

# *Radiation Patterns and Radiation Fields\**

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**1. Introduction.** Consider a scalar radiation field, described by a function  $U$ , which satisfies

$$\Delta U + k^2 U = 0$$

with positive real  $k$  outside a certain finite region  $G$ . Let this function  $U$  satisfy the Sommerfeld radiation conditions. This function then may be regarded as being generated by volume sources, surface sources, or point singularities, all of which are inside  $G$ .

The radiation pattern of the field is then given by the asymptotic behavior of the function  $U$  at infinity. The object of this paper is to investigate the relation between the radiation pattern and the function  $U$ . We shall prove first that when we introduce spherical coordinates  $(x) = R(\xi)$ , any function which has the properties mentioned above satisfies, for  $R \rightarrow \infty$ , an asymptotic relation

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