



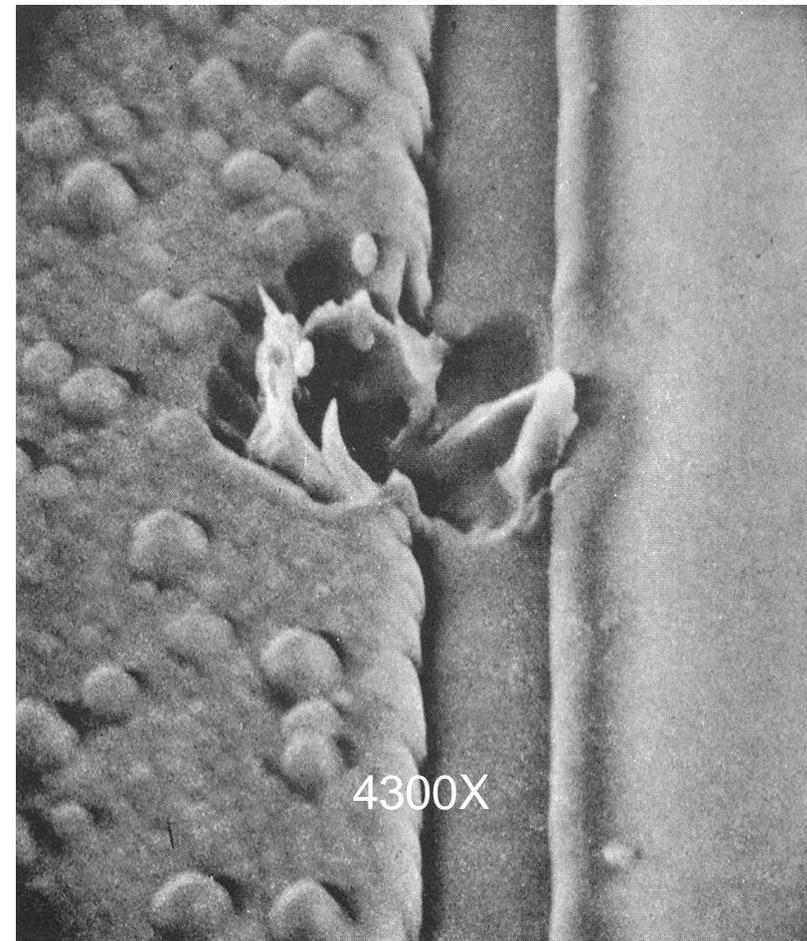
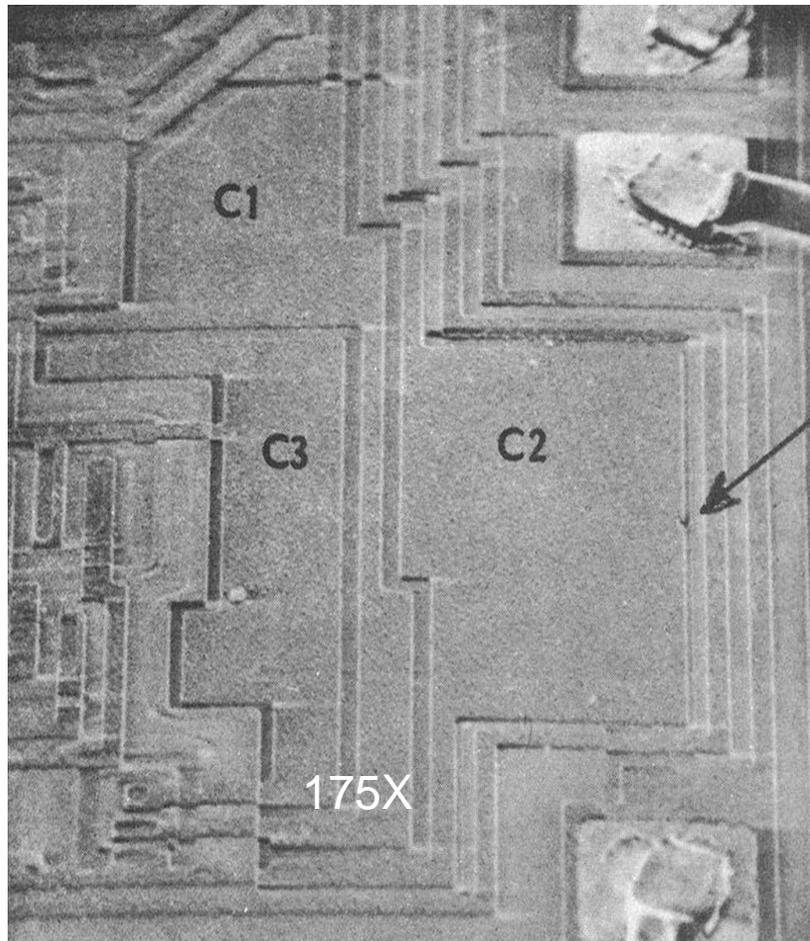
GLAST ASIC Electrostatic Discharge (ESD) Protection



- **GLAST ASICS are very sensitive to ESD**
 - Measured failures at less than 200V
 - Walking across a floor can generate 3000V
- **So far there have been few incidents, but...**
 - There are thousands in the LAT
 - Much handling is going on during manufacture
 - A number of them are tied directly to output pins
- **Proper handling techniques for protecting ASICs from ESD damage must be used**
 - NASA-STD-8739.7 or ANSI/ESD-S20.20

ESD Damage

HA-2700 surface damage in the C2 MOS capacitor
(Courtesy of JPL)





GLAST ASIC ESD Protection



- **Review of proper ESD techniques (1 of 2)**
 - **All ESD Sensitive (ESDS) parts must be stored and transported in complete, sealed faraday cages – no shortcuts**
 - **Approach ESD workstation and connect ground strap before opening the container**
 - **Observe 1-meter rule at all times**
 - **No ungrounded personnel within 1 meter of the bench while hardware is exposed**
 - **Prior to leaving workstation for any reason, ESDS parts must be completely sealed in a faraday cage container**
 - **This also includes whenever additional personnel need to approach the bench**
 - **No untrained personnel in any ESD work area without escort and proper protection**
 - **Basic protection is individual wrist strap and ESD protective smock (lab coat)**



GLAST ASIC ESD Protection



- **Review of proper ESD techniques (2 of 2)**
 - **Wrist straps, heel and toe straps and grounded footwear must be checked daily and recorded on a log**
 - **If continuous monitors in use a log need not be kept for wrist straps only**
 - **It takes some time to get a good circuit to ground through heel and toe straps/grounded footwear**



GLAST ASIC ESD Protection



- **Additional ESD Protective Measures Required for GLAST ASICs (1 of 3)**
 - **Wrist Straps and other grounding devices must be verified before every use**
 - **Benchtop air ionizers in use during test/assembly**
 - **Provides constant stream of positive and negative ions to neutralize charges**
 - **Have a finite effective area, positioning is important**
 - **Limit physical handling ASIC as much as possible**
 - **Connection of cables to hardware and/or test equipment**
 - **Drain charge from cable using a grounded, brass-bristle brush**
 - **Ground brush through a 1 Megohm resistor to prevent spark**
 - **Verify the connection of the brush to ground prior to use**
 - **Discharge parts via the brush or ionizer (to use the slow bleed) prior to connecting the hard ground**



GLAST ASIC ESD Protection



•Additional ESD Protective Measures for GLAST ASICs (2 of 3)

- Hold brush so bristles are 45° from vertical and bring receptacle or plug down to the brush
- Check connector for particles and cleanliness
- Check cable with a static meter (to ensure brush's effectiveness in draining charge)
- Connect

OR:

- Connect cables, etc. to test or other equipment first to drain the charge from the cable (check with static meter to ensure no charge on cable)
- Small cables connecting on the hardware itself may be bathed in ionized air prior to connection (check with static meter to ensure no charge on cable)



GLAST ASIC ESD Protection



Additional ESD Protective Measures for GLAST ASICs (3 of 3)

- Breakout box faceplates must be metal or static dissipative material and grounded to eliminate static buildup
 - Verify the ground wire continuity prior to connecting to hardware
- Test probes should also be checked for possible static charge buildup (check with static meter before use)



GLAST ASIC ESD Protection



Recommendation:

- **Continuous monitors for wrist straps are highly recommended since they give immediate indication if ground connection is interrupted**
 - Indications are both visual and aural
 - With continuous monitors, a daily log need not be kept
- **Static Field Sensors can be used at benches for warning purposes**

Additional Note:

- **Where possible, elevate the humidity in work areas**
 - Higher humidity, lower charge buildup (exponential)
 - Calorimeter crystals are hygroscopic so this can only be a temporary measure when crystals are not present