

# Kan ESD-skyddskläder dämpa ett kvasistationärt elektriskt fält?

Lars Fast, SP- Elektronik

ESTAT-Garments

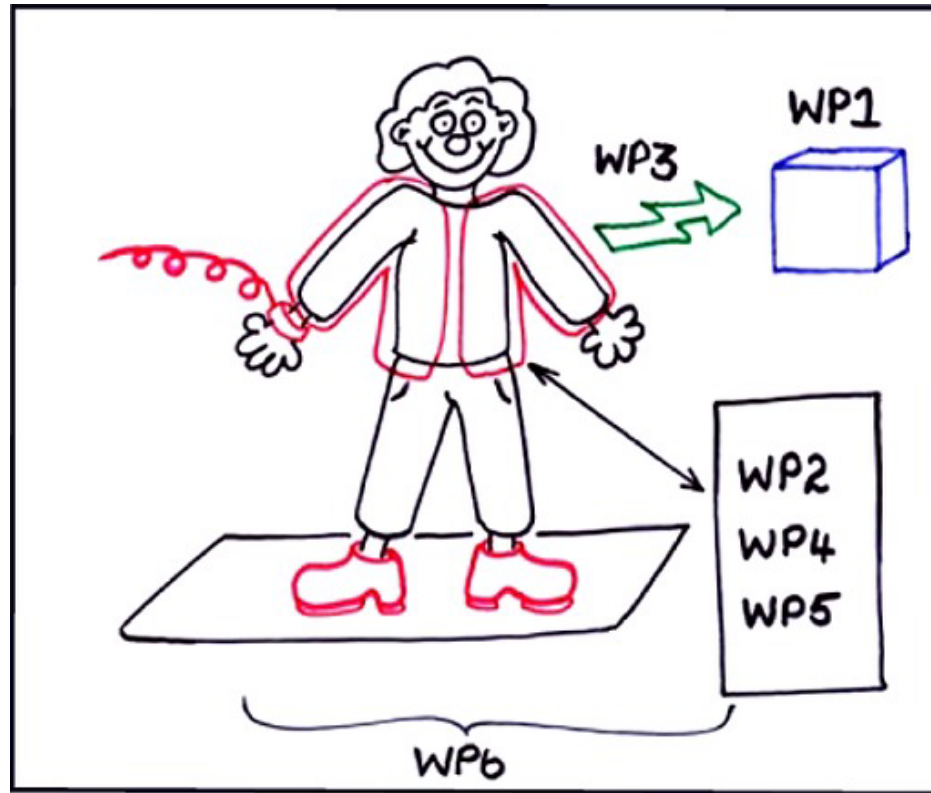
## Content

- ESTAT-Garments **<= *project***
- The field probe **<= *measuring device***
- Normal Garments **<= *field generator***
- Protective Garments **<= *means to stop the field***

## Who are we?

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What are we doing?



The function of the normal electro-static field probe:

- *Measures the potential at a distance of 3-8 mm*
- *Tries to assume the same potential as the measuring object*
- *Measuring an average over an angle of around 5 degrees*

*“Can measure a potential on a thin thread.”*

## Field probe

Normal electro-static field probe:



### *Modified electro-static field probe:*

#### **The first modification:**

***Placed in front of the sensitive opening is a 15 mm copper coin. The purpose of the coin is to average the potential from the measuring object.***

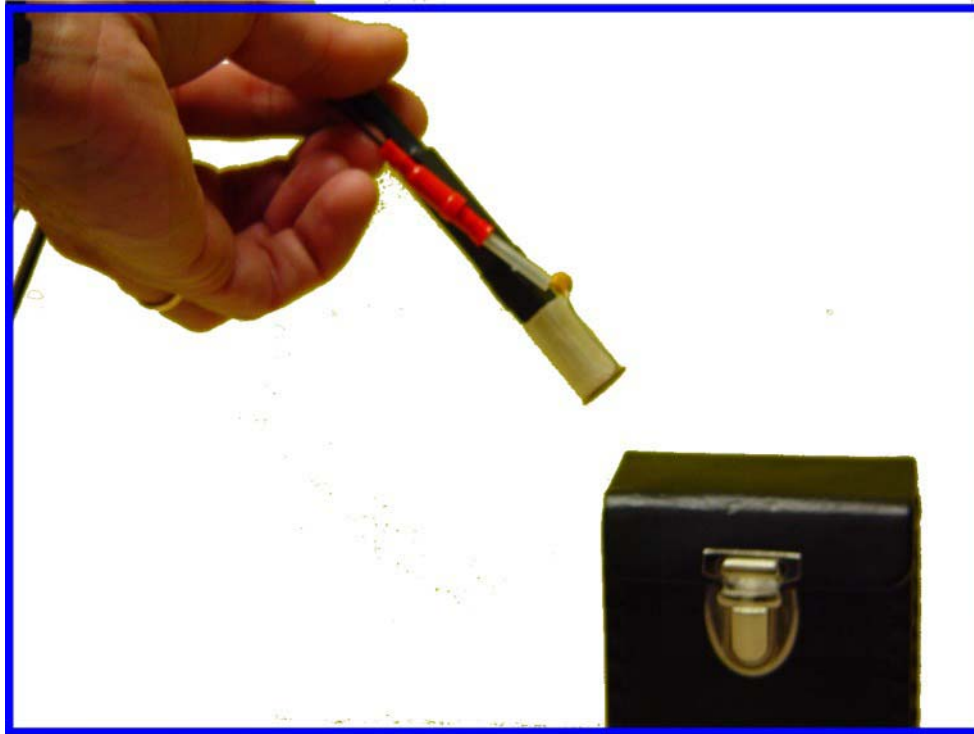
#### **The second modification:**

***A 2 pF capacitor is connected in-between the coin and ground. This is done to relate the potential of the coin to the ground potential. The coin has a capacitive coupling to the measuring object and also to ground.***

***“We want to mimic a grounded component.”***

## Field probe

Modified electro-static field probe:



### Questions

- What potentials can be found on the normal clothing?

### Answers

- We measured  $> 3.5 \text{ kV}_1$  and  $1.4 \text{ kV}_2$ ?

**Can this damage sensitive devices? - Yes**

1. Measured with the normal field probe, **above 3.5 kV**
2. Measured with the modified field probe, **1.4 kV**

## Normal clothing

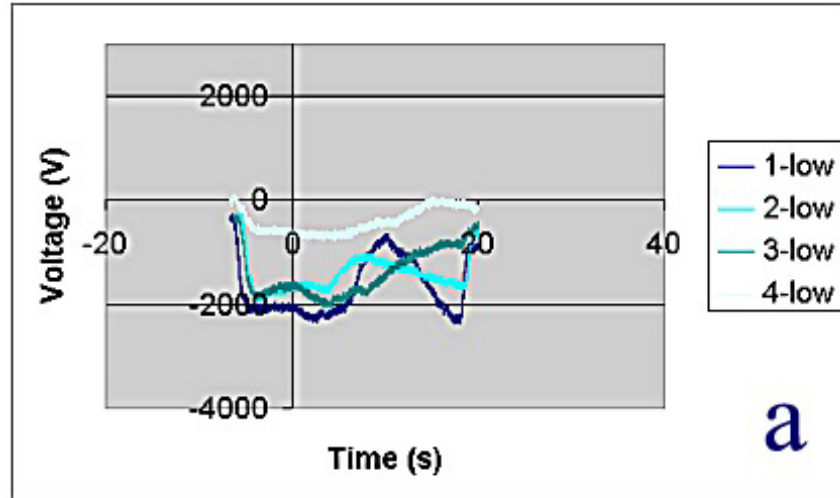
23°C and 12 %RH

Measuring paths 1 to 4.

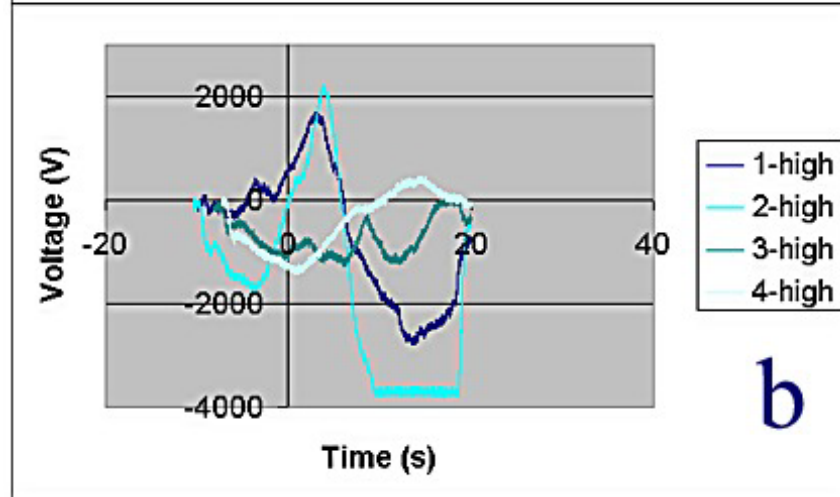
Top-down measurement.



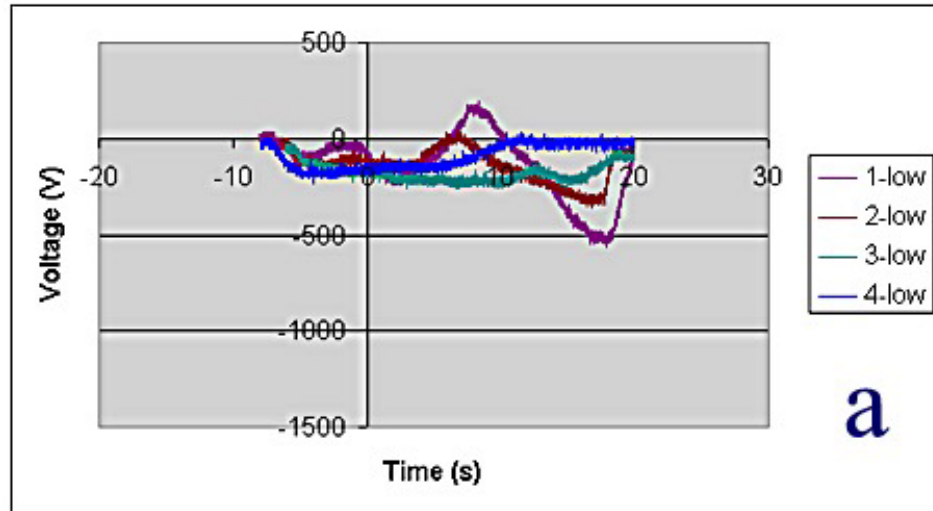
Low - no extra tribo



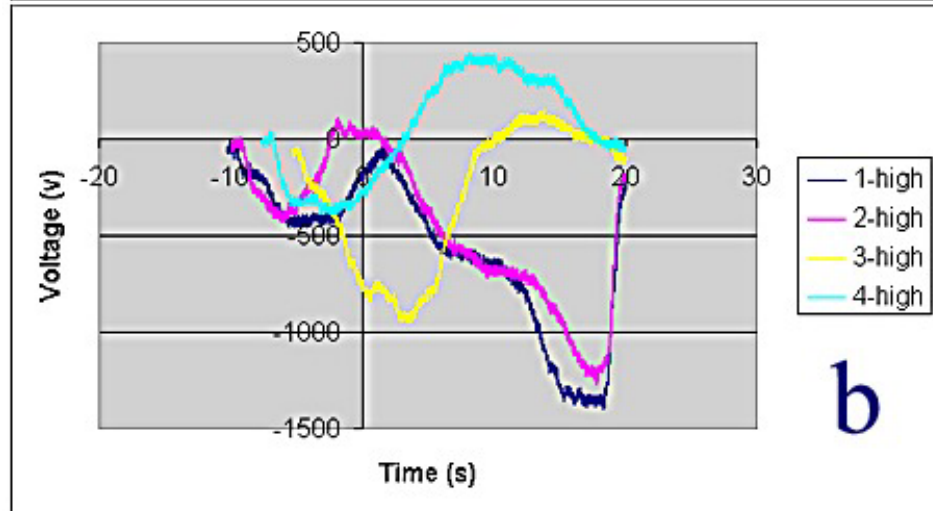
High - extra tribo



Low - no extra tribo



High - extra tribo



## Question

- What should the function of the ESD protective garment be?

## Answer

- The protective garment should effectively shield the electrical field originating from the insulating parts of the operators normal clothing; **and**
- The protective garment should prevent direct discharges from the operators normal clothing; **and**
- The protective garment should not itself cause similar problems.

**Open questions are the protection levels.**

## Garment/Fabrics

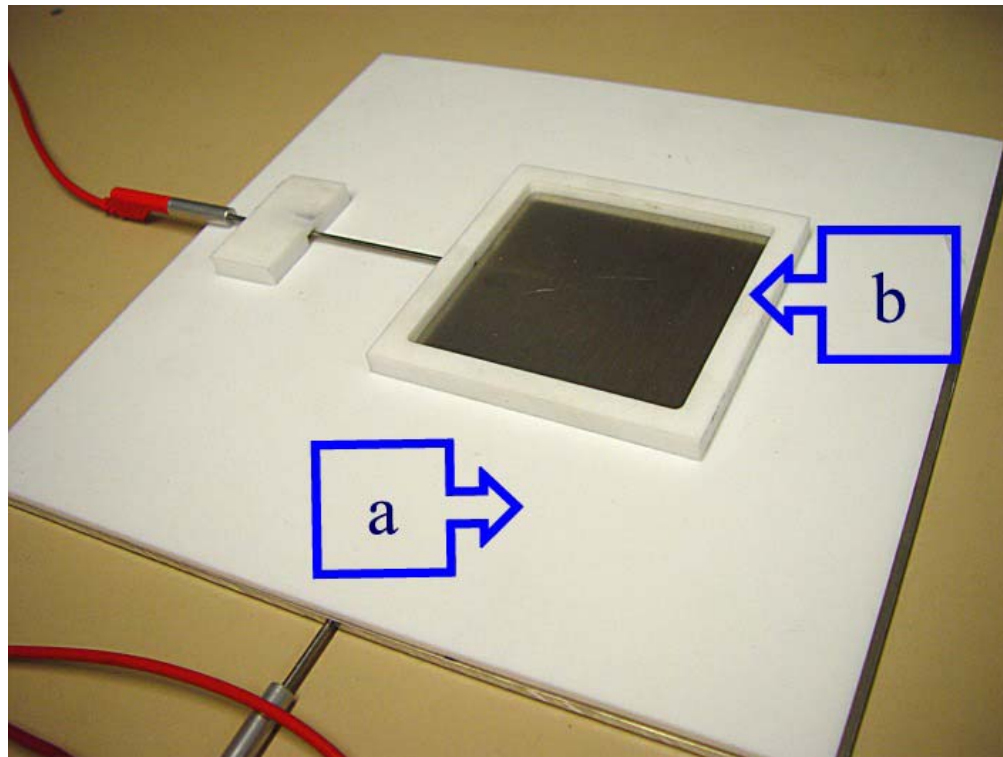
- The difference between a garment and fabrics are the seams.

## Only Fabrics

- Only fabrics are tested
- Controlled environment

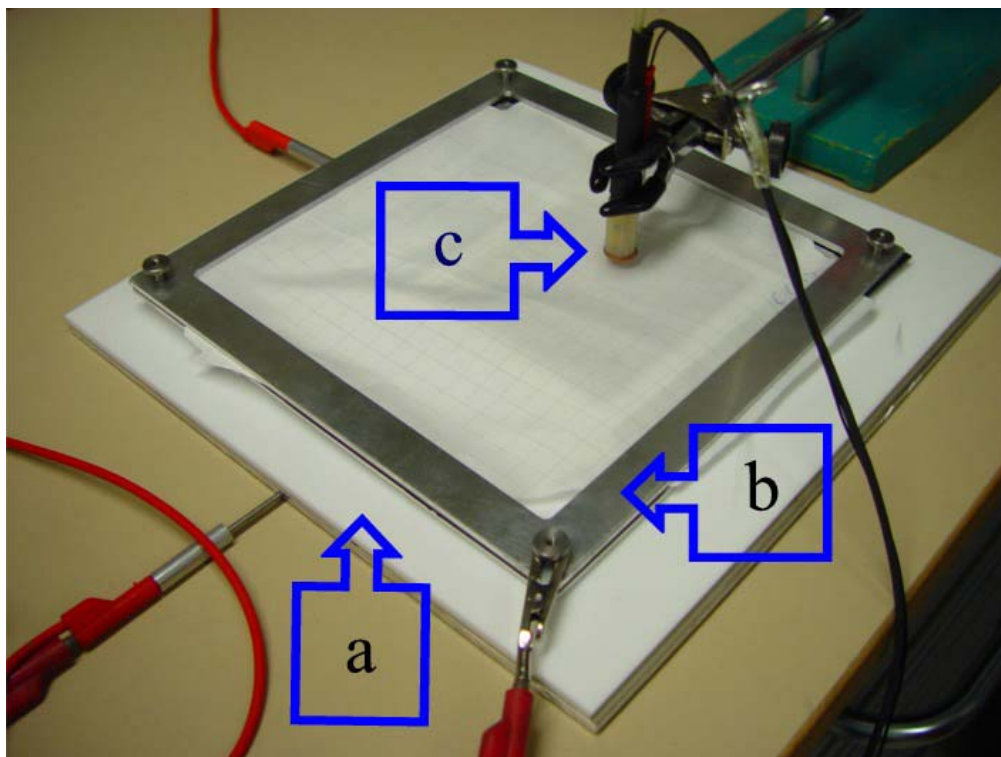
## Protective garment

- a) Ground plane + insulating plane
- b) Metal plane (1000V)

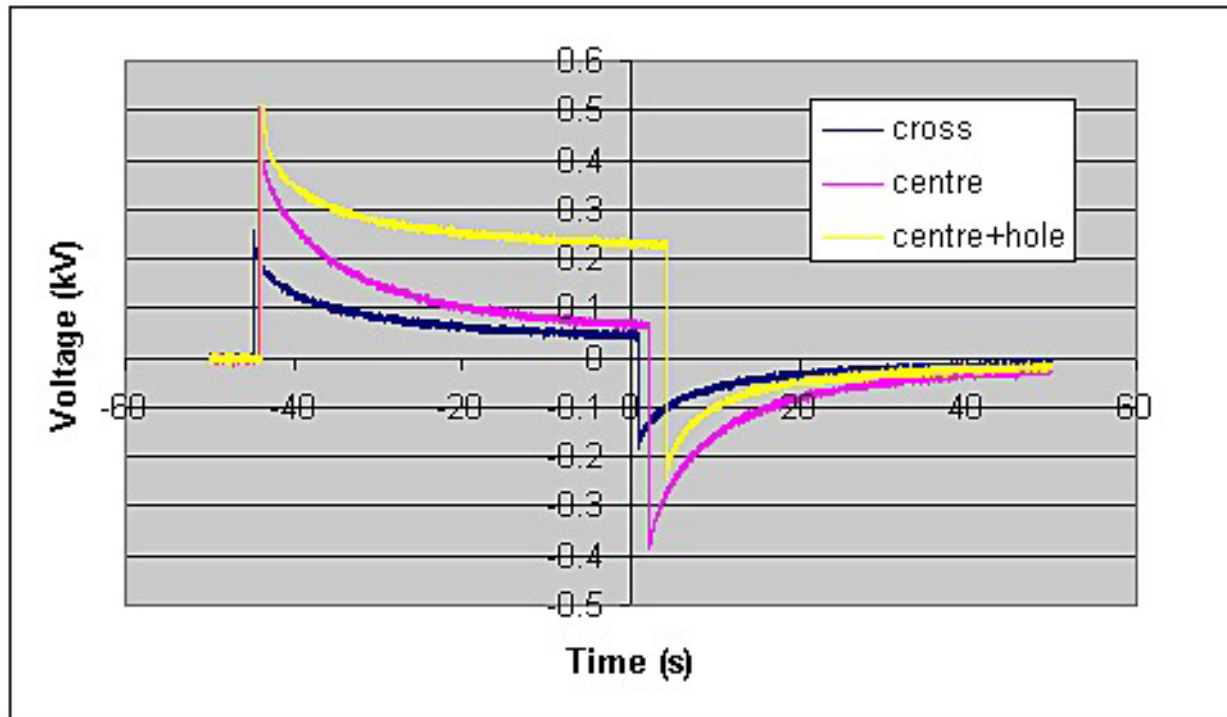


## Protective garment

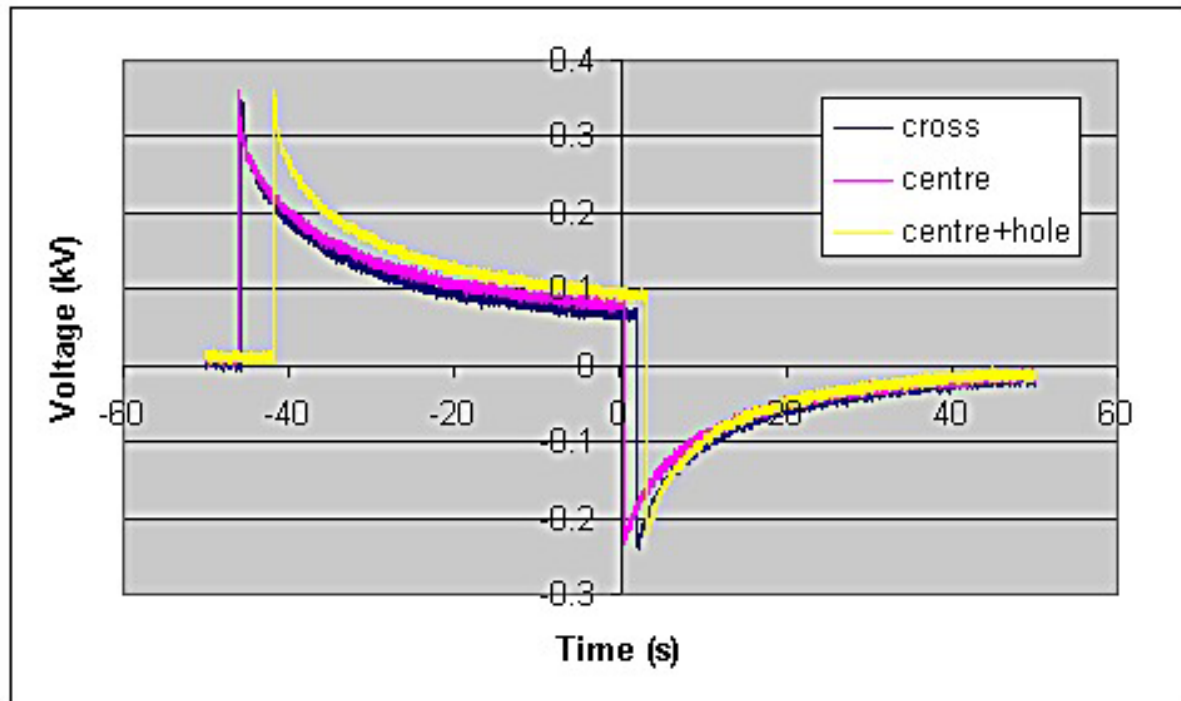
- a) Ground plane + insulating plane
- b) Conducting frame + test object
- c) Modified field probe



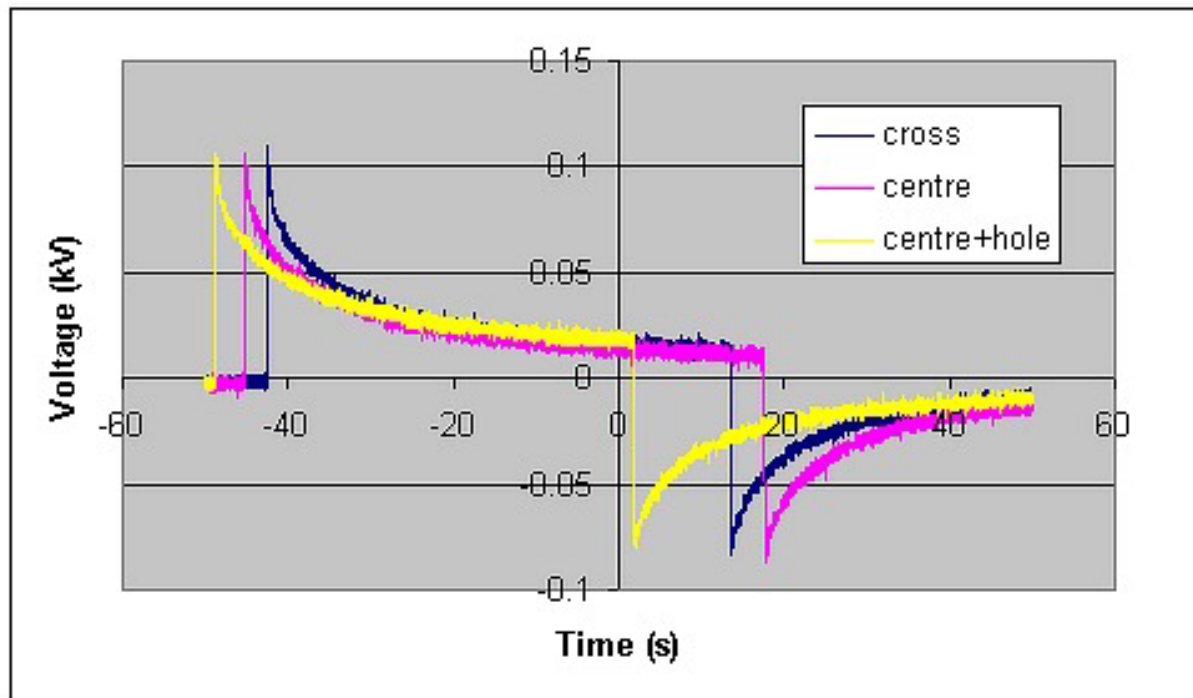
## Normal field probe



Normal field probe + 15mm coin

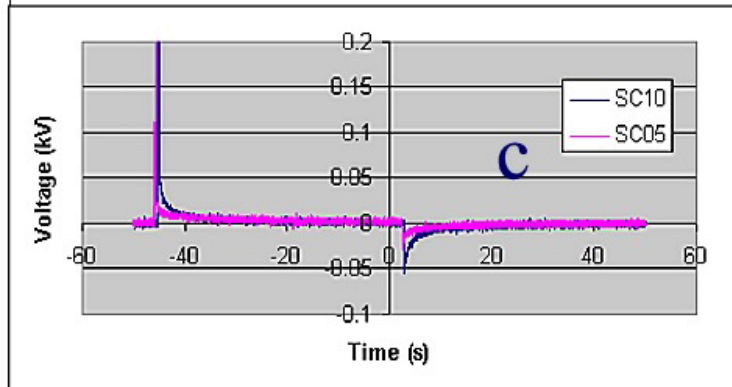
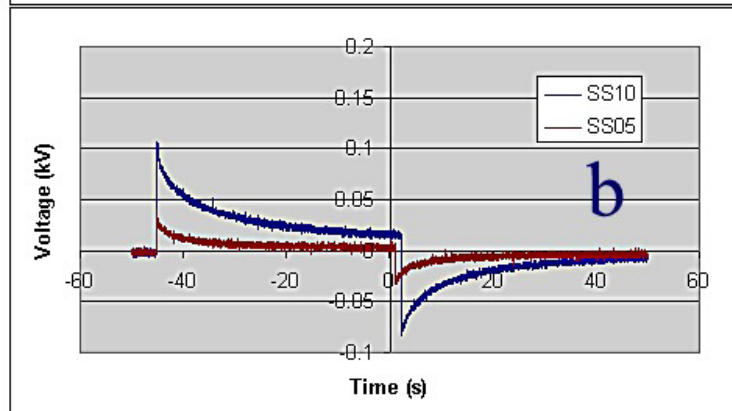
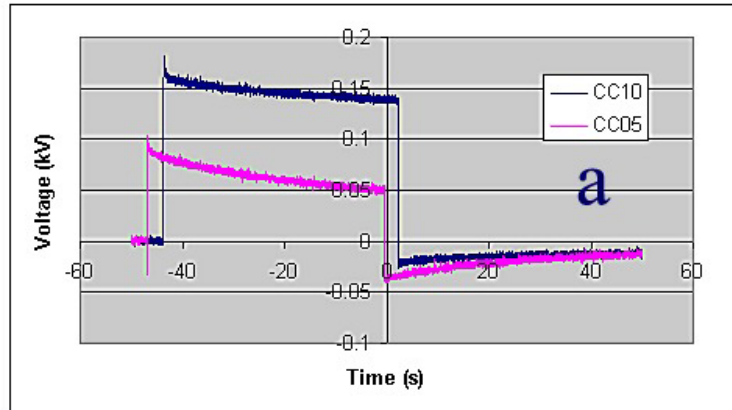


Normal field probe + 15mm coin + 2pF



# Protective garment

- a) Core conducting
- b) Stainless steel
- c) Surface conducting



## **Kan ESD-skyddskläder dämpa ett kvasistationärt elektriskt fält?**

**Ja**