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On vector modular invariant fields

Let G be one of the three groups $GL(n, \mathbf{F}_q), SL(n, \mathbf{F}_q)$ or $U(n, \mathbf{F}_q)$ and let W be the standard n-dimensional representation of G. For non-negative integers m and d we let $mW \oplus dW^*$ denote the representation of G given by the direct sum of m vectors and d covectors. Let $\mathbf{F}_q(mW \oplus dW^*)^G$ be the vector invariant field. In this talk, we give a collection of homogenous invariant polynomials $\{\ell_1, \ell_2, \ldots, \ell_{(m+d)n}\} \subset \mathbf{F}_q[mW \oplus dW^*]^G$ such that $\mathbf{F}_q(mW \oplus dW^*)^G = \mathbf{F}_q(\ell_1, \ell_2, \ldots, \ell_{(m+d)n})$ for all cases except when $md = 0$ and $G = GL(n, \mathbf{F}_q)$ or $SL(n, \mathbf{F}_q)$. This is a joint work with David L. Wehlau.