LAMPIRAN

LAMPIRAN

LAMPIRAN 1

Contoh data yang diperoleh dari simulasi COMSOL34 MULTIPHYSICS

% Coordinates

0.0	243.16252
1.0E-6	-266.71298
2.0E-6	1281.3728
3.0E-6	-4178.7983
4.0E-6	6695.465
5.0E-6	-3900.5056
6.0E-6	-1643.714
7.0E-6	3164.3442
8.0E-6	-1519.9358
9.0E-6	319.76202
1.0E-5	-102.75486
…….	……
1.0E-04	4.1820493

% Elements (lines)

1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
…	….
100	101

LAMPIRAN 2

Program pembentukan citra pada MATLAB

```
clear all; % fungsi untuk membersihkan data pada workspace dari
        % program yang telah dijalankan sebelumnya
clc;      % fungsi untuk membersihkan data pada command window dari
        % program yang dijalankan sebelumnya
 %% untuk membuka file data
 n=1:70;
file_n=load('name_file_n.txt'); % fungsi untuk membuka data hasil
                        % simulasi COMSOL34 MULTIPHYSICS
file_n(:,1)=[]; % fungsi untuk mereduksi data pada posisi x, karena
            % data yang ingin diambil hanya data amplitudo sinyal
 %% memberikan penguatan
 A0=1;                % konstanta pengali
x=[1:2001];         % waktu yang kisarannya disesuaikan dengan waktu
              % pada simulasi COMSOL34 MULTIPHYSICS
alfa=9.75e-03;      % nilai alfa bergantung kepada operator bergantung
                    % kepada tiap sinyal yang muncul.
P=(A0.*(1-exp(-alfa.*x)))*(1e04); % fungsi penguatan sinyal
 %% membentuk matriks citra
matriks_image=[file_1 file_2 file_3 … … … … file_n];
 % mereduksi sinyal transmisi.
% sinyal transmisi dari hasil simulasi comsol dapat direduksi dengan memperkirakan sinyal
transmisi % berada pada posisi x = 0:i dimana nilai i untuk semua sinyal sama karena sinyal
transmisi yang
% diberikan oleh transducer untuk semua posisi sama karena frekuensinya sama selanjutnya
reduksi
% juga dilakukan untuk menghilangkan data elemen dari hasil Comsol nilai elemen dihilangkan
karena % nilai elemen hanya digunakan sebagai pemberitahuan jumlah data yang diambil per
satuan waktu.
% untuk mengetahui nilai akhir pemunculan citra dapat dilihat nilai akhir dari elemen. Untuk
semua
% sinyal nilai elemen ini sama karena waktu pemancaran gelombang ultrasonik untuk tiap proses
% scanning sama. untuk simulasi pada tugas akhir ini nilai i bernilai 110 dan m bernilai 1001. ini
% karena jumlah data yang diperoleh untuk tiap sinyal adalah 1001 data. sedangkan untuk nilai
% matriks y semua nilai y yang diperoleh dari simulasi COMSOL digunakan karena nilai
% y menandakan amplitudo dari setiap nilai echo yang muncul.
i = 131;       % nilai akhir dari data sinyal yang ditransmisikan, dapat  dilihat dari data sinyal
```

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```
m = 1001; % jumlah data sinyal yang dihasilkan
A=matriks_image((i+1):m,1:end); % matriks baru setelah mereduksi sinyal
figure      % fungsi ini untuk membuka kanvas citra
imagesc(A)  % fungsi untuk menampilkan citra dari matriks yang telah dihasilkan dari
pengabungan
            % semua data dari hasil COMSOL
colormap(gray) % fungsi untuk menghasilkan citra dengan warna gray scale
```

LAMPIRAN 3

Spesifikasi transducer PT900 **Ultrasonic Thickness Gauge Specifications** yang digunakan :

Measurement Range	: 1.0mm to 200.00 mm in carbon steel This is dependent upon the transducer used and the material measured.
Resolution	: ± （0.5%H + 0.1） mm
Velocity	: 1000 — 9999 m/s
Diameter	: 1 cm
Panjang	: 8 cm
Temperature Range	: -20℃- +50℃
Weight	: 50g

LAMPIRAN 4

Dual Element Transducers

A dual element transducer consists of two crystal elements housed in the same case, separated by an acoustic barrier. One element transmits longitudinal waves, and the other element acts as a receiver.

For information on transducers for MG2 and 37 Series thickness gages, see pages 28-29.

Advantages

- Improves near surface resolution
- Eliminates delay line multiples for high temperature applications
- Couples well on rough or curved surfaces
- Reduces direct back-scattering noise in coarse grained or scattering materials
- Combines penetration capabilities of a lower frequency single element transducer with the near surface resolution capabilities of a higher frequency single element transducer
- Can be contoured to conform to curved parts

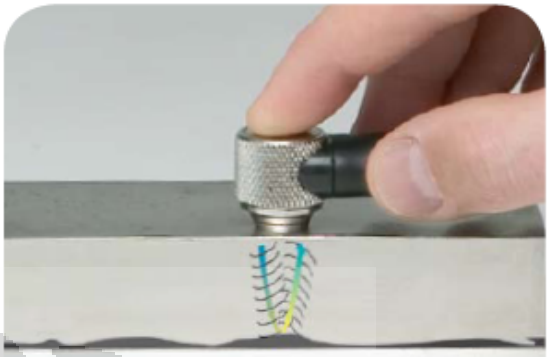
Applications

- Remaining wall thickness measurement
- Corrosion/erosion monitoring
- Weld overlay and cladding bond/disbond inspection
- Detection of porosity, inclusions, cracks, and laminations in castings and forgings
- Crack detection in bolts or other cylindrical objects
- Maximum temperature capability is 800° F (425° C) for 5.0 MHz and below; 350° F (175° C) for 7.5 MHz and 10 MHz. Recommended duty cycle for surface temperatures from 200° F (90° C) to 800° F (425° C) is ten seconds maximum contact followed by a minimum of one minute air cooling (does not apply to Miniature Tip Dual)

Flush Case Duals

- Metal wear ring extends transducer life
- Wear indicator references when transducer face needs resurfacing
- Knurled, 303 stainless steel case
- Replaceable cable design (special dual cables with strain relief available)

Frequency	Nominal Element Size		Transducer Part Numbers
MHz	inches	mm	
1.0	0.50	13	DHC703-RM
2.25	0.50	13	DHC706-RM
	0.25	6	DHC785-RM
5.0	0.50	13	DHC709-RM
	0.25	6	DHC711-RM
10	0.25	6	DHC713-RM



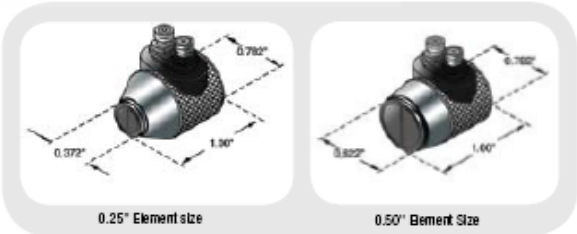
Two angled elements create a V-shaped sound path in the test material. This pseudo-focus enhances resolution in the focal zone.

Flush Case Dual Cables

Cable Part Number	Fits Connector Style
BCMD-316-5F	Dual BNC to Microdot®
L1CMD-316-5F	Dual Large LEMO® 1 to Microdot®
LCMD-316-5F	Dual Small LEMO® 00 to Microdot®

Composite Element Flush Case Duals

Frequency	Nominal Element Size		Transducer Part Number
MHz	inches	mm	
2.25	0.50	13	CHC706-RM



LAMPIRAN 5

Spesifikasi Osiloskop Tektronix TDS 2024

Features:

- 60 MHz, 100 MHz and 200 MHz Bandwidths
- Sample Rates up to 2 GS/s
- 2 or 4 channels
- 2.5 k Points Record Length
- Color or Monochrome LCD Display
- Auto-set Menu with Waveform Selection
- Probe Check Wizard to Ensure Correct Probe Usage
- Context-Sensitive Help
- Dual Time Base
- Advanced Triggering
- 11 Automatic Measurements
- Multi-language User Interface
- Waveform and Setup Memories
- FFT Standard on All Models
- Optional RS232, GPIB and Centronics Printer Interfaces with TDS2CMAX Module
- Optional CompactFlash Memory Storage, RS232 and Centronics Printer Interfaces with TDS2MEM Module
- Only 12.75"W x 5.96"H x 4.9"D, 4.4 lbs.

Description

The TDS1000 and TDS2000 Series digital storage oscilloscopes deliver an unbeatable combination of superior performance, unmatched ease-of-use, and affordability in an ultra lightweight, portable package. These new products extend the performance and ease-of-use features in the former TDS200 Series, the benchmark for low-cost oscilloscopes.

Affordable Digital Performance

With up to 200 MHz bandwidth and 2 GS/s maximum sample rate, no other color digital storage oscilloscope offers as much bandwidth and sample rate for the price. The TDS1000 and TDS2000 Series oscilloscopes provide accurate real-time acquisition up to their full bandwidth. These instruments offer advanced triggering, such as pulse width triggering and line-selectable video triggering, and 11 standard automatic measurements on all models. The Fast Fourier Transform (FFT) math function allows the user to analyze, characterize and troubleshoot circuits by viewing frequency and signal strength (standard).

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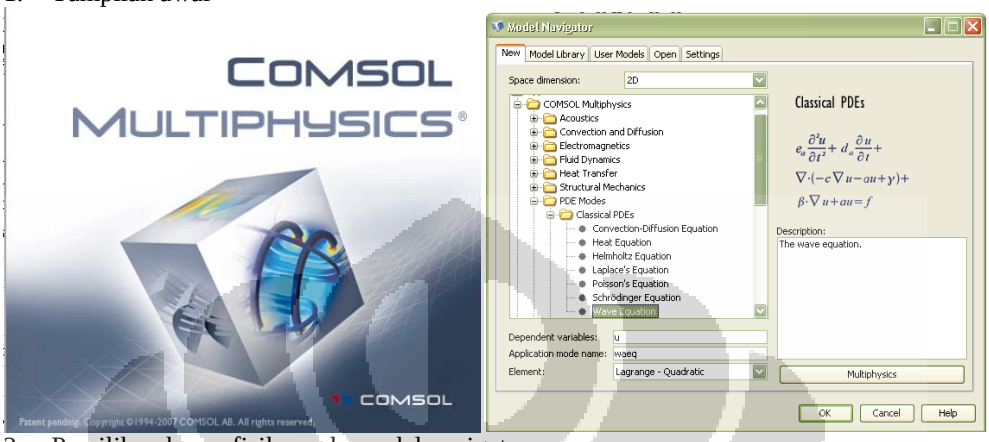
Ultra-fast Setup and Use
The simple user interface with classic, analog-style controls makes these instruments easy to use, reducing learning time and increasing efficiency. Innovative features such as the autoset menu, probe check wizard, context-sensitive help menu and color LCD display (TDS2000 Series) optimize instrument setup and operation.

Simple, Speedy Documentation and Analysis
OpenChoice® solutions deliver simple, seamless integration between the oscilloscope and the personal computer, providing you with multiple choices to easily document and analyze your measurement results. Choose from optional communication modules, CompactFlash mass storage capability, OpenChoice software or integration with third-party software.

LAMPIRAN 6

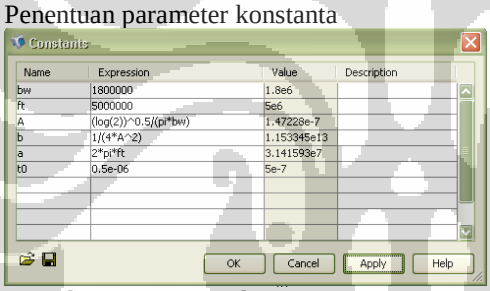
Tahapan Simulasi COMSOL

1. Tampilan awal

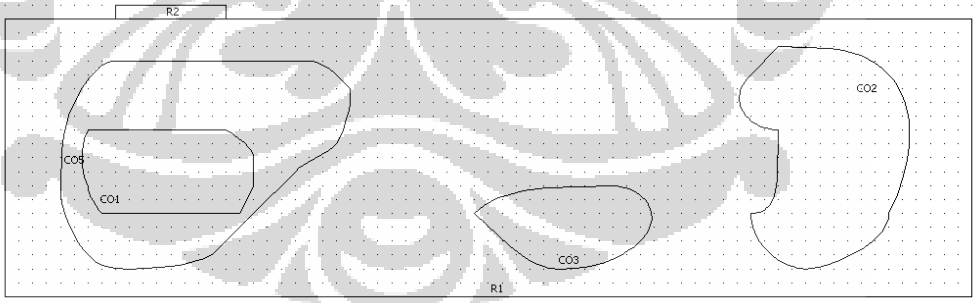


2. Pemilihan kasus fisika pada model navigator

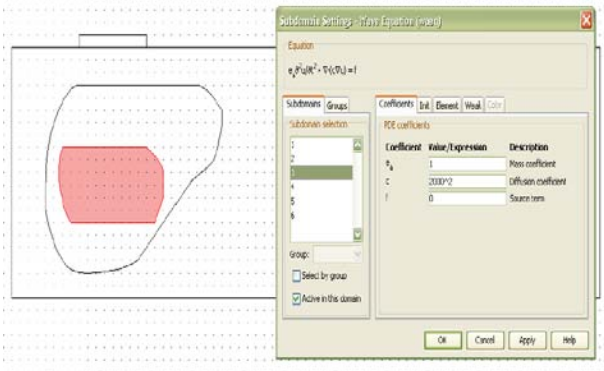
3. Penentuan parameter konstanta



4. Bentuk geometri simulasi



5. Penentuan parameter subdomain



6. Penentuan parameter boundary condition

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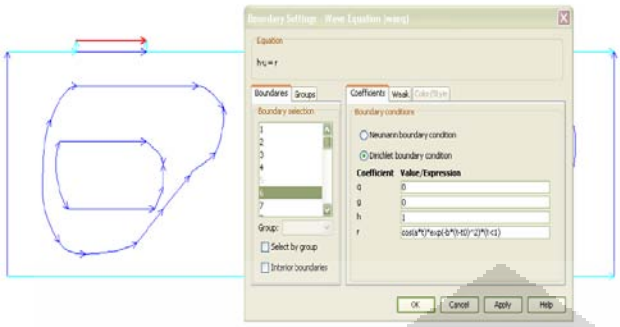
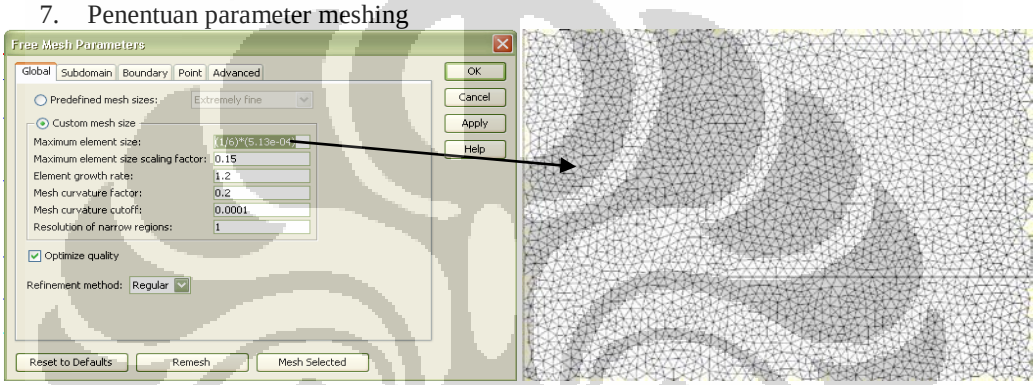
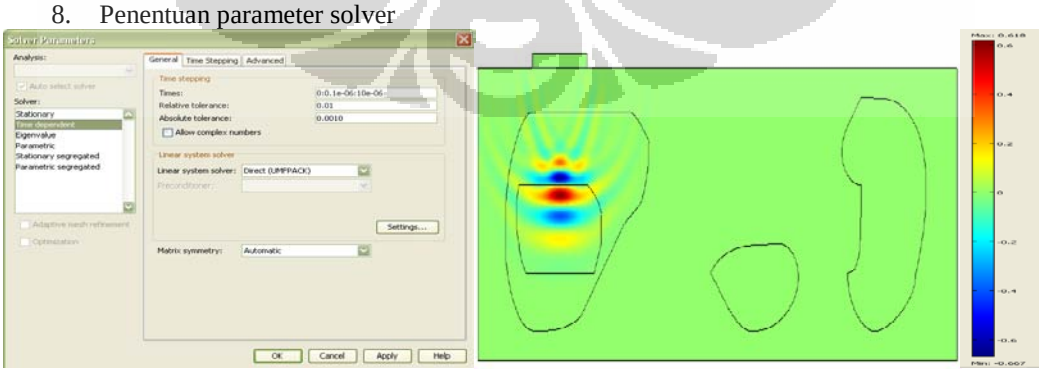


7. Penentuan parameter meshing



8. Penentuan parameter solver



9. Hasil tampilan

10. Post processing, untuk menghasilkan data yang diinginkan dilakukan pada tahapan post processing pada bagian cross-section plot parameter

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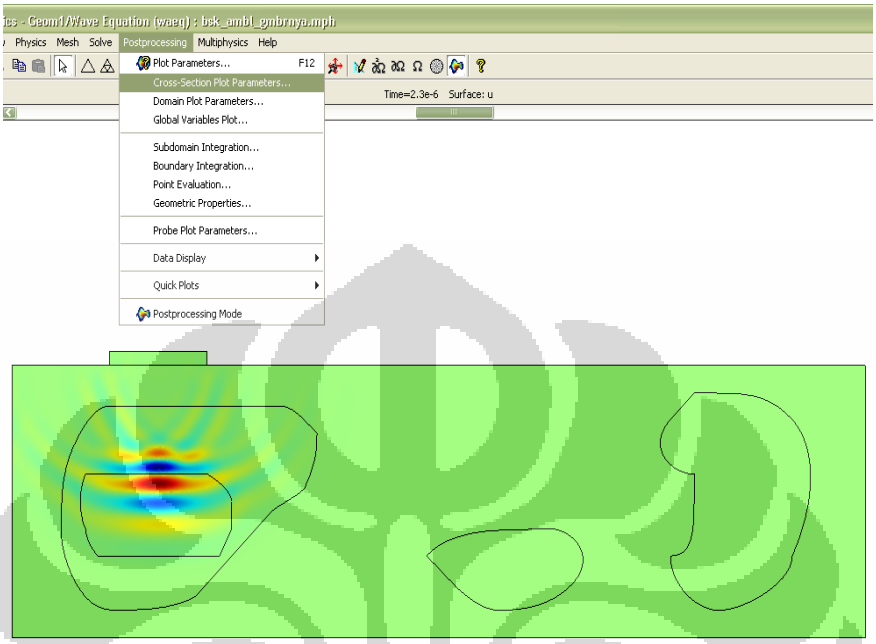
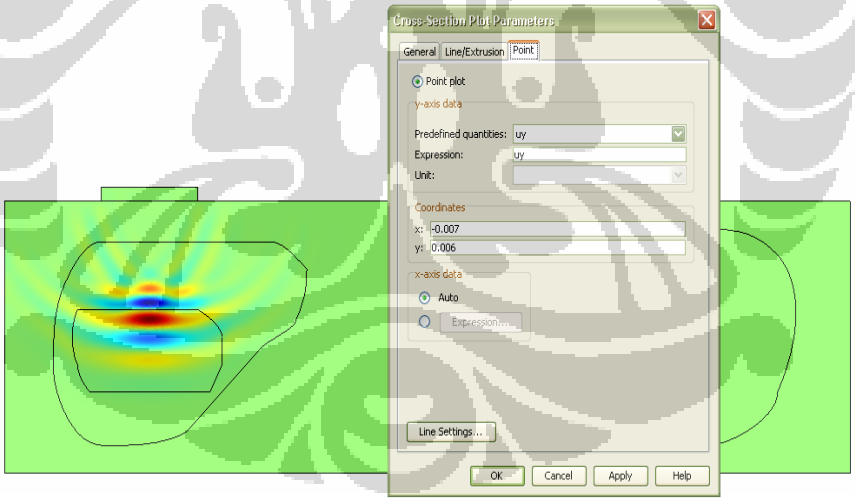


11. Parameter yang digunakan adalah uy



12. Data yang dihasilkan seperti pada lampiran 1