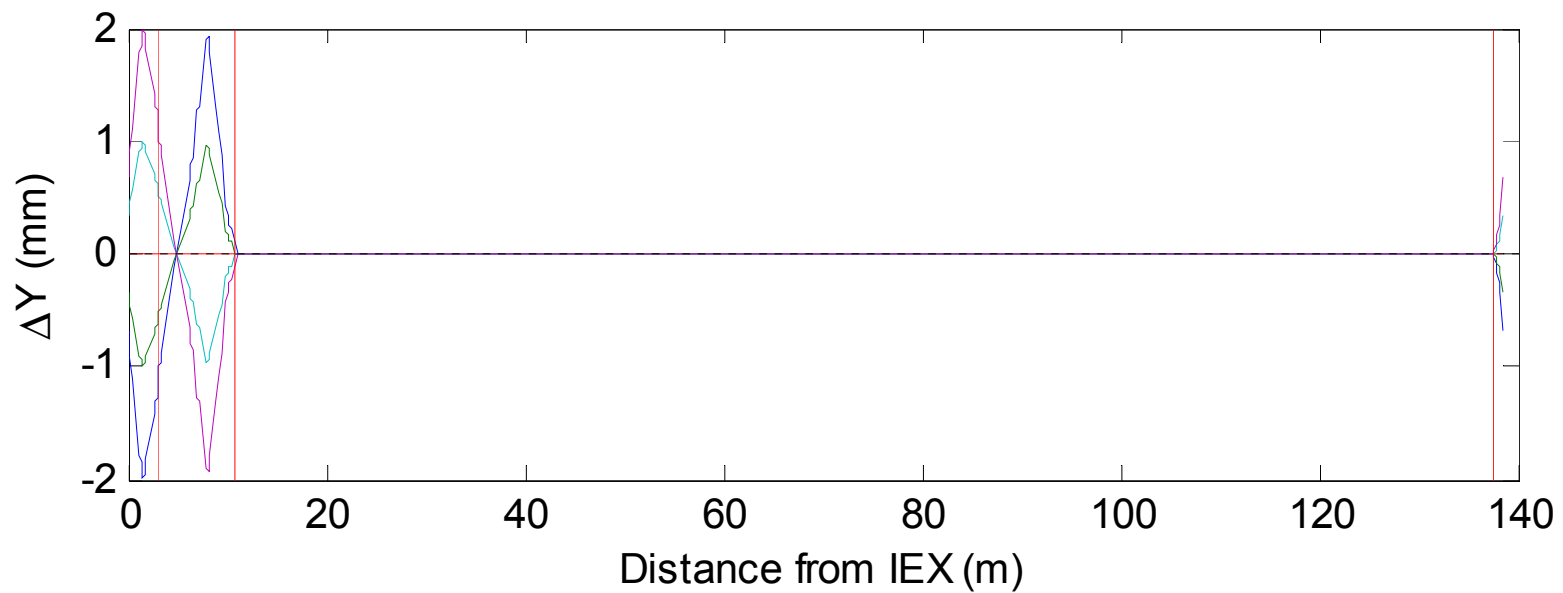
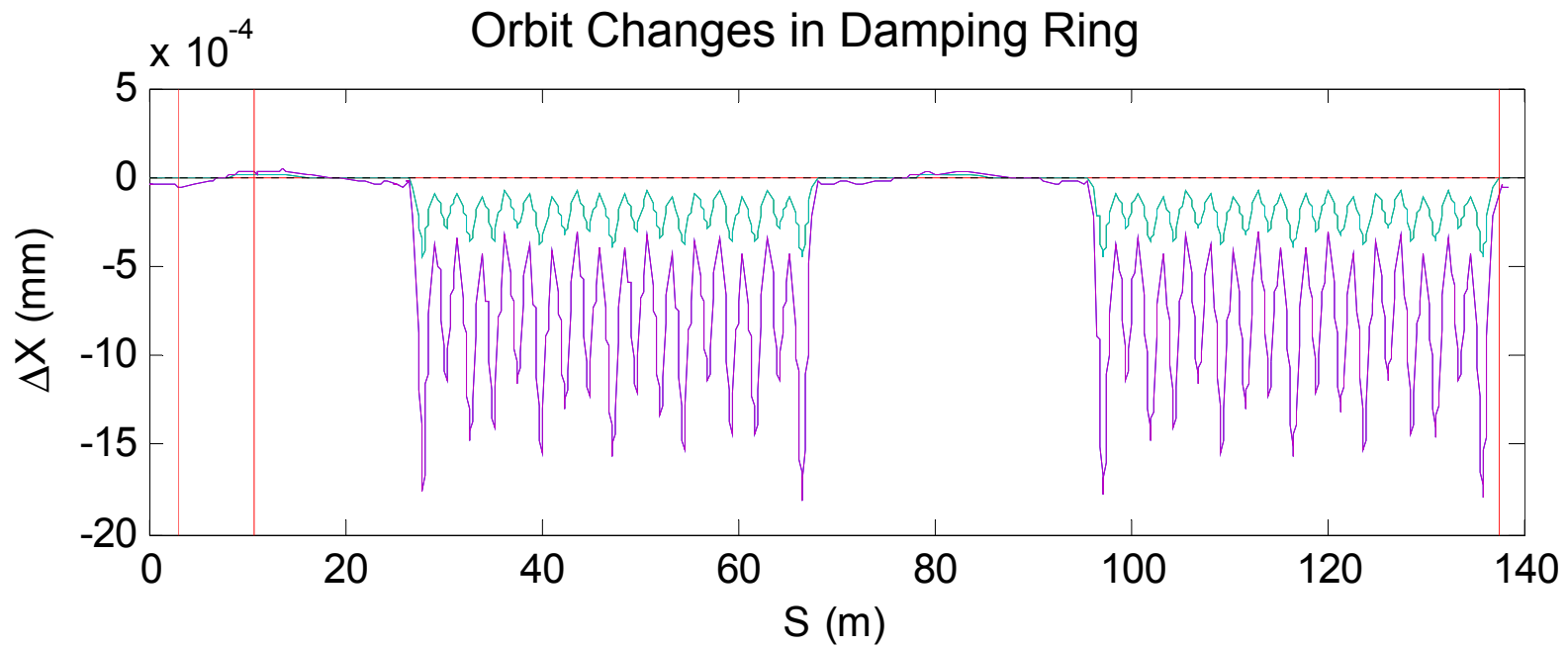


QM7R Bump Simulations with MAD

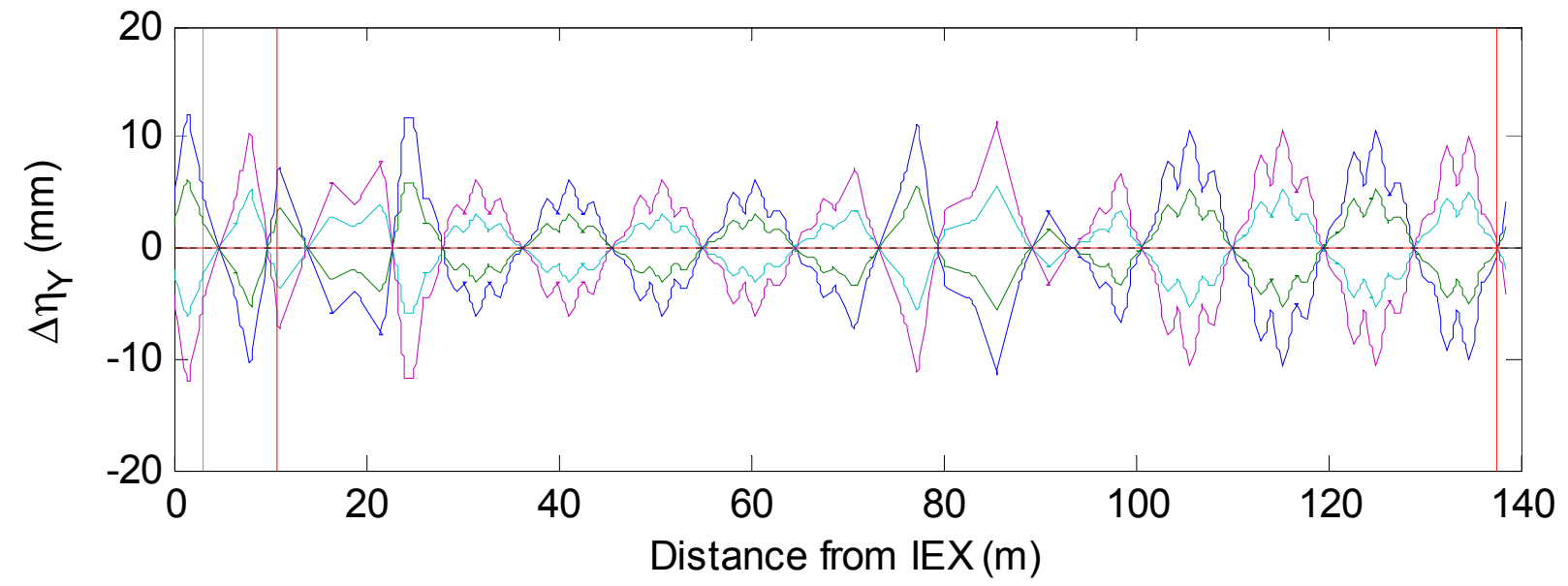
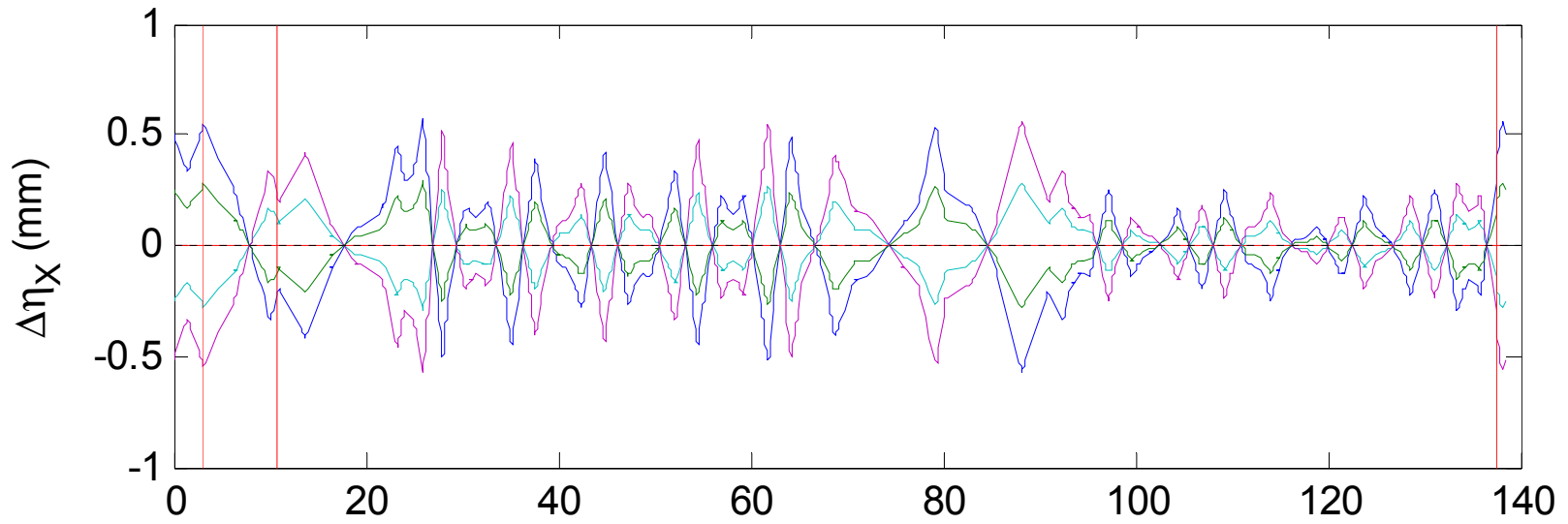
Simulation Parameters

- start with SET08MAY28_1204
- assume: $\epsilon_{x0} = 2 \text{ nm}$, $\epsilon_{y0} \approx 11 \text{ pm}$, $\sigma_{\delta} = 0.08 \%$
- at XSR:
 - $\sigma_x = 46.4965 \text{ }\mu\text{m}$, $\beta_x = 0.2269 \text{ m}$, $\eta_x = 0.0519 \text{ m}$
 - $\sigma_x(\eta) = |\eta_x \sigma_{\delta}| = 41.3414 \text{ }\mu\text{m}$
 - $\sigma_x(\beta) = \text{sqrt}(\sigma_x^2 - \sigma_x(\eta)^2) = 21.2794 \text{ }\mu\text{m}$
 - $\epsilon_x = 1.9954 \text{ nm}$
 - $\sigma_y = 9.0763 \text{ }\mu\text{m}$, $\beta_y = 2.0914 \text{ m}$, $\eta_y = -0.0049 \text{ m}$
 - $\sigma_y(\eta) = |\eta_y \sigma_{\delta}| = 3.9225 \text{ }\mu\text{m}$
 - $\sigma_y(\beta) = \text{sqrt}(\sigma_y^2 - \sigma_y(\eta)^2) = 8.1849 \text{ }\mu\text{m}$
 - $\epsilon_y = 20.0109 \text{ pm ... emittance growth (DR skews } \neq 0)$
- scan QM7R Y bump in MAD: [-1.0:0.5:1.0] mm
- scan QM7R X bump in MAD: [-0.5:0.5:1.0] mm

Vertical Bumps

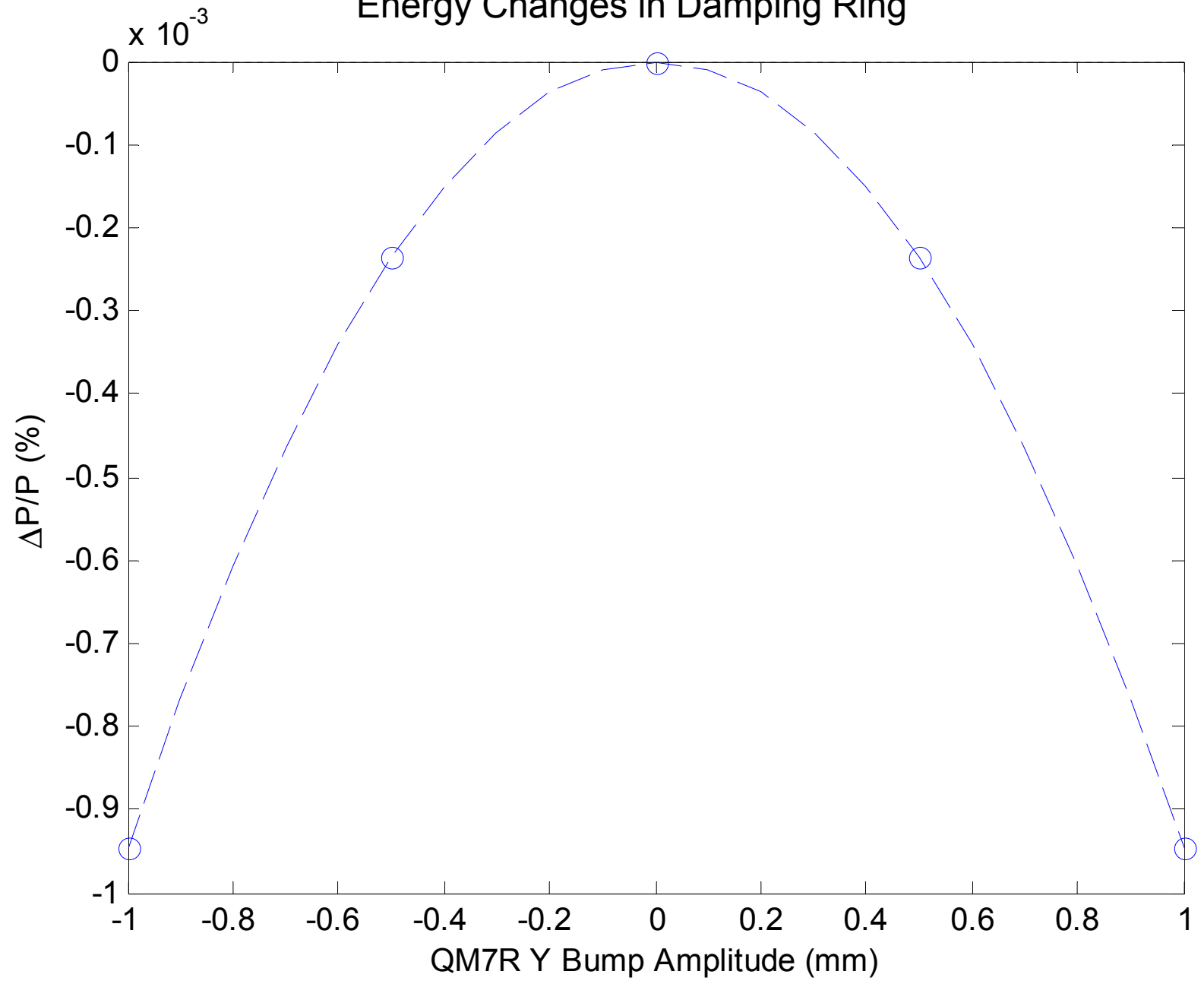


Dispersion Changes in Damping Ring

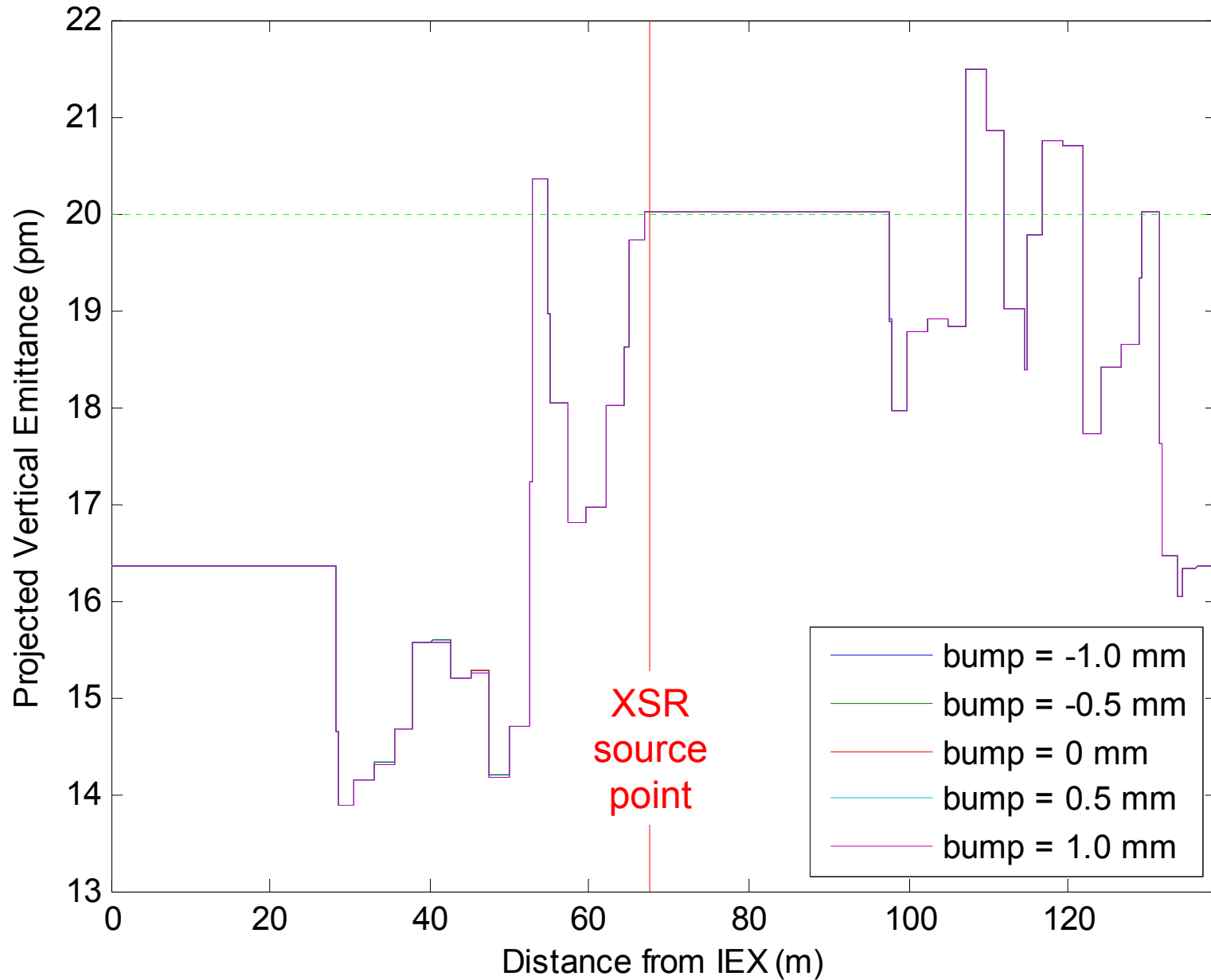


Distance from IEX (m)

Energy Changes in Damping Ring



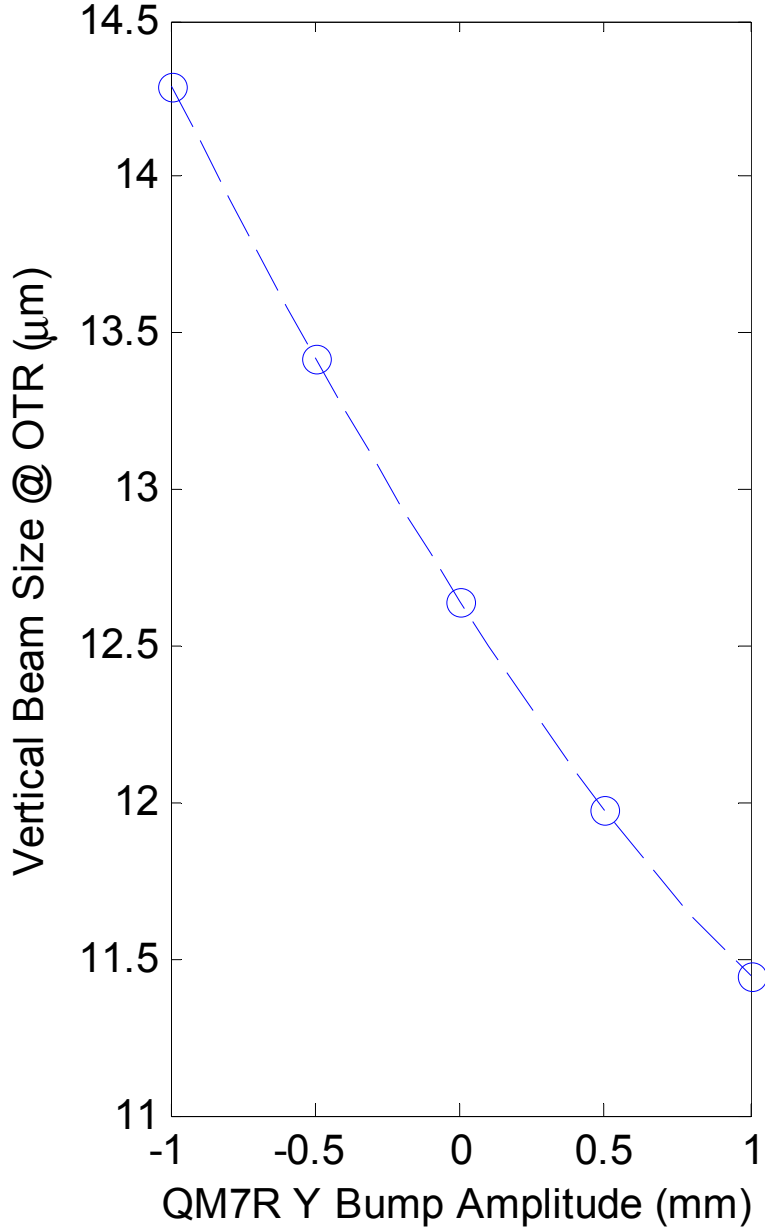
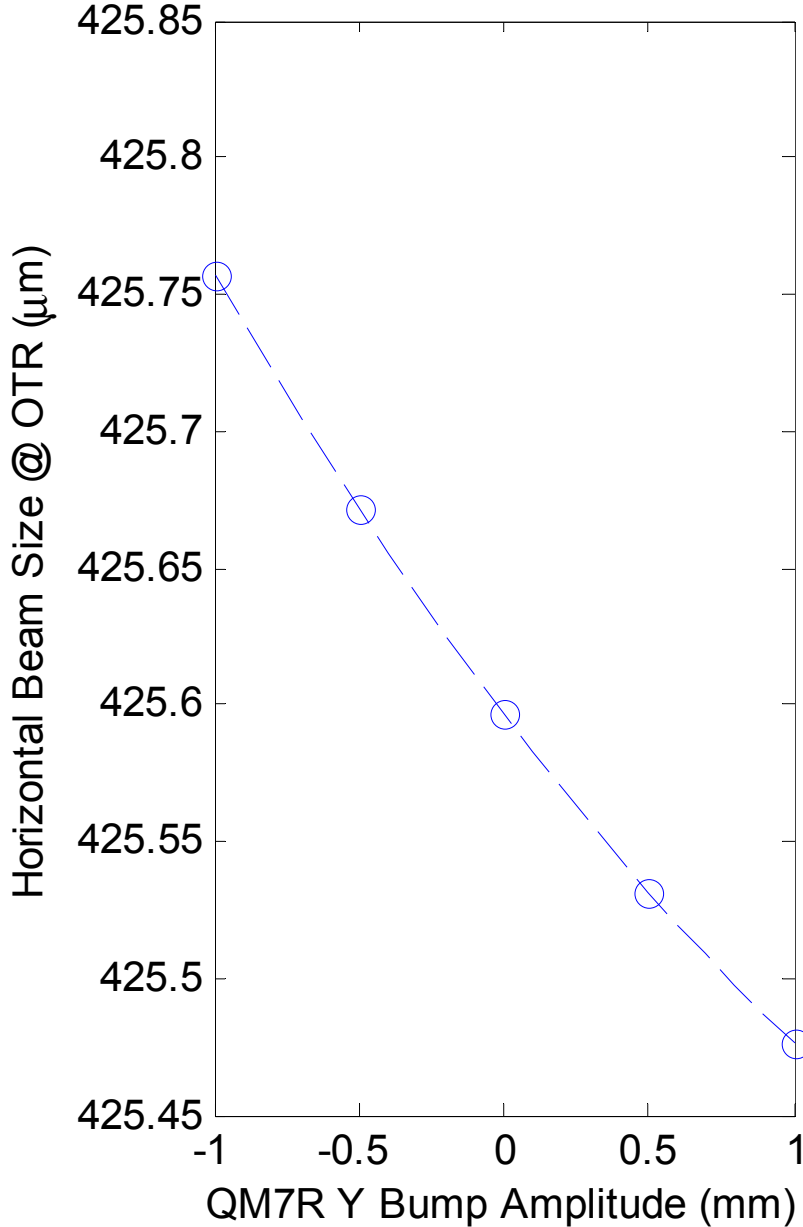
Damping Ring: SET08MAY28_1204 ($\epsilon_{yi} = 10.98 \text{ } \mu\text{m}$)



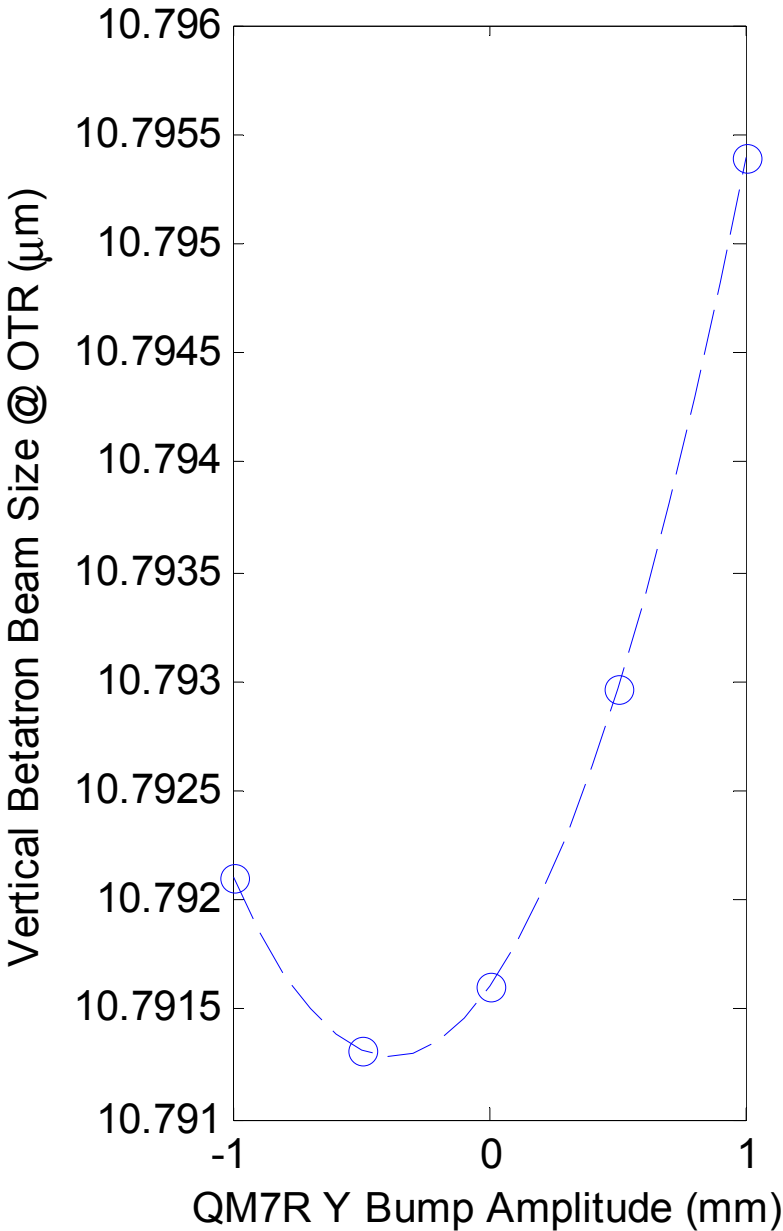
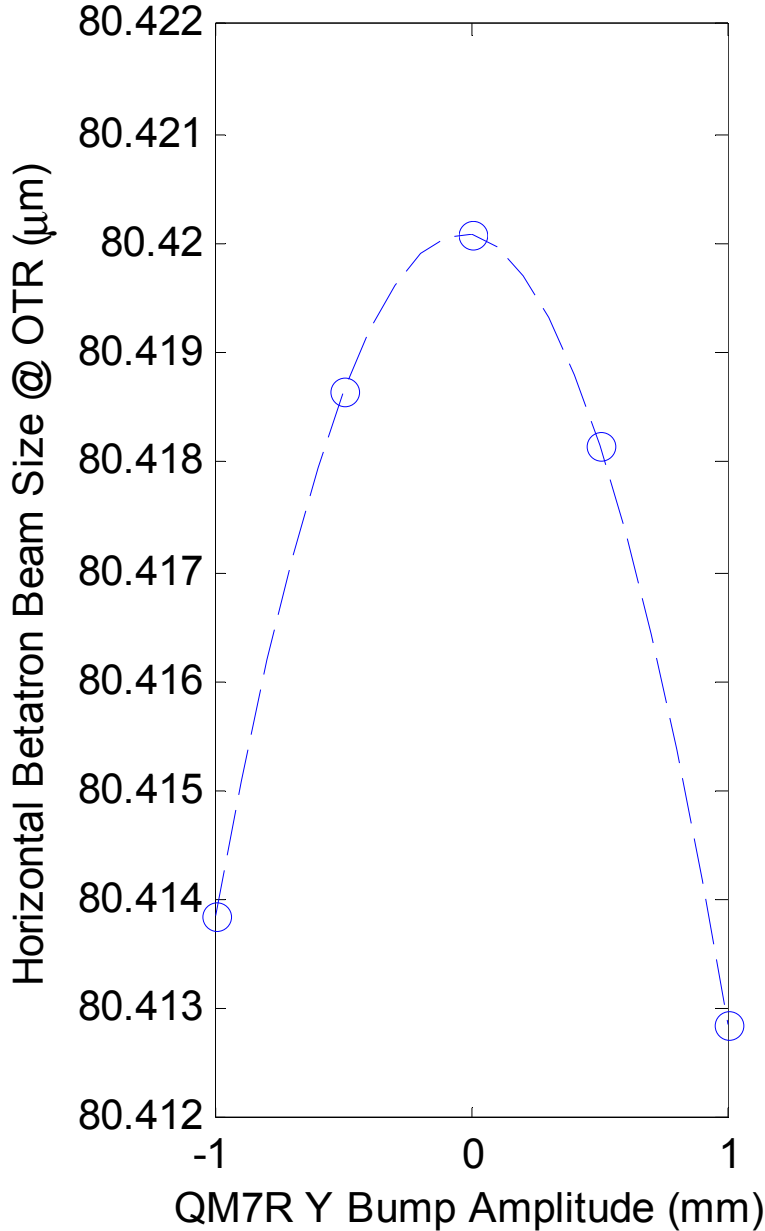
Simulation Parameters

- QM7R gradient error = 0
- QM7R sextupole component = 0 m⁻²
- at OTR:
 - $\sigma_x = 425.5966 \mu\text{m}$, $\beta_x = 3.1777 \text{ m}$, $\eta_x = 0.5243 \text{ m}$
 - $\sigma_x(\eta) = |\eta_x \sigma_\delta| = 417.9300 \mu\text{m}$
 - $\sigma_x(\beta) = \text{sqrt}(\sigma_x^2 - \sigma_x(\eta)^2) = 80.4201 \mu\text{m}$
 - $\epsilon_x = 2.1593 \text{ nm}$
 - $\sigma_y = 12.6443 \mu\text{m}$, $\beta_y = 5.5949 \text{ m}$, $\eta_y = -0.0083 \text{ m}$
 - $\sigma_y(\eta) = |\eta_y \sigma_\delta| = 6.5893 \mu\text{m}$
 - $\sigma_y(\beta) = \text{sqrt}(\sigma_y^2 - \sigma_y(\eta)^2) = 10.7916 \mu\text{m}$
 - $\epsilon_y = 16.3584 \text{ pm} \dots$ emittance growth (DR skews $\neq 0$)

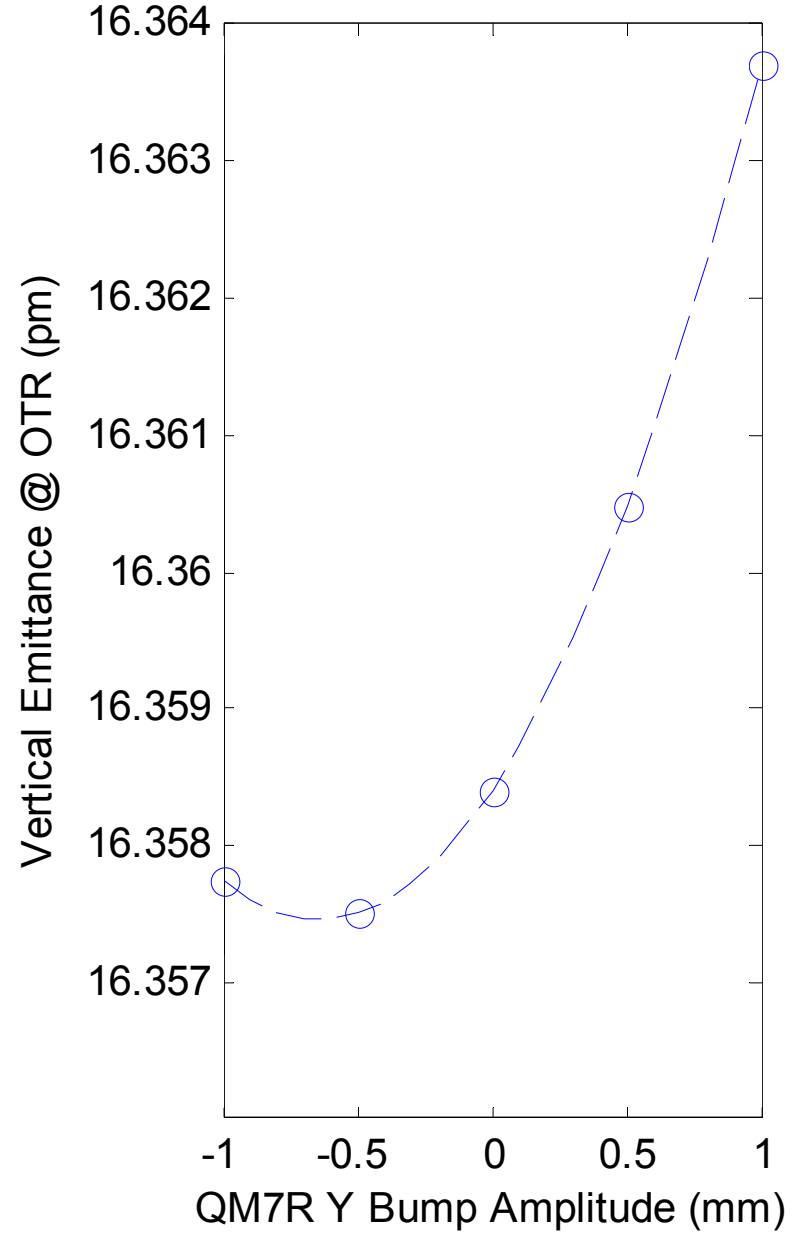
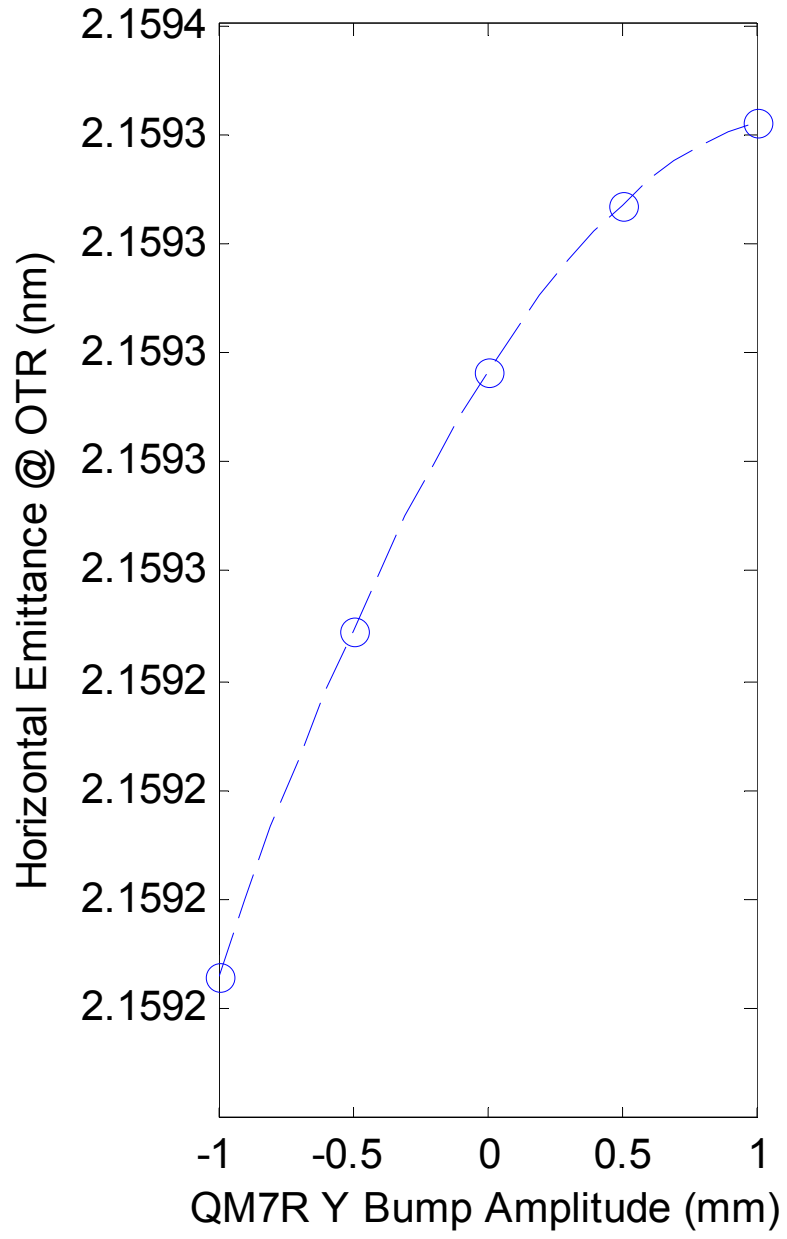
Beam Size at OTR (uncorrected)



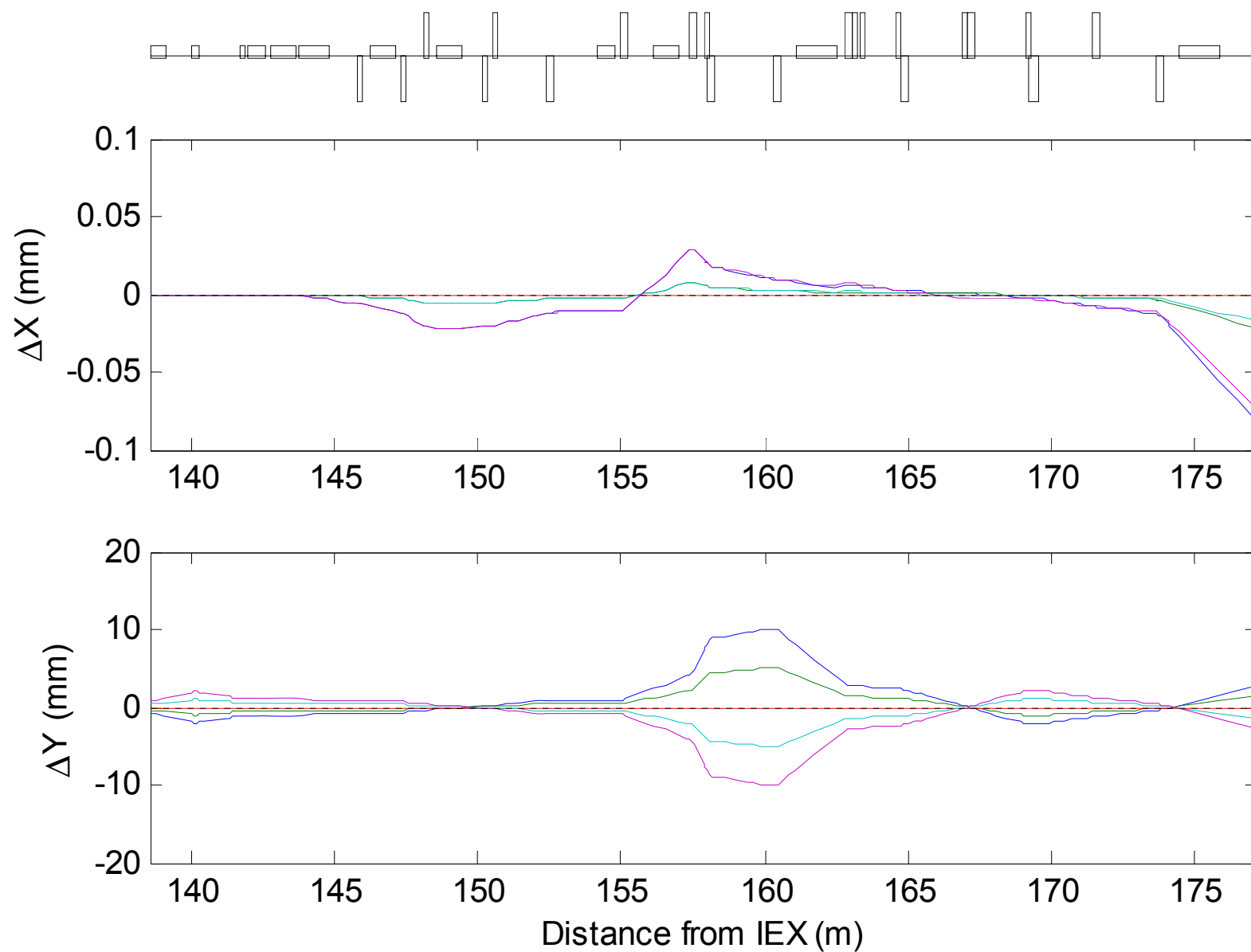
Beam Size at OTR (dispersion corrected)



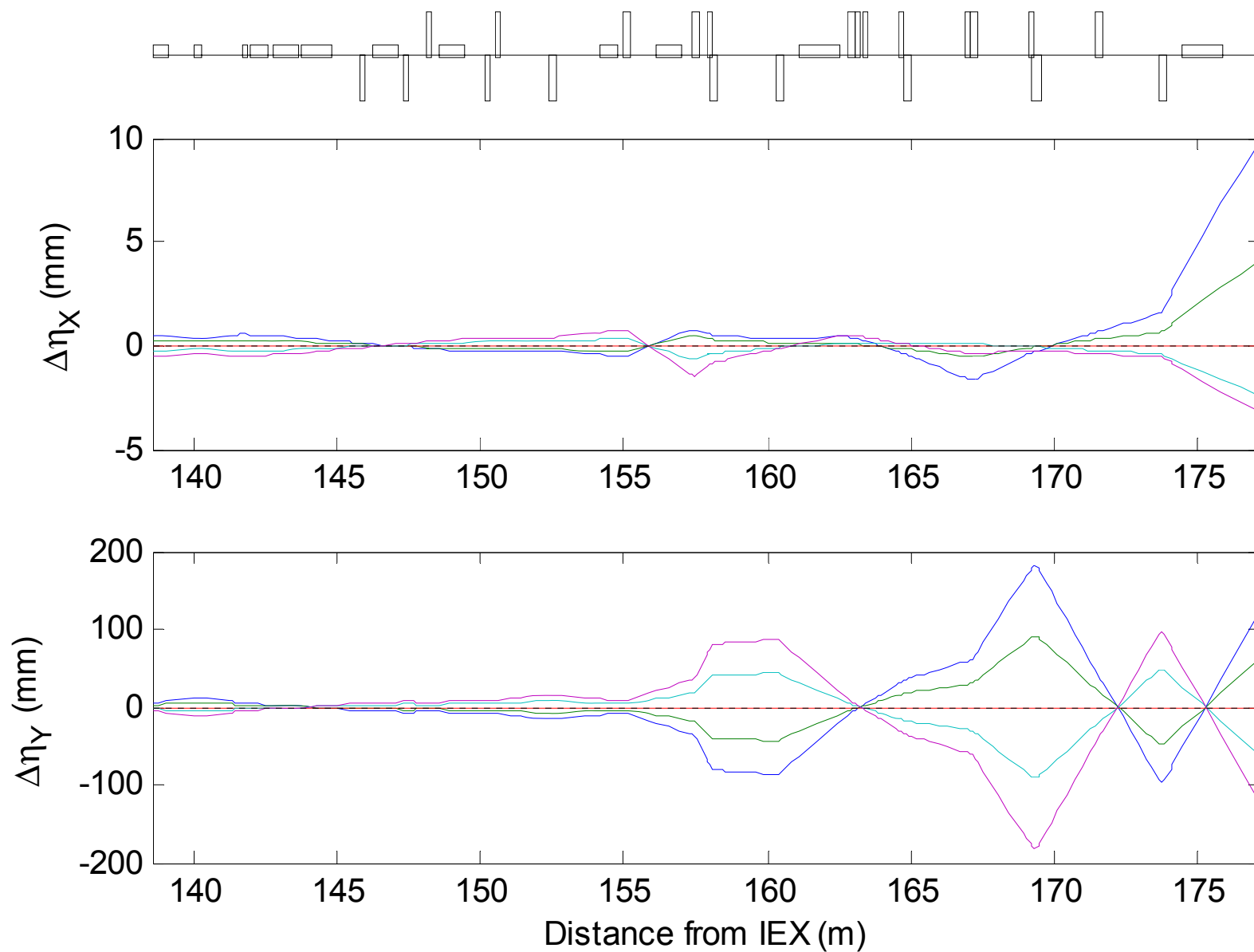
Emittance at OTR



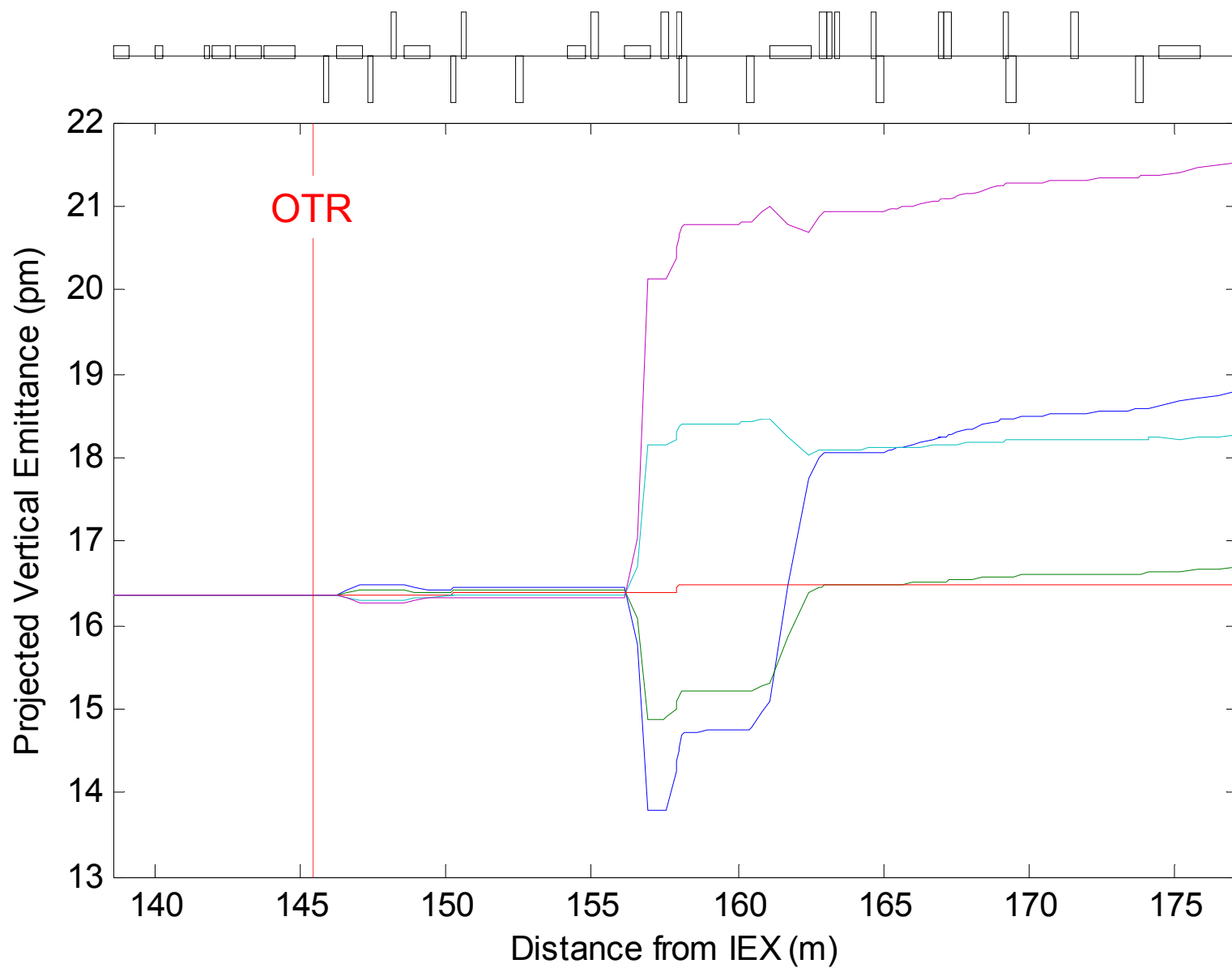
EXT



EXT



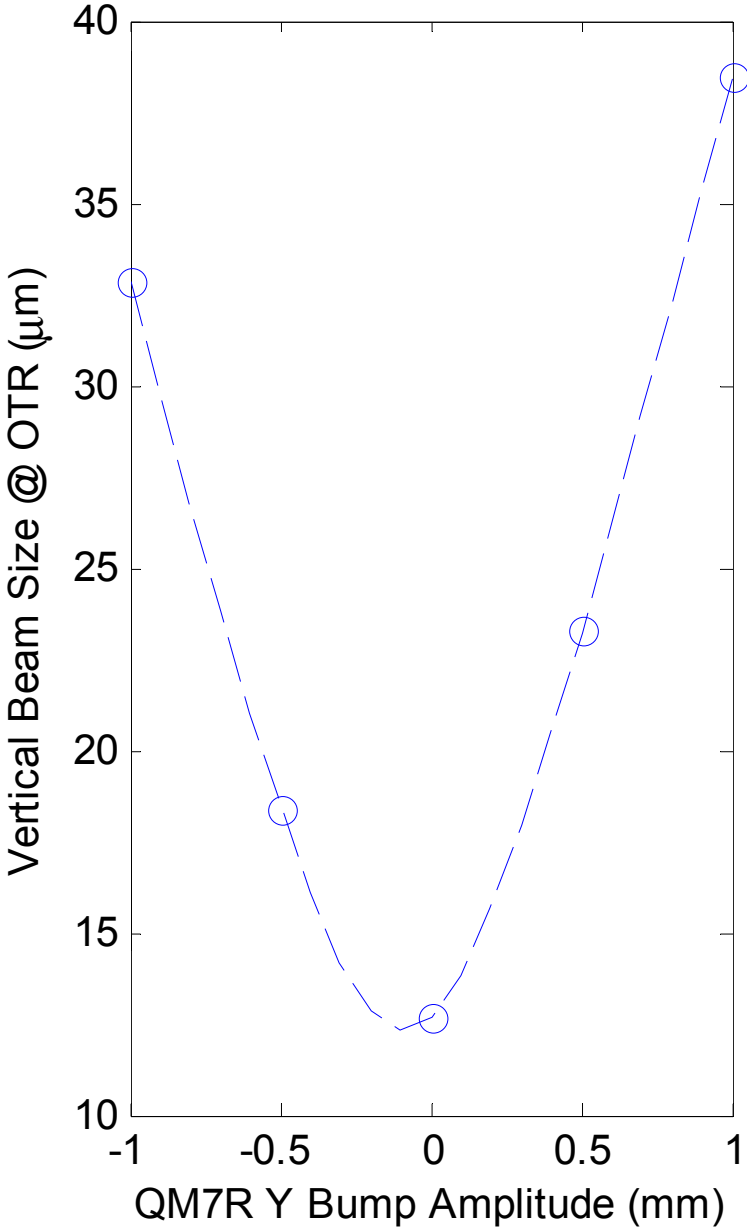
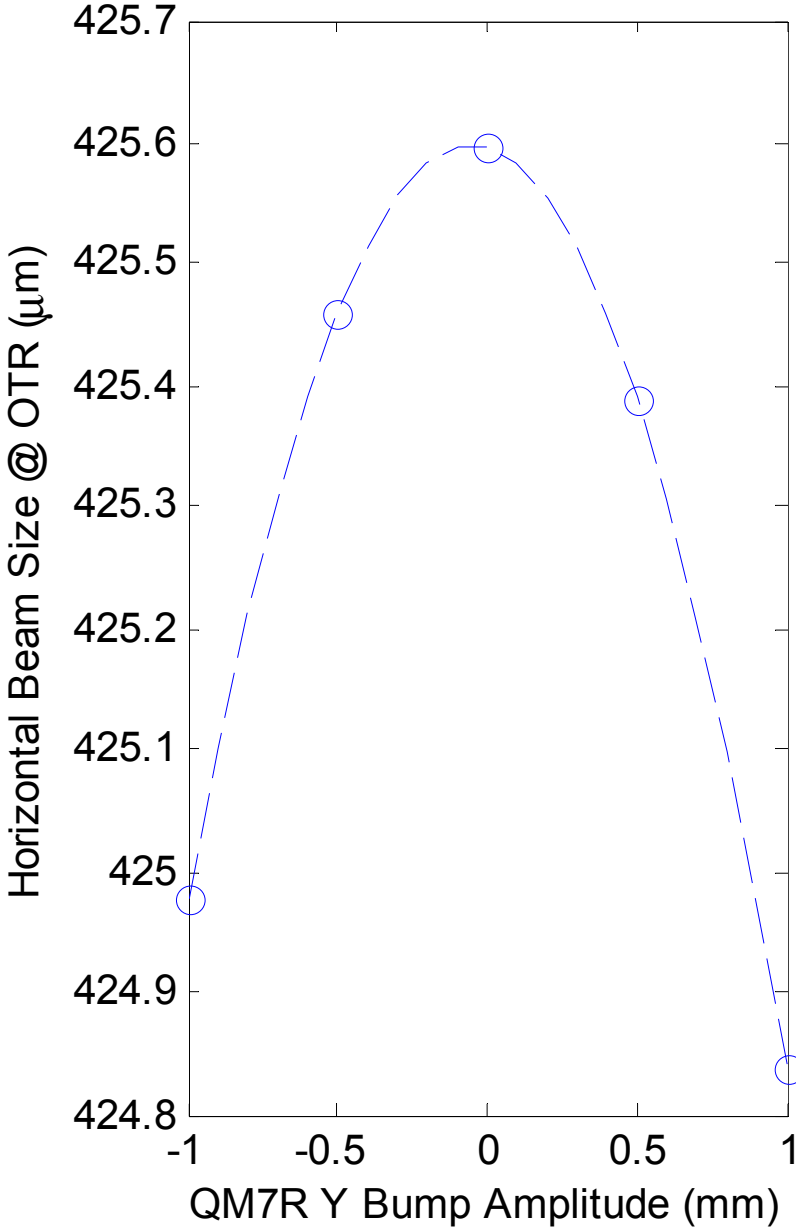
EXT: SET08MAY28_1204 ($\epsilon_{yi} = 10.98 \text{ pm}$)



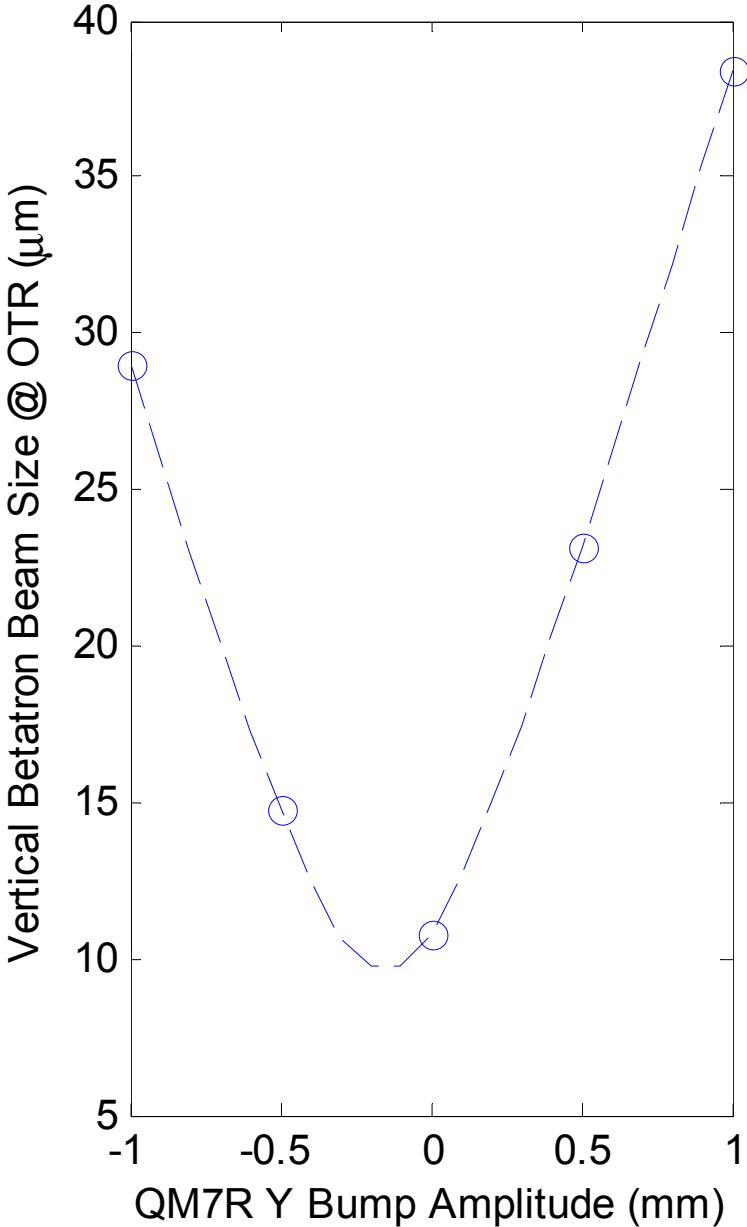
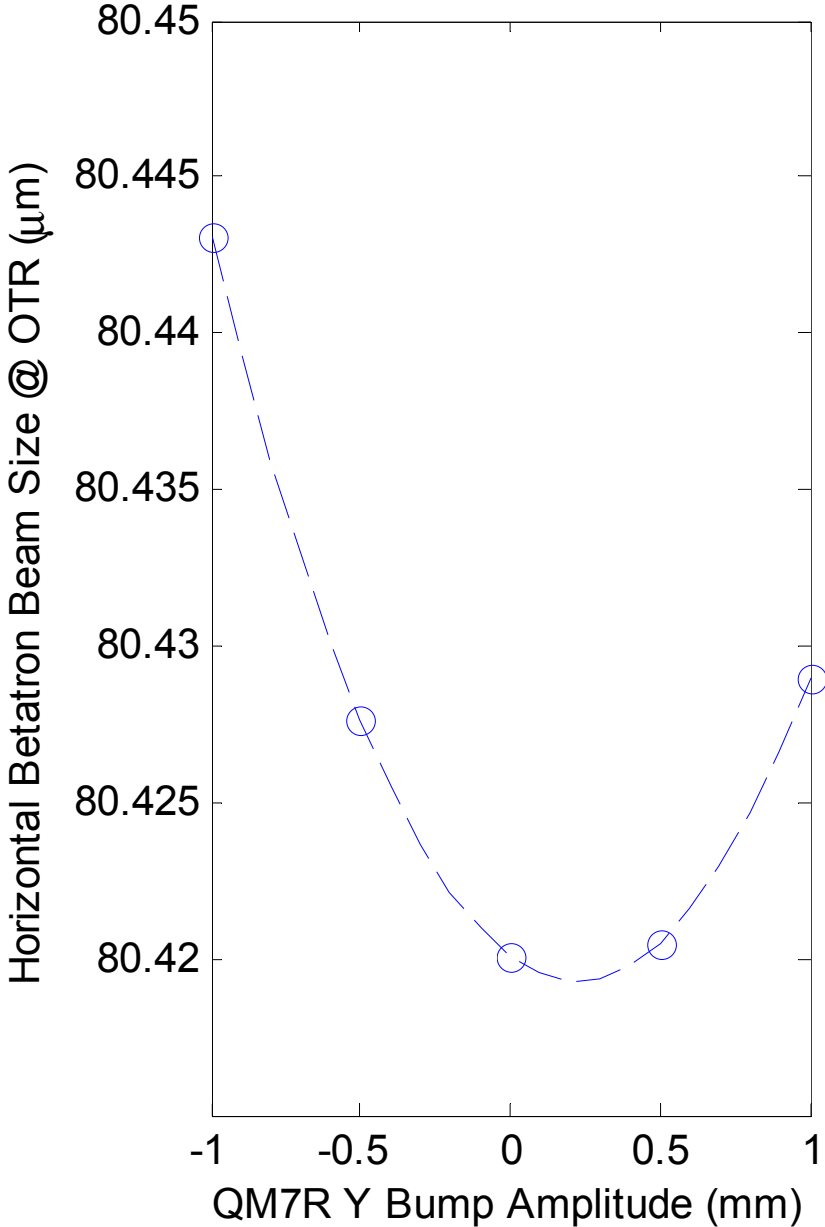
Simulation Parameters

- QM7R gradient error = 0
- QM7R sextupole component = 44.179 m⁻²

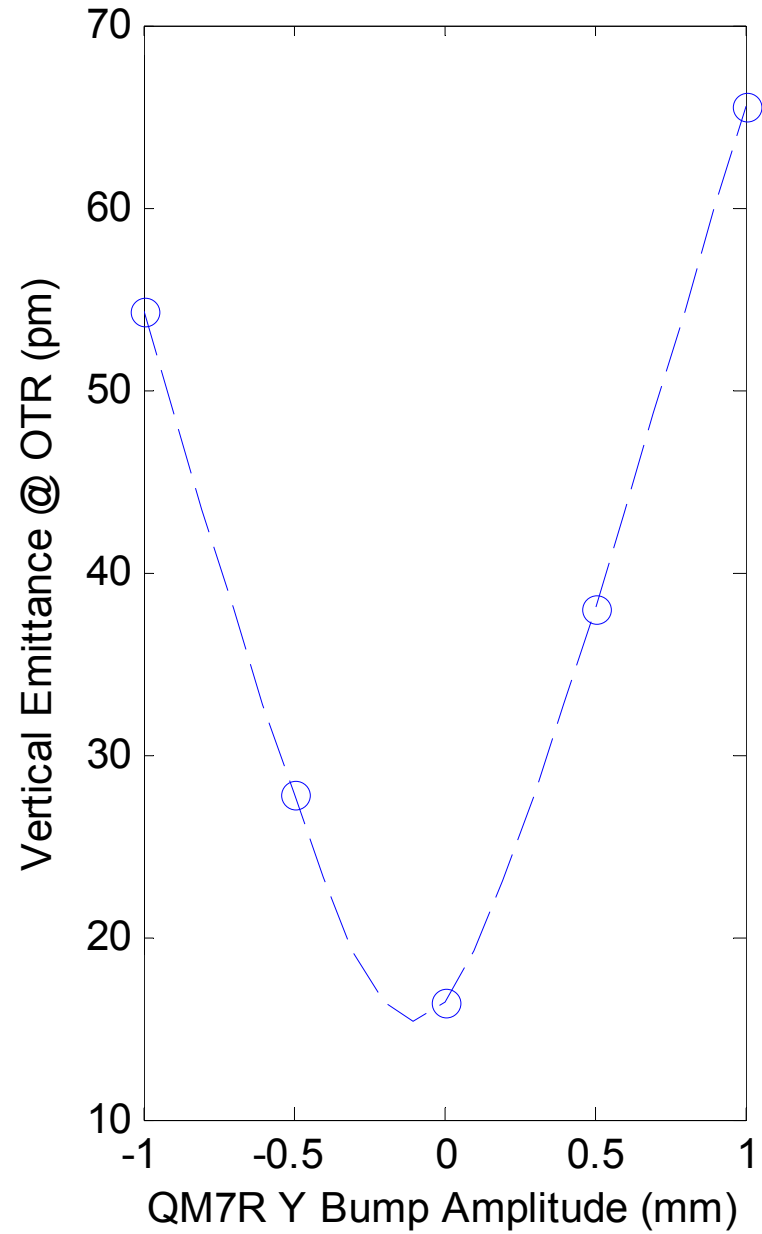
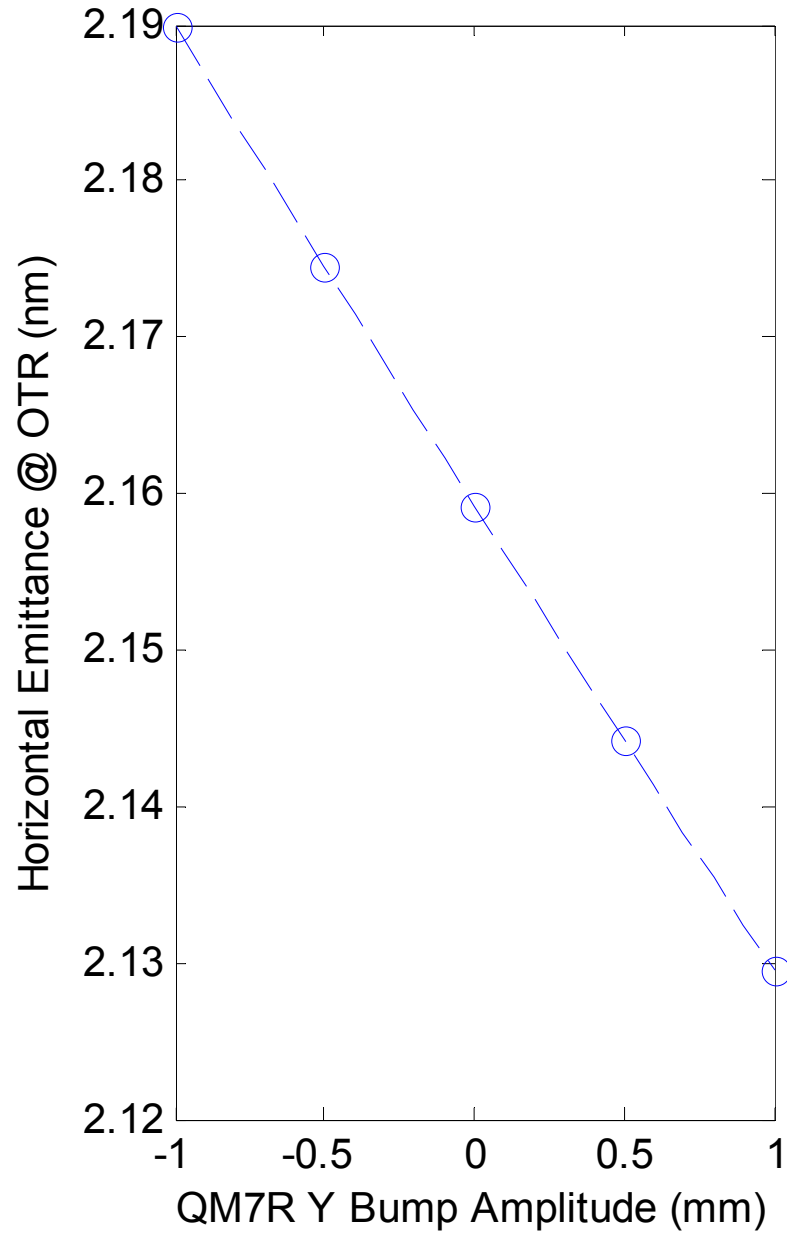
Beam Size at OTR (uncorrected)



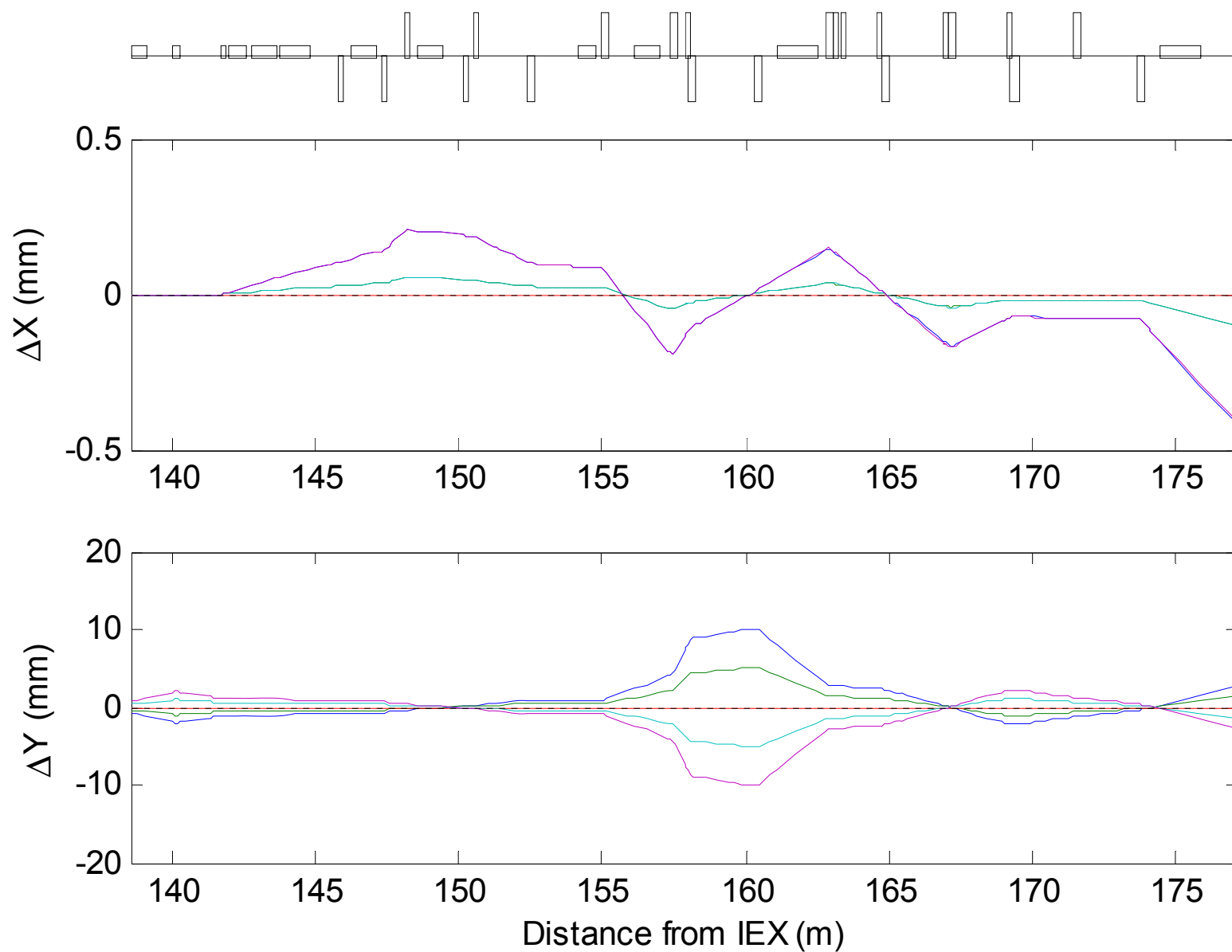
Beam Size at OTR (dispersion corrected)



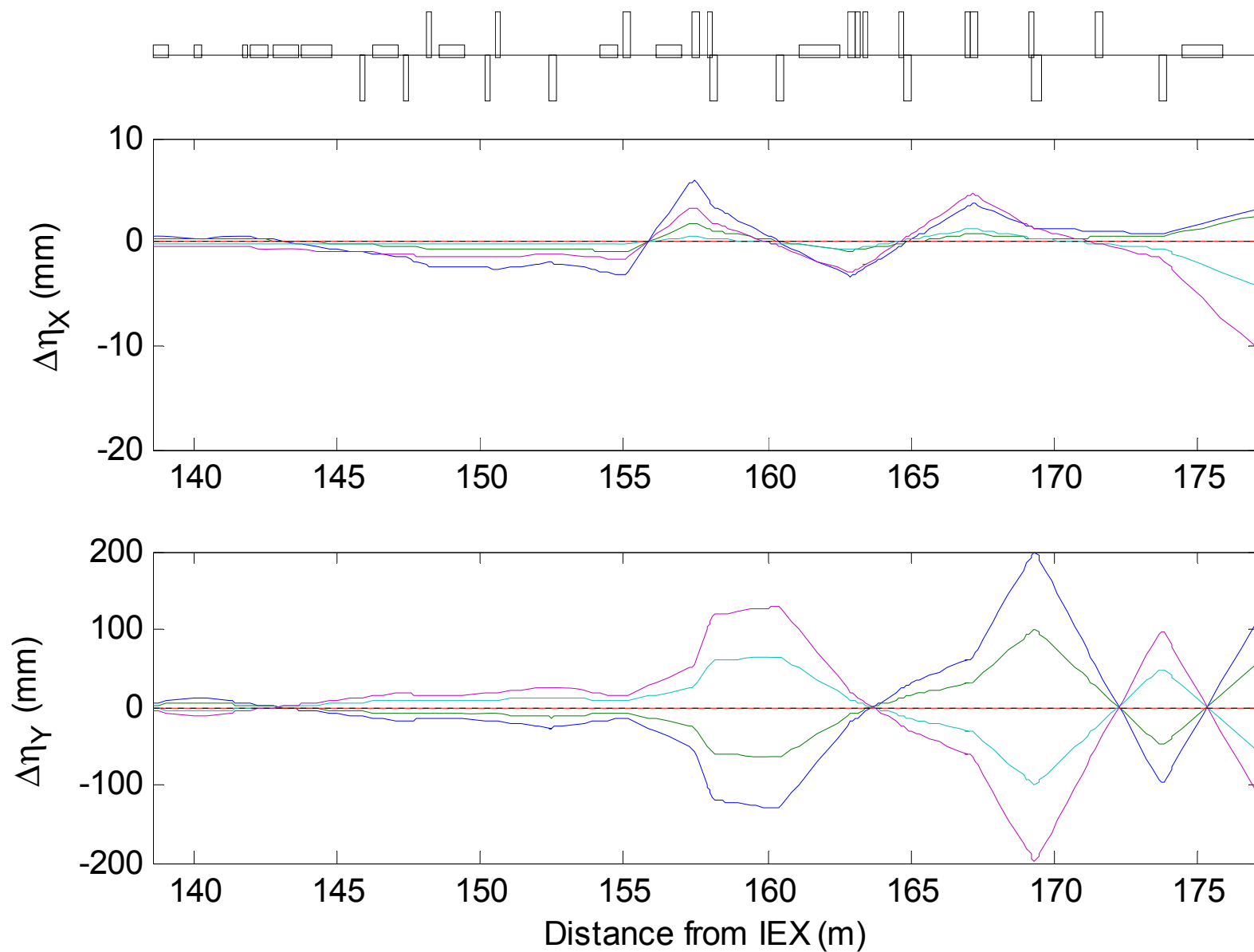
Emittance at OTR



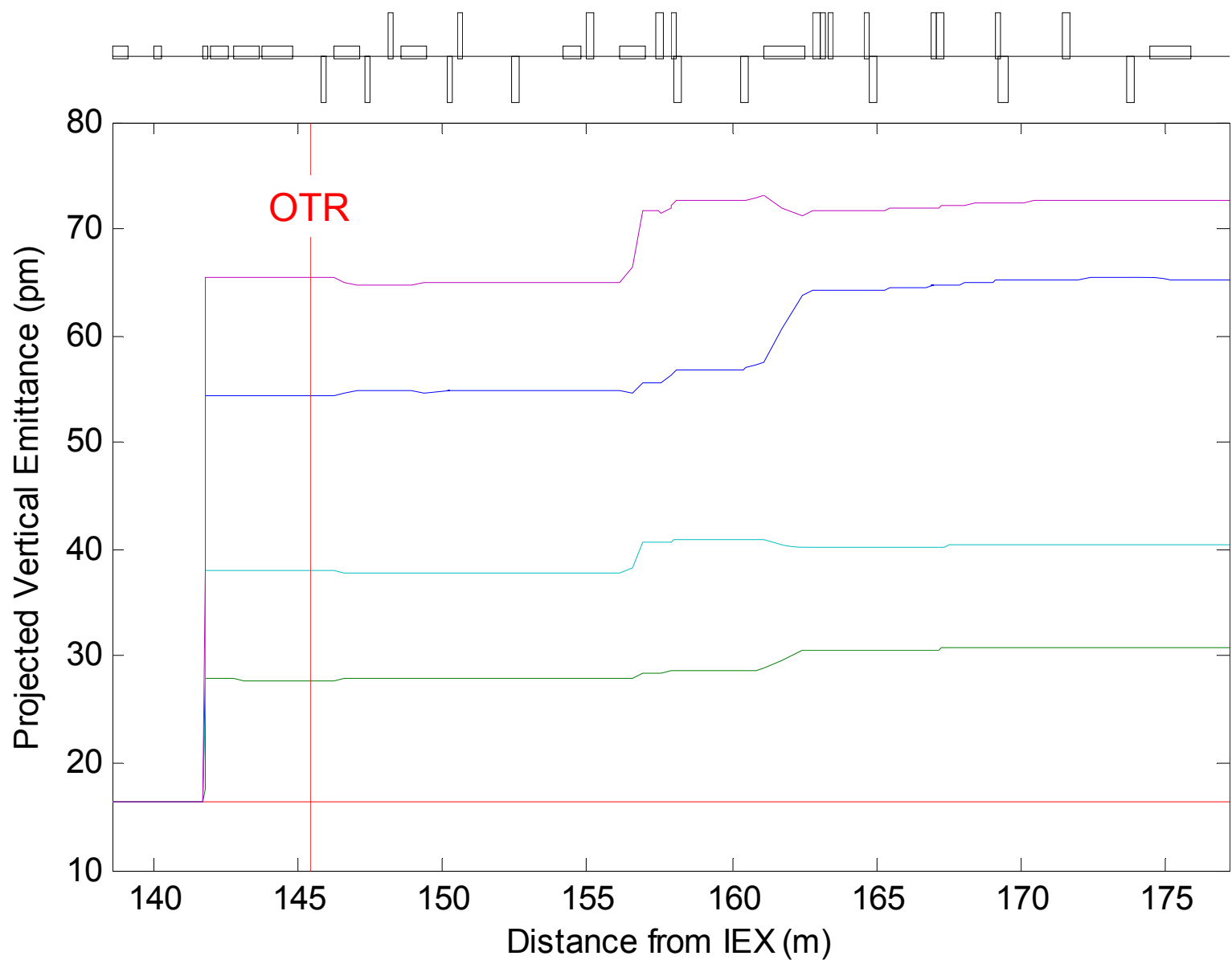
EXT



EXT

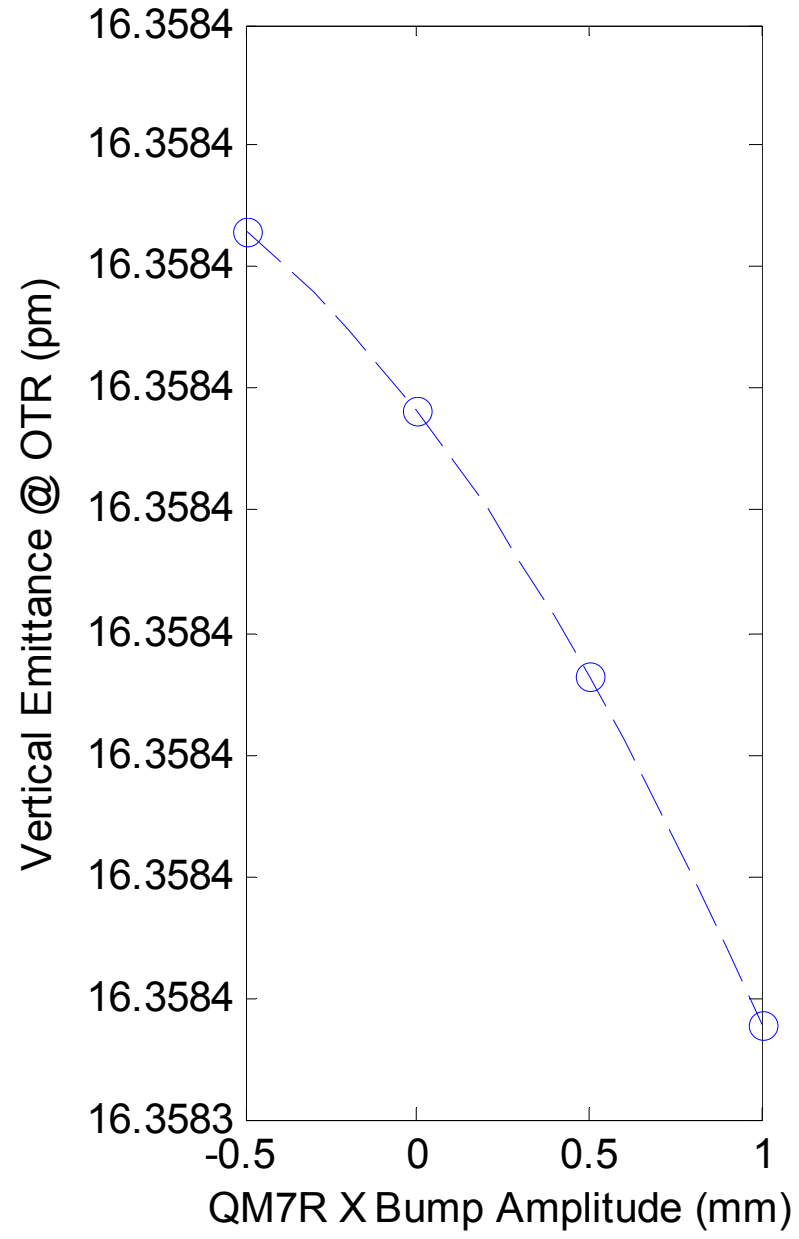
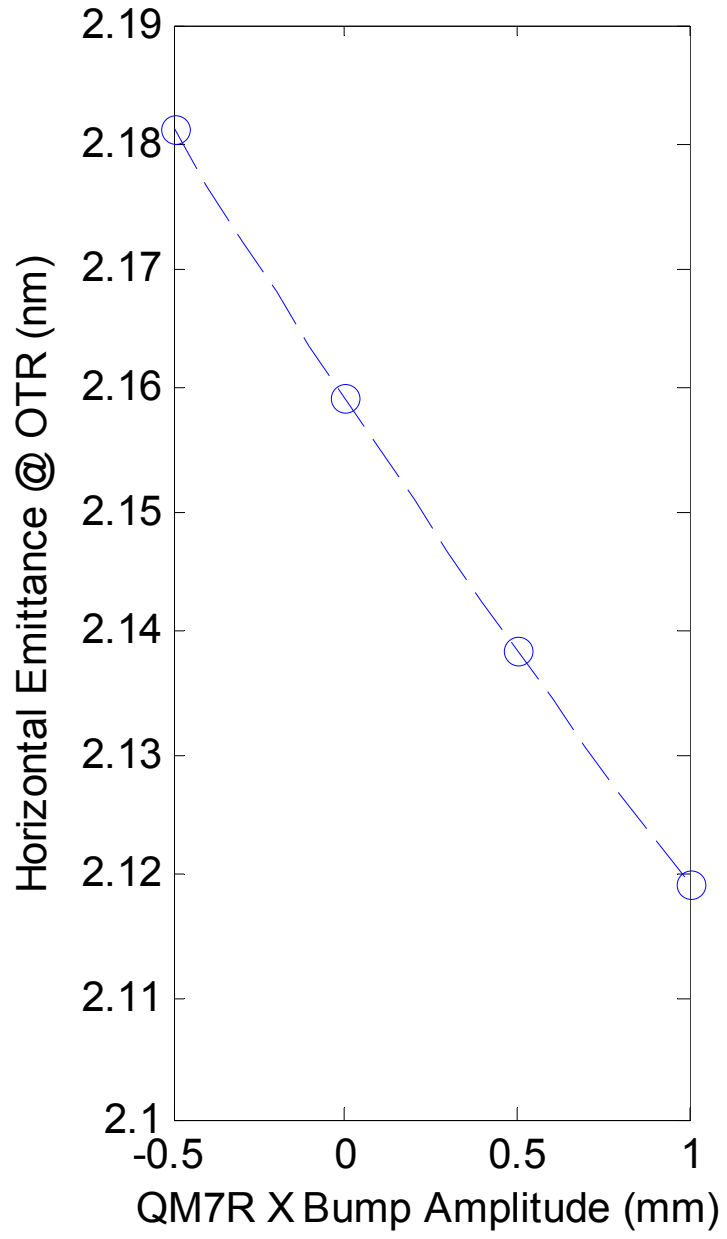


EXT: SET08MAY28_1204 ($\epsilon_{yi} = 10.98 \text{ pm}$)



Horizontal Bumps

Emittance at OTR



EXT: SET08MAY28_1204 ($\epsilon_{yi} = 10.98 \text{ pm}$)

