



Database for Radiation Hardening of Material

Fermilab Robotics Meeting

K. Yonehara

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Building block of electronics

- Most materials are sensitive to radiation
 - Semiconductor
 - Insulator
 - Resistor, capacitor
 - Cable
- Specify damage (physics)
 - By ionizing species
 - Alpha, beta, gamma, neutron, ions
 - By energy
 - meV-eV (thermal & atomic), keV-MeV (nuclear), GeV (accelerator)
 - By intensity
 - By exposure time
 - Single event effect (SEE) vs total ionizing dose (TID)

Online Data base

The screenshot shows a web browser window with the URL `imhotep.rl.ac.uk/cgi-bin/imhquery.pl`. The page features the IMHOTEP logo and navigation links for AIDA HOME, IMHOTEP, FAQ, ABOUT US, and CONTACT. A navigation breadcrumb shows `AIDA >> imhotep`. The main heading is "Welcome to Imhotep". Below this, a paragraph states: "This database contains summary data from tests to quantify materials and components for LHC detector upgrades. If you would like to submit data to IMHOTEP, you can do so [here](#)." Further instructions mention searching by category or keyword. The search form includes fields for "Category", "Object Type", and "Radiation Type", each with a dropdown menu. Under "Radiation Parameters", there are input fields for "Particle Energy (MeV) and Fluence (cm²)" and "Dose (MGy)", each with "More than" and "Less than" options. There are also fields for "Irradiation Temperature (K)", "Experiment Name", "Record contains these words:", and "Published After" (with a date format `dd/mm/yyyy` and an "(inclusive)" note). A red "SEARCH" button is at the bottom left of the form. The footer contains the European Union flag, the text "IMHOTEP is part of the AIDA project and is provided by STFC. About IMHOTEP | About AIDA | Disclaimer | © STFC 2013 - 2017. AIDA is co-funded by the European Commission within Framework Programme 7 Capacities, Grant Agreement 262025", and a "7" logo.

~260 materials are listed

Other citation

- CERN
 - “Yellow book”, CERN82-10, Compilation of radiation damage test data, part I, part II, and part III
 - Radiation Effects on Electronics (REE) group
 - HiRadMat
- NASA
 - NASA Radiation Effects and Analysis Group (REAG)
- RaDIATE
- Journal
 - Radiation Physics and Chemistry
 - Nuclear Instrumentation and Method A & B
 - IEEE
- International Conference
 - NSREC, RADECS

Question

- Can we ask a research budget?
 - Visit to/Invite from major institutions
 - Attend the domestic/international conference/workshop
- Obtain rad hard electronics
 - Mechanism of rad damage is well understood
 - LHC Si tracker consisting in an oxygen enrichment of the float zone wafers during detector processing for rad hardening
 - Vendor can provide a rad hard electronics; but it is expensive because it is a custom-made (not a mass product)
 - Maybe ask NASA (High-Performance Spaceflight Computing (HPSC) Project) to obtain some electronics
- Propose beam test at Fermilab?
 - FTBF, MTA, etc
 - Currently it is not the plan