

Eligibility Criteria for FCC 442 Experimental Program License Application

Applicant: University of Vermont

Confirmation Number: EL800954

Application File Number: 0078-EX-PN-2018

FCC Registration Number (FRN): 0027946219

POC: Dryver Huston, (O) 802-656-1922 (M) 802-999-8652, dryver.huston@uvm.edu

Technology Name: Waveform Acquisition Augmented Reality Penetrating Radar

Company / Organization:

University of Vermont and State Agricultural College

Mechanical Engineering Department

33 Colchester Ave.

Burlington, VT 05405

§ 5.302 Eligibility.

Program experimental licensees may be granted to the following entities: a college or university with a graduate research program in engineering that is accredited by the Accreditation Board for Engineering and Technology (ABET); a research laboratory; a hospital or health care institution; a manufacturer of radio frequency equipment; or a manufacturer that integrates radio frequency equipment into its end product. Each applicant must meet the following requirements:

(a) The radiofrequency experimentation will be conducted in a defined geographic area under the applicant's control;

The experiments will be conducted on the University of Vermont campus in Burlington, VT 05405

(b) The applicant has institutional processes to monitor and effectively manage a wide variety of research projects; and

The University of Vermont (UVM), officially The University of Vermont and State Agricultural College, is a public research university and, since 1862, the sole land-grant university in the U.S. state of Vermont. Details concerning research can be found at <https://www.uvm.edu/spa>

(c) The applicant has demonstrated expertise in radio spectrum management or partner with another entity that has such expertise.

The planned experiments will be conducted by Prof. Dryver Huston and Prof. Tian Xia, both Engineering faculty members at the University of Vermont. Dr. Huston and Dr. Xia both have multiple years of experience in penetrating radar design and testing. Abbreviated resumes are attached.

DRYVER R. HUSTON

a. Professional Preparation

Institution, Location	Major	Degree	Year
University of Pennsylvania, Philadelphia, PA	Mechanical Engineering	B.S.E.	1980
Princeton University, Princeton, NJ	Civil Engineering	M.A.	1983
Princeton University, Princeton, NJ	Civil Engineering	Ph.D.	1986

b. Appointments

- Professor of Mechanical Engineering with secondary appt. in Ortho. & Rehab., Univ. of Vermont, June 1999 - present.
- Interim Chairperson, Mech. Eng. Dept., Univ. of Vermont, Dec. 1996 - 2000.
- Assoc. Professor of Mechanical Engineering with secondary appt. in Ortho. and Rehab., Univ. of Vermont, June 1993 - 1999.
- Acting Chairperson, Mech. Eng. Dept., Univ. of Vermont, October 1996 - December 1996
- Graduate Program Coordinator, Mech. Eng. Dept. Univ. of Vermont, June 1993 - October 1996.
- Asst. Professor of Mechanical Engineering, Univ. of Vermont, Jan. 1987 - May 1993.
- Assoc. Research Scientist and Lecturer, Johns Hopkins Univ., Dept. of Civil Eng., Aug. 1985 – Dec. 1986.
- Graduate Research Fellow, Turner Fairbanks Highway Research Center, McLean VA. June 1984 - October 1985.
- Research Consultant, Colorado State University, Wind Tunnel Labs. May 1983 - May 1984.
- Laboratory Technician Procter and Gamble Co., Cincinnati, OH, Summer 1978.

c. Selected Publications

Zhang Y, Orfeo D, Keranen J, Huston D, Xia T. (2018) “High Dynamic Range Ground-Penetrating Doppler Radar for Landmine Detection through Vibration Sensing” IEEE Transactions on Geoscience and Remote Sensing, under review

Xu X, Xia T, Ma Z, Huston D. (2018) “An Integrated Synchronous Data Acquisition Subsystem for High Speed GPR System” IET Circuits, Devices & Systems, accepted for publication, pending minor revisions, April 2018

Ahmed A, Zhang Y, Burns D, Huston D, Xia T. (2016) “Design of UWB Antenna for Air-Coupled Impulse Ground-Penetrating Radar” IEEE Geoscience and Remote Sensing Letters, Vol. 13, Issue 1, pp 92 – 96, DOI: 10.1109/LGRS.2015.2498404

Venkatachalam AS, Xu X, Huston D, Xia T. (2013) “Development of a New High Speed Dual-Channel Impulse Ground Penetrating Radar” IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing Vol. 7, No. 3, 753-760 DOI:10.1109/JSTARS.2013.2280995

Xu X, Xia T, Venkatachalam A, Huston D. (2013) "The Development of a High Speed Ultrawideband Ground Penetrating Radar for Rebar Detection" *Journal of Engineering Mechanics*, Vol. 139, No. 3, 272-285, DOI:10.1061/(ASCE)EM.1943-7889.0000458.

Xia T, Venkatachalam AB, Huston D. (2012) "A High Performance Low Ringing Ultra-Wideband Monocycle Pulse Generator" *IEEE Transactions on Instrumentation and Measurement*, Volume: 61 Issue:1, 261 - 266

Gucunski N, Rascoe C, Huston D, Jalinoos F. (2008) "Condition Assessment of Bridge Decks by Complementary Impact/Echo and Ground Penetrating Radar" *ASNT Materials Evaluation Journal*, Vol. 66, No. 11, November 2008, pp. 1125-1128

Huston DR, Hu JQ, Maser K, Weedon W, and Adam C. (2000) "GIMA Ground Penetrating Radar System for Infrastructure Health Monitoring" *Jnl. of Applied Geophysics* 43, 139-146.

Huston DR, Busuoic D. "Radar and Millimeter Wave Methods" in *Sensor Technologies for Civil Infrastructures: Performance Assessment & Health Monitoring*, M. Wang, H. Sohn and J. Lynch eds., Woodhead Publishing, Ch. 8, 201-234, 2014.

Huston D, Burns DC (2005) "Radiated Emission Measurements of Ground Penetrating Radars" *Antenna Measurements Test Association Conference*, Rhode Island.

Huston D, Miller J, and Esser B (2004) "Regulation of Ultrawideband Ground Penetrating Radar Inspection Systems ASNT Structural Materials Technology VI (SMT): NDT/NDE for Highways and Bridges 2004 Conference, Buffalo, NY.

Huston D, Maser K, Weedon W, Fuhr and Adam C. "Bridge Deck Evaluation with Ground Penetrating Radar" *Structural Health Monitoring*, F Chang ed., Technomic Publishing, pp. 91-103 *Proc. International Workshop on Structural Health Monitoring*, Stanford, CA, Sept. 1997.

Xia T, Huston D. (2016) "High Speed Ground Penetrating Radar for Road Pavement and Bridge Structural Inspection and Maintenance" *Vermont Agency of Transportation, Final Report Project Number: SPR-RSCH017-738*

Huston DR, "Measurement of Electromagnetic Characteristics of Ground Penetration Radars" *Federal Highway Administration, DTFH61-03-H0012*, March 2006.

Tian Xia

Department of Electrical and Biomedical Engineering
University of Vermont, Burlington, VT 05405
Tel: 802-656-8996 Email: txia@uvm.edu

Professional Preparations

Huazhong University of Science and Technology, China.	Electrical Engineering	B.S.E 1994
Nanjing University of Posts and Telecommunications, China.	Electrical Engineering	M.S.2000
University of Rhode Island, U.S.A.	Electrical Engineering	Ph.D.2003

Appointments

Professor

Department of Electrical and Biomedical Engineering	05/2017- present
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Associate Professor

School of Engineering, University of Vermont.	05/2009–05/2017
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Assistant Professor

School of Engineering, University of Vermont.	08/2003–05/2009
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Integrated Circuit Design Engineer

IBM T.J.Watson Research Center, Yorktown, New York.	05/2003-08/2003
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Integrated Circuit Design Engineer

IBM T.J.Watson Research Center, Yorktown, New York.	05/2002-08/2002
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Electronics Engineer

Panda Electronics Co. Ltd. Nanjing, China.	08/1994-07/1997
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Selected Publications

1. A. Venkatachalam, X.L.Xu and D. Huston, T. Xia, "Development of a New High Speed Dual-Channel Impulse Ground Penetrating Radar," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*. Vol. 6, No. 6, Dec. 2013.
2. Y. Zhang, P. Candra, G.A.Wang, T. Xia, "2D Entropy and Short Time Fourier Transform to Leverage GPR Data Analysis Efficiency," *IEEE Transactions on Instrumentation and Measurement*, Vol. 64, Issue 1, 2015. pp. 103-111.
3. T. Xia, A. S. Venkatachalam, D. Huston, "A High Performance Low Ringing UltraWideband Monocycle Pulse Generator," *IEEE Transactions on Instrumentation and Measurement*. vol. 61, Issue 1. 2012. pp. 261-266.
4. Y. Zhang, T. Xia, "In-Wall Clutter Suppression based on Low-Rank and Sparse Representation for Through-the-Wall Radar," *IEEE Geoscience and Remote Sensing Letters*. Vol. 13, No. 5 2016.
5. A. Ahmed, Y. Zhang, D. Burns, D. Huston, T. Xia, "Design of UWB Antenna for Air Coupled Impulse Ground Penetrating Radar," *IEEE Geoscience and Remote Sensing Letters*. Vol. 13, No. 1. Jan. 2016. pp 92-96.
6. G.A.Wang, F. Rahman, T. Xia, H.Q.Zhang, "Patterned Permalloy and Barium Strontium Titanate Thin Film Enabled Tunable Slow Wave Elements for Compact Multiband RF Applications," *IEEE Transactions on Magnetics*, Vol. 49, No. 7, 2013.
7. Y. Zhang, T. Xia, "Frequency Domain Clutter Removal for Compressive OFDM Ground

Penetrating Radar," in *Proceedings of IEEE International Symposium on Circuits and Systems (ISCAS)*. 2016.

8. T. Fan, T. Xia, L. Cheng, "Antenna Performance under Geo-Property Variations for Real-Time Tomography," in *Proceedings of IEEE International Geoscience and Remote Sensing Symposium (IGARSS)* 2016.

9. D. Huston, T. Xia, D. Burns, D. Orfeo, Y. Zhang, C. Ou, "Mapping, Assessing and Monitoring Urban Underground Infrastructure," in *Proceedings of International Workshop on Structural Health Monitoring (IWSHM)* 2017.

10.. T. Xia, H. Zheng, "Timing Jitter Characterization for Mixed Signal Production Test Using the Interpolation Algorithm", *IEEE Trans. Industrial Electronics*, Volume 54, Issue 2, April 2007. pp. 1014-1023.

Synergistic Activities

1. Faculty advisor of IEEE UVM section;
2. Session chair of SPIE Smart Structures/NDE Conference 2018;
3. Associate editor of Springer Journal of Electronic Testing: Theory and Applications;
4. Associate editor of Journal of Circuits, Systems, and Computers;
5. Program chair of IEEE North Atlantic Test Workshop 2018.