

Instantaneous Formulation for Transitions Between Two Instantaneous Bound States and Its Gauge Invariance

CHANG Chao-Hsi,^{1,2,3} CHEN Jiao-Kai,³ and WANG Guo-Li^{3,4}

¹ Institute for Advanced Study, Princeton, New Jersey 08540, USA

² CCAST (World Laboratory), P.O. Box 8730, Beijing 100080, China

³ Institute of Theoretical Physics, the Chinese Academy of Sciences, P.O. Box 2735, Beijing 100080, China

⁴ Department of Physics, Harbin Institute of Technology, Harbin 150006, China

(Received: 2005-12-31; Revised:)

Abstract: We have precisely derived a "rigorous instantaneous formulation" for transitions between two bound states when the bound states are well-described by instantaneous Bethe-Salpeter (BS) equation (i.e. the kernel of the equation is instantaneous "occasionally"). The obtained rigorous instantaneous formulation, in fact, is expressed as an operator sandwiched by two "reduced BS wave functions" properly, while the reduced BS wave functions appearing in the formulation are the rigorous solutions of the instantaneous BS equation, and they may relate to Schrödinger wave functions straightforwardly. We also show that the rigorous instantaneous formulation is gauge-invariant with respect to the $U_{em}(1)$ transformation precisely, if the concerned transitions are radiative. Some applications of the formulation are outlined.

PACS: 11.10.St, 12.39.Jh, 36.10.Dr, 13.40.Hq

Key words: instantaneous formulation, transitions between bound states, Bethe-Salpeter equation, gauge invariance

[\[Full text: PDF\]](#)

Close