

*Fourier–Mukai and Nahm*  
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*Fourier-Mukai for singular varieties and  
singular Mukai partners*

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**Abstract**

We study relative integral functors for singular varieties. We prove that a relative integral functor is an equivalence if and only if its restriction to every fibre is an equivalence. This allows us to construct a non-trivial auto-equivalence of the derived category of an arbitrary genus one fibration with no conditions on either the base or the total space and getting rid of the usual assumption of irreducibility of the fibres. We also extend to Cohen-Macaulay schemes the criterion of Bondal and Orlov for an integral functor to be fully faithful in characteristic zero and give a different criterion which is valid in arbitrary characteristic. Finally, we prove that for projective schemes both the Cohen-Macaulay and the Gorenstein conditions are invariant under Fourier-Mukai functors.