RIKEN BNL Research Center

# MULTI-HADRON SYSTEMS FROM LATTICE BSM

by Enrico Rinaldi

# NEW STRONG DYNAMICS

Composite Higgs

Composite Dark Matter

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Composite Dark Matter

New SU($\mathbf{N_c}$) gauge sector with $\mathbf{N_f}$ fermions in the $\mathbf{N_r}$ representation of the gauge group

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$\pi\pi$ scattering

⇳

WW scattering

Composite Dark Matter

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**ππ** scattering

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**ππ** & **NN** scattering

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DM self-interactions

New SU(**$N_c$**) gauge sector with **$N_f$** fermions in the **$N_r$** representation of the gauge group

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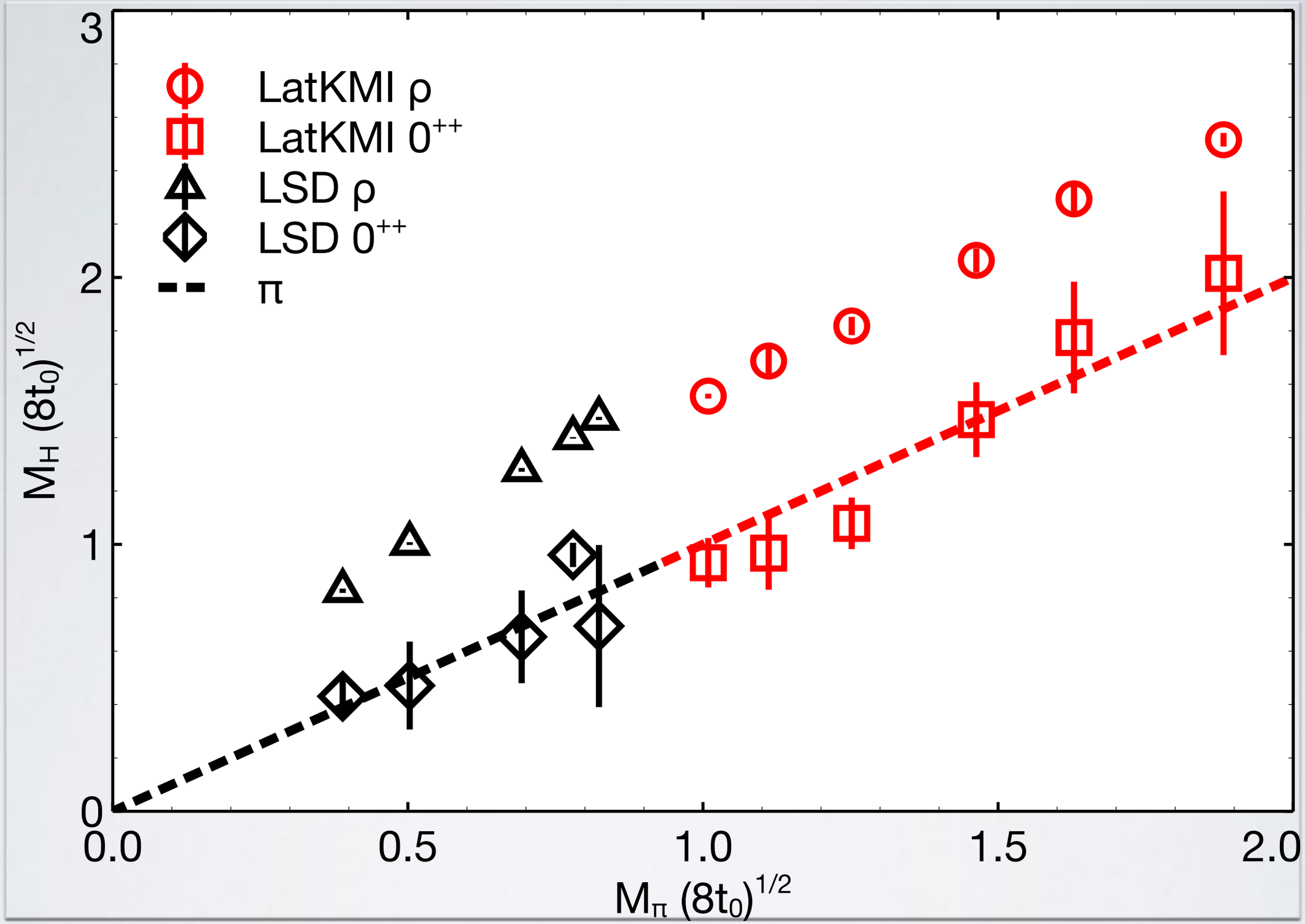
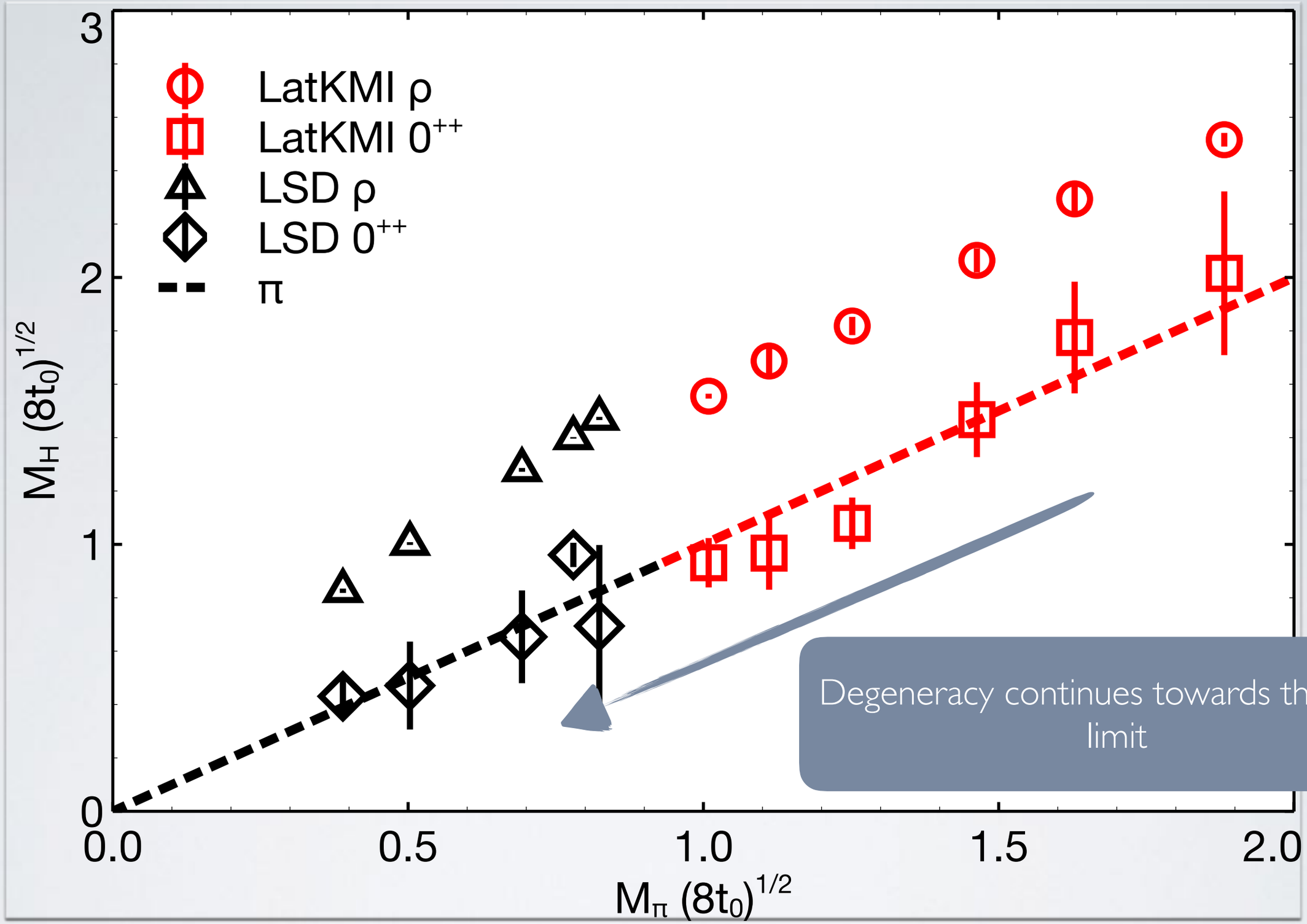
next 3 slides focus on SU(3) $N_f$=8 $N_r$=fund




LSD arxiv:1601.04027 [scalar update, preliminary] | LatKMI arxiv:1610.07011

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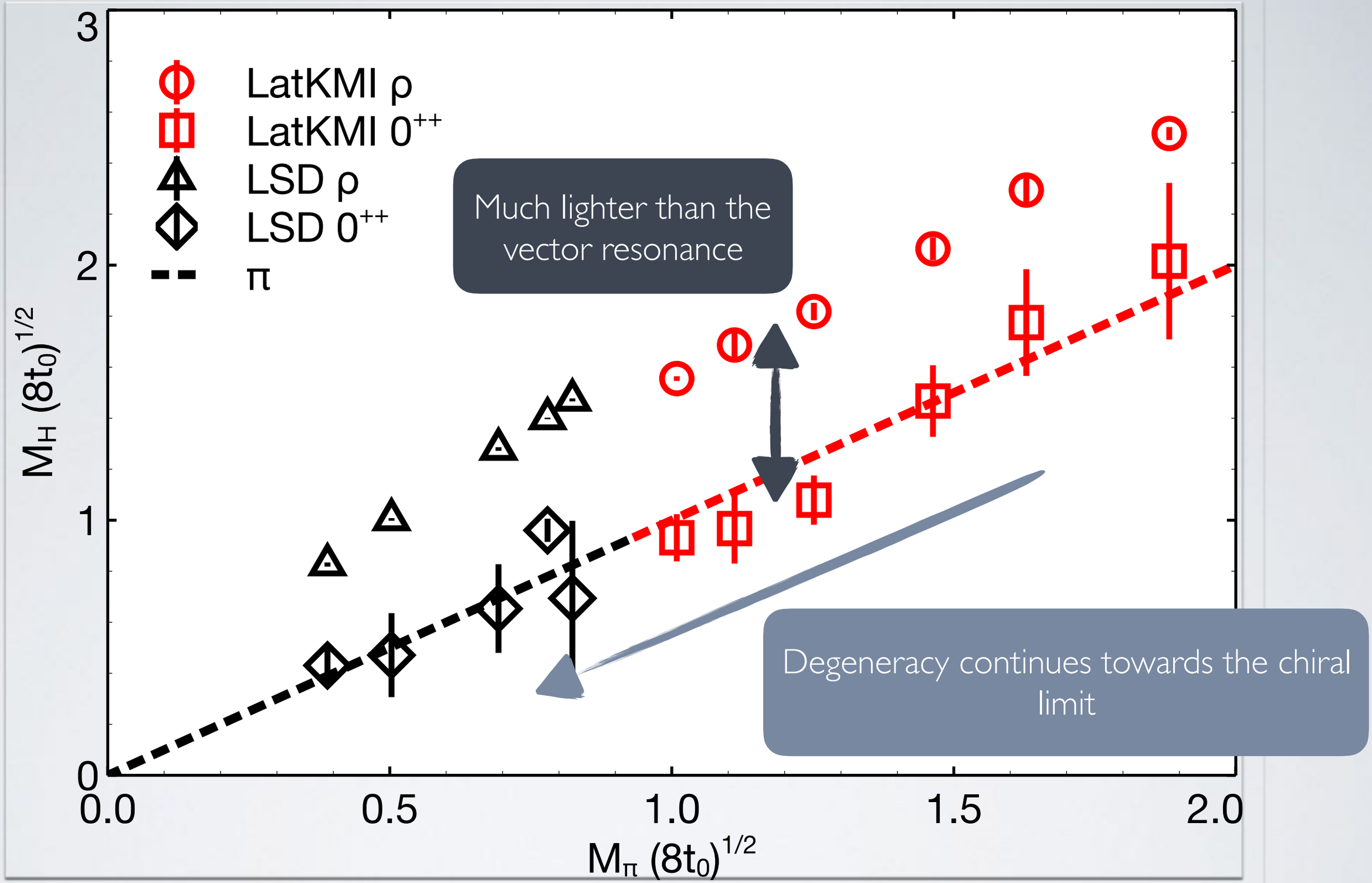


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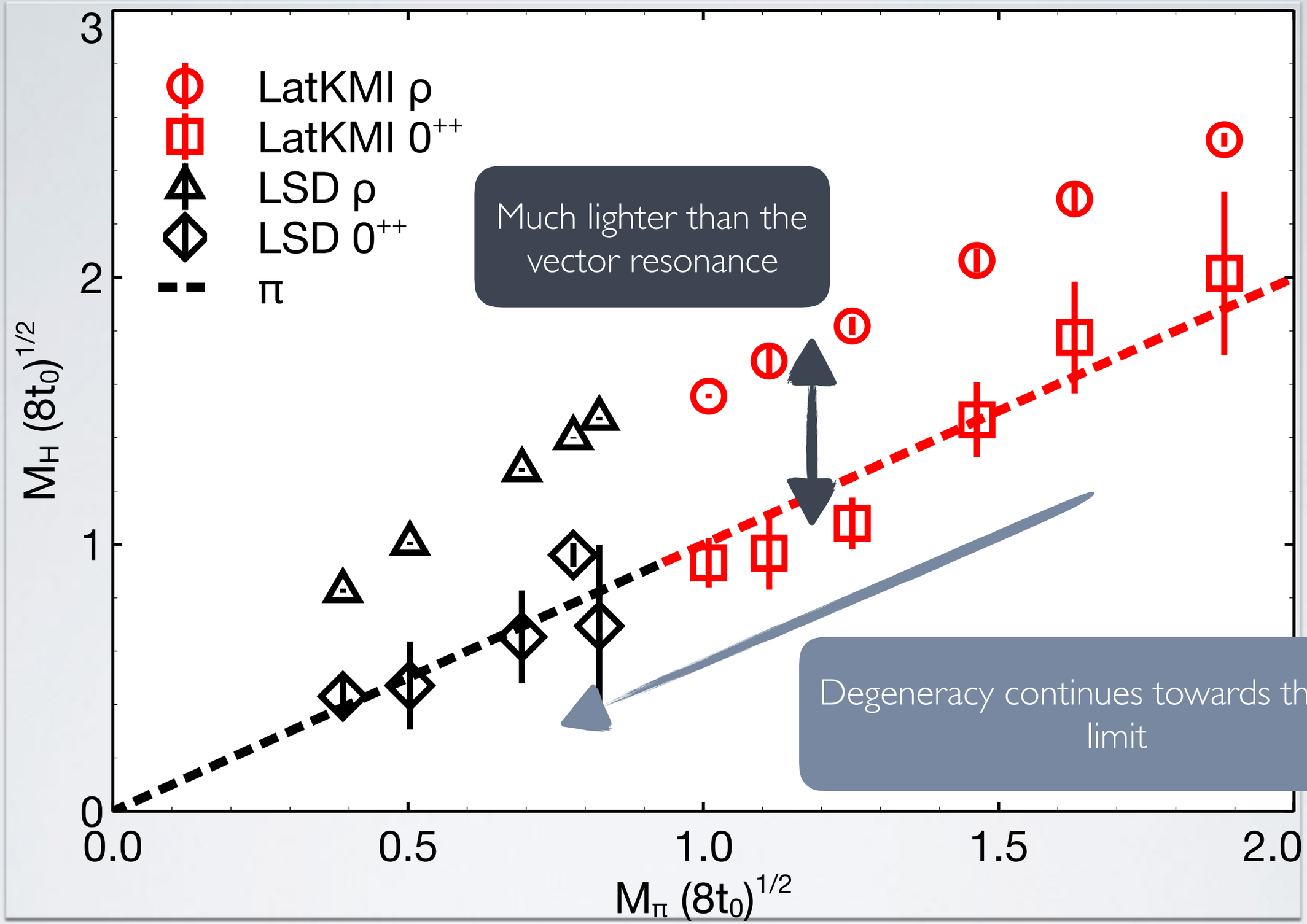


Different from QCD

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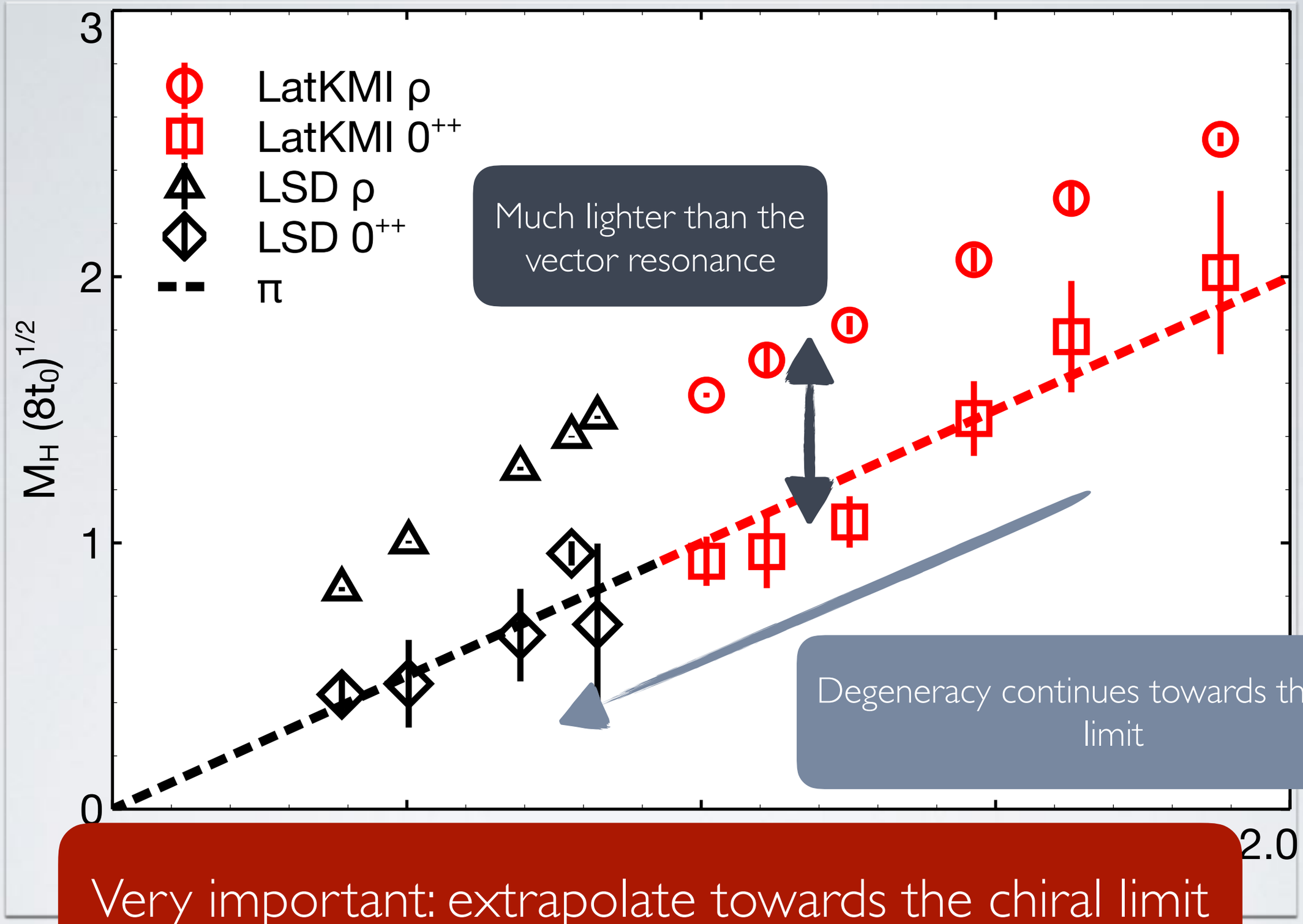


Very important: extrapolate towards the chiral limit using an appropriate effective low-energy theory

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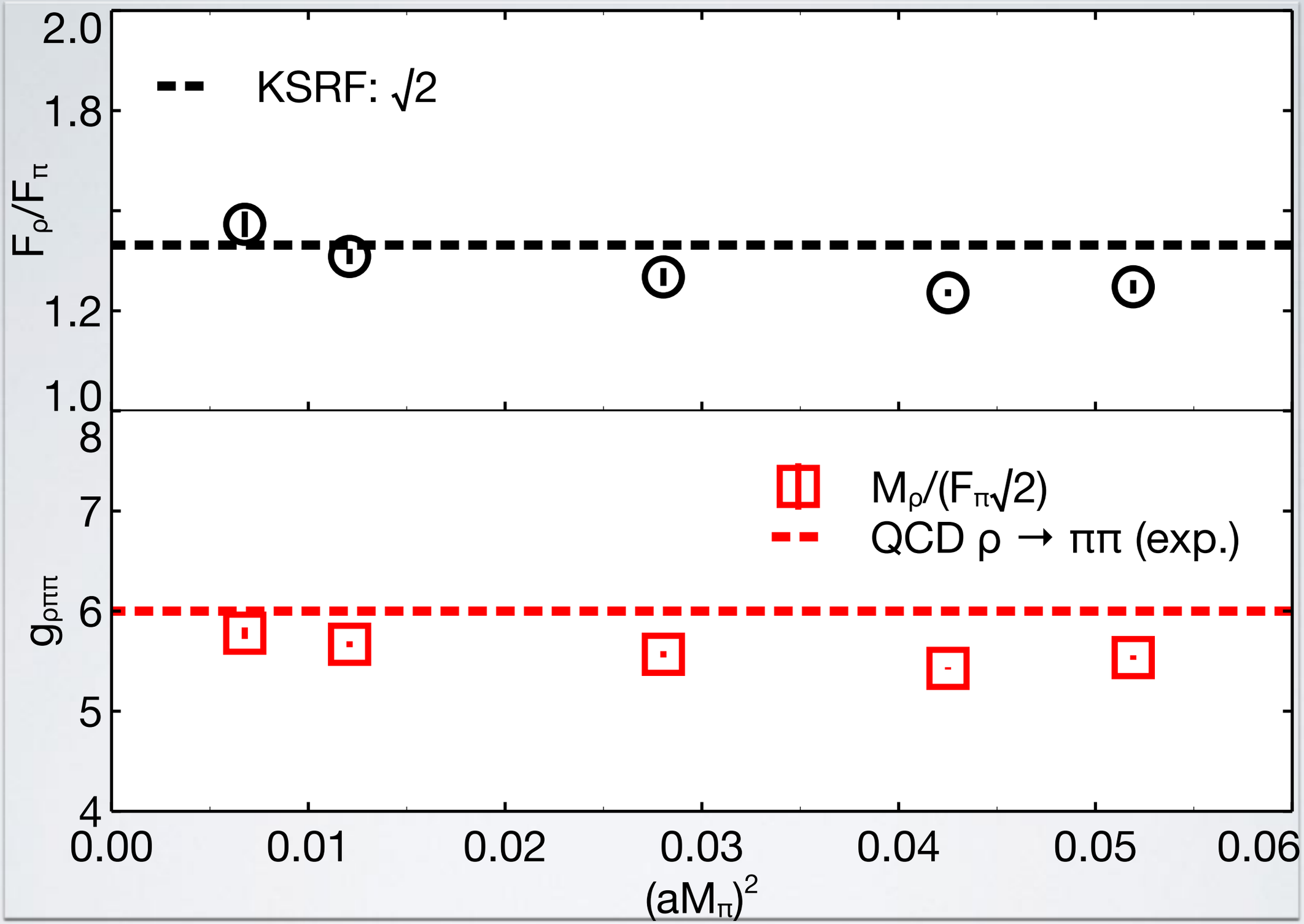


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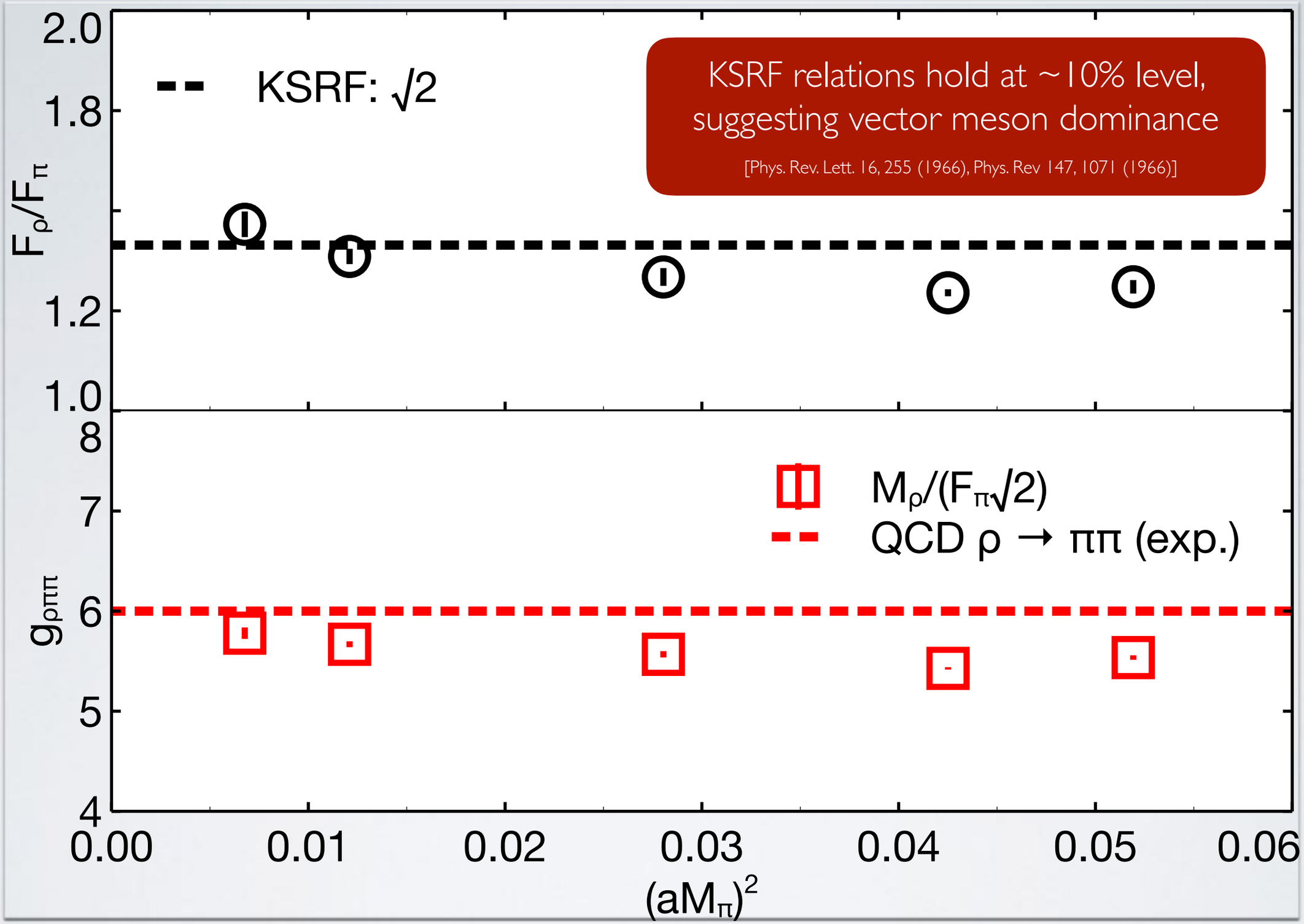
KSRF relations hold at ~10% level, suggesting vector meson dominance

[Phys. Rev. Lett. 16, 255 (1966), Phys. Rev 147, 1071 (1966)]

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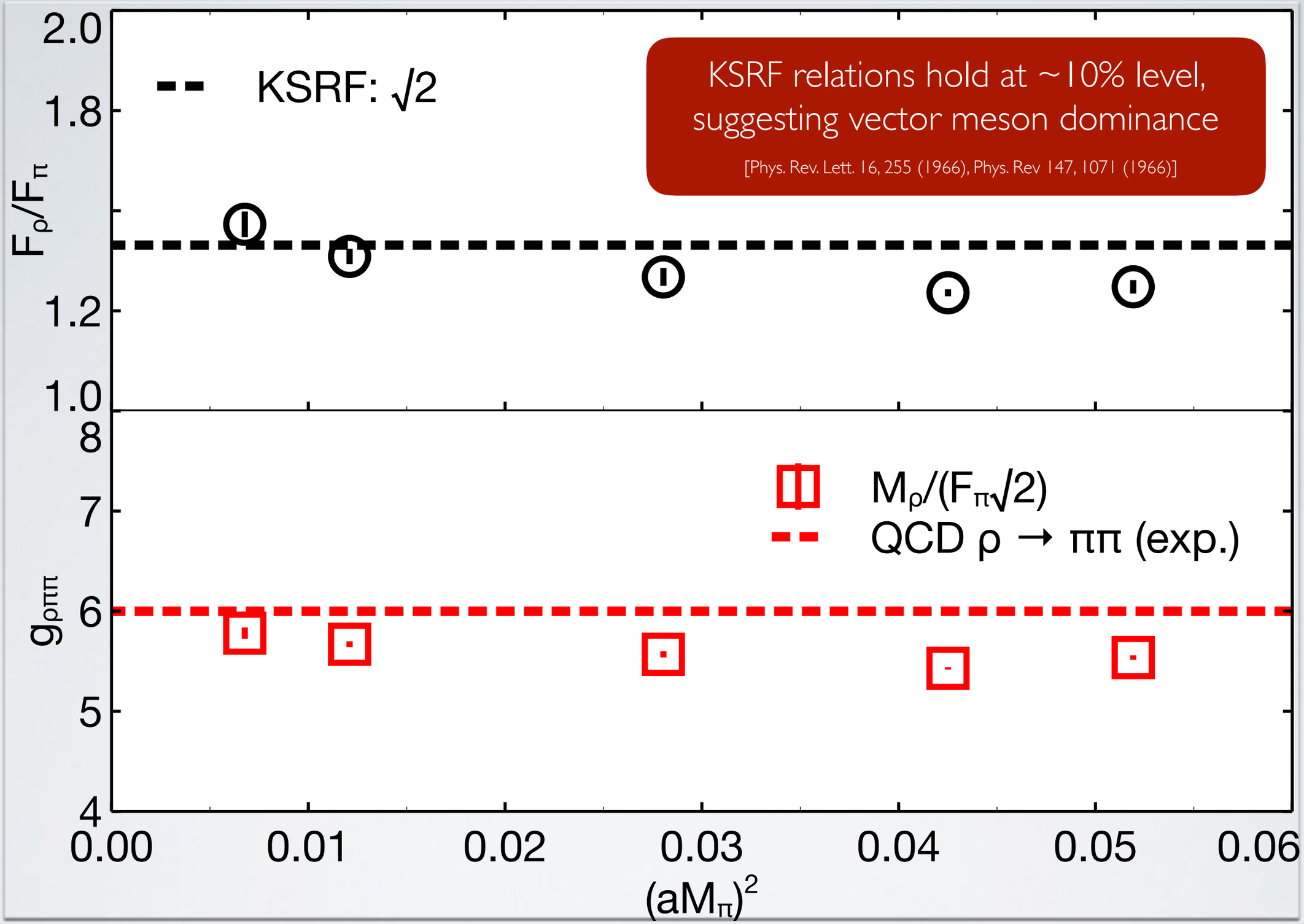


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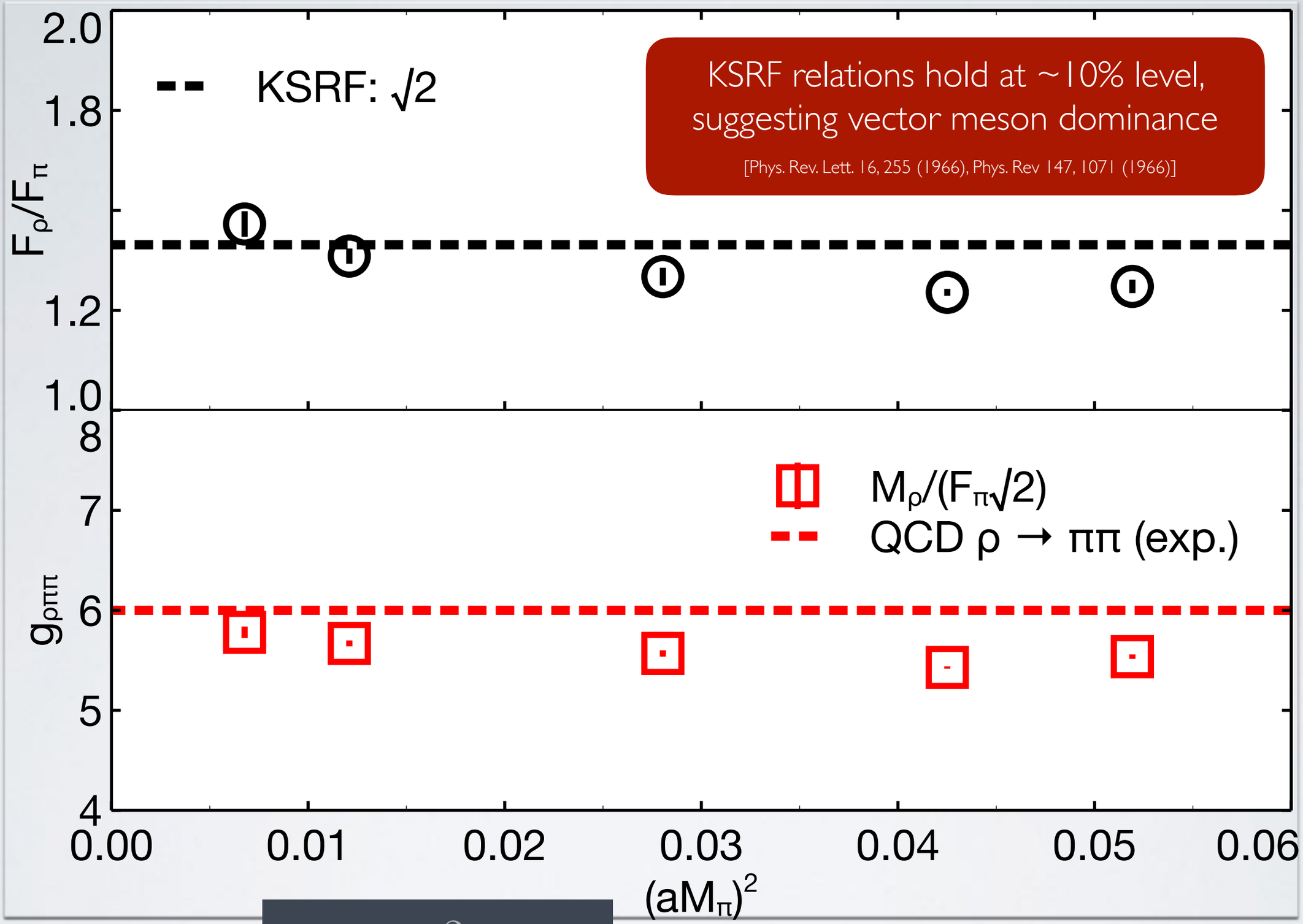


$$\Gamma_\rho \approx \frac{g^2_{\rho\pi\pi} M_\rho}{48\pi}$$

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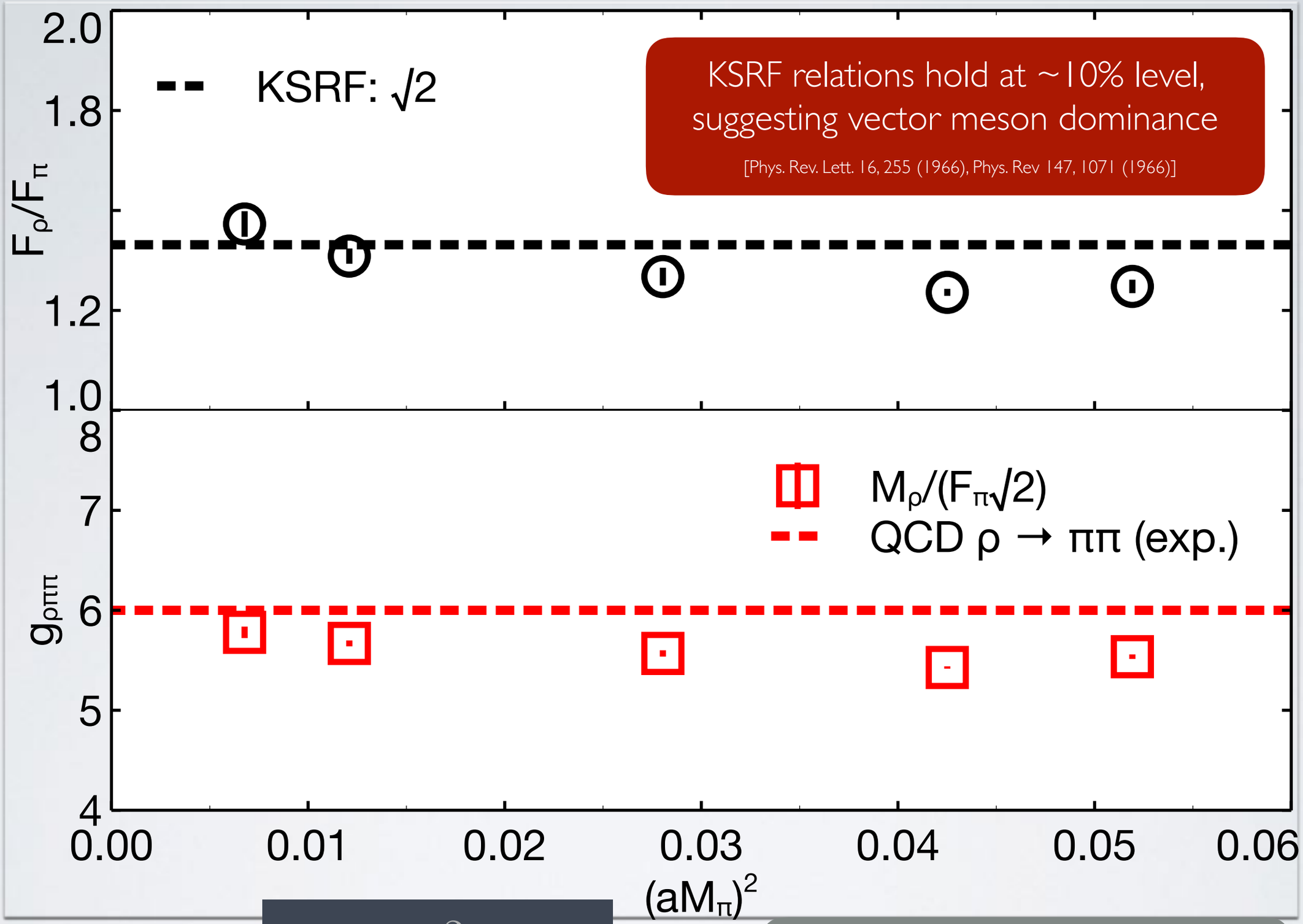


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$M_\rho$~2TeV and $\Gamma_\rho$~450GeV

Similar to QCD

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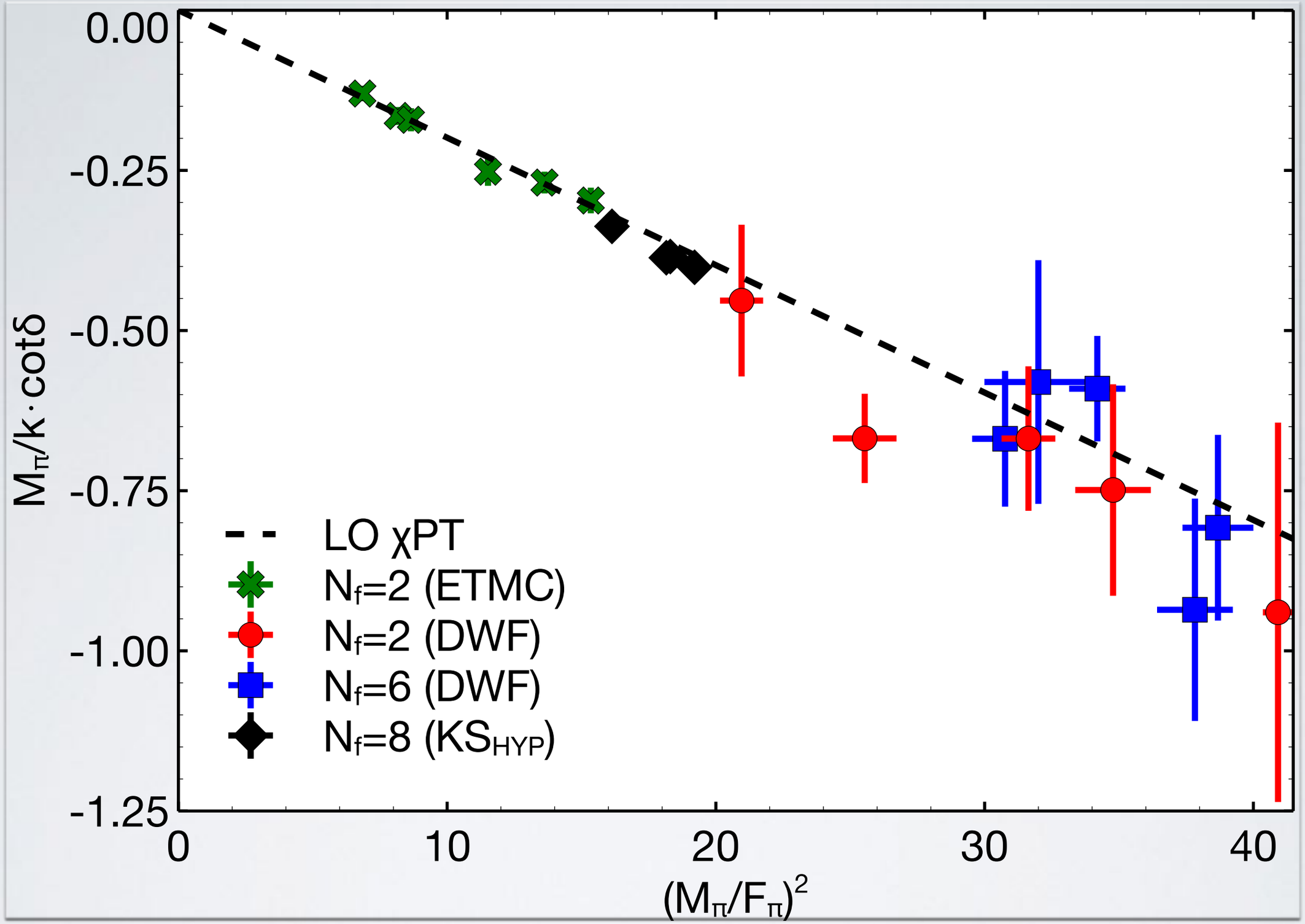
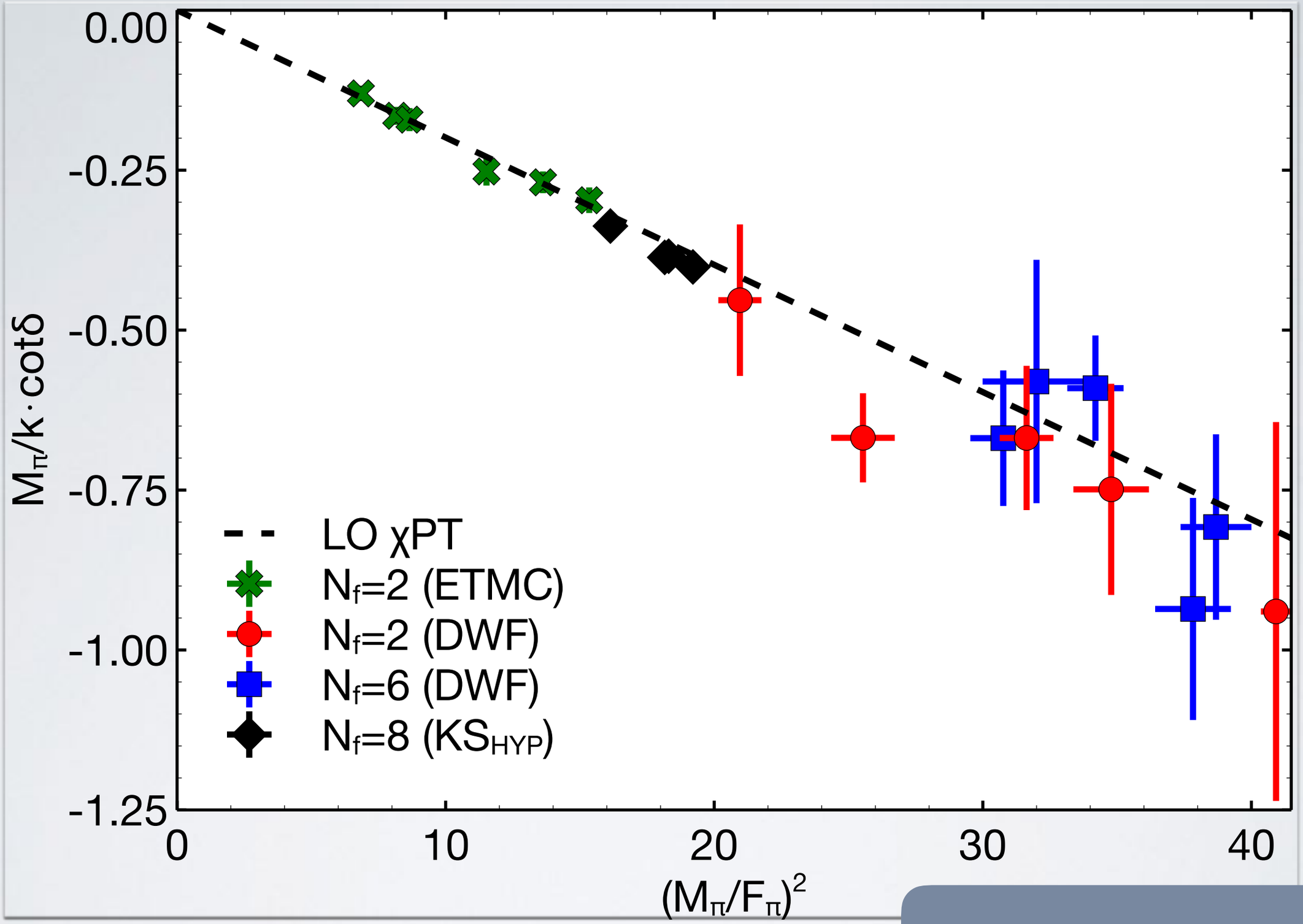



Gasbarro and Fleming (LSD collaboration) 1702.00480




Scattering observables are useful to constrain EFT terms

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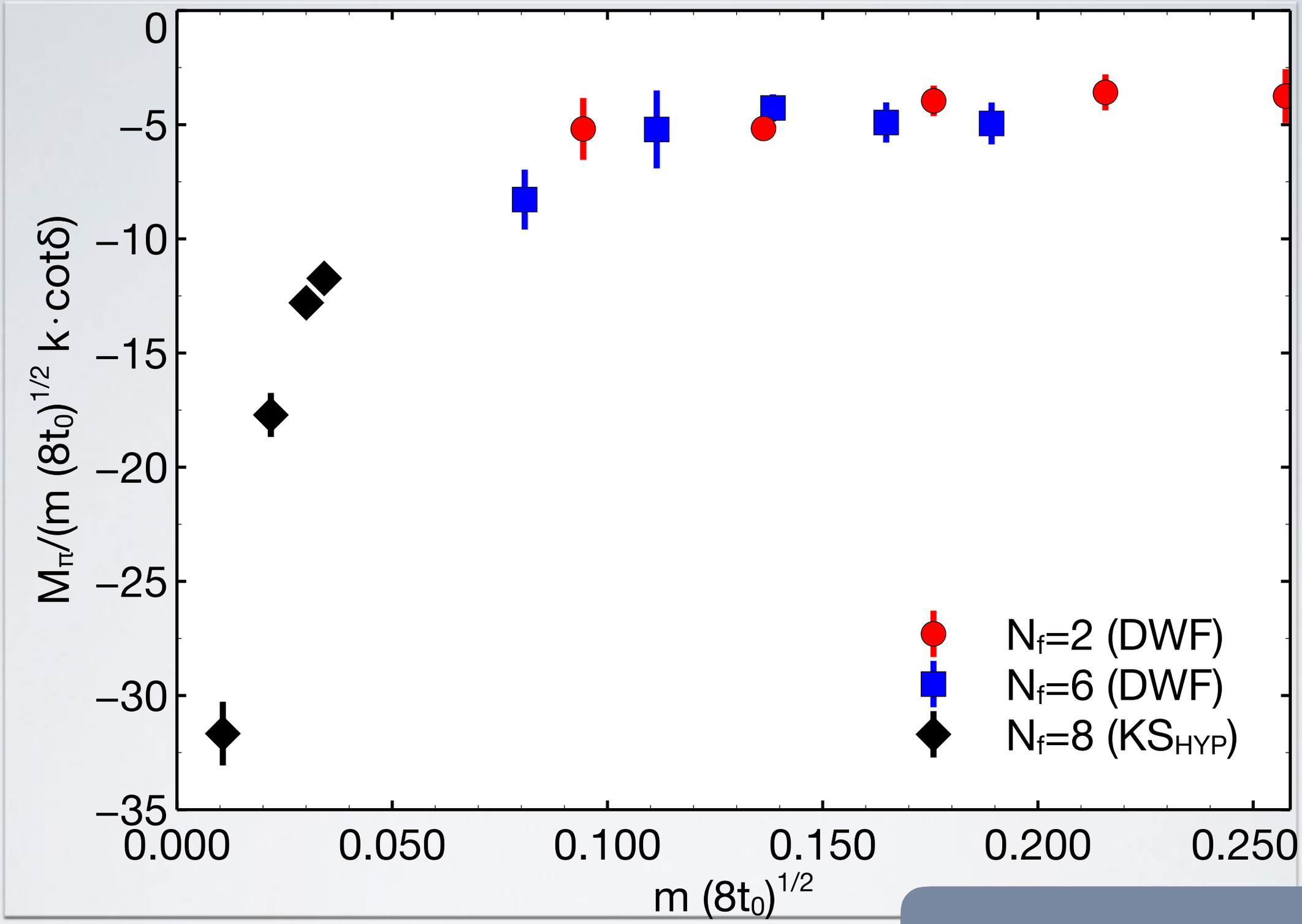


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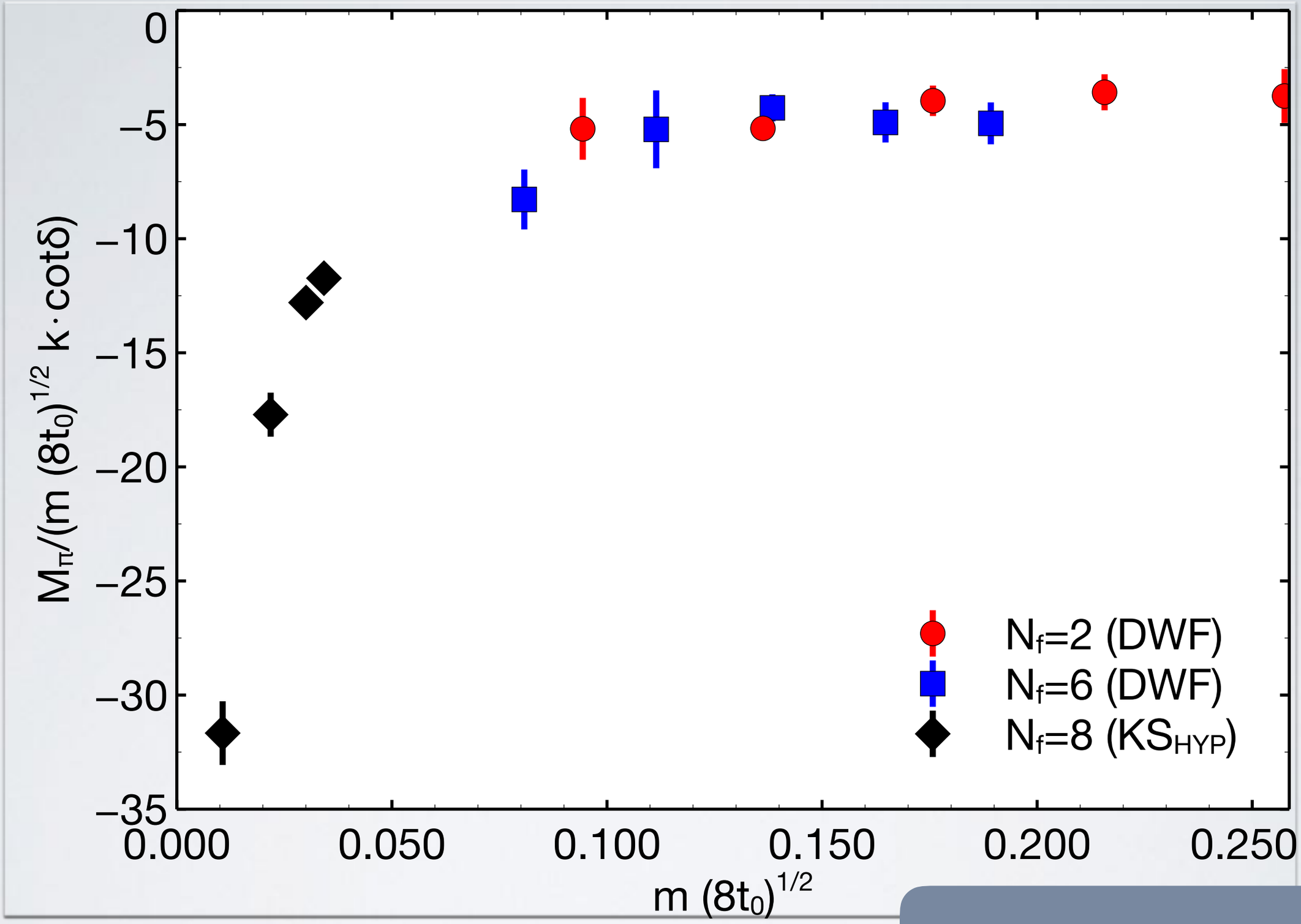


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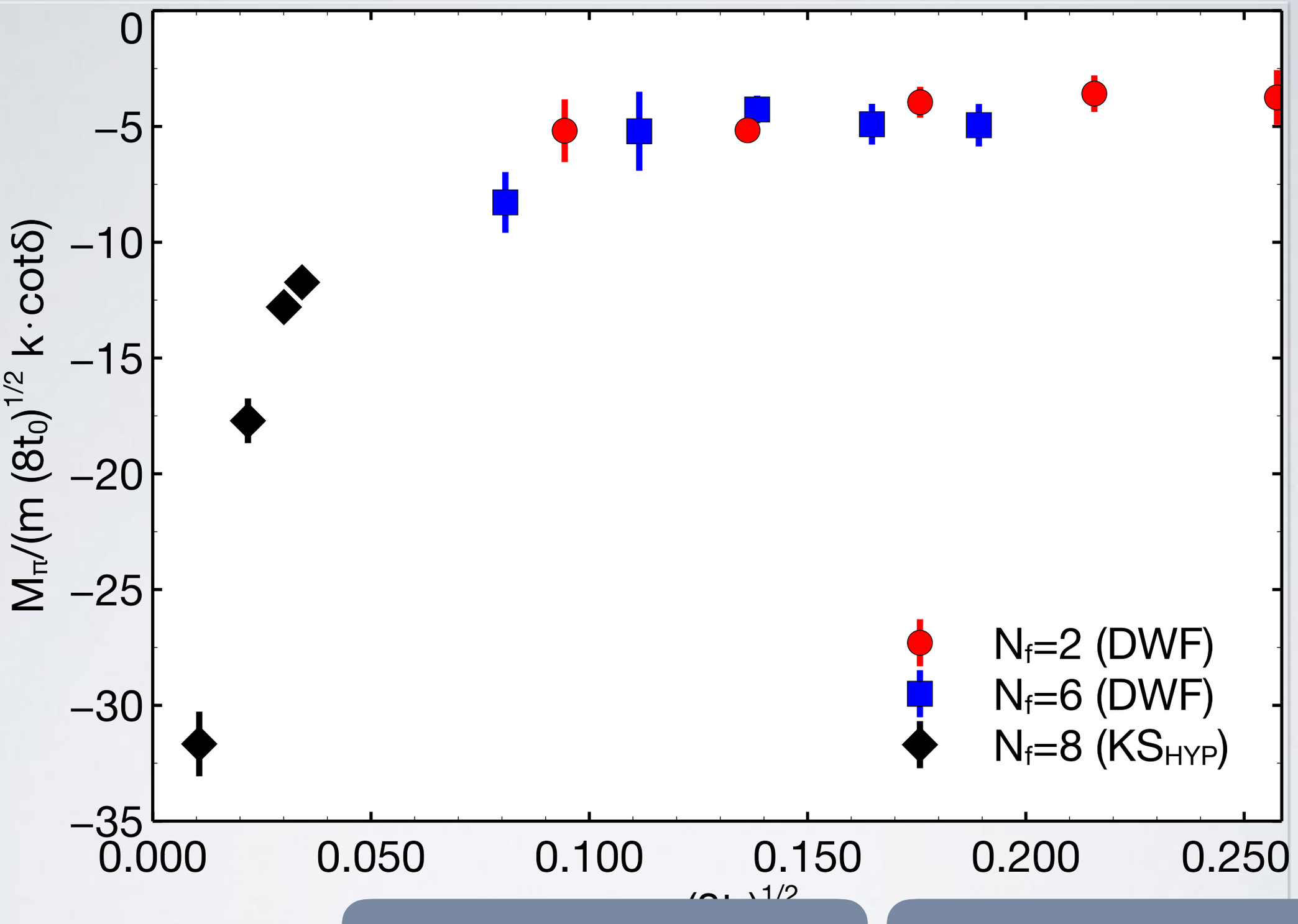


The more channels are explored, the more "data" we can use

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