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A sharp condition for Békollé-Bonami weights to satisfy the reverse Hölder inequality

Békollé-Bonami B_p weights are the unit disc analogue of Muckenhoupt A_p weights and characterize L^p boundedness of the Bergman projection. It is well-known that A_p weights satisfy a reverse Hölder inequality, which brings with it a number of desirable properties such as self-improvement. On the other hand, B_p weights do not in general satisfy the reverse Hölder inequality, and this makes them harder to work with. Aleman, Pott and Reguera recently identified a condition under which B_p weights satisfy the reverse Hölder inequality. This condition requires that the weight be “almost constant” on the top halves of Carleson squares.

In this talk, we prove that being almost constant on top halves is a sharp condition for B_p weights to satisfy the reverse Hölder inequality. Moreover, we investigate the relationships between twelve conditions (including B_p and reverse Hölder) for weights on the unit disc. These conditions are known to be equivalent for weights on $\mathbb{R}^n$ (and are called A_∞ conditions in that case) and were recently studied by Duoandikoetxea, Martín-Reyes and Ombrosi in a more general context. We complete all missing implications and counterexamples between these twelve conditions, both for weights which are almost constant on top halves and for arbitrary weights on the unit disc.