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On the Classification of $N = 2$ Superconformal Coset Theories*

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Abstract. We show that two dimensional $N = 2$ superconformal field theories cannot be constructed by applying the supersymmetric extension of the GKO construction to the so-called special subalgebras, i.e. subalgebras for which at least one generator associated to a root of the subalgebra does not correspond to a root of the algebra itself. We thus prove the completeness of the classification of $N = 2$ supersymmetric coset models obtained by Kazama and Suzuki. Furthermore we point out that compared to their papers an additional criterion has to be added in the $N = 2$ conditions.

1. Introduction

Coset constructions [4] in conformal field theory have recently undergone an intensive investigation for they allow the construction of many new models within the framework of Kac Moody algebras. In [6] Kazama and Suzuki proposed to use a supersymmetric extension of the GKO construction to obtain new $N = 2$ superconformal field theories.

They considered a reductive subalgebra H of a semi-simple Lie algebra G to perform a supersymmetric coset construction, yielding in all cases an $N = 1$ superconformal field theory. They also gave a necessary and sufficient condition under which this supersymmetry should be enlarged to an $N = 2$ supersymmetry. In a later paper [7] they gave a geometrical interpretation of this criterion which was used in turn to classify all $N = 2$ coset models.

Let us adopt in this note the short-hand convention that the generator in G corresponding to a root is called a root vector. As for reductive subalgebras of reductive Lie-algebras there are two different types (compare e.g. [2,3]): the subalgebra H is called *regular* iff the root vectors of H are also root vectors of G. (The embedding $H \hookrightarrow G$ is always chosen in a way that the Cartan-subalgebra

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