Spectrum Detector, Inc.

Detector solutions that cover the spectrum.
Our technical strengths

- Pyroelectric detectors
  - design and manufacture
  - LiTaO3/LiNO3 crystal processing
    - thin film metallization
    - UV photo lithography
  - hybrid assembly and packaging
  - black absorbing coatings
  - detector test and calibration
- Optical Test and Measurement methods and calibration
- Analog and Digital instrumentation electronics design, assembly and test
- Instrument firmware development
- LabView Applications Software development
- AutoCad/Solid Works mechanical packaging design
- NIST Traceable optical calibration of sensors and electronics in Watts or Joules
  - Pulsed and CW lasers
  - Black Body Source
  - THz BB Source
  - Optical TRAP Standards
- Custom detector and instrument solutions
Product Families

1. Discrete and Hybrid Pyroelectric Detectors
2. “SXI” Modular, Analog and Digital Joulemeters, Radiometers and Power Meters
3. “delta” Compact, Economical, Analog and Digital Energy Meters, Optical Power Meters and Radiometers
4. “mach 5” 100 kHz Digital Joulemeter and Probes
5. Optical TRAP Detectors and Instruments (Primary Calibration Standards)
6. “STEP” Temperature Controlled or Compensated Broadband Radiometers
7. “T.rad” Broadband THz Radiometer, THz Sensors and Instruments
8. Custom and OEM Products
Discrete and Hybrid Pyroelectric Detectors

• Broadband 0.1 um to 1000 um
• Wide dynamic range …nW to mW
• High bandwidth …10 MHz
• Response time …<10 nsec
• Large area …to 9 mm
• Voltage Mode Circuit
• Current Mode Circuit
• IR windows

Accessories for Hybrid Pyroelectric Detectors

- Detector Evaluation Test Box
  - SPH-CM-TEST
  - SPH-VM-TEST
- Interchangeable Infrared Windows
- SDC-5000 Digital Optical Chopper

Modular SXI Instruments

- Interchangeable “detector modules”
- SM1 threaded front bezel
- Analog models are battery or AC powered for use with scopes, Lock In Amplifiers or Digital Voltmeters
- Digital models are USB powered and include stand alone LabView Software and USB Drivers
- Measure power from fW to W
- Measure energy from fJ to mJ
- Single, Dual or multi-channel

• Small, compact probes
• Designed for use on the lab bench or in a laser system (OEM)
• Versatile analog power module
• Powerful digital USB power module
• Interchangeable smart Probes and Modules
• Sensors available Si, Ge, InGaAs and Pyro
• Measure energy ..pJ to mJ
• Measure power…fW to mW
• LabView Software/Drivers
• Dual or multi channel
• Low cost

Single and Dual Channel LabView Application Software for “SXI” and “delta” Instruments

mach 5 100kHz Digital Joulemeter

• 1st ever 100kHz Joulemeter
• 100 times faster than any other Joulemeter
• capture up to 4 million pulses at max rep rate (100kHz)
• measure with high speed Joulemeter probes
  • Silicon
  • Pyroelectric
  • InGaAs
• measure from pJ to mJ
• includes powerful LabView Software
• measure missing pulses
• measure pulse jitter
• use Life Test mode for automated laser testing

mach 5 joulemeter. 100kHz measure laser energy
mach 5 Applications Software with powerful diagnostic capabilities

Live Screen where pulses are sampled at 10 Hz

Histogram with best fit Gaussian Curve

FFT Screen for time based analysis of the data set

Life Test set up and report
Optical TRAP Detectors (NIST Technology Transfer)

- Absolute power measurement from 450nm to 980nm
- Primary standard based on physical constants
- Calibrate Fiber Optic and Optical Power Meters
- NIST Boulder Design
- Low calibration uncertainty <0.5%
- Use with our picoammeter SST-PREAMP

Optical TRAP Instruments

- Accurate, low uncertainty measurement or calibration
- Silicon Detectors
  - Radiometer (pW)
  - Joulemeter (fJ)
- Pyroelectric Detector
  - Radiometer (0.19 to 15 um)
  - Joulemeter (0.19 to 15 um)
- Analog or Digital (USB) models
- LabView Software and USB Drivers

Temperature Controlled/Compensated Radiometers

- TE Controlled Broadband Radiometer for spectral calibration of IR detectors
- TE Controlled, Low Noise Silicon Radiometer for calibration of photon counting detectors
- Temperature compensated, Hybrid Pyroelectric Radiometer for precise power measurements
- Technology developed for the Radiometric Sensors Group at NIST Gaithersburg

Pyroelectric Products for an emerging THz market

Hybrid Detectors and Test Box
- 2 mm to 9 mm diameter
- High Rv ~150 kV/W @ 5 Hz
- Broadband response 0.1 to 3000 um
- Room temperature operation
- Spectral response matches the Golay Cell

SPI-A and SPI-D Instruments
- 5 and 9 mm models
- High Sensitivity 1 uW
- Analog probes for use with Lock In Amps
- Digital probes with LabView Applications Software

T.rad Broadband THz Radiometer
- 2, 5 and 9 mm models
- High sensitivity 50 nW
- Broad spectral response 0.1 THz to 3 THz
- DC drift compensation
- DSP Lock In Amplifier Software
- Plug and play operation

Measure the Power of THz sources
Pyroelectric Quad Detectors and Digital Position Monitor

DPQ Quadrant Pyroelectric Detectors
- 9 mm or 20 mm square
- 4 CH preamplifier
- Joulemeter (V/J) probes for pulsed sources
- Radiometer (V/W) probes for chopped CW or Quasi-CW sources
- Spectral Response from 0.19 to 3000 µm

DPQ-4Track Digital Laser Position Monitor
- measure, align and track pulsed or CW lasers
- pulses at up to 400 pps
- CW and Quasi-CW lasers...µW to mW
- Pulsed Lasers from...µJ to mJ
- THz sources from 0.1 to 30 THz
- stand alone, LabView Applications Software
- Unique calibration routine for near Gaussian beams
Custom Engineered Optical Instruments

**Calibration Transfer Standard for Single Photon Detectors (model SDX-1018)**

The SDX-1018 analog instrument was designed to work as an Optical Calibration Reference Standard for Single Photon Detectors. It included a temperature controlled Silicon detector, digital temperature control electronics and high gain voltage output (Rv > 3 V/nW).

**Pulsed Ruby Laser Test Set (model SDX-1052)**

The SDX-1052 can be used to measure the pulse energy and pulse shape of a 50 nsec pulsed Ruby laser. Includes self aligning enclosure, fast photodiode, large area Pyro Joulemeter Probe and USB powered Digital electronics that included LabView Software. It is based on our “delta” digital product family.

**8 CH Pyroelectric Array and Analog Electronics for THz Tomography**

The SDX-1076 8 element Pyroelectric Array and electronics were designed for a Fiber Laser based, multi-beam, THz Tomography project which is joint venture between the Universities of Manchester, Southampton and Leeds in the UK. The goal was to produce a high performance (low NEP), discrete array, capable of measuring 10 nW per channel in the 0.5 to 2 THz range.

**Broadband Pyroelectric Detector Hybrid and Thermistor for temperature compensation (model SDX-1016)**

We designed an analog detector system for NIST that incorporates our high gain, flat spectral response SPH-45 OB detector hybrid in a housing that includes a thermistor to monitor it’s temperature while in operation. The electronics include a power supply and analog outputs for the detector and thermistor. It is used as a spectral calibration transfer standard.
Long Pulse Pyroelectric Radiometer (model SDX-1003) for a Far IR CO\textsubscript{2} Laser

This was a custom digital instrument designed around our SPI-D-59 Pyroelectric Radiometer. It required having the capability of measuring the pulse width, peak power and pulse energy of a long pulse CO\textsubscript{2} (10.6 um) laser. It included four ranges from 100 µW to 100 mW and required having a 1 µW resolution on the lowest range. It could resolve pulses that ranged from 1 msec to 500 msec in length. Special LabView Applications Software was included.

High precision, high gain preamp for NIR Calibration Standard (model SDX-1063)

SDX-1063 is a precision, thermally stable, high gain preamplifier for a NIR InGaAs Calibration Transfer Standard designed at NIST Gaithersburg. The effort included the designing the analog and digital electronics, unique noise reduction software, and shielded enclosure.

Colorimeter Standard for NIST Gaithersburg

We provided design improvements to increase the reliability of the Colorimeter Standards used by NIST. The improvements included a new precision preamplifier, strain relieved wiring and new mechanical components. We were responsible for the assembly and functional test.

Multi-channel, Digital, Multiplexing Pyroelectric Energy Meter for pulsed lasers

We’ve develop a multi-channel, multiplexing laser energy meter with up to 16 channels. The instrument can be used with discrete Pyro Joulemeters or custom linear arrays. It features full speed USB 2.0 output and a fast analog output for use with an Oscilloscope to view the relative output of each channel. It includes custom, stand alone LabView Software.
Summary

1. The modular, interchangeable design of our instruments yields flexible, versatile operation.
2. Our USB powered digital instruments are unique, versatile, and easy to use in multi-channel applications.
3. Our executable LabView Applications Software is incredibly powerful for use in the lab … single or dual channel.
4. Analog probes can offer the ultimate in performance but must be used with lab instruments like oscilloscopes, lock in amps, digital volt meters, etc.
5. Analog products lend themselves to customer specified modifications like … optimizing Rv, NEP, Response time, Bandwidth, etc.
6. The mach 5 100 kHz Joulemeter is a true technical break through in the pulsed laser measurement field. Perfect match for DPSS and Fiber Lasers.
7. The Optical TRAP Detectors and Instruments are totally unique in the photonics market and offer a level of low calibration uncertainty usually reserved for the National Labs.
8. The Temperature controlled and/or compensated Radiometers are an important development for those trying to lower the uncertainty of their optical calibration procedures … and not available from other companies.
9. Our THz product line is continually evolving as we strive to learn more about their performance in the 30 THz to 0.1 THz portion of the spectrum. We just introduced an expanded line of products including the first DSP Lock In based Broadband Digital Radiometer for THz measurements.
10. New Pyroelectric Quadrant Detectors and DPQ-4Track Laser Position Monitor for use with CW and Pulsed Lasers to track, control, or measure beam position.
11. Custom engineered instruments … if you don’t see a solution using our standard products, don’t hesitate to ask us for a custom solution.

Detector solutions that cover the spectrum.