

1 keV to 30 keV
Medium Energy Electron Beam, High Current Density

FOR USE IN:

- MBE RHEED Studies
- Electron Diffraction
- Space Physics Studies
- Gas Electron Fluorescence
- X-ray Generation
- Heating / Melting / Welding
- Vacuum Physics Experiments

FEATURES / OPTIONS:

- New Modular Design
- Internal Alignment During Operation
- Collimated Beam
- Spot Size down to 500 μm
- Medium Current Beams to 5 mA
- Electrostatic Focus and Deflection
- UHV Compatible and Bakeable
- Computer / Remote Control
- User-Replaceable Firing Units



*EMG-4215 Electron Gun with 4.5" inch
Mounting Flange*

The Kimball Physics EMG-4215 Electron Gun, with its matching EGPS-4215 Power Supply, is a multi-purpose modular Electron Gun with applications in many areas. The EMG-4215/EGPS-4215 is a complete subsystem ready to attach to a user's vacuum system and turn on. The gun has the capability of producing a collimated, small spot or flood electron beam.

Beam current, beam divergence, and beam energy are all adjustable over wide ranges. The energy can be varied from 1 keV to 30 keV. With the lanthanum hexaboride cathode (LaB_6), the beam current is independently adjustable from 1 nA to 5 mA. The gun can deliver spots down to 500 μm . Rastering is also available as an option.

The modular design of the EMG-4215 allows either the firing unit assembly or the lens assembly to be replaced. The firing unit cartridge (including the cathode, cathode-mount, and Wehnelt aperture) is user-replaceable without removing the entire gun from the vacuum chamber. The anode is also replaceable. The

cathode to anode spacing is internally adjustable to vary perveance.

The gun features an adjustable cathode feedthrough assembly that allows the mechanical alignment of the firing unit with respect to the anode and the column. This alignment can be done in real-time while the gun is operating at full voltage with beam on.

UHV technology is used throughout. The gun can be run in vacuums from 10^{-11} torr up to 10^{-7} torr for the standard LaB_6 cathode. The electron gun is bakable to 350°C with cables removed. Various designs of stand-alone Faraday cups are available.

Firing unit cartridges are user-replaceable and used cartridges may be returned to the factory for rebuild. The electron gun itself may also be sent back to the factory for complete disassembly, cleaning, and rebuild of the firing unit assembly (including installation of a new cathode).

The EGPS-4215 Power Supply features a modular design with miniaturized power supply

clusters, optically isolated signals, and the FlexPanel digital interface controller. The included power supplies are Beam Energy, Focus, X, Y Deflection and the floating Source/ECC and Grid supplies. The system includes a separate High Voltage Power Supply connected to and controlled by the EGPS-4215.

A rastering option can be provided by an on-board power supply module or as an additional feature in a LabVIEW™ software package.

The FlexPanel provides a digital display screen and a keypad controller for programming control on the front panel. Rear panel connectors allow remote /computer control and metering of all gun power supplies. RS-232 and mini-USB serial ports and an analog input/output

connector are included on standard power supply units. All common computer interface bus types can be accommodated, by use of appropriate digital to analog converters. RS-422/485 conversion is possible.

An optional LabVIEW™ computer program designed for the EMG-4215 is available for remote computer control and metering. Software is available in two types: 1) using National Instrument DAQ modules and the 50-pin connector on the EGPS-4215, or 2) via a simple serial connector interface. The program provides a virtual panel of controls and real-time metering on the user's computer screen.



EGPS-4215A Electron Gun Power Supply with FlexPanel controller.

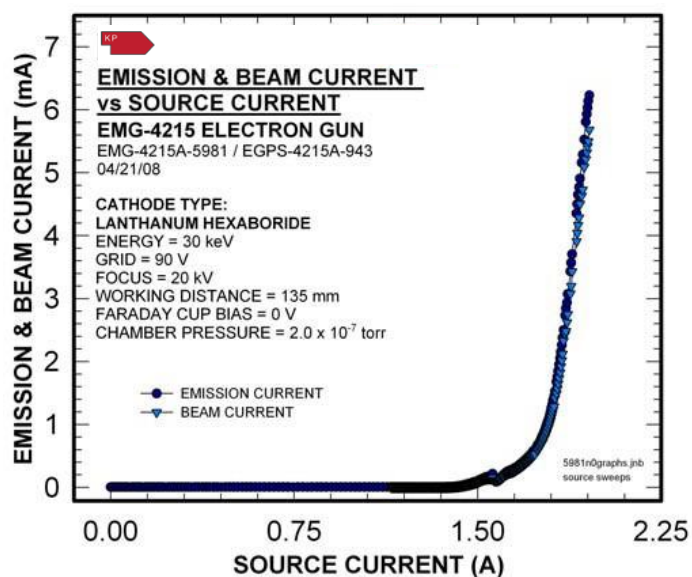
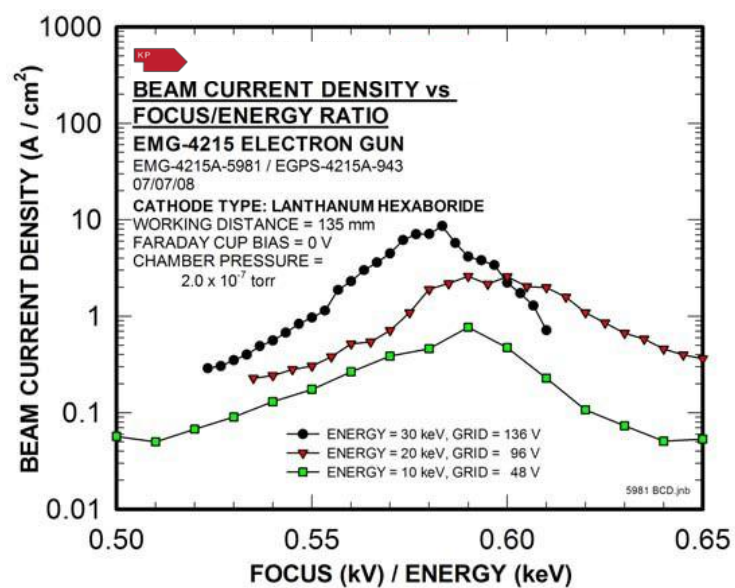


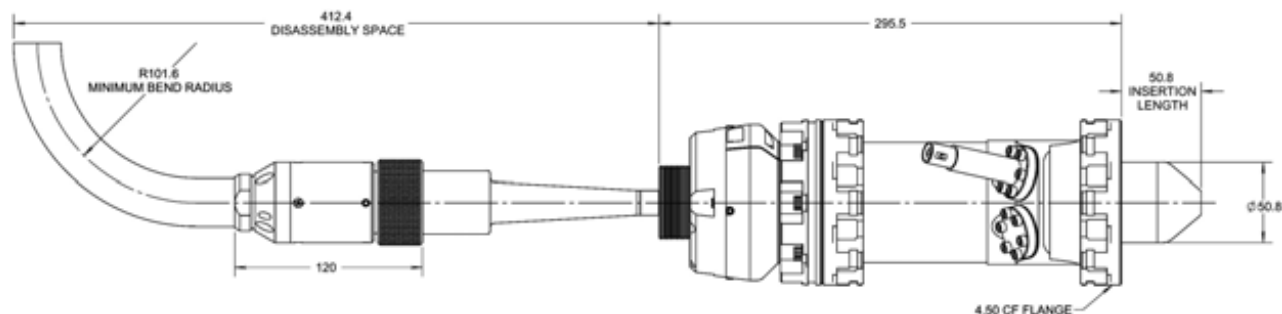
A typical lab set-up of a complete Kimball Physics system with power supplies, electron gun, and optional computer control system.

EMG-4215 ELECTRON GUN SPECIFICATIONS	
BEAM ENERGY	1 keV to 30 keV (Independently adjustable)
BEAM CURRENT	1 nA to 5 mA
ENERGY SPREAD	Approx. cathode thermal spread, calculated: LaB_6 - 0.4eV
BEAM DIVERGENCE	Collimated beam or Flood beam
SPOT SIZE	500 μ m to 25 mm
WORKING DISTANCE	Typical: 150 mm. Range: 100 mm to 1000 mm
BEAM DEFLECTION	4 Pole Electrostatic: $\pm 2^\circ$ at 30 keV; scales larger at lower energies
PULSE CAPABILITY (using appropriate pulse generator, not included)	Optional Dual Grid Power Supply: pulse width 2 μ s to DC, rise/ fall 500 ns, rep rates to 5 kHz (TTL required)
BEAM UNIFORMITY	Gaussian
FIRING UNIT	Customer-replaceable Firing Unit Cartridge includes precision-aligned cathode and Wehnelt (G-1) assembly
CATHODE TYPE	Standard: Lanthanum Hexaboride
BEAM ALIGNMENT	Adjustable Feedthrough for mechanical alignment of firing unit while gun is operating
MOUNTING	Flange Multiplexer with a 4½ inch CFF, including both tapped and clear mounting holes
INSERTION LENGTH	Standard: 51 mm
GUN DIMENSIONS	Gun length in vacuum: 51 mm sealing surface to end, 51 mm dia. Outside vacuum: 295.5 mm sealing surface to end of cable
FEEDTHROUGHS	Multi-pin brazed ceramic, threaded stainless steel shell
CABLES / CONNECTORS	Multi-conductor 30 kV high voltage fully ground-shielded cable, 20 kV focus cable, and low voltage deflection cable, with mating aluminum connectors, to connect gun and power supply. Standard lengths: 3 m, Optional: 5 m
MAXIMUM BAKEOUT	350°C with cables removed

EGPS-4215 POWER SUPPLY SPECIFICATIONS	
OUTPUT	All necessary voltages to drive the EMG-4215 Electron Gun (in combination with H.V. Power Supply)
ENERGY SUPPLY STABILITY	<0.01% per hour with 0.05% RMS ripple at full output
BEAM STABILITY	$\pm 0.1\%$ per hour with Emission Current Control (ECC) or $\pm 10\%$ per hour after warm-up without ECC
CONTROLS	FlexPanel controls: Energy, Source, Grid, Focus, X and Y Deflection, Emission Current Control,
METERING	FlexPanel digital meters: Energy, Source Voltage, Source Current, Emission Current, Grid, Focus, X and Y Deflection
COMPUTER/REMOTE CONTROL & METER	Power supplies: 0 to +10 V (-10 V to +10 V, deflection) Metering: 0 to +2 V (-2 V to +2 V, deflection) Standard 50-pin connector for analog input/output and RS-232 and mini-USB serial port (RS-422 or RS-485 available, if specified at time of order)
SOFTWARE	Standard configuration designed for RS-232 and USB serial connections. Optional: National Instruments LabVIEW™ file, designed to run with NI DAQ modules
INPUT	115 VAC or 230 VAC, 50 to 60 Hz single phase, 250 VA
ENVIRONMENT	Temperature: 0 to 40°C, Relative humidity: 0 to 75% RH non-condensing, Classified as a pollution degree 2, installation category (overvoltage category) II environment unit
DIMENSIONS (width x height x depth)	Two units, total approximately: 17 in. x 12.2 in. x 22 in. excluding handles (425 mm x 310 mm x 560 mm); 19 in. rack mountable

OPTIONAL HARDWARE RASTER SPECIFICATIONS	
RASTER GENERATOR	Continuous control of X & Y Raster Amplitude, variable offset (Centering) and Frequency, with 0-10 kHz (X) and 0-100 Hz (Y) standard. All parameters controllable via serial input, analog input, or computer control with LabVIEW™ software option.





EMG-4215 Electron Gun (Dimensions in mm).

References

For more information on electron sources / gun operations (and the technical bulletins and additional documents listed below), please visit the Resources and Documents section of our website.

General Operating Hints

Operating Instructions, Typical LabVIEW™ Electron Gun Systems

Beam Pulsing Options

Note: A comprehensive custom manual is supplied with each system.

Notes:

1. Charts /graphs show typical performance, data is for guidance only
2. It is not necessarily possible to achieve all maximum specifications simultaneously.
3. Specifications Subject to Change Without Notice.
4. DE Altobelli, DT Taylor 04/18/2025

Document EMG-4215_EGPS-4215_2025_0418
COPYRIGHT KIMBALL PHYSICS 2025, ALL RIGHTS RESERVED