ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.12

0.10

0.08

0.06

0.04

0.02

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

0

5

10

15

20

25

30

35

40

Leading track jet n_{ch}

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

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0.08

0.06

0.04

0.02

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syst_MS_Up

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0.08

0.06

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40

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5

10

15

20

25

30

35

40

Leading track jet n_{ch}

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.12
0.10
0.08
0.06
0.04
0.02
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

0
5
10
15
20
25
30
35
40

Leading track jet n_{ch}

ATLAS Simulation Internal

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syst_MSResbias_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.12
0.10
0.08
0.06
0.04
0.02
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

0
5
10
15
20
25
30
35
40

Leading track jet n_{ch}

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syst_Scale_Up

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0.12

0.10

0.08

0.06

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0.00

Ratio to "Data" Truth

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1.0

0.8

0

5

10

15

20

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30

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syst_Scale_Down

"Data" Truth (Target)

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Events per bin (normalized)

0.12

0.10

0.08

0.06

0.04

0.02

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

0

5

10

15

20

25

30

35

40

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syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet n_{ch}

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

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"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet n_{ch}

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet n_{ch}

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

0
5
10
15
20
25
30
35

Subleading track jet n_{ch}

ATLAS Simulation Internal

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syst_MSResbias_Up

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MultiFold

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Ratio to "Data" Truth

Subleading track jet n_{ch}

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syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet m [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet m [GeV]

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000

Ratio to "Data" Truth

1.2
1.0
0.8

0
5
10
15
20
25
30
35
40

Subleading track jet m [GeV]

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Subleading track jet m [GeV]

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$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.008

0.007

0.006

0.005

0.004

0.003

0.002

0.001

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

200

400

600

800

1000

Leading track jet p_T [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

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MultiFold

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0.006

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Leading track jet p_T [GeV]

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Leading track jet p_T [GeV]

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syst_MSResbias_Up

"Data" Truth (Target)

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0.8

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0.006

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200

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Leading track jet p_T [GeV]

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

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MultiFold

Events

0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

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1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

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syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

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MultiFold

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0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

ATLAS Simulation Internal

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syst_MSResbias_Up

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MultiFold

Events per bin (normalized)

0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

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MultiFold

Events per bin (normalized)

0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

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0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.030

0.025

0.020

0.015

0.010

0.005

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

Subleading track jet p_T [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

−2
−1
0
1
2

Leading track jet y

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.0

0.1

0.2

0.3

0.4

Ratio to "Data" Truth

0.8

1.0

1.2

−2

−1

0

1

2

Leading track jet y

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet y

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.0

0.1

0.2

0.3

0.4

Ratio to "Data" Truth

0.8

1.0

1.2

−2

−1

0

1

2

Leading track jet y

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet y

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

−2
−1
0
1
2

Leading track jet y

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet y

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.4

0.3

0.2

0.1

0.0

Ratio to "Data" Truth

1.2

1.0

0.8

−2

−1

0

1

2

Leading track jet y

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.35
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Ratio to "Data" Truth

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1
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Subleading track jet y

ATLAS Simulation Internal

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Events per bin (normalized)

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1.2

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1

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−3 −2 −1 0 1 2 3

Leading track jet ϕ

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

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Subleading track jet ϕ

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syst_Scale_Down

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2

3

Subleading track jet ϕ

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up
"Data" Truth (Target)
MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_1

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_1

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_1

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"Data" Truth (Target)

MultiFold

Events per bin (normalized)

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Subleading track jet τ_1

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Ratio to "Data" Truth

Subleading track jet τ_1

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"Data" Truth (Target)

MultiFold

Events per bin (normalized)

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Subleading track jet τ_1

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syst_MSResbias_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_1

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_1

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_1

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up
"Data" Truth (Target)
MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_2

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_2

ATLAS Simulation Internal

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syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_2

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"Data" Truth (Target)

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Leading track jet τ_2

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Leading track jet τ_2

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Events per bin (normalized)

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Subleading track jet τ_2

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"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_2

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_2

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_2

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_2

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Leading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_3

ATLAS Simulation Internal

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"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

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MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_3

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

Subleading track jet τ_3

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.0175

0.0150

0.0125

0.0100

0.0075

0.0050

0.0025

0.0000

Ratio to "Data" Truth

1.2

1.0

0.8

200 300 400 500 600 700 800 900 1000

$p_T^{\mu\mu}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

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0.8

200 300 400 500 600 700 800 900 1000

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$p_T^{\mu\mu}$ [GeV]

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0.8

200 300 400 500 600 700 800 900 1000

$p_T^{\mu\mu}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

−2
−1
0
1
2

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.40

0.35

0.30

0.25

0.20

0.15

0.10

0.05

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

−2

−1

0

1

2

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

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MultiFold

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0.40

0.35

0.30

0.25

0.20

0.15

0.10

0.05

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

−2

−1

0

1

2

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.40

0.35

0.30

0.25

0.20

0.15

0.10

0.05

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

−2

−1

0

1

2

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.40

0.35

0.30

0.25

0.20

0.15

0.10

0.05

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

−2

−1

0

1

2

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.40

0.35

0.30

0.25

0.20

0.15

0.10

0.05

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

−2

−1

0

1

2

$y_{\mu\mu}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.012

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

600

700

800

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.012

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

600

700

800

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.012

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

600

700

800

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.012

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

600

700

800

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

600

700

800

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

0

100

200

300

400

500

600

700

800

$p_T^{\mu 1}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.016

0.014

0.012

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

50

100

150

200

250

300

350

400

$p_T^{\mu 2}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.016

0.014

0.012

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

0.8

50

100

150

200

250

300

350

400

$p_T^{\mu 2}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.0175

0.0150

0.0125

0.0100

0.0075

0.0050

0.0025

0.0000

Ratio to "Data" Truth

1.2

1.0

0.8

50 100 150 200 250 300 350 400

$p_T^{\mu 2}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

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"Data" Truth (Target)

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Events per bin (normalized)

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Ratio to "Data" Truth

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0.8

50

100

150

200

250

300

350

400

$p_T^{\mu 2}$ [GeV]

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

IBU

UniFold

MultiFold

Events per bin (normalized)

0.016

0.014

0.012

0.010

0.008

0.006

0.004

0.002

0.000

Ratio to "Data" Truth

1.2

1.0

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50

100

150

200

250

300

350

400

$p_T^{\mu 2}$ [GeV]

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$p_T^{\mu 2}$ [GeV]

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$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

−2
−1
0
1
2

$\eta_{\mu 1}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 1}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 1}$

ATLAS Simulation Internal

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MultiFold

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0.20
0.15
0.10
0.05
0.00

Ratio to "Data" Truth

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0.8

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0
1
2

$\eta_{\mu 1}$

ATLAS Simulation Internal

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 1}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

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syst_MSResbias_Down

"Data" Truth (Target)

MultiFold

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0.10
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0.00

Ratio to "Data" Truth

1.2
1.0
0.8

−2
−1
0
1
2

$\eta_{\mu 1}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 1}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 1}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 2}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_ID_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 2}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 2}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MS_Down

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 2}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_MSResbias_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

Ratio to "Data" Truth

$\eta_{\mu 2}$

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Dilepton, $p_T^{\mu\mu} > 190$ GeV

syst_Scale_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00

Ratio to "Data" Truth

1.2
1.0
0.8

−2
−1
0
1
2

$\eta_{\mu 2}$

ATLAS Simulation Internal

$\sqrt{s} = 13$ TeV, $Z \to \mu\mu$, 139.0 fb^{-1}

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syst_ID_Up

"Data" Truth (Target)

MultiFold

Events per bin (normalized)

0.20

0.15

0.10

0.05

0.00

Ratio to "Data" Truth

1.2

1.0

0.8

−3

−2

−1

0

1

2

3

$\phi_{\mu 1}$

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syst_ID_Down

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