Working Seminar
(APDE - Analysis of Partial Differential Equations
HA – Harmonic Analysis)

Thursday, May 3, 16:00

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SINGULAR INTEGRAL OPERATORS IN THE PLANE WHOSE L^2-BOUNDEDNESS IMPLIES RECTIFIABILITY

Let $E \subset \mathbb{C}$ be a Borel set such that $0 < H_1(E) < \infty$. G. David and J.C. Léger (1999) proved that the Cauchy kernel $1/z$ (and even its real part $\mathrm{R}z/|z|^2$) has the following property: the $L_2(H_1\lfloor E)$-boundedness of the corresponding singular integral operators (SIOs) imply that E is rectifiable. Later on V. Chousionis, J. Mateu, L. Prat and X. Tolsa (2012) extended this result to the kernel $(\mathrm{R}z)^3/|z|^4$. Moreover, there are examples of kernels due to P. Huovinen (2001) and B. Jaye and F. Nazarov (2013) such that the corresponding SIOs are $L_2(H_1\lfloor E)$-bounded for some purely unrectifiable sets E, i.e. the above-mentioned property does not hold.

In the talk, we present results related to the behaviour of SIOs associated with the class of kernels that generalise all above-mentioned ones, namely, $(\mathrm{R}z)^3/|z|^4 + t \cdot \mathrm{R}z/|z|^2$, where t is a real parameter. The talk is based on a joint work with J. Mateu and X. Tolsa.