Three dimensional Fourier transform general formula for singular potentials

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By the use of the Abel summation method of any infinite integral, a three dimensional Fourier transform general formula can be derived for singular potentials. The present general formula contains all three dimensional Fourier transform formulas which are well known as Bethe-Salpeter formulas [H. A. Bethe and E. E. Salpeter, Handbuch der Physik, Bd. XXXV, 1957] as special cases. It is shown that, in several of the Bethe-Salpeter formulas, the integral does not converge in the meaning of the Riemann integral but converges in the meaning of hyper function as the Schwartz distribution. However, it is shown that these hyper functions cause no problem in typical molecular calculations. As examples for showing the usage of the present formula, simple molecular integrals are derived for singular potentials $S_{2m}(\vec{r})/r^5$ and $S_{2m}(\vec{r})/r^6$, where $S_{2m}(\vec{r}) (-2 \leq m \leq 2)$ is the 2nd-order solid harmonics.