# Expansion on plane waves and integral transformations between $\vec{x}-$ and $\vec{r}-$ representations

V.N. Kapshai

Department of Theoretical Physics, Gomel State University
Sovyetskaya ul. 104, 246019, Gomel, Belarus
Fax: + 375−232−576557
E-mail: kvn@gsu.unibel.by

Two methods of expansion of a quantum system wave function given in momentum representation on plane waves are considered:

a) the expansion on nonrelativistic plane waves $exp(i\vec{p}\vec{x})$,

b) the expansion on relativistic plane waves $\xi(\vec{r},\vec{p}) = ((p_0 - \vec{p}\vec{n})/m)^{-1-imr}$ [1].

Formulas connecting wave functions in $\overrightarrow{x}-$ and $\overrightarrow{r}-$ representations are discussed.

The partial expansion of all magnitudes of the approach is performed. As a result an explicit form of direct and inverse integral transformations for partial wave functions is found. The kernels of these transformations are expressed in terms of McDonald functions and $\Gamma$ - functions.

It is shown, that the obtained integral transformations are some generalizations of direct and inverse Kontorovich-Lebedev transformations.

# References

[1] Kadyshevsky V.G., Mir-Kasimov R.M., Skachkov N.B., Nuovo Cimento.- 1967.-X -Vol. 55.- P.233-257.