醫工導論
生醫超音波技術作業
due 11/11/2003 5pm（請逕投 309 信箱）

1. Suppose the sound velocity in tissue is 1500 m/sec and suppose a 128 element transducer array being constructed with a center frequency of 3MHz, an aperture size of 5cm, and uniform weighting (apodization). (a) What is the angle of the grating lobe when the radiation pattern is steered to 45^o? (b). What is the maximum steering angle without the presence of grating lobes ? (c). If the array is weighted by a hamming function (as opposed to uniform weighting), describe the effects of non-uniform weighting on the radiation pattern. Hamming weighting is specified as

$$w = 0.54 - 0.46*\cos(2\pi*(i-1)/(127)),$$

where i is the channel index (1 to 128).

2. Assume that a transducer array (90^o sector format for B-mode) has 128 elements, $\lambda/2$ interelement spacing at 3MHz and the B-mode display depth is 20cm. Also assume that the Color Doppler display area is from -30^o to 30^o and from 5cm to 15cm. If a [1 –2 1] wall filter is used and sound velocity is 1500m/sec, (a) what is the maximum achievable frame rate for the mean velocity estimation ? (b). what is the maximum achievable frame rate for the variance estimation ? (c). what is the maximum achievable frame rate for the energy estimation ? (d). If a 4 tap wall filter is used for better tissue rejection, what is the maximum achievable frame rate for the mean velocity estimation?