

Appendix A

Focused Beam Size

The purpose of this Appendix is to provide diameter of an electromagnetic beam was focused by the lens. The focused beam size can predict from Rayleigh criterion equation, that is:

$$R = \frac{12.2f\lambda}{D}, \quad (\text{A.1})$$

where R is focused beam diameter, f is lens focal length, λ is wavelength of electromagnetic wave and D is the beam diameter before focusing. For this thesis, the beam diameter of terahertz (THz) radiation from source is 25 mm and lens focal length that was used in the work is 6 cm. Table A.1 will show the focused beam size for THz radiation range.

Table A.1: Focused beam diameter for different wavelength.

f (THz)	λ (mm)	$1/\lambda$ (cm ⁻¹)	Focused beam size (mm)	f (THz)	λ (mm)	$1/\lambda$ (cm ⁻¹)	Focused beam size (mm)
0.1	3.00	3.33	8.784	1.1	0.27	36.67	0.799
0.2	1.50	6.67	4.392	1.2	0.25	40.00	0.732
0.3	1.00	10.00	2.928	1.3	0.23	43.33	0.676
0.4	0.75	13.33	2.196	1.4	0.21	46.67	0.627
0.5	0.60	16.67	1.757	1.5	0.20	50.00	0.586
0.6	0.50	20.00	1.464	1.6	0.19	53.33	0.549
0.7	0.43	23.33	1.255	1.7	0.18	56.67	0.517
0.8	0.38	26.67	1.098	1.8	0.17	60.00	0.488
0.9	0.33	30.00	0.976	1.9	0.16	63.33	0.462
1.0	0.30	33.33	0.878	2.0	0.15	66.67	0.439

Curriculum Vitae

Name	Mr. Pikad Buaphad
Date of birth	5 April 1986
Education	2009 - 2011 M.S. (Physics), Chiang Mai University, Thailand 2005 - 2008 B.S. (Physics) First-class honors, Chiang Mai University, Thailand
Scholarship	2009 - 2011 Research Assistantship of Thailand Center of Excellence in Physics (ThEP) 2005 - 2008 Science Achievement Scholarship of Thailand (SAST)
Publications	<p><u>P. Buaphad</u>, P. Thamboon, K. Kusoljariyakul, et. al., <i>Investigation of Water Distribution in Proton Exchange Membrane Fuel Cells via Terahertz Imaging</i>, Proceedings of The 7th EMSES 2009, Chiang Mai, Thailand, 2009</p> <p>P. Thamboon, <u>P. Buaphad</u>, C. Thongbai, et. al., <i>Investigation of water distribution in proton exchange membrane fuel cells via Terahertz imaging</i>, Nucl. Instr. and Meth. A, 2010, doi:10.1016/j.nima.2010.02.047</p> <p><u>P. Buaphad</u>, P. Thamboon, C. Tengsirivattana, et.al, <i>Terahertz imaging and direct visualization of water presence in the flow channels of a PEM fuel cell</i>, Proceedings of The SPC 2010, Kanchanaburi, Thailand, 2010</p> <p><u>P. Buaphad</u>, P. Thamboon, C. Tengsirivattana, et. al., <i>Progress on Reflective Terahertz Imaging for Identification of Water in Flow Channels of PEM Fuel Cells</i>, Applied Mechanics and Material, 2012, doi:10.4028/www.scientific.net/AMM.110-116.2301.</p>