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Equivariant multiplicities of Coxeter arrangements and invariant bases

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Let $\A$ be an irreducible Coxeter arrangement and W be its Coxeter group. Then W naturally acts on $\A$. A multiplicity $\bfm : \A\rightarrow \Z$ is said to be equivariant when $\bfm$ is constant on each W-orbit of $\A$. In this article, we prove that the multi-derivation module $D(\A, \bfm)$ is a free module whenever $\bfm$ is equivariant by explicitly constructing a basis, which generalizes the main theorem of \cite{T02}. The main tool is a primitive derivation and its covariant derivative. Moreover, we show that the W-invariant part $D(\A, \bfm)^{W}$ for any multiplicity $\bfm$ is a free module over the W-invariant subring.

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