ROCHESTER INSTITUTE OF TECHNOLOGY
MICROELECTRONIC ENGINEERING

Wireless Implantable Intraocular Pressure Sensor

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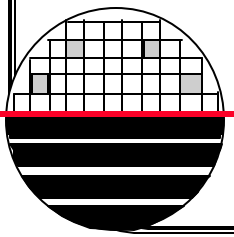

OUTLINE

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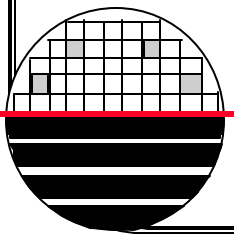


TEAM MEMBERS

from RIT

Dr. David Borkholder, Electrical Engineering
Dr. Robert Bowman, Electrical Engineering
Dr. Lynn Fuller, Microelectronic Engineering
Dr. Syed Islam, Electrical Engineering
Dr. Sergey Lyshevski, Electrical Engineering
Dr. Jayanti Venkataraman, Electrical Engineering

from University of Rochester, Eye Institute

Shakeel Shareef, M.D., Associate Professor of Ophthalmology

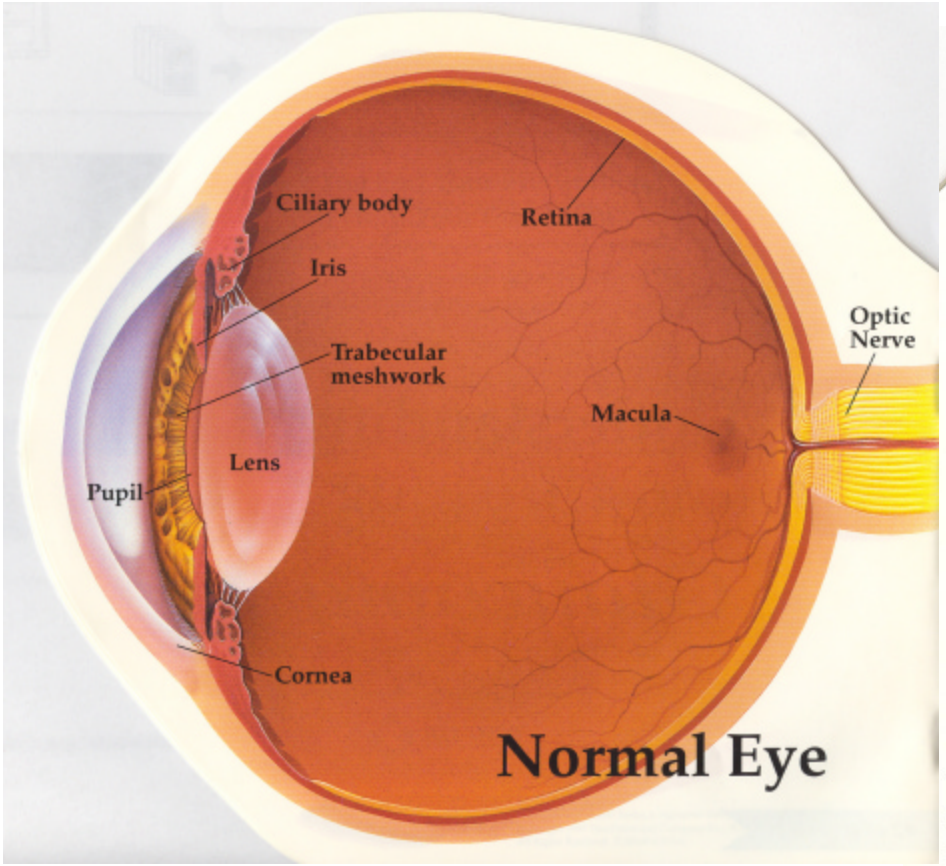
from Bausch and Lomb

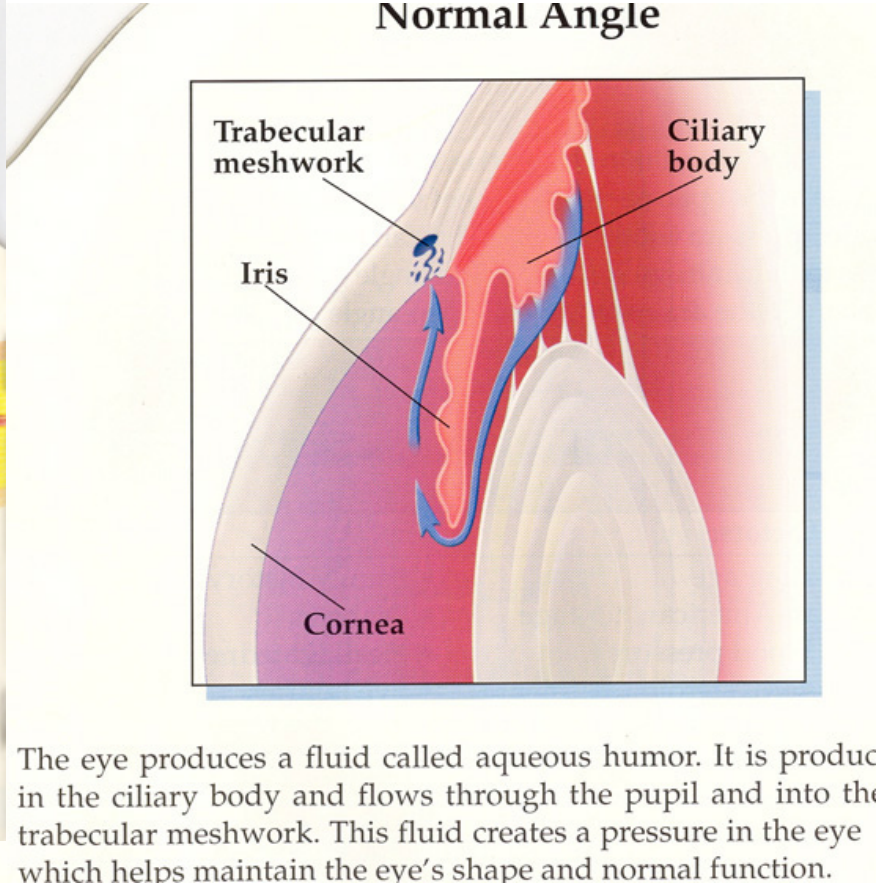
Dr. Brian Levy

RIT Graduate Students:

Gianni Franceschinis pena, MS, Microelectronic Engineering
Marie Yvanoff, PhD, Microsystems Engineering

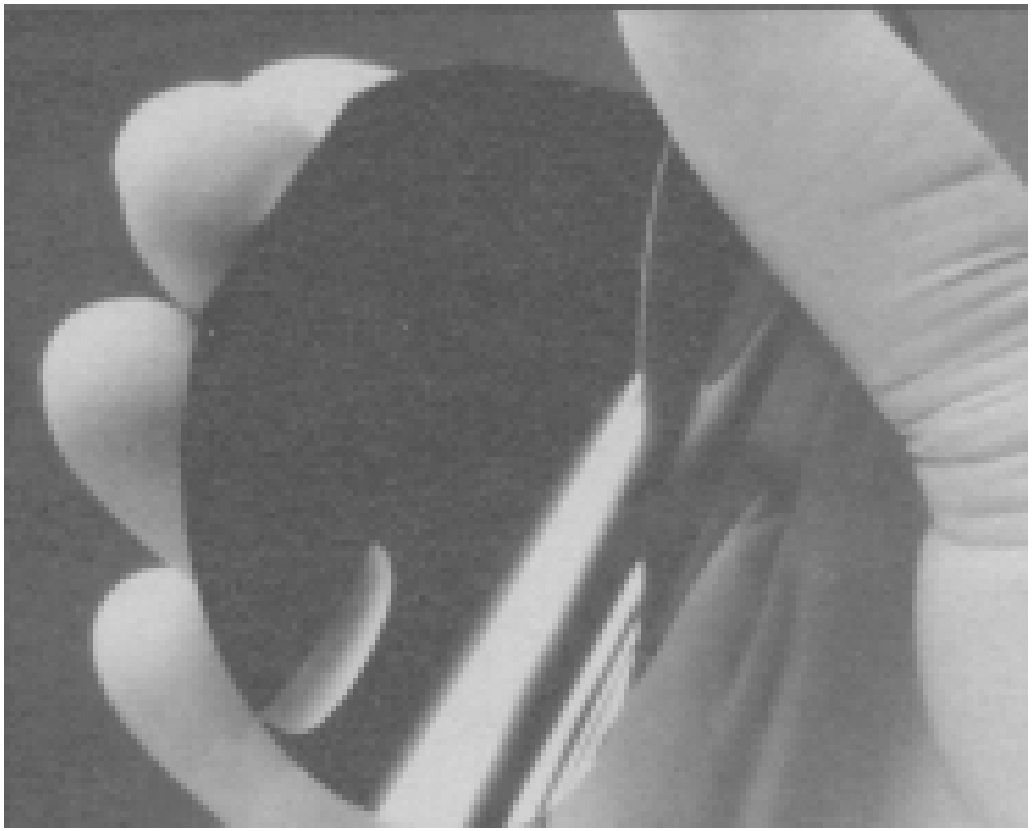
INTRODUCTION





The eye produces a fluid called aqueous humor. It is produc in the ciliary body and flows through the pupil and into th trabecular meshwork. This fluid creates a pressure in the eye which helps maintain the eye's shape and normal function.

SINGLE CRYSTAL SILICON

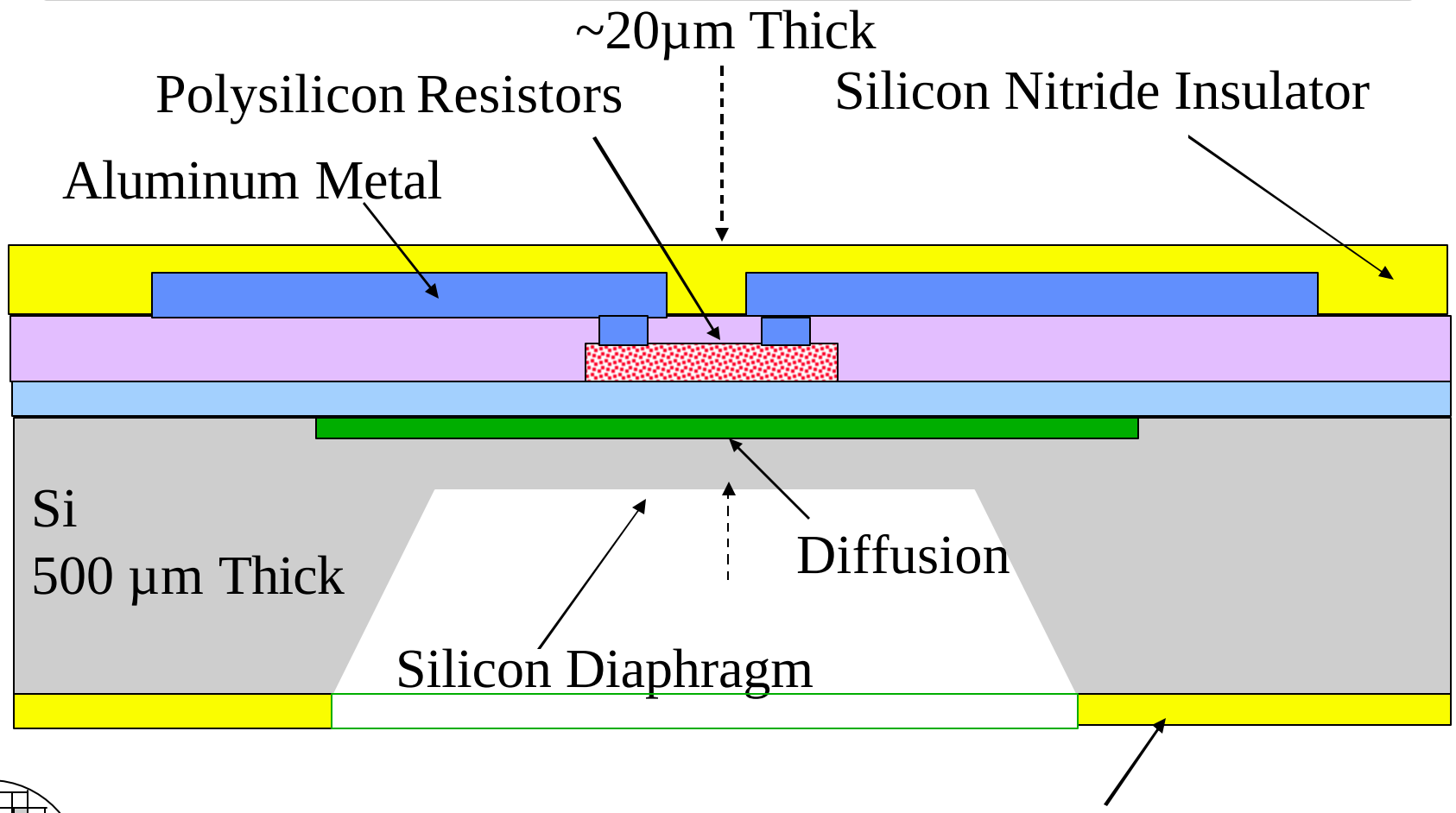


Thickness
10 µm

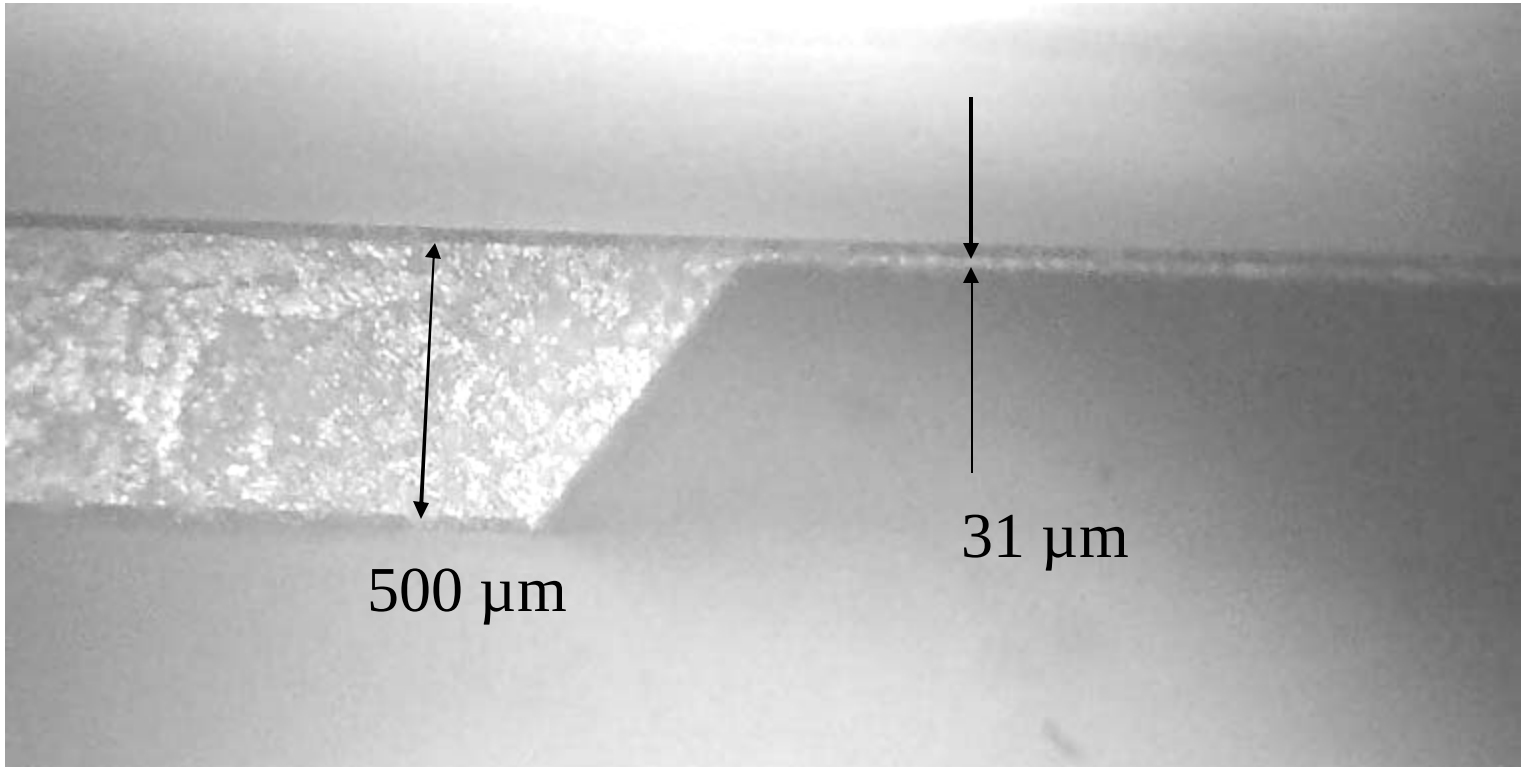
Wafer
Diameter
75 mm

Thin silicon is strong and flexible and can be integrated with electronics.

PRESSURE SENSOR



DIAPHRAGM THICKNESS MEASUREMENTS

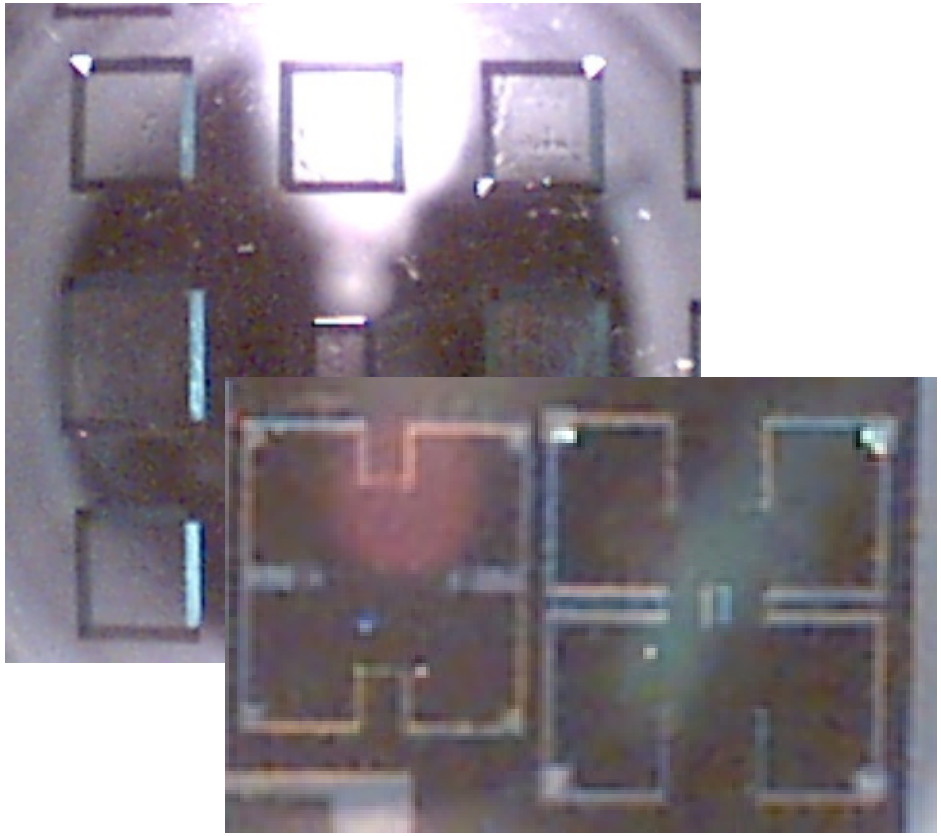


20% KOH Etch, @ 72 C, 10 Hrs.

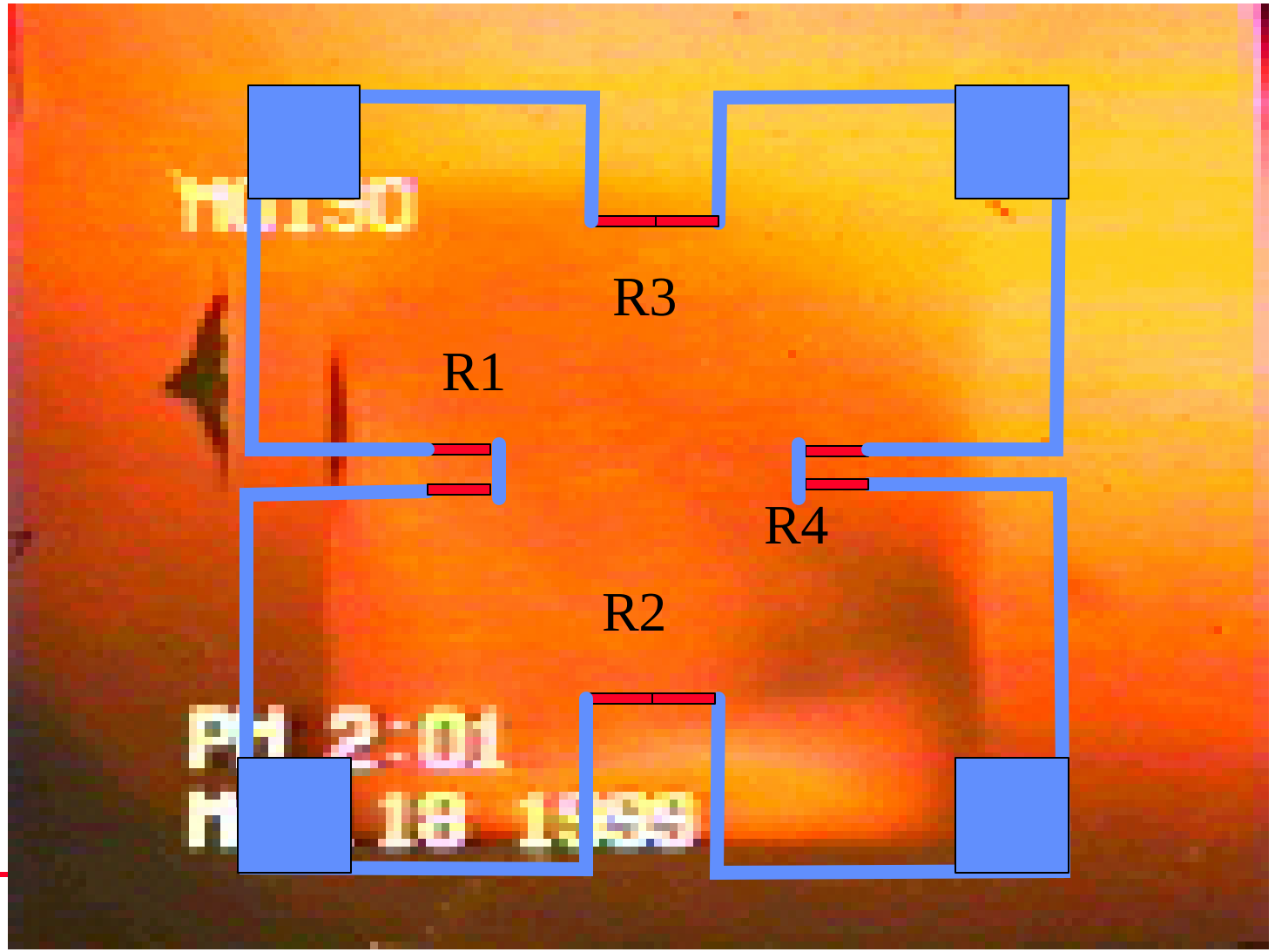
PICTURE OF WAFERS AFTER KOH ETCH

50 µm in 57 min ~.877 µm/min

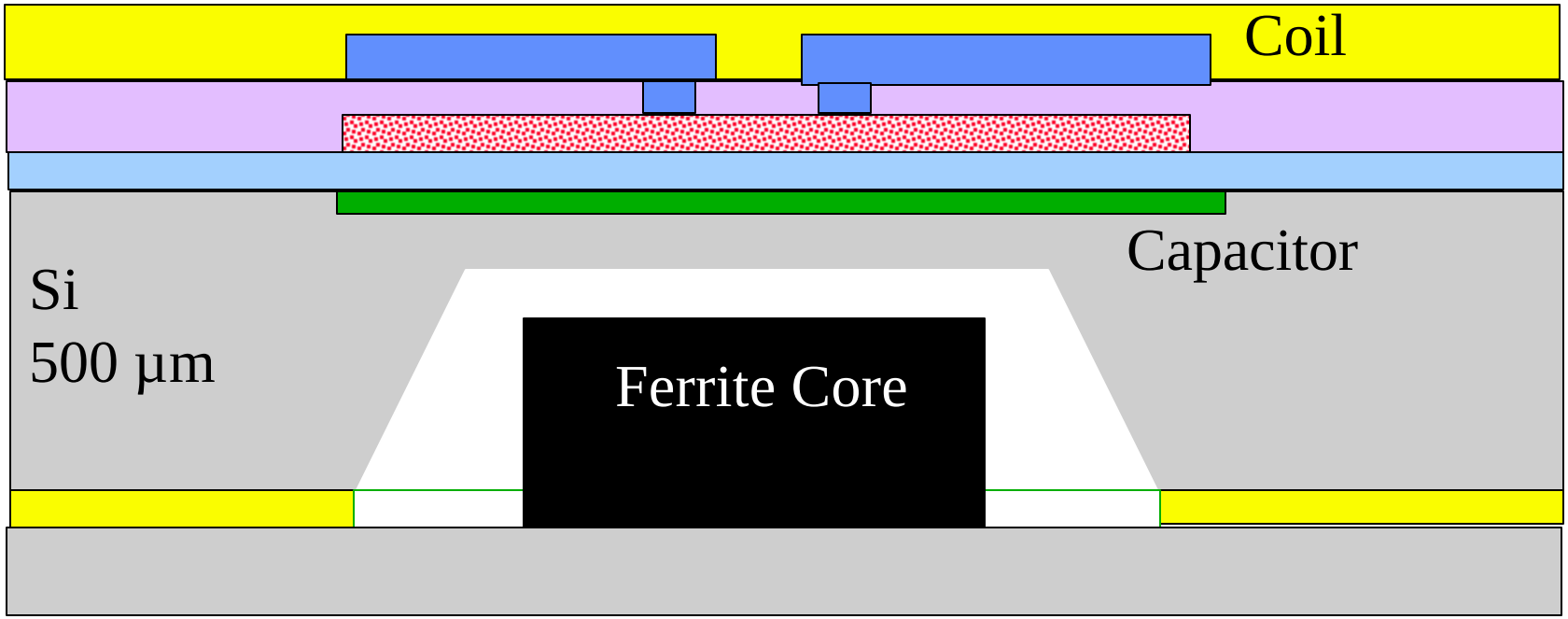
COMPLETED PRESSURE SENSORS



VACUUM WAND CAUSES DIAPHRAGM TO DEFLECT

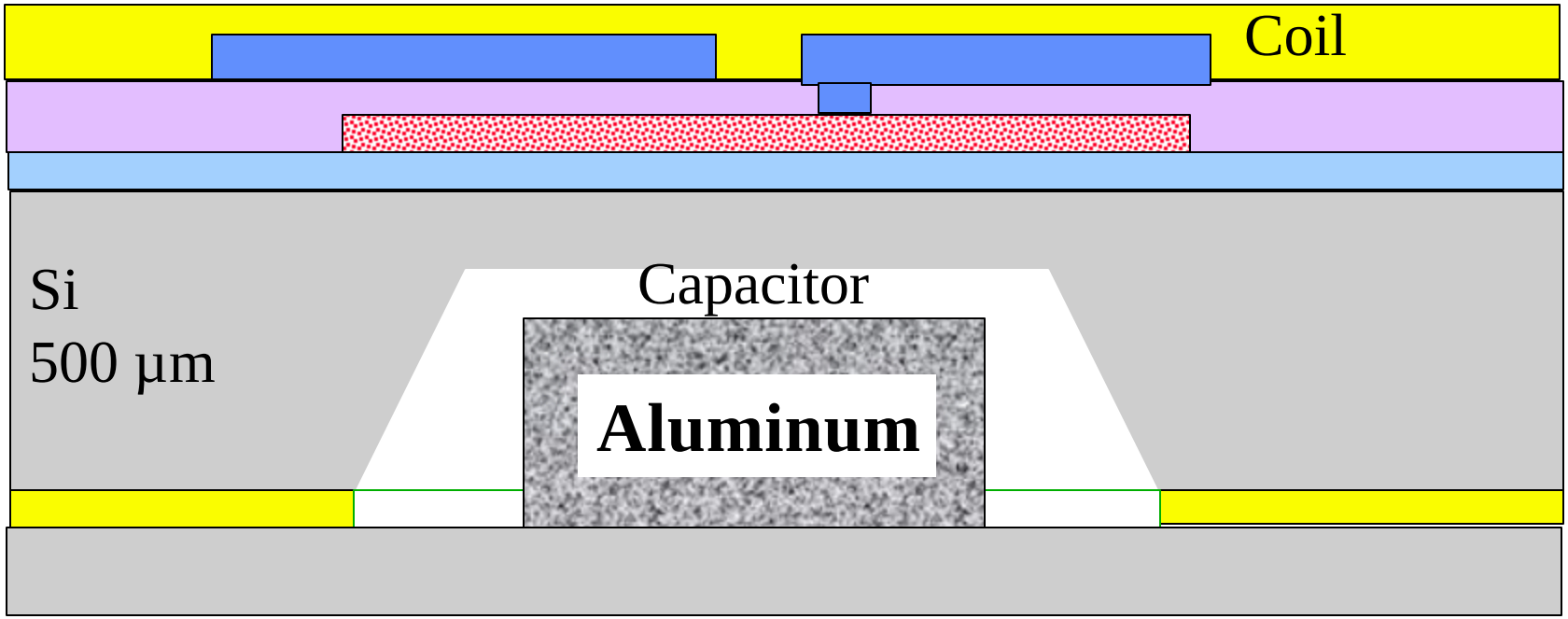


VARIABLE INDUCTOR IOP PRESSURE SENSOR



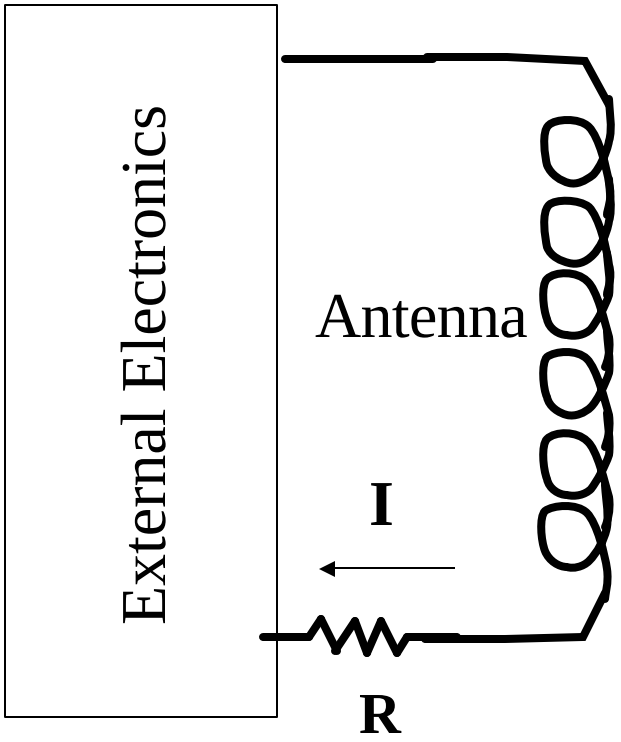
This structure forms an inductor and capacitor in parallel, creating a resonant circuit. Pressure causes Ferrite Core and Coil to move closer

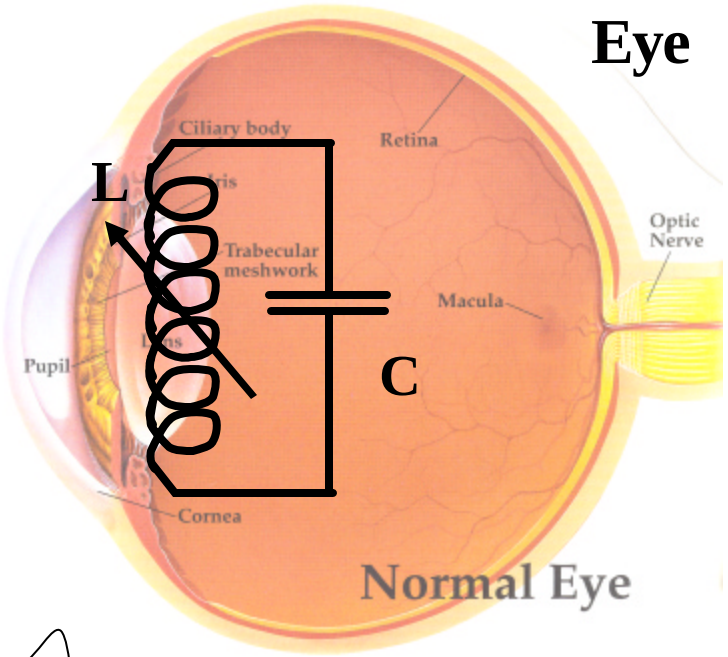
VARIABLE CAPACITOR IOP PRESSURE SENSOR

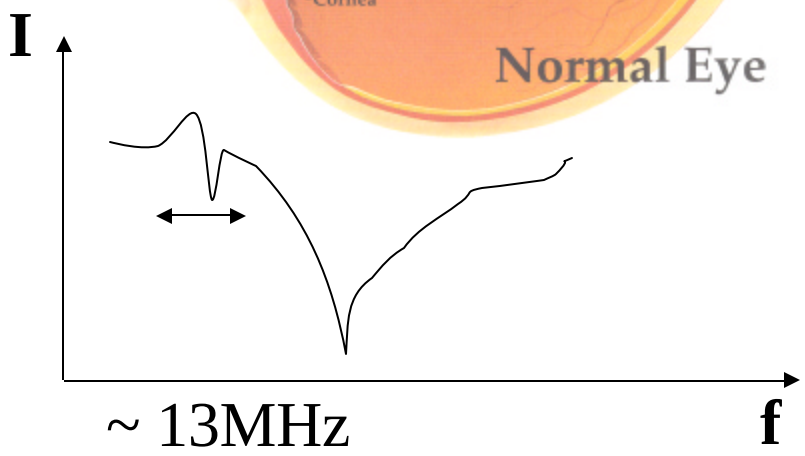


This structure forms an inductor and capacitor in parallel, creating a resonant circuit. Pressure causes Aluminum Capacitor Plate and Poly top Capacitor Plate to move closer

BASIC IDEA





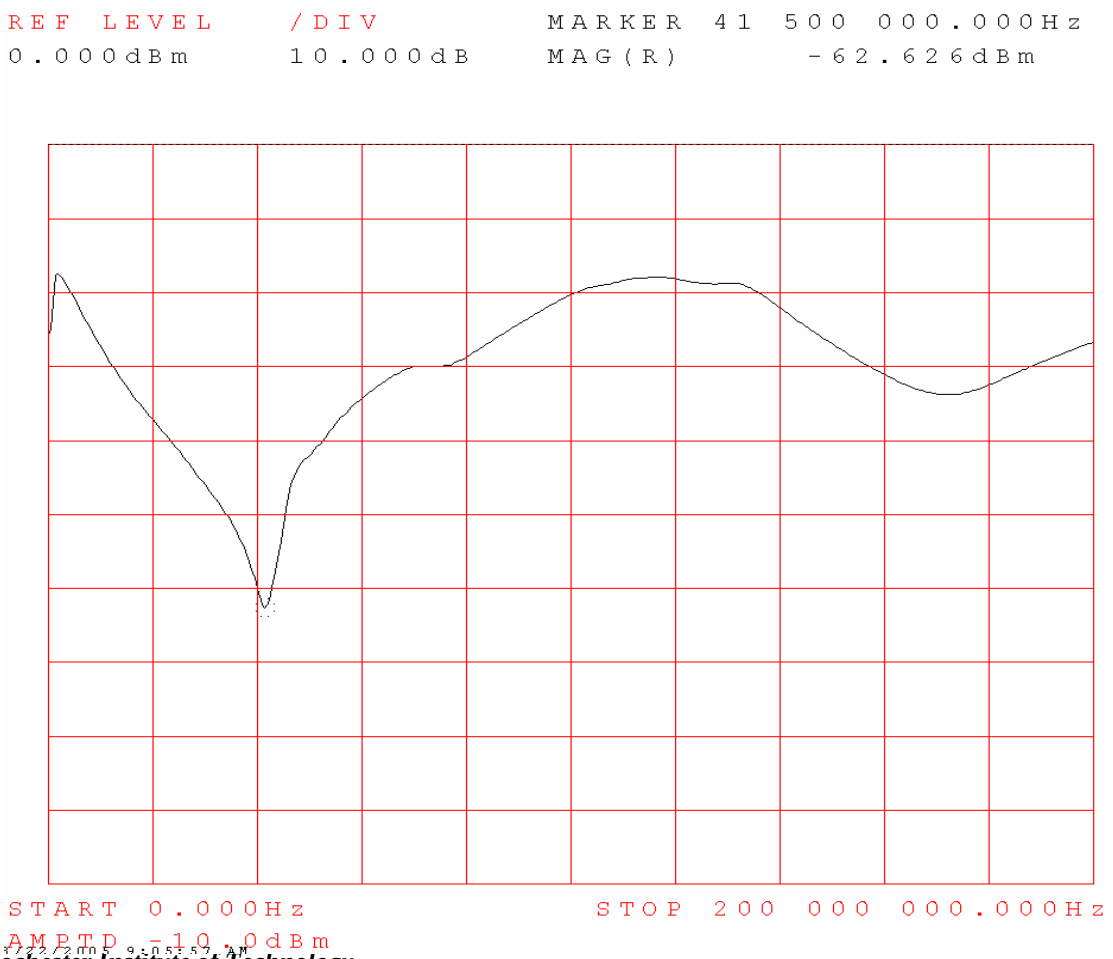


VERIFICATION OF BASIC IDEA

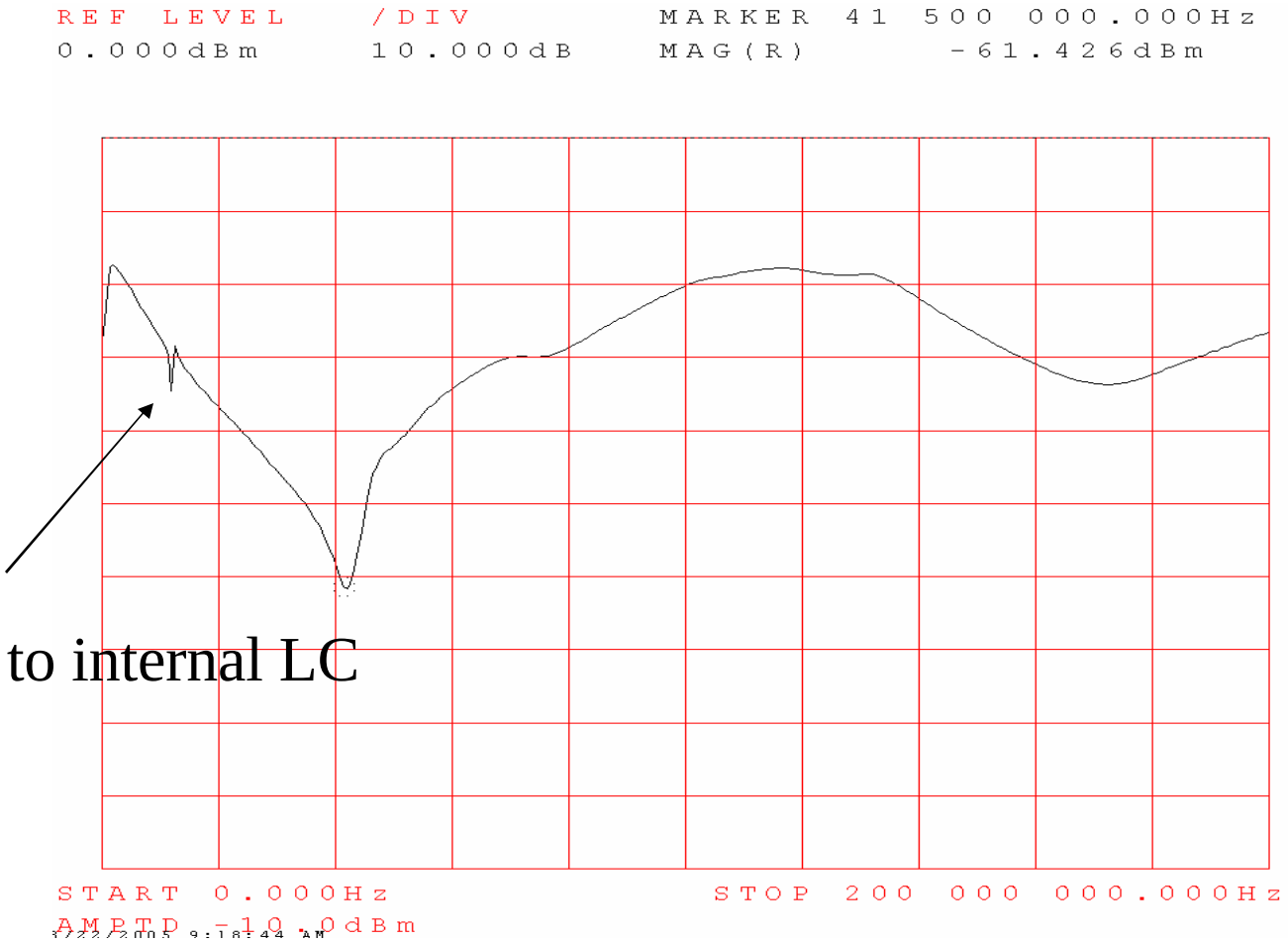
Network Analyzer

I vs. Frequency

PICKUP COIL CURRENT WITHOUT RESONANT CIRCUIT

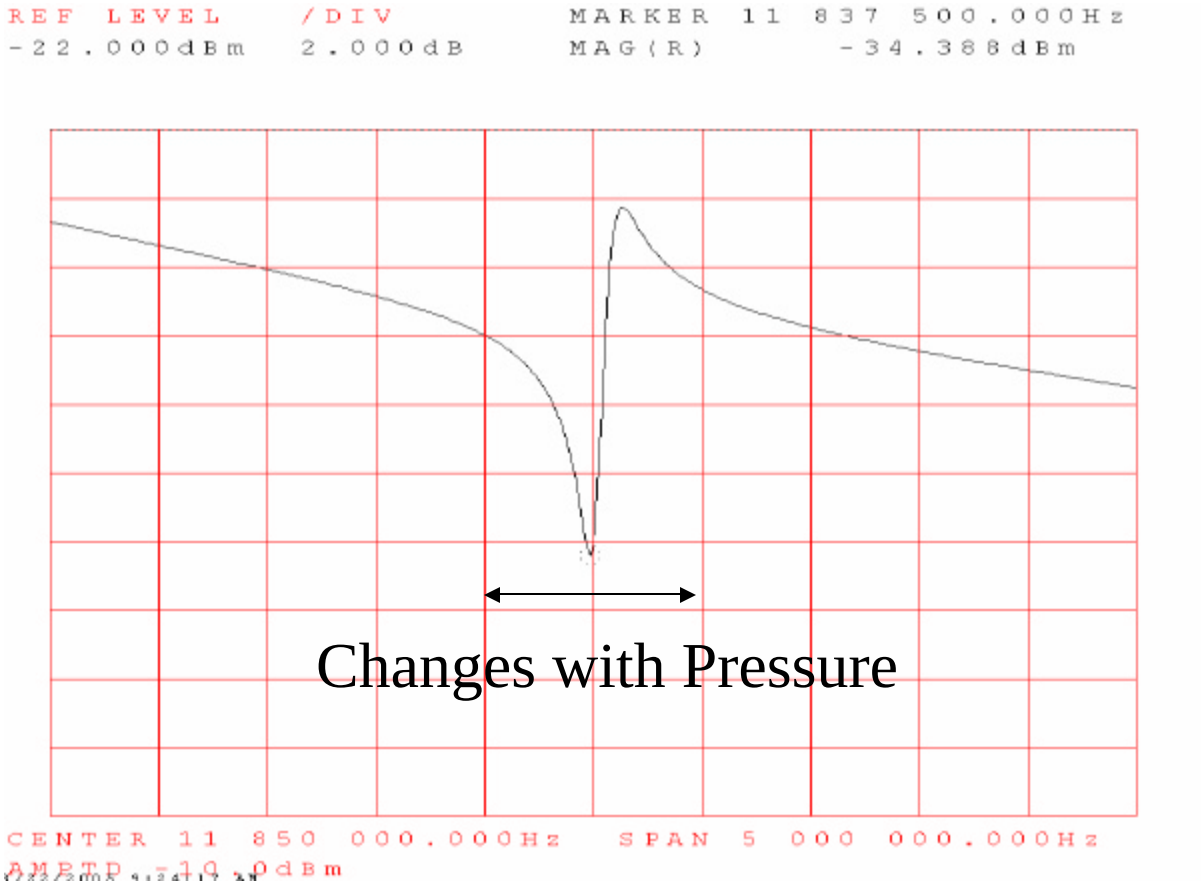


PICKUP COIL CURRENT WITH RESONANT CIRCUIT

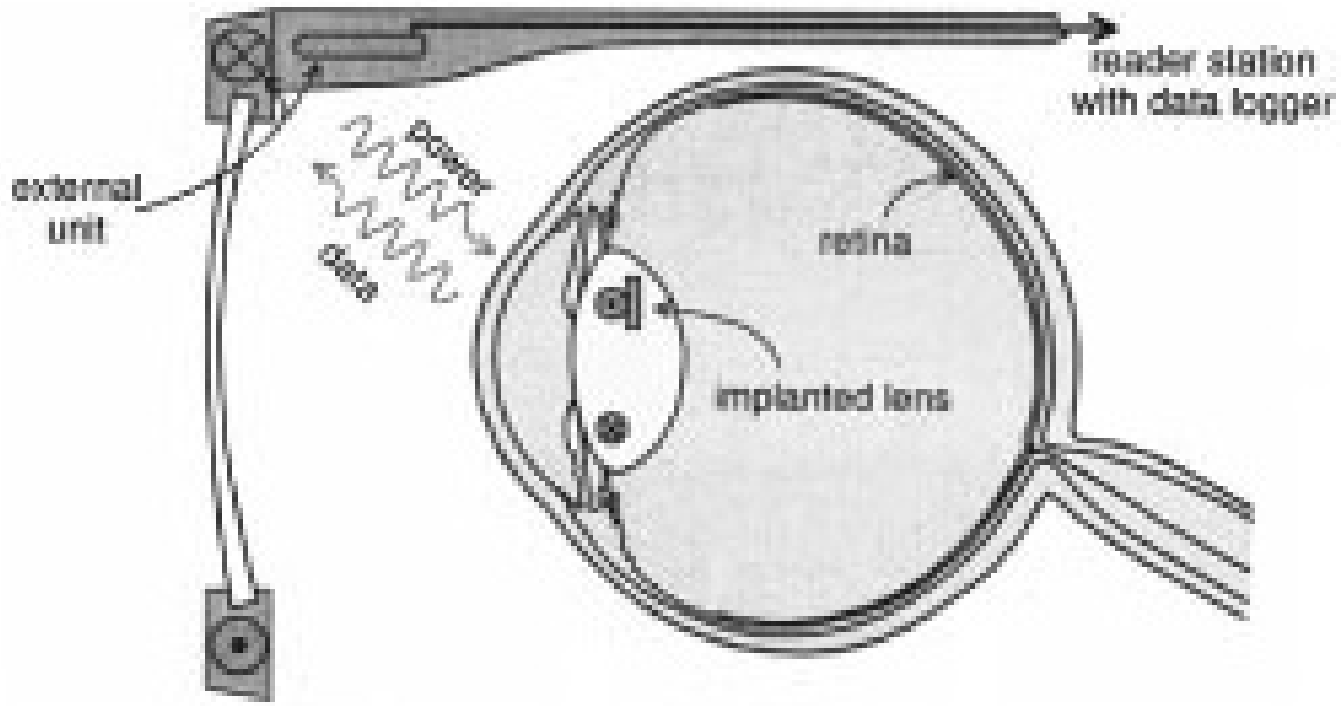


Due to internal LC

ZOOM IN ON RESONANCE DUE TO LC IN THE EYE



EXTERNAL ELECTRONICS



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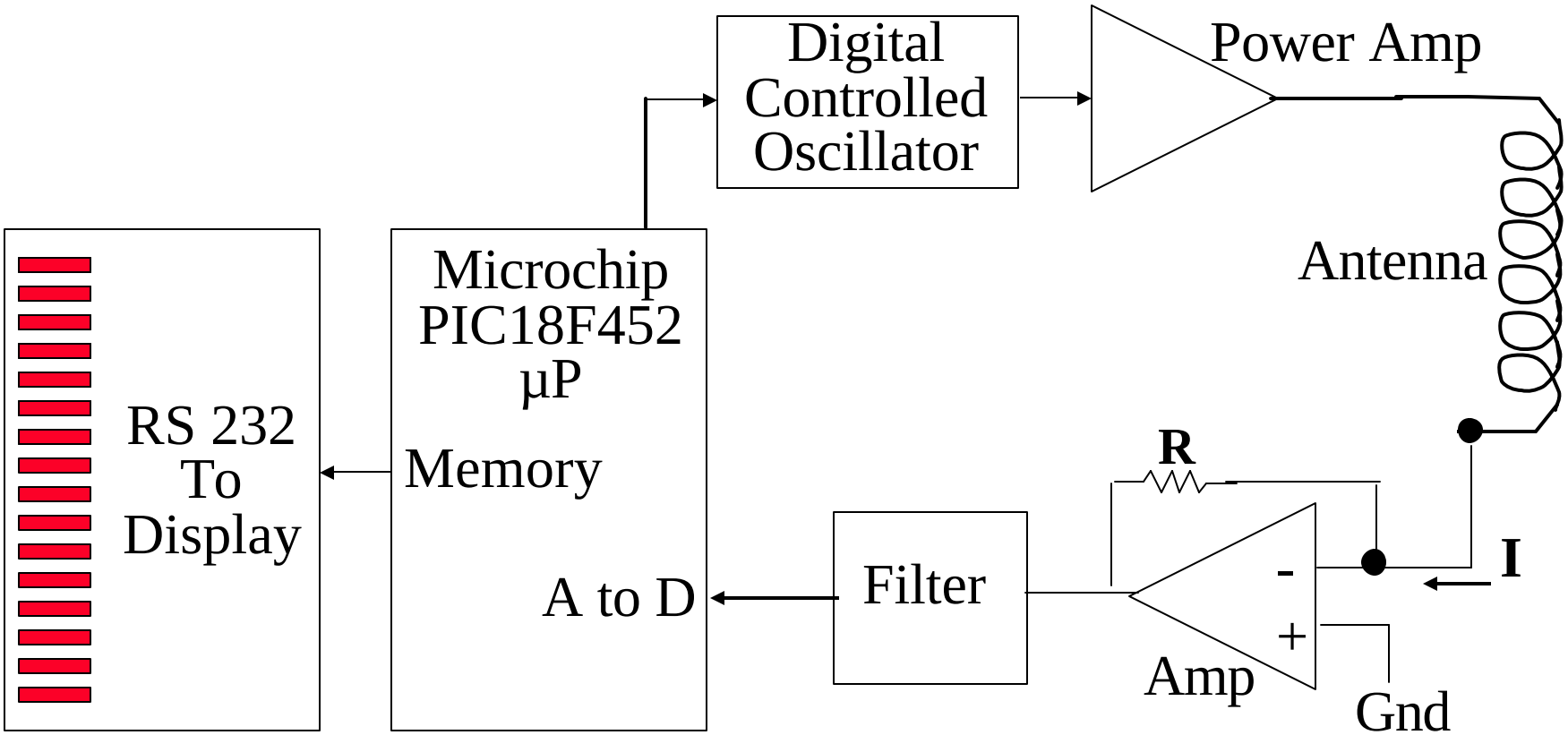
BLOCK DIAGRAM FOR EXTERNAL ELECTRONICS



MORE INFORMATION

RIT Microelectronic Engineering Department

http://www.microe.rit.edu

RIT Semiconductor and Microsystems Fabrication Laboratory (SMFL)

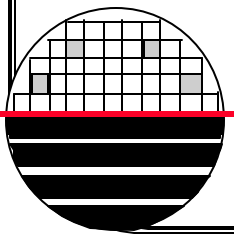
http://smfl.microe.rit.edu

University of Rochester Eye Institute

http://www.stronghealth.com/services/ophthalmology/index.cfm

National Eye Institute

http://www.nei.nih.gov/health/glaucoma/glaucoma_facts.asp



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This is a book that describes techniques used in the 1960's for this application. At that time integrated circuits and especially CMOS integrated circuits were not available. However the techniques are valid and provide insight for approaches using more state-of-the-art devices.
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