

# Average dimension of fixed point spaces with applications

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Let  $G$  be a finite group,  $F$  a field, and  $V$  a finite dimensional  $FG$ -module such that  $G$  has no trivial composition factor on  $V$ . Then the arithmetic average dimension of the fixed point spaces of elements of  $G$  on  $V$  is at most  $(1/p) \dim V$  where  $p$  is the smallest prime divisor of the order of  $G$ . This solves an old problem of Peter M. Neumann and Michael Vaughan-Lee. Several applications of this result will be given. (Joint work with R. M. Guralnick.)