Can we detect quasicrystals using time-frequency distributions?

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Quasicrystals are an aperiodic ordered form of solid matter discovered by Daniel Schechtman in 1982. Various mathematical definitions for them have been proposed. Among them *Fourier quasicrystals* are defined by symmetric conditions on a tempered distribution μ and its Fourier transform $\widehat{\mu}$ suggesting a profitable use of time-frequency analysis tools. In this direction we present results obtained by posing "quasicrystals type" conditions on time-frequency representations, instead of separately on the distribution and its Fourier transform. More precisely we prove how Fourier quasicrystal structures can be detected with the use of the Wigner transform and its matrix-Wigner generalization, which include most of the commonly used time-frequency representations.