
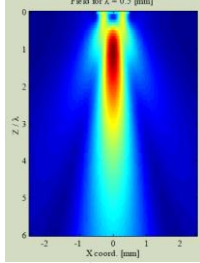



آزمون فراصوتی
Ultrasonic Testing (UT)
باریکه فراصوتی (Ultrasonic beam)

مدرس: دکتر فرهنگ هنرور
 گروه ساخت و تولید
 دانشکده مهندسی مکانیک
 دانشگاه صنعتی خواجه نصیرالدین طوسی

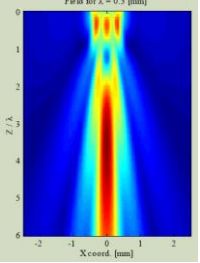

میدان صوتی پروب فراصوتی

Transducer field in water, transducer 1x1 mm



Field for $\lambda = 0.5$ [mm]


Field for $\lambda = 0.3$ [mm]



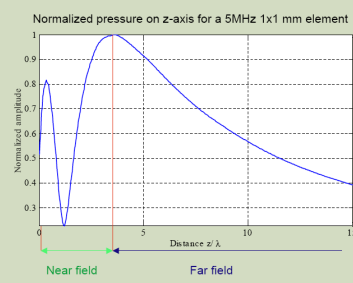
$$\lambda = \frac{c}{f}$$

f – frequency
 c – sound velocity
 λ – wavelength
 $c_{H_2O} = 1480$ m/s

Acknowledgements to Tadeusz Stepinski


میدان دور و نزدیک

Near and far field



Normalized pressure on z-axis for a 5MHz 1x1 mm element

Near field length for a circular element

$$N \cong \frac{d^2 f}{4c} = \frac{d^2}{4\lambda}$$


d – diameter
 f – frequency
 c – sound velocity
 λ – wavelength

Near field length for a circular element

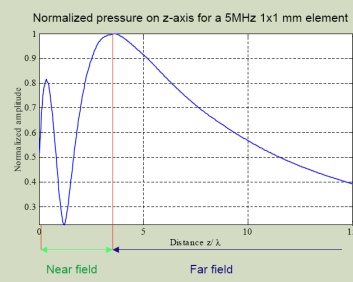
$$N \cong \frac{d^2 f}{4c} = \frac{d^2}{4\lambda}$$

d – diameter
 f – frequency
 c – sound velocity
 λ – wavelength

Acknowledgements to Tadeusz Stepinski


زاویه گستردهگی پرتو

Near and far field



Normalized pressure on z-axis for a 5MHz 1x1 mm element

Near field length for a circular element

$$N \cong \frac{d^2 f}{4c} = \frac{d^2}{4\lambda}$$

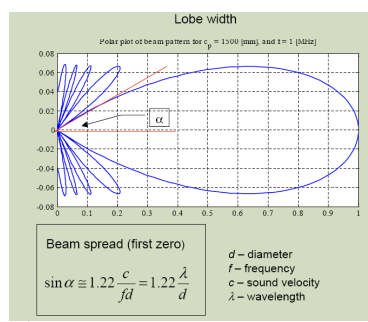
d – diameter
 f – frequency
 c – sound velocity
 λ – wavelength


Near field length for a circular element

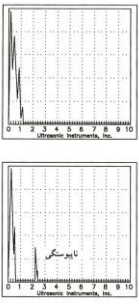
$$N \cong \frac{d^2 f}{4c} = \frac{d^2}{4\lambda}$$

d – diameter
 f – frequency
 c – sound velocity
 λ – wavelength

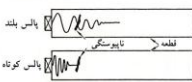
Acknowledgements to Tadeusz Stepinski




منطقه مرده (Dead Zone)




تایپستگ



پالس بلند
پالس کوتاه

Acknowledgements to Tadeusz Stepinski


نمونه برگه کالیبراسیون پروب

TRANSUCER DESCRIPTION

PART NO.: 1000 FREQUENCY: 5.00 MHz
 SERIAL NO.: 100000 ELEMENT SIZE: 25 x 25A

TEST INSTRUMENTATION

PULSER MODEL: FRAME TRACE SIZE (X,Y):
 CURVE COLLECTION: ELEMENT AND Z-DEPTH (mm):
 TEST PROGRAM: TEST FREQUENCY: 5.00 MHz
 SELECT: TEST MODE: TEST MODE: TEST MODE:
 CHANNEL: TEST MODE: TEST MODE: TEST MODE:

TEST CONDITIONS

PULSER ENERGY: 10.000
 PULSER RISE TIME: 10.000
 PULSER FALL TIME: 10.000
 PULSER WIDTH: 10.000
 PULSER POSITION: 10.000
 PULSER ATTENUATION: 10.000
 PULSER BACKWALL OF: 31.6 POLYSTYRENE

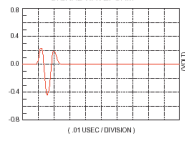
MEASUREMENTS PER ASTM E1005

MEASUREMENT POSITION: SPECTRUM MEASUREMENT: 0.0000 Hz
 CENTER FREQUENCY: CENTER FREQUENCY: 5.0000 Hz
 BANDWIDTH: BANDWIDTH: 10.000 Hz
 CENTER FREQUENCY: CENTER FREQUENCY: 5.0000 Hz
 BANDWIDTH: BANDWIDTH: 10.000 Hz

COMMENTS:

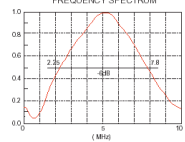
**ACCEPTED
 TECHNICIAN: DATE: 08-22-07

SIGNAL WAVEFORM



(0.10000 DIVISION)

FREQUENCY SPECTRUM

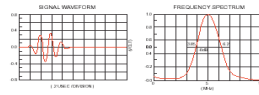


(MHz)

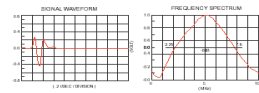
Acknowledgements to Tadeusz Stepinski



نقش ماده پستی در میرایی پروب



پروب با میرایی کم



پروب با میرایی زیاد