**Zinaida A. Lykova**
School of Mathematics and Statistics, Newcastle University, Newcastle upon Tyne, NE1 7RU, UK; (Z.A.Lykova@ncl.ac.uk)

***On higher-dimensional amenability of Banach algebras***

ABSTRACT. For any $n \geq 1$, a Banach algebra $\mathcal{A}$ is called *n-amenable* if the continuous Hochschild cohomology $\mathcal{H}^n(\mathcal{A}, X^*) = \{0\}$ for every Banach $\mathcal{A}$-bimodule $X$. It is clear that $\mathcal{A}$ is $n$-amenable but not $(n-1)$-amenable if and only if the *weak bidimension* of $\mathcal{A}$

$$db_w\mathcal{A} = \inf\ \{n : \mathcal{H}^{n+1}(\mathcal{A}, X^*) = \{0\} \text{ for all Banach } \mathcal{A}-\text{bimodule } X\}$$

is equal to $(n-1)$. Other equivalent definitions for higher-dimensional amenability of $\mathcal{A}$ will be given. Connections between higher-dimensional amenability of $\mathcal{A}$ and closed ideals with bounded approximate identities (b.a.i.) will be considered. We will show that the weak bidimension $db_w$ of the tensor product $\mathcal{A}\widehat{\otimes}\mathcal{B}$ of Banach algebras $\mathcal{A}$ and $\mathcal{B}$ with b.a.i. satisfies

$$db_w\mathcal{A}\widehat{\otimes}\mathcal{B} = db_w\mathcal{A} + db_w\mathcal{B}.$$

We prove further that the formula does *not* hold for algebras with no b.a.i, nor for algebras with only 1-sided b.a.i. The well-known trick of adjoining an identity to the algebra does not work for the tensor product of algebras.

References: Lykova, Z.A. The higher-dimensional amenability of tensor products of Banach algebras, accepted for publication in *J. Operator Theory* in June 2009, 24 pp. (arXiv:0904.4548v1 [math.KT] 29 Apr 2009.)