NTU Mathematics Colloquium

演講者：Prof. Der-Chen Chang (Georgetown University)

講　題：ANALYSIS ON A FAMILY OF MODEL DOMAINS IN C^{n+1}

時　間：2024年1月12日 (星期五) 10:30 - 11:30

地　點：臺灣大學天數館 440 室

摘　要：

The theory of singular integrals (SIO), introduced by Calderón and Zygmund as part of the theory of elliptic PDE's, has seen many extensions to different settings. Remaining within $\mathbf{R}^n$ as the ambient space, the variations introduced involve the following aspects, possibly also combined together:

(a). replace the standard dilations, *i.e.*, scalar multiplications, with non-isotropic ones;

(b). distinguish between a "*global*" theory and a "*local*" one;

(c). allow multi-parameter dilations.

The basic property that is common to all these types of singular integral operators is L^p-boundedness for $1 < p < \infty$ and *failure* of L^p-boundedness, in general, for other values of p.

Hardy spaces H^p enter into this picture as the natural substitutes of L^p with $0 < p \leq 1$, allowing positive results about $H^p \to H^p$ and $H^p \to L^p$ boundedness of singular integrals for these values of p. The point is that each of the classes of SIO mentioned above admits its own Hardy spaces, so that, whenever a new class of SIO is introduced, it is natural to ask what are its Hardy spaces.

In this talk, we will start with a brief introduction of the analysis induced by the Kohn Laplacian $\Box_b$ on a family of "model" domains $\Omega \subset \mathbf{C}^{n+1}$ and its boundary $\partial\Omega$ are said to be *decoupled of finite type* if there exists sub-harmonic, non-harmonic polynomials $\{\mathcal{P}_j\}_{j=1,\dots,n}$ with $\mathcal{P}_j(0) = 0$ such that

$$\partial\Omega = \left\{(z_1, \dots, z_n, z_{n+1}) : \operatorname{Im}(z_{n+1}) = \sum_{j=1}^{n} \mathcal{P}_j(z_j)\right\}.$$

We call the integer $m_j = 2 + \text{degree}(\Delta\mathcal{P}_j)$ the degree of $\mathcal{P}_j$. The "*type*" of Ω is $m = \max\{m_1, \dots, m_n\}$. Then we use the solving operator for $\Box_b$ as an example to see how harmonic analysis, especially different type of singular integral operators arise.

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