

INTRODUCTION	11
CHAPTER 1: THEORETICAL ASPECTS OF DIELECTRIC RESPONSE IN LIQUID MEDIA...	13
1.1 MAXWELL'S EQUATIONS IN A LINEAR MEDIUM.....	13
1.2 THE WAVE EQUATION IN ISOTROPIC LOSSY DIELECTRIC MEDIA.....	15
1.3 THEORETICAL MODELS FOR THE STATIC PERMITTIVITY OF LIQUIDS.....	16
1.4 THEORETICAL MODELS FOR THE FREQUENCY DEPENDENCE OF THE COMPLEX DIELECTRIC FUNCTION OF LIQUIDS.....	22
1.5 INFLUENCE OF TEMPERATURE AND VISCOSITY OF THE MEDIUM.....	30
1.6 DIELECTRIC DATA BASE FOR WATER.....	32
CHAPTER 2: MEASUREMENT METHODS FOR DIELECTRIC PROPERTIES OF DIFFERENT SUBSTANCES INCLUDING LIQUIDS AT MICRO-TO-MILLIMETER WAVES...	36
2.1 – MEASUREMENT SYSTEMS.....	37
2.2 – COMPARISON OF METHODS.....	41
CHAPTER 3: ELECTRODYNAMIC PROPERTIES OF WHISPERING-GALLERY MODE DIELECTRIC RESONATORS WITH LIQUID INHOMOGENEITIES.....	50
3.1– DIELECTRIC RESONATORS.....	51
3.2.–SENSITIVITY STUDIES AND OPTIMIZATION OF WGM-RESONATORS FOR LIQUID CHARACTERIZATION.....	57
CHAPTER 4: CHARACTERIZATION OF DILUTED AQUEOUS SOLUTIONS WITH AN OPEN WGM RESONATOR TECHNIQUE.....	79
4.1 EXAMPLE OF AQUEOUS SOLUTIONS OF NON-ELECTROLYTES: ETHANOL-WATER MIXTURES.....	80
4.2 EXAMPLE OF AQUEOUS ELECTROLYTE SOLUTIONS: SODIUM CHLORIDE DISSOLVED IN WATER.....	89
4.3 AQUEOUS SOLUTIONS OF ALBUMIN AND GLUCOSE.....	93
CHAPTER 5: TOWARDS BIOSENSING APPLICATIONS: FIRST MICROFLUIDIC IMPLEMENTATION AND SUBMILLIMETRE WAVE WGM RESONATORS.....	100
5.1 WGM SAPPHIRE RESONATOR COMBINED WITH A QUARTZ WAFER CONTAINING A NANOLITER LIQUID FILLED CAVITY.....	101
5.2 WGM RESONATOR APPROACH AT 170 GHz.....	106
CHAPTER 6: CONCLUSION AND OUTLOOK.....	109
APPENDIXES	
A. THE DIELECTRIC DISK WGM RESONATOR WITH CEP.....	111
B. THEORETICAL ELECTRODYNAMICS OF RADIALLY TWO-LAYERED WGM WITH CEP.....	121
ACKNOWLEDGEMENTS.....	124
PERSONAL PUBLICATION LIST.....	124
BIBLIOGRAPHY.....	126