The mathematics of absolutely continuous diffraction

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Since the discovery of quasicrystals in 1982, there has been a lot of progress in finding sufficient and necessary conditions for their mathematical counterparts such as point sets and measures to have pure point diffraction. A comparatively less tackled issue is the presence of absolutely continuous components. An inherent stochasticity or randomness of the underlying structure guarantees the presence of absolutely continuous spectrum, but is not the only mechanism that does so. There are deterministic examples arising from aperiodic tilings of the d-dimensional Euclidean space which also share this feature [3,4]. In this talk, we will present the mathematical requirements for such objects to give rise to absolutely continuous diffraction components [1,5], and we will give some deterministic examples which satisfy them. We will also briefly mention several sufficient criteria to conclude the singularity of the spectrum (i.e., absence of absolutely continuous components) [1,2].

This is based on joint works with Michael Baake, Natalie Priebe Frank, Franz Gaehler and Uwe Grimm.

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