Abstract Submitted
for the APR16 Meeting of
The American Physical Society

Application of covariant analytic mechanics to gravity with Dirac field SATOSHI NAKAJIMA, Graduate School of Pure and Applied Sciences, University of Tsukuba, Japan — We applied the covariant analytic mechanics with the differential forms to the Dirac field and the gravity with the Dirac field. The covariant analytic mechanics treats space and time on an equal footing regarding the differential forms as the basis variables. A significant feature of the covariant analytic mechanics is that the canonical equations, in addition to the Euler-Lagrange equation, are not only manifestly general coordinate covariant but also gauge covariant. Combining our study and the previous works (the scalar field, the abelian and non-abelian gauge fields and the gravity without the Dirac field), the applicability of the covariant analytic mechanics was checked for all fundamental fields. We studied both the first and second order formalism of the gravitational field coupled with matters including the Dirac field. It was suggested that gravitation theories including higher order curvatures cannot be treated by the second order formalism in the covariant analytic mechanics. In addition, we showed that the covariant analytic mechanics is equivalent to corrected De Donder-Weyl theory.

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Date submitted: 08 Jan 2016 Electronic form version 1.4