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***Homologically trivial and annihilator locally  $C^*$ -algebras.***

ABSTRACT. In this talk, we give a survey of recent results concerning structural properties of some classes of homologically trivial locally  $C^*$ -algebras. These include: algebras with projective irreducible Hilbert modules, biprojective and superbiprojective algebras. In particular, we note that (i) each superbiprojective locally  $C^*$ -algebra is isomorphic to a direct product of full matrix algebras, i.e., it is contractible, and (ii) each biprojective  $\sigma$ - $C^*$ -algebra is isomorphic to the direct product of a countable family of biprojective  $C^*$ -algebras (i.e., of  $c_0$ -sums of full matrix algebras). We present an example of a biprojective locally  $C^*$ -algebra that is not isomorphic to a product of biprojective  $C^*$ -algebras. We notice the following result: if  $A$  is a locally  $C^*$ -algebra, generally speaking without an identity, then the condition that all (non-annihilator) irreducible Hilbert  $A$ -modules be projective is equivalent to  $A$  being an annihilator topological algebra. We describe the structure of annihilator locally  $C^*$ -algebras and of biprojective locally  $C^*$ -algebras.

This talk is based on joint work with Alexei Pirkovskii.