Sacher Lasertechnik

Next Generation Micron Laser

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(confidential technical documentation)
Littrow Laser Products

- Cavity Layout
- Product Photo

Application
- Optical Cooling & Trapping
- Raman Spectroscopy
- Holography

Award Winning Product
- CLEO Conference 2000

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Next Generation Littrow Cavity

- Compact Package
- Excellent Stability
- No Moving Parts
- No Mechanic Cavity Resonances
- Narrow Linewidth
- Low Temperature Drift
High Power Model @ 780nm

- PI Curve

Efficiency
- 1mW/mA

Wavelength Tuning

Tuning Factor
- 1pm / mA

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High Power Model @ 780nm

Spectrum

Side mode suppression ratio

![Graph showing the spectrum of a High Power Model @ 780nm Littrow Laser Product, with a side mode suppression ratio of 52 dB.](image)
- Rubidium D2
- Large Scan
  - Several Absorption Lines
- Narrow Scan
  - Hyperfine Structure

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Linewidth

Beat Experiment

Linewidth << 100kHz
< 15kHz (typ.)
Tuning Mechanism

(a) Initial Status

(b) Laser Current Change
   Mode position change

(b) Wavelength Tuning
   Mode position changes relative to Grating

(c) Defined Mode-Hop
   As soon as one mode leaves the reflection band of the Grating, another mode shifts in

![Graph showing wavelength vs injection current]
Littrow Laser Products – Industrial Grade

- **Performance Data @ 760nm**
  - PI Curve
  - Efficiency: 1mW/mA

- **Wavelength Tuning**
  - Tuning Factor: 0.625pm / mA

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High Power Model @ 780nm

PI Curve

Efficiency

1 mW/mA

Wavelength Tuning

Tuning Factor

1 pm / mA

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Littrow Laser Products – Industrial Grade

Performance Data @ 785nm

- PI Curve

- Efficiency: 1mW/mA

- Tuning Factor: 0,625pm / mA
Littrow Laser Products – Industrial Grade

Performance Data @ 795nm

- PI Curve
- Efficiency: 0.8mW/mA

Wavelength Tuning

- Tuning Factor: 1pm / mA

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Performance Data @ 830nm

- PI Curve

- Efficiency
  - 0.8mW/mA

Wavelength Tuning

- Tuning Factor
  - 1pm / mA

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- **Performance Data @ 852nm**
  - **PI Curve**
  - **Efficiency**
    - 1mW/mA

- **Wavelength Tuning**
  - **Tuning Factor**
    - 0.5pm / mA

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Littrow Laser Products – Industrial Grade

**Performance Data @ 895nm**

- **PI Curve**

![PI Curve](image)

- **Efficiency**
  - 0.6mW/mA

**Wavelength Tuning**

- **Tuning Factor**
  - 1pm / mA

![Wavelength Tuning](image)

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Littrow Laser Products – Industrial Grade

Calcium Ion Cooling

Schematic

- 375nm → Continuum
- 393nm
- 397nm
- 850nm
- 854nm
- 866nm

Available upon request

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Strontium Cooling

- Schematic

- Available upon request

460.9nm

- 689.5nm → 7.8kHz
- 698nm

- 679.2nm
- 688nm
- 707.2nm

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**Relative Intensity Noise (RIN)**
- Low, nearly constant RIN of -136 dB/Hz above 1 kHz
- No Microphonic Cavity Resonances
- RIN is reduced for higher Operation Current Values
Low Noise Laser Controllers

- Micro Controller Operated Laser Controllers

- Sub µA Noise Figure
- Up to 4000mA Laser Current
- Integrated Function Generator
- Integrated Piezo Amplifier
- Fully Remote Control Features
- USB, GPIB, RS232
- Laboratory and OEM Versions
Low Noise Laser Controllers

- Laser Diode Current
- Sub μA Noise Figure

Pilot PZ 500 Noise Spectrum

- 100mA
- 200mA
- 500mA

Current Noise [A/\sqrt{Hz}]

Frequency [Hz]

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Servo Controller

- High Frequency PI Regulator
- 10MHz Bandwidth
- Adjustable Corner Frequencies
- Integration Hold Function
- Low Frequency Gain Limit
- FPGA Controlled Operation
- Fully Remote Control via USB

- Application: Laser Stabilization
- Optical Cooling & Trapping

Principles of Operation

Product Photo

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Modulator & Demodulator

- High Frequency Synthesizer
- Central 3GHz Clock
- 2 DDS Synthesizer
- 100kHz to 100MHz Modulation
- ns Phase Adjustment
- High Frequency Mixer
- High Modulation Amplitude
- Fully Remote Control via USB

Application: Laser Stabilization
- Pound Drever Hall Lock
- Optical Cooling & Trapping

Principles of Operation

Product Photo
Laser Frequency Stabilization
- Frequency Tolerance <1MHz
- 24/7 Operation Requirement
- Locking to Rubidium Transition
- Locking to Cesium Transition
- Side of Fringe & Top of Line Lock

Fully Remote Control Operation
- Internal Operation Control via FPGA
- Remote Control via USB
Sacher Lasertechnik Headquarter

- Space 1200m²
- 12900 square ft.
- 30 employees at location

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Product Family Overview

- AR Coated Laser Diodes
- DFB Laser Diodes
- ns Pulsed Laser
- Laser Controller
- Laser Controller
- Laser Controller
- ps Mode Locked Laser
- Micro Cavity Laser
- Littrow Laser System
- Littman Laser System
- Laser Amplifier System
- MOPA Laser System
- MOPA Laser System
- SHG Laser System
- THz Laser System
Thin Film Coating Equipment

- Sputter Coater
  - High Volume Production
  - R&D Coatings

- E-Beam Coater
  - R&D Coatings

(Confidential technical documentation)
Technology: Diode Laser Chip Handling

- Dye Bonder
- Laser Chip Mounting

- Wire Bonder
- Laser Chip Electrical Connection

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Technology: Electro Optic Micro-Assembly

- Multi-Emitter Fiber Coupling
- Up to 12 Single Mode Emitters Fiber Coupled
- Multi-Wavelength Emitter Fiber Coupled
Thank You For Your Attention!

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