1D Bose-Einstein correlations

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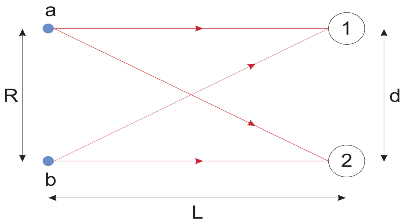
Fast reminder

- HBT interferometry can be used to study the diameters of source.
- For indistinguishable particles the phenomena is know as Bose-Einstein Correlations(BEC).
- BEC correlations occur as enhancement of same particles in the low Q region.
- We already observed the effects.
- For now I want to make BEC for pions, kaons are for future(less statistics).
- Use 2011 sample.



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Pre-Selection

	Cut
track χ^2	< 2.6 GeV
track momentum	> 3.0 GeV
track p_T	> 0.1 GeV
track IP	$< 0.2\ \mathrm{mm}$
track IP χ^2	< 2.6
PID NN (pion, kaon)	> 0.25
track probability to be a ghost	< 0.3

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Hard cuts, as we have enough statistics.

	Cut
PID NN (pion, kaon)[1]	> 0.9
track IP	$< 0.05\ \mathrm{mm}$
track IP χ^2	< 2
track probability to be a ghost	< 0.2
n. PV	$== 1$

[1] No double counting with this cut

How to measure correlations?

- Define a correlations function:

$$C(q_1, q_2) = \frac{\rho(q_1, q_2)}{\rho(q_1)\rho(q_2)} \quad (1)$$

- There are many kinematic variables where BEC can occur. Canonical choice $Q = \sqrt{-(q_1 - q_2)^2}$.
- $\rho(q_1, q_2)$ is easy. For each pair of same sign particles calculate Q and plot.
- $\rho(q_1)\rho(q_2)$ is a bit more tricky. One way is to take opposite sign particles or mix events. Both by construction kill the BEC effects.

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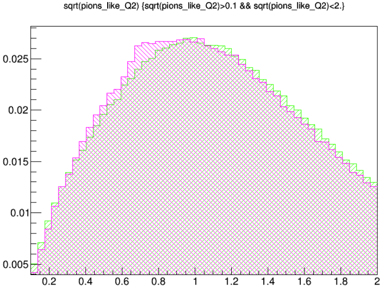
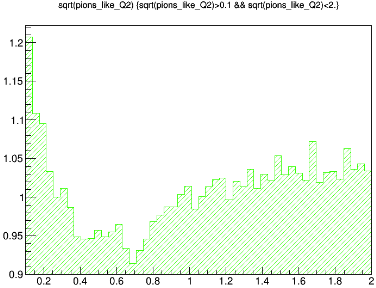
Opposite sign

Q Distribution.



$C(q_1, q_2)$ Distribution.



- Here I just took 1% of data not to bias myself afterwards.
- The same sign sample is not the perfect one as it has resonances inside.

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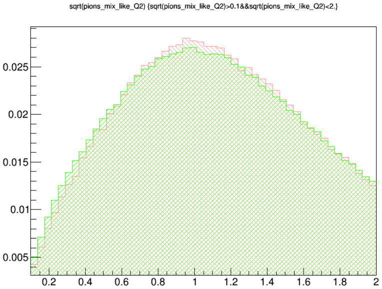
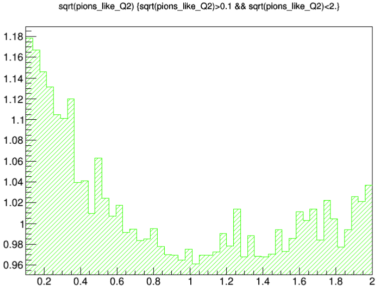
Q Distribution.



$C(q_1, q_2)$ Distribution.



- Here I just took 1% of data not to bias myself afterwards.
- Correlation looks much much better.

To Do

- Do double ration(take into account detector effects).
- DO systematics.