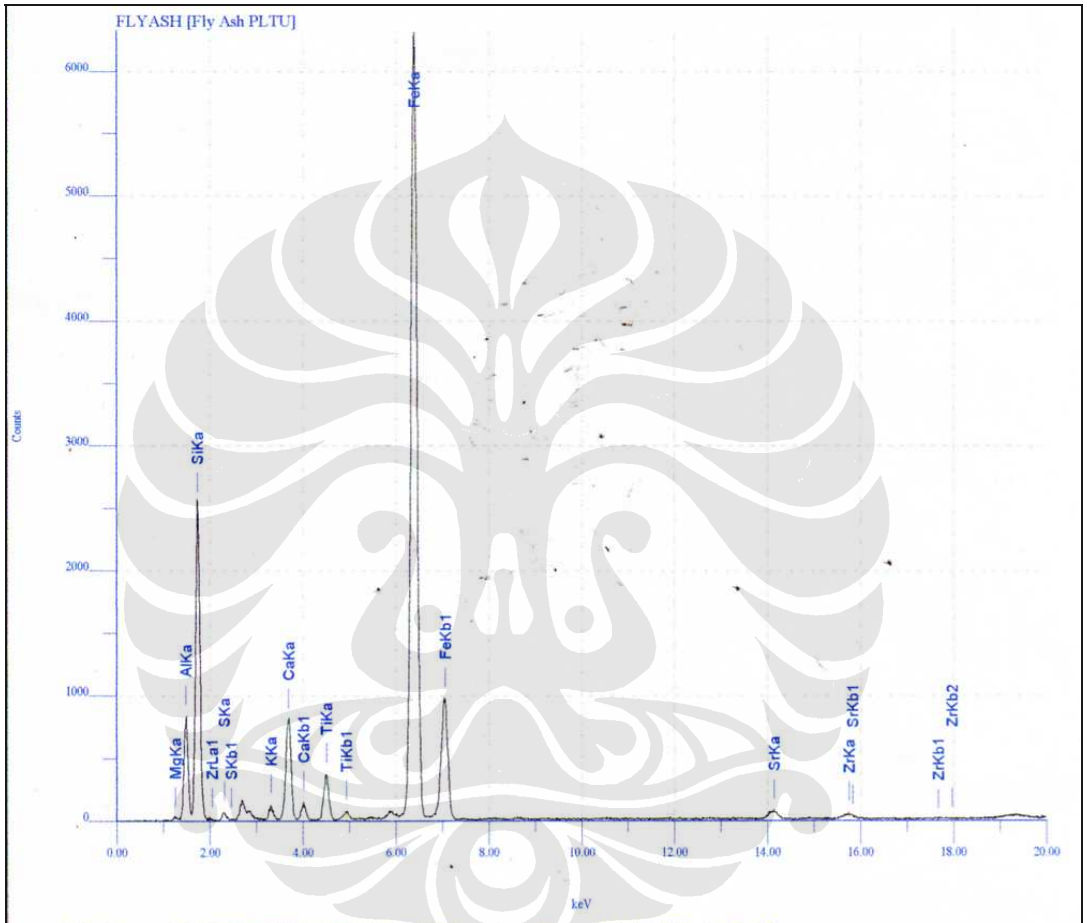
LAMPIRAN 1

Pengujian *Fly Ash*



File Name : D:\USER\FEB08\FLYASH.SPC Acq. Time: 2008/ 2/18 9:15:35
Sample Name: Fly Ash PLTU
Memo : Ria
Acq. Cond. : Voltage: 30.0kV Current: 0.089mA Live time: 110.00sec Pass:Vac
Analysis Element: Mg,Al,Si,S,K,Ca,Ti,Fe,Sr,Zr

Num	Atom/Chem.Formula		wt(%)	at/mole(%)	K-ratio	Integral Int.	Standard dev
1	12	Mg	1.6518	2.3188	0.0077083	242	0.8004
2	13	Al	19.6704	24.8813	0.0525858	8658	0.2775
3	14	Si	36.9493	44.9005	0.1410130	28495	0.1665
4	16	S	0.4895	0.5210	0.0015124	793	0.0894
5	19	K	1.3072	1.1410	0.0073793	1522	0.1334
6	20	Ca	7.1182	6.0614	0.0416753	12011	0.0990
7	22	Ti	2.3313	1.6611	0.0110570	5503	0.0780
8	26	Fe	29.9807	18.3221	0.1572605	113973	0.0586
9	38	Sr	0.3280	0.1278	0.0034374	1664	0.0909
10	40	Zr	0.1737	0.0650	0.0021534	848	0.1106

LAMPIRAN 2

Pengujian Natrium Silikat Na_2SiO_3

Lab. Afiliasi
& Keselamatan Kimia

LABORATORY TEST RESULTS

Job. Number : 034/II/008 Date : 03 - 03 – 2008

Customer : Ria Attention :

Sample Code : Water Glass
Date Received : 18 - 02– 2008
Sample Matrix : Liquid

No.	Parameter Analysis	Result	Units	Method
1.	Kadar Air	22.84	%	Gravimetri
2.	Na_2O	0.11	%	AAS
3.	SiO_2	42.23	%	Gravimetri

Mengetahui,

UNIVERSITAS INDONESIA

Drs. Sunardi M.Si
Direktur

Laboratorium Afiliasi UI
Departemen Kimia, FMIPA UI, Kampus UI Depok 16424
Telp. 021-7872720, Faks 021-7863432

LAMPIRAN 3

Perancangan *Mix Design* Beton

A. Sampel Kubus, Silinder, dan Balok Lentur

Design Strength = Beton K-400

Agregat maksimum = 40 mm

Slump = 10 cm

SG Cement = 3,15

SG Sand = 2,6

SG Coarse Agregat = 2,65

FM Sand = 2,6

1. Menentukan Target Strength

$$T_{ts} = \frac{T_{ds}}{1 - t.V} = \frac{400}{1 - (0,883.0,15)} = 461,06853 = 461$$

keterangan :

t : Konstanta yang besarnya ditentukan berdasarkan perkiraan % benda uji oleh karena 80 % yang mau lolos, maka t = 0,883

V : Koefisien variasi, didapat dari penelitian sebelumnya = 0,15

2. Menentukan W/C dengan metode JSCE berdasarkan *Compressive Strength*

Berdasarkan rumus dari Japan Cement Association :

T28 = -113 + 214 C/W

461 = -113 + 214 C/W

C/W = 2,66355

W/C = 0,37278 = 0,373

3. Menentukan S/A, jumlah air adukan (W), dan kandungan udara (A) dari tabel 4.3 diperoleh :

W = 165 kg

S/A = 36 %

A = 1,2 %

Harga diatas berlaku untuk beton yang menggunakan pasir alam FM = 2,8 dan slump = 80 mm. Oleh karena itu, untuk menyesuaikan dengan harga sebenarnya dihitung menggunakan berikut, dimana perhitungannya adalah sebagai berikut :

No.	Change in material or proportion	Correction on S/A and W	
		S/A (%)	W (kg)
1.	FM = 2.6	$36+\left(\left(\frac{2,6-2,8}{0,1}\right)0,5\right)=35\%$	No correction
2.	Slump = 10 cm	No correction	$165+\left(\frac{1,2}{100}(10-8)165\right)=168,96$
3.	Using crushed CA	35 + 4 = 39 %	168,96 + 12 = 180,96
4.	Increase in S/A	39 %	180,96+((39 - 35)1,5)=186,96

Jadi setelah disesuaikan dengan keadaan sebenarnya didapatkan harga-harga :

S/A = 39,00 %

W = 186,96 kg

4. Dari W/C = 0.373 dan W = 186.96 kg dapat dihitung berat semen yang dibutuhkan :

$$C=\frac{W}{W/C}=\frac{186,96}{0,373}=501,532\ kg$$

5. Menghitung volume total agregat (Ag) :

Ag = $Ag=1-\frac{W}{1000}-\frac{C}{SG_{cement}}-A=1-\frac{186,96}{1000}-\frac{501,532}{3150}-\frac{1,2}{100}=0,6418$

6. S/A = 39 %, maka dapat dihitung volume pasir dan agregat kasar, yaitu :

Volume S = 39 % x 0,6418 m³ = 0,2503 m³

S = 0,2503 m³ x 2600 kg/ m³ = 650,809 kg

Volume CA = Ag –S = 0,6418 m³ - 0.2503 m³ = 0,3915 m³

CA = 0,3915 m³ x 2650 Kg/ m³ = 1037,508 kg

Dari hasil perhitungan ini, untuk per m^3 beton dapat campuran sebagai berikut :

Semen (C)	=	501,532	kg
Air (W)	=	186,960	kg
Pasir (S)	=	650,809	kg
Agregat kasar (CA)	=	1037,508	kg

LAMPIRAN 4

File 'Work' pada Matlab untuk hammer kecil

```
% Data excel disimpan dengan nama Posisi Hammer
% perhitungan displacement %
% pada sheet1 satuan waktu adl ms dan acc m/s^2

clear
sheet1 = xlsread('N10',1);
N1 = length(sheet1);
time = sheet1(1:N1,1);
acceleration = sheet1(1:N1,2);
X1 = sheet1(1:N1,1)*0.001;        % convert satuan time ke s
Y1 = sheet1(1:N1,2)*100;          % convert satuan acc ke cm/s^2

% perhitungan velocity %
for i = 1:N1-1;
    int1(i) = (X1(i+1) - X1(i))*(Y1(i+1) + Y1(i))/2;
    velocity(i+1)=sum(int1);
end
velocity(1) = 0;

%----------- DATA PEMBANDING (DATA Vel PIT)-------------------%
% pada sheet2 satuan waktu adl ms dan vel cm/s
sheet2 = xlsread('N10',2);
N2 = length(sheet2);
time2 = sheet2(1:N2,1);
velocity2 = sheet2(1:N2,2);
%-------------------------------------------------------------%

% perhitungan displacement %
for j = 1:i;
    int2(j) = (X1(j+1) - X1(j))*(velocity(j+1) + velocity(j))/2;
    displacement(j+1)=sum(int2).*10;    % satuan dalam mm
end
displacement(1) = 0;

% perhitungan fast fourier transform %
Npoint = 2048;
Yfft = abs(fft(velocity,Npoint));
Ymaks = max(Yfft);
Ynorm = Yfft./Ymaks;

% pengaturan frequency vector
range = 1500;
df = (N1-1)*500/(time(N1)*N1);
M1 = int16(range/df);
Xfreq = linspace(0,range,M1);
```

```
Yfreq = Ynorm(1:M1);

%----------- DATA PEMBANDING (DATA Freq PIT)-----------------%
dataPIT = xlsread('N10',3);
XPIT1 = dataPIT(:,1);
YPIT1 = dataPIT(:,2);
df1 = XPIT1(2)-XPIT1(1);
M2 = int16(range/df1);
XPIT2 = XPIT1(1:M2);
YPIT2 = YPIT1(1:M2);
%------------------------------------------------------------%

% konfigurasi grafik %

subplot(4,1,1)
plot(time,acceleration)
xlabel('time (ms)')
ylabel('acceleration (m/s^2)')
title('Accelerometer vs Time','FontSize',12)
h = legend('PIT',1);

subplot(4,1,2)
plot(time,velocity)
xlabel('time (ms)')
ylabel('velocity (cm/s)')
title('Velocity vs Time','FontSize',12)

%----------- DATA PEMBANDING (DATA Vel PIT)-----------------%
hold on
plot (time2,velocity2,'r')
hold off
h = legend('MATLAB','PIT',1);
%------------------------------------------------------------%

subplot(4,1,3)
plot(time,displacement)
xlabel('time (ms)')
ylabel('displacement (mm)')
title('Displacement vs Time','FontSize',12)
h = legend('MATLAB',1);

subplot(4,1,4)
plot(Xfreq,Yfreq,'b')
xlabel('frequency (Hz)')
ylabel('Norm Amplitude')
title('Frequency Domain','FontSize',12)

%------------DATA PEMBANDING (DATA Freq PIT)-----------------%
hold on
plot (XPIT2,YPIT2,'r')
hold off
h = legend('matlab','PIT',1);
%------------------------------------------------------------%
```

File ‘Work’ pada Matlab untuk hammer Besar

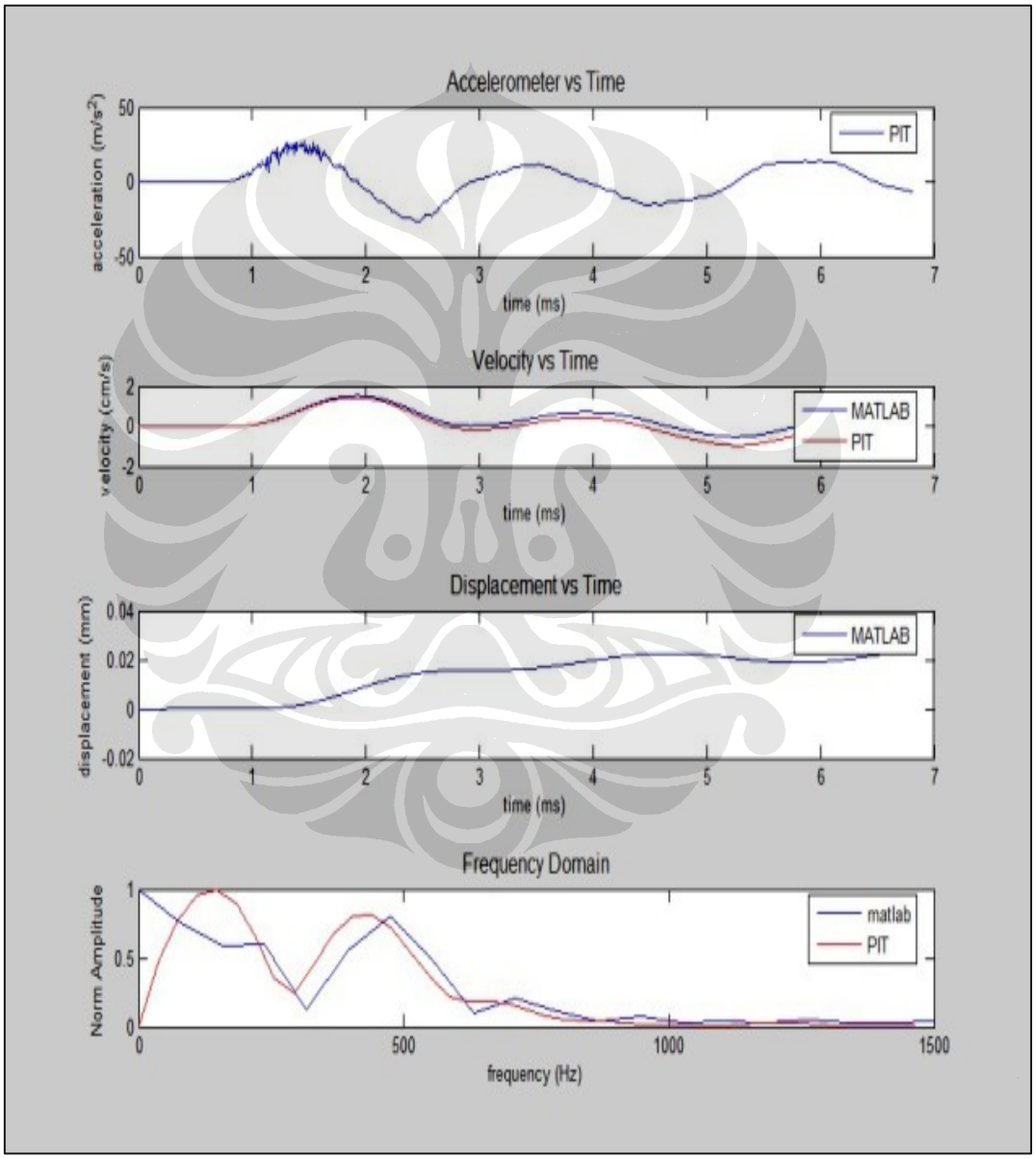
```
% Data excel disimpan dengan nama Posisi Hammer
% perhitungan displacement %
% pada sheet1 satuan waktu adl ms dan acc m/s^2

clear
sheet1 = xlsread('N10',1);
N1 = length(sheet1);
time = sheet1(1:N1,1);
acceleration = sheet1(1:N1,2);
X1 = sheet1(1:N1,1)*0.001;      % convert satuan time ke s
Y1 = sheet1(1:N1,2)*100;        % convert satuan acc ke cm/s^2

% perhitungan velocity %
for i = 1:N1-1;
    int1(i) = (X1(i+1) - X1(i))*(Y1(i+1) + Y1(i))/2;
    velocity(i+1)=sum(int1);
end
velocity(1) = 0;

%----------- DATA PEMBANDING (DATA Vel PIT)-------------------%
% pada sheet2 satuan waktu adl ms dan vel cm/s
sheet2 = xlsread('N10',2);
N2 = length(sheet2);
time2 = sheet2(1:N2,1);
velocity2 = sheet2(1:N2,2);
%-------------------------------------------------------------%

% perhitungan displacement %
for j = 1:i;
    int2(j) = (X1(j+1) - X1(j))*(velocity(j+1) + velocity(j))/2;
    displacement(j+1)=sum(int2).*10;    % satuan dalam mm
end
displacement(1) = 0;

% perhitungan fast fourier transform %
Npoint = 2048;
Yfft = abs(fft(velocity,Npoint));
Ymaks = max(Yfft);
Ynorm = Yfft./Ymaks;

% pengaturan frequency vector
range = 1500;
df = (N1-1)*500/(time(N1)*N1);
M1 = int16(range/df);
Xfreq = linspace(0,range,M1);
Yfreq = Ynorm(1:M1);

%----------- DATA PEMBANDING (DATA Freq PIT)-----------------%
dataPIT = xlsread('N10',3);
XPIT1 = dataPIT(:,1);
YPIT1 = dataPIT(:,2);
df1 = XPIT1(2)-XPIT1(1);
M2 = int16(range/df1);
XPIT2 = XPIT1(1:M2);
```

```
YPIT2 = YPIT1(1:M2);
%-------------------------------------------------------------%

% Force
accforce = sheet1(1:N1,3);
velforce = sheet2(1:N2,3);

% konfigurasi grafik %

subplot(4,1,1)
plot(time,acceleration,'b')
xlabel('time (ms)')
ylabel('acceleration (m/s^2)')
title('Accelerometer vs Time','FontSize',12)
hold on
plot(time,accforce,'r')
hold off
f = legend('acc','F^l/Z',1);

subplot(4,1,2)
plot(time,velocity,'b')
xlabel('time (ms)')
ylabel('velocity (cm/s)')
title('Velocity vs Time','FontSize',12)

%----------- DATA PEMBANDING (DATA Vel PIT)-------------------%
hold on
plot (time2,velocity2,'g')
hold off
%-------------------------------------------------------------%

hold on
plot(time,velforce,'r')
hold off
f = legend('MATLAB','PIT','F/Z',1);

subplot(4,1,3)
plot(time,displacement)
xlabel('time (ms)')
ylabel('displacement (mm)')
title('Displacement vs Time','FontSize',12)
h = legend('matlab',1);

subplot(4,1,4)
plot(Xfreq,Yfreq,'b')
xlabel('frequency (Hz)')
ylabel('Norm Amplitude')
title('Frequency Domain','FontSize',12)

%------------DATA PEMBANDING (DATA Freq PIT)-----------------%
hold on
plot (XPIT2,YPIT2,'r')
hold off
h = legend('matlab','PIT',1);
%-------------------------------------------------------------%
```

LAMPIRAN 5

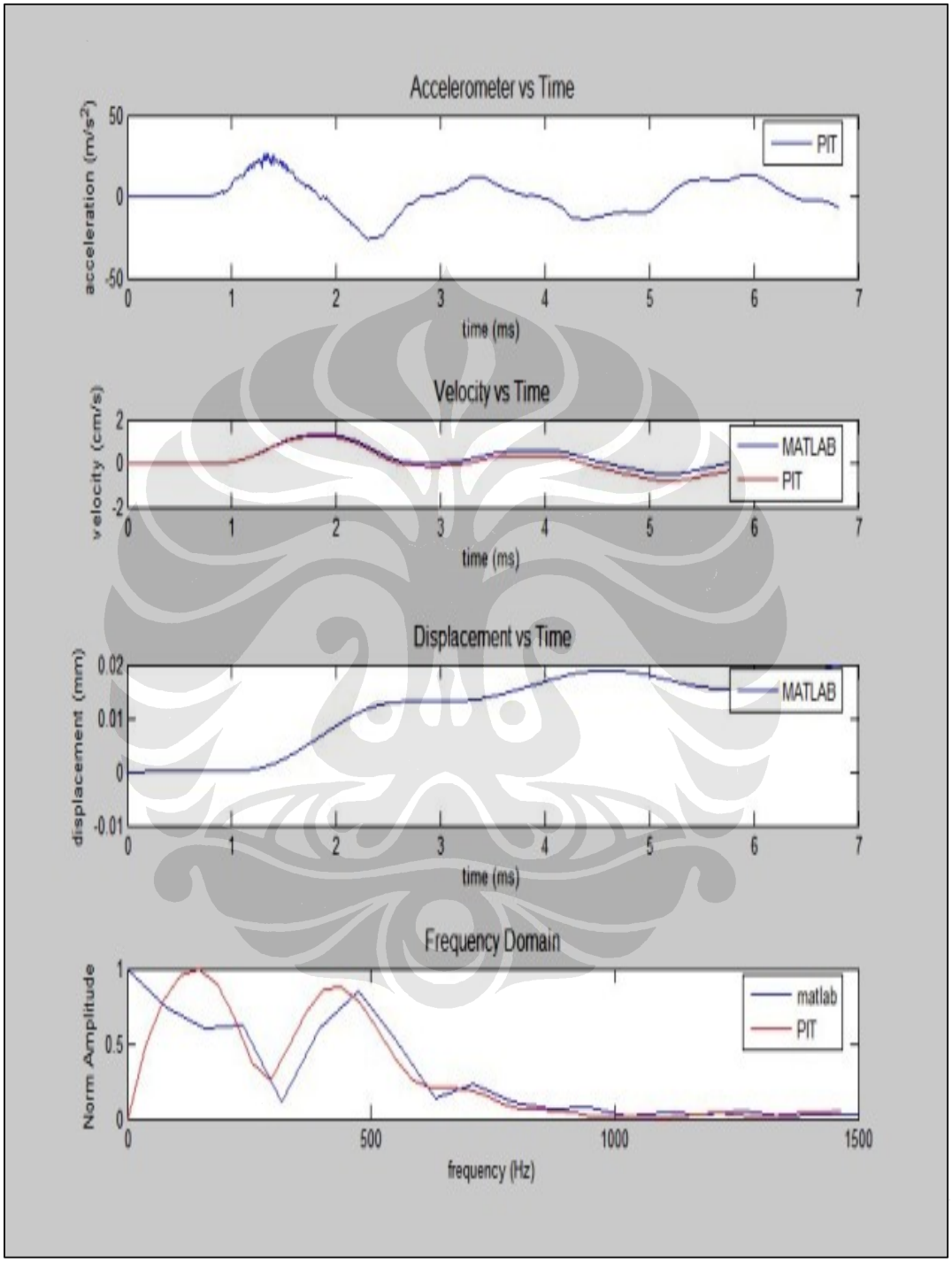
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 1



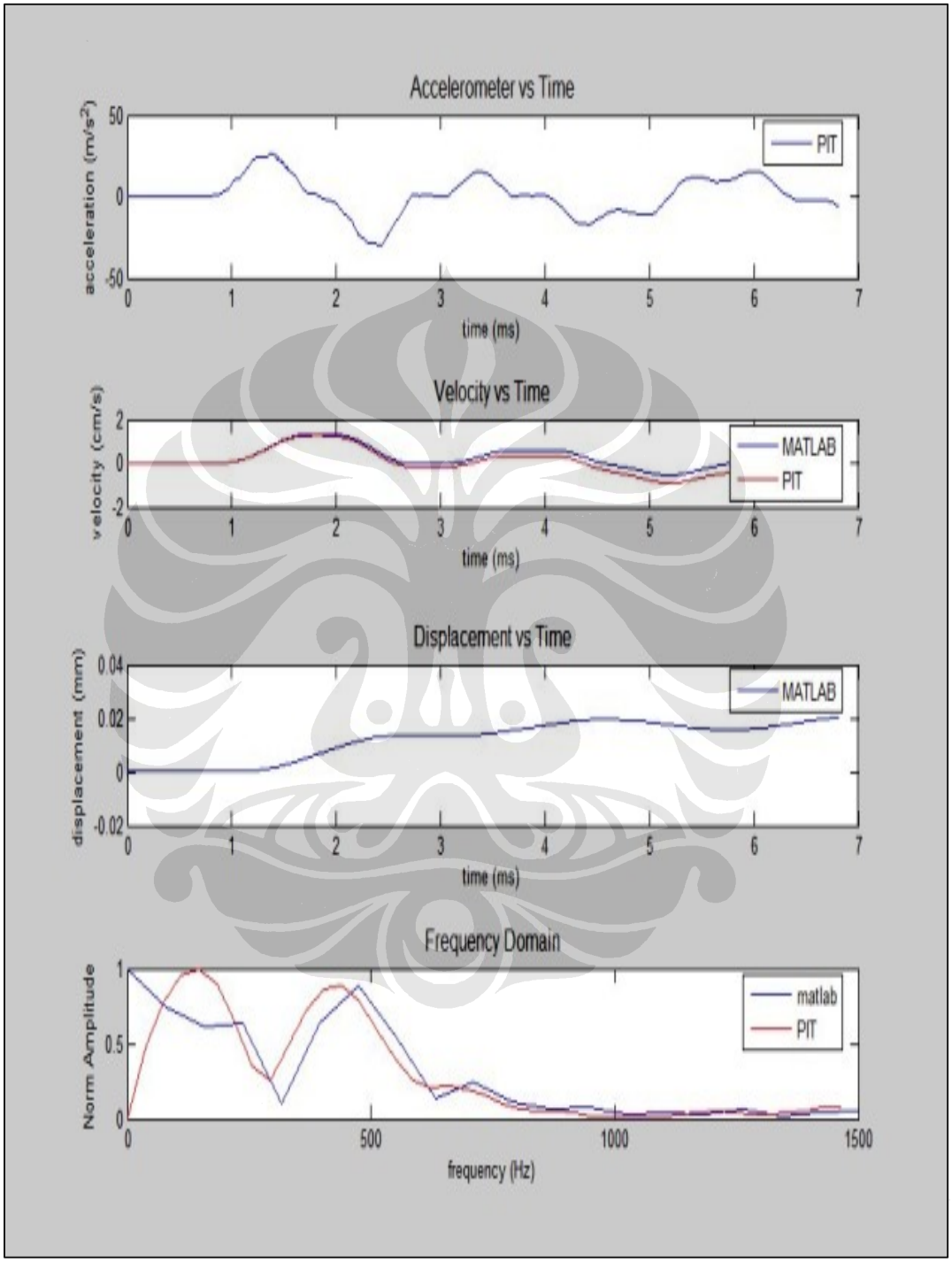
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 2



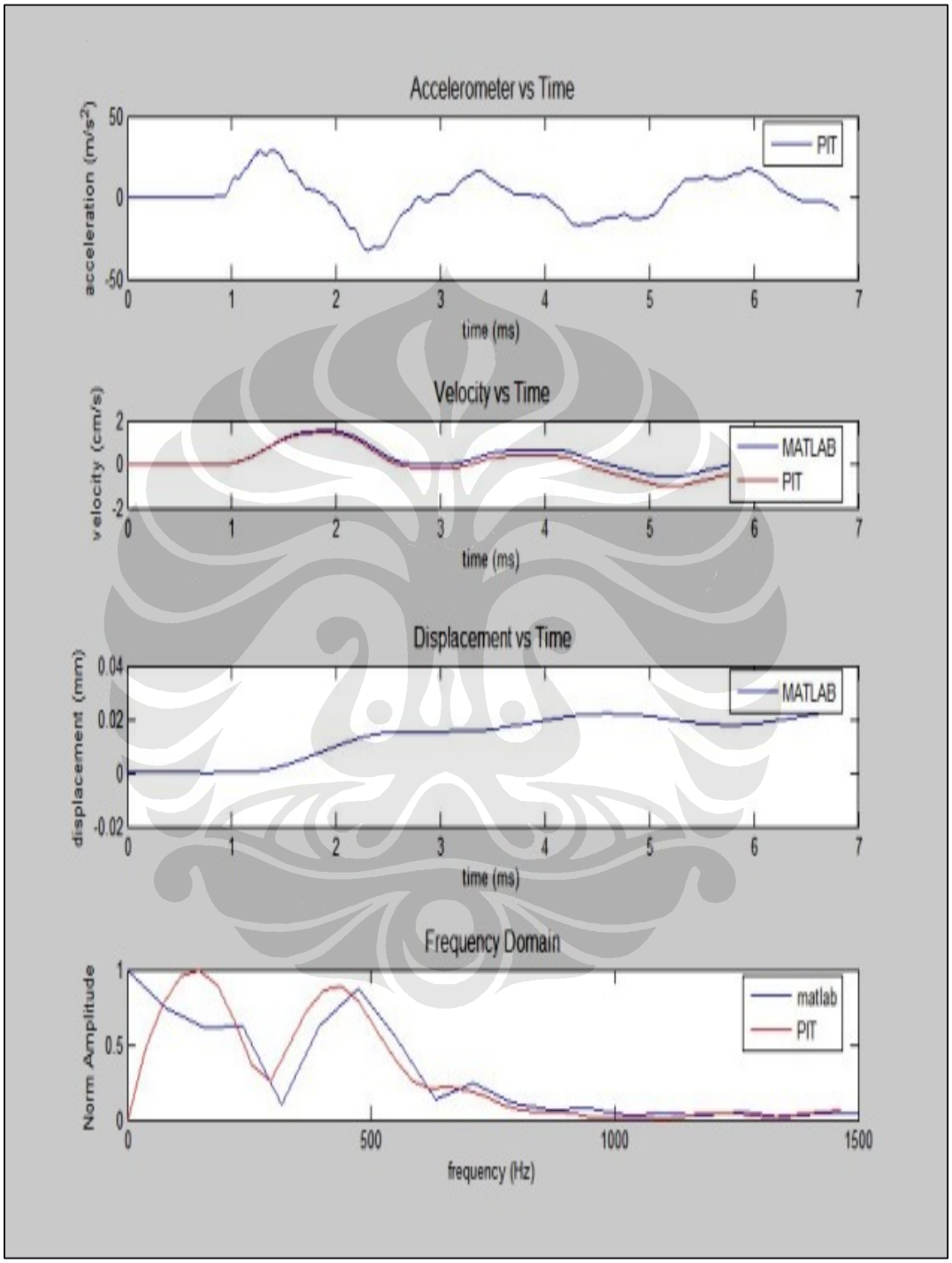
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 3



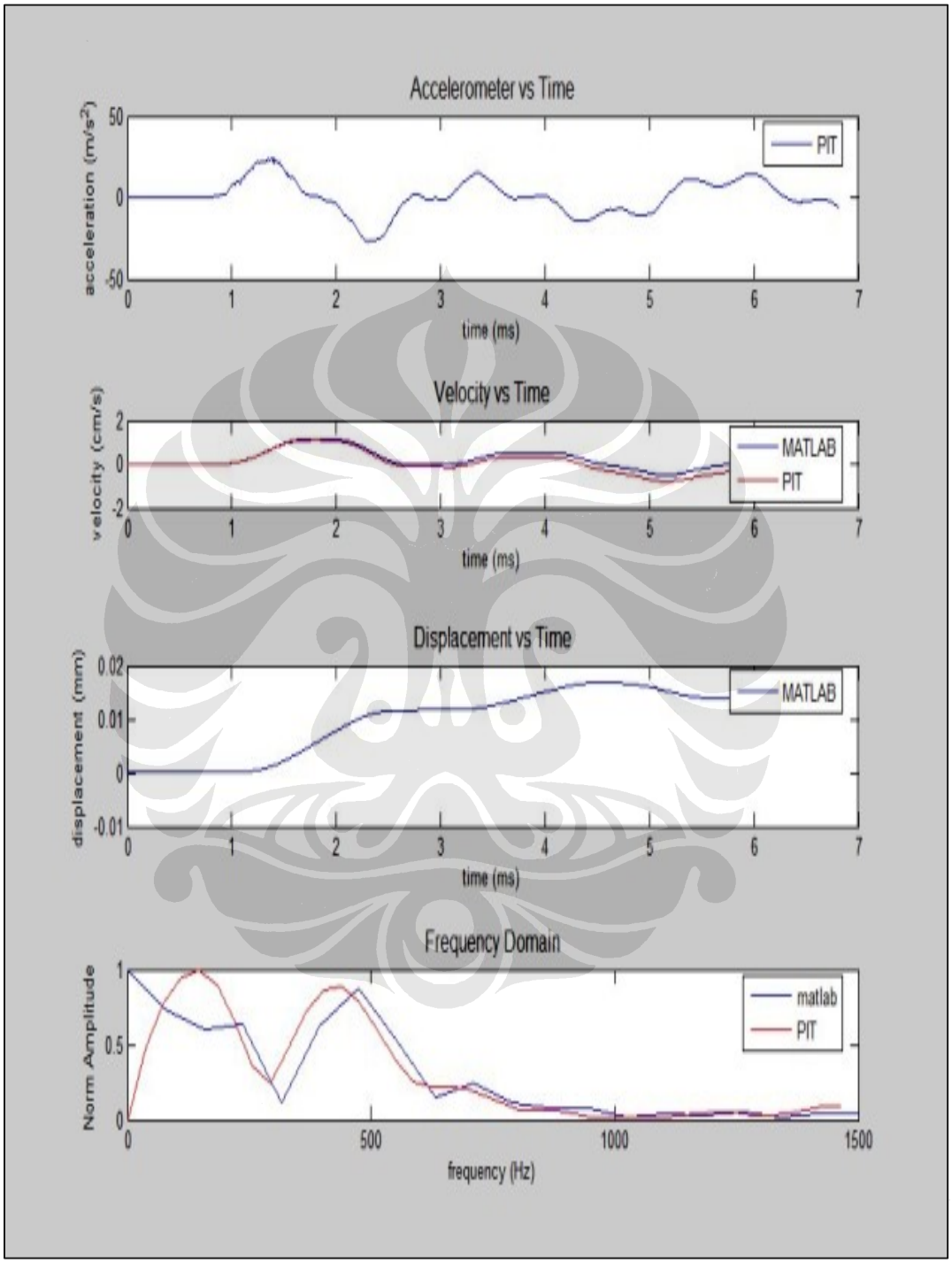
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 4



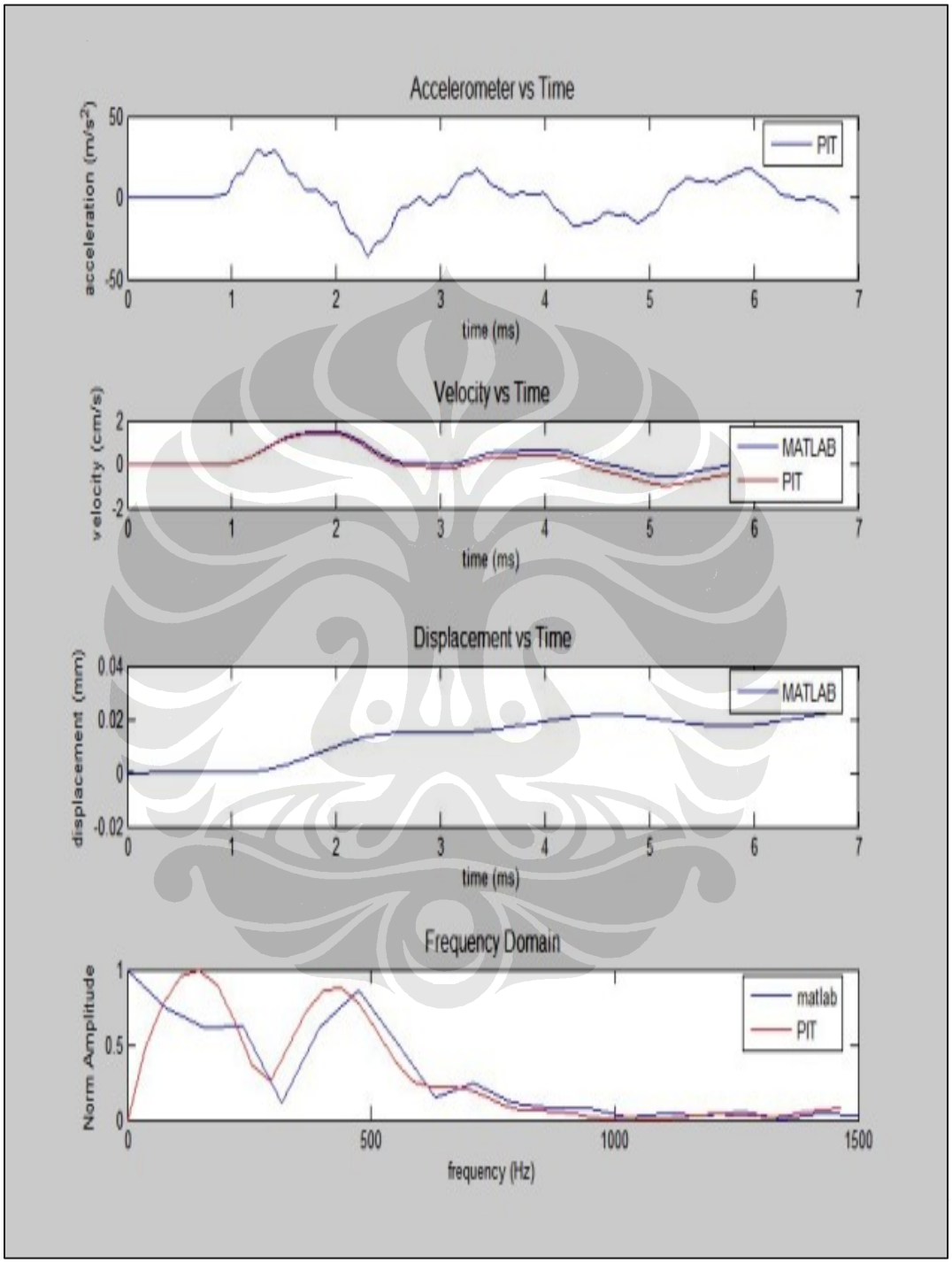
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 5



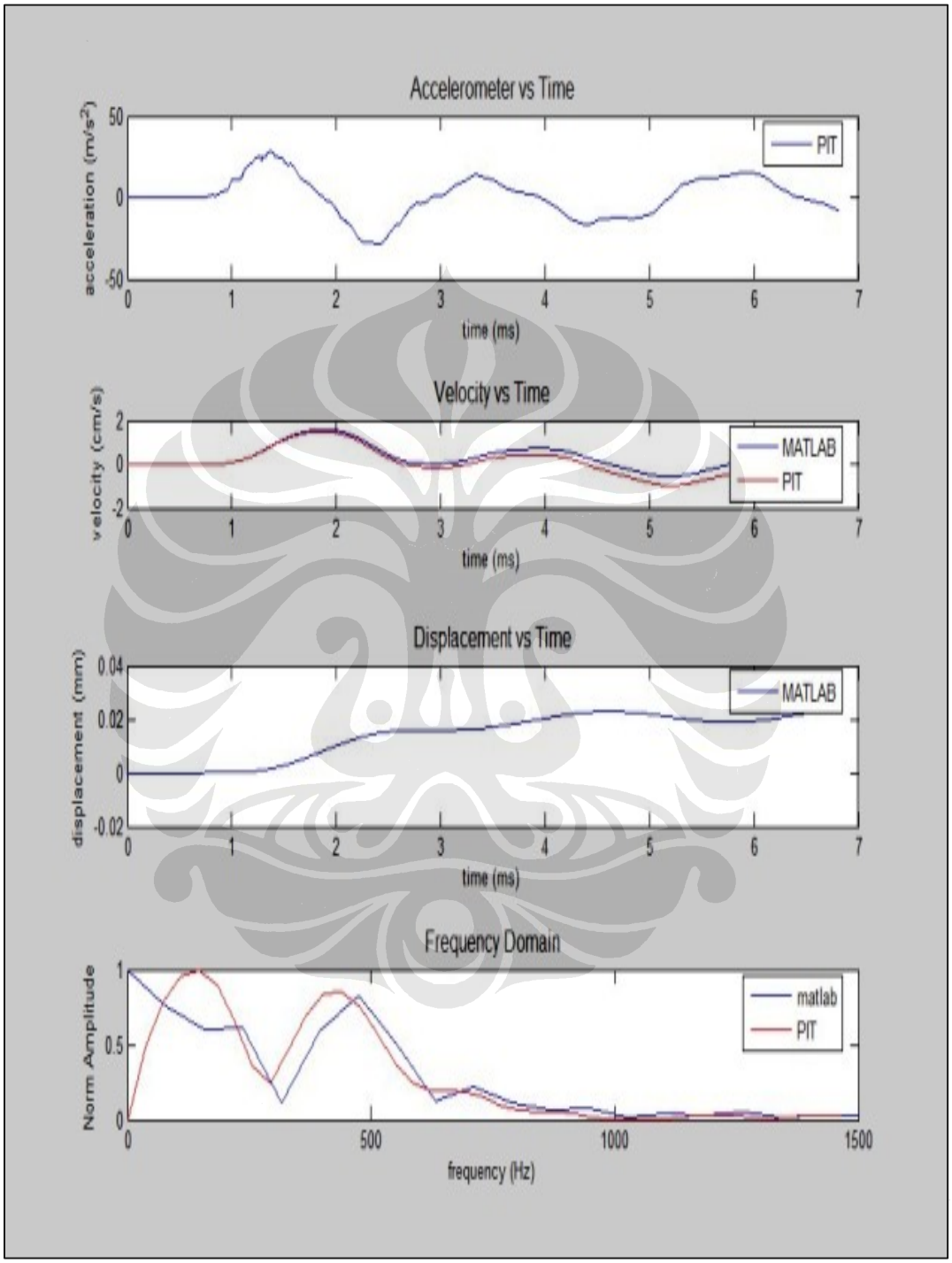
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 6



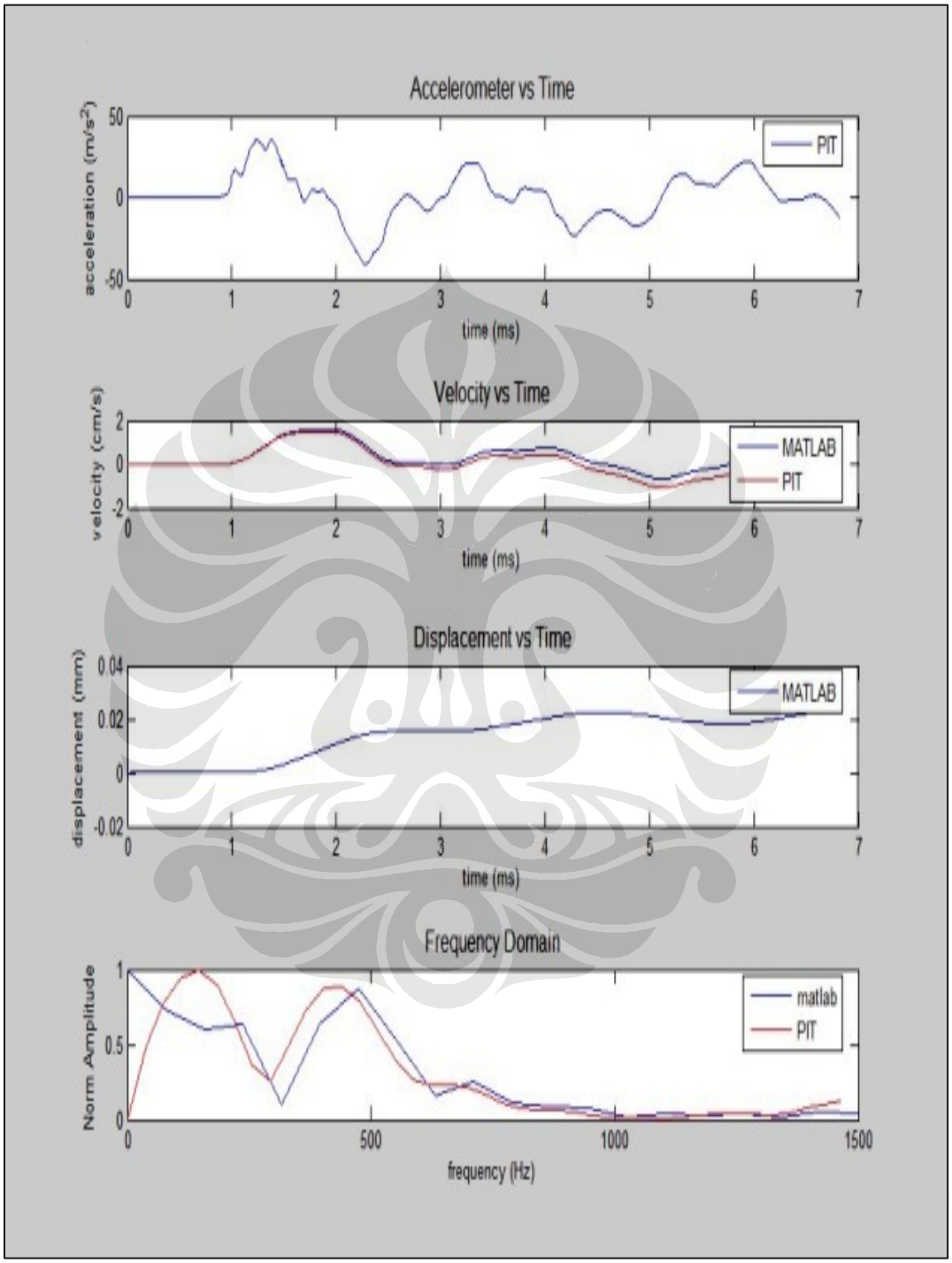
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 7



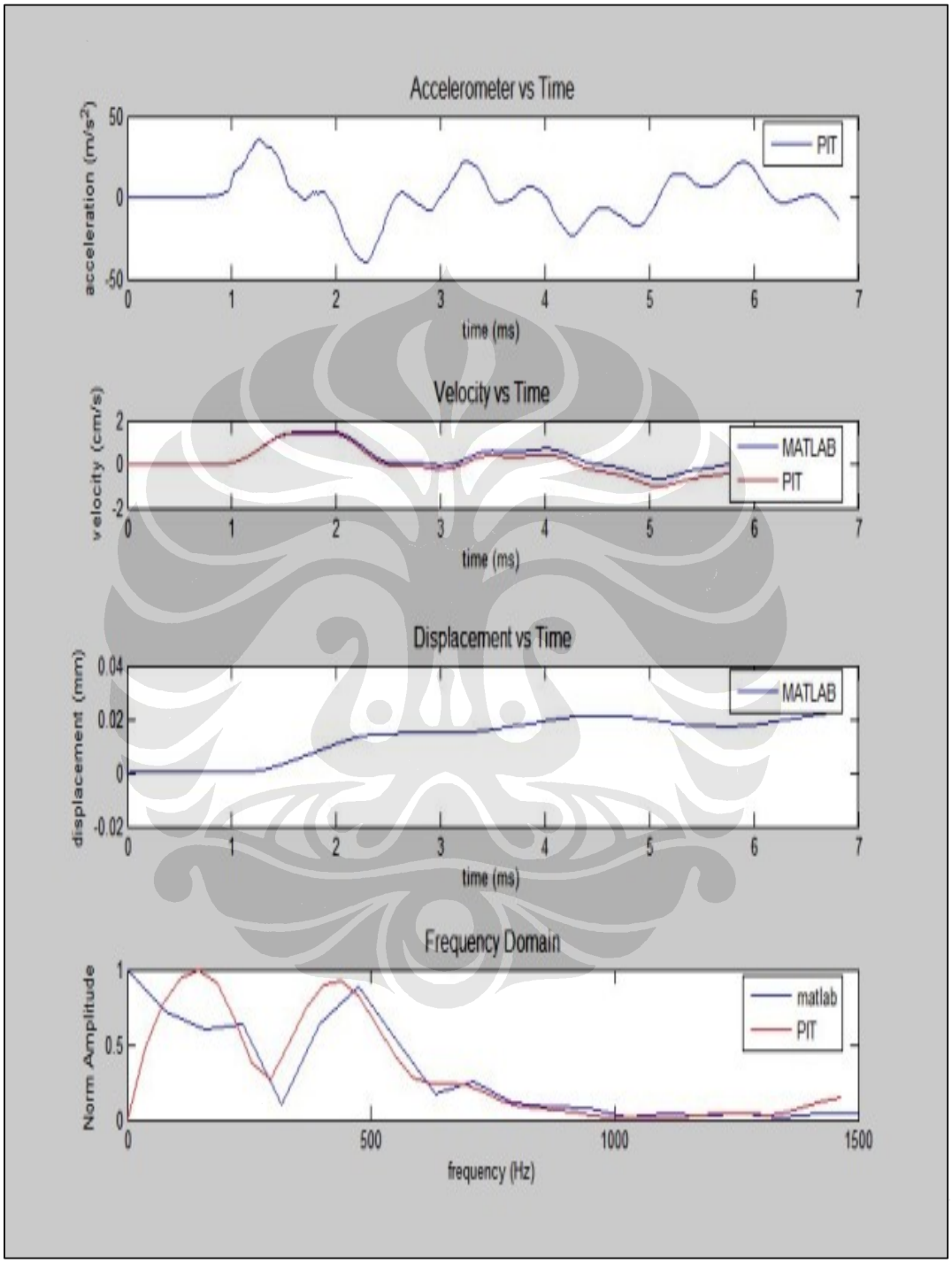
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 8



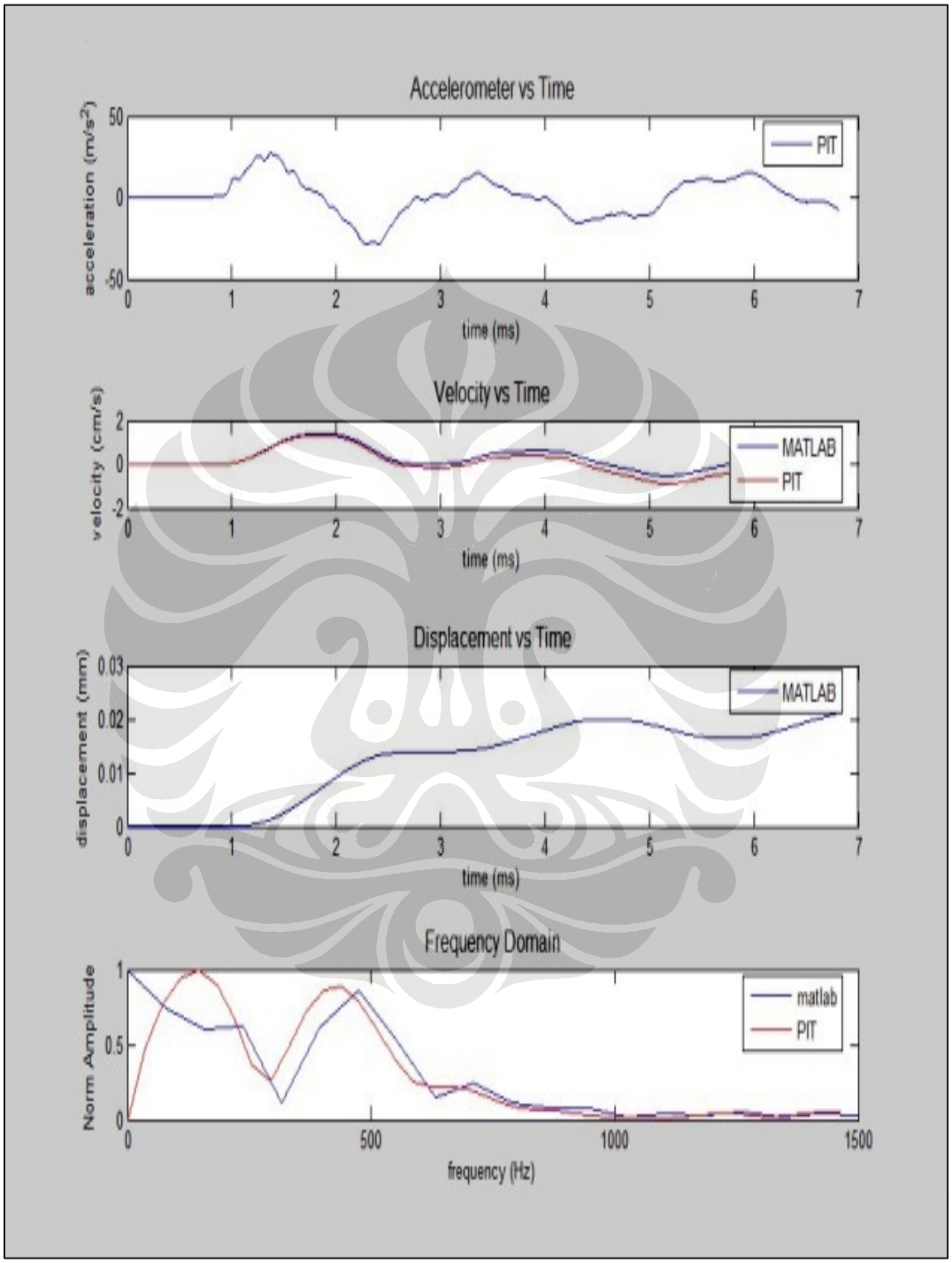
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 9



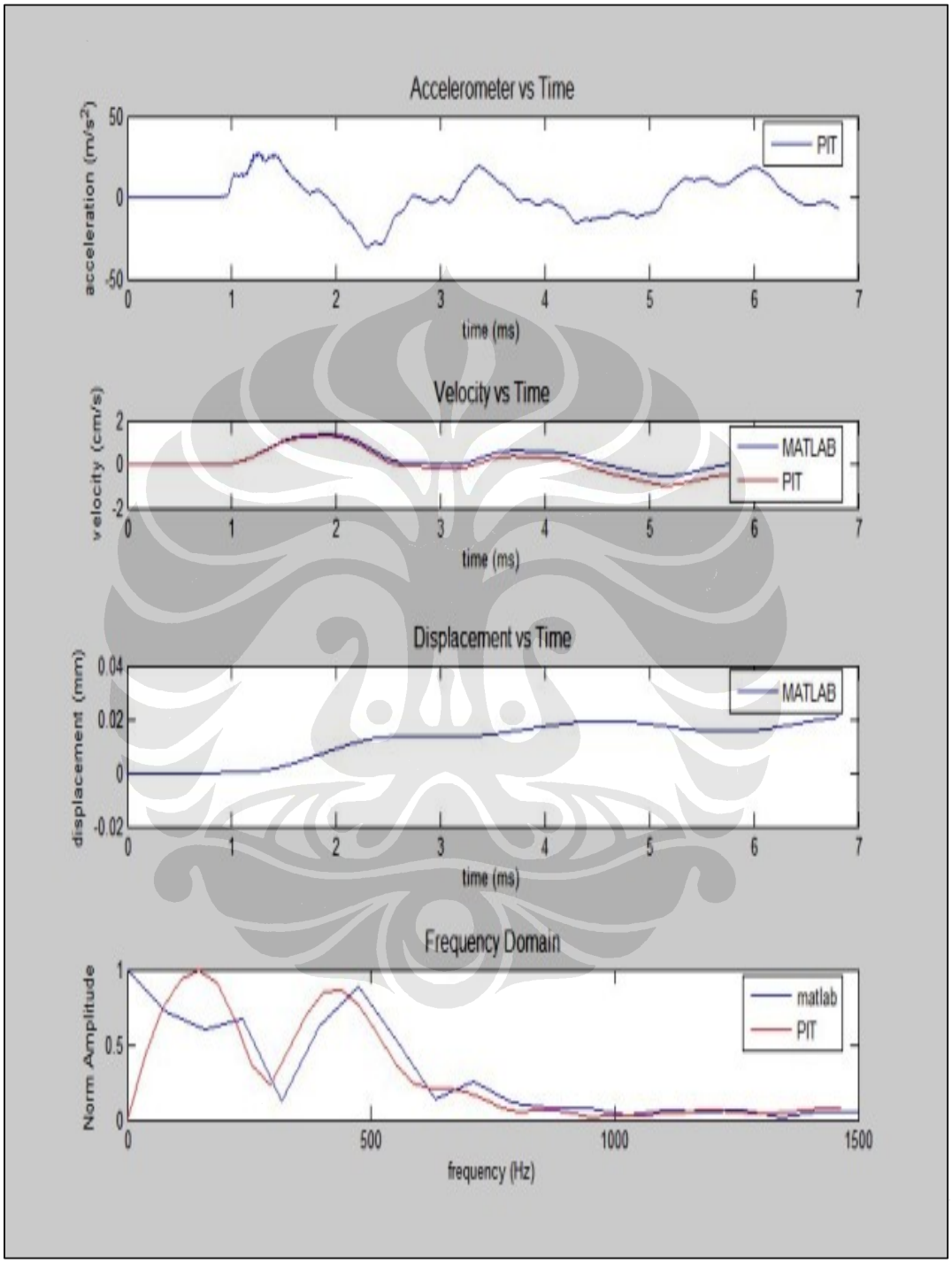
Akselerometer di tengah, hammer di timur akselerometer, hammer = 1250 gr

Data 10



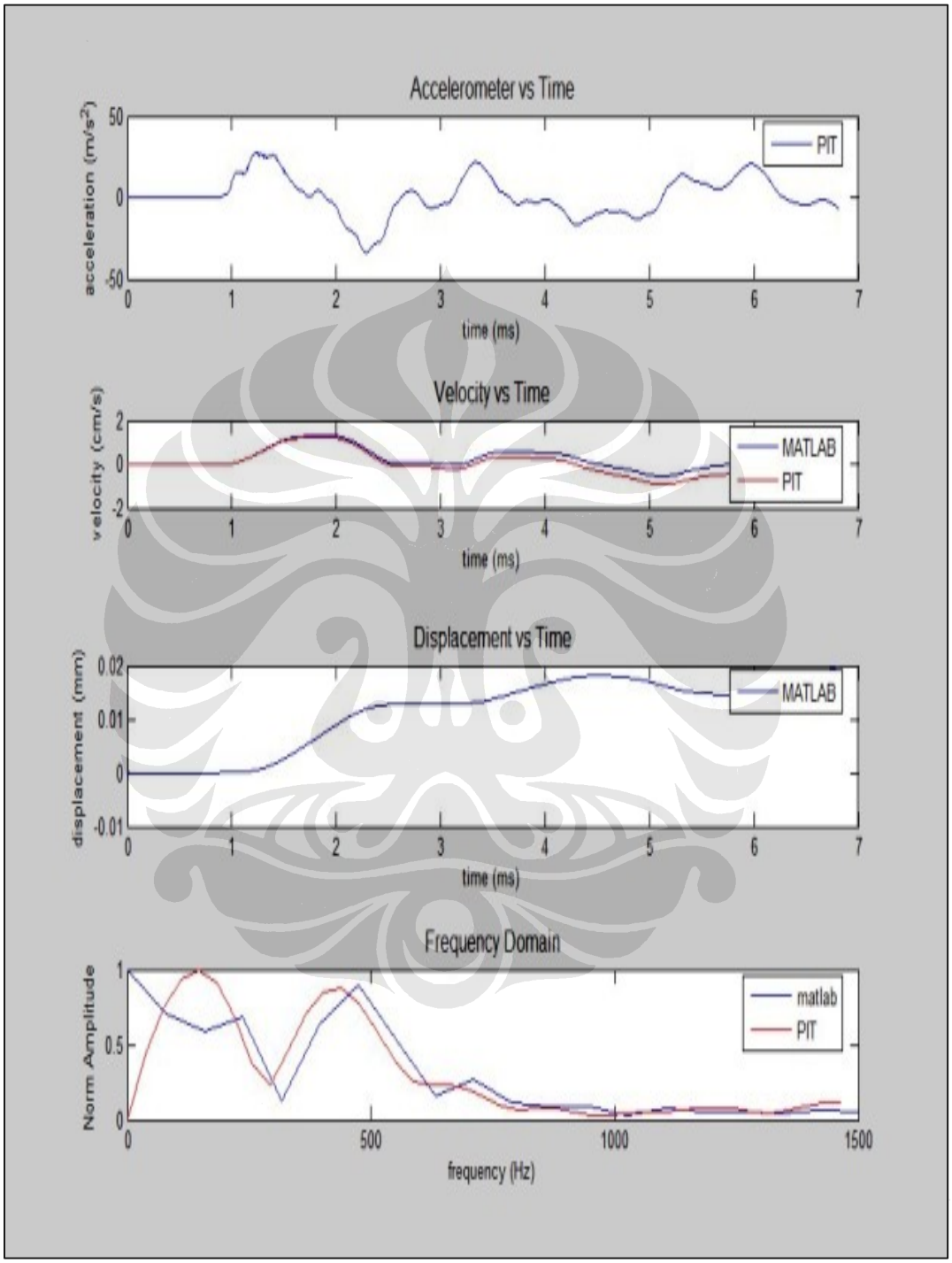
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 1



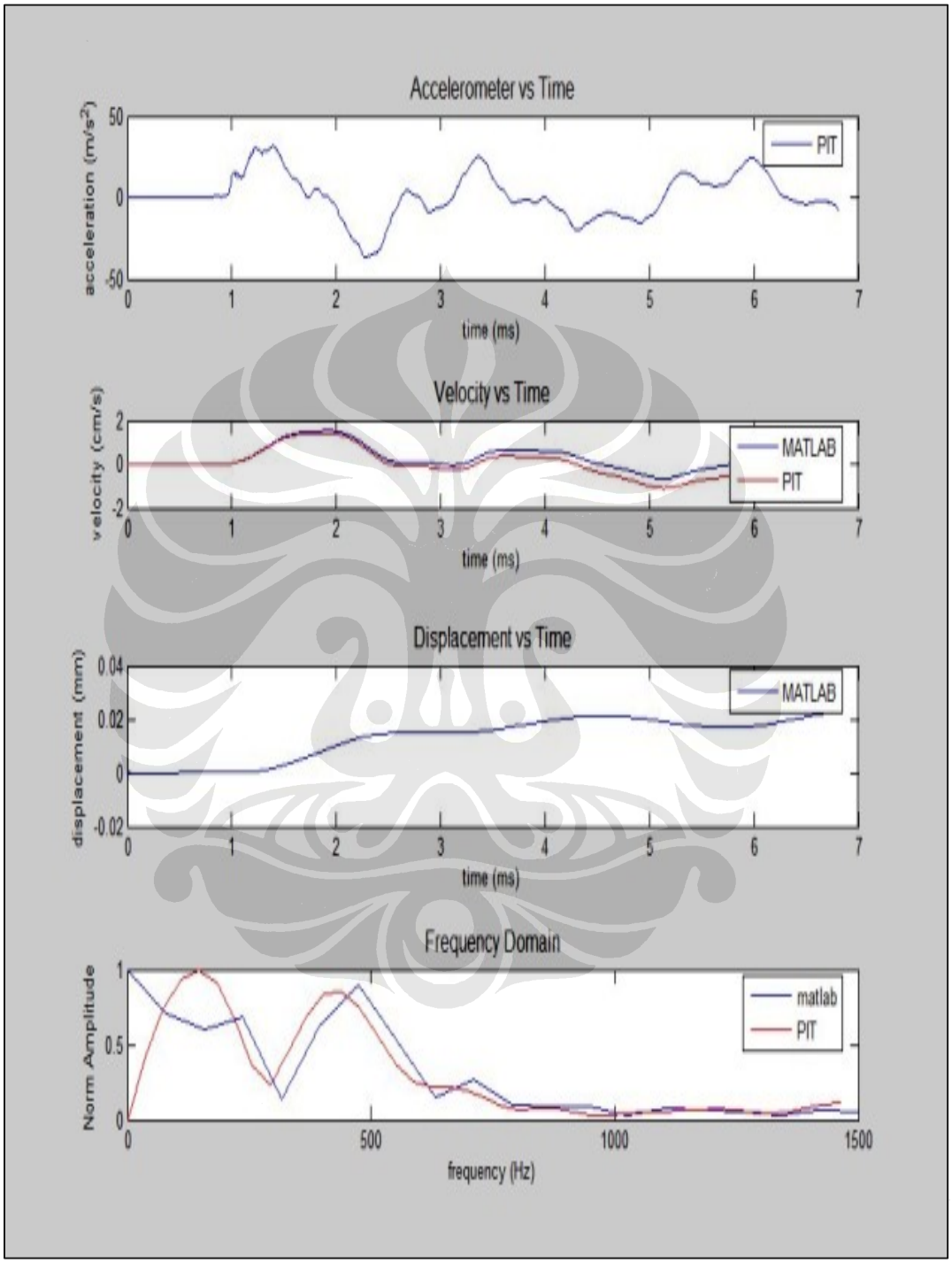
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 2



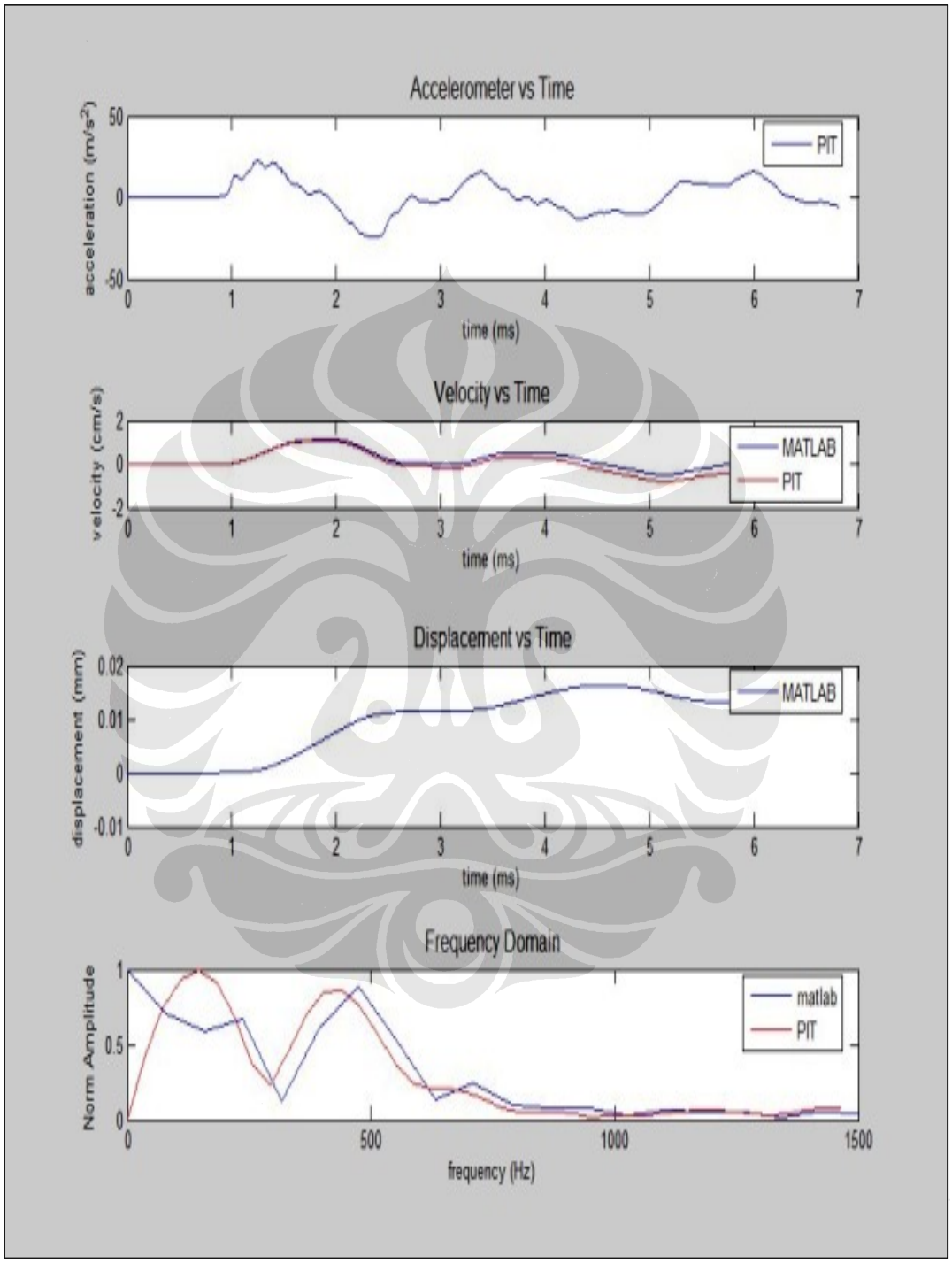
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 3



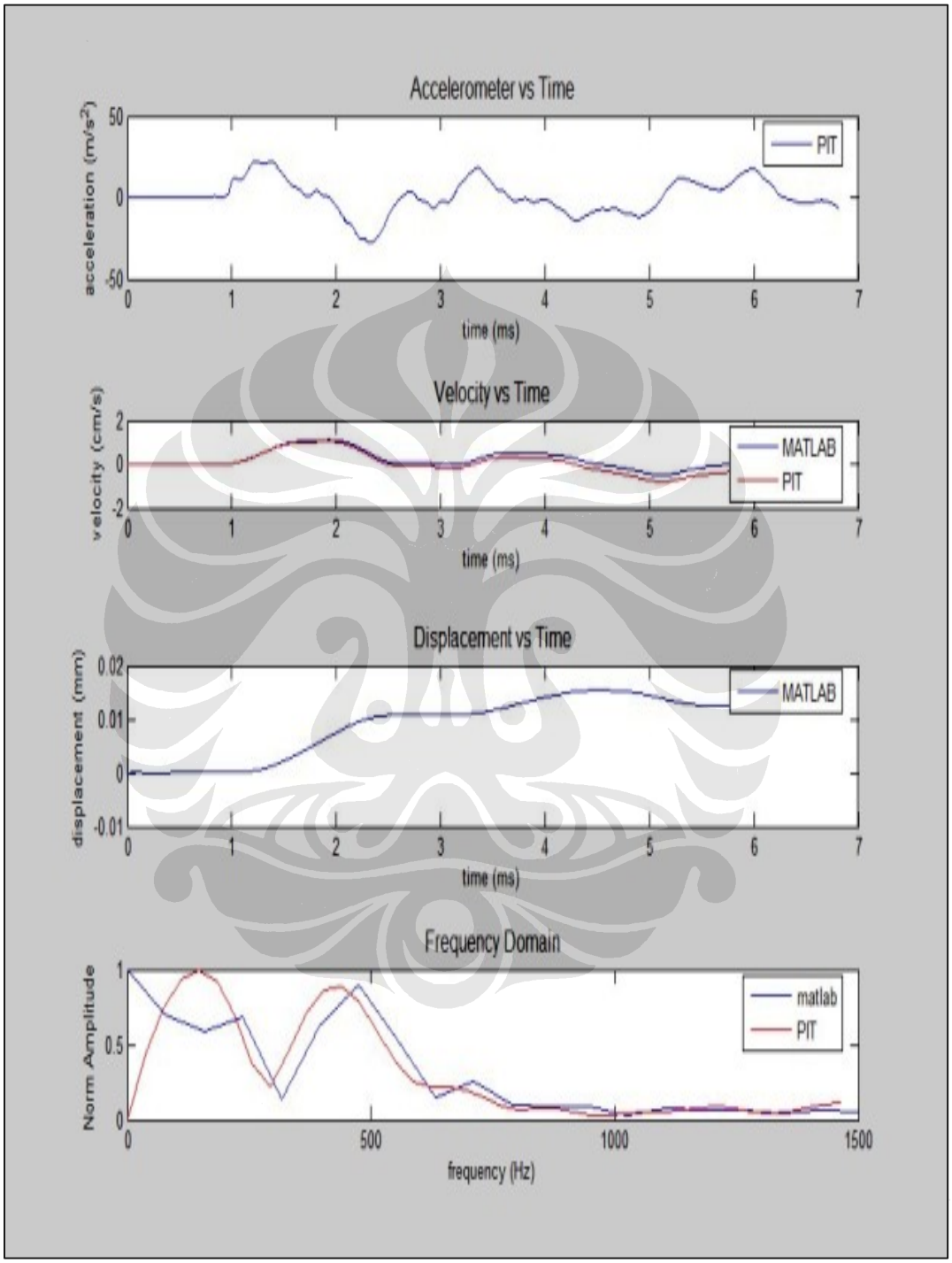
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 4



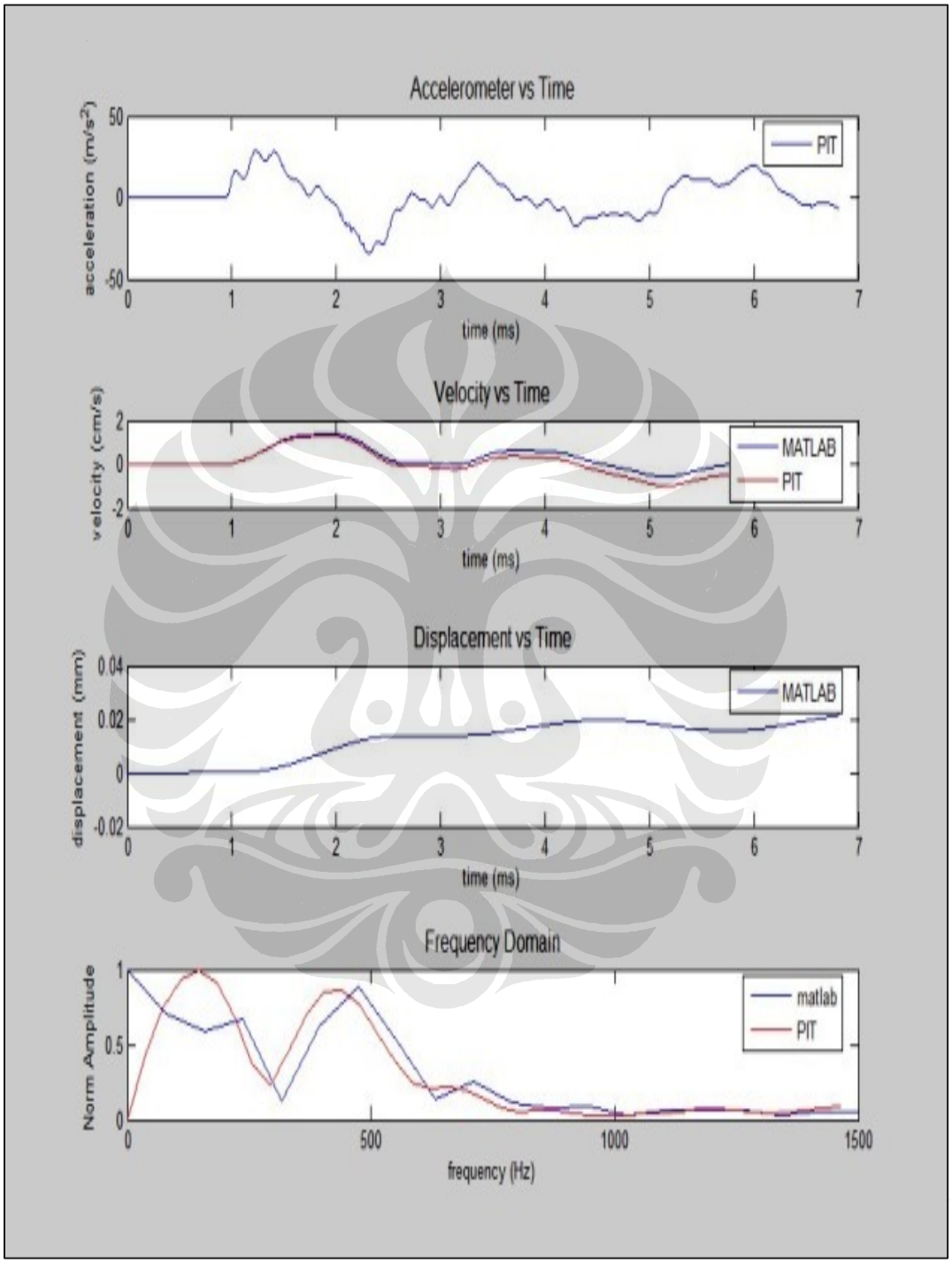
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 5



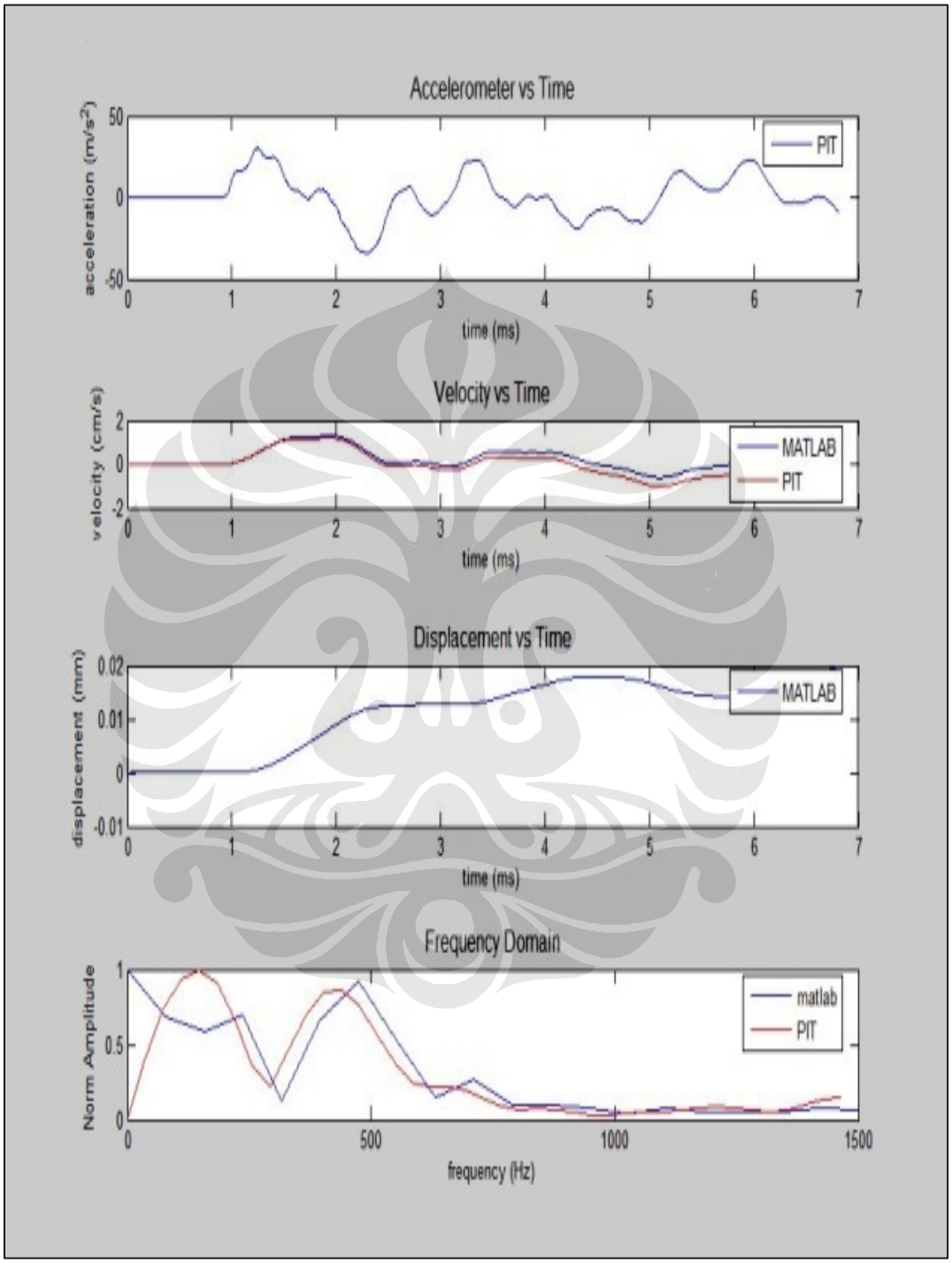
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 6



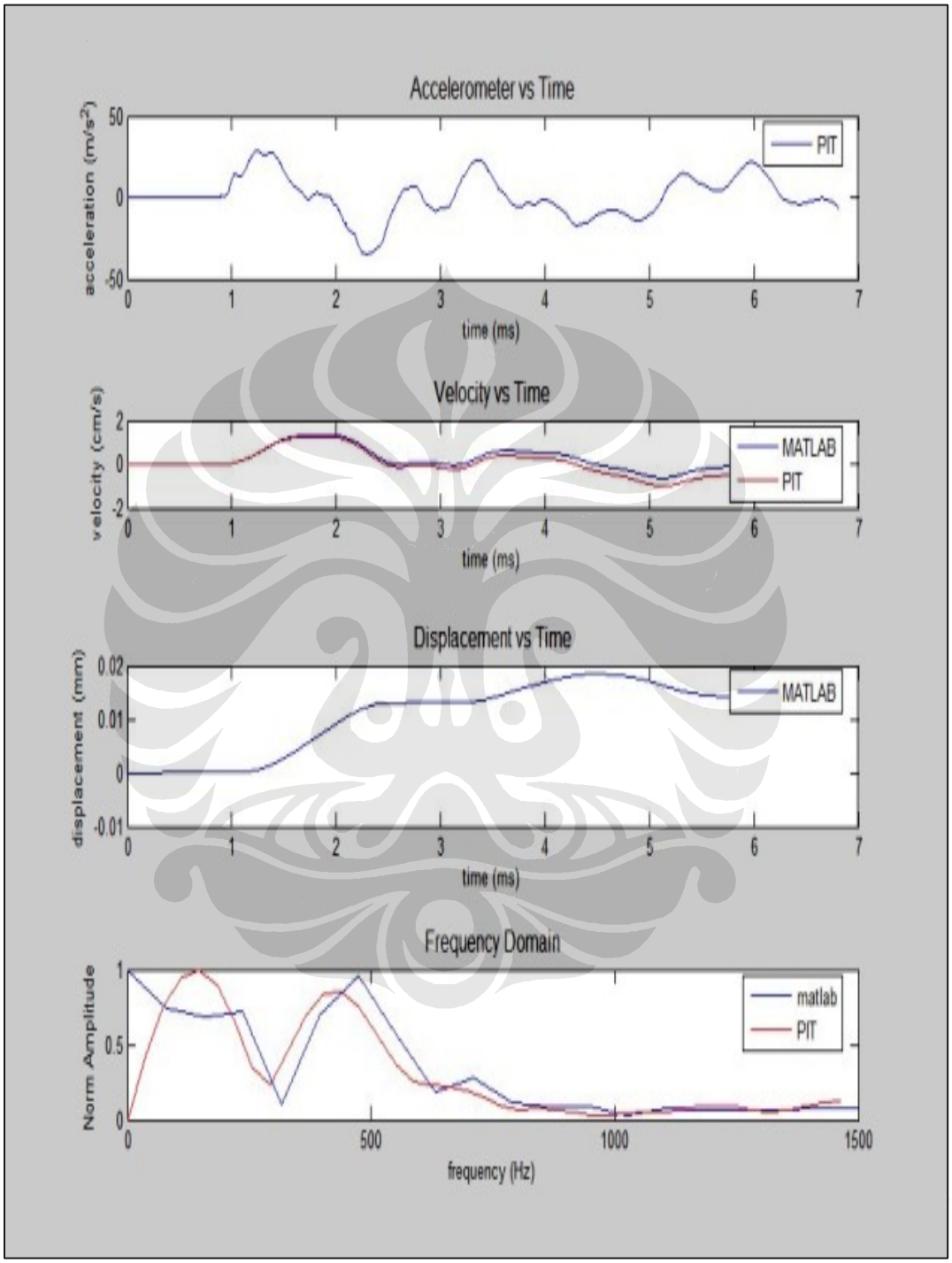
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 7



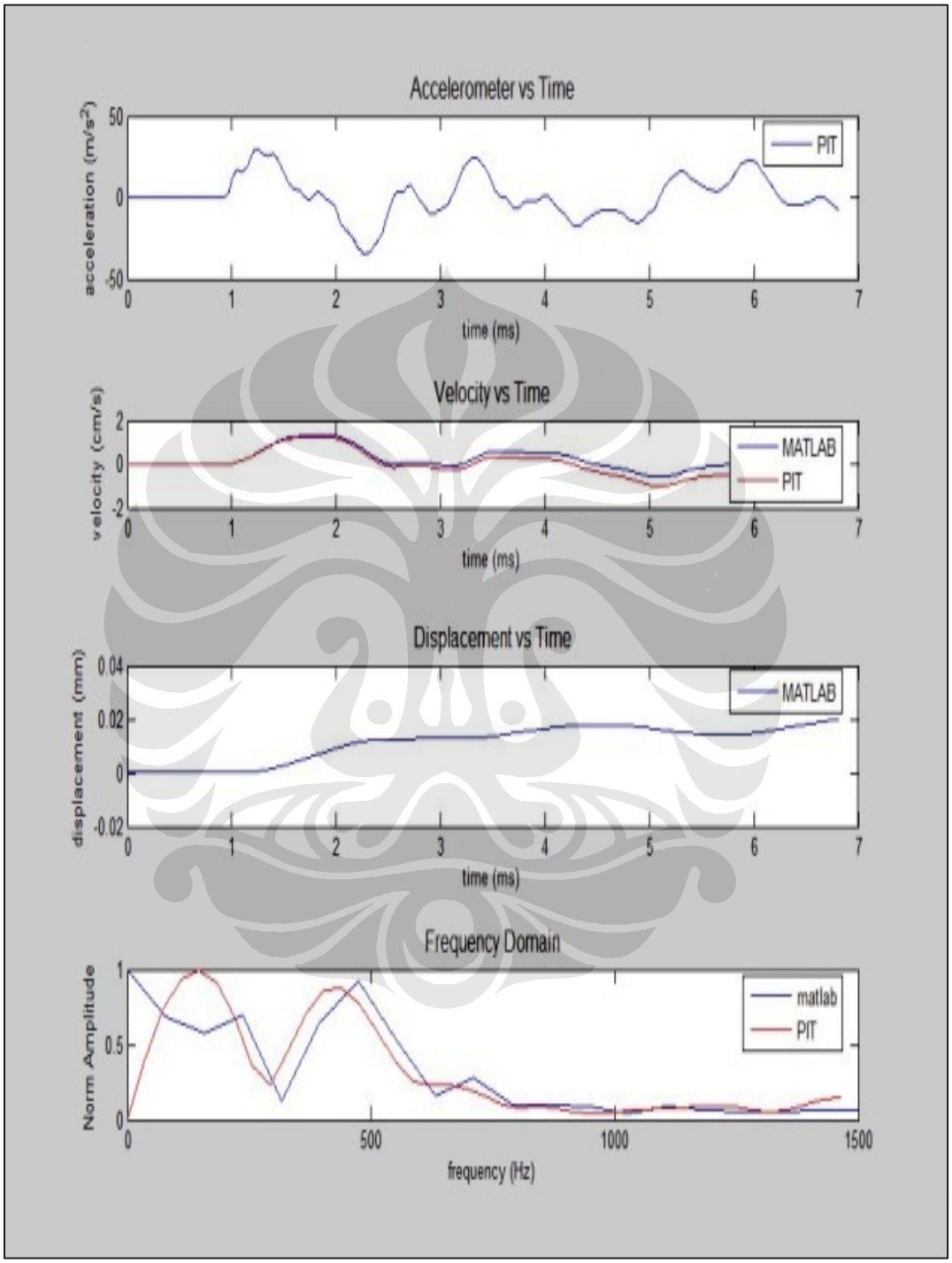
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 8



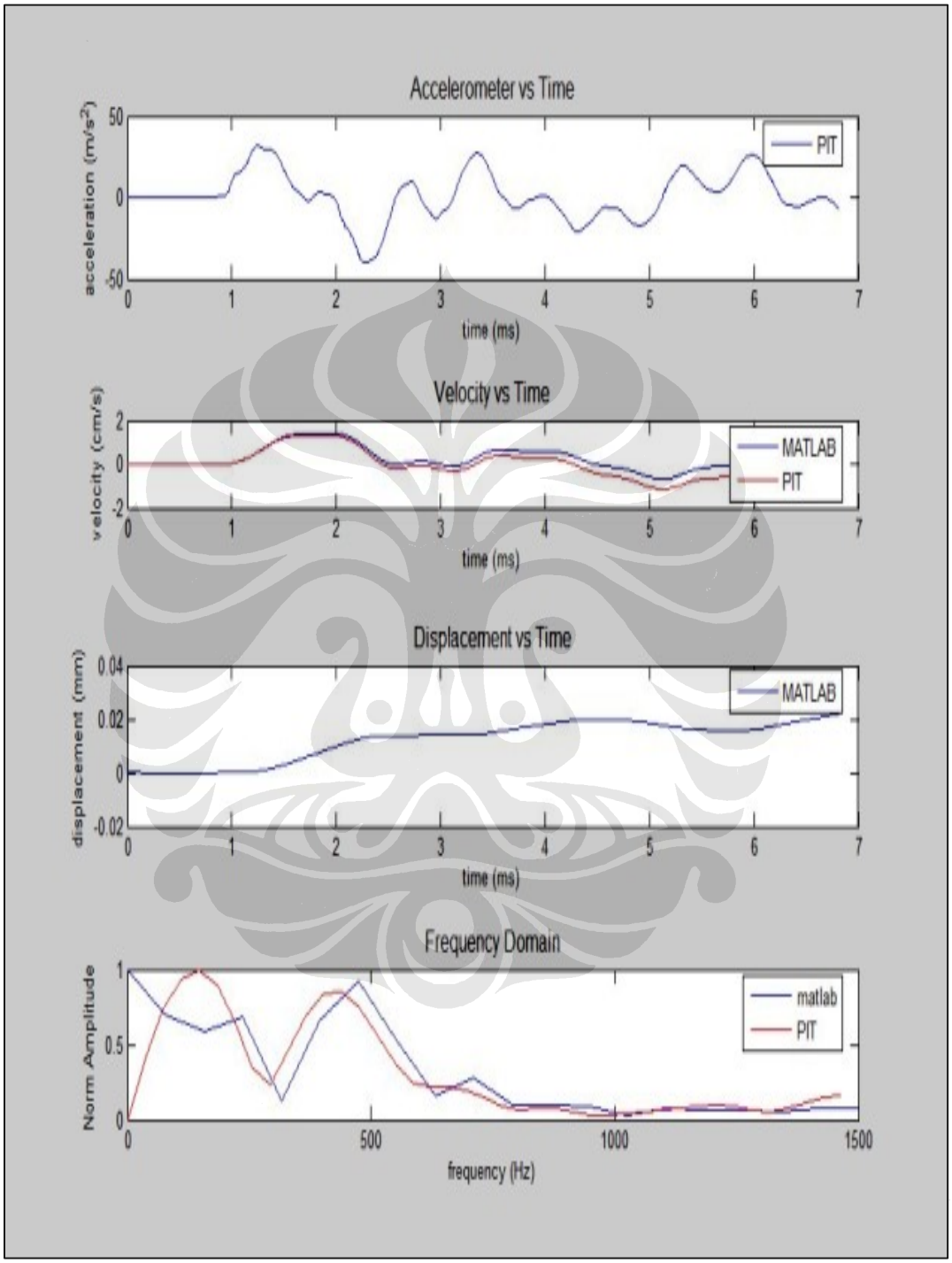
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 9



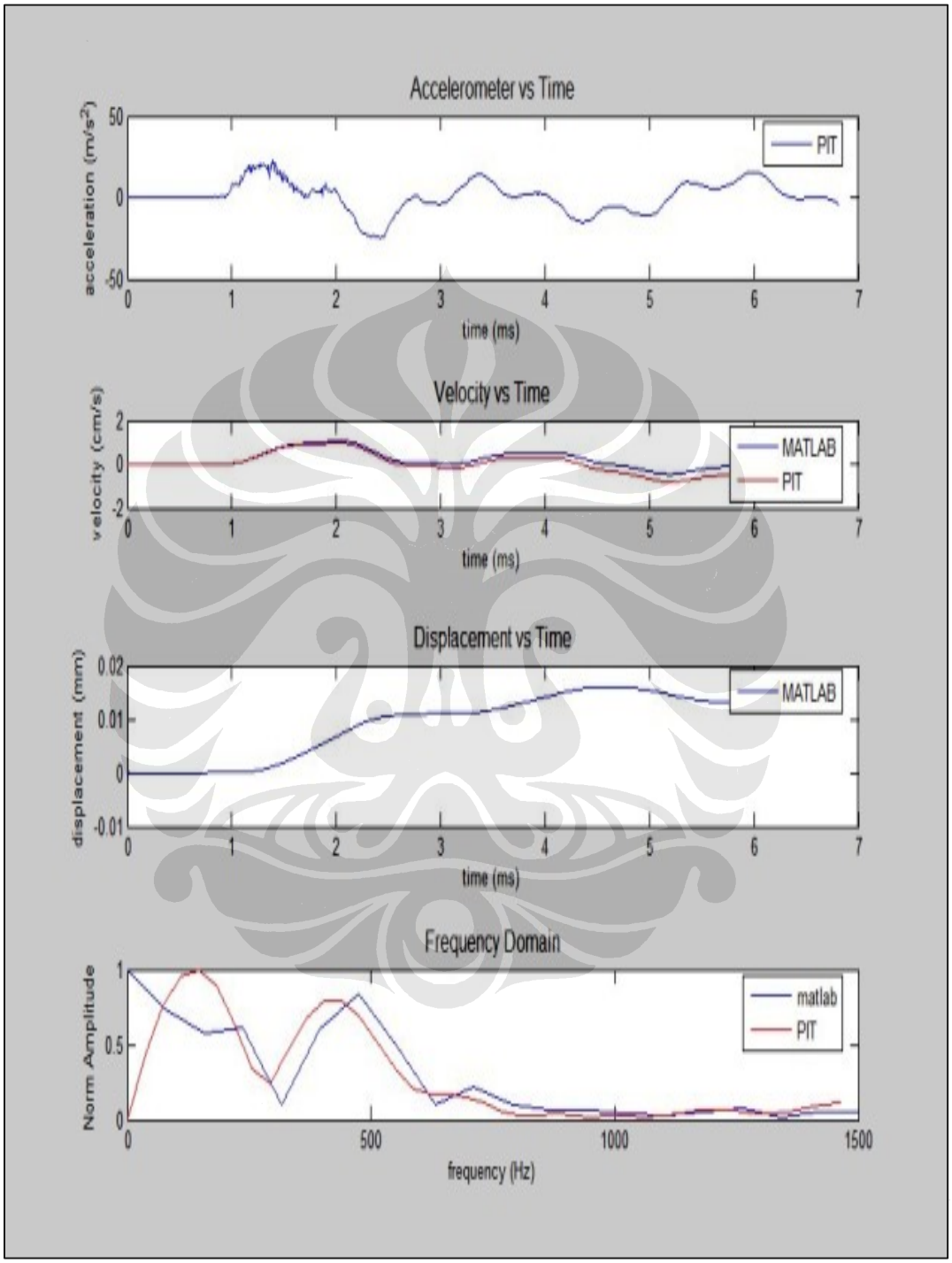
Akselerometer di tengah, hammer di utara akselerometer, hammer = 1250 gr

Data 10



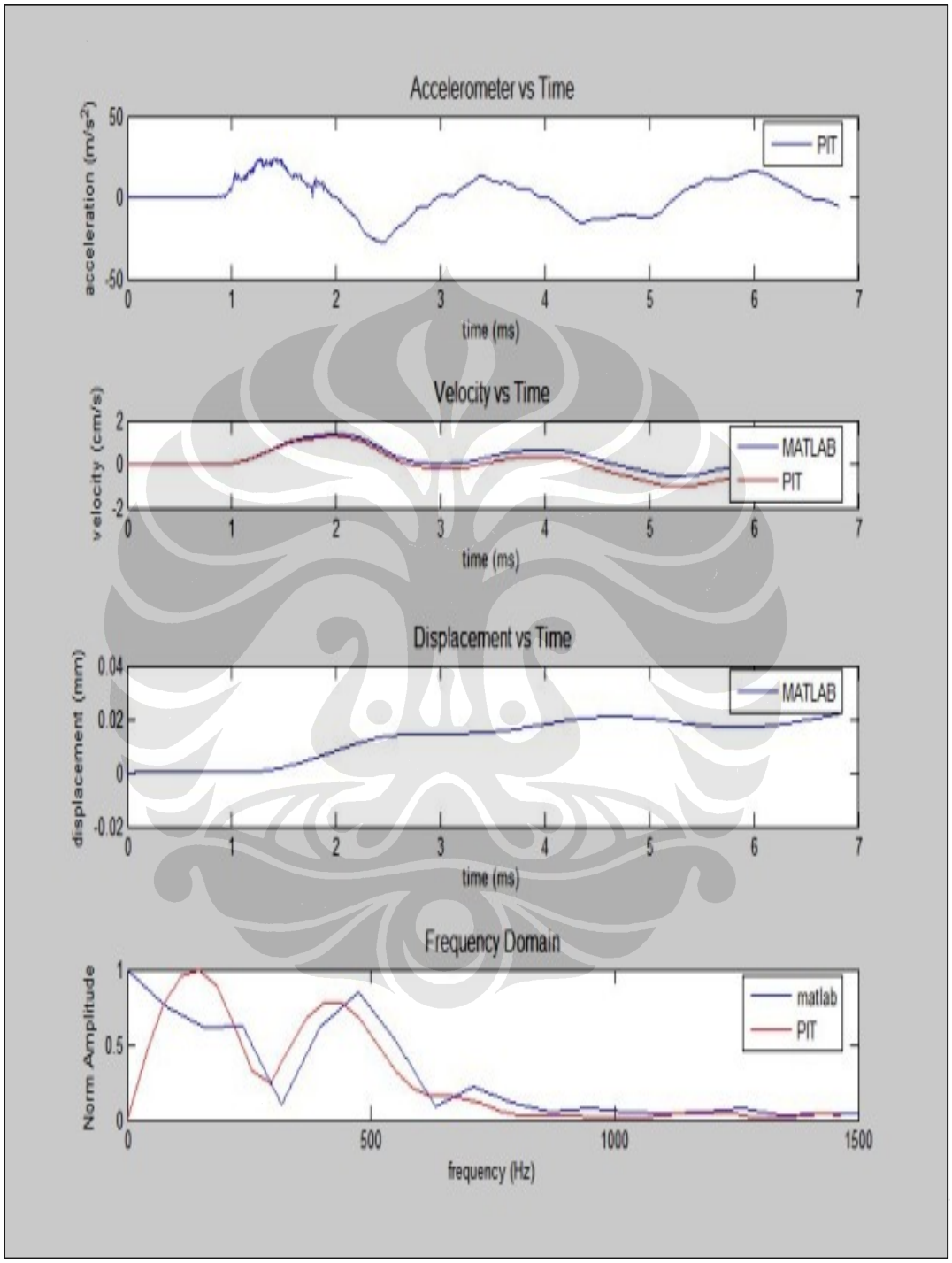
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 1



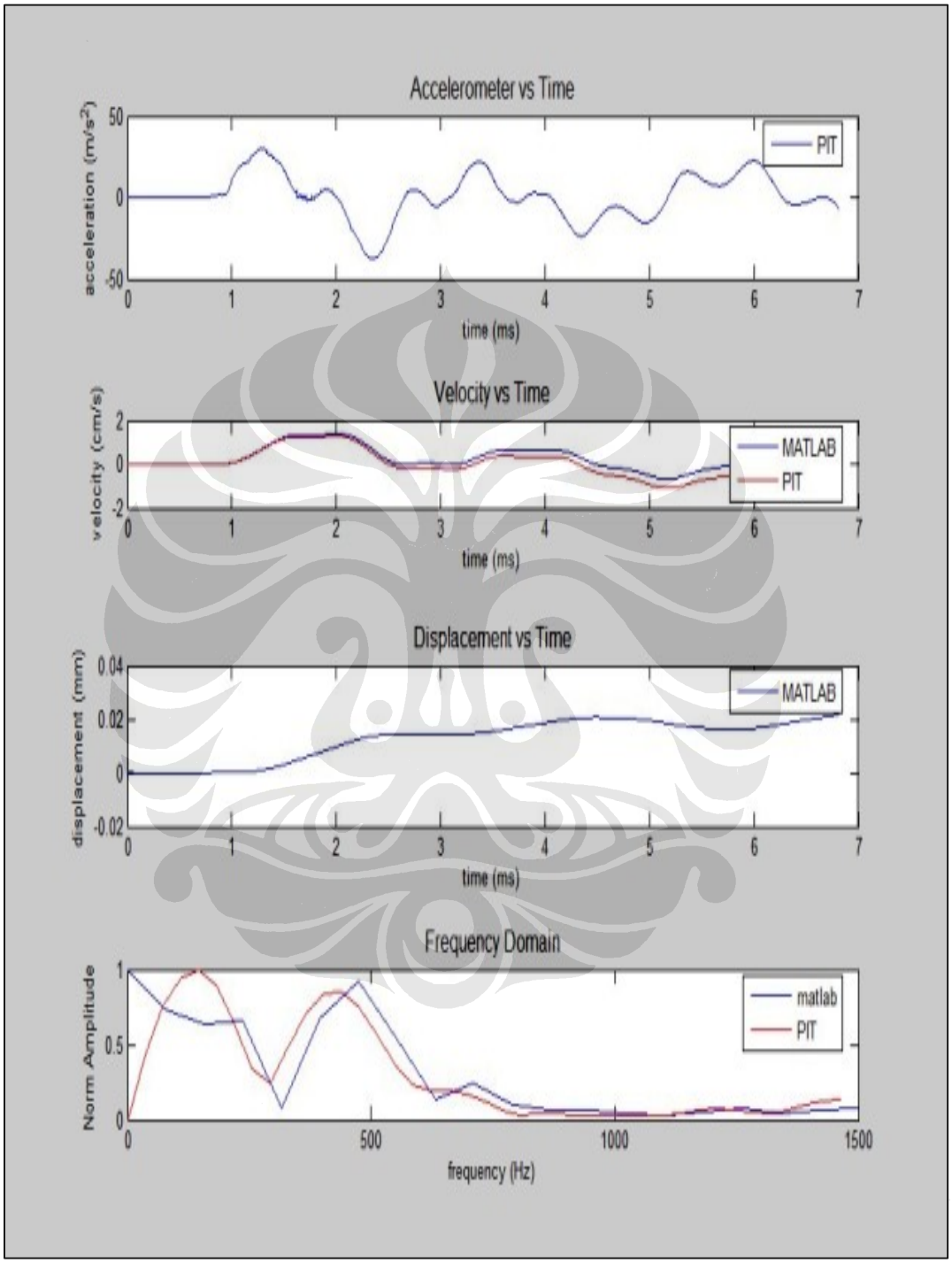
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 2



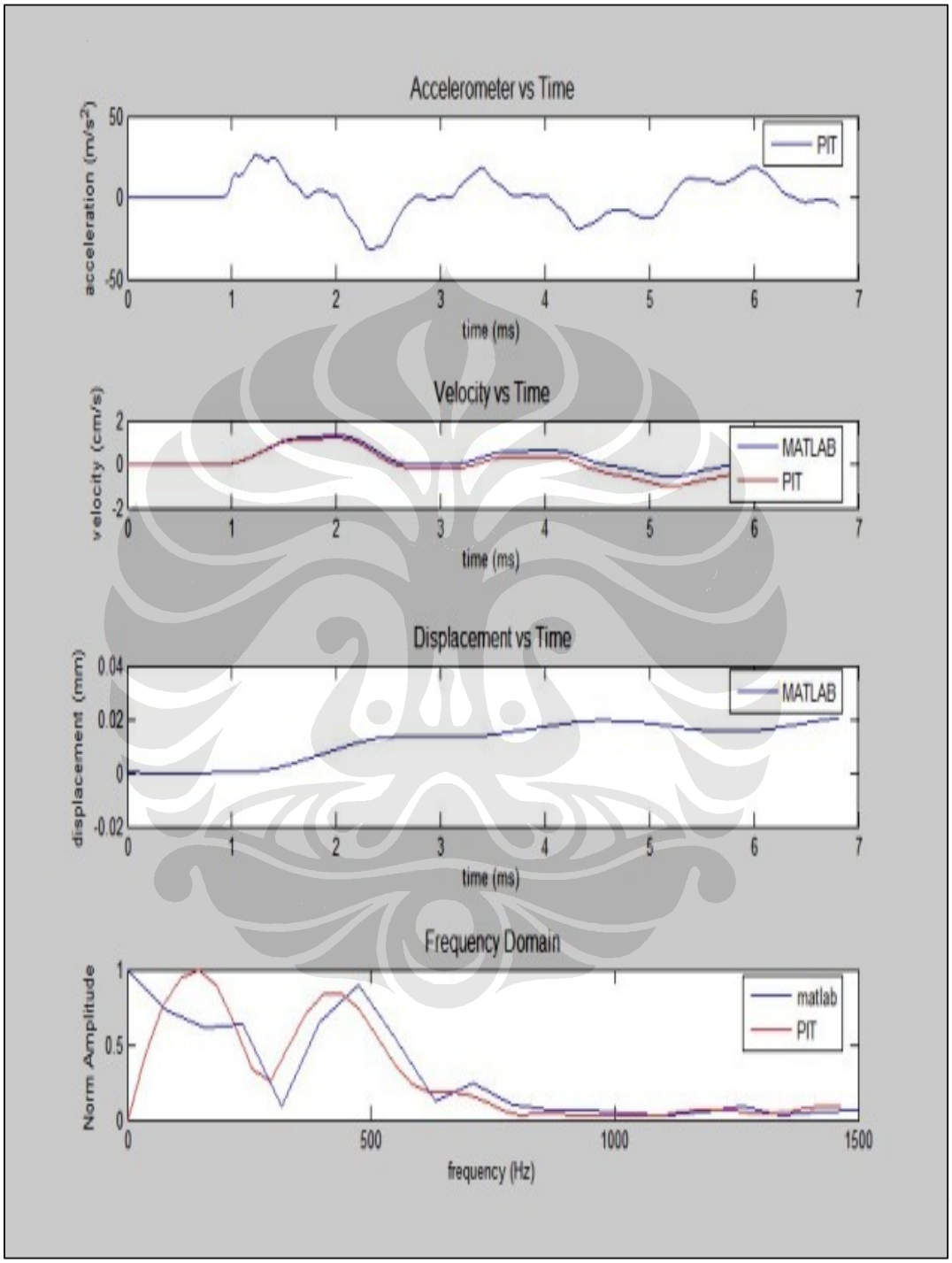
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 3



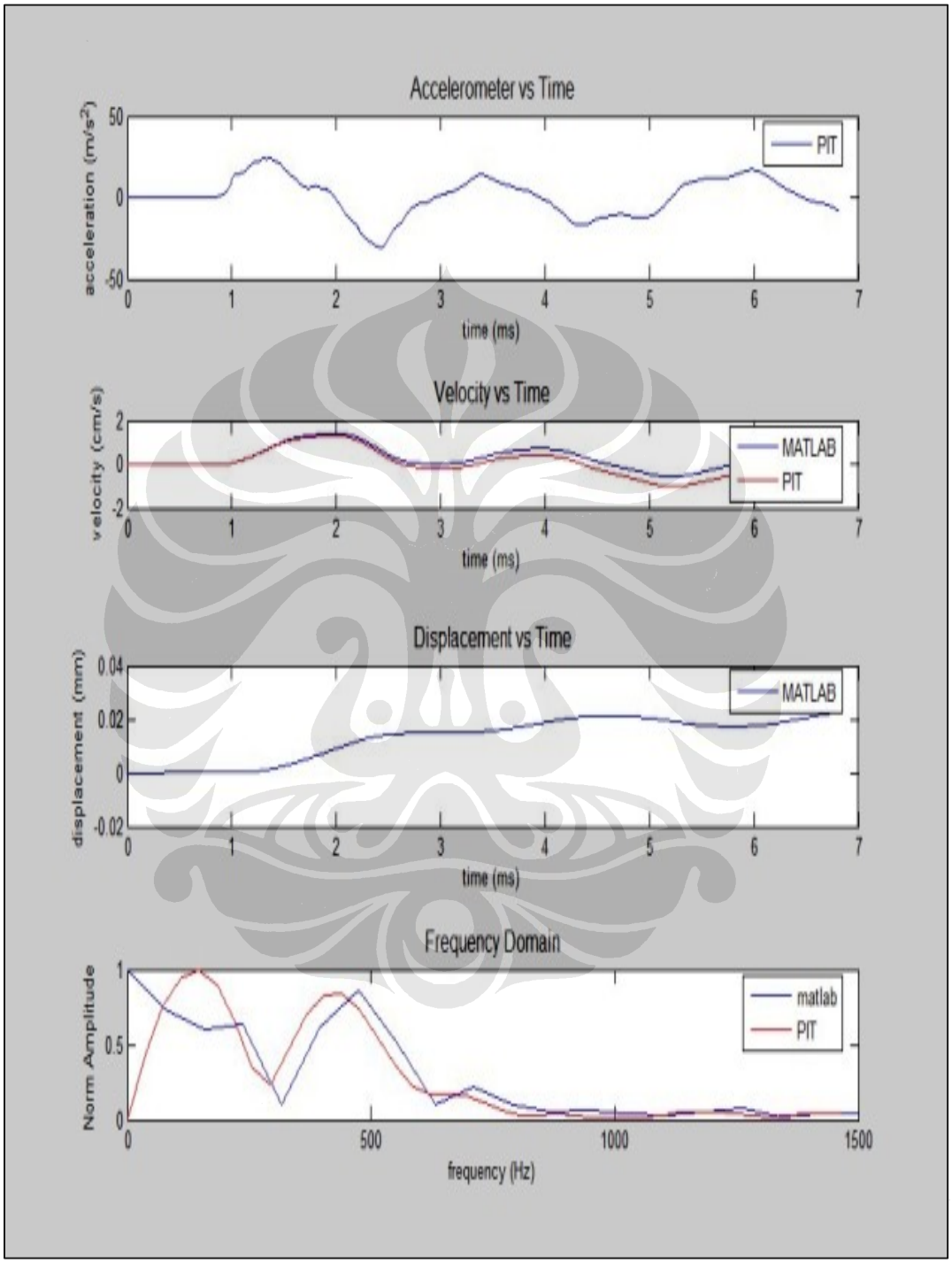
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 4



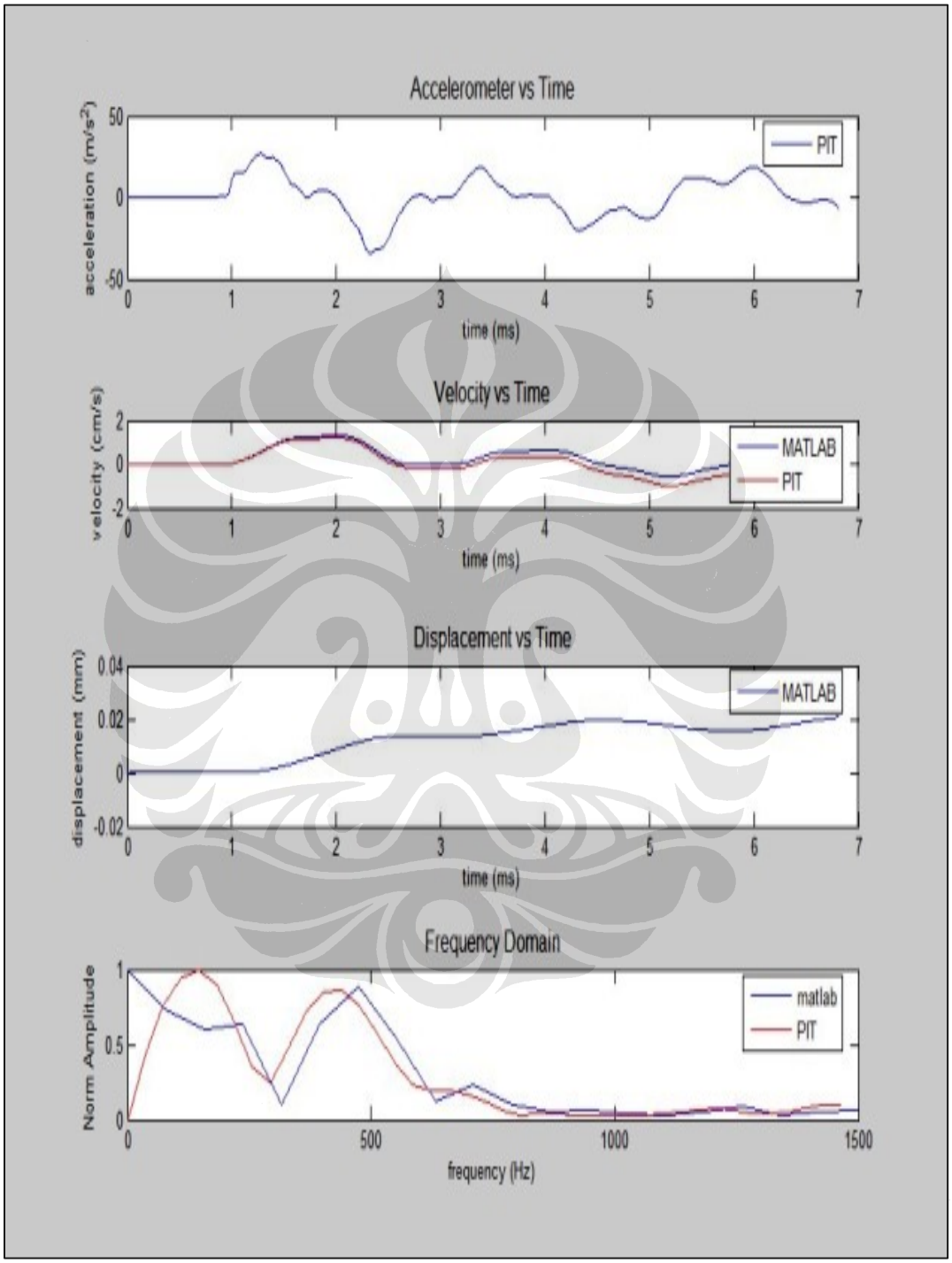
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 5



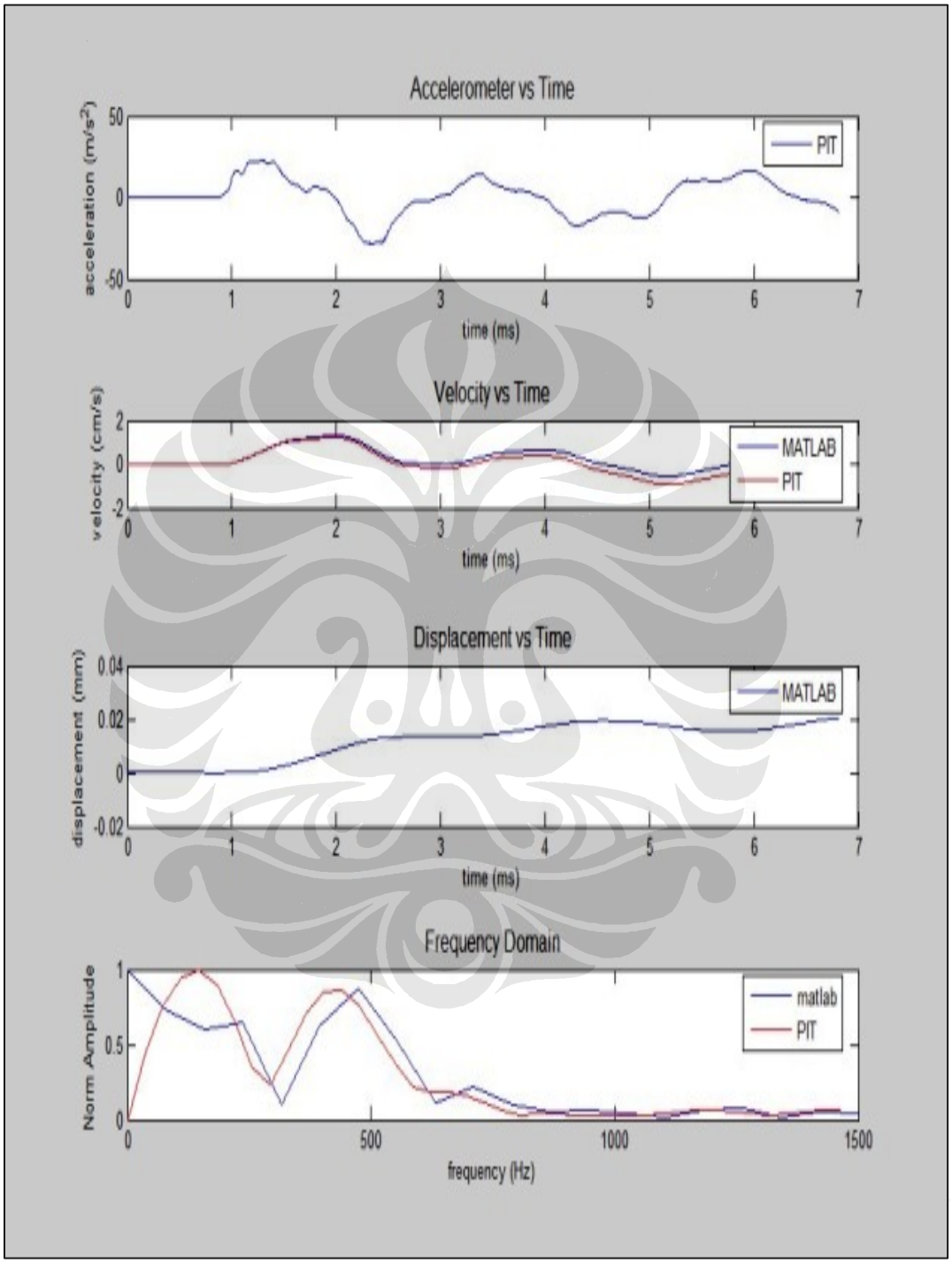
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 6



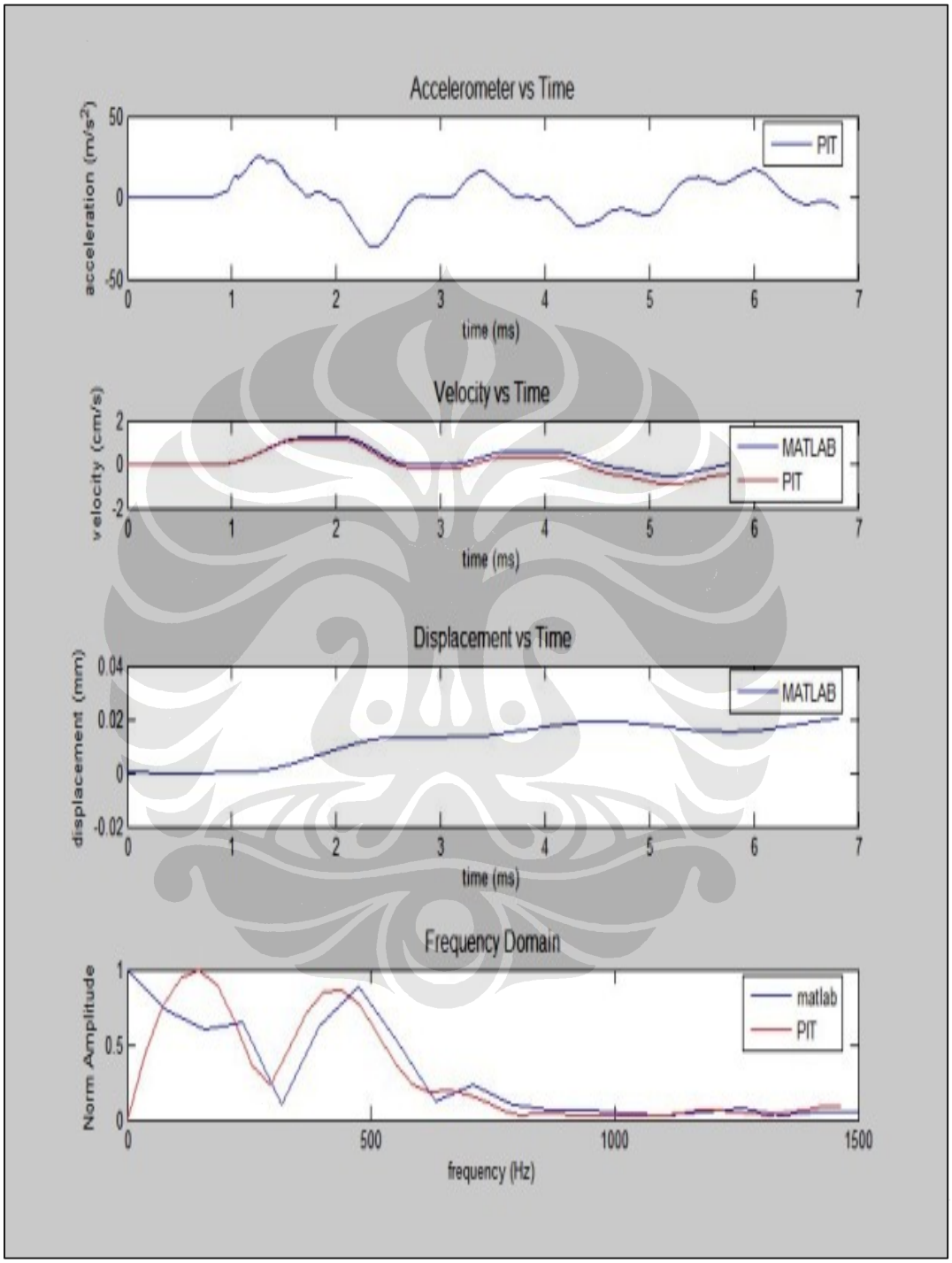
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 7



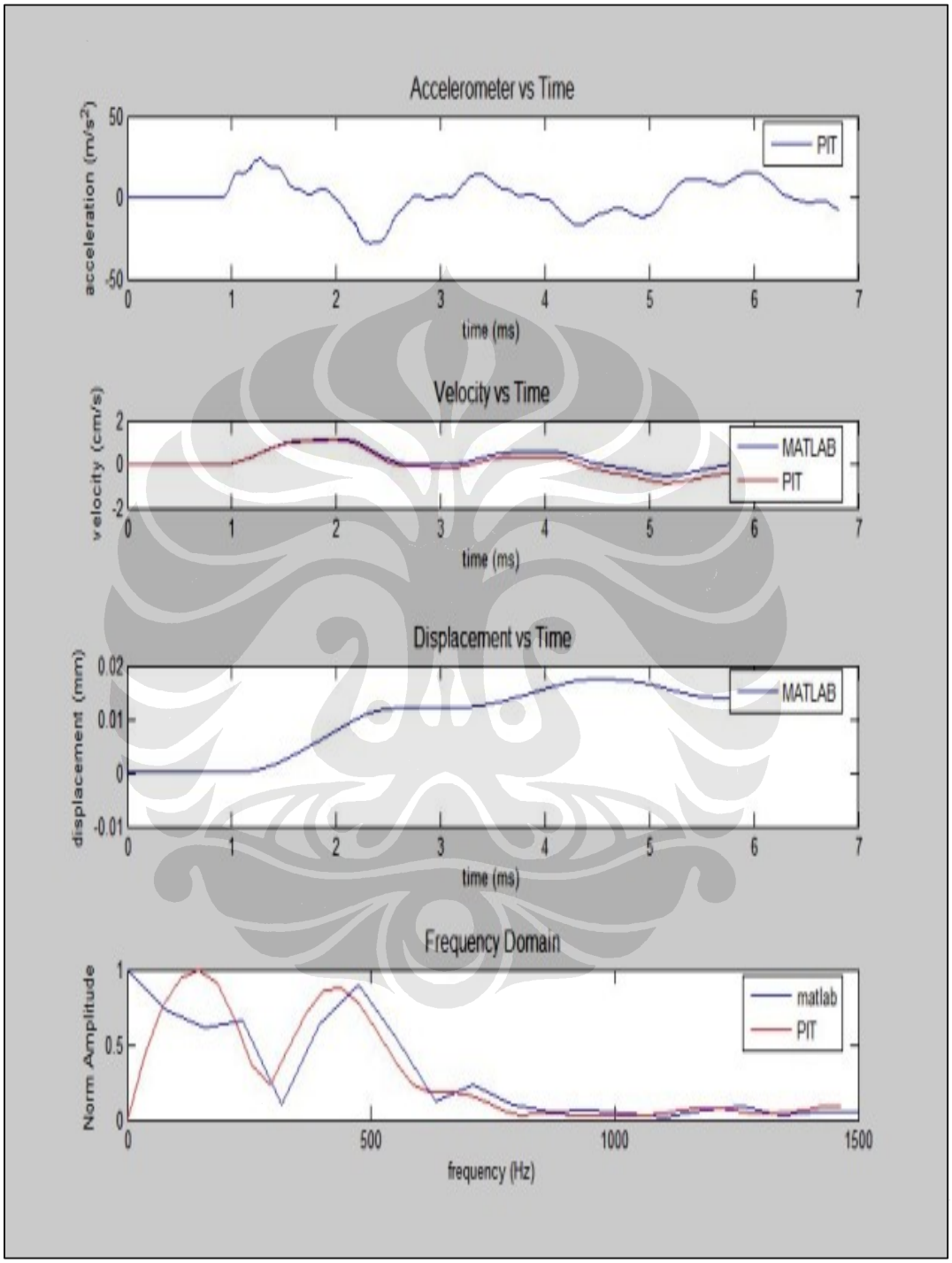
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 8



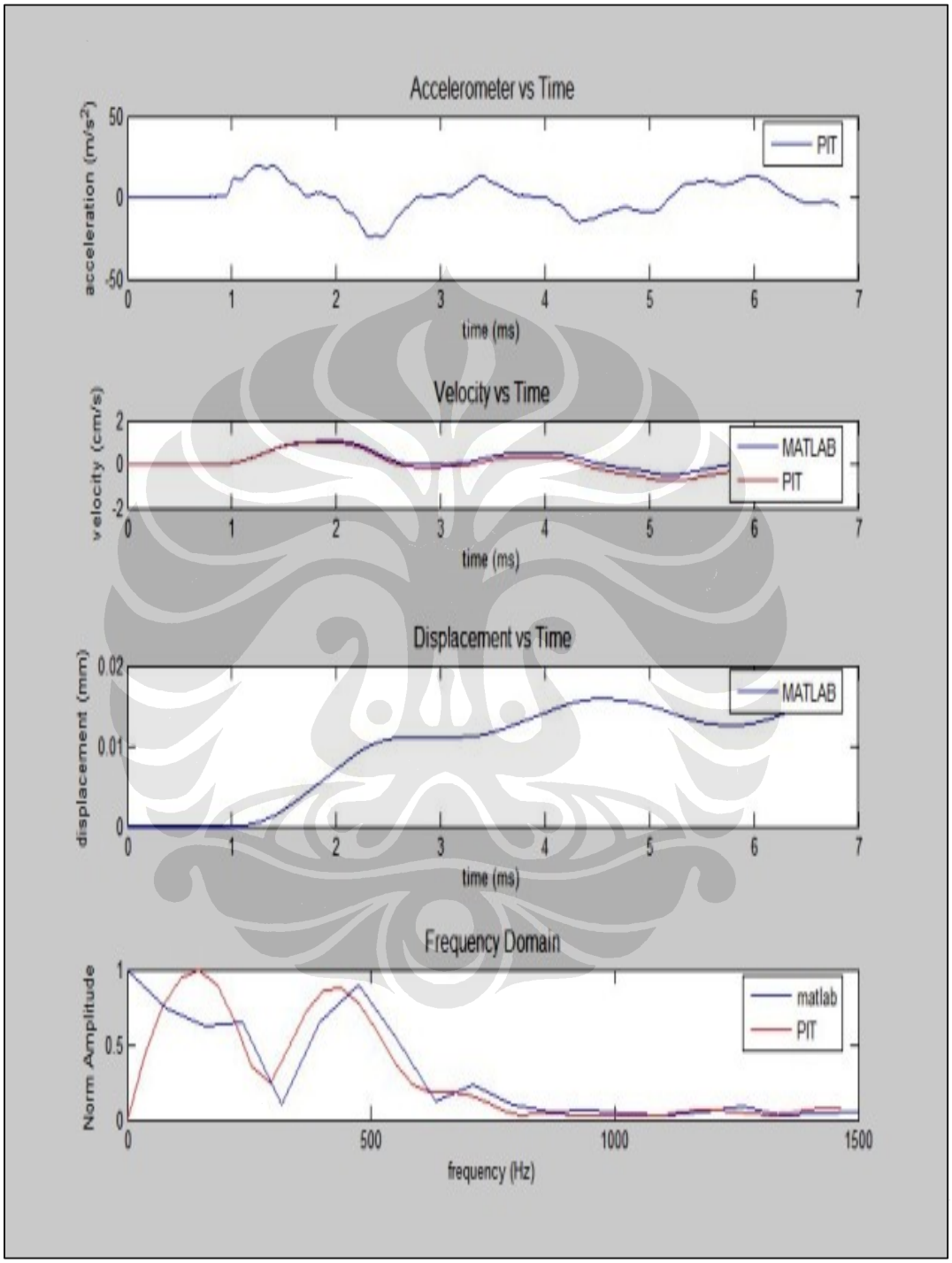
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 9



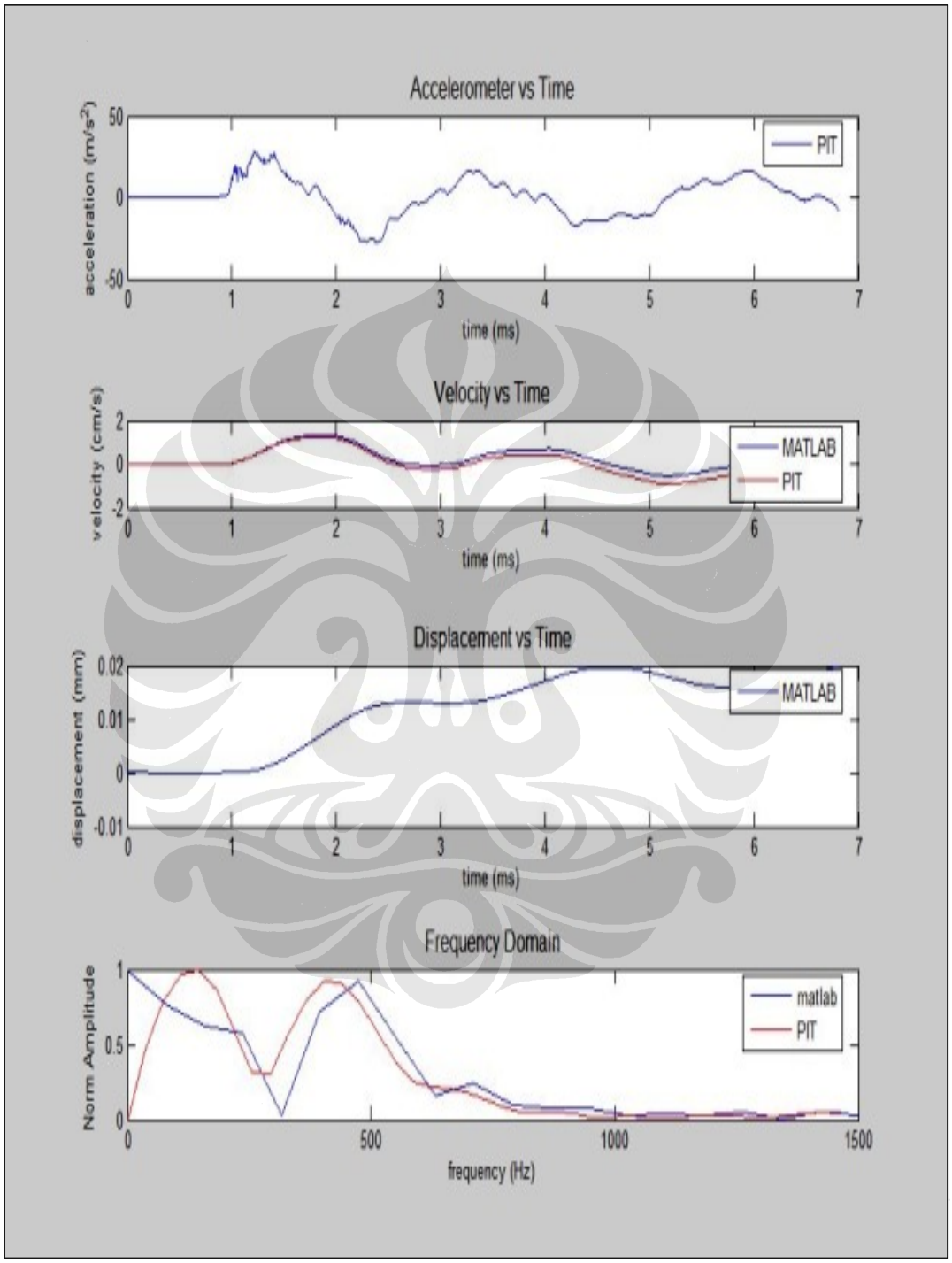
Akselerometer di tengah, hammer di barat akselerometer, hammer = 1250 gr

Data 10



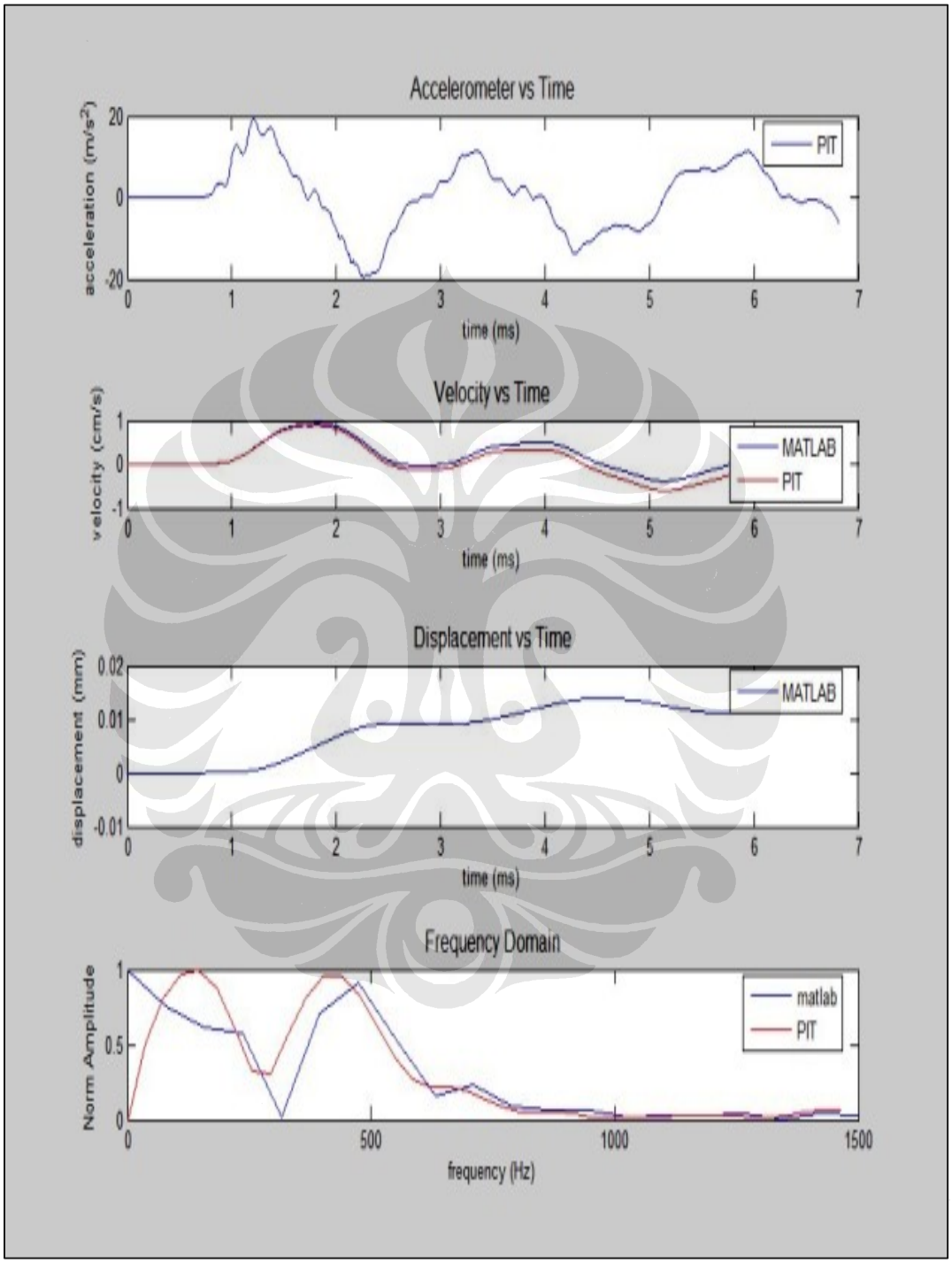
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 1



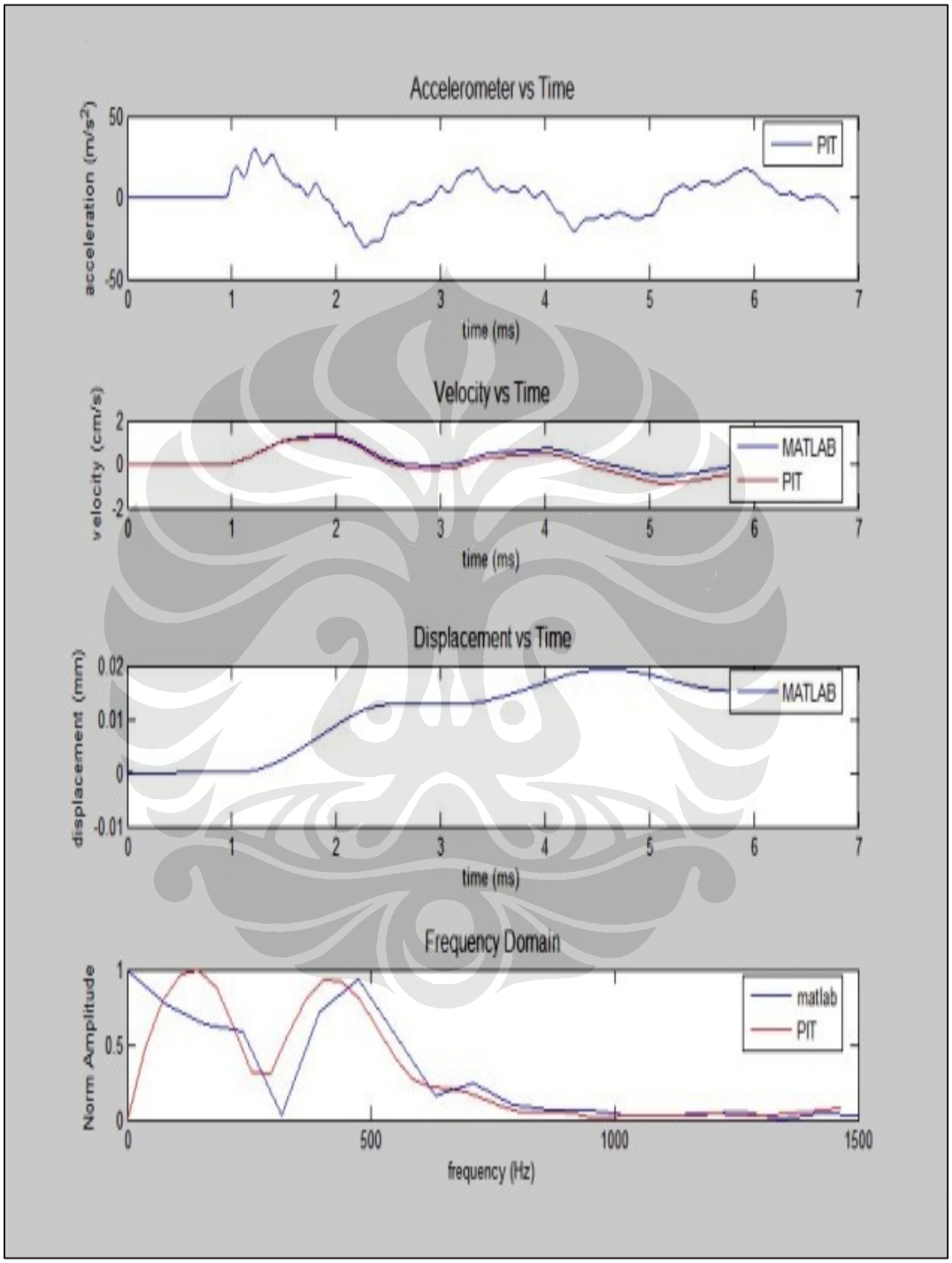
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 2



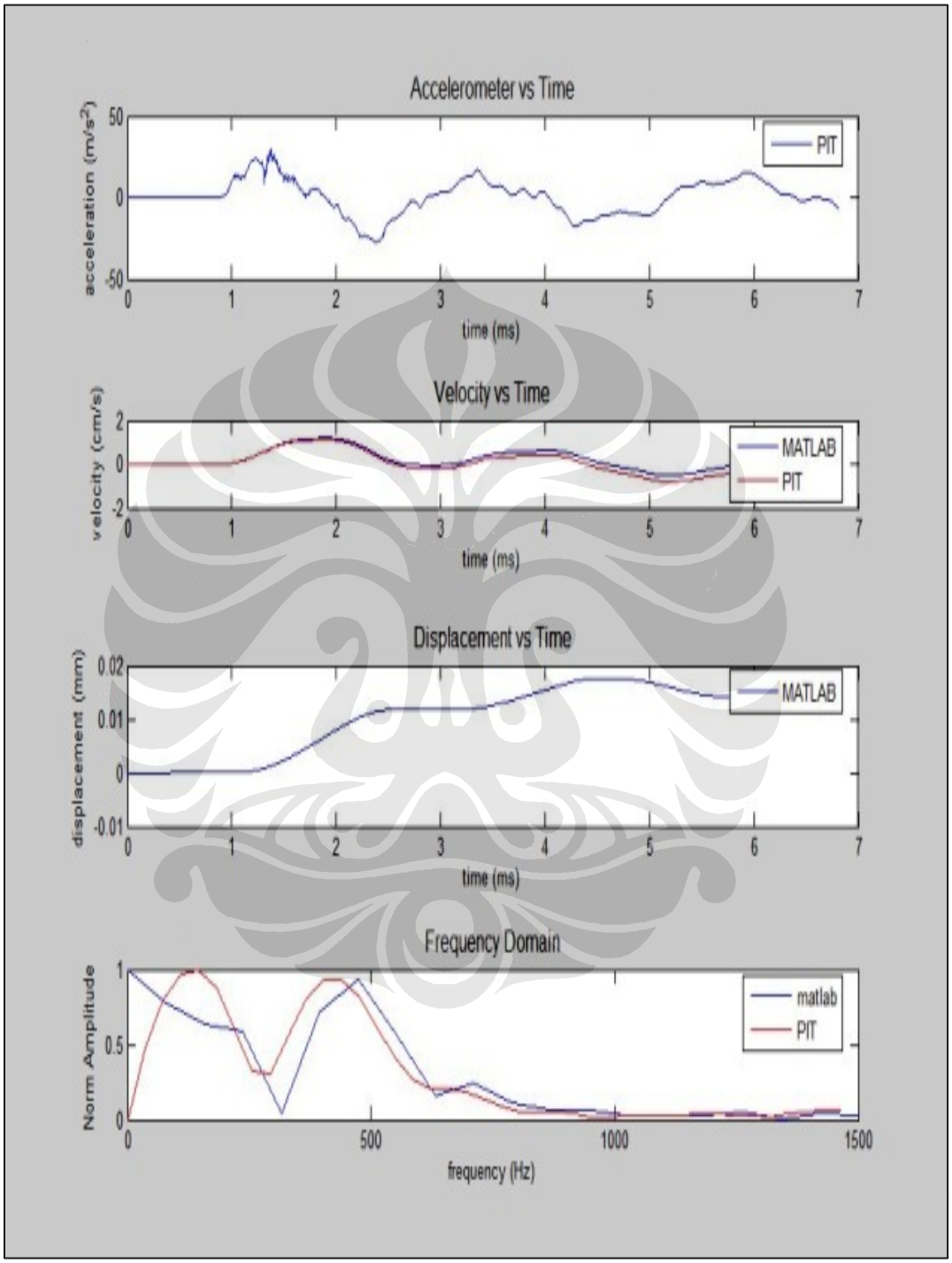
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 3



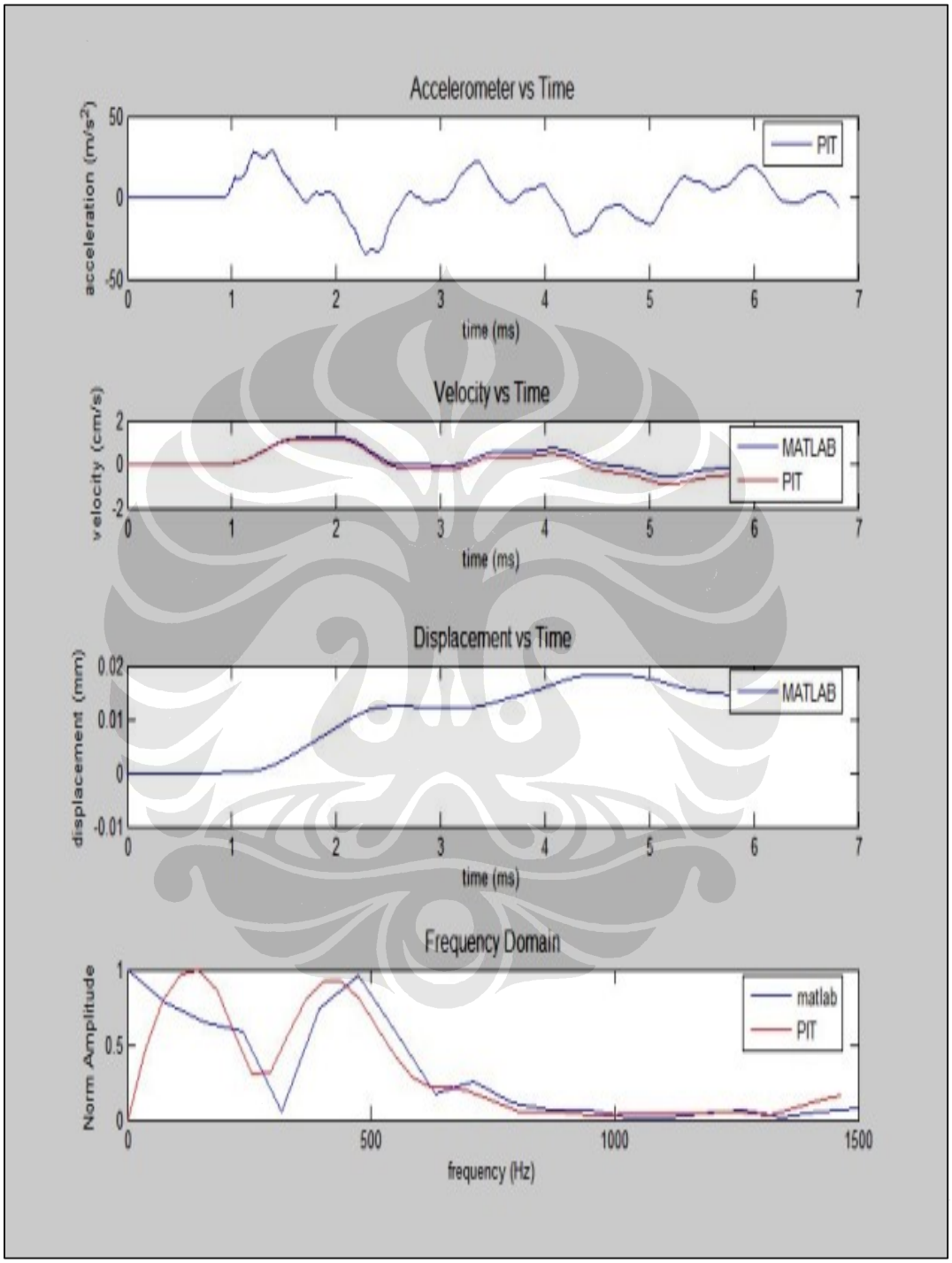
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 4



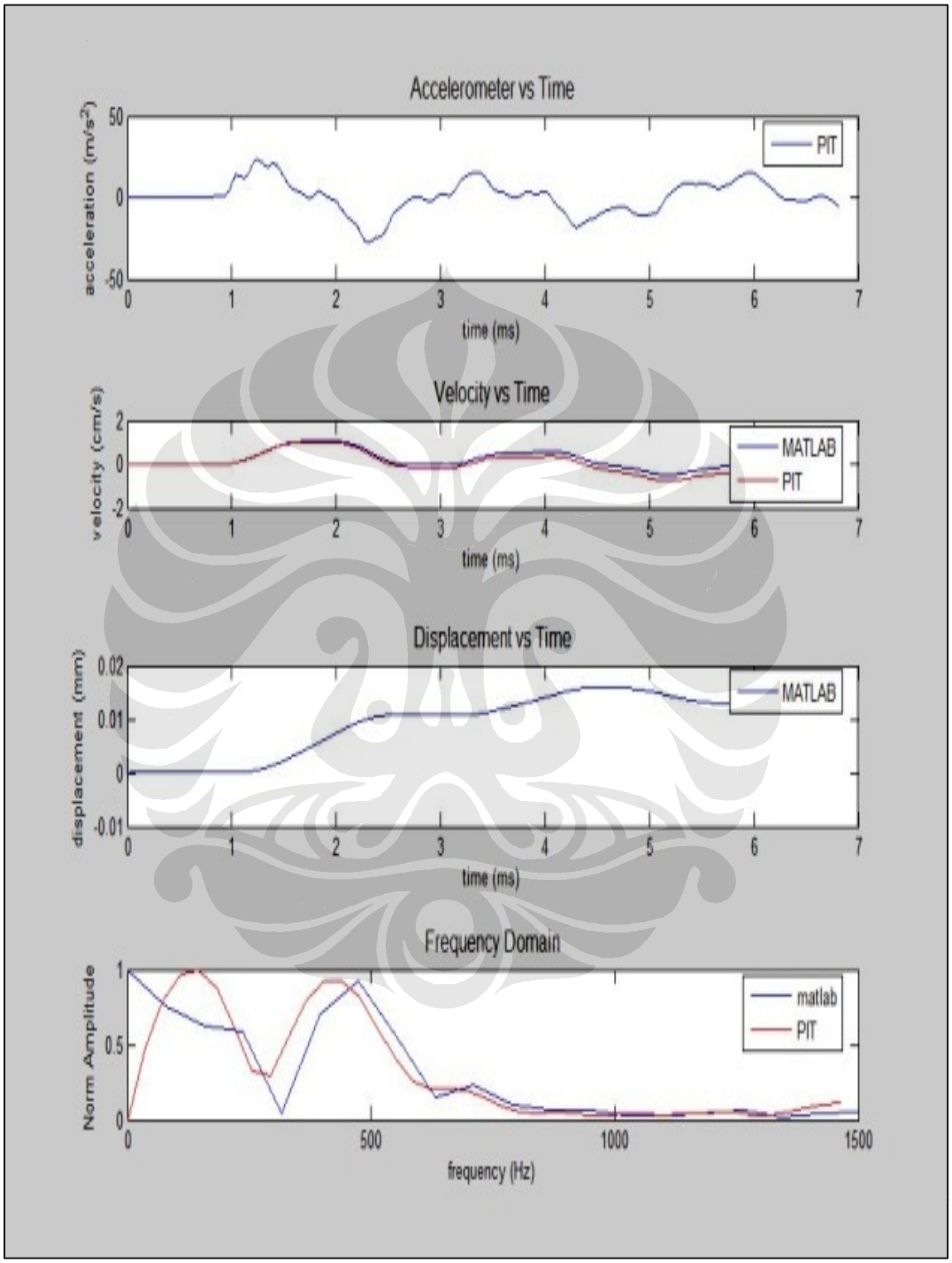
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 5



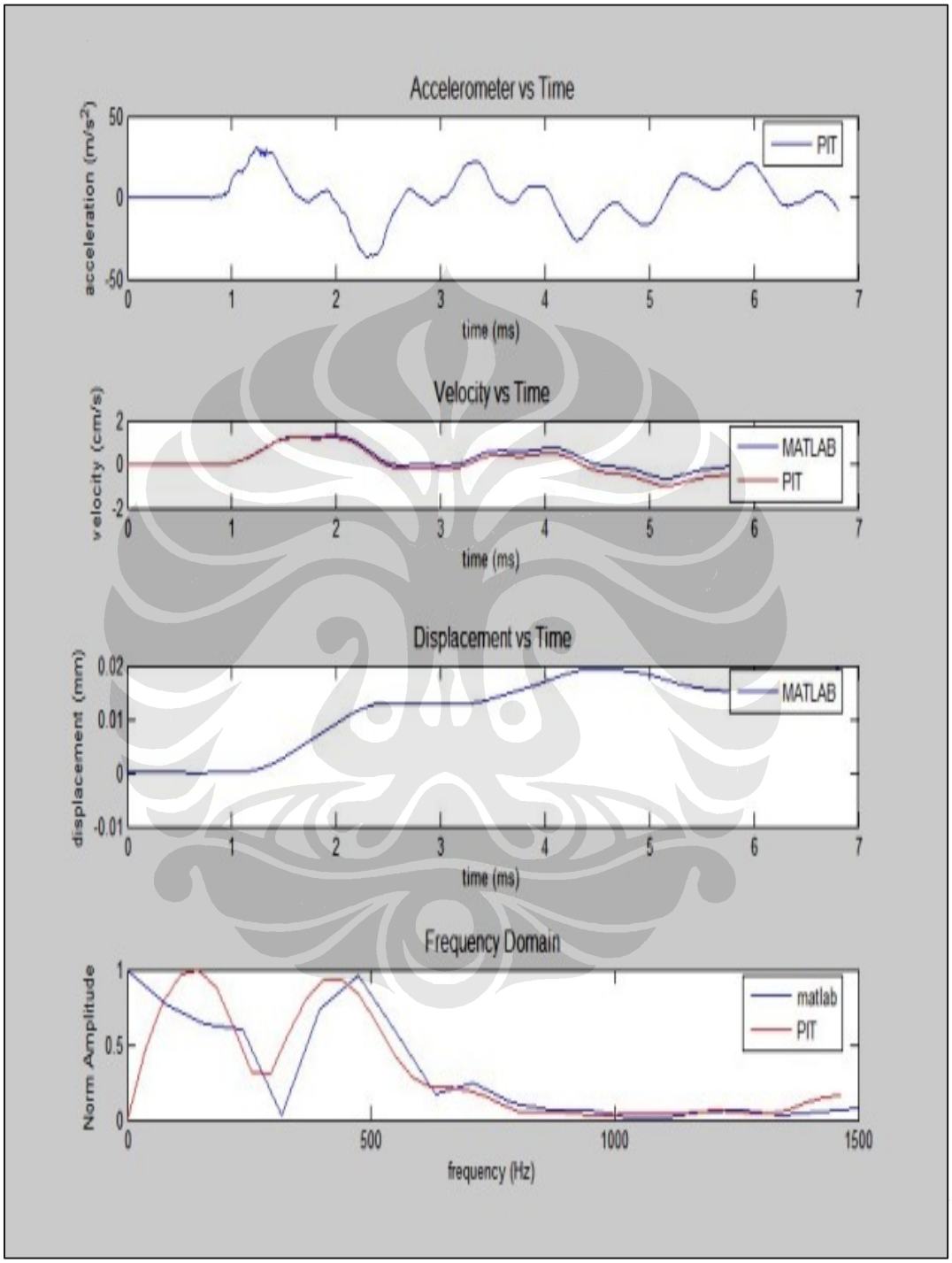
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 6



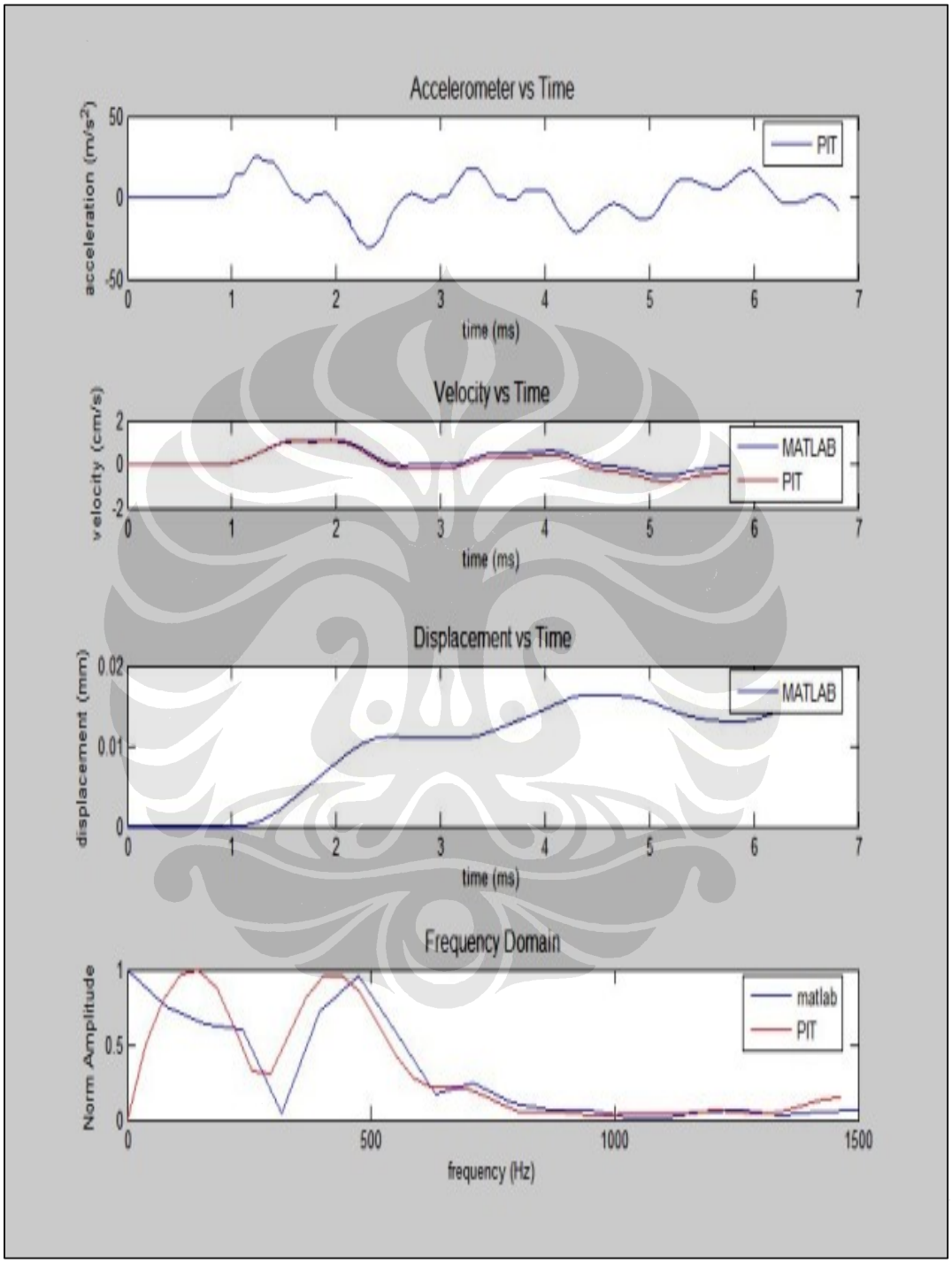
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 7



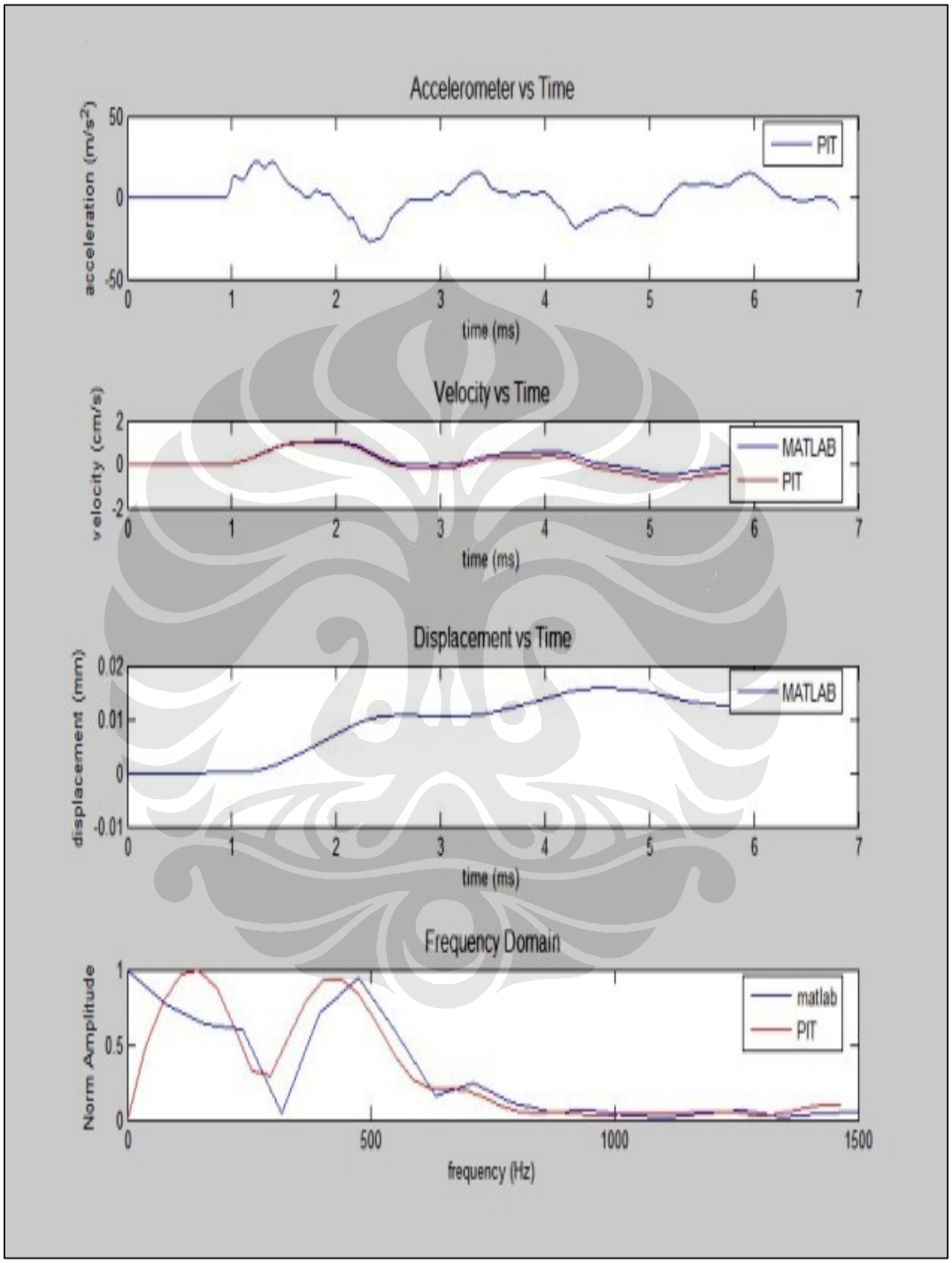
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 8



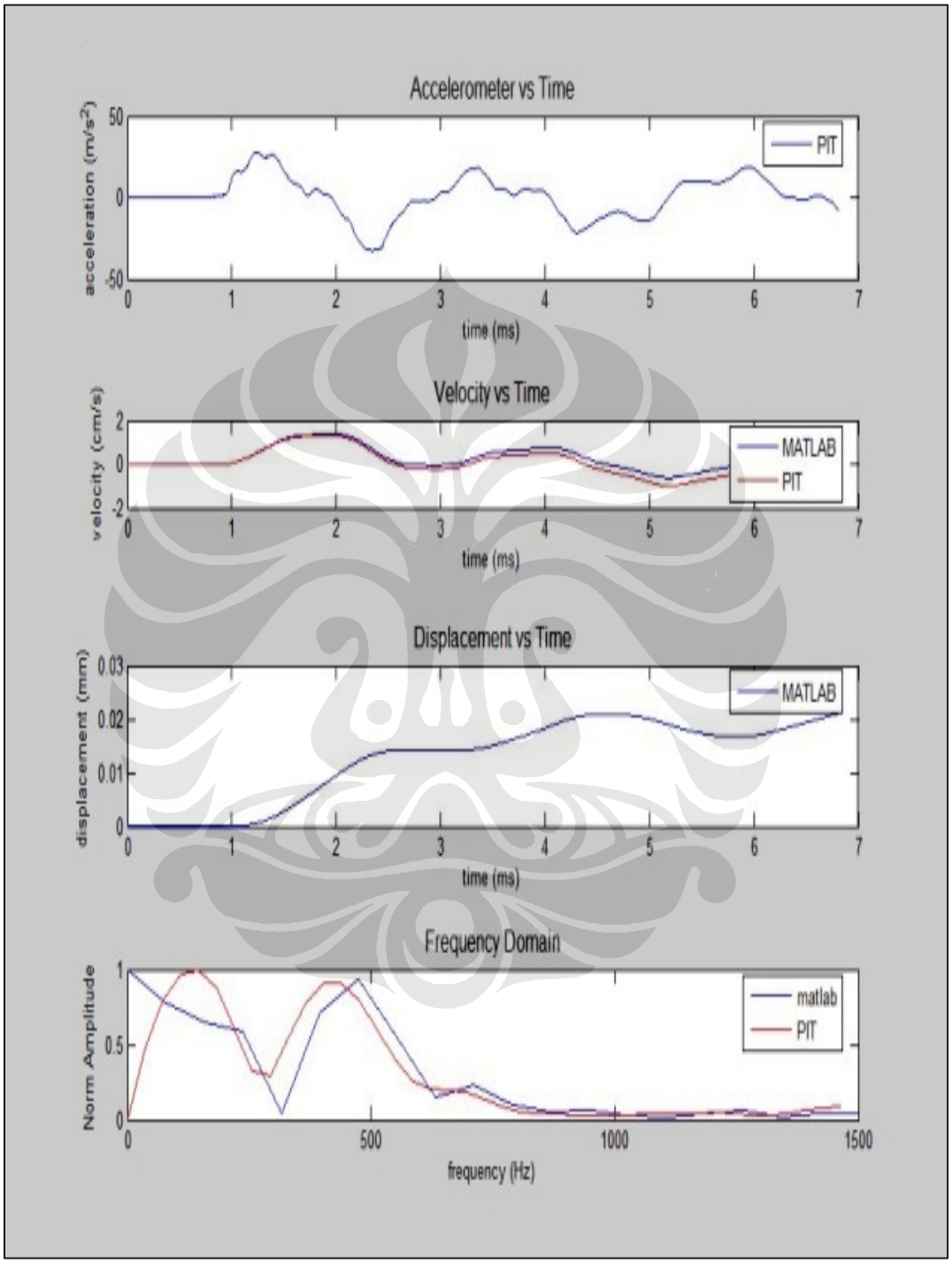
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

Data 9



Akselerometer di tengah, hammer di selatan akselerometer, hammer = 1250 gr

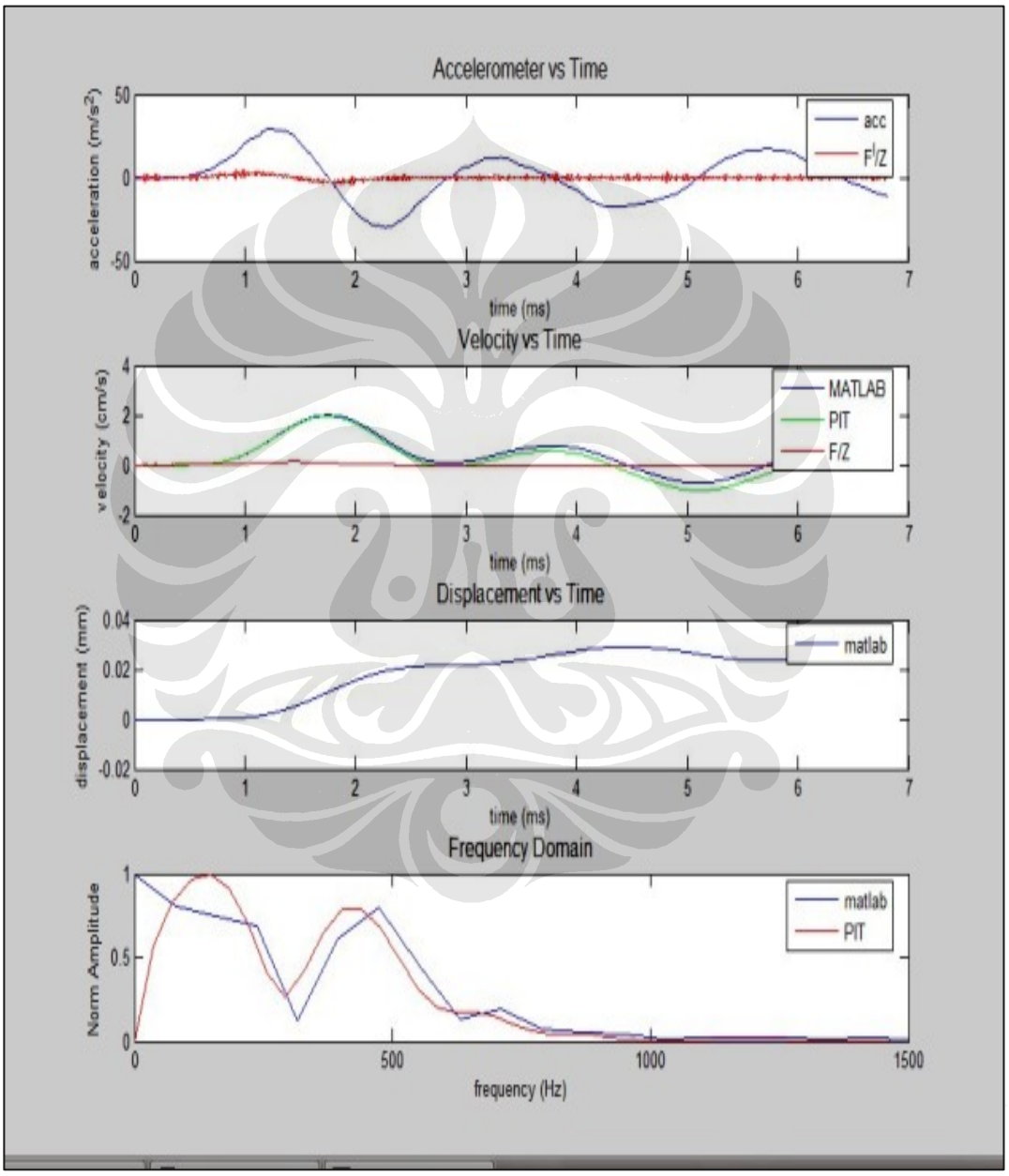
Data 10



LAMPIRAN 6

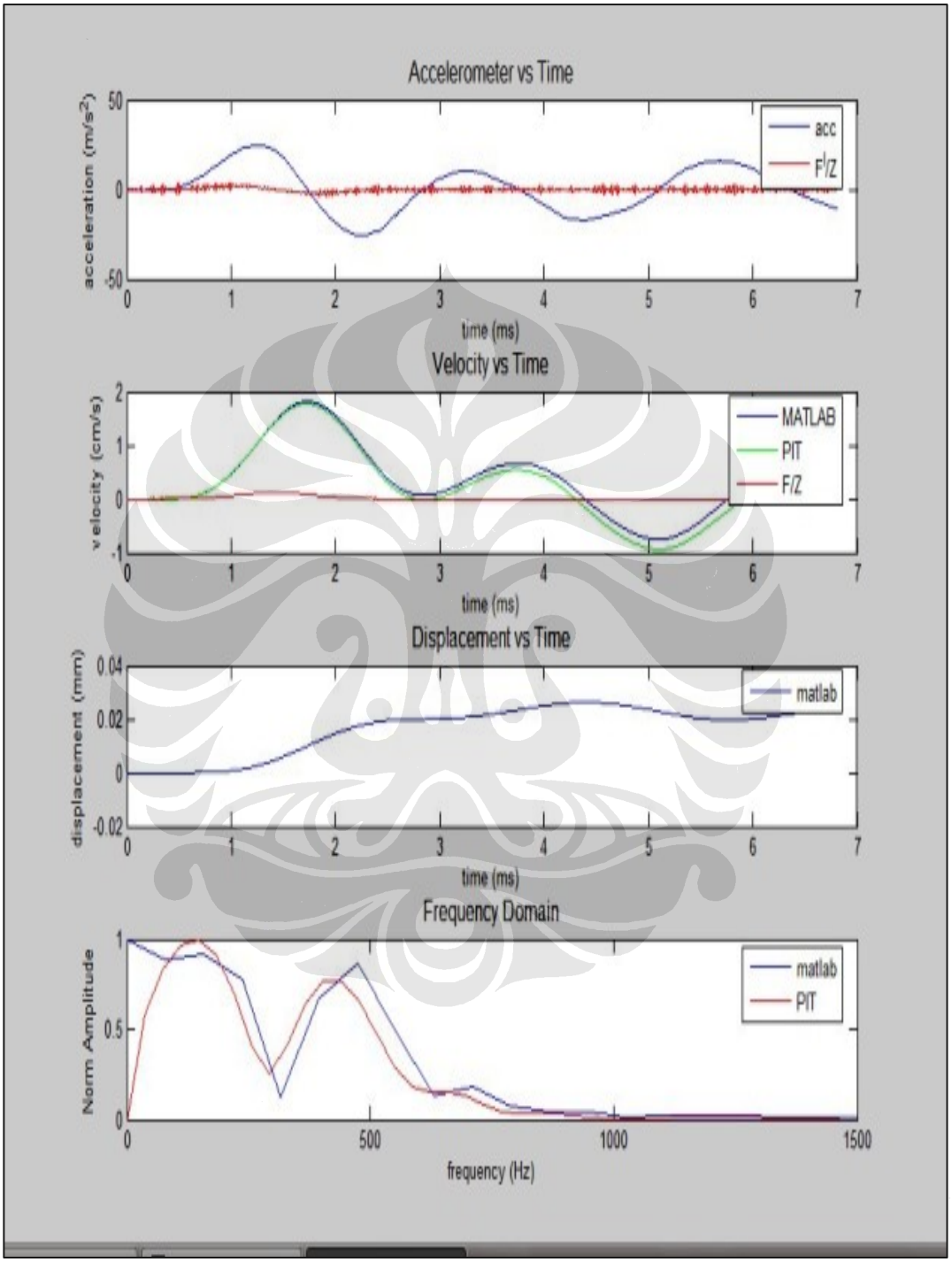
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 1



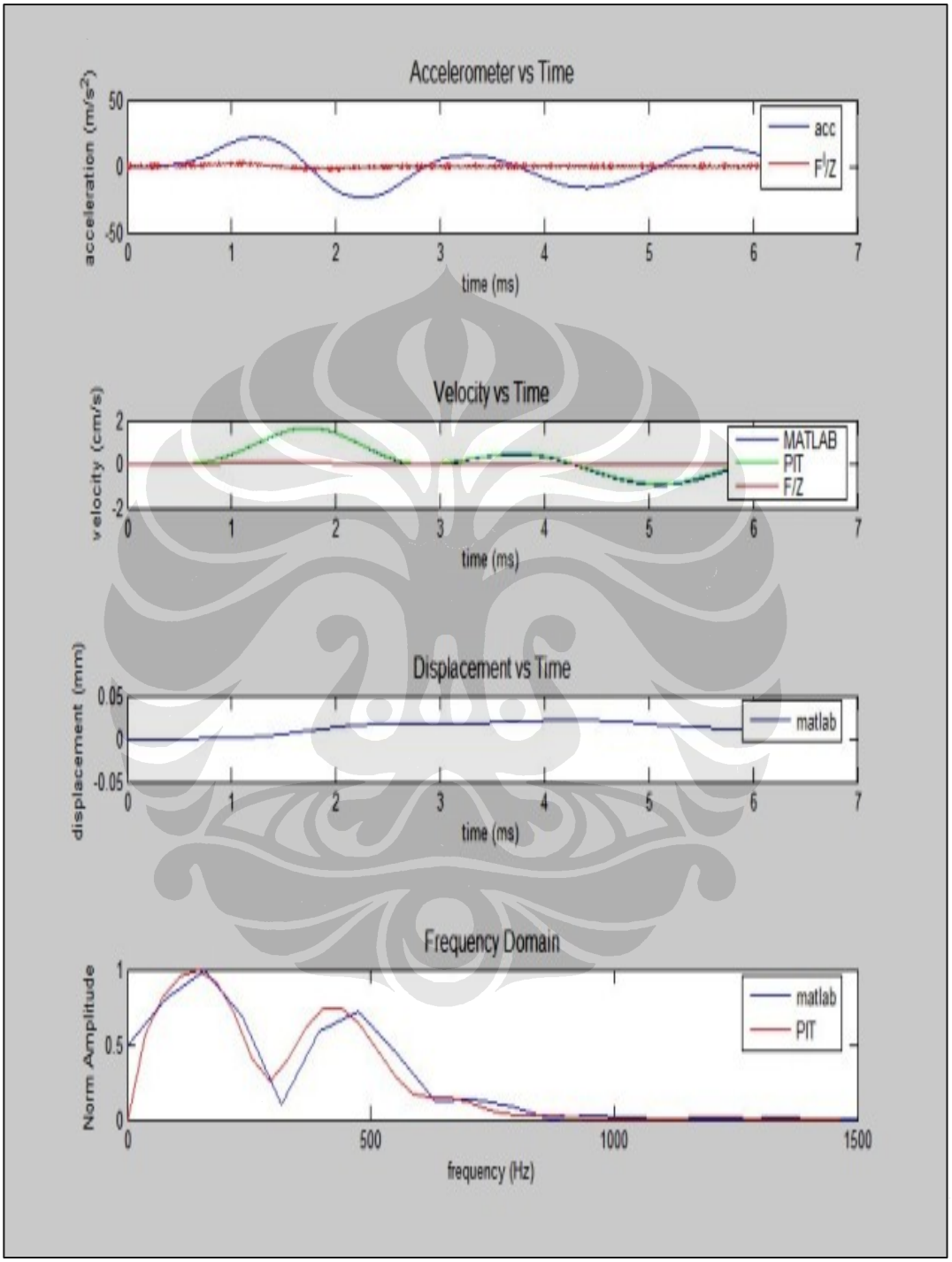
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 2



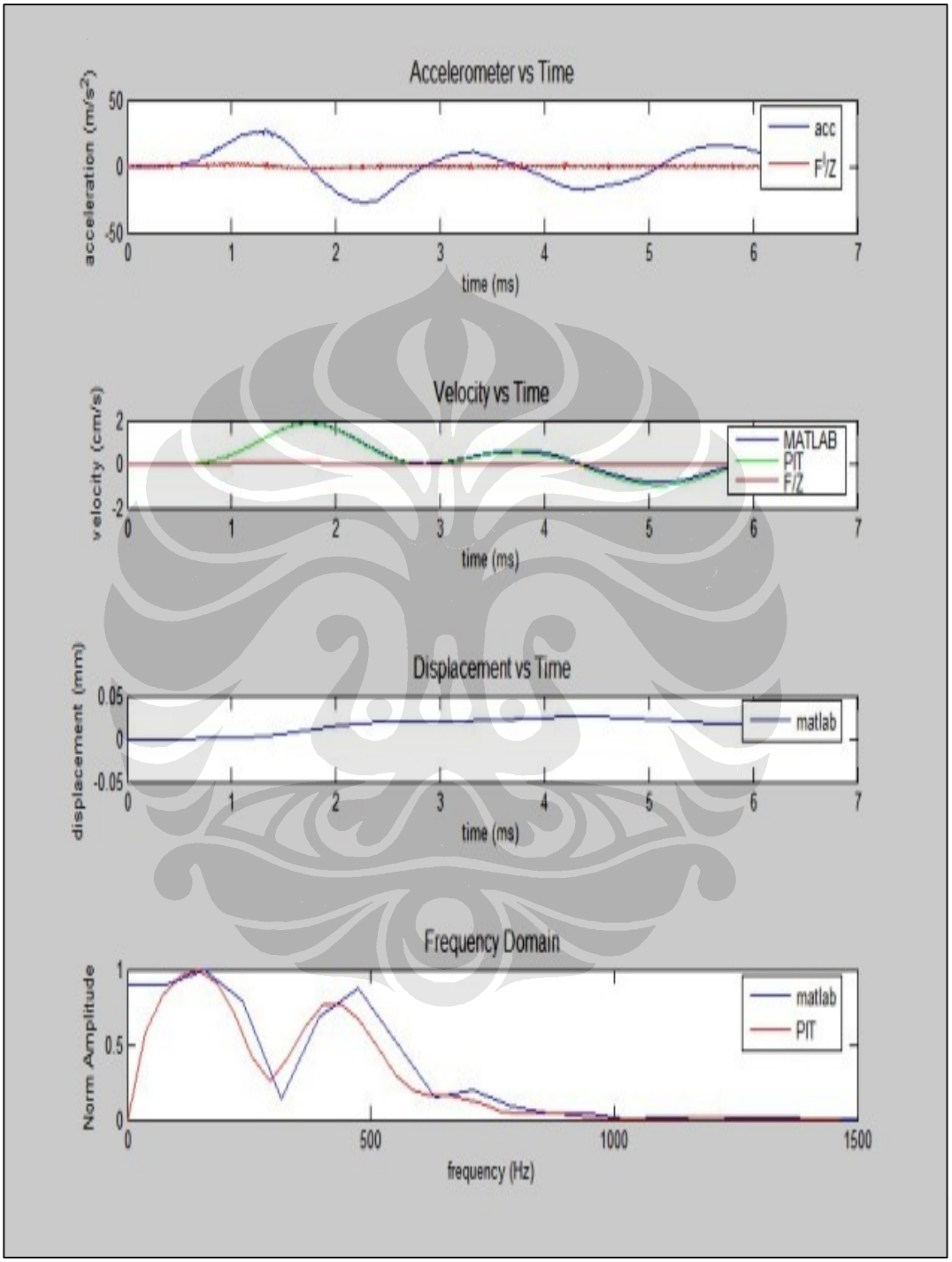
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 3



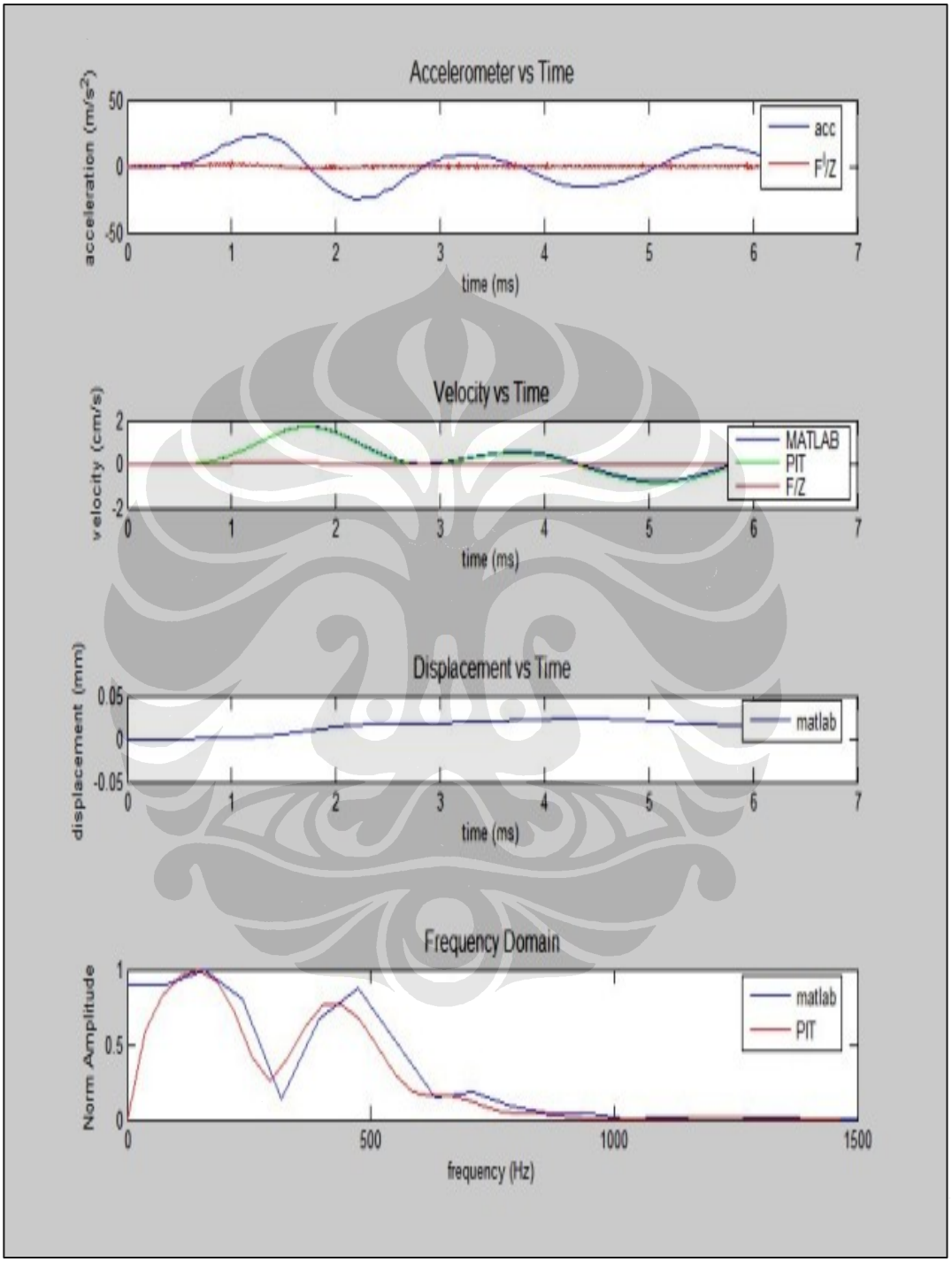
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 4



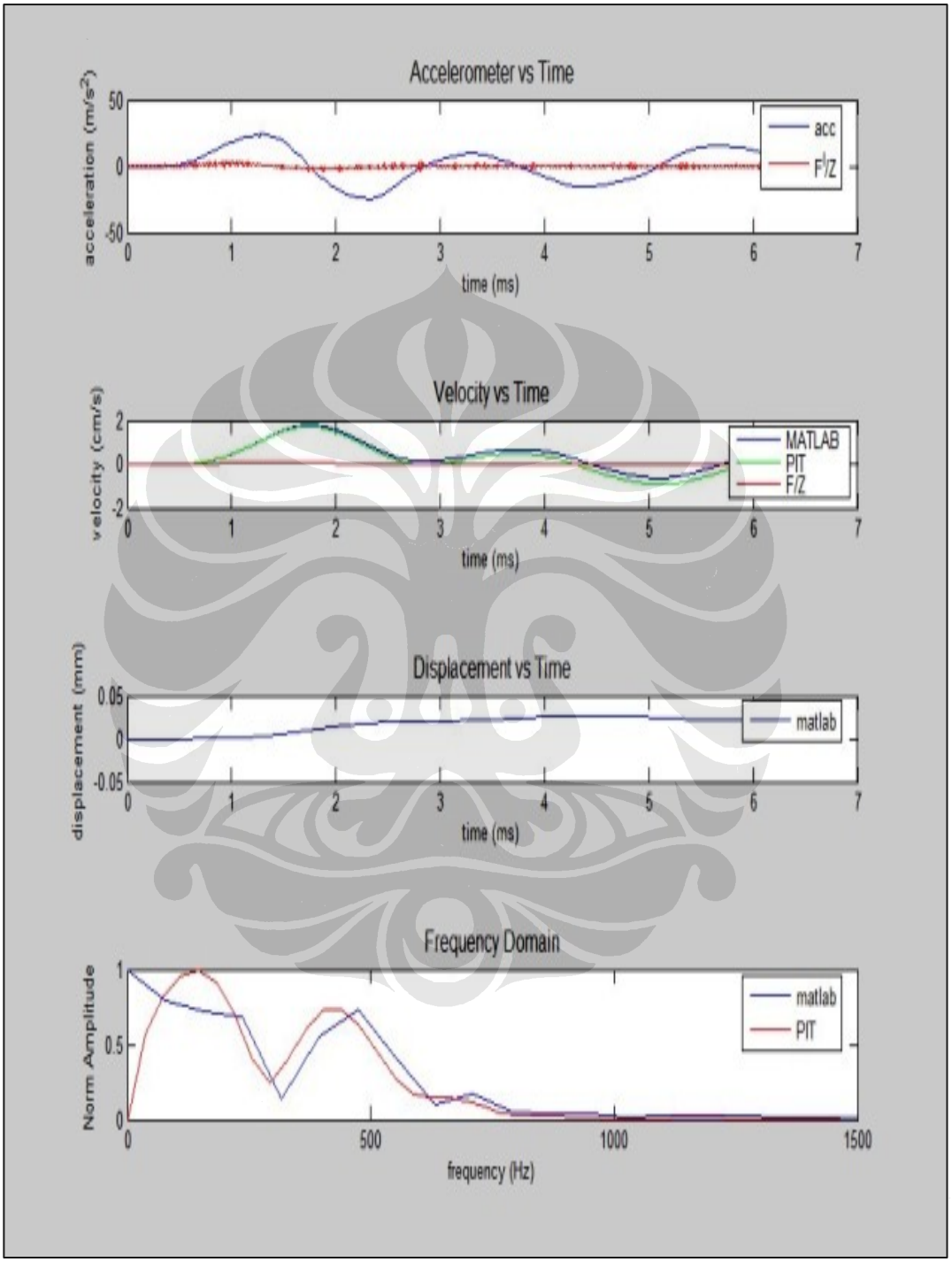
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 5



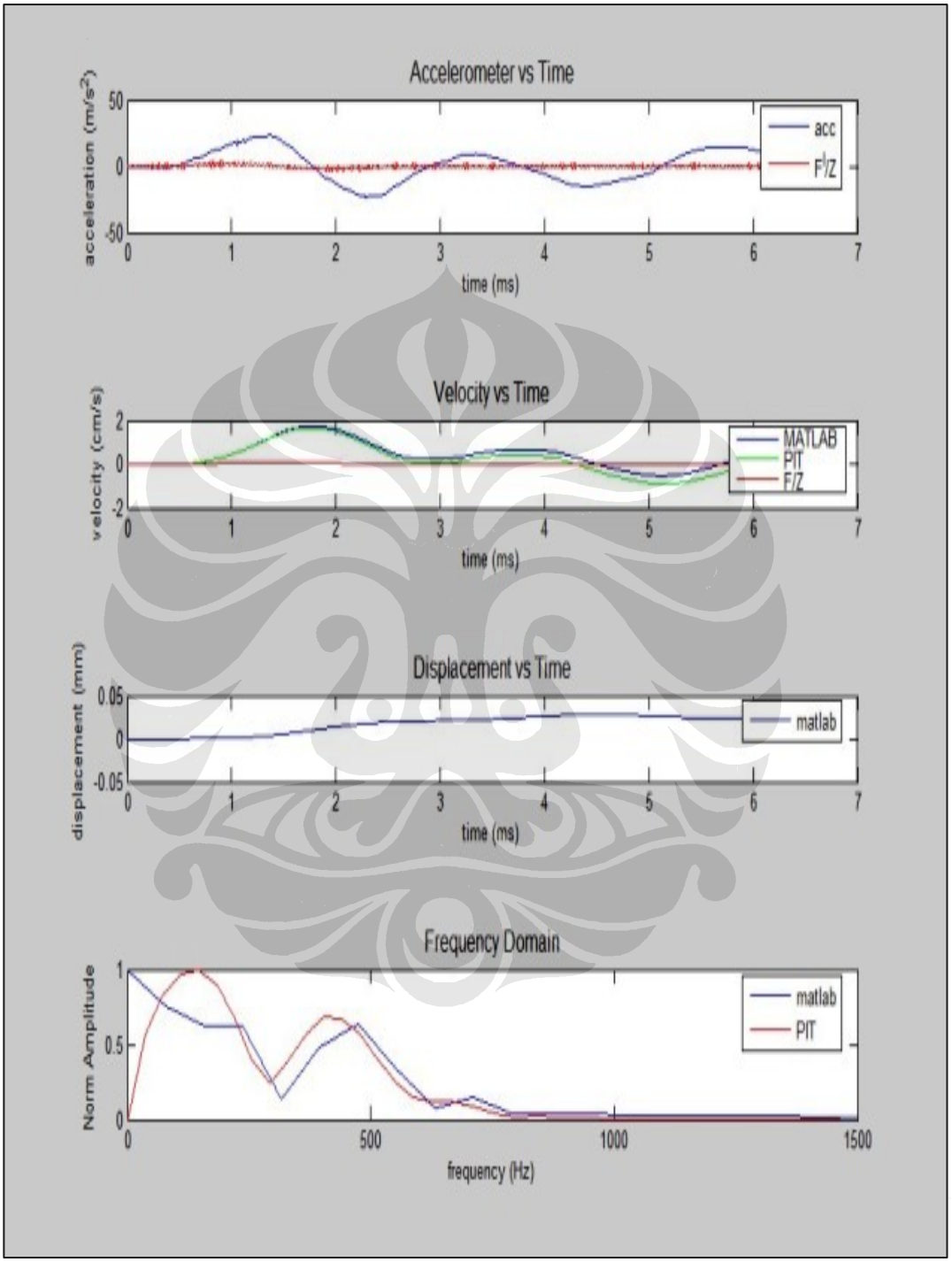
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 6



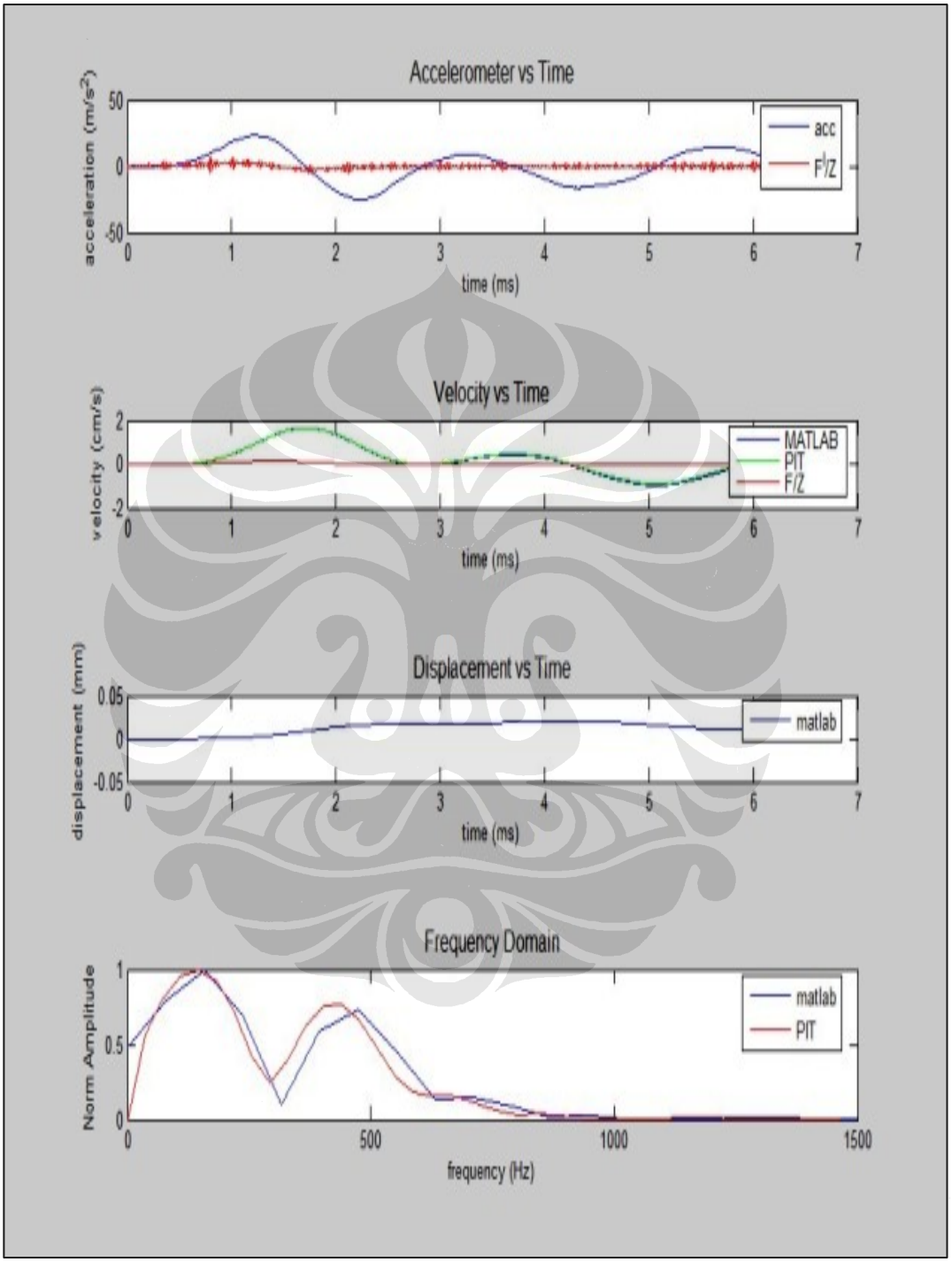
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 7



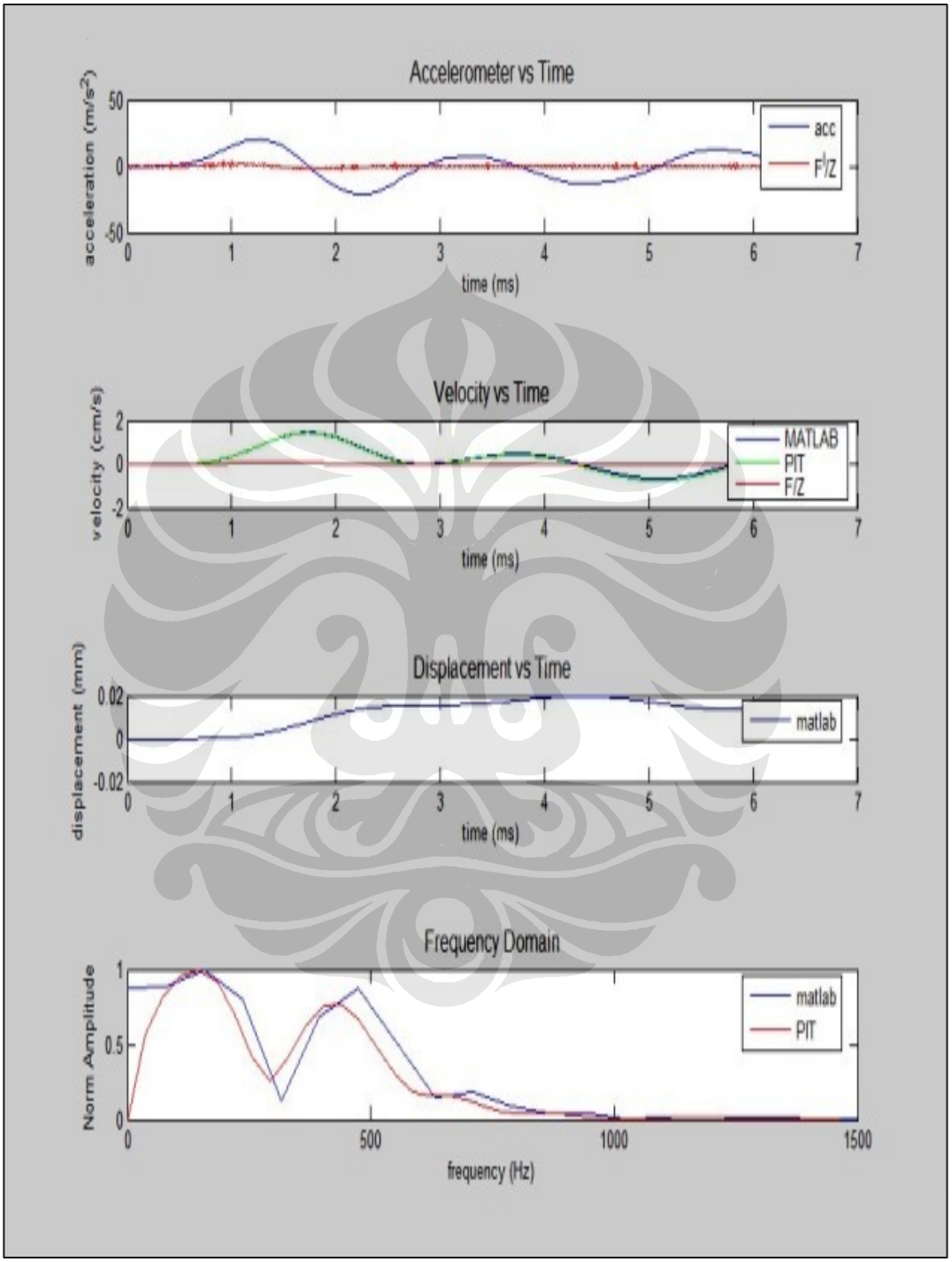
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 8



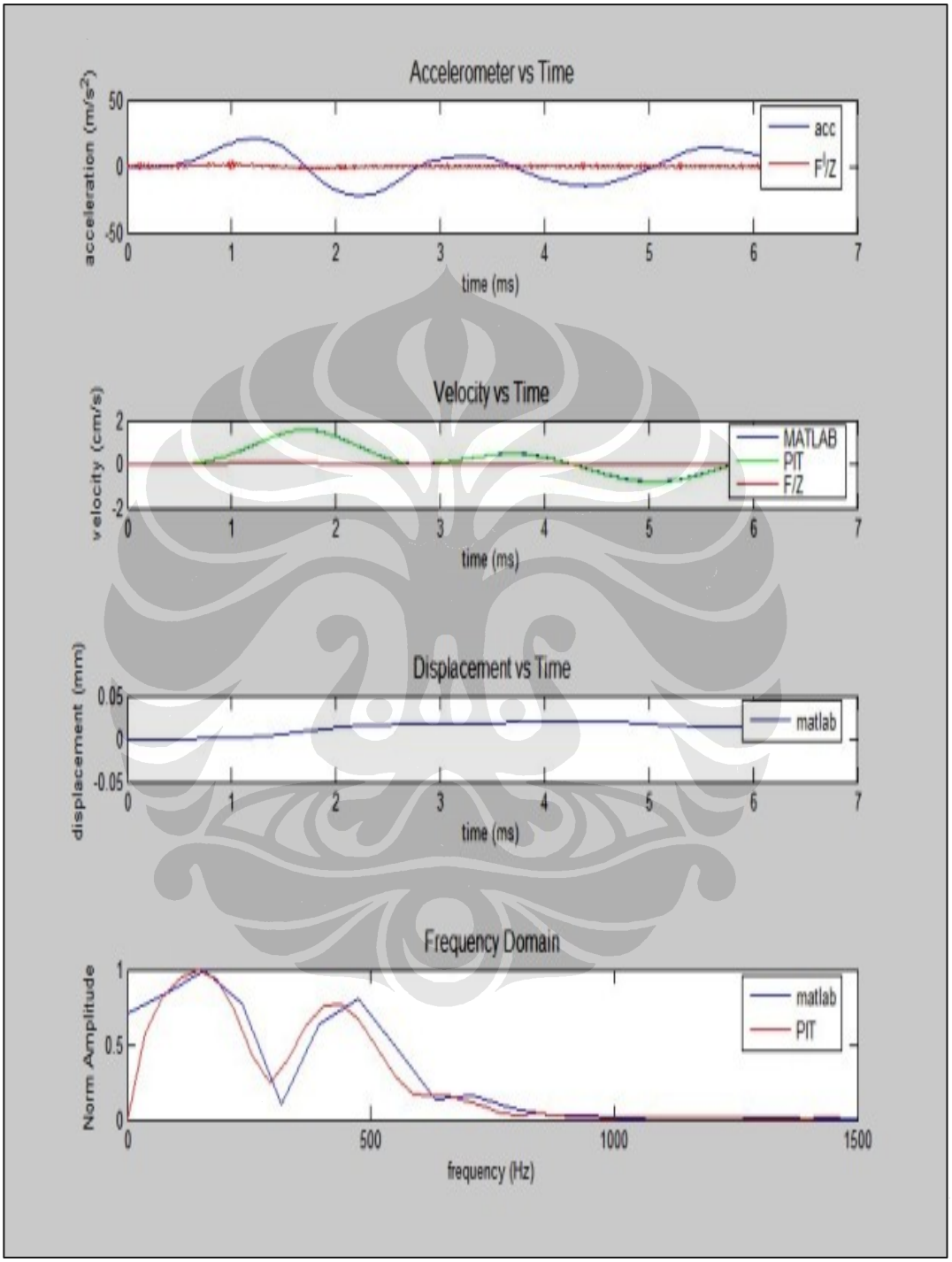
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 9



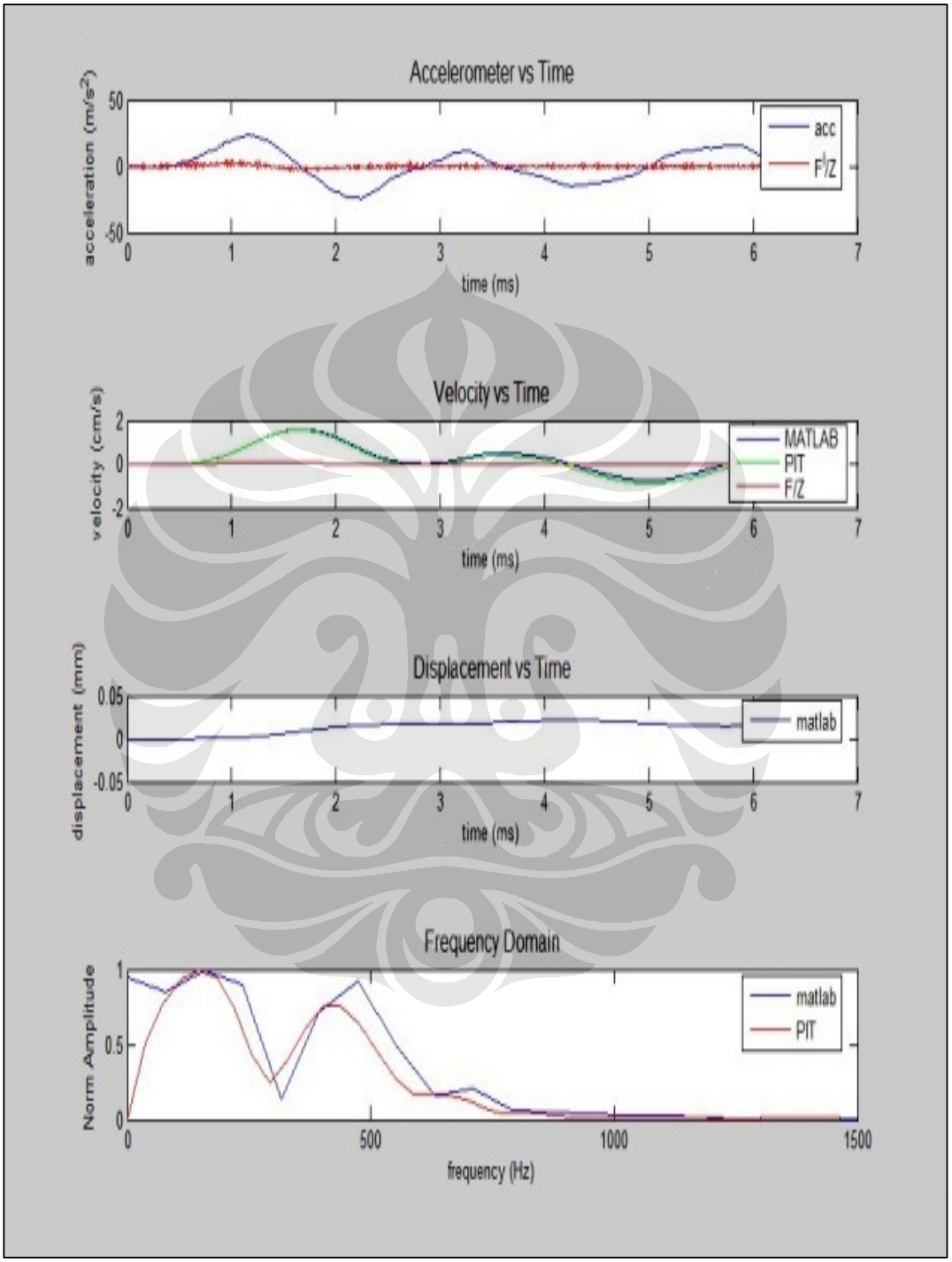
Akselerometer di tengah, hammer di timur akselerometer, hammer = 3120 gr

Data 10



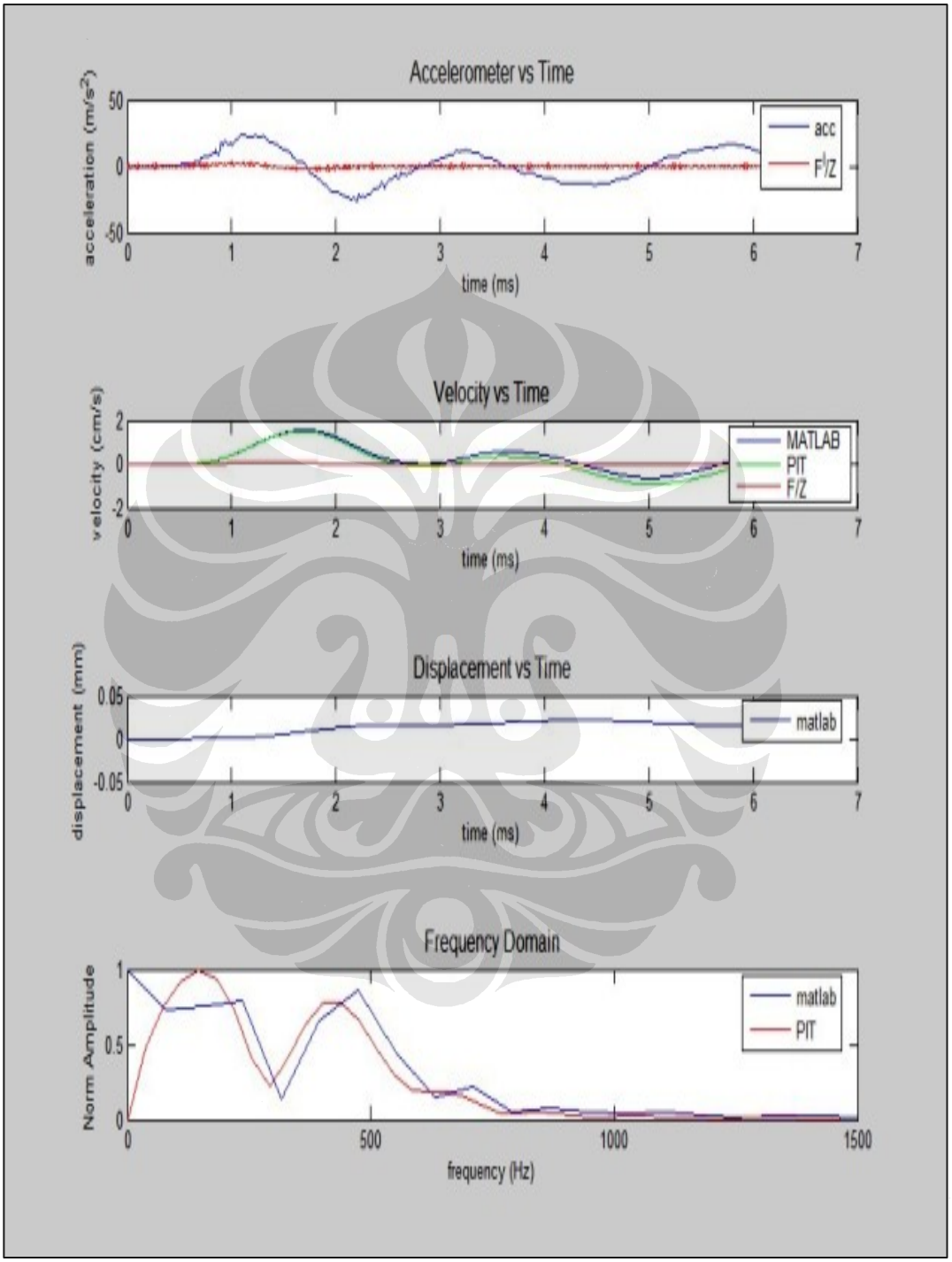
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 1



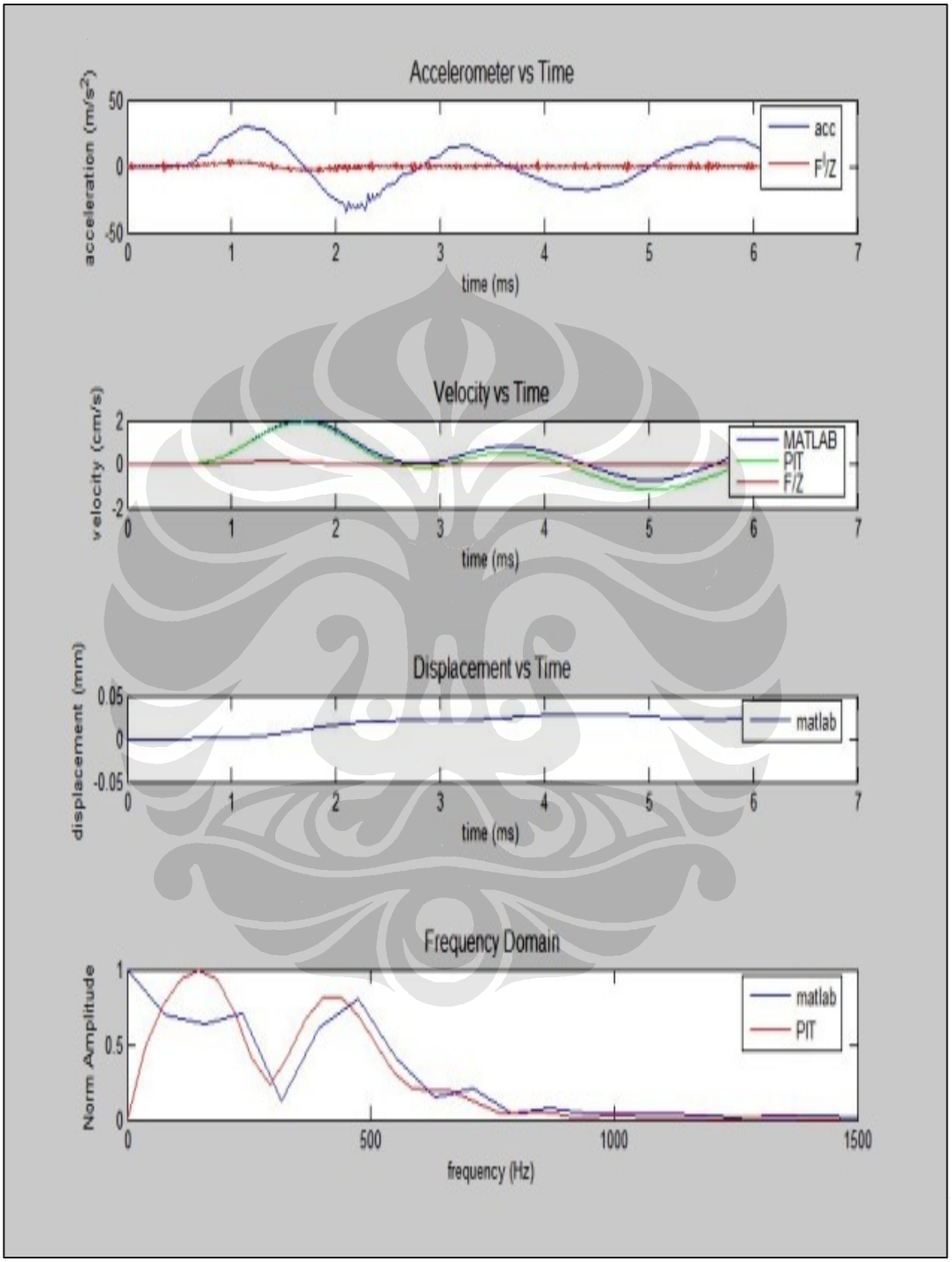
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 2



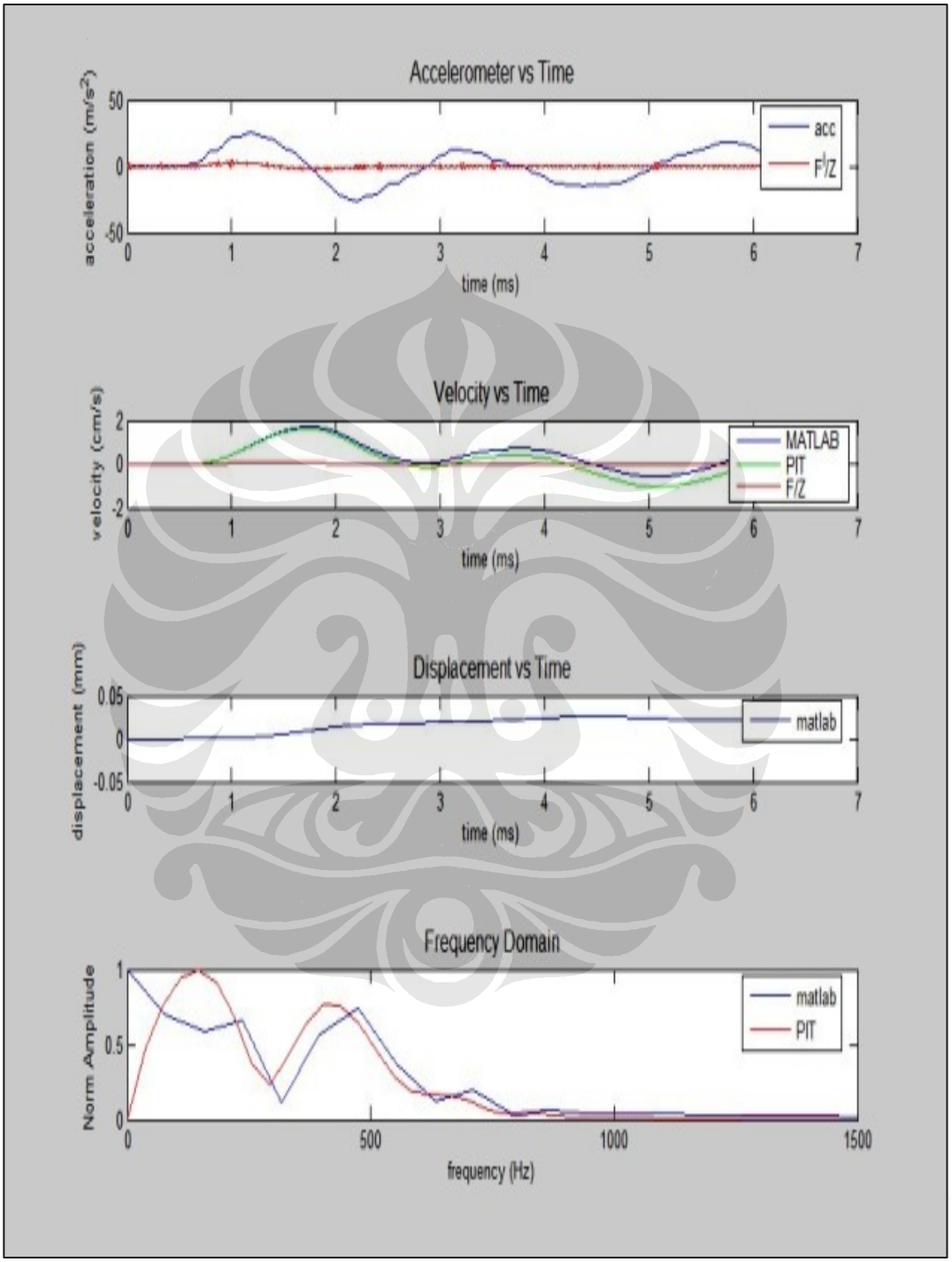
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 3



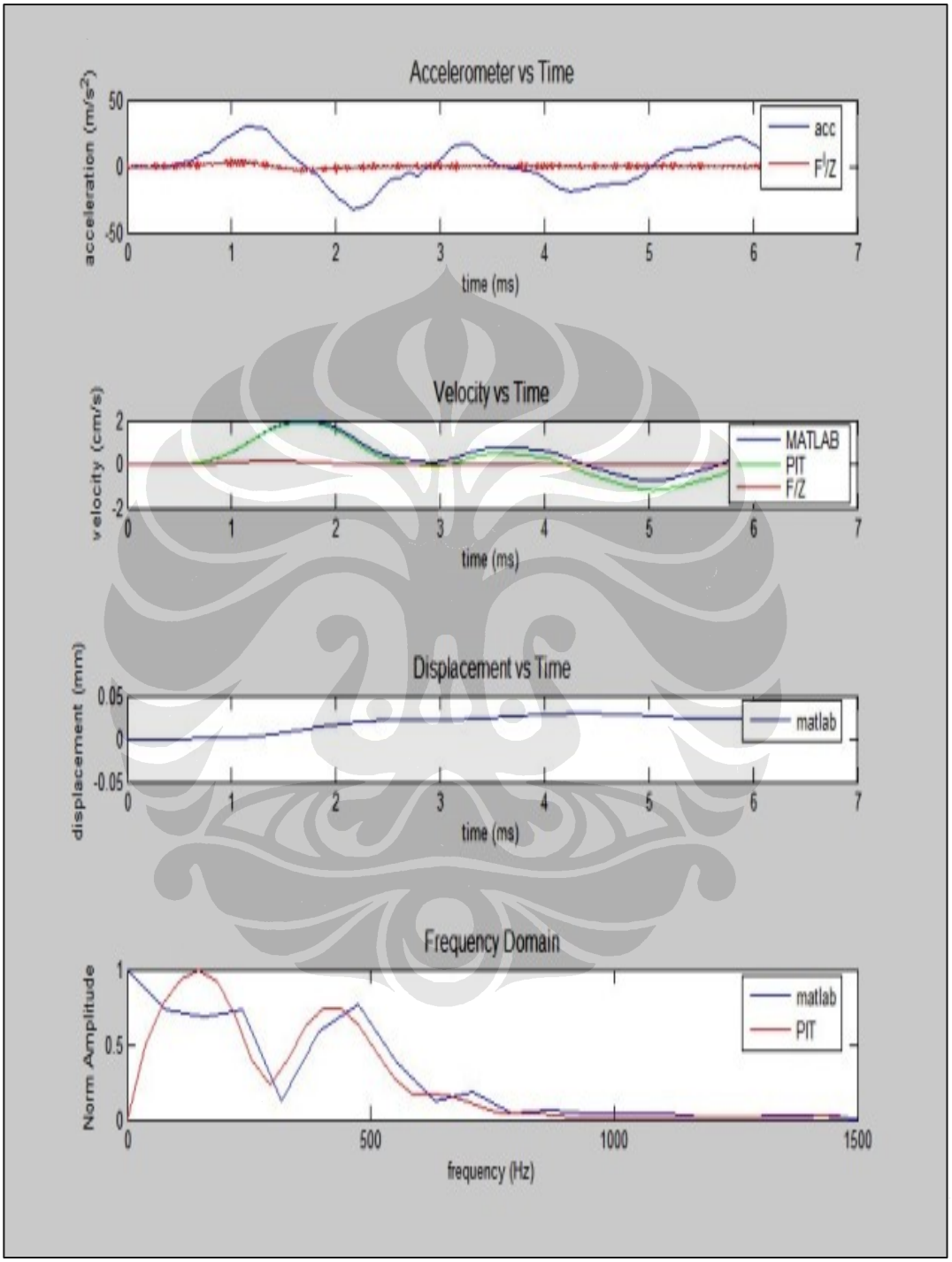
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 4



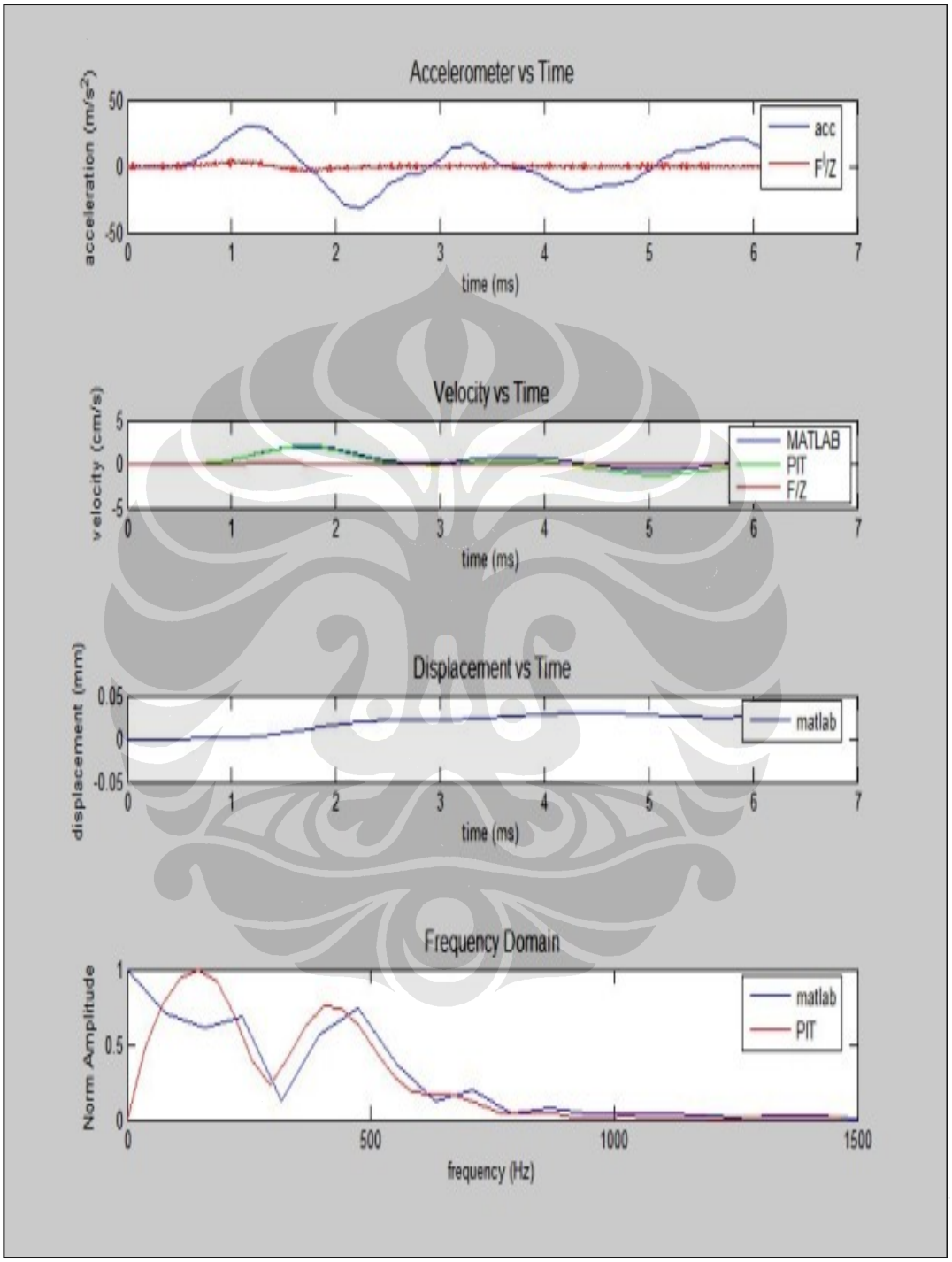
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 5



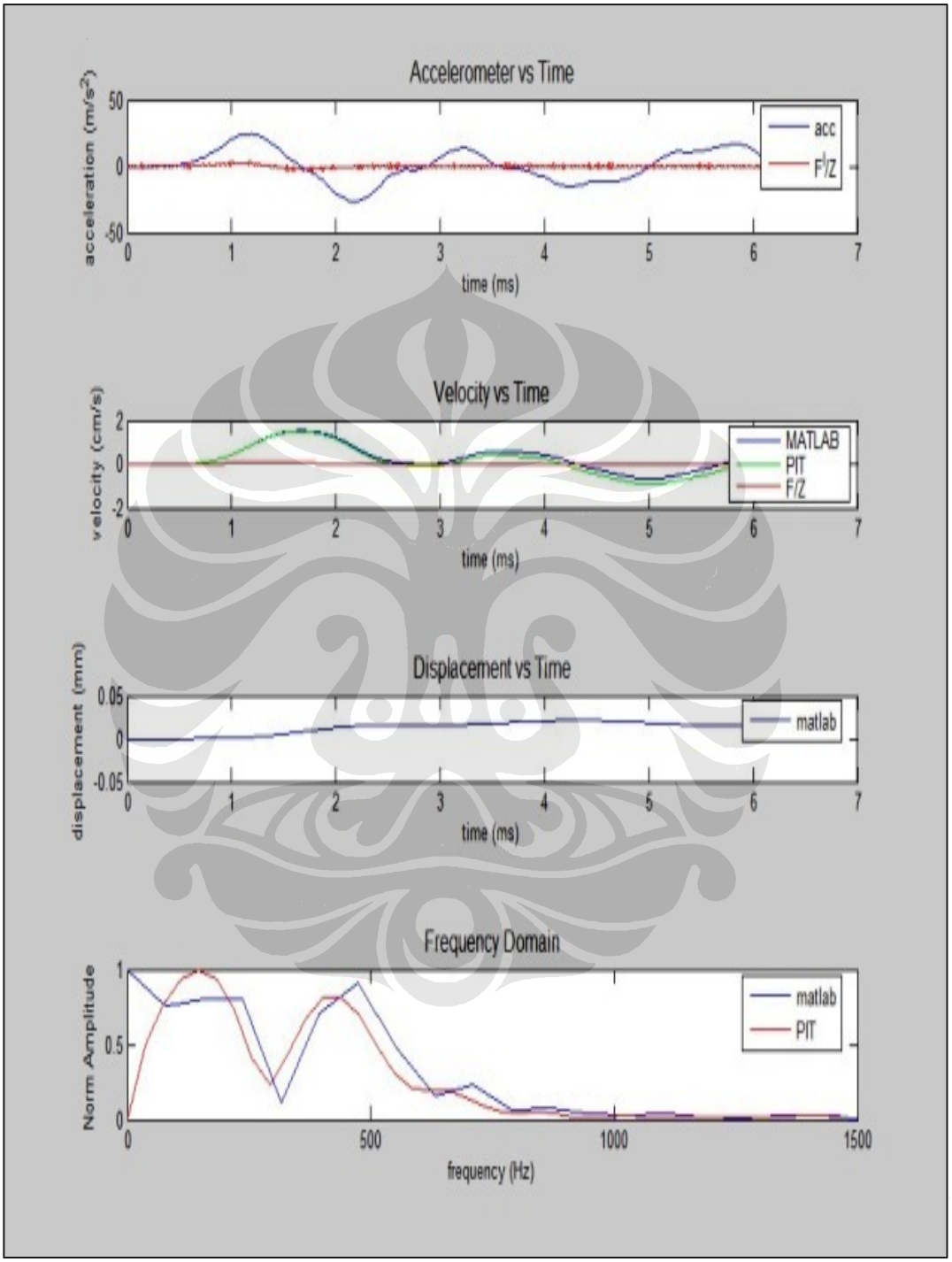
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 6



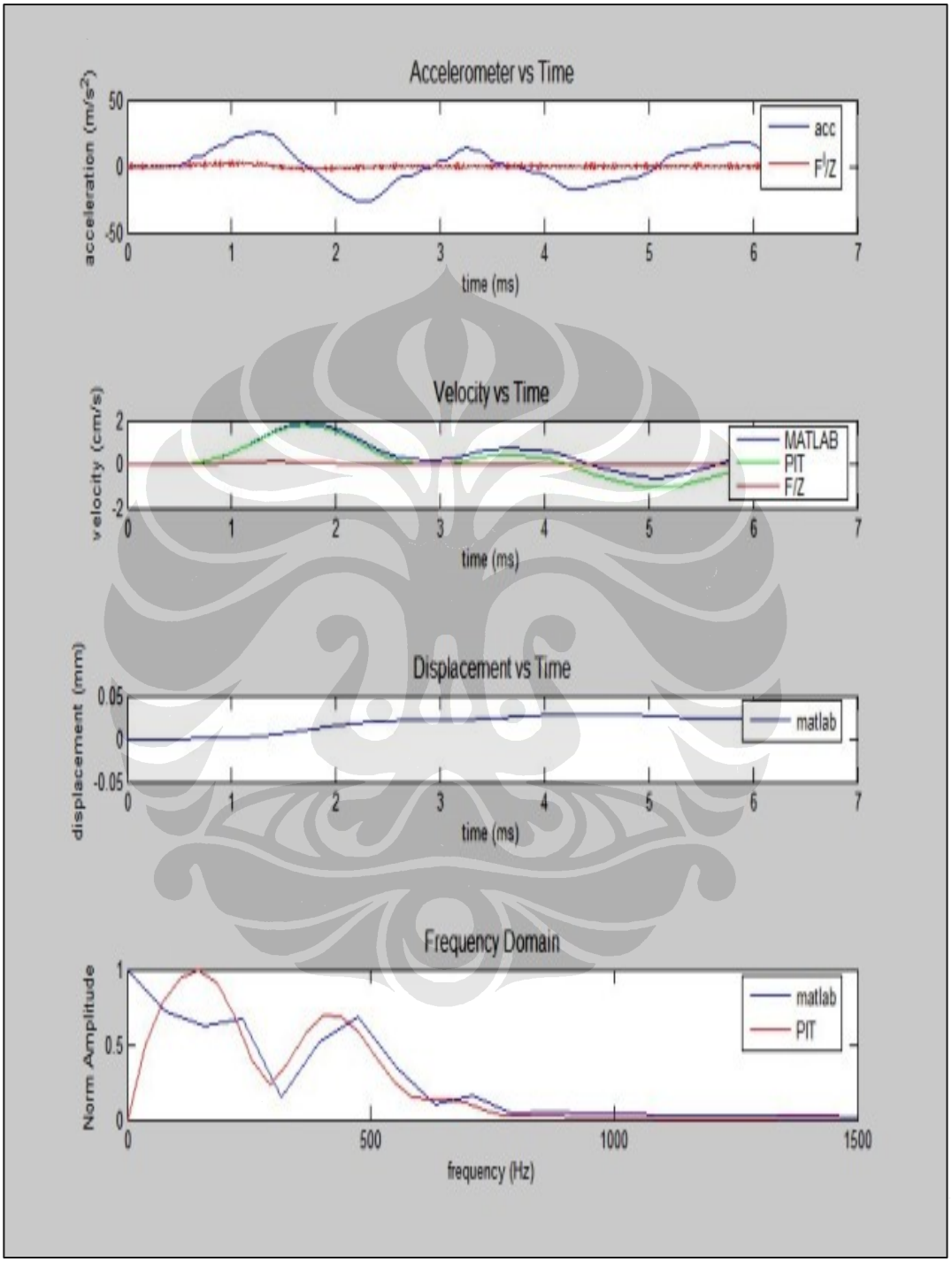
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 7



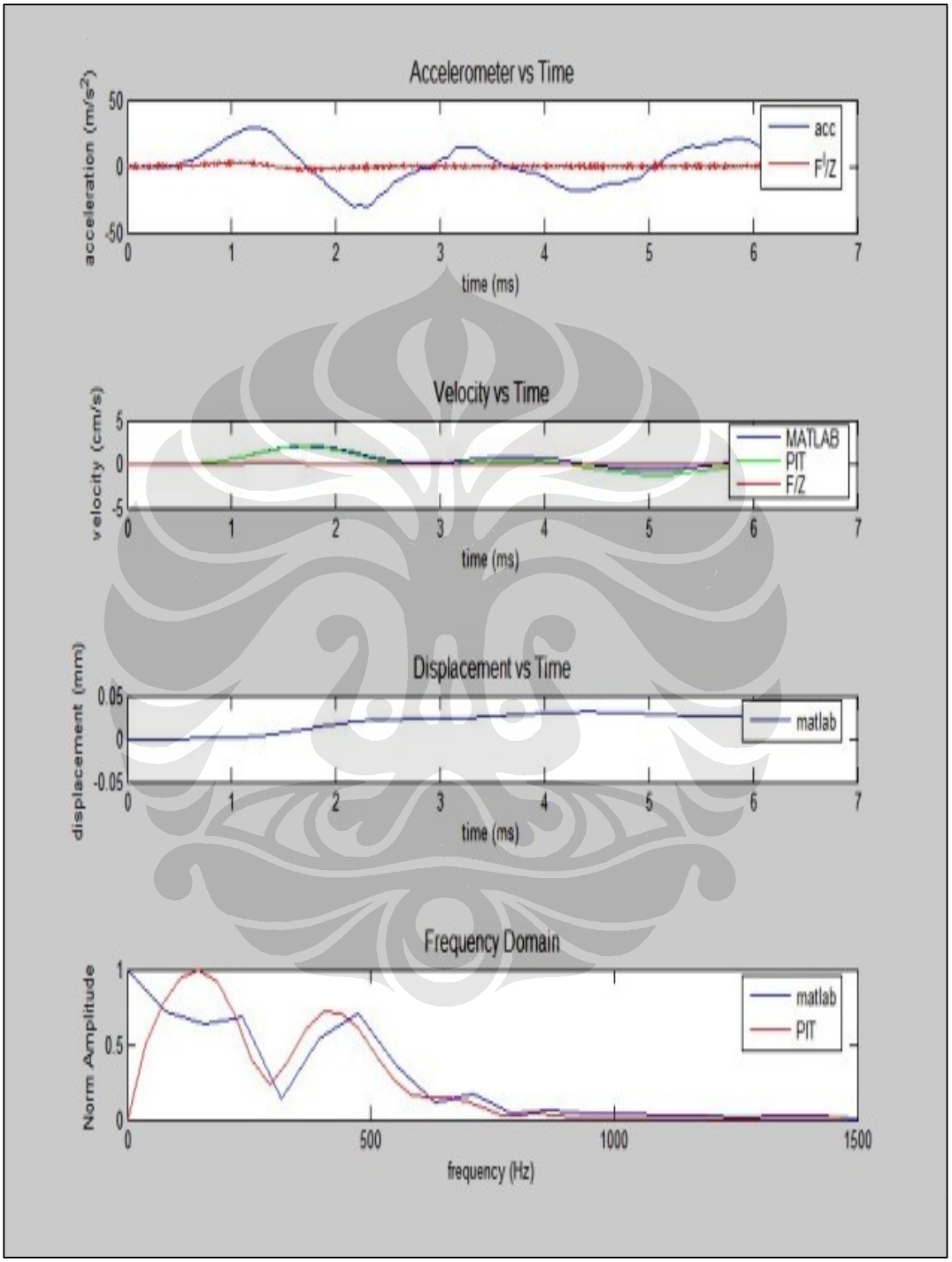
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 8



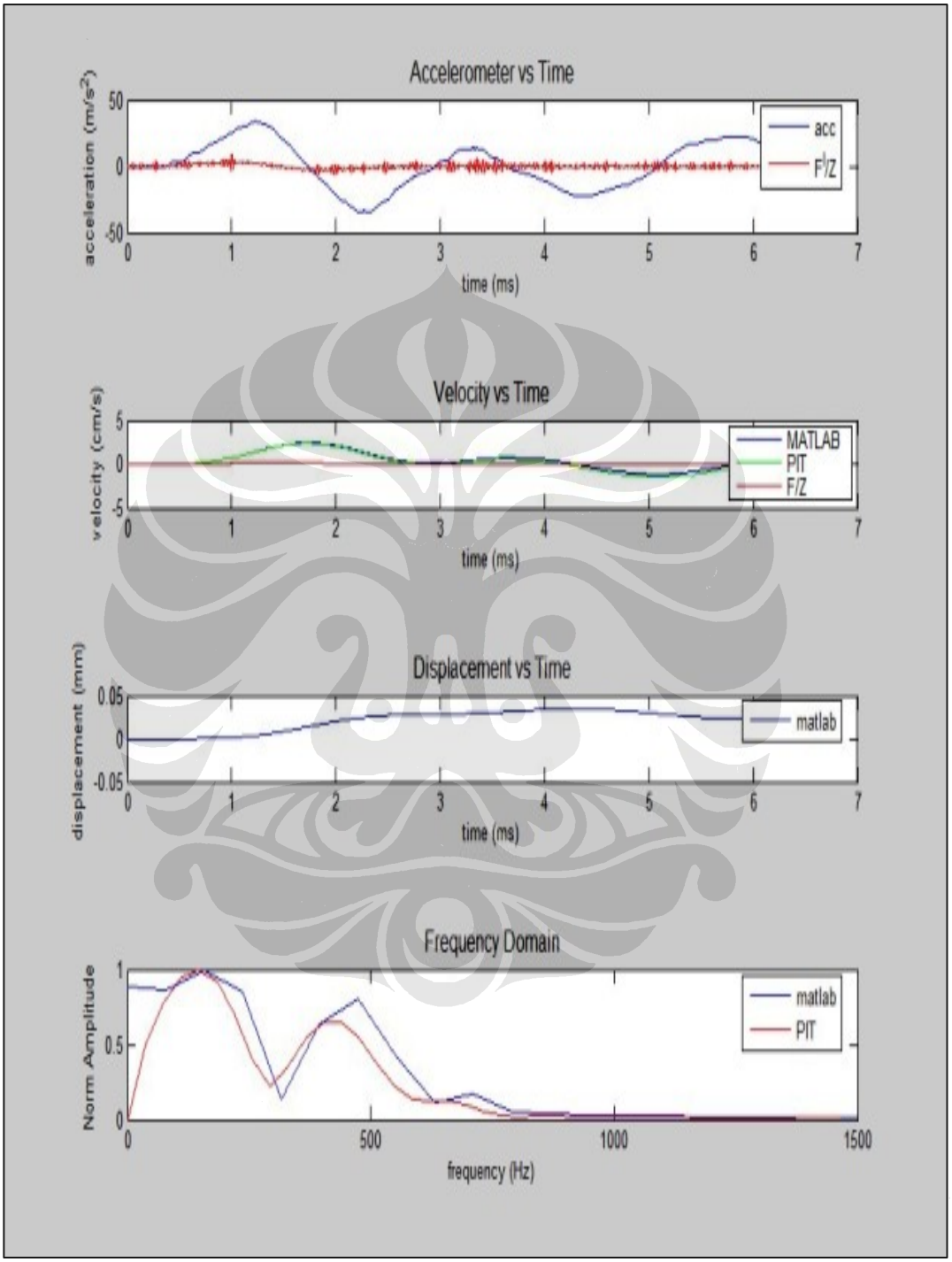
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 9



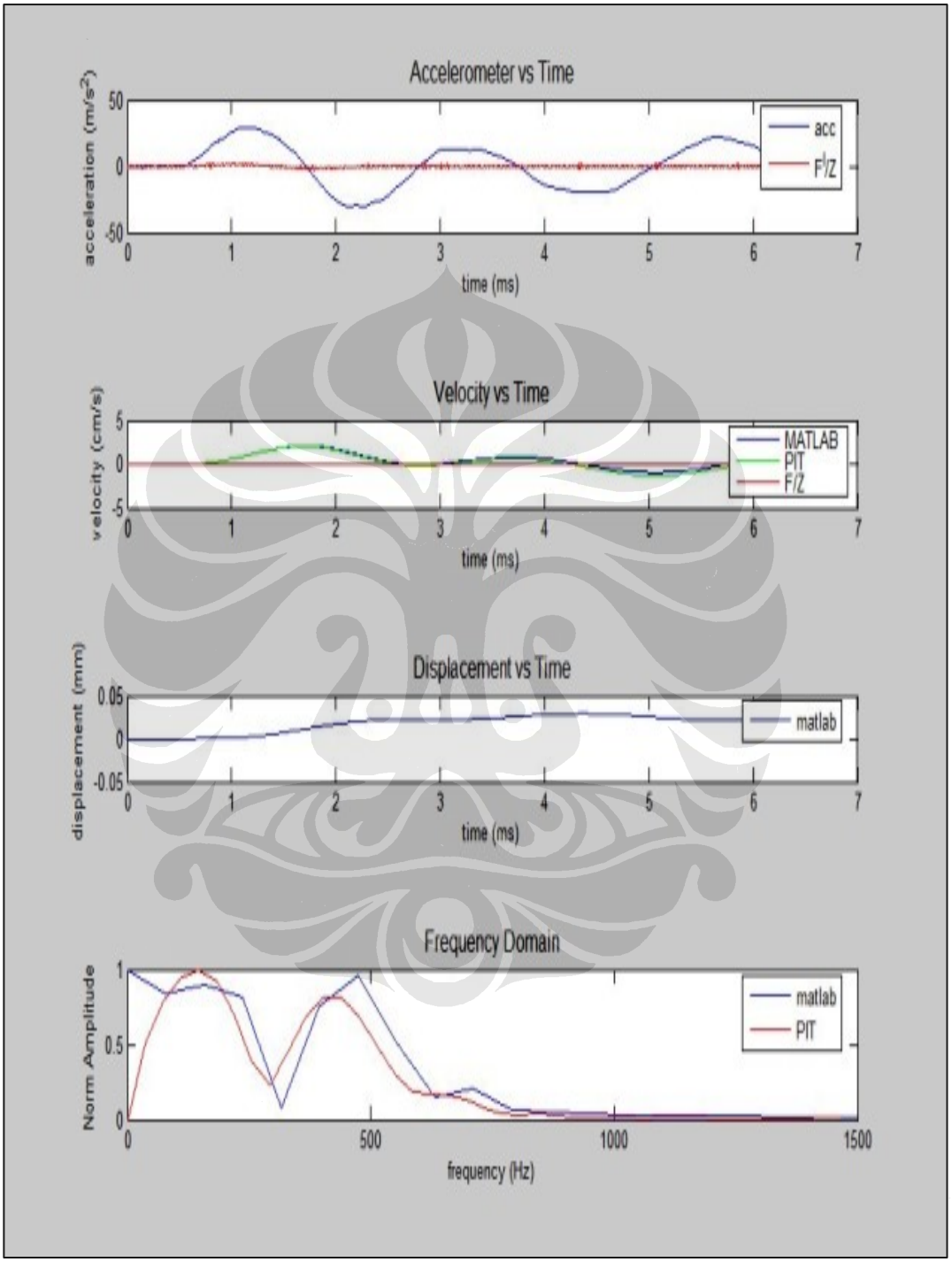
Akselerometer di tengah, hammer di utara akselerometer, hammer = 3120 gr

Data 10



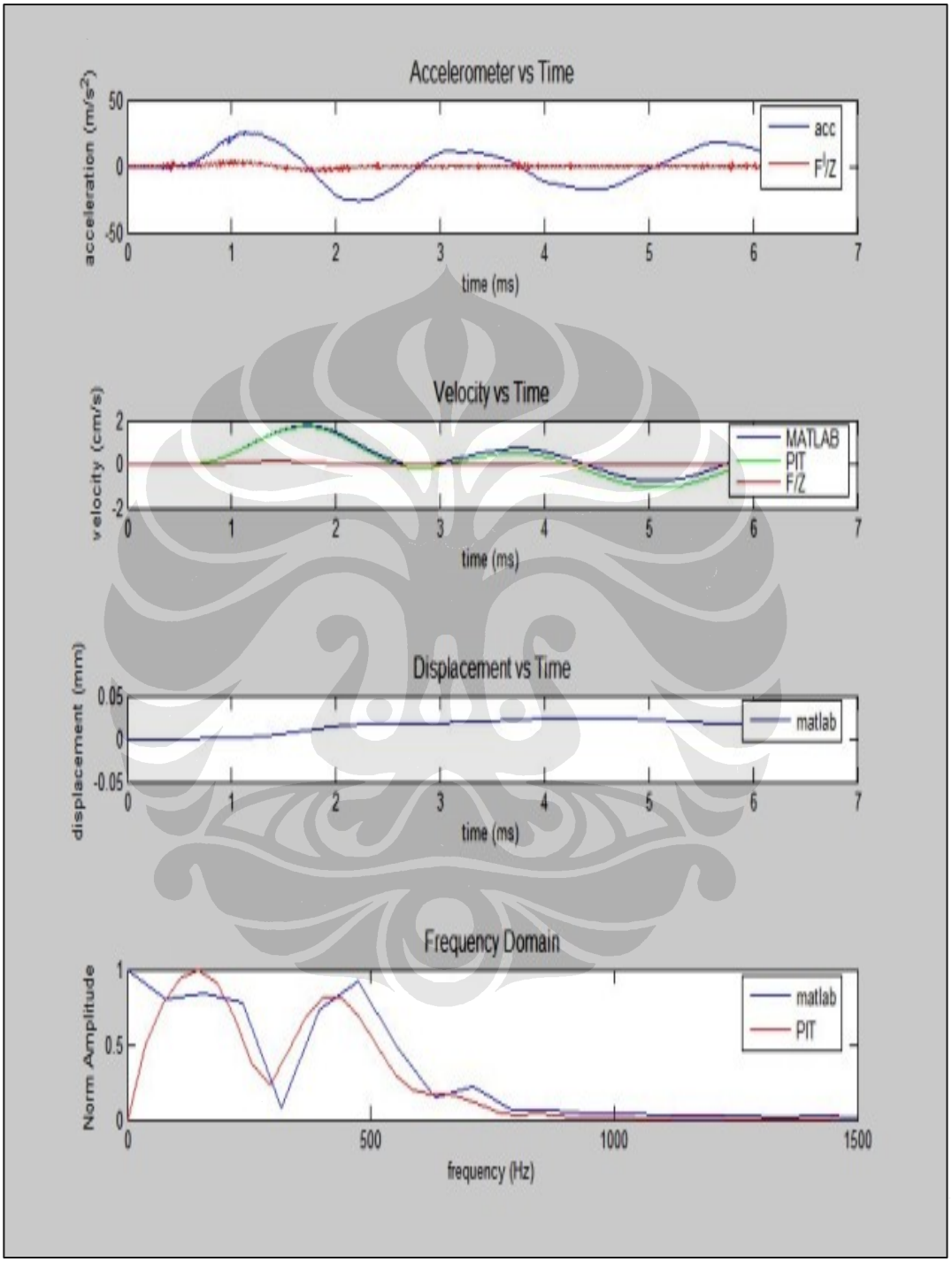
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 1



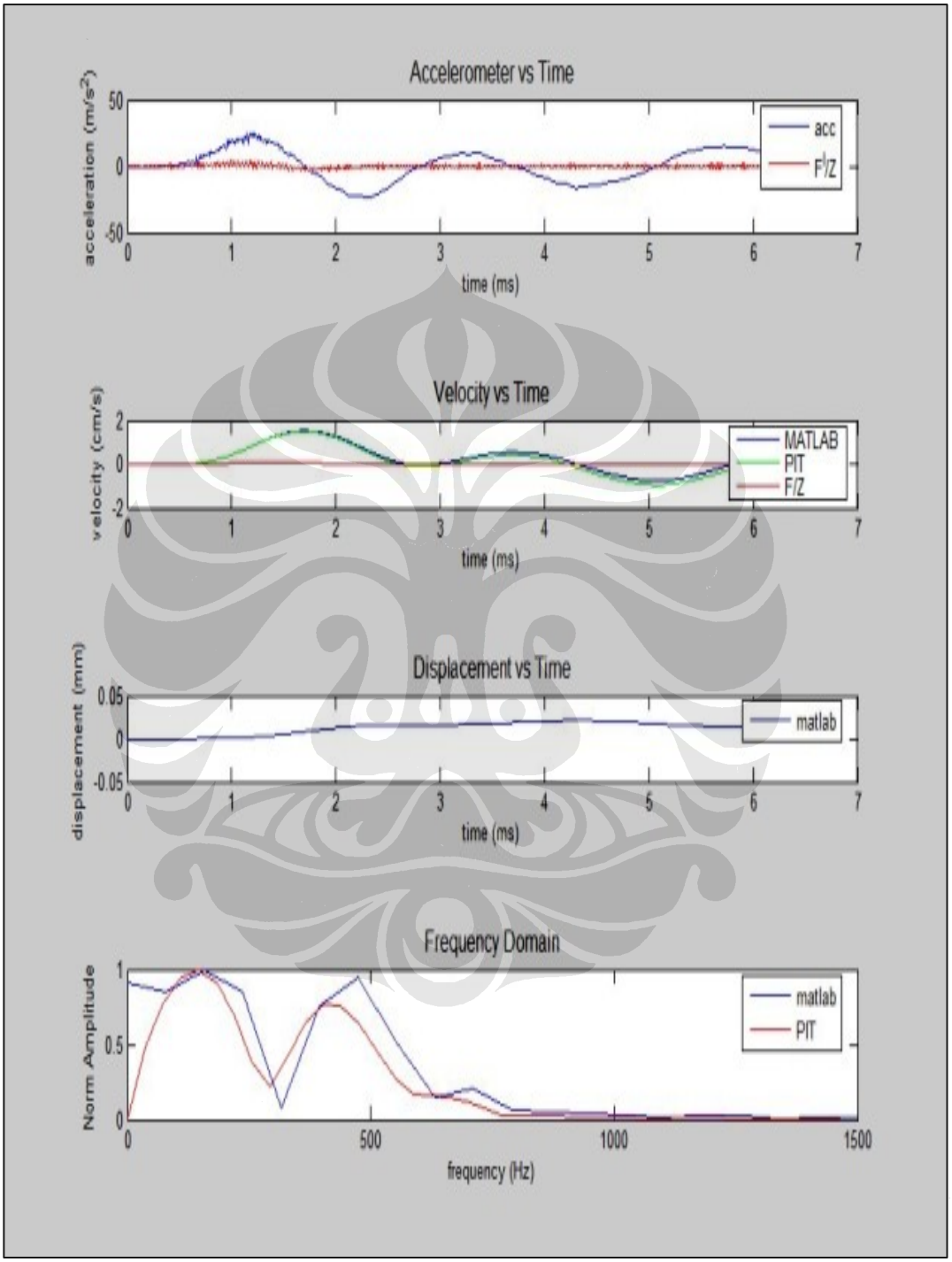
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 2



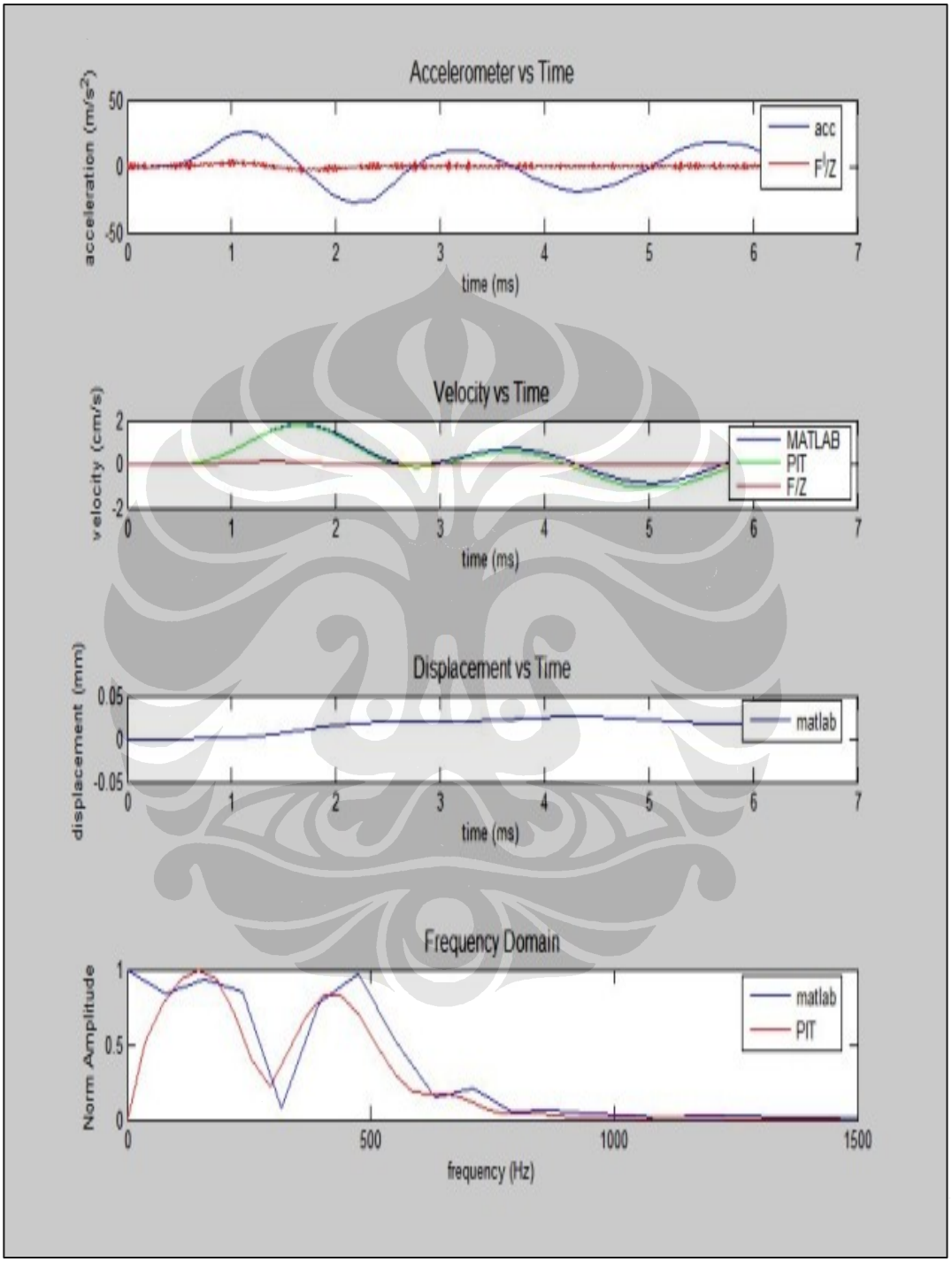
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 3



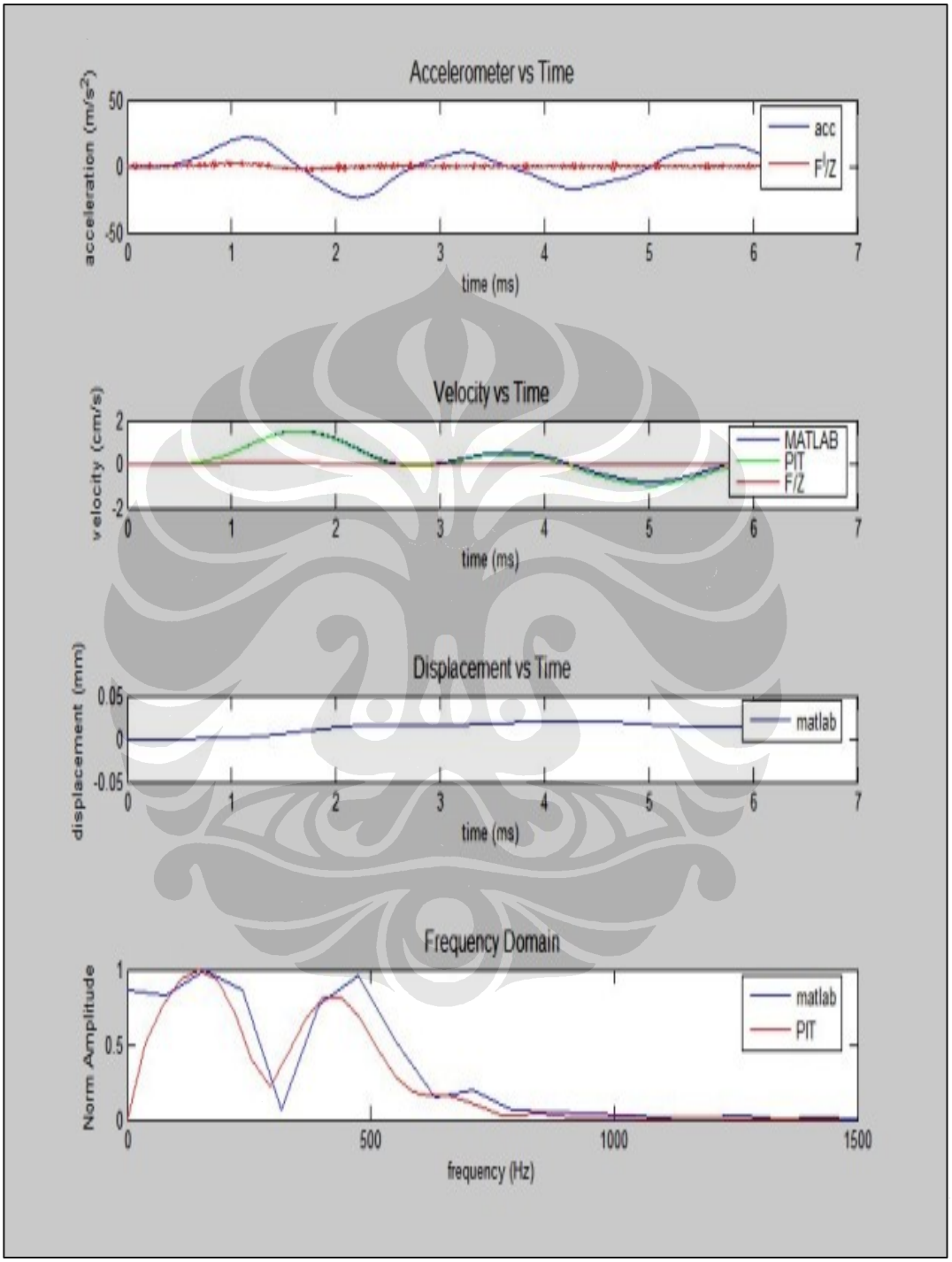
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 4



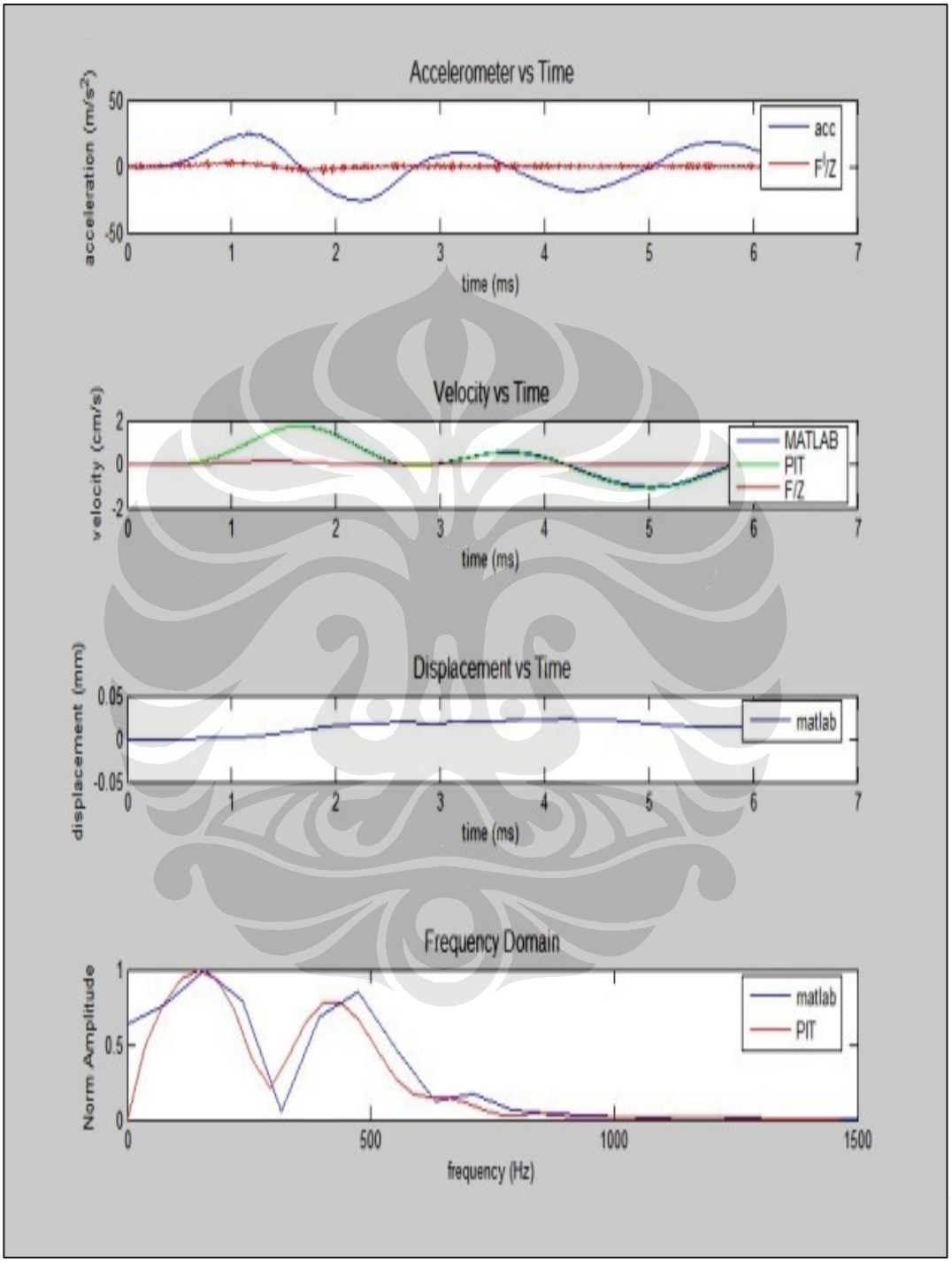
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 5



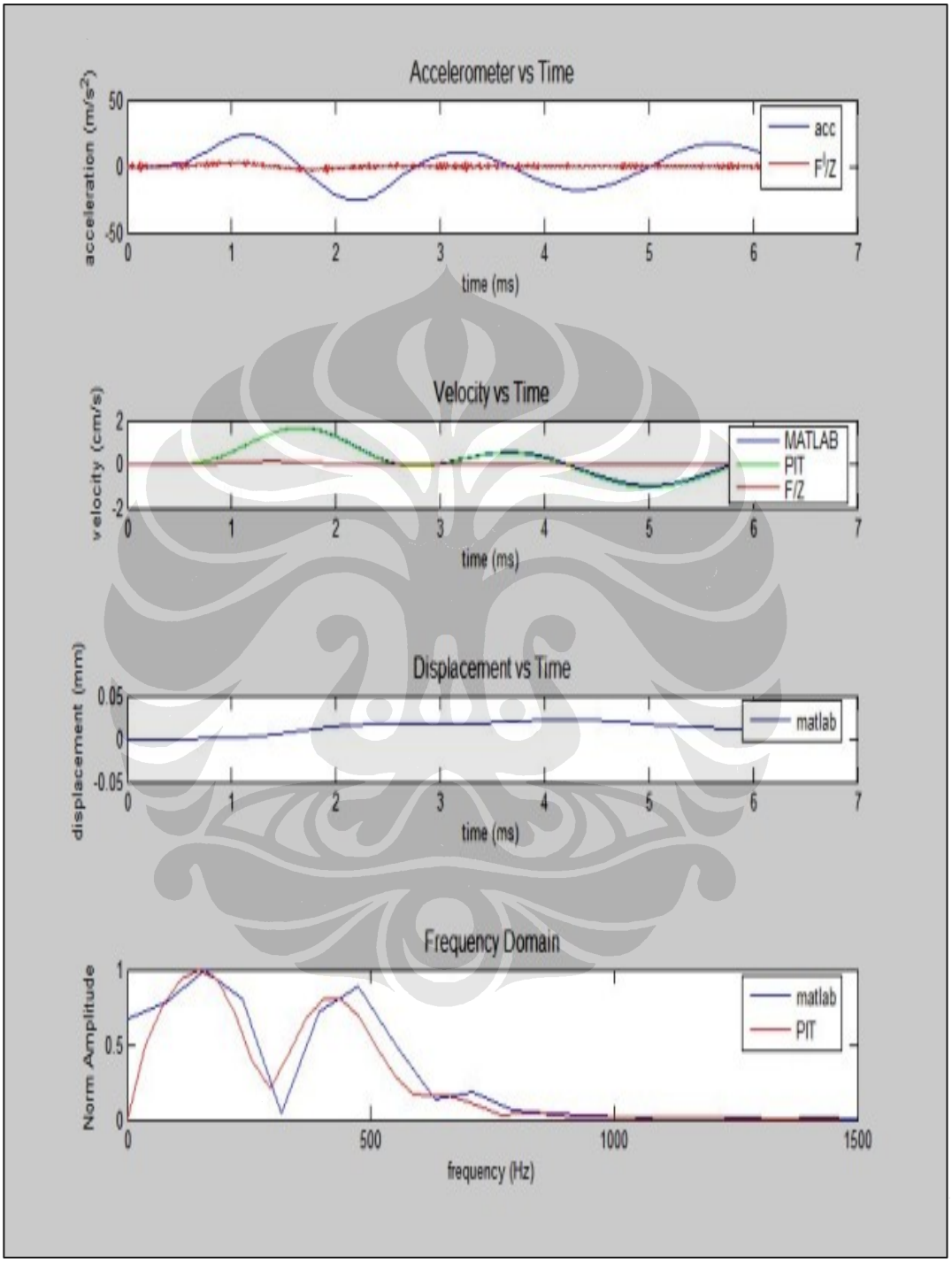
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 6



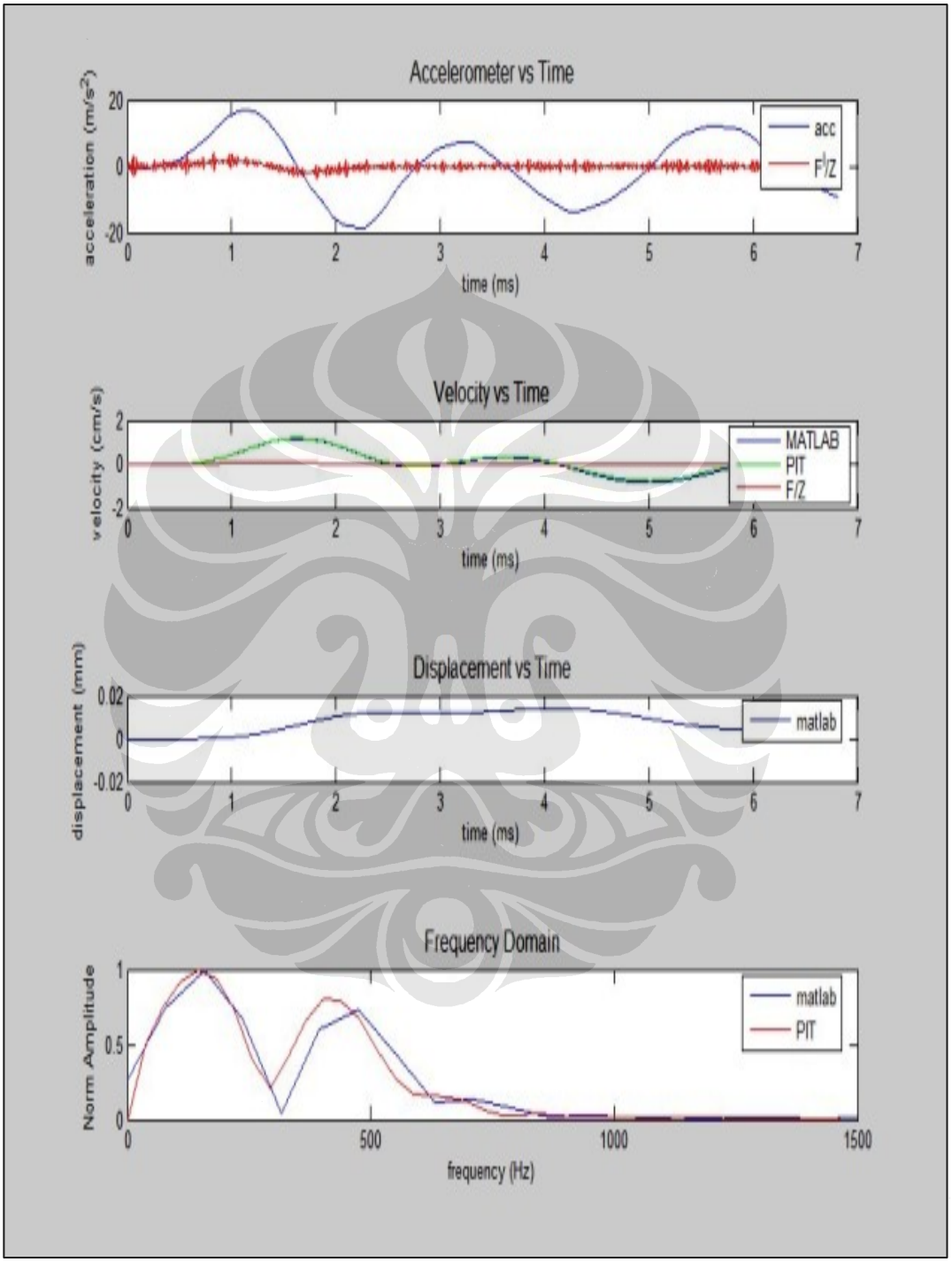
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 7



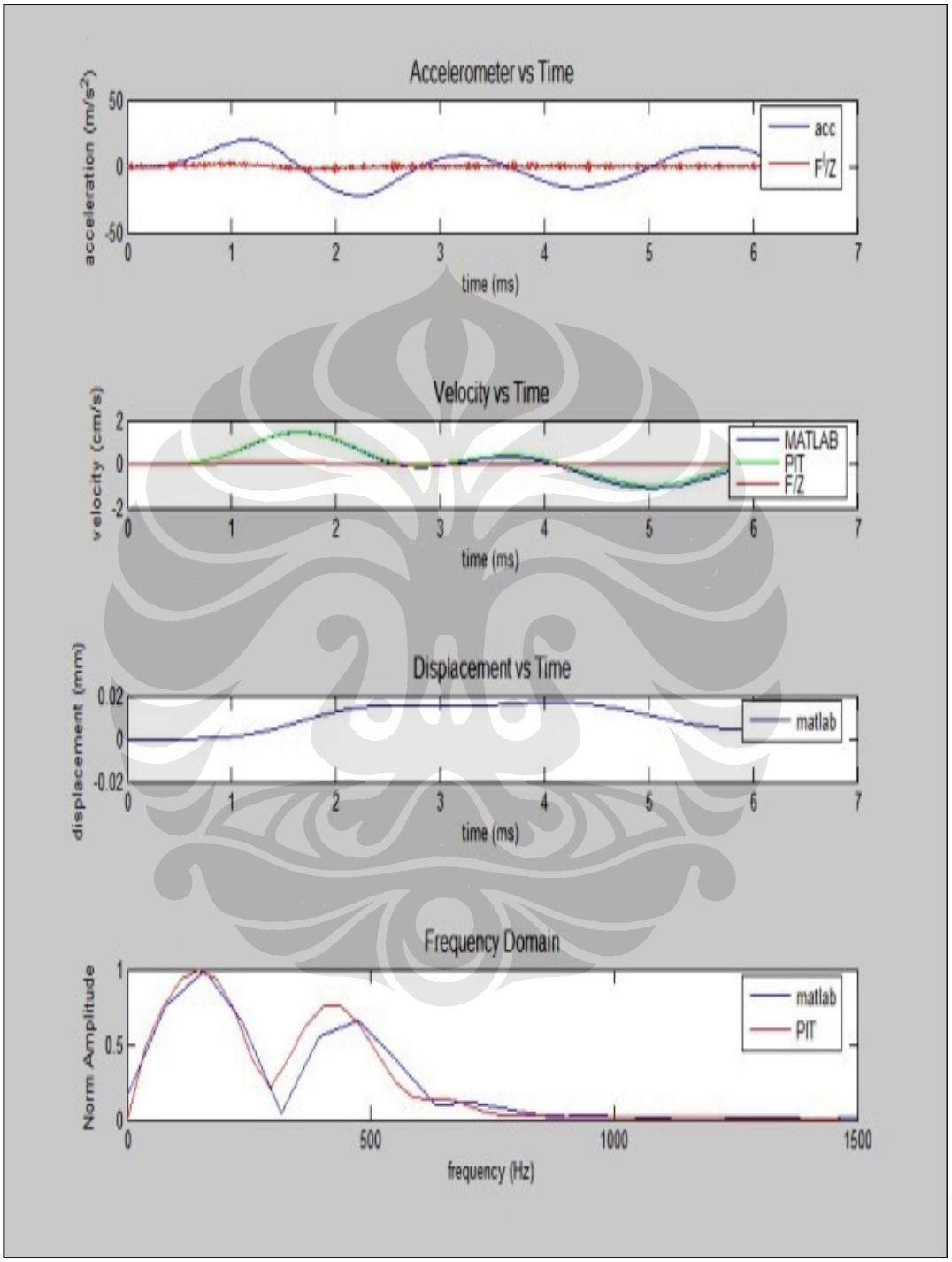
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 8



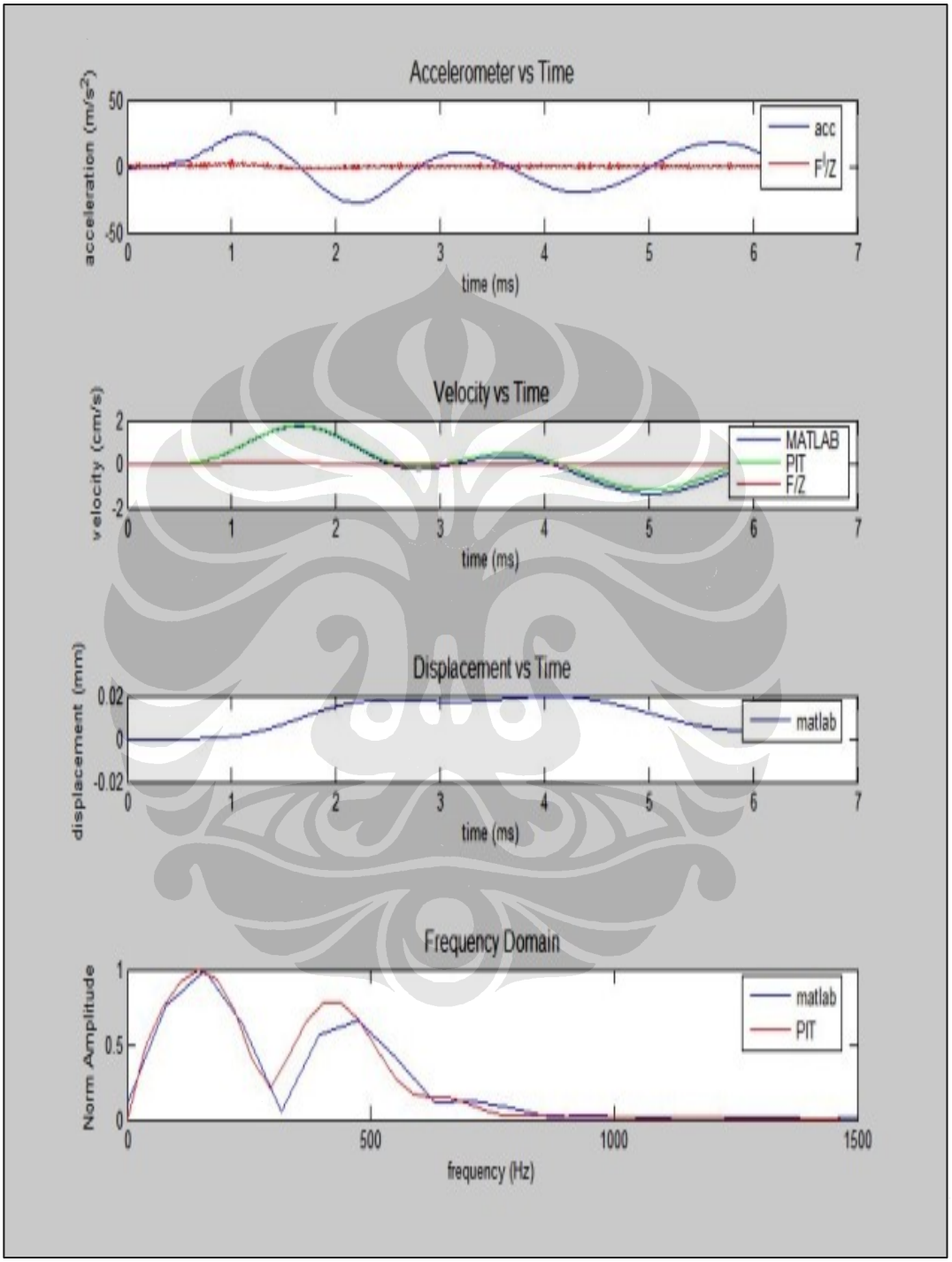
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 9



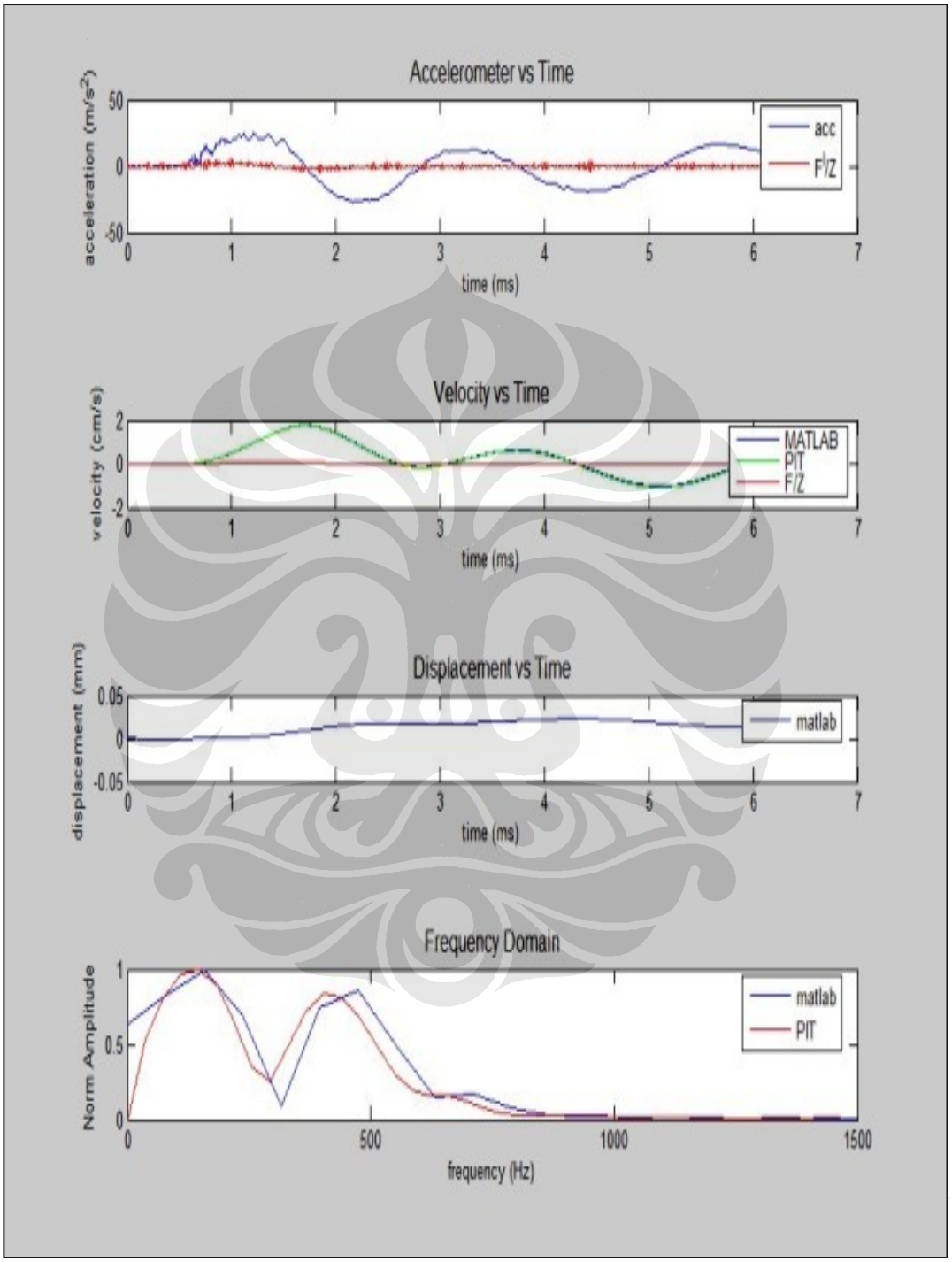
Akselerometer di tengah, hammer di barat akselerometer, hammer = 3120 gr

Data 10



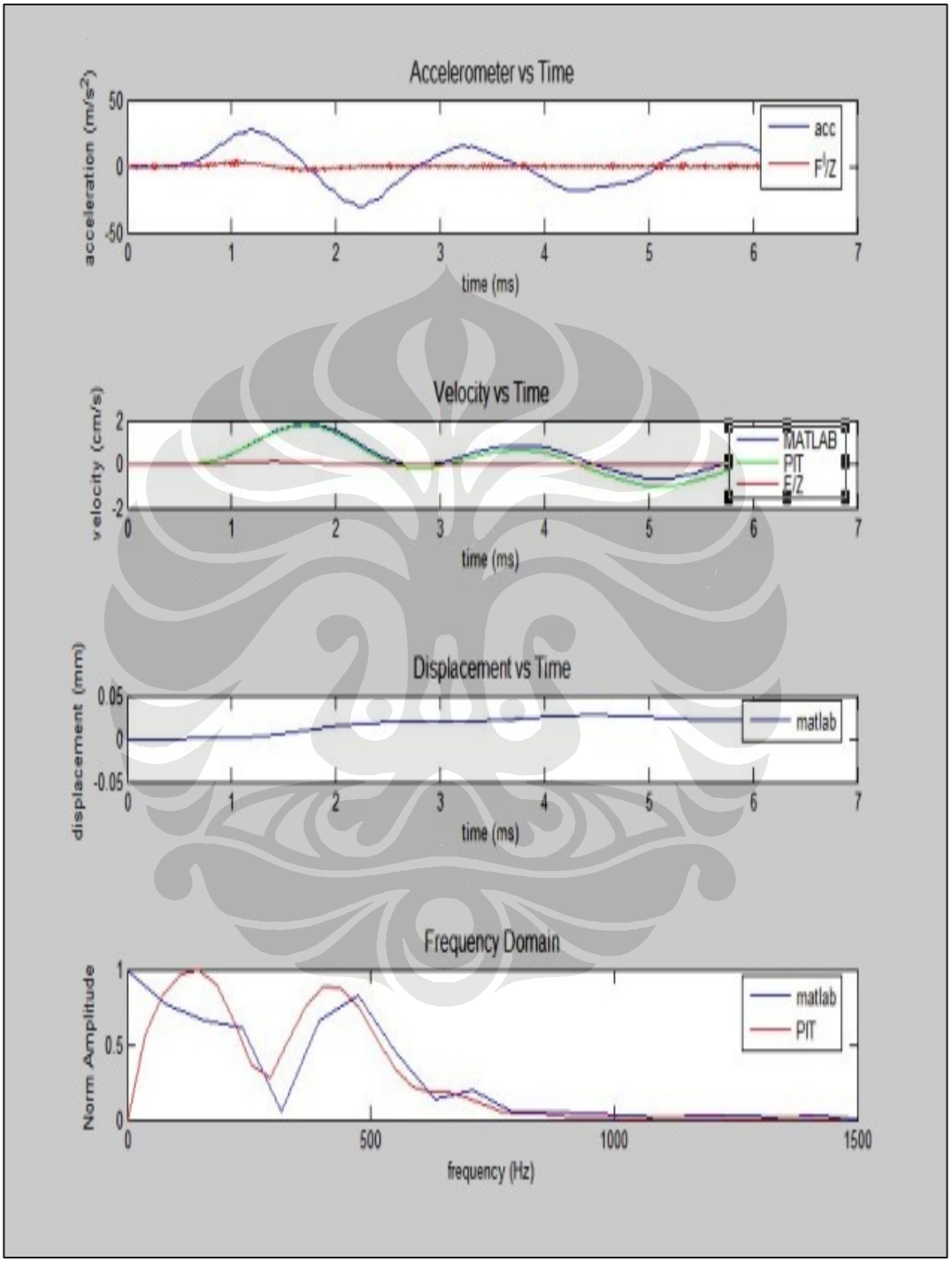
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 1



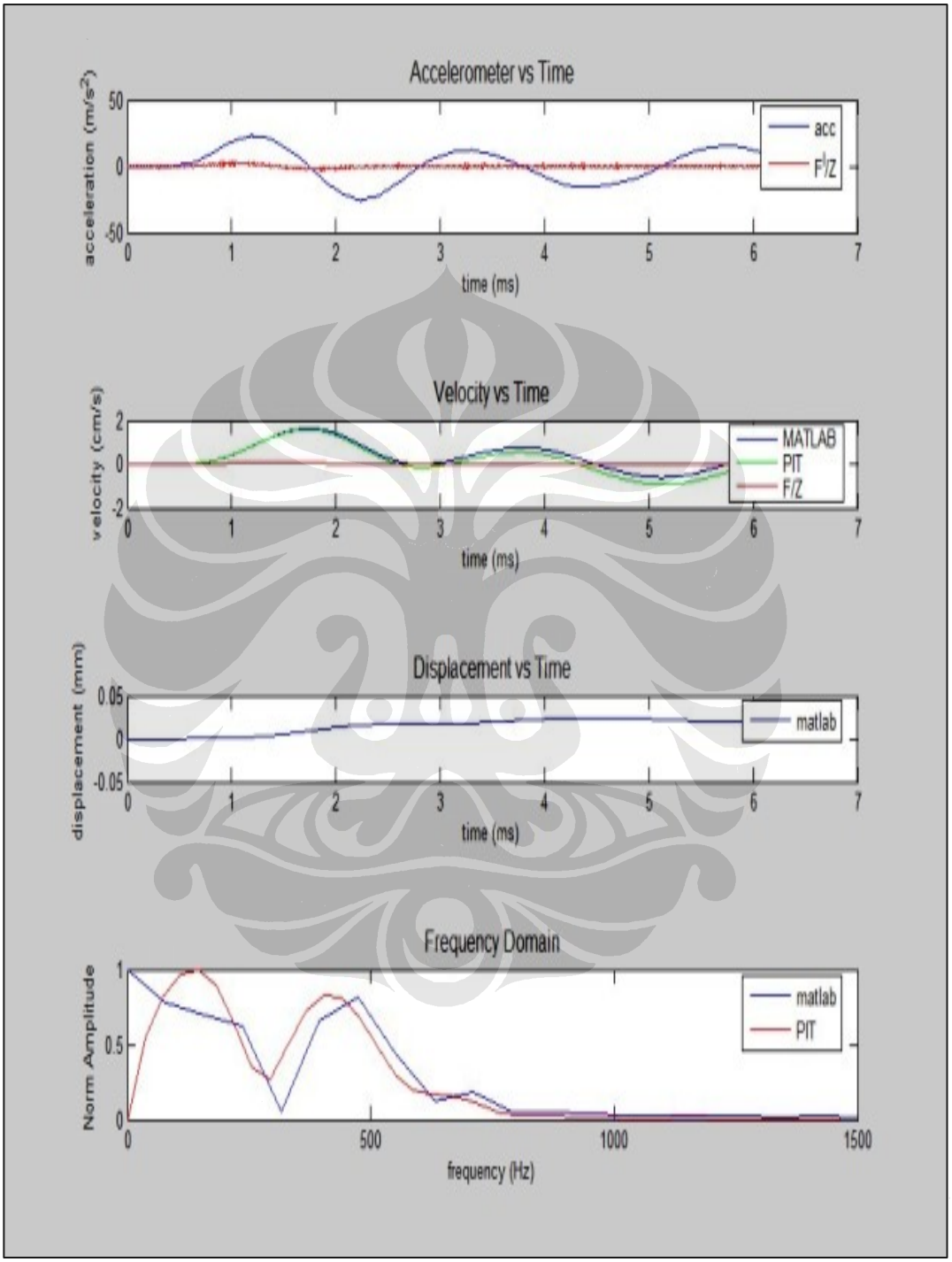
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 2



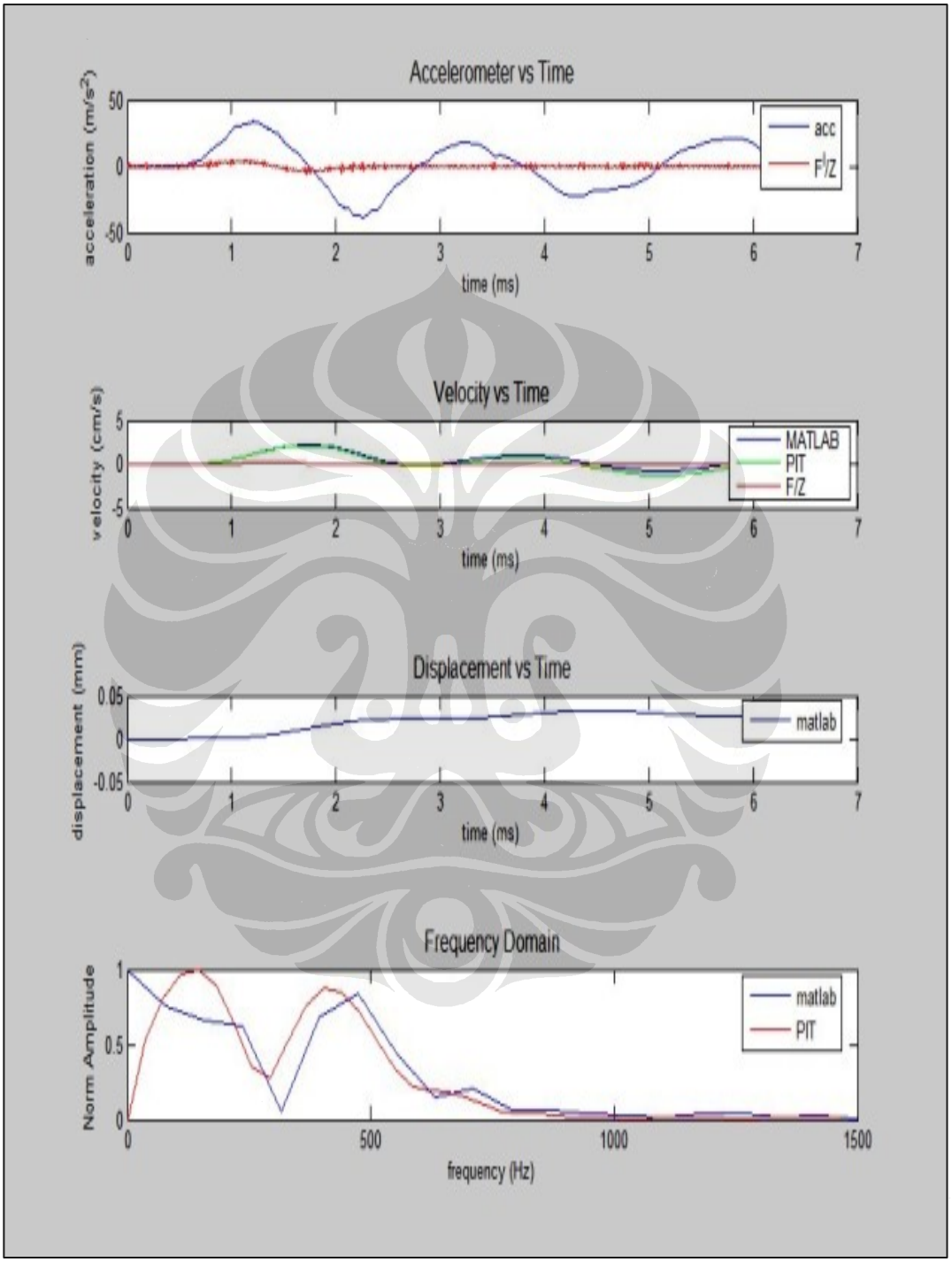
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 3



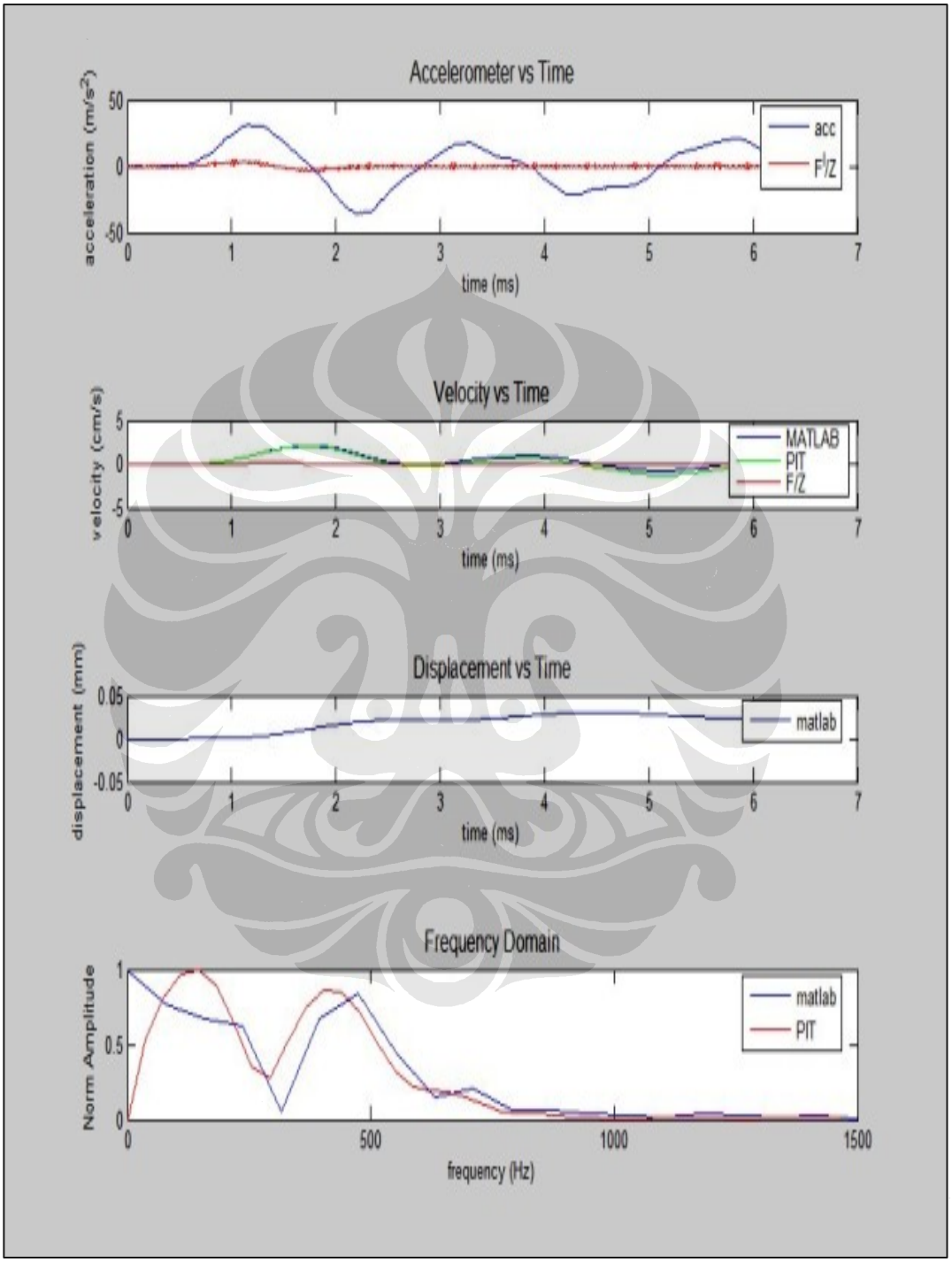
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 4



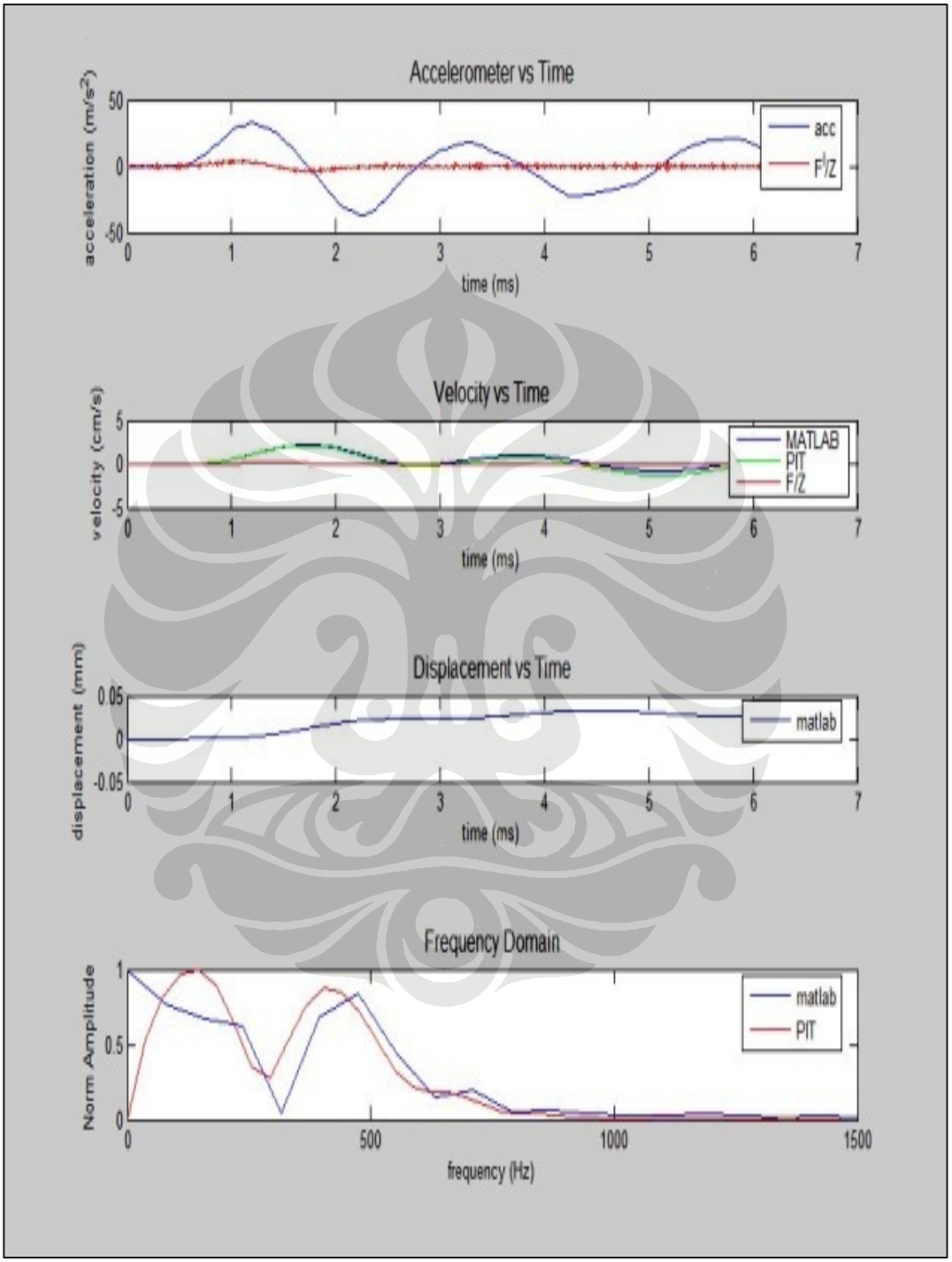
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 5



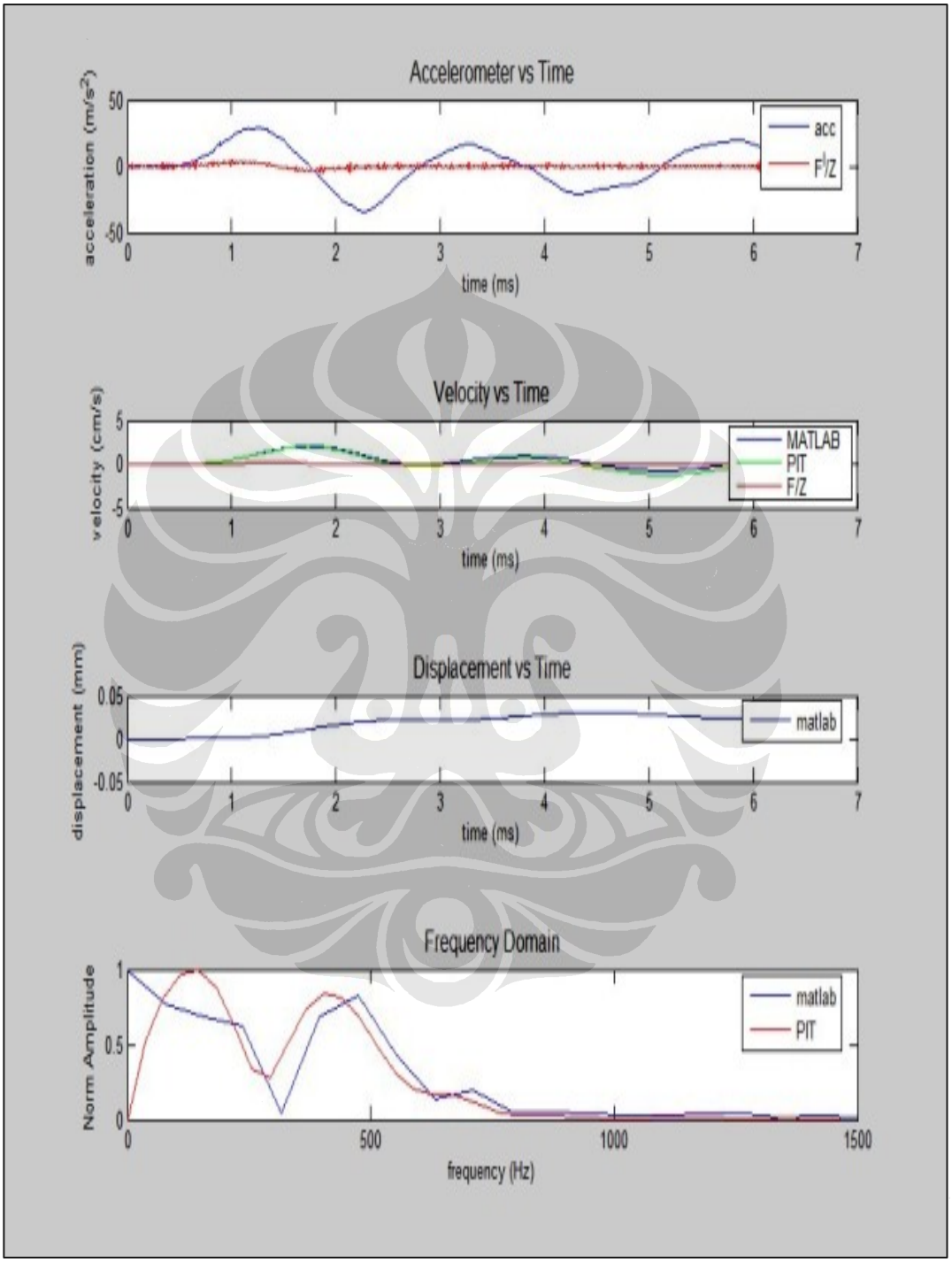
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 6



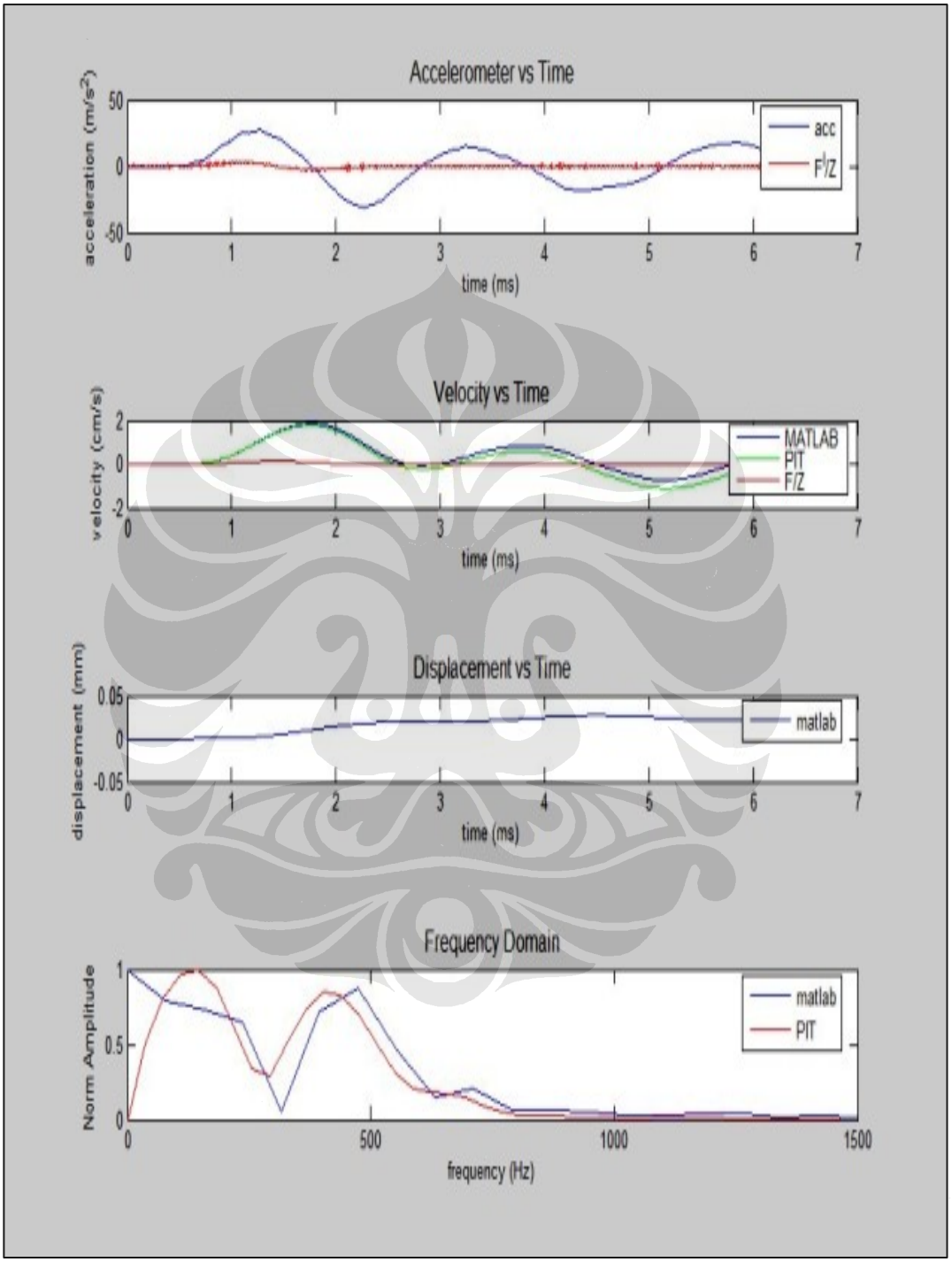
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 7



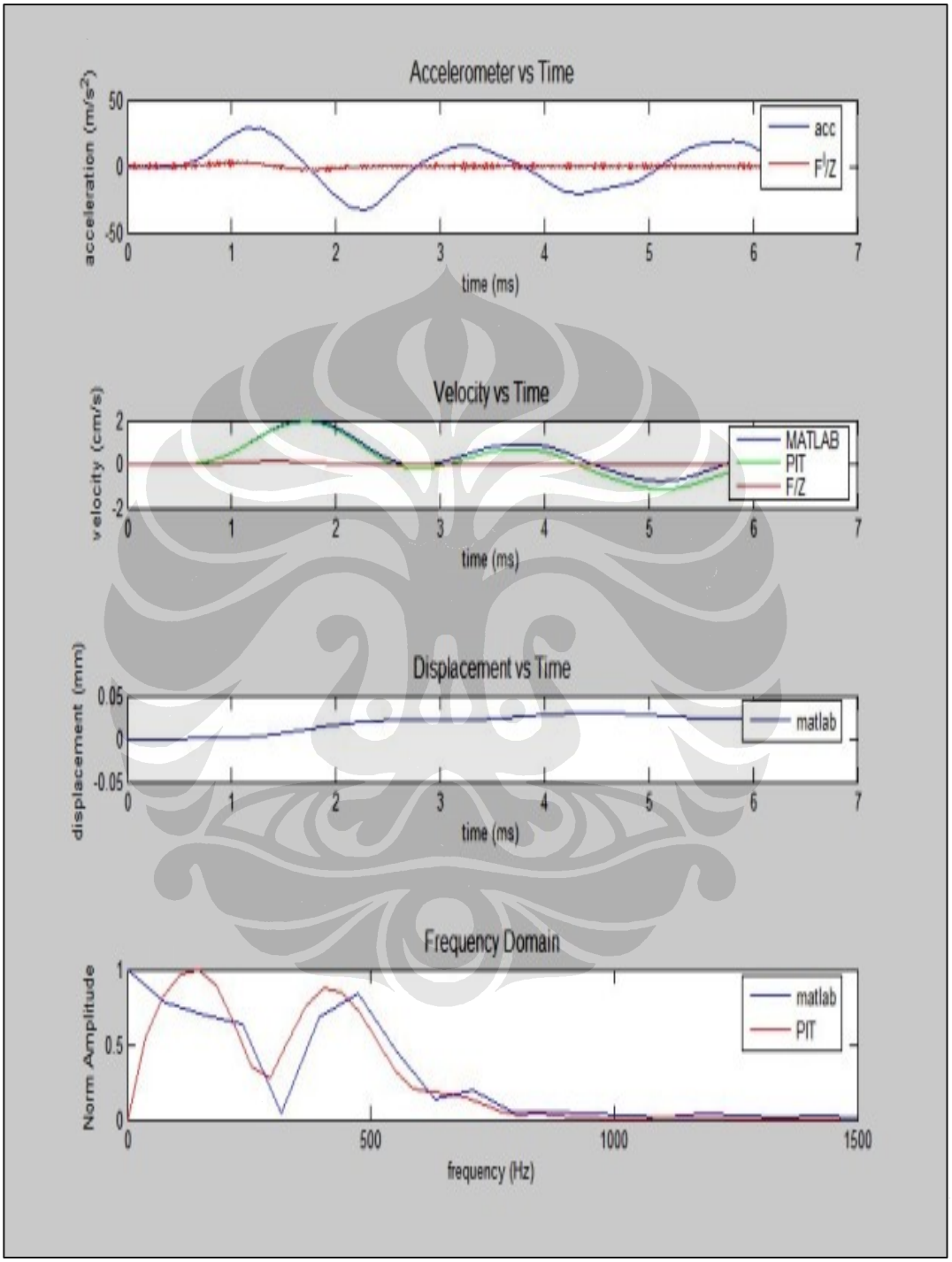
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 8



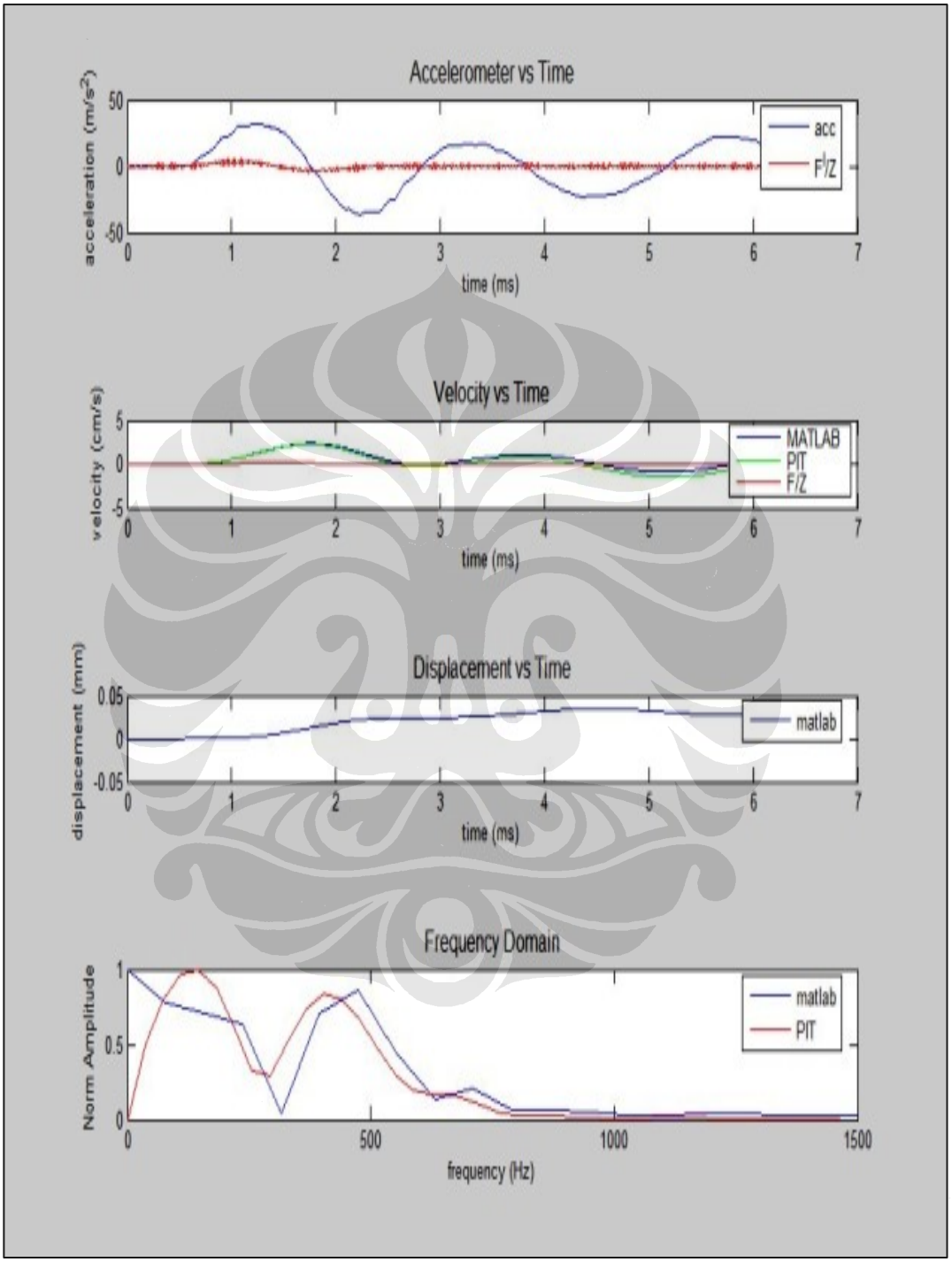
Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 9



Akselerometer di tengah, hammer di selatan akselerometer, hammer = 3120 gr

Data 10



LAMPIRAN 7

Hasil pengolahan data mencari kekakuan dengan *logarithmic decrement* pada Excel

Hammer Kecil

Data dari Hasil Pengolahan di Matlab dan Pile Integrity Test												
Posisi Hammer	Hammer Kecil											
	a_1 (m/s^2)	a_{1+j} (m/s^2)	Damping Ratio (ζ)	T_1 (ms)	T_{1+j} (ms)	Tn (s)	Log Dec (δ)	ω_n	Massa Balok (Kg)	Kekakuan (kN/m)	Redaman (kN.s/m)	K=48EI/L^3 (kN/m)
E1	27.03	13.71	0.108092654	1.453	5.847	0.004394	0.678821867	1440.262158	211.43	438580.8951	65.8315886	292248.0001
E2	26.84	13.68	0.107318217	1.33	5.953	0.004623	0.6739584	1368.806423	211.43	396141.8072	62.11723081	292248.0001
E3	26.61	15.91	0.081901153	1.38	6	0.00462	0.514339243	1366.447471	211.43	394777.5907	47.32379495	292248.0001
E4	29.14	17.56	0.080650989	1.4	5.953	0.004553	0.506488213	1386.416103	211.43	406400.0923	47.28244198	292248.0001
E5	24.22	14.76	0.078862726	1.353	5.975	0.004622	0.495257919	1365.526039	211.43	394245.3521	45.53741528	292248.0001
E6	29.17	18.1	0.075991854	1.253	5.947	0.004694	0.477228846	1344.284665	211.43	382075.4193	43.19712989	292248.0001
E7	28.58	15.87	0.093674624	1.38	5.927	0.004547	0.588276638	1389.804466	211.43	408388.9813	55.05189419	292248.0001
E8	35.68	22.41	0.074057806	1.38	5.933	0.004553	0.46508302	1385.716067	211.43	405989.793	43.39520039	292248.0001
E9	35.21	21.51	0.078473279	1.24	5.88	0.00464	0.49281219	1360.18748	211.43	391168.7534	45.13538762	292248.0001
E10	27	15.68	0.08653676	1.38	5.953	0.004573	0.543450851	1381.024663	211.43	403245.4528	50.53574464	292248.0001
N1	26.86	18.24	0.061627581	1.42	6.04	0.00462	0.387021206	1364.478703	211.43	393640.8246	35.55809498	292248.0001
N2	28.02	20.66	0.048522146	1.247	5.967	0.00472	0.304719077	1334.613218	211.43	376597.5182	27.38369368	292248.0001
N3	31.73	24.61	0.040463335	1.393	5.98	0.004587	0.254109741	1372.820835	211.43	398468.8102	23.48941156	292248.0001
N4	23.01	16.02	0.057657797	1.247	5.993	0.004746	0.362090962	1327.941459	211.43	372841.6915	32.37677423	292248.0001
N5	22.22	17.43	0.038662408	1.38	5.98	0.0046	0.242799925	1368.844113	211.43	396163.6232	22.37893949	292248.0001
N6	27.96	19.73	0.055515063	1.42	5.98	0.00456	0.348634597	1381.941092	211.43	403780.8064	32.44120484	292248.0001
N7	30.43	23.34	0.042238907	1.24	5.967	0.004727	0.265260337	1332.259147	211.43	375270.1588	23.79567285	292248.0001
N8	28.28	21.87	0.040929778	1.247	5.967	0.00472	0.257039006	1334.162723	211.43	376343.3221	23.09110933	292248.0001
N9	30.1	23.47	0.039618179	1.24	5.967	0.004727	0.248802162	1332.117035	211.43	375190.103	22.31688078	292248.0001
N10	32.07	26.14	0.032556418	1.253	5.98	0.004727	0.204454306	1331.779337	211.43	374999.9023	18.33434903	292248.0001

S1	29.03	16.64	0.088617889	1.213	5.94	0.004727	0.556520343	1336.273292	211.43	377534.971	50.07411632	292248.0001
S2	19.4	11.33	0.085639967	1.22	5.94	0.00472	0.537818991	1337.91179	211.43	378461.3823	48.45075802	292248.0001
S3	30.11	17.39	0.087414333	1.22	5.913	0.004693	0.548962014	1345.813427	211.43	382944.9296	49.74668123	292248.0001
S4	29.6	15.19	0.106232013	1.38	5.94	0.00456	0.667137045	1387.55904	211.43	407070.4268	62.33091322	292248.0001
S5	28.9	19.74	0.060699771	1.373	5.987	0.004614	0.381194561	1366.17611	211.43	394620.8093	35.06633228	292248.0001
S6	23.71	15.44	0.068301808	1.247	5.967	0.00472	0.428935355	1336.14484	211.43	377462.3918	38.59067238	292248.0001
S7	30.78	21.28	0.058773482	1.233	5.973	0.00474	0.369097464	1329.708141	211.43	373834.4023	33.04717578	292248.0001
S8	25.51	17.19	0.06285712	1.24	5.953	0.004713	0.394742713	1337.6555	211.43	378316.4008	35.55456445	292248.0001
S9	21.95	15.08	0.059776716	1.393	5.96	0.004567	0.375397777	1380.159553	211.43	402740.4038	34.88654442	292248.0001
S10	27.89	18.49	0.065451936	1.233	5.953	0.00472	0.411038156	1335.892304	211.43	377319.7216	36.97349868	292248.0001
W1	23.45	15.93	0.061571078	1.387	6.013	0.004626	0.386666371	1362.704244	211.43	392617.6569	35.47929428	292248.0001
W2	23.48	16.5	0.056176531	1.467	5.98	0.004513	0.352788614	1396.384348	211.43	412265.0833	33.17084187	292248.0001
W3	30.67	22.8	0.047217268	1.3	6.007	0.004707	0.296524442	1338.216127	211.43	378633.5806	26.71921648	292248.0001
W4	25.93	18.79	0.051285953	1.247	6.007	0.00476	0.322075786	1323.579378	211.43	370396.2607	28.70417236	292248.0001
W5	24.08	17.07	0.054786478	1.36	5.967	0.004607	0.344059084	1367.788126	211.43	395552.6225	31.68756148	292248.0001
W6	27.28	18.85	0.058860019	1.273	5.98	0.004707	0.369640919	1339.037271	211.43	379098.3907	33.32803193	292248.0001
W7	22.74	16.91	0.047168842	1.273	5.953	0.00468	0.296220325	1345.933547	211.43	383013.292	26.84574338	292248.0001
W8	24.7	17.34	0.056335553	1.293	6.007	0.004714	0.353787272	1336.855865	211.43	377864.2291	31.84664979	292248.0001
W9	23.95	15.86	0.065631864	1.267	5.973	0.004706	0.412168108	1339.882158	211.43	379576.9376	37.18587028	292248.0001
W10	19.92	13.61	0.060655961	1.4	5.993	0.004593	0.380919435	1372.418885	211.43	398235.5082	35.20114412	292248.0001
							Rata-Rata			**389546.7575**	**37.78659355**	**292248.0001**

Hasil pengolahan data mencari kekakuan dengan *logarithmic decrement* pada Excel

Hammer Besar

Data dari Hasil Pengolahan di Matlab dan Pile Integrity Test												
Posisi Hammer	Hammer Besar											
	a_1 (m/s^2)	a_{1+j} (m/s^2)	Damping Ratio (ζ)	T_1 (ms)	T_{1+j} (ms)	Tn (s)	Log Dec (δ)	ω_n	Massa Balok (Kg)	Kekakuan (kN/m)	Redaman (kN.s/m)	K=48EI/L^3 (kN/m)
E1	29.78	17.27	0.086762123	1.227	5.72	0.004493	0.54486614	1405.6416	211.43	417749.3816	51.5705046	292248.0001
E2	24.8	16.03	0.06948753	1.24	5.68	0.00444	0.43638169	1420.5213	211.43	426640.5165	41.73988243	292248.0001
E3	22.13	14.74	0.064708482	1.233	5.653	0.00442	0.40636927	1426.4953	211.43	430236.522	39.0326601	292248.0001
E4	28.19	15.78	0.092392355	1.32	5.627	0.004307	0.58022399	1467.076	211.43	455063.3302	57.31723849	292248.0001
E5	24.02	15.06	0.074338311	1.293	5.673	0.00438	0.46684459	1440.4784	211.43	438712.5978	45.2810036	292248.0001
E6	25.16	15.45	0.077650705	1.293	5.647	0.004354	0.48764643	1449.4416	211.43	444189.248	47.59296103	292248.0001
E7	23.27	14.34	0.077087921	1.373	5.77	0.004397	0.48411214	1435.205	211.43	435506.3655	46.7839499	292248.0001
E8	23.62	14.3	0.079909916	1.22	5.68	0.00446	0.50183427	1415.2423	211.43	423475.4429	47.82203919	292248.0001
E9	20.21	12.71	0.073851663	1.26	5.667	0.004407	0.46378845	1431.602	211.43	433322.4549	44.70737589	292248.0001
E10	20.84	14.37	0.059192917	1.22	5.593	0.004373	0.37173152	1441.3381	211.43	439236.4031	36.07714848	292248.0001
N1	23.54	15.5	0.066538388	1.153	5.8	0.004647	0.41786108	1356.9744	211.43	389322.8829	38.18040601	292248.0001
N2	24.7	16.47	0.064532277	1.12	5.8	0.00468	0.4052627	1347.2303	211.43	383751.6846	36.76338034	292248.0001
N3	30.01	20.8	0.058372241	1.153	5.81	0.004657	0.36657767	1353.3755	211.43	387260.5039	33.40575331	292248.0001
N4	25.9	18.06	0.057411373	1.173	5.72	0.004547	0.36054342	1386.0395	211.43	406179.3137	33.64884274	292248.0001
N5	30.3	22.67	0.046195103	1.18	5.853	0.004673	0.29010525	1347.8888	211.43	384126.9191	26.32974261	292248.0001
N6	30.76	21.6	0.056293285	1.153	5.86	0.004707	0.35352183	1338.8408	211.43	378987.1523	31.87000541	292248.0001
N7	24.39	17.23	0.055337765	1.193	5.833	0.00464	0.34752116	1358.1013	211.43	389969.7482	31.7797423	292248.0001
N8	26.02	18.26	0.056393726	1.273	5.893	0.00462	0.3541526	1364.0604	211.43	393399.5098	32.52827223	292248.0001
N9	29.37	20.7	0.055707014	1.22	5.88	0.00466	0.34984004	1352.3	211.43	386645.2962	31.85514179	292248.0001
N10	34.04	22.92	0.062981913	1.233	5.88	0.004647	0.39552641	1356.6644	211.43	389145.0148	36.13140767	292248.0001

S1	24.55	17.24	0.056286559	1.213	5.673	0.00446	0.35347959	1412.9868	211.43	422126.7171	33.63097191	292248.0001
S2	27.74	17.05	0.077504015	1.213	5.767	0.004554	0.48672521	1385.7702	211.43	406021.5181	45.41632869	292248.0001
S3	23	15.4	0.063873679	1.207	5.76	0.004553	0.40112671	1384.7514	211.43	405424.7548	37.4016159	292248.0001
S4	33.85	21.5	0.072274851	1.213	5.827	0.004614	0.45388606	1367.2193	211.43	395223.6791	41.78515176	292248.0001
S5	31.74	20.74	0.067756929	1.147	5.847	0.0047	0.42551351	1341.7812	211.43	380653.6882	38.44430673	292248.0001
S6	32.77	20.99	0.070934288	1.213	5.833	0.00462	0.44546733	1365.3138	211.43	394122.7909	40.95295927	292248.0001
S7	28.7	19.6	0.060727318	1.24	5.86	0.00462	0.38136756	1364.4041	211.43	393597.7925	35.03674304	292248.0001
S8	27.29	17.77	0.068313486	1.267	5.833	0.004566	0.42900869	1381.2108	211.43	403354.1759	39.89909339	292248.0001
S9	28.76	18.97	0.066262221	1.16	5.8	0.00464	0.41612675	1358.9969	211.43	390484.2458	38.07860666	292248.0001
S10	32.36	22.53	0.057655309	1.267	5.76	0.004493	0.36207534	1402.7174	211.43	416013.0713	34.19842377	292248.0001
W1	29.5	22.11	0.04591724	1.187	5.647	0.00446	0.28836027	1412.2431	211.43	421682.4609	27.42090896	292248.0001
W2	26.07	18.67	0.053163578	1.133	5.66	0.004527	0.33386727	1391.8382	211.43	409585.0799	31.28956802	292248.0001
W3	25.18	14.55	0.087334241	1.187	5.82	0.004633	0.54845903	1363.233	211.43	392922.4308	50.34441087	292248.0001
W4	26.49	18.69	0.055538007	1.147	5.673	0.004526	0.34877868	1392.3242	211.43	409871.1555	32.69845756	292248.0001
W5	22.13	15.37	0.058044044	1.147	5.8	0.004653	0.3645166	1354.5132	211.43	387911.8999	33.24585564	292248.0001
W6	25.09	17.82	0.054482156	1.14	5.613	0.004473	0.34214794	1408.7404	211.43	419593.3074	32.45501846	292248.0001
W7	23.85	17.37	0.050484019	1.14	5.62	0.00448	0.31703964	1406.2461	211.43	418108.7467	30.02008002	292248.0001
W8	17.03	12.05	0.055081502	1.147	5.653	0.004506	0.34591183	1398.469	211.43	413496.9394	32.5728101	292248.0001
W9	20.57	14.77	0.052744523	1.193	5.673	0.00448	0.33123561	1406.4091	211.43	418205.6939	31.36791438	292248.0001
W10	25.16	18.04	0.052971961	1.167	5.653	0.004486	0.33266392	1404.5448	211.43	417097.709	31.46141534	292248.0001
							Rata-Rata			**408710.4536**	**37.70345246**	**292248.0001**