Field distribution in 1D random multilayer system

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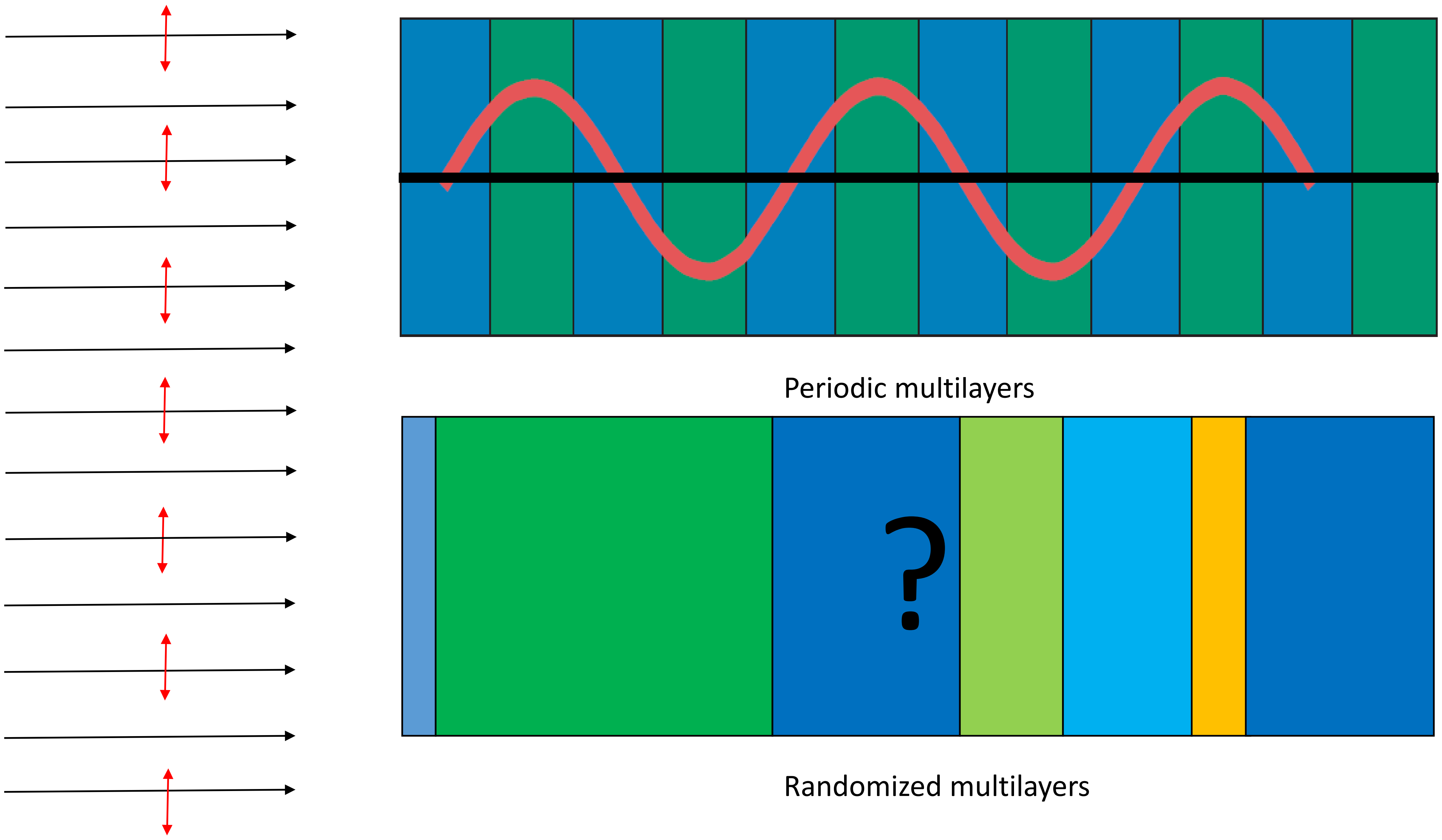
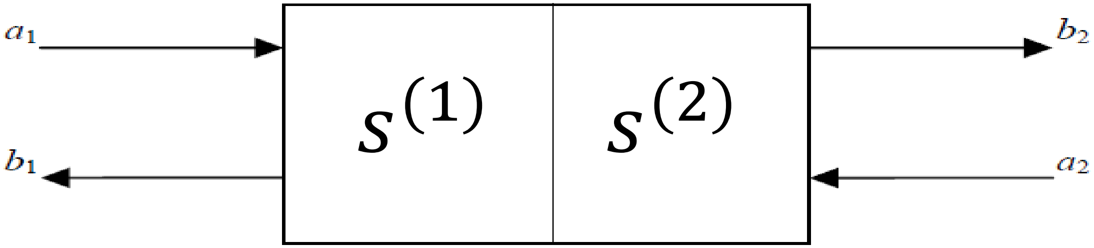

Periodic multilayers
?
Randomized multilayers

Scattering Matrix
for one layer

$$\begin{bmatrix} b_1 \\ b_2 \end{bmatrix} = \begin{bmatrix} s_{11} & s_{12} \\ s_{21} & s_{22} \end{bmatrix} \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} r & t' \\ t & r' \end{bmatrix} \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$$

Scattering Matrix
for two layers



$$s^{(1-2)}\left(s^{(1)}, s^{(2)}\right)$$

Like $s_{21}^{(1-2)} = \dfrac{s_{21}^{(1)} s_{21}^{(2)}}{1 - s_{11}^{(2)} s_{22}^{(1)}}$

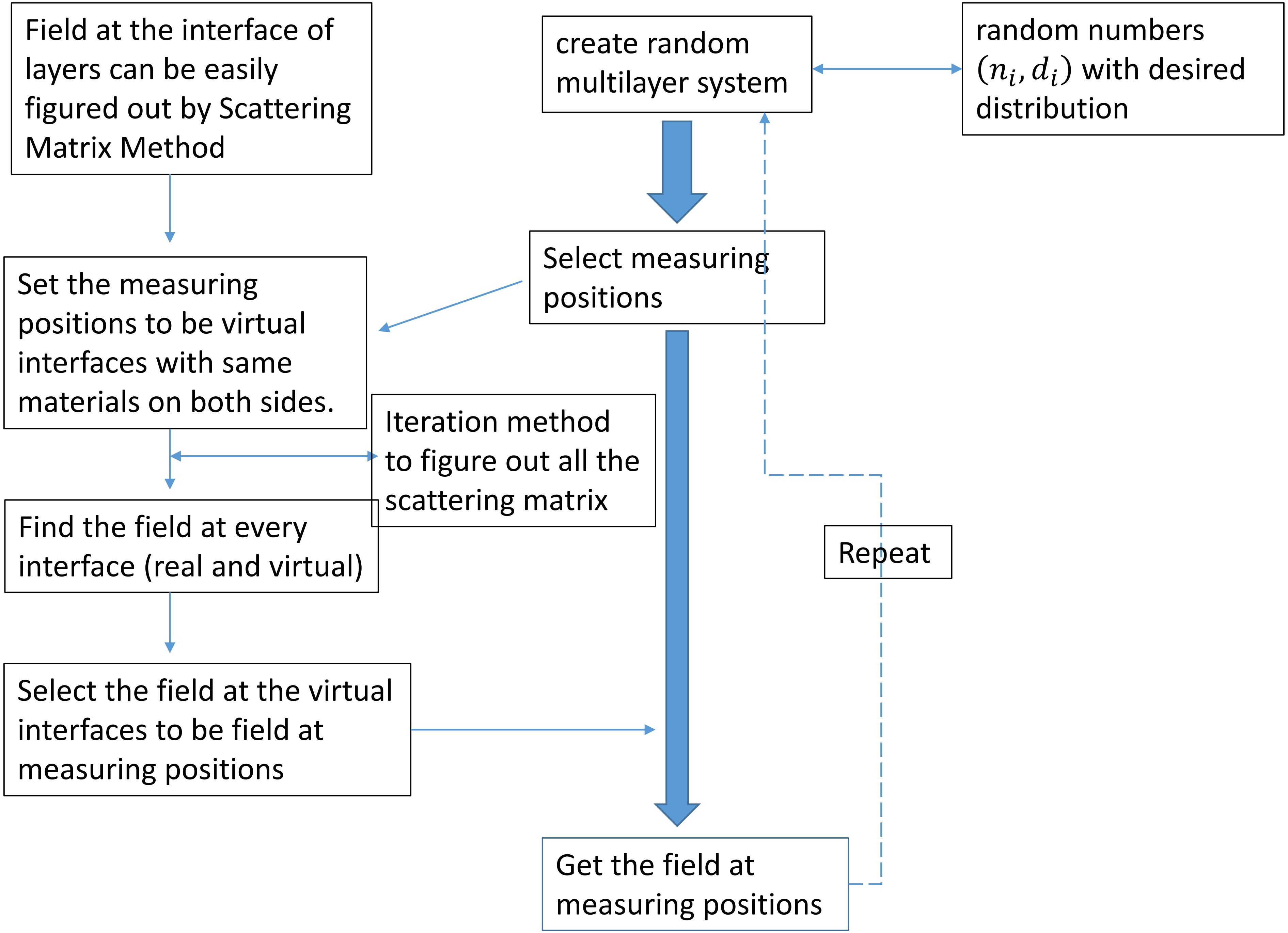
a(b) represents the field propagating to some direction

For N-layer case with left incident wave boundary condition $(a_1 = 1, a_2 = 0)$

$$EB_k = \frac{s_{11}^{(1-N)} - s_{11}^{(1-k)}}{s_{12}^{(1-k)}}, EF_k = s_{21}^{(1-k)} + EB_k\, s_{22}^{(1-k)}$$

$$E_k = EB_k + EF_k$$

Field at the interface of layers can be easily figured out by Scattering Matrix Method


Field at the interface of layers can be easily figured out by Scattering Matrix Method
create random multilayer system
random numbers (n_i, d_i) with desired distribution
Select measuring positions
Set the measuring positions to be virtual interfaces with same materials on both sides.
Iteration method to figure out all the scattering matrix
Find the field at every interface (real and virtual)
Repeat
Select the field at the virtual interfaces to be field at measuring positions
Get the field at measuring positions