LAMPIRAN

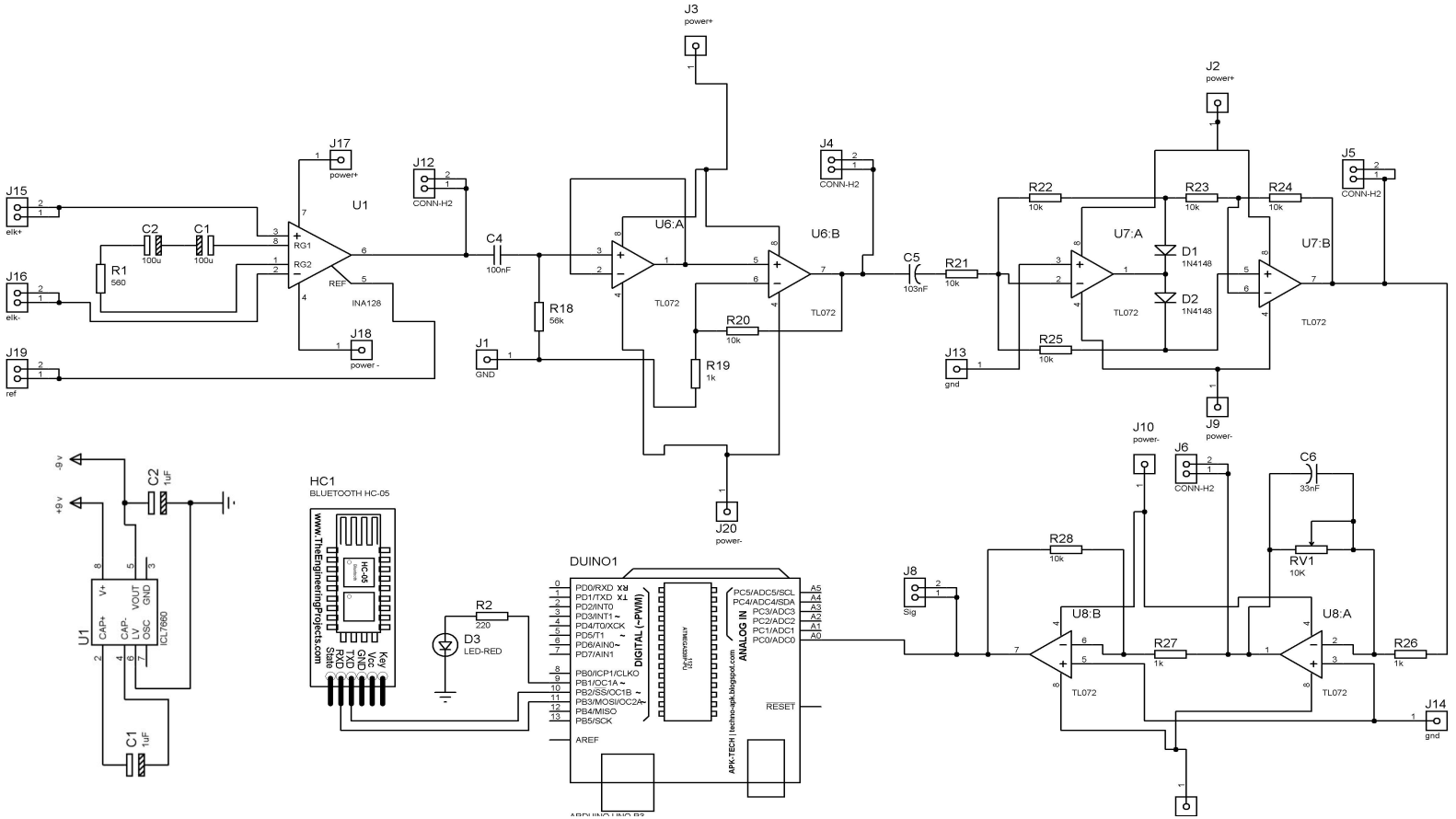
Lampiran 10

Nilai Perbandingan Tegangan Sinyal *peak to peak Pada Alat EMG Terkalibrasi*

Nama Pasien	Data pasien		MODUL		PEMBANDING		Rata - rata Modul	Rata - rata Pembanding	SELISIH	Error	Rata-Rata Error
			Pengukuran ke-1	Pengukuran ke-2	Pengukuran ke-1	Pengukuran ke-2					
LIUS	Kanan	Kontraksi Radialis	3,75	3,05	3,58	3,27	3,4	3,425	0,025	0,73%	0,64%
		Kontraksi Bicep	2,75	2,75	2,78	2,76	2,75	2,77	0,02	0,72%	
	Kiri	Kontraksi Radialis	1,17	1,12	1,16	1,14	1,145	1,15	0,005	0,43%	
		Kontraksi Bicep	0,7	0,8	0,79	0,72	0,75	0,755	0,005	0,66%	
KURNI	Kanan	Kontraksi Radialis	0,89	1,62	0,81	1,71	1,255	1,26	0,005	0,40%	0,57%
		Kontraksi Bicep	1,52	1,39	1,58	1,34	1,455	1,46	0,005	0,34%	
	Kiri	Kontraksi Radialis	1,46	1,47	1,49	1,47	1,465	1,48	0,015	1,01%	
		Kontraksi Bicep	0,97	0,88	0,92	0,94	0,925	0,93	0,005	0,54%	
KAUTSAR	Kanan	Kontraksi Radialis	1,32	1,28	1,26	1,37	1,3	1,315	0,015	1,14%	1,07%
		Kontraksi Bicep	0,97	0,92	0,93	0,95	0,945	0,94	-0,005	0,53%	
	Kiri	Kontraksi Radialis	3,34	2,96	3,41	2,97	3,15	3,19	0,04	1,25%	
		Kontraksi Bicep	2,5	2,63	2,33	2,87	2,565	2,6	0,035	1,35%	
LUQMAN	Kanan	Kontraksi Radialis	1,49	1,64	1,61	1,49	1,565	1,55	-0,015	0,97%	1,15%
		Kontraksi Bicep	0,82	0,95	0,88	0,92	0,885	0,9	0,015	1,67%	
	Kiri	Kontraksi Radialis	1,18	1,2	1,12	1,29	1,19	1,205	0,015	1,24%	
		Kontraksi Bicep	0,62	0,79	0,79	0,63	0,705	0,71	0,005	0,70%	

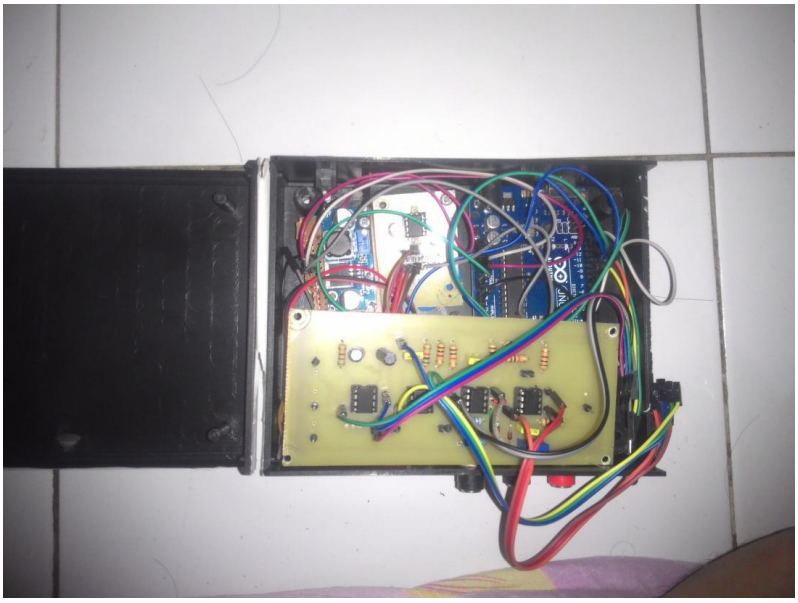
Lampiran 1

Skema Elektromiograf



Lampiran 2

Hasil Alat Elektromiograf

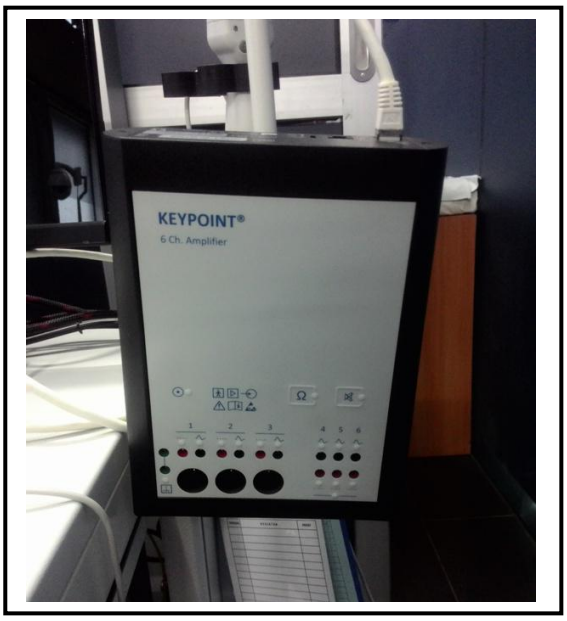


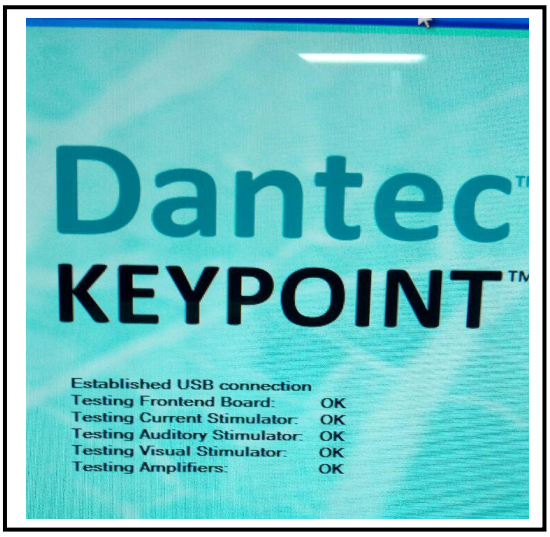
Lampiran 3

Elektromiograf Natus

Elektromiograf *Natus* merupakan elektromiograf yang sudah terkalibrasi yang terdapat pada RSUD A. Wahab Sjahranie Samarinda. Elektromiograf *Natus* pada penelitian ini merupakan alat pembanding atau kalibrator. Berikut gambar dari Elektromiograf *Natus* :

Natus UltraPro S100 dapat mengkalibrasi secara otomatis ketika pertama kali di nyalakan.





Lampiran 6

Listing Program Pada *Software Arduino Uno*

```
#include <SoftwareSerial.h>

SoftwareSerial BTSerial(10, 11); // RX | TX

 #define ldrPin A0

 int ldrValue = 0;

 void setup()

{

 pinMode(9, OUTPUT);  // this pin will pull the HC-05 pin 34 (key pin) HIGH to switch module to AT mode

pinMode(ldrPin, INPUT);

 BTSerial.begin(9600);

Serial.begin(9600);

 }

   void loop()

 {

   ldrValue = analogRead(ldrPin);

   float voltage = ldrValue*1000.0*(5.0/1023.0);

   BTSerial.println(voltage);

   Serial.println(voltage);

   delay(10);

   digitalWrite(9, HIGH);

   delay(10);

                                                    }
```

Lampiran 7

Listing Program Pada *Software MatLab* untuk Menampilkan Tampilan Sinyal

```
function varargout = PROJECT2(varargin)
% PROJECT2 MATLAB code for PROJECT2.fig
%      PROJECT2, by itself, creates a new PROJECT2 or raises the
existing
%      singleton*.
%
%      H = PROJECT2 returns the handle to a new PROJECT2 or the
handle to
%      the existing singleton*.
%
%      PROJECT2('CALLBACK',hObject,eventData,handles,...) calls
the local
%      function named CALLBACK in PROJECT2.M with the given input
arguments.
%
%      PROJECT2('Property','Value',...) creates a new PROJECT2 or
raises the
%      existing singleton*.  Starting from the left, property
value pairs are
%      applied to the GUI before PROJECT2_OpeningFcn gets called.
An
%      unrecognized property name or invalid value makes property
application
%      stop.  All inputs are passed to PROJECT2_OpeningFcn via
varargin.
%
%      *See GUI Options on GUIDE's Tools menu.  Choose "GUI allows
only one
%      instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help PROJECT2

% Last Modified by GUIDE v2.5 26-Jul-2017 16:22:54

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                   'gui_Singleton',  gui_Singleton, ...
                   'gui_OpeningFcn', @PROJECT2_OpeningFcn, ...
                   'gui_OutputFcn',  @PROJECT2_OutputFcn, ...
                   'gui_LayoutFcn',  [] , ...
                   'gui_Callback',   []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end
```

```
if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT


% --- Executes just before PROJECT2 is made visible.
function PROJECT2_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to PROJECT2 (see VARARGIN)
uiwait(msgbox({'Welcome to EMG Monitoring',' ',...
                   'TEKNIK ELEKTROMEDIK ',...
    'UNIVERSITAS MUHAMMADIYAH YOGYAKARTA',...
    'automatically recognize EMG Monitoring',...
    ' ',' ',' ',...
    'PRESENT BY. LUQMAN Eng',' ',...
    ' ','Just Like, Dont Comment'}));
h=waitbar(1,' BISMILLAH..INSYA ALLAH SUKSES'); %Waitbar is here to
measure time and show when initialization
tic                                          %is over
toc
commandwindow
close(h);
% Choose default command line output for PROJECT2
handles.output = hObject;

axes(handles.axes2)
imshow('D:\DATA PRIBADI\KTI L\pic rangkaian\logo\logo tem.jpg');

% Update handles structure
guidata(hObject, handles);


% UIWAIT makes PROJECT2 wait for user response (see UIRESUME)
% uiwait(handles.figure1);

global a;
instrhwinfo('Bluetooth','HC-05')
a = Bluetooth('HC-05',1)
out1 = instrfind(a);
fclose(out1);
fopen(a);


% --- Outputs from this function are returned to the command line.
function varargout = PROJECT2_OutputFcn(hObject, eventdata,
handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
```

```
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;


% --- Executes on button press in play_button.
function play_button_Callback(hObject, eventdata, handles)
% hObject    handle to play_button (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    structure with handles and user data (see GUIDATA)

 global a;

setappdata(0,'utama', gcf);
setappdata(gcf, 'nn', 0);
h = 1;
x = [];

while h == 1
    utama = getappdata(0,'utama');
    nn = getappdata(utama, 'nn');
    if nn == 1;
        break
    end
    input = fscanf(a);
    y = str2num(input);
    x = [x ; y];
    axes(handles.axes1)
    plot(x)
    xlabel('time');
    ylabel('amplitude');
    pause(0.01); %waktu pencacahan disesuaikan sendiri sesuai
kebutuhan satuannya s, jadi ini mencacah tiap 0.1 s
end
guidata(hObject,handles);


% --- Executes on button press in reset_button.
function reset_button_Callback(hObject, eventdata, handles)
% hObject    handle to reset_button (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    structure with handles and user data (see GUIDATA)
cla(handles.axes1, 'reset')
guidata(hObject,handles);


% --- Executes on button press in stop_button.
function stop_button_Callback(hObject, eventdata, handles)
% hObject    handle to stop_button (see GCBO)
```

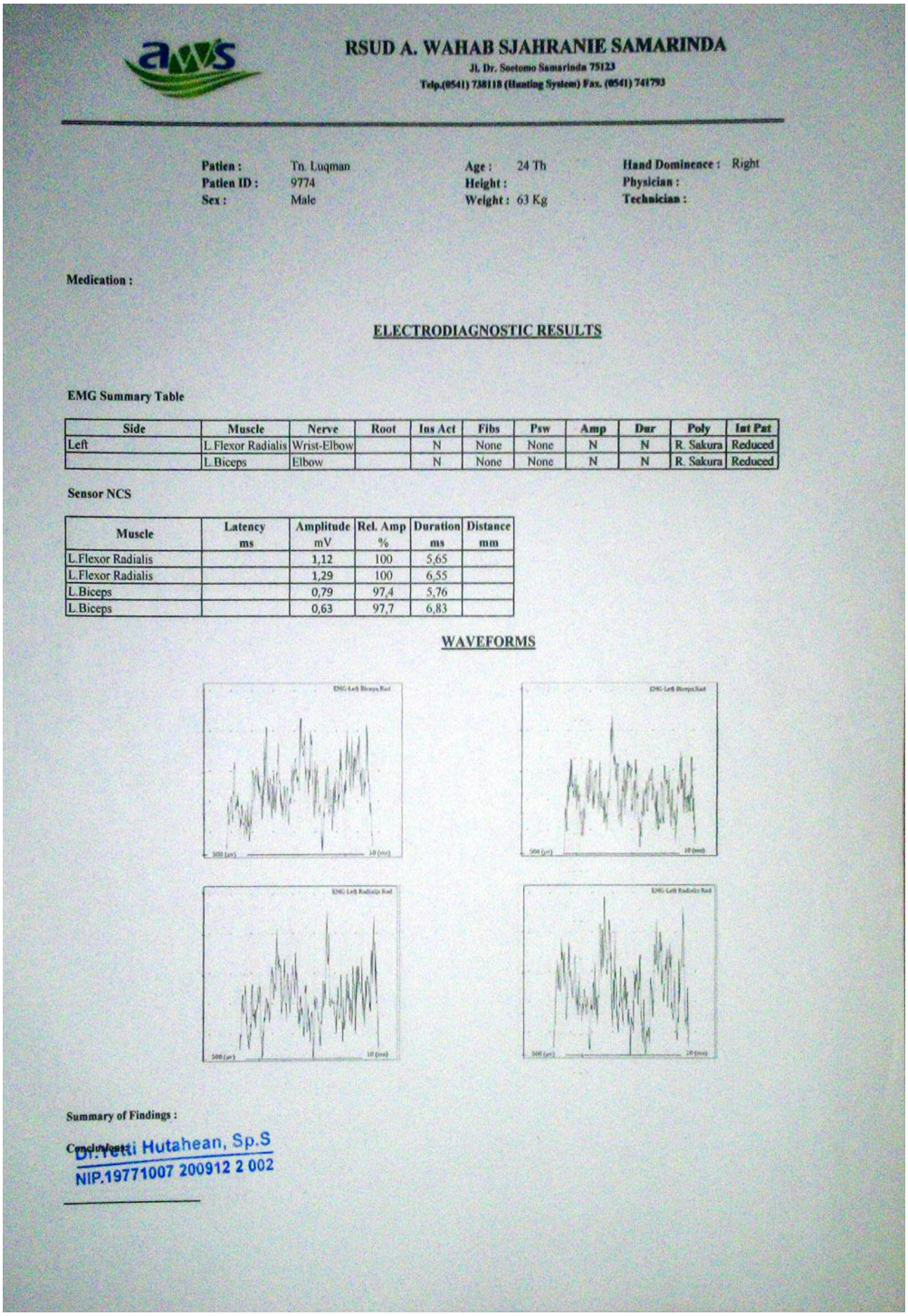
```
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    structure with handles and user data (see GUIDATA)

setappdata(0,'utama',gcf);
setappdata(gcf,'nn',1);
guidata(hObject,handles);


% --- Executes during object creation, after setting all
properties.
function axes7_CreateFcn(hObject, eventdata, handles)
% hObject    handle to axes7 (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    empty - handles not created until after all
CreateFcns called

% Hint: place code in OpeningFcn to populate axes7


% --- Executes during object creation, after setting all
properties.
function text5_CreateFcn(hObject, eventdata, handles)
% hObject    handle to text5 (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    empty - handles not created until after all
CreateFcns called



function time_value_Callback(hObject, eventdata, handles)
% hObject    handle to time_value (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of time_value as
text
%        str2double(get(hObject,'String')) returns contents of
time_value as a double
handles.data1 = get(hObject,'string');
handles.time = str2double(handles.data1);
guidata(hObject, handles);

% --- Executes during object creation, after setting all
properties.
function time_value_CreateFcn(hObject, eventdata, handles)
% hObject    handle to time_value (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    empty - handles not created until after all
CreateFcns called
```

```
% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end


% --- Executes during object creation, after setting all
properties.
function axes2_CreateFcn(hObject, eventdata, handles)
% hObject    handle to axes2 (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    empty - handles not created until after all
CreateFcns called

% Hint: place code in OpeningFcn to populate axes2


% --- Executes on button press in pushbutton7.
function pushbutton7_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton7 (see GCBO)
% eventdata  reserved - to be defined in a future version of
MATLAB
% handles    structure with handles and user data (see GUIDATA)
fig = figure;
copyobj(handles.axes1, fig);
saveas(fig, 'figure_file','fig'); %figure akan disimpan di folder
dimana matlab aktif
%close(fig); %jika close diaktifkan maka fig yang disimpan akan
langsung
%ditutup
```

Lampiran 8

Hasil Pengambilan Data Menggunakan *Natus UltraPro S100*

Data hasil dari pengukuran aktifitas otot saat kontraksi dengan menggunakan alat *Natus UltraPro S100*



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Telp.(0541) 738118 (Hunting System) Fax. (0541) 741793

Patien :	Tn. Luqman	**Age :**	24 Th	**Hand Dominence :**	Right
Patien ID :	9774	**Height :**		**Physician :**	
Sex :	Male	**Weight :**	63 Kg	**Technician :**	

Medication :

ELECTRODIAGNOSTIC RESULTS

EMG Summary Table

Side	Muscle	Nerve	Root	Ins Act	Fibs	Psw	Amp	Dur	Poly	Int Pat
Left	L.Flexor Radialis	Wrist-Elbow		N	None	None	N	N	R. Sakura	Reduced
	L.Biceps	Elbow		N	None	None	N	N	R. Sakura	Reduced

Sensor NCS

Muscle	Latency ms	Amplitude mV	Rel. Amp %	Duration ms	Distance mm
L.Flexor Radialis		1,12	100	5,65	
L.Flexor Radialis		1,29	100	6,55	
L.Biceps		0,79	97,4	5,76	
L.Biceps		0,63	97,7	6,83	

WAVEFORMS

Summary of Findings :

Conclusion :

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Lampiran 9

Perhitungan rata – rata dan % *error* alat Elektromiograf Pada Aktifitas Otot Saat Kontraksi *Radialis* dan Kontraksi *Bisep*

1. Perhitungan rata – rata dan % *error* pada saat kontraksi, pada Lius.

A. Elektromiograf

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{3,75+3,05}{2} = 3,4$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{2,75+2,75}{2} = 2,75$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,17+1,12}{2} = 1,14$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,7+0,8}{2} = 0,75$

B. Elektromiograf *Natus UltraPro S100*

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{3,58+3,27}{2} = 3,42$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{2,78+2,76}{2} = 2,77$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,16+1,14}{2} = 1,15$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,79+0,72}{2} = 0,75$

Error % kontraksi radialis kanan $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{3,425-3,4}{3,425}$ x 100%

= 0,73 %

Error % kontraksi Bisep kanan $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{2,77-2,75}{2,77}$ x 100%

= 0,72 %

Error % kontraksi radialis kiri $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{1,15-1,145}{1,15}$ x 100%

= 0,43 %

Error % kontraksi Bisep kiri $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{0,755-0,75}{0,755}$ x 100%

= 0,66 %

2. Perhitungan rata – rata dan % *error* pada saat kontraksi, pada Neli.

A. Elektromiograf

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,89+1,62}{2} = 1,25$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,52+1,39}{2} = 1,45$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,46+1,47}{2} = 1,46$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,97+0,88}{2} = 0,92$

B. Elektromiograf *Natus UltraPro S100*

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,81+1,71}{2} = 1,26$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,58+1,34}{2} = 1,46$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,49+1,47}{2} = 1,48$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,92+0,94}{2} = 0,93$

Error % kontraksi radialis kanan $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{1,26-1,255}{1,26}$ x 100%

= 0,40 %

Error % kontraksi Bisep kanan $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{1,46-1,455}{1,46}$ x 100%

= 0,34 %

Error % kontraksi radialis kiri $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{1,48-1,465}{1,48}$ x 100%

= 1,01 %

Error % kontraksi Bisep kiri $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{0,93-0,925}{0,93}$ x 100%

= 0,54 %

3. Perhitungan rata – rata dan % *error* pada saat kontraksi, pada Kautsar.

A. Elektromiograf

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,32+1,28}{2} = 1,3$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,97+0,92}{2} = 0,94$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{3,34+2,96}{2} = 3,15$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{2,5+2,63}{2} = 2,56$

B. Elektromiograf *Natus UltraPro S100*

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,26+1,37}{2} = 1,31$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,93+0,95}{2} = 0,94$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{3,41+2,97}{2} = 3,19$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{2,33+2,87}{2} = 2,6$

Error % kontraksi radialis kanan $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{1,315-1,3}{1,315}$ x 100%

= 1,14 %

Error % kontraksi Bisep kanan $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{0,94-0,945}{0,94}$ x 100%

= 0,53 %

Error % kontraksi radialis kiri $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{3,19-3,15}{3,19}$ x 100%

= 1,25 %

Error % kontraksi Bisep kiri $= \frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

$= \frac{2,6-2,565}{2,6}$ x 100%

= 1,35 %

4. Perhitungan rata – rata dan % *error* pada saat kontraksi, pada Luqman.

A. Elektromiograf

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,49+1,64}{2} = 1,56$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,82+0,95}{2} = 0,88$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,18+1,2}{2} = 1,19$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,62+0,79}{2} = 0,70$

B. Elektromiograf *Natus UltraPro S100*

- Tangan kanan

Kontraksi Radialis	Kontraksi Bisep
Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{1,61+1,49}{2} = 1,55$	Rata-rata ($\bar{x}$) $= \frac{\sum Xi}{n}$ $= \frac{0,88+0,92}{2} = 0,9$

- Tangan Kiri

Kontraksi Radialis	Kontraksi Bisep

Rata-rata ($\bar{x}$) = $\frac{\sum Xi}{n}$ = $\frac{1,12+1,29}{2}$ = 1,20	Rata-rata ($\bar{x}$) = $\frac{\sum Xi}{n}$ = $\frac{0,79+0,63}{2}$ = 0,71

Error % kontraksi radialis kanan = $\frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

= $\frac{1,55-1,565}{1,55}$ x 100%

= 0,97 %

Error % kontraksi Bisep kanan = $\frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

= $\frac{0,9-0,885}{0,9}$ x 100%

= 1,67 %

Error % kontraksi radialis kiri = $\frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

= $\frac{1,205-1,19}{1,205}$ x 100%

= 1,24 %

Error % kontraksi Bisep kiri = $\frac{SIMPANGAN}{DATA\ SETTING}$ x 100%

= $\frac{0,71-0,705}{0,71}$ x 100%

= 0,70 %