This paper establishes several fundamental theorems of the theory of integral transforms on derived categories of possibly singular varieties. Let me remark that this paper is written in the language of the derived algebraic geometry, so that a certain amount of knowledge is required.

The first main theorem (Theorem 1.1.3, Theorem 3.0.2) states that we have a one-to-one correspondence between coherent kernels with functors taking perfect complexes over $X$ to coherent complexes over $Y$, where $X$ is a proper relative algebraic space over $S$ and $Y$ is a locally Noether $S$-stack with $S$ a perfect stack. It is an analogue of the classical Schwartz kernel theorem in functional analysis.

The second main theorem (Theorem 1.2.4, Theorem 5.0.2) is a relative version of the first one. It establishes the equivalence between kernels which are coherent relative to the source with functors taking coherent complexes to coherent complexes. Here the relative coherence means finite Tor-dimension (Definition 1.2.3).

The proofs of both theorems, in particular of the second one, is based on the analysis of the shrink integral transforms (§4). Such a transform do not give an equivalence between the categories of shrink quasi-coherent sheaves. In Theorem 1.3.1 (Theorem 4.0.5) states that it gives an equivalence between categories of "bounded-above” sheaves, where the growth is estimated by the usage of $t$-structures.

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