A new set of cuts and (almost) an acceptance measurement for Γ_{ee}

Jim Pivarski

$\Upsilon(1S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	*n/a*	*n/a*	*n/a*	*n/a*
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
second-biggest track < 85%	11.28%	± 0.63%	99.94%	± 0.01%	98.58%	± 0.14%	± 0.04%	± 0.08%
event vertex Z or z0 < 7.5 cm	90.26%	± 1.82%	99.39%	± 0.02%	99.31%	± 0.19%	± 0.09%	± 6.76%
visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	*n/a*	*n/a*	*n/a*	*n/a*

$\Upsilon(2S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	*n/a*	*n/a*	*n/a*	*n/a*
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
second-biggest track < 85%	12.44%	± 0.62%	99.95%	± 0.01%	97.38%	± 0.32%	± 0.02%	± 2.10%
event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	*n/a*	*n/a*	*n/a*	*n/a*

$\Upsilon(3S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	*n/a*	*n/a*	*n/a*	*n/a*
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	*n/a*	*n/a*	*n/a*	*n/a*

$\Upsilon(1S)$

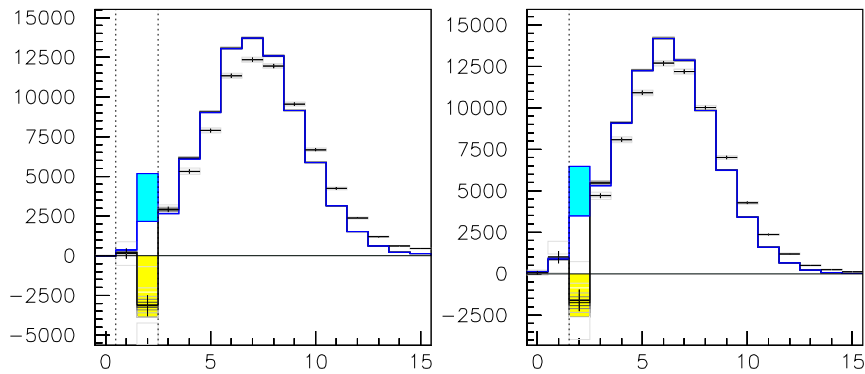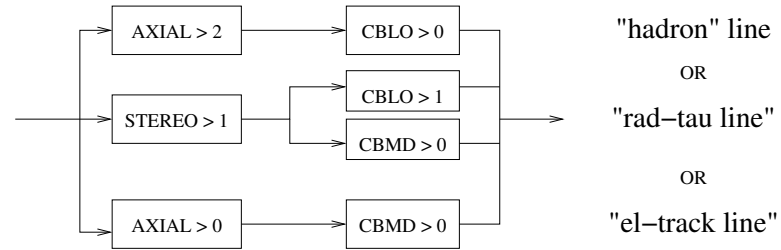|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
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all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(2S)$

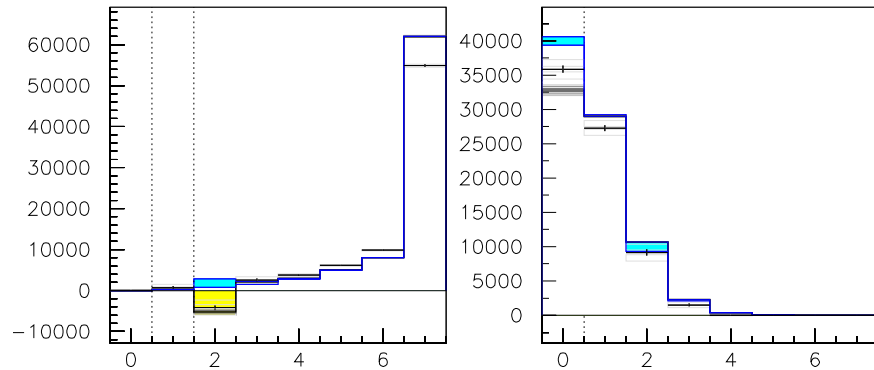|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
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visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	n/a	n/a	n/a	n/a

$\Upsilon(3S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(1S)$ trigger *(implies one track)*

AXIAL > 2 → CBLO > 0
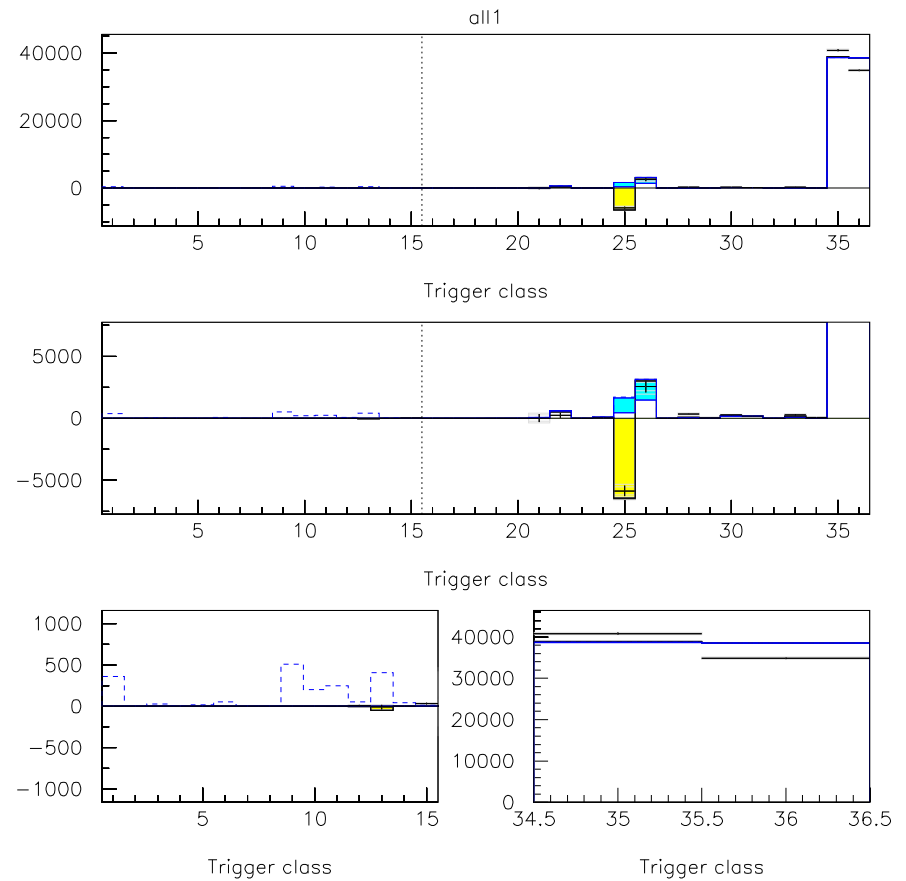
STEREO > 1 → CBLO > 1
STEREO > 1 → CBMD > 0

AXIAL > 0 → CBMD > 0

"hadron" line
OR
"rad−tau line"
OR
"el−track line"

Trigger AXIAL

Trigger STEREO

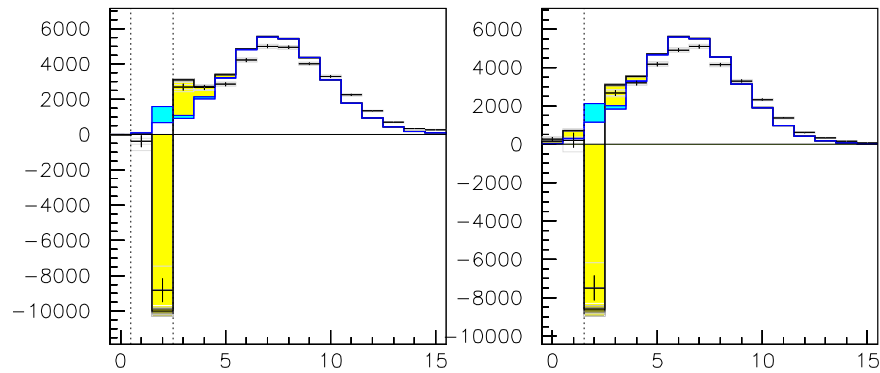Trigger CBLO

Trigger CBMD

all1

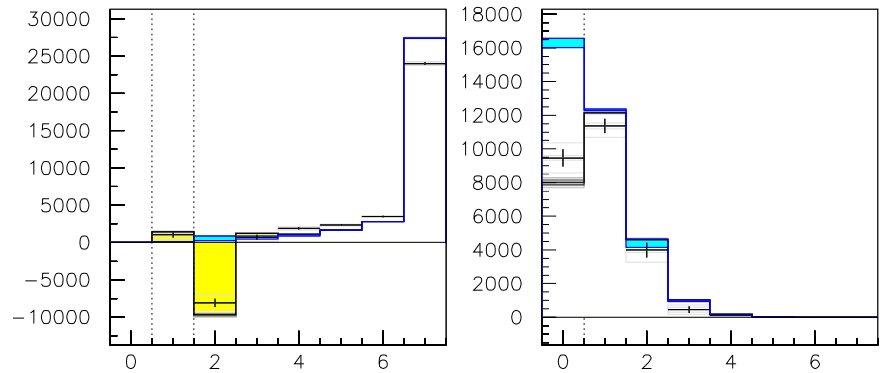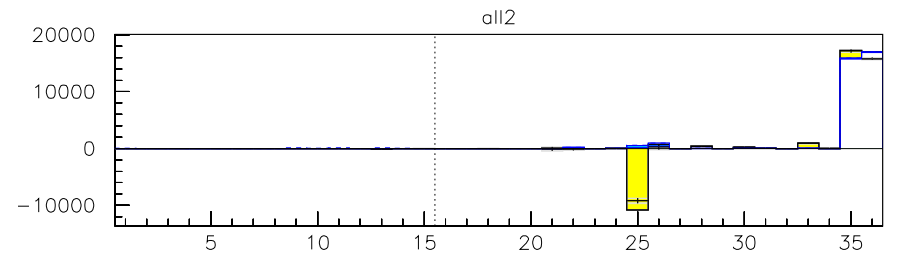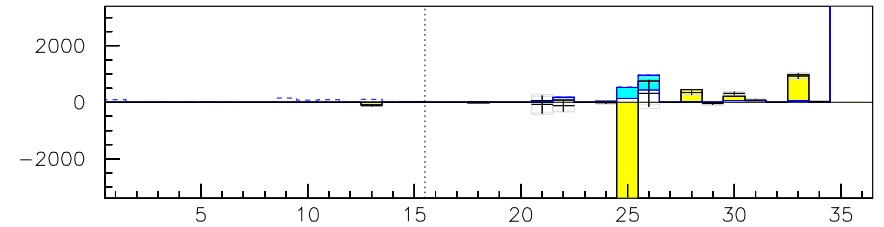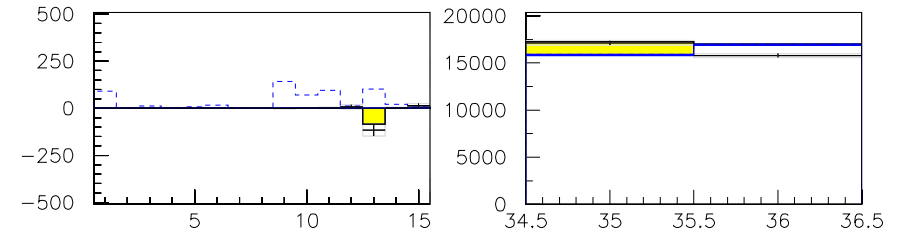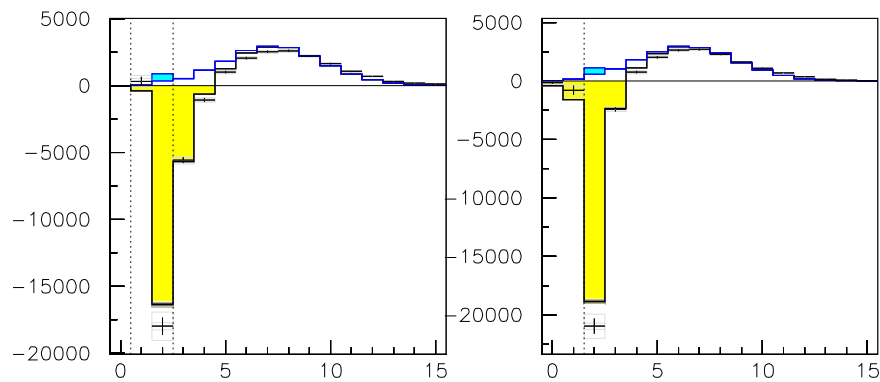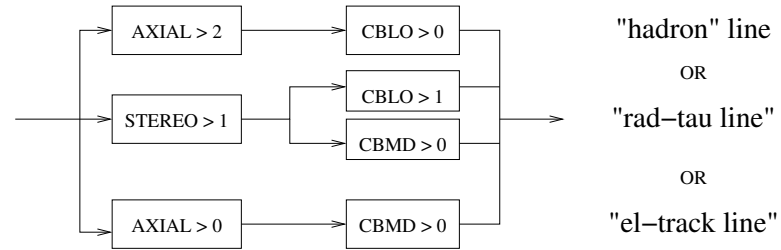Trigger class

Trigger class

Trigger class

Trigger class

$\Upsilon(2S)$ trigger *(implies one track)*

AXIAL > 2 → CBLO > 0

STEREO > 1 → CBLO > 1 / CBMD > 0

AXIAL > 0 → CBMD > 0

"hadron" line
OR
"rad−tau line"
OR
"el−track line"

Trigger AXIAL

Trigger STEREO

Trigger CBLO

Trigger CBMD

all2
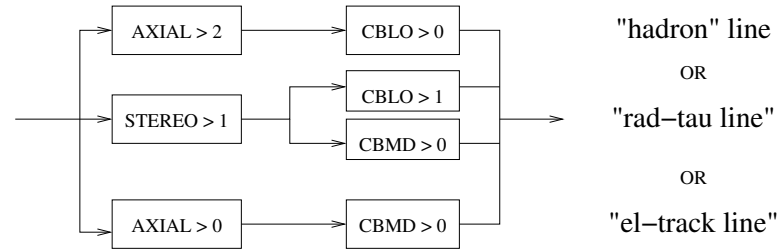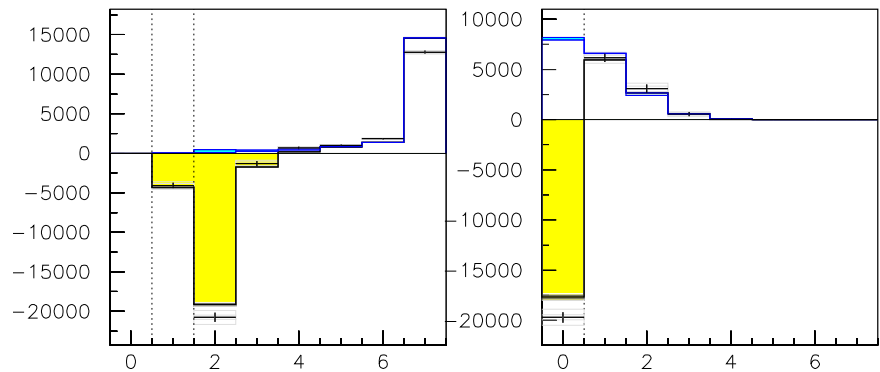
Trigger class

Trigger class

Trigger class

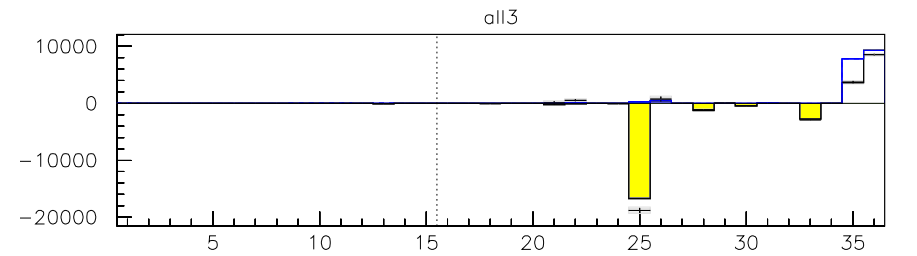Trigger class

$\Upsilon(3S)$ trigger *(implies one track)*

AXIAL > 2 → CBLO > 0

STEREO > 1 → CBLO > 1

STEREO > 1 → CBMD > 0

AXIAL > 0 → CBMD > 0

"hadron" line

OR

"rad−tau line"

OR

"el−track line"

Trigger AXIAL

Trigger STEREO
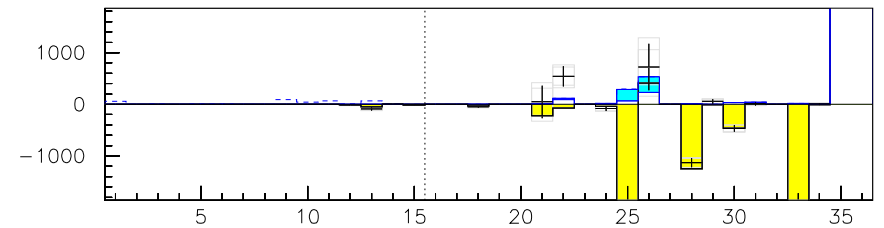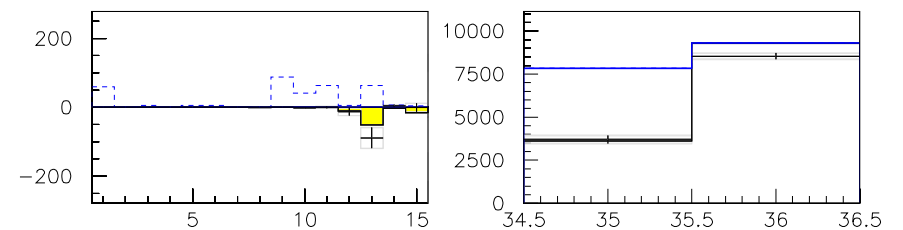
Trigger CBLO

Trigger CBMD

all3

Trigger class

Trigger class

Trigger class

Trigger class

$\Upsilon(1S)$

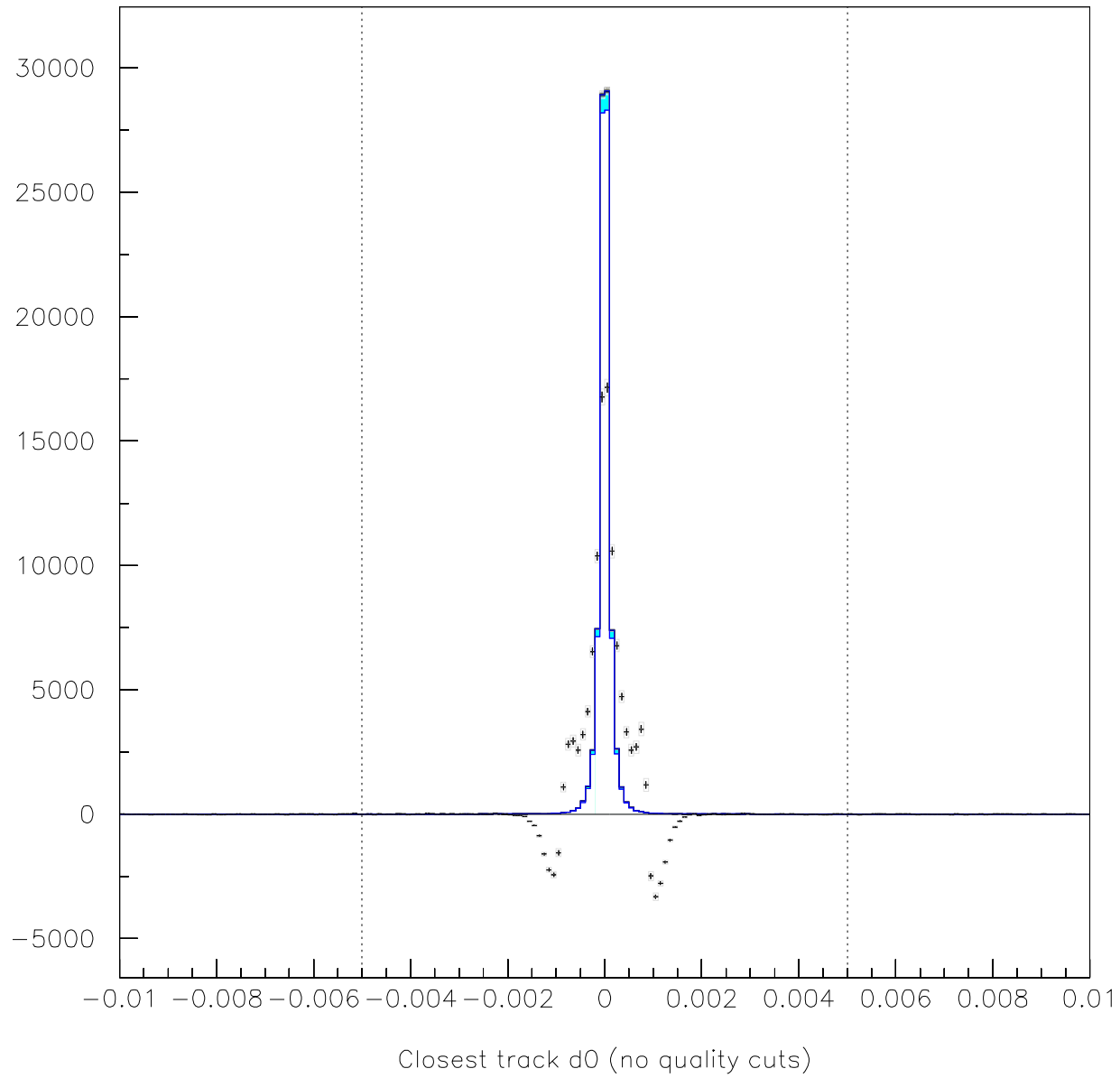|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
second-biggest track < 85%	11.28%	± 0.63%	99.94%	± 0.01%	98.58%	± 0.14%	± 0.04%	± 0.08%
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visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
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all cuts	1.56%	± 0.13%	95.60%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(2S)$

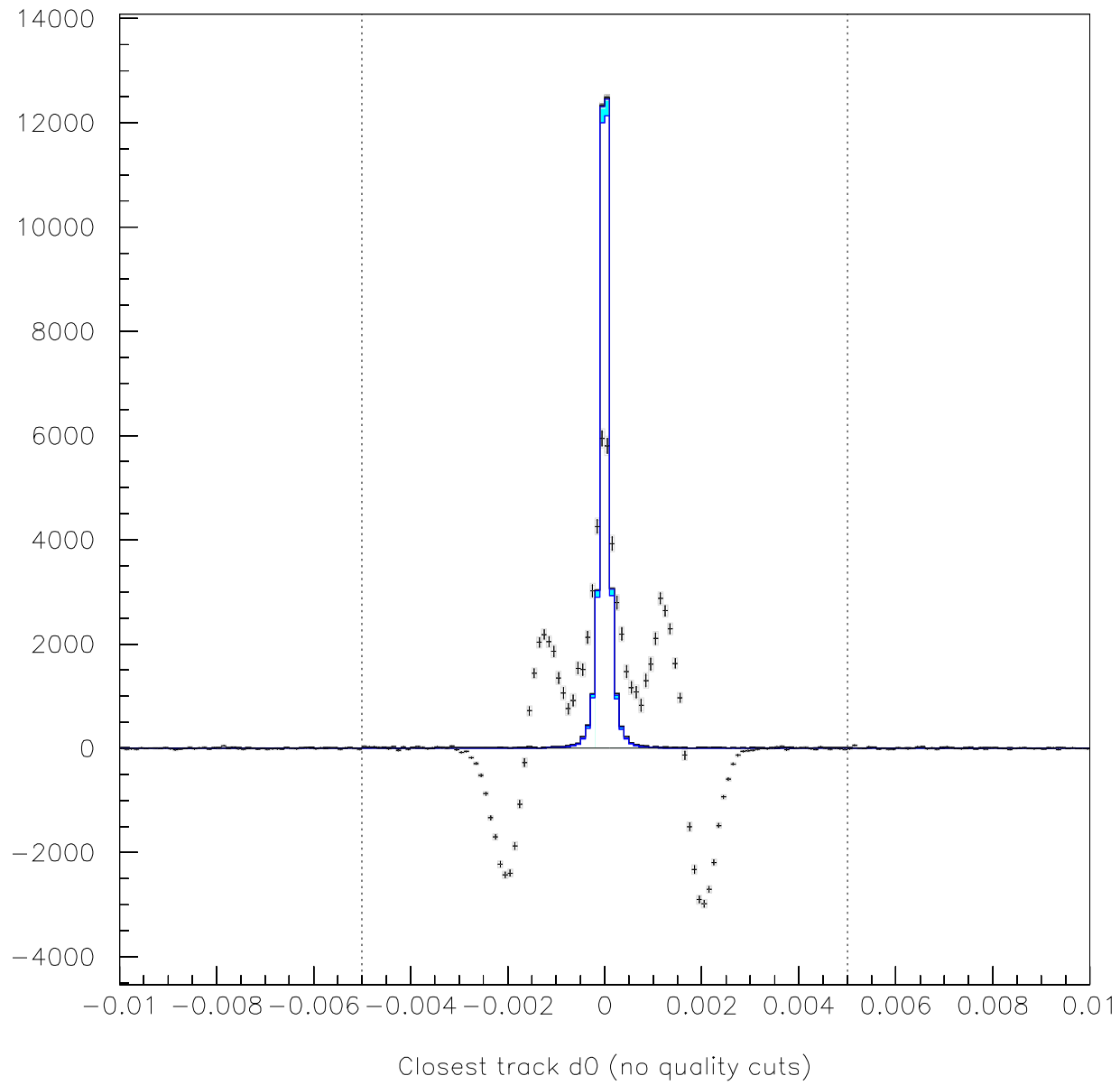|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
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event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
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$\Upsilon(3S)$

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second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

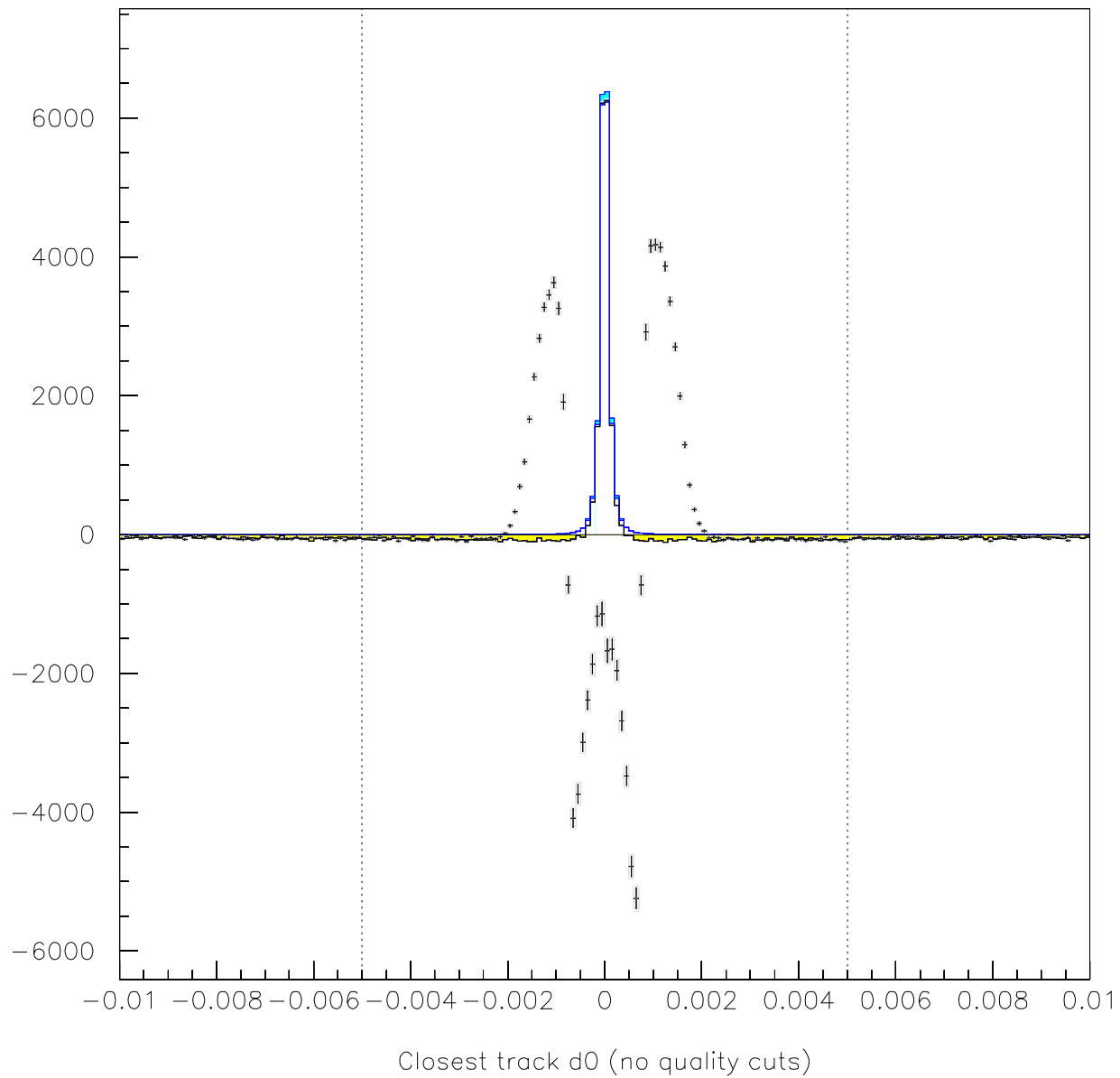# $\Upsilon(1S)$ closest track d0 < 5 mm *(implies one track)*

Closest track d0 (no quality cuts)

$\Upsilon(2S)$ closest track d0 < 5 mm *(implies one track)*

Closest track d0 (no quality cuts)

$\Upsilon(3S)$ closest track d0 < 5 mm *(implies one track)*

Closest track d0 (no quality cuts)

$\Upsilon(1S)$

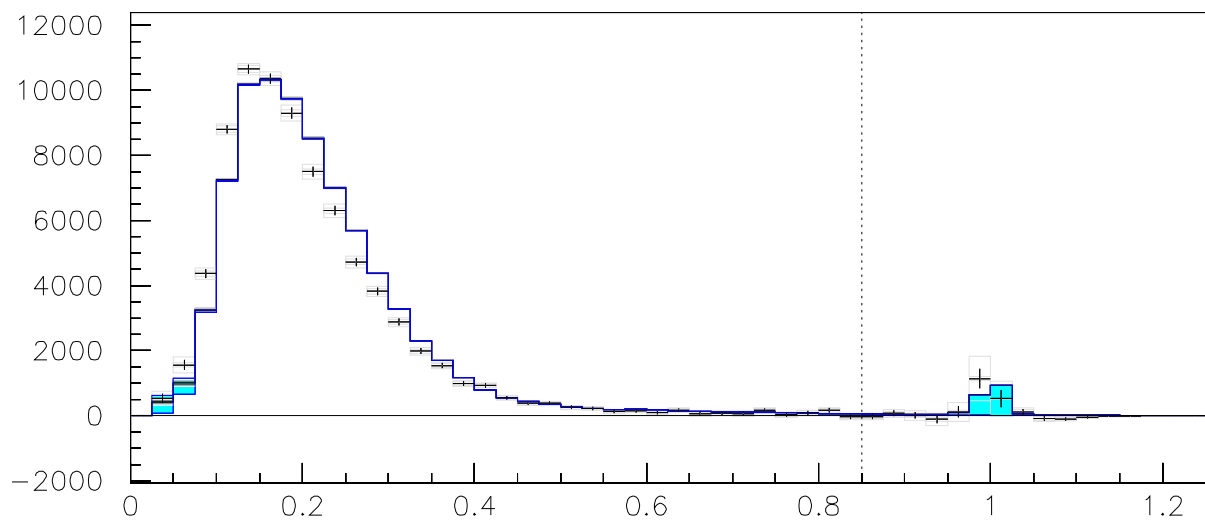|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
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$\Upsilon(2S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
second-biggest track < 85%	12.44%	± 0.62%	99.95%	± 0.01%	97.38%	± 0.32%	± 0.02%	± 2.10%
event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	n/a	n/a	n/a	n/a

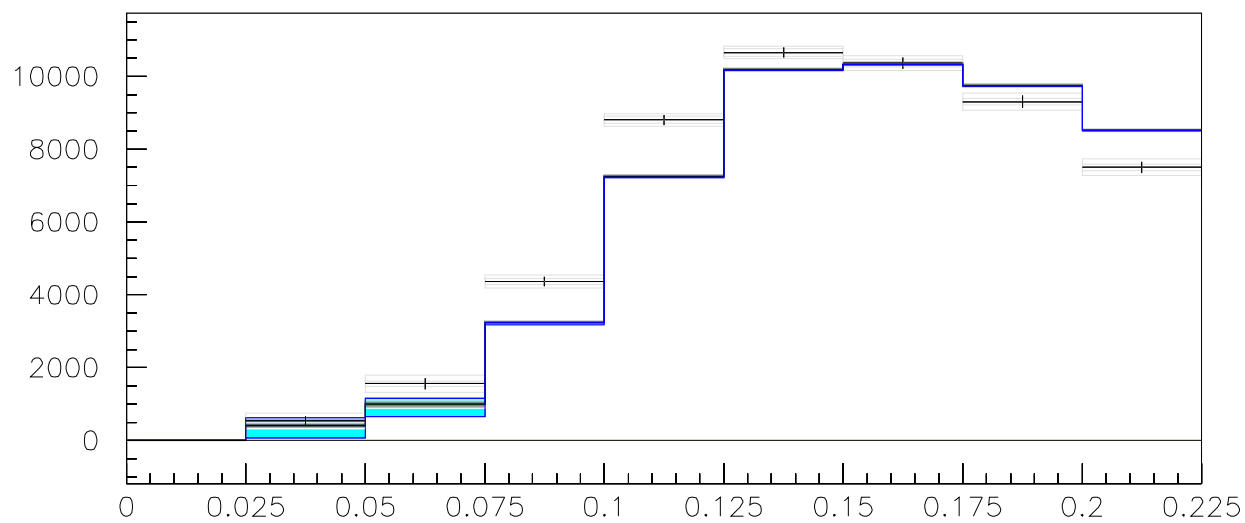## $\Upsilon(3S)$

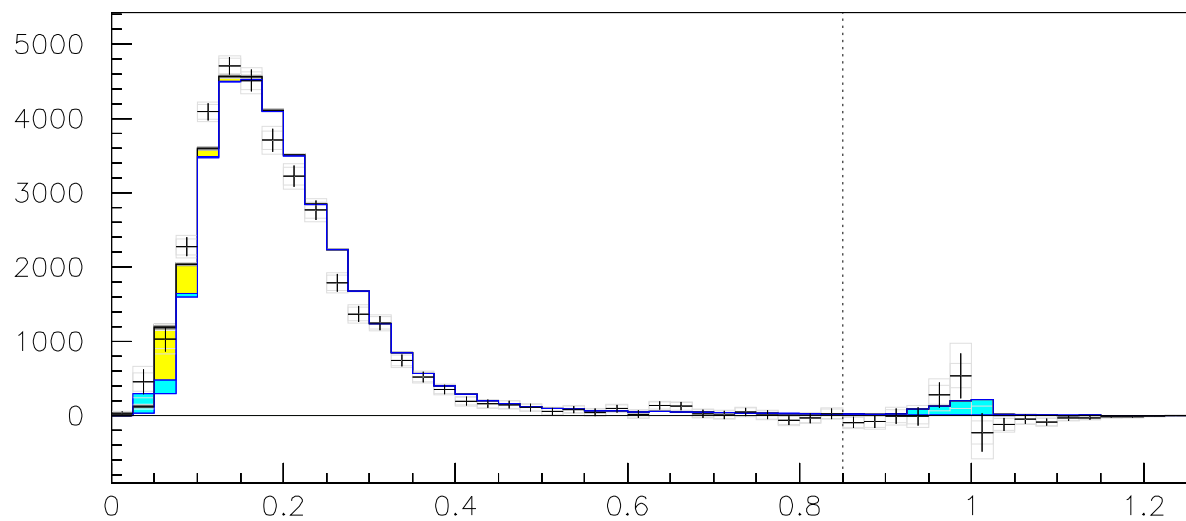|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(1S)$ biggest shower $< 85\%$
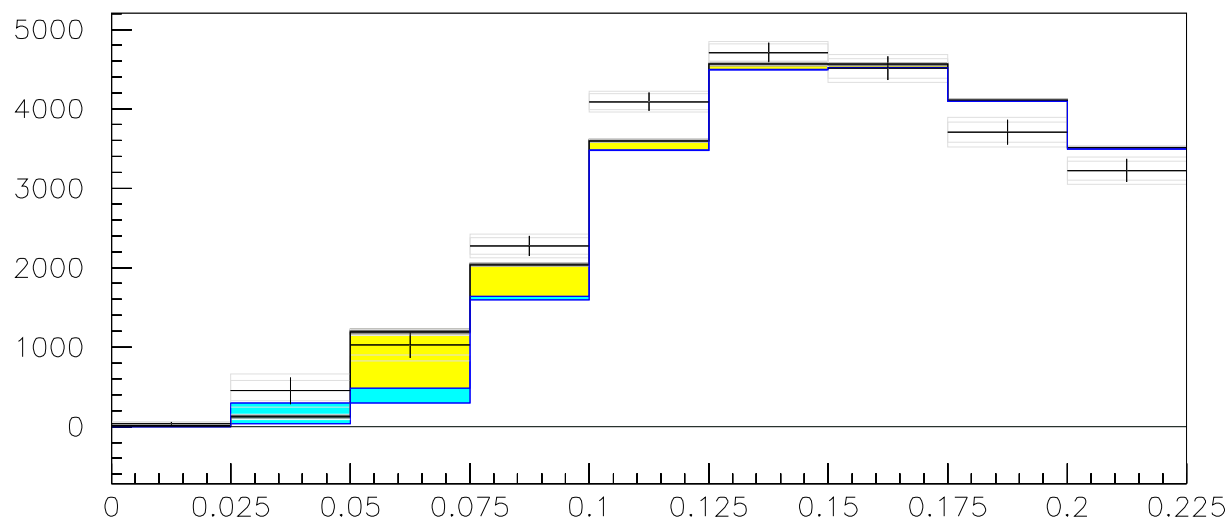

Biggest shower

Biggest shower
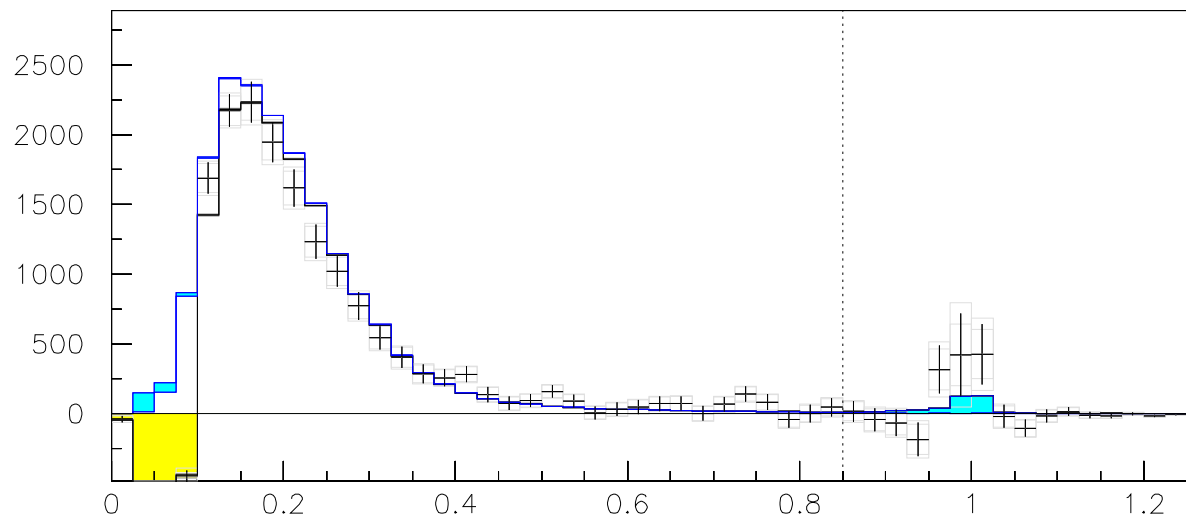
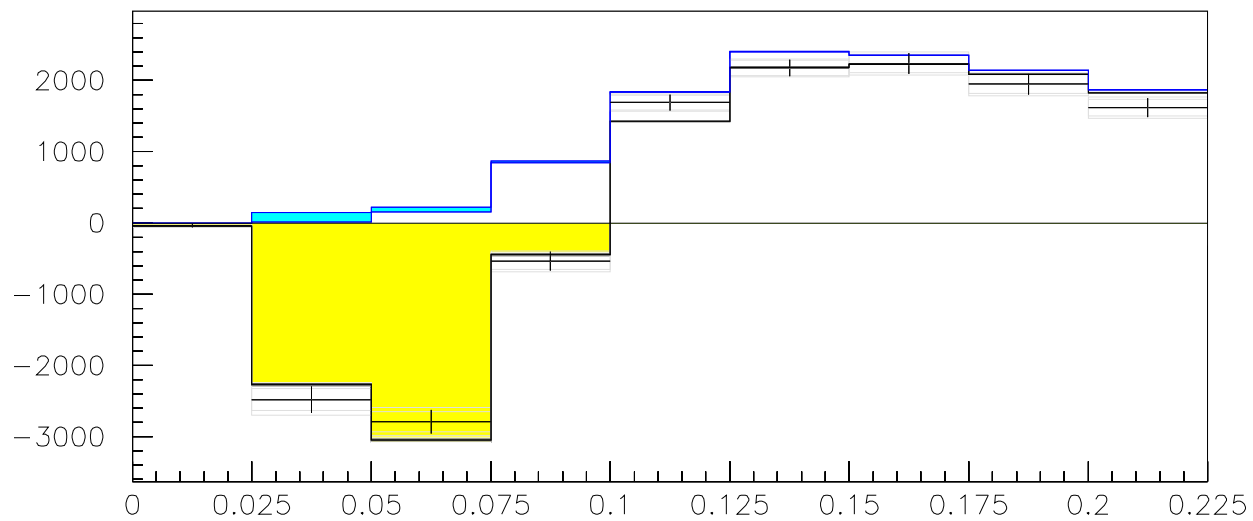# $\Upsilon(2S)$ biggest shower $< 85\%$

Biggest shower

Biggest shower

$\Upsilon(3S)$ biggest shower $< 85\%$

Biggest shower

Biggest shower

$\Upsilon(1S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	*n/a*	*n/a*	*n/a*	*n/a*
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
<mark>second-biggest track < 85%</mark>	<mark>11.28%</mark>	<mark>± 0.63%</mark>	<mark>99.94%</mark>	<mark>± 0.01%</mark>	<mark>98.58%</mark>	<mark>± 0.14%</mark>	<mark>± 0.04%</mark>	<mark>± 0.08%</mark>
event vertex Z or z0 < 7.5 cm	90.26%	± 1.82%	99.39%	± 0.02%	99.31%	± 0.19%	± 0.09%	± 6.76%
visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	*n/a*	*n/a*	*n/a*	*n/a*

$\Upsilon(2S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	*n/a*	*n/a*	*n/a*	*n/a*
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
<mark>second-biggest track < 85%</mark>	<mark>12.44%</mark>	<mark>± 0.62%</mark>	<mark>99.95%</mark>	<mark>± 0.01%</mark>	<mark>97.38%</mark>	<mark>± 0.32%</mark>	<mark>± 0.02%</mark>	<mark>± 2.10%</mark>
event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	*n/a*	*n/a*	*n/a*	*n/a*

$\Upsilon(3S)$

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	*n/a*	*n/a*	*n/a*	*n/a*
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
<mark>second-biggest track < 85%</mark>	<mark>14.00%</mark>	<mark>± 0.88%</mark>	<mark>99.97%</mark>	<mark>± 0.01%</mark>	<mark>97.96%</mark>	<mark>± 0.56%</mark>	<mark>± 0.04%</mark>	<mark>± 2.93%</mark>
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	*n/a*	*n/a*	*n/a*	*n/a*

$\Upsilon(1S)$ second-biggest track $< 85\%$
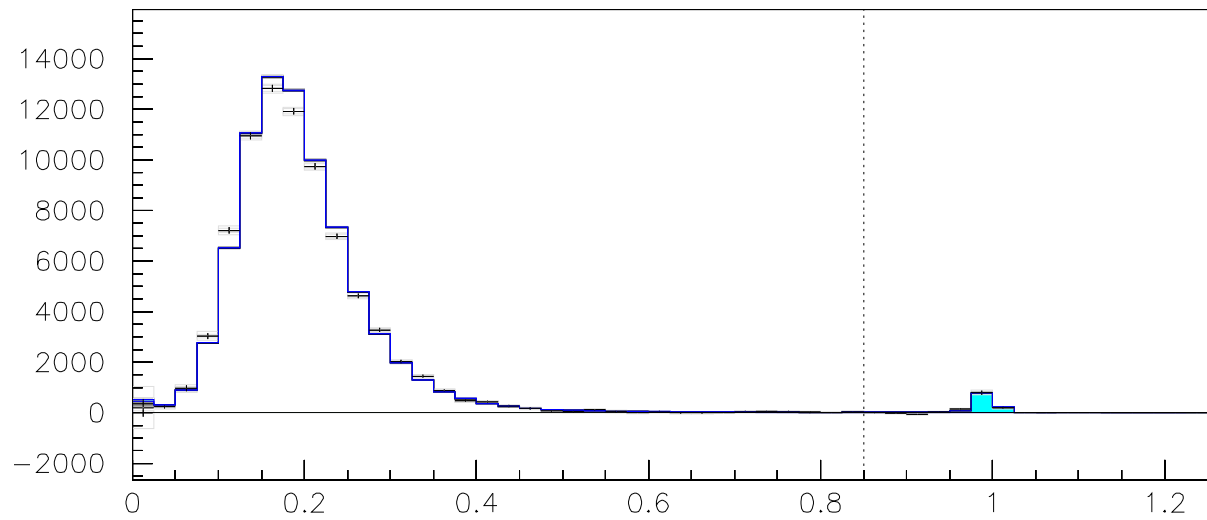
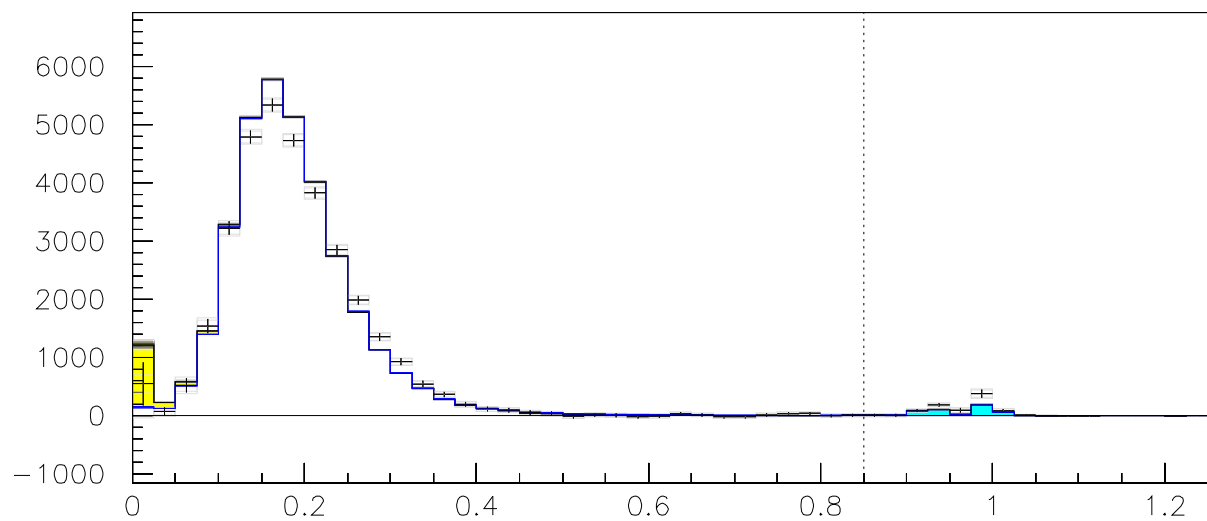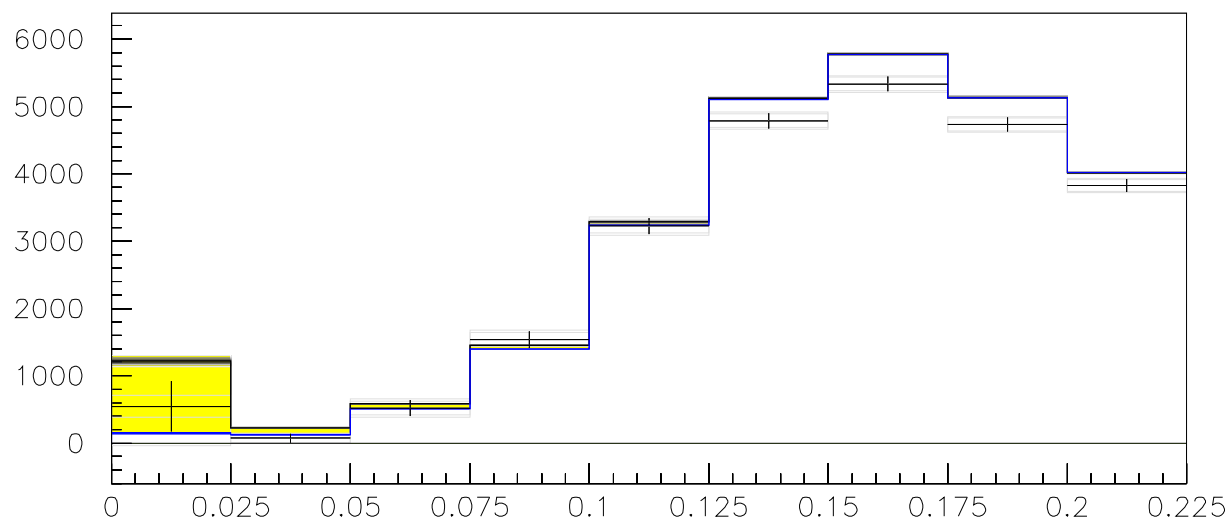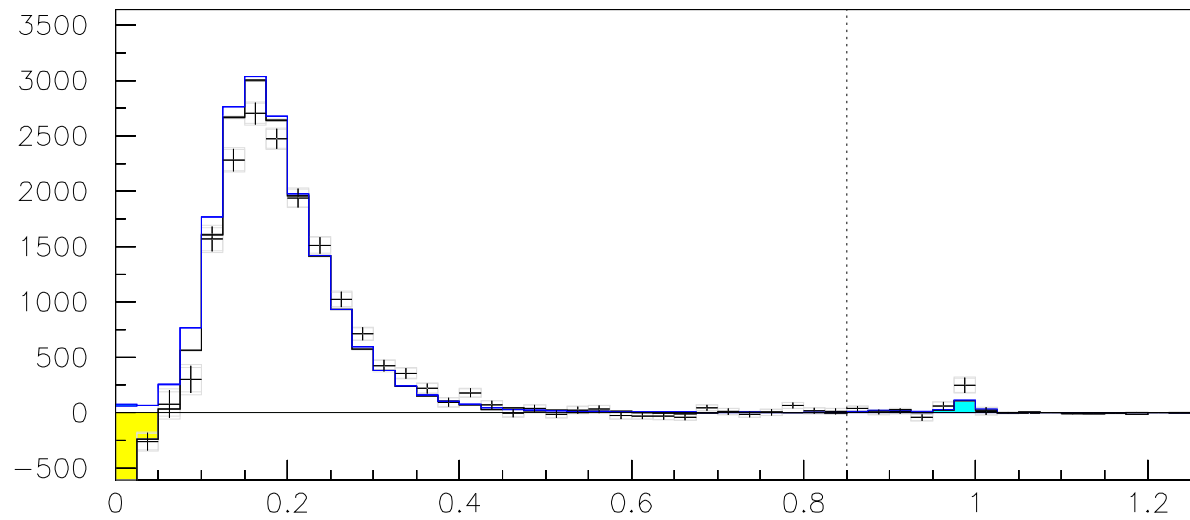Second−biggest track
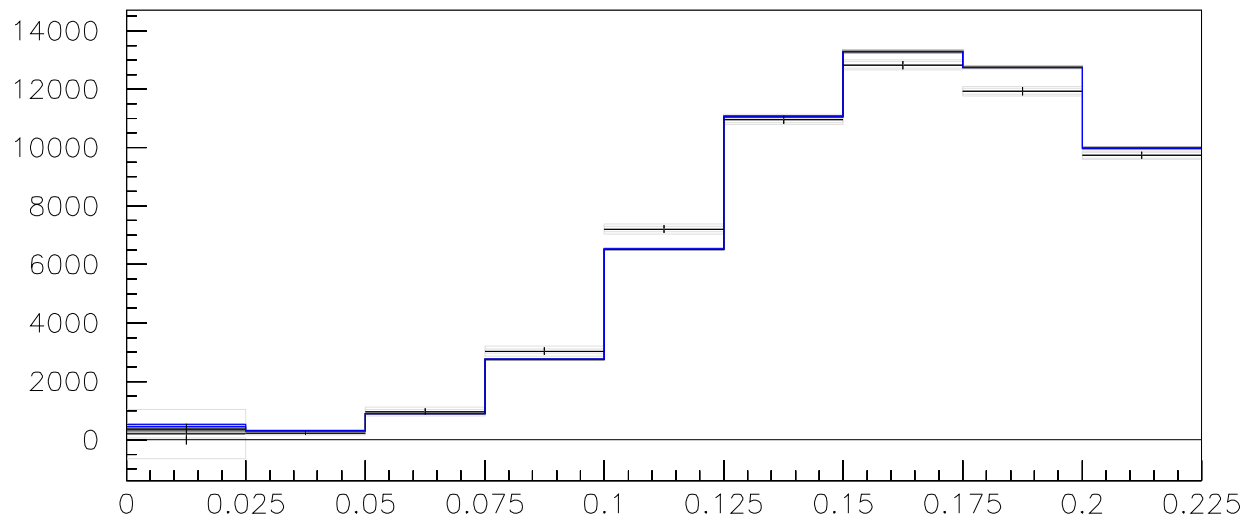
Second−biggest track

$\Upsilon(2S)$ second-biggest track $< 85\%$

Second−biggest track
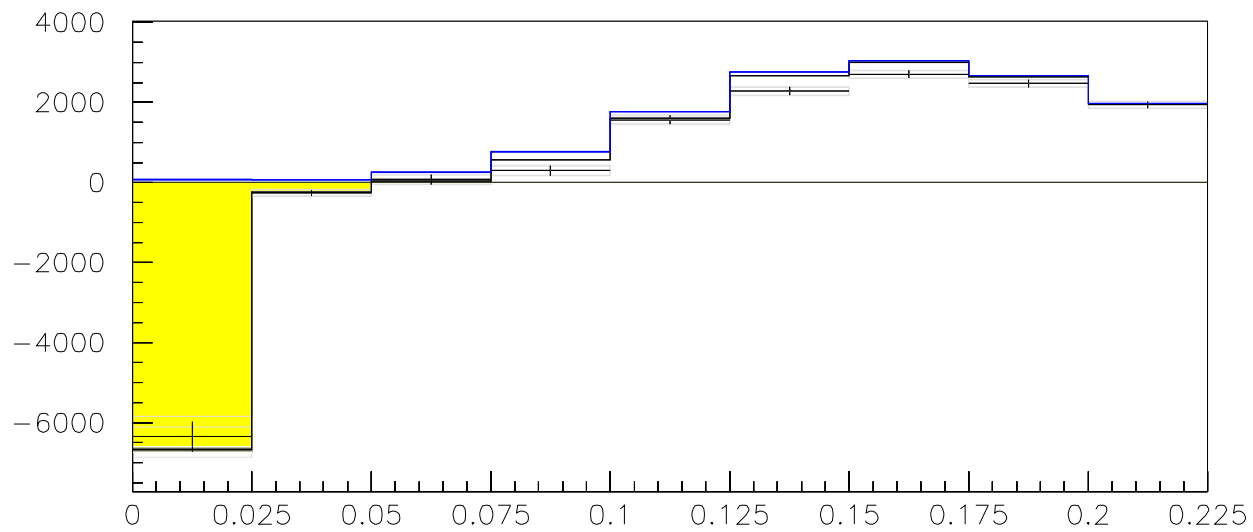

Second−biggest track

$\Upsilon(3S)$ second-biggest track $< 85\%$

Second−biggest track

Second−biggest track

Υ(1S)

|	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
second-biggest track < 85%	11.28%	± 0.63%	99.94%	± 0.01%	98.58%	± 0.14%	± 0.04%	± 0.08%
event vertex Z or z0 < 7.5 cm	90.26%	± 1.82%	99.39%	± 0.02%	99.31%	± 0.19%	± 0.09%	± 6.76%
visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	n/a	n/a	n/a	n/a

Υ(2S)

	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
second-biggest track < 85%	12.44%	± 0.62%	99.95%	± 0.01%	97.38%	± 0.32%	± 0.02%	± 2.10%
event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	n/a	n/a	n/a	n/a

Υ(3S)

|	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
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second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(1S)$ event vertex Z or z0 < 7.5 cm *(implies one track)*
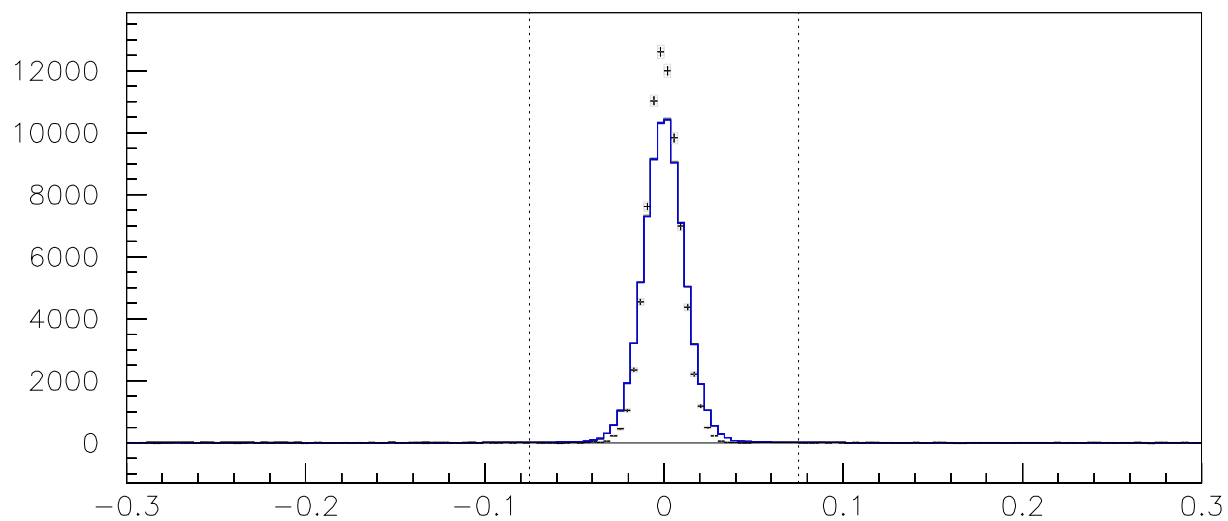
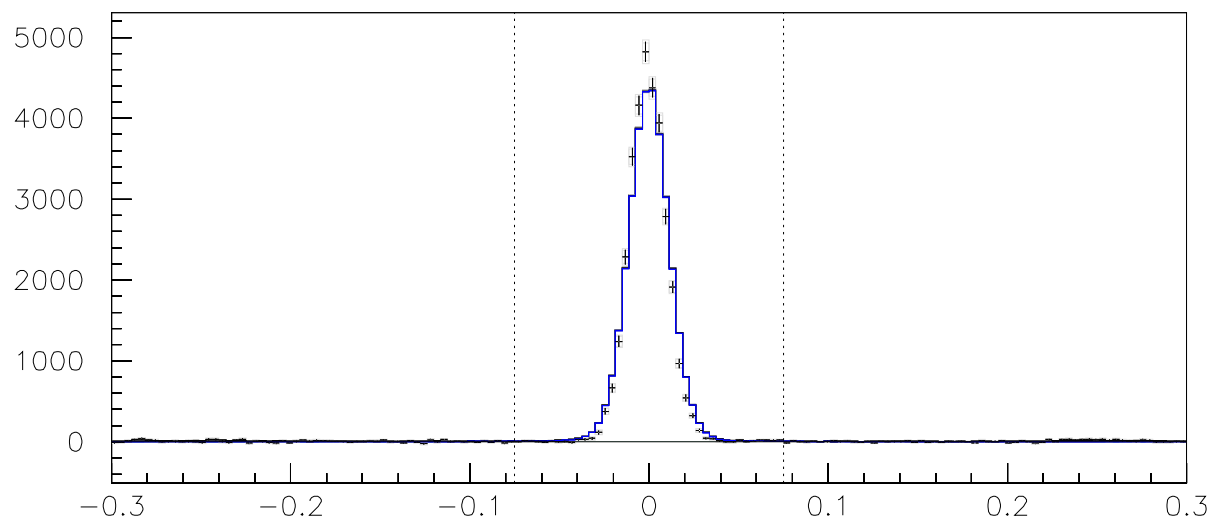Event vertex Z (requires 2 low−quality tracks)
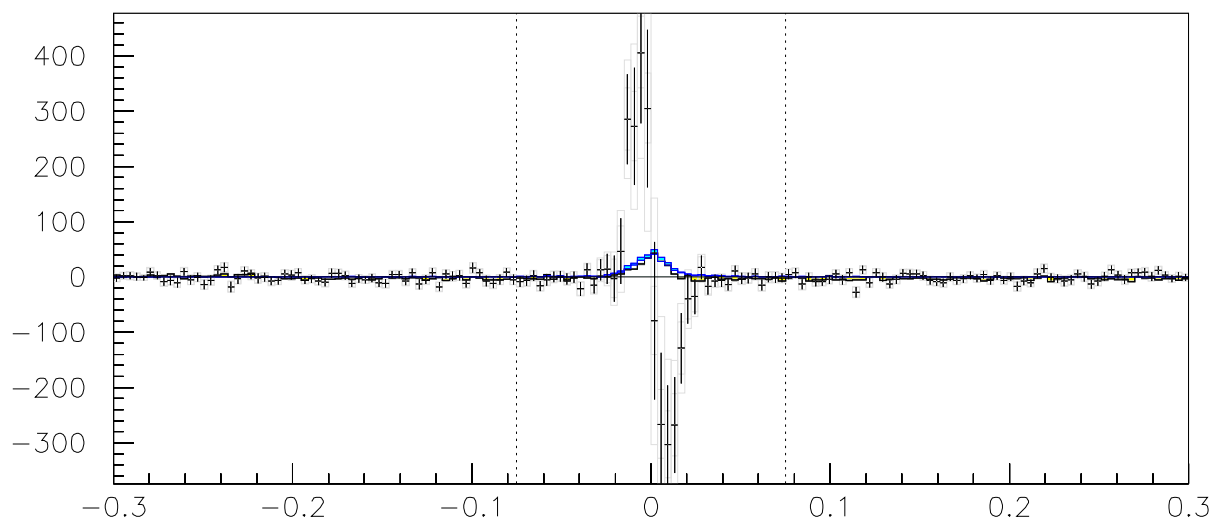
Closest track z0 when 2 tracks are unavailable

$\Upsilon(2S)$ event vertex Z or z0 < 7.5 cm *(implies one track)*
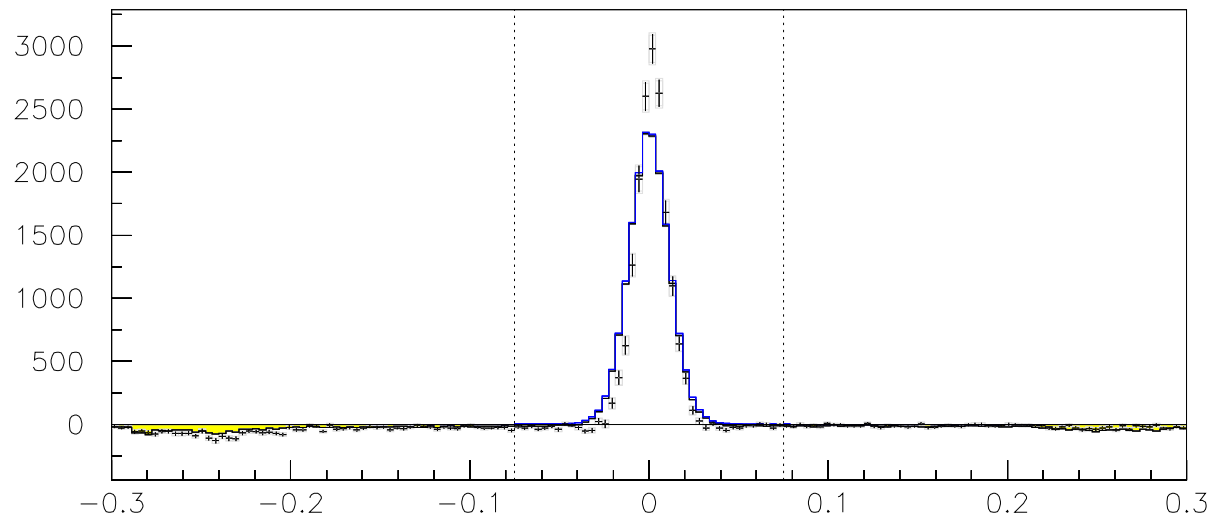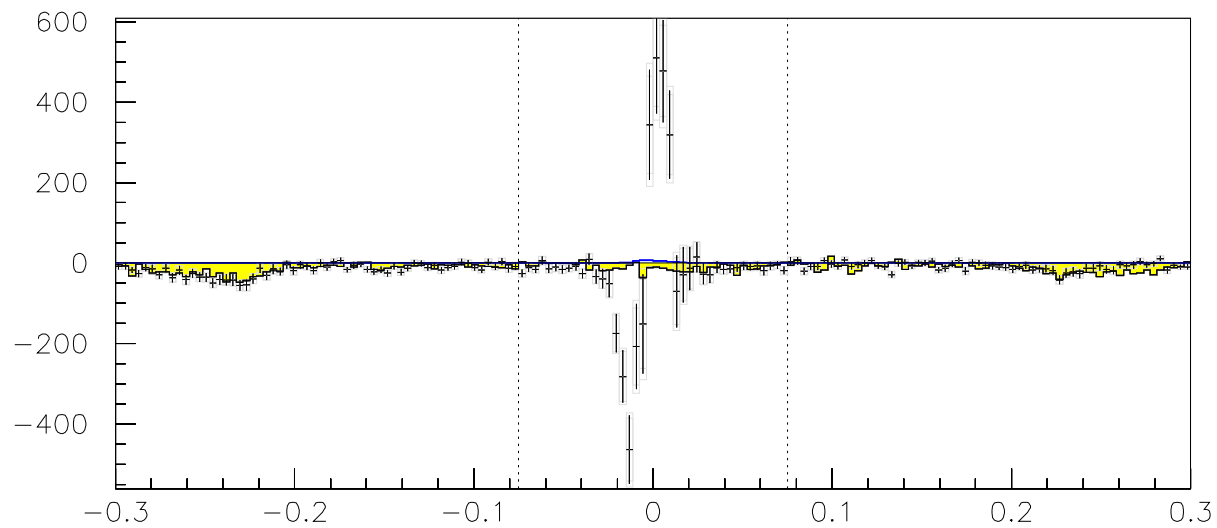

Event vertex Z (requires 2 low−quality tracks)
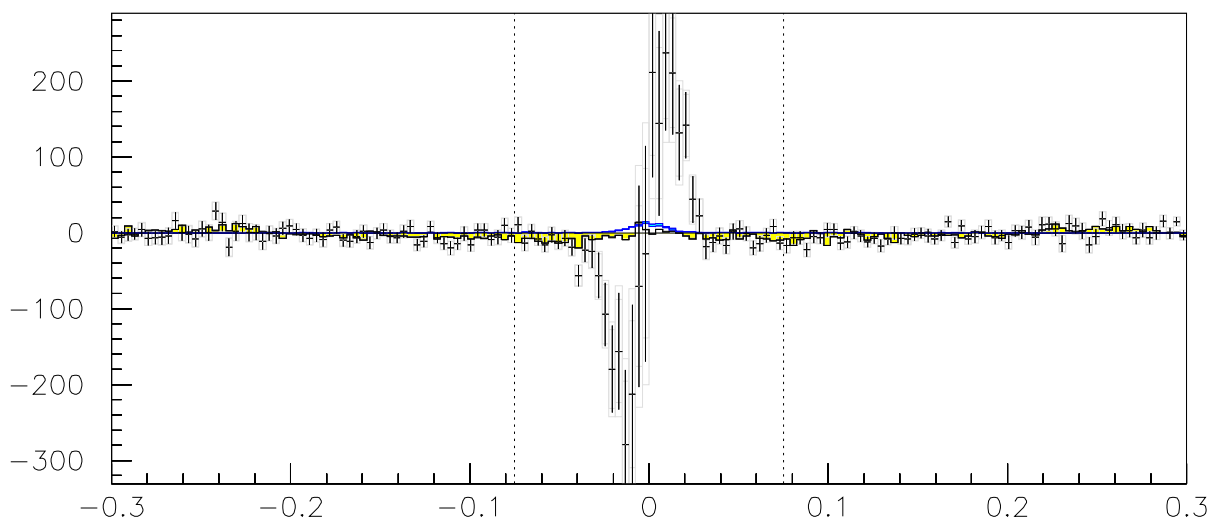
Closest track z0 when 2 tracks are unavailable

$\Upsilon(3S)$ event vertex Z or z0 < 7.5 cm *(implies one track)*

Event vertex Z (requires 2 low−quality tracks)

Closest track z0 when 2 tracks are unavailable

Υ(1S)

	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
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event vertex Z or z0 < 7.5 cm	90.26%	± 1.82%	99.39%	± 0.02%	99.31%	± 0.19%	± 0.09%	± 6.76%
visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	n/a	n/a	n/a	n/a

Υ(2S)

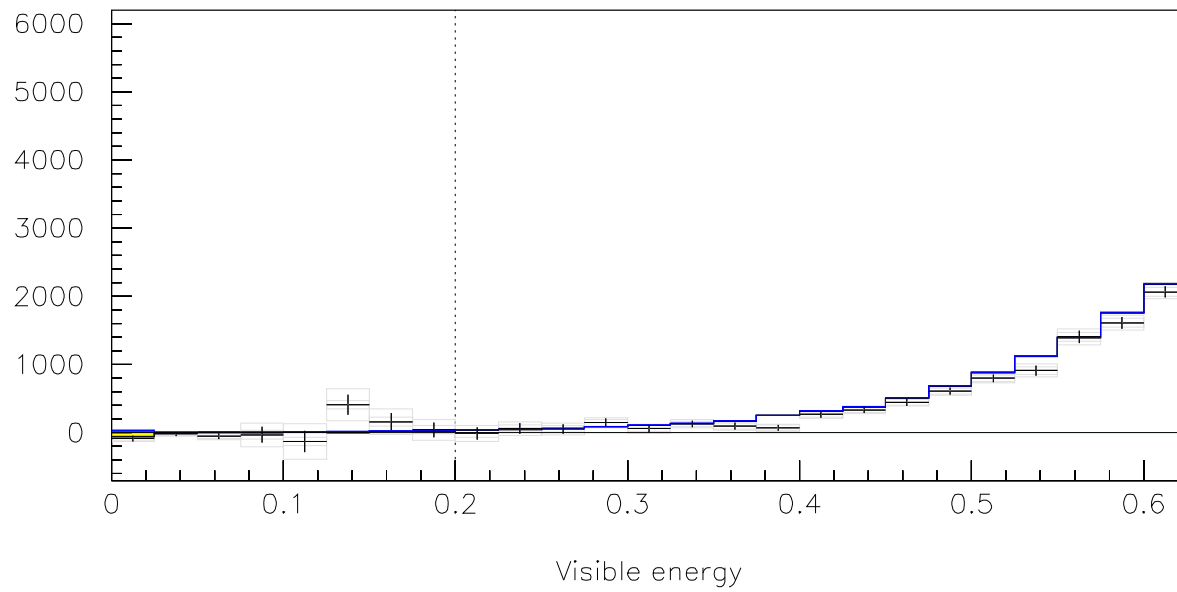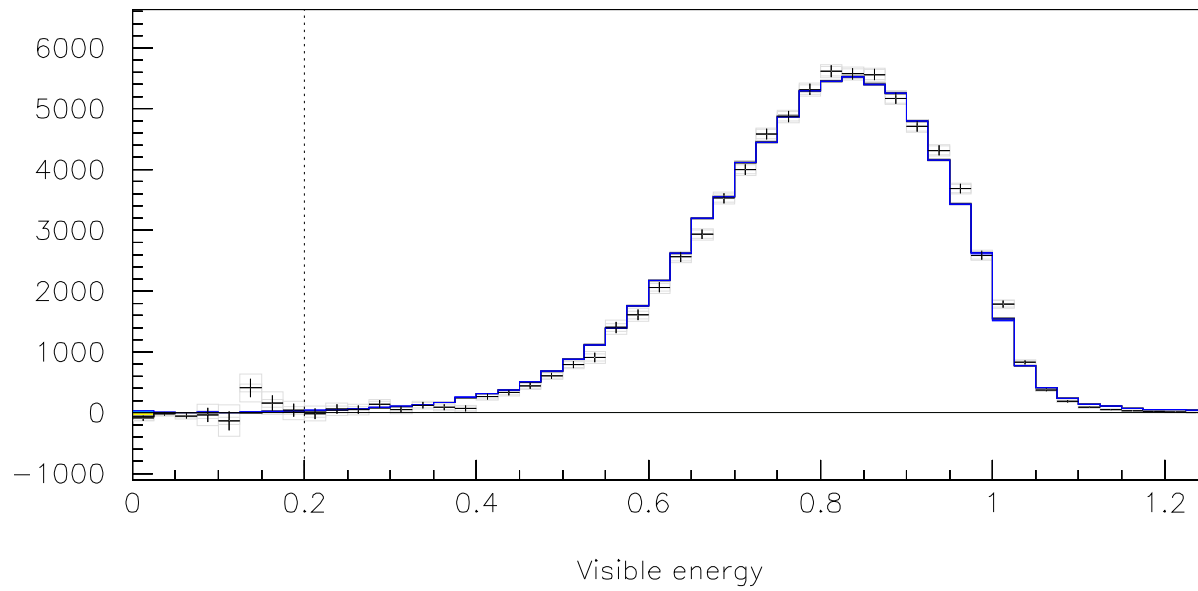|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
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event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	n/a	n/a	n/a	n/a

Υ(3S)

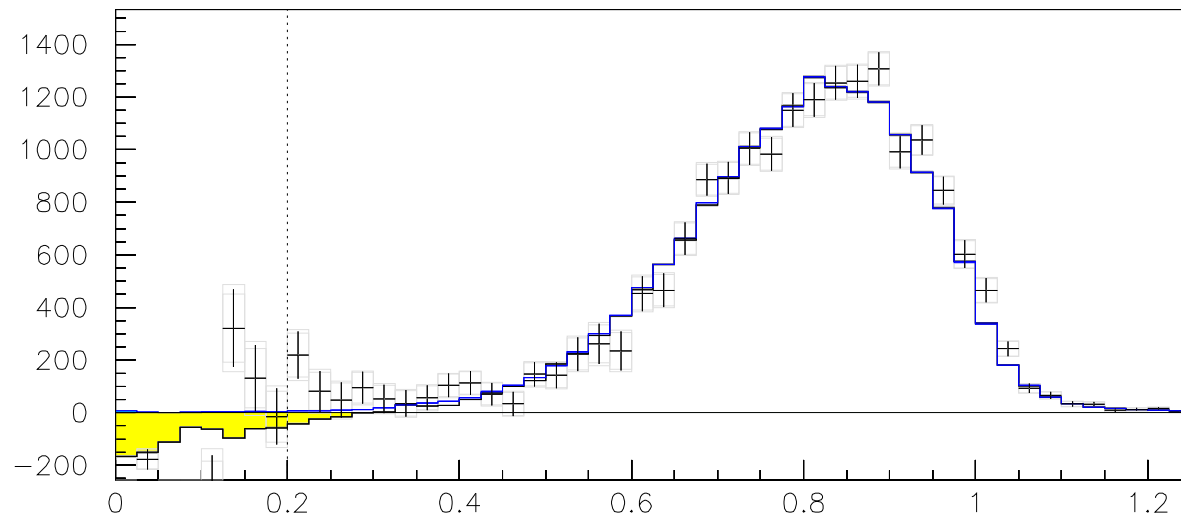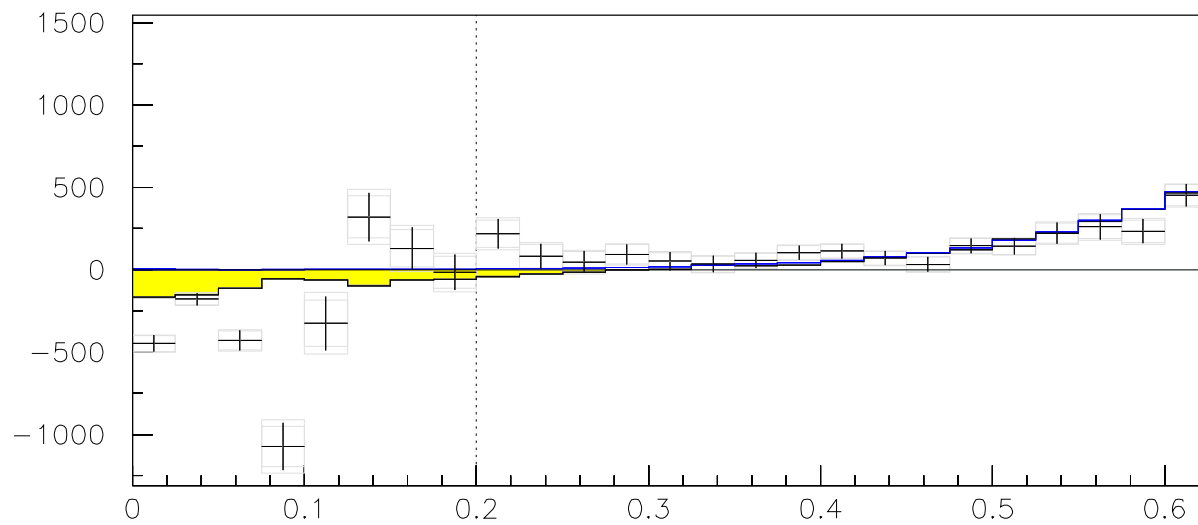|	MC$\ell\ell$		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(1S)$ visible energy > 20%

$\Upsilon(2S)$ visible energy > 20%

Visible energy

Visible energy

$\Upsilon(3S)$ visible energy > 20%

Visible energy

Visible energy

Υ(1S)

|	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
second-biggest track < 85%	11.28%	± 0.63%	99.94%	± 0.01%	98.58%	± 0.14%	± 0.04%	± 0.08%
event vertex Z or z0 < 7.5 cm	90.26%	± 1.82%	99.39%	± 0.02%	99.31%	± 0.19%	± 0.09%	± 6.76%
visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	n/a	n/a	n/a	n/a

Υ(2S)

	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
second-biggest track < 85%	12.44%	± 0.62%	99.95%	± 0.01%	97.38%	± 0.32%	± 0.02%	± 2.10%
event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	n/a	n/a	n/a	n/a

Υ(3S)

|	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(1S)$ number of quality tracks ≥ 2

Number of quality tracks

$\Upsilon(2S)$ number of quality tracks ≥ 2
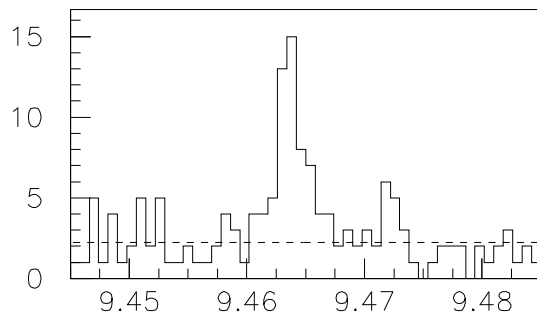
Number of quality tracks

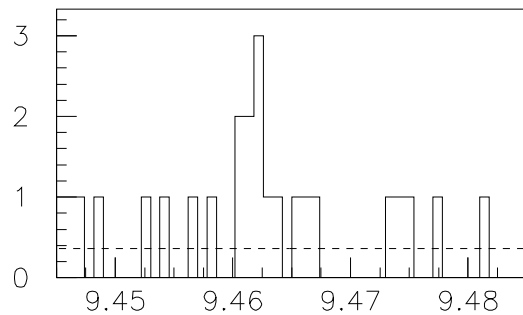$\Upsilon(3S)$ number of quality tracks ≥ 2
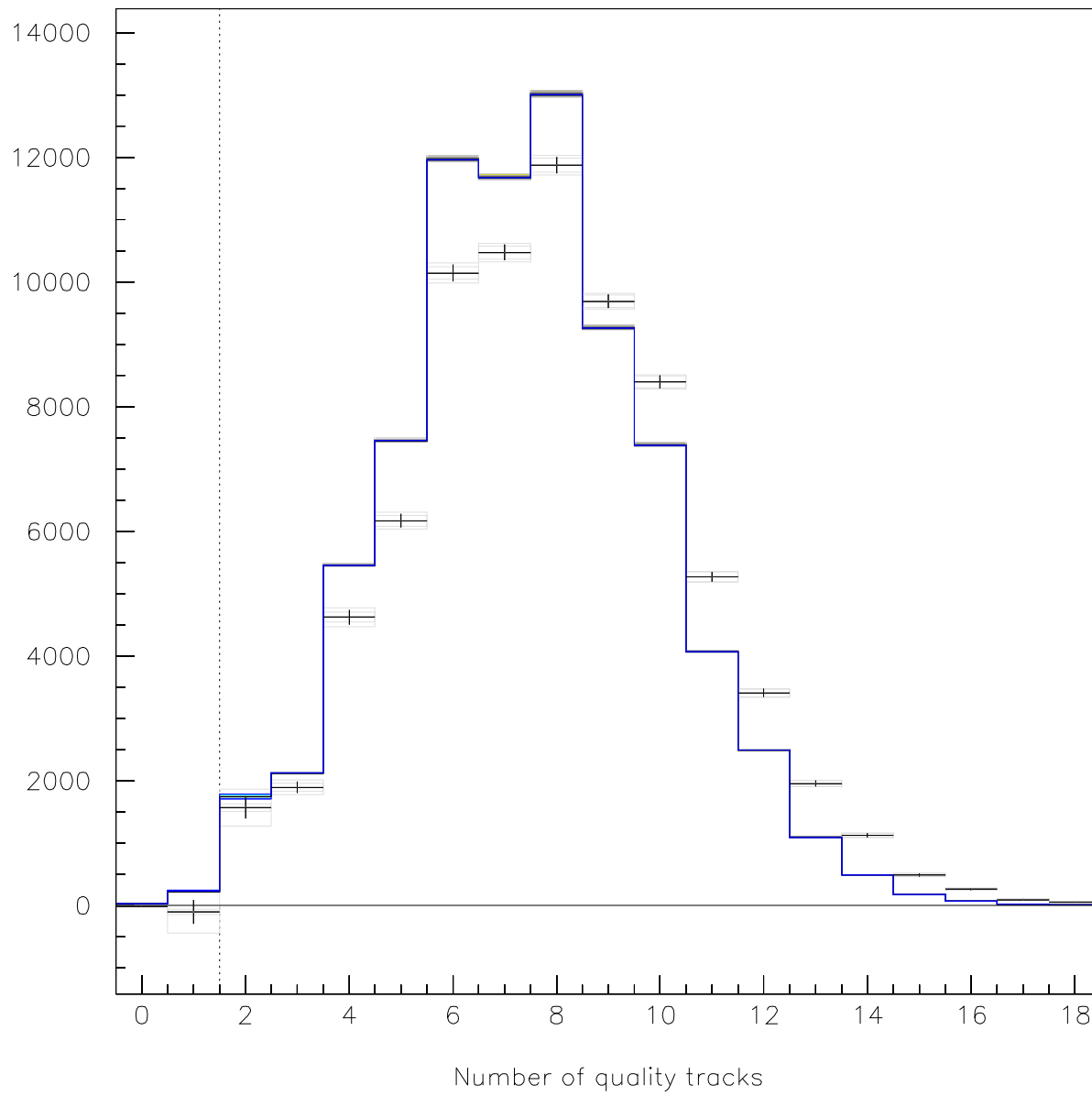
Number of quality tracks
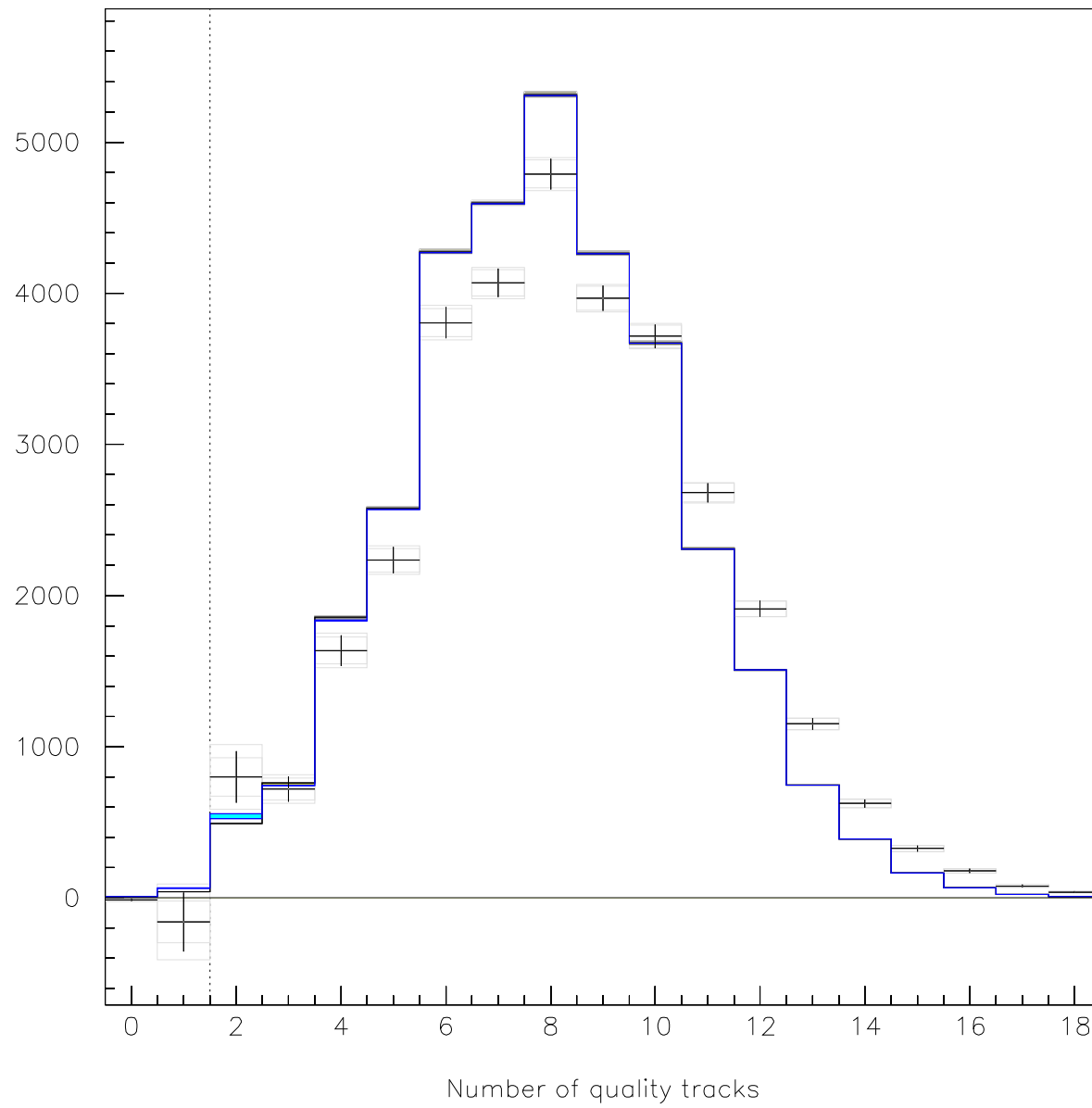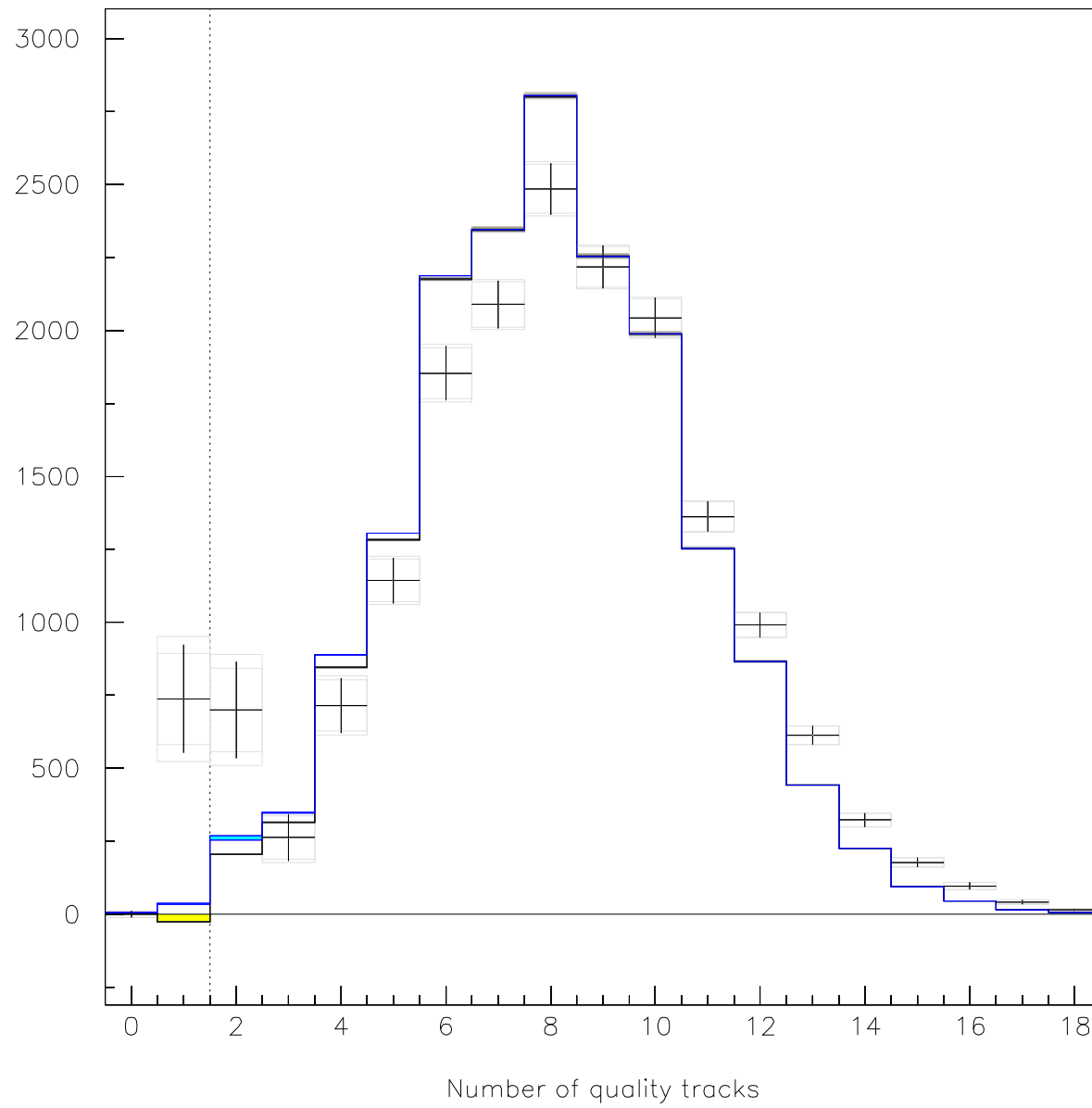
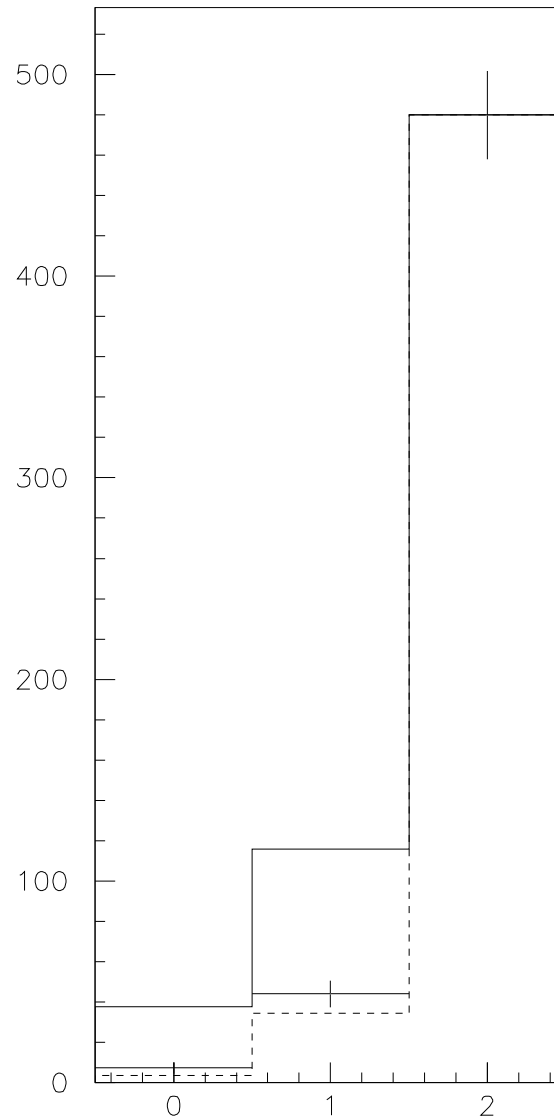# $\Upsilon(1S)$ number of quality tracks ≥ 2
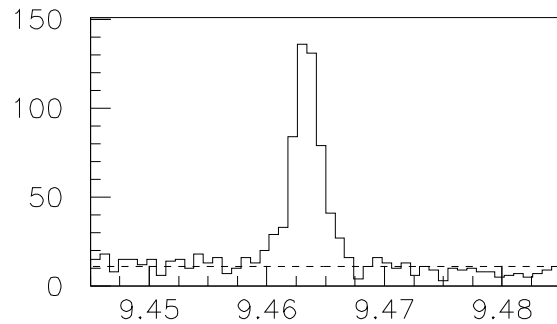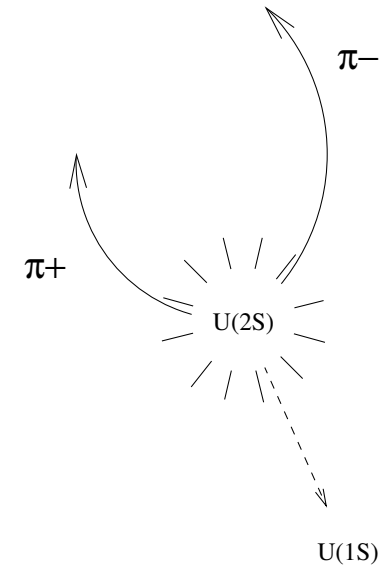
$\Upsilon(1S)$ mass (2 extra tracks)

$\Upsilon(1S)$ mass (1 extra track)

$\Upsilon(1S)$ mass (0 extra tracks)

1S MC is solid, 2S cascade MC is dashed

$\pi-$

$\pi+$

U(2S)

U(1S)

Only cuts which don't imply a track cut are applied

- biggest shower < 85%

- 2nd biggest track < 85%

- visible energy > 20%

- CC energy < 85%

MC normalized at tracks=2

Boost required for agreement

Υ(1S)

	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
second-biggest track < 85%	11.28%	± 0.63%	99.94%	± 0.01%	98.58%	± 0.14%	± 0.04%	± 0.08%
event vertex Z or z0 < 7.5 cm	90.26%	± 1.82%	99.39%	± 0.02%	99.31%	± 0.19%	± 0.09%	± 6.76%
visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	n/a	n/a	n/a	n/a

Υ(2S)

	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
second-biggest track < 85%	12.44%	± 0.62%	99.95%	± 0.01%	97.38%	± 0.32%	± 0.02%	± 2.10%
event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	n/a	n/a	n/a	n/a

Υ(3S)

	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(1S)$ CC energy $< 85\%$
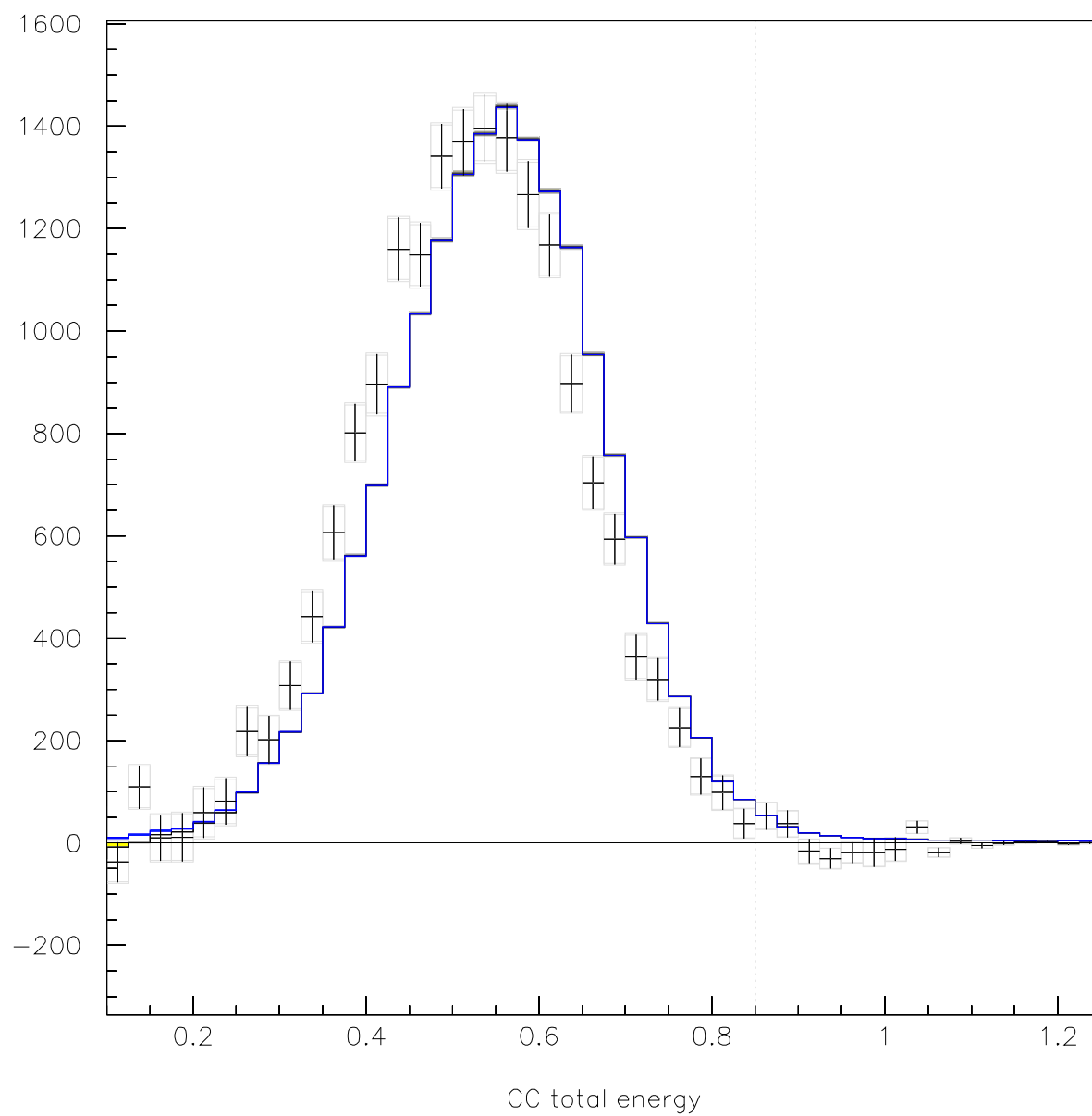
CC total energy

$\Upsilon(2S)$ CC energy < 85%

CC total energy

$\Upsilon(3S)$ CC energy < 85%

CC total energy

$\Upsilon(1S)$

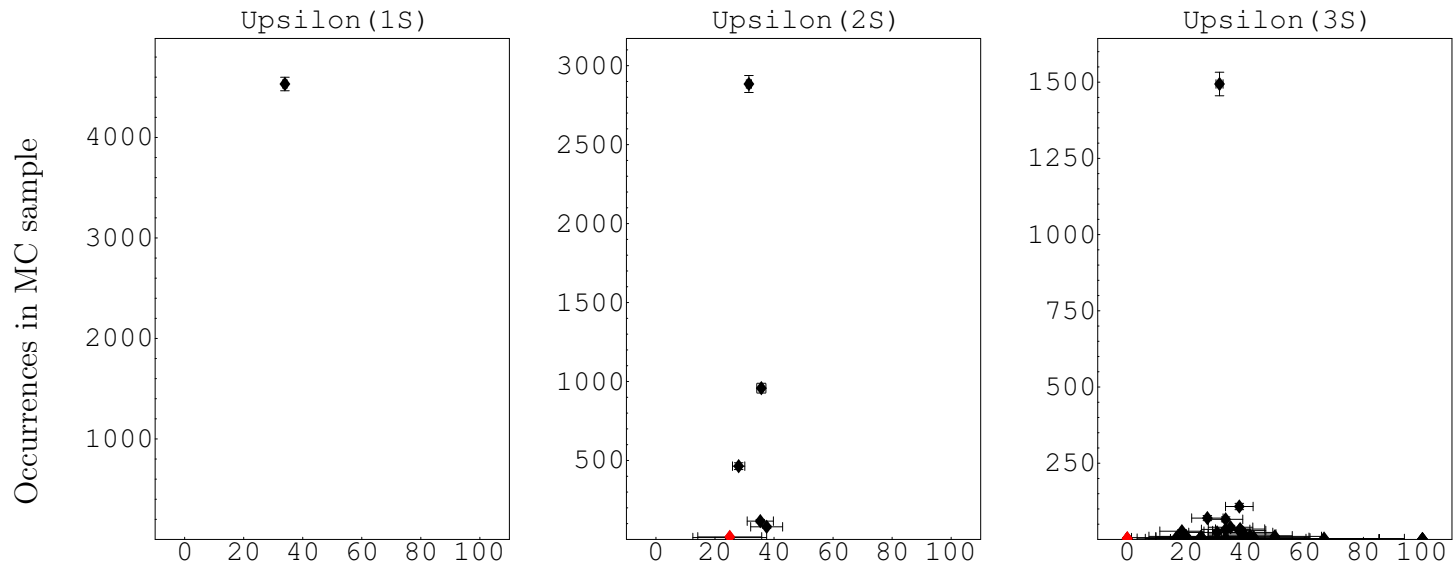|	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	69.67%	± 0.55%	99.17%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.89%	± 0.14%	99.88%	± 0.01%	99.05%	± 0.40%	± 0.10%	± 5.67%
biggest shower < 85%	42.95%	± 0.67%	99.02%	± 0.03%	98.08%	± 0.45%	± 1.19%	± 0.15%
second-biggest track < 85%	11.28%	± 0.63%	99.94%	± 0.01%	98.58%	± 0.14%	± 0.04%	± 0.08%
event vertex Z or z0 < 7.5 cm	90.26%	± 1.82%	99.39%	± 0.02%	99.31%	± 0.19%	± 0.09%	± 6.76%
visible energy > 20%	72.20%	± 2.73%	99.89%	± 0.01%	99.45%	± 0.31%	± 0.42%	± 0.50%
number of quality tracks ≥ 2	78.74%	± 3.03%	99.67%	± 0.01%	100.11%	± 0.23%	± 0.20%	± 0.03%
level3/level4	100%	± 0%	100%	± 0%	99.99%	± 0.02%	± 0.00%	± 0.00%
CC energy < 85%	91.24%	± 2.34%	98.56%	± 0.03%	99.84%	± 0.09%	± 0.02%	± 0.00%
all cuts except trigger	2.24%	± 0.20%	96.40%	± 0.05%	94.54%	± 0.41%	± 1.64%	± 10.82%
all cuts	1.56%	± 0.13%	95.60%	± 0.06%	n/a	n/a	n/a	n/a

$\Upsilon(2S)$

	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	75.46%	± 0.48%	99.39%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	99.37%	± 0.10%	99.91%	± 0.01%	96.09%	± 1.00%	± 0.07%	± 35.84%
biggest shower < 85%	46.03%	± 0.60%	99.13%	± 0.02%	99.82%	± 1.09%	± 1.09%	± 0.11%
second-biggest track < 85%	12.44%	± 0.62%	99.95%	± 0.01%	97.38%	± 0.32%	± 0.02%	± 2.10%
event vertex Z or z0 < 7.5 cm	92.01%	± 1.41%	99.46%	± 0.02%	101.53%	± 0.56%	± 0.03%	± 46.06%
visible energy > 20%	79.64%	± 2.13%	99.92%	± 0.01%	100.44%	± 0.73%	± 0.46%	± 1.41%
number of quality tracks ≥ 2	89.10%	± 1.82%	99.79%	± 0.01%	100.44%	± 0.50%	± 0.17%	± 0.09%
level3/level4	99.58%	± 0.41%	100%	± 0%	100.01%	± 0.04%	± 0.00%	± 0.03%
CC energy < 85%	87.29%	± 2.15%	98.70%	± 0.03%	99.48%	± 0.19%	± 0.02%	± 0.00%
all cuts except trigger	3.23%	± 0.21%	96.90%	± 0.04%	95.18%	± 0.86%	± 1.60%	± 132.64%
all cuts	2.44%	± 0.17%	96.30%	± 0.04%	n/a	n/a	n/a	n/a

$\Upsilon(3S)$

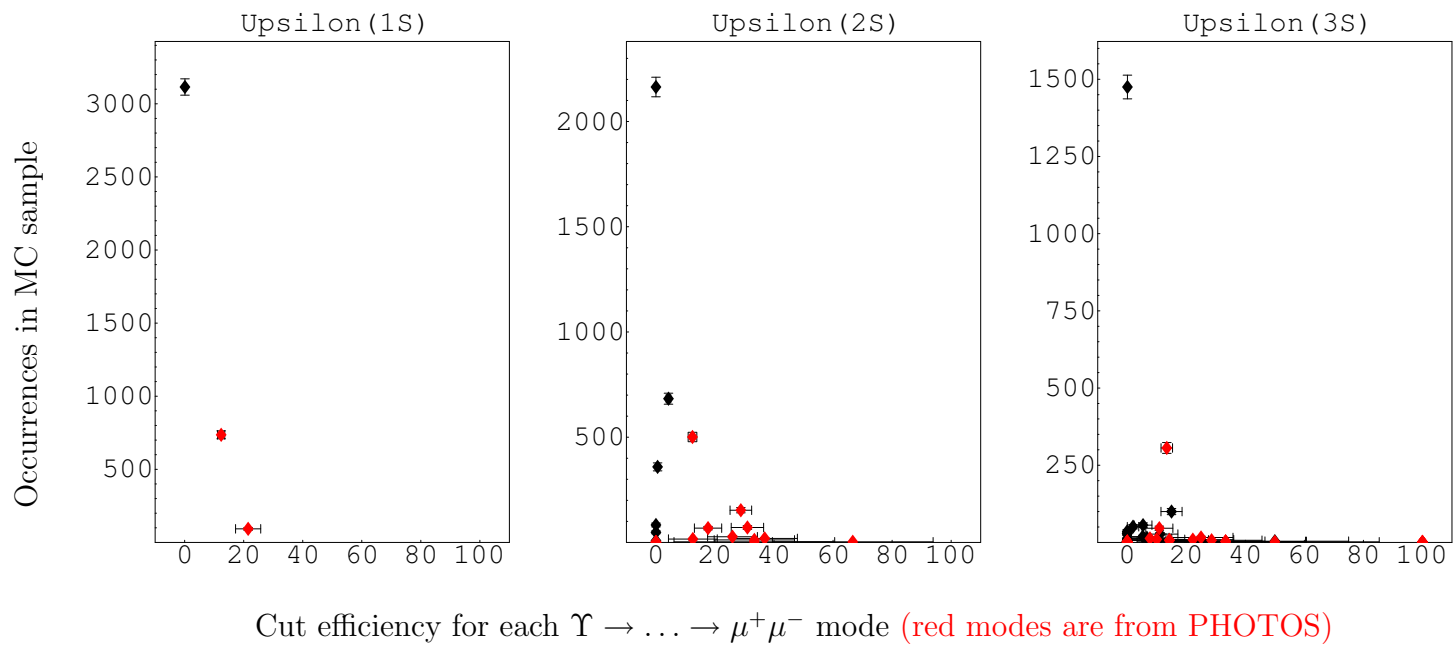|	MCℓℓ		MCother		data	err from stat	cont-sub	bkgnds
trigger	71.29%	± 0.64%	99.40%	± 0.02%	n/a	n/a	n/a	n/a
closest track d0 < 5 mm	98.61%	± 0.21%	99.90%	± 0.01%	110.60%	± 2.25%	± 0.12%	± 519.57%
biggest shower < 85%	44.27%	± 0.83%	99.29%	± 0.03%	96.07%	± 1.89%	± 1.01%	± 14.87%
second-biggest track < 85%	14.00%	± 0.88%	99.97%	± 0.01%	97.96%	± 0.56%	± 0.04%	± 2.93%
event vertex Z or z0 < 7.5 cm	95.26%	± 1.44%	99.75%	± 0.02%	97.62%	± 1.10%	± 0.13%	± 238.53%
visible energy > 20%	70.15%	± 3.16%	99.93%	± 0.01%	107.29%	± 1.43%	± 0.58%	± 3.22%
number of quality tracks ≥ 2	84.40%	± 3.13%	99.77%	± 0.02%	95.57%	± 0.85%	± 0.14%	± 0.17%
level3/level4	100%	± 0%	100%	± 0%	100.03%	± 0.07%	± 0.00%	± 0.05%
CC energy < 85%	89.92%	± 2.74%	98.74%	± 0.04%	99.91%	± 0.36%	± 0.02%	± 0.00%
all cuts except trigger	3.10%	± 0.30%	97.37%	± 0.05%	104.12%	± 1.70%	± 1.84%	± 22071.80%
all cuts	2.21%	± 0.22%	96.79%	± 0.06%	n/a	n/a	n/a	n/a

Upsilon(1S)

Upsilon(2S)

Upsilon(3S)

Cut efficiency for each $\Upsilon \to \ldots \to$ gluons mode (red modes are from PHOTOS)

Upsilon(1S)

Upsilon(2S)

Upsilon(3S)

Cut efficiency for each $\Upsilon \to \ldots \to gg\gamma$ mode (red modes are from PHOTOS)

Upsilon(1S)   Upsilon(2S)   Upsilon(3S)

Occurrences in MC sample

Cut efficiency for each $\Upsilon \to \ldots \to e^+e^-$ mode (red modes are from PHOTOS)

Upsilon(1S)   Upsilon(2S)   Upsilon(3S)

Occurrences in MC sample
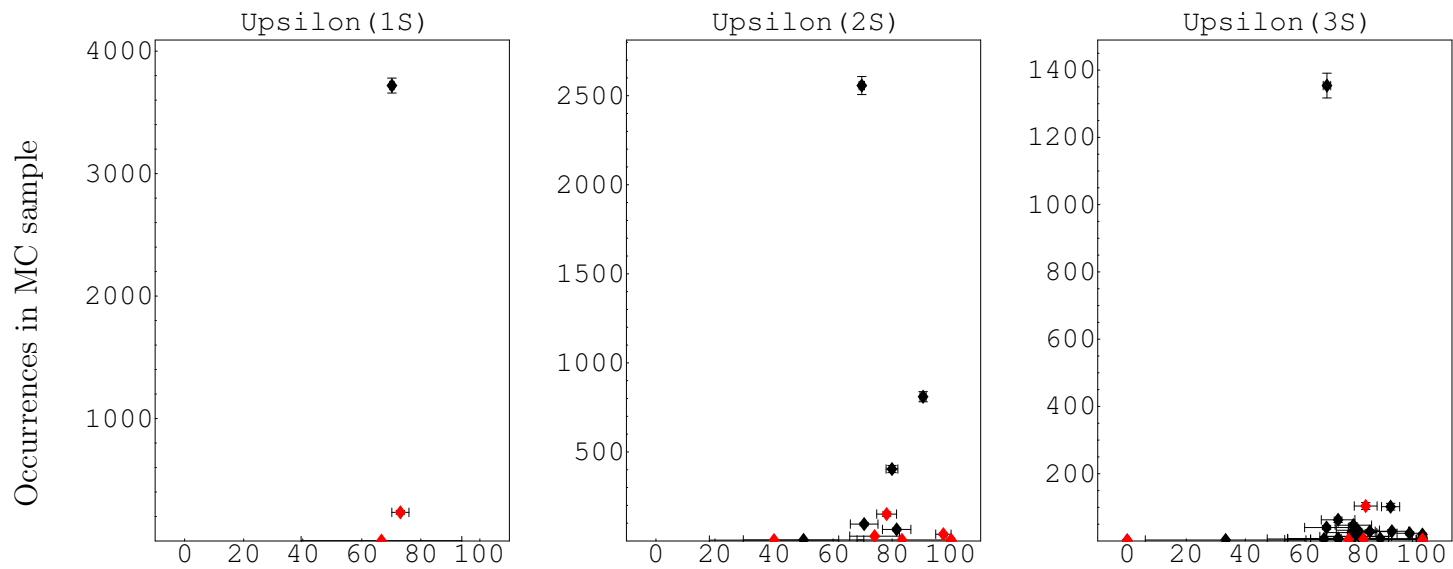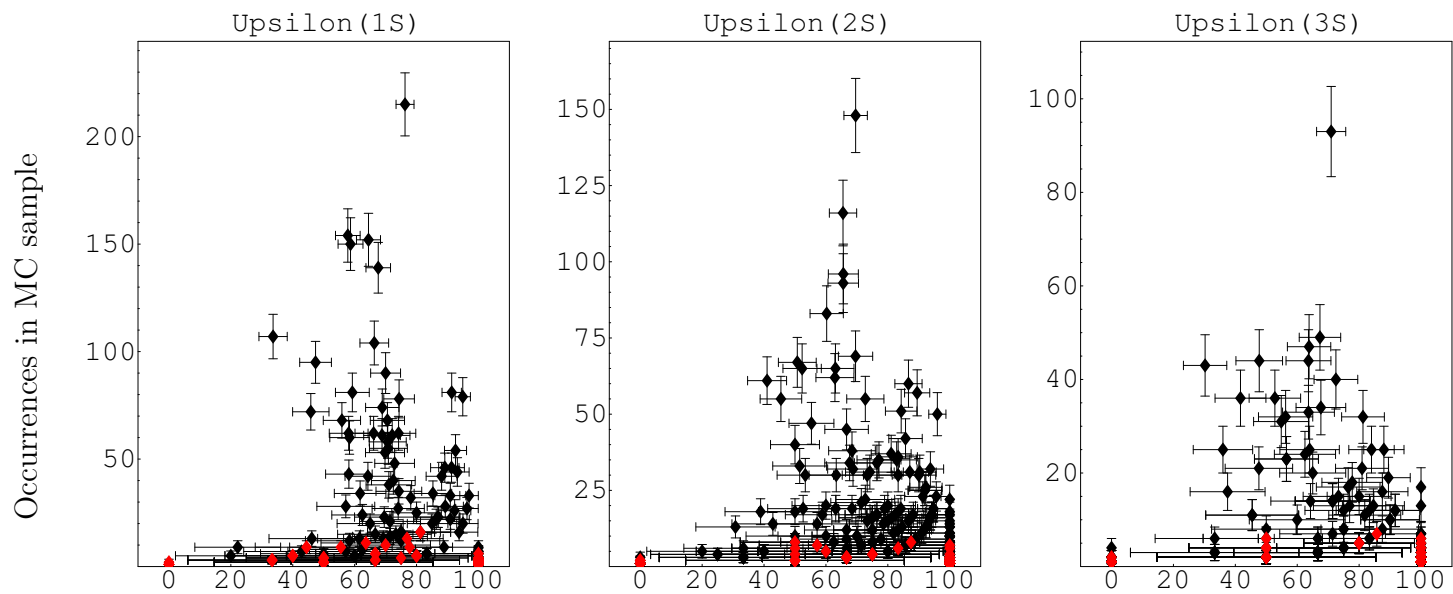
Cut efficiency for each $\Upsilon \to \ldots \to \mu^+\mu^-$ mode (red modes are from PHOTOS)
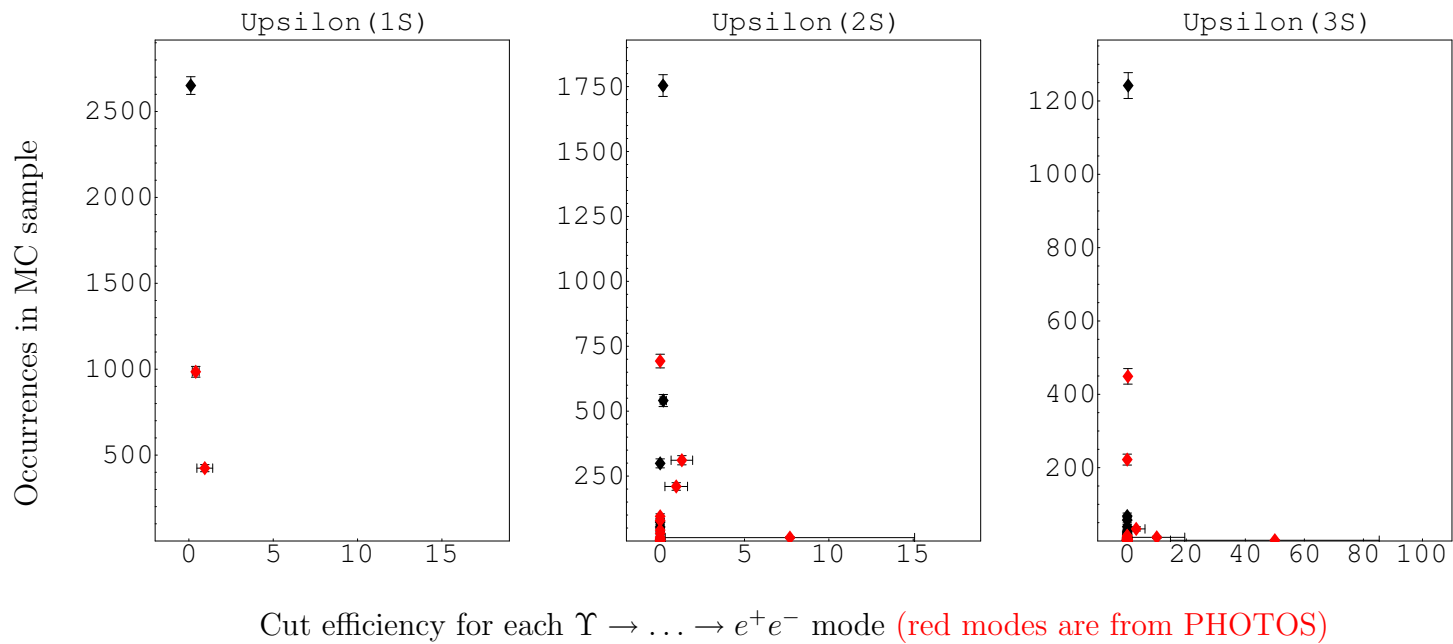
Cut efficiency for each $\Upsilon \to \ldots \to \tau^+\tau^-$ cascades mode (red modes are from PHOTOS)

Cut efficiency for each $\Upsilon \to \ldots \to \tau^+\tau^- \to$ final state (red modes are from PHOTOS)

		stat	vary modes	vary PHOTOS 30%	vary $\mathcal{B}(\frac{gg\gamma}{ggg})$ 33%
$\Upsilon(1S)$					
(PDG $\mathcal{B}_{\mu\mu}$)	$\epsilon_\Upsilon = 90.99\%$	$\pm\, 0.07\%$	$\pm\, \begin{matrix} 0.08\% \\ 0.09\% \end{matrix}$	$\pm\, 0.38\%$	$\pm\, 0.59\%$
(Istvan's $\mathcal{B}_{\mu\mu}$)	$\epsilon_\Upsilon = 90.98\%$				
$\Upsilon(1S) \to$ hadrons					
(PDG $\mathcal{B}_{\mu\mu}$)	$\epsilon_{\Upsilon\to\text{had}} = 96.39\%$	$\pm\, 0.05\%$	$\pm\, \begin{matrix} 0\% \\ 0\% \end{matrix}$	$\pm\, 0\%$	$\pm\, 0.64\%$
(Istvan's $\mathcal{B}_{\mu\mu}$)	$\epsilon_{\Upsilon\to\text{had}} = 96.39\%$				
$\Upsilon(2S)$					
(PDG $\mathcal{B}_{\mu\mu}$)	$\epsilon_\Upsilon = 92.46\%$	$\pm\, 0.06\%$	$\pm\, \begin{matrix} 0.24\% \\ 0.11\% \end{matrix}$	$\pm\, 0.34\%$	$\pm\, 0.53\%$
(Istvan's $\mathcal{B}_{\mu\mu}$)	$\epsilon_\Upsilon = 91.17\%$				
$\Upsilon(2S) \to$ hadrons					
(PDG $\mathcal{B}_{\mu\mu}$)	$\epsilon_{\Upsilon\to\text{had}} = 95.25\%$	$\pm\, 0.05\%$	$\pm\, \begin{matrix} 0.06\% \\ 0.06\% \end{matrix}$	$\pm\, 0.12\%$	$\pm\, 0.55\%$
(Istvan's $\mathcal{B}_{\mu\mu}$)	$\epsilon_{\Upsilon\to\text{had}} = 95.23\%$				
$\Upsilon(3S)$					
(PDG $\mathcal{B}_{\mu\mu}$)	$\epsilon_\Upsilon = 92.25\%$	$\pm\, 0.08\%$	$\pm\, \begin{matrix} 0.29\% \\ 0.17\% \end{matrix}$	$\pm\, 0.34\%$	$\pm\, 0.45\%$
(Istvan's $\mathcal{B}_{\mu\mu}$)	$\epsilon_\Upsilon = 91.06\%$				
$\Upsilon(3S) \to$ hadrons					
(PDG $\mathcal{B}_{\mu\mu}$)	$\epsilon_{\Upsilon\to\text{had}} = 96.20\%$	$\pm\, 0.06\%$	$\pm\, \begin{matrix} 0.06\% \\ 0.06\% \end{matrix}$	$\pm\, 0.08\%$	$\pm\, 0.49\%$
(Istvan's $\mathcal{B}_{\mu\mu}$)	$\epsilon_{\Upsilon\to\text{had}} = 95.99\%$				

Conclusions

- tables of numbers are hard to consolidate!

- data is rapidly becoming "understood"

- $\Upsilon(1S)$ plots look convincing; for $\Upsilon(2S)$ and $\Upsilon(3S)$, I'll need more data to match significance

- large number of 1-track events in $\Upsilon(3S)$ is not understood, but perhaps it will go away with more data

- 1%-ish precision is attainable for acceptance, as soon as I consolidate all these figures. . .