

Accepted Manuscript

Section sigma models coupled to symplectic duality bundles on Lorentzian four-manifolds

C.I. Lazaroiu, C.S. Shahbazi

PII: S0393-0440(18)30046-9

DOI: <https://doi.org/10.1016/j.geomphys.2018.02.003>

Reference: GEOPHY 3151

To appear in: *Journal of Geometry and Physics*

Received date: 24 November 2017

Revised date: 31 January 2018

Accepted date: 2 February 2018

Please cite this article as: C.I. Lazaroiu, C.S. Shahbazi, Section sigma models coupled to symplectic duality bundles on Lorentzian four-manifolds, *Journal of Geometry and Physics* (2018), <https://doi.org/10.1016/j.geomphys.2018.02.003>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Section sigma models coupled to symplectic duality bundles on Lorentzian four-manifolds

C. I. Lazaroiu¹ and C. S. Shahbazi²

¹ Center for Geometry and Physics, Institute for Basic Science, Pohang 790-784, Republic of Korea, E-mail: calin@ibs.re.kr

² Department of Mathematics, University of Hamburg, Germany, E-mail: carlos.shahbazi@uni-hamburg.de

Abstract: We give the global mathematical formulation of a class of generalized four-dimensional theories of gravity coupled to scalar matter and to Abelian gauge fields. In such theories, the scalar fields are described by a section of a surjective pseudo-Riemannian submersion π over space-time, whose total space carries a Lorentzian metric making the fibers into totally-geodesic connected Riemannian submanifolds. In particular, π is a fiber bundle endowed with a complete Ehresmann connection whose transport acts through isometries between the fibers. In turn, the Abelian gauge fields are “twisted” by a flat symplectic vector bundle defined over the total space of π . This vector bundle is endowed with a vertical taming which locally encodes the gauge couplings and theta angles of the theory and gives rise to the notion of twisted self-duality, of crucial importance to construct the theory. When the Ehresmann connection of π is integrable, we show that our theories are locally equivalent to ordinary Einstein-Scalar-Maxwell theories and hence provide a global non-trivial extension of the universal bosonic sector of four-dimensional supergravity. In this case, we show using a special trivializing atlas of π that global solutions of such models can be interpreted as classical “locally-geometric” U-folds. In the non-integrable case, our theories differ locally from ordinary Einstein-Scalar-Maxwell theories and may provide a geometric description of classical U-folds which are “locally non-geometric”.

Contents

1. Introduction	1
2. Kaluza-Klein spaces, vertical potentials and bundles of scalar structures	4
3. Section sigma models	10
4. Scalar-electromagnetic bundles	13
5. Generalized Einstein-Section-Maxwell theories	18
6. A simple example	22
7. Conclusions and further directions	23
A. Pseudo-Riemannian submersions and Kaluza-Klein metrics	24
B. Local description in adapted coordinates	27

1. Introduction

The construction of four-dimensional supergravity theories usually found in the physics literature (see, for example, [1, 2, 3, 4]) is local in the sense that it is carried out ignoring the topology of the space-time manifold and without specifying the precise global description of the configuration space or the global mathematical structures required to define it. Such constructions are discussed traditionally only on a contractible subset U of space-time, which guarantees that any fiber bundle defined on U is trivial and

Download English Version:

<https://daneshyari.com/en/article/8255570>

Download Persian Version:

<https://daneshyari.com/article/8255570>

[Daneshyari.com](https://daneshyari.com)