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Second Order Even and R -diagonal Operators

Voiculescu showed that circular operators, the free analogue of complex Gaussian random variables, and Haar unitaries are related by polar decomposition. This relationship was deepened by Nica and Speicher who showed that both are examples of R -diagonal operators. Nica and Speicher also showed that R -diagonal operators and even operators, self-adjoint operators with vanishing odd moments, are related algebraically and via their free cumulants. We extend these results to the case of second order freeness. This is joint work with Octavio Arizmendi.