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Measurement of Energy Absorption from Antennas Placed Near Models of the Human Body

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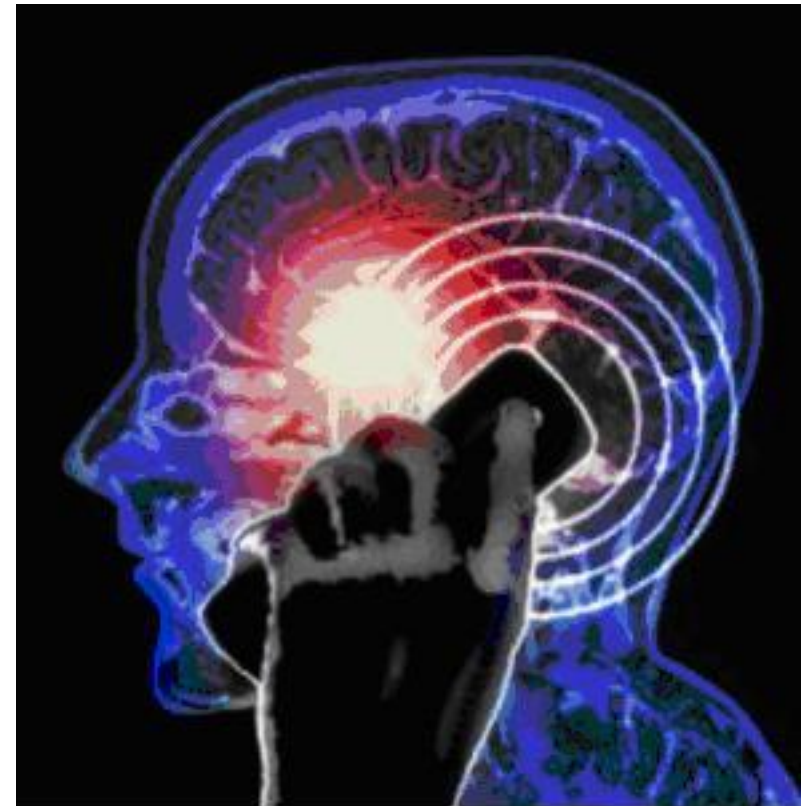


- **Background Information:**
 - S.A.R. Measurement
 - FCC Regulation
 - Issues with Current Testing Methods
- **Previous Research/Experimentation:**
 - Rapid Optical SAR Measuring Device
 - Problems Encountered
-
- **Project Goals/Accomplishments:**
 - Mechanical stability of testing system
 - Test/improve pointing stability of laser
 - Results
 - Conclusion

- **Specific Absorption Rate**
 - Measure of the rate at which RF energy is absorbed by the body

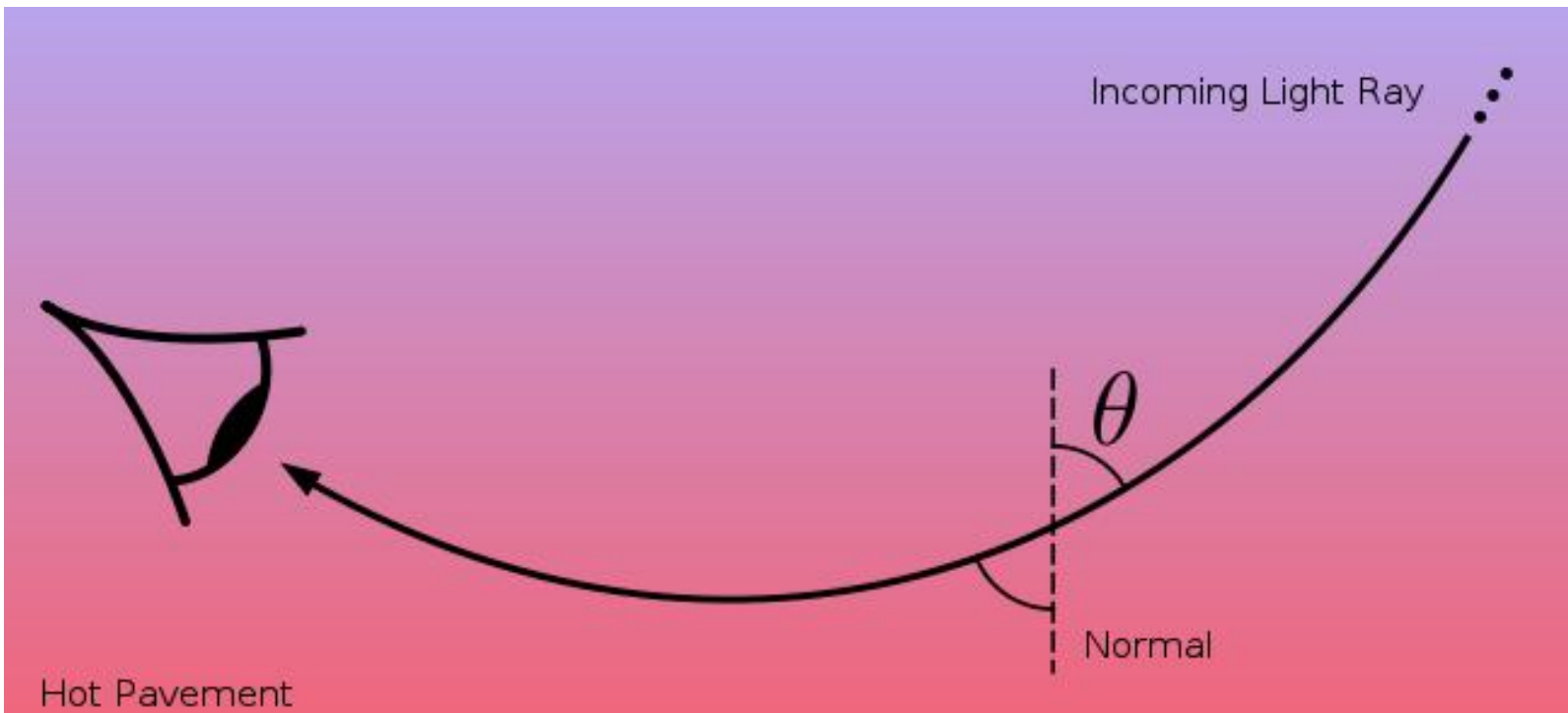
$$\text{SAR} = \int_{\text{sample}} \frac{\sigma(\mathbf{r})|\mathbf{E}(\mathbf{r})|^2}{\rho(\mathbf{r})} d\mathbf{r}$$

- **FCC Standard**
 - Requires that phones emit radiation or have a SAR no greater than 1.6 W/kg averaged over any 1 gram of tissue



"IphoneWorld.ca "

Photothermal Deflection

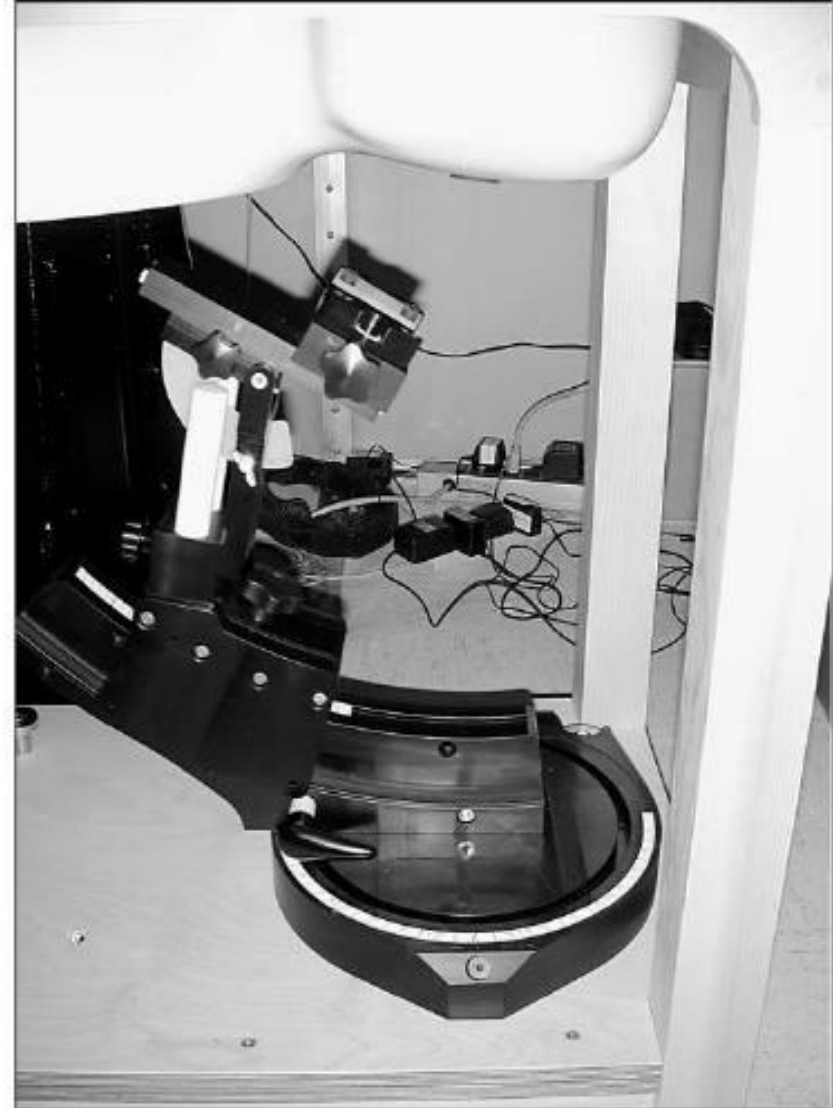


A simple diagram of an inferior mirage caused by hot pavement. Created by Rick Manning.



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FCC's Mobile Phone SAR Test Equipment

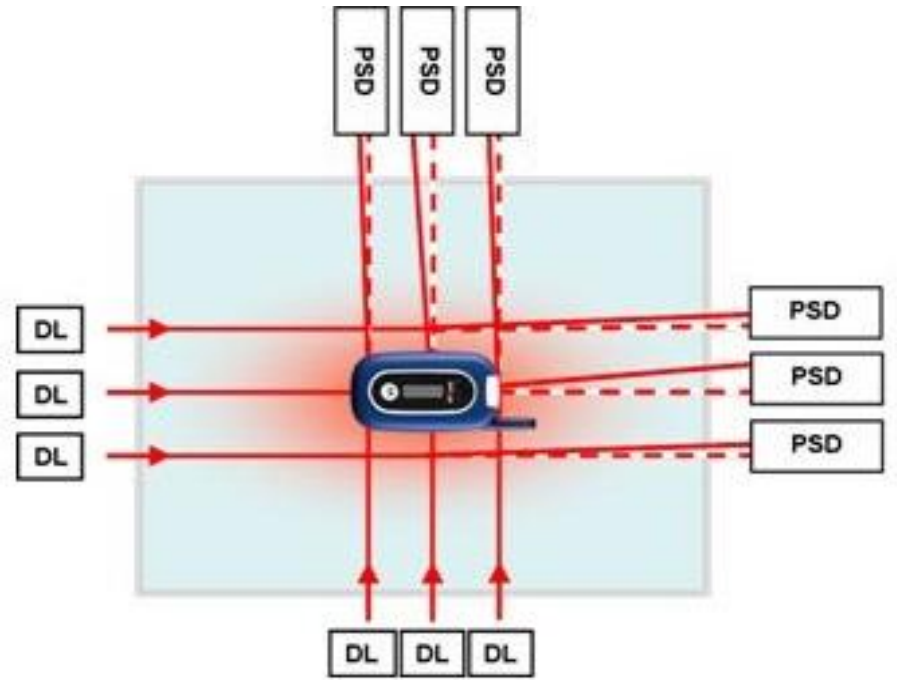
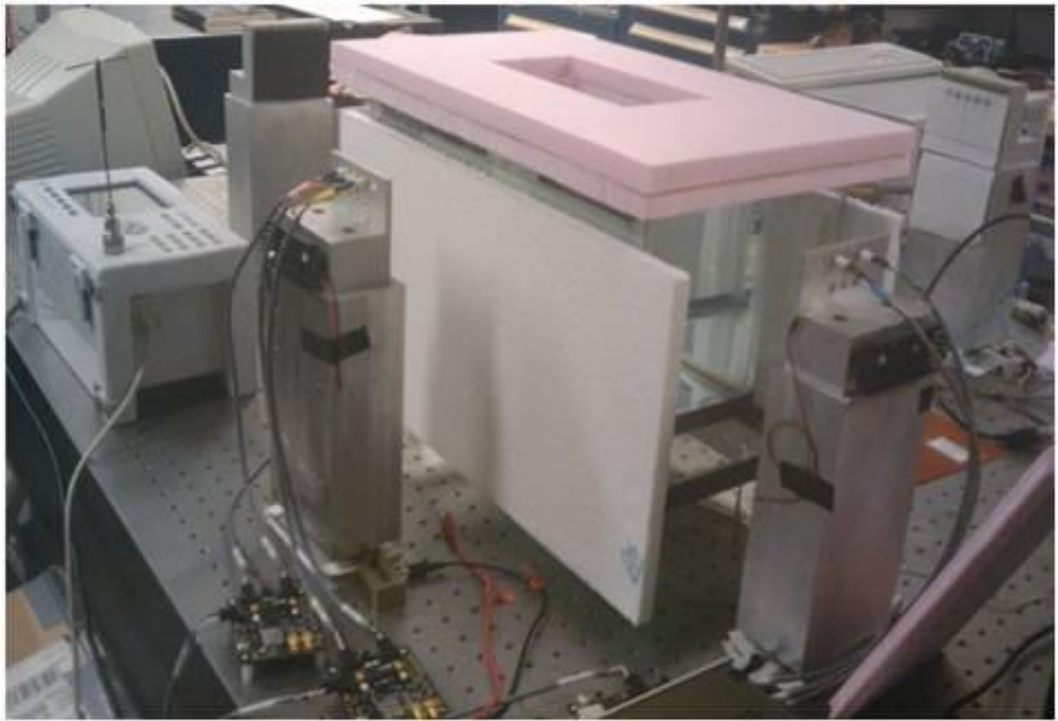


"Research and Regulatory Efforts on Mobile Phone Health Issues"



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Rapid Optical SAR Measuring Device



Problems Encountered:

- laser instability
- undesired effects on data from human contact with devices



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Project Goals/ Accomplishments

- Mounting of components
- Reduction of human error
- Characterization of laser pointing stability

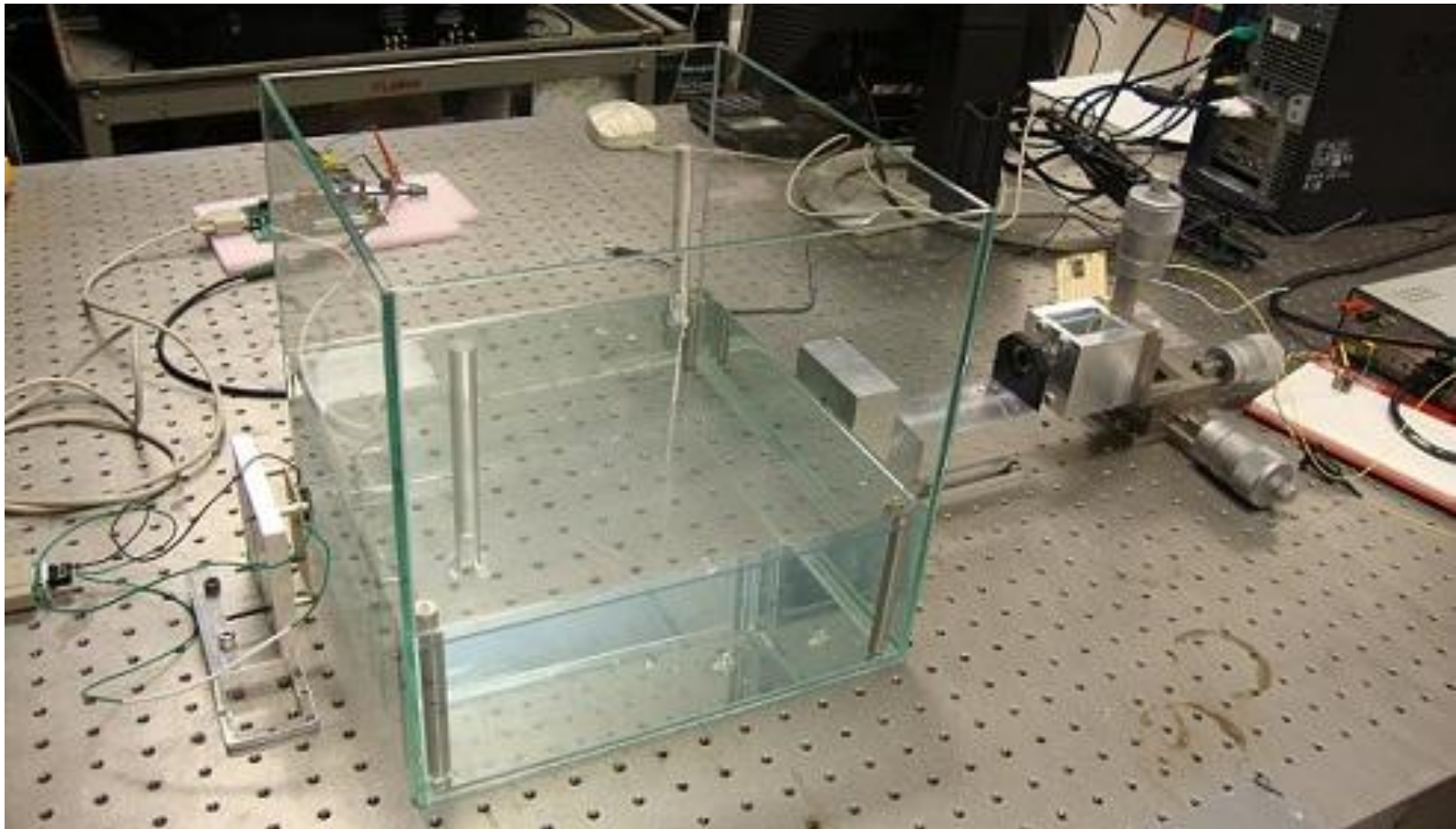




Table 1: Average position drift of laser beam over four testing conditions

	Open Air	Empty Tank	Enclosed Tank	Stimulant-Filled Tank
Ave. Drift (μm)	0.284	0.251	0.078	0.269
Std. Deviation	3.162	1.075	1.09	2.642
Ave. Drift Range (μm)	10.7	9.64	9.215	15.375
Std. Deviation	1.565	2.116	1.704	4.518



- Sources of Error
 - mechanical instability
 - environmental factors
 - A-D conversion
 - laser beam divergence
 - power loss
 - interferences in the water
- Future Work
 - more stability tests
 - test effects of RF radiation on laser beam
 - replace A-D converter
 - lens research



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Acknowledgments



- National Science Foundation CISE award #0755224
- Dr. Christopher Davis, Dr. Vildana Hodzic
- John Rzasa, Navik Agrawal, Ehren Hwang
- Joe Kselman, ECE Machine Shop

