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Freeness of Ideal Subarrangements of Weyl Arrangements

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The exponents of an irreducible root system (or of a Weyl arrangement), which are the most important integers deriving from the root system, control the corresponding Lie group, the reflection group, and the arrangement of hyperplanes. The celebrated SSKM formula, due to A. Shapiro, R. Steinbrg, B. Kostant, and I. G. Macdonald, connects the exponents to the height distribution of positive roots by the concept of dual partitions. The SSKM formula was first proved (without using the classification) by Kostant by studying 3-dimensional Lie subgroups. On the other hand, E. Sommers and J. Tymoczko (2006) conjectured that any ideal subarrangement of the Weyl arrangement is a free arrangement and that the exponents and the height distribution are dual partitions to each other. In this talk, we will prove that the Sommers-Tymoczko conjecture holds true. Our proof, even in the case of the entire Weyl arrangement, gives a new proof of the SSKM formula.

This work is joint with Takuro Abe, Mohamed Barakat, Michael Cuntz, and Torsten Hoge.

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