

# **EUV Photodiodes with Directly Deposited Uranium Filter**

**Raj Korde\***

International Radiation Detectors, Inc.  
2527 W. 237<sup>th</sup> St. Unit A, Torrance, CA 90505-5243  
Phone:310-534-3661, Fax:310-534-3665, [rajkorde@ird-inc.com](mailto:rajkorde@ird-inc.com)

**John F. Seely**

Naval Research Laboratory, 4555 Overlook Avenue S.W., Washington DC 20375

**Eric M. Gullikson**

Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720

**Benjawan Kjornrattanawanich**

Universities Space Research Association  
Brookhaven National Laboratory/NSLS Beamline X24C, Upton, NY 11973

**David D. Allred**

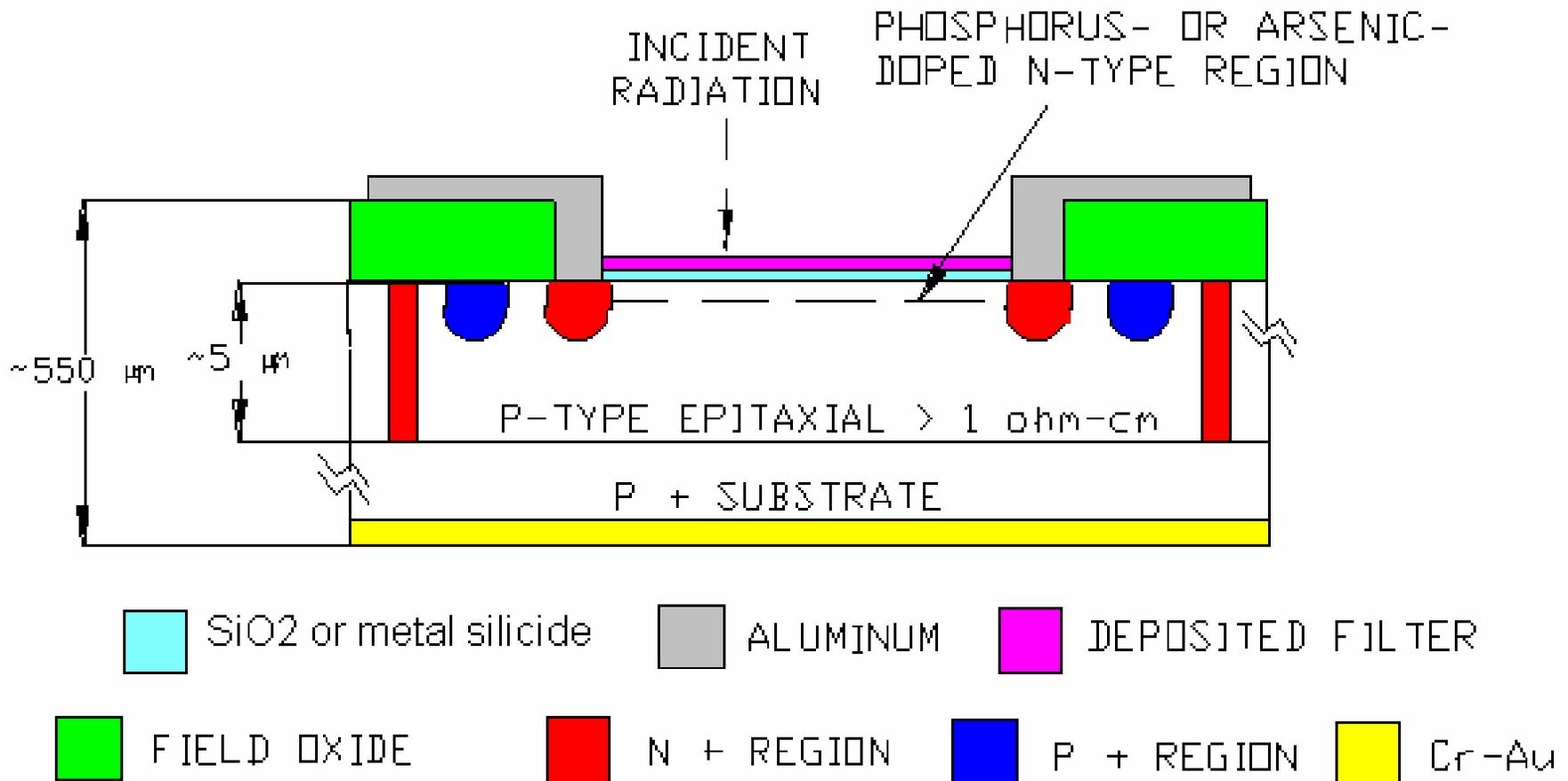
Department of Physics and Astronomy, Brigham Young University, Provo, UT 84602

# ABSTRACT

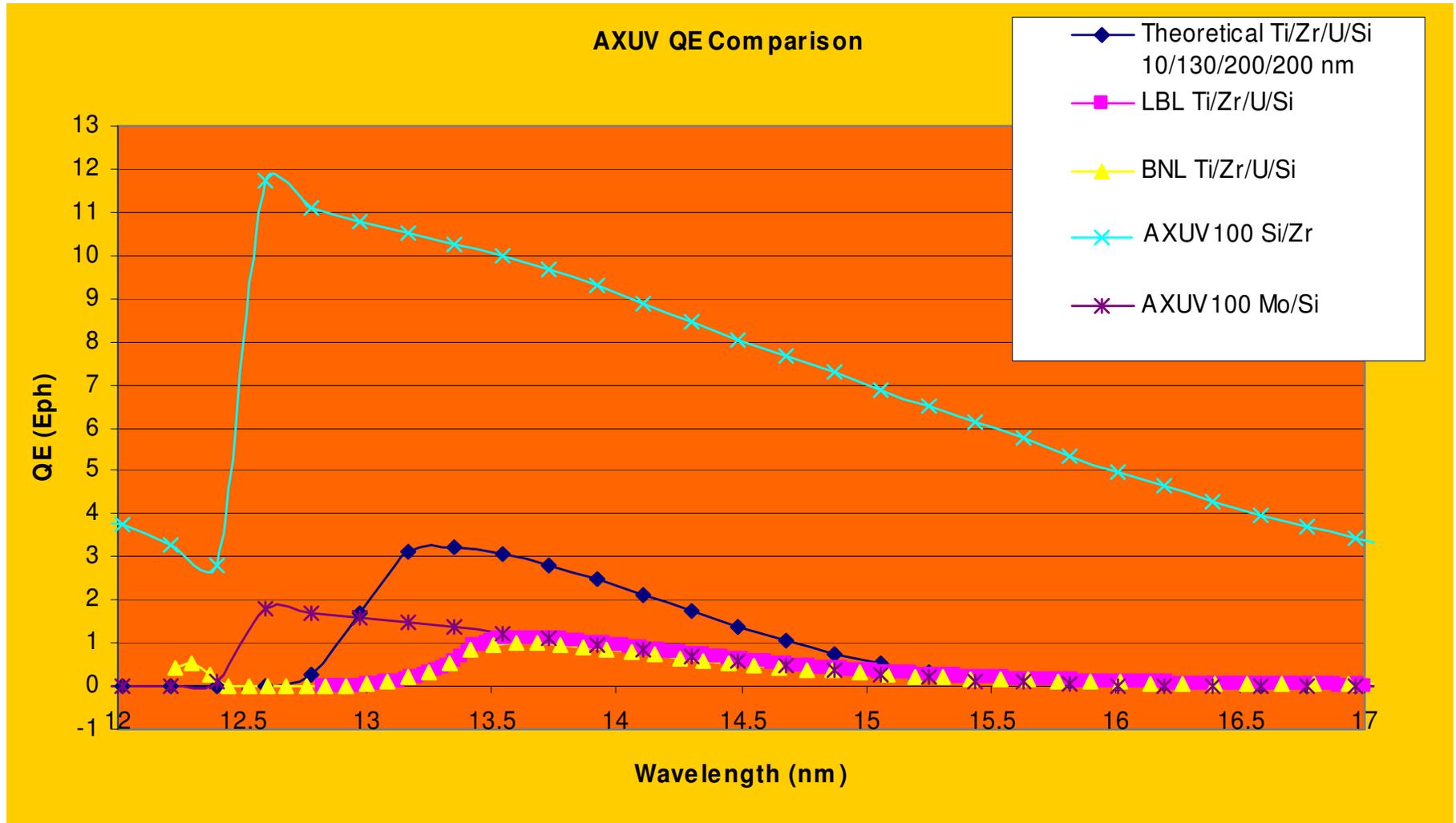
**Silicon photodiodes with directly deposited Si/Zr and Mo/Si filters are used presently for dose measurements in EUV steppers and sources. Owing to the inherent optical properties of Si, Zr, and Mo, the passband of these coatings is quite wide (6 to 10 nm) and the peak transmission does not occur at the desired 13.5 nm wavelength. According to the available optical constants (CXRO), uranium will be an excellent filter material because of the narrow EUV passband and the peak transmission around 13.5 nm. Characteristics of the fabricated AXUV photodiodes with directly deposited U/Zr/Si filter will be presented here. Zirconium and silicon were added to the filter to get better visible light blocking and surface passivation respectively. The fabricated devices had a peak responsivity of .0124 C/J at 13.6 nm with 3 nm passband and 3 orders of magnitude blocking for the visible light.**

**Keywords: Sensors and Diagnostics, EUV dose measurement**

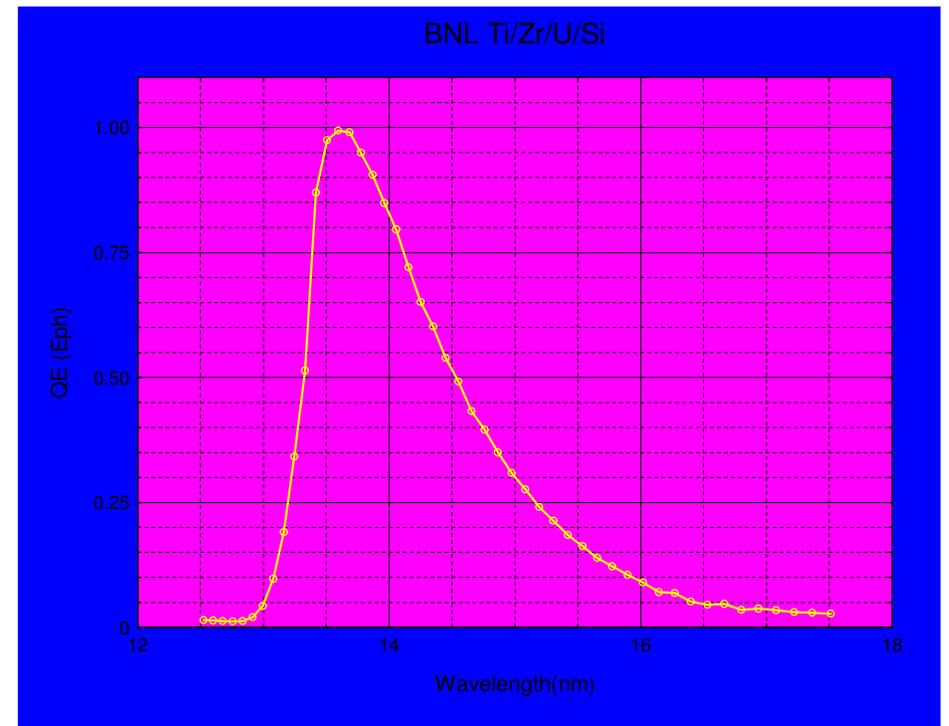
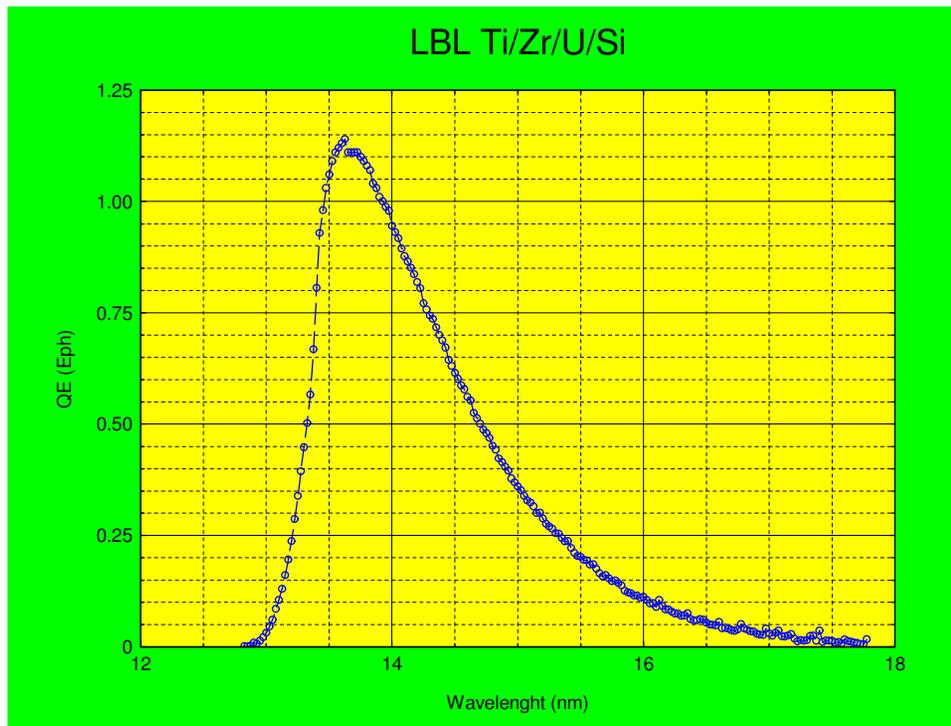
## Structure of the AXUV/SXUV photodiodes with directly deposited filter



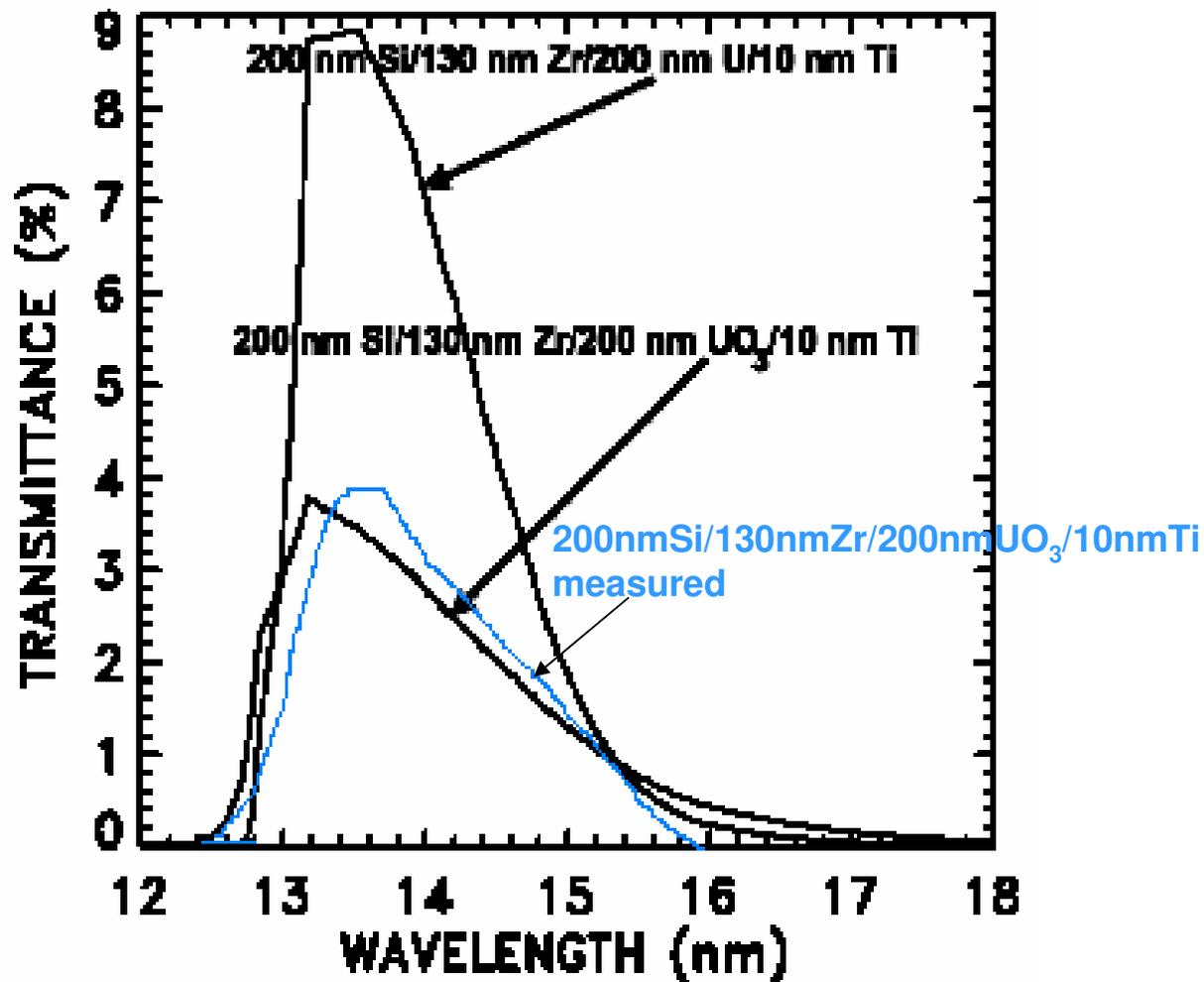
# Measured and calculated Q.E. of various types filtered diodes



The measured Q.E. of Ti/Zr/U/Si filtered diode is  $\geq 1$  at 13.5 nm wavelength



The simulated transmittance with 200nm  $\text{UO}_3$  instead of 200nm U agrees with the measured values !



## CONCLUSION

Fabrication of U coated silicon photodiodes with narrow passband around 13.5nm has been demonstrated.