

## **Rathnayaka Mudiyansele Thushara Damayanthi, Ph. D.**

Senior Lecturer (Grade I) , Department of Electrical Engineering, University of Moratuwa, Sri Lanka

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## **EDUCATION**

September 2009	<b>DOCTOR OF PHILOSOPHY</b> Nuclear Engineering and Management University of Tokyo, Japan
September 2006	<b>MASTER OF ENGINEERING</b> Quantum Engineering and Systems Science University of Tokyo, Japan
August 2003	<b>BACHELOR OF SCIENCE IN ENGINEERING (First Class Honors)</b> Electrical Engineering University of Moratuwa, Sri Lanka

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## **HONORS & AWARDS**

- ◆ Japanese MONBUKAGAKUSHO scholarship for M.Sc. and Ph. D. reading at University of Tokyo (2004 – 2009).
- ◆ JSPS (Japan Society for Promotion of Science) postdoctoral fellowship (2009 – 2011).
- ◆ RIKEN Special Postdoctoral Research Fund (2013 – 2016).
- ◆ University of Tokyo – University of California Summer School best poster award in 2009.
- ◆ Best B.Sc. final year group project, Department of Electrical Engineering, University of Moratuwa.

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## **AREA OF EXPERTISE**

- ◆ Superconductivity and superconducting detector technologies.
- ◆ Thin film fabrication (micro and nano scale).
  - Wafer processing, Sputtering, UV patterning, etching, lift-off, micro scale dicing, micro scale bonding.
- ◆ Operation of cryogenic systems.
  - Adiabatic demagnetization refrigerator, dilution refrigerator.

- ◆ Multiplexing readout electronics.
- ◆ Electromagnetic simulation software.
  - CST (Computer Simulation Technology), Sonnet, TFCalc (optical thin film design)
- ◆ THz wave receiving antenna designing : slot, dipole, dual-pole, patch antenna and so on.
  - Can easily upgrade for any kind of antenna.
- ◆ Optical absorption cavity designing and fabrication.

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## **SUBJECTS FOLLOWED AT POSTGRADUATE STUDIES**

- ◆ Advanced nuclear engineering.
- ◆ Advanced nuclear materials.
- ◆ Medical radiation technology.
- ◆ Advanced simulation.
- ◆ Numerical analysis.
- ◆ Advanced system innovation.

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## **TEACHING AND PROFESSIONAL EXPERIENCE**

**Senior Lecturer (Grade 1) :** **April 2017 ~**  
Department of Electrical Engineering, University of Moratuwa, Sri Lanka

**Teaching Subjects**

- Nuclear Power Engineering
- Electrical Machines and Drives
- Applied Electricity
- Energy and Environment
- Engineering Design Project

**Visiting Lecturer :** **September 2017 ~**  
Department of Electrical, Electronic & Telecommunication Engineering, General Sir John Kotelawala Defence University, Sri Lanka

**Teaching Subjects**

- Nuclear Safety and Applications

**Visiting Lecturer :** **January 2018 ~**  
Department of Nuclear Science, Colombo University, Sri Lanka

**Teaching Subjects**

- Detection and Measurement of Radiation and Applied Statistics, M.Sc in Nuclear Science
- Nuclear Power, Undergraduate

**Senior Lecturer (Contract) :** **April 2016 – March 2017**  
 Department of Electrical Engineering, University of Moratuwa, Sri Lanka

**Teaching Subjects**

- Power Systems
- Nuclear Power Engineering
- Theory of Electricity

**Special Postdoctoral Researcher :** **April 2013 – March 2016**  
 THz Sensing and Imaging Team, Terahertz Wave Research Group, RIKEN Advanced Research Institute, Wako, Saitama, Japan

- ◆ Design and development of superconducting detectors and THz receiving antennas.
- ◆ Working with top class THz scientists and astrophysics scientists in Japan.

**Research Scientist :** **Oct. 2011 – March 2013**  
 Department of Nuclear Engineering and Management, University of Tokyo, Tokyo, Japan

- ◆ Development of superconducting Transition Edge Sensor (TES) microcalorimeters for Gamma ray spectroscopy.
- ◆ Assist postgraduate and doctoral students.

**JSPS (Japan Society for Promotion of Science) Postdoctoral Researcher: Oct. 2009 – Sept. 2011**  
 Department of Nuclear Engineering and Management, University of Tokyo, Tokyo, Japan

- ◆ Development of superconducting Transition Edge Sensor (TES) microcalorimeters for X-ray and Gamma ray spectroscopy.
- ◆ Assist postgraduate and doctoral students.

**Temporary Researcher :** **June 2006 – March 2007**  
 National Metrological Institute of Japan, Advanced Institute of Science and Technology (AIST), Tsukuba, Japan

- ◆ Development of optical absorption cavities for superconducting TES microcalorimeters for Quantum communication applications.
- ◆ Had the opportunity to work with top class scientists in AIST.

**Temporary Instructor :** **Jan. 2004 – Sept. 2004**  
 Department of Electrical Engineering, University of Moratuwa, Sri Lanka

- ◆ Conducted practical classes for undergraduate students of University of Moratuwa and Kothalawala Defense Academy.

**Undergraduate Industrial Trainee :**

**May 2002 – Sept. 2002**

Thermal Power Plant, Lakdhanavi (Pvt.) Ltd, Embilipitiya, Sri Lanka

- ◆ Gained experience in operating and maintaining of thermal power plants through fieldworks.

## **RESEARCH EXPERIENCE**

**April 2013 – to date**

### **RIKEN SPDR Funded**

**Design and development of Lumped Element Kinetic Inductance Detectors (LEKIDs) for THz imaging.**

- ◆ High sensitive superconducting LEKIDs are developed that have applications in terahertz wave researches in various fields such as astrophysics, material analysis and medical imaging.
- ◆ In this research, LEKIDs are designed using Sonnet electronic simulation software.
- ◆ Nano scale LEKIDs are fabricated using superconducting materials at high quality clean room facilities in RIKEN.
- ◆ Measurements are done at cryogenic temperatures (<100 mK) and data analysis is done at THz wave research facilities in RIKEN.

### **JAPAN Grant-in-Aid-for Scientific Research (Kakenhi) Funded : Collaborative research with High Energy Accelerator Research Institute (KEK) in Japan.**

**Design of THz antennas for CMB radiation absorption**

- ◆ A GroundBIRD satellite is developed as a joint project in RIKEN and KEK. This is a high-speed rotational telescope to scan the sky to measure Cosmic Microwave Background (CMB) radiation remaining from beginning of the universe.
- ◆ My work in this big project is the design of micro-scale antennas to receive THz radiation from the sky, which are coupled with Microwave Kinetic Inductance Detectors (MKIDs) to use as the focal plane detector system in the GroundBIRD satellite.
- ◆ Design is done using CST (Computer Simulation Technology) simulation software.

**Oct. 2011 – March 2013**

### **Japan Science and Technology Agency Funded**

**Development of bulk absorber coupled transition edge sensor (TES) detectors for Nuclear Spectroscopy.**

- ◆ TES detectors are nanometer-scale thick superconducting films and operate as microcalorimeters.
- ◆ In this project, TES detectors were developed for nuclear spectroscopy.
- ◆ TES detectors are fabricated at University of Tokyo clean room facility and pre measurements were done at University of Tokyo Cryogenic Center.
- ◆ Nuclear material samples were successfully measured at Japan Atomic Energy Agency in Oarai, Japan and could obtain the spectrum of Plutonium.

Oct. 2009 – Sep. 2011

**Japan Society for the Promotion of Science Funded**

**Development of bulk absorber coupled transition edge sensor (TES) detectors for Gamma-ray Spectroscopy**

- ◆ Worked on improving resolution and response speed of TES detectors for gamma-ray spectroscopy.
- ◆ Radiation measurements were done at world's largest third generation synchrotron radiation facility Spring 8 at Japan.

Feb. 2011 – March 2011

**Visiting Researcher at CMB Group, University of California, Berkeley, USA**

- ◆ Worked with CMB group, who is developing PoalrBEAR satellite
- ◆ Studied focal plane arrangement in a satellite and multiplexing readout electronics practically and theoretically for a large detector array system.

Oct. 2006 – Sep. 2009

**Ph. D. Thesis : Japan Monbukagakusho Funded**

**Development of superconducting transition edge sensor (TES) microcalorimeters**

- ◆ In this project, bulk absorber coupled TES detectors were developed for gamma ray spectroscopy.
- ◆ Fabrication and measurements were done at university of Tokyo.
- ◆ This thesis reports the successful **first measurements of high-energy gamma rays** (662 keV) using a TES detector in the world.

Oct. 2004 – Sep. 2006

**M. Sc. Thesis : Japan Monbukagakusho Funded**

**Development of small-pixel transition edge sensor (TES) Microcalorimeters**

- ◆ Single pixel and small pixel arrays were developed for X-ray spectroscopy and imaging data were recorded successfully.
- ◆ Optical absorption cavity was designed for TES detectors for infrared measurements and near 100% optical absorption was reported.
- ◆ That design was modified and successfully used for Quantum communication and quantum cryptography measurements at AIST Japan.

2002

**B. Sc. Final Year Group Project**

**Implementation of Electronic Governor and Control System of a Mini-hydro Power Plant**

- ◆ Selected as the best final year group project

## PEER-REVIEWED PUBLICATIONS

1. **R. M. Thushara Damayanthi**, M. Ohno, S. Hatakeyama, H. Takahashi and C. Otani, "Development of bulk superconducting absorber coupled transition edge sensor detectors for positron annihilation spectroscopy", *IEEE Trans. On Appl. Super.*, Vol.23, No.3, pp. 2100304 (2013).
2. **R. M. T. Damayanthi**, M. Ohno, S. Hatakeyama, H. Takahashi, K. Maehata, T. Yasumune, N. Iyomoto, "Observation of very fast response signals from Pb absorber coupled transition edge sensor gamma-ray microcalorimeter", *Nucl. Instrum. Methods A* 691, pp. 30-33 (2012).
3. **R. M. T. Damayanthi**, M. Ohno, N. Iyomoto and H. Takahashi, "Characterization of signal response of lead absorber coupled transition edge sensor gamma-ray microcalorimeters", *IEEE Trans. Appl. Supercond.*, Vol. 21, No. 3, pp. 211-214 (2011).
4. **R. M. Thushara Damayanthi**, S. W. Leman, H. Takahashi, M. Ohno, Y. Minamikawa, K. Nishimura and N. Iyomoto, "Development of a gamma-ray detector with iridium transition edge sensor coupled to a Pb absorber", *IEEE Trans. Appl. Supercond.*, Vol. 19, No. 3, pp. 540-543 (2009).
5. **R. M. T. Damayanthi**, N. Iyomoto, H. Takahashi, M. Ohno, Y. Minamikawa and K. Nishimura, "Development of a transition edge sensor gamma-ray microcalorimeter with an epoxy coupled bulk lead absorber", *AIP Conf. Proc.*, Vol. 1185, pp. 207-210 (2009).
6. **R. M. T. Damayanthi**, D.Fukuda, H.Takahashi, M.Ohkubo and M. Ohno, "Design of an optical absorption cavity for titanium transition edge sensor", *J Low Temp Phys*, 151, pp.46-50 (2008).
7. **R. M. T. Damayanthi**, Y. Kunieda, N. Zen, , F. Mori, K. Fujita, H. Takahashi, M. Nakazawa, D. Fukuda, M. Ohkubo, "Waveform analysis of bilayer iridium/gold superconducting transition edge sensor microcalorimeter", *Jpn J of Appl Physics*, Vol. 45, No.8A, pp. 6259-6262 (2006).
8. S.A.U.A.Madusanka, D.M.O.R.Mahadiulwewa, S.P.A.A.J.Samarakoon, K.A.H.Sandeepanie, **R.M.T. Damayanthi**, "Improving the performance of lead acid batteries using nano-technology", *MERCon*, pp. 589-593 (July 2019).
9. D. Fukuda, **R. M. T. Damayanthi**, A. Yoshizawa, N. Zen, H. Takahashi, K. Amemiya, and M. Ohkubo, "Titanium Based Transition Edge Microcalorimeters for Optical Photon Measurements", *IEEE Trans. Appl. Supercond.*, 17, pp. 259-262 (2007).
10. S.Oguri, J. Choi, **T. Damayanthi**, M. Hasttori et al. for the GroundBIRD group, "GROUNDBIRD – observing cosmic microwave polarization at large angular scale with kinetic inductance detectors and high speed rotating telescope", *J Low Temp. Phys.*, Vol. 184, No.3, pp. 786-792 (2016).
11. S. Hatakeyama, T. Irimatsugawa, M. Ohno, H Takahashi, **R. M. T. Damayanthi**, C. Otani and T. Maekawa, "Development of hard X-ray and gamma ray detector with transition edge sensor for nuclear material analysis", *IEEE Trans.On Appl. Supercond.*, Vol.17, pp. 259-262 (2015).
12. K. Karatsu, S.Mima, S. Oguri, J. Choi, **R.M.Thushara Damayanthi**, A. Dominjon et al., "Development of Microwave Kinetic Inductance Detector for Cosmological Observations", *IEICE Trans. Electron.*, Vol. E98-C, No. 3, pp. 207-218 (2015).
13. S. Hatakeyama, M. Ohno, H. Takahashi, **R. M. Thushara Damayanthi**, C. Otani, Takashi Yasumune, Takashi Ohnishi, Koji Takasaki and Shinichi Koyama, "Gamma ray spectrometer based on a transition edge sensor for nuclear material analysis", *Journal of Low Temperature Physics, Springer*, Vol. 176, No. 3/4, pp. 560-565 (2014).

14. S. Hatakeyama, M. Ohno, **R. M. Thushara Damayanthi**, H. Takahashi, Y. Kuno, N. Iyomoto, K. Maehata, C. Otani, T. Usui, T. Ohnishi, H. Obayashi and K. Takasaki, "Development of hard X-ray and gamma ray spectrometer using superconducting transition edge sensor" *Radiation Measurements, Elsevier*, Vol. 55, pp. 83-86 (2013).
15. S. Hatakeyama, M. Ohno, **R. M. Thushara Damayanthi**, H. Takahashi, Y. Kuno, K. Maehata, C. Otani and K. Takasaki, "Development of hard X-ray and gamma ray spectrometer using superconducting transition edge sensor", *IEEE Trans. On Appl.Supers.*, Vol.23, No.3, pp. 2100804 (2013).
16. M. Ohno, H. Takahashi, K. Nishimura, Y. Minamikawa, **R. M. T. Damayanthi**, H. Sato, C. Otani, H. Toyokawa, H. Tanida and T. Uruga, "Development of a new TES structure using a radiation absorber self-adjusting the operating temperature, *IEEE Trans. Appl. Supercond.*, Vol. 19(3), pp. 473-476 (2009).
17. D. Fukuda, G.Fujii, A. Yoshizawa, H. Tsuchida, **R. M.T. Damayanthi**, H. Takahashi, S. Inoue, M. Ohkubo, "High speed photon number resolving detector with titanium transition edge sensor", *J Low Temp Phys*, 151, pp. 100-105 (2008).
18. Minamikawa Y., Sato H., Mori F., **Damayanthi R.M.T.**, Takahashi H., Ohno M., "Simulation of Transient Response of Ir-TES for Position-Sensitive TES with Waveform Domain Multiplexing", *J Low Temp Phys*, 151, pp. 155-160 (2008).
19. F. Mori, Y. Minamikawa , **R.M.T. Damayanthi** , S. Leman , N. Zen , M. Ohno , H. Takahashi , H. Toyokawa, H. Tanida , T. Uruga , "Synchrotron beam test of a position-sensitive small-pixel Ir-TES array ", *J Low Temp Phys*, 151, pp. 150-154 (2008).
20. M. Ohno, F. Mori, Y.Minamikawa, **R.M.T. Damayanthi**, H. Takahashi, H. Sato, H. Toyokawa, , "Development of high count rate TES microcalorimeters", *J Low Temp Phys*, 151, pp. 229-233 (2008).
21. Zen N., Takahashi H., **Damayanthi R.M.T.**, Mori F., Fujita K., Fukuda D., Ohkubo M., "Signal analysis of a small-pixel TES in a digital operation mode", *IEEE Trans. Appl. Supercond.*, 17, No. 2, pp. 318-320 (2007).
22. Zen N., Takahashi H., Kunieda Y., **Damayanthi R.M.T.**, Mori F., Fujita K., Nakazawa M., Fukuda D., Ohkubo M., "Development of pixellated Ir-TESs", *Nucl. Instrum. Methods A*, 559, pp. 494-496 (2006).
23. Y. Kunieda, H. Takahashi, N. Zen, **R.M.T. Damayanthi**, F. Mori, K. Fujita, M. Nakazawa, D. Fukuda, M. Ohkubo, "Characterization of Ir/Au pixel TES", *Nucl. Instrum. Methods A*, 559, pp. 429-431 (2006).

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## CONFERENCE PRESENTATIONS

### International

1. Applied Superconductivity Conference (ASC) 2012, Portland, Oregon, **USA**, October 2012: **Oral** , "Development of bulk superconducting absorber coupled transition edge sensor detectors for positron annihilation spectroscopy".
2. 14<sup>th</sup> international workshop on low temperature detectors (LTD 14), Heidelberg University, Heidelberg, **Germany**, August 2011: **Poster**, "Characterization of fast response, epoxy-post, Pb absorber coupled, transition edge sensor gamma-ray microcalorimeter".
3. Applied Superconductivity Conference (ASC) 2010, Washington D.C., **USA**, August 2010: **Oral** , "Characterization of signal response of lead absorber coupled TES microcalorimeters".
4. 13<sup>th</sup> international workshop on low temperature detectors (LTD 13), Stanford University, California, **USA**, July 2009: **Poster**, "Development of a transition edge sensor gamma-ray microcalorimeter with an epoxy coupled bulk lead absorber".
5. Applied Superconductivity Conference (ASC) 2008, Chicago Illinois, **USA**, August 2008: **Oral**, "Development of a gamma-ray detector with iridium transition edge sensor coupled to a lead absorber".

6. 12<sup>th</sup> international workshop on low temperature detectors (LTD 12), **Paris**, July 2007: **Poster**, “Design of an optical absorption cavity for titanium transition edge sensors”.

## **Local (In Japan)**

7. RAP symposium, Sendai, Nov. 25-26, 2014: **poster** : “Development of dual-polarized slot antenna coupled MKID arrays for CMB polarization measurements with GroundBIRD”.
8. RIKEN – NICT symposium, Tokyo, Jan 2014 : **poster** : “Development of Microwave Kinetic Inductance Detectors”.
9. JSAP 75<sup>th</sup> Autumn meeting 2014, Sapporo Campus, Hokkaido University, Sep. 17-20, 2014 : **Oral**, “Development of dual-polarized slot antenna coupled MKID arrays for CMB polarization observation with GroundBIRD”.
10. RAP Symposium, Wako, Oct. 31- No. 01, 2013: **poster**, “Microwave kinetic inductance detectors using Al-superconductor for THz detection”.
11. JSAP 72<sup>nd</sup> fall meeting 2011, Yamagata University, August 29 - September 2, 2011: **Oral (Invited): on behalf of Hiroyuki Takahashi**, “Gamma-ray TES development for nuclear applications”.
12. 2010 Fall Meeting of AESJ, Hokkaido University, September 15-17, 2010: **Oral**, “Development of TES microcalorimeter for positron annihilation spectroscopy”.
13. 2010 Annual Meeting of AESJ – Ibaraki University Mito Campus – March 26 – 28, 2010: **Oral**, “Development of TES microcalorimeter for gamma-ray spectroscopy”.
14. GONERI Symposium 2009 – Takeda Hall, University of Tokyo - November 25-26, 2009, **Poster**, “Development of superconducting transition edge sensor microcalorimeter for gamma ray spectroscopy”.
15. 2009 Annual meeting of AESJ – Tokyo Institute of technology – March 23-25, 2009: **Oral**, “Development of transition edge sensor gamma-ray microcalorimeter for PAS analysis”.
16. 2009 KEK 23<sup>rd</sup> workshop on Radiation detectors and their uses – KEK, Tsukuba, Ibaraki – January 27-29, 2009: **Oral**, “Development of transition edge sensor gamma-ray detectors”.
17. GCOE Symposium 2008 (GONERI) – Takeda Hall, University of Tokyo – October 8-10, 2008: **Poster**, “High energy resolution gamma-ray spectroscopy with transition edge sensor microcalorimeter”.
18. 2008 fall meeting of AESJ – Kochi University of Technology – September 4-6, 2008: **Oral**, “Development of a gamma-ray detector with an Ir TES coupled to a Pb absorber”.
19. JSAP 54<sup>th</sup> Spring Meeting 2007 – Aoyama Gakuin University, Sagami-hara Campus – March 27-30, 2007: **Oral**, “Fast response single photon detector with titanium transition edge sensor”.
20. JSAP 66<sup>th</sup> Annual meeting 2005, University of Tokushima, September 7-11, 2005: **Oral**, “Pixellated ETF-TES arrays for X-ray measurements & Design of a pixellated Ir-TES near infrared single photon counter.

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## **RESEARCH INTERESTS**

- ◆ Energy and Environment
- ◆ Battery Energy Storage Systems
- ◆ Thin-film Applications
- ◆ Renewable Energy
- ◆ Nano Technology



## LANGUAGES

Sinhala, English, Japanese

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## REFERENCES

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