

# Accepted Manuscript

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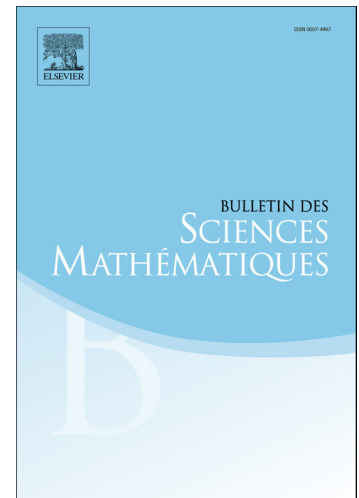
PII: S0007-4497(17)30094-5  
DOI: <https://doi.org/10.1016/j.bulsci.2017.10.001>  
Reference: BULSCI 2735

To appear in: *Bulletin des Sciences Mathématiques*

Received date: 26 April 2016

Please cite this article in press as: G. Bazzoni, J.C. Marrero, On locally conformal symplectic manifolds of the first kind, *Bull. Sci. math.* (2017), <https://doi.org/10.1016/j.bulsci.2017.10.001>

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# On locally conformal symplectic manifolds of the first kind

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We present some examples of locally conformal symplectic structures of the first kind on compact nilmanifolds which do not admit Vaisman metrics. One of these examples does not admit locally conformal Kähler metrics and all the structures come from left-invariant locally conformal symplectic structures on the corresponding nilpotent Lie groups. Under certain topological restrictions related with the compactness of the canonical foliation, we prove a structure theorem for locally conformal symplectic manifolds of the first kind. In the non compact case, we show that they are the product of a real line with a compact contact manifold and, in the compact case, we obtain that they are mapping tori of compact contact manifolds by strict contactomorphisms. Motivated by the aforementioned examples, we also study left-invariant locally conformal symplectic structures on Lie groups. In particular, we obtain a complete description of these structures (with non-zero Lee form) on connected simply connected nilpotent Lie groups in terms of locally conformal symplectic extensions and symplectic double extensions of symplectic nilpotent Lie groups. In order to obtain this description, we study locally conformal symplectic structures of the first kind on Lie algebras.

**MSC classification [2010]:** 22E25, 22E60, 53C12, 53D05, 53D10, 53C55

**Key words:** Locally conformal symplectic structures, contact structures, mapping torus, Lie algebras, Lie groups, nilpotent Lie algebras, nilpotent Lie groups, compact nilmanifolds, locally conformal Kähler metrics, Vaisman metrics.

## Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Preliminaries</b>	<b>6</b>
2.1	Locally conformal symplectic structures . . . . .	6
2.2	Twisted Lie algebra cohomology . . . . .	8
2.3	Multiplicative vector fields on Lie groups . . . . .	9

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