

# Esha Manne

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## SNAPSHOT PROFILE

- I envision research and development as an integral part of my career profile. I have a unique background combining education and experience in Laser spectroscopy with expertise in the development of near and mid-infrared optical sensors for planetary, environmental, and biomedical applications.
- Significant experience collaborating with well known specialists in their related fields.
- Blend of organizational and analytical talents with creativity and strong communication skills.
- Highly focused and motivated with excellent problem solving skills.

### Laser Spectroscopy

- Cavity ring-down spectroscopy (CRDS)
- Off-axis cavity enhanced spectroscopy (CES)
- Wavelength modulation spectroscopy (WMS)
- Long pulse (chirp) spectroscopy

### Communication skills

- Lab instructor and course lecturer
- Conference presentations

### Research grant applications

- Significant contribution in various research proposals and grant applications with a high rate of successful outcome

### Novel instruments developed

- Pulsed TDLS-WMS open path system for optical trace gas sensing
- Breath ammonia analyzer based on laser spectroscopy

### Mathematical modeling

- Absorption line shape modeling such as Hartmann-Tran function.
- LabView based phase locked loop code for harmonics detection

### Management

- Research Lab Manager

### Software and Languages

- Matlab, Mathematica, LabView, Origin, AutoCAD, Zemax
- C/C++, JAVA, Latex

### Leadership

- Mentoring and supervising students at undergraduate and graduate levels
- WISEST volunteer

### Other Optical techniques

- Infrared Imaging
- Polarimetry (Visible spectroscopy)

## EDUCATION

2009	UNIVERSITY OF ALBERTA, <b>PhD Electrical and Computer Engineering</b> ( GPA 3.7/4) <ul style="list-style-type: none"> <li>• <i>Alberta Innovates Industry Associate award. (2009)</i></li> <li>• <i>Queen Elizabeth II graduate scholarship-Doctoral level. (2007)</i></li> <li>• <i>CAM2007-CAP/NSERC Presenter Award. (2007)</i></li> <li>• <i>Mary Louise Imrie Graduate Student Award. (2007)</i></li> <li>• <i>Graduate student's association (GSA) professional development award. (2008)</i></li> </ul>
1996	OSMANIA UNIVERSITY, <b>MS Physics Distinction</b> <ul style="list-style-type: none"> <li>• <i>Council of Scientific and Industrial Research (CSIR) scholarship holder.</i></li> <li>• <i>Secured a percentile score of 95 in Graduate Aptitude Test in Engineering.</i></li> </ul>
1994	OSMANIA UNIVERSITY, <b>BS Physics Distinction</b>

## PROFESSIONAL EXPERIENCE

**Postdoctoral fellow** Jet Propulsion Lab /Caltech

2013- Present

- *NPP fellowship (2014)*

Part of a research team that supports the goals of NASA's Mars Exploration Program by supporting Mid-infrared TLS

(Tunable Laser Spectrometer) on SAM (Sample Analysis at Mars). I am involved in the data analysis and measurements in support of TLS, which includes processing and analysis of TLS spectral data (direct and second harmonic absorption) and laboratory work on assessing the integrity of isotope ratios in carbon, oxygen and hydrogen when using SAM-like processing such as methane enrichment.

- Designed, conducted, and completed research on the measurements of spectral parameters to assess the integrity of isotopic ratios in carbon, oxygen and hydrogen using SAM like processing directly supporting Mars-TLS instrument.
- Contributed to the processing and analyses of Mars-TLS spectral data.
- Research and development efforts towards development of next generation laser spectrometers for future planetary missions.

## Research Associate, ALLSAS (Alberta Laboratory for Laser Spectroscopy and Atmospheric Sensing) University of Alberta

2009 - 2013

My major role was to develop high sensitivity trace gas sensing techniques using diode and Quantum cascade (QC) lasers for tracking important greenhouse gases and other important toxic molecules. I also contributed towards developing spectroscopic temperature sensors using dual absorption lines technique.

- Designed, implemented, and tested optical sensing instruments for the detection of important greenhouse gases and other environmentally important molecules.
- Developed and implemented sensitive optical spectrometers for atmospheric, planetary, and biomedical applications. E.g. spectroscopic techniques including cavity ring-down spectroscopy (CRDS), off-axis cavity enhanced spectroscopy (CES), frequency chirp spectroscopy, and wavelength modulation spectroscopy (WMS).
- Directed research and development efforts for design and implementation of spectroscopic techniques for temperature measurements using near IR VCSELS (vertical cavity surface emitting lasers) for planetary and meteorological applications.

## Research Engineer, Boreal Laser Inc.

2007-2009

This research work was a NRC (National research council) and NSERC (Natural sciences and engineering research) Nanotechnology Initiative which supports collaborative research in fields that are of world importance: cleaner energy and cleaner environment. My role was to develop innovative optical techniques for portable open path trace gas sensing applications.

- Designed, tested, and prototyped an innovative laser spectrometer based on a pulsed, QC laser in combination with wavelength modulation spectroscopy for open path gas sensing applications (field applications).  
*Commercial product based on this technique is being developed at Boreal*
- Led research and development of technology for sensitive, real time, and field applicable optical sensors.
- Contributed to the research project for the development of Micro-electro mechanical systems (MEMS) based external cavity diode laser systems.

## TEACHING AND MENTORING

2002-2009	<b>Lab Instructor, teaching assistant, guest lecturer, Research lab manager</b> , Dept. of ECE, University Of Alberta
2007-2013	<b>Volunteer</b> , University Of Alberta, WISEST (Women in scholarship, science, and engineering technology) as a role model
2007-2013	<b>Volunteer</b> , University of Alberta Housing Community

## PUBLICATIONS

### Submitted

**J. Manne** and W. Jaeger, "Wavelength modulation spectroscopy with a distributed feedback, pulsed and continuous wave quantum cascade lasers: A comparison", Accepted: "International Journal of Advances in Science, Engineering and Technology" Volume **3**, Issue 4 (2015) Online ISSN: 2321-9009

**J. Manne** and C.R. Webster, "Determination of Spectral Parameters for Lines Targeted by the Tunable Laser Spectrometer (TLS) on the Mars Curiosity Rover", Submitted: JQSRT (2015)

**J. Manne** and W. Jaeger, "Characterization of a pulsed quantum cascade laser for wavelength modulation spectroscopic applications", Submitted: Applied Physics B (2015)

**J. Manne** and C.R. Webster, "Determination of foreign broadening coefficients for methane lines targeted by the tunable laser spectrometer (TLS) on the Mars Curiosity Rover", In preparation (2015)

### Published articles

**J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Sensitive detection of acrolein and acrylonitrile with a pulsed quantum cascade laser", Appl. Phys. B, **107**: 441-447 (2012).

**J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Wavelength modulation spectroscopy with a pulsed quantum cascade laser for the sensitive detection of acrylonitrile", Appl. Opt., **50**: E112-118 (2011).

**J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Wavelength modulation spectroscopy with a pulsed quantum cascade laser for the sensitive detection of acrylonitrile", Appl. Opt., **50**: E112-118 (2011).

**J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Wavelength modulation spectroscopy with a pulsed quantum cascade laser", SPIE: **8173**: 81730D (2011).

**J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Off-axis cavity enhanced spectroscopy based on a pulsed quantum cascade laser for the sensitive detection of ammonia and ethylene", Applied Optics **49**: 5302-5308 (2010).

**J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Detection of acrolein and acrylonitrile with a pulsed, room temperature quantum cascade laser", SPIE **7750**-123 (2010).

**J. Manne**, W. Jaeger, and J. Tulip, "Sensitive detection of ammonia and ethylene with a pulsed quantum cascade laser using intra- and inter-pulse spectroscopic techniques", Applied Physics B. **94**: 337-344 (2008).

**J. Manne**, W. Jaeger, and J. Tulip, "Pulsed quantum cascade laser based cavity ring-down and cavity enhanced spectroscopy for the detection of ethylene", R. Vallee, M. Piche, P. Mascher, et al, eds. SPIE. **7900**: 709922-1-8 (2008).

**J. Manne**, W. Jaeger, and J. Tulip, "A quantum cascade laser based room temperature spectrometer for sensitive detection of ammonia and ethylene," R. Sudharsanan and C. Jelen, eds. SPIE, **6900**, pp. 690014 (2008).

**J. Manne**, O. Sukhorukov, W. Jaeger, and J. Tulip, "Pulsed quantum cascade laser based cavity ring-down spectroscopy for ammonia detection in breath," Applied Optics **45**, 9230-9237 (2006).

O. Sukhorukov, A. Lytkine, **J. Manne**, "Cavity ring-down spectroscopy with a pulsed distributed feedback quantum cascade laser," M. Razeghi and G. J. Brown, eds. SPIE, **6127**, pp. 61270A (2006).

A. Lytkine, **J. Manne**, W. Jäger, "Characterization of a 10.3- $\mu\text{m}$  Pulsed DFB Quantum Cascade Laser," Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy **63**, 947-951 (2006).

**J. Manne** and J. Govindarajan, "Internal magnetic field measurement in tokamak plasmas using a Zeeman polarimeter", PRAMANA-journal of physics **55**, 751-756 (2000).

## Conference presentations

- J. Manne** and C.R. Webster, "Measurements of foreign broadening coefficients using Tunable Laser Diode Spectrometer for Mars-TLS specific lines", ICOLS, Singapore, 2015.
- J. Manne** and W. Jaeger, "Characterization of distributed feedback, pulsed and continuous wave quantum cascade lasers for wavelength modulation spectroscopy: A comparison", International conference on Electrical, Electronics, and Communication Engineering (ICEECE) India, 2015.
- J. Manne** and C.R. Webster, "Measurements of foreign broadening coefficients using Tunable Laser Diode Spectrometer for Mars-TLS specific lines", JPL postdoc day, Pasadena, USA, 2015.
- J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Wavelength modulation spectroscopy with a pulsed quantum cascade laser", SPIE Optics +Photonics conference, San Diego, USA, 2011. [Refereed]
- J. Manne**, A. Lim, W. Jaeger, and J. Tulip, "Wavelength modulation spectroscopy with a pulsed quantum cascade laser", International conference on fiber optics and Photonics, Guwahati, India, 2010. [Refereed]
- J. Manne**, W. Jaeger, and J. Tulip, "Comparative study of inter- and intra-pulse detection schemes with a pulsed, distributed feedback quantum cascade laser for atmospheric monitoring." 56<sup>th</sup> International conference on Analytical Sciences and Spectroscopy (ICASS), Edmonton, Canada, 2010.
- J. Manne**, A. Lim, J. Tulip, and W. Jaeger, "Detection of acrolein and acrylonitrile with a pulsed, room temperature quantum cascade laser," Photonics North-2010, Niagra Falls, Canada. [Refereed]
- J. Manne**, J. Tulip, and W. Jaeger, "A pulsed Quantum Cascade laser based cavity enhanced spectroscopy for absorption measurements," Photonics North-2008, Montreal, Canada. [Refereed]
- J. Manne**, J. Tulip, and W. Jaeger, "Pulsed quantum cascade lasers for gas sensing applications," 91<sup>st</sup> Canadian chemistry conference and exhibition-2008, Edmonton, Canada.
- J. Manne**, J. Tulip, and W. Jaeger, "A quantum cascade laser based room temperature system for sensitive detection of ammonia and ethylene," SPIE Photonics West-2008, San Jose, USA. [Refereed]
- J. Manne**, O. Sukhorukov, J. Tulip, and W. Jaeger, "Cavity ring-down spectroscopy with a pulsed distributed feedback quantum cascade laser," 52<sup>nd</sup> ICASS (International conference on analytical sciences and spectroscopy) - 2006, Kelowna, Canada.
- O. Sukhorukov, A. Lytkine, **J. Manne**, J. Tulip, and W. Jaeger, "Cavity ring-down spectroscopy with a pulsed distributed feedback quantum cascade laser," SPIE Photonics West-2006, San Jose, USA. [Refereed]
- A. Lytkine, **J. Manne**, J. Tulip, and W. Jaeger, "Characterization of a 10.3 m pulsed DFB quantum cascade laser," TDLS (Tunable Diode Laser Spectroscopy) -2005, Florence, Italy. [Refereed]
- A. Antoniu, **J. Manne**, J. Tulip, and W. Jaeger, "Challenges and packaging solutions for portable quantum cascade laser systems for atmospheric gas detection," Electrostatics Society of America Conference-2005, Edmonton, Canada. **(Second best paper award)** [Refereed]
- J. Manne** and J. Govindarajan, "IR Imaging system for SST-I," International Atomic Energy Agency 3rd IAEA Tech. Committee Meeting on "Steady state operation of magnetic fusion devices" -2002 Germany. [Refereed]
- J. Manne** and J. Govindarajan, "Plasma Internal magnetic field measurement in tokamak plasmas using a Zeeman polarimeter" Plasma Science Society of India (PSSI) 1999, Amritsar, India.
- J. Manne** and A. Chainani, "Plasma Nitridation of solar cells for the use in Semiconductor Industry," Plasma Science Society of India (PSSI) 1997, Physical Research Laboratories, India.