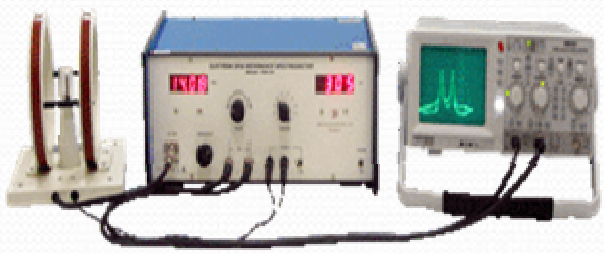
Electron Spin Resonance Spectrometer

KS/PHY/ELECSPRESSPEC

Exp-Determination of lande-g-factor
Required Components For the experimental Set-Up
Complete Experimental Set up
Experimental Kit
With Helmholtz coils (152mm dia with 500 tums) 180x180x185mm separate coil arrangement
Pickup coil with 40 turn and DPPH sample
Built-in Digital frequency meter
Complete unit housed in metal cabinet of 385x2.10x165mm with effective electromagnetic shielding
Proper cables RG-591 for connection with oscilloscope included with the setup

- FET based marginal R.F. Oscillator
- Digital display of frequency
- Excellent peaks display
- Digital display of Helmoltz Coil Current
- Compatible with general purpose CRO in X-Y mode
- Advantages and Limitations of our Spectrometer:



- The instrument is basically designed for postgraduate laboratories keeping in view their requirements and limitations.
- The observation of ESR at low magnetic fields and consequently in radio-frequency region makes its instrumentation and working a lot simple and within the reach of a postgraduate students. Good resonance peaks can be obtained as a class room exercise.

The spectrometer is complete in all respects including a sample DPPH.

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Digital Gauss Meter

Purpose

A Digital Gauss Meter measures magnetic flux density (magnetic field strength) in gauss (G) or tesla (T). It is used in physics labs, material testing, magnet characterization, and electromagnetic device analysis.

Principle

Most digital Gauss meters operate using a Hall-effect sensor. When the sensor is placed in a magnetic field, a voltage proportional to the field intensity is generated. The meter amplifies, conditions, and digitizes this voltage to display magnetic field strength.

Key Components

Hall probe

- Axial probe for fields parallel to the probe axis
- Transverse probe for fields perpendicular to the probe axis

Probe handle and cable

- Shielded to minimize noise

Control and display unit

- High-gain amplifier
- Analog-to-digital converter
- LCD/LED digital readout
- Range selector

Calibration magnet or zero-field chamber

- For zeroing and calibration

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Digital Gauss Meter

KS/PHY/DIGGAUSSMTR

Power supply

Internal battery or DC adapter

List of Experiment

Measurement of magnetic field

Digital Gauss meter with GaAs Transverse Probe

Range: 0-2KG, 0-20KG and

7 segment LED display with accuracy 0.5%

Complete unit housed in metal cabinet of 260x200x110mm with effective electromagnetic shielding

Cabinet shall be powder coated with plastic moulding on edges

Range : 0-20 K.Gauss/ 0-20 K Gauss

Accuracy 1% of reading

Display : LCD display (16X2) with backlight

Microcontroller based

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Constant Current Power Supply

KS/PHY/CONSCURRNTPS

Purpose

A constant current power supply delivers a fixed, regulated current to a load regardless of changes in load resistance or input voltage. It is used for LED driving, battery charging, sensor biasing, and laboratory experiments requiring stable current.

Principle

Current regulation is achieved by sensing the load current through a resistor and controlling the output via a feedback loop so that:

Iout=Vref / Rsense

Any change in load voltage or resistance is compensated by adjusting the output voltage to keep the current constant.

Core Components

Current-sense resistor

- Low-value resistor for accurate current measurement

Error amplifier or op-amp

- Compares sensed voltage with reference

Reference voltage source

- Provides a stable set-point

Series pass element

- Power transistor or MOSFET
- Adjusts voltage to maintain constant current

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Constant Current Power Supply

KS/PHY/CONSCURRNTPS

DC supply input
- Often 12 V, 24 V, or adjustable

Protection circuitry
- Thermal, over-voltage, and short-circuit protection

Output terminals with current indicator
- Digital meter or LED display

List of Experiments

To provide constant current to an electromagnet

Constant Current Power Supply (transistor based) for an electromagnet (0-4A current) continuously variable.

Complete unit housed in metal cabinet of 390x280x160 mm with effective electromagnetic shielding

Cabinet shall be powder coated with plastic moulding on edges.

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Photoconductivity

List of Experiments
To study the current vs voltage characteristics of CdS photoresistors at constant irradiance
To measure the photo current as a function of irradiance at constant voltage

OPTICAL BENCH
Material: Aluminium alloy
Type: Hexagonal Section
Scale: 0 - 100 cm
Least count: 1 mm

POWER SUPPLY 0-16V
Voltage: 0-16 Volt DC continuously variable & stabilized
Ripple: Less than 25mV
Overload protection: Current limiting
Current: 1 Amp. continuously variable from 10% to full rating
Display: Two separate displays (3 digit LED) are provided to monitor the output voltage and load current continuously
Working voltage: 230V AC, 50 Hz single phase

PHOTORESISTOR LDR IN MOUNT
Photo resistor: CdS (Cadmium sulphide)
Aperture: 10 mm, Clear
Mounting rod: 10 mm dia.
Connection: 4mm safety terminals
Working voltage: 0-16V DC

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Photoconductivity

CONVEX LENS IN HOLDER **KS/PHY/PHOTOCONDCVTY**

Focal Length: 100mm
Diameter of Lens: 50 mm
Frame Diameter: 130 mm to avoids scattering of lights
Rod Diameter: 10 mm

POWER SUPPLY 12V AC/DC

Output: 2, 3, 4, 5, 6, 8, 10 & 12 VAC full wave rectified, unsmoothed & unregulated DC
Overload: Resettable thermal trip.
Input: 230 V AC, 50 Hz

LAMP HOUSING

Lamp: 12V, 21V
Lens: Spherical condenser, to and fro adjustment
Connection: 4mm plug lead
Mounting rod: 10 mm dia.
Housing Aluminium, Heat ventilation arrangement

Photoconductivity Experimental Set up: Setup on a aluminium profile type optical bench with rides, halogen light source variable power with housing. Mounted photo conductor with BNC and Cable, DC regulated power supply with meter, lens with lens mount. Filters in filter when in visible wavelength (400-700nm) with FWHM 10nm and various accessories like DMM and cables.

Learning Objectives/experiments
< To study the current vs voltage characteristics of CdS photo-resistor at constant irradiance.
< To measure the photo-current as a function of the irradianceat constant voltage.

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Faraday Effect with Diode Laser

List of Experiments **KS/PHY/FARADYEFF**

Exp-1: Observing the rotation of the polarization plane when polarized monochromatic light passes through flint glass under influence of a magnetic field.
Exp-2: Determining Verder's constant from the relation between motion angle and magnetic flux.
Exp-3: Verification of the relationship between Verdier's constant and wavelength
Flint Glass: DEDF glass, size 15x15x15mm
HC Power supply 0-30V DC, 10A, 31/2 Display LED
Digital Gauss meter
Range 2KG & 20 KG,
Resolution 1G &10G,
Sensor: In As
Electromagnet coil: 500 T coil, 7Amp (Max), 185WG, Cu,
Electromagnet Core: Ferromagnetic, 40x40mm cross section,
Optical beach
Al exclusion,
L= 1mtr,

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Faraday Effect with Diode Laser

KS/PHY/FARADYEFF

Triangular shape with end stop, 4 SS leveling screw
Transversal slider: Al, 25-0-25mm, LC 0.01mm
Fixed slider: Al, Base width 50mm, Height 115mm
Diode laser
Wavelength 532nm, 5mW, Class II
Scope of delivery
Flint glass with Holder
Electromagnet unit with slider
Polarizer/Analyzer
Object screen
Optical bench, 1 m
Fixed slider
Power supply (0-30V DC,10A)
Digital gauss meter with probe
Hall probe holder
Convex lens (F=10cm)
Cylindrical base
Green Diode laser
Power Adapter

OPTICAL BENCH TRIANGULAR Material : Aluminum extrusion
Type : Triangular shape Scale : 0-100cm
Least count : 1mm
This optical bench is rigid, heavy, stable and long lasting.
It has
four levelling screw and flexible feets. **He-Ne LASER** Wavelength :
632.8 nm Working current : 4mA ~ 6mA
Output power : > 2mW Working time : > 8 hrs.
Working voltage : AC 220 V ± 22 V Input Power : <2 W
Dimension : 300x62x82 mm Weight : 1.5 kg (approx.)
DIODE LASER
Peak wavelength : 635nm Operating voltage : 5V DC
Operating current : 250mA Optical power : 0.4-0.8mW
Laser product : Class II Operating temp. : 0 - 40°C
Storage temp. : -10 to 50°C

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Study of pn Junction & Energy Band Gap

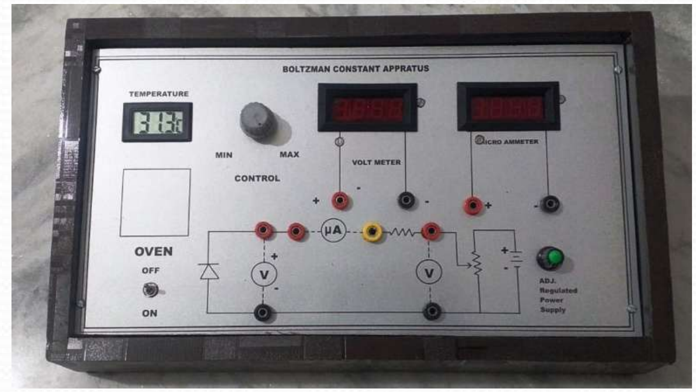
KS/PHY/PNJN&ENGYBNGP

List of Experiment
Exp-1 Determination of reverse saturation current.
Exp-2 Study of Energy Band Gap of p-n Junction
Exp-3 Study of Junction capacitance

P-N JUNCTION SETUP
Selector Switch: V-I and V-T experiment, Bias & Junction
Selector Switch at V-I position/Junction
Voltmeter Display: 31/2 digit, 7 segment LED, auto polarity
Voltage Range: 0.000-1.999V
Current Display: 31/2 digit, 7 segment LED
Current Range: 0-20mA

Selector Switch at V-T position/Junction
Voltage Display 3 1/2 digit, Tsegment LED
Voltage Range: 0.000-1.999V
Temperature Display: 3 1/2 digit, 7 segment LED
Temperature Range: 273 K le 353 K

CRO in Bias Position
Frequency: 5 KHz & 20 KHz
Voltage: 220 mV (p-p)
Output Connector: 3 Pin, DIN type
Voltage Range: 0.00-10.00V
Oven Connector: 5 Pin, DIN type
Diode & Transistor: 4 mm safety socket
Input Voltage: 220 V, 50 Hz AC



OVEN WITH TEMPERATURE SENSOR
Hosting Element: 35 ohm
Oven Connector 5 PiN, DIN type
Ambient Temperature 353
Temperature Sensor: Pt 100

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Kerr Effect Experiment Kit

KS/PHY/KERREFFEXP

Purpose

A Kerr Effect Experiment Kit is used to study the **Electro-Optic Kerr Effect**, where an applied electric field induces birefringence in an optical medium. This results in rotation of light polarization, allowing measurement of Kerr constants and modulation of light intensity.

Principle

When a strong electric field E is applied across a Kerr medium (commonly nitrobenzene), the refractive index changes proportionally to E^2:

Δn=K E^2

This induced birefringence converts linearly polarized light into elliptically polarized light. Using crossed polarizers, the intensity change is measured as a function of voltage.

Exp-1 To demonstrate the Kerr effect in nitrobenzene solution (only observation)

Exp-2 To measure the light intensity as a function of voltage across the Kerr cell using photodetector

Kerr Cell

Electrode gap: 1mm

Voltage limit: 5 kV, DC (max

Dimensions: 50x50x20 mm

Polarizer/Analyzer

Angle: Adjustable (0 - 90 deg)

Aperture: 21mm dia

Frame 130mm dia Blackrood, to avoid scattering of light

Rod: 10 mm dia

Least count: 1 deg

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Kerr Effect Experiment Kit

KS/PHY/KERREFFEXP

Halogen Light Source

Halogen bulb :12V, 50W
Operating voltage: 12V, 5A
Safety sockets: 4 mm
Rod dia: 10mm

Object screen

High voltage power supply

Input voltage: 230V AC 50Hz
Output Voltage: 0- 6KV DC: 6.3V AC/2 Amp
Display: 31/2 digit LED
Current limit: 50 μA & 2 mA(Max.)

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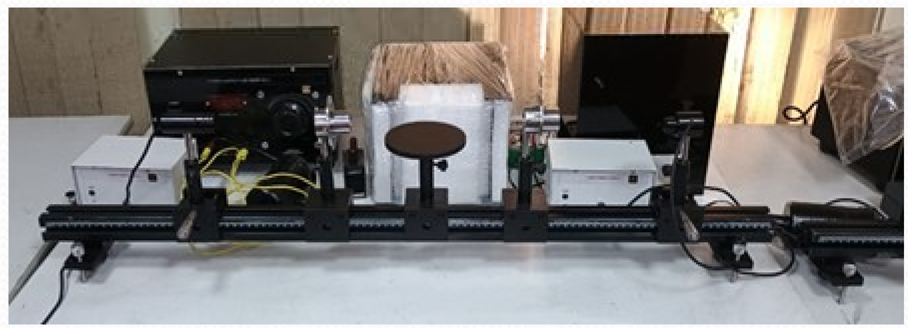
Kerr Effect Experiment Kit

KS/PHY/KERREFFEXP

<u>Power Supply</u>
Output: 2,3,4,5,6,8,10 & 12VAC full wave rectified, unsmoothed & unregulated D.C.
Overload: Resettable thermal trip.
Input: 230 VAC, 50 Hz

<u>Prism Table</u>
Optical bench triangular
Material: Aluminum extrusion
Type: Triangular shape
Scale: 0-100cm
Least count: 1mm
This optical bench is rigid, heavy, stable and long lasting. It has four levelling screw and flexible feets
Convex lens in holder
Set of six filter
Flexible plug lead
Transversal slider
Pin hole photodetector
Digital Multimeter
Power cord
Fixed slider
Fixed optical slider



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Zeeman Effect Experiment Kit

KS/PHY/ZEEMANEFF

Purpose

The Zeeman Effect Experiment Kit is used to study the splitting of atomic spectral lines when an external magnetic field is applied. This experiment verifies electron orbital magnetic moment theory and allows determination of the **Landé g-factor**.

Principle

When an atom is placed in a magnetic field BBB, its energy levels split according to:

ΔE=ml μB B\Delta E = m_l \, \mu_B \, BΔE=mlμBB This causes a single spectral line to split into multiple components (normal or anomalous Zeeman effect). Using an interferometric or high-resolution spectroscopic setup, these split components are observed and measured.

Experiment

EXP 1. To observe the Zeeman splitting of the green (546.1nm) mercury Line using Fabry-Perot etalon for normal

EXP 2. transverse and longitudinal configuration

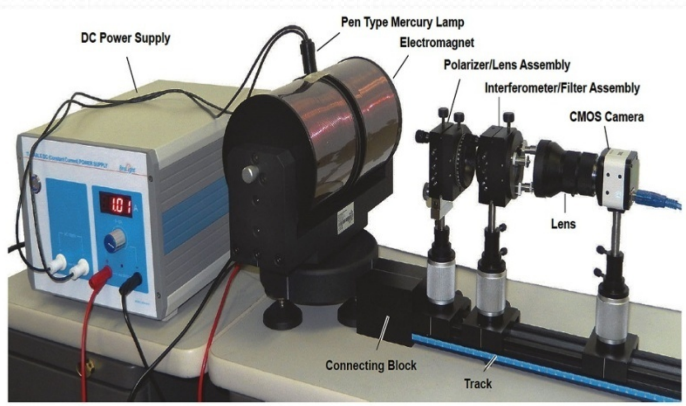
EXP 3. Determination the polarizacion as of the triplet components in transverse configuration

EXP 4. Determining the polarization state of the doublet components is longitudinal configuratio

Electromagnets

Ferromagnetic core, Coils 500 T. Current 5A (max), 4 mm safety socket

U Core 150 x 130 mm (LxH), 40 x 40 mm, cross section, I Core L=150mm



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Zeeman Effect Experiment Kit

KS/PHY/ZEEMANEFF

Fabry Perot Etalon

Mirror optics Lamda/20, Mirror gap 3mm, Filter 532nm, Green Interference Filter, Clear View 40mm dia, Rod 10 mm dia

CMOS Camera

1.3 MP, USB Interface

Power Supply

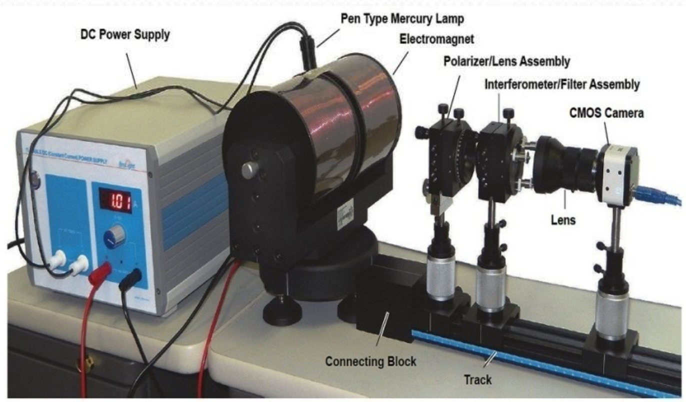
0-40V DC, 0-10A, voltage resolution 0.1V, display 3 1/2 digit LED, Current resolution 0.1A, primary fuse 8A

Optical bench

Al exclusion, 1-1.5 mm with Scale, Triangular shape with endpoint leveling (steel scre

Optics holder

AI Dia 130 x3 mm ***(Φx T)***, H 230 mm



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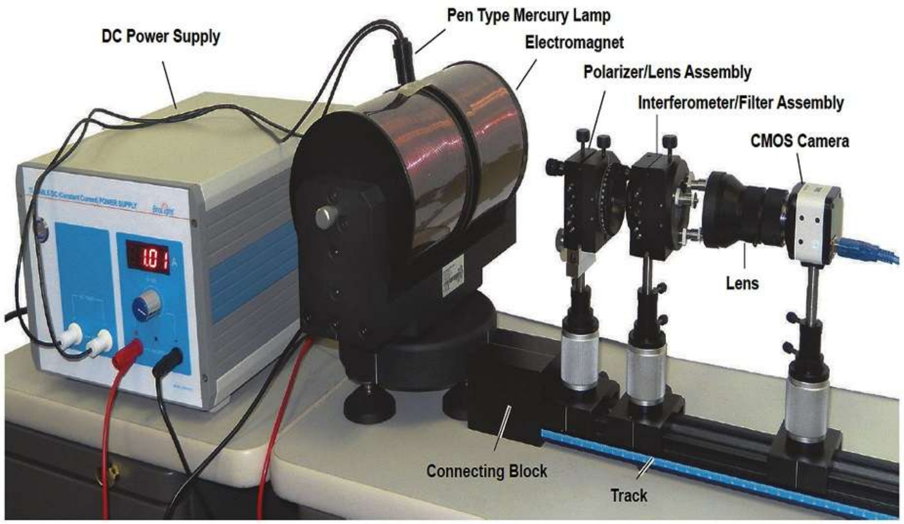
Zeeman Effect Experiment Kit

KS/PHY/ZEEMANEFF

Traversal slider

25-0-23 LC 0.01mm
Scope of delivery
Optical Bench briangular
Transverse slider
Convex Lens in Lens in Holder, FL. 150 mm
Convex Lens in holder, FL 50mm
Polarizer fiber
Quarter wave filter
Electromagnet Coil
Mercury Lamp with Power Supply
Mercury Lamp holder
Fabry-Perot etalon
CMOS Camera with Software
Digital Gauss meter
Green Filter with holder
Micrometer Eyepiece
Fixed slider
Desktop Computer



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Melde's Experiment

KS/PHY/MELDEEXP

Purpose

To determine the frequency of a vibrating source or the tension in a string using standing waves formed on a stretched string driven by a vibrator.

Principle

A string under tension T and linear mass density μ supports standing waves.

The wavelength is related to the string length and mode number.

Wave velocity:

$v=\sqrt{(T/\mu)}$

Frequency:

$f=v/\lambda f$

Modes for a string fixed at both ends:

$\lambda n=2L/n$

Experiment

EXP 1. To determine the frequency of an electrically maintained tuning fork by Melde's Experiment & verify λ^2 - T

Heavy steel fork

Heavy cast iron base

Electromagnet

Weight box

Voltage source 1.5 V – 12 V/ 3A

Pulley with clamp

Reel of thread

Meter scale of length 1m

Scale pan

Aim

To determine the frequency of an electrically maintained tuning fork by,

1. Transverse mode of vibration
2. Longitudinal mode of vibration

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Michelson Interferometer Kit KS/PHY/MICHELSNINTRFE

Purpose

To observe interference fringes and perform precision measurements such as wavelength determination, refractive index variation, and small displacement measurement.

Principle

Light from a coherent source is split into two beams by a partially silvered **beam splitter**. These reflect off two mirrors (one movable) and recombine to form interference fringes. Moving one mirror by distance ddd shifts fringes: 2d=mλ2d = m\lambda2d=mλEXP-1. To determine the wavelength of monochromatic light (using sodium light source)

EXP-2. To determine the wavelength of monochromatic light (using He - Ne laser).

Moveable mirror: Range 10-0-10mm

Course knob Least count 0.01mm

Micrometer fine: Least count 0.0001mm

Beam splitter: Rectangular, size 50 x 29 x 7mm. R/T% 50/50, Flatness lambda/8 at (632 mm)

Compensator Rectangular, size 50 x 29 x 7mm, Flatness lambda/8 at (632 mm)

Mirror Circular: 2 no, dimension 30x10mm

Dimension: 290 X 210 X 230mm (LxWxH)

Telescope : Tube 90 X 25mm (L x Φ) , X 10 eye piece

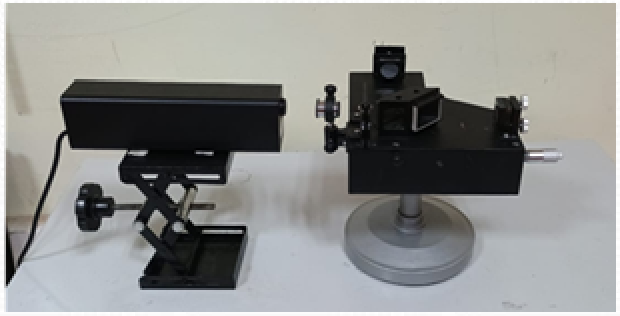
Sodium source: MS housing, 200 X 85mm (L x Φ) slit (L xW) 20 x 16 m

Laser: He-Ne Laser (632mm), Power 2 mW

Beam Expender with holder

object screen with cylinder base

Lab jack



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Frank Hertz Experiment

KS/PHY/FRANKHRTZ

Purpose

To verify the quantized nature of atomic energy levels by observing inelastic collisions between electrons and gas atoms (typically mercury or neon).

Principle

Electrons emitted from a heated cathode are accelerated through a low-pressure gas. When electron kinetic energy reaches specific threshold values equal to atomic excitation energies, they undergo inelastic collisions, losing energy. This causes periodic drops in the collected anode current.

Key relation:

$eV=\Delta E$

The spacing between successive minima/maxima in the I–V curve equals the excitation energy of the gas.

Frank hertz experiment (Neon tube) with digital data logger & software

EXP 1. To observe the neon spectral bands formation in Frank Hertz tube

EXP 2. To record the Frank Hertz characteristics curve for neon

EXP 3. To study the effect of filament voltage and anode plate on the characteristics plate

Frank Hertz unit: mode manual or data logging

Voltage: 1.2-12 V, Display: 3 1/2 digit LED screen

Grid(G) voltage : 0 -80

Control Grid(G) voltage : 0 -10v

Filament Voltage: 0 -9 V

Neon Tube:

Dia: 130 x 26 mm

Filament Voltage: 6 -9 V

Control voltage: 9 V

Accelerating Voltage Max : 80 V

Counter Voltage: 1.2 - 10 V

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Frank Hertz Experiment

Data logger **KS/PHY/FRANKHRTZ**

I/P channels 4, 6 PIN BT connector,
Resolution 12 bit ADC @100 ksps
Analog I/P 0-5V,
O/P channels 12 bit DAC
Analog O/P +/- 12 V max 10 mA, Current booster
1A, Power connector 3 PIN, DIN, USB cable
Power Supply: 220V, 50Hz AC output +/- 12 V, 3 PIN DIN
Voltage Sensor +/- 10V, 4mm socket, 6 PON BT connector
Current Smuor: 100A, 4mm socket, 6 PIN BT connector

In Package

Franck-Hertz unit
Neon tube with mount
Power Cord
Data logger
Power supply for data logger
Current sensor +/- 100mA
Voltage sensor maor +/- 10V
Software CD disc, With Desktop Computer

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Automatic Spin Canting System & Accessories

KS/PHY/ASCS&ACCESS

Purpose

Used for precise measurement and control of spin canting angles in magnetic materials, nano-magnetic samples, thin films, and ferrites. Provides automated rotation, magnetic field alignment, and data acquisition for magneto-optical and magnetization studies.Programmable Speed Range: 50 -12,000 RPM

[based on a glass substrate of dimension 38 mm (L) x 25 mm (W) x thickness 1 mm (H)]

Theand on a Glass Substrate Dimension 18 mm (L) X 25 mm (W) & Thickeni mm (H)

Programmable Acceleralics: 40-6,000 RPM/s

[based on a glass substrate of dimension 38 mm (L) x 25 mm (W) x thickness 1 mm (H)]

Candona Glass Subsome of Dimension 18 mm (L) X 25 mm (W) & Thicks mm (7)

< +/- 1% Error across the Full Spend Range

N2 & other Inert Gas Purging Port

Programmable Controlling Duration: 1-9,999 sec./step

30% editable program

50 editable steps / program

Microcontroller controlled

PC connectivity through USB 2.0 (for PC mode)

warm up option

Calibration Option

Spill-drainage facility

High-speed DC Motor

Non Volatile Program Monary

user friendly firmware interface

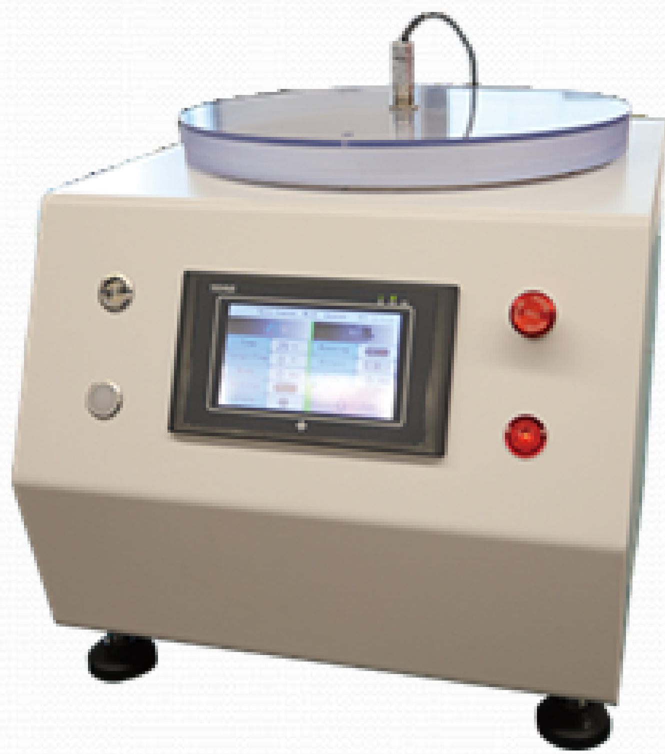
Dimension: 291 mm (L) X 448 mm (W) X 243 mm (H)

Input & Controlling through Key-pad

PTFE coated Working Chamber of 8 " Diameter

Integrated Power On/Off Switch with Indicator

Integrated Lid Protection Switch with On/Off Indicator



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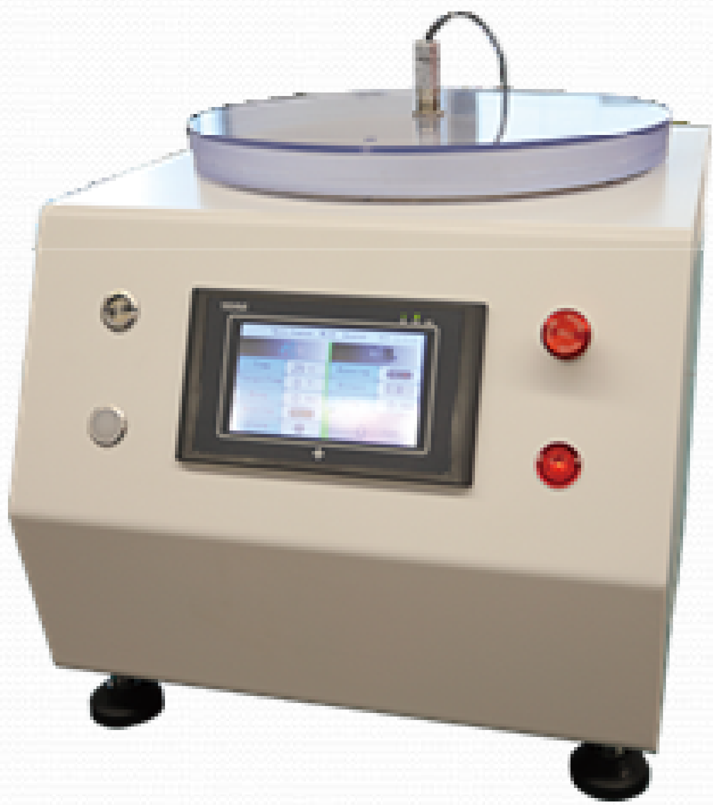
Automatic Spin Canting System & Accessories

KS/PHY/ASCS&ACCESS

Integrated Mechanical Lid Inter-lock with Lid-open Sensor
Integrated Vacuum Release Switch with On/Off Indicator
Transparent Photo-resist Safety Lid over the Working Chamber
In-situ Sample Dispensing Port on the Transparent Photo-resist Safety Lid
Real-time Display of RPM, Timing & Program Status on Graphical LCD Console
Real-time Display of R.P.M. during Warm-up & Calibration on Graphical LCD Console
Real-time Display of R.P.M. vs. Timing Graph during Program Run-time on Graphical LCD Console
Power Input: Universal

Advanced Oil-free Vacuum Pump

Power Input: Indian Standard
Power: 80 W (Maximum)
Overflow Protection available
Vacuum-735 mm/Hg. (Maximum)
Flow Rate: 6-10 1/min
Motor Rotation 1,450 RPM.
Capacitance 3 micro farad 450V
Horse Power : 1/6 HP
Net Weight: 5.2kg
Port Thread: 0.3125"
Noise Level: 52 dB
Current: 0.4 A (Maximum)
Moisture Trap available
Vacuum Regular available
Diesensie: 310 mm (L) X 135mm(W) X 204(H)



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Viscosity by Stoke's Method

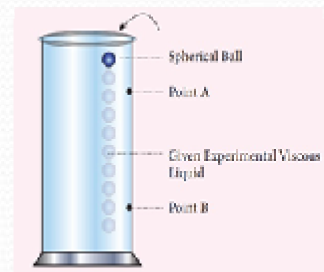
KS/PHY/VISCOSTYSTOKE

Purpose

To determine the coefficient of viscosity of a viscous liquid (usually glycerin) by measuring the terminal velocity of a falling spherical ball.

Principle

A small sphere falling through a viscous liquid experiences:
Gravitational force
Buoyant force
Viscous drag force (Stokes' law)
To determine the coefficient of viscosity of glycerin by falling sphere method
To determine the density of given liquid using steel sphere, glass beads
To predict the fall time of different spheres of same material
Tube Stand
base (cast iron): 23 x 15 cm
Rod mild steel: 110 cm
Cylindrical Tube
Length 100 cm (approx)
Internal diameter: 3.5 cm
External diameter: 4.0 cm
Volume : 962 cm3
Measurement Unit
Mains Supply Voltage: 230V +/- 10%, 50Hz
Adaptor Output: 5V DC
Timer checking time: 5 sec
Time segments: 3
Steel Sphere
Diameter 0.2 cm to 0.5cm
Density: 7.85 gm/cm3



EXPERIMENTAL SET UP OF MEASURING VISCOSITY BY STOKE'S METHOD

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Semiconductor Diode Laser with Power Supply

KS/PHY/SEMIDIODLASR

Purpose

A semiconductor diode laser with its dedicated power supply is used for optics, fiber-optic communication experiments, holography, interferometry, and opto-electronic characterization. It provides a stable, coherent, monochromatic light source.

Principle

A p–n junction diode with a direct bandgap material (GaAs, AlGaAs, InGaAs, etc.) emits coherent light via **stimulated emission** when forward-biased above threshold current. The diode is housed in a laser package with mirrors forming a Fabry–Perot cavity or distributed feedback (DFB) structure.

A compact, fully solid-state instrument produces an inese beam of light at a wavelength 635 - 670 nm for red color. This semiconductor diode laser is mounted in a simple mount. Supplied completely with power supply.

Operating voltage 3V
Optical power 3-5mW
Wavelength: 532nm
Optical Power 3-5mw
Operating Current <250mA
Operating Voltage 3V DC
Operating Temperature 15°C-35°C
Storage Temperature: 0°C-50°C
Spot Runs Range: 300M
Spot Size:< 6.5 mm
Lifetime >3000 hrs

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IC Tester

KS/PHY/ICTESTR

Purpose

An IC Tester checks the functionality of digital and analog integrated circuits by applying predefined logic patterns or electrical conditions and comparing outputs with expected responses.

Types

Digital IC Tester

- Tests logic families: TTL, CMOS
- Supports ICs like gates, counters, flip-flops, decoders, multiplexers

Analog IC Tester

- Tests op-amps, comparators, voltage regulators

Universal IC Tester

- Programmable patterns
- Large IC library
- Automatic pin detection and fault diagnosis

40 Pin Digital IC Tester to test 54/74 series TTL, and 4000 & 4500 series CMOS ICs, tests more than 2000 kinds of devices

Self Diagnosis

Identifies Unknown model number of Devices

Measures more than 2000 kinds of devices

test 54/74 series TTL

test 4000 & 4500 series CMOS

40 Pin capability

Control: 16 key test switch keypad with dual tone sound indication

Display: 6 Digit LED Display

Test Socket: 40 pin ZIP Socket

Library of ICs: TTL54 Series, TTL55 Series, TTL74 Series, TTL75 Series CMOS 14 Series, CMOS 40 Series, Optical Coupler Series, LED Display Series, RAM Series, SCM Series, CPU Peripheral Series

Auxiliary Power Supply: 220V AC 50Hz

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Pockel Effect Apparatus

KS/PHY/POCKELEFF

Purpose

To study the **linear electro-optic (Pockels) effect**, where an applied electric field changes the refractive index of a non-centrosymmetric crystal (e.g., KDP, $LiNbO_3$). Used to observe phase retardation, intensity modulation, and determine the electro-optic coefficient.

Principle

In a Pockels crystal:

$\Delta n \propto E$

Applying a voltage produces a phase shift between ordinary and extraordinary rays. With crossed polarizers, the light intensity varies with voltage. At half-wave voltage $V\pi$, the induced phase shift is π.

To plot the graph and study the birefringence with respect to applied voltage in an electro optic crystal (Lithium niobate)

Polarizer Rotator with Mount

Resolution 2 deg

Rotation 360 degree

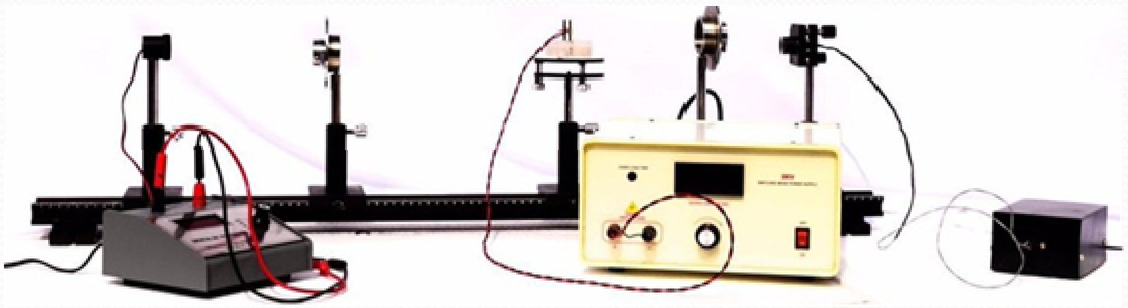
Polarizer with Precision Rotation

Material: Sheet Polarizer

Rotation: 360 deg

Fine Rotation : 15 degree

Resolution: 0.1 degree



Optical Rail

Length: 1000mm

Material: Black anodized Aluminum alloy

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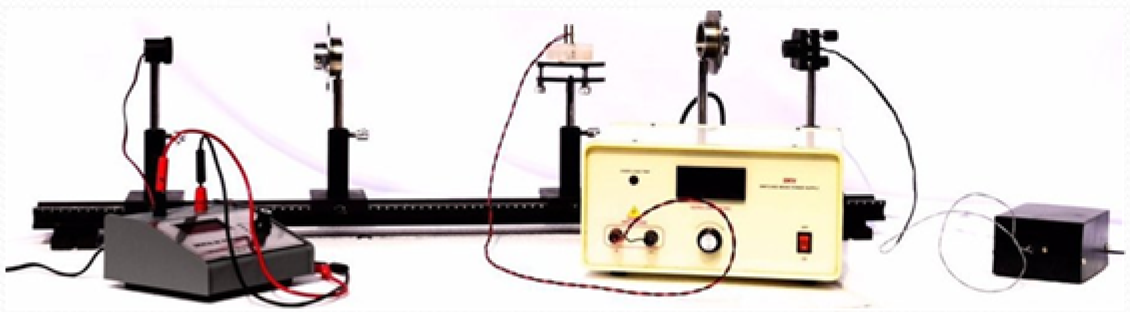
Pockel Effect Apparatus

KS/PHY/POCKELEFF

Kinetic Laser Mount
Material: Black anodized Aluminum alloy
Adjustment: Using 80 tpi lead screws
Adjustment Range: +/- 3 degrees
Detector Mount with X-Translation
Material: Copper Black Anodized Aluminum Alloy
Resolution: 0.01mm
Travel: Micro meter control
Pockel Cell with Mount
Electrode Material: copper
Cavity width : 0 - 6 mm Lead Screw control
Cavity Size: 30x5x5 mm



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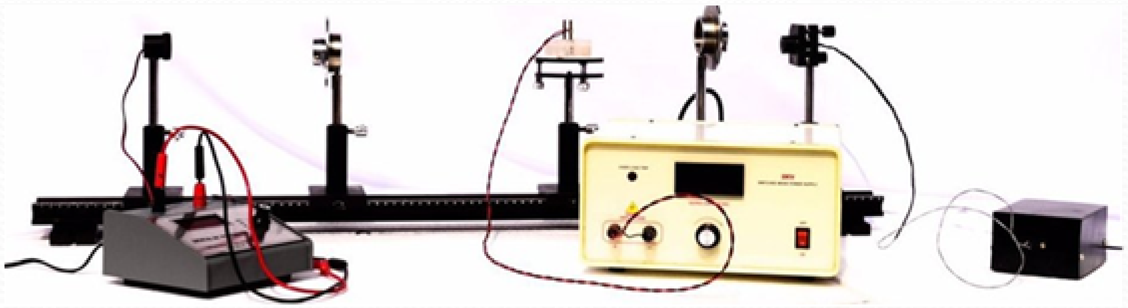
Pockel Effect Apparatus

KS/PHY/POCKELEFF

Electro-Optic Crystal
Material: Lithium niobate (Li NbO_3)
Dimension : 25x4x4mm
Switched Mode Power Supply
SMPS Input: 230v 50 Hz
Voltage: 0-2 KV
Diode Laser with Power supply (Red)
Wave length: 650 nm
Optical power: 3mW
Detector Output Measurement Unit
Sensor Type: Photo Transistor
Display: 7 segment, 31/2 digit
Range: 0-199 mill/micro



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Lees Disc Apparatus

KS/PHY/LEEDISCAPP

Purpose

Used to determine the **thermal conductivity of a poor conductor** (insulating material such as cardboard, felt, ebonite, or rubber).

Principle

At steady state, the heat conducted through the test specimen equals the heat lost from the upper disc by radiation and convection. Using temperature differences and heat flow rate, thermal conductivity KKK is calculated.

Main Components

EXP- To determine thermal conductivity of bad conductors (Glass, Nylon, Plywood, etc.) in the form of a disc using Lee's method

Required Components For the experimental Set-Up

Complete Experimental Set up

Disc Sample type: Cardboard, Glass, Plywood

Temperature Sensors: 0.5°C (Thermometer)

Disc Diameter: 111 mm

Disc Thickness: 2.8 mm

Components: Electric Oven for heating, heat chamber, Sand, rubber tube, water boiling container ect.

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Searls's Method Apparatus

KS/PHY/SEARLMAPP

Purpose

To determine the **Young's modulus** of a wire by measuring its extension under load in a controlled setup.

Principle

A wire under tensile load extends proportionally to the applied force:

$Y = FL/A\Delta L$

Searle's method compares the extension of the test wire with a reference wire to eliminate errors due to frame movement and temperature effects.

To determine conductivity of good conductor

Required Components For the experimental Set-Up

Complete Experimental Set up

Copper Turing, Steam Chamber, Digital Scale, Thermometer, Beaker, Tubing,Maker, insulating Material, Vernier Caliper, Metal Rod.

Consists of a cylindrical copper rod about 300 mm long & 25 mm diameter with its one end surrounded by a steam jacket for heating it from a boiler & the other end is kept cool by a system of water flowing through a spiral tube soldered to that end. Through two sockets, two thermometers are inserted in the rods for finding the temperature at two points. Two more thermometers are inserted in the other end which is kept cool by the stream of water. Through this apparatus, the difference of temperature between the inflowing & outflowing water is determined. Fitted in teak wood case, packed with felt with removable front; with thermometers.

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Optical Fiber Characterization Apparatus

KS/PHY/OPTFIBCHAR

Purpose

Used to measure key parameters of optical fibers such as numerical aperture, attenuation, bending loss, dispersion, and coupling efficiency.Exp. Numerical aperture measurement of multi mode fibre, measurement of bending loss in multi-mode fiber, Numerical aperture measurement of single mode fibre, Relative measurement of splice loss in multi mode fibre, Calculation of normalized Frequency or V- number of single mode fibre, Calculation of mode field diameter of single mode fibre.

Required Components For the experimental Set-Up

Complete Experimental Set up

Optical Rail

Length: 1000 mm

Material: Aluminum alloy

Finish: Black anodized

Quantity: 1 no.

XYZ Translation stage with mount:

Material: Black anodized aluminium alloy

Travel: Mimometer controlled

Resolution: 0.01mm

Quantity: 1 no

Fiber Check Holder:

Material: Aluminum alloy

Finish: Black anodized

Quantity: 1 no.

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Optical Fiber Characterization Apparatus

KS/PHY/OPTFIBCHAR

Single Mode Optical Fiber
Material: Glass Fibre
Numerical Aperture: 0.11
Core Dia: 9 micron
Length: 3 meters
Quantity: 1 no=

Detector Output Measurement Unit
Sensor Type: Photo Resistor
Display 7 segments, 3 1/2 digit
Range 0-199 milli/micro ampere
Quantity:1 no

Kinetic Laser Mount:
Material: Black anodized aluminium alloy
Adjustment: Using 80 tpi lead screws
Adjustment Range: +/- 4 degrees
Quantity: 1 no

Laser Fibre Coupler with Mount:
Magnification of object: 10 x
Positioning: lead screw controlled
Quantity: 1 no

Bending Loss Apparatus
Chuck material: Nylon
Step diameter 35, 45, 55, 65 mm
Quantity: 1 no

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Optical Fiber Characterization Apparatus

KS/PHY/OPTFIBCHAR

Multi Mode Optical Fibre
Material: Plastic fibre
Numerical Aperture: 0.5
Core Diameter: 735, 240 microns
Length: 5 meters
Quantity:1 no each
Detector Mount
Material: Black anodized Aluminum alloy
Diameter: 30 mm
Quantity: 1 no
Fibre Holder with Angular Tilt
Material: Aluminum alloy
Finish: Black anodised
Resolution: 2 degree
Quantity: 1 no
Fibre Chuk:
Material: Black anodized Aluminum alloy
Diameter : 30 mm
Quantity: 1 no
Diode Laser with Power supply (Red)
Wave length: 650nm
Output power: 5mw
Quantity: 1no

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Apparatus for Opto Electronics Characterization

Purpose **KS/PHY/OPTOELECHAR**

To characterize the electrical and optical properties of opto-electronic devices such as LEDs, laser diodes, photodiodes, phototransistors, LDRs, and solar cells.Light Sources
LED sources (various wavelengths)
Laser diode modules
Halogen or tungsten lamps
Monochromator (optional for wavelength-selective illumination)
2. Photodetectors
Photodiodes (PIN, avalanche)
Phototransistors
LDRs
Solar cells
Photoconductive cells (CdS, CdSe)
3. Optical Components
Collimating lenses
Optical filters
Diffusers
Beam splitters
Optical fiber patch cords
Adjustable apertures
4. Mechanical and Alignment Hardware
Optical bench with graduated rails
Lens holders and mounts
XYZ translation stage
Rotary stage for angular characterization
5. Electrical Measurement Instruments
Source-measure unit (SMU) for I-V curve measurement
Digital storage oscilloscope
DC regulated power supply
Picoammeter or electrometer (for low currents)
Digital multimeter (μA/mA ranges)
Function generator for modulated light studies
6. Optical Power Measurement
Optical power meter with calibrated sensor head
Spectroradiometer or optical spectrum analyzer (for wavelength response)

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Apparatus for Opto Electronics Characterization

KS/PHY/OPTOELECHAR

Characteristic study of Light Dependent Resistor (LDR), Characteristic study of Light Emitting Diode (LED), Characteristic study of Photo Transistor, Characteristic study of Photo Diode, Characteristic study of Solar Cell, Characteristics of Opto - Coupler

Required Components For the experimental Set-Up

Complete Experimental Set up

Required Components For the experimental Set up

Optical Rail

Length: 500mm

Material: Aluminum alloy

Finish: Black anodized

Quantity: 1 no

Detector Mount

Material: Black anodized aluminium alloy

Diameter: 30mm

Quantity: 1 no

Diode Laser with Power Supply (Red)

Wavelength: 650 nm

Output Power: 3 mW

Quantity: 1 no

Kinetic Laser Mount

Material: Black anodized aluminium alloy

Adjustment: Using 80 tpi lead screws

Adjustment Range: +/- 4 degrees

Quantity: 1 no

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Apparatus for Opto Electronics Characterization

KS/PHY/OPTOELECHAR

Mounted Opto-Electronic Detectors
Light dependent resistor (LDR)
Light emitting diode (LED)
Photo Transistor
Photo Diode
Scar Cell
Opto-Coupler
Quantity: 1no cach
Polarizer Rotator with Mount
Material: Sheet Polarizer
Rotation: 360 degree
Quantity: 1 no
Resolution : 1degree Quantity
Opto Electronic measurement Unit
Output Voltage
Port 1:0-5 Volt Variable
Part 2: 5 Volt fixed
Quantity: 1 no
Pc is not scope of supply.

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Carey Foster Bridge Apparatus

KS/PHY/CAREYFBRDG

Purpose

The Carey Foster Bridge is used to measure very small differences in resistance with high precision. It is especially useful for calibrating low-value resistors.

Principle

It is based on the Wheatstone bridge principle. Instead of directly measuring an unknown resistance, the bridge detects the *difference* between two nearly equal resistances by shifting the balance point along a uniform slide wire.

Apparatus Components

Carey Foster bridge base with uniform slide wire (typically 1 m).
Set of known standard resistances.
Unknown low-value resistor.
Two nearly equal ratio arms P and Q
Galvanometer.
Battery or regulated DC supply.
Key/switch and connecting wires.
Determination of unknown resistance by Carey Foster Bridge method
Required Components For the experimental Set-Up
Complete Experimental Set up
Required Components For the experimental Set-Up
Meter bridge,unknown resistance (5 nos), variable rest box (2 nos), DC power supply (2nos), fixed resistance(2 nos), connecting wire, extra bridge wire

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