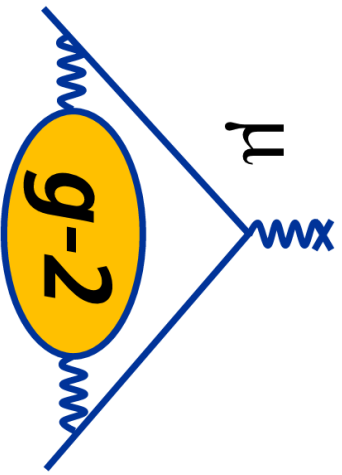


# Fine time tracker studies

Joe Price



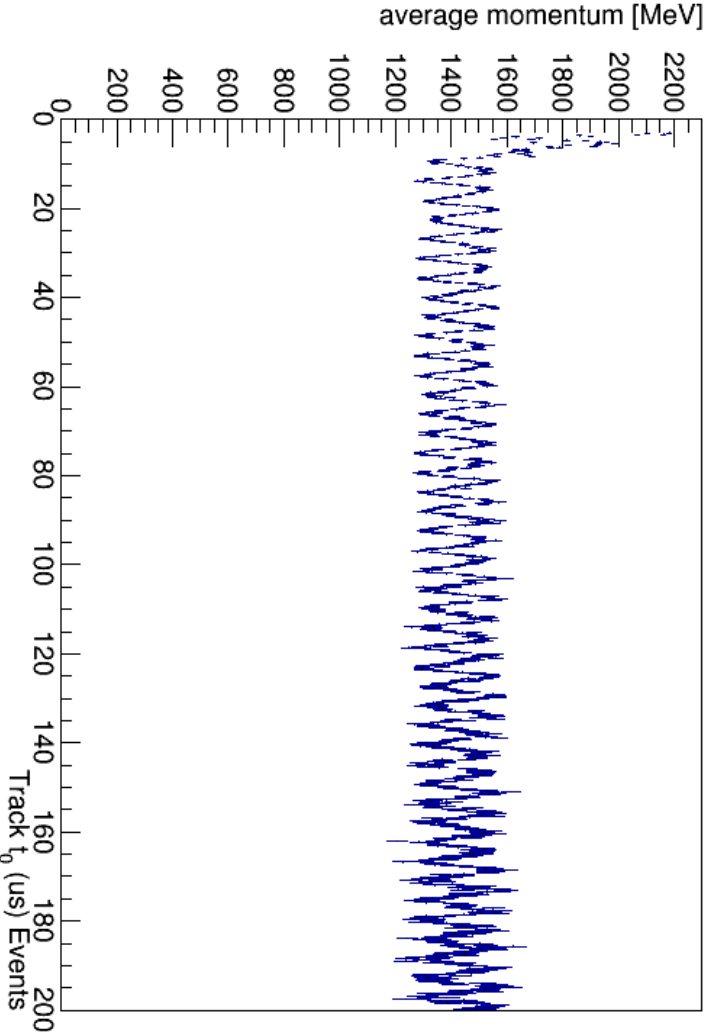
# Introduction

- Have focused on the 65kV runs (11589-92)
- Looking at CBO style plots and new fast rotation plots with aim at understanding the beam dynamics
- Preliminary analyses shown here, continually improving tracking and analysis algorithms

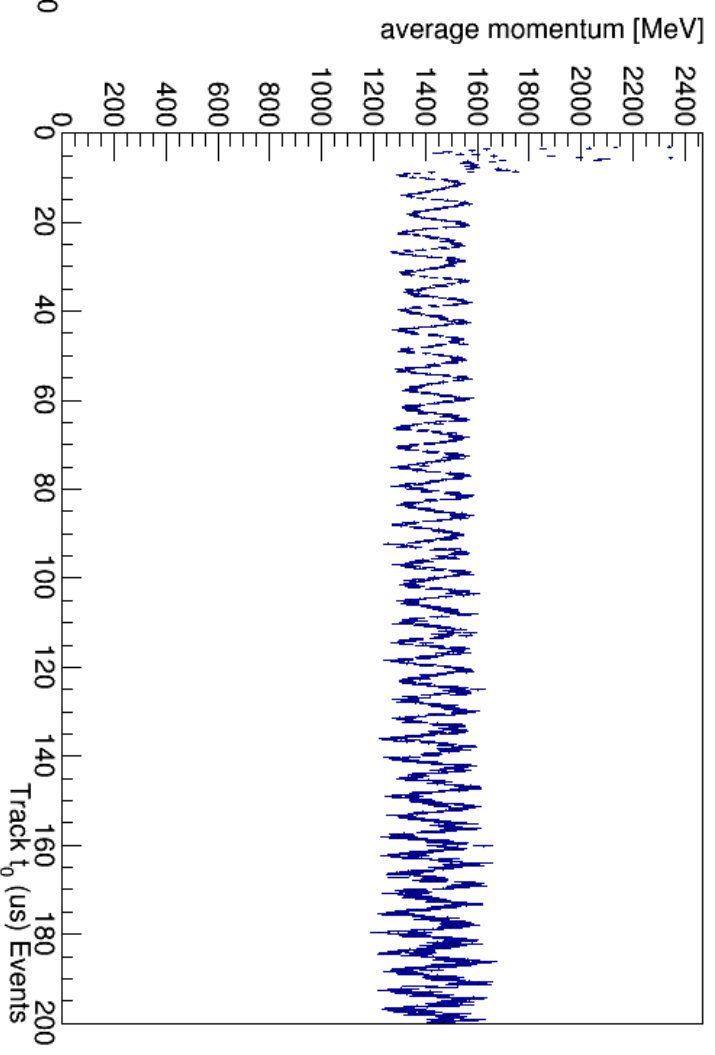
# Average momentum

At early times ( $< 10\mu\text{s}$ ) the momentum distribution is pulled up by lost muons.  
After this we see the momentum change with the  $\omega_a$  frequency

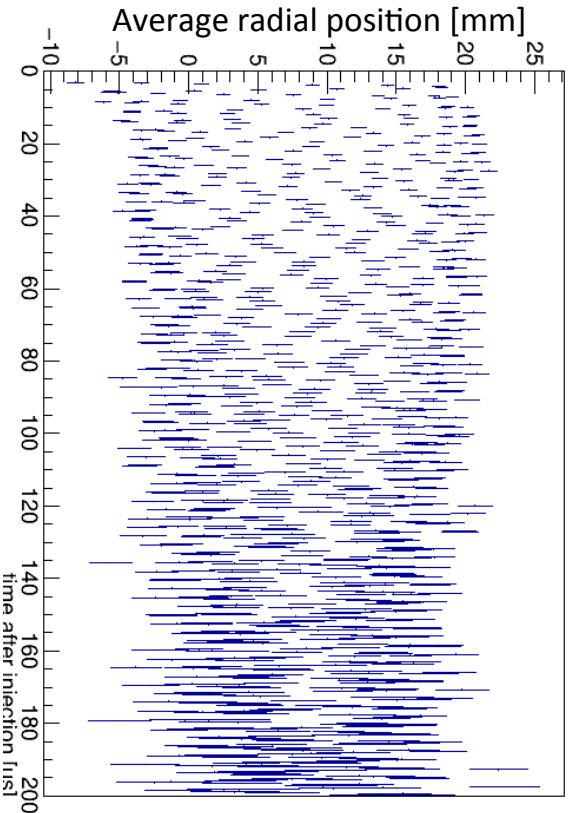
station12



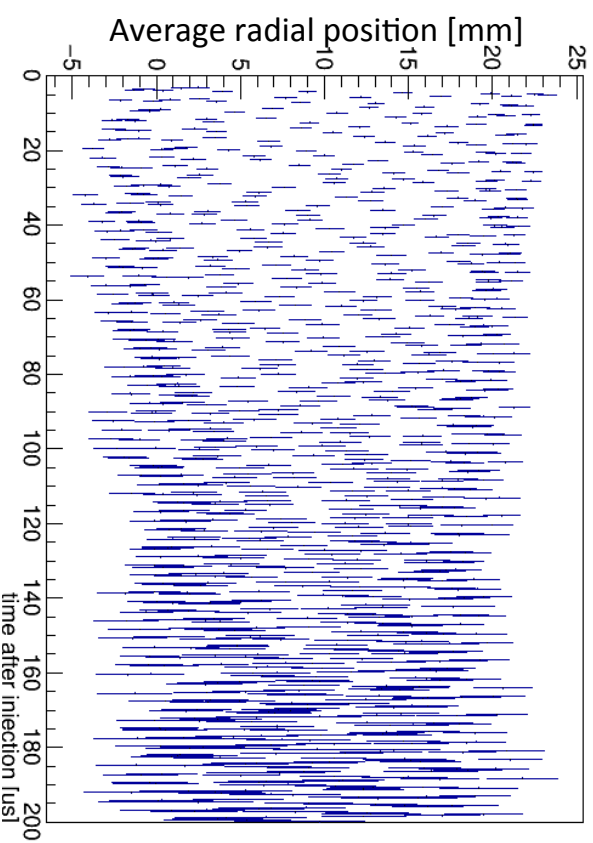
station18



# Average radial position



Average radial position oscillates at  $\omega_{\text{CBO}}$ . Fits suggest CBO lifetime of  $\sim 320\mu\text{s}$

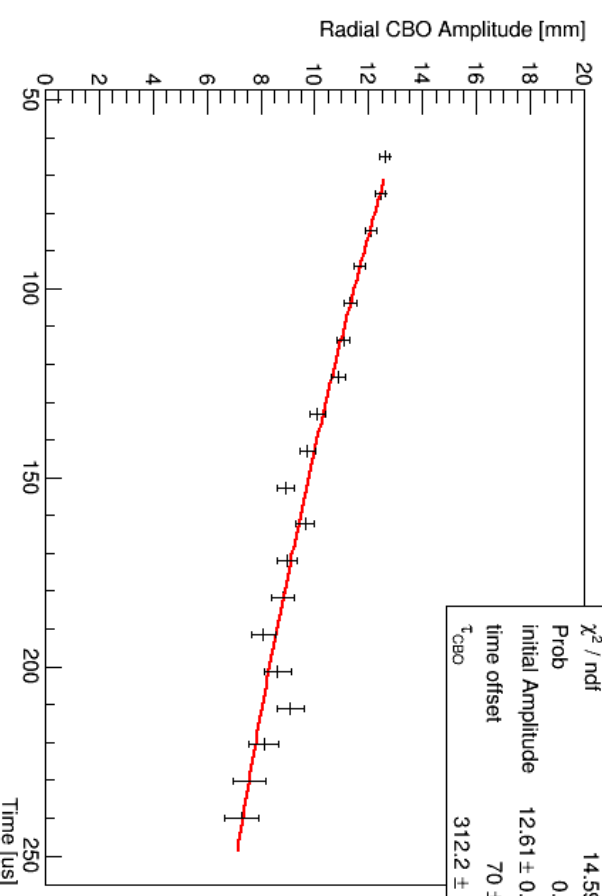
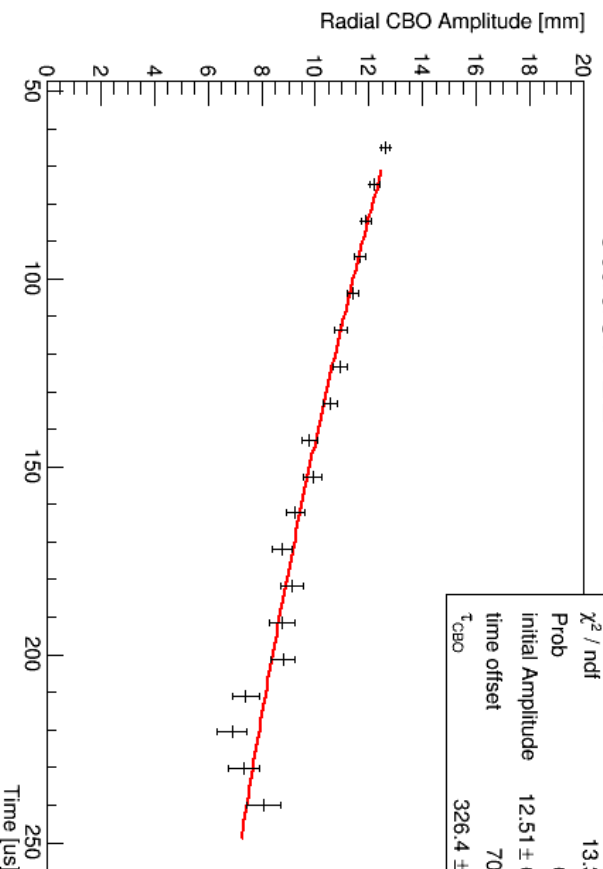


station 12

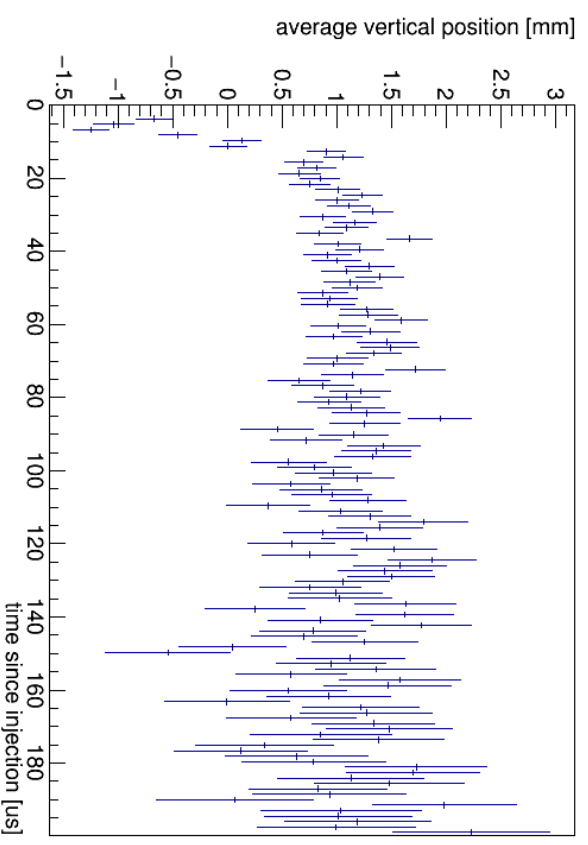
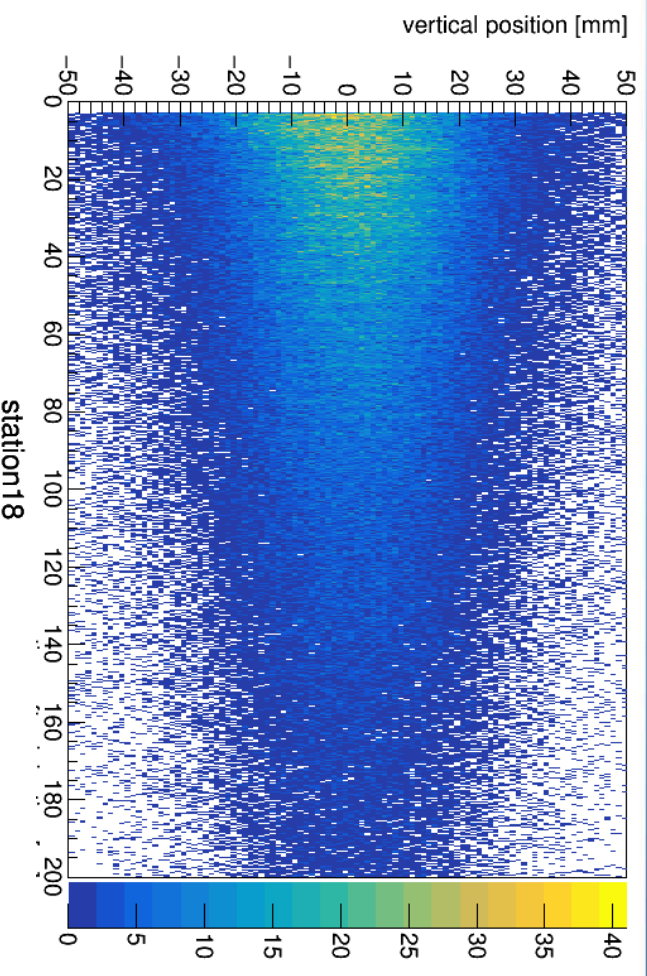
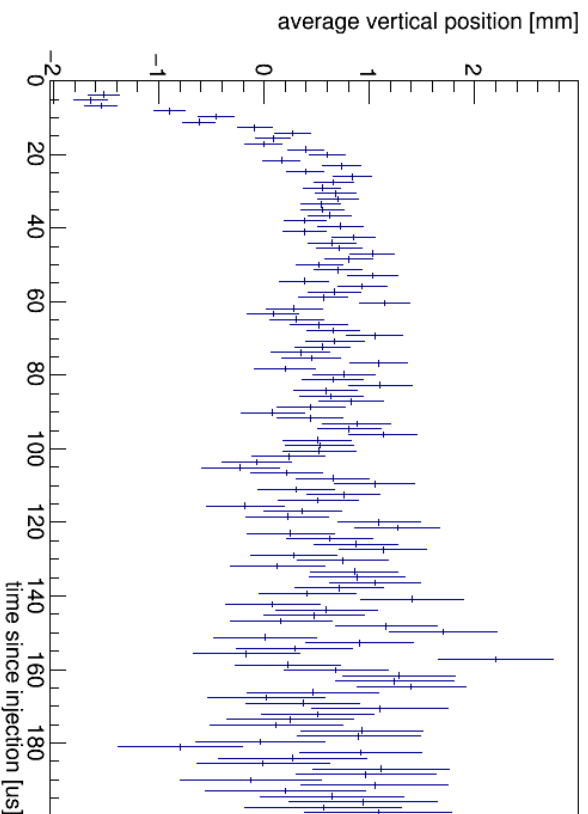
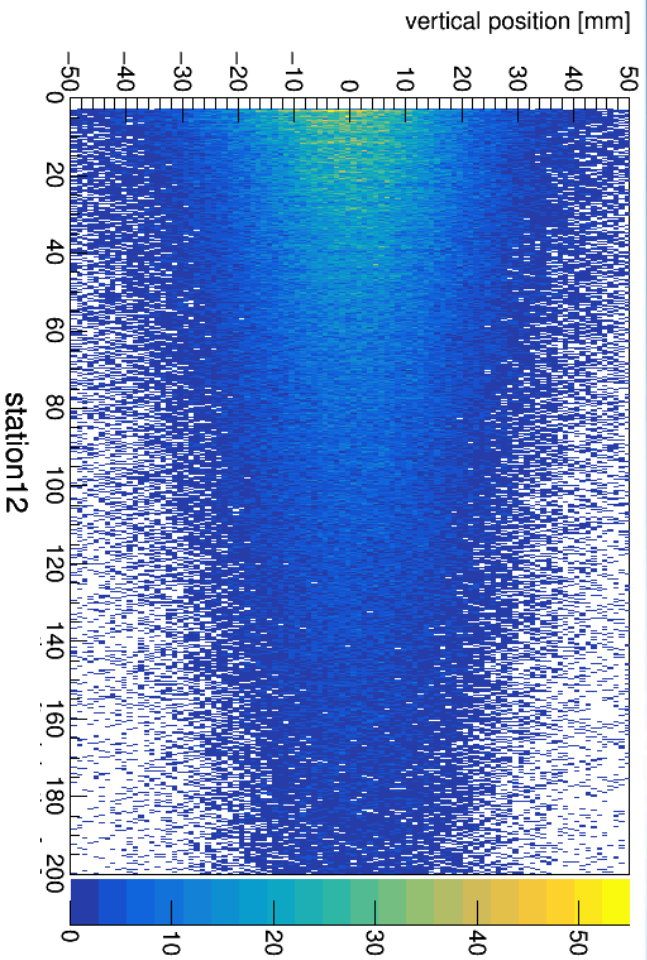
station 18

$\chi^2 / \text{ndf}$	13.31 / 16
Prob	0.6499
initial Amplitude	$12.51 \pm 0.1143$
time offset	$70 \pm 0$
$\tau_{\text{CBO}}$	$326.4 \pm 17.44$

$\chi^2 / \text{ndf}$	14.59 / 16
Prob	0.5549
initial Amplitude	$12.61 \pm 0.1203$
time offset	$70 \pm 0$
$\tau_{\text{CBO}}$	$312.2 \pm 16.71$



# Average vertical position



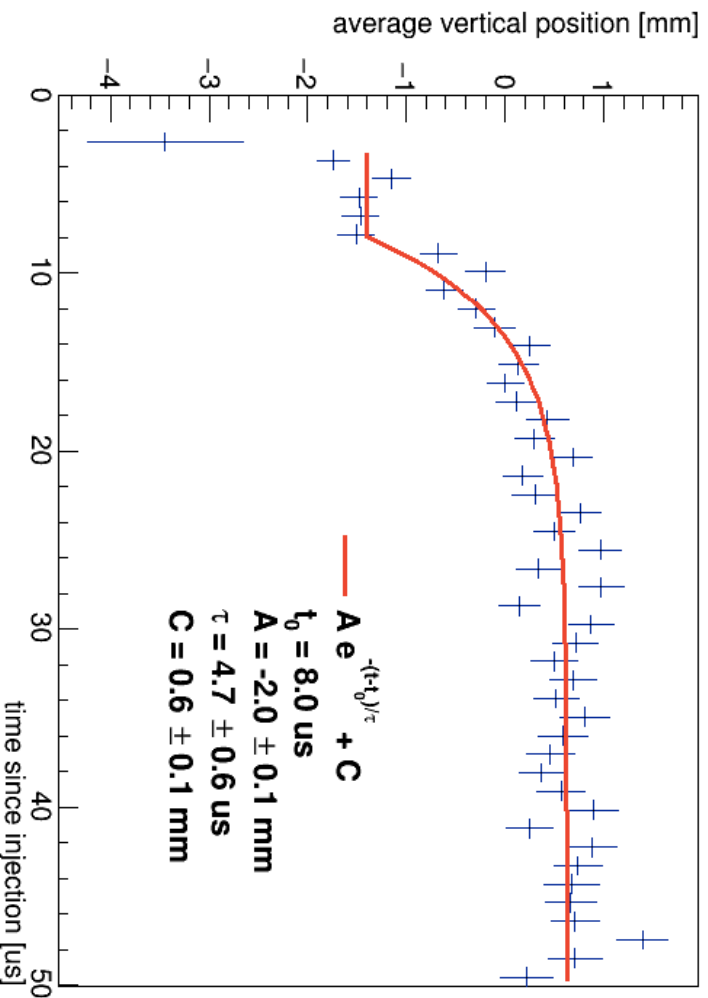
# Average vertical position - early

Do not see  $\omega_{\text{CBO}}$  in average vertical position

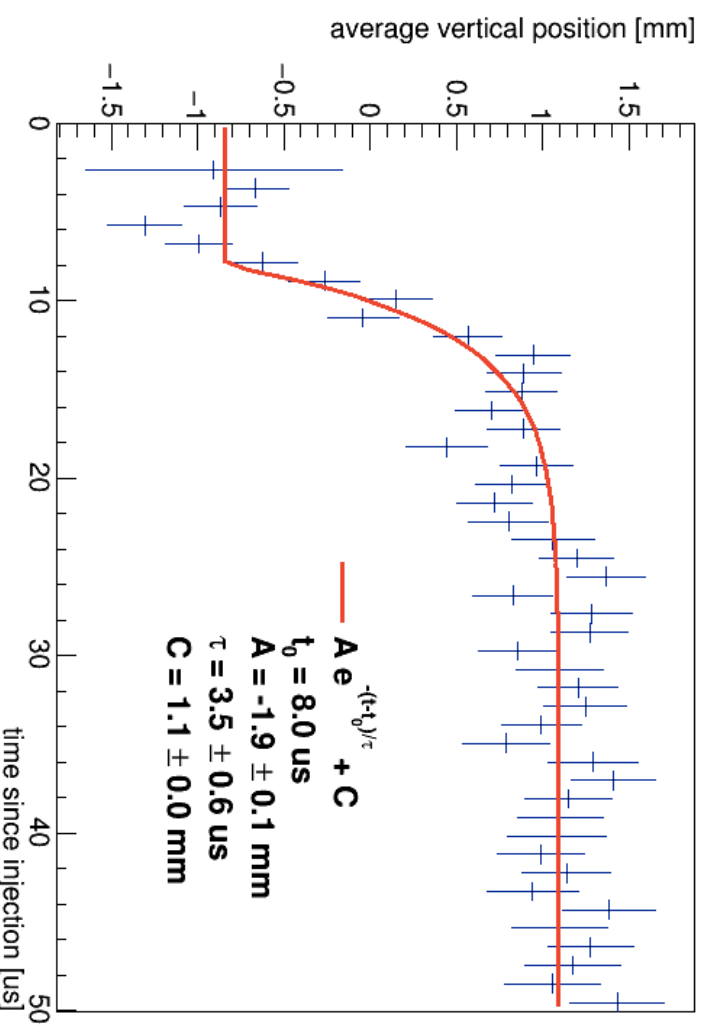
Can see effect of scraping

Preliminary fits shown here suggest average position shifted up by 2mm, lifetime around 4 us

station12

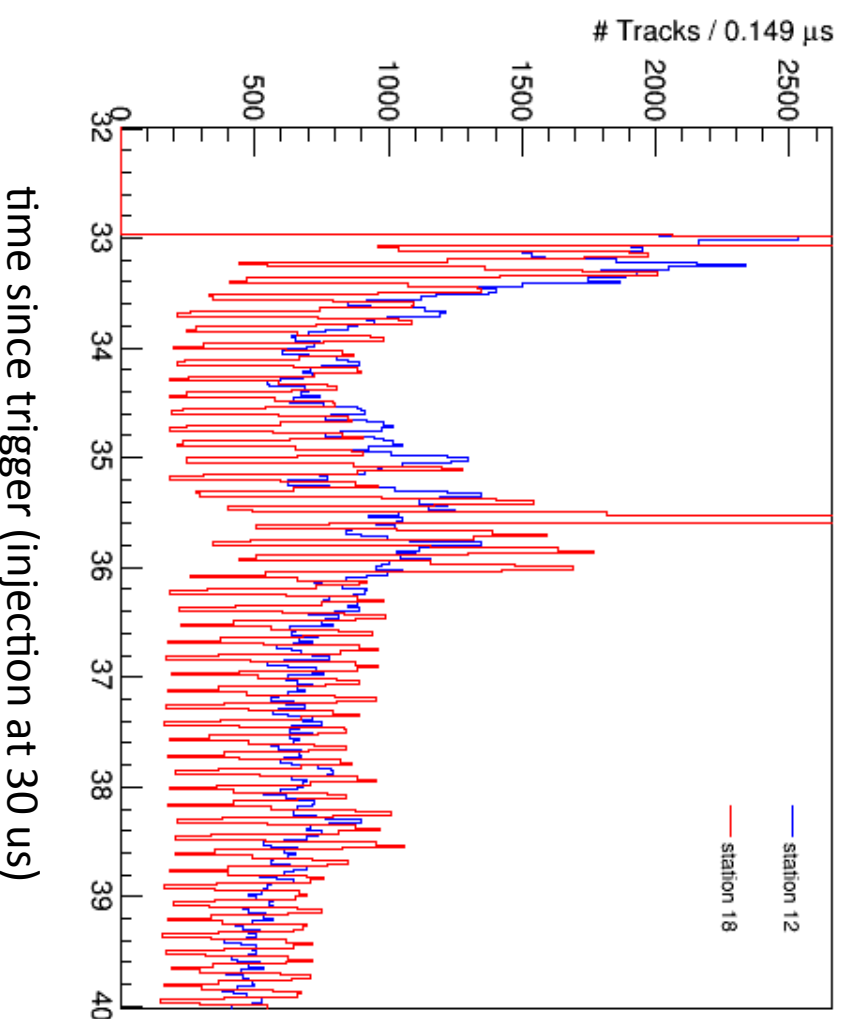


station18



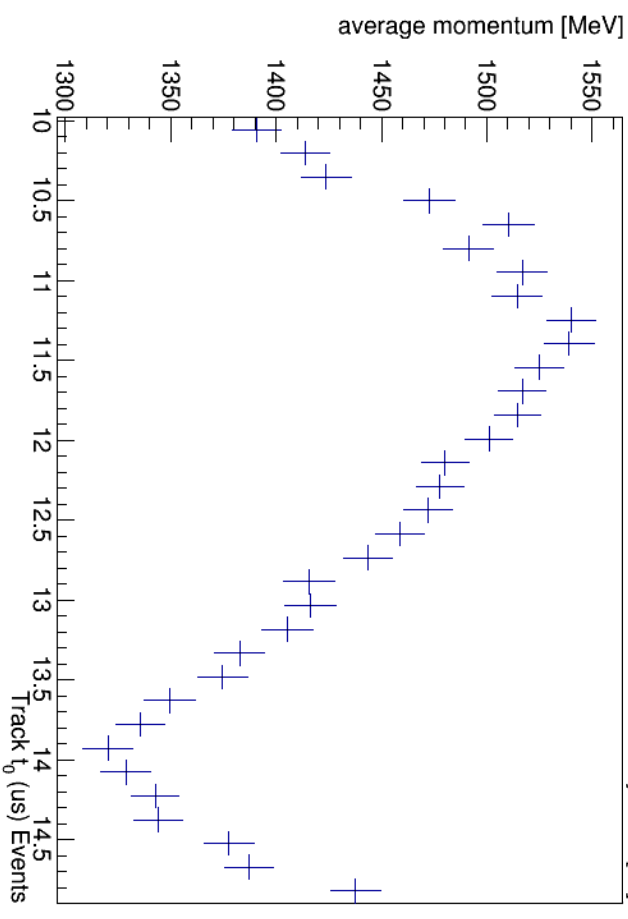
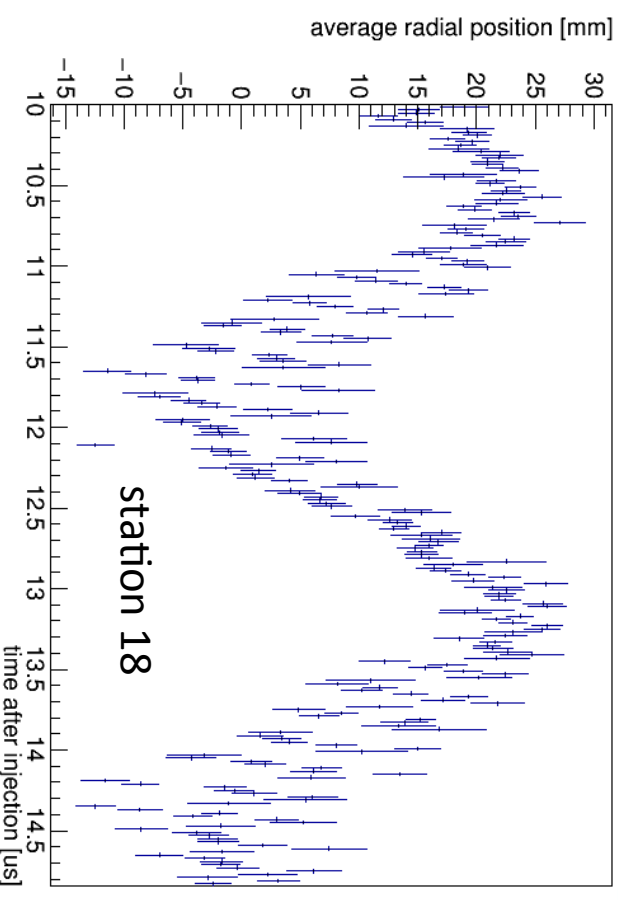
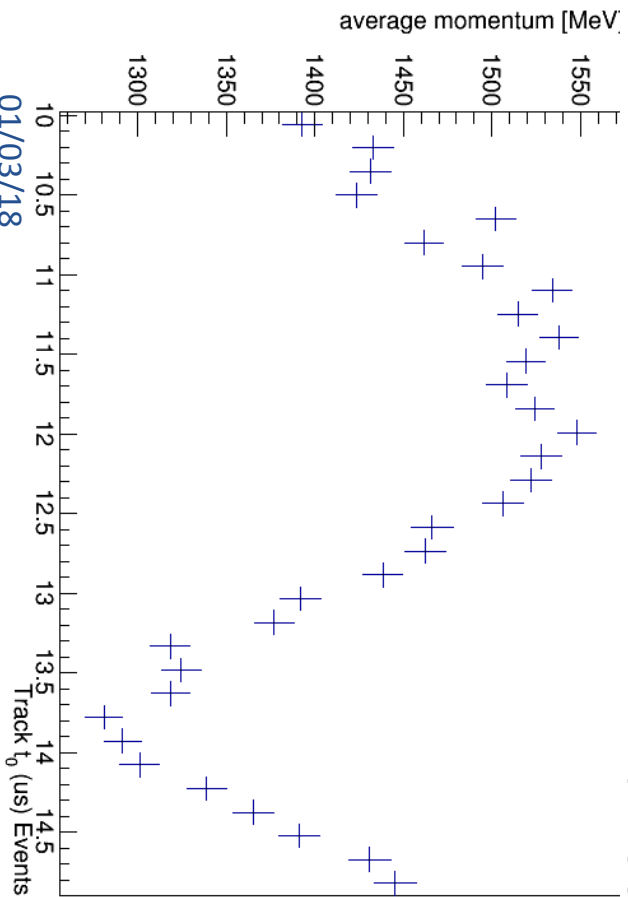
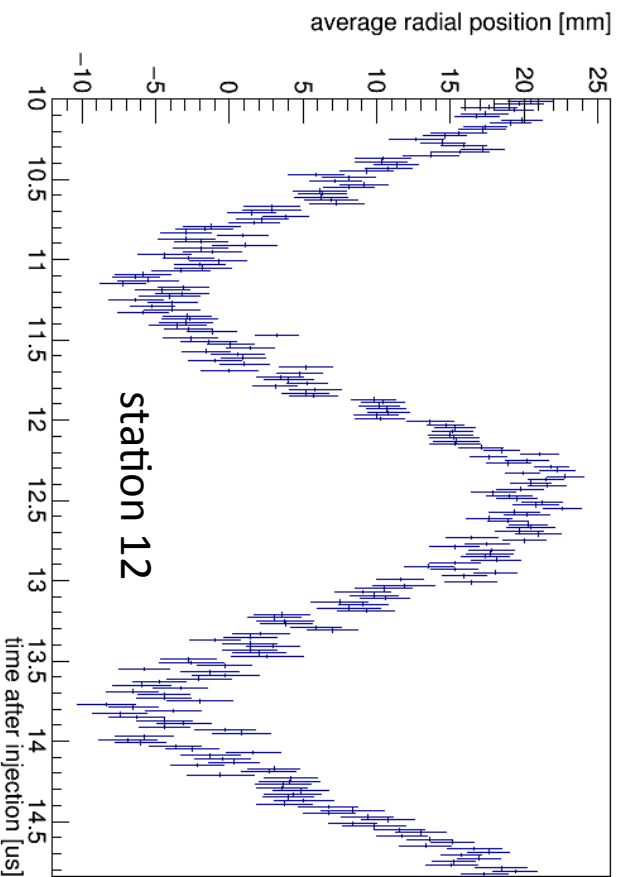
# Fast rotation

Binning our track time into very fine bins allows us to see the fast rotation  
Signal much larger in station 18 (@270°)  
Thought to be readout issue with station 12, under investigation now...



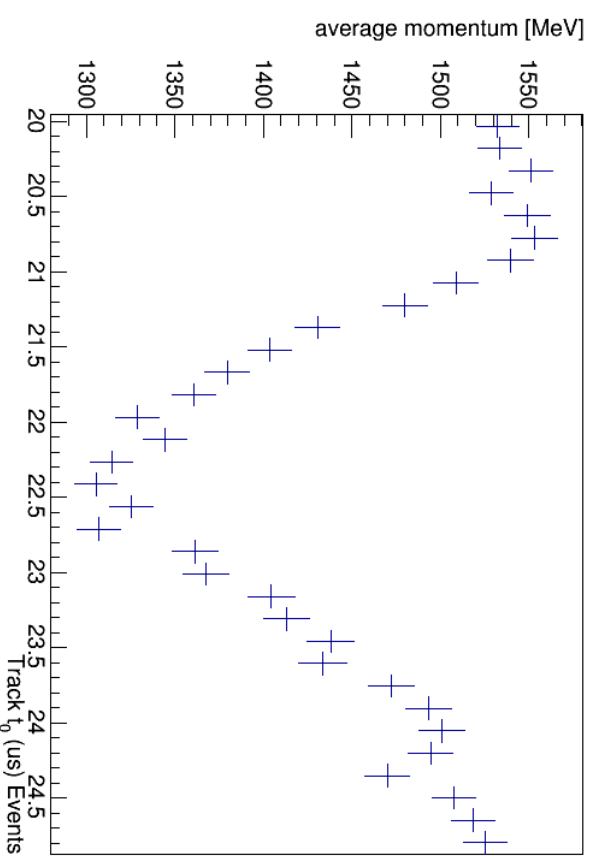
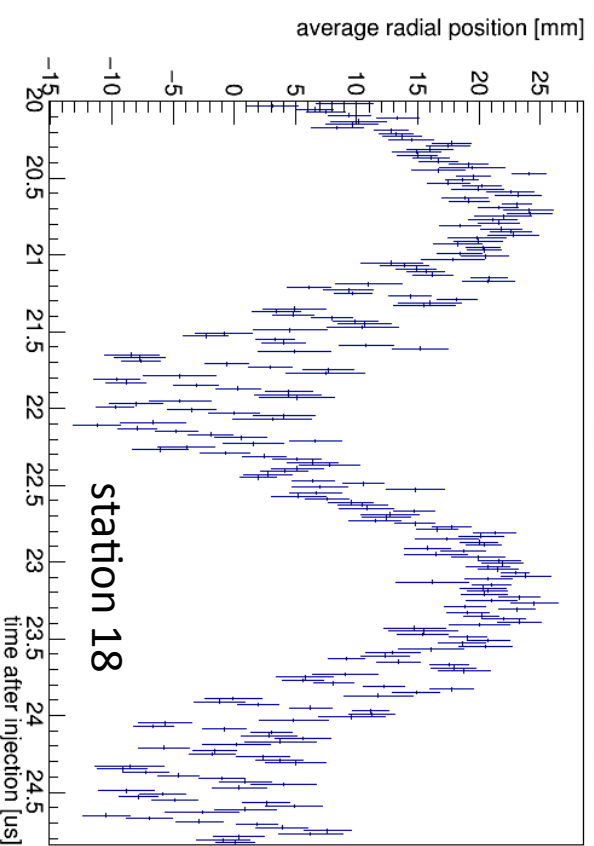
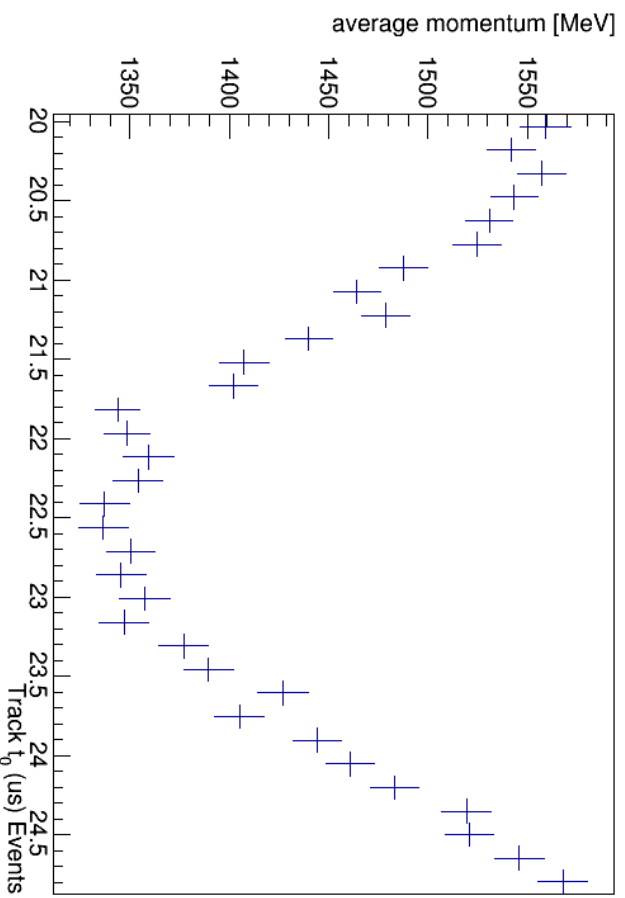
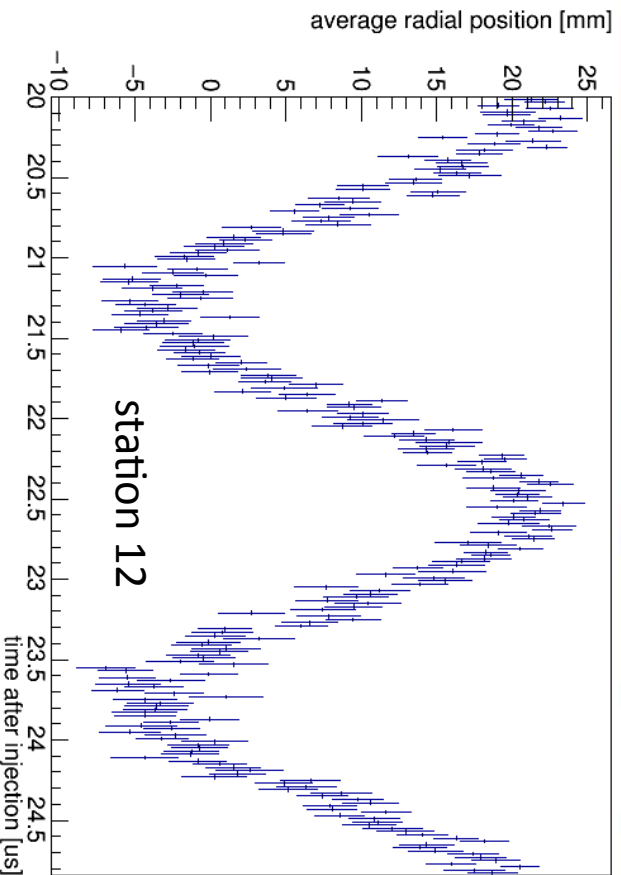


# 10 microseconds

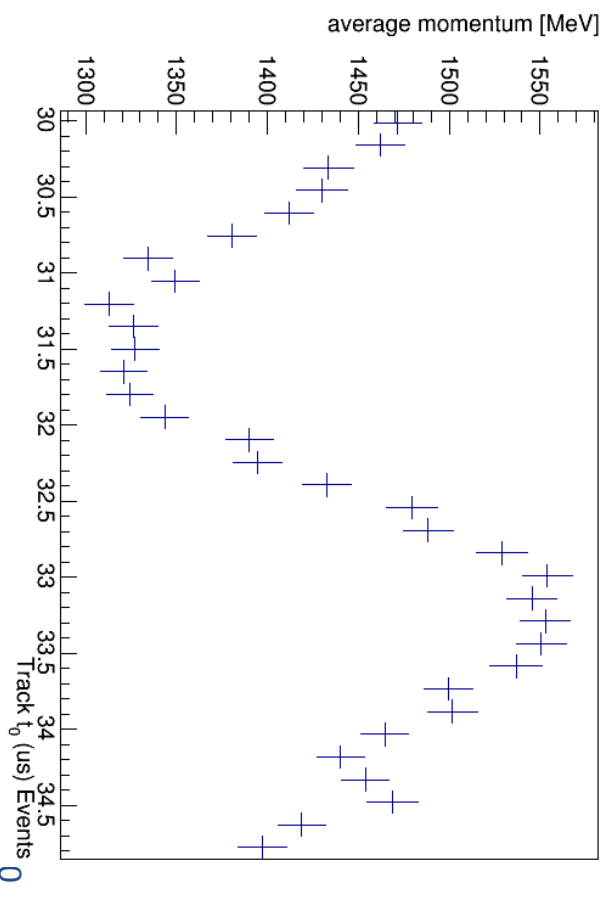
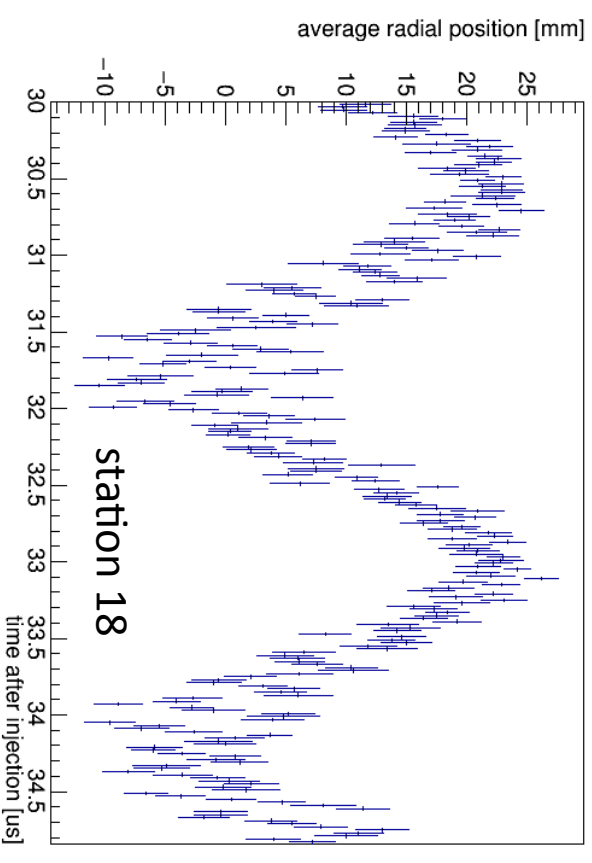
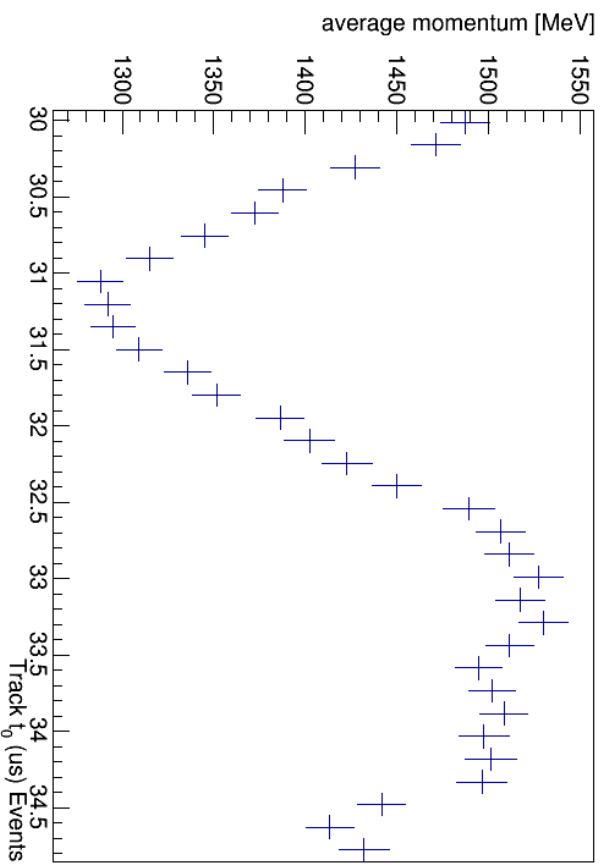
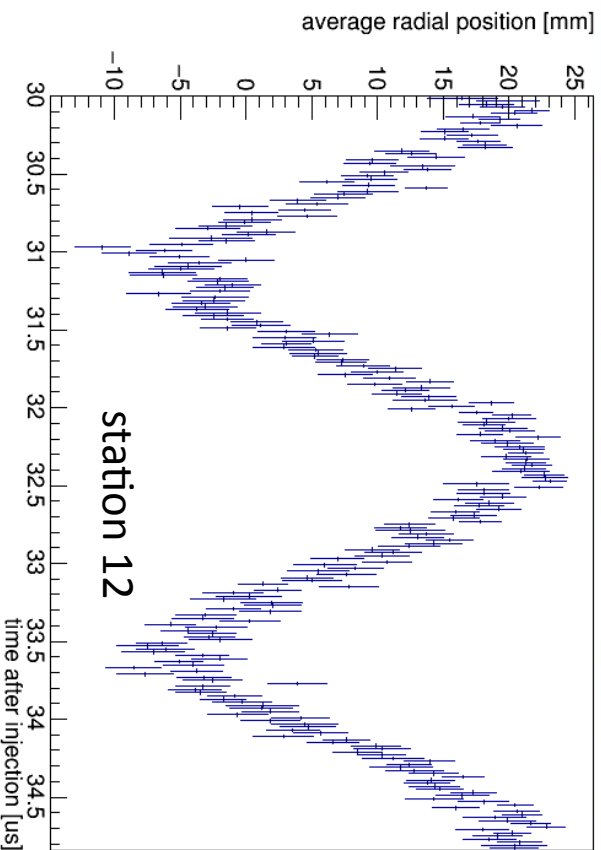




# 20 microseconds



# 30 microseconds

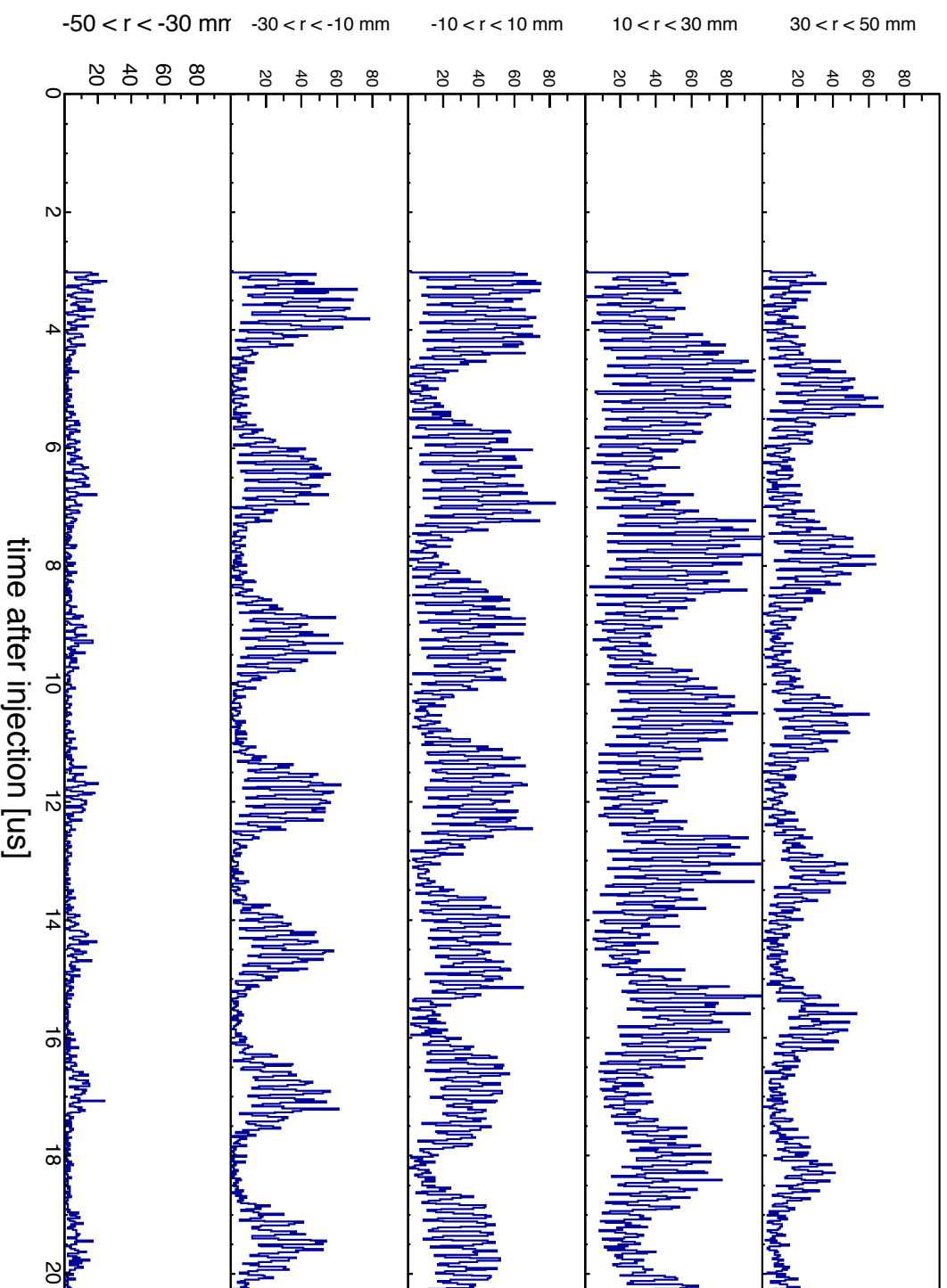


# Radial position videos

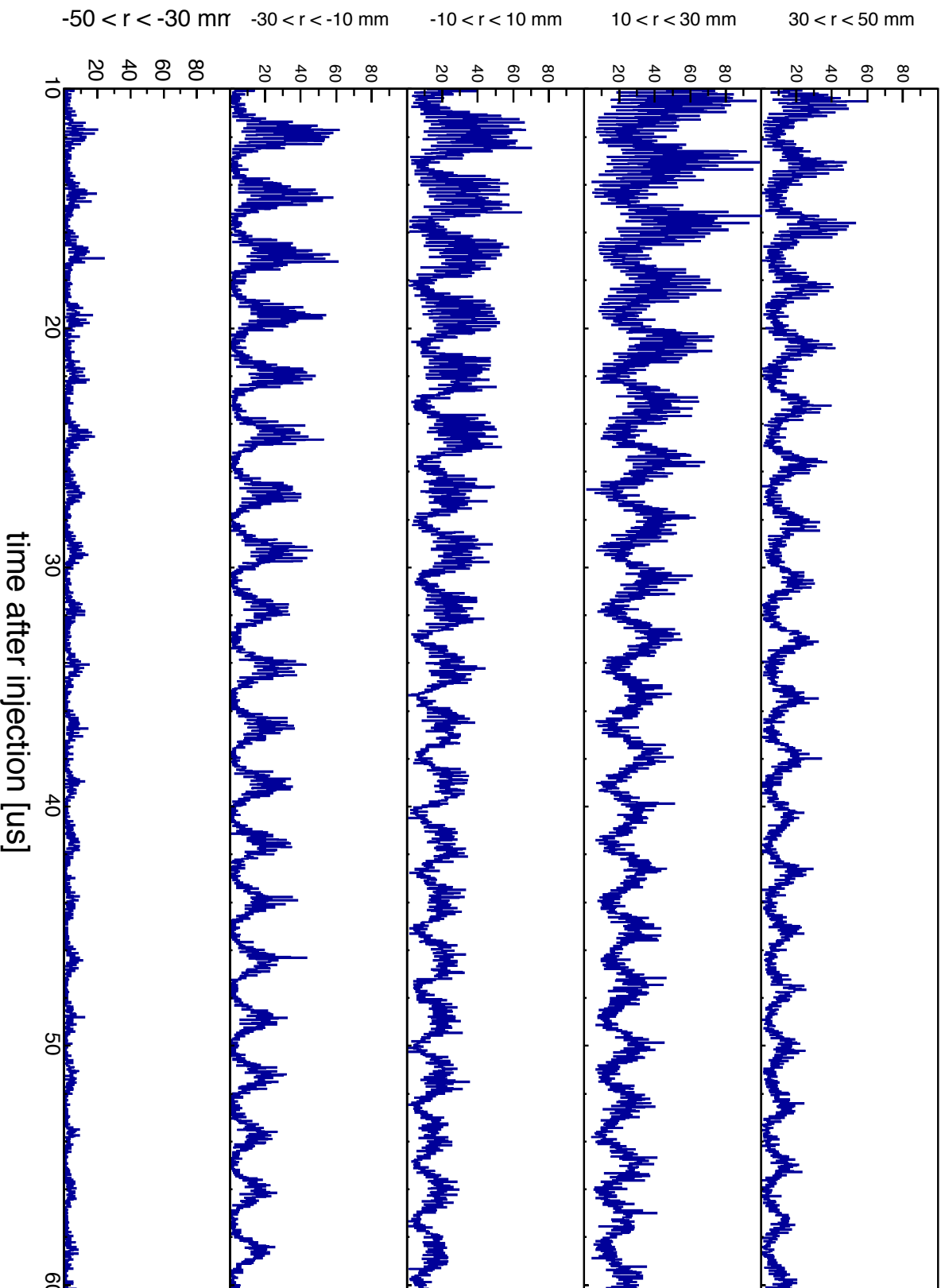


# Radial analysis

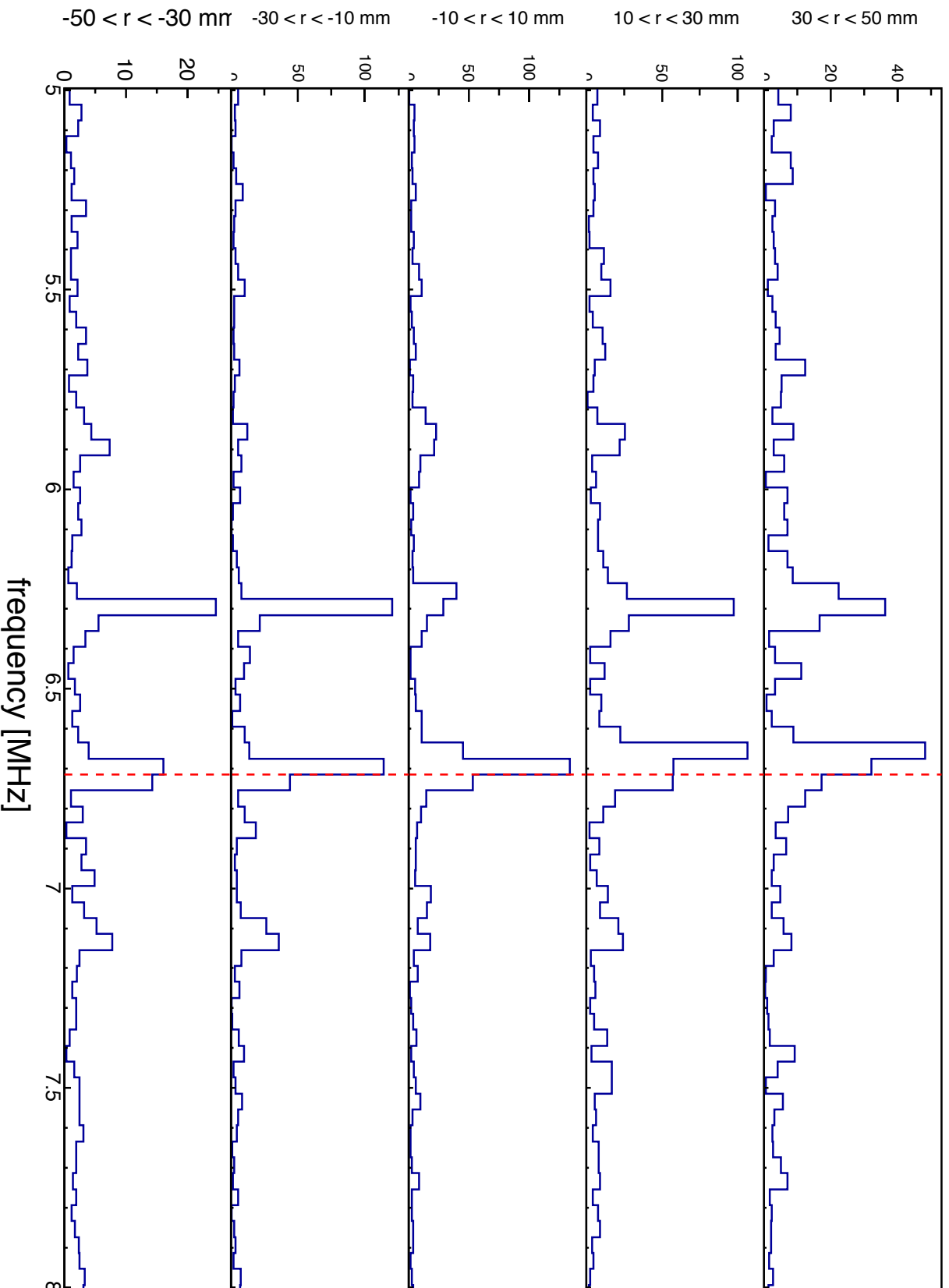
Focus on station 18. split into 5 radial bins and count number of tracks:



# Radial analysis



# Radial analysis FFT



red line  
indicates  
frequency for  
148.936 ns  
period

Can see the  
 $\omega_c$  frequency  
and the  
 $\omega_c -/+ \omega_{CBO}$

Slight change  
in different  
radial bins?

# Conclusions

- Runs 11589-92 re-analysed
- CBO analysis suggests decoherence lifetime  $\sim 320\text{us}$
- Effect of lost muons seen at early times in the average momentum, effect mostly gone at time  $> 10\text{us}$
- Average vertical position shows effect of scraping
  - $\sim 4\text{ us}$  time constant
  - shift of  $\sim 2\text{mm}$  seen at both stations
- Trackers can see fast rotation (very useful!)
- Fast rotation is apparent in average radial position
- Preliminary results shown for  $\omega_c$  vs radial position
- One station under investigation...