ON THE STRUCTURE OF MINIMAL AFFINIZATIONS OF QUANTUM GROUPS

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Abstract: Minimal affinizations of representations of quantum groups, introduced by Chari in 1995, are the central objects in the project of understanding the smallest representations of quantum affine algebras. Immediately after their introduction, Chari and Pressley gave an almost complete characterization of the Drinfeld polynomials corresponding to minimal affinizations. It was also soon realized that certain minimal affinizations played a crucial role in the study of integrable lattices in statistical mechanics. Namely, the minimal affinizations of simple modules having scalar multiples of fundamental weights as highest weights turned out to be the Kirillov-Reshetikhin modules, predicted to exist by Kirillov and Reshetikhin in their investigations related to the Bethe Ansatz, a method for predicting eigenvectors of the transfer matrix of the six-vertex model. Motivated by the Kirillov-Reshetikhin conjecture which stated that the character of tensor products of KR modules satisfied certain fermionic formulas, the efforts were focused in studying the structure of the KR modules from a variety of perspectives for awhile. Although the proof of the KR conjecture has been completed by D. Hernandez in 2010, the KR modules are still the focus of intensive research. However, in the last few years, the interest on more general minimal affinizations has grown as connections with the theory of Demazure modules have become better understood.

In this talk, partially based on joint work with F. Pereira, we will focus on the so called irregular preminimal affinizations of minimality order 2 for types D and E. They are of two kinds: coherent and incoherent ones. There are 3 equivalence classes of coherent ones and at least 1 and at most 3 equivalence classes of incoherent ones. Each equivalence class is associated to a boundary node of the Dynkin diagram. We conjecture that, if the incoherent kind exists for a given boundary node, the associated preminimal affinizations are in fact minimal affinizations and are strictly smaller than the their coherent counterparts. We will discuss the results that lead to a proof of this for type D as well as for type E under certain technical restrictions on the highest weight. We will also give pointers on the ongoing investigations in the direction of understanding the character of these representations.