

Action Principle and Modification of the Faddeev–Popov Factor in Gauge Theories

K. Limboonsong and E. B. Manoukian

School of Physics, Institute of Science, Suranaree University of Technology, Nakhon Ratchasima, 30000, Thailand.

The quantum action (dynamical) principle is exploited to investigate the nature and origin of the Faddeev–Popov (FP) factor in gauge theories without recourse to path integrals. Gauge invariant as well as gauge non-invariant interactions are considered to show that the FP factor needs to be modified in more general cases and expressions for these modifications are derived. In particular we show that a gauge invariant theory does not necessarily imply the familiar FP factor for proper quantization.

KEYWORDS: action principle; gauge theories; Faddeev–Popov factor; quantization rules.