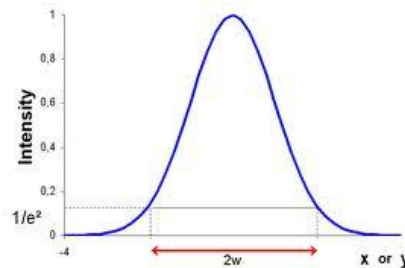


Medical Instrumentation – Exercise #2

1. When scanning a uniform water phantom inside a CT scanner at 100keV, the maximum attenuation measured over a small area in different places within the phantom was found to range from 0.169 to 0.171 cm^{-1} . Calculate the uniformity of this CT scanner.
2. Determine the spatial resolution in lp/cm of a CT scanner with an MTF that drops to 50% at 4 cm^{-1} .
3. For a CT scanner with low-contrast resolution of 0.5%, determine the smallest detectable of attenuation coefficients given that the average attenuation within the imaged object is 300 HU.
4. To test the linearity of a CT scanner, 3 materials were scanned with the following results:
 - Material 1: known attenuation coefficient=0.20, measured CT number= 10
 - Material 2: known attenuation coefficient=0.19, measured CT number= -100
 - Material 3: known attenuation coefficient=0.24, measured CT number= 100Compute the linearity parameter of this CT scanner.
5. Compute the slice thickness of a CT scanner with a sensitivity profile shown with $w=2\text{mm}$:



6. If the width of the collimated x-ray beam (or slice width) in a spiral CT scanner is 2 mm, compute the required relative spiral travel in mm/rad to reach a pitch of 1.0.