

Electron-Ion Path Integral Monte Carlo with the Pair-Product Action

Riccardo Fantoni*

Università di Trieste, Dipartimento di Fisica, strada Costiera 11, 34151 Grignano (Trieste), Italy

(Dated: May 2, 2026)

...

Keywords: Path Integral; Monte Carlo; Quantum Mixture; Bosons; Fermions; Two Component Plasma; Thermodynamics; Structure; Superfluidity; Sign Problem; Metallic Hydrogen; Molecular Hydrogen; Hydrogen Atom; Hydrogen Molecule; Pair Coulomb Density Matrix

CONTENTS

I. Introduction	1
A. Description of our PIMC and RPIMC algorithms	2
Author declarations	2
Conflicts of interest	2
Data availability	2
Funding	2
References	2

I. INTRODUCTION

[1]

TABLE I. ...

case	statistics	T	M	n	N	x_2	μ_2	Ne_K	$-Ne_V$	$f_s(1)$	$f_s(2)$
A	b (PIMC)	0.07	20	0.3	30	0.5	1836.15	...	...	...	...
B	f (RPIMC)	0.07	20	0.3	20	0.5	1836.15	...	...	...	...
A	b (PIMC)	0.07	20	0.1	30	0.5	1836.15	...	...	...	...
B	f (RPIMC)	0.07	20	0.1	20	0.5	1836.15	...	...	...	...

FIG. 1. A, B

FIG. 2. C, D

* riccardo.fantoni@scuola.istruzione.it

Appendix A: Description of our PIMC and RPIMC algorithms**AUTHOR DECLARATIONS****Conflicts of interest**

None declared.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Funding

None declared.

[1] D. M. Ceperley, Path integrals in the theory of condensed Helium, Rev. Mod. Phys. **67**, 279 (1995).