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# A note on Segre varieties in characteristic two

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Let $\boldsymbol{V}_1, \boldsymbol{V}_2, \ldots, \boldsymbol{V}_m$ be $m \geq 1$ two-dimensional vector spaces over the same commutative field $F$. The non-zero decomposable tensors of $\bigotimes_{k=1}^{m} \boldsymbol{V}_k$ determine the *Segre variety* $\mathcal{S}_{(m)}(F)$ in the projective space $\mathbb{P}\big(\bigotimes_{k=1}^{m} \boldsymbol{V}_k\big)$. Each $\boldsymbol{V}_k$ admits a symplectic bilinear form $[\cdot,\cdot]$, so that $\bigotimes_{k=1}^{m} \boldsymbol{V}_k$ is equipped with a bilinear form which is given by

$$\big[\boldsymbol{a}_1 \otimes \boldsymbol{a}_2 \otimes \cdots \otimes \boldsymbol{a}_m, \boldsymbol{b}_1 \otimes \boldsymbol{b}_2 \otimes \cdots \otimes \boldsymbol{b}_m\big] := \prod_{k=1}^{m} [\boldsymbol{a}_k, \boldsymbol{b}_k] \quad \text{for} \quad \boldsymbol{a}_k, \boldsymbol{b}_k \in \boldsymbol{V}_k.$$

In projective terms this form yields the well known *fundamental polarity* of $\mathcal{S}_{(m)}(F)$. It is associated to a regular quadric when $m$ is even and $\operatorname{Char} F \neq 2$. Otherwise it is a null polarity.

In our talk we focus on the case when $F$ has characteristic two. Here the fundamental polarity of $\mathcal{S}_{(m)}(F)$ is always null, and there exists an *invariant quadric:*

**Theorem.** *Let* $m \geq 2$ *and* $\operatorname{Char} F = 2$. *There exists in the ambient space of the Segre* $\mathcal{S}_{(m)}(F)$ *a regular quadric* $\mathcal{Q}(F)$ *with the following properties:*

1. *The projective index of* $\mathcal{Q}(F)$ *is* $2^{m-1} - 1$.
2. $\mathcal{Q}(F)$ *is invariant under the group of projective collineations stabilising the Segre* $\mathcal{S}_{(m)}(F)$.

This is joint work with Boris Odehnal (Vienna, Austria) and Metod Saniga (Tatranská Lomnica, Slovakia).

## References

[1] H. Havlicek, B. Odehnal, and M. Saniga. On invariant notions of Segre varieties in binary projective spaces. *Des. Codes Cryptogr.* 62 (2012), 343–356.