CV of Devnath Dhirhe, PhD(University of Glasgow, UK)

Research Domains:

- MiD-IR and THz Quantum Cascade Laser
- Quantum Dot Lasers
- Integrated Optics and Si-Photonics
- Integrated Polarisation Manipulation
- Ring Lasers
- Fiber Laser/Low Noise Fiber Amplifier
- High Speed Free-Space Optical Communication
- Telecommunication 1550 nm Semiconductor Laser

Sponsored Projects:

- Electrically Tuneable Quantum Cascade Laser, Funded by: LASTEC-DRDO, Sanction Amount:2.96Cr, Tenure: 3 Years (**From May 2020**)
- Design and Development of THz Quantum Cascade Laser, Funded by: SSPL-DRDO, Sanction Amount:4.7 Cr, Tenure: 3 Years (**From March 2021**)

Research Facility Developed:

- Mid-IR and THz Quantum Cascade Laser Characterization/ Spectroscopy Laboratory
- IR Laser (Telecommunication wavelength) Characterization Laboratory
- Fiber Laser and Fiber Optics Sensor Laboratory
- Tuneable OPO based Spectroscopic facility
- Class 10000 cleanroom facility for all above laboratory
- 1.3 kW CO_2 Laser Laboratory
- Nd:YAG Laser laboratory (**Proposed**)

Doctoral Supervision:

- **Sahil Saini "**THz Quantum Cascade Laser**" Ongoing**
- **Lalit Gaikwad "**Ultrafast Fiber Laser**" Ongoing**
- **Arvindkumar Yelashetty** "Propagation of Optical Coherence Through Various Linear Optical Systems" **Awarded, 2021**
- **Nitika Gupta** "Investigation of Electro-Optical Properties of III-VI Quantum Dot Epitaxial Structure for High Power Quantum Dot Laser Application" **Submitted-2021**

Non-Doctoral Supervision JRF/SRF:

- **Pankaj Bhujbal: Electrically Tuneable Quantum Cascade Laser**
- **Shraddha Rajpoot: Electrically Tuneable Quantum Cascade Laser**
- **Praveen Gond: THz Quantum Cascade Laser**
- **Pranav G: THz Quantum Cascade Laser**

Master Thesis Supervision:

Ongoing: area of research • **Sakshi Dubey:** Free-Space Optical Communication • **Priyanka A:** Ultrafast Fiber Laser • **Samruddhi Meshram: I**ntegrated Optics
2021 • **W/C Praneeth Kumar Tanugula** "Study and Analysis of Infrared Thermographic Methods for Structural Health Monitoring using Non-contact Methods." • **W/C Amit Kumar Tiwari** "Designing a Laser-Based Security System using Microcontroller with Immediate SMS, Alarm and Video Attention." • Akshara V "Computer Communication using Free Space Network."

2020

- **Ankur Chatterjee** "Design of 5GBPS MZM Drives using 0.18 µm CMOS Technology for PSK Modulation."
- **Sqn Ldr Ankit Sharma** "Designing an Optical Fiber Link for Arrestor Barrier Connectivity with Software Control."

2019

- **S/L Anshul Puntambekar** "Laser-based Parameter Security System."
- **Prasath R** "Optical current sensor."
- **Supriya Rajhans** "Pulse Compression and Broadband Source Generation for Optical Coherence Tomography using Microstructured Optical Fiber."
- **Bhaswar Dutta Gupta** "Ultrafast Fiber Source for Chirped Pulse Amplification at 1µm"
- **Abhishek Kumar** "Photonics radar simulation and modeling."

2018

- **Jagmohan Kumar** "Study on Feasible Solutions to Prevent Failure of Laser Range Finder"
- **Mahesh Kumar S** "Study on frequent Failures of Laser Range Finder."
- **Joshi Sameehan** "Study & analysis of different Fiber optic sensor cables and configurations for the intrusion detection system."
- **Pisipati Rajeev** "Design and Development of Fiber Optics Based Interferometer Techniques for Acoustic Signature Sensing"
- **Pawan Kumar Pandit** "Differential phase modulation (DPSK) for free-space-optical communication."
- **Soumya Purohit** "Computational Imaging Technique for improving the performance of optical imaging system"
- **Pragya Sharma** "Design of Microbolometer Pixel"
- **P Naveen Kumar** "Design and Development of the algorithm for Shack Hartmann wavefront sensor for adaptive optics applications"
- **Gauravi Pore** "Study & Design of Signal Processing Algorithm for Fiber Optic Sensors

2017

- **Wg Cdr Ajay Kumar Thakur** "Designing & Analysis of High-Power Semiconductor Laser Array Beam Combiner: MMI Coupler."
- **Deepak Kumar Pandey** "Stress Analysis of ERBIUM Doped Phosphate Glass"

2016

- **P. Vijaya Kumar** "Simulating the DIRCM engagement system-level performance"
- **Rahul Patil** "Trace Gas detection using IR QCL Photo Acoustic Spectroscopy"

Education

09.2013	**PhD (Electronics and Electrical Engineering)** from University of Glasgow, Glasgow, UK Thesis: "*Monolithic Tuneable Quantum cascade Lasers*" Research performed at the Optoelectronics Group and James Watt Nanofabrication Centre, University of Glasgow, UK Advisor – *Prof. Charles N. Ironside* *Co-adviser- Prof. Douglas J. Paul*
02.2008	***M.Phil (Physics)** from Periyar University, Salem, TN*
07.2002	**Advanced Diploma in System Maintenance Engineering** from Centre for Electronics Design and technology of India, Mohali, Punjab, India
11.1998	**M.Sc (Electronics)** From Guru Ghasidas University, Bilaspur, India

08.1996 **B.Sc (Physics, Chemistry, Mathematics)** from Guru Ghasidas University, Bilaspur, India

Short-term Course

2004 **Maintenance of Electronics Instruments** (One week), Pt. Ravishanker University Raipur and WRIC, Mumbai, INDIA

2005 **Organic Electronics and Flat Panel Display** (One week), IIT, Kanpur, India

2005 **Matlab** (One week), NIT, Raipur, India

2006 **Organic Electronics** (One week), IIT, Kanpur, India

2007 **Scanning Electron Microscopy (SEM)** (3 days), USIC, University of Burdwan, Burdwan

2007 **Advanced Training Workshop on Instrumentation and Sensors on the Grid** (Two weeks), ICTP, Trieste, Italy

Teaching/Professional Experience

20/08/2014 – Till date	Assistant Professor, Department of Applied Physics, Defence Institute of Advanced Technology, Pune, India
13/09/2002 – 15/10/2013	Assistant Professor (On study Leave), Kamla Nehru College, Korba, Chhattisgarh, India
07/08/2008 - 20/03/2009	Senior Research Fellow (Department of Science and Technology, Government of India, New Delhi, project), Indian School of Mines, Dhanbad, India (PI Prof. V. Kumar)
01/09/1999 - 31/03/2001	Assistant Professor, Govt. College, Korba, Chhattisgarh, India

Technical skills (Hand on Experience)

1. **Software**
   - Nextnano^3 Simulation Tool for Quantum Heterostructures and Quantum Devices
   - Lumerical and RSoft for Device Modelling
   - Tanner EDA L-edit for Device Fabrication Process and VLSI Fabrication
   - Matlab for Device Numerical Modelling
   - Mathmatica for Device Modelling
   - OrCAD for Electronics Circuit and PCB Design
2. **Major Equipment's: Hand on Experience**
   - Fourier Transform Infra-red Spectroscopy (FTIR): **Burker Vertex 70**
   - Boxcar and Cascade Technologies Laser Driver
   - Oxford Instrument Cryogenic Cooling system
   - Atomic Force Microscopy (AFM)
   - Scanning Electron Microscopy (SEM)
   - Daktak Surface Profiler
   - Electron Beam Metal Evaporator
   - Sputter Coater (Gold)
   - Electroplating Kit
   - Oxygen Barrel Asher -Gala
   - Photolithography (MA6/BA6)
   - E-beam Lithography
   - RIE 80 Plus and III-V RIE system 100
   - Cleanroom Technology
   - General Chemical Processing for semiconductor laser

Award and Fellowship

- **National Oversees Scholarship**: Ministry of Social Justice and Empowerment, Govt. of India, New Delhi
- **Post-graduate Travel Grant**: University of Glasgow, Glasgow to attend conference at California, USA (2012)
- **Post-graduate Travel Grant**: University of Glasgow, Glasgow to attend conference at Vienna, Austria (2012)

Membership of Professional Bodies/Organizations

- APS (American Physical Society)
- IOP (Institute of Physics)
- IEEE, IEEE Photonics Society and IEEE Communication Society
- OSA (Optical Society of America)
- OSI(Optical Society of India)

Other Academic and Corporate Activities

- **Adviser for QCL device fabrication** : Prof. Robert Peale, Department of Physics, University of Central Florida, Orlando, FL 32816-2385
- **III-N MBE growth for THz QCL laser** : Dr. R. Pallai, Nanoscientist, University of Puerto Rico, Río Piedras Campus, Institute for Functional Nanomaterials, San Juan, PR 00931-3334
- **E-beam lithography process development for commercial QCL fabrication** : Dr. Thomas J. Slight, Sr. Engineer at Compound Semiconductor Technologies, Hamilton International Technology Park, Hamilton- G72 0BN, UK

List of Publications

1. Publications in international journals (SCI-index peer-reviewed**)**

2021

1. **Impact of Built-in Electric Field on the Emission Characteristics of InAs/GaAs Quantum Dot Laser Structure**, N Gupta, P Mudi, A Yelashetty, TK Sharma and D Dhirhe, physica status solidi (b), 2100090, 2021, PP. 0370-1972 (https://doi.org/10.1002/pssb.202100090)

2020

1. **Linear canonical transform as a tool to analyze coherence properties of electromagnetic beams propagating in a quadratic phase system**, A Yelashetty, N Gupta, D Dhirhe, U Gopinathan, JOSA A 37 (8), 2020, 1350-1360 (DOI: 10.1364/JOSAA.395777)
2. **Intermittent events due to spectral filtering induced multi-pulsing instability in a mode-locked fiber laser**, BD Gupta, SD Chowdhury, D Dhirhe, M Pal, JOSA B 37 (8), 2020, 2278-2286 (DOI: 10.1364/JOSAB.396768)
3. **Evolution of stokes parameters in quasi homogeneous electromagnetic sources in the far field**, A Yelashetty, N Gupta, D Dhirhe, G Unnikrishnan, Optik 207, 2020, 163811 (DOI: 10.1016/j.ijleo.2019.163811)
4. **Temperature-Independent Performance of an 8-Layer λ~ 1.3 μ m InAs/GaAs Quantum-Dot Laser**, N Gupta, A Yelashetty, A Sharma, A Jain, U Gopinathan, D Dhirhe, Journal of Russian Laser Research, 1-8, 2020 (https://doi.org/10.1007/s10946-020-09851-3)

2013

1. **Active polarisation control of a quantum cascade laser using tuneable birefringence in waveguides**, D Dhirhe, TJ Slight, BM Holmes, CN Ironside, Optics express 21 (20), 24267-24280 (DOI:10.1364/OE.21.024267)

2012

1. **Quantum cascade lasers with an integrated polarization mode converter**, Dhirhe, TJ Slight, BM Holmes, DC Hutchings, CN Ironside, Optics express 20 (23), 25711-25717 (**https://doi.org/10.1364/OE.20.025711**)
2. **A tunable single-mode double-ring quantum-cascade laser**, D Dhirhe, TJ Slight, CC Nshii, CN Ironside, Semiconductor Science and Technology 27 (9), 094007 (http://dx.doi.org/10.1088/0268-1242/27/9/094007)

2009

1. **Debye temperature and melting point of ternary chalcopyrite semiconductors** V. Kumar, A. K. Shrivastava, R. Banarji and **D. Dhirhe**, Solid State Commun., Vol. 149(25-26), pp. 1008-1011 (2009)

2007

2. **Enhanced luminance efficiency of polymer light emitting diode by blending with ionic solid electrolytes, D. Dhirhe**, S. Tiwari and H. S. Tewari, IONICS, Vol. 13(5), pp. 319-321(2007)

Contributions to international conferences (Scopus Indexed: Peer Reviewed**)**

1. **Pulse Compression at 1064 nm Using Air-Silica Nonlinear Microstructured Optical Fiber** S Rajhans, S Das Choudhury, D Dhirhe, M Pal, D Ghosh, ICOL-2019: ICOL-2019: Proceedings of the International Conference on Optics and Electro-Optics, Dehradun, India, Springer, PP. 173-176, 2021
2. **Propagation of EM-Coherence Through Varying Lens Position Fractional Fourier Transform System**, A Yelashetty, N Gupta, D Dhirhe, G Unnikrishnan, Frontiers in Optics, Optical Society of America, FW1A. 3, 2020
3. **Propagation of Stokes parameters in oceanic turbulence**, A Yelashetty, N Gupta, D Dhirhe, G Unnikrishnan, Seventh International Conference on Optical and Photonic Engineering (icOPEN 2019), ISOP, Vol.11205, PP. 112050H, 2019
4. **Broadband Source for Optical Coherence Tomography at 1064 nm Using Silica-based Microstructured Optical Fiber**, S Rajhans, M Pal, D Dhirhe, SK Bhadra, D Ghosh, 2019 Workshop on Recent Advances in Photonics (WRAP), 1-3, 2019
5. **Room temperature performance of InAs-GaAs quantum dot laser emitting at 1.3 μm**, N Gupta, A Yalashetty, A Sharma, A Jain, D Dhirhe, Seventh International Conference on Optical and Photonic Engineering (icOPEN 2019), ISOP, Vol.11205, PP. 1120520, 2019
6. **Wavelength tuning and polarisation control with an integrated tunable birefringent filter for quantum cascade lasers**, D Dhirhe, TJ Slight, BM Holmes, DC Hutchings, CN Ironside, 2013 Conference on Lasers & Electro-Optics Europe & International Quantum Electronics Conference CLEO EUROPE/IQEC, IEEE, PP. 1-1 (2013)
7. **Polarization Control of a Quantum Cascade Laser, D. Dhirhe**, T. J. Slight, B. M. Holems, D. C. Hutchins, C. N. Ironside, In Conference on Lasers and Electro-Optics 2012, OSA Technical Digest (Optical Society of America, 2012), paper JW2A.99.
8. **Wavelength Tuning and Polarisation Control with an Integrated Tunable Birefringent Filter for Quantum Cascade Lasers, D. Dhirhe**, T. J. Slight, B. M. Holems, D. C. Hutchins, C. N. Ironside, The European Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference (CLEO/Europe-IQEC), paper CB-1:5, Munich, Germany, 12-16

Contributions to National/ international conferences (Non-Scopus Indexed)

1. **Active and Passive Polarization control of Quantum Cascade Lasers, D. Dhirhe**, T. J. Slight, B. M. Holmes, D. C Hutchings, and C. N. Ironside, 22nd European Workshop on Heterostructure technology, University of Glasgow, Glasgow, UK, 9-11th Sept. 2013
2. **Wavelength and polarization control of quantum cascade laser,** T. J. Slight, **D. Dhirhe**, W. Meredith, and C. N. Ironside, US-UK Workshop in Mid-IR to THz Technology and Applications, Royal, Society of Edinburgh, Edinburgh, UK, 18th - 19th February 2013
3. **An Integrated Tunable Birefringent Filter for Quantum Cascade Lasers, D. Dhirhe**, T. J. Slight, B. M. Holems, D. C. Hutchins, C. N. Ironside, Paper presented at International Quantum Cascade Lasers School and Workshop, 2 – Dec. 2012, Vienna, AUSTRIA
4. **Spectroscopy With A Double-ring Quantum-Cascade Laser, D. Dhirhe**, T. J. Slight, C. C. Nshii, M. Sorel and C. N. Ironside, Paper presented at International Quantum Cascade Lasers School and Workshop, 2 – Dec. 2012, Vienna, AUSTRIA
5. **Wavelength and polarisation control of quantum cascade lasers,** T. J. Slight, **D. Dhirhe**, W. Meredith, and C. N. Ironside, Paper presented at US-UK Workshop in Mid-IR to THz Technology and Applications, 18 Feb. -19 Feb. 2013, Royal Society of Edinburgh, Edinburgh, UK
6. **Optimization of Efficiency of Polymer Light-emitting Diodes, D. Dhirhe**, S. Tiwari and H. S. Tewari, Paper presented at National Conference on Advances in Electronics Materials and Devices(AEMD-2006), Guru Ghasidas University, Bilaspur (C.G.), INDIA
7. **Teaching Electronics with Computer Based Matlab Software, D. Dhirhe**
   Proceeding of National Seminar on Multidisciplinary approach of computer science in higher education, 15-16 Dec 2005,Kamla Nehru College, Korba, India.

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