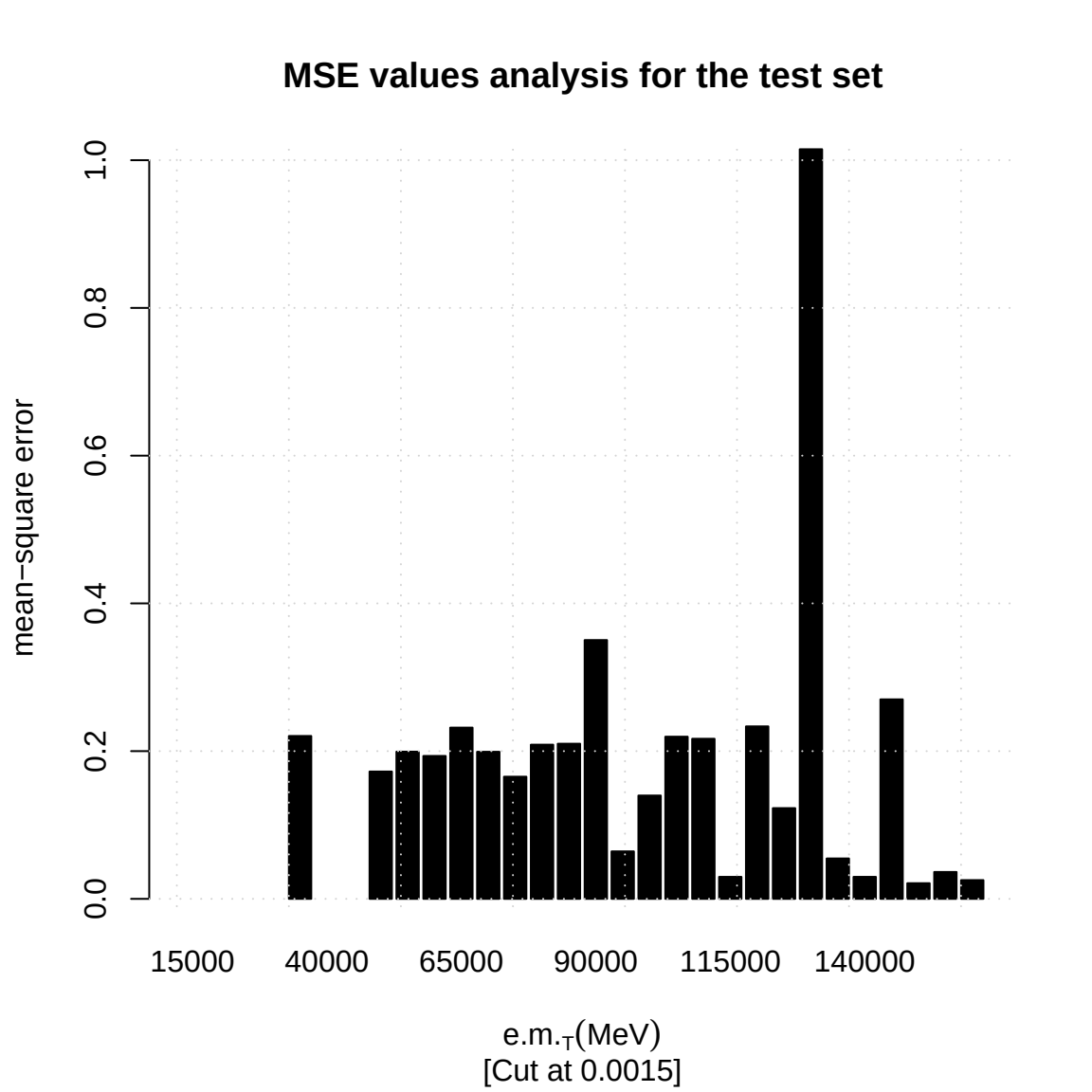

SP product analysis for the test set
SP product
0.0
0.5
1.0
1.5
[e=385/j=122]
[e=338/j=109]
[e=341/j=104]
[e=303/j=108]
[e=353/j=105]
[e=321/j=98]
[e=368/j=96]
[e=384/j=113]
[e=338/j=107]
[e=322/j=116]
[e=363/j=121]
[e=330/j=108]
[e=325/j=109]
[e=345/j=131]
[e=396/j=117]
[e=230/j=77]
[e=342/j=94]
[e=330/j=120]
[e=330/j=90]
[e=361/j=92]
[e=339/j=113]
[e=360/j=105]
[e=367/j=131]
[e=329/j=127]
[e=330/j=112]
[e=373/j=115]
[e=369/j=112]
[e=481/j=170]
[e=333/j=118]
[e=317/j=114]
[e=358/j=103]
0.049087
1.249087
2.449087
3.649087
4.849087
6.049087
phi
[Cut at 0.0015]

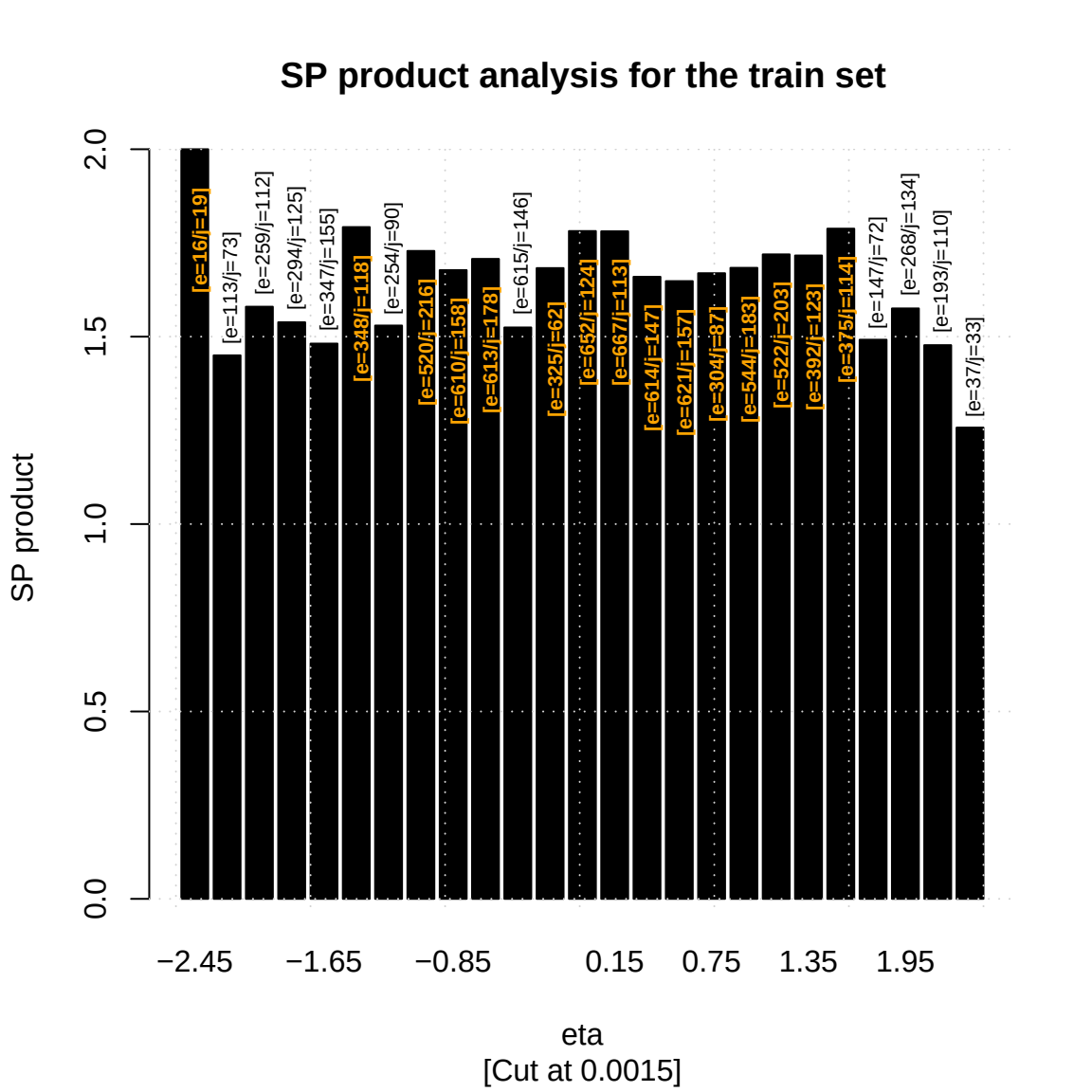

Efficiency analysis for the test set
percentage
0
20
40
60
80
electron eff.
jet false alarm
0.049087
1.249087
2.449087
3.649087
4.849087
6.049087
phi
[Cut at 0.0015]

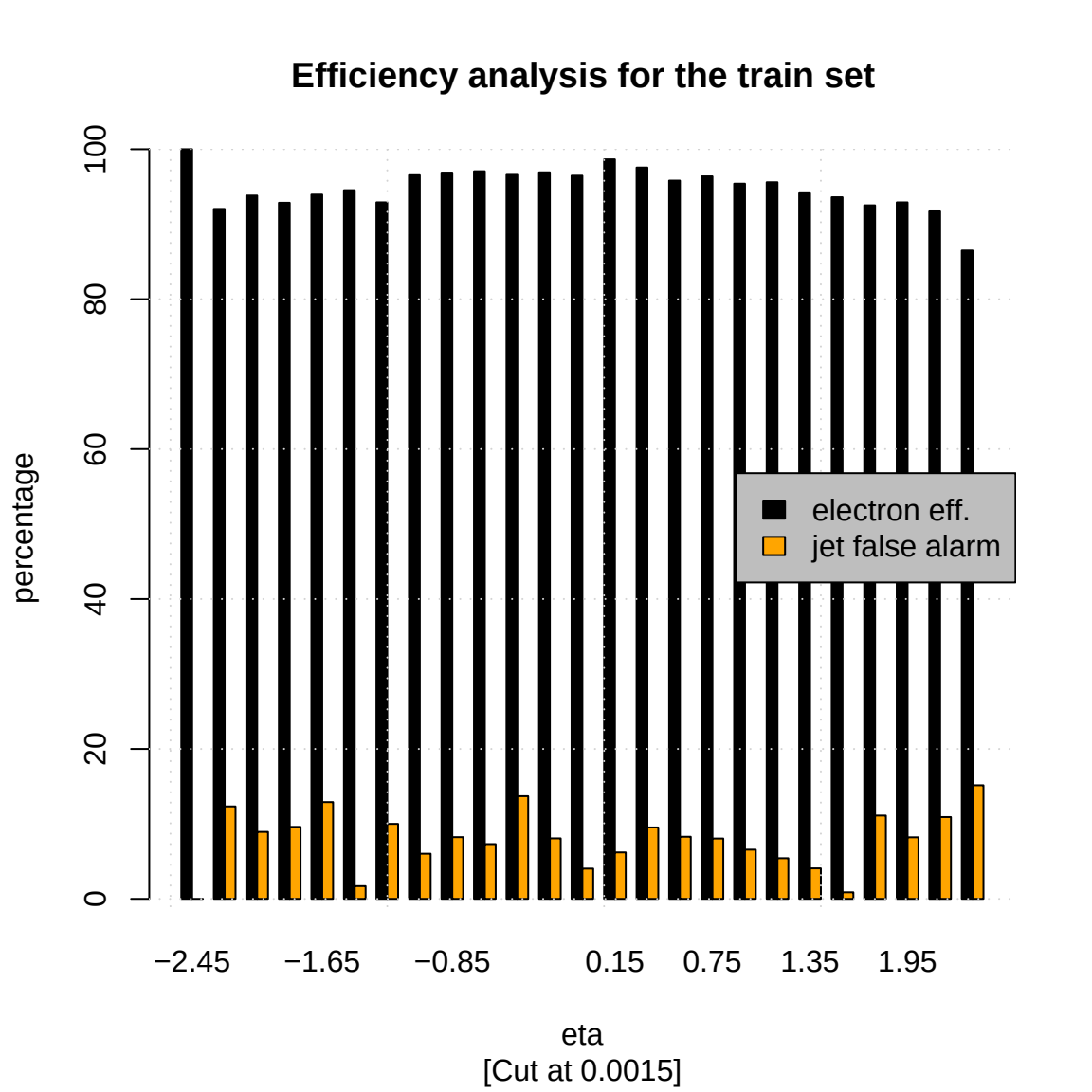

MSE values analysis for the test set
mean−square error
0.0
0.1
0.2
0.3
0.4
[e=385/j=122]
[e=338/j=109]
[e=341/j=104]
[e=303/j=108]
[e=353/j=105]
[e=321/j=98]
[e=368/j=96]
[e=384/j=113]
[e=338/j=107]
[e=322/j=116]
[e=363/j=121]
[e=330/j=108]
[e=325/j=109]
[e=345/j=131]
[e=396/j=117]
[e=230/j=77]
[e=342/j=94]
[e=330/j=120]
[e=330/j=90]
[e=361/j=92]
[e=339/j=113]
[e=360/j=105]
[e=367/j=131]
[e=329/j=127]
[e=330/j=112]
[e=373/j=115]
[e=369/j=112]
[e=481/j=170]
[e=333/j=118]
[e=317/j=114]
[e=358/j=103]
0.049087
1.249087
2.449087
3.649087
4.849087
6.049087
phi
[Cut at 0.0015]

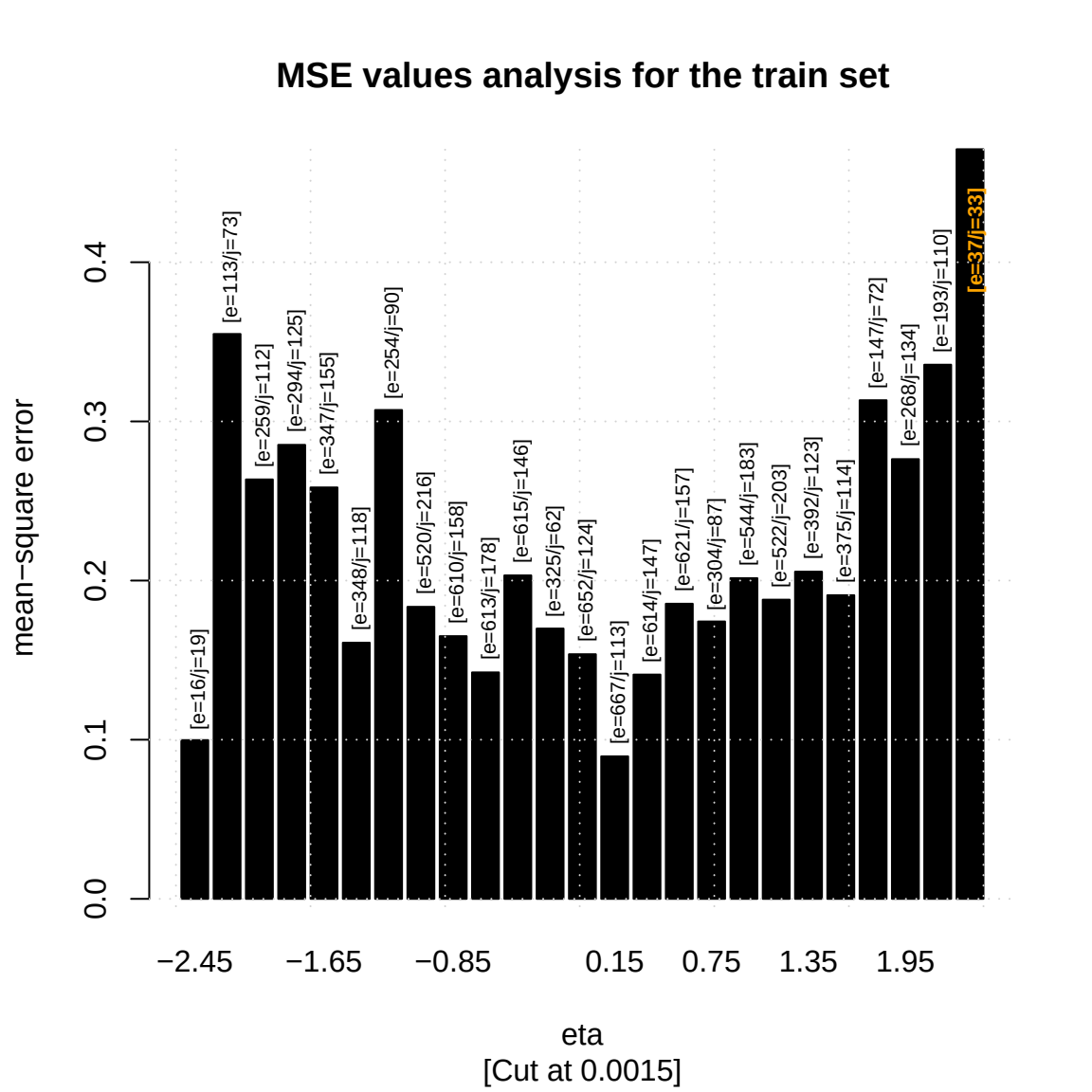

SP product analysis for the test set
SP product
0.0
0.5
1.0
1.5
2.0
15000
40000
65000
90000
115000
140000
e.m.$_T$(MeV)
[Cut at 0.0015]
[e=86/j=325]
[e=1262/j=117
[e=1810/j=1057
[e=1642/j=482]
[e=1475/j=229]
[e=1289/j=102]
[e=1009/j=50]
[e=696/j=31]
[e=450/j=27]
[e=337/j=10]
[e=229/j=7]
[e=176/j=1]
[e=119/j=6]
[e=76/j=6]
[e=71/j=2]
[e=52/j=1]
[e=32/j=1]
[e=38/j=1]
[e=17/j=e]
[e=12/j=e]
[e=7/j=0]
[e=5/j=1]
[e=10/j=0]
[e=4/j=0]
[e=5/j=0]
[e=11/j=0]
[e=6/j=0]
[e=2/j=0]
[e=6/j=0]
[e=2/j=0]

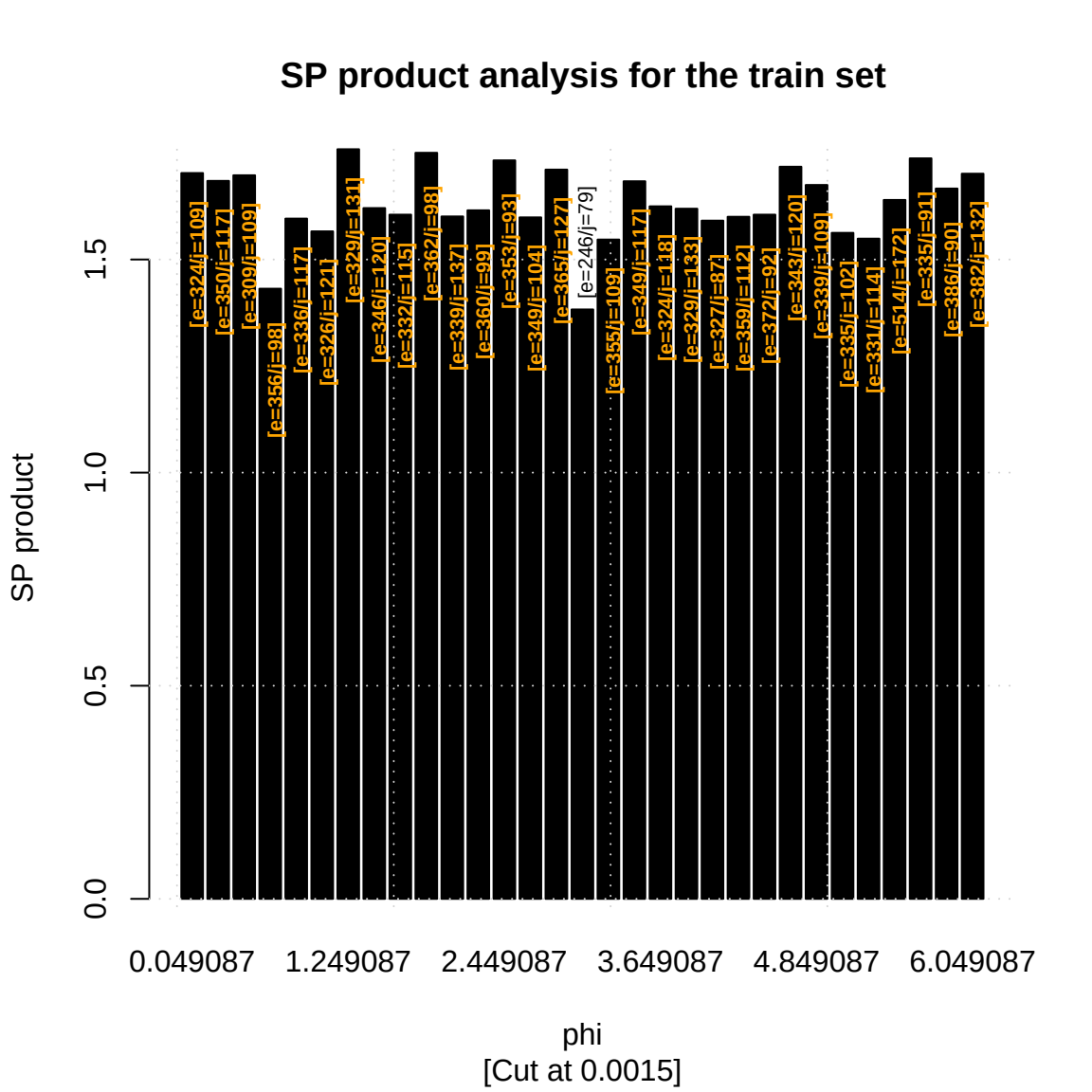

Efficiency analysis for the test set
percentage
0
20
40
60
80
100
15000
40000
65000
90000
115000
140000
electron eff.
jet false alarm
e.m.$_T$(MeV)
[Cut at 0.0015]

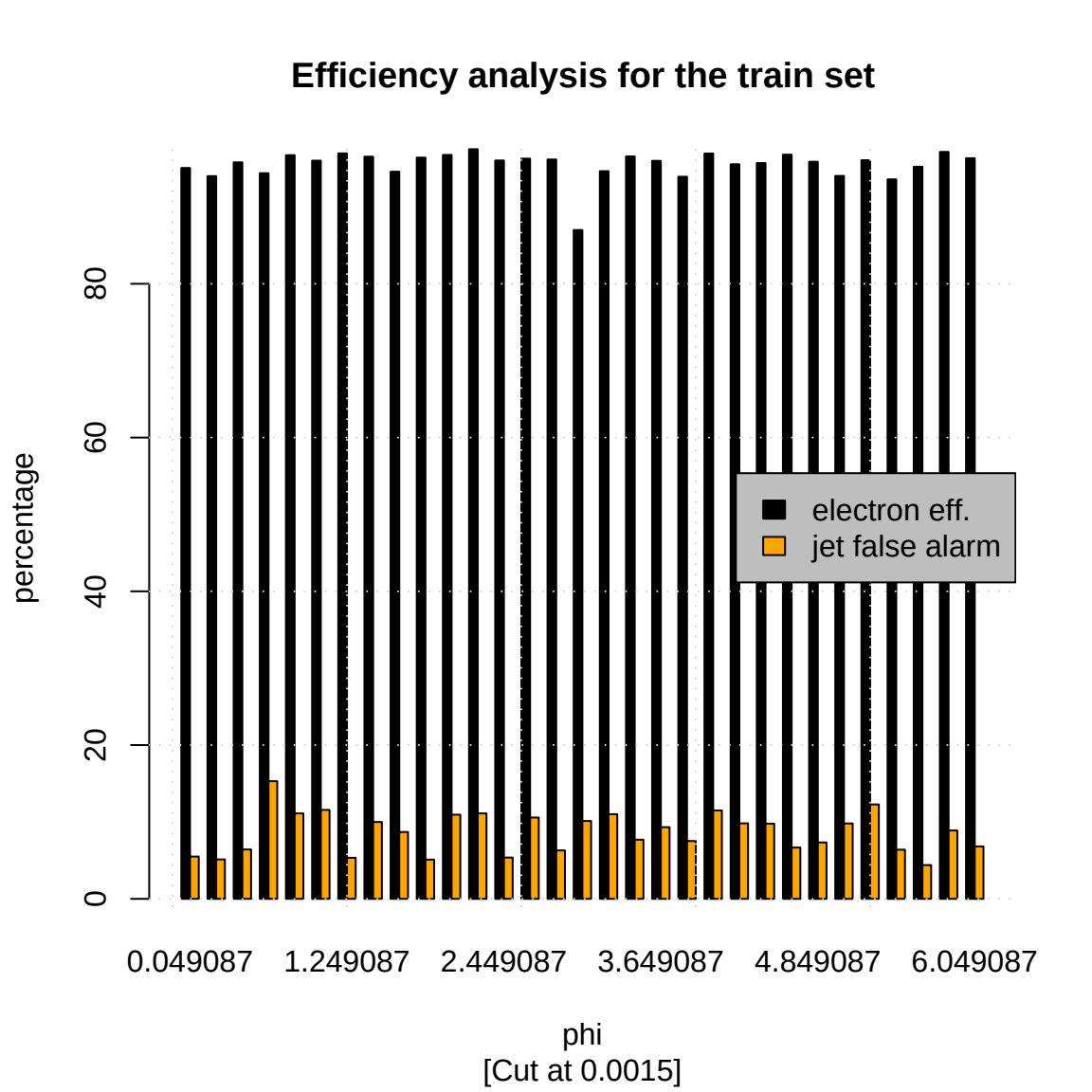

MSE values analysis for the test set
mean−square error
0.0
0.2
0.4
0.6
0.8
1.0
15000
40000
65000
90000
115000
140000
e.m.$_T$(MeV)
[Cut at 0.0015]

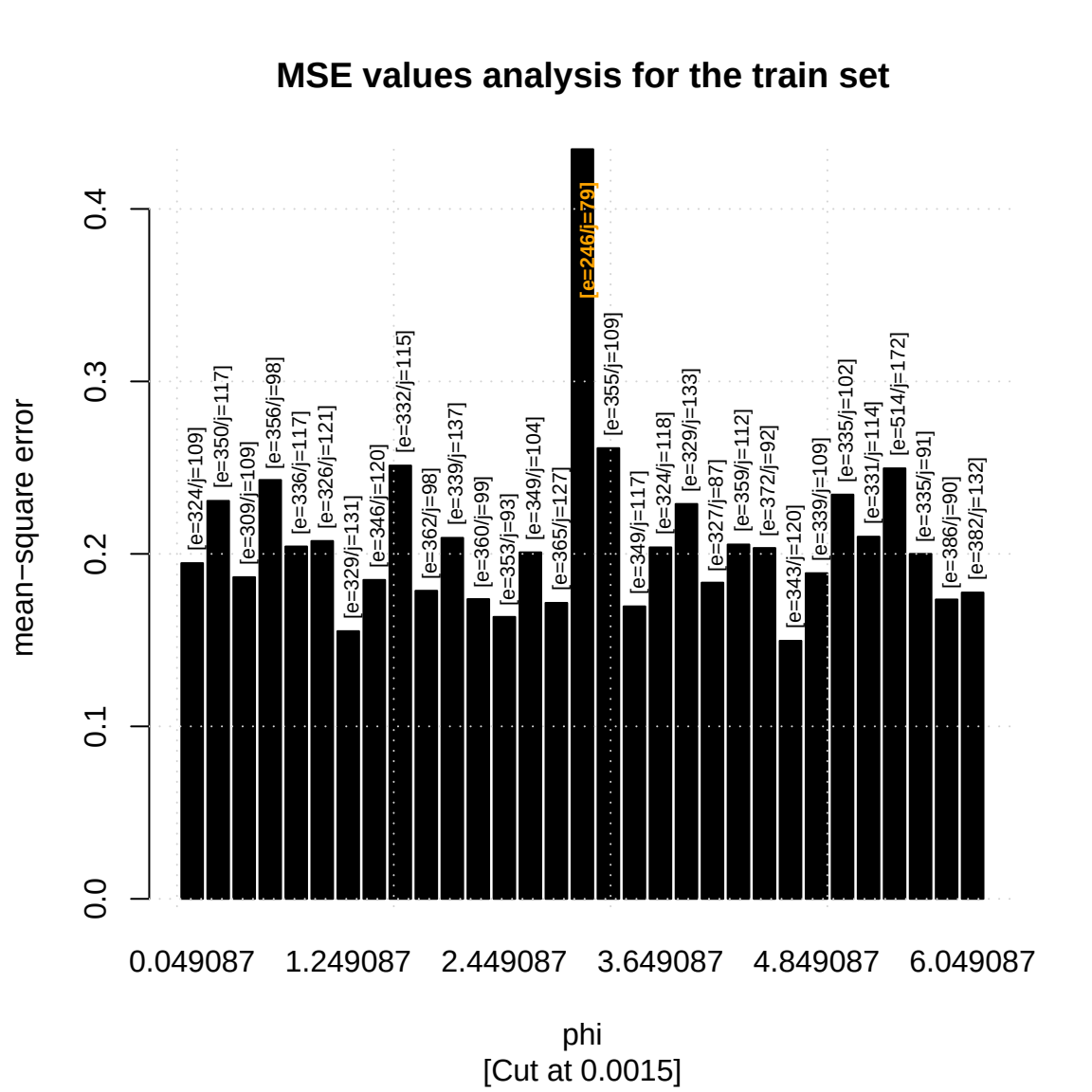

SP product analysis for the train set
SP product
0.0
0.5
1.0
1.5
2.0
[e=16/j=19]
[e=113/j=73]
[e=259/j=112]
[e=294/j=125]
[e=347/j=155]
[e=348/j=118]
[e=254/j=90]
[e=520/j=216]
[e=610/j=158]
[e=613/j=178]
[e=615/j=146]
[e=325/j=62]
[e=652/j=124]
[e=667/j=113]
[e=614/j=147]
[e=621/j=157]
[e=304/j=87]
[e=544/j=183]
[e=522/j=203]
[e=392/j=123]
[e=375/j=114]
[e=147/j=72]
[e=268/j=134]
[e=193/j=110]
[e=37/j=33]
−2.45
−1.65
−0.85
0.15
0.75
1.35
1.95
eta
[Cut at 0.0015]

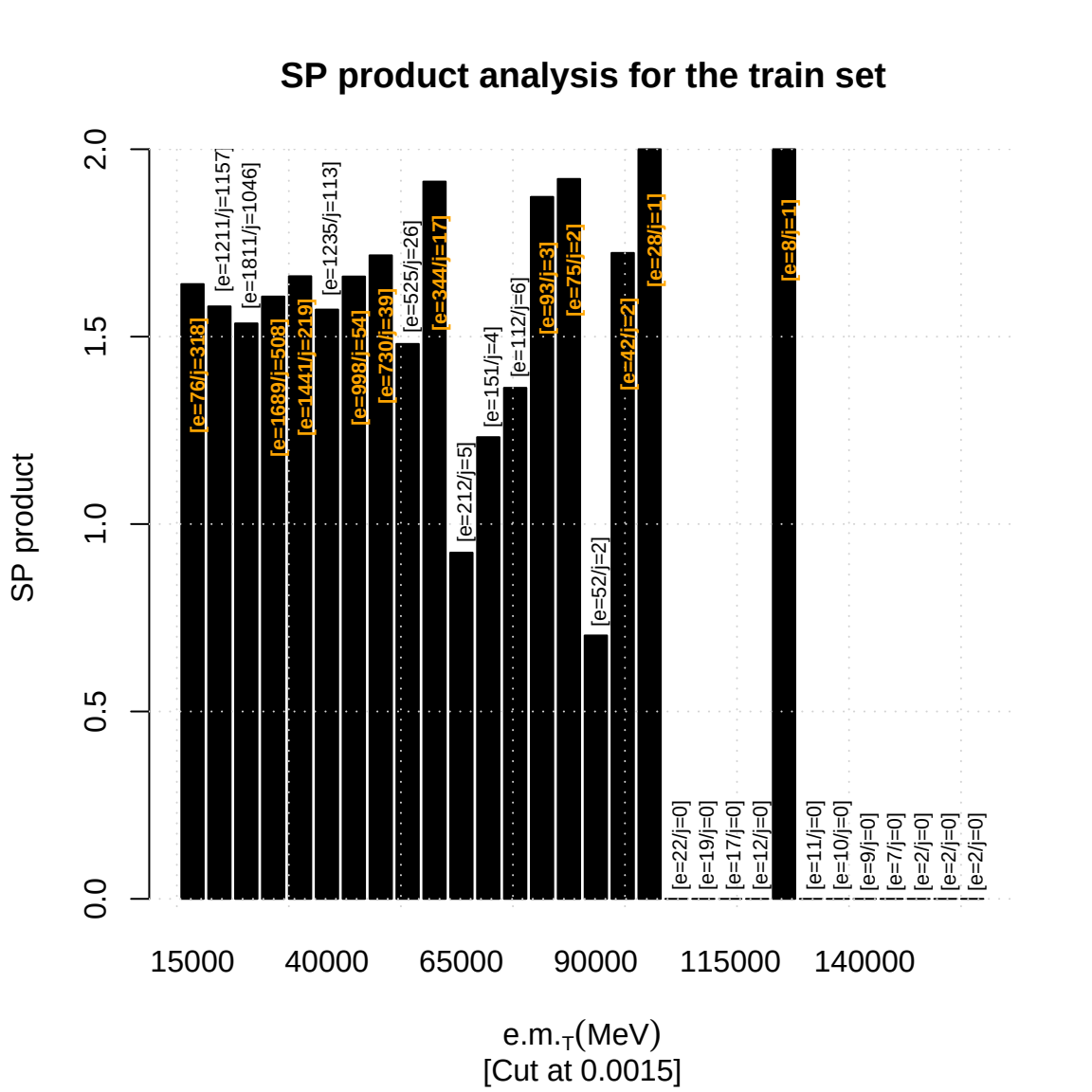

Efficiency analysis for the train set
percentage
0
20
40
60
80
100
electron eff.
jet false alarm
−2.45
−1.65
−0.85
0.15
0.75
1.35
1.95
eta
[Cut at 0.0015]

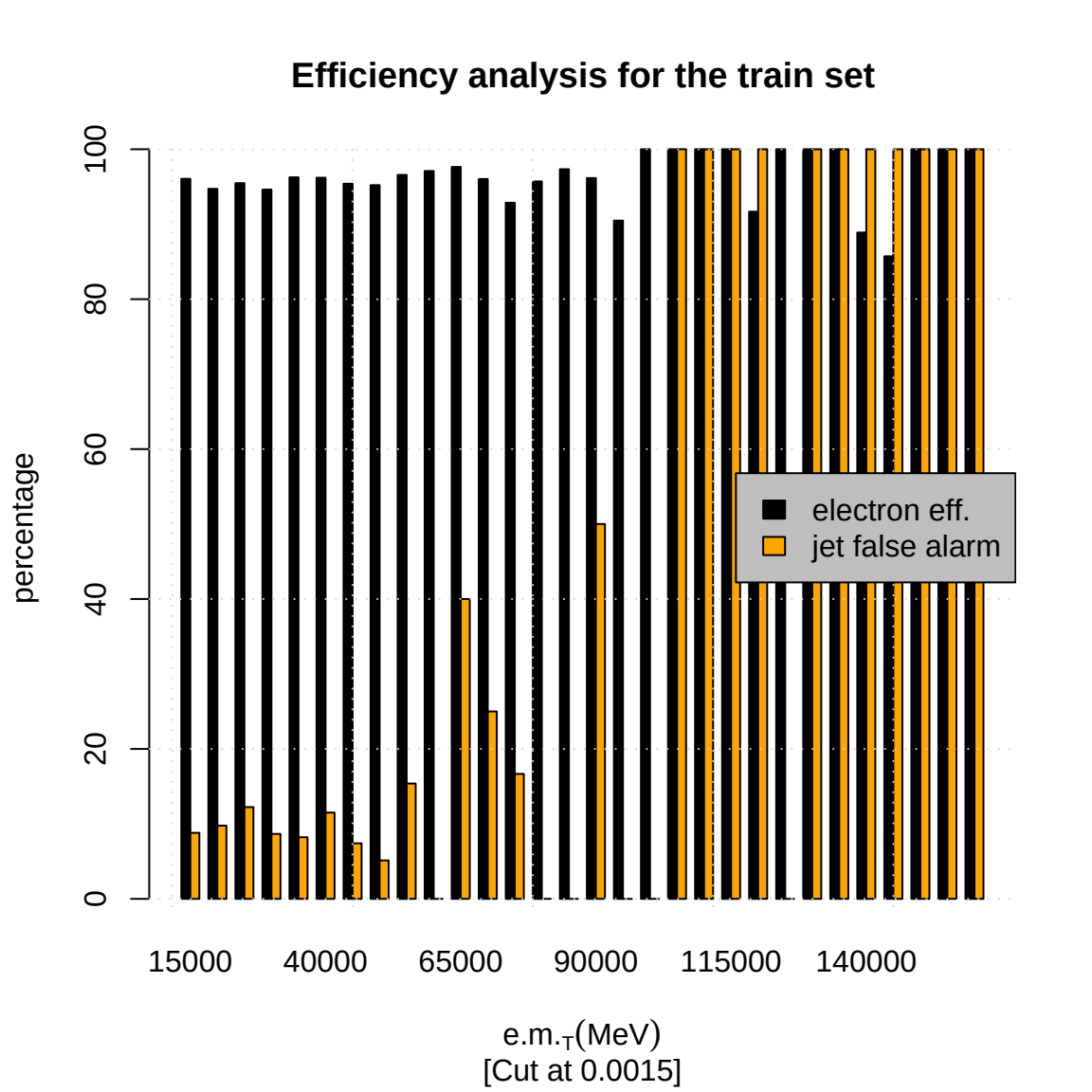

MSE values analysis for the train set
mean−square error
0.0
0.1
0.2
0.3
0.4
[e=16/j=19]
[e=113/j=73]
[e=259/j=112]
[e=294/j=125]
[e=347/j=155]
[e=348/j=118]
[e=254/j=90]
[e=520/j=216]
[e=610/j=158]
[e=613/j=178]
[e=615/j=146]
[e=325/j=62]
[e=652/j=124]
[e=667/j=113]
[e=614/j=147]
[e=621/j=157]
[e=304/j=87]
[e=544/j=183]
[e=522/j=203]
[e=392/j=123]
[e=375/j=114]
[e=147/j=72]
[e=268/j=134]
[e=193/j=110]
[e=37/j=33]
−2.45
−1.65
−0.85
0.15
0.75
1.35
1.95
eta
[Cut at 0.0015]

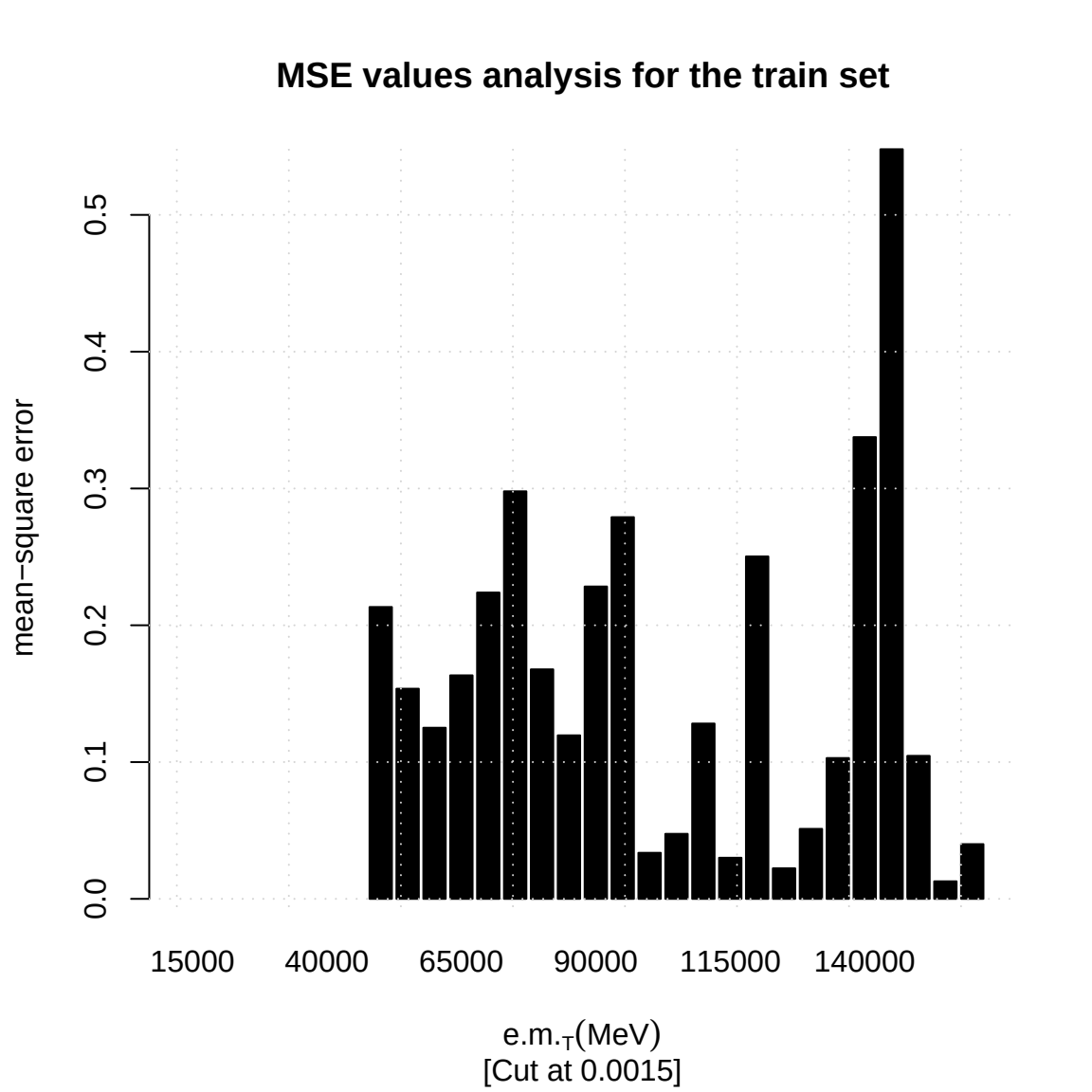

SP product analysis for the train set
SP product
0.0
0.5
1.0
1.5
[e=324/j=109]
[e=350/j=117]
[e=309/j=109]
[e=356/j=98]
[e=336/j=117]
[e=326/j=121]
[e=329/j=131]
[e=346/j=120]
[e=332/j=115]
[e=362/j=98]
[e=339/j=137]
[e=360/j=99]
[e=353/j=93]
[e=349/j=104]
[e=365/j=127]
[e=246/j=79]
[e=355/j=109]
[e=349/j=117]
[e=324/j=118]
[e=329/j=133]
[e=327/j=87]
[e=359/j=112]
[e=372/j=92]
[e=343/j=120]
[e=339/j=109]
[e=335/j=102]
[e=331/j=114]
[e=514/j=172]
[e=335/j=91]
[e=386/j=90]
[e=382/j=132]
0.049087
1.249087
2.449087
3.649087
4.849087
6.049087
phi
[Cut at 0.0015]

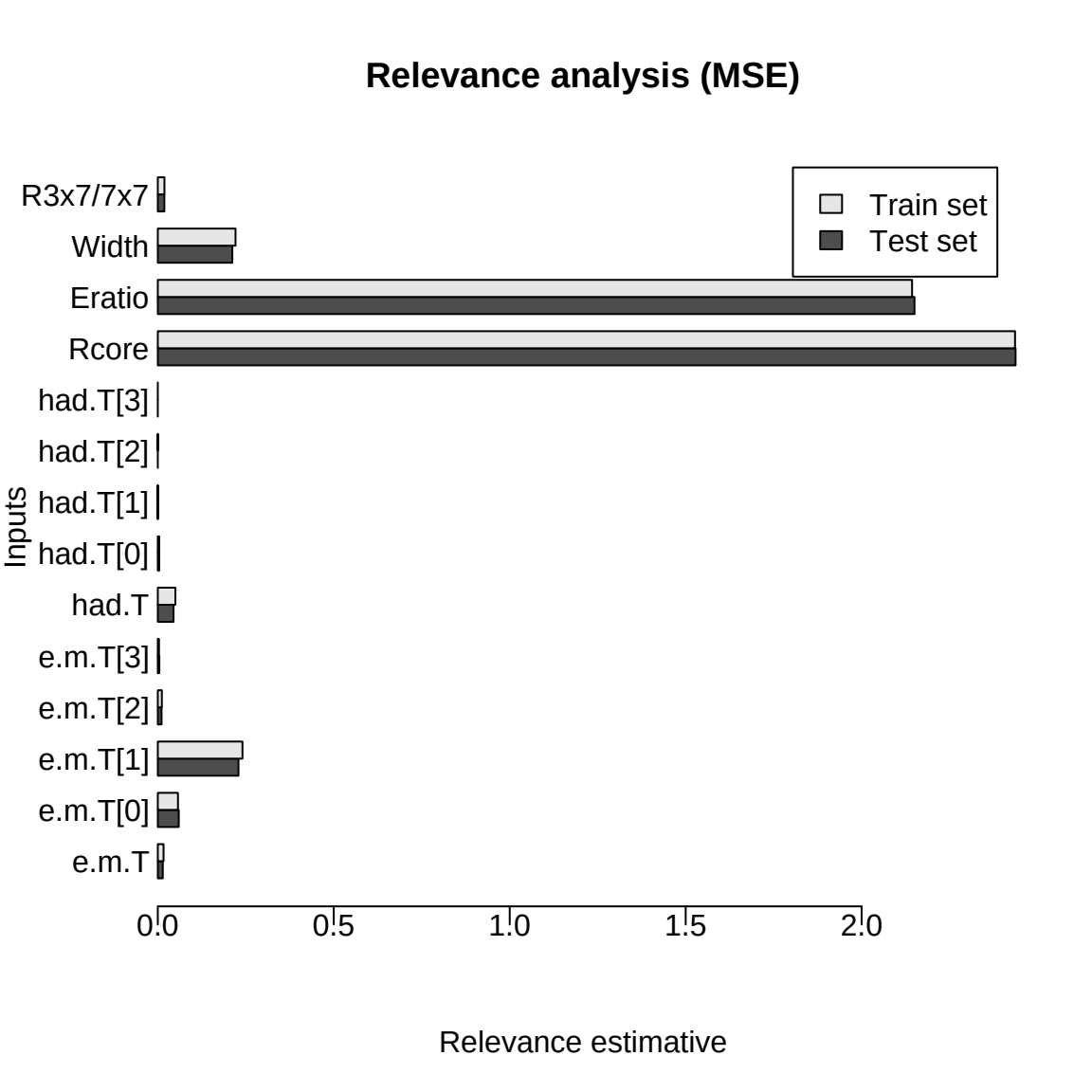

Efficiency analysis for the train set
percentage
0
20
40
60
80
electron eff.
jet false alarm
0.049087
1.249087
2.449087
3.649087
4.849087
6.049087
phi
[Cut at 0.0015]

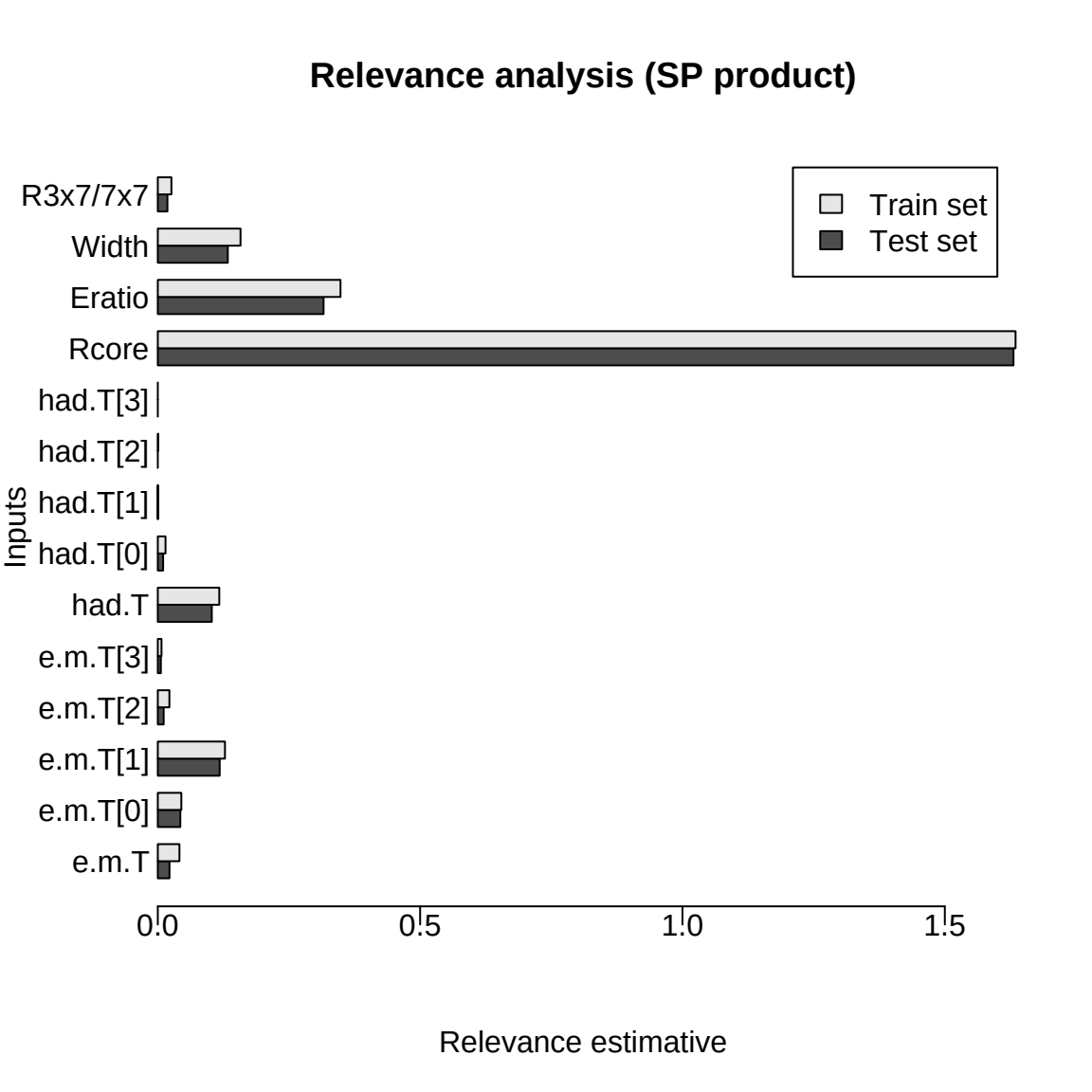

MSE values analysis for the train set
mean−square error
0.0
0.1
0.2
0.3
0.4
[e=324/j=109]
[e=350/j=117]
[e=309/j=109]
[e=356/j=98]
[e=336/j=117]
[e=326/j=121]
[e=329/j=131]
[e=346/j=120]
[e=332/j=115]
[e=362/j=98]
[e=339/j=137]
[e=360/j=99]
[e=353/j=93]
[e=349/j=104]
[e=365/j=127]
[e=246/j=79]
[e=355/j=109]
[e=349/j=117]
[e=324/j=118]
[e=329/j=133]
[e=327/j=87]
[e=359/j=112]
[e=372/j=92]
[e=343/j=120]
[e=339/j=109]
[e=335/j=102]
[e=331/j=114]
[e=514/j=172]
[e=335/j=91]
[e=386/j=90]
[e=382/j=132]
0.049087
1.249087
2.449087
3.649087
4.849087
6.049087
phi
[Cut at 0.0015]


SP product analysis for the train set
SP product
0.0
0.5
1.0
1.5
2.0
15000
40000
65000
90000
115000
140000
e.m.$_T$(MeV)
[Cut at 0.0015]
[e=76/j=318]
[e=1211/j=1157]
[e=1811/j=1046]
[e=1689/j=503]
[e=1441/j=219]
[e=1235/j=113]
[e=998/j=54]
[e=720/j=39]
[e=525/j=26]
[e=344/j=17]
[e=212/j=5]
[e=151/j=4]
[e=112/j=6]
[e=93/j=3]
[e=75/j=2]
[e=52/j=2]
[e=42/j=2]
[e=28/j=1]
[e=22/j=0]
[e=19/j=0]
[e=17/j=0]
[e=12/j=0]
[e=8/j=1]
[e=11/j=0]
[e=10/j=0]
[e=9/j=0]
[e=7/j=0]
[e=2/j=0]
[e=2/j=0]
[e=2/j=0]


Efficiency analysis for the train set
percentage
0
20
40
60
80
100
15000
40000
65000
90000
115000
140000
electron eff.
jet false alarm
e.m.$_T$(MeV)
[Cut at 0.0015]


MSE values analysis for the train set
mean−square error
0.0
0.1
0.2
0.3
0.4
0.5
15000
40000
65000
90000
115000
140000
e.m.$_T$(MeV)
[Cut at 0.0015]


Relevance analysis (MSE)
Train set
Test set
R3x7/7x7
Width
Eratio
Rcore
had.T[3]
had.T[2]
had.T[1]
had.T[0]
had.T
e.m.T[3]
e.m.T[2]
e.m.T[1]
e.m.T[0]
e.m.T
Inputs
0.0
0.5
1.0
1.5
2.0
Relevance estimative


Relevance analysis (SP product)
Train set
Test set
R3x7/7x7
Width
Eratio
Rcore
had.T[3]
had.T[2]
had.T[1]
had.T[0]
had.T
e.m.T[3]
e.m.T[2]
e.m.T[1]
e.m.T[0]
e.m.T
Inputs
0.0
0.5
1.0
1.5
Relevance estimative