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*On second order weakly hyperbolic equations and the ultradifferentiable classes*

## Abstract

Let us consider the Cauchy problem for second order weakly hyperbolic equation with time dependent coefficient:

$$\begin{cases} \left(\partial_t^2 - a(t)^2\Delta\right) u = 0, & (t,x) \in (0,T] \times \mathbf{R}^n, \\ (u(0,x), u_t(0,x)) = (u_0(x), u_1(x)), & x \in \mathbf{R}^n, \end{cases} \tag{1}$$

where $a(t) \in C^\infty([0,T))$ satisfies $C^{-1}\lambda(t) \le a(t) \le C\lambda(t)$ with a positive constant $C > 1$ and a strictly decreasing function $\lambda(t)$ satisfying $\lambda(T) = 0$. Moreover, we assume that

$$|a^{(k)}(t)| \le \lambda(t) M_k \rho(t)^k \quad (k = 1, 2, \ldots)$$

for a positive function $\rho(t)$ and a logarithmical convex sequence $\{M_k\}$. Our main purpose is to describe the weight function $\mu$ for the estimate

$$|(\hat{u}(t,\xi), \hat{u}_t(t,\xi))| \le e^{\mu(\langle\xi\rangle)} |(\hat{u}_0(\xi), \hat{u}_1(\xi))|,$$

which implies the well-posedness of (1) in $\mu$-ultradifferentiable class of Beurling-Roumieu type, by $\lambda(t)$, $\rho(t)$ and $\{M_k\}$.

## Bibliography

[1] Hirosawa, F., *On second order weakly hyperbolic equations with oscillating coefficients and regularity loss of the solutions*, Math. Nachr., **283**, 1771–1794 (2010).

[2] Hirosawa, F. and Ishida, H., *On second order weakly hyperbolic equations and the ultradifferentiable classes*, submitted.