Der Wissenschaftsfonds.

Spectra of Heavy Quarkonia in a Bethe-Salpeter Approach
- Results -

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together with
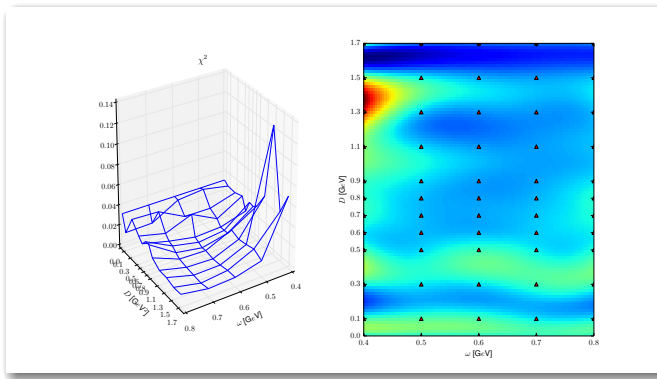Maria Gómez-Rocha, Carina Popovici, Andreas Krassnigg

`Covariant.ModelsOfHadrons.com`

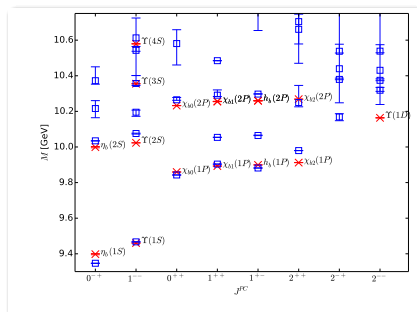# Bottomonium

- evaluate splittings at $(\omega - D)$-grid
- find minimal $\chi^2(\omega, D) = \sum_{\text{splittings}} (\Delta M_{\text{exp}} - \Delta M_{\text{th}})^2$
- find minimal $\bar{\chi}^2(m_q) = \sum_{\text{groundstates}} (M_{\text{exp}} - M_{\text{th}})^2$ for optimal (ω, D)

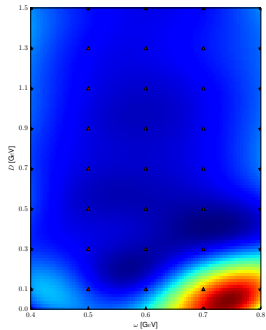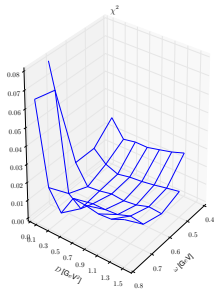[C. Popovici, T. Hilger, M. Gómez-Rocha, A. Krassnigg, submitted to FBS, arXiv:1407.7970 (2014).]

Bottomonium

[T. Hilger, C. Popovici, M. Gómez-Rocha, A. Krassnigg, submitted to PRD, arXiv:1409.3205 (2014).]

▶ $m_{\mathrm{b}} = 3.635\,\mathrm{GeV}$ at $\mu = 19\,\mathrm{GeV}$, $\omega = 0.7\,\mathrm{GeV}$, $D = 1.3\,\mathrm{GeV}^2$

▶ good identification of states

▶ well reproduced splittings (excitations, level orderings)
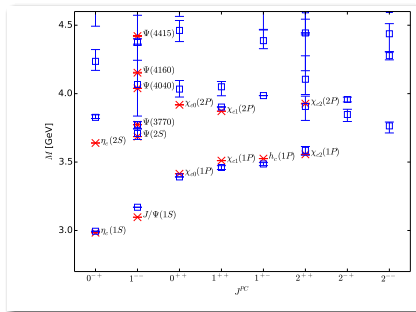
FWF Der Wissenschaftsfonds.
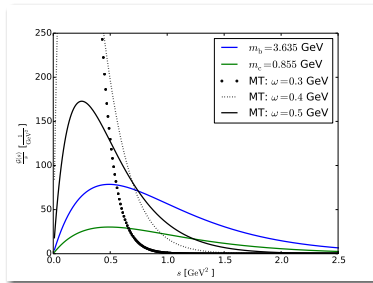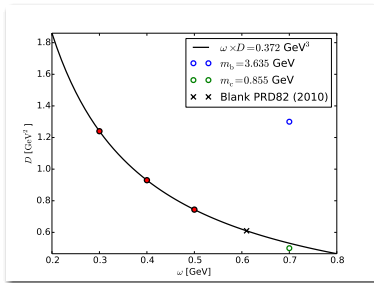
Charonium

Charmonium

[T. Hilger, C. Popovici, M. Gómez-Rocha, A. Krassnigg, submitted to PRD, arXiv:1409.3205 (2014).]

- $m_c = 0.855\,\text{GeV}$ at $\mu = 19\,\text{GeV}$, $\omega = 0.7\,\text{GeV}$, $D = 0.5\,\text{GeV}^2$
- no extra states
- excellently reproduced splittings, in particular 1^{--}

Interaction

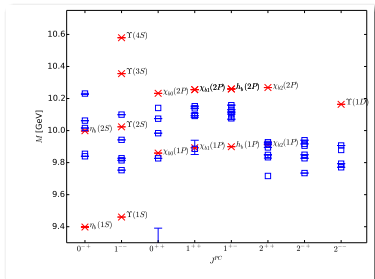$m_{\mathrm{b}} = 3.635$ GeV: $\omega = 0.7$ GeV, $D = 1.3$ GeV^2

$m_{\mathrm{c}} = 0.855$ GeV: $\omega = 0.7$ GeV, $D = 0.5$ GeV^2
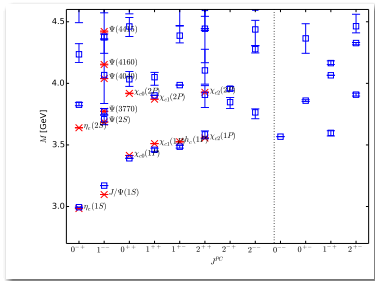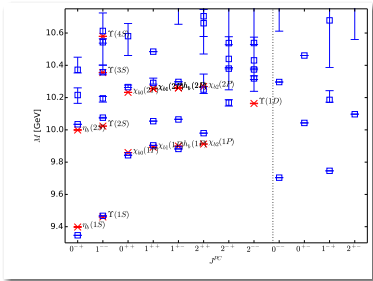
Exchanging parameters
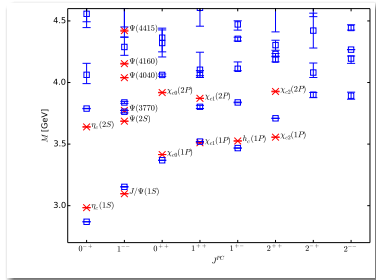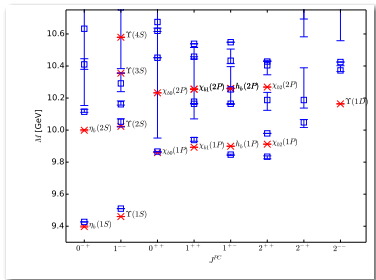
[T. Hilger, C. Popovici, M. Gómez-Rocha, A. Krassnigg, submitted to PRD, arXiv:1409.3205 (2014).]

Maris-Tandy parameters for bottomonium
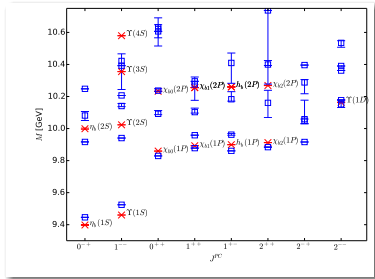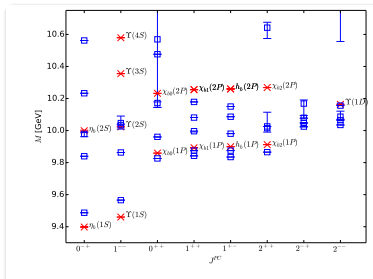
Exotics: Outlook

▶ too low compared to quark model predictions, in particular 0^{--}, 1^{-+}

▶ lower than $I = 1$ groundstates

Summary and Outlook

- quark mass dependence of effective interaction
- optimized rainbow-ladder DS-BS study describes ground states and lowest radial excitations
- extra states in vector- and axial-vector channel for bottomonium
- improve state identification (beyond J^{PC} and mass)
- exotics

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