A New Class of Representations of EALA Coordinated by Quantum Tori in Two Variables

To Professor R. V. Moody on his sixtieth birthday

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Abstract. We study the representations of extended affine Lie algebras $\mathfrak{sl}_{\ell+1}(C_q)$ where $q$ is $N$-th primitive root of unity ($C_q$ is the quantum torus in two variables). We first prove that $\bigoplus \mathfrak{sl}_{\ell+1}(C)$ for a suitable number of copies is a quotient of $\mathfrak{sl}_{\ell+1}(C_q)$. Thus any finite dimensional irreducible module for $\bigoplus \mathfrak{sl}_{\ell+1}(C)$ lifts to a representation of $\mathfrak{sl}_{\ell+1}(C_q)$. Conversely, we prove that any finite dimensional irreducible module for $\mathfrak{sl}_{\ell+1}(C_q)$ comes from above. We then construct modules for the extended affine Lie algebra $\mathfrak{sl}_{\ell+1}(C_q) \oplus C d_1 \oplus C d_2$ which is integrable and has finite dimensional weight spaces.