Inferences on normalization condition of tomograms and quasi-distributions of quantum states

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In this research tomograms and quasi-distribution functions like Wigner, Glauber - Sudarshan P - and Husimi Q- functions that violate the standard normalization condition are considered. It is shown that the Radon transform is not always applicable for such Wigner function. The conditions on the Wigner function under which the Radon transform is valid to define the tomogram are introduced. It is also shown that the tomogram must satisfy certain conditions in order to reconstruct the density matrix. Several special quantum states are considered. First the de Broglie plane wave in the momentum and coordinate forms is studied. Its Wigner function is known to be the delta function depended only on one of its variables P or Q, respectively. In this case the standard Radon transform to obtain the tomogram is not applicable since the conditions on the Wigner function are not satisfied. Author develop explicit tomogram formulas an d their suitability for the reconstruction of the density matrix are studied for both cases. Next, the Moschinsky shutter problem and the stationary state of the charged particle in the uniform and constant electric field are considered. The Wigner functions and the tomograms depend in this case on the Fresnel integral and the Airy function, respectively, and do not satisfy normalization condition. Their properties to reconstruction the density matrix are studied in detail.
The report is based on the articles [1, 2].

References

[1] V.I. Man'ko and L.A. Markovich Symplectic tomography of de Broglie wave, J. Russ. Laser Res., 38(6), 507-515, 2017 (10.1007/s10946-017-9674-0)

[2] V.I. Man'ko and L.A. Markovich Unnormalized tomograms and quasi-distributions of quantum states, submitted to Communications in Mathematical Physics, 2017, (arXiv:1708.04847)

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