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On the existence of lateral waves

By

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§1. Introduction

We consider the reflection of the singularities at the boundary for hyperbolic equations with constant coefficients. In [5] and [6], we studied this problem in a very general framework, and determined the singular supports of the fundamental solutions by using the localization theorem. The wave which attracts our attension extremely is the lateral wave. Moreover there exists the case where it does not appear. The aim of this paper is to determine the case where the lateral wave arises.

In this paper we treat the following equation in the domain $\Omega=\{t>0, x>0, y=(y_1, y_2, \cdots, y_{n-1})\in R^{n-1}\}$:

$$(1.1)\qquad \begin{cases} P(D)u=(D_t^2-D_x^2-D_y^2)(a^2D_t^2-D_x^2-D_y^2)u=0 & \text{in } \Omega \\ (u, D_tu, D_t^2u, D_t^3u)=(0, 0, 0, i\delta_{(x-l,y)}) & \text{on } \partial\Omega\cap\{t=0\}, \\ B_j(D_t, D_x, D_y)u=0 & \text{on } \partial\Omega\cap\{x=0\}, j=1, 2, \end{cases}$$

where i) $a>1$ and $l>0$, ii) $D_t=-i\partial/\partial t$, $D_x=-i\partial/\partial x$, $D_{y_i}=-i\partial/\partial y_i$ and $D_y^2=\sum_{i=1}^{n-1}D_{y_i}^2$. B_j $(j=1, 2)$ are homogeneous differential operators of degree m_j $(m_1<m_2)$ with constant coefficients. The waves governed by $Pu=0$ propagate

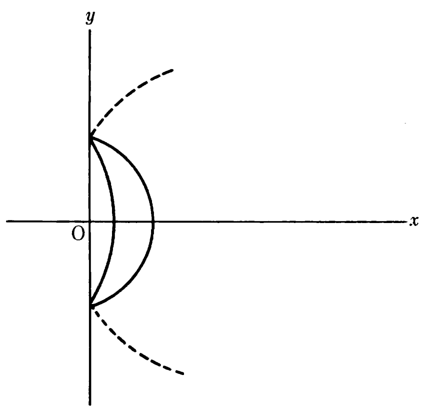

Figure 1

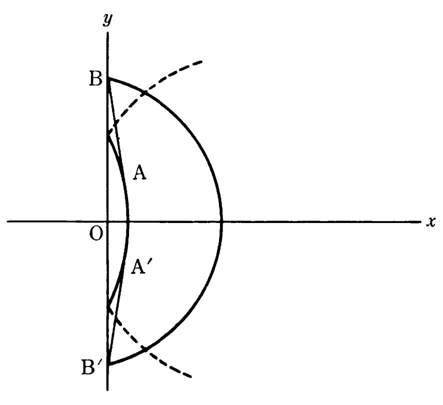

Figure 2