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$\mathscr{E}$-well posedness for hyperbolic mixed problems with constant coefficients

By

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Introduction. Hersh has made a characterization of hyperbolic mixed problems ([1], [2]), where it seems that there are some rough discussions, especially about analyticities. Recently, Shirota has also made its characterization by means of Lopatinski's determinants with some restrictions ([3]). In this paper, we deal with the same problem as Shirota without his restrictions.

Now we state our problems, assumptions and main results. We consider the mixed problem

$$(P)\begin{cases} A(D_t, D_x, D_y)u=f(t, x, y) & \text{for } t>0,\ x>0,\ y\in R^{n-1}, \\ B_j(D_t, D_x, D_y)u=g_j(t, y)(j=1,\dots, \mu) & \text{for } t>0,\ x=0,\ y\in R^{n-1}, \\ D_t^j u=h_j(x, y)(j=0, 1,\dots, m-1) & \text{for } t=0,\ x>0,\ y\in R^{n-1} \\ \left(D_t=\frac{1}{i}\frac{\partial}{\partial t},\ D_x=\frac{1}{i}\frac{\partial}{\partial x},\ D_y=\left(\frac{1}{i}\frac{\partial}{\partial y_1},\dots,\frac{1}{i}\frac{\partial}{\partial y_{n-1}}\right)\right), \end{cases}$$

where $\{A, B_j\}$ are differential operators of orders $\{m, r_j\}$ with constant coefficients and $\{f, g_j, h_j\}$ are given deta. We denote the principal parts of $\{A, B_j\}$ by $\{A_0, B_{j0}\}$. We assume

i) A is hyperbolic with respect to $(1, 0, 0)$, i.e.

$$\begin{cases} A_0(1, 0, 0)\neq 0, \\ A(\tau, \xi, \eta)\neq 0 \quad \text{for } \operatorname{Im}\tau<-\gamma_0,\ (\xi, \eta)\in R^n, \end{cases}$$