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RESTRICTION THEOREMS AND MAXIMAL OPERATORS RELATED TO OSCILLATORY INTEGRALS IN $\mathbb{R}^3$

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0. Introduction. In this paper we continue the investigation started in [MVV]. We are interested in some estimates of oscillatory integrals and in their relation with the almost everywhere convergence to the initial data of some dispersive equations of the type

$$(0.1)\qquad i\partial_t u(x,t) = \left(\frac{-\Delta_x}{4\pi^2}\right)^{a/2} u(x,t), \qquad (x,t) \in \mathbb{R}^2 \times \mathbb{R},$$

$$u(x,0) = u_0(x), \qquad x \in \mathbb{R}^2,$$

where $a > 1$.

The solution to (0.1) can be written as

$$(0.2)\qquad e^{it(-\Delta)^{(a/2)}} u_0 = u(x,t) = \int_{\mathbb{R}^2} e^{2\pi i x\xi - it|\xi|^a} \widehat{u_0}(\xi)\, d\xi,$$

where

$$\widehat{u_0}(\xi) = \int_{\mathbb{R}^2} e^{-2\pi i x\xi} u_0(x)\, dx.$$

Then (0.2) is a particular example of the more general oscillatory integral

$$(0.3)\qquad \widehat{fd\sigma}(\xi,\xi_3) = \int_{|x|\leqslant 1} e^{-2\pi i(x\cdot\xi + \Phi(x)\xi_3)} f(x)\, dx, \qquad (\xi,\xi_3) \in \mathbb{R}^2 \times \mathbb{R}.$$

A natural assumption for the phase function Φ in (0.3) is the nondegeneracy of the Hessian matrix of Φ. From a geometric point of view, this means that the surface $x_3 = \Phi(x)$ has nonzero gaussian curvature. However, we are not able to consider the problem with this generality, and we restrict ourselves to the elliptic

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