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Удаљене лабораторије
Remote Labs

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Крагујевац, Србија, 28. април 2022. године

Преглед

Удаљене лабораторије су специфичан облик наставе (истраживања) на даљину за коришћење удаљених ресурса потребних за лабораторијски рад

Настава на даљину зависи од технологије која је на располагању

Класичан облик овакве наставе су разни дописни курсеви и школе који могу бити сасвим успешни, али са успореном динамиком комуникације са учесницима, као и одсуством коришћења наставних средстава и наравно лабораторија

Из тих разлога, дописни курсеви су углавном ограничени на области изучавања за које писани материјали могу бити довољни

Телекомуникационе технологије XX века, радио и ТВ, али и кинематографија, омогућавају значајно унапређење у погледу динамике комуникације, као и аудио визуелног искуства

Преглед

Радио као прво масовно средство телекомуникације, се убрзо по увођењу користи и за извођење наставе на даљину.

Пример је SOA (School Of the Air) у Америци и Аустралији.

SOA почиње са радом 1929 године на Ohio State University, првобитно са програмом намењеним школама, који доживљава успех јер долази до интересовања код много ширег аудиторијума – одрасли без одговарајућег претходног образовања.

Поређења ради, радио Београд почиње са радом 1. октобра 1924

SOA ради све до средине 90 тих година

https://www.learntechlib.org/p/65567/

Education by Radio: America's Schools of the Air

ARTICLE

William Bianchi

TLRPTIL Volume 52, Number 2, April 2008 ISSN 8756-3894

Abstract

As an educational media, radio has a long and complex history in the United States, but its most extensive and important use in education took place during the School of the Air (SOA) movement. From approximately 1929 to 1975, commercial broadcast networks, state universities and departments or colleges of education, and local school boards operated over a dozen SOAs; one continued broadcasting into the mid-1990s. At their peak, SOAs reached approximately 2.5 million students nationwide and involved tens of thousands of teachers and children directly in radio broadcasting. They also generated scholarly studies by universities, government agencies, and foundations. Despite these achievements, educational scholars who mention SOAs dismiss them as failed experiments in educational technology. Their assessments are drawn from research conducted in the early 1940s, which concluded that despite high hopes, the SOA movement had never attracted more than 10% of the potential universe of K-12 student listeners. The author maintains that early scholars rushed to judgment, over-emphasizing the significance of audience studies/size, neglected to define any other criteria for measuring SOA success, and failed to document the accomplishments of the most successful SOAs such as NBC's Music Appreciation Hour, the Wisconsin School of the Air, and the Portland School of the Air. This article provides an overview of the origins of the SOAs movement and an in-depth look at several of the most successful SOAs, and demonstrates that in individual incidences, education by radio performed successfully for many decades, typically with niche audiences. The author hopes to fill gaps in knowledge and understanding of a significant in the history of American education and educational technology. (Contains 4 tables.)

Преглед

Сличан концепт - COA је коришћен и у Аустралији

Специфичност Аустралије половином XX века је ретка насељеност у неким областима, на пр фарме које су доста удаљене од образовних центара

COA почиње са радом 1951 године и у почетку користи Royal Flying Doctor Service – медицинска служба за удаљене области.

Користи се двосмерна радио веза и “радио на педале”

Ученици се окупљају на додели диплома

У XXI веку, прелази се на савременије комуникационе технологије – телефон, Интернет

https://australian-children.com/school-of-the-air/history-of-school-of-the-air/

School of the Air - Australian Children

Many children in Australia live in remote areas which we call "The Bush" many of these children have been schooled by a combination of home schooling from parents and via the School of the Air a uniquely Australian way of getting an education by using an HF radio receiver to communicate with the school teacher and your class mates.

School of the Air

Australians are great inventors because this vast arid continent constantly challenges us to be innovative: Necessity is the mother of invention. So how do children living in remote areas get an education? Our solution is the 'School of the Air"

This is a story about a day in the life of an 8-year-old child living in Australia on a Cattle Farm 300 kilometres from the nearest school. He leads an active life learning hands on skills from interaction with his family and station workers. His is enrolled in the 'School of The Air'.

The School of the Air is a unique Australian Correspondence school using a combination of traditional correspondence teaching methods complimented by cutting edge technology.

Jack wakes up at dawn to feed the chickens and let them out of their coop. He then finds his Dad and helps with the other morning chores. Then it is back to the house at 7 am for some breakfast. 8 am is his scheduled class with his teacher. He leaves the kitchen and goes to the study room. He sits in front of the computer and waits for his classmates and teacher to come online. The microphone is in

Radios in the Outback

Reverend John Flynn, who established the Australian Inland Mission to help people of the outback, had seen the hardships that people in the bush faced, especially during medical emergencies. He had seen the lonely, dusty graves of men, women and children who had died—perhaps unnecessarily—because of the isolation and the inability to get to a doctor in time.

Flynn's dream was to create a scheme whereby doctors arrived by plane ... 'flying doctors'. He had heard about a man called Alf Traeger who could build high voltage generators. These would be needed to power the radio transmitters that Flynn hoped to set up at homesteads and townships across the outback. Alf Traeger had the skills. Flynn had the plan.

During the 1920s, Flynn and Traeger went on many outback excursions together with a baby transmitter-receiver and a hand-driven generator. But after many failed trials, Traeger realised that it would be difficult to operate Morse Code and a hand-driven generator at the same time. So he decided to use bicycle pedals to work

We forget the tea leaves for the cuppa. Can someone bring some out for us?

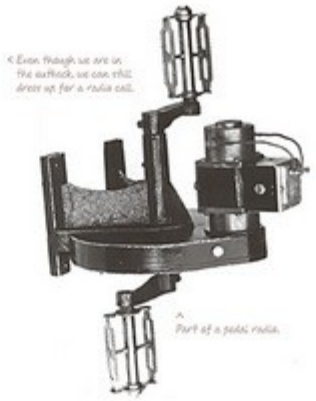
the generator. In November 1928, after working on his design for months and months, Traeger finally assembled his pedal wireless machine. It was an odd-looking contraption consisting of a radio on a table, under which sat the pedal generator. The famous photo of Traeger, dressed in his best suit and tie, pedalling the generator, was taken on 17 November 1928.

Flynn was keen to provide the baby radio sets, with pedal generators, to as many people as possible. By April 1929, Traeger had constructed ten sets as well as a 200-watt 'Mother' set for the base.

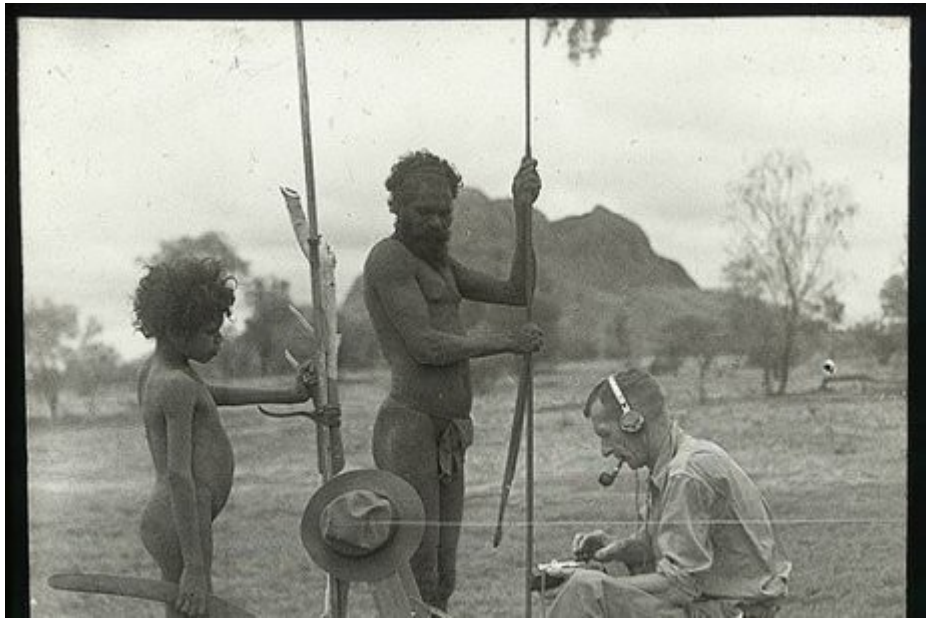
On 19 June 1929, Mrs Gertrude Rothery, at Augustus Downs Station in Queensland, became the first person to work the first pedal radio. At the time, Gertrude was mother to two children, aged two and a half and just six months. Although nervous to begin with, she later wrote, at the grand old age of 92:

> *Mr Traeger helped me to practise sending the word 'Hello' on the Morse key. So when I was ready to work the pedals and send my first message to Harry Kirstbrunner in Cloncurry Mr Traeger sat beside me and after my 'Hello', he said, 'That's great—now go ahead and send the telegram to Mr Flynn in Sydney'.*

< Even though we are in the outback, we can still dress up for a radio call.



^ Part of a pedal radio.



Преглед

Телевизија наставља са образовним концептима и стиче популарност широм света са разним интересантним образовним програмима

Национална телевизија Србије РТС, је званично учествовала у припреми и реализацији наставе за основне и средње школе током пандемије, што се показало као вредан и значајан резервни образовни ресурс применљив за масовно образовање првог и другог нивоа

Факултетска настава углавном није тако масовна и током пандемије коришћен је савременији приступ базиран на Интернету

Веома брз прелазак на удаљену – онлине наставу је био могућ, јер су већ постојали сви потребни ресурси које је само требало почети користити

Тамо где нису постојали потребни ресурсри и могућности, као на пр рад у лабораторији са опремом, није било могуће прећи на онлине наставу

Крагујевац, Србија, 28. април 2022. године

Онлине лабораторије

Online, web, remote labs су неки од термина који се користе за лабораторије са контролом уређаја и опреме преко рачунарске мреже

У основи оваквих лабораторија су две врсте технологија:

1. мрежне веб технологије које се користе за приступ и пренос података

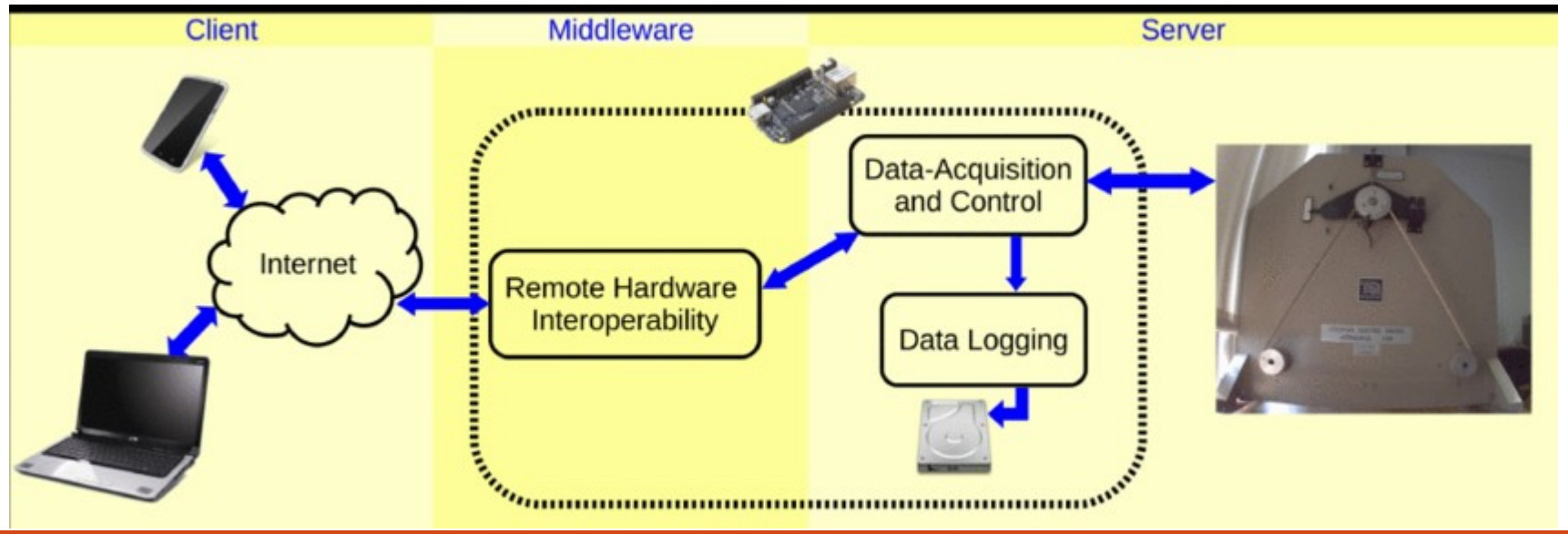
2. програмабилни уређаји којима се може софтверски управљати

Онлине лабораторије

Нешто детаљнији приказ струкутуре онлине лаб је на слици

Клијенти са различитих уређаја лево приступају middleware – u, што је софтвер који повезује клијенте са програмабилном апаратуром – сервер

Програмабилни уређаји могу бити разноврсни – DAC, DL и разни други



Програмабилни уређаји

Програмабилни уређаји се могу поделити на универзалне као што су ADC(Analog Digital Converters), DAC(Digital Analog Converters) GPIO(General Purpose Input Output)

Ови универзални уређаји спадају у јефтину категорију (мада могу бити и веома скупи) и интегрисани су у микроконтролерима, мада могу бити и сложенији (скупљи) уређаји

Микроконтролери су комплетни рачунарски системи са процесором, меморијом, улазно излазним јединицама и повезани су са експерименталном опремом која не мора (може) бити програмабилна

Друга врста уређаја су специфични сложени програмабилни уређаји као на пр дигитални осцилоскоп, IC (Ion Chromatography) идр који поседују сложену електронику којом се управља софтверски и који могу да обједињавају експерименталну опрему

Пимери онлине експеримената

Неки од remote – online експеримената развијених у периоду 2005 – 2018 на ПМФ Крагујевац биће приказани у наставку

Део експеримената је објављен на REV (Remote Engineering and Virtual instruments) и часописима као и на порталу https://www.golabz.eu/

Мерење брзине електричног сигнала кроз коаксијални кабл REV 2005, iJOE

Linear analog systems from 1st to 5th order REV 2006

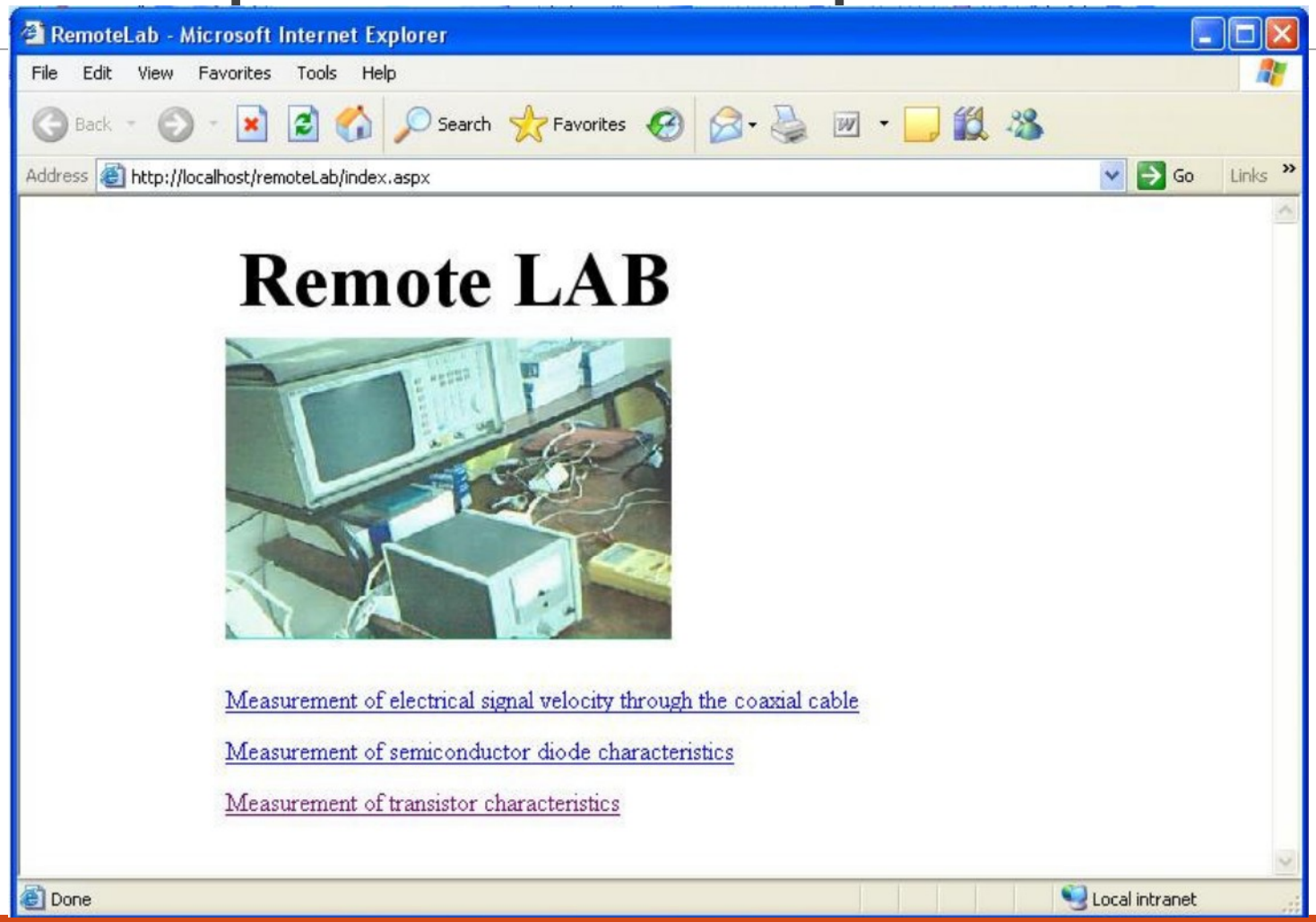
Programming and playing with RoboSapien REV 2012, iJOE

AC / DC Rectification & Filtering golabz.eu

Diodes static characterisics REV 2005, iJOE, golabz.eu

Transistor static characteristics REV 2005, iJOE, golabz.eu

Мерење брзине електричног сигнала



Мерење брзине електричног сигнала

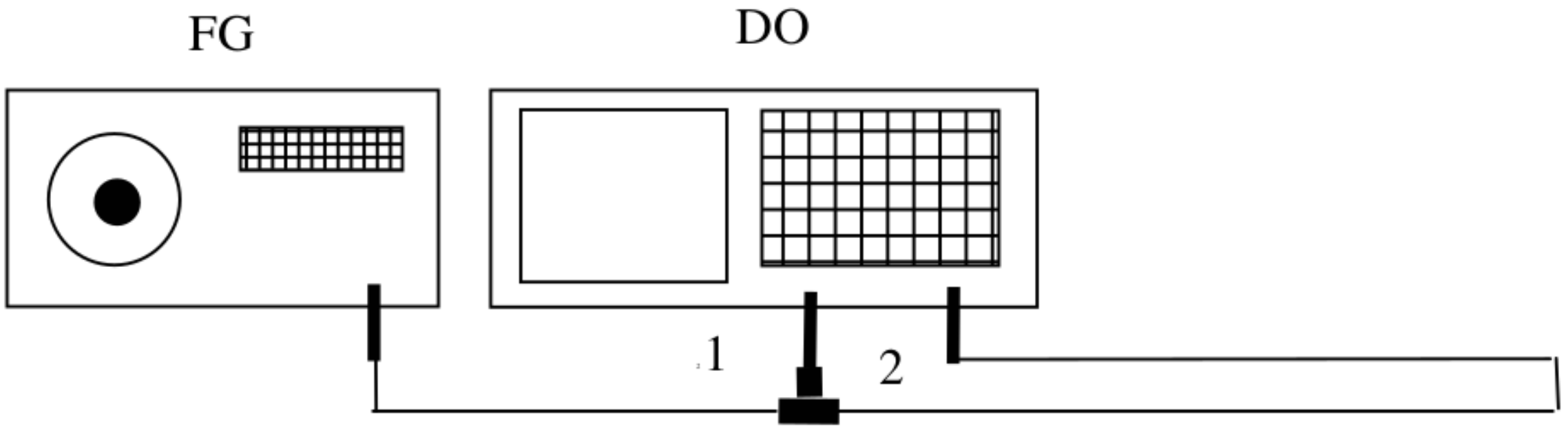


Figure 7 Experiment setup for electrical signal velocity measurement

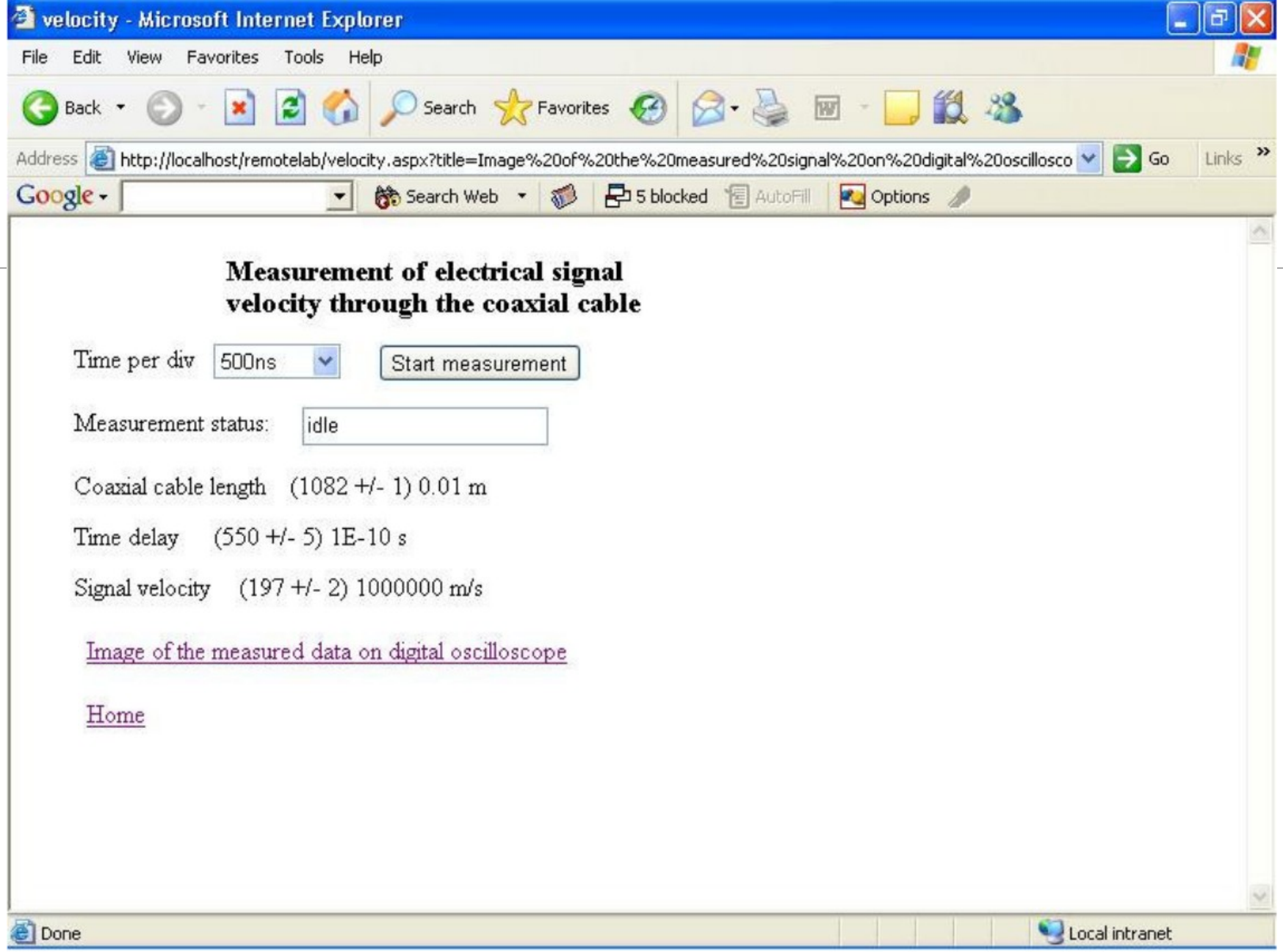
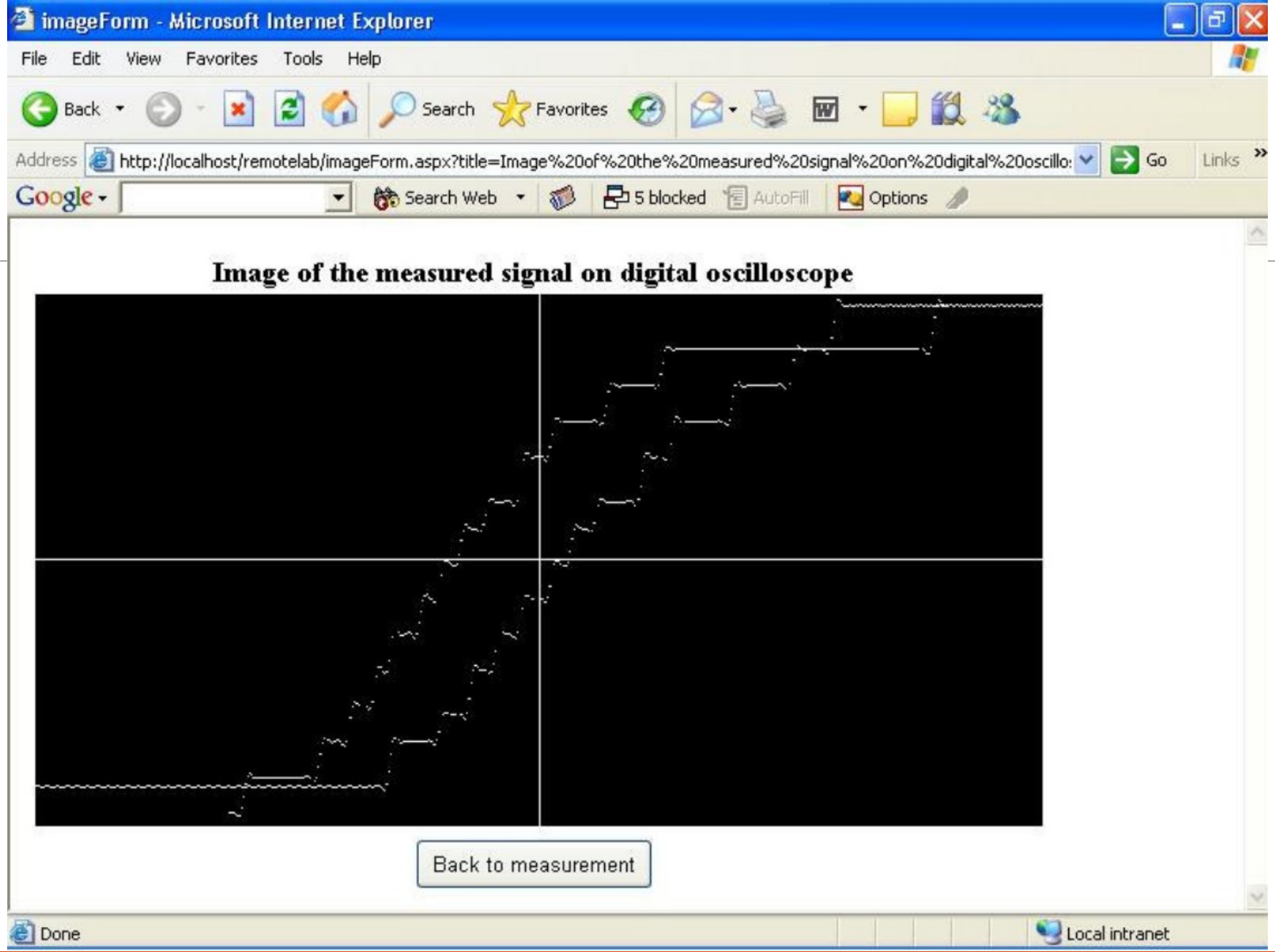


Figure 8 Web page for velocity measurement


imageForm - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://localhost/remotelab/imageForm.aspx?title=Image%20of%20the%20measured%20signal%20on%20digital%20oscillo:
Go Links
Google Search Web 5 blocked AutoFill Options
Image of the measured signal on digital oscilloscope
Back to measurement
Done
Local intranet

Аналогни линеарни систем од 1. до 5. реда

Аналогни линеарни систем је имплементиран као софтверски контролисано RC електронско коло

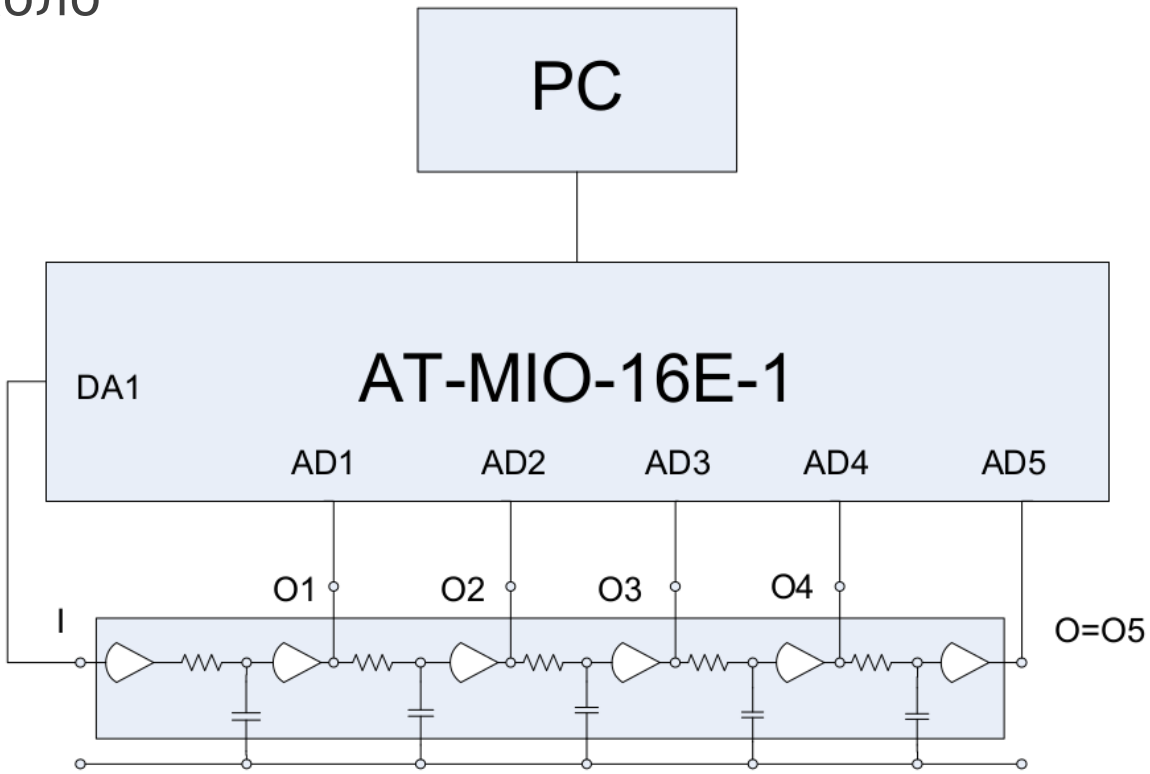


Fig 3 Measurement configuration

2.4 Negative feedback

Introduction of the negative feedback in the system as given on the block diagram in figure 1 yields:

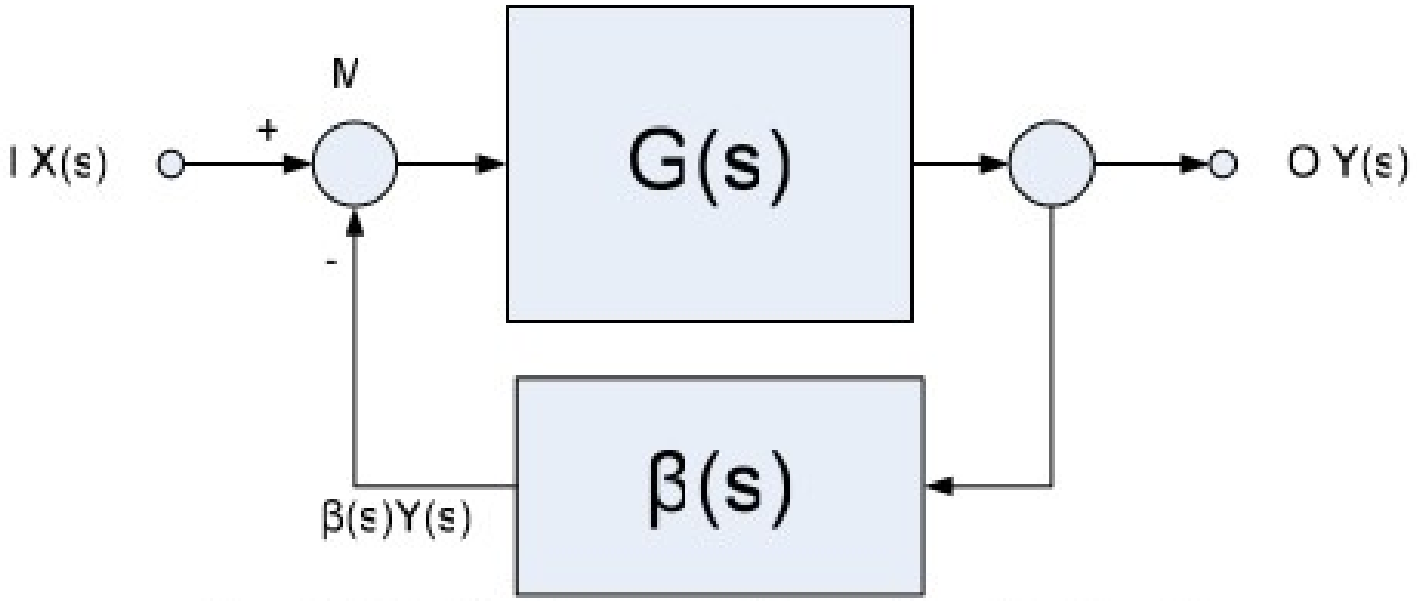
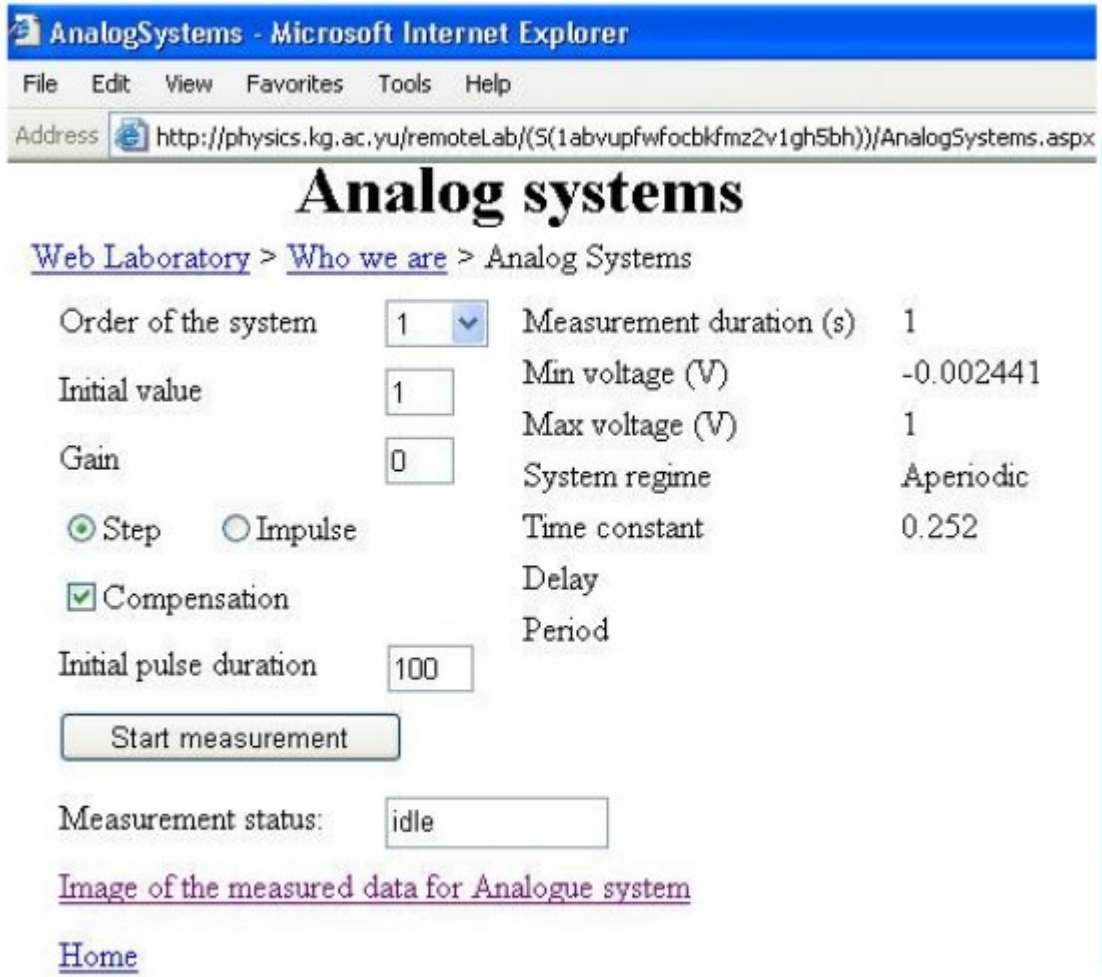


Fig. 1 Block diagram of negative feedback



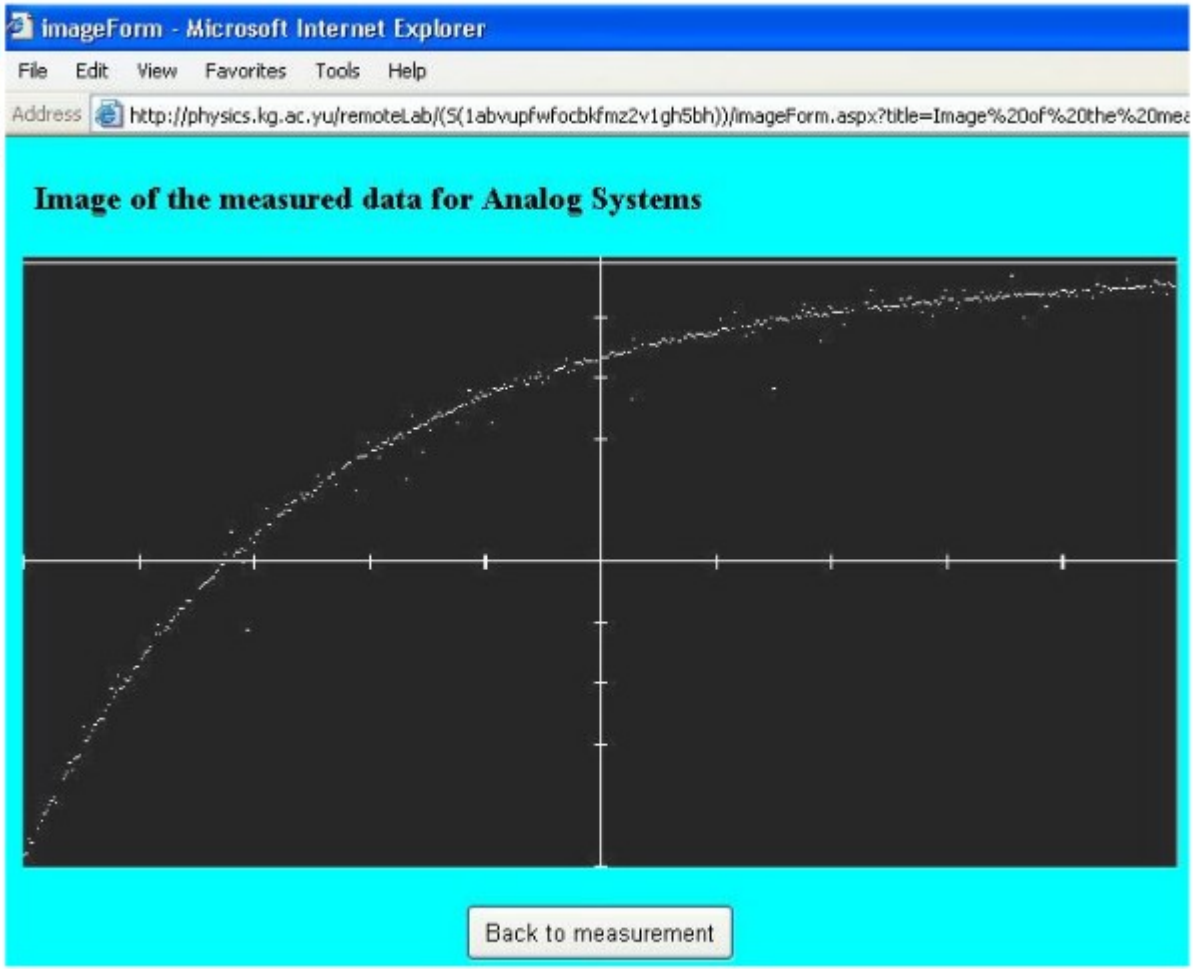


Figure 5 n=1 β_0=0 Left: web user interface Right: input and output signals

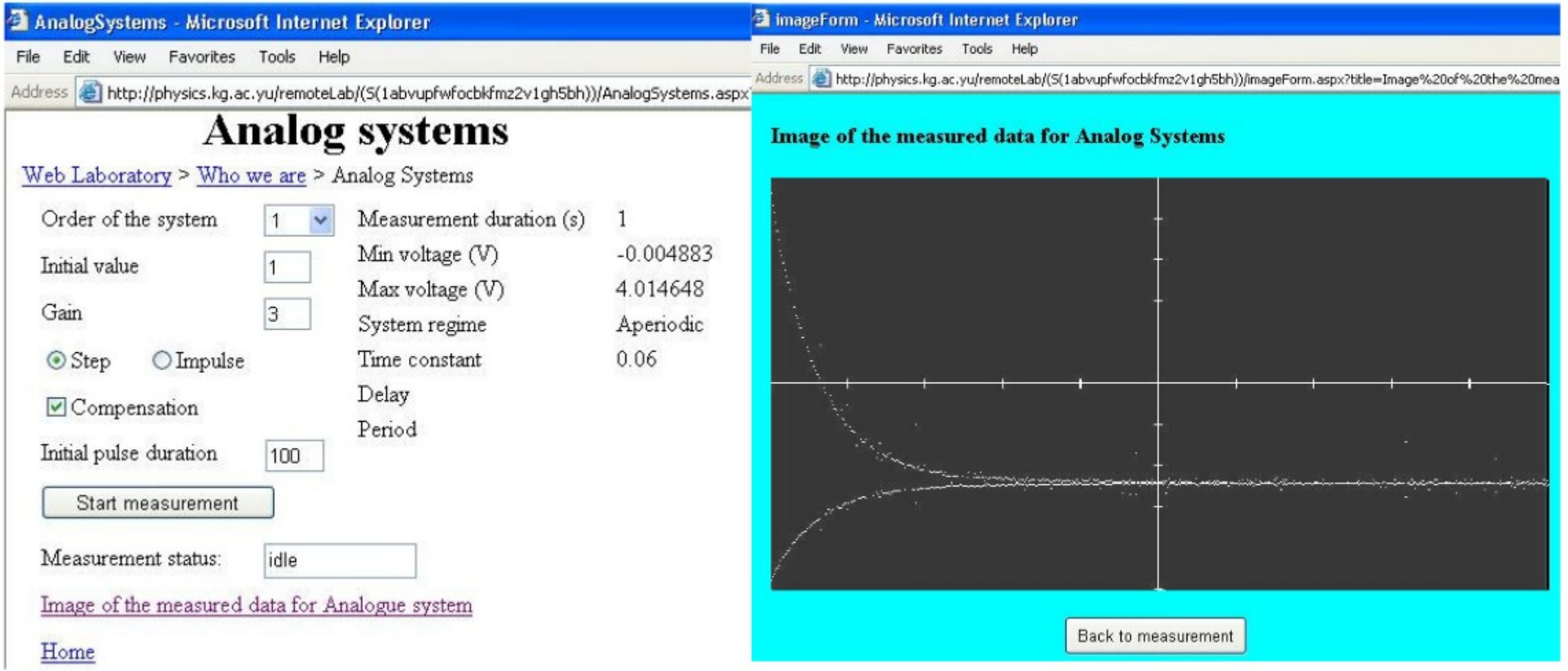


Figure 6 n=1, β_0=3 Left: web user interface Right: output and feedback signals

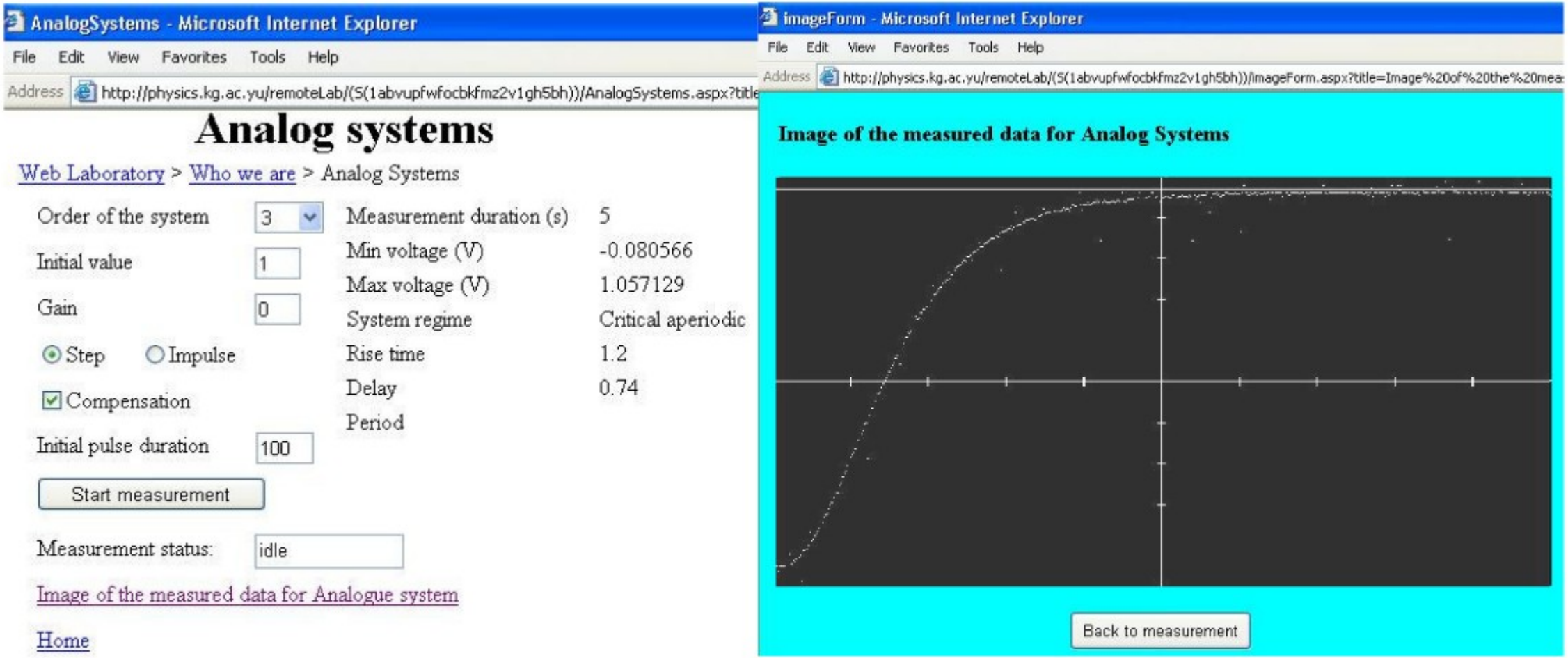


Figure 7 n=3, β_0=0 Left: web user interface Right: input and output signals

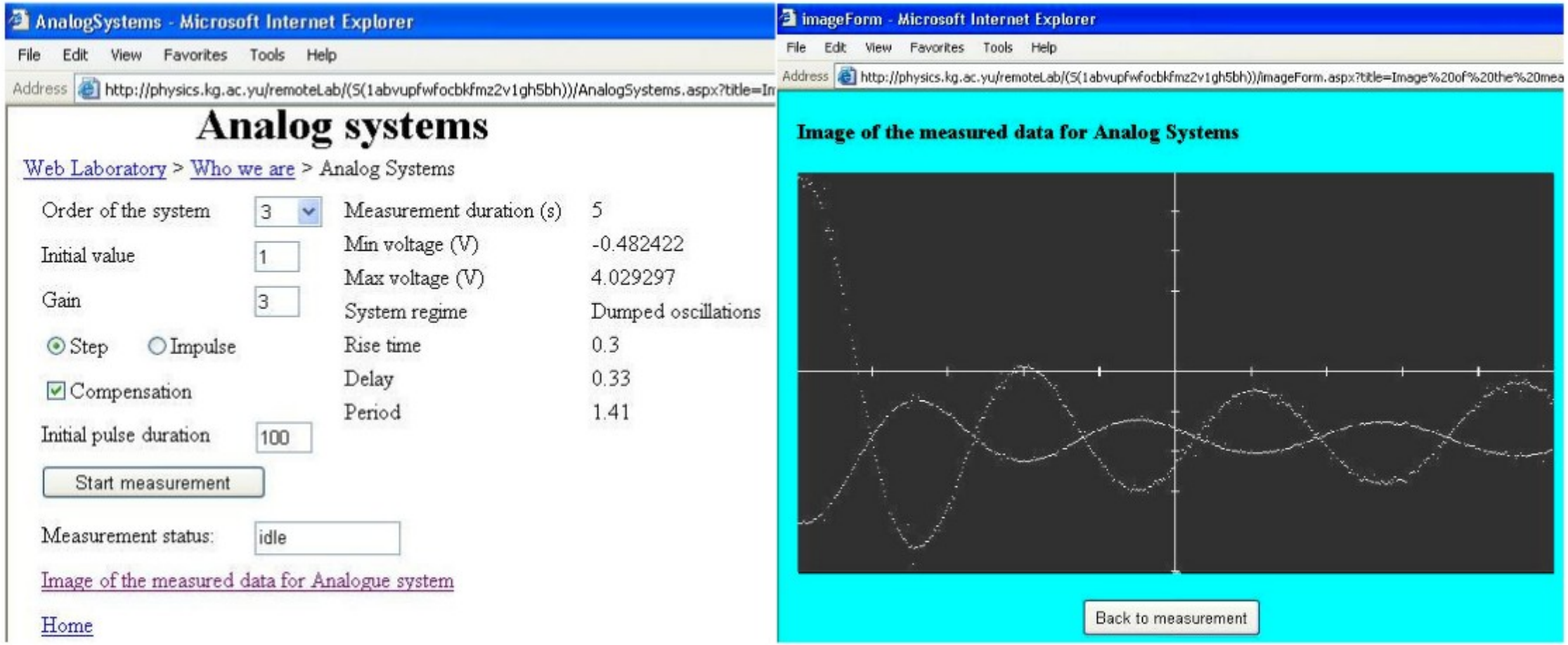


Figure 8 n=3, β_0=3 Left: web user interface Right: output and feedback signals

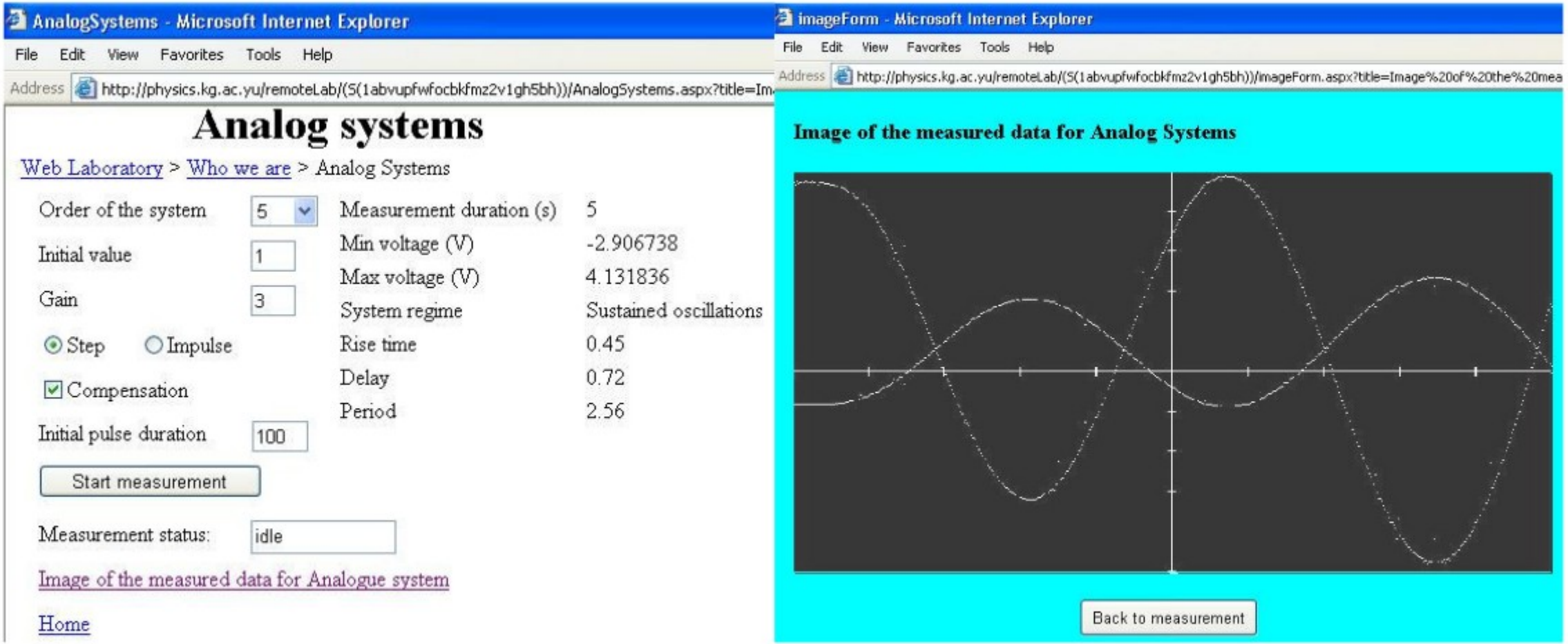


Figure 9 n=5, β_0=3 Left: web user interface Right: output and feedback signals

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LAB

Electrical Circuit Lab

In the Electrical Circuit Lab students can create their own electrical circuits...

LAB

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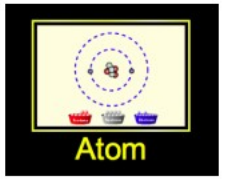
There are two similar labs that you can see if you create a spa

APP

Hypothesis Scratchpad

The Hypothesis Scratchpad helps learners formulate hypotheses.

LAB

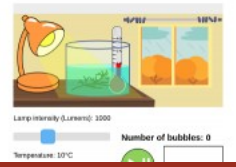


Build An Atom

Build an atom out of protons, neutrons, and electrons, and see how the element...

LAB

LAB



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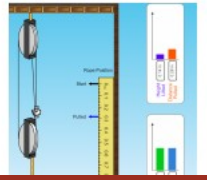

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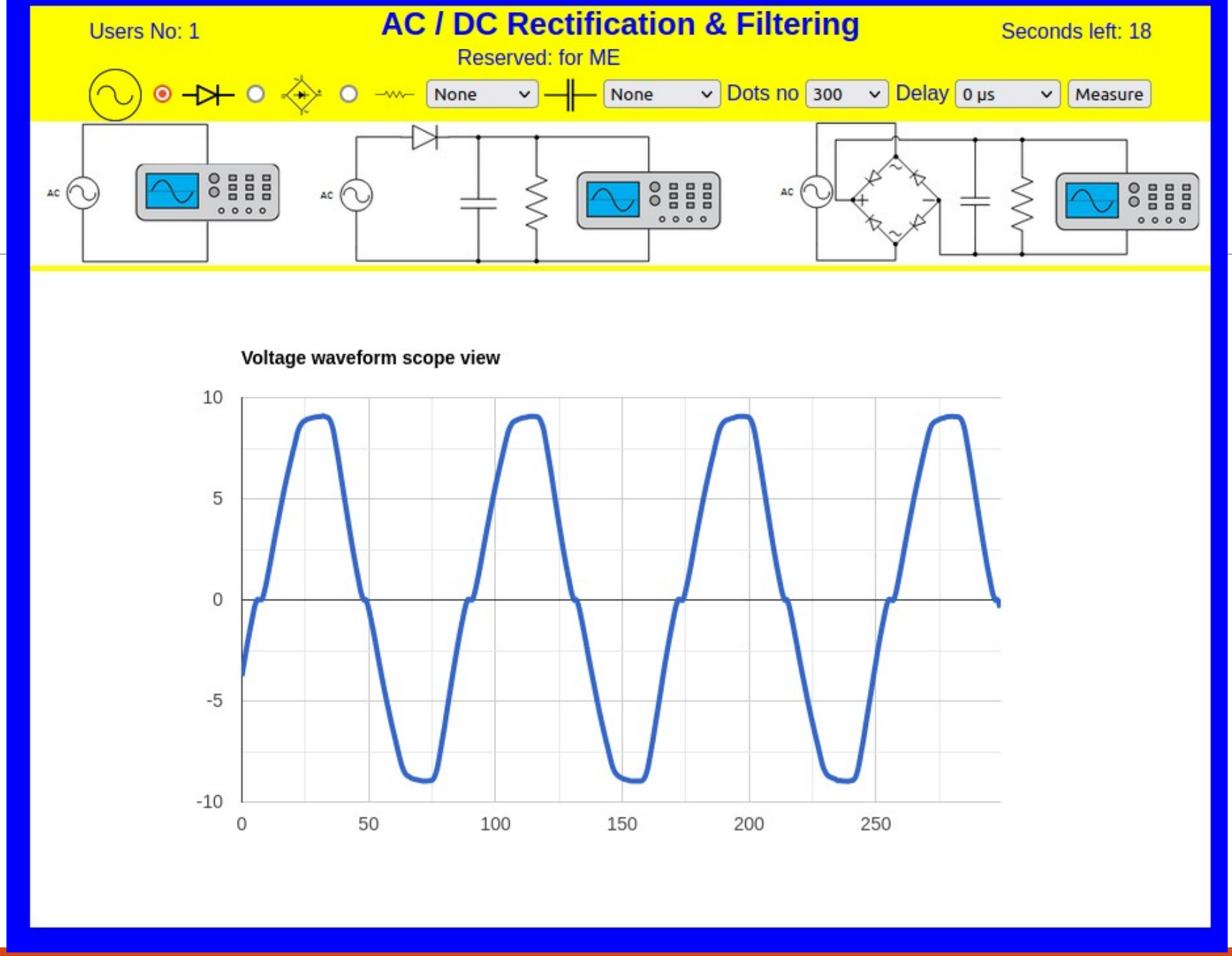
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AC / DC Rectification & Filtering
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Voltage waveform scope view
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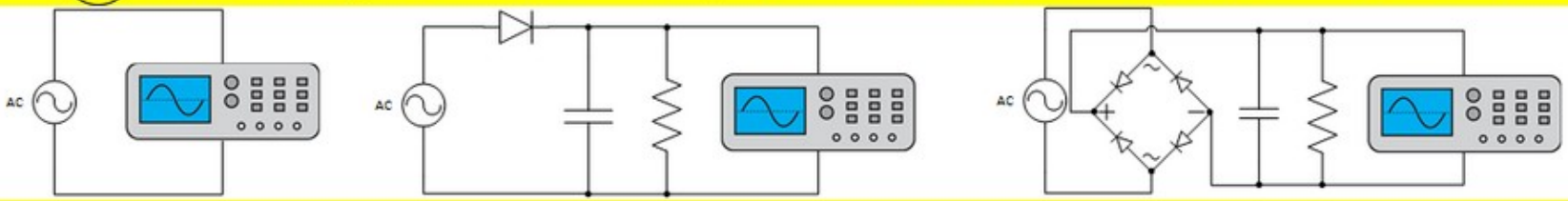
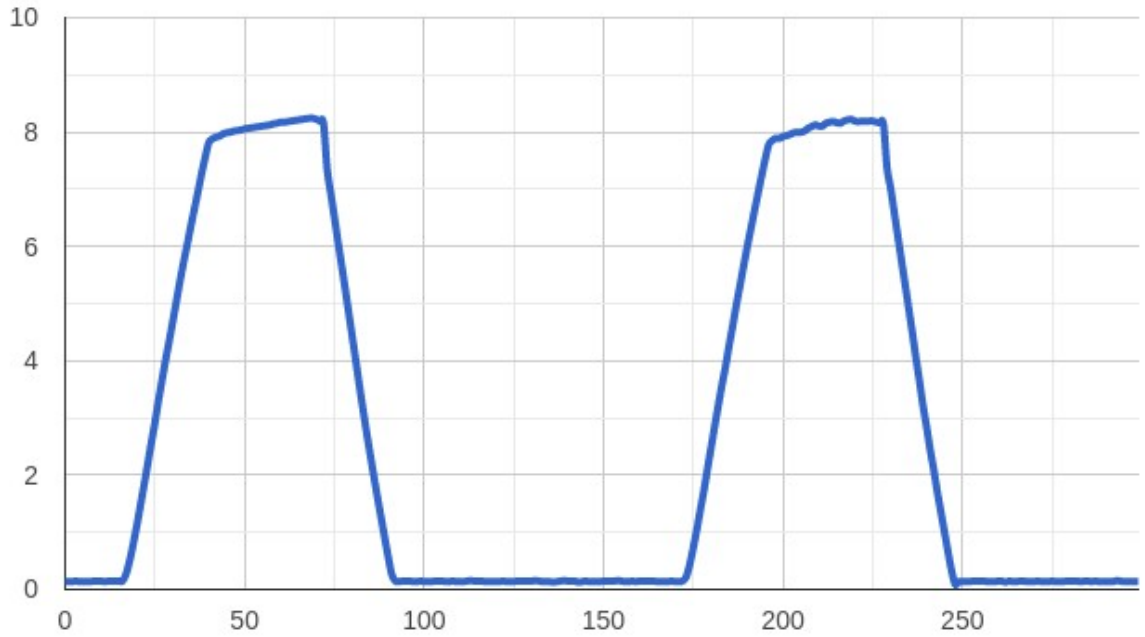


Voltage waveform scope view



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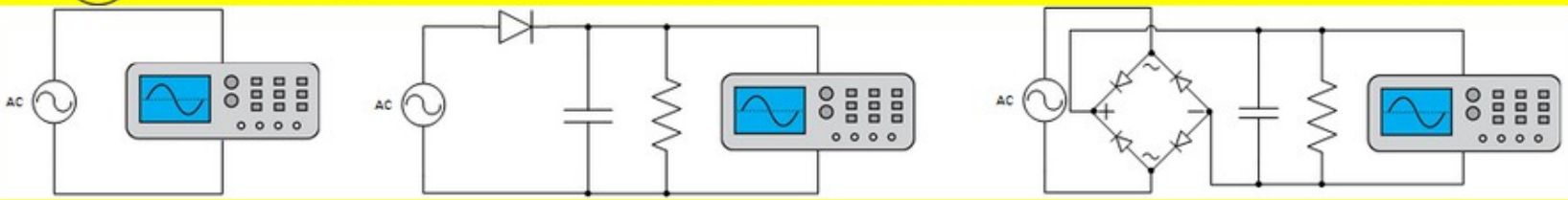
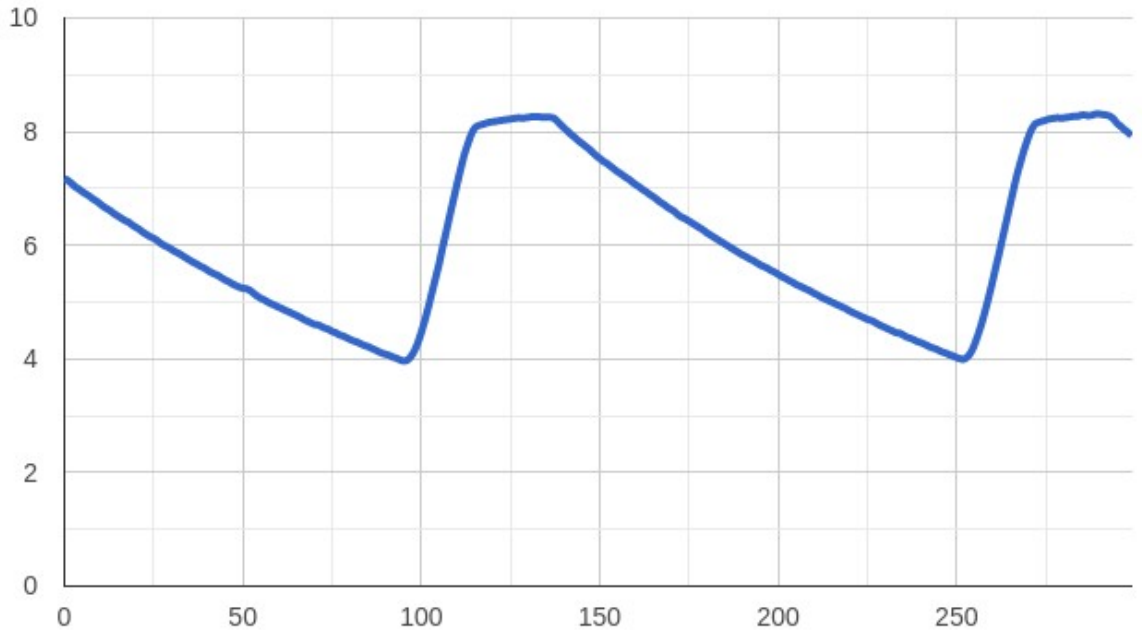


Voltage waveform scope view



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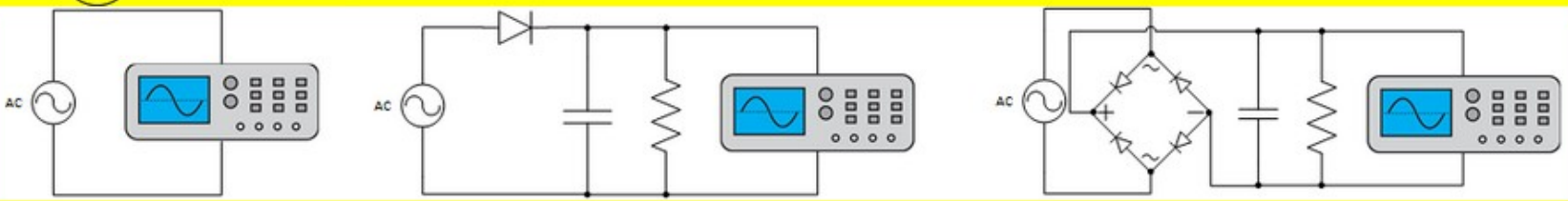
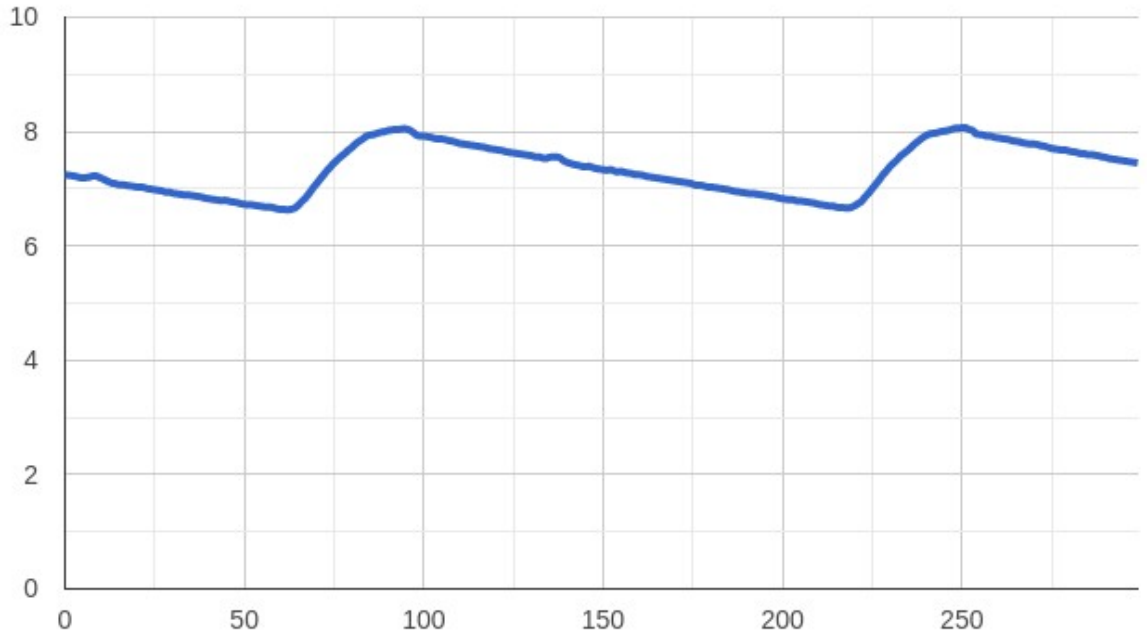


Voltage waveform scope view



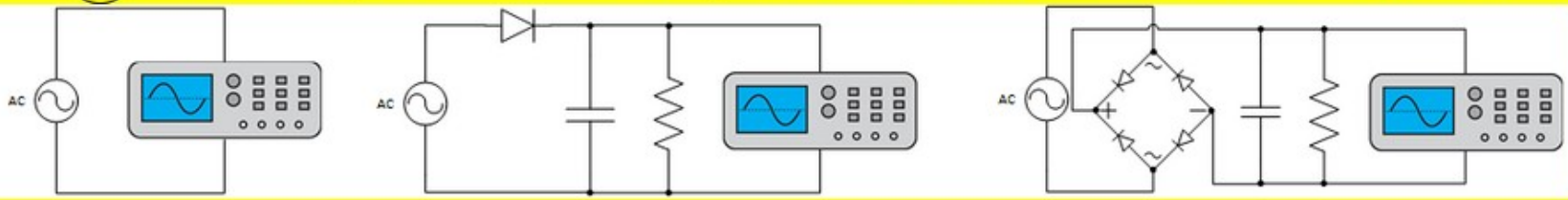
Users No: 1

AC / DC Rectification & Filtering

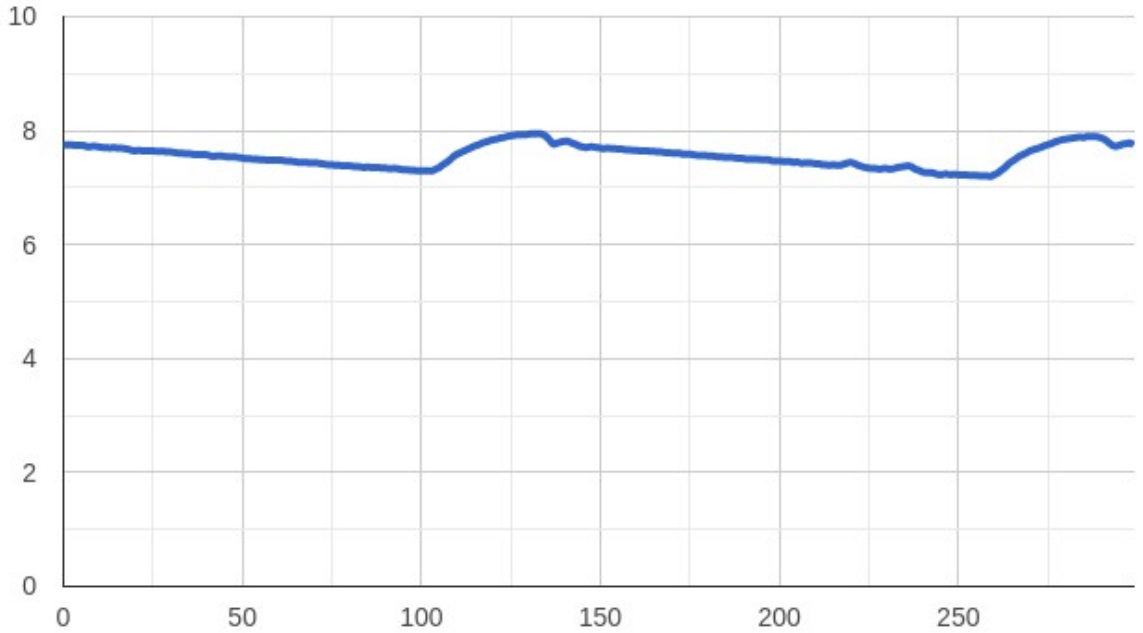
Reserved: for ME

Seconds left: 15

220 Ω | 1000 µF | Dots no 300 | Delay 0 µs | Measure



Voltage waveform scope view



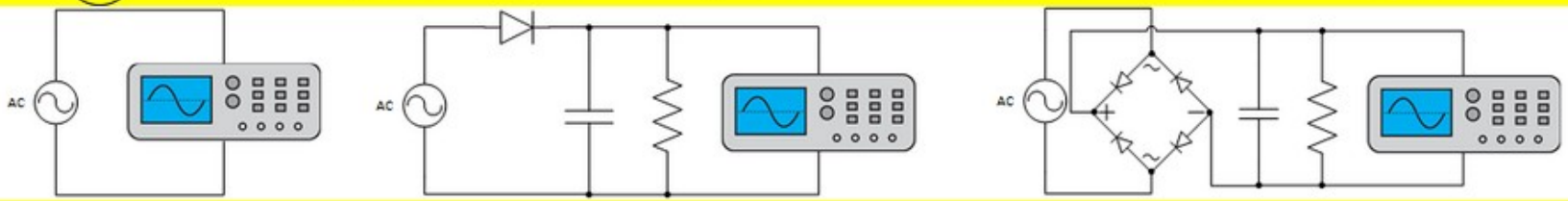
Users No: 1

AC / DC Rectification & Filtering

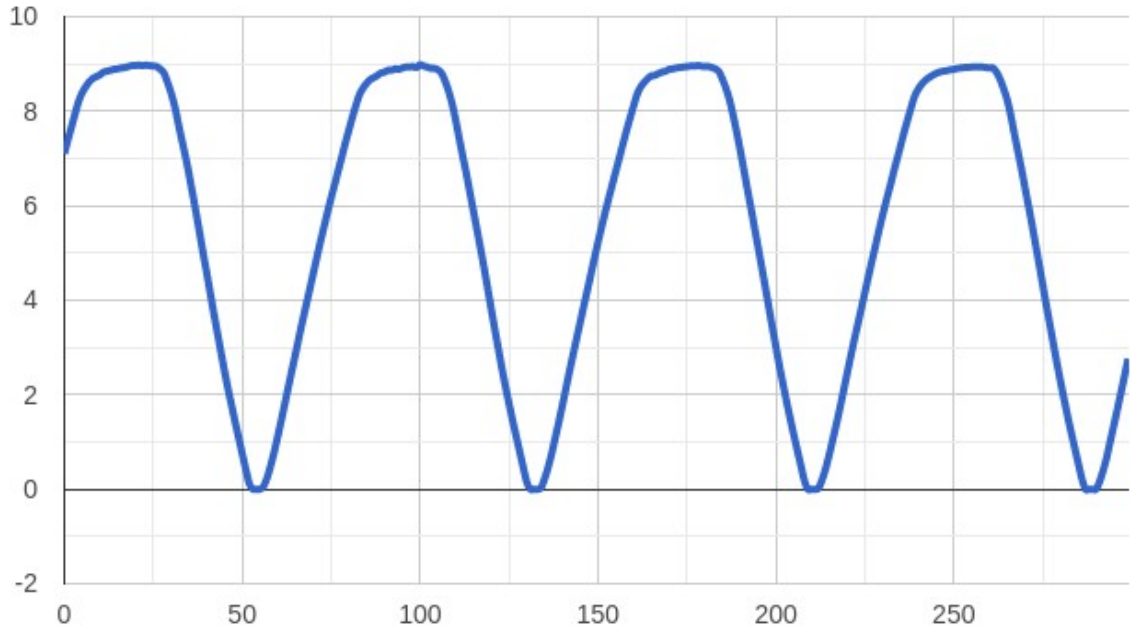
Seconds left: 12

Reserved: for ME

None None Dots no 300 Delay 0 µs Measure



Voltage waveform scope view



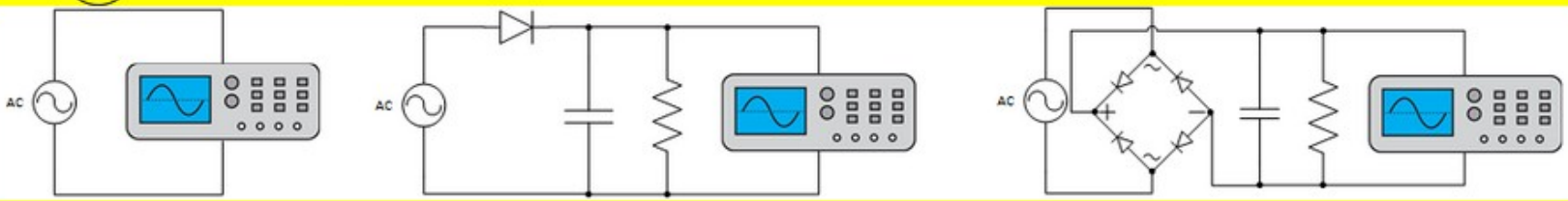
Users No: 1

AC / DC Rectification & Filtering

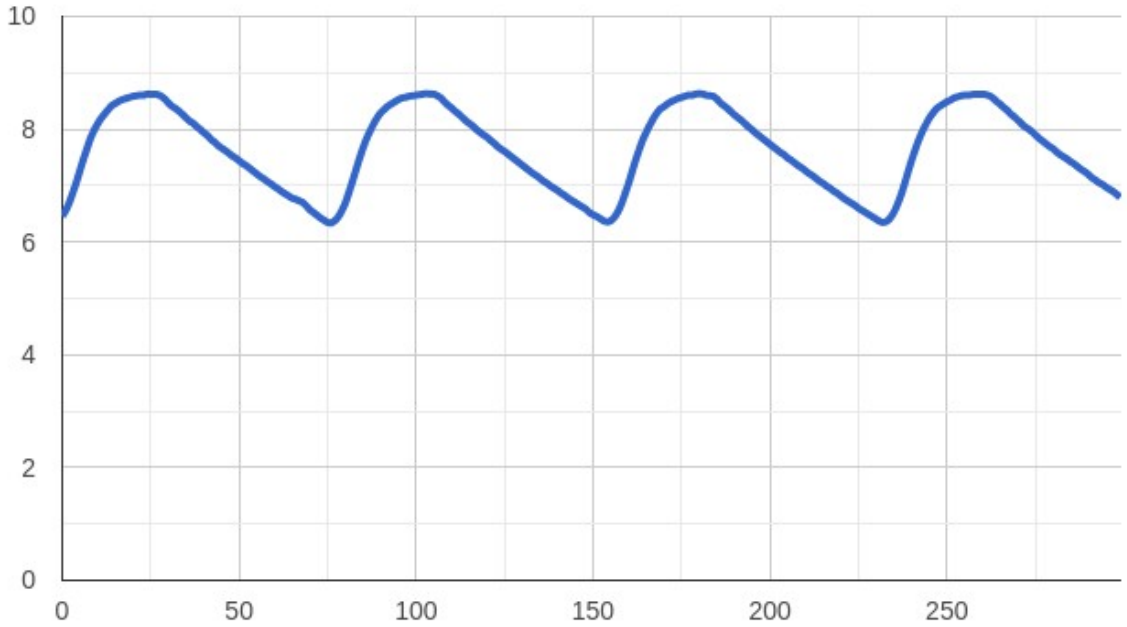
Seconds left: 14

Reserved: for ME

220 Ω | 220 µF | Dots no 300 | Delay 0 µs | Measure



Voltage waveform scope view



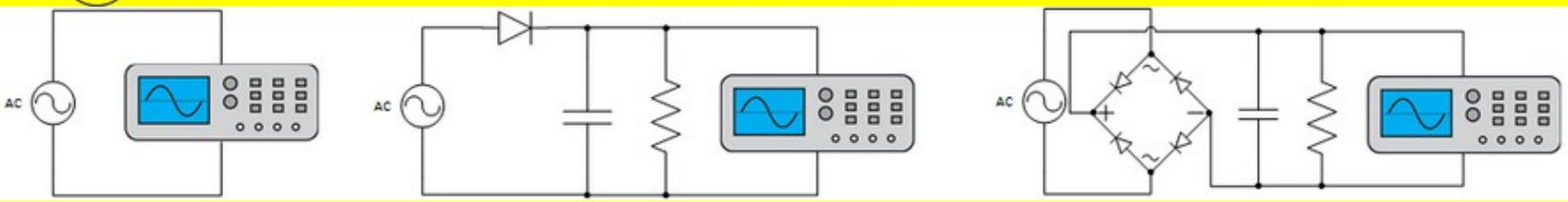
Users No: 1

AC / DC Rectification & Filtering

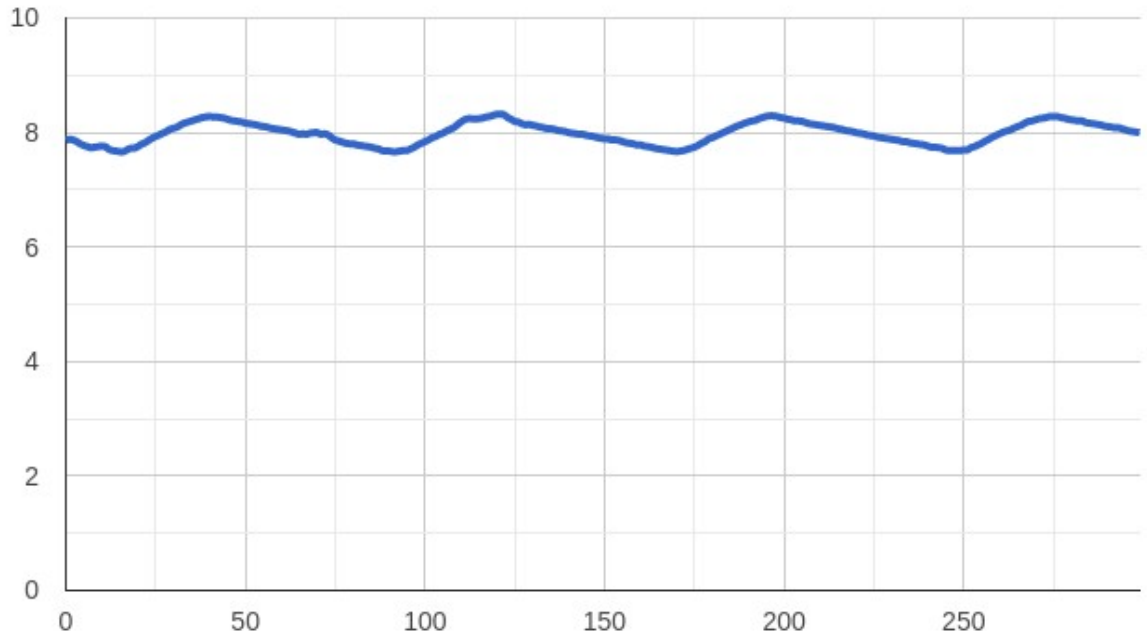
Reserved: for ME

Seconds left: 16

220 Ω | 470 µF | Dots no 300 | Delay 0 µs | Measure



Voltage waveform scope view



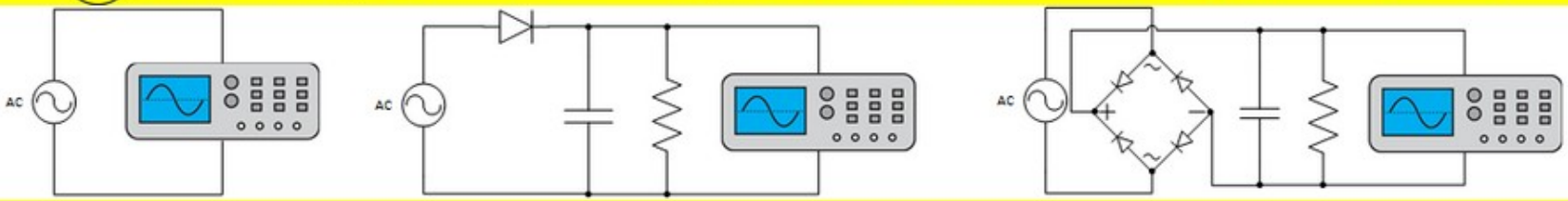
Users No: 1

AC / DC Rectification & Filtering

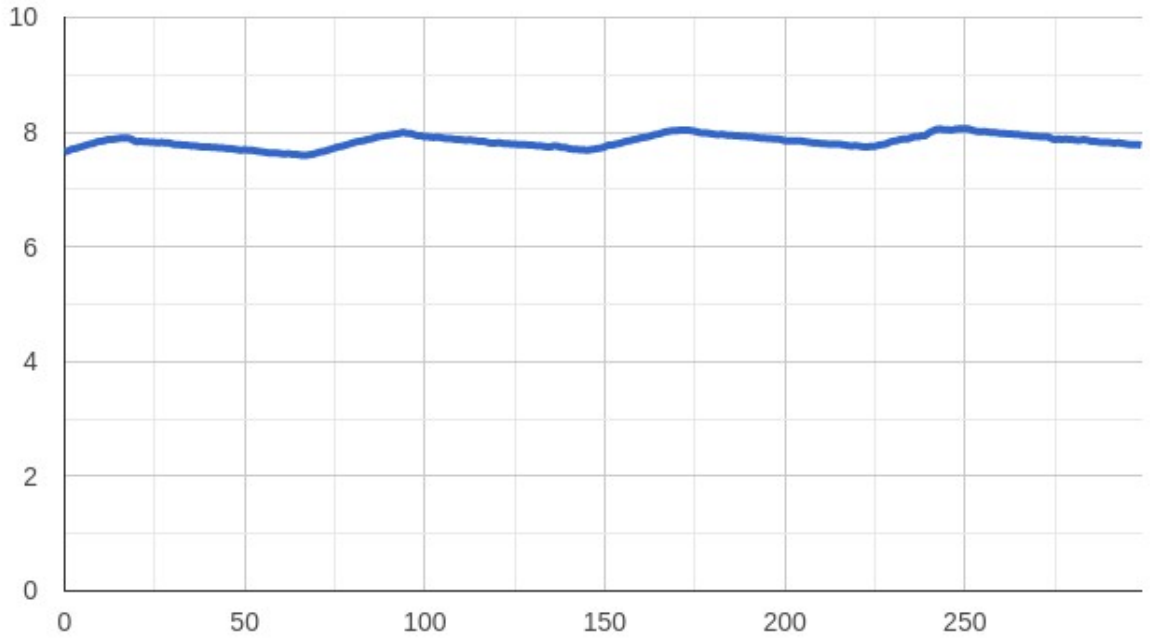
Seconds left: 14

Reserved: for ME

220 Ω | 1000 µF | Dots no 300 | Delay 0 µs | Measure



Voltage waveform scope view



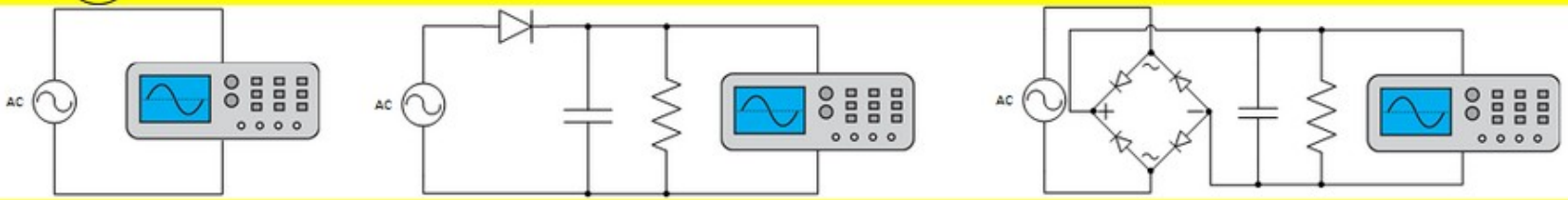
Users No: 1

AC / DC Rectification & Filtering

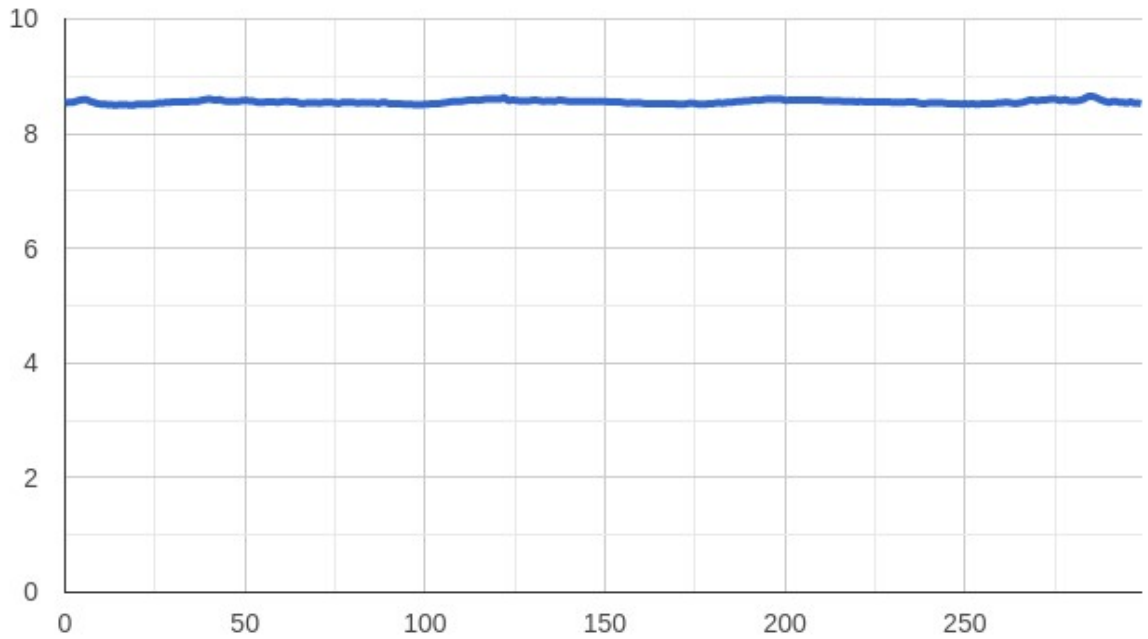
Reserved: for ME

Seconds left: 17

1000 Ω | 1000 µF | Dots no 300 | Delay 0 µs | Measure



Voltage waveform scope view



Diode characteristics measurement

Diode data

Diode type: Germanium

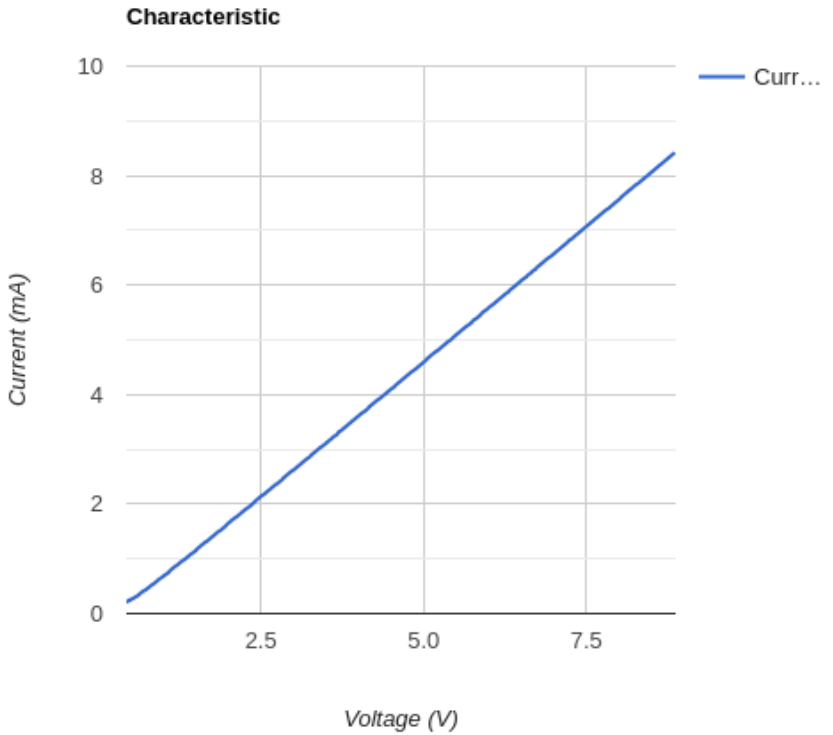
Points No: 150

Start

Result

Experiment status: OFF

Diode voltage: 0.44V



TeComp

Diode characteristics measurement

Diode data

Diode type: Silicium

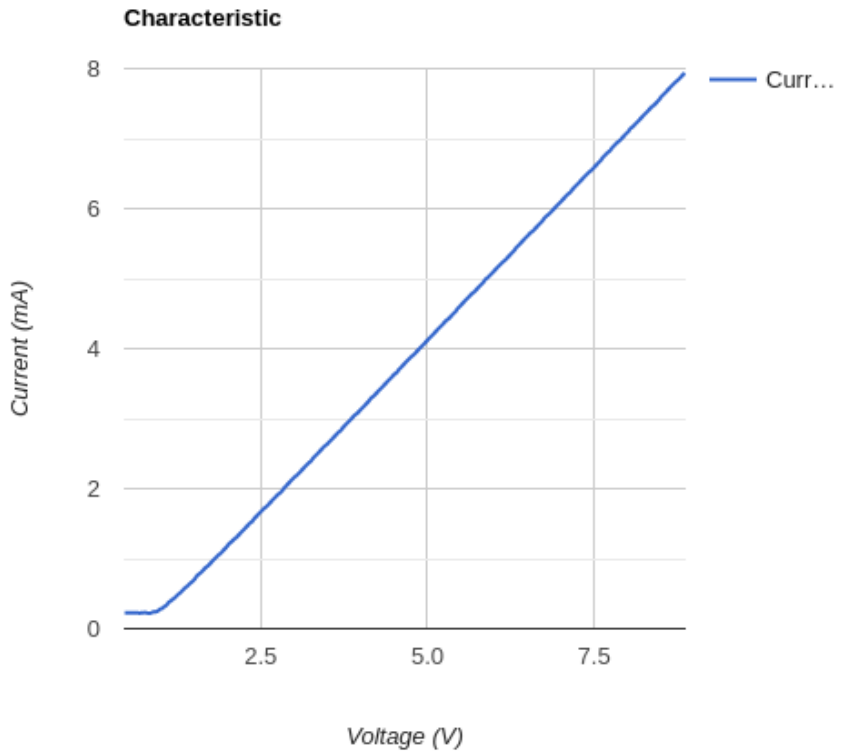
Points No: 150

Start

Result

Experiment status: OFF

Diode voltage: 0.92V



TeComp

Diode characteristics measurement

Diode data

Diode type: Red LED

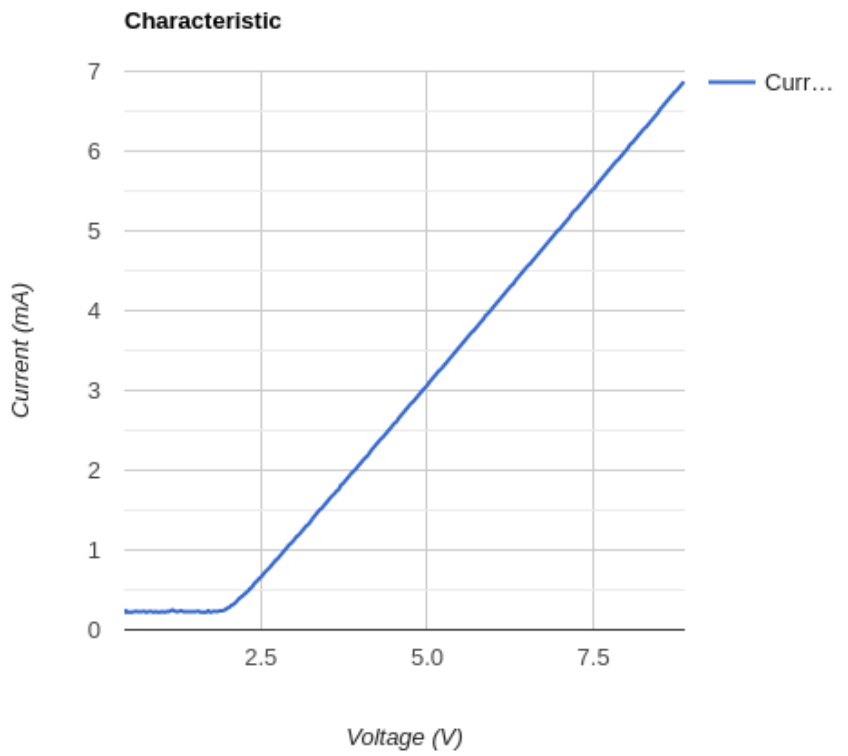
Points No: 150

Start

Result

Experiment status: OFF

Diode voltage: 1.99V



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Diode characteristics measurement

Diode data

Diode type: Zener 3.3V

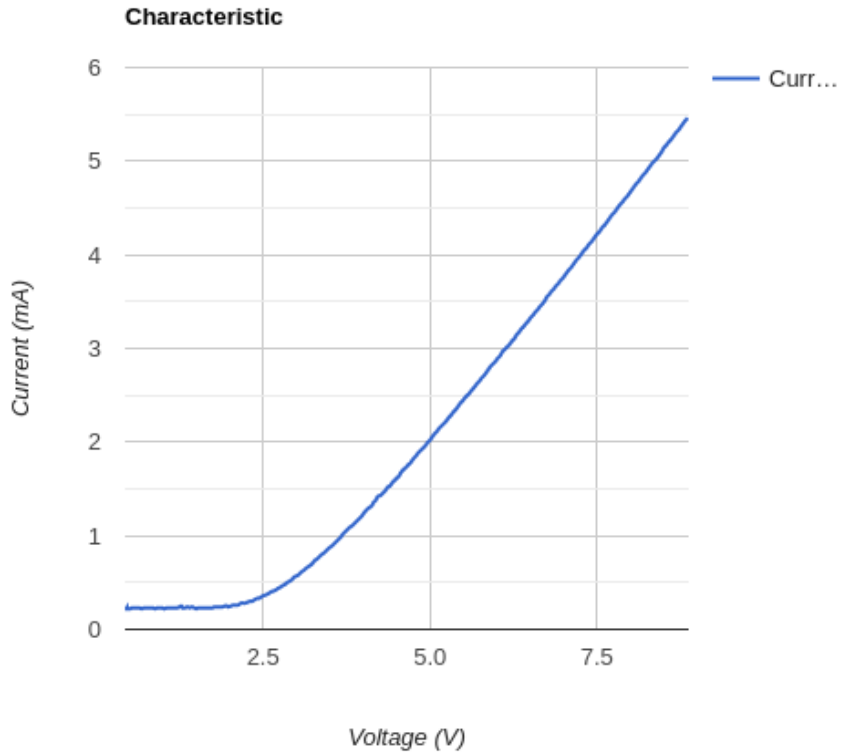
Points No: 150

Start

Result

Experiment status: OFF

Diode voltage: 3.39V



Transistor characteristic measurement

Transistor data

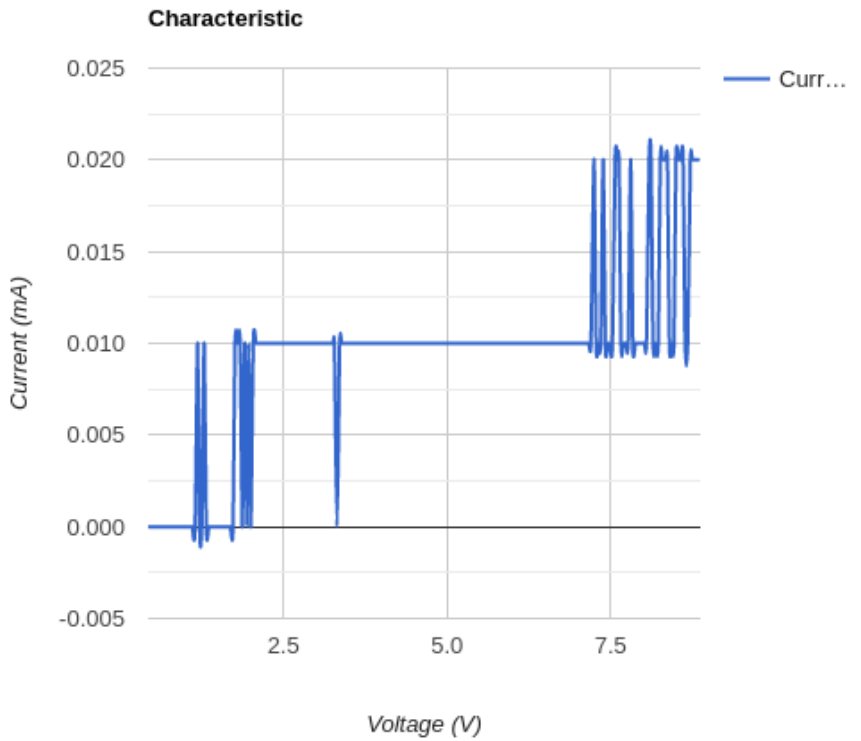
Transistor: NPN BD139

Input: Start

Experiment data

Experiment status: OFF Current Gain: Recommended input values: 50-255

Selected input values: 0uA



Transistor characteristic measurement

Transistor data

Transistor: NPN BD139

Input: 50

Start

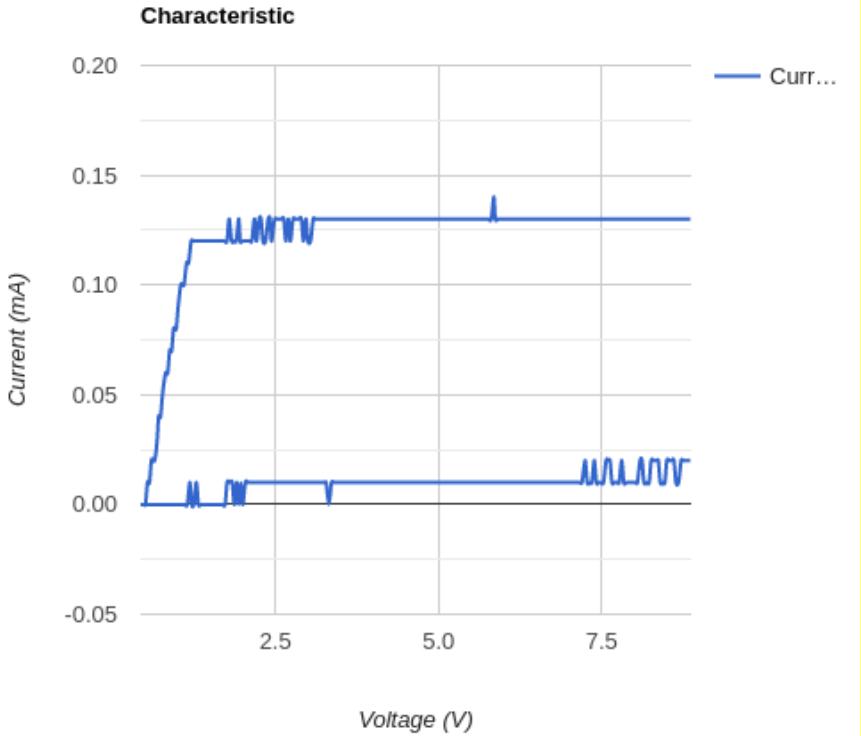
Experiment data

Experiment status: OFF

Current Gain: 52.63

Recommended input values: 50-255

Selected input values: 0uA, 2.09uA



Transistor characteristic measurement

Transistor data

Transistor: NPN BD139

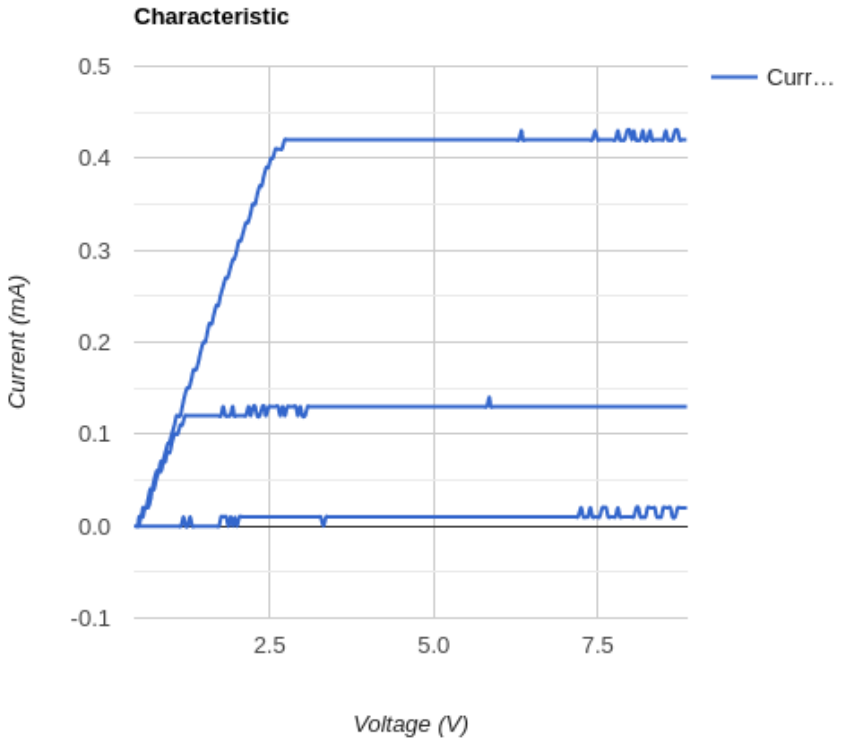
Input: 100

Start

Experiment data

Experiment status: OFF Current Gain: 96.03 Recommended input values: 50-255

Selected input values: 0uA, 2.09uA, 4.17uA



TeComp

Transistor characteristic measurement

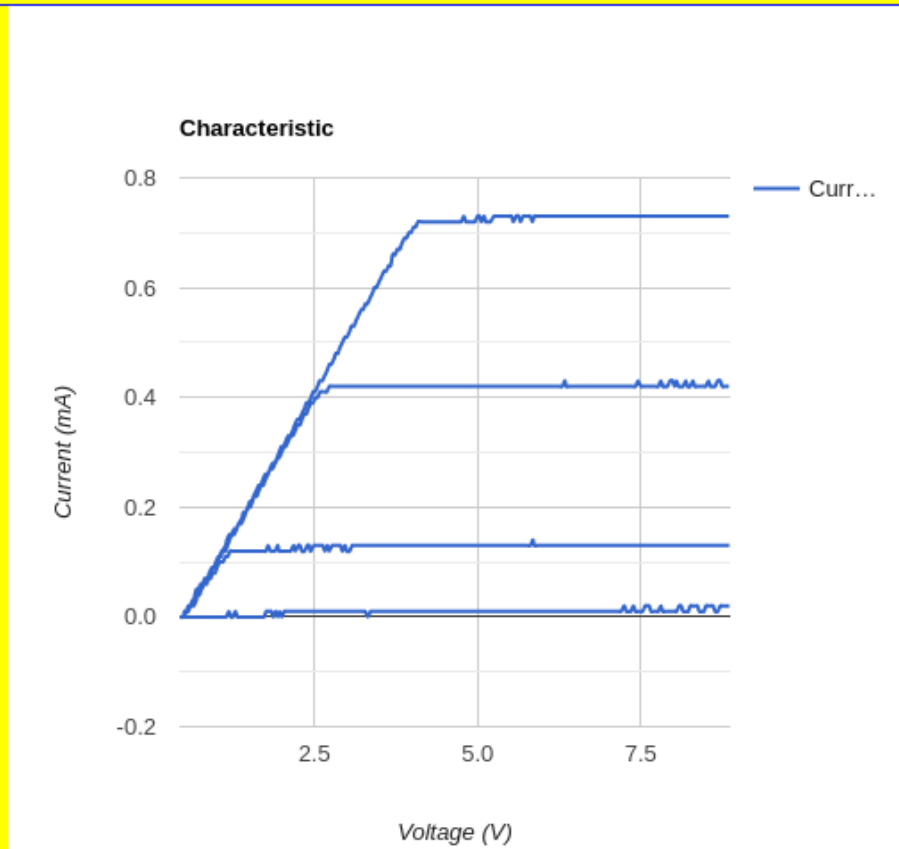
Transistor data

Transistor: NPN BD139 | Input: 150 | Start

Experiment data

Experiment status: OFF Current Gain: 113.46 Recommended input values: 50-255

Selected input values: 0uA, 2.09uA, 4.17uA, 6.26uA



Transistor characteristic measurement

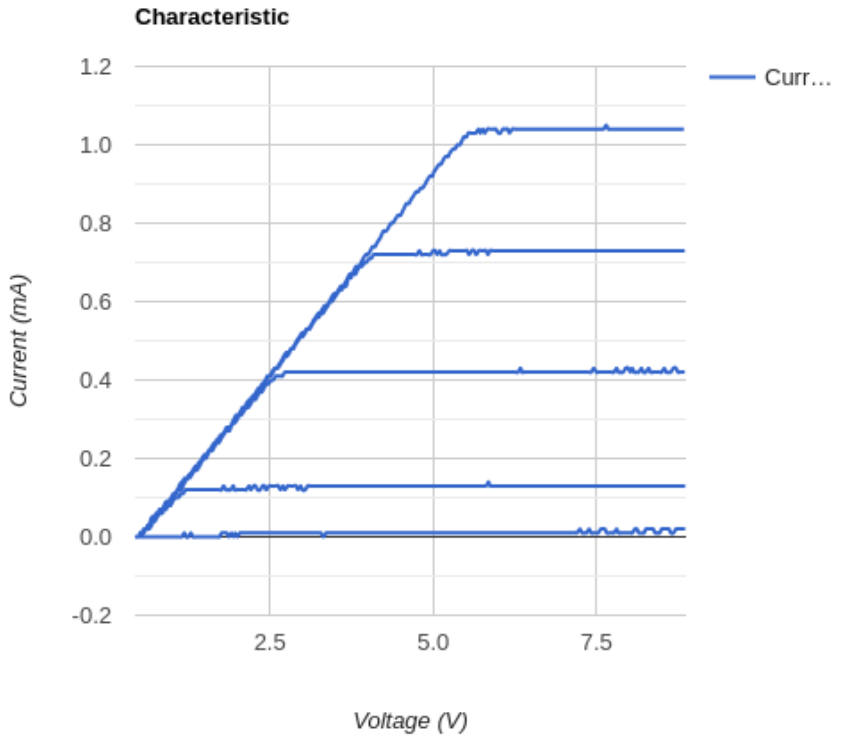
Transistor data

Transistor NPN BD139 Input 200 Start

Experiment data

Experiment status: OFF Current Gain: 122.35 Recommended input values: 50-255

Selected input values: 0uA, 2.09uA, 4.17uA, 6.26uA, 8.34uA



TeComp

Transistor characteristic measurement

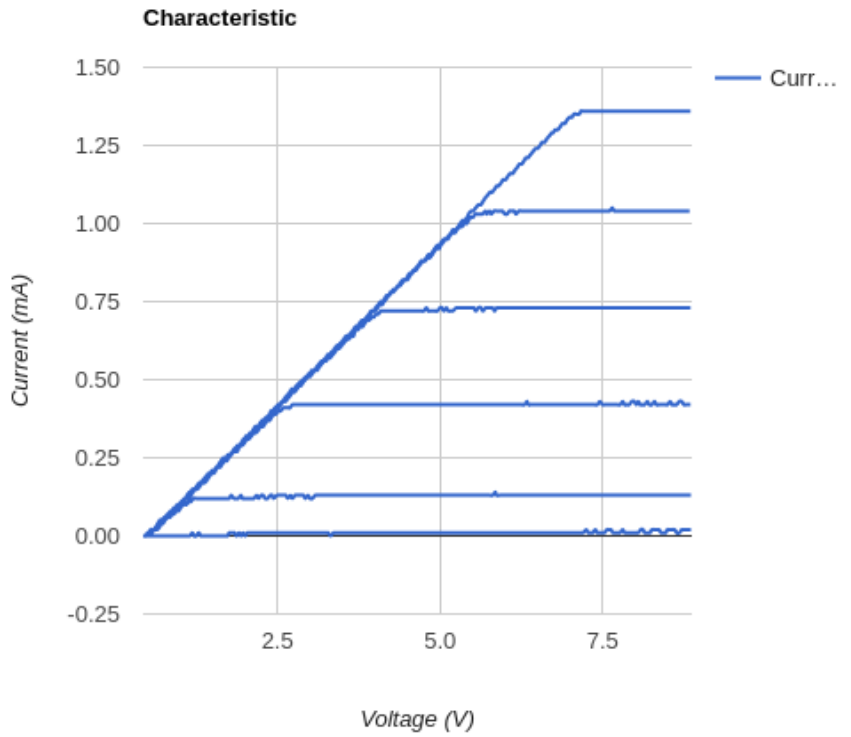
Transistor data

Transistor: NPN BD139 | Input: 250 | Start

Experiment data

Experiment status: OFF Current Gain: 128.51 Recommended input values: 50-255

Selected input values: 0uA, 2.09uA, 4.17uA, 6.26uA, 8.34uA, 10.43uA



Transistor characteristic measurement

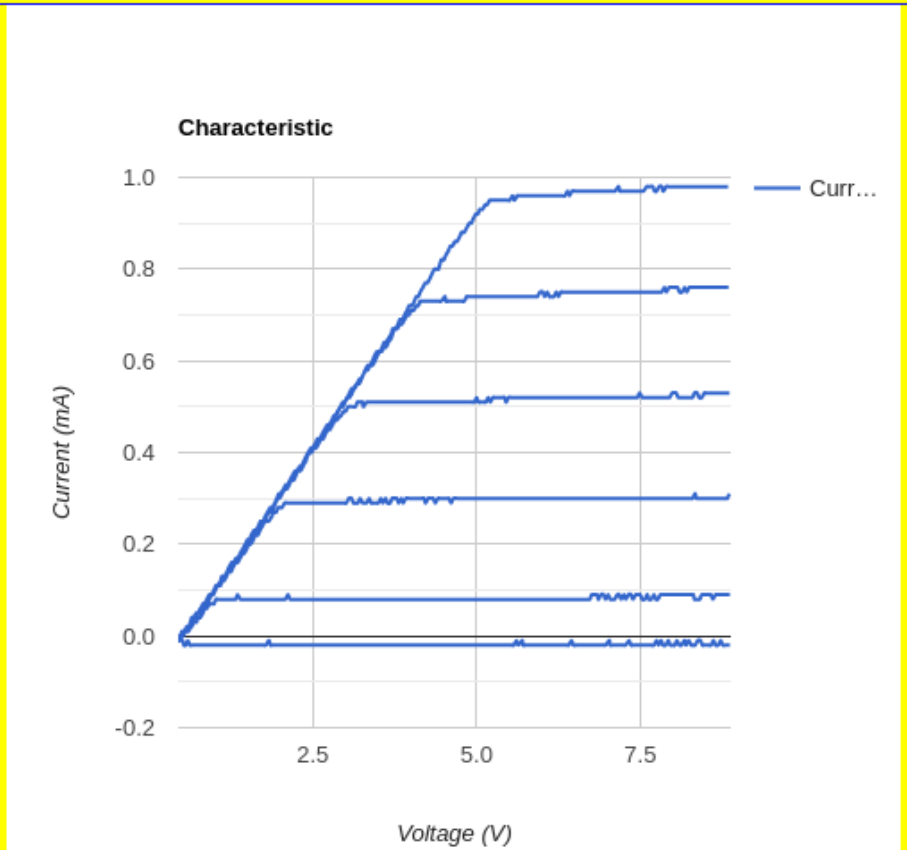
Transistor data

Transistor PNP BD140 Input 250 Start

Experiment data

Experiment status: OFF Current Gain: 95.90 Recommended input values: 50-255

Selected input values: 0uA, 2.09uA, 4.17uA, 6.26uA, 8.34uA, 10.43uA



Transistor characteristic measurement

Transistor data

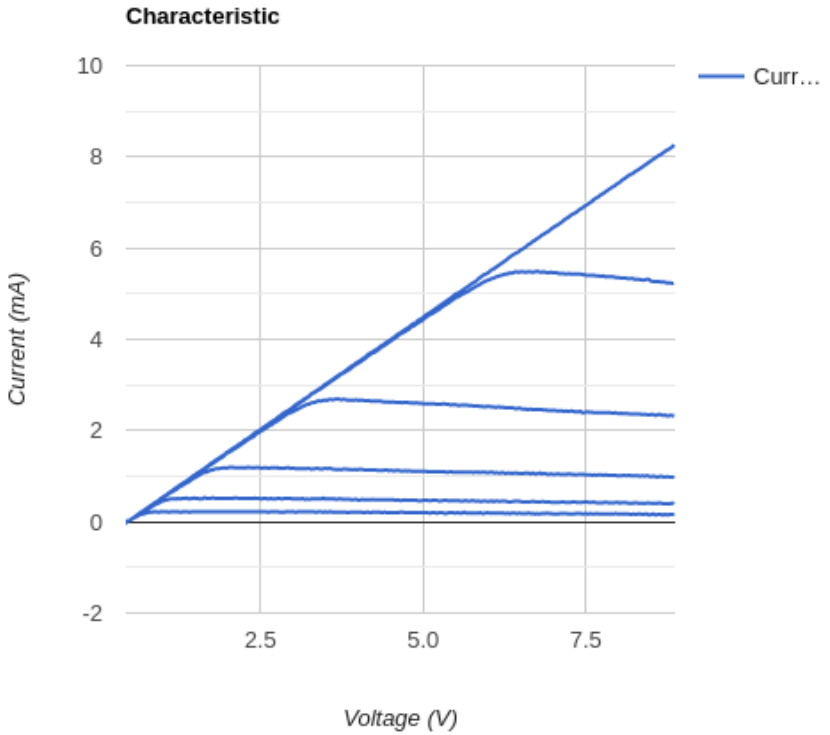
Transistor: N MOSFET IRF520 | Input: 175 | Start

Experiment data

Experiment status: OFF

Recommended input values: 120-170

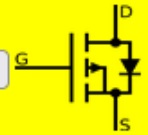
Selected input values: 2.94V, 3.04V, 3.14V, 3.24V, 3.33V, 3.43V



Transistor characteristic measurement

Transistor data

Transistor: P MOSFET IRF9530 | Input: 205 | Start

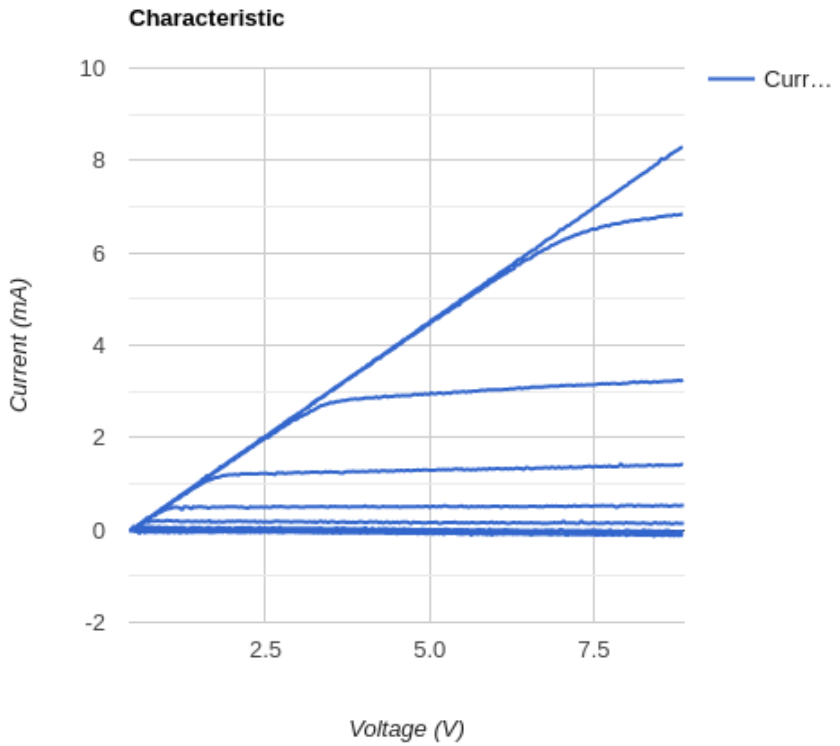


Experiment data

Experiment status: OFF

Recommended input values: 160-195

Selected input values: 3.14V, 3.24V, 3.33V, 3.43V, 3.53V, 3.63V, 3.73V, 3.82V, 3.92V, 4.02V



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Pocket Labs Supported IoT Teaching

Vladimir M Cvjetkovic
Faculty of Science University of Kragujevac

DOI: https://doi.org/10.3991/ijep.v8i2.8129

Keywords: IoT, Pocket Labs, teaching

ABSTRACT

IoT is both a concept and a specific platform with large variety of applications that rapidly become inseparable part of everyday life not only improving it, but making it more interesting and fun. ICT based, it is devoted to interactions with environment that are usually not available with traditional ICT equipment and platforms. IoT is at the same time both complementary and compatible with exist-ing non IoT world, which offers computing power and resources to IoT, making it a unique and powerful combination. Pocket Lab is a relatively new teaching concept that supports students' creativity and initiative allowing for carrying and experimenting with real equipment at a time and place of choice, much like using of regular text books for studying. Although the IoT & Pocket Labs are not nec-essarily interconnected or mutually conditioned, this paper discusses such a real case of teaching practice, where the Pocket Labs are a natural solution for teach-ing of IoT. The paper deals with one semester teaching experience of IoT as a university course. Obtained results and experience

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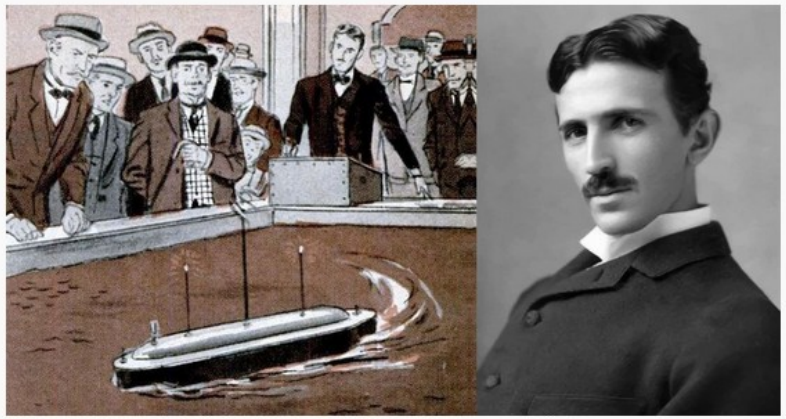

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J. Turi
@jonturi
January 19th, 2014

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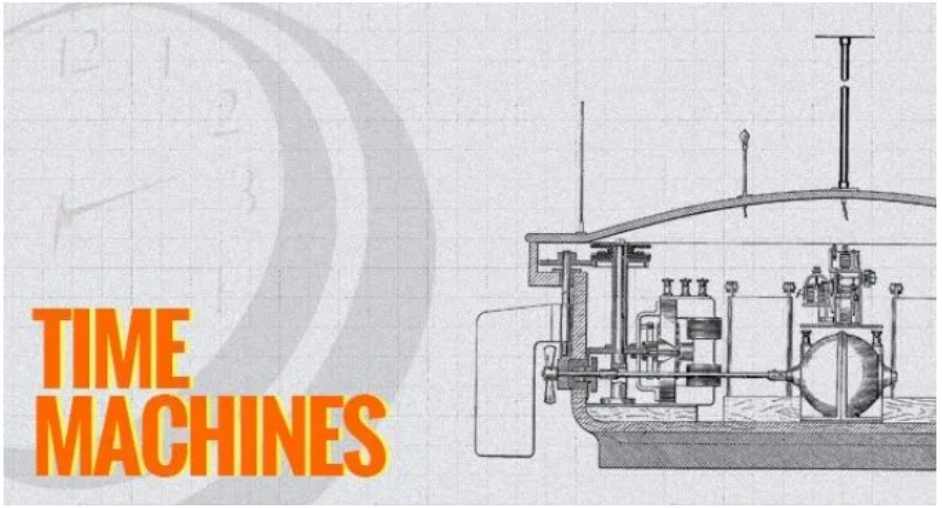

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