

Q7,8,9 Offset Study

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Outline

- Details of simulation
- % change in emittance (e) with offset quads from emittance with no offsets (e_0)
- % change in particle rates between Q9, US tracker ref plane (US TRP) and DS tracker ref plane (DS TRP)
- Conclusions

Simulation

- Simulated 200 muons starting just upstream of Q7, with initial emittance of 1.5 mm.
- Using legacy geometry in MAUS v0.9.1, no diffuser, LH2 absorber.
- Simultaneously offset Q7,8,9 in x, each with individual random gaussian shifts ($\sigma=5\text{mm}$).
- Looking only at MC truth, with virtual planes placed just downstream of Q9 and at the US TRP and DS TRP.
- Cut on the active area of the tracker.

Values for zero offset

	Emittance (e0)
Q9	2.72
US TRP	3.70
DS TRP	2.64

Change in emittance across channel = $(-28.7 \pm 67.0)\%$

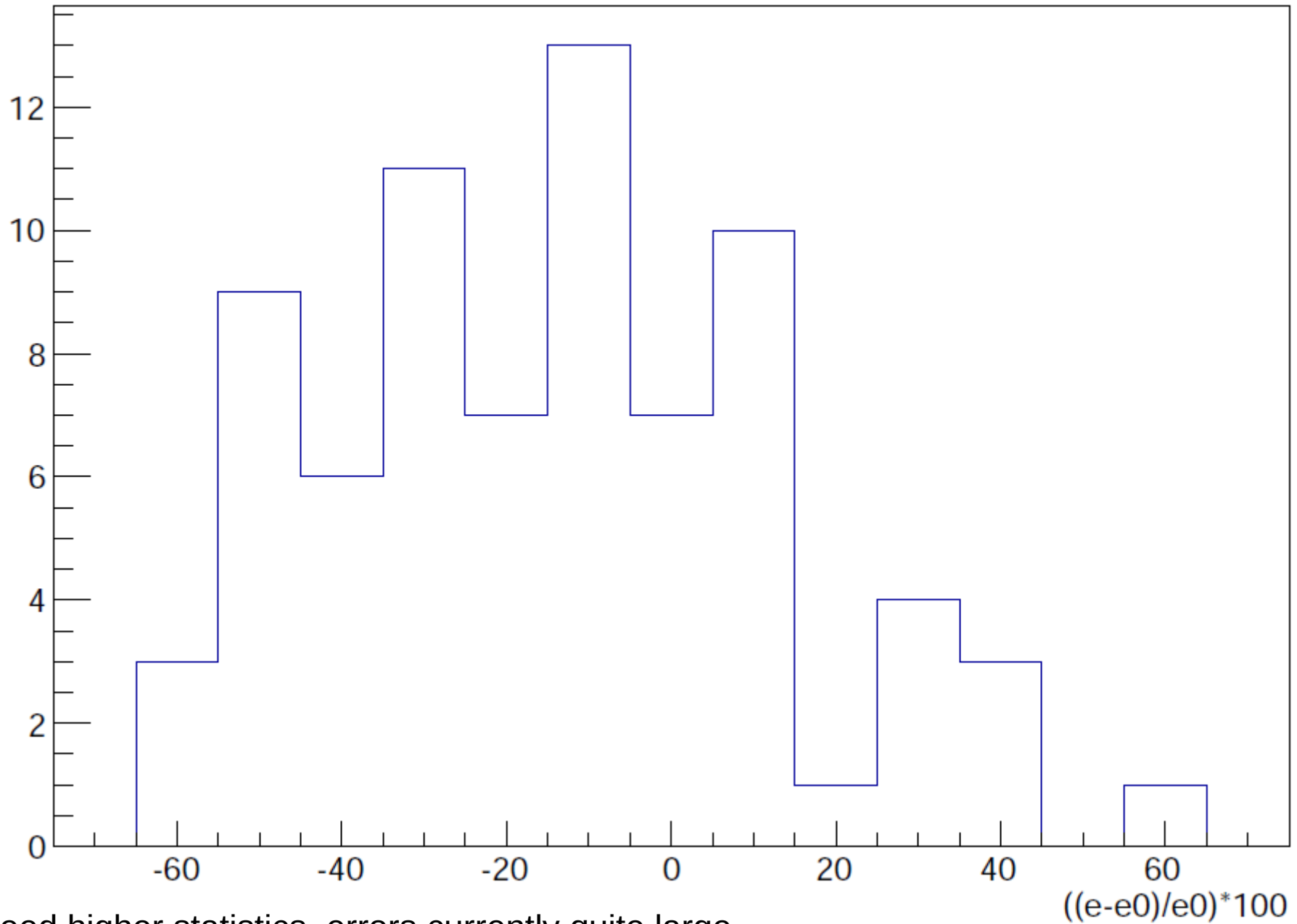
% of particles from Q9 that reach US TRP = 71.5 %

% of particles from US TRP that reach DS TRP = 61.6%

Percentage change in emittance
with offset quads (e) from emittance
with no offsets (e_0)

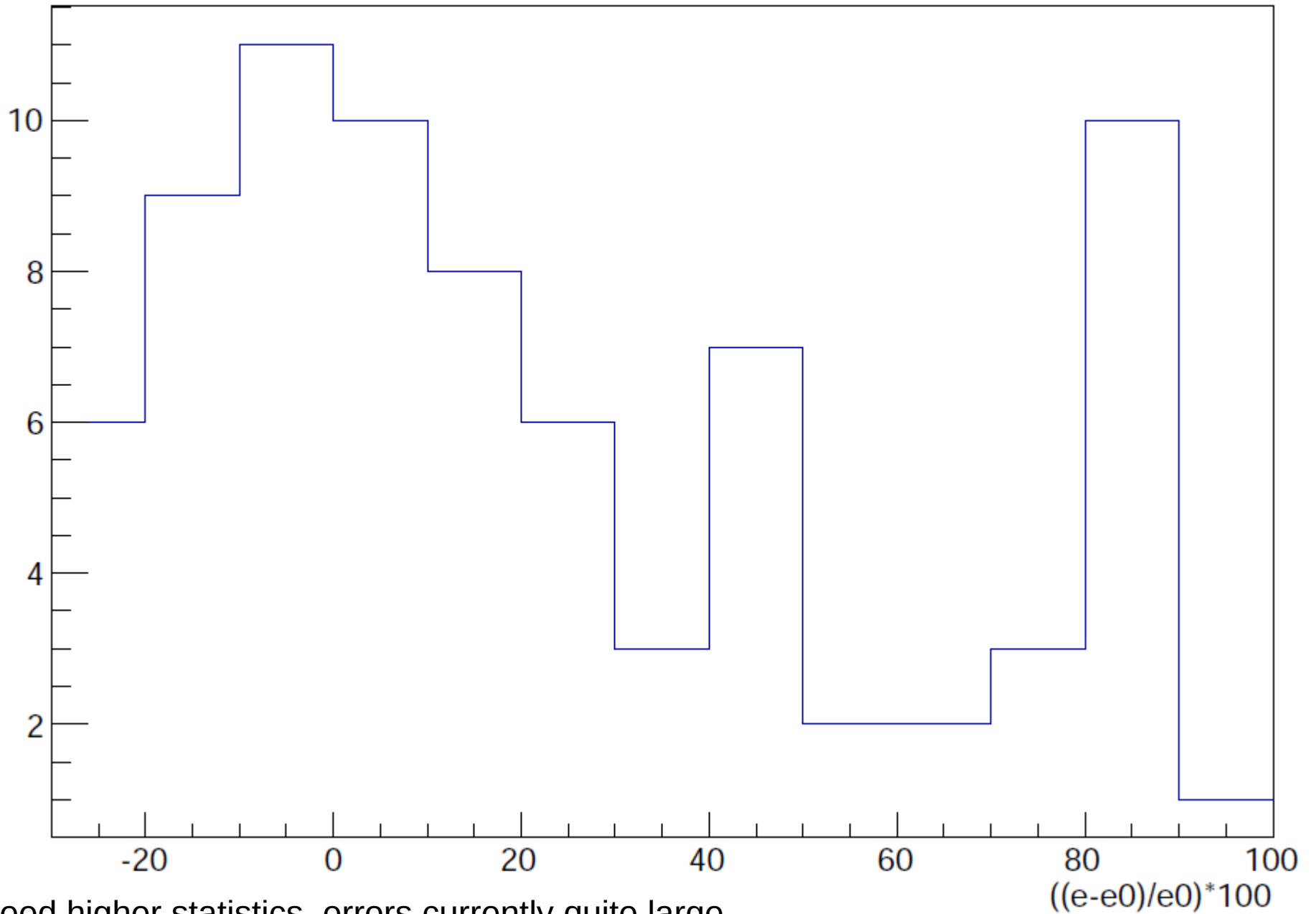
$$\frac{(e - e_0) * 100}{e_0}$$

Percentage change in emittance at US tracker ref. plane for varying Q7,8,9 x offsets from non-offset case



Need higher statistics, errors currently quite large

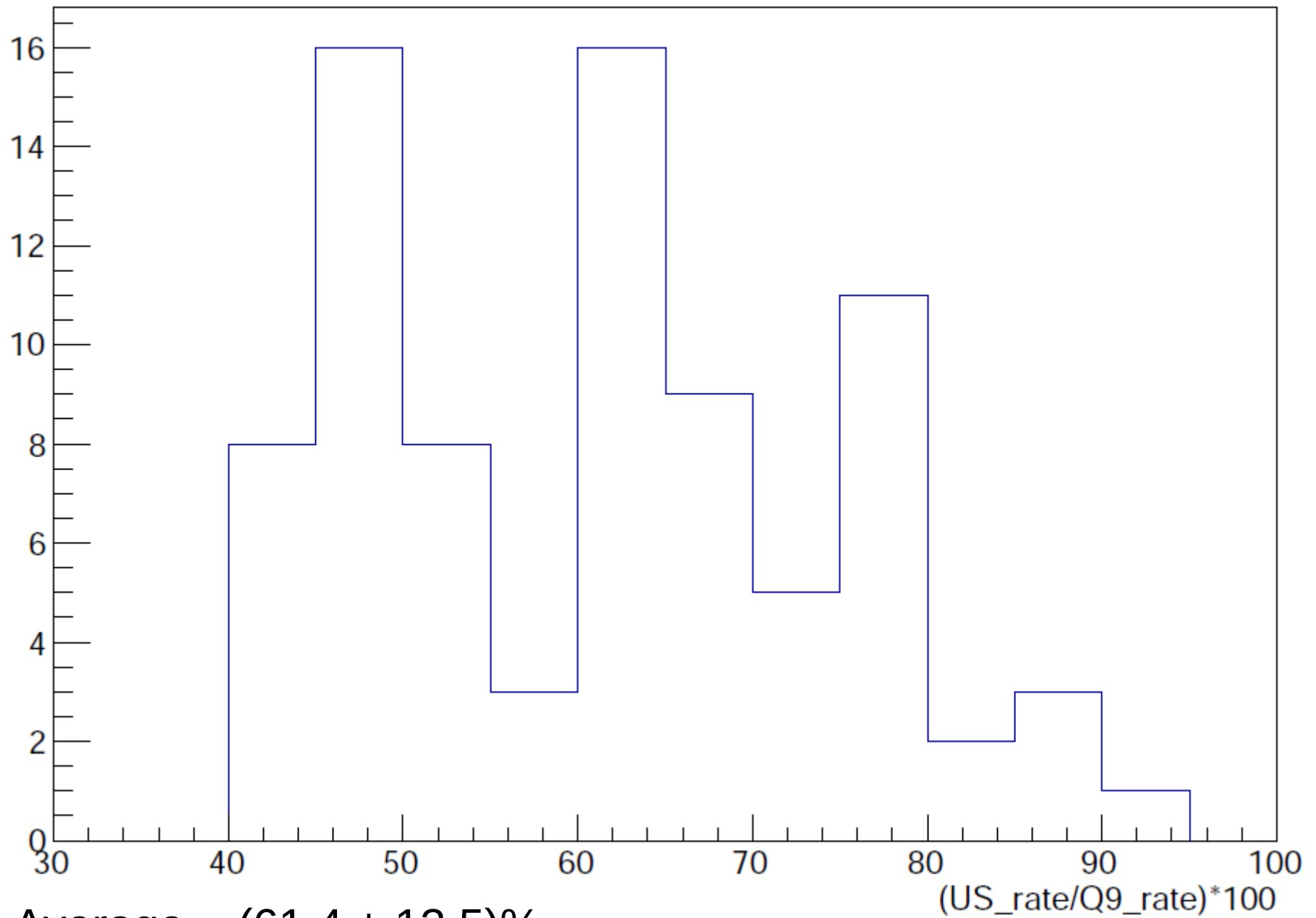
Percentage change in emittance at DS tracker ref. plane for varying Q7,8,9 x offsets from non-offset case



Need higher statistics, errors currently quite large

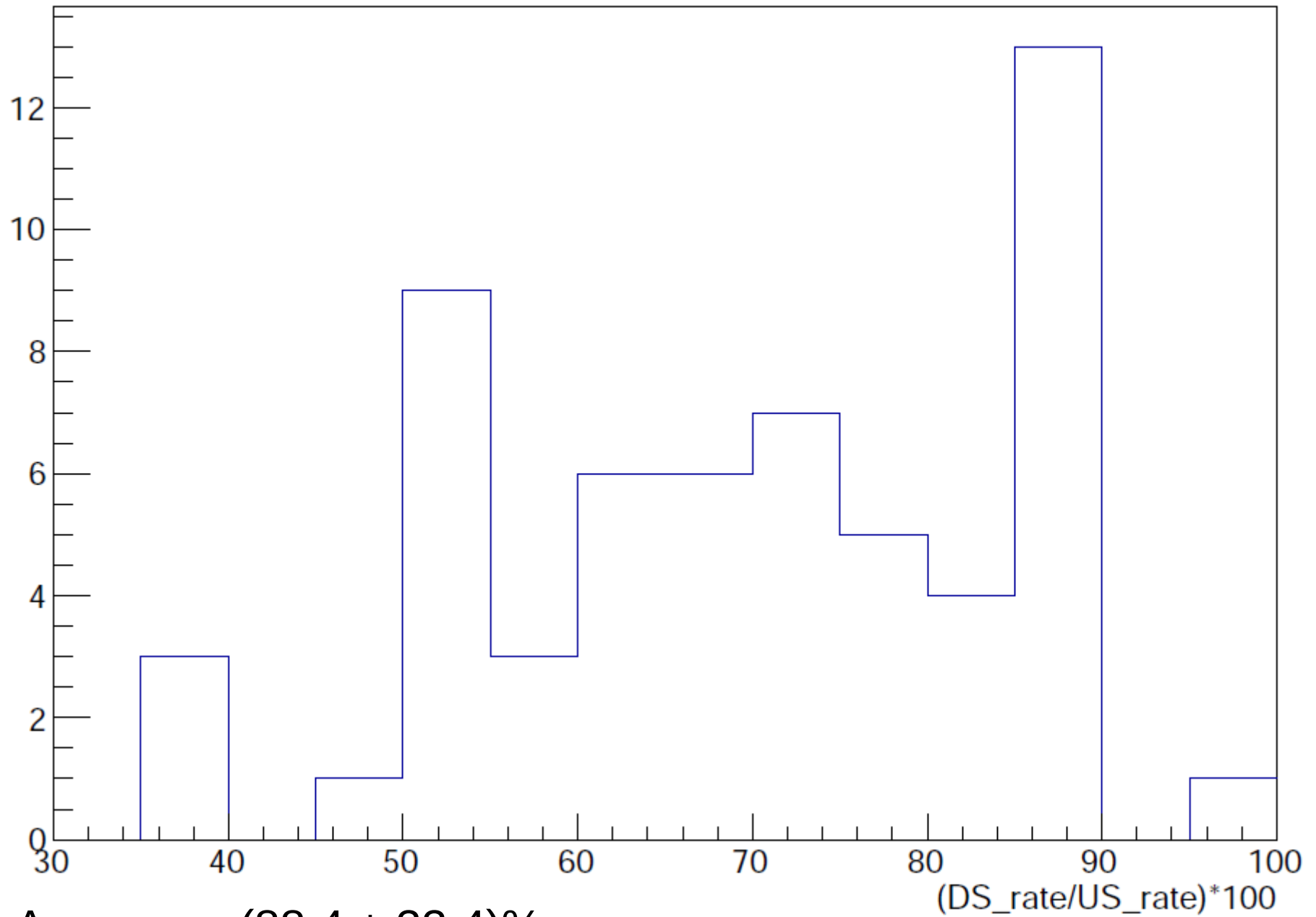
Percentage change in particle rates
between Q9 and US TRP, and US
TRP and DS TRP

Percentage of particles from Q9 at US tracker ref. plane



Average = $(61.4 \pm 13.5)\%$

Percentage of particles from US tracker ref. plane at DS tracker ref. plane



Average = $(88.4 \pm 33.4)\%$

Conclusions

- Offsetting quads does seem to have an effect on particle rate, but need to do for higher statistics.
- Also need to study effect of other tolerances on the quad positions.