

# Micrometeorite Impact Test of Flex Solar Array Coupon

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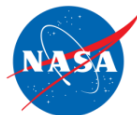
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# Background

- ❑ SSL is developing an advance, lightweight, flexible 28 kW solar array for commercial use
  - Based on Deployable Space Systems (DSS) Rollout Solar Array (ROSA) designs
  - Power level comparable to present SSL rigid solar array design
- ❑ Design risk reduction efforts are underway
  - Mechanical evaluation at DSS
  - Thruster plume evaluation at the NASA/JPL
  - Thermal cycle evaluation at the Air Force/AEDC
  - Thermal balance evaluation at the NASA/GRC
  - Micro-meteoroid impact evaluation at the NASA/MSFC

# Test Coupon

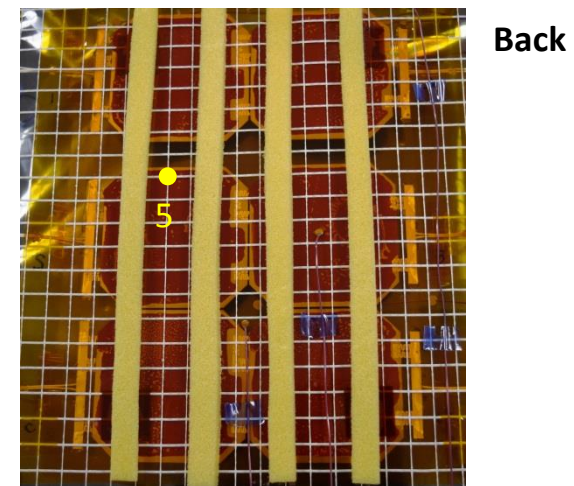
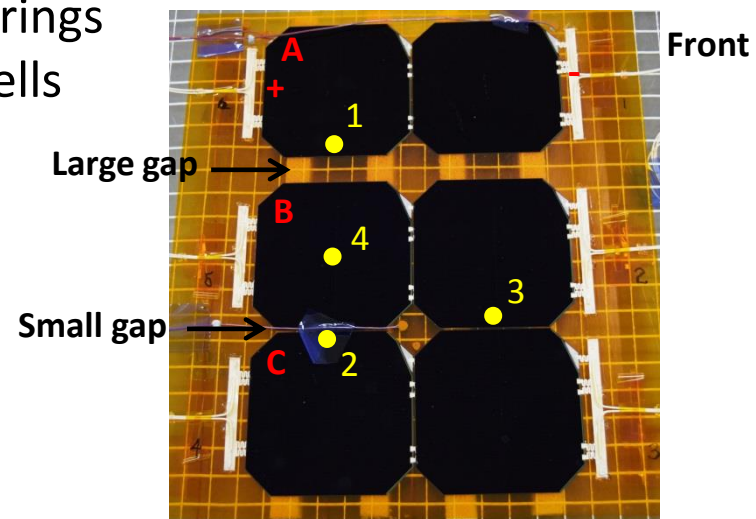
- ❑ 3 strings with 2 cells per string
- ❑ The large gap represents separation between strings
- ❑ The small gap represents separation between cells within a string

Electrical Configuration					
Test Shot	Impact Side	SAS Volt./Cur.	String A	String B	String C
1	Front	100V/1.1A	High	Low	NP
2	Front	15V/1.1A	NP	Low	High
3	Front	22.5V/1.65A	NP	Low	High
4	Front	150V/1.65A	High	Low	NP
5	Back	150V/1.65A	High	Low	NP

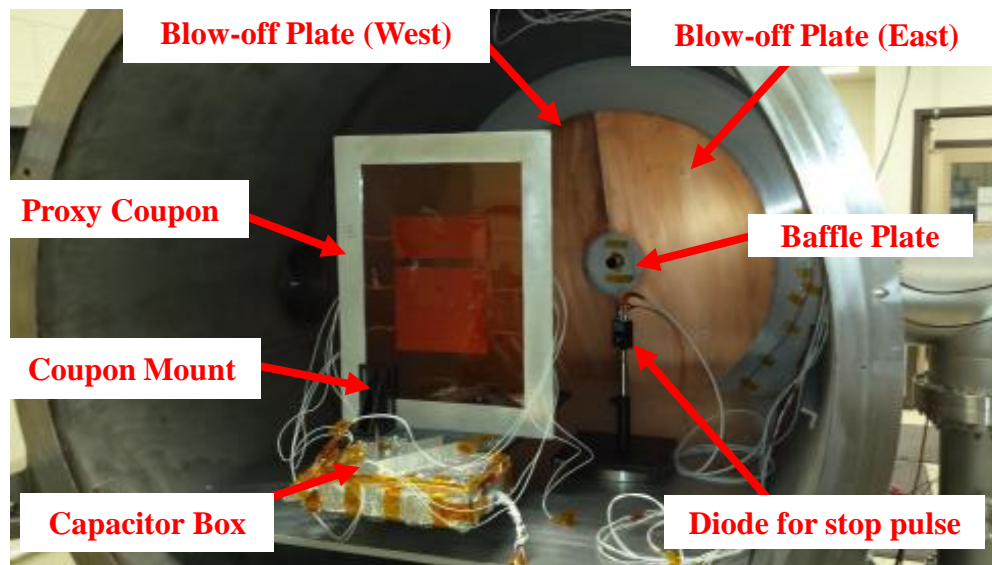
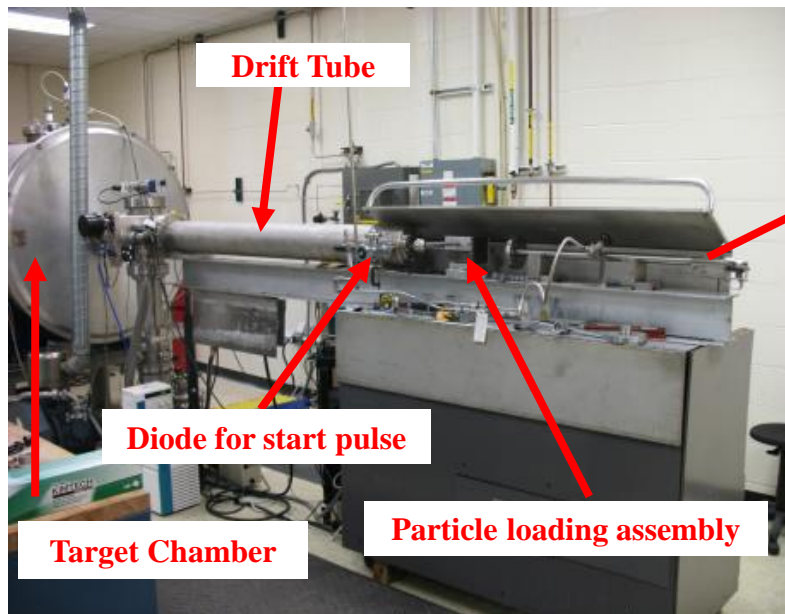
High = Solar Array Simulator (SAS) voltage

Low = SAS return

NP = Not Powered

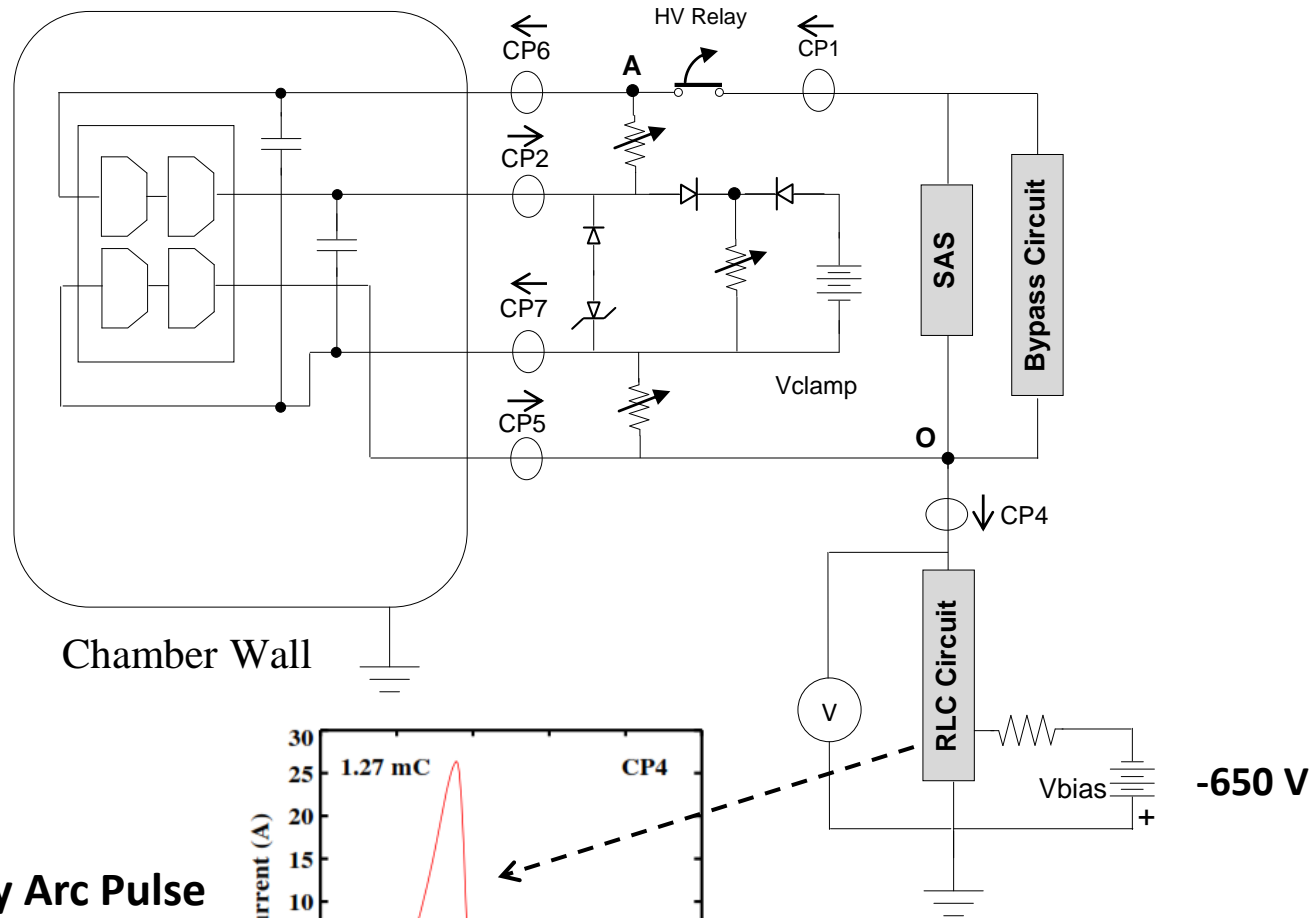


# NASA/MSFC Micro Light Gas Gun (MLGG)

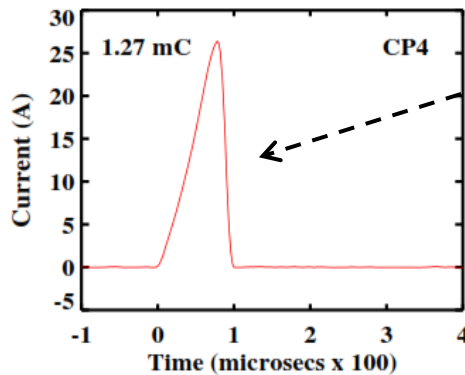


- A Nylon pellet (1.76 mm dia. by 1.76 mm length) is used as the debris proxy and reaches speeds  $> 5\text{km/s}$

# Electrostatic Discharge (ESD) Test Circuit

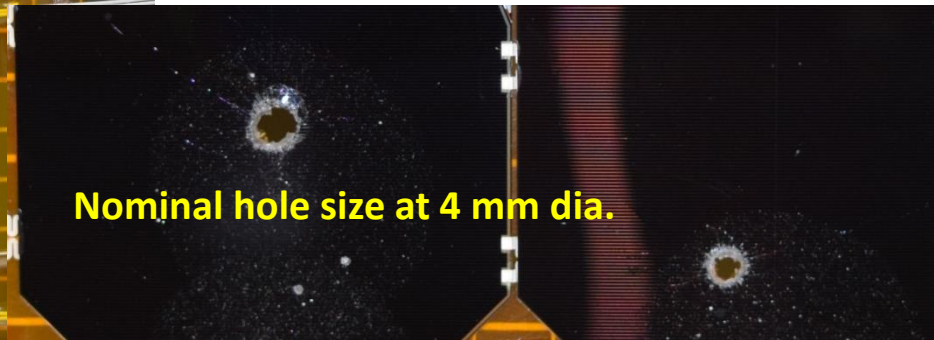
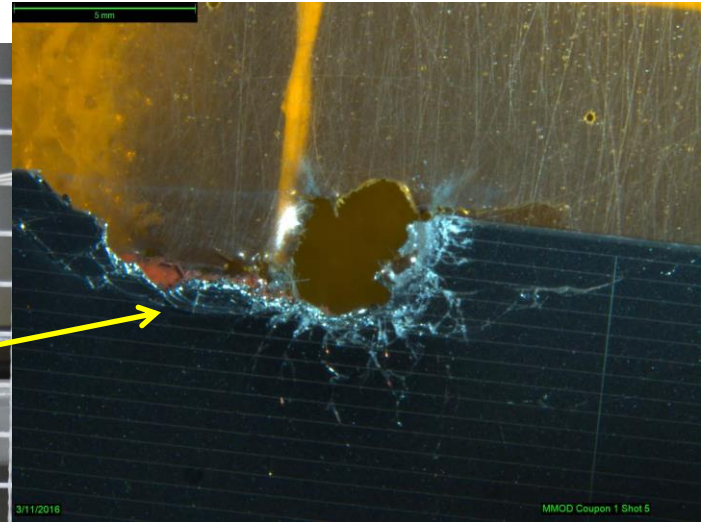
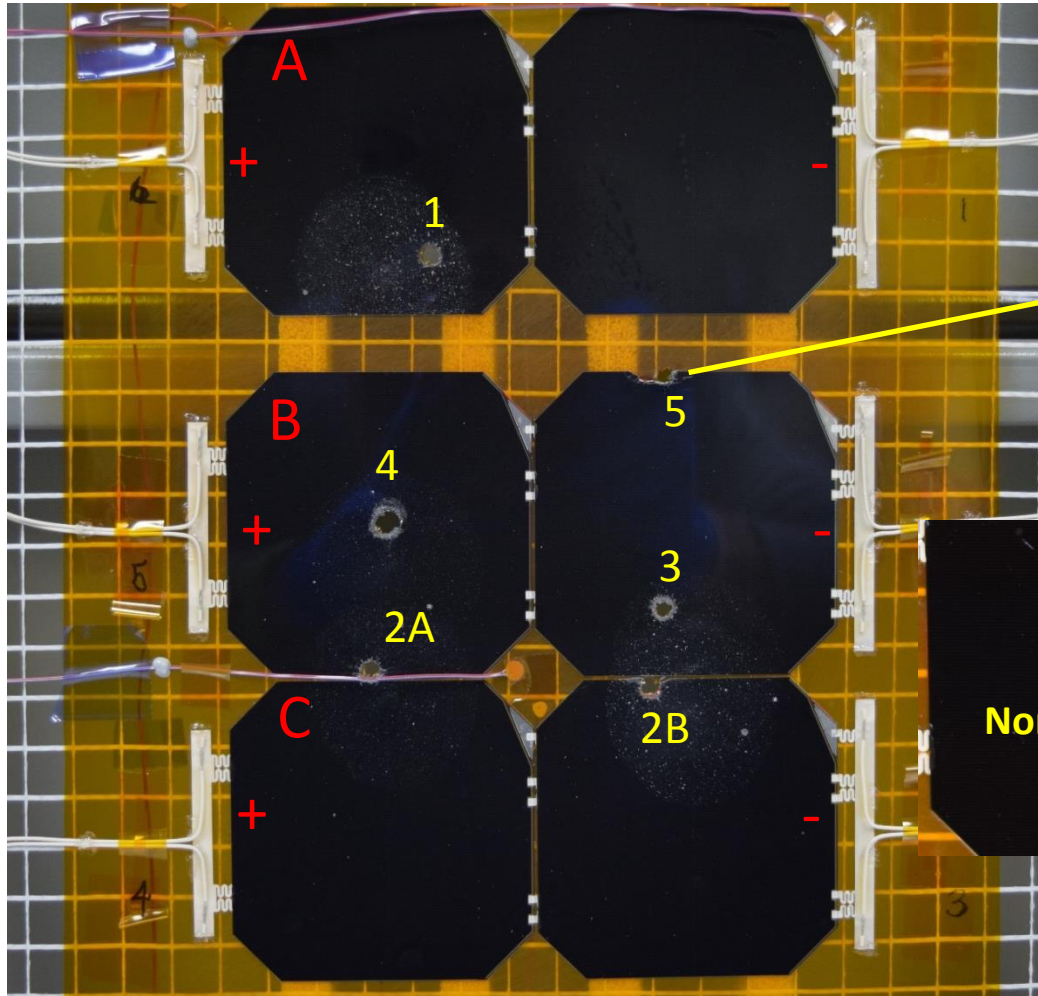


Primary Arc Pulse



# Impact Results

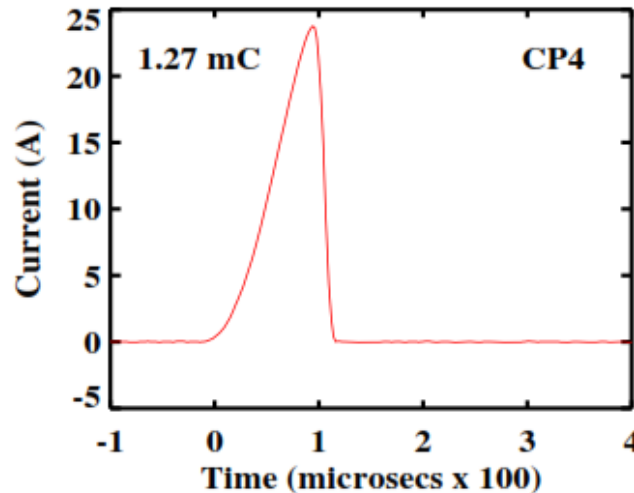
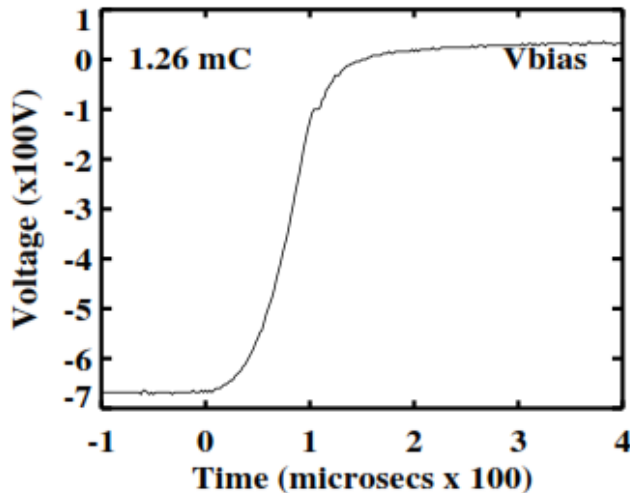
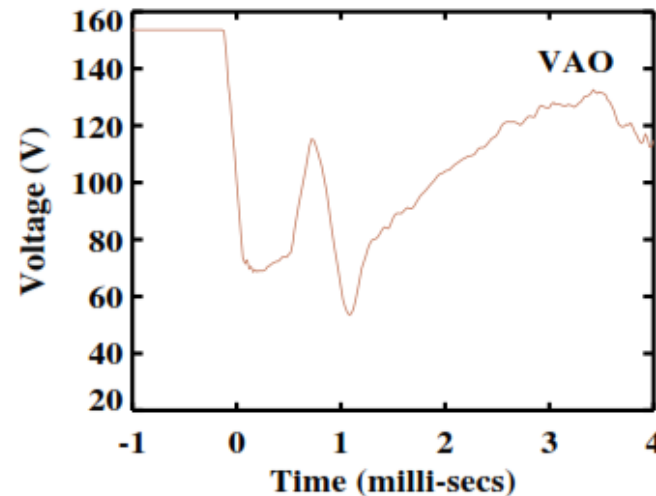
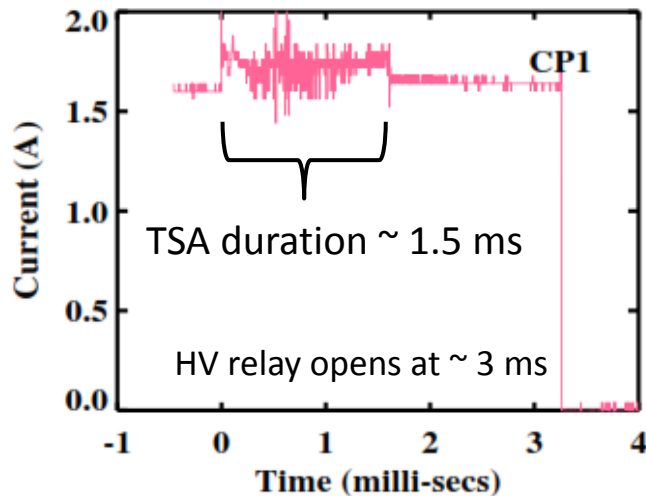
Front View



# Impact 5: Temporary Sustained Arc (TSA) event

Coupon-1: Impact 5 (B back); String-A-to-B at 150V; SAS at 1.65A

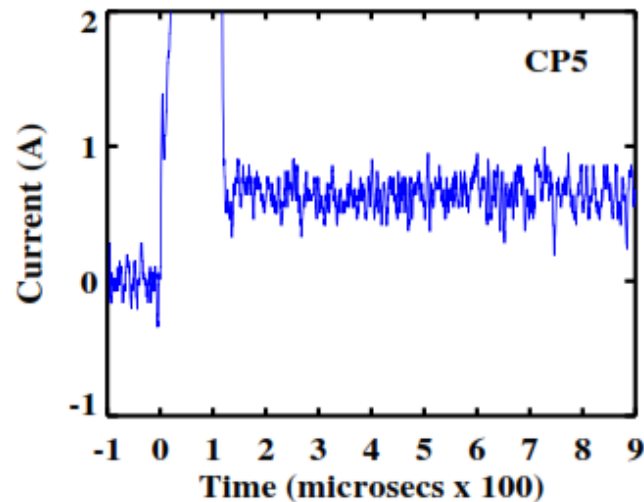
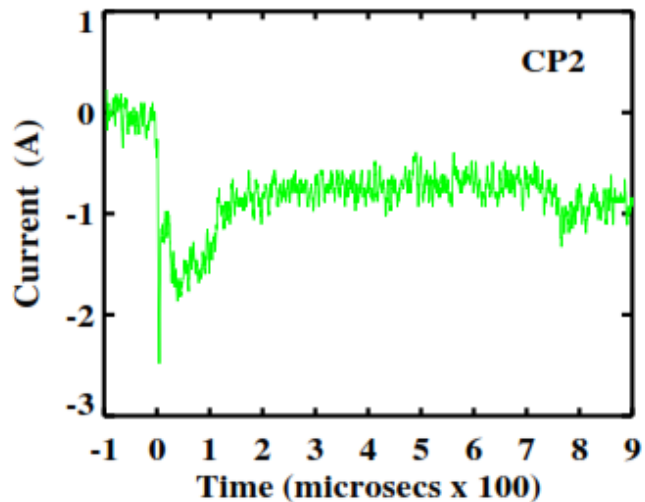
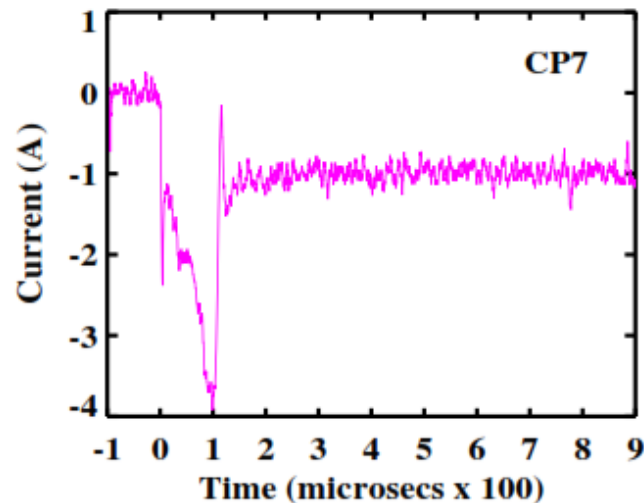
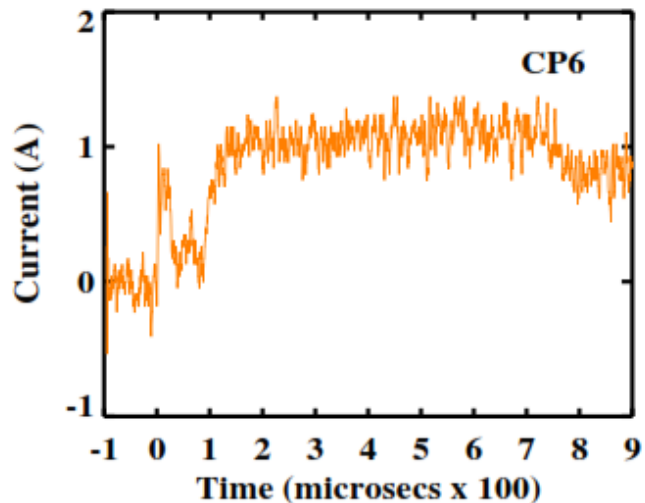
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# Impact 5: TSA event

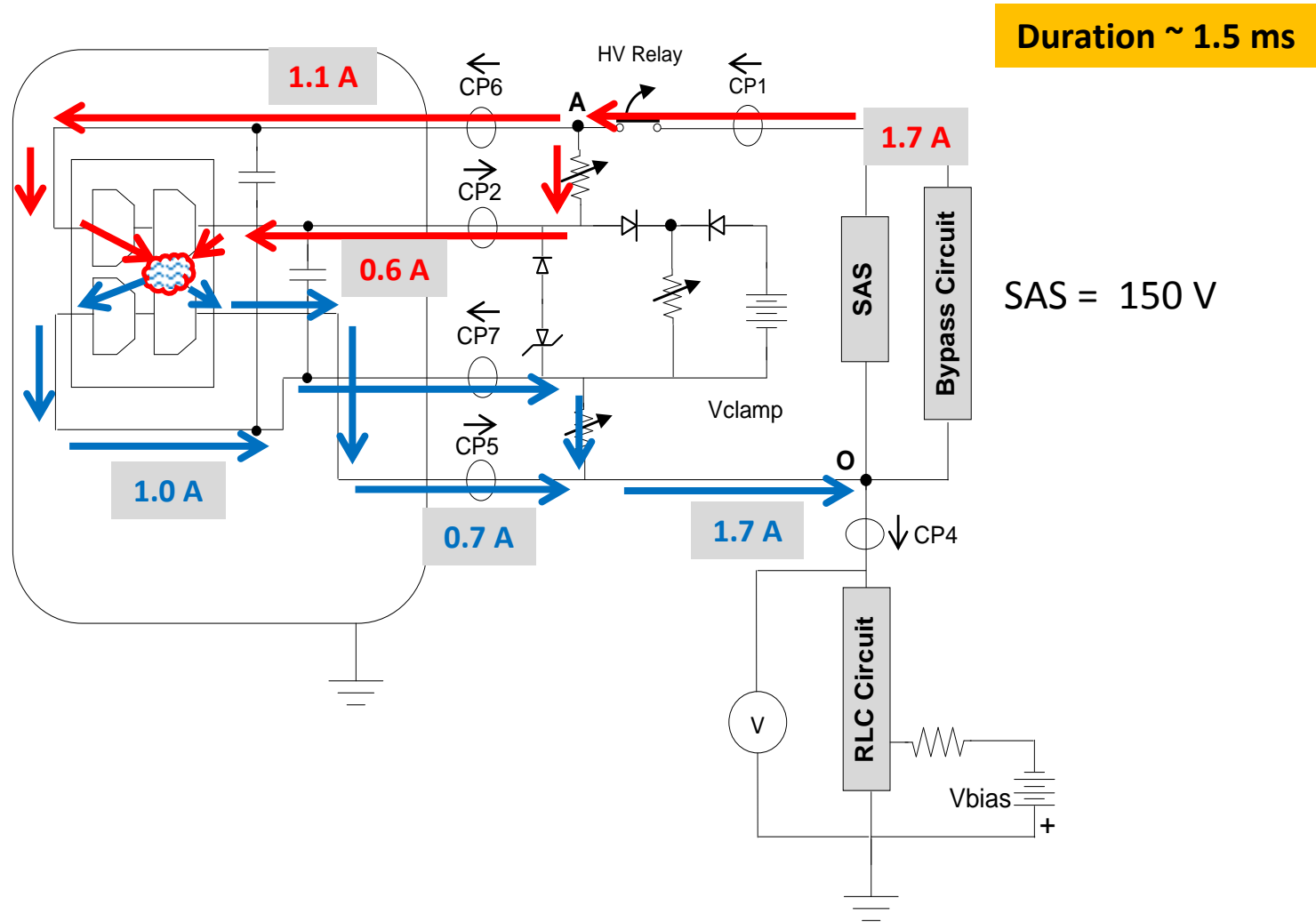
Coupon-1: Impact-5 (B back); String-A-to-B at 150V; SAS at 1.65A

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## Impact 5: Estimated TSA Current Paths



# Summary

- ❑ NASA/MSFC has performed impact testing on SSL ROSA coupons
- ❑ No Permanent Sustained Arc (PSA) observed for any of the six impacts
  - However, further impact testing may be needed to clarify the results and to demonstrate the ROSA design robustness
- ❑ Post-impact observations
  - Local damage only – no structural breakdown
  - No visual evidence of arc tracking on Kapton or pyrolyzation
  - Insulation resistance measurement after impacts same as Beginning-of-Life; namely,  $> 50 \text{ G}\Omega$  between all string combinations