**American University of Beirut** 

ECE312 Lab

# **MyDAQ Assignment 2**

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20110\*\*\*\*

Due on 08/12/2011

## 1. <u>Description of the hardware setup</u>:

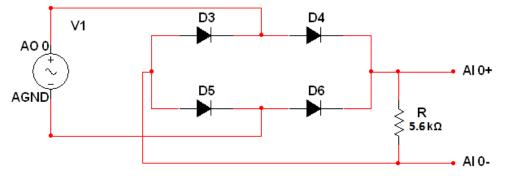
## a. Circuit Connections :

## 1. Half-wave Rectifier:

In this first experiment, a diode was to be connected in series with a resistor and a voltage source. First off, a breadboard was used to connect the resistor and the diode in series. The two components were placed adjacent to each other with one terminal of each connected to a common node. Next was the introduction of a voltage source.

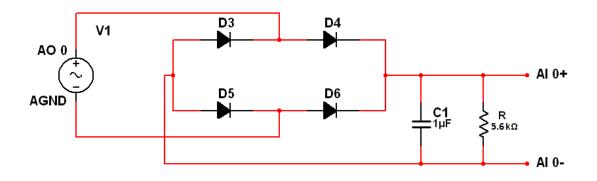
## 2. Bridge Full-wave Rectifier:

In this experiment, four diodes were connected to each other in bridge form. That is, each pair was connected to a common node, and the pairs were connected in parallel. In parallel with the diode pairs, we connected a resistor on the breadboard.



## 3. Bridge Full-wave Rectifier with Filter:

Same as the full-wave rectifier in addition to a capacitor in parallel to the resistor.



## b. MyDAQ & Circuit Connections:

In our case, a MyDAQ was used as an AC supply. In order to obtain a closed circuit, the positive pole of the diode was connected to the AOO (analog out) line of the DAQ while the free end of the resistor was connected to the AGND (ground). Finally, to study the resistor (output), its poles were connected to the AI 0+ and AI 0- input lines of the DAQ. When measuring the PIV of the diode, the input lines where connected to the diode itself.

#### c. Input & Output Lines used:

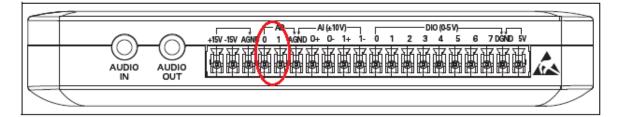
The AIO+ and AIO- are connected across the terminals of the resistor to find the output.

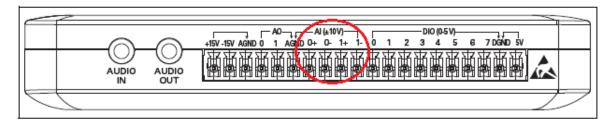
The AIO+ and AiO- are connected across the terminals of a diode to measure the PIV.

The DMM is used to measure the mean voltage across the resistor.

AOO is the voltage generator and AGND is its ground.

4 lines are used from the MyDAQ : AI0+, AI0-, AO0, & AGND

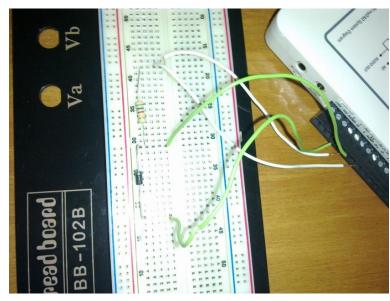




AO0 and AGND are the input lines used

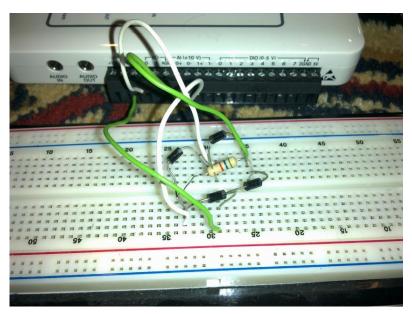
AIO+ and AIO- are the output lines used

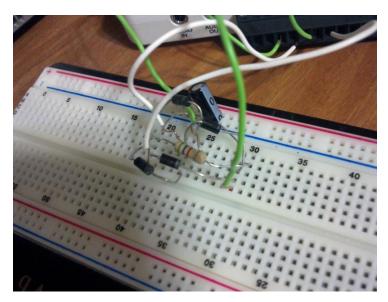
## c. <u>Photos</u>:



1. Half-wave Rectifier

2. Full-wave Bridge Rectifier





3. Full-wave Bridge Rectifier with Filter

## 2. <u>Description of the software setup</u>:

## (Modules and Configurations Used)

For this experiment, we were asked to measure the Pk-Pk voltage of the output using the oscilloscope module; the mean of the output using the DMM; the PIV of the diode using the oscilloscope. The function generator was used and programmed to provide a signal of amplitude 5V pk-pk and 1KHz's frequency. Before proceeding with the experiment, the value of the resistor was checked and found to be 5.54KOhms

Digital Multimeter - NI ELVISmx	- • •	
LabVIEW	Ð	
0.0	V	
	••••••••••••••••••••••••••••••••••••••	
V== V~ A== A~ f	Σ ⊣⊢ <u>(</u> (())	DMM
	na Jack Connections	
Specify Range 💌		
Range 60V		
	HI COM HI	
Null Offset		
- Instrument Control		
Device Dev1 (NI myDAQ)	Acquisition Mode Run Continuously	
	Run Stop Help	
]		

Oscilloscope - NI ELVISmx		
Sample Rate:	Basic Settings Advanced Settings Channel 1 Settings	
	Source Source AI 0 AI 1	
	Scale     Vertical       Volts/Div     Position (Div)       Volts/Div     Position (Div)       Volts/Div     Volts/Div       Volts/Div     Volts/Div	Scope
	Timebase Trigger Slope Immediate Slope Source Level (V)	
CH 0 Meas: RMS: ? Freq: ? Vp-p: 0.00 V	Horizontal Position (%)	
Cursors Settings Cursors On C1 CH 0 C2 CH 0 C2 CH 0 CH 0 CH 1	Instrument Control     Acquisition Mode       Device     Acquisition Mode       Dev1 (NI myDAQ)     Run Continuously       Run     Stop       Autoscale     Image: Continuously	

Function Generator - NI ELVISmx			
LabVIEW		OFF	
			Function
Frequency	Amplitude 0.0 10.0 -5 1.00 Vpp	DC Offset	Generator
200m 20k 100 Hz Sweep Settings Start Frequency Stop Frequence	Duty Cyde	Modulation Type None	
100.0  ↔ Hz 1.0k  ↔		1000 🔶 ms	
Device Dev1 (NI myDAQ)		•	
Manual Mode	Run Sweep St	top Help	

All these were chosen from the Instrument Launcher:

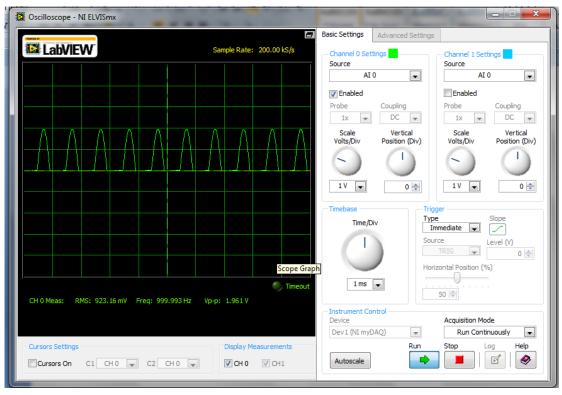


## 3. Testing:

a.	Digital Multimeter - NI ELVISmx	
	5.54 kOhms	
	Measurement Settings $V = V \sim A = A \sim \Omega + P (0000 \Rightarrow 3)$	R
	Mode Specify Range 20Kohm v Null Offset	l
	Instrument Control Device Dev1 (NI myDAQ) Run Continuously Run Stop Help	

#### R = 5.54kOhms

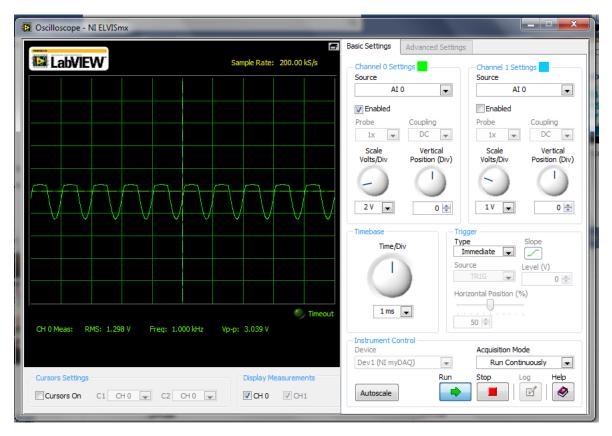
#### b. Half-wave Rectifier:



Vpk-pk = 1.956V

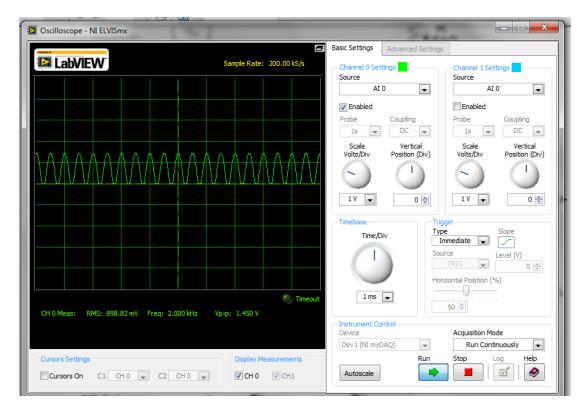
🔀 Digital Multimeter - NI ELVISmx		
0.6 V DC		
Measurement Settings           V=         V~         A=         Ω         ⊣         β         →)         →)		
Mode Specify Range Range 60V V Null Offset		
Instrument Control Device Dev1 (NI myDAQ) Run Stop Help		

V<sub>DC</sub>(Mean) = 0.6V





## c. Bridge Full-wave Rectifier:



#### Vpk-pk = 1.45V



V<sub>DC</sub>(Mean) = 0.7V

Oscilloscope - NI ELVISmx	1	Sai	
LabVIEW	Sample Rate: 200.00 kS/s	Advanced Settings Channel 0 Settings Source	- Channel 1 Settings
		AI 0	AI 0
		Enabled       Probe     Coupling       1x     DC       Scale     Vertical       Volts/Div     Position (Div)	Enabled       Probe     Coupling       1x     DC       Scale     Vertical       Volts/Div     Position (Div)
		1V     0 ⊕       Timebase     Time/Div	Slope
	Scope Graph	Sour	ce     Level (V)       TRIG     0 (*)       contal Position (%)
CH 0 Meas: RMS: 984.55 mV Freq: 1.000 kHz	Vp-p: 2.479 V	- Instrument Control Device Dev1 (NI myDAQ)	Acquisition Mode Run Continuously
Cursors Settings	Display Measurements ▼ CH 0 ▼ CH1	Autoscale Run	Stop Log Help

## **PIV = 2V**

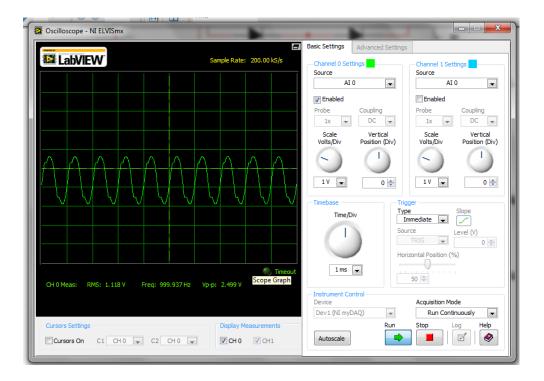
# d. Bridge Full-wave Rectifier with Filter:

Scilloscope - NI ELVISmx	Sample Rate: 200.00 kS/s		igs
LabVIEW	Sample Rate: 200.00 kS/s	Channel 0 Settings	Channel 1 Settings
		AI 0	AI 0
		Tenabled	Enabled
		Probe Coupling	Probe Coupling
		Scale Vertical	Scale Vertical
		Volts/Div Position (Div)	Volts/Div Position (Div)
		1V 💌 0 🖨	1V V 0 荣
			Frigger Type Slope
		Time/Div	Immediate 🖵 🗾
			Cource Level (V)
			Horizontal Position (%)
	Scope Graph	1 ms 👻	
CH 0 Meas: RMS: 1.258 V Freq: ?	Vp-p: 92.67 mV		50 🔛
		Instrument Control     Device	Acquisition Mode
		Dev1 (NI myDAQ)	Run Continuously
Cursors Settings	Display Measurements	Run	Stop Log Help
Cursors On C1 CH 0 🛒 C2 CH 0 🛒	CH 0 CH 1	Autoscale	

Vpk-pk = 92.67mV

Digital Multimeter - NI ELVISmx	
LabVIEW	Ð
1.3	V DC
	%FS
Measurement Settings	
V== V~ A== A~ Ω	+ ⊨ _0002 🔸 🕦
Mode Banana Specify Range 💌	Jack Connections
Range	$\downarrow \downarrow$
60V 🖵	
Null Offset	
Instrument Control	Acquisition Mode
Device Dev1 (NI myDAQ)	Run Continuously
	Run Stop Help

 $V_{DC}(Mean) = 1.3V$ 





**e.** The shape of the output in Exp.1 was a half wave. That is, a sinusoidal wave without its negative part. The shape can be described as a series of on-off "humps". The pk-pk voltage was 1.956V.

For Exp.2, the shape was approximately a series of uninterrupted humps (fully rectified wave), with pk-pk voltage of 1.45V<1.956V

Finally, in Exp3, the shape of the wave was very close to a horizontal straight line with a pk-pk voltage of 92.67mV<1.45V<1.956V.

We thus conclude that the curve gets closer to a horizontal straight line as we cascade our three rectifiers since Vpk-pk gets less and less.

Concerning the mean, we notice that in experiment 1, the mean voltage is 0.6V. The mean voltage becomes 0.7V in Exp2 and finally reaches 1.3V in the final configuration. We deduce that the DC voltage we are trying to obtain will have a considerable high value.