# Report on CR10456D

I have read carefully the authors' response and the revised manuscript. For publication in PRD, I think their manuscript requires further polish.

- 1. To begin with, the authors noticed that the LDMEs in Ref. [1] and Ref. [2] are incompatible with each other, however, this can not be considered as the weakness of the NLO calculations (according to the authors' answer to Referee A). This is actually because even though the $^1S_0^{[8]}$ and $^3S_1^{[8]}$ channels have different $p_t$ behaviours, in middle $p_t$ region, they are still approximately correlated. The data can not distinguish two sets of the LDMEs in this region. The LO calculations suffer the same problem.

- 2. The authors should cite Ref. [3] rather than Ref. [2]. They should also notice that Ref. [3] came out earlier than Ref. [1].

- 3. In the first paragraph, the authors state "The ratios of excited to ground state quarkonia yields are considered as robust signals of Quark Gluon Plasma (QGP) and measuring such ratios has become the most important goals of Pb+Pb experiments at LHC." Actually, the ratio for the $J/\psi$ suppression in nucleus-nucleus collisions is considered as a signal for QGP. However, this signal is not robust, since, in addition to the hot-nuclear-matter effects, there also exist cold-nuclear-matter effects. Further studies on this issue are still required.

- 4. The calculation of $\chi_c$ hadroproduction can not be correct. According to Ref. [4], the ratio for $\sigma(\chi_{c2})/\sigma(\chi_{c1}) \times Br(\chi_{c2} \to J/\psi)/Br(\chi_{c1} \to J/\psi)$ at QCD LO is approximately $5/3 \times 0.195/0.344 \approx 0.94$. However, the authors obtained different results in their Fig.2. Their values of the LDME for $^3S_1^{[8]}$ to $\chi_{c0}$ is also inconsistent with Ref. [5]. The authors should check it.

- 5. For publication in PRD, I insist that the authors use more common conventions, e.g. the LDMEs be denoted as $\langle \mathcal{O}^H(n) \rangle$.

If the above issue are carefully considered, I can recommend publication of this paper in Physical Review D.

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[1] M. Butenschoen and B. A. Kniehl, Phys. Rev. Lett. **106**, 022003 (2011), 1009.5662.

[2] Y.-Q. Ma, K. Wang, and K.-T. Chao, Phys. Rev. **D84**, 114001 (2011), 1012.1030.

[3] Y.-Q. Ma, K. Wang, and K.-T. Chao, Phys. Rev. Lett. **106**, 042002 (2011), 1009.3655.

[4] Y.-Q. Ma, K. Wang, and K.-T. Chao, Phys. Rev. **D83**, 111503 (2011), 1002.3987.

[5] H.-F. Zhang, L. Yu, S.-X. Zhang, and L. Jia, Phys. Rev. **D93**, 054033 (2016), [Addendum: Phys. Rev.D93,no.7,079901(2016)], 1410.4032.