KKMC and RRes for low energy colliders

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Outline:

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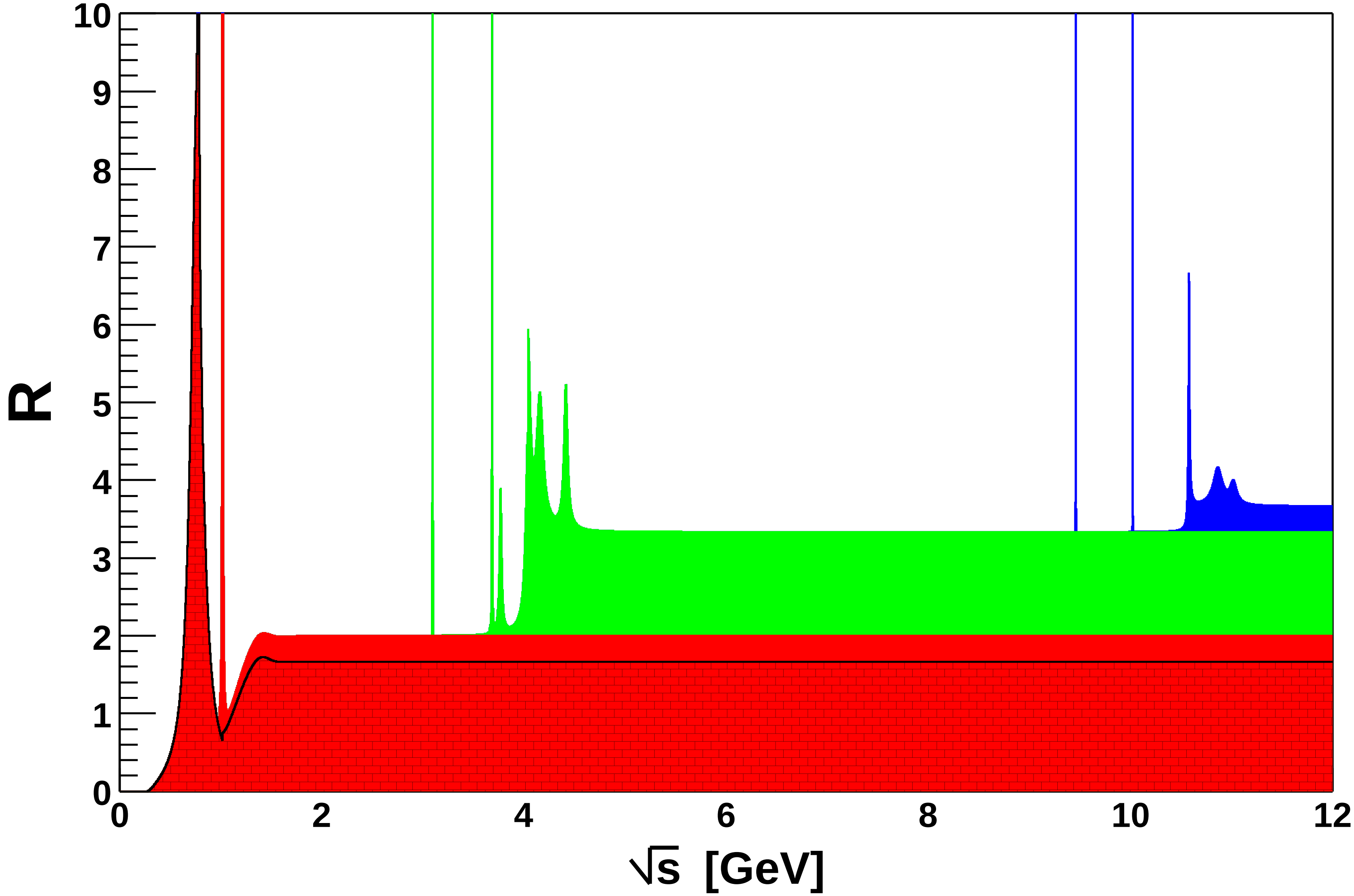
KKMC available from http://home.cern.ch/jadach

RRes package of M. Boonekamp, now included in $\mathcal{KK}$MC

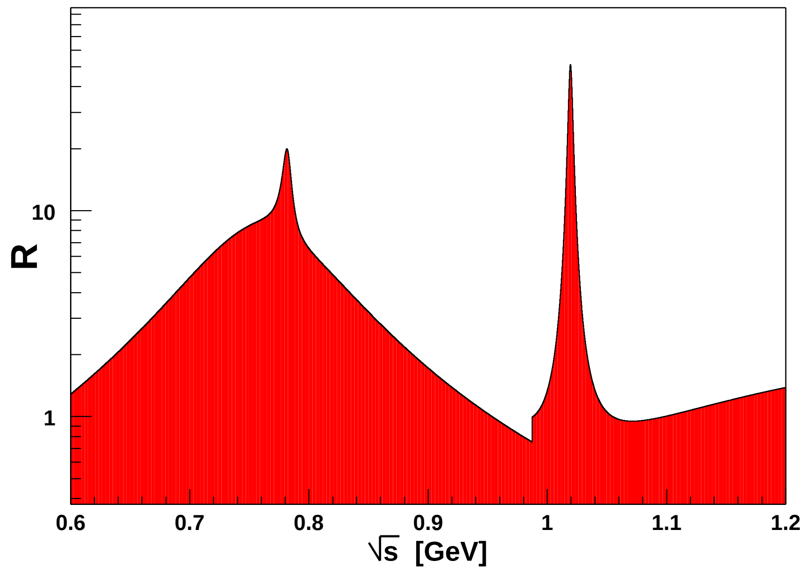
- $R(s)$ from most available hadronic data, old ones (SLAC, Orsay) and new (Novosibirsk).
- In particular ρ and ω region parametrized using new Novosibirsk data, hep-ex/9904027.
- In MC generation $R(s)$ split into resonant and non-resonant parts. $R(s)$ is also split among available $q_i\bar{q}_i$ pairs, for resonances and continuum.
- Resonance decays (from ρ to Υ) generated using Pythia tool.
- Non-resonant "continuum" part modelled using Pythia tool for $q_i\bar{q}_i$ string. At $\sqrt{s} < 2GeV$ for (small) non-resonant component flat phase space is used experimental data are used to determine the type of final state (any channel).
- No naive QCD applied for "continuum", for the moment.

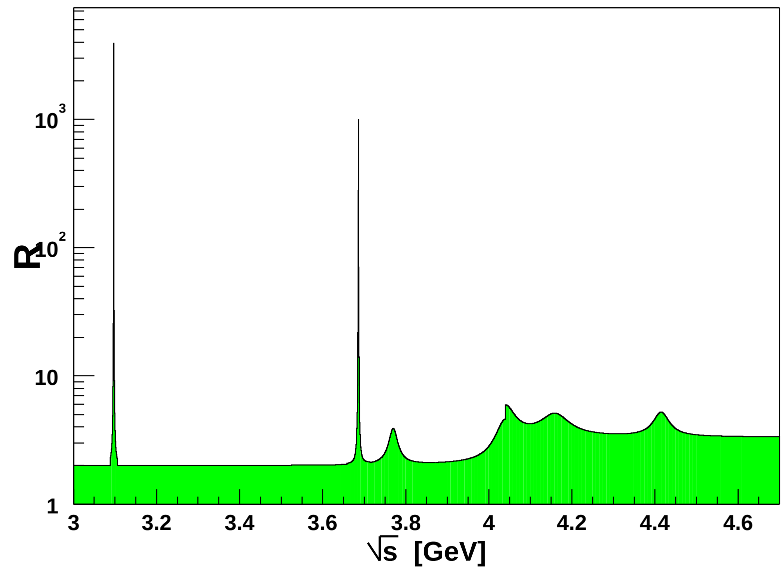
To be improved: for continuum part replace flat phase space with more realistic description of $n\pi$ state, better matching with perturbative QCD and QED (FSR).

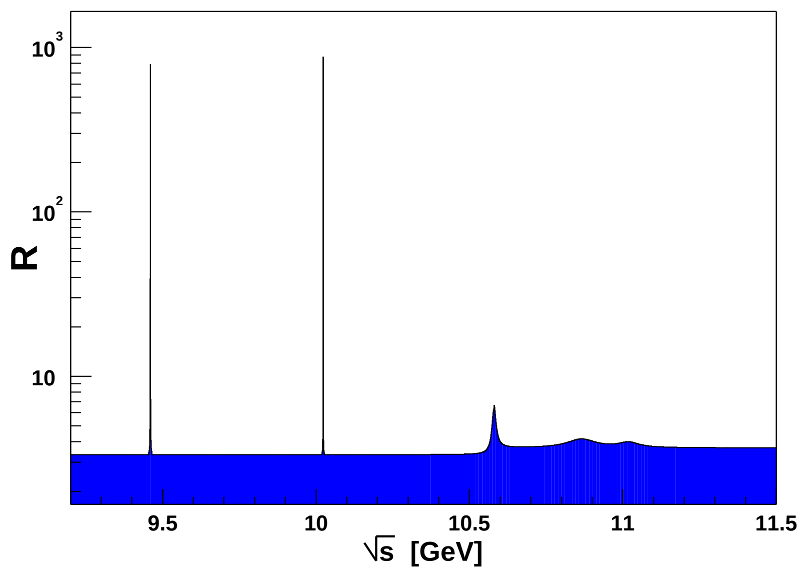
$q\bar{q}$ SKYLINE from RRes package



Zoom on resonances (RRes package)

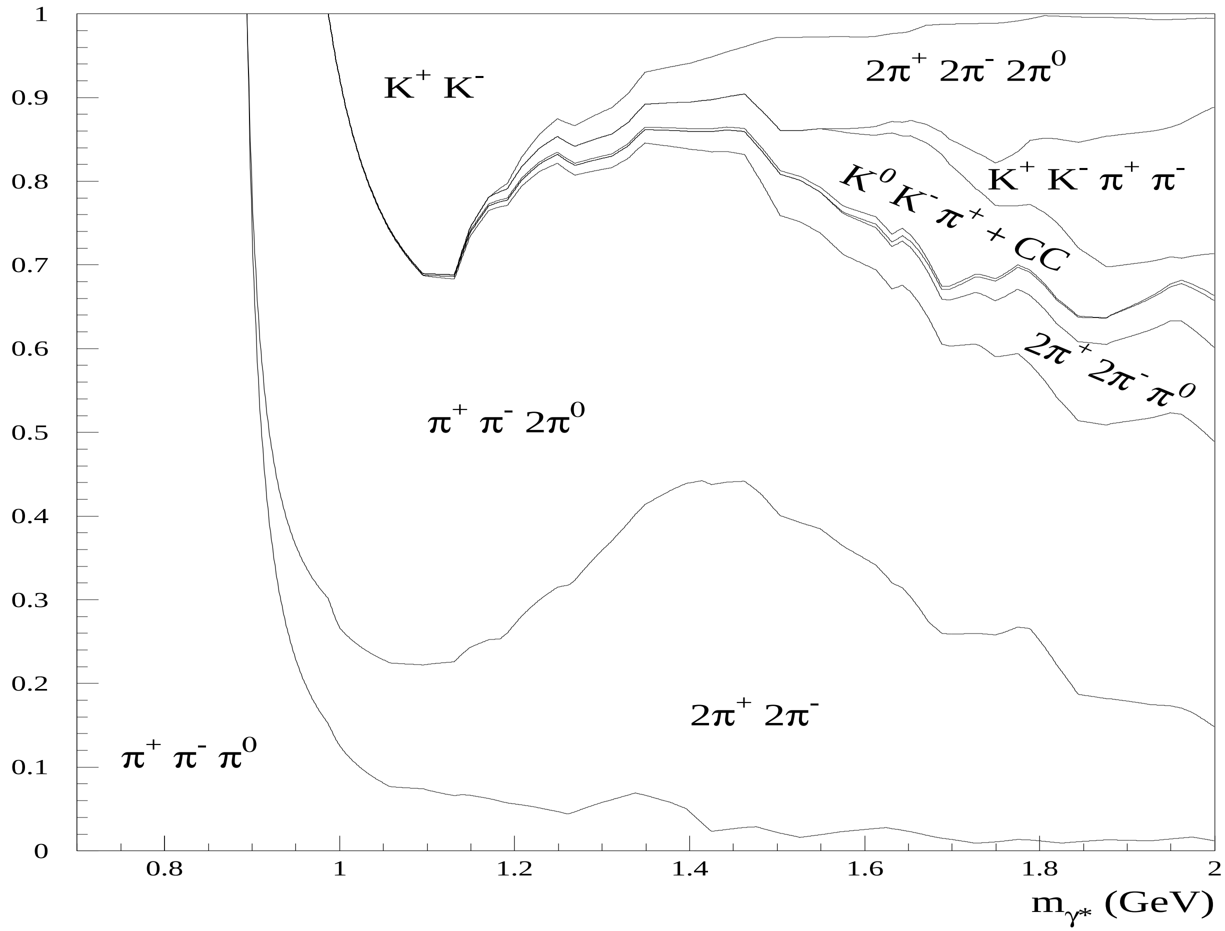






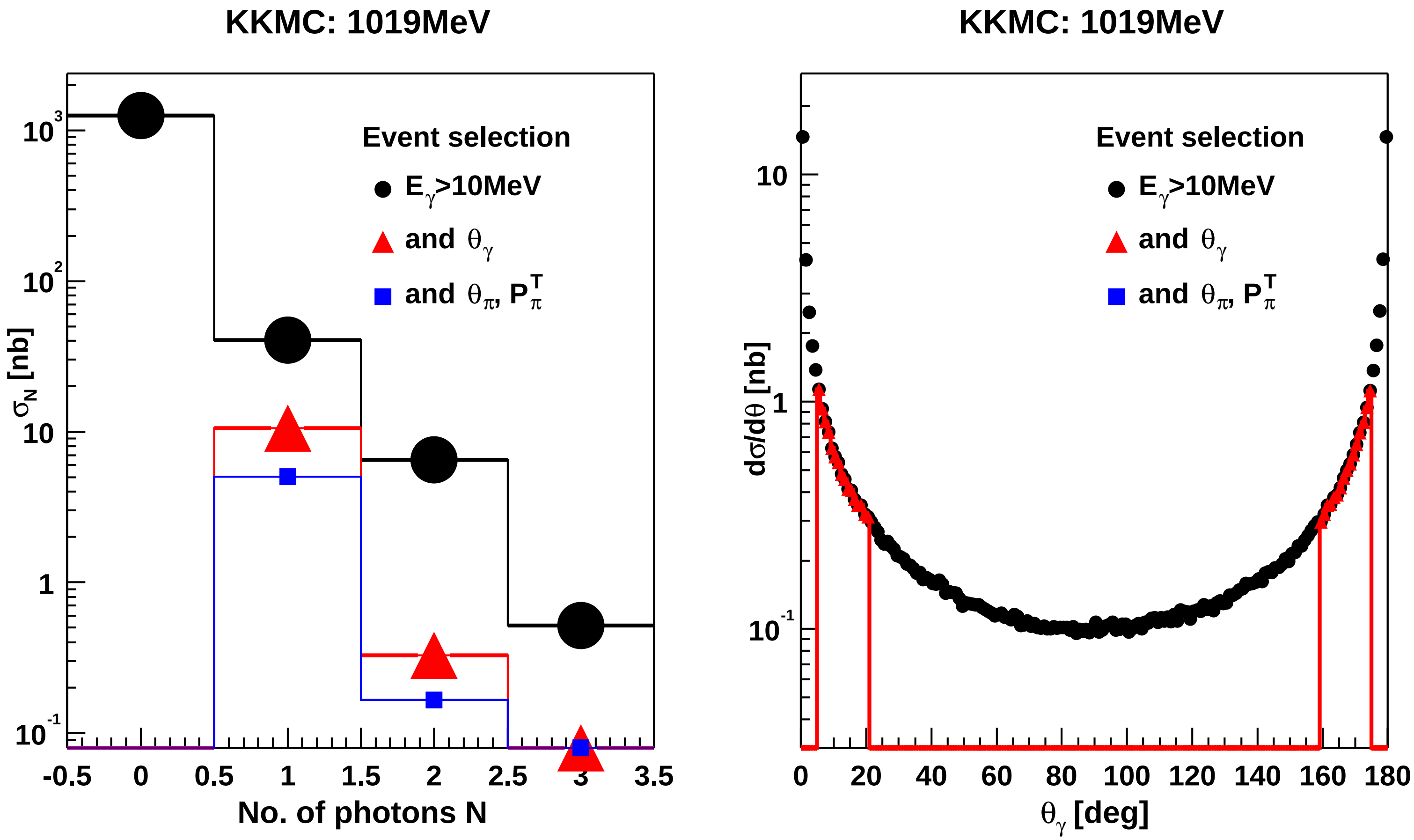
This hadronic experimental distribution $R(s)$ is now implemented in package RRes by M. Boonekamp and used in $\mathcal{KK}$MC for low Q^2 quark-pair spectrum

Split of continuum into channels



Experimental data are used to determine channel in the non-resonant part below 2GeV.

Radiative return at KLOE with $\mathcal{KK}$MC. PHOTON DISTRIBUTIONS



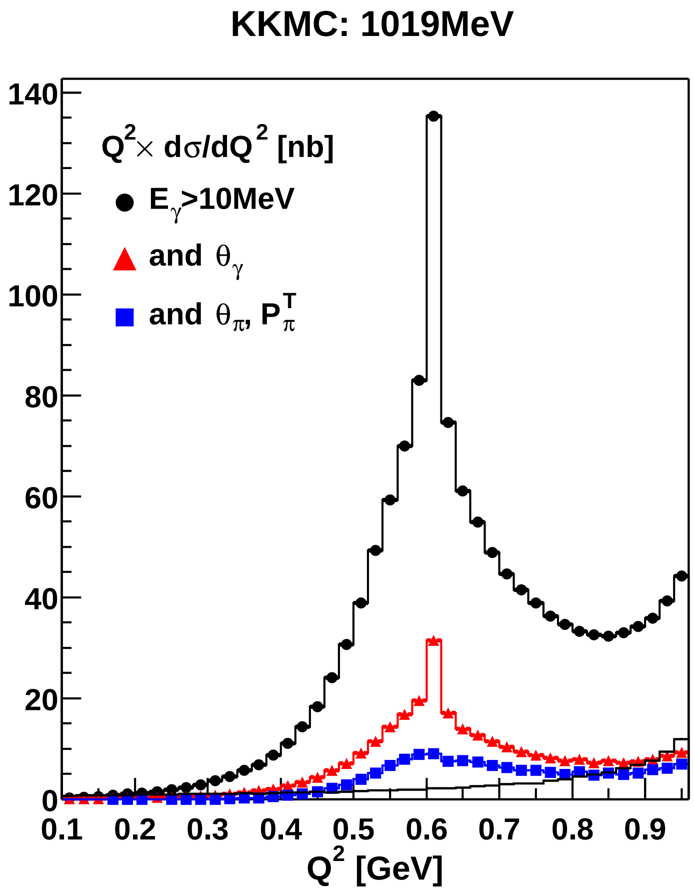
Event selection as in KLOE paper hep-ex/0106100:

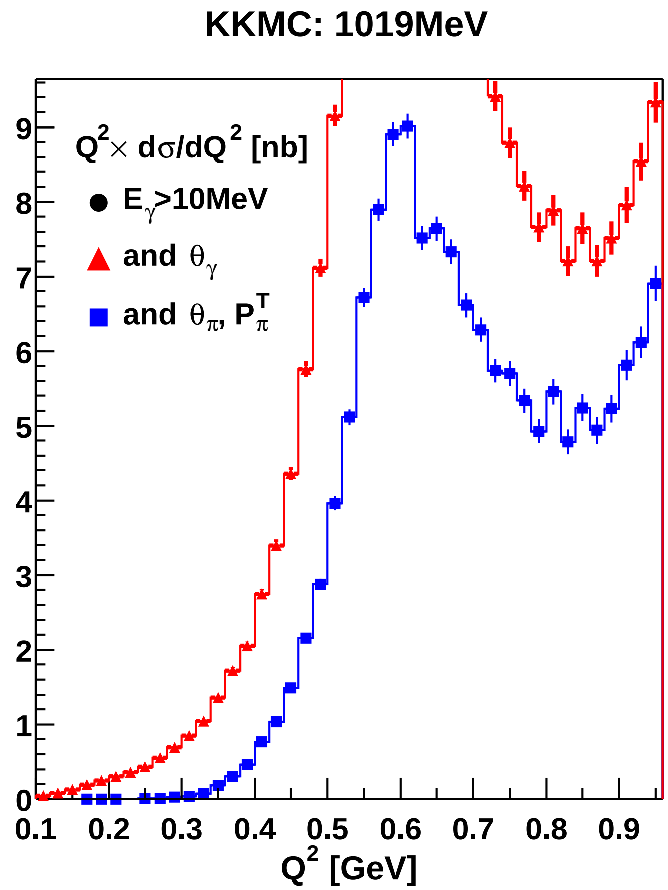
$$5^\circ < \Theta_\gamma < 21^\circ, \quad 159^\circ < \Theta_\gamma < 175^\circ, \quad E_\gamma > 10MeV$$

$$55^\circ < \Theta_\pi < 125^\circ, \quad p_\pi^T > 200MeV.$$

N.B. TWO photons within the “detection window” with $\sim 3\%$ probability!

Radiative return at KLOE with $\mathcal{KK}$MC. $Q^2_{\pi^+\pi^-}$ DISTRIBUTIONS



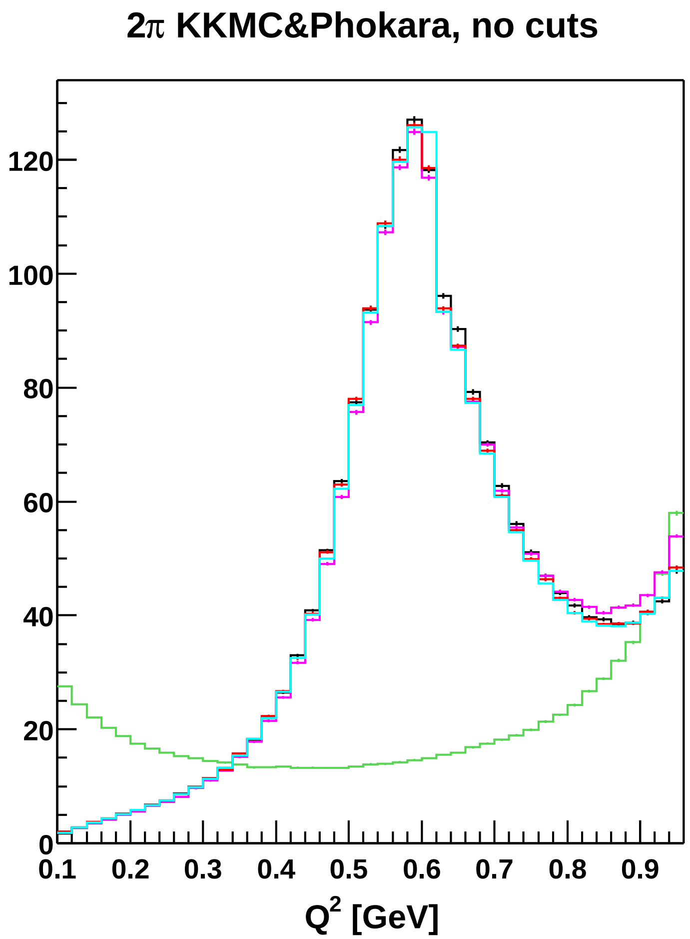


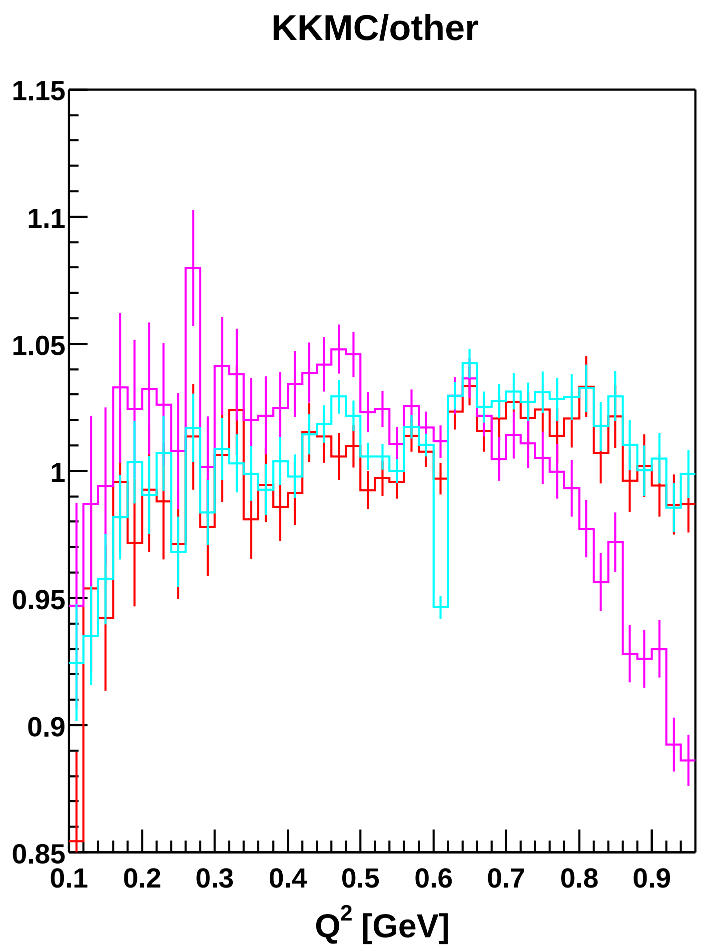
Event selection as in KLOE paper hep-ex/0106100:

$$5^\circ < \Theta_\gamma < 21^\circ, \quad 159^\circ < \Theta_\gamma < 175^\circ, \quad E_\gamma > 10MeV$$

$$55^\circ < \Theta_\pi < 125^\circ, \quad p^T_\pi > 200MeV.$$

CEEX $\mathcal{O}(\alpha^2)$ matrix element.



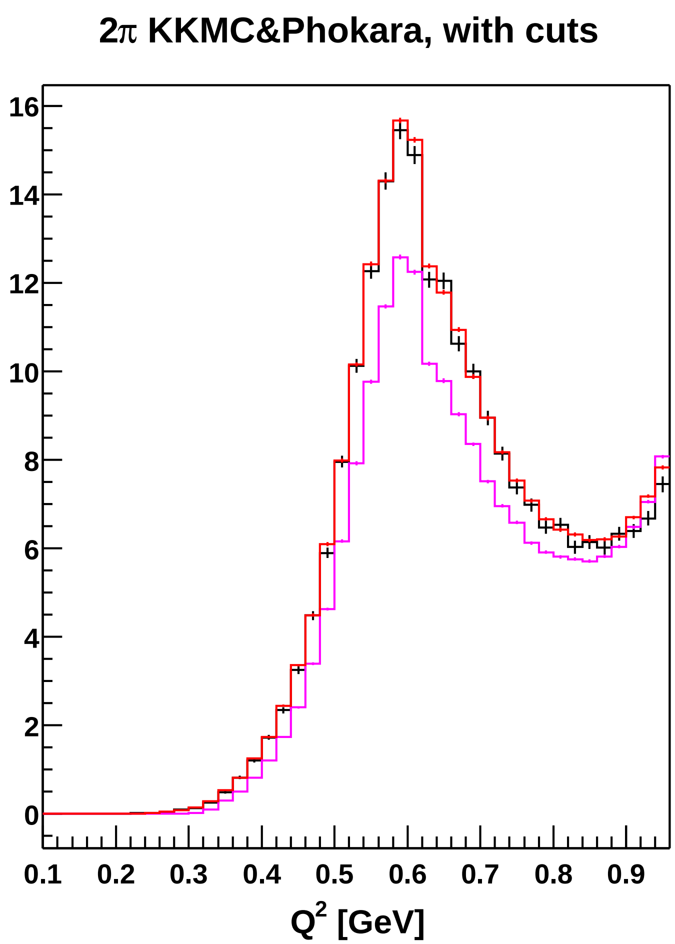


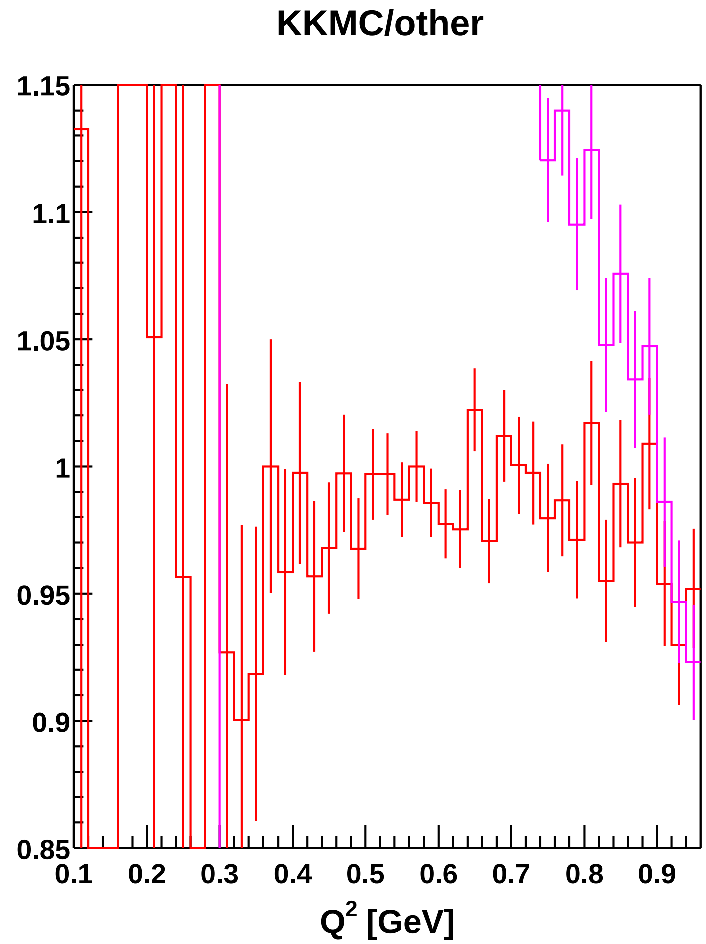
ds_dqq_phokhara_g_10e6_born_0_180_0_180.dat MAGENTA

ds_dqq_phokhara_g_10e6_nlo_0_180_0_180.dat RED

KKMC **BLACK**, Muon pair KKMC GREEN, Axel, CYAN

Note: No cut on pions! For KKMC $\pi^+\pi^-$ from ϕ is NOT excluded.





$5^\circ < \vartheta_\gamma < 21^\circ$ and $55^\circ < \vartheta_{\pi_\pm} < 125^\circ$

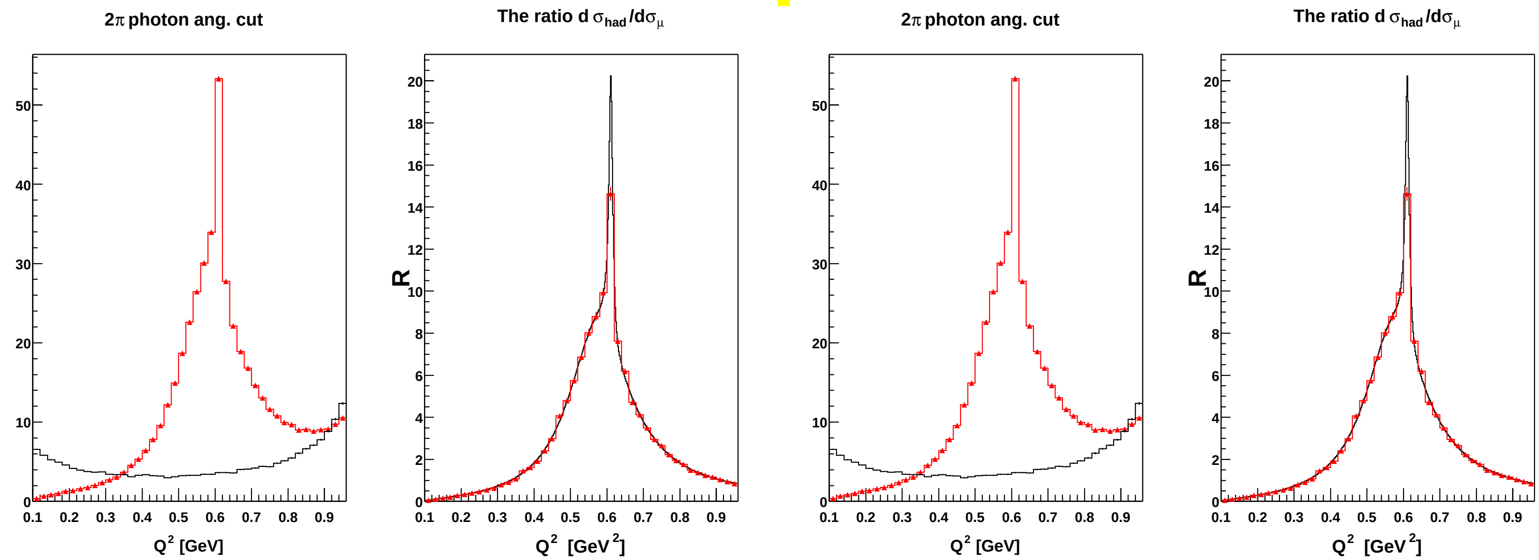
ds_dqq_phokhara_g_10e6_born_5_21_55_125.dat MAGENTA,

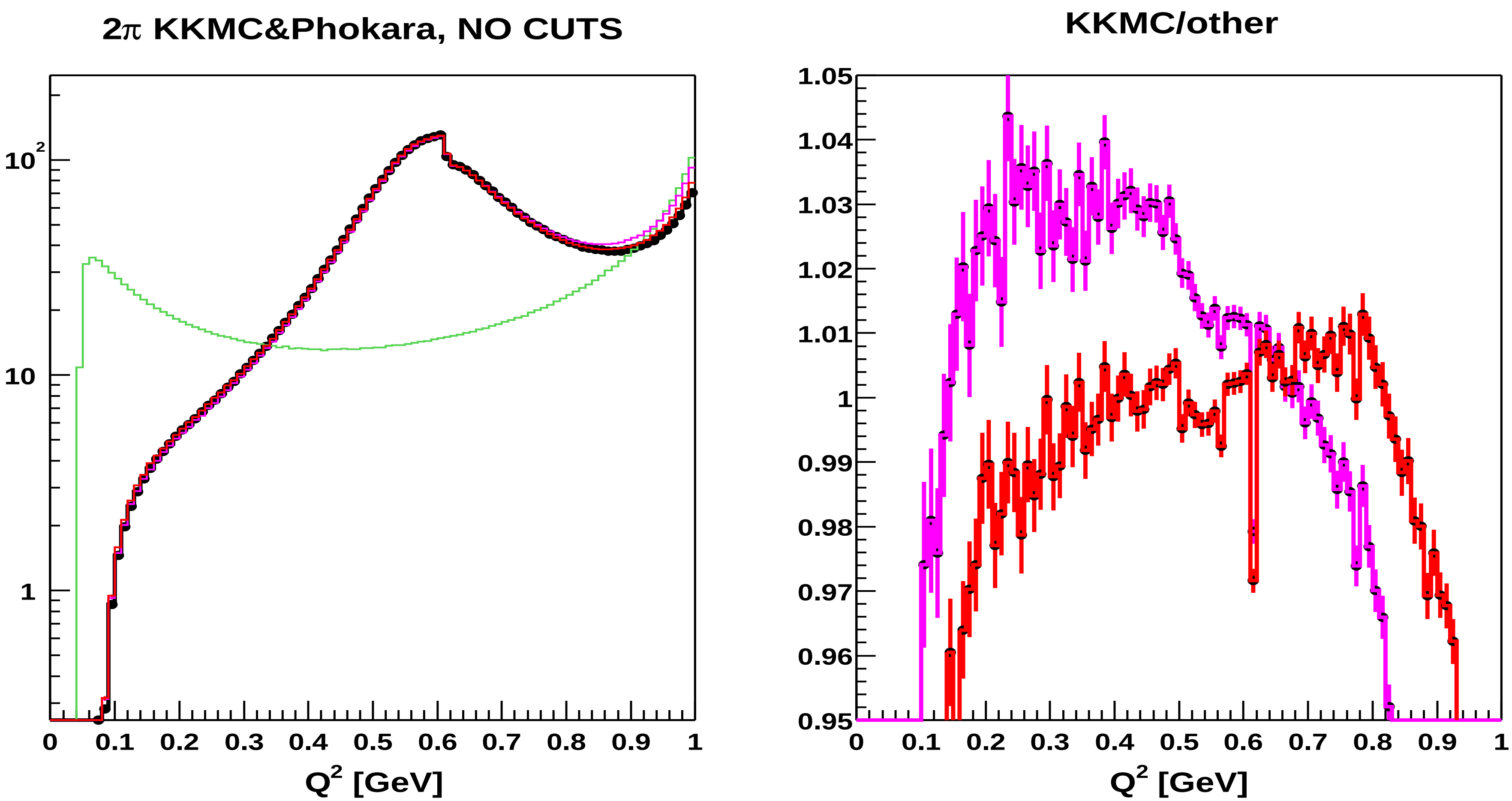
ds_dqq_phokhara_g_10e6_nlo_5_21_55_125.dat RED,

KKMC **BLACK**, Note1: for KKMC cut on "explicit photon", not on missing energy momentum!

Note2: for KKMC also $p_\pi^T > 200 MeV$ cut and $\pi^+\pi^-$ from ϕ is not excluded!

extra tests, unfinished



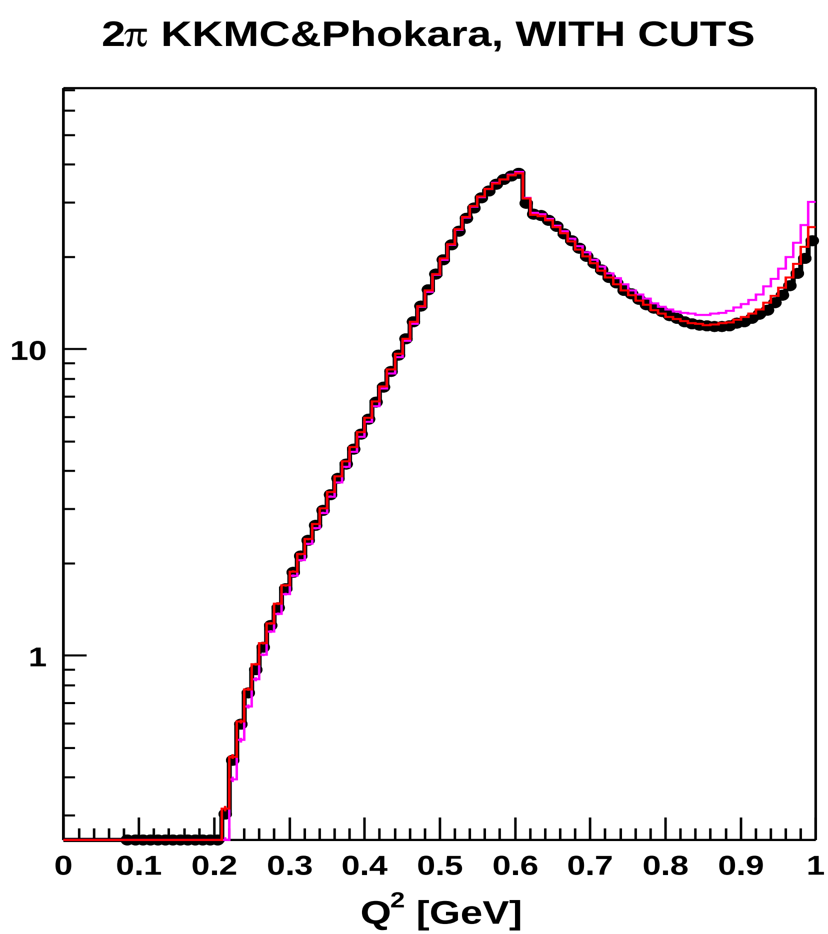


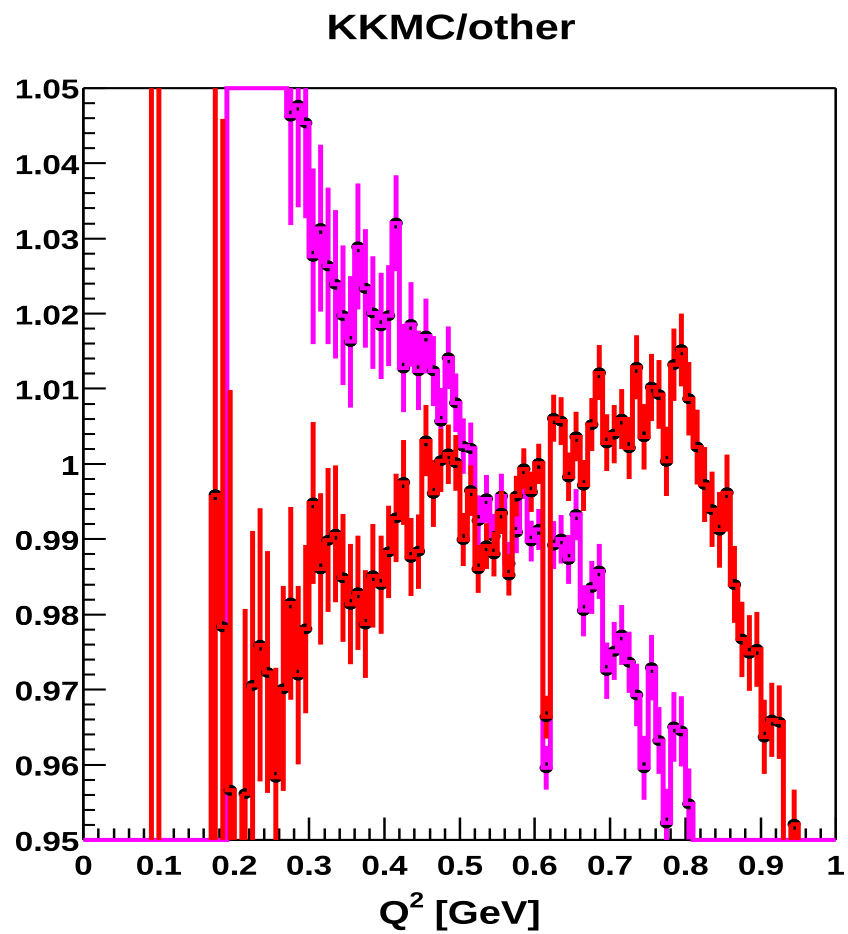
phokara_born_1_qq.dat **BORN MAGENTA**

phokara_nlo_1_qq.dat **NLO RED**

KKMC BLACK, **Muon pair KKMC GREEN,**

NOTES: No cut on pions nor photons! KKMC run at slightly off-resonance 1.02100GeV. (For KKMC $\pi^+\pi^-$ from ϕ is excluded).





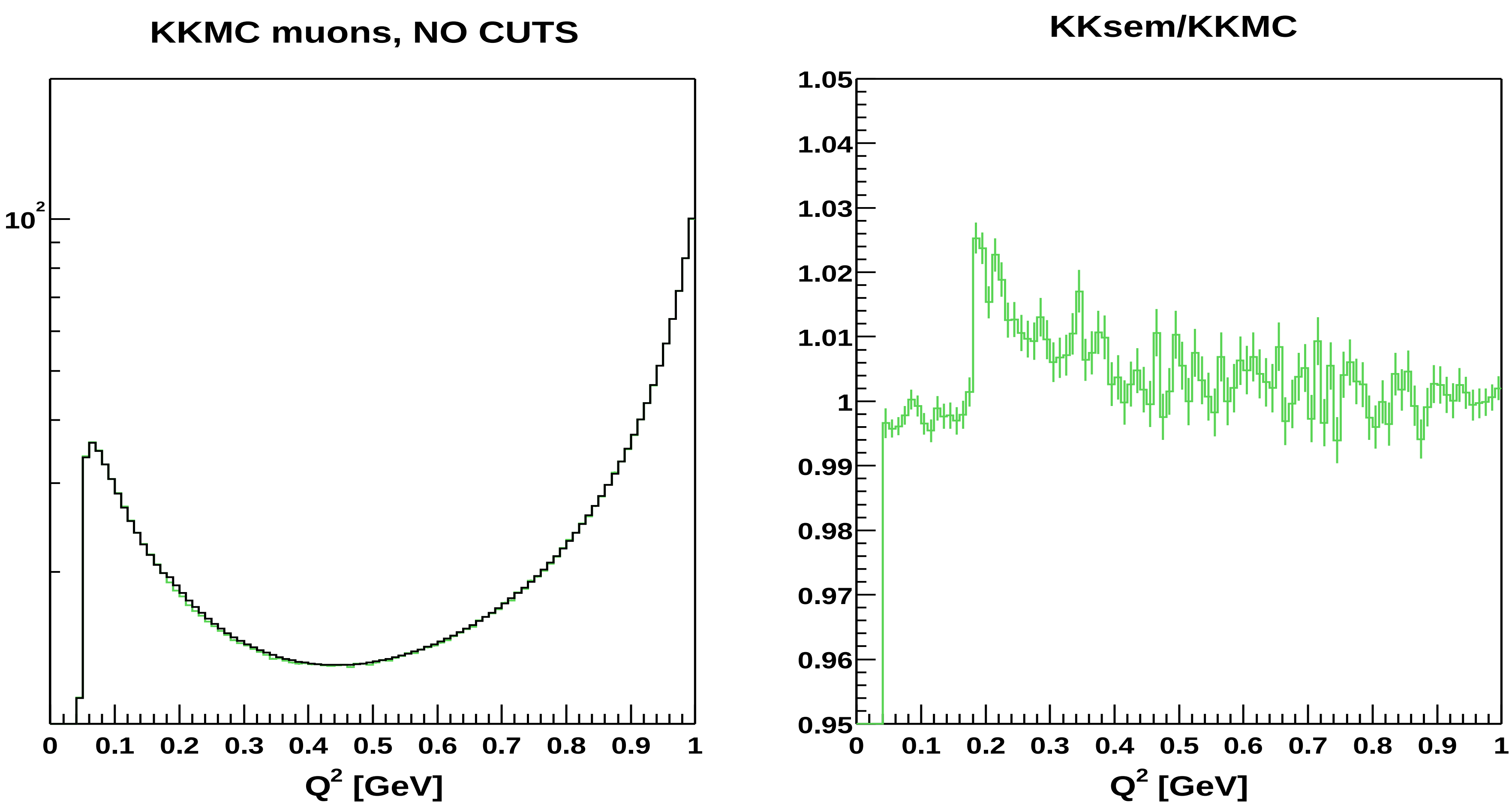
phokara_born_2_qq.dat BORN MAGENTA

phokara_nlo_2_qq.dat NLO RED, KKMC BLACK,

With cuts: $\vartheta_\gamma < 15^\circ$, $E_\gamma > 10$**MeV,** $40^\circ < \vartheta_\pi < 140^\circ$, $p_\pi^T > 0.2$**GeV.**

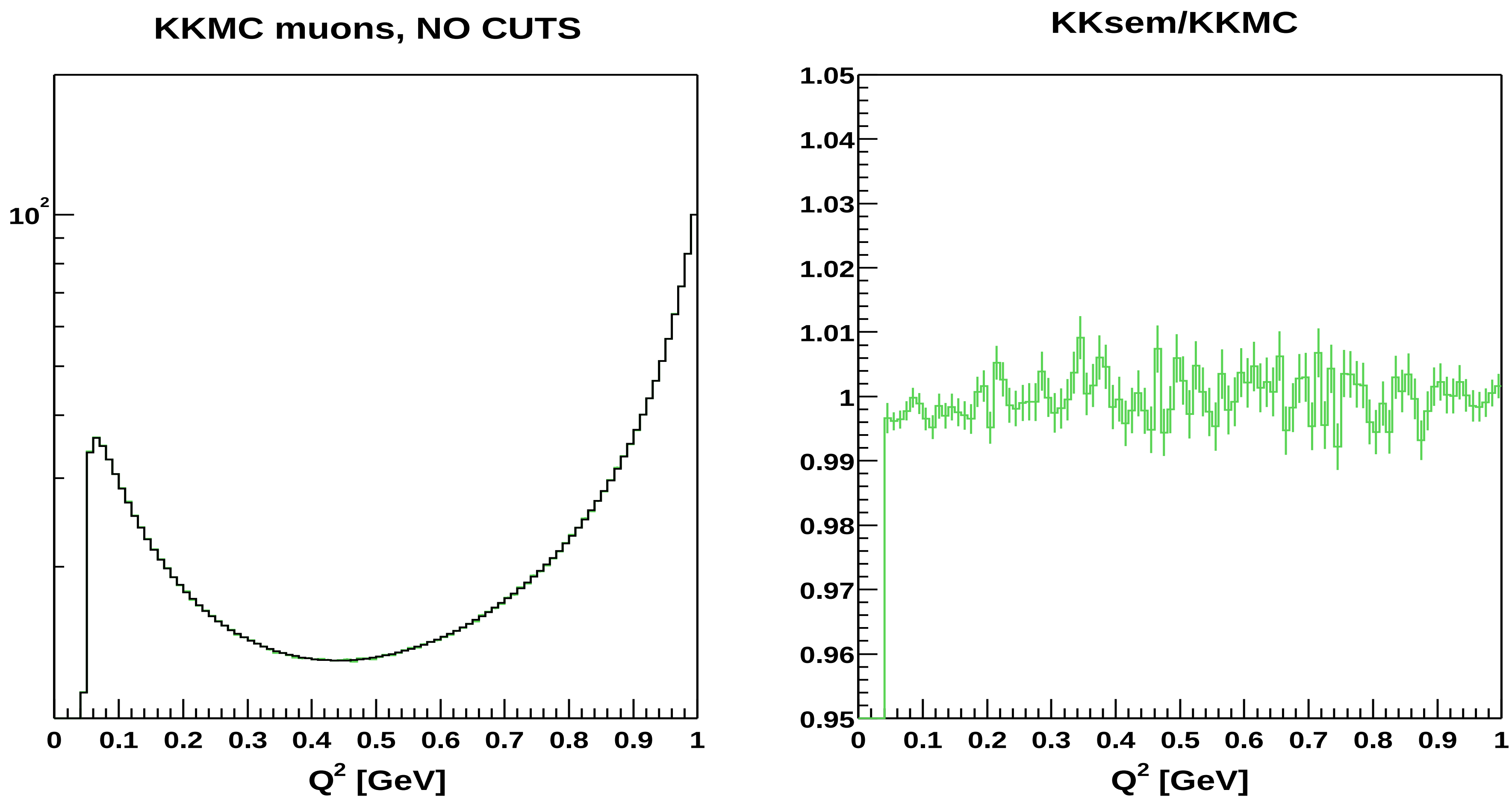
The p_π^T **cut not included in Pkokara results. KKMC run at slightly off-resonance 1.02100GeV.**

KKMC CEEX versus KKsem, muons, 14apr 7AM



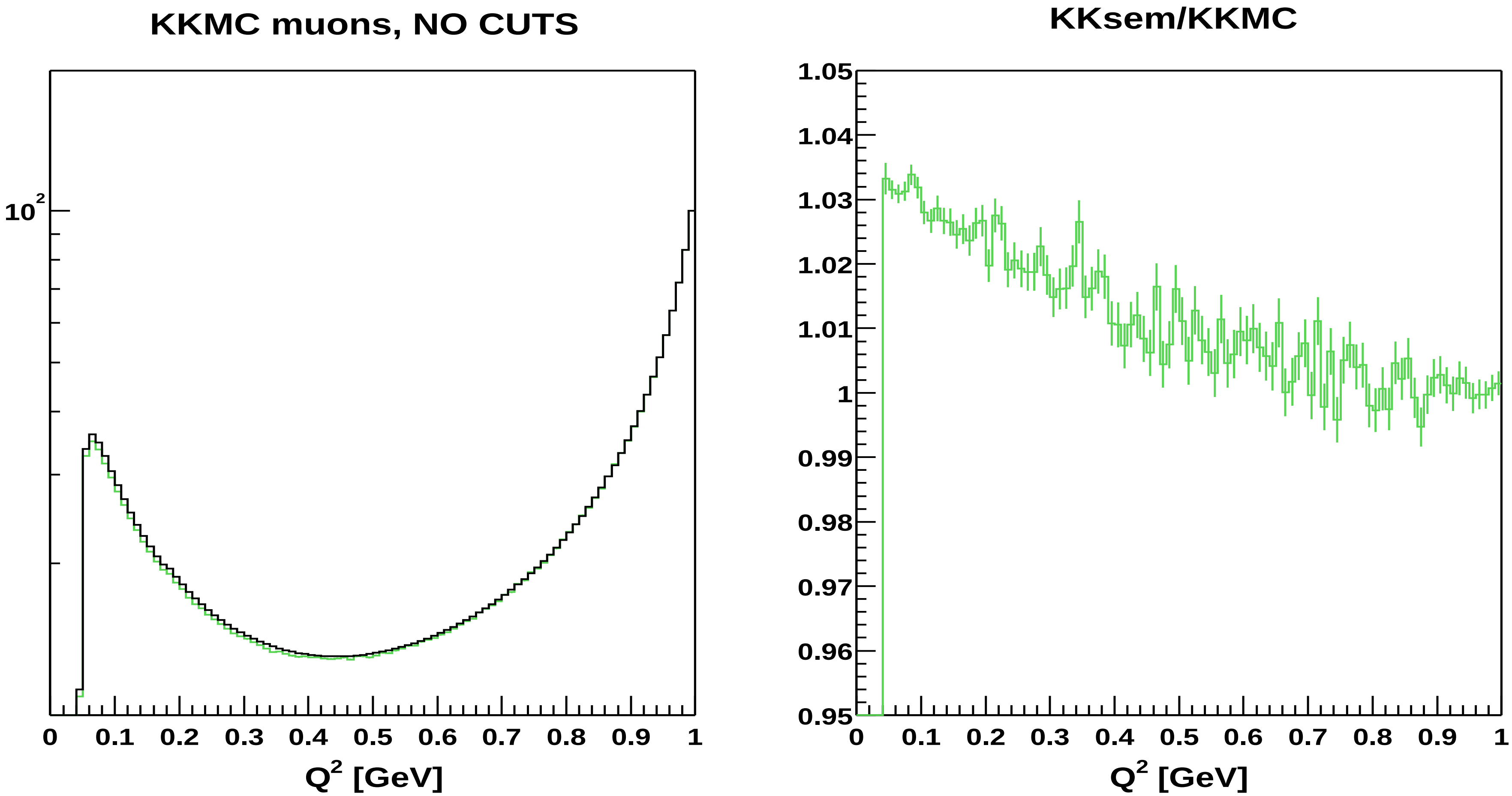
KKMC CEEX versus KKsem, muons, error in Born of KKsem

KKMC CEEX versus KKsem, muons, 14apr 8AM



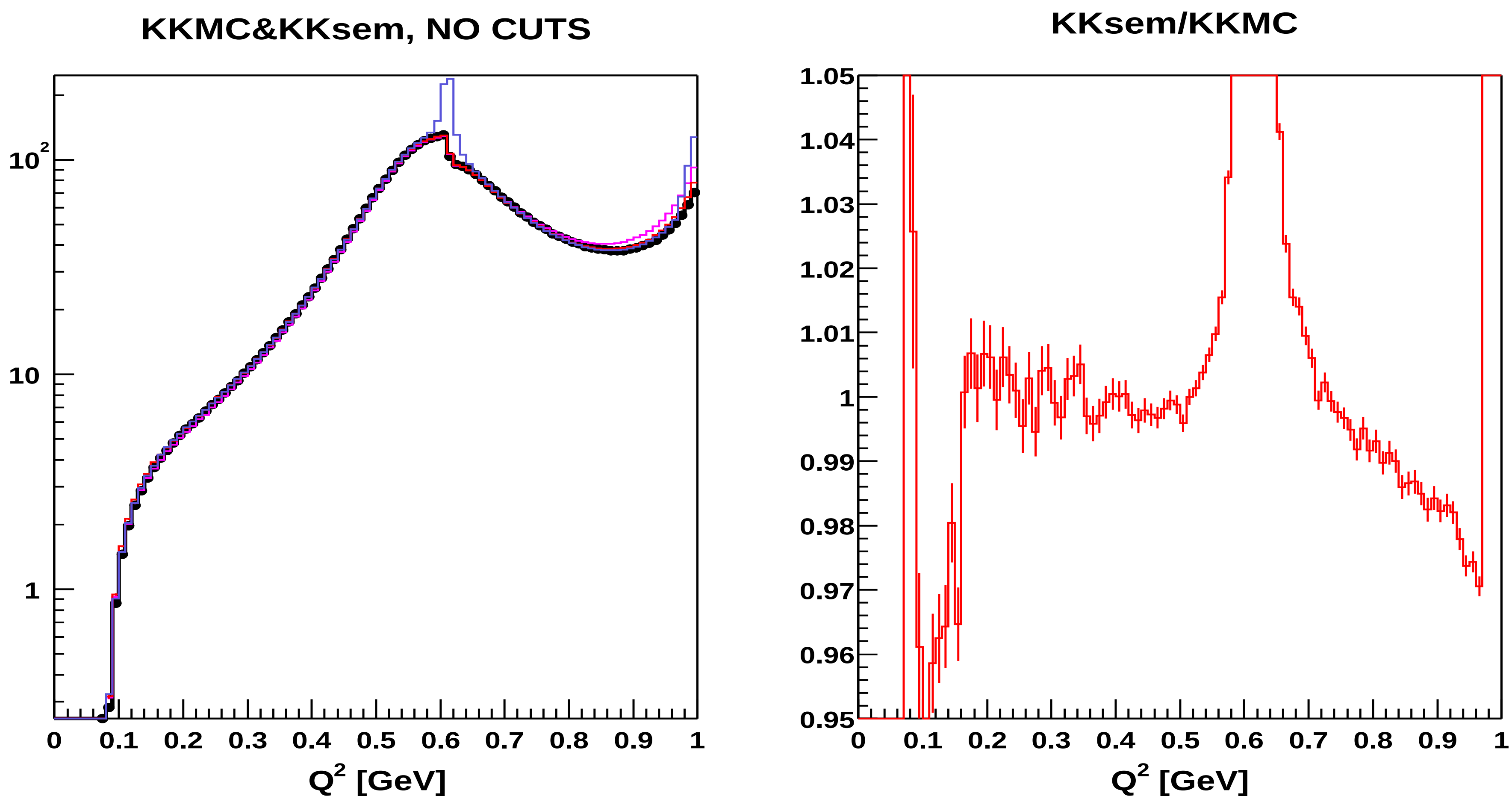
Muon pairs. KKMC CEEX versus KKsem, the best NLL+LL3 exponentiated analytical ISR. (Corrected error in Born of KKsem).

KKMC EEX versus KKsem, muons



Muon pairs. KKMC EEX versus KKsem with the best NLL+LL3 exponentiated analytical ISR.

(UNCORRECTED error in Born of KKsem to match the same error in EEX of KKMC).



KKMC EEX versus KKsem, pions FIRTST ATTEMPT. KKMC EEX versus KKsem with the best NLL+LL3 exponentiated analytical ISR.

Big differences due to phi chanel in KKsem which is not in the histo from KKMC. On to of that problem near threshold probably of the same origin...

Conclusions

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