

## Outline

### QED/QCD Correlations:

- Running latest version of RESBOS-A (v1.1)
- Ran a number of QED / QCD checks using W mass fast detector simulation
- In general, compare some MC templates to some “data” (in this case it is MC also) and observe shifts between fitted mass and input mass
  - Compiled a large collection of results
- Compare photon distributions between WGRAD and RESBOS-A
  - See some interesting behaviour

## QED/QCD Correlations

### Notation to follow:

- RESUM = resummed + LO decay (i.e. “regular” RESBOS run in RESBOS-A framewrok)
- RESUM + histo = RESUM with sampling of a histogram created from WGRAD
- RESUM + SV+FSR = RESUM with soft, virtual and real fsr terms explicitly included (i.e. “full” RESBOS-A)

## QED/QCD Correlations

- First was absolute values of shifts due to FSR from either histogram sampling or full RESBOS-A
- Then check if they compensate for one another

Channel/Type	Templates	Data	Fit Type	FSR Shift (MeV) (from check value**, $\pm 9$ )	$\chi^2/58$
$W \rightarrow ev$	RESUM	RESUM	pt	-153	245
		+SV+FSR	mt	-140	253
			met	-64	85
$W \rightarrow ev$	RESUM	RESUM	pt	-162	223
		+histo	mt	-130	157
			met	-80	107
$W \rightarrow ev$	RESUM +histo	RESUM	pt	9	87
		+SV+FSR	mt	-10	91
			met	17	68

- Electron channel looks pretty good

## QED/QCD Correlations

- Now do muon channel

Channel/Type	Templates	Data	Fit Type	FSR Shift (MeV) (from check value, $\pm 9$ )	$\chi^2/58$
$W \rightarrow \mu\nu$	RESUM	RESUM	pt	-361	545
		+SV+FSR	mt	-286	623
			met	-168	100
$W \rightarrow \mu\nu$	RESUM	RESUM	pt	-198	177
		+histo	mt	-166	139
			met	-97	100
$W \rightarrow \mu\nu$	RESUM +histo	RESUM	pt	-163	164
		+SV+FSR	mt	-121	278
			met	-72	133

- Clearly large differences between WGRAD and RESBOS-A
- Why should they differ so much? (if RESBOS-A is RESBOS+WGRAD FSR)

## QED/QCD Correlations

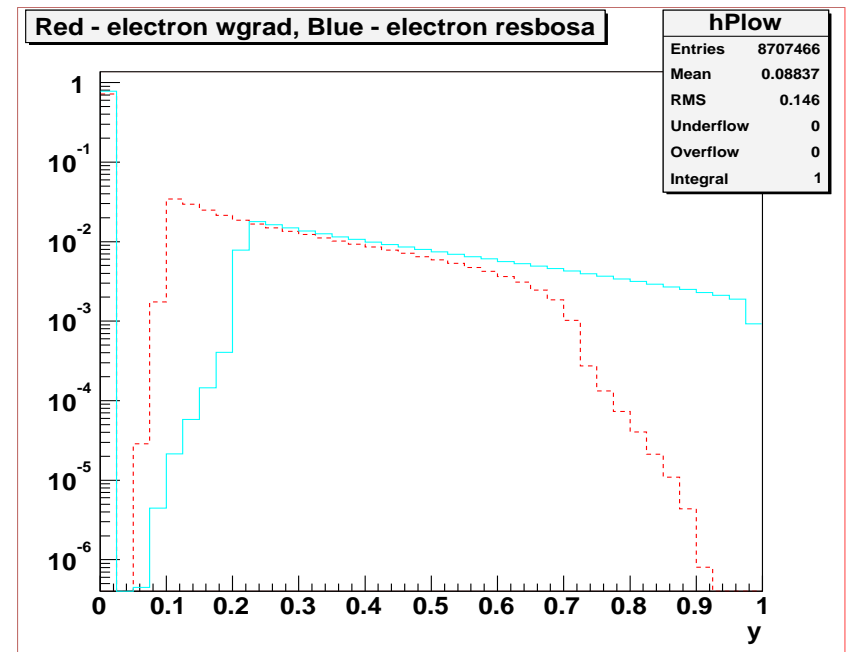
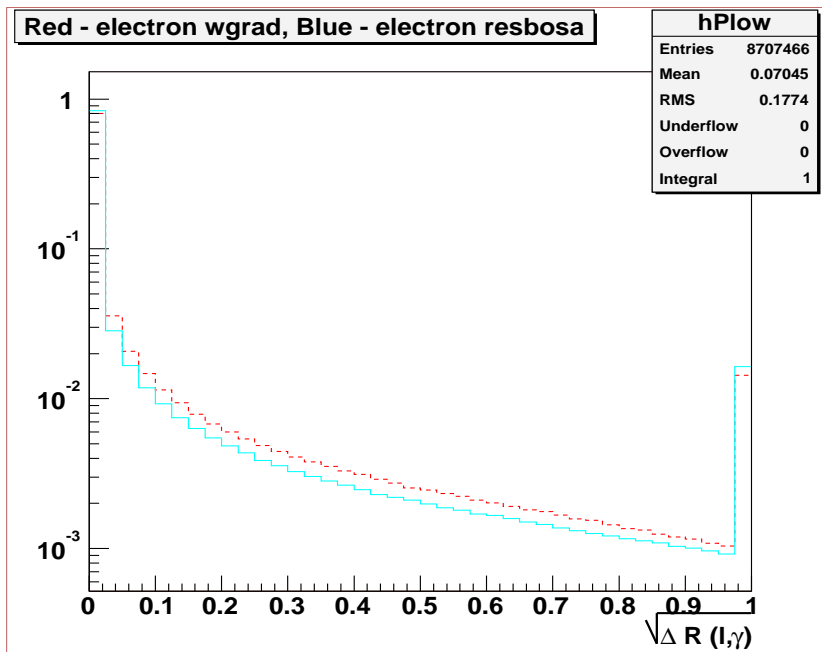
- Constructing a histogram from RESBOS-A in exactly the same way as was done with WGRAD – sample this histogram instead of WGRAD one

Channel/Type	Templates	Data	Fit Type	FSR Shift (MeV) (from check value, $\pm 9$ )	$\chi^2/58$
$W \rightarrow e\nu$	RESUM	RESUM	pt	-153	245
		+SV+FSR	mt	-140	253
			met	-64	85
$W \rightarrow e\nu$	RESUM	RESUM	pt	-288	578
		+histo(svfsr)	mt	-133	327
			met	99	78
$W \rightarrow e\nu$	RESUM +histo(svfsr)	RESUM	pt	137	105
		+SV+FSR	mt	-8	104
			met	-162	73
$W \rightarrow \mu\nu$	RESUM	RESUM	pt	-361	545
		+SV+FSR	mt	-286	623
			met	-168	100
$W \rightarrow \mu\nu$	RESUM	RESUM	pt	-375	177
		+histo(svfsr)	mt	-289	139
			met	-149	100
$W \rightarrow \mu\nu$	RESUM +histo(svfsr)	RESUM	pt	13	69
		+SV+FSR	mt	3	56
			met	-19	115

- Now muons look good and electrons are broken

## QED/QCD Correlations

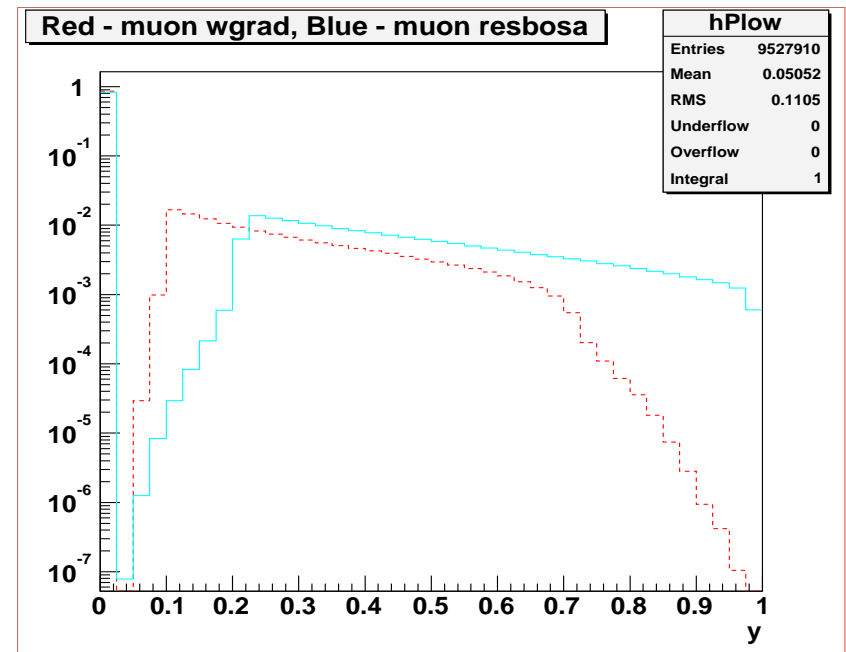
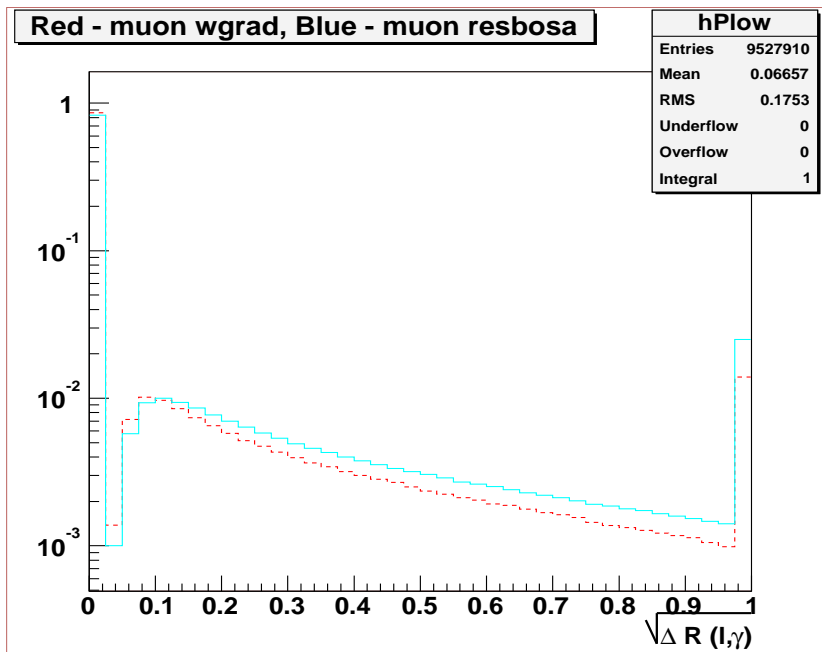
- Compare RESBOS-A and WGRAD photon distributions
- Electrons:



- Large differences – especially in  $y = E_\gamma / (E_l + E_\gamma)$

## QED/QCD Correlations

- Compare RESBOS-A and WGRAD photon distributions
- Muons:



- Large differences –  $\Delta R$  is worse than for electrons

## QED/QCD Correlations

- Seems like the cleanest test of QED/QCD correlations would be to construct a histogram (sv+fsr) from LO initial state, i.e. no resummed, then sample this histogram for resummed templates and compare to resummed+sv+fsr (i.e. full RESBOS-A) data
- Am running this right now
- Why are photon distributions so different between RESBOS-A and WGRAD?