



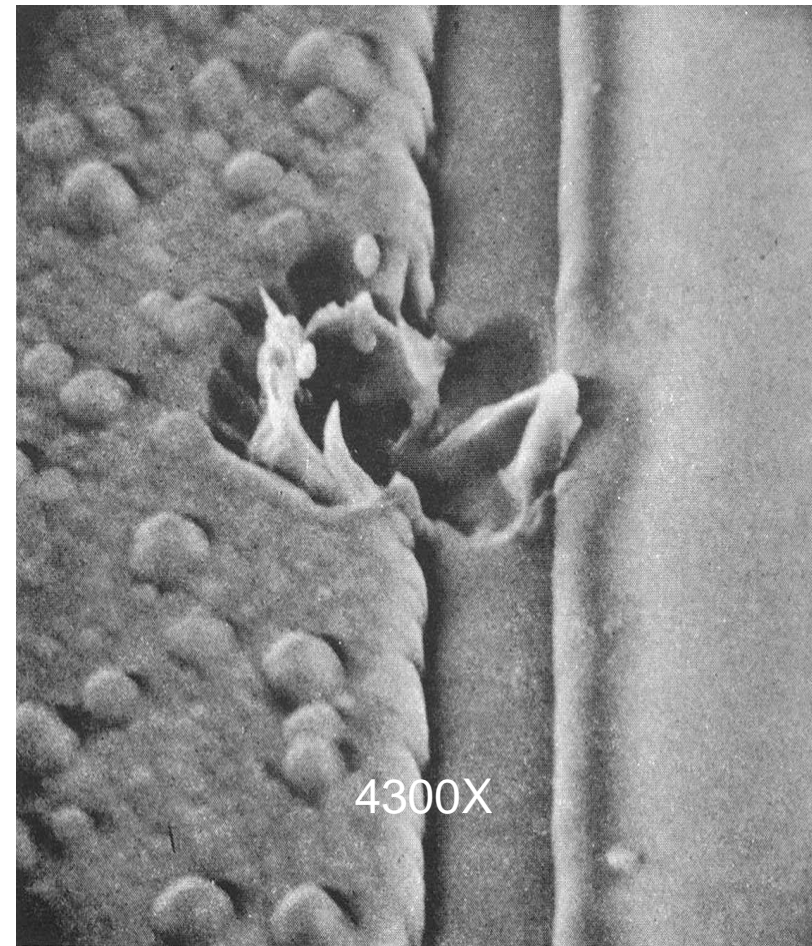
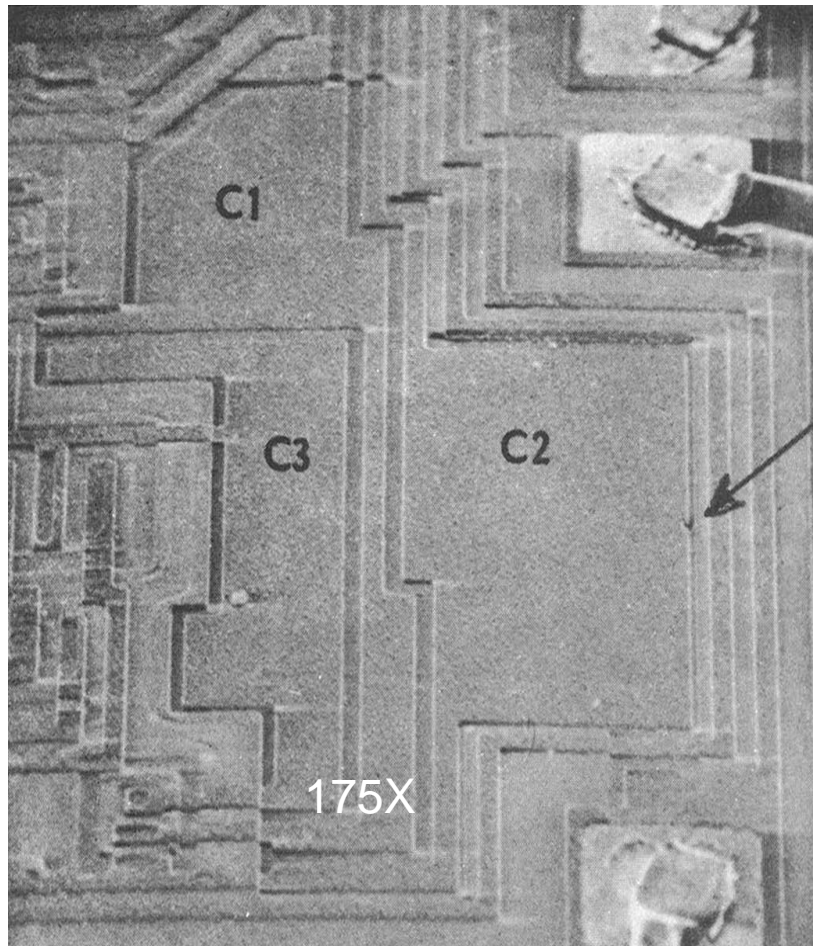
# GLAST ASIC Electrostatic Discharge (ESD) Protection



- **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