

EQUIVALENCE PRINCIPLES

• Justified by uniqueness Thm.

• Basic Approach:

1) want to determine fields in a region due to specified sources & BC's

2) Direct calculation appears too hard. Use shortcut. Find a different (equivalent) set of sources giving the correct fields in the region of interest (but typically not correct outside region of interest) and for which the fields are more easily determined.

Example: our ^{integral} tools were developed for a single medium problem:

PDE's can deal with $\epsilon(\underline{r})$, $\mu(\underline{r})$, but the integrals work best for single media problems

$$\begin{cases} \nabla^2 \underline{A} + \beta^2 \underline{A} = -\mu \underline{J} & \nabla^2 \underline{F} + \beta^2 \underline{F} = -\epsilon \underline{M} \\ \underline{A} = \frac{\mu}{4\pi} \iiint \frac{\underline{J}(\underline{r}') e^{-j\beta R}}{R} d^3 r' & \underline{E} = \underline{E}_A + \underline{E}_F \\ \underline{F} = \frac{\epsilon}{4\pi} \iiint \frac{\underline{M}(\underline{r}') e^{-j\beta R}}{R} d^3 r' & \underline{H} = \underline{H}_A + \underline{H}_F \end{cases}$$

thus:



this can be a tough problem, using these tools.