BroLight 博源光电

Since 2012

教育与光电子仪器合作伙伴

Education & Photonics Instrument Partner

Science Education

Product Catalog 2025

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Hydrogen Oxygen Fuel Cell Experiment

BEM-5031

Summary

BEM-5031 is a complete energy system. The experiment is designed to demonstrate the reaction of a small amount of hydrogen and oxygen within a given time for teaching purposes. It fully demonstrates the conversion of solar energy - electrical energy - chemical energy - electrical energy. It offers two energy output options: fan and LED.

Features

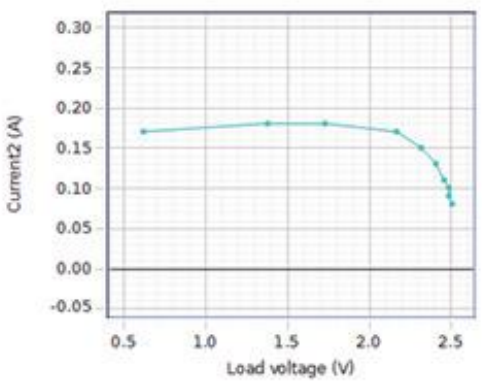
1. Complete demonstration of the conversion between solar energy - electrical energy - chemical energy - electrical energy.
2. Simultaneously collect hydrogen and oxygen.
3. Two energy output demonstration methods: fan / LED.

Main Experiment Contents

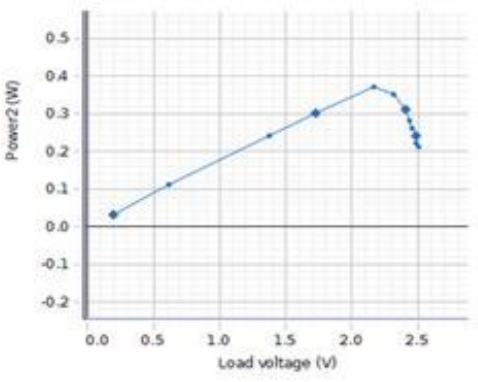
1. Current-Voltage characteristics and Power-Voltage characteristic of solar cells.
2. Matching of the maximum power point of solar cell panels.
3. Electrolysis efficiency of electrolysis modules.
4. Reaction efficiency of fuel cells.

Experiment Contents and Typical Data

1. Current-Voltage characteristics and Power-Voltage characteristic of solar cells

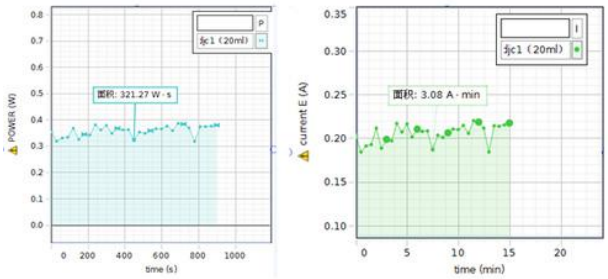


Current-Voltage characteristics of solar cells

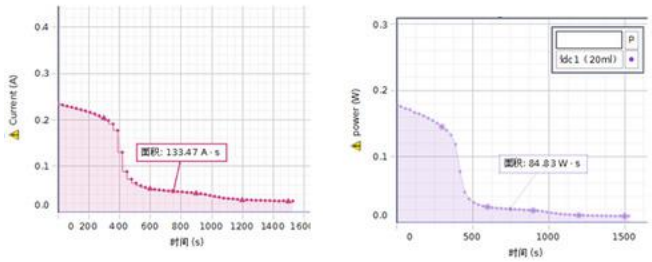


Power-Voltage characteristic of solar cells

2. Electrolysis efficiency of electrolytic modules



3. Reaction efficiency of fuel cells



Specifications

NO.	Part Name	Main Parameter
1	Proton Exchange Membrane Electrolytic Module	Input voltage: 1.5V to 3V DC; Input current: 700mA
2	Proton Exchange Membrane Fuel Module	Output voltage: 0.6V DC
3	Base Unit (with Solar Panel and Load)	1. Solar panel: Voltage: 2.5V; Current: 300mA 2. Micro motor: Operating voltage: 0.5 - 1V DC

Configuration List

NO.	Part Name	Model	Qty.
1	Proton Exchange Membrane Electrolytic Module	BC-201012	1
2	Proton Exchange Membrane Fuel Module	BC-201013	1
3	Base Unit (with Solar Panel and Load)	BC-201014	1
4	Water Reservoir	BC-121141	1
5	Hydrogen/Oxygen Gas Storage Tubes	BC-201016	2
6	Fan Blade	BC-124058	1
7	Plastic Tube Clamp	BC-124055	8
8	3mm Inner Diameter Silicone Hose	BC-124054	8
9	Connection cable, banana jack, 20cm, red	BC-104085	2
10	Connection cable, banana jack, 20cm, black	BC-104086	2

Optional

SEM-5406 Angle Adjustable Long Arm Light Source

Hydrogen Oxygen Fuel Cell Experiment (Includes Long Arm Light Source)

BEM-5031A

Summary

BEM-5031A is a complete energy system. The experiment is designed to demonstrate the reaction of a small amount of hydrogen and oxygen within a given time for teaching purposes. It fully demonstrates the conversion of solar energy - electrical energy - chemical energy - electrical energy. It offers two energy output options: fan and LED.

Features

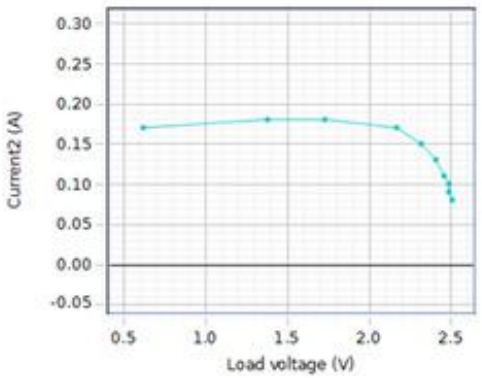
1. Complete demonstration of the conversion between solar energy - electrical energy - chemical energy - electrical energy.
2. Simultaneously collect hydrogen and oxygen.
3. Two energy output demonstration methods: fan / LED.

Main Experiment Contents

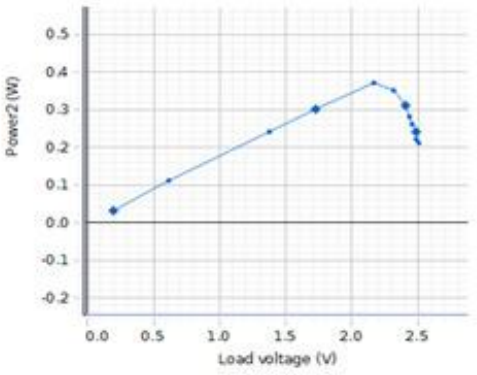
1. Current-Voltage characteristics and Power-Voltage characteristic of solar cells.
2. Matching of the maximum power point of solar cell panels.
3. Electrolysis efficiency of electrolysis modules.
4. Reaction efficiency of fuel cells.

Experiment Contents and Typical Data

1. Current-Voltage characteristics and Power-Voltage characteristic of solar cells

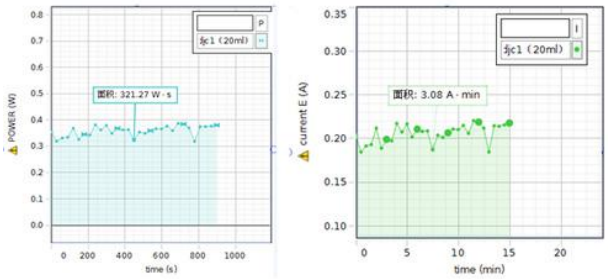


Current-Voltage characteristics of solar cells

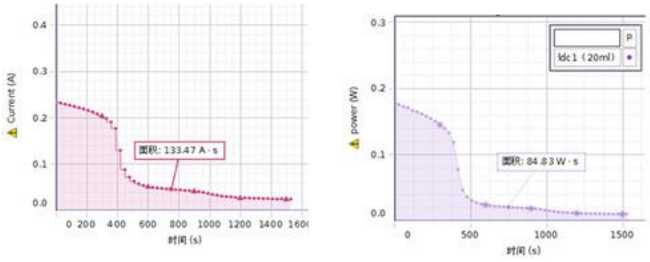


Power-Voltage characteristic of solar cells

2. Electrolysis efficiency of electrolytic modules



3. Reaction efficiency of fuel cells



Specifications

NO.	Part Name	Main Parameter
1	Proton Exchange Membrane Electrolytic Module	Input voltage: 1.5V to 3V DC; Input current: 700mA
2	Proton Exchange Membrane Fuel Module	Output voltage: 0.6V DC
3	Base Unit (with Solar Panel and Load)	1. Solar panel: Voltage: 2.5V; Current: 300mA 2. Micro motor: Operating voltage: 0.5 - 1V DC
4	Angle Adjustable Long Arm Light Source	Power: 100W

Configuration List

NO.	Part Name	Model	Qty.
1	Proton Exchange Membrane Electrolytic Module	BC-201012	1
2	Proton Exchange Membrane Fuel Module	BC-201013	1
3	Base Unit (with Solar Panel and Load)	BC-201014	1
4	Water Reservoir	BC-121141	1
5	Hydrogen/Oxygen Gas Storage Tubes	BC-201016	2
6	Fan Blade	BC-124058	1
7	Plastic Tube Clamp	BC-124055	8
8	3mm Inner Diameter Silicone Hose	BC-124054	8
9	Connection cable, banana jack, 20cm, red	BC-104085	2
10	Connection cable, banana jack, 20cm, black	BC-104086	2
11	Angle Adjustable Long Arm Light Source	SEM-5406	1

Teslameter

BEM-5032A

Definition

A Tesla meter (or Gaussmeter) is an instrument used to measure magnetic flux density (magnetic induction).

Principle

Based on the Hall effect: When a conductive material is placed in a magnetic field and current is passed through it, the magnetic field causes the charges to deflect, generating a potential difference (Hall voltage) on both sides of the material. By measuring this voltage, the magnetic field strength can be calculated.

Features

Wide Measurement Range
Capable of measuring magnetic fields from 0 to 2000 mT (millitesla).

Portable & Handheld Design
Compact and lightweight for on-site testing and field applications.
Compatible with PC/lab software (e.g., LabVIEW, MATLAB) for automated measurements.

Parameter

Item	Parameter
Model	BEM-5032A
Measurement Range	0-2000mT
Accuracy	0.1mT

Configuration List

No.	Part Name	Model	Qty.
1	Teslameter	BEM-5032A	1
2	power supply adapter，12VDC，1A	BC-105150	1

Experiment of Energy Transmission Characteristics in the Electromagnetic Field

BEX-8103

Summary

BEX-8103 utilizes the resonance principle and owns a transmission efficiency far superior to that of inductive magnetic coupling transmission. Moreover, the transmission of electrical energy is not affected by non-magnetic obstacles in space. By changing the size, number or frequency of the resonant coils, the transmission efficiency can be maximized as much as possible. Meanwhile, the magnetic coupling resonant radio power transmission technology converts electrical energy into electromagnetic field energy for transmission. Therefore, studying the transmission characteristics of electromagnetic field energy in different media to improve the efficiency of radio power transmission is also a research direction. Experimental research on the transmission characteristics of electromagnetic field energy in media helps experimenters deepen their intuitive understanding of electromagnetic field knowledge.

This set of experiment devices contains transmitting and receiving coils, facilitating understanding and operation. It is equipped with various loads (resistors, LEDs, fans) and media (wire mesh, aluminum plates, plexiglass), and the coils can rotate ±90° . The experimental content is rich and intuitive, and the operation is strong.

Features

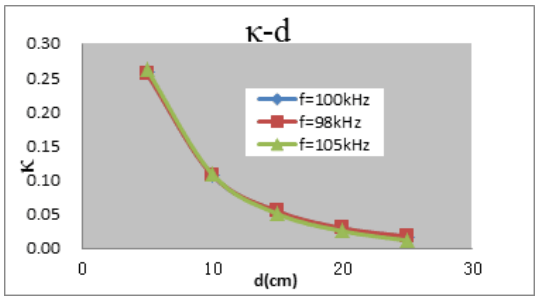
1. It only contains the transmitting coil and the receiving coil, which is conducive to students' understanding of the experimental principle and also facilitates their operation;
2. It has a rich range of experimental loads, including resistors of 5Ω, 20Ω, 50Ω, 75Ω, and 100Ω, as well as LEDs and fans. Students can directly observe the changes in the brightness of the LEDs or the speed of the fan rotation;
3. The coils can be rotated, and each coil is equipped with a 180° scale dial that can be rotated ±90° , enriching the experimental content and enhancing the operability of the experiment;
4. It provides various media: wire mesh, aluminum plate, and plexiglass, allowing students to have a clearer understanding of the energy transfer effect under different media.

Main Experiment Contents

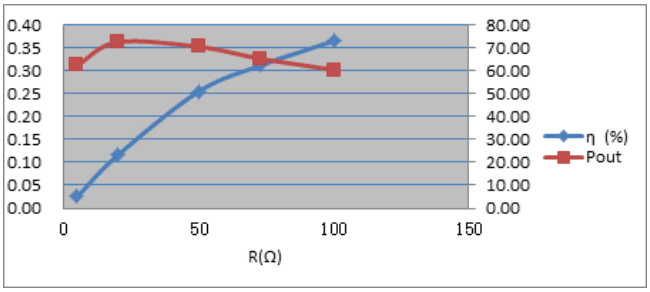
1. Relationship between the coils distance and inductance coefficient & coupling coefficient
2. Relationship between load resistance and transmission efficiency
3. Relationship between coil angle and transmission efficiency
4. Relationship between frequency and transmission efficiency in different medias

Experiment Contents and Typical Data

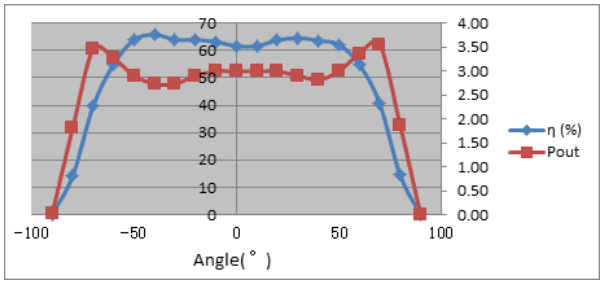
1. Relationship between the coils distance and coupling coefficient K



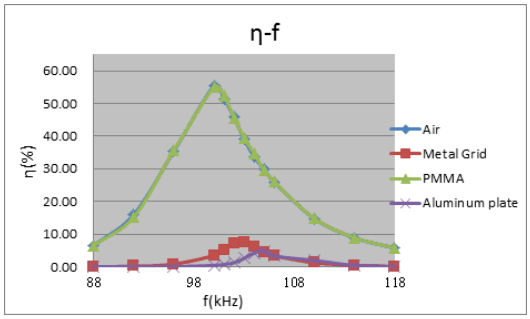
2. Relationship between load resistance and transmission efficiency



3. Relationship between coil angle and transmission efficiency



4.Relationship between frequency and transmission efficiency in different medias



Specifications

NO.	Part Name	Main Parameter
1	Power Supply of Energy Transmission Characteristics Experiment	Output signal: 0 - 5Vpp; Input signal: 0 - 50Vpp;
2	Magnetic coupling resonant coil group	Rotation angle ±90°
3	Track	Length 400mm
4	Fan and LED demo module	Fan and LED demo module
5	Media group	With a medium-fixed frame, three types of media
6	Resistance load module	five different types of resistive loads

Configuration List

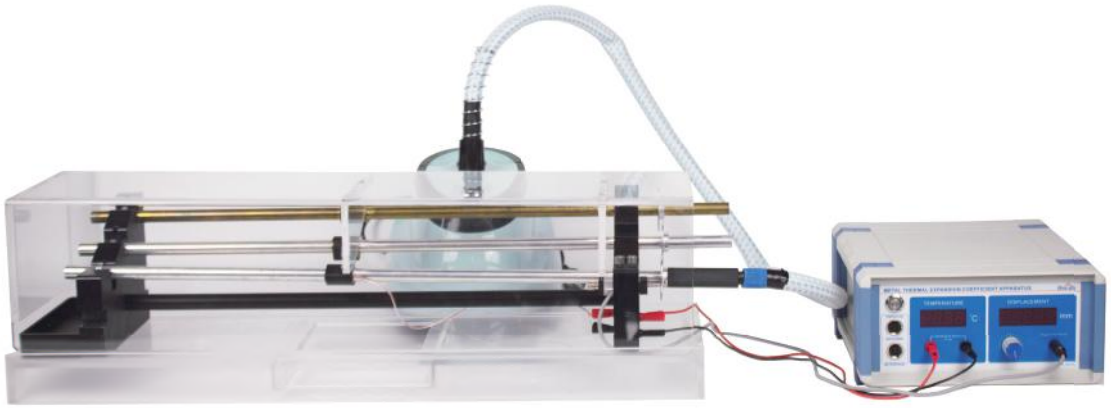
NO.	Part Name	Model	Qty.
1	Power Supply of Energy Transmission Characteristics Experiment	BEM-5713	1
2	Magnetic coupling resonant coil group	BEM-5043	1
3	Track	BEM-5201-04	1
4	Fan and LED demo module	BEM-5044	1
5	Media group	BEM-5225	1
6	Resistance load module	BEM-5045	1
7	BNC to banana plug adapter	BC-105192	2
8	Power cord	BC-105075	1
9	Connection wire group	BEM-5046	2

Metal Thermal Expansion Coefficient Experiment

BEX-8105

Summary

This experiment involves heating sample tubes made of copper, aluminum, and stainless steel using steam, and the tiny elongation of the samples is directly measured with a micrometer, achieving a teaching experimental instrument for determining the linear expansion coefficient of metals. The apparatus consists of a steam generator, metal sample tubes, temperature sensors, and a micro-displacement sensor. It dynamically measures the minute changes in the samples using a stable cooling temperature, with two digital displays providing real-time readings of the sample temperature and micro-displacement. Additionally, digital sensors can be employed to dynamically record the displacement and temperature change curves in real time. The steam method for measuring the thermal expansion coefficient of metals avoids issues such as scale formation, pipe blockages, and water leakage. Equipped with an acrylic protective cover to ensure safety, the displacement sensor offers a precision up to 0.001 mm. The instrument provides three types of sample tubes—aluminum, brass, and stainless steel—which are easy to replace, making the experiment efficient and intuitive.



Features

1. The steam-based method for determining metal thermal expansion coefficients eliminates common issues like limescale deposition, pipeline clogging, and water leakage.
2. The acrylic protective enclosure provides both visual access to the experimental apparatus and safeguards against direct contact with heated specimens and steam, ensuring student safety during operation.
3. Featuring 0.001mm resolution, the displacement sensor delivers rapid and intuitive measurements, significantly facilitating real-time data acquisition.
4. Three interchangeable metal specimen tubes (aluminum, brass, and stainless steel) are provided for convenient comparative testing.

Main Experiment Contents

Measure the linear expansion coefficients of different metals (stainless steel pipe, brass pipe, aluminum pipe) (the relationship between elongation and temperature)

Specifications

NO.	Part Name	Main Parameter
1	Metal Thermal Expansion Coefficient Experiment	Input: 110~220V wide voltage range Temperature measurement module: Temperature measurement range: room temperature ~ 100°C Displacement measurement module: Micro-displacement sensor measurement range: 0 - 10.000mm
2	Metal Thermal Expansion Coefficient Testing Sample Holder	Stainless steel pipe / Brass pipe / Aluminum pipe: Length 80cm;
3	Vapor Generator	1.6L water tank capacity

Configuration List

NO.	Part Name	Model	Qty.
1	Metal Thermal Expansion Coefficient Experiment	BEM-5721	1
2	Metal Thermal Expansion Coefficient Testing Sample Holder	BEM-5723	1
3	Vapor	BEM-5724	1
4	Temperature Sensor	BC-101542	1
5	Displacement Sensor	BC-105242	1
6	4mm banana plug Connection Cable, 0.6m, red	BC-105084	1
7	4mm banana plug Connection Cable, 0.6m, black	BC-105083	1
8	Power cord	BC-105075	1
9	8 Pin cable	BC-105077	2

LED Comprehensive Characteristic Measurement (Comprehensive Upgrade Version)

BEX-8202A

Summary

The parts used in the comprehensive LED experiment, such as the voltage stabilizing power supply, constant current source, illuminance meter, integrating sphere, spectrometer and temperature control experiment box, are all jointly developed with professional LED measurement enterprises. Under the premise of meeting the teaching requirements, the functions, accuracy, and reliability are maintained at a high level.

The experiment comprehensively covers the light, electricity, color, and heat characteristics of LEDs. The modules are independent and the functions are clear. It conforms to teaching standards, and the software design is complete. The testing principles strictly follow international authoritative standards. The operation is clear and easy to understand, which helps to deepen theoretical learning.

Features

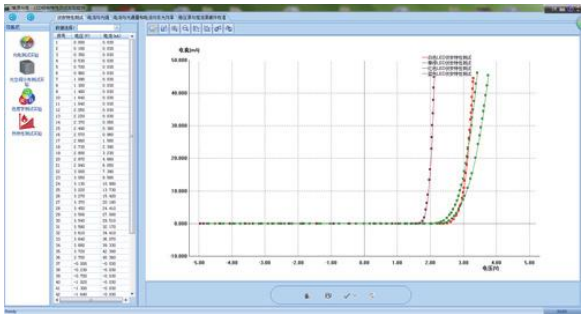
1. The experiment is rich in content and comprehensively covers the four most important characteristics of LED - light, electricity, color and heat. It is the most basic theoretical knowledge required for the compulsory courses of optoelectronics majors in universities.
2. Several experiment modules are independent of each other but also mutually supportive. The function divisions of the components are clearly defined, making it easy for students to understand.
3. The components of the experimental device and the software design are all designed according to the standards of teaching products. The operation settings comply with teaching requirements, and the software functions are complete, including knowledge navigation, independent test modules, which enable students to have a clear logical thinking and easy understanding when using it, achieving the effect of deepening theoretical learning.
4. The principle of parameter testing strictly follows the current authoritative testing standards in China and abroad. For example: the average light intensity test adopts the CIE average light intensity test standard conditions; the luminous flux test adopts the integrating sphere method; the junction temperature measurement adopts the pulse current method. This method has the advantages of simplicity, non-destructiveness, accuracy and good transient response.

Main Experiment Contents

1. Volt-ampere characteristic test experiment.
2. Relationship experiment between light intensity and current.
3. Relationship experiment between luminous flux and current.
4. Measurement experiment of spatial distribution characteristics of LED output light.
5. Measurement experiment of chromaticity parameters of different LEDs.
6. RGB color matching experiment.
7. Measurement experiment of VT coefficient (ripple) of pulse power supply.
8. Measurement experiment of K coefficient.
9. Measurement experiment of junction temperature and thermal resistance.

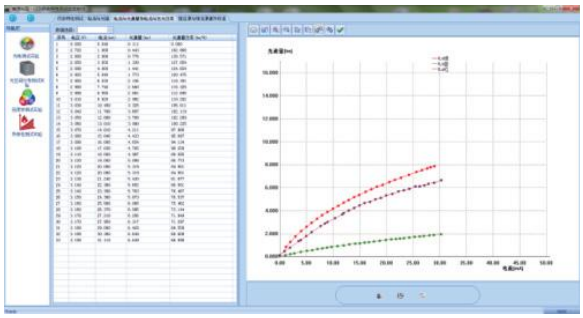
Experiment Contents and Typical Data

1. Electrical & electro-optical conversion experiment



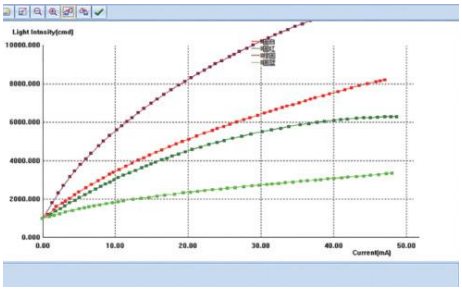
LED Forward and Reverse V-I Characteristics Measurement

2. Investigate the relationship between current, luminous flux and luminous efficiency

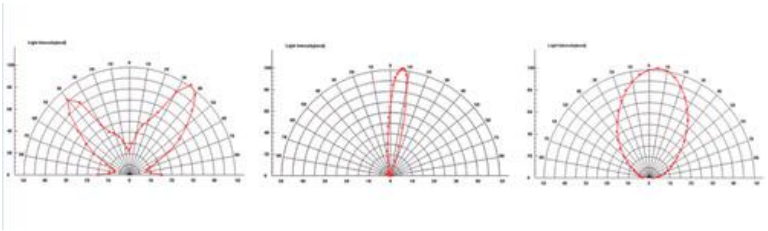


LED Forward and Reverse V-I Characteristics Measurement

3. Light spatial distribution (light distribution curve) experiment

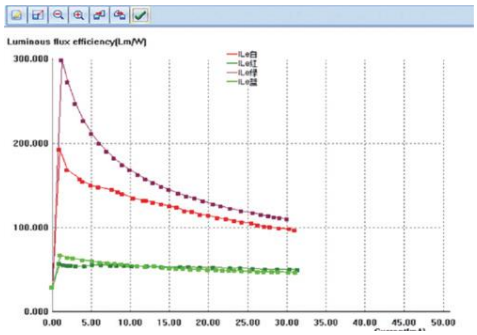


The curve showing the variation of the average light intensity in one-dimensional space with the current



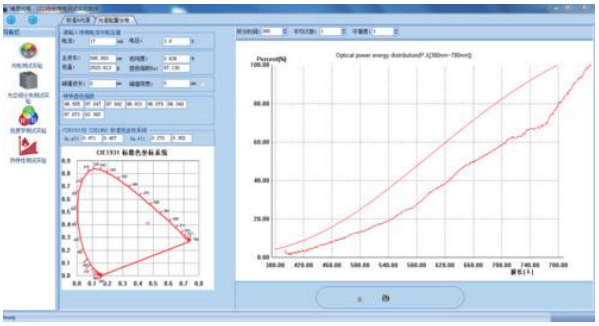
Two-dimensional spatial light distribution (light distribution) curve

4. The curve showing the relationship between current and luminous flux



The curve showing the relationship between current and luminous efficiency

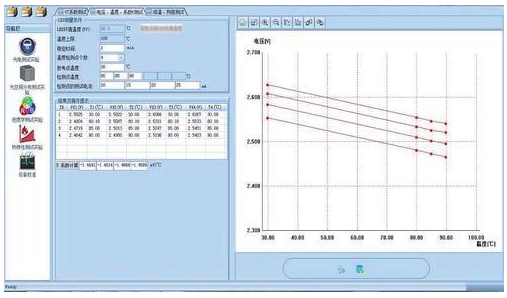
5.Measure the chromaticity parameters of different LEDs



The curve showing the relationship between current and luminous efficiency

6. Thermal Characteristic Test Experiment

This module is used to measure and calculate the K coefficient, thermal resistance, and junction temperature of LEDs. The experimental setup includes a temperature control system, a temperature control power supply, and a pulse power supply. After the experiment begins, the voltage-time curve can be displayed in real time on the software interface, allowing for the analysis of the junction temperature and thermal resistance at the steady state.



Small current K coefficient test

Specifications

NO.	Part Name	Main Parameter
1	LED Power Supply I (constant current source)	110V/220V input, 0~50/500mA output, voltage range 0-10V
2	LED Power Supply II (constant voltage source)	110V/220V input, 0~10V output; current range 0 - 0.1A
3	(Programmable) Pulse Power Supply	Output small current ranging from 0 to 50 mA; output large current ranging from 50 to 500 mA.
4	Temperature Control Power Supply	Heating range: 0 - 100°C
5	Illuminometer with Detector	Measurable illuminance and luminous flux values, illuminance range: 0.001 LX to 2000 LX; Luminous flux range: 0.001 LM to 999 LM;
6	RGB Power Supply (constant current source)	Three-phase current output
7	Fiber Spectrometer	Wavelength range: 350-1050nm, resolution 2nm
8	Fan Cooling Tungsten Light Source	Wavelength range: 400 nm-2000 nm Cooling method: Fan
9	Temperature Controller System	Heating range 0~100°C
10	Integrating Sphere	Radiation integrating sphere
11	LED Fixture and Holder	Dia 50mm

Configuration List

NO.	Part Name	Model	Qty.
1	LED Power Supply I (constant current source)	BEM-5036	1
2	LED Power Supply I (constant voltage source)	BEM-5035	1
3	(Programmable) Pulse Power Supply	BEM-5037	1
4	Temperature Control Power Supply	BEM-5038	1
5	Illuminometer with Detector	BEM-5409	1
6	RGB Power Supply (constant current source)	BEM-5711	1
7	Fiber Spectrometer	BIM-6001-06	1
8	Fan Cooling Tungsten Light Source	BIM-6210	1
9	Temperature Controller System	BEM-5040A	1
10	Integrating Sphere	BEM-5216-15004	1
11	LED Fixture and Holder	BEM-5217	1
12	RGB Light Source Fixture	BEM-5224	1
13	Adjustment Platform for Light Source	BEM-5214	1
14	Aperture tube with Holder	BEM-5215	1
15	Aperture	BEM-5221-03	1
16	View Screen	BEM-5410	1
17	Track	BEM-5201-06	1
18	Carrier	BEM-5204-50	1
19	Adjustable Post Holder	BEM-5205-25	1
20	Poster	BEM-5209-09	1
21	Quartz Fiber	SIM-6102-0605-S/S-P	1
22	Laser Module with Fixture	BEM-5047	1
23	LED Test Samples with Storage Case	BEM-5048	1
24	Power Cable	BC-105075	5
25	USB Data Cable	BC-105080	2
26	4mm Banana Plug Connector Cable, Red	BC-105084	6
27	4mm Banana Plug Connector Cable, Black	BC-105083	6
28	6-Pin Aviation Connector Cable	BC-104103	1

LED Comprehensive Characteristic Measurement (Comprehensive Version)

BEX-8202B

Summary

The parts used in the comprehensive LED experiment, such as the voltage stabilizing power supply, constant current source, illuminance meter, integrating sphere, spectrometer and temperature control experiment box, are all jointly developed with professional LED measurement enterprises. Under the premise of meeting the teaching requirements, the functions, accuracy, and reliability are maintained at a high level.
The experiment comprehensively covers the light, electricity, color, and heat characteristics of LEDs. The modules are independent and the functions are clear. It conforms to teaching standards, and the software design is complete. The testing principles strictly follow international authoritative standards. The operation is clear and easy to understand, which helps to deepen theoretical learning.

Features

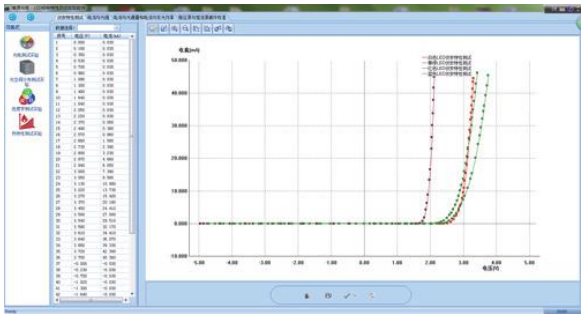
1. The experiment is rich in content and comprehensively covers the four most important characteristics of LED - light, electricity, color and heat. It is the most basic theoretical knowledge required for the compulsory courses of optoelectronics majors in universities.
2. Several experiment modules are independent of each other but also mutually supportive. The function divisions of the components are clearly defined, making it easy for students to understand.
3. The components of the experimental device and the software design are all designed according to the standards of teaching products. The operation settings comply with teaching requirements, and the software functions are complete, including knowledge navigation, independent test modules, which enable students to have a clear logical thinking and easy understanding when using it, achieving the effect of deepening theoretical learning.
4. The principle of parameter testing strictly follows the current authoritative testing standards in China and abroad. For example: the average light intensity test adopts the CIE average light intensity test standard conditions; the luminous flux test adopts the integrating sphere method; the junction temperature measurement adopts the pulse current method. This method has the advantages of simplicity, non-destructiveness, accuracy and good transient response.

Main Experiment Contents

1. Volt-ampere characteristic test experiment.
2. Relationship experiment between light intensity and current.
3. Relationship experiment between luminous flux and current.
4. Measurement experiment of spatial distribution characteristics of LED output light.
5. Measurement experiment of chromaticity parameters of different LEDs.
6. Measurement experiment of VT coefficient (ripple) of pulse power supply.
7. Measurement experiment of K coefficient.
8. Measurement experiment of junction temperature and thermal resistance.

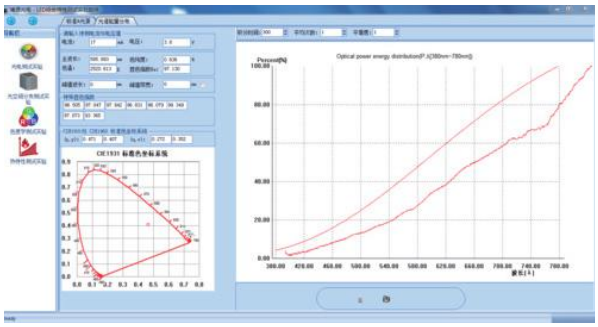
Experiment Contents and Typical Data

1. Electrical & electro-optical conversion experiment



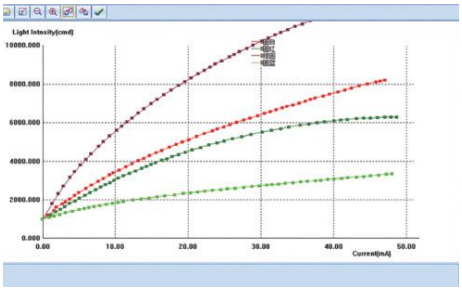
LED Forward and Reverse V-I Characteristics Measurement

2.Measure the chromaticity parameters of different LEDs

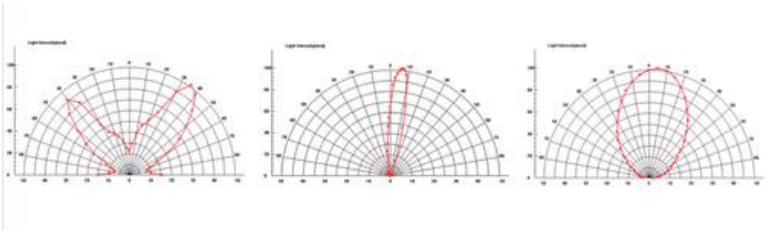


Measurement of LED colorimetric parameters

3. Light spatial distribution (light distribution curve) experiment

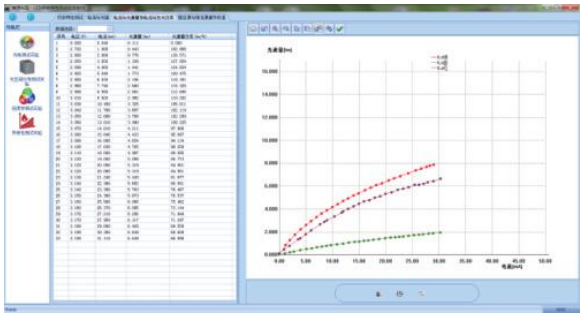


The curve showing the variation of the average light intensity in one-dimensional space with the current

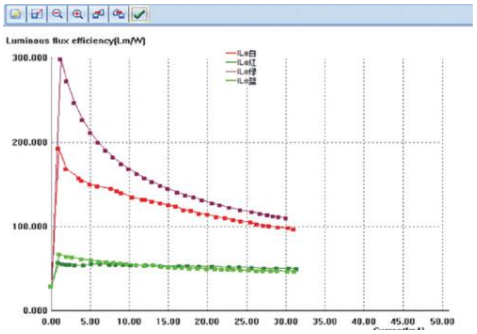


Two-dimensional spatial light distribution (light distribution) curve

4. Investigate the relationship between current, luminous flux and luminous efficiency

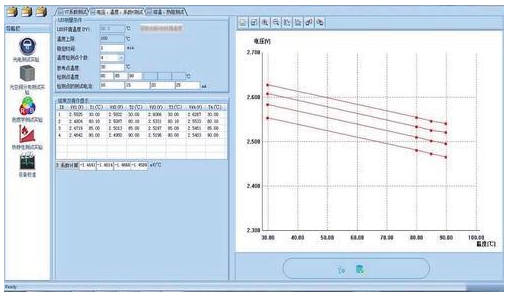


The curve showing the relationship between current and luminous flux



The curve showing the relationship between current and luminous efficiency

5. This module is used to measure and calculate the K coefficient, thermal resistance, and junction temperature of LEDs. The experimental setup includes a temperature control system, a temperature control power supply, and a pulse power supply. After the experiment begins, the voltage-time curve can be displayed in real time on the software interface, allowing for the analysis of the junction temperature and thermal resistance at the steady state.



Small current K coefficient test

Specifications

NO.	Part Name	Main Parameter
1	LED Power Supply I (constant current source)	110V/220V input, 0~50/500mA output, voltage range 0-10V
2	LED Power Supply II (constant voltage source)	110V/220V input, 0~10V output; current range 0 - 0.1A
3	(Programmable) Pulse Power Supply	Output small current ranging from 0 to 50 mA; output large current ranging from 50 to 500 mA.
4	Temperature Control Power Supply	Heating range: 0 - 100°C
5	Illuminometer with Detector	Measurable illuminance and luminous flux values, illuminance range: 0.001 LX to 2000 LX; Luminous flux range: 0.001 LM to 999 LM;
6	RGB Power Supply (constant current source)	Three-phase current output
7	Fiber Spectrometer	Wavelength range: 350-1050nm, resolution 2nm
8	Fan Cooling Tungsten Light Source	Wavelength range: 400 nm-2000 nm Cooling method: Fan
9	Temperature Controller System	Heating range 0~100°C
10	Integrating Sphere	Radiation integrating sphere
11	LED Fixture and Holder	Dia 50mm

Configuration List

NO.	Part Name	Model	Qty.
1	LED Power Supply I (constant current source)	BEM-5036	1
2	LED Power Supply I (constant voltage source)	BEM-5035	1
3	(Programmable) Pulse Power Supply	BEM-5037	1
4	Temperature Control Power Supply	BEM-5038	1
5	Illuminometer with Detector	BEM-5409	1
6	Fiber Spectrometer	BIM-6001-06	1
7	Fan Cooling Tungsten Light Source	BIM-6210	1
8	Temperature Controller System	BEM-5040A	1
9	Integrating Sphere	BEM-5216-15003	1
10	LED Fixture and Holder	BEM-5217	1
11	Adjustment Platform for Light Source	BEM-5214	1
12	Aperture tube with Holder	BEM-5215	1
13	Aperture	BEM-5221-03	1
14	View Screen	BEM-5410	1
15	Track	BEM-5201-06	1
16	Carrier	BEM-5204-50	1
17	Adjustable Post Holder	BEM-5205-25	1
18	Poster	BEM-5209-09	1
19	Quartz Fiber	SIM-6102-0605-S/S-P	1
20	Laser Module with Fixture	BEM-5047	1
21	LED Test Samples with Storage Case	BEM-5048	1
22	Power Cable	BC-105075	4
23	USB Data Cable	BC-105080	2
24	4mm Banana Plug Connector Cable, Red	BC-105084	6
25	4mm Banana Plug Connector Cable, Black	BC-105083	6

LED Comprehensive Characteristic Measurement (Photoelectric Basic Version)

BEX-8202C

Summary

The parts used in the comprehensive LED experiment, such as the voltage stabilizing power supply, constant current source, illuminance meter, integrating sphere, are all jointly developed with professional LED measurement enterprises. Under the premise of meeting the teaching requirements, the functions, accuracy, and reliability are maintained at a high level.

The experiment comprehensively covers the light, electricity, color, and heat characteristics of LEDs. The modules are independent and the functions are clear. It conforms to teaching standards, and the software design is complete. The testing principles strictly follow international authoritative standards. The operation is clear and easy to understand, which helps to deepen theoretical learning.

Features

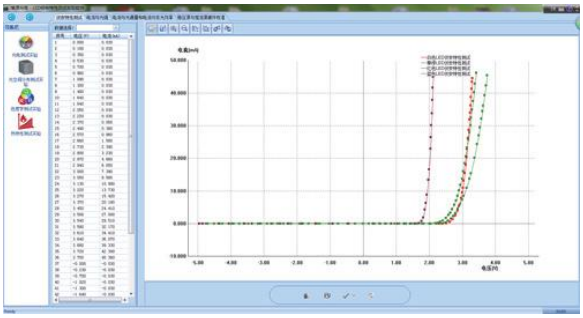
1. 1.Several experiment modules are independent of each other but also mutually supportive. The function divisions of the components are clearly defined, making it easy for students to understand.
2. 2.The components of the experimental device and the software design are all designed according to the standards of teaching products. The operation settings comply with teaching requirements, and the software functions are complete, including knowledge navigation, independent test modules, which enable students to have a clear logical thinking and easy understanding when using it, achieving the effect of deepening theoretical learning.
3. The principle of parameter testing strictly follows the current authoritative testing standards in China and abroad.

Main Experiment Contents

1. Volt-ampere characteristic test experiment.
2. Relationship experiment between light intensity and current.
3. Relationship experiment between luminous flux and current.
4. Measurement experiment of spatial distribution characteristics of LED output light.

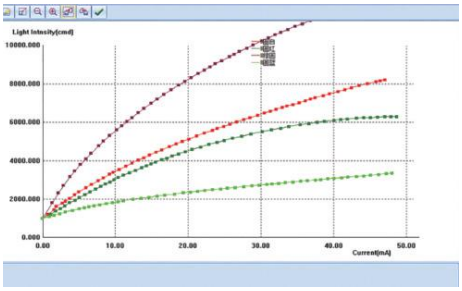
Experiment Contents and Typical Data

1. Electrical & electro-optical conversion experiment

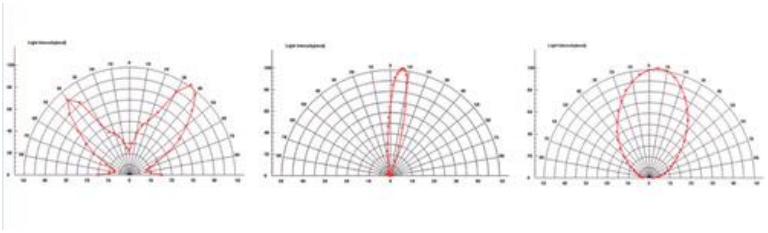


LED Forward and Reverse V-I Characteristics Measurement

2. Light spatial distribution (light distribution curve) experiment

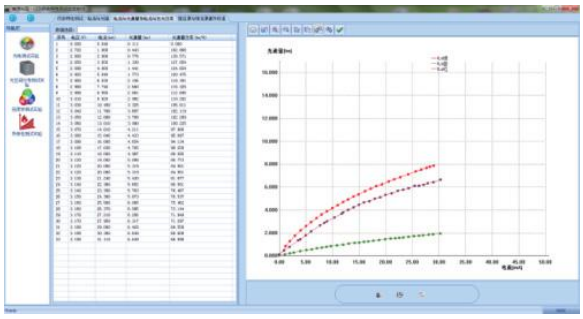


The curve showing the variation of the average light intensity in one-dimensional space with the current

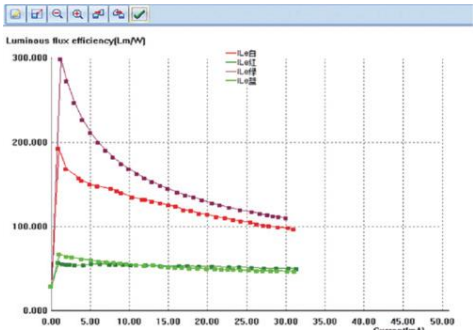


Two-dimensional spatial light distribution (light distribution) curve

3. Investigate the relationship between current, luminous flux and luminous efficiency



The curve showing the relationship between current and luminous flux



The curve showing the relationship between current and luminous efficiency

Specifications

NO.	Part Name	Main Parameter
1	LED Power Supply I (constant current source)	110V/220V input, 0~50/500mA output, voltage range 0-10V
2	LED Power Supply II (constant voltage source)	110V/220V input, 0~10V output; current range 0 - 0.1A
5	Illuminometer with Detector	Measurable illuminance and luminous flux values, illuminance range: 0.001 LX to 2000 LX; Luminous flux range: 0.001 LM to 999 LM;
10	Integrating Sphere	Radiation integrating sphere
11	LED Fixture and Holder	Dia 50mm

Configuration List

NO.	Part Name	Model	Qty.
1	LED Power Supply I (constant current source)	BEM-5036	1
2	LED Power Supply I (constant voltage source)	BEM-5035	1
3	Illuminometer with Detector	BEM-5409	1
4	Laser Module with Fixture	BEM-5047	1
5	LED Test Samples with Storage Case	BEM-5048	1
6	Integrating Sphere	BEM-5216-15003	1
7	LED Fixture and Holder	BEM-5217	1
8	Adjustment Platform for Light Source	BEM-5214	1
9	Aperture tube with Holder	BEM-5215	1
10	Aperture	BEM-5221-03	1
11	View Screen	BEM-5410	1
12	Track	BEM-5201-06	1
13	Carrier	BEM-5204-50	1
14	Adjustable Post Holder	BEM-5205-25	1
15	Poster	BEM-5209-09	1
16	Power Cable	BC-105075	2
17	USB Cable	BC-105080	1
18	4mm banana plug connection wire, red	BC-105084	3
19	4mm banana plug connection wire, black	BC-105083	3

RGB Color Matching Apparatus

BEX-8204

Summary

BEX-8204 is mainly composed of integrating sphere, fiber spectrometer, and a standard light source, etc. Red, green, and blue LED or LD are selected as RGB color sources, and they are powered by independent power supplies. By adjusting the current to change the light intensity, the continuous variations of RGB tristimulus values can be achieved, matching out different colors of light. One can not only observe the color changes directly through the window of the integrating sphere, but also precisely measure color coordinates, color temperature, main wavelength and other chromaticity parameters through the spectrometer and BSV software. Moreover, optical power meter can be used for absolute intensity measurement, helping students understand and master the basic theory and methods of color measurement.

Features

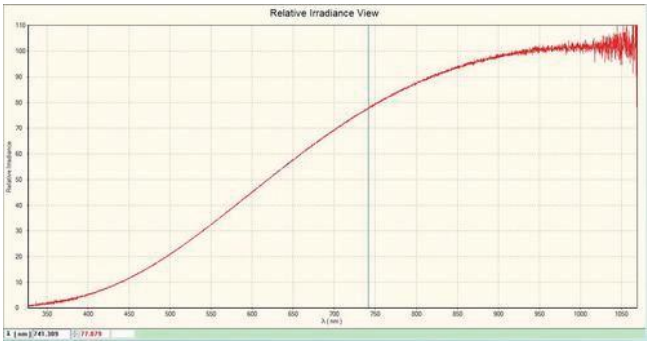
1. Through the observation window, one can directly observe the continuous changes of the three primary color-matched colors.
2. Equipped with an industrial-grade fiber spectrometer, it can accurately measure chromaticity parameters.
3. Independent power supply design, allowing for experiments with a single light source as well as measurements of mixed colors.
4. The application of integrating sphere prevents the direct illumination of the light source through the fiber onto the eyes, enhancing safety and improving experimental accuracy.
5. Professional color measurement software.

Main Experiment Contents

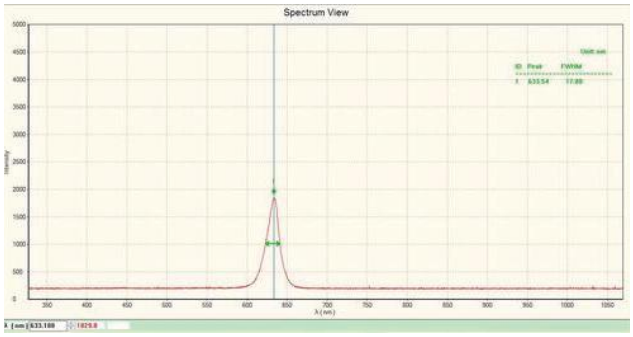
1. Relative strength calibration of the measurement system.
2. Measurement of LED basic optical properties.
3. Matching white light using red, blue and green LED.

Experiment Contents and Typical Data

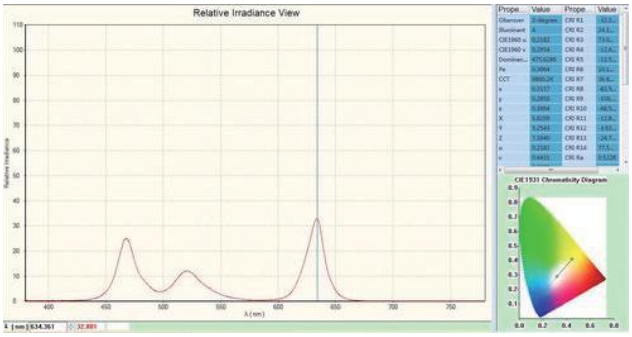
1. Perform relative intensity calibration of the measurement system using a standard halogen-tungsten lamp with known color temperature.



2.Measurement of basic optical properties such as LED bandwidth and central wavelength



3.Utilize red, blue and green LED to match white light



Specifications

NO.	Part Name	Main Parameter
1	RGB Light Distribution Power Supply	3-channel current output, current 0-40mA, current 0-20mA, current 0-8mA
2	Fiber Spectrometer	wavelength range: 350nm-1050nm resolution: ~ 1nm
3	Fan Cooling Tungsten Light Source	wavelength range: 400 nm-2000 nm Cooling method: fan
4	Integrating Sphere	Radiation integrating sphere
5	RGB Light Source Fixture	Configure 3 LEDs.
6	Quartz Fiber	Length 0.5m, Φ600μm

Configuration List

NO.	Part Name	Model	Qty.
1	RGB Light Distribution Power Supply	BEM-5711	1
2	Fiber Spectrometer	BIM-6002A-05	1
3	Fan Cooling Tungsten Light Source	BIM-6210	1
4	Integrating Sphere	BEM-5216-15004	1
5	RGB Light Source Fixture	BEM-5224	1
6	Quartz Fiber	SIM-6102-0605-S/S-P	1
7	Power cord	BC-105075	1
8	USB cable	BC-105080	1
9	6-core aviation plug cable	BC-104103	1

ModuSpec Spectral Analysis Kit

BEX-8205

Summary

Each atom owns its unique energy level structure, absorbing or emitting specific spectral lines during transitions. By measuring these characteristic spectral lines, we can determine a substance's chemical composition and relative content—this identification method is called spectral analysis.

In this experimental kit, a refrigerated halogen-tungsten lamp serves as the reference light source, while a miniature spectrometer acts as the detector. When equipped with the transmission module, the setup can measure liquid absorbance to calculate solution concentration or determine the transmittance of light-permeable materials such as optical filters. When fitted with the reflection module, it can measure surface reflectance spectra to compute color parameters of materials.

Features

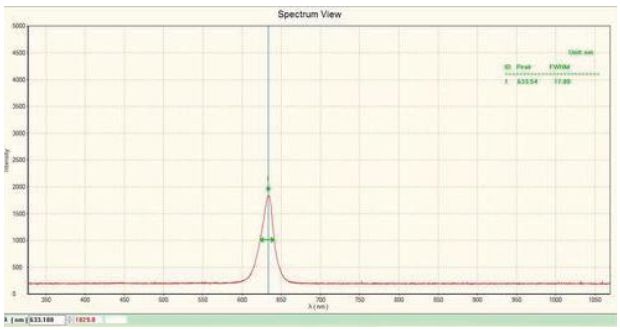
1. Simple and modular structure with strong versatility.
2. Rich experiment content, capable of various spectroscopic measurements and analyses.
3. High expandability—additional components can be integrated for extended functionalities.
4. Suitable for both teaching experiments and scientific research.

Main Experiment Contents

1. Observation of emission spectra from various light sources.
2. Transmittance measurement of solid samples.
3. Absorbance and concentration measurement of liquid samples.
4. Reflectance spectroscopy and acquisition of colorimetric parameters.

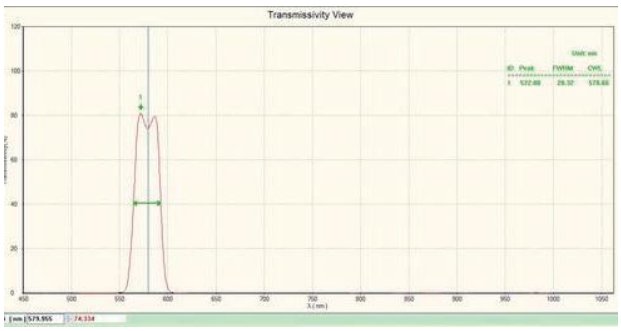
Experiment Contents and Typical Data

1. Observe the emission spectra distribution of various light sources, such as sunlight, LED lights, etc.



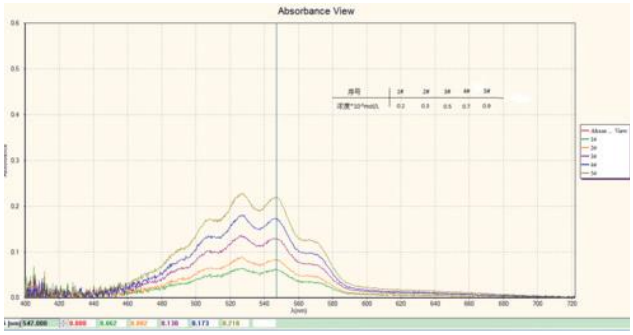
The spectral distribution of LED lights

2.By measuring the transmittance curve, the optical characteristic parameters such as the central wavelength, transmittance and half-width of the half-maximum of the sample can be obtained.



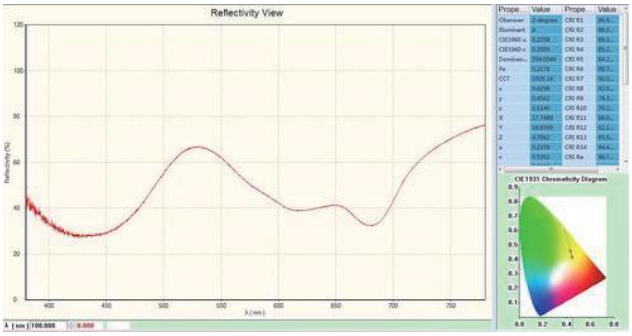
Measurement of Filter Characteristics

3.By measuring the absorbance curve of the liquid sample and applying Lambert-Beer's Law, the concentration of the sample can be determined.



Measurement of potassium permanganate concentration

4.Utilizing the standard A light source as the reference light, the reflectance curve of the sample can be measured, thereby obtaining the chromaticity parameters of the sample.



The chromaticity diagram of the paper under the standard A light source

Specifications

NO.	Part Name	Main Parameter
1	Fiber Spectrometer	wavelength range: 350nm-1050nm, resolution: ~ 1nm
2	Fan Cooling Tungsten Light Source	wavelength range: 400 nm-2000 nm, cooling method: fan
3	Quartz Fiber	Length 5cm, Φ600μm
4	Reflectivity Module	adopt a unique "L" shaped structure
5	Transmittance Module	adopt a unique "Zhong" shaped sample slot
6	Standaed Whiteboard	The material of the protective cover is aluminium alloy

Configuration List

NO.	Part Name	Model	Qty.
1	Fiber Spectrometer	BIM-6001-06	1
2	Fan Cooling Tungsten Light Source	BIM-6210	1
3	Quartz Fiber	SIM-6102-060005-S/S-M	1
4	Reflectivity Module	BIM-6328	1
5	Transmittance Module	BIM-6327	1
6	Standard Whiteboard	SEM-5424-20	1
7	Transmittance Test Sample Set	BEM-5420	1
8	Reflectivity Test Sample Set	BEM-5421	1
9	Plastic Cuvette	SIM-6301-PT10	6

785nm Raman Measurement Experiment

BEX-8206

Summary

BEX-8206 emits laser from a narrow linewidth laser, focusing on the sample through a Raman probe. The Raman signals generated after interacting with the sample are collected by the probe and transmitted through an optical fiber to an optical spectrum analyzer, from which the final Raman spectrum of the sample is obtained.
This experiment adopts a modular design structure, facilitating the rapid connection and efficient coupling of the spectrometer, Raman probe and laser, and also ensuring the safety of the experiment greatly. Meanwhile, it is convenient for students to understand and master the basic principles, composition and structure of the Raman spectrometer.

Features

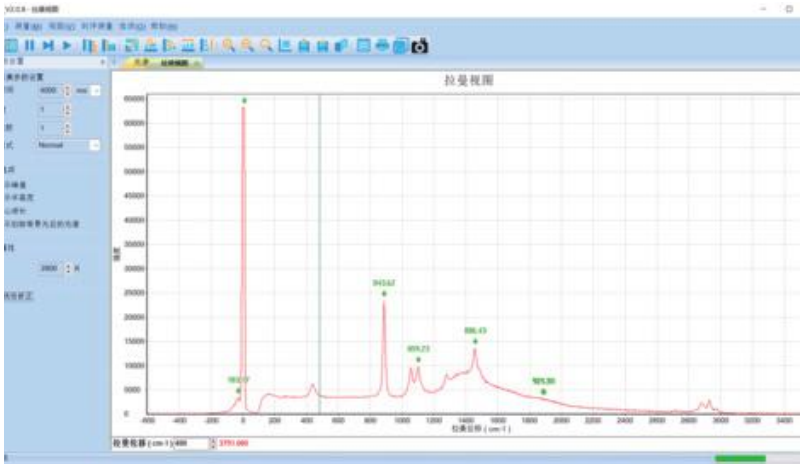
1. The modular design structure is convenient for students to understand and master the basic principles, composition and structure of the Raman spectrometer.
2. Adopting the industry standard structure design, it facilitates the quick connection and efficient coupling of the spectrometer, Raman probe and laser, and also greatly ensures the safety of the experiment.
3. Professional test software is available, facilitating students and teachers to conduct experiment operations and data processing.
4. It can be used for both teaching experiments and research experiments.

Main Experiment Contents

1. Master the basic principles, composition and structure of Raman spectroscopy instruments.
2. Analyze and test liquid and solid samples to obtain Raman spectra.

Experiment Contents and Typical Data

Ethanol Raman spectrum



Specifications

NO.	Part Name	Main Parameter
1	Fiber Spectrometer	wavelength range: 750nm-1100nm resolution: ~ 1nm
2	785nm Raman Probe	Matched laser wavelength: 785nm, Operation mode: Fiber output
3	Raman Sample Holder	12.7mm×12.7mm
4	Solid Sample Testing Holder	Adjustable range 0-130mm
5	785nm Narrow Linewidth Laser	wavelength: 785nm, output power 0~400mW
6	Quartz Cuvette	12.5 mm×12.5 mm×45 mm

Configuration List

NO.	Part Name	Model	Qty.
1	Fiber Spectrometer	BIM-6002A-04	1
2	785nm Raman Probe	SIM-6131-785F	1
3	Raman Sample Holder	BIM-6322	1
4	Solid Sample Testing Holder	BEM-5239	1
5	785nm Narrow Linewidth Laser	BRM-7602	1
6	Quartz Cuvette	SIM-6301-QT10	1
7	Power cord	BC-105075	1
8	USB cable	BC-105080	1

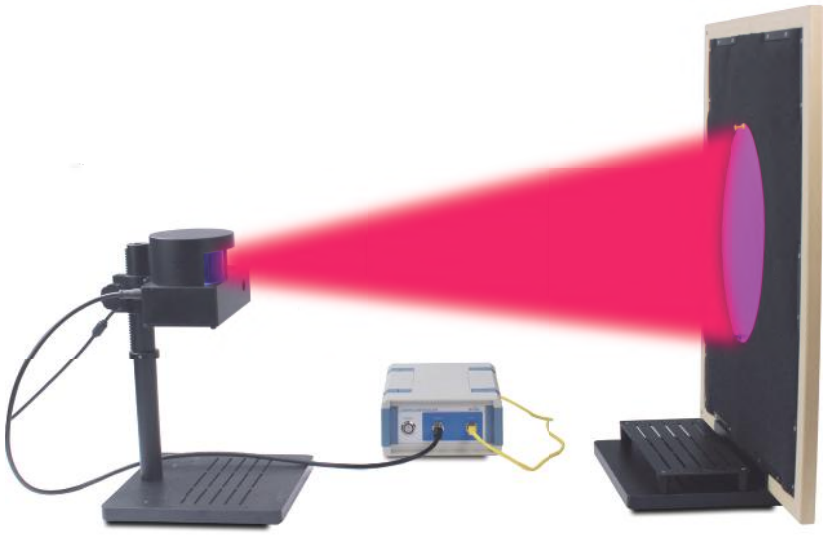
Lidar Experiment

BEX-8207

Summary

BEX-8207 is an experimental device that combines Lidar 3D scanning technology with infrared imaging detection technology. By testing different samples and designing multi-dimensional experimental operations, it can automatically collect and process point cloud images of the samples, and further obtain information such as distance, reflection intensity, and spatial coordinates. Thus, it enables learning and exploration of the relevant optical characteristics and applications of Lidar.

The software is powerful and can analyze and measure the distance, reflection intensity, etc. of the target object. It can also measure the vertical resolution and horizontal resolution.



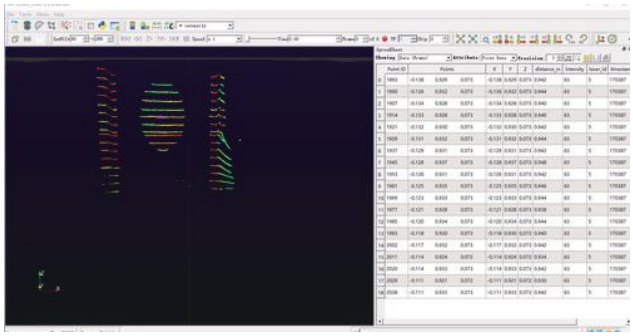
Features

1. Utilizing 3D Lidar, a large amount of information can be obtained, and multi-dimensional images of the target can be generated.
2. By adopting infrared cameras, the radar scanning path can be visualized.
3. A wide range of measurement samples are provided to assist students in completing experiments and enabling them to independently explore and conduct extension experiments.
4. The software is highly functional, capable of analyzing and measuring the distance, reflection intensity, etc. of the target object, as well as measuring the vertical resolution and horizontal resolution.

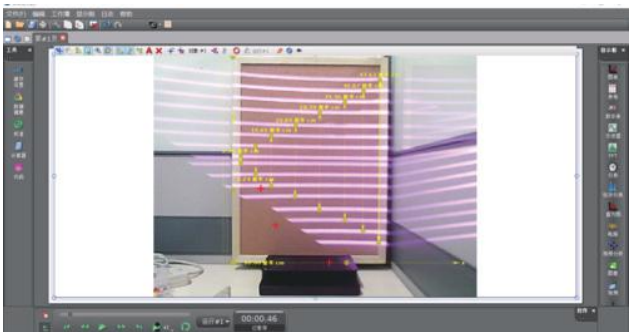
Main Experiment Contents

1. Understand the fundamental principles of Lidar imaging.
2. Perform 3D object recognition using the experimental setup.
3. Learn Time-of-Flight (TOF) measurement principles, including target position (distance) and relative distance between multiple objects.
4. Master various methods for measuring Lidar's vertical angular resolution.
5. Measure the horizontal angular resolution of Lidar at different rotation speeds.
6. Evaluate Lidar target discrimination capability at varying distances.
7. Study the algorithms used for calculating target spatial coordinates in Lidar.
8. Observe the effects of different media on Lidar imaging performance.

Experiment Contents and Typical Data



Target object graphic recognition



Vertical resolution measurement

Specifications

NO.	Part Name	Main Parameter
1	Lidar Apparatus	Radar: Adjustable height range: up to 120mm Scanning window size (horizontal): 90mm Laser wavelength: 905nm
2	measuring Assembly	Including the measuring plate, the fixed base and the ranging plate
3	Adjustable Slit and Base	With width adjustable continuously from 0 to 100mm
4	Measuring Accessory	Samples with various shapes of diffuse reflection, high reflection and specular reflection.

Configuration List

NO.	Part Name	Model	Qty.
1	Lidar Apparatus	BEM-5741	1
2	Lidar Controller	BEM-5736	1
3	Measuring Assembly	BEM-5744	1
4	Adjustable Slit and Base	BEM-5745	1
5	Measuring Accessory	BEM-5746	1
6	Power cable	BC-105075	1
7	USB cable	BC-105080	1
8	M12 data connection cable	BC-105320	1
9	Tape	SEM-5801	1

iToF Light Speed Measurement Experiment

BEX-8208

Summary

iToF is an optical ranging method that utilizes the flight time of light. It is widely applied in Lidar, depth cameras and other 3D depth perception sensors. Therefore, the speed of light can be measured by Lidar under the condition of known distance. Through the experimental device composed of laser module, track, reflective blocks component and controller, students can understand the principle of measuring the speed of light based on flight time measurement and the refractive index of different media, as well as the principle of measuring the speed of light by iToF phase method.

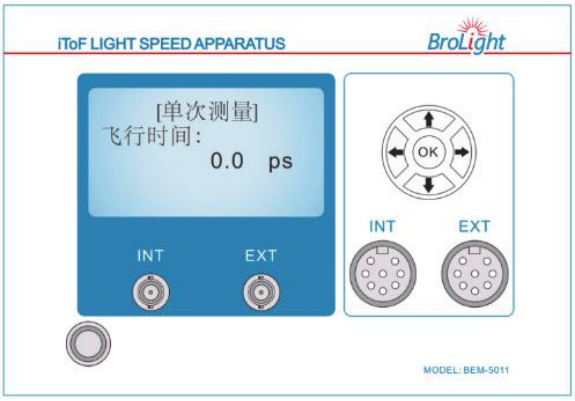
Features

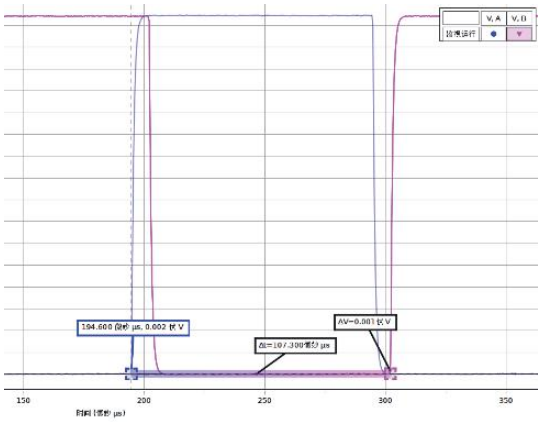
1. Capable of simultaneously conducting flight time and phase method for measuring the speed of light.
2. Flight time measurement and display with ps-level accuracy.
3. Supports both single-shot measurement and continuous measurement modes.
4. Modular design for convenient and flexible experimental assembly and adjustment.
5. Industrial-grade design to ensure the stability of experiments.
6. Supports measurement by oscilloscope and digital acquisition device.

Main Experiment Contents

1. Measurement of the speed of light in air.
2. Measurement of the speed of light in liquids and calculation the refractive index of the medium.
3. Measurement of the speed of light in solids and calculation the refractive index of the medium.
4. Measurement of the speed of light based on phase modulation signals.
5. Extended experiment: measurement of other transparent liquids and solid media.

Experiment Contents and Typical Data





Specifications

NO.	Part Name	Main Parameter
1	iToF Light Speed Measurement Controller	Capable of simultaneously conducting flight time and phase method for measuring the speed of light. Flight time measurement and display with ps-level accuracy. Supports both single-shot measurement and continuous measurement modes.
2	iToF Light Speed Measurement Laser Light Source	Light sources and light source platforms
3	Track	Length:600mm
4	Overhead Gantry Assembly	Including sliding seat, reflective block, support rod, fixing screw and hand-tightening screw
5	Transparent Medium Block 1	Size: 300 * 28 * 40mm
6	Transparent Medium Block 2	Size: 400 * 28 * 40mm
7	Transparent Sink	Size: 580 * 29 * 40mm

Configuration List

NO.	Part Name	Model	Qty.
1	iToF Light Speed Measurement laser light source	BEM-5011	1
2	iToF Light Speed Measurement Laser Light Source	BIM-6217	1
3	Track	BEM-5201-06	1
4	Overhead Gantry Assembly	Z010002T2	1
5	Transparent Medium Block 1	M060005T2	1
6	Transparent Medium Block 2	M060006T3	1
7	Transparent Sink	M060008T2	1
8	iToF Light Speed Measurement cable	C040004	1
9	Plastic measuring cup	A070022	1
10	BNC cable	BC-105076	2
11	8 Pin cable	BC-105077	2
12	Power cord	BC-105075	1

Multi-channel Infrared Radiation Measurement System

BEX-8209

Summary

The measurement of radiant intensity is becoming increasingly important for the development of high-tech fields such as aviation, aerospace, electronics, nuclear energy, materials, energy and metallurgy. As a standard radiation source, the blackbody is used as a standard object for thermal radiation research and is widely used as an absolute standard for infrared equipment. It can also be used as a standard to calibrate other radiation sources or infrared systems. The experiment device consisting of a heating source, infrared camera, guide rail and controller enables students to understand the concept of the blackbody and the principle of radiant temperature measurement, as well as the influence of color, materials, etc. on radiant temperature measurement.

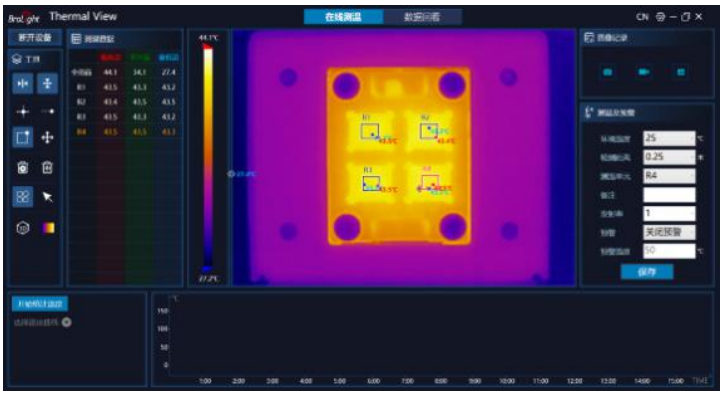
Features

1. Closed-loop feedback temperature control heating based on PID control.
2. 5-channel thermocouple sensors monitor temperature in real time.
3. Autonomous definition and division of the radiation source monitoring area.
4. Support for multi-channel synchronous real-time radiation temperature measurement.
5. Limiting the heating temperature of the radiation source to prevent burns.
6. The test sample block of the radiation source can be replaced.

Main Experiment Contents

1. Understand the principles of blackbody radiation and infrared temperature measurement.
2. Implement multi-channel measurement based on the radiation measurement principle.
3. Achieve blackbody temperature measurement based on the radiation measurement principle.
4. Understand the radiation measurement and emissivity of different materials.
5. Understand the temperature calibration methods and implementation approaches.

Experiment Contents and Typical Data



Specifications

NO.	Part Name	Main Parameter
1	Multi-channel Infrared Radiation Measurement Device Controller	Closed-loop feedback temperature control heating based on PID control 5-channel thermocouple sensors monitor temperature in real time Supports 4-channel calibration of temperature measurement area parameters
2	Multi-channel infrared radiation measurement device heating box	Can be heated up to 180°C
3	Track	Length 400mm
4	Adjustable Post Holder	adjustable range 25mm
5	Carrier	Width 50mm
6	Post	Length 90mm, metric thread
7	Infrared thermal imager (with connecting cable)	Pixel size: 12 um, Infrared resolution: 256 × 192
8	Temperature measurement sample group (blackbody)	The surface morphology samples contain four types of samples.
9	Temperature measurement sample group	The material samples include four types of samples.

Configuration List

12NO.	Part Name	Model	Qty.
1	Multi-channel Infrared Radiation Measurement Device Controller	BEM-5014	1
2	Multi-channel infrared radiation measurement device heating box	BEM-5027	1
3	Track	BEM-5201-04	1
4	Adjustable Post Holder	BEM-5205-25	1
5	Carrier	BEM-5204-50	1
6	Post	BEM-5209-09	1
7	Infrared thermal imager (with connecting cable)	L050005	1
8	Thermal imager mounting base	M030075T2	1
9	Thermal imager adapter ring	M030076T2	1
10	Temperature measurement sample group (blackbody)	Z010004T1	1
11	Temperature measurement sample group	Z010003T1	1

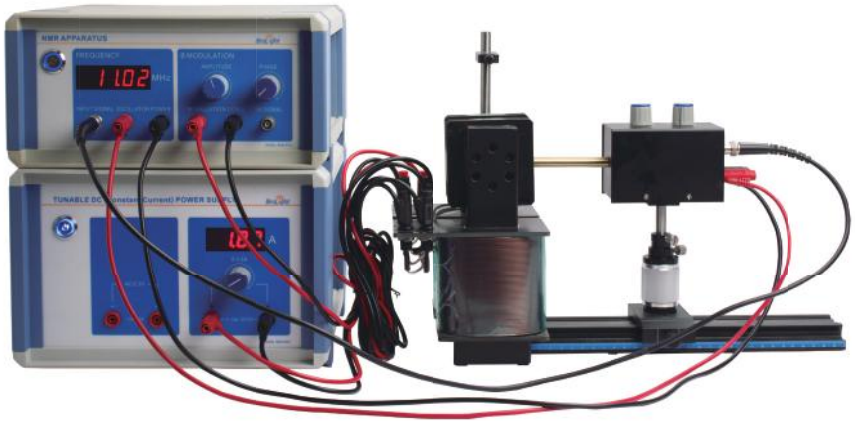
Nuclear Magnetic Resonance (NMR)

BEX-8505

Summary

BEX-8505 is one of the compulsory experiments in the modern physics experiment course of science colleges and universities.

This experiment adopts an open experimental structure, allowing for an intuitive observation of the positions and functions of the experimental detection coil, scanning coil, excitation coil, and the sample in the magnetic field. With the experiment and a user-provided general oscilloscope, the nuclear magnetic resonance phenomenon can be observed and the resonance frequency can be measured in a scanning field manner. This experiment instrument is suitable for the basic experimental teaching of modern physics in science colleges and universities.



Features

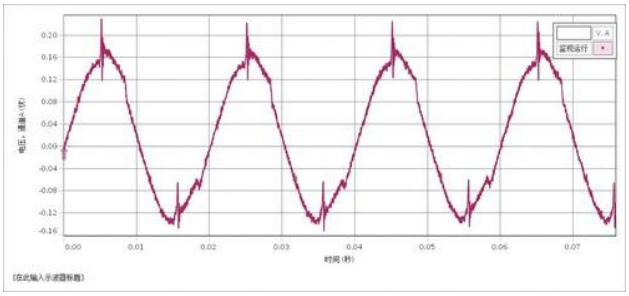
1. The experiment samples can be freely replaced. Besides the samples provided by the manufacturer, users can also bring their own samples for measurement.
2. The electromagnet design allows for freely adjusting the magnetic field strength. Compared to permanent magnets, it can measure multiple sets of experiment data, increasing the experimental time and the accuracy of the experimental results.
3. The detector is fixed on the track and its position can be adjusted in two dimensions.
4. There is a Tesla meter probe fixture, which is convenient for measuring the magnetic field.
5. The open experimental structure enables intuitive observation of the positions and functions of the experimental detection coil, scanning coil, excitation coil, and the sample in the magnetic field.
6. It can be optionally equipped with a scope or a PASCO digital acquisition interface to display the resonance signal.

Main Experiment Contents

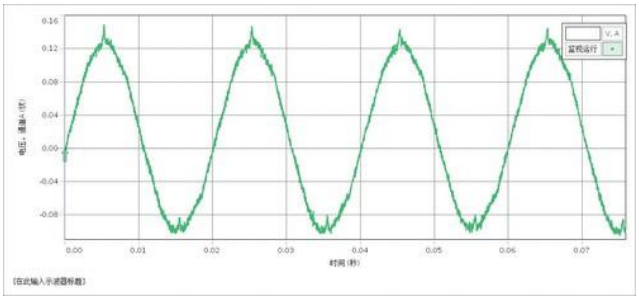
1. Observe the resonance phenomena of hydrogen nuclei in the liquid sample and fluorine nuclei in the solid sample.
2. Calculate the g-factor of hydrogen nuclei and fluorine nuclei.

Experiment Contents and Typical Data

Observe the resonance phenomena of hydrogen nuclei in the liquid sample and fluorine nuclei in the solid sample.



Water sample



PTFE sample

Specifications

NO.	Part Name	Main Parameter
1	Tunable DC(Constant Current) Power Supply	Current output: 0 - 3.5 ADC, Voltage output: 6.3 VAC
2	NMR Apparatus	Input frequency range: 1 - 20 MHz;
3	NMR Probe Unit	PTFE sample, water sample (H, F-nucleus)
4	NMR Samples	NMR Samples
5	U-Core Electromagnetic Coil	1000 turns, including commutating coils

Configuration List

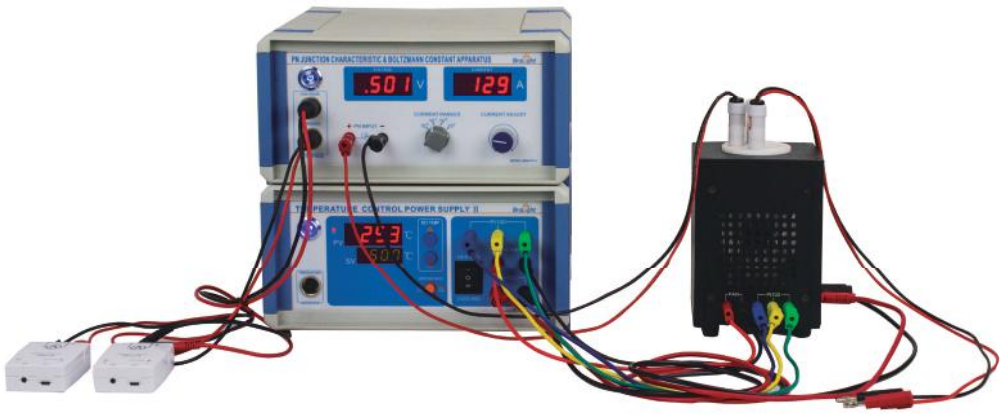
NO.	Part Name	Model	Qty.
1	Tunable DC (Constant Current) Power Supply	BEM-5003	1
2	NMR Apparatus	BEM-5704	1
3	NMR Probe Unit	BEM-5021	1
4	NMR Samples	BC-150001	1
5	U-Core Electromagnetic Coil	BEM-5023	1
6	Track	BEM-5201-03	1
7	Optical Carrier	BEM-5204-50	1
8	Adjustable Post Holder	BEM-5205-25	1
9	Post	BEM-5209-09	1
10	Power cord	BC-105075	2
11	BNC cable	BC-105076	3
12	4mm banana cable, black	BC-105073	4
13	4mm banana cable, red	BC-105074	4

PN Junction Characteristic & Boltzmann Constant Experiment

BEX-8507

Summary

This experiment device is designed with a micro current source to serve as the forward current of the PN junction. By adjusting the micro current source, the forward voltage drop across the PN junction can be obtained, which effectively avoids the instability of measuring the micro current and enables accurate measurement of the forward voltage drop. Additionally, a temperature control device is configured to obtain the volt-ampere characteristic curves of the PN junction under different temperatures, study the relationship among the PN junction voltage, current and temperature, and thereby obtain the Boltzmann constant k, sensitivity S and the band gap width of silicon materials.



Features

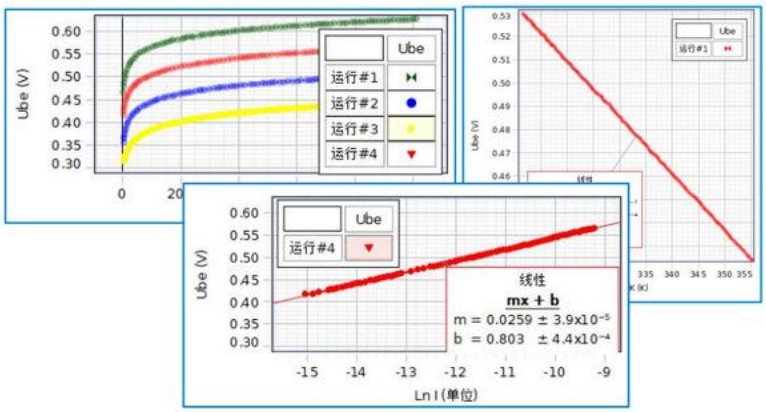
1. To measure the Boltzmann constant more precisely. A micro-current constant current source was designed, with the micro-current output divided into 4 levels: 10-6 to 10-9 A; it can stably output precise micro-current ranging from 1 nA to 1 mA, solving the problem of unstable measurement of micro-current and enabling accurate measurement of forward voltage drop.
2. Temperature control system adopts semiconductor heating and cooling functions, which can quickly warm up and cool down.
3. Open design, providing multiple universal temperature sockets, in addition to PN junction sensors, users can use them to measure thermistors, copper resistors, thermocouples, AD590 and LM35 and other temperature sensors, having good scalability.

Main Experiment Contents

1. Obtain the volt-ampere characteristic curves of PN junctions at different temperatures.
2. Investigate the relationship among the voltage, current and temperature of PN junctions.
3. Obtain the Boltzmann constant k, sensitivity S and band gap width of silicon material.

Experiment Contents and Typical Data

Data obtained through digital lab measurement



Specifications

NO.	Part Name	Main Parameter
1	PN Junction Characteristic & Boltzmann Constant Controller	micro current output is available in 4 levels: 10-6 to 10-9 A; The range of microcurrent output is: 2 nA to 1 mA;
2	Temperature Control Power Supply II	Temperature control range: Room temperature ~ 100°C
3	PN Junction Heating Device	Temperature control range: Room temperature ~ 100°C
4	PN Junction Probe	Two types of probes

Configuration List

NO.	Part Name	Model	Qty.
1	PN Junction Characteristic & Boltzmann Constant Controller	BEM-5714	1
2	Temperature Control Power Supply II	BEM-5051	1
3	PN Junction Heating Device	BEM-5052	1
4	PN Junction Probe	BEM-5053	1
5	Power cord	BC-105075	2
6	Connection Cable, 1m, Blue	BC-105281	1
7	Connection Cable, 1m, Yellow	BC-105282	1
8	Connection Cable, 1m, Green	BC-105283	1
9	Connection Cable, 1m, Black	BC-105073	1
10	Connection Cable, 1m, Red	BC-105074	1
11	8 pin connection cable	BC-105077	2

Metal Electric Work Function Experiment

BEX-8509

Summary

In this experiment, by measuring the electric work function of tungsten metal, tungsten wire is used as the "ideal" diode cathode material, the anode is made into a cylinder coaxial with the cathode, and the cathode emission surface is limited to a certain length with uniform temperature and can be approximated Think of the electrode as an ideal state of infinite length without edge effects. For the measurement experiment of Metal Electric Work Function (work function), basic experimental methods such as Richardson's straight line measurement method, epitaxy measurement method and compensation measurement method are comprehensively applied. There is better skill training in data processing. Therefore, this is a more meaningful experiment.

Features

1. Independent ideal vacuum diode seat: The ideal vacuum diode is inserted on the independent tube seat, and is equipped with a transparent acrylic protective cover, which can not only intuitively observe the working state of the vacuum diode, but also effectively protect the glass device. The independent tube base is engraved with a clear experimental schematic diagram, which can enable students to better understand the entire experimental principle.
2. Accurate anode current measurement module: the anode current measurement module uses a micro-amp current amplifier and a four and a half digital display meter, with a measurement range of up to 0.1uA~20mA, which can measure weak anode current accurately, finely and stably.
3. Stable anode voltage output module: the anode voltage output uses a linear power supply, and the output amplitude reaches 0~160.0V, which can provide the anode voltage of the vacuum diode stably and efficiently.

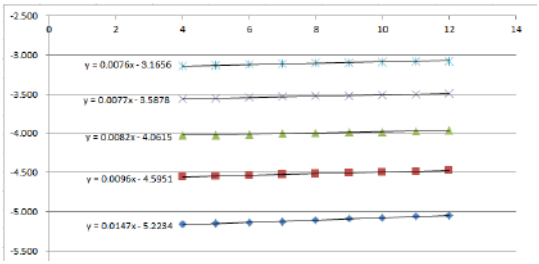
Main Experiment Contents

1. Measurement experiment of Metal Electric Work Function (work function).
2. Learn basic experimental methods such as Richardson's straight line measurement method, epitaxy measurement method and compensation measurement

Experiment Contents and Typical Data

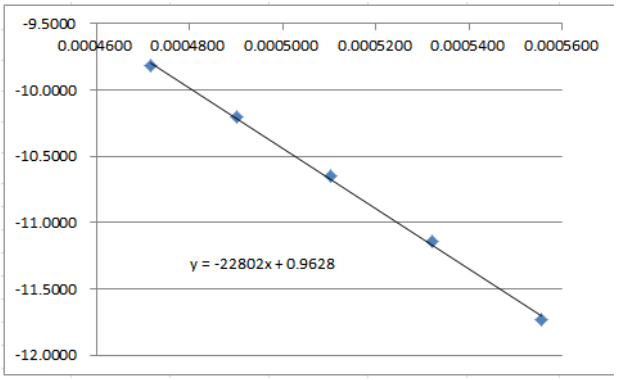
Anode current and its logarithmic value at different anode voltages and filament temperatures, graph lgIa ~ √Ua, get the intercept lgI at different temperatures and fill in

		U_A (V)	16V	25V	36V	49V	64V	81V	100V	121V	144V
I_F (mA)	T (K)	$U_A^{1/2}$ ($V^{1/2}$)	4	5	6	7	8	9	10	11	12
550	1800	I_A (uA)	6.9	7.1	7.3	7.5	7.8	8.1	8.4	8.7	9.0
		lgI_A	-5.161	-5.149	-5.137	-5.125	-5.108	-5.092	-5.076	-5.060	-5.046
600	1880	I_A (uA)	27.8	28.4	29.0	29.6	30.3	31.0	31.7	32.4	33.2
		lgI_A	-4.556	-4.547	-4.538	-4.529	-4.519	-4.509	-4.499	-4.489	-4.479
650	1960	I_A (uA)	93.6	95.5	97.2	98.9	100.9	102.8	104.8	106.8	108.9
		$lgIA$	-4.029	-4.020	-4.012	-4.005	-3.996	-3.988	-3.980	-3.971	-3.963
700	2040	I_A (uA)	276.7	282.3	287.3	292.5	297.7	303.0	308.0	313.5	319.0
		$lgIA$	-3.558	-3.549	-3.542	-3.534	-3.526	-3.519	-3.511	-3.504	-3.496
750	2120	I_A (uA)	730.0	746.0	760.0	774.0	787.0	801.0	814.0	828.0	842.0
		$lgIA$	-3.137	-3.127	-3.119	-3.111	-3.104	-3.096	-3.089	-3.082	-3.075



Anode current and its logarithmic value at different anode voltages and filament temperatures, graph lgIa ~ √Ua, get the intercept lgI at different temperatures and fill in

T/K	1800	1880	1960	2040	2120
lgI	-5.2234	-4.5951	-4.0615	-3.5878	-3.1656
lgT	3.2553	3.2742	3.2923	3.3096	3.3263
$1/T(1/K)$	0.0005556	0.0005319	0.0005102	0.0004902	0.0004717
$lgI-2lgT$	-11.7339	-11.1434	-10.6460	-10.2071	-9.8183



Specifications

NO.	Part Name	Main Parameter
1	Metal Electric Work Function Experiment Apparatus	Anode Voltage Module: Adjustable voltage range from 0 to 160VDC Anode Current Module: Measuring range is 0 to 20mA Filament Current Module: Adjustable range from 0 to 800mA
2	Ideal Vacuum Diode Box	Filament material: Pure tungsten Anode material: Nickel Filament current: 0.50 - 0.80 A

Configuration List

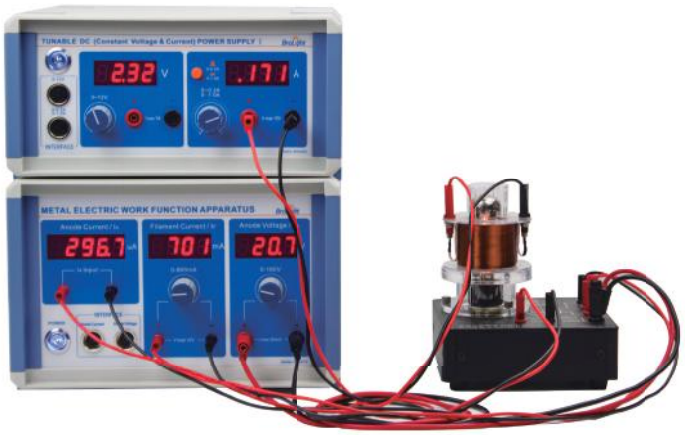
12NO.	Part Name	Model	Qty.
1	Metal Electric Work Function Experiment Apparatus	BEM-5715	1
2	Ideal Vacuum Diode Box	BEM-5716	1
3	4mm banana plug Connection Cable, 0.6m, Red	BC-105084	2
4	4mm banana plug Connection Cable, 0.6m, Black	BC-105083	2
5	Connection Cable, 1m, Black	BC-105073	1
6	Connection Cable, 1m, Red	BC-105074	1
7	Power cord	BC-105075	1
8	8 pin connection cable	BC-105077	2

Ideal Vacuum Diode Comprehensive Experiment

BEX-8510

Summary

The core components of this experiment are an ideal (vacuum) diode and an energized solenoid coil wrapped around the ideal diode. In this experiment, by measuring the electric work function of tungsten metal, tungsten wire is used as the "ideal" diode cathode material, the anode is made into a cylinder coaxial with the cathode, and the cathode emission surface is limited to a certain length with uniform temperature and can be approximated Think of the electrode as an ideal state of infinite length without edge effects. For the measurement experiment of Metal Electric Work Function (work function), basic experimental methods such as Richardson's straight line measurement method, epitaxy measurement method, compensation measurement method and magnetic control method are comprehensively applied. There is better skill training in data processing. Therefore, this is a more meaningful experiment.



Features

1. Independent ideal vacuum diode seat: The ideal vacuum diode is inserted on the independent tube seat, and is equipped with a transparent acrylic protective cover, which can not only intuitively observe the working state of the vacuum diode, but also effectively protect the glass device. The independent tube base is engraved with a clear experimental schematic diagram, which can enable students to better understand the entire experimental principle.
2. Matching solenoid coil: conveniently placed on the acrylic cover.
3. Accurate anode current measurement module: the anode current measurement module uses a micro-amp current amplifier and a four and a half digital display meter, with a measurement range of up to 0.1uA~20mA, which can measure weak anode current accurately, finely and stably.
4. Stable anode voltage output module: the anode voltage output uses a linear power supply, and the output amplitude reaches 0~160.0V, which can provide the anode voltage of the vacuum diode stably and efficiently.

Main Experiment Contents

1. Determination of Metal Electric Work Function.
2. Motion of electrons in radial electric field and axial magnetic field (measurement of electron charge-to-mass ratio using the magnetic control method).
3. Research on Fermi-Dirac distribution.
4. Volt-ampere characteristics of the ideal vacuum diode.

Experiment Contents and Typical Data

Experiment 1: Determination of Metal Electric Work Function

Table 1: Anode current and its logarithmic value at different anode voltages and filament temperatures, graph lgIa ~ √ Ua, get the intercept lgI at different temperatures and fill in Table 2

		U_A (V)	16V	25V	36V	49V	64V	81V	100V	121V	144V
I_F (mA)	T (K)	$U_A^{1/2}$ ($V^{1/2}$)	4	5	6	7	8	9	10	11	12
550	1800	I_A (uA)	6.9	7.1	7.3	7.5	7.8	8.1	8.4	8.7	9.0
		lgI_A	-5.161	-5.149	-5.137	-5.125	-5.108	-5.092	-5.076	-5.060	-5.046
600	1880	I_A (uA)	27.8	28.4	29.0	29.6	30.3	31.0	31.7	32.4	33.2
		lgI_A	-4.556	-4.547	-4.538	-4.529	-4.519	-4.509	-4.499	-4.489	-4.479
650	1960	I_A (uA)	93.6	95.5	97.2	98.9	100.9	102.8	104.8	106.8	108.9
		lgIA	-4.029	-4.020	-4.012	-4.005	-3.996	-3.988	-3.980	-3.971	-3.963
700	2040	I_A (uA)	276.7	282.3	287.3	292.5	297.7	303.0	308.0	313.5	319.0
		lgIA	-3.558	-3.549	-3.542	-3.534	-3.526	-3.519	-3.511	-3.504	-3.496
750	2120	I_A (uA)	730.0	746.0	760.0	774.0	787.0	801.0	814.0	828.0	842.0
		lgIA	-3.137	-3.127	-3.119	-3.111	-3.104	-3.096	-3.089	-3.082	-3.075

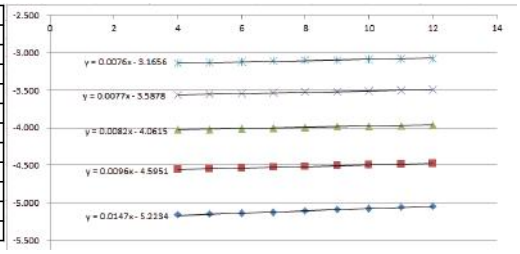
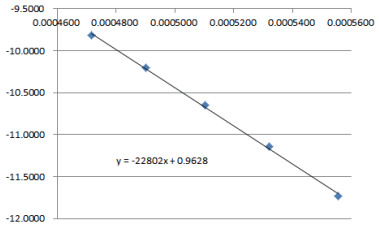
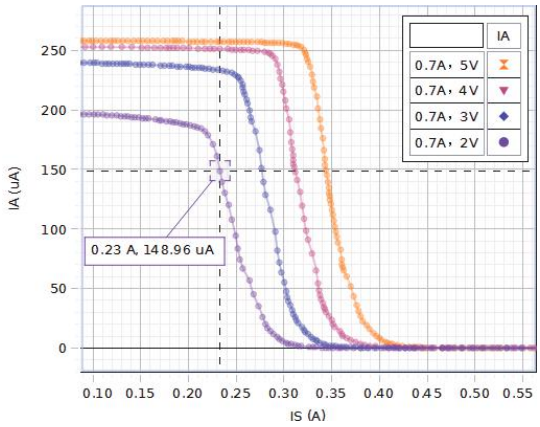


Table 2: The calculated values of lg(I / T2) and 1/T at different temperatures T

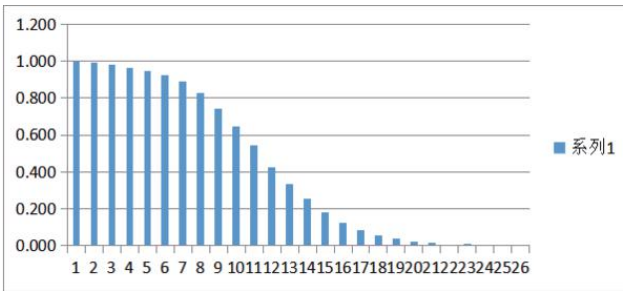
T / K	1800	1880	1960	2040	2120
lgI	-5.2234	-4.5951	-4.0615	-3.5878	-3.1656
lgT	3.2553	3.2742	3.2923	3.3096	3.3263
1/T(1/K)	0.0005556	0.0005319	0.0005102	0.0004902	0.0004717
lgI-2lgT	-11.7339	-11.1434	-10.6460	-10.2071	-9.8183

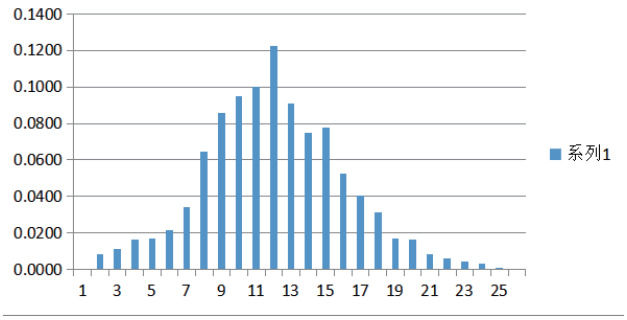


Experiment 2: Motion of electrons in radial electric field and axial magnetic field (measurement of electron charge-to-mass ratio using the magnetic control method)

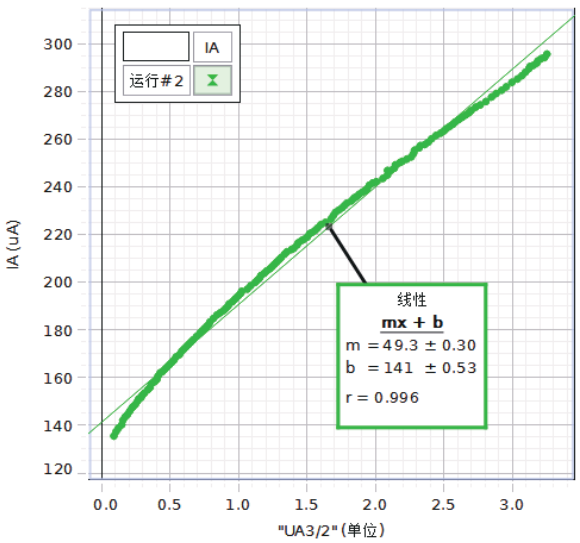


Experiment 3: Research on Fermi-Dirac distribution





Experiment 4: Volt-ampere characteristics of the ideal vacuum diode



Specifications

NO.	Part Name	Main Parameter
1	Metal Electric Work Function Experiment Apparatus	Anode Voltage Module: Voltage adjustable within 0 - 160VDC Anode Current Module: Measuring range 0 - 20mA Filament Current Module: Adjustable range 0 - 800mA
2	Adjustable DC (constant voltage and constant current) power supply I	Voltage is adjustable from 0 to 12.0V, Current is adjustable from 0 to 1.0A.
3	Ideal vacuum diode box	Filament material: Pure tungsten Anode material: Nickel Filament current: 0.50 - 0.80 A
4	Solenoid coil	560 turns

Configuration List

NO.	Part Name	Model	Qty.
1	Metal Electric Work Function Experiment Apparatus	BEM-5715	1
2	Adjustable DC (constant voltage and constant current) power supply I	BEM-5055	1
3	Ideal vacuum diode box	BEM-5716	1
4	Solenoid coil	BC-201026	1
5	BANANA RED PLUG	BC-104087	2
6	BANANA Black PLUG	BC-104088	2
7	4mm banana plug Connection Cable, 0.6m, red	BC-105084	1
8	banana plug Connection Cable, 0.6m, black	BC-105083	1
9	Connection Cable, 1m, Black	BC-105073	1
10	Connection Cable, 1m, Red	BC-105074	1
11	Power cord	BC-105075	1
12	8 pin connection cable	BC-105077	2

Giant Magnetoresistance Effect Experiment

BEX-8511

Summary

BEX-8511 refers to the phenomenon where the resistivity of magnetic materials undergoes significant changes when subjected to an external magnetic field compared to when no external magnetic field is present. Giant magnetoresistance is a quantum mechanical effect that arises from the layered magnetic thin-film structure. This structure is composed of alternating layers of ferromagnetic and non-ferromagnetic materials. When the magnetic moments of the ferromagnetic layers are parallel to each other, the scattering related to the carriers and spin is minimal, resulting in the material having the lowest resistance. When the magnetic moments of the ferromagnetic layers are antiparallel, the scattering related to spin is the strongest, and the material has the highest resistance.
The main contents of this experiment include the measurement and exploration of the magnetoelectric conversion characteristics of GMR analog sensors, the GMR magnetoresistance characteristics, and the magnetoelectric conversion characteristics of GMR switches (digital) sensors. The exploration of the application of GMR analog sensors in measuring current, the exploration of the characteristics of GMR gradient sensors and their applications, as well as the study of the principles and processes of magnetic recording and magnetic readout.

Features

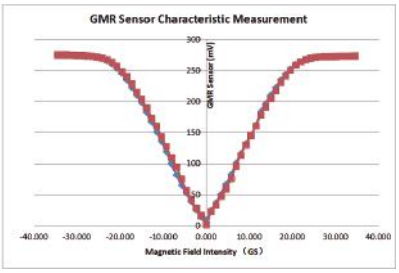
1. Modular Design – Four independent measurement modules: GMR basic characteristic, current, angular displacement, and magnetic card read/write.
2. Versatile Experiments – Supports 7 tests including GMR analog/digital conversion, magneto-resistance, current, solenoid field distribution, angular displacement, and card read/write.
3. Smart Data Interface – 4 data ports for PASCO software integration, enabling real-time high-speed data collection and analysis.

Main Experiment Contents

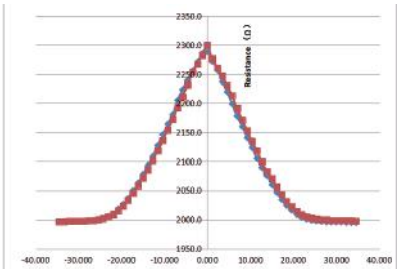
1. Measure the magnetoelectric conversion characteristic curve of the GMR analog sensor.
2. Measure the magnetoresistance characteristic curve of GMR.
3. Measure the magnetoelectric conversion characteristic curve of the GMR switch (digital) sensor.
4. Use the GMR sensor to measure the magnetic field distribution curve of the energized solenoid.
5. Use the GMR sensor to measure the current of the wire.
6. Use the GMR gradient sensor to measure the angular displacement of the gear, and understand the principle of the GMR rotational speed (velocity) sensor.
7. Implement the principle of magnetic card recording and reading through the GMR sensor.

Experiment Contents and Typical Data

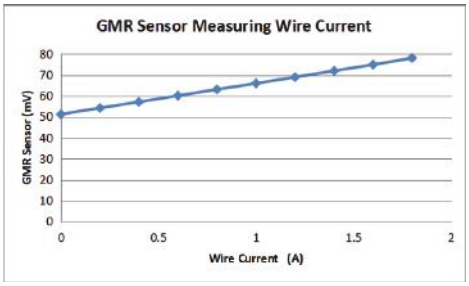
Experiment 1: Measurement of Magnetoelectric Conversion Characteristics in GMR Analog Sensors



Experiment 2: Measurement of GMR Magnetoresistance Characteristics



Experiment 3: Current Measurement Using GMR Analog Sensors



Specifications

NO.	Part Name	Main Parameter
1	Adjustable DC (constant voltage and constant current) power supply I	Adjustable voltage source: 0 - 12.0V with continuous adjustment range. Adjustable constant current source: 0 - 200mA / 0 - 1000mA with two continuous adjustment ranges.
2	DC voltage current meter I	Ammeter: two ranges of 2mA and 20mA, Voltmeter: two ranges of 200mV and 2V.
3	Basic Characteristic Measurement Module of Giant Magnetoresistance	The horizontal displacement of GMR sensor is ⩾ 80mm. Two experimental functional modules: including giant magnetoresistance measurement and sensor characteristic measurement.
4	Giant Magnetoresistance Current Measurement Module	The input current of the wire is adjustable within the range of 0 to 1A. The working voltage of the GMR sensor is adjustable within the range of 0 to 12V.
5	Giant Magnetoresistance Angular Displacement Measurement Module	Gear, the rotation angle is 0 ~ 180 degrees. The working voltage of GMR sensor is adjustable within the range of 0 to 0-12V.
6	Giant Magnetoresistance Magnetic card reading and writing Module	Magnetic card writing section: Digital signal 0 and 1 setting keys; Magnetic card reading section: GMR sensor operating voltage 0 - 12V adjustable.

Configuration List

NO.	Part Name	Model	Qty.
1	Adjustable DC (constant voltage and constant current) power supply	BEM-5055	1
2	DC voltage current meter I	BEM-5056	1
3	Basic Characteristic Measurement Module of Giant Magnetoresistance	BEM-5717	1
4	Giant Magnetoresistance Current Measurement Module	BEM-5718	1
5	Giant Magnetoresistance Angular Displacement Measurement Module	BEM-5719	1
6	Giant Magnetoresistance Magnetic card reading and writing Module	BEM-5720	1
7	4mm banana plug Connection Cable, 0.6m, red	BC-105084	4
8	4mm banana plug Connection Cable, 0.6m, black	BC-105083	4
9	Mini 8 pin cable	BC-105243	1
10	Power cable	BC-105075	2
11	8 pin connection wire	BC-105077	2

Comprehensive Microwave Optics System

BEX-8512

Summary

This apparatus precisely utilizes the generation, transmission and reception of microwaves, in conjunction with the spectrometer structure and some accessories, to conduct research on the characteristics of microwave fluctuations. The microwaves emitted from the signal source pass through structures such as the single/double slits and polarization plates on the central platform, resulting in phenomena such as diffraction, interference and polarization. These signals are then received by the receiver for recording and verification of the fluctuation characteristics of microwaves.

Features

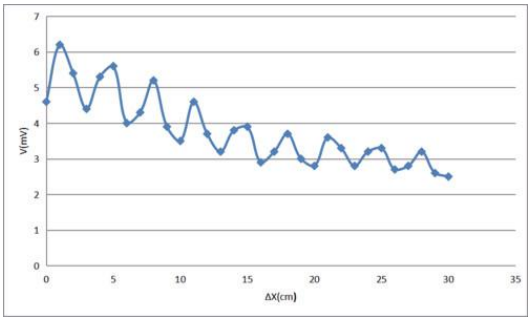
1. Rich accessories, basically covering the experiments on electromagnetic wave fluctuation characteristics.
2. Adopting a separate and combined mode, it is easy to assemble and disassemble. All components are designed innovatively, delicately and beautifully. It is convenient for students to design experimental schemes and assemble them by themselves.
3. The platform is equipped with a dedicated angle measurement synchronization device for upgrading to digital experiments. When used in conjunction with wireless rotation sensors, it can quickly and simply install and remove sensors.
4. A dedicated 8-pin analog voltage data acquisition port is designed at the signal output end for upgrading to digital experiments. When used in conjunction with wireless voltage sensors, it can achieve wireless automatic data acquisition and processing.
5. Mature solutions support the expansion of digital experiments. Without a computer, the wireless automatic data acquisition and processing can be realized by using the provided mobile APP software, achieving wireless digital real-time acquisition and real-time analysis.
6. Using cm-level microwaves, the experimental content is elevated from microscopic structures to large scales, allowing for simple observation and analysis of experiments.
7. The microwave power of the instrument is small, with less radiation to students, ensuring safety.

Main Experiment Contents

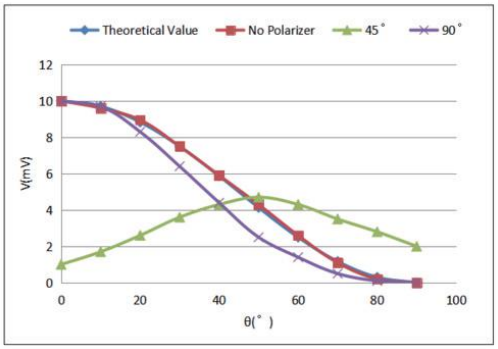
1. Learn the reflection phenomenon of microwave and deepen the understanding of wave theory.
2. Learn the single-slit diffraction phenomenon of microwaves.
3. Understand the interference characteristics of microwaves and calculate microwave wavelengths.
4. Understand the standing wave phenomenon of microwaves and use standing waves to measure microwave wavelengths.
5. Understand the refraction phenomenon of microwaves and calculate the refractive index of the specified material.
6. Observe and understand the polarization phenomenon of microwaves polarized by the horn.
7. Understand the principle of the Lloyd mirror and measure the microwave wavelength with the Lloyd mirror.
8. Understand the principle of Fabry-Perot interference and calculate the microwave wavelengths.
9. Understand the working principle of Michelson interference and calculate the microwave wavelengths.
10. Understand the polarization characteristics of microwaves and find the Brewster angle.
11. Understand the principle of the Bragg diffraction experiment, verify the Bragg formula by microwave diffraction on a simulated crystal and measure the distance between the crystal planes of the cubic crystal array.
12. Understand the propagation characteristics of microwaves in fibers.

Experiment Contents and Typical Data

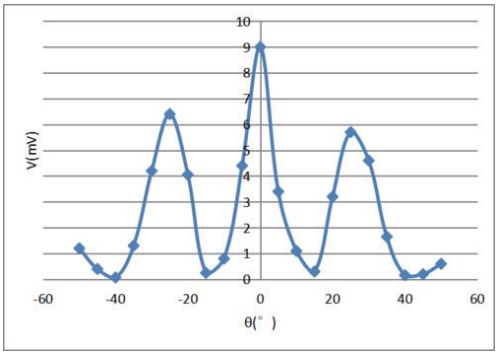
The relationship between the received voltage and the position



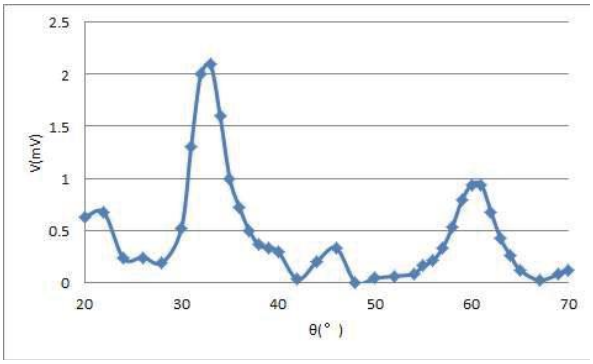
Under different angles of the polarizing plate, the received signals at various angles were measured.



The relationship between the voltage of double-slit interference and the angle of rotation



The relationship between voltage and rotation angle in the Bragg diffraction process



Specifications

NO.	Part Name	Main Parameter
1	Microwave signal generator	Microwave frequency: 10.5 GHz
2	Signal amplifier	The design features a dedicated 8-pin analog voltage data acquisition port.
3	Experiment platform	The diameter of the central platform is 20 cm; the fixed arm is 50 cm long; the movable arm is 70 cm long.
4	Movable post	Fixed transmitter and receiver
5	Test accessory group	Reflective plate, single slit plate, double slit plate, transmission plate, polarization plate
6	Crystal Array with Holder	Metal balls are arranged in parallel to form a cubic structure.

Configuration List

NO.	Part Name	Model	Qty.
1	Microwave signal generator	BEM-5722	1
2	Signal amplifier	BEM-5734	1
3	Experiment platform	BEM-5727	1
4	Microwave signal transmitter component	BEM-5725	1
5	Microwave signal receiver component	BEM-5726	1
6	Movable post	BEM-5232	2
7	Test accessory group	BEM-5233	1
8	central post	BEM-5234	1
9	Movable post, fixed accessories	BEM-5235	2
10	Prism with Holder	BEM-5236	1
11	Crystal Array with Holder	BEM-5237	1
12	Auxiliary pump	BEM-5238	2
13	N-JJ dual-color cable	BC-105262	1
14	BNC-JJ cable	BC-105261	1
15	Horizontal bubble	AP-A1028	1

Optional

BC-121510 Limit Pin
BC-121593 Rotation Transmission Fixing Base

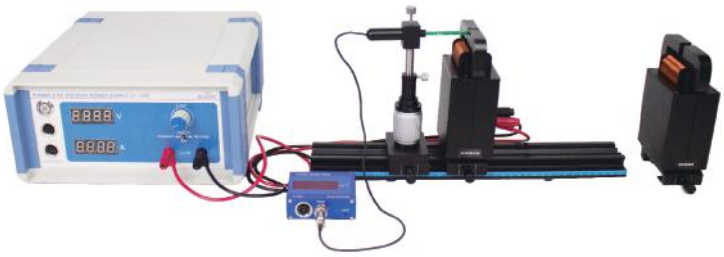
Magnetic Hysteresis Loop Apparatus

BEX-8513

Summary

BEX-8513 is an apparatus that can be used to measure the magnetic hysteresis loop of magnetic materials. The common Magnetic Hysteresis Loop Apparatus basically adopts the principle of electromagnetic induction, that is, observing the magnetic hysteresis loop through an oscilloscope. However, the images displayed by the oscilloscope correspond to the voltage of the sampling resistor of the magnetizing coil and the voltage across the capacitor of the secondary coil, which belongs to an indirect measurement method.

BEX-8513 is based on the Hall Effect principle, which converts magnetic fields into Hall potentials, making electromagnetic measurement simpler and more intuitive, and also beneficial for students to understand the use of Hall elements. By combining the digital acquisition function of BEX-8513, students can flexibly control and adjust the electromagnetic intensity, and even observe the changing trend and characteristics of magnetic materials segment by segment. The highly modular feature allows the power supply and Teslameter in the kit to be used completely independently. In addition, soft electromagnetic components can be selected as needed to compare the differences between hard and soft magnets.



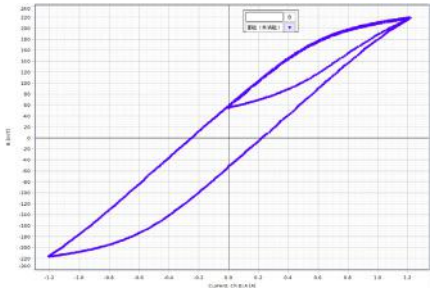
Features

1. Hall method principle, simpler and more intuitive measurement
2. Master the magnetic hysteresis loop and understand the practical application of Hall Effect
3. Modular design: power supply, Teslameter and electromagnetic coil can be used independently
4. Rich digital interfaces allow for intuitive and convenient observation of magnetic hysteresis loop phenomena

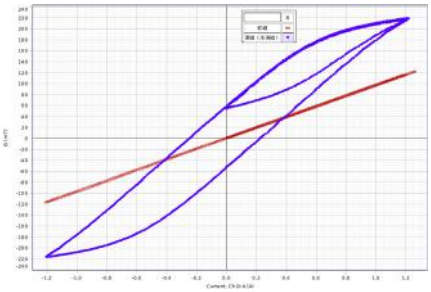
Main Experiment Contents

1. Electromagnetic distribution measurement in magnetic samples
2. Magnetic hysteresis loop measurement
3. DC demagnetization of magnetic materials
4. Magnetic hysteresis loop measurement of different materials

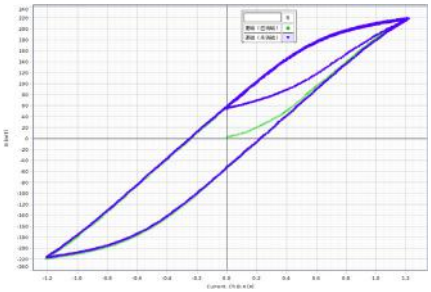
Experiment Contents and Typical Data



Hard magnetic hysteresis loop

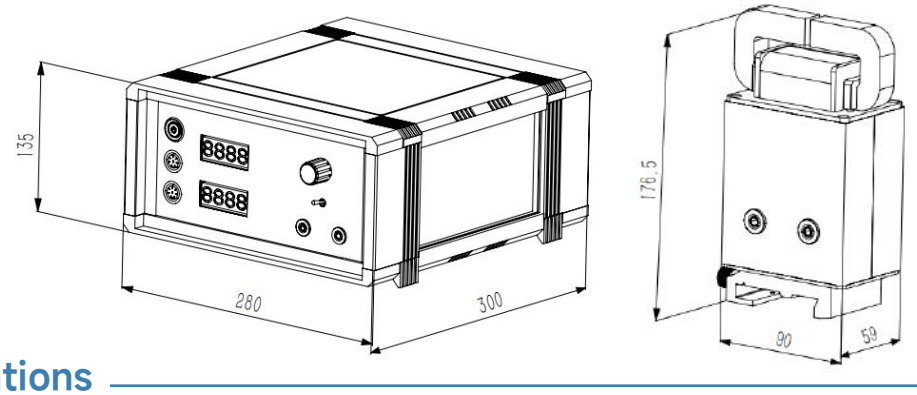


Soft magnetic hysteresis characteristics



Hard magnetic demagnetization effect

Dimensions



Specifications

NO.	Part Name	Main Parameter
1	Adjustable constant voltage power supply (0-12V)	Voltage: 0-12V, resolution: 10mV Current: 0-1.5A, resolution: 1mA
2	Teslameter	0-2000mT, accuracy 0.1mT
3	Hard Electromagnetic Coil	Hard magnetic material, U-shaped magnetic field coil, 1000 turns
4	Soft Electromagnetic Coil	Soft magnetic material, U-shaped magnetic field coil, 1000 turns
5	Track	Length 400mm

Configuration List

NO.	Part Name	Model	Qty.
1	Adjustable constant voltage power supply (0-12V)	BEM-5060	1
2	Hard U-Core Electromagnetic Coil	BEM-5067	1
3	Track, length 400mm	BEM-5201-04	1
4	Optical Carrier, length 50mm	BEM-5204-50	1
5	Adjustable Post Holder	BEM-5205-25	1
6	Post, length 90mm	BEM-5209-09	1
7	Teslameter	BEM-5032A	1
8	Soft U-Core Electromagnetic Coil (optional)	BEM-5022	1
9	8 Pin cable	BC-105077	2
10	Power cable	BC-105075	1

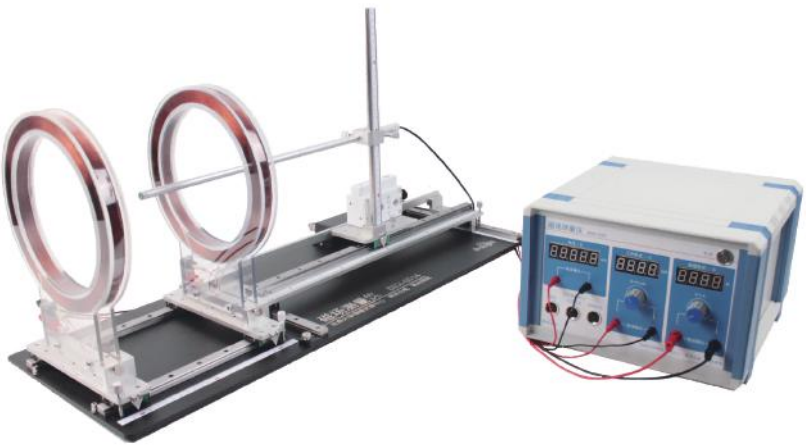
Magnetic Field Measurement Apparatus

BEX-8514

Summary

BEX-8514 is a new launched magnetic field measurement apparatus developed with the Physics Experiment Center of Southeast University after extensive market research and analysis of similar products at home and abroad. Compared with some existing Helmholtz coil magnetic field measurement products in the market, BEX-8514 has made some innovative designs from the customer's perspective in terms of practicality and ease of use, effectively solving the pain points of use.

Meanwhile, BEX-8514 continues to adhere to the concept of modular and digital design of Brolight products. The product includes modules such as power supply chassis, magnetic field coil moving component, Hall probe moving component, Hall signal sampling component, coil component, and Zero adjustment control box, which are convenient for maintenance and storage; the digital interface reserved on the power supply chassis is convenient for connecting digital acquisition instruments and processing software to realize efficient measurement and analysis.



Features

- Original practical design, synchronous track displacement measurement based on rotation sensor, realizes digital expansion measurement of displacement in the simplest and most efficient way
- Industrial grade materials, using professional linear guides and strict machining processes to ensure product quality

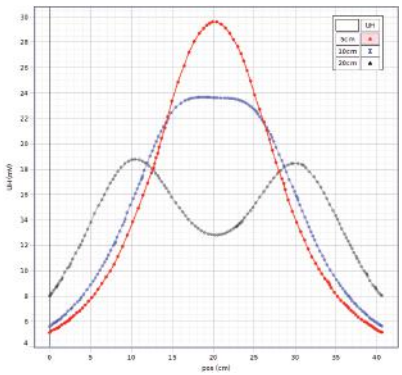
- Modular coil moving components and probe moving components meet the requirements of flexibility, ease of use, maintenance and storage
- Various coil types, supporting more expansibility application research

- Rich digital design interfaces for easy and fast installation and connection

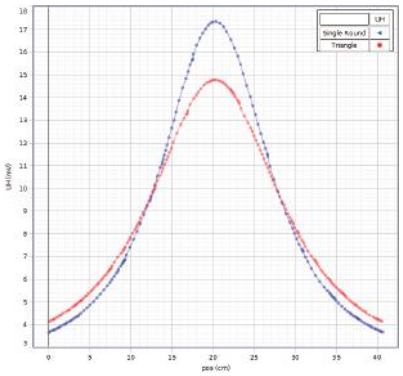
Main Experiment Contents

1. Measurement of axial magnetic field distribution of single coil
2. Measurement of axial magnetic field distribution of double coils
3. Measurement of magnetic field distribution of other coils
4. Measurement of transverse magnetic field distribution of coi

Experiment Contents and Typical Data

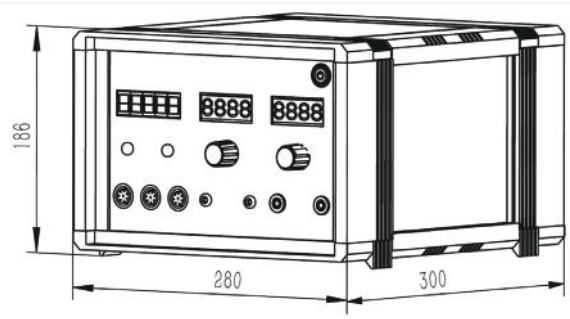


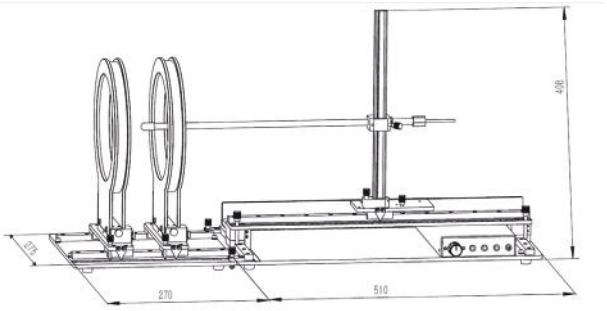
Axial magnetic field distribution curve of double coil



Axial magnetic field distribution curve of single coil

Dimensions





Specifications

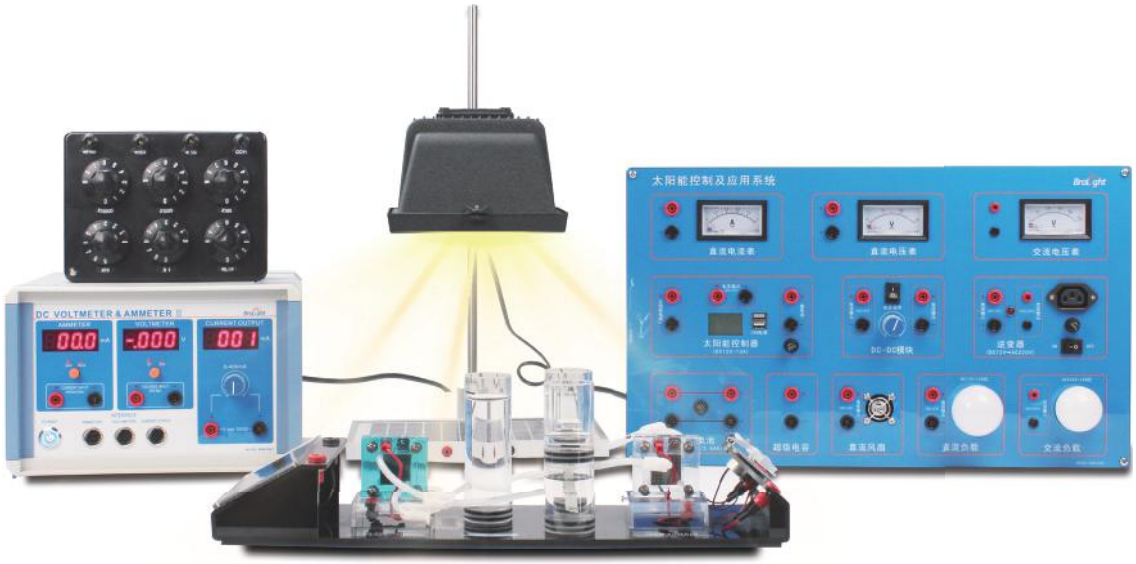
NO.	Part Name	Main Parameter
1	Hall probe component	Built-in Hall element, Hall current < 20mA, Hall sensitivity ⩾ 2000mV/(mA·T)
2	Hall probe moving component	Scribed Z-axis linear guide, a pair of X-axis linear guides installed parallelly with scales, rotating sensor adapter, rotating sensor roller track, aluminum alloy fixed base plate, supporting XYZ three-axis continuous adjustable magnetic field measurement probe
3	Magnetic field coil moving component	The distance between the two coils can be continuously adjusted within the range of 0.5R to 2R. The current position can be identified through the scale ruler, with a resolution of 1mm. It uses standard industrial linear guides, ensuring smooth adjustment without any jamming.
4	adjustment control box	Support for zero magnetic field voltage
5	Circular coil component	The coil support frame is made of colorless and transparent materials. The fixing method of the coil module enables quick disassembly and assembly, facilitating the replacement of different types of coils.
6	Power supply of Magnetic Field Measurement Apparatus	Current: Adjustable from 0 to 1A continuously, Current: Adjustable from 0 to 10mA continuously, Voltage measurement range: ±199.99mV, Includes 3 digital acquisition interfaces

New Energy Experiment

BEX-8602

Summary

This system adopts a modular building-block design that enables students to personally assemble components like gas storage tubes and electrolysis modules, effectively developing their practical skills. It integrates both fuel cells and solar cells to form a complete energy conversion chain, complemented by versatile load modules and convenient data acquisition interfaces for real-time performance analysis. The environmentally-friendly design ensures efficient, clean energy experiments with minimal waste, making it ideal for hands-on renewable energy education and research.



Features

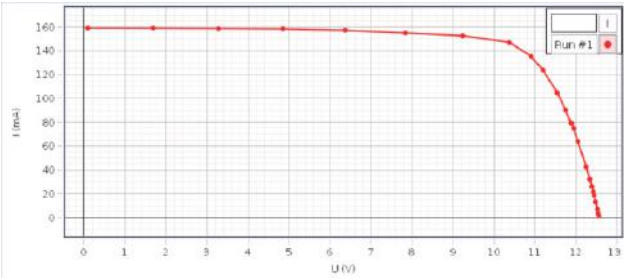
1. Adopt the building block design, students can build up the Gas reservoir, Electrolysis Module, Fuel Cell Module and other components by themselves; Train students' experimental construction and hands-on ability;
2. This experiment contains multiple energy conversion links, which organically combine fuel cells and solar cells to form a complete chain of energy conversion, storage, and use.
3. Variety of solar cell load modules: the experiment is rich in content, and the experiment process is environmentally friendly and clean.

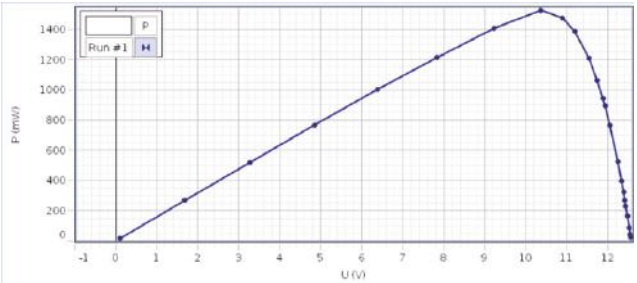
Main Experiment Contents

1. The current-voltage characteristics and power-voltage characteristics of solar cells.
2. The output characteristics of hydrogen-oxygen fuel cells.
3. The charging characteristics of supercapacitors.

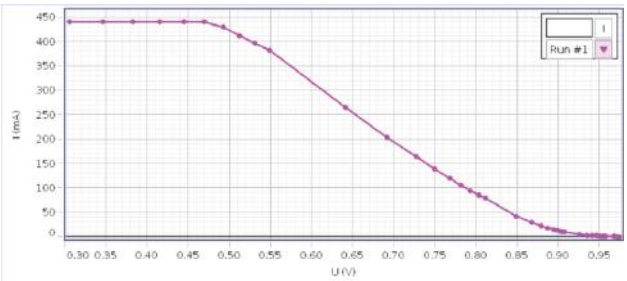
Experiment Contents and Typical Data

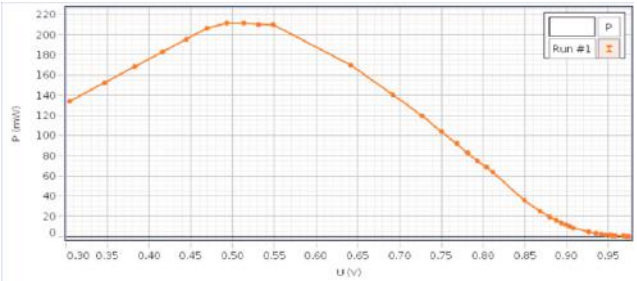
Output characteristics of solar cells: current-voltage characteristics and power-voltage characteristics



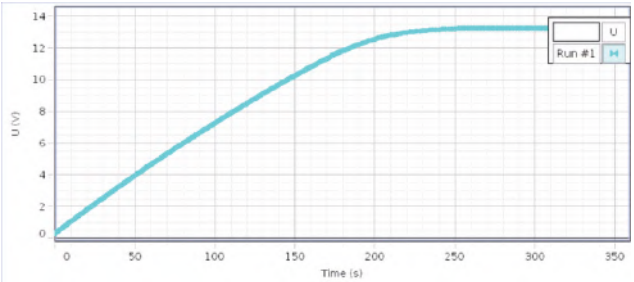


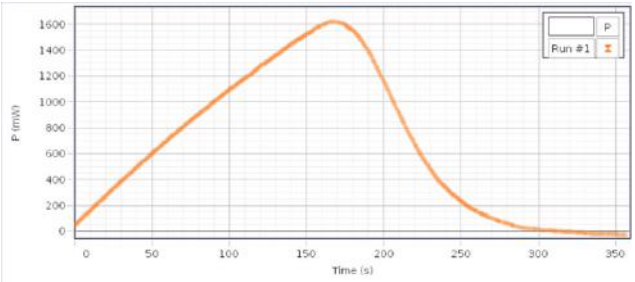
Output characteristics of hydrogen-oxygen fuel cells

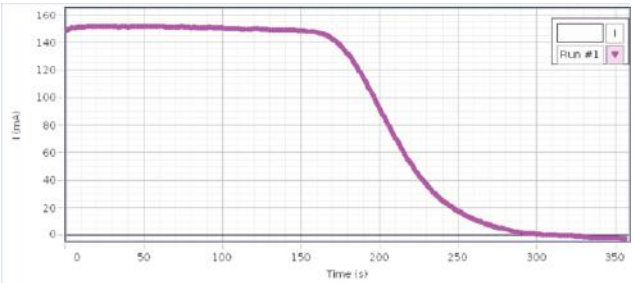




The charging characteristics of supercapacitors







Specifications

NO.	Part Name	Main Parameter
1	Hydrogen-oxygen fuel cell experiment	1) Two energy output display methods: fan and LED lamp. The LED lamp has self-flashing function; 2) Both the gas storage tank and the water storage tank adopt double O-ring seals to ensure the reliability of the experimental data.
2	Solar energy control and application system	1) Pointer-type DC voltmeter: 0 - 30.0V; Pointer-type DC ammeter: 0 - 1.0A; 2) Pointer-type AC voltmeter: 0 - 250V; 3) Solar controller: DC12V/10A
3	DC Voltage Current Meter II	1) DC voltmeter: DC voltage meter Voltage range: 0~20V and 0~2V, range can be switched by manual button. 2) DC ammeter: Current range: 0~200.0mA and 0~2000mA, range can be switched by manual button. 3) DC adjustable constant current source: Current output range: 0~400mA, adjustable continuously.
4	solar cell	Rated Voltage: 12V
5	Halogen tungsten lamp source and bracket	Halogen tungsten lamp source: 150W
6	DC resistance box	6 steps, 0 - 99999.9 Ω

Configuration List

NO.	Part Name	Model	Qty.
1	Hydrogen-oxygen fuel cell experiment	BEM-5031	1
2	Solar Energy Control and Application System	BEM-5735	1
3	DC Voltage Current Meter II	BEM-5057	1
4	Solar Cell	BC-105263	1
5	Halogen tungsten lamp source and bracket	BEM-5743	1
6	DC resistance box	ZX-21	1
7	2mm banana plug with sheath for connecting wires, red	BC-104087	1
8	2mm banana plug with sheath for connecting wires, red	BC-104088	1
9	4mm Banana Plug Connected Wire, Red	BC-105084	5
10	4mm Banana Plug Connected Wire, black	BC-105083	5
11	4mm Banana Plug Connected Wire, Red	BC-105292	1
12	4mm Banana Plug Connected Wire, Black	BC-105293	1
13	Power cord	BC-105075	1
14	Eight-pin interface cable	BC-105077	2

Solar Cell Characteristics Testing Apparatus

BEX-8603

Summary

In this experiment, a tungsten iodide lamp is used to simulate sunlight, and then directed onto solar panels to generate electricity. The irradiance of sunlight at different positions is measured using an irradiance meter. This enables the measurement of the output characteristics of three types of solar cells under illumination, and the determination of their short-circuit current (ISC), open-circuit voltage (UOC), maximum output power (Pmax), and fill factor (FF). The fill factor is an important parameter that represents the performance of solar cells.

Features

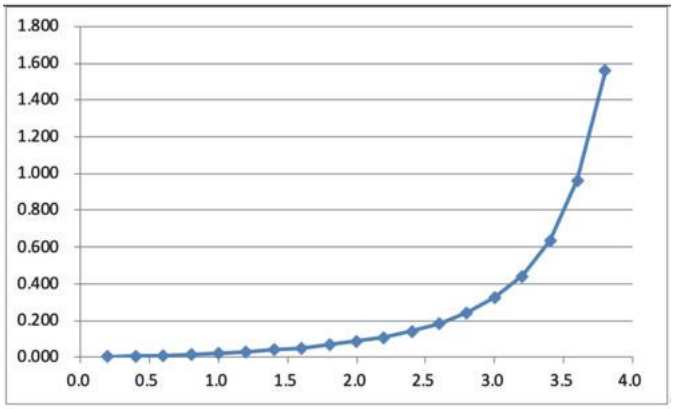
1. Adopt the building block design, students can replace different solar cell sample components by themselves.; Train students' experimental construction and hands-on ability;
2. This experiment contains multiple energy conversion links, which organically combine fuel cells and solar cells to form a complete chain of energy conversion, storage, and use.
3. Includes three types of solar cell modules: monocrystalline silicon, polycrystalline silicon, and amorphous silicon, the experiment is rich in content, and the experiment process is environmentally friendly and clean.

Main Experiment Contents

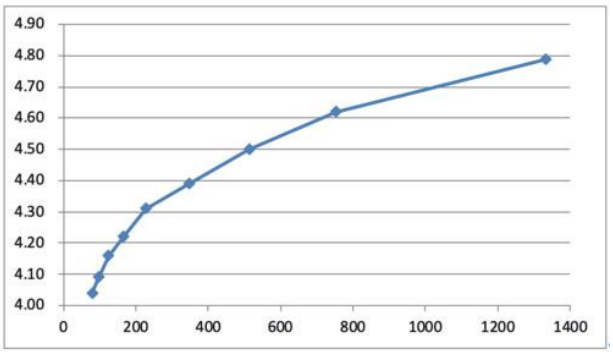
1. Measure the open circuit output voltage and short circuit current of solar cells under different light intensities
2. The voltage-current characteristic of the applied voltage of the solar cell under full dark conditions
3. Measurement experiment of solar cell output characteristics under light
4. Measurement of the inverse-square relationship between light radiation and distance (extension);

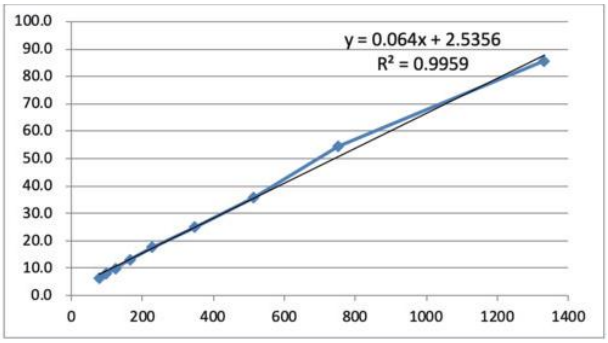
Experiment Contents and Typical Data

The volt-ampere characteristics of solar cells under total darkness conditions

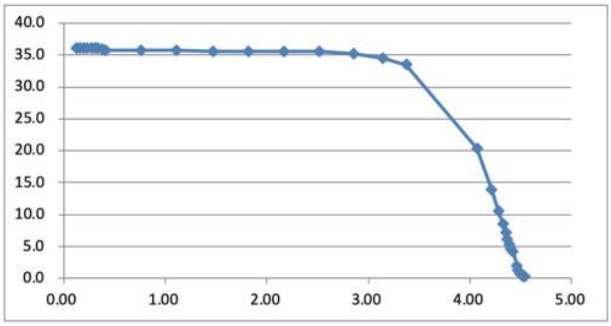


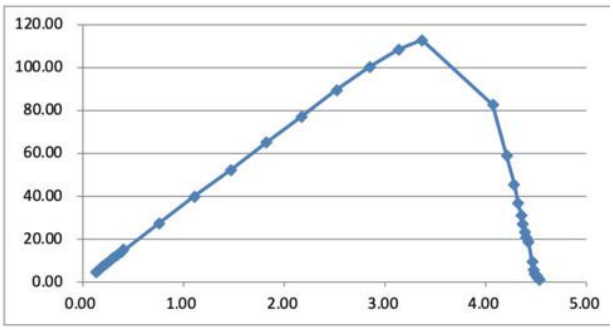
Measure the open-circuit output voltage UOC and the short-circuit current ISC of the solar cell under different light intensities





Measure the open-circuit output voltage UOC and the short-circuit current ISC of the solar cell under different light intensities





Specifications

NO.	Part Name	Main Parameter
1	Solar cell characteristic testing apparatus	Voltage meter: 2.000V, 20.00V Current meter: 2.000mA, 200.0mA
2	Solar cell sample group	Three types of solar cells
3	Track	Length 600mm
4	Halogen tungsten lamp source and bracket	100W
5	DC resistance box	6 steps 0-99999.9Ω

Configuration List

12NO.	Part Name	Model	Qty.
1	Solar cell characteristic testing apparatus	BEM-5737	1
2	Solar cell sample group	BEM-5739	1
3	Solar cell sample holder	BEM-5740	1
4	Track	BEM-5201-06	1
5	Halogen tungsten lamp source and bracket	BEM-5742	1
6	DC resistance box	ZX-21	1
7	4mm banana plug connected wire, red	BC-105084	2
8	4mm banana plug connection wire, black	BC-105083	2
9	4mm banana plug to U-shaped socket wire, red	BC-105292	1
10	4mm banana plug to U-shaped socket wire, black	BC-105293	1
11	BNC to banana plug adapter cable	BC-105192	1
12	Power cord	BC-105075	1

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