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Secant varieties to the varieties of reducible hypersurfaces

Let $S = k[x_1, \ldots, x_n]$ be the standard graded polynomial ring, where k is an algebraically closed field. Let $\lambda = [d_1, \ldots, d_r]$ be a partition of a positive integer d into $r \geq 2$ parts. In $\mathbb{P}^{N-1}$, where $N = \binom{d+n-1}{n-1}$, we have $\mathbb{X}_{n-1,\lambda}$, the *variety of reducible hypersurfaces (forms) of type* λ. The dimension of $\mathbb{X}_{n-1,\lambda}$ is well known, and there is a well-known formula for the expected dimension of the variety $\sigma_\ell(\mathbb{X}_{n-1,\lambda})$ spanned by the secant $\mathbb{P}^{\ell-1}$'s to $\mathbb{X}_{n-1,\lambda}$ in $\mathbb{P}^{N-1}$. When this expected dimension is not achieved, $\sigma_\ell(\mathbb{X}_{n-1,\lambda})$ is said to be *defective*. We compute the precise dimension of $\sigma_\ell(\mathbb{X}_{n-1,\lambda})$ in many new cases, identifying the instances when $\sigma_\ell(\mathbb{X}_{n-1,\lambda})$ is defective. We furthermore give a conjecture that, if true, would explicitly give the precise dimension of $\sigma_\ell(\mathbb{X}_{n-1,\lambda})$ in all cases. This conjecture is based on the Weak Lefschetz Property for a certain collection of graded artinian algebras. This is joint work in progress with M. Catalisano, A.V. Geramita, A. Gimigliano, B. Harbourne, U. Nagel and Y.S. Shin.