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ANOTHER PROOF OF THE REPRESENTATION FORMULA OF THE SCATTERING KERNEL FOR THE ELASTIC WAVE EQUATION

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§ 0. Introduction

In 1977, Majda [6] proved a representation formula of the scattering kernel for the scalar-valued wave equation. Melrose [7] and Soga [9] obtained the equivalent representation formula. This formula was very useful to investigate the inverse scattering problems (cf. Majda [6], Soga [9], [10]). For the elastic wave equation, Shibata and Soga [8] recently have given us the scattering theory by the same conception as in Lax and Phillips [4] and a representation formula has been proved by Soga [11]. Since he uses the same approach as in the case of the scalar-valued wave equation (cf. Soga [9]) it is necessary to get the leading terms of integrals $\int_{S^{n-1}}(J_{\pm}k)(t\varphi(\omega), \omega)d\omega$ as $|t|\to\infty$, where $J_{\pm}$ is a pseudo-differential operator with a homogeneous symbol of order $(n-1)/2$ (for the precise definition of $J_{\pm}$ see § 1). This caused the difficulty in his strategy and the necessity of the convexity of each slowness surface.

In the present paper, we give a proof of the representation formula of the scattering kernel for the elastic wave equation without a convexity assumption of the slowness surfaces. Our proof is based on a kernel representation for the Fourier transform of the scattering kernel (cf. Theorem 1.2 in § 1). Since the Fourier transformation changes the operator $J_{\pm}$ into a multiplication operator, in the proof of that kernel representation we do not meet the difficulty in Soga [11] stated above. Furthermore, we do not need the convexity assumption of the slowness surfaces to obtain that kernel representation. This is one of the main parts in the present paper. Thus, our proof gives us not only the simplicity but also the removal of the convexity assumption of the slowness surfaces.

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