The $\phi$-dimension: A new homological measure

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ABSTRACT. In [5], K. Igusa and G. Todorov introduced two functions $\phi$ and $\psi$, which are natural and important homological measures generalising the notion of the projective dimension. These Igusa-Todorov functions have become into a powerful tool to understand better the finitistic dimension conjecture.

In this paper, for an artin $R$-algebra $A$ and the Igusa-Todorov function $\phi$, we characterise the $\phi$-dimension of $A$ in terms either of the bi-functors $\text{Ext}_A^i(\cdot, \cdot)$ or Tor’s bi-functors $\text{Tor}_1^A(\cdot, \cdot)$. Furthermore, by using the first characterisation of the $\phi$-dimension, we show that the finiteness of the $\phi$-dimension of an artin algebra is invariant under derived equivalences. As an application of this result, we generalise the classical Bongartz’s result [? Corollary 1] as follows: For an artin algebra $A$, a tilting $A$-module $T$ and the endomorphism algebra $B = \text{End}_A(T)^{op}$, we have that $\phi \dim (A) – \text{pd} T \leq \phi \dim (B) \leq \phi \dim (A) + \text{pd} T$.

REFERENCES


