

MEDT8007 Simulation methods in Medical Imaging

Exercise 4

Transducer simulations using xTrans

Use composite with parameters as shown below

h 10^8 V/m	$\varepsilon/\varepsilon_0$	Z MRayl	c m/s	q
22.2	580	15	3670	30

Set up a xTrans model for a 6 MHz transducer, with 1 matching layer.
Let the backing be air (400 Rayls), the load is tissue, 1.65MRayls.
Choose matching layer for flat response.

Find H_{it} and Z_e for the transducer.

How will the two parameters be changed if the backing is changed to 3 MRayls?
And if you use 2 matching layer (maximally flat response).

Use the model with 2 matching layers and 3 Mrayl backing.
Find serial tuning inductance for the transducer and use a cable with 150 pF total capacitance.
Assume preamp input resistance 70 Ω .
Find the receive voltage level for the transducer with and without tuning.

Find the received pulse, assume 1 period sinus pressure pulse incoming.

Find the pulse echo level when applying 1 period sinus, 1V pulse at 6 MHz, and we have total reflection.

Compare reflection coefficient for the tuned transducer, (without cable), with the one for matched impedance to the transducer.