醫用超音波原理

Computer Homework #2: Beam Formation
Due 12:00pm 5/2/2006 by emailing to
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0. Load hw2_dat.mat. In this data file, *apertureU* defines a uniform aperture and *apertureH* defines an aperture with non-uniform weighting. The spacing between two points in both cases is defined by *d0* in *mm*. The vector *pulseF* defines a pulse spectrum of a particular excitation with the frequency axis specified by *faxis* (in *MHz*). Finally, the sound propagation velocity is defined by *soundV* in *mm/μsec*. In all figures, please label all axes.
1. Assuming a continuous wave at 5MHz from the far field and zero incidence angle, plot the magnitude of the one-way diffraction patterns for both *apertureU* and *apertureH* (in dB). The horizontal axis should be $\sin\theta$ from –1 to 1. (20%)
2. Assuming a pulse wave which has the frequency response specified by *pulseF* and *faxis*, plot the magnitude of the one-way, far-field diffraction patterns (zero incidence angle) for both *apertureU* and *apertureH* (in dB). The horizontal axis should be $\sin\theta$ from –1 to 1. (20%)
3. Calculate the –6dB and –20dB mainlobe widths of the diffraction patterns obtained from 1 and 2. Comment on your answers and the sidelobe levels between two different apodization schemes. (20%)
4. Repeat 3 if the incidence angle is at 45 degrees. Justify your answers (20%)
5. Repeat 2 and 3 if the aperture is focused at 60 mm but the diffraction patterns are drawn at 55 mm and 65 mm, respectively. Comments on your answers. (20%)
6. (Bonus) Use the simulation programs to investigate dual beam formation (transmit/receive aperture, beam spacing).