# Failure event analysis



Possible failure causes in Q1+ ( until June )

1. **Mechanical Stress Breakdown**
   Breakdown by mechanical effect such as tensile force

2. **Di-electric Breakdown by Maxwell Stress**
   Thinner EAP film as maxwell stress applied

3. **Stress Concentration Breakdown with Pull-in effected area**
   In high voltage partial pull-in area causes stress concentration, and eventually stress make film mechanical breakdown

4. **Thermal Breakdown with repetitious Electrical field change**
   Changing applied voltage and tensile force makes electrical filed change. This means some amount of current is flowed according to this event. At that time, current induces joule heat. This heat may damage the materials of EAP and electrode. Eventually they may be melt.

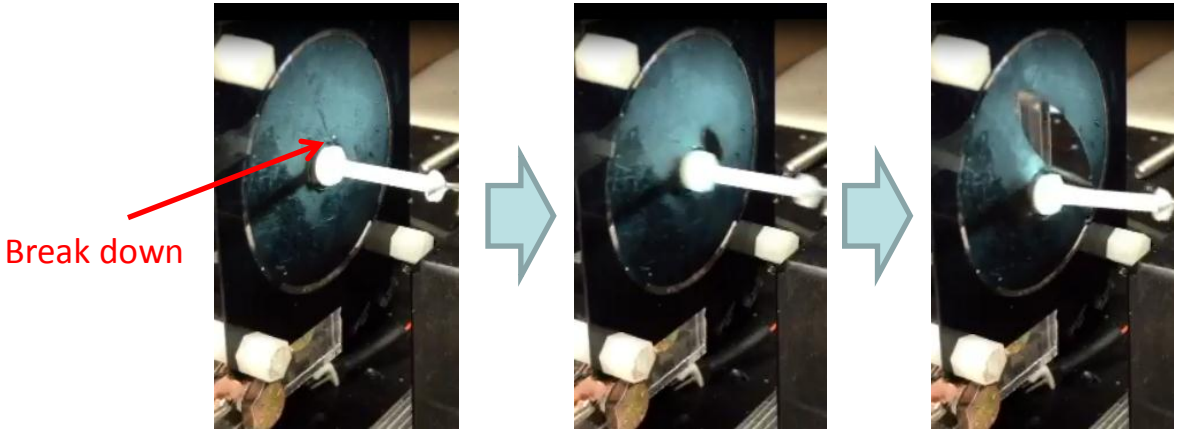
5. **Film Breakdown by frame edge surface**
   EAP film was damaged by the rough surface of frame edge, and di-electric breakdown was occurred at that point

# Failure Event Analysis

Failure event 1

**5. Film Breakdown by frame edge surface**

Tearing from Inner Edge
(Sprayed coating EAP)




Failure event 2

**5. Film Breakdown by frame edge surface**

Tearing from Outer Edge
(Screen Printing EAP)

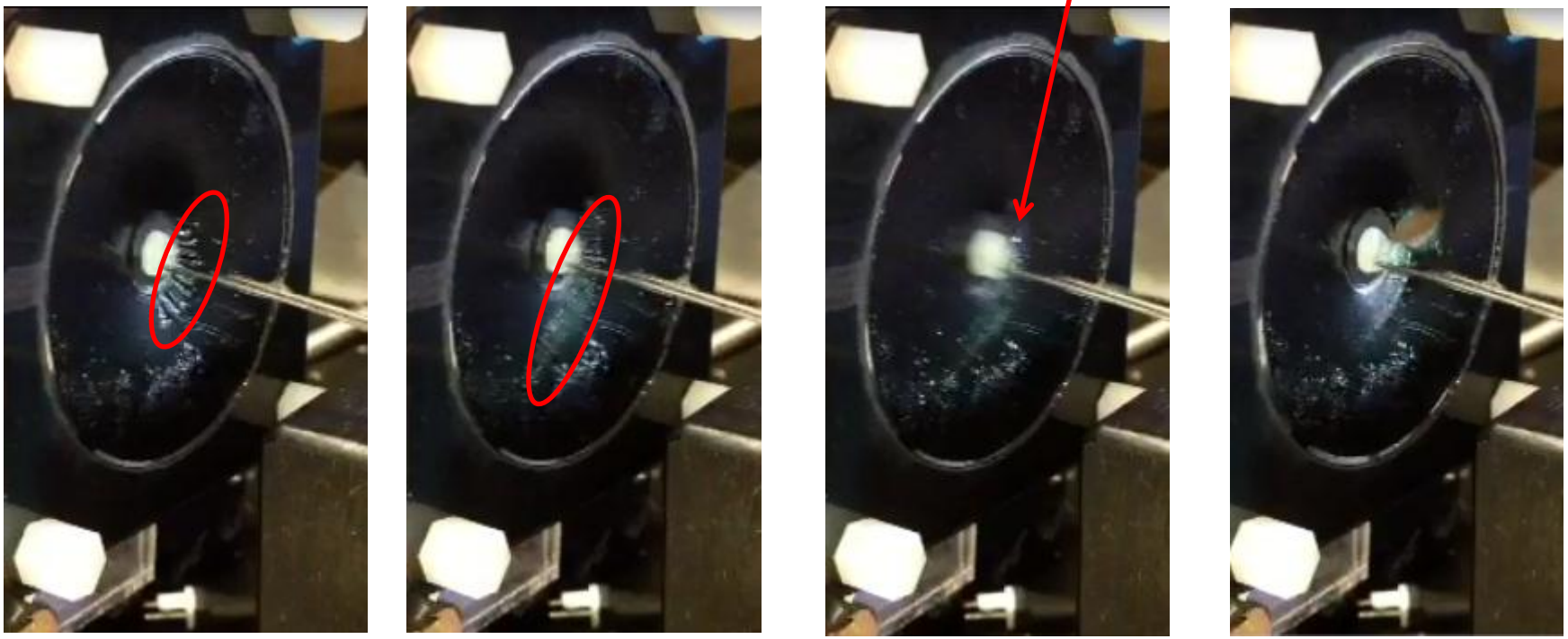
# Failure Event Analysis

Failure event 3

**2. Di-electric Breakdown by Maxwell Stress**

Tearing from pulling area

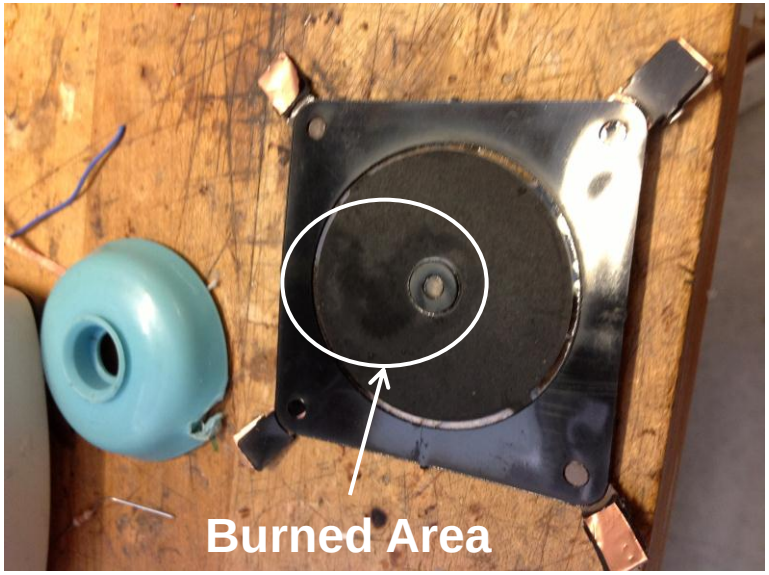
(Screen printing EAP)

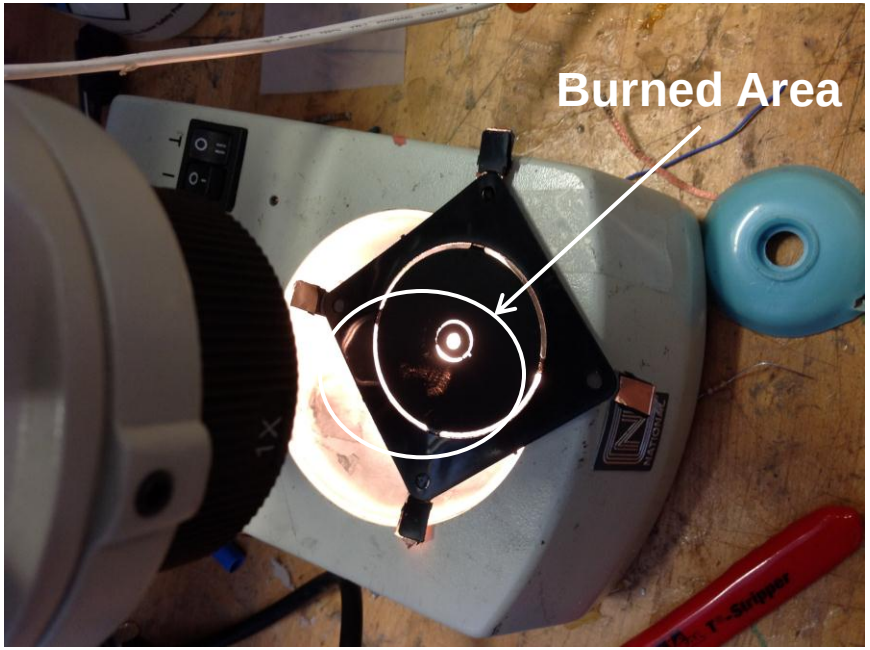


Failure event 4

**4. Thermal Breakdown with repetitious Electrical field change**
(Sprayed coating EAP)

In 7KV test the surface of EAP was burned.




In this quarter we should execute more failure analysis, and evaluate the validity
Of these failure causes