J. Math. Kyoto Univ. (JMKYAZ)
21-3 (1981) 517-535

On Hamada's theorem for a certain of the operators with double characteristics

By

Jiichiroh URABE

(Communicated by Prof. S. Mizohata, March 28, 1980)

§0. Introduction

We consider the non-characteristic Cauchy problem with meromorphic initial data for a linear partial differential operator with holomorphic coefficients in the complex domain.

Y. Hamada, J. Leray and C. Wagschal [1] treated this problem for the operator with constant multiple characteristics. Y. Hamada and G. Nakamura [2], [4] treated this problem for the operator with involutive characteristics of variable multiplicities. In the preceeding paper [5], the author treated this problem for the Tricomi operator $D_t^2-tD_x^2$ with lower order term whose coefficients depended on only t. In this paper we remove the condition on the lower order term's coefficients and treat the more general operator than the Tricomi operator with arbitrary lower order term.

Our method is to costruct the formal solution which was developed by D. Ludwig in [3] and to verify its convergence by using the majorant functions $\phi_\alpha(z, \zeta, y)$ due to Y. Hamada, which make us be able to remove the conditions on lower order term.

The author wishes to express thanks to Professor Y. Hamadr for his valuable advices.

§1. Assumptions and results

Let Ω be a neighbourhood of the origin of C^{n+1}, and $x=(x_0, x_1, \cdots, x_n)$ be a point of Ω. By $\mathrm{L}^k(\Omega)$, we mean the set of all linear partial differential operators of order k whose coefficients are holomorphic in Ω. Let $P(x, \mathrm{D})\in\mathrm{L}^m(\Omega)$, $Q(x, \mathrm{D})\in\mathrm{L}^{2m}(\Omega)$ and $R(x, \mathrm{D})\in\mathrm{L}^{2m-1}(\Omega)$. We shall be studying a linear partial differential operator belonging to $\mathrm{L}^{2m}(\Omega)$:

$$L(x, \mathrm{D})=P(x, \mathrm{D})^2-x_0Q(x, \mathrm{D})+R(x, \mathrm{D}).$$

We shall impose on $P(x, \xi)$ and $Q(x, \xi)$ the following conditions, where $\xi=(\xi_0, \xi_1, \cdots, \xi_n)$.

Assumption (A) (i) $P(x, \xi)$ is a homogeneous polynomial in ξ of degree m.

(ii) $P(x, 1, 0, \cdots, 0)=1$.