CONFORMAL METRICS OF CONSTANT CURVATURE ON PLANAR DOMAINS

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Five dimensional minimal supergravities have played an important role in recent advances in string theory. In this lecture we shall discuss the relation between timelike solutions of such theories admitting Killing spinors and four dimensional complex geometries. In the ungauged theory (vanishing cosmological constant Lambda=0) the solutions are determined in terms of a hyper-Kahler base space; in the gauged theory (Lambda¡0) the complex geometry is Kahler; in the de Sitter theory (Lambda¿0) the complex geometry is hyper-Kahler with torsion (HKT). In the latter case some details of the derivation are given, using spinorial geometry techniques. The method for constructing explicit solutions is presented in each case, and some solutions of physical importance briefly discussed. We shall then turn to null solutions in the de Sitter theory. These are defined in terms of a one parameter family of 3-dimensional constrained Einstein-Weyl spaces called Gauduchon-Tod structures. They admit a geodesic, expansion-free, twist-free and shear-free null vector field and therefore are a particular type of Kundt geometry. When the Gauduchon-Tod structure reduces to the 3-sphere, the null vector becomes recurrent, and therefore the holonomy is contained in Sim(3), the maximal proper subgroup of the Lorentz group SO(4,1). For these geometries, all scalar invariants built from the curvature are constant. Explicit examples will again be presented.

References

[1] Gauduchon-Tod structures, Sim holonomy and De Sitter supergravity Jai Grover, Jan B. Gutowski, Carlos A.R. Herdeiro, Patrick Meessen, Alberto Palomo-Lozano, Wafic A. Sabra, Accepted in JHEP, e-Print: arXiv:0905.3047 [hep-th]

[2] Five Dimensional Minimal Supergravities and Four Dimensional Complex Geometries Jai Grover, Jan B. Gutowski, Carlos A.R. Herdeiro, Wafic Sabra, AIP Conf.Proc.1122:129-136,2009, e-Print: arXiv:0901.4066 [hep-th]

[3] HKT Geometry and de Sitter Supergravity Jai Grover, Jan B. Gutowski, Carlos A.R. Herdeiro, Wafic Sabra, Nucl.Phys.B809:406-425,2009, e-Print: arXiv:0806.2626 [hep-th]

[4] On a class of 4D Kahler bases and AdS(5) supersymmetric Black Holes. Pau Figueras, Carlos A.R. Herdeiro, F. Paccetti Correia, JHEP 0611:036,2006, e-Print: hep-th/0608201

[5] Spinning deformations of the D1 - D5 system and a geometric resolution of closed timelike curves. Carlos A.R. Herdeiro Nucl.Phys.B665:189-210,2003, e-Print: hep-th/0212002

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