IPCE & Spectral Response Measurement System

Type: VK-IPCE-10

- This compact instrument with fully automatic operation allows user to perform IPCE measurement by one click.
- User-friendly simple operation interface allows to start measurement quickly without reading bulky manuals and setting up various parameters.
- State-of-the-art Bluetooth communication allows user to control all the functions remotely.
- No attached equipments such as lock-in amplifier, source meter, and lamp power supply, only the main power switch needs to turn on.
- Utilize 100 % Digital Signal Processing (DSP) technique with Fast Fourier Transform (FFT) to measure synchronous current produced with chopped light beam.
- The double beam technique with a Si reference cell measures sample current & light intensity simultaneously.
- The motorized sample mounting stage aligns sample precisely.

Specifications

Type of Measurement	Incident Photon-to-electron Conversion Efficiency (IPCE), Spectral response (A/W)	Recommended sample size	10 mm x 10 mm
Wavelength Range	340 - 1000 nm (calibrated photo diode limits). 0 - 1400 nm mechanical limit.	White light (bias) source	Three watts white LED (output power can be set through the software).
Light Source	Halogen Photo Optic Lamp (OSRAM XENOPHOT®) 3400 K.	Sample mounting stage	This system equipped with motorized sample mounting stage. User can remotely switch the sample and standard Si photo diode in order to do baseline calibration or verify accuracy of measurements.
Irradiation modes	Natural (Halogen lamp spectrum) Constant energy Constant photon (Constant energy or photon Irradiation mode is achieved by controlling the halogen lamp current. Automatic calibration process performs the calibration of lamp current to keep constant energy or photon output).	User Interface and data collection	Computer software is provided free of charge to control all of the functions and data logging. Measurement data can be saved as a text file and directly plotted on ®Microsoft Excel graph. User interface is designed such that normal user can be performed measurements by setting just the scan wavelength range. Also advanced user can control hardware settings such as grating and filter changing position FFT bin size and also able to get raw I vs. t and FFT data.
Irradiation monochromatic light power on sample	1 to 100 µW (400 - 1000 nm range)	Communication	Bluetooth
Measuring technique	Optically chopped (1 – 21 Hz) light beam is split into two parts (double beam technique) then incident on Device-Under-Test (DUT), and calibrated Si reference (REF) cell. Simultaneously digitized DUT and REF signals (short circuit currents) were Fast Fourier Transform (FFT) to obtain power spectrum (filter out only the chopped frequency component).	Power Requirement	100 – 240 VAC (50-60 Hz) Input voltage selection switch available to set the correct input voltage range.
Grating	1200G / 500nm blaze.	Dimensions Weight	91 cm x 47 cm x 29 cm, 20 kg
Filters	Up to 5 different high-order light cut filters can be installed. L-37 and R-64 installed.	PC	Windows based PC is needed to install control software, despite not included to the standard setup and can be added as a option.

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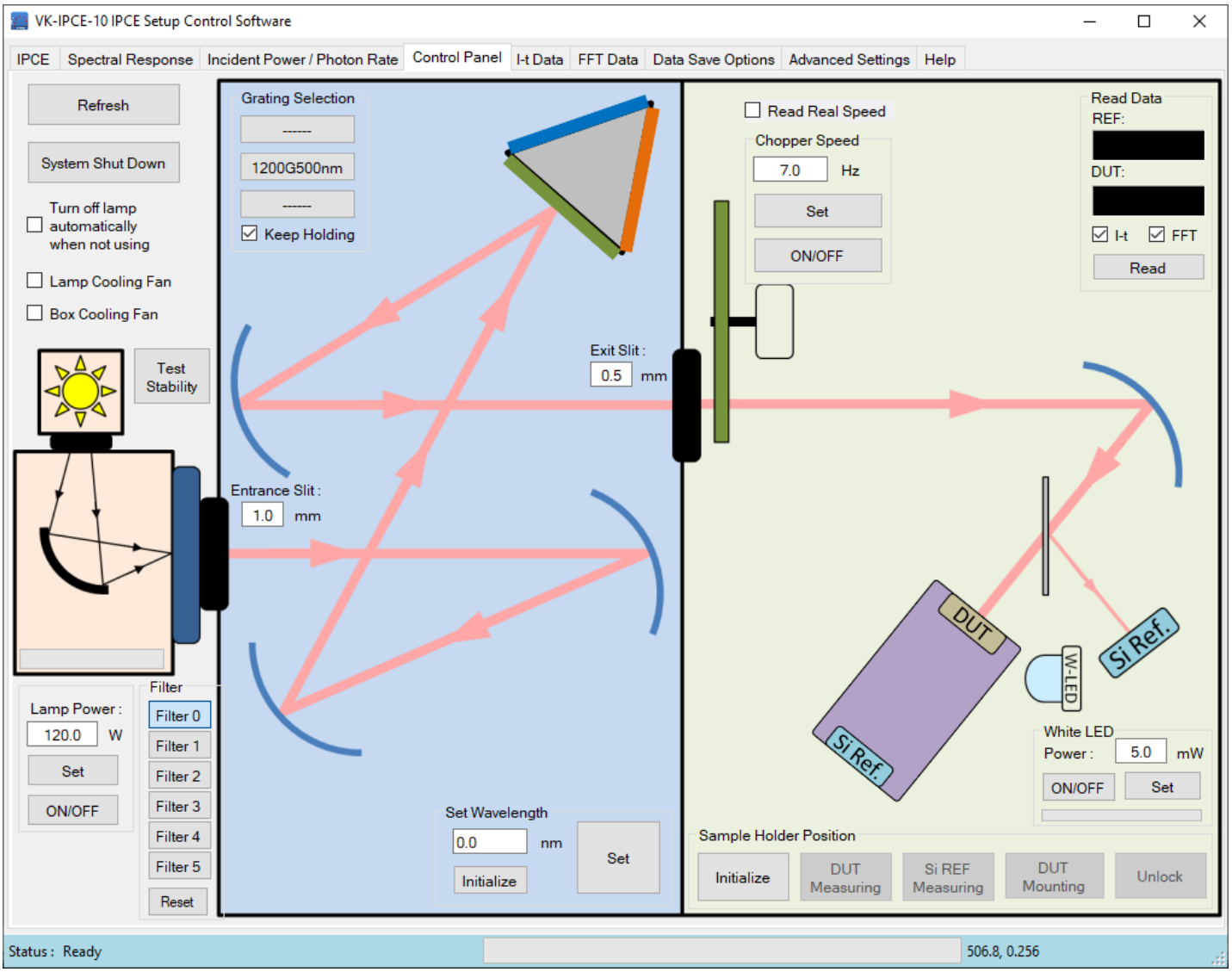
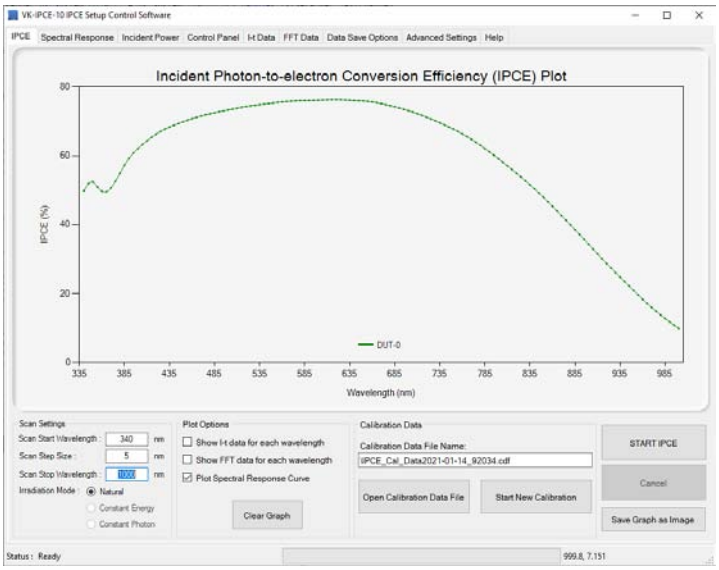
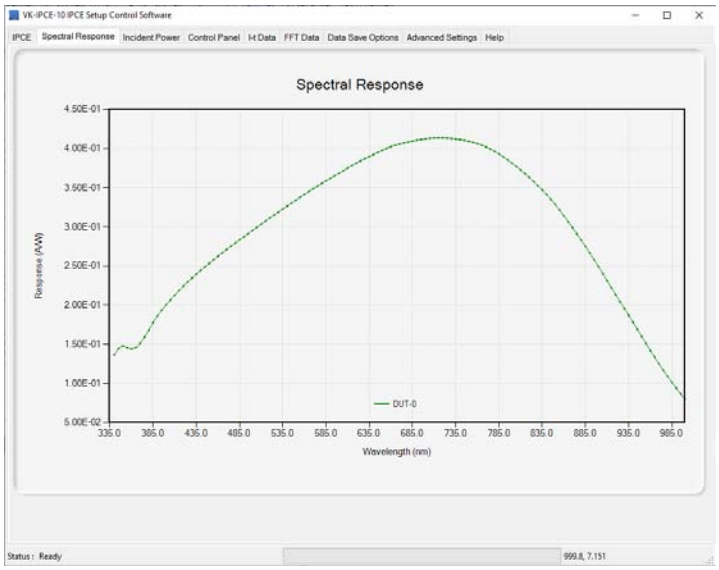


"Control Panel" tab allows user to control all of functions such as sample stage position, lamp current, chopper speed, and filters. Also user can measure both output of the sample and reference at desired wavelength.



"IPCE" tab of the control software allows user to set scan range, Irradiation mode, and plot options. Also user can open previously saved baseline calibration curve or start new calibration curve. Si photo diode was used as a sample for reference.



"Spectral Response" tab shows the spectral sensitivity (A/W) curve of measured sample. Si photo diode was used as a sample in this example.

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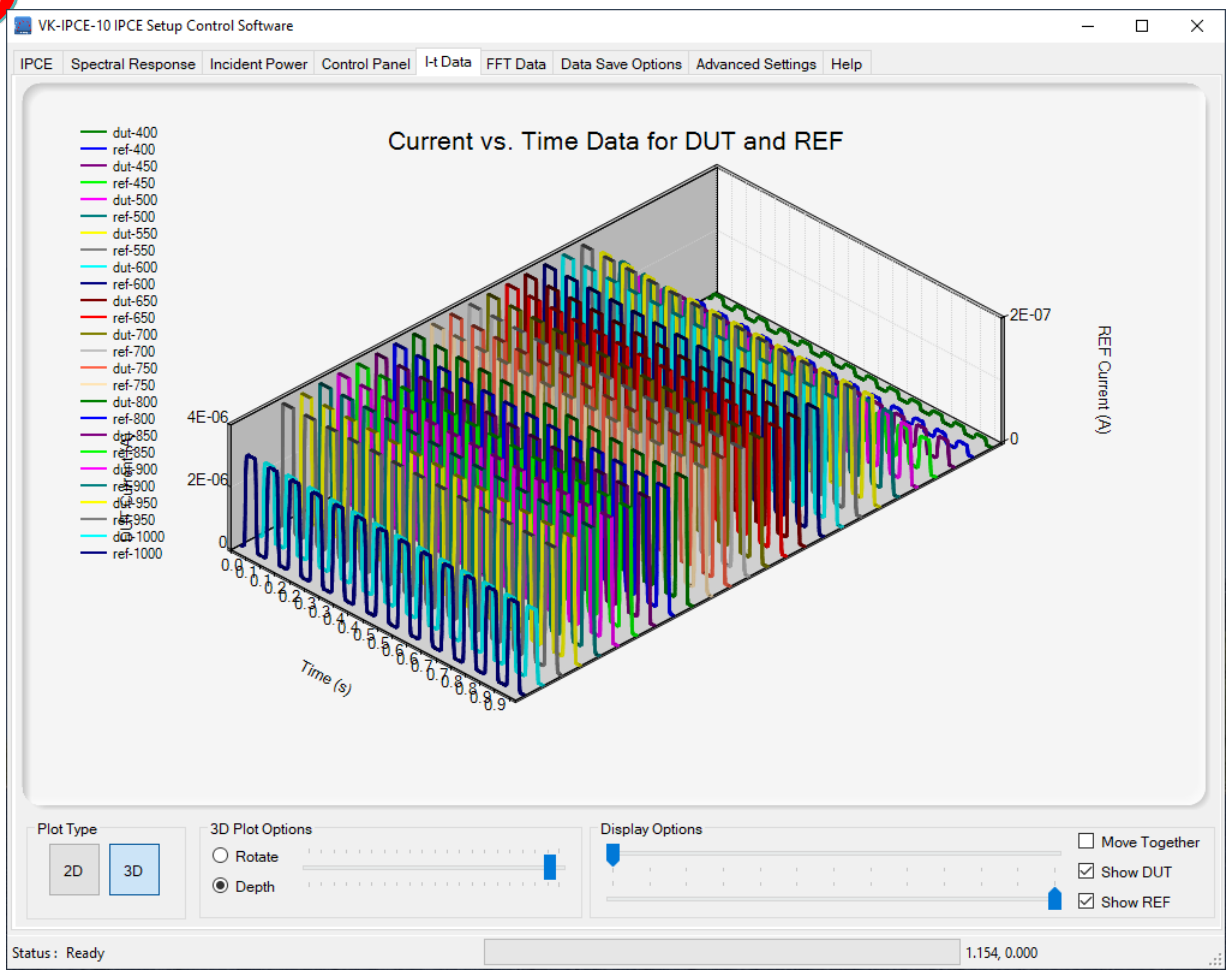
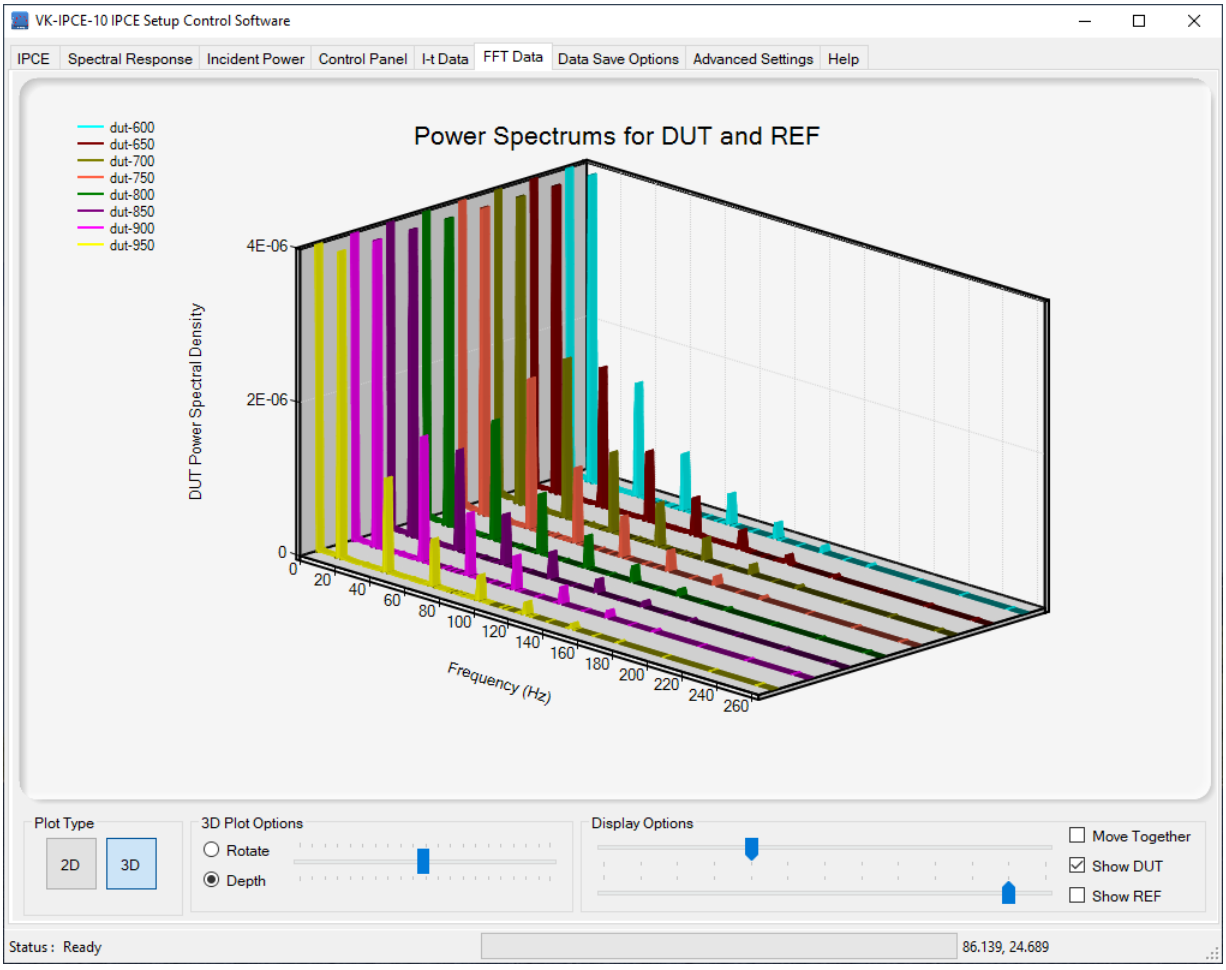


"I-t Data" tab shows the time domain data taken for each measurement point. User can view data as 2D or 3D plot for select number of measurement points.



"FFT Data" tab shows the Fourier transformed data for each measurement point. User can view data as 2D or 3D plot for select number of measurement points.

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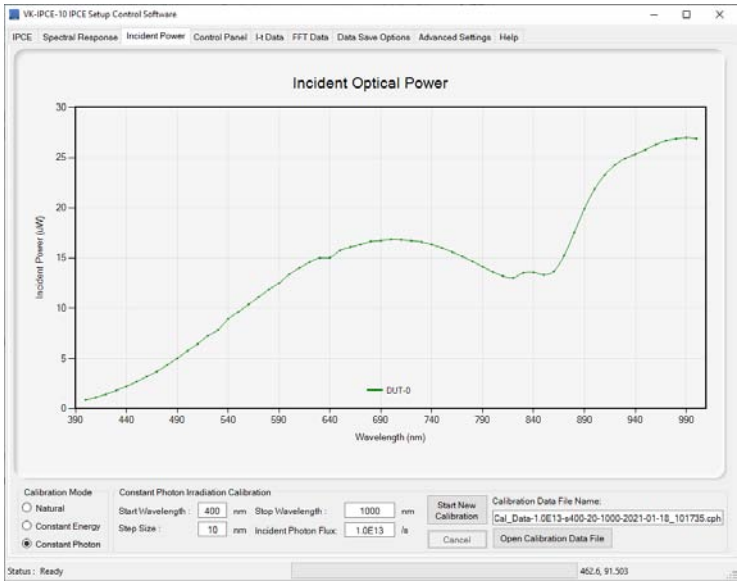
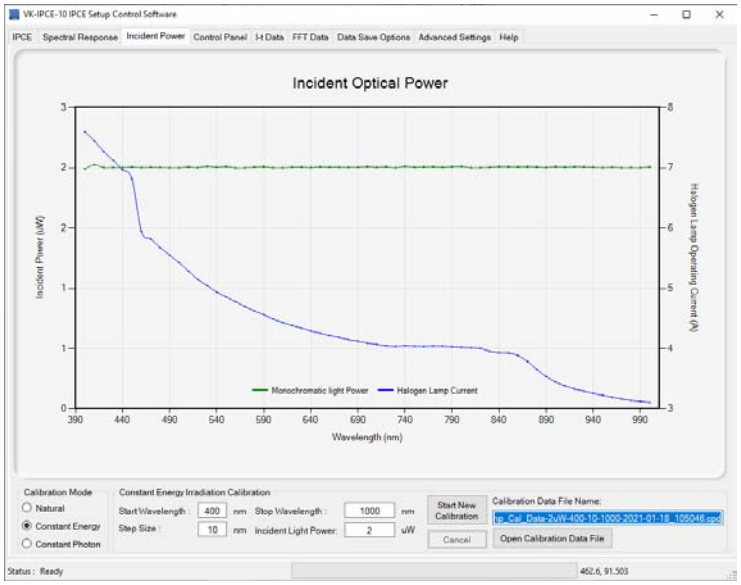
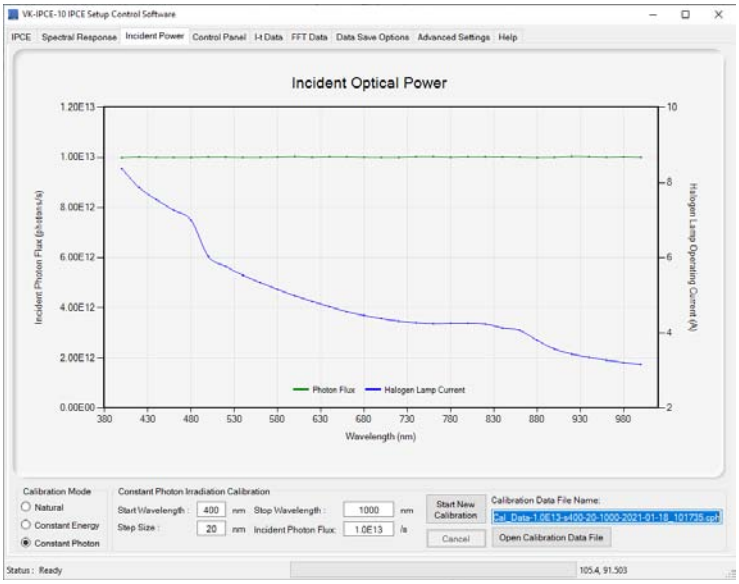


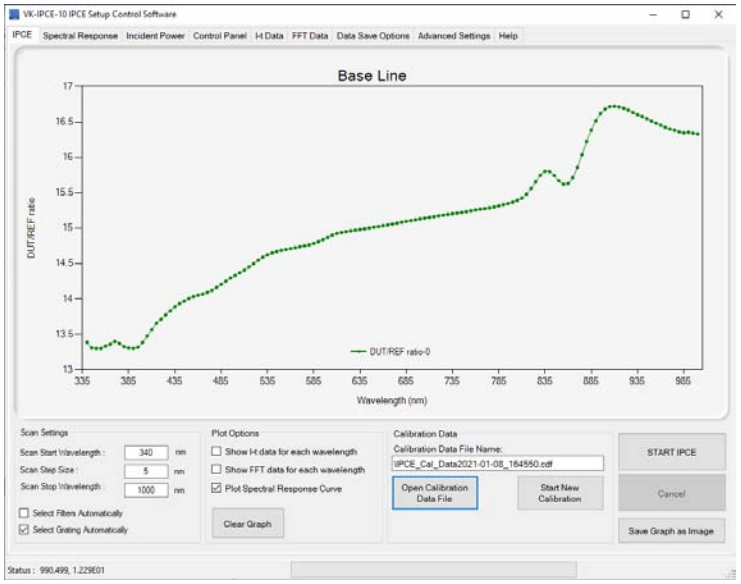
Incident optical power on the sample during an IPCE measurement with natural irradiation mode. In this mode halogen lamp operating current keeps at a user set fixed value.



Lamp calibration curve taken for constant energy irradiation mode. Green curves shows 2 µW constant incident optical power on the sample and blue curve shows the halogen lamp current variation for keeps constant power on the sample.



Lamp calibration curve taken for constant photon irradiation mode. Green curves shows 1.0 x 10^{13} s^{-1} constant photon flux on the sample and blue curve shows the halogen lamp current variation to keep the constant photon flux on the sample.



The optical power dividing ratio of sample to reference is measured and stored as a baseline calibration curve. This figure shows an example of the baseline calibration curve.

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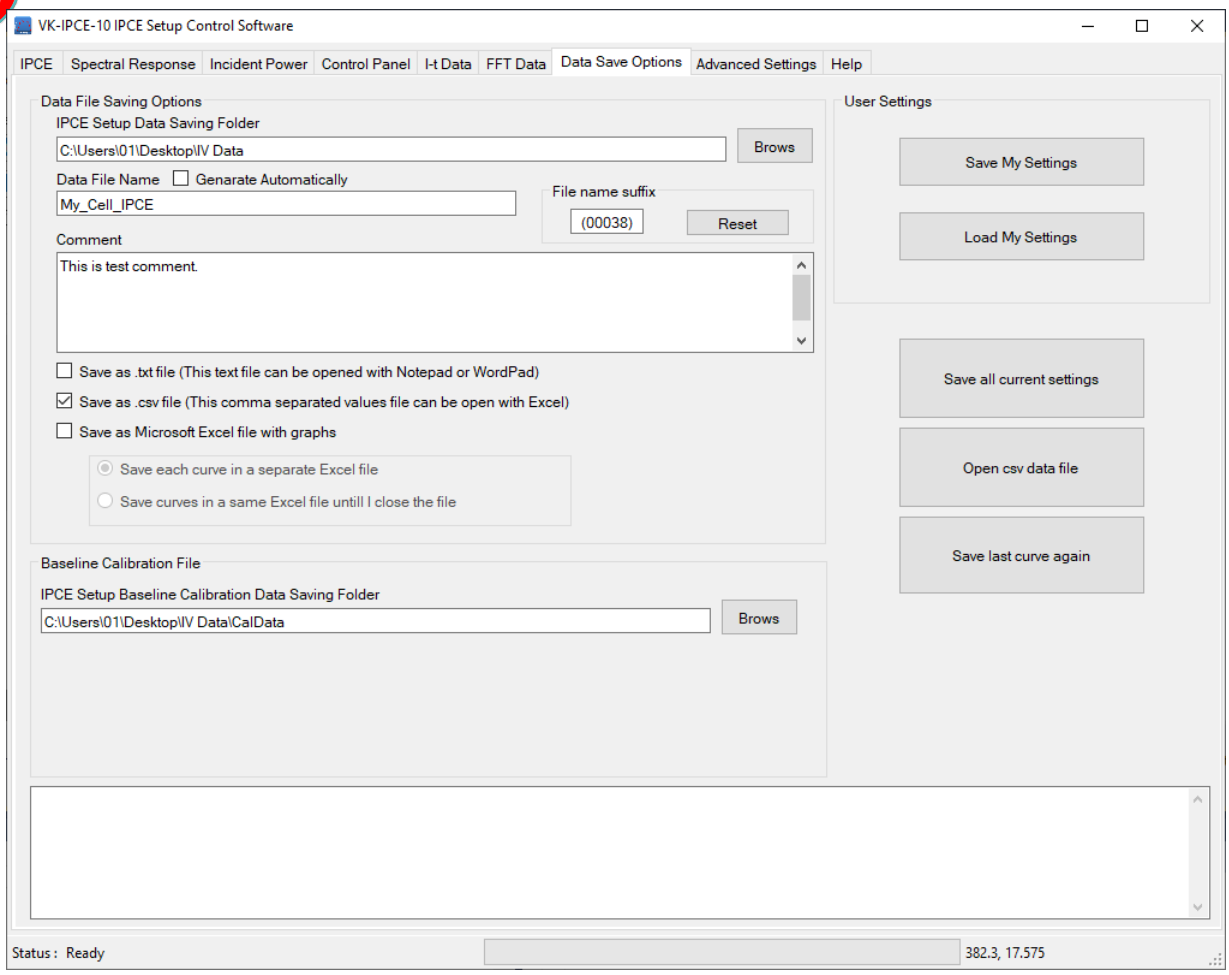
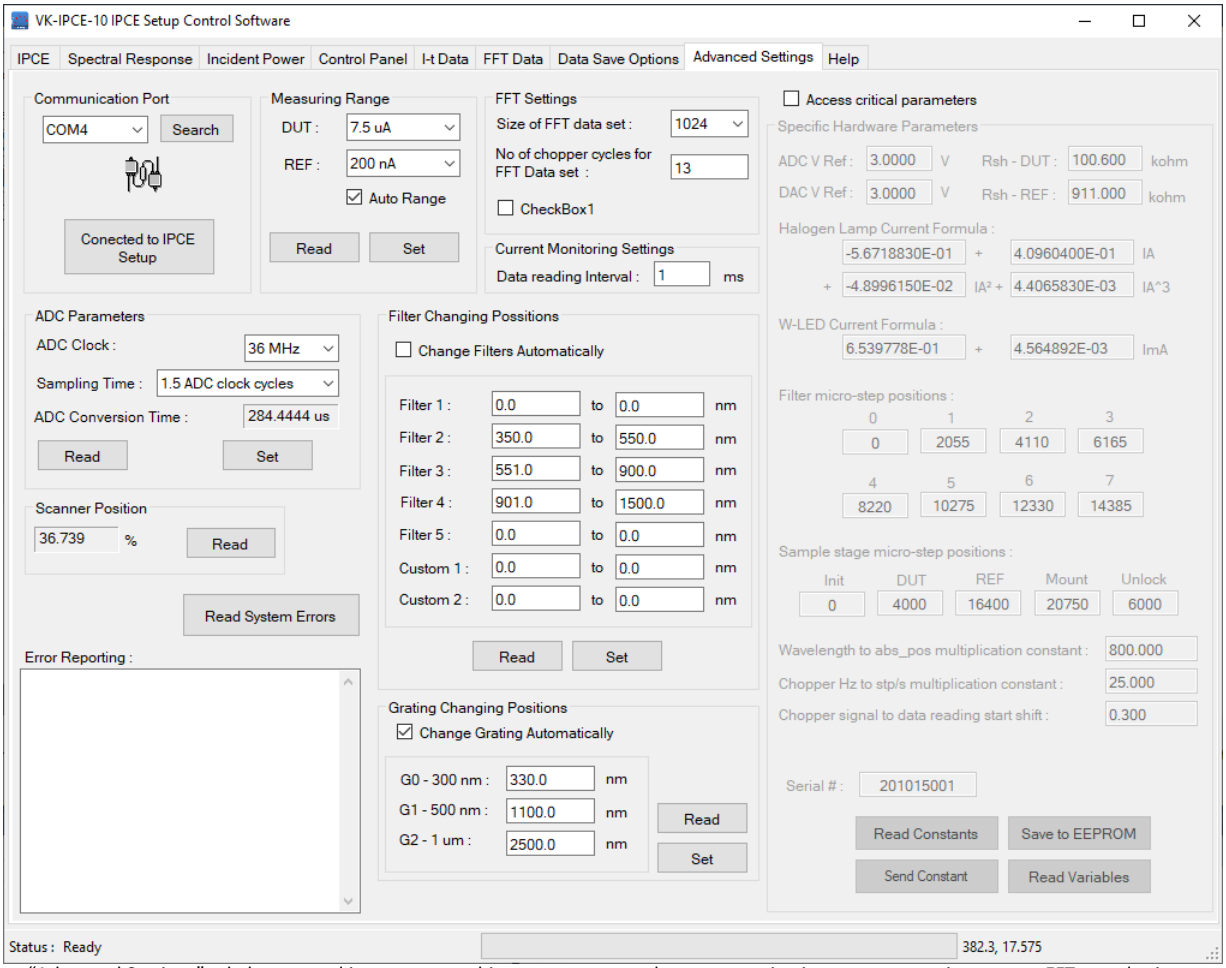


"Data Save Options" tab allow user to specify data file and calibration file saving folders in the computer. Also user can select desired output file formats in this screen.



"Advanced Settings" tab has several important machine parameters such as communication port, measuring ranges, FFT sample size, ADC speed. Parameters such as filter and grating changing position were not need to modify during normal operation.

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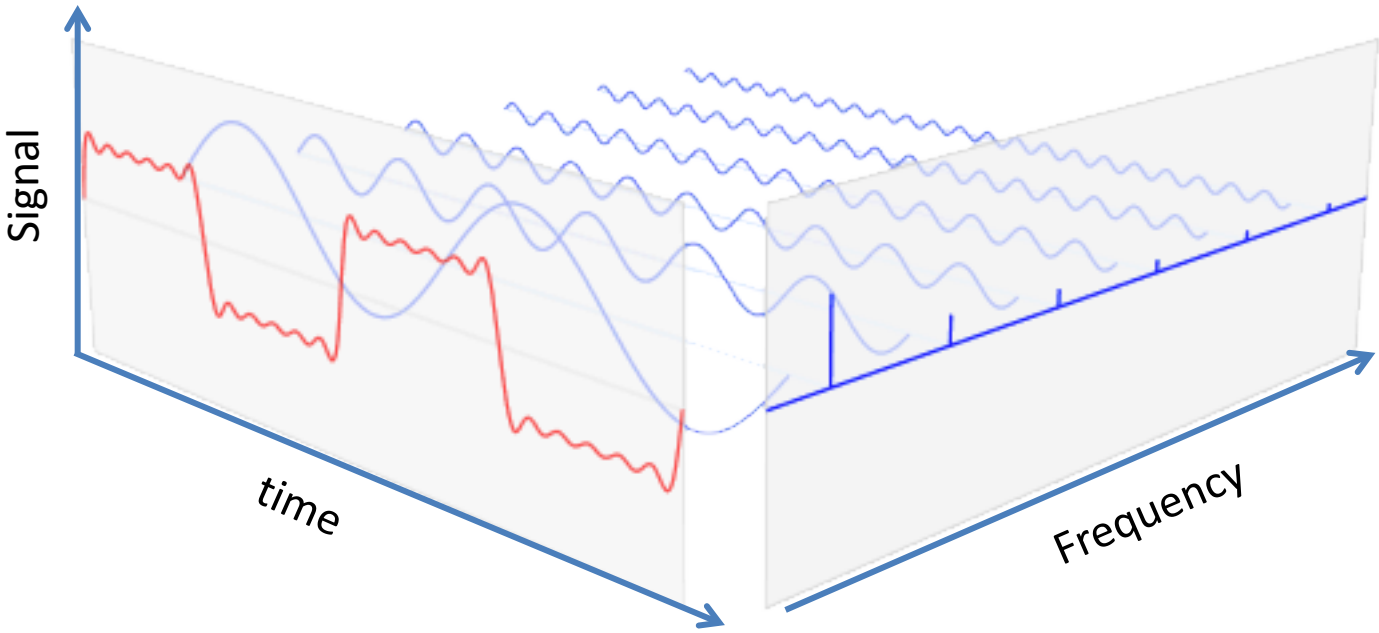

FFT based DSP is used to measure DUT current

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