# HOMOTOPY TYPES OF MOMENT-ANGLE COMPLEXES

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The *moment-angle complex* $\mathcal{Z}_K$ is a cell complex composed of products of discs $D^2$ and circles $S^1$ which are parametrised by faces of a simplicial complex $K$. The complex $\mathcal{Z}_K$ has a natural torus action. By replacing the pair $(D^2, S^1)$ by an arbitrary pair of spaces $(X, A)$ we obtain the notion of the *polyhedral product* $(X, A)^K$. This construction is currently studied actively in toric topology and homotopy theory, and has many geometric interpretations. For example, the moment-angle complex $\mathcal{Z}_K = (D^2, S^1)^K$ is homotopy equivalent to the complement of the arrangement of coordinate subspaces in $\mathbb{C}^m$ defined by the simplicial complex $K$. If $K$ is the boundary of a simplicial polytopes (or, more generally, comes from a complete simplicial fan), then $\mathcal{Z}_K$ is a smooth manifold. It admits quite interesting non-Kähler complex-analytic structures generalising the well-known series of Hopf and Calabi–Eckmann manifolds.

In our talk we consider the classes of simplicial complexes $K$ whose corresponding moment-angle complex $\mathcal{Z}_K$ has homotopy type of a wedge of spheres or connected sum of sphere products. In the case of flag complexes we obtain a complete characterisation of these classes, both in algebraic and combinatorial terms. For wedges of spheres, the criterion is as follows: the 1-skeleton of $K$ must be a chordal graph (this notions features in the combinatorial theory of optimisation on graphs). We also calculate explicitly the number of spheres in the wedge. The loop spaces of $\mathcal{Z}_K$ and $(\mathbb{C}P^\infty, pt)^K$ are homotopy equivalent to products of spheres and loops on spheres, and we show that the canonical map $\mathcal{Z}_K \to (\mathbb{C}P^\infty, pt)^K$ can be described by iterated Whitehead products of two-dimensional spherical classes.

The talk is based on the joint work [1].

## References

[1] J. Grbic, T. Panov, S. Theriault, J. Wu, "Homotopy types of moment-angle complexes", preprint; arXiv:1211.0873.

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