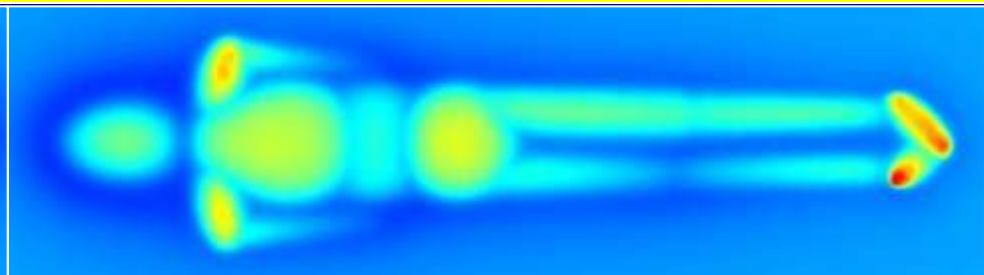
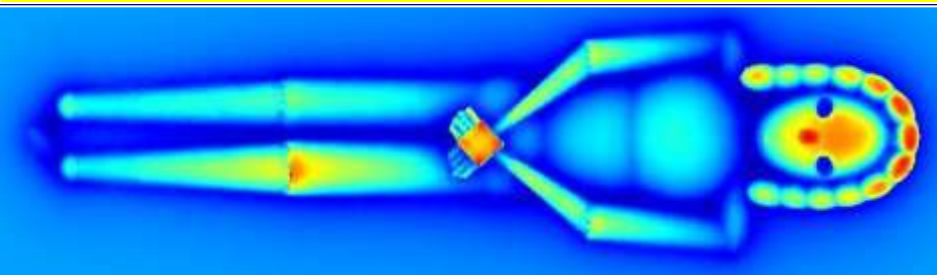




**Giulio Fanti and Luca Matordes
Of Padua University
with V.Amoruso, M. Bullo, F. Lattarulo, G.
Pesavento**



**Numerical Simulation of a Human Body
Subjected to Electrostatic Fields for Study of
the Turin Shroud Body Image**



PART I: what is the Turin Shroud?

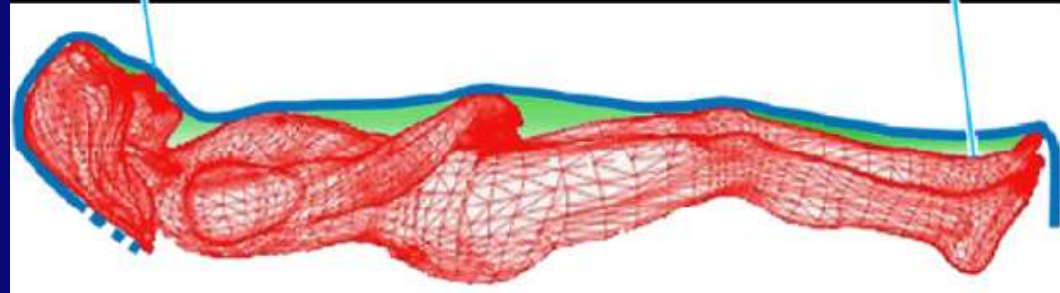
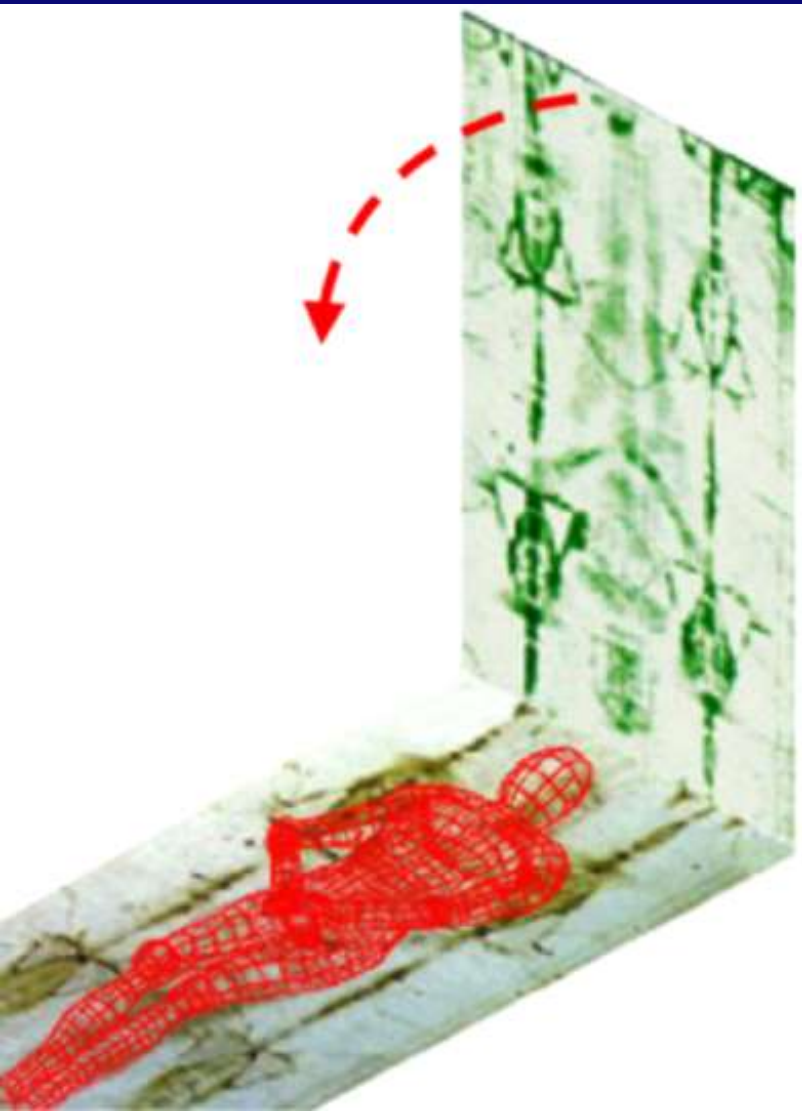


The TS (Turin Shroud) is the most important Relic of Christianity, a linen cloth 4.4 m long and 1.1 m wide, which enveloped a dead man showing evident rigor mortis. He was scourged, thorn-crowned, crucified and stabbed in the side with a spear.

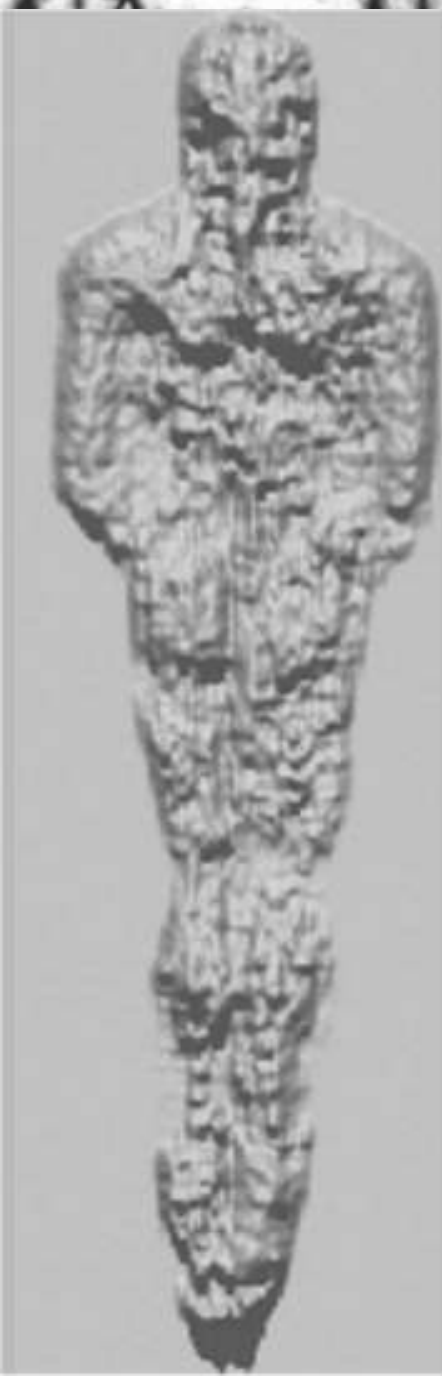
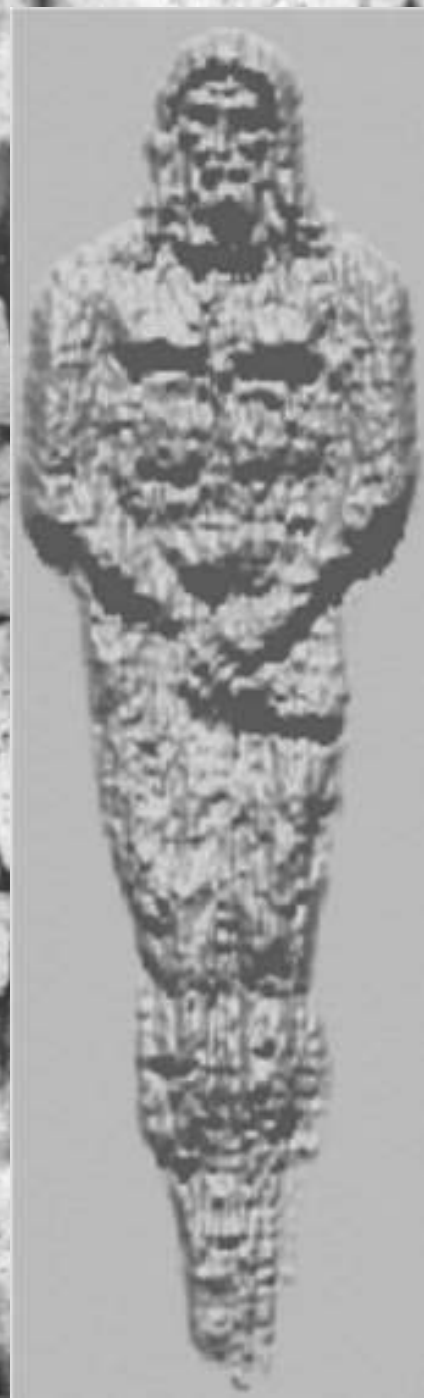
The characteristics of the TS image are unique and cannot be reproduced. The best hypothesis to explain this image is based on a Corona Discharge produced by an intense electric field.

The Shroud enfolded a man.

The rigor mortis shows a position coherent with the crucifixion (arms excluded).

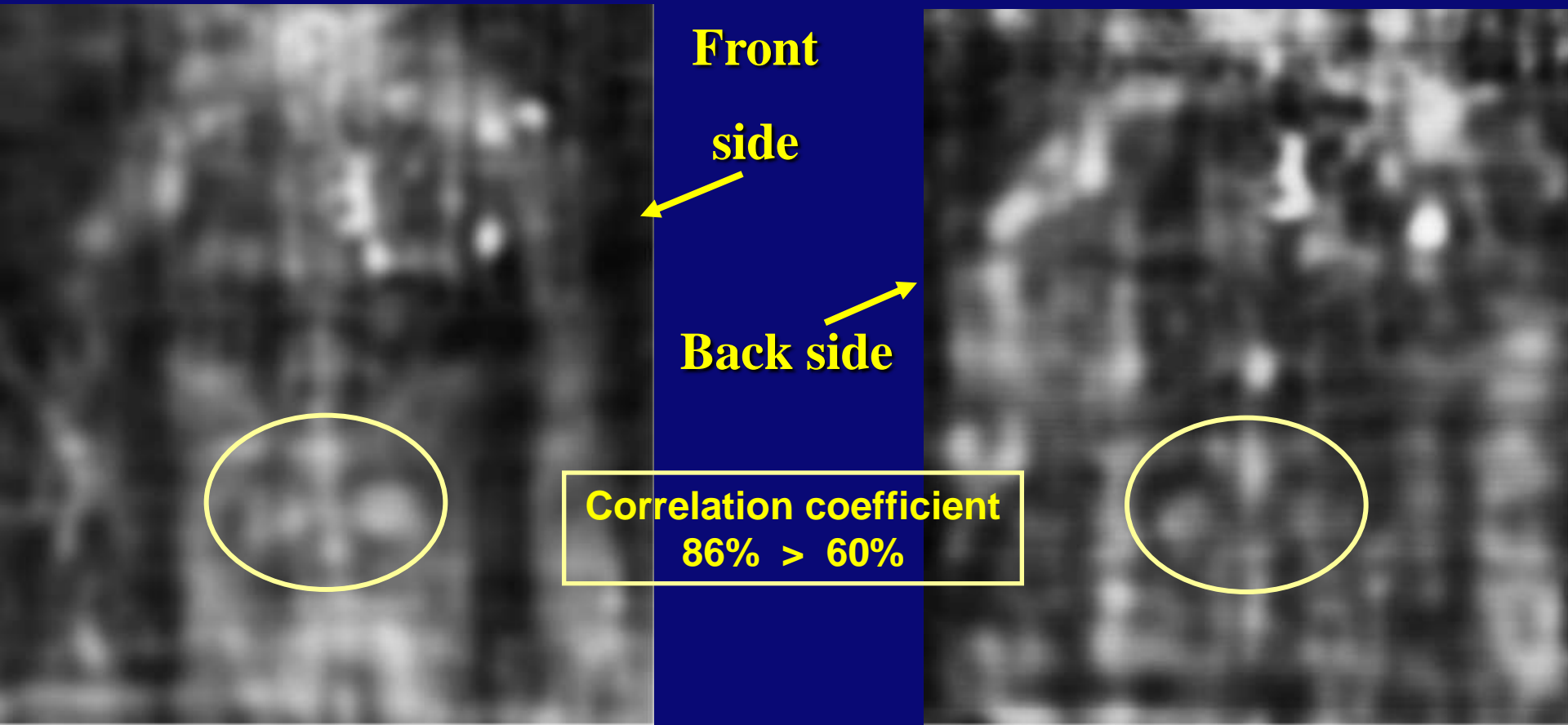


The TS is like a negative and the TS Man has 3-D features



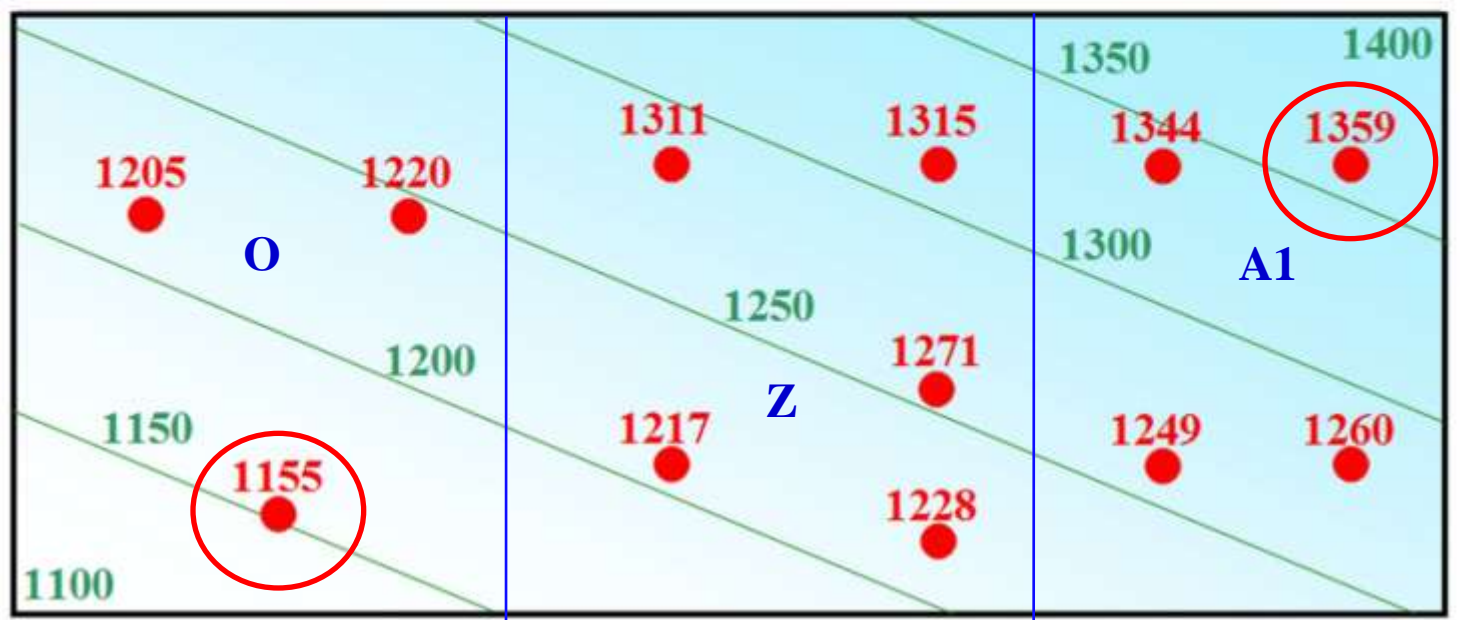
The image is superficial
and in some areas is doubly superficial ...

... like the result of a Corona discharge.



In 1988 the TS was radiocarbon dated but the analysis forgot some systematic effects.

Age: 1325 AD, uncertainty: ± 65 years:
wrong! (118 years)



What is Corona Discharge (CD) ?

CD is a partial electrical discharge brought on by the ionization of a fluid and associated to two high-voltage electrodes having opposite charges.

CD produces:

- Heating
- Luminescence (UV)
- Ozone
- Acoustic effects.



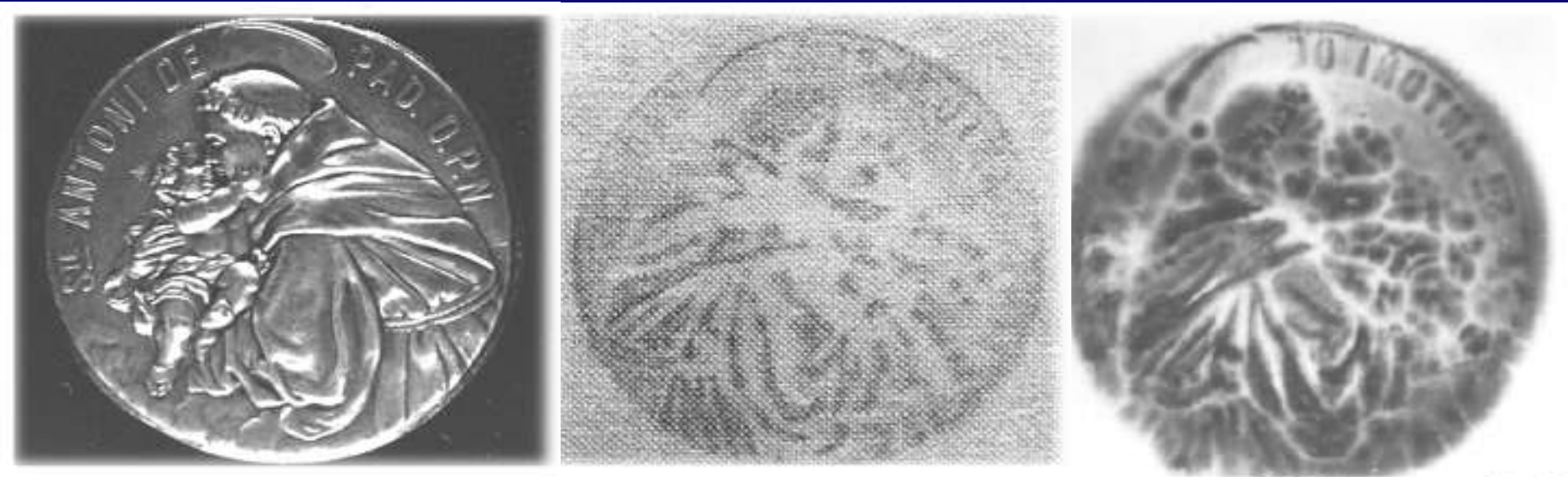
Plasma ball



CD in non-ionized air caused by a needle.



Which images does CD produce ?



S. Anthony medal (left) with corresponding CD images on linen fabric and paper (left).

Experiments at Padua University

The chemical and physical features correspond to those of the TS.



Image on
linen cloth



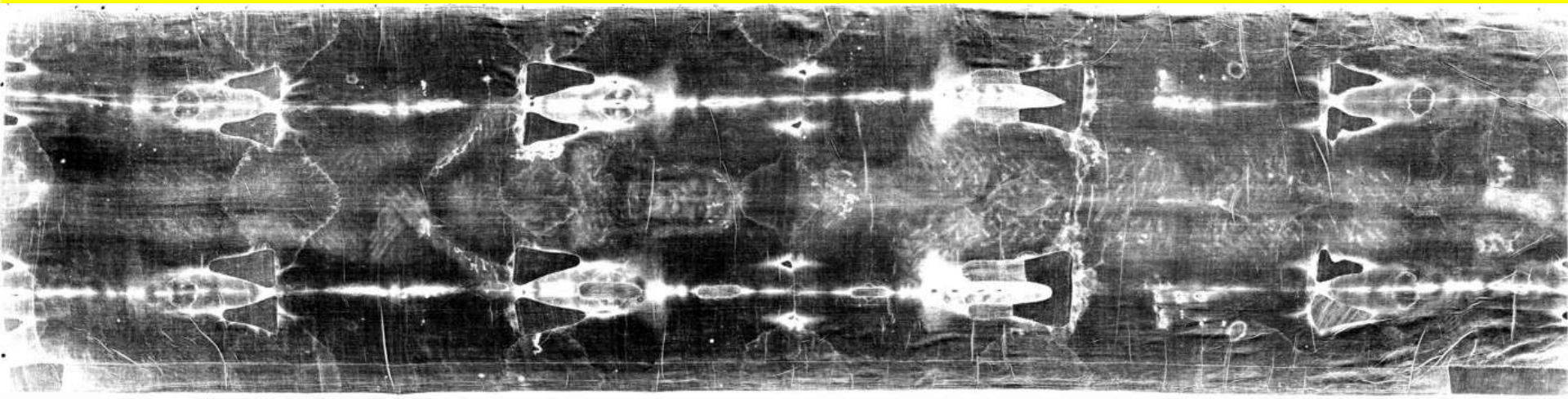
Giulio Fanti and Luca Matordes Of Padua University

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Pesavento

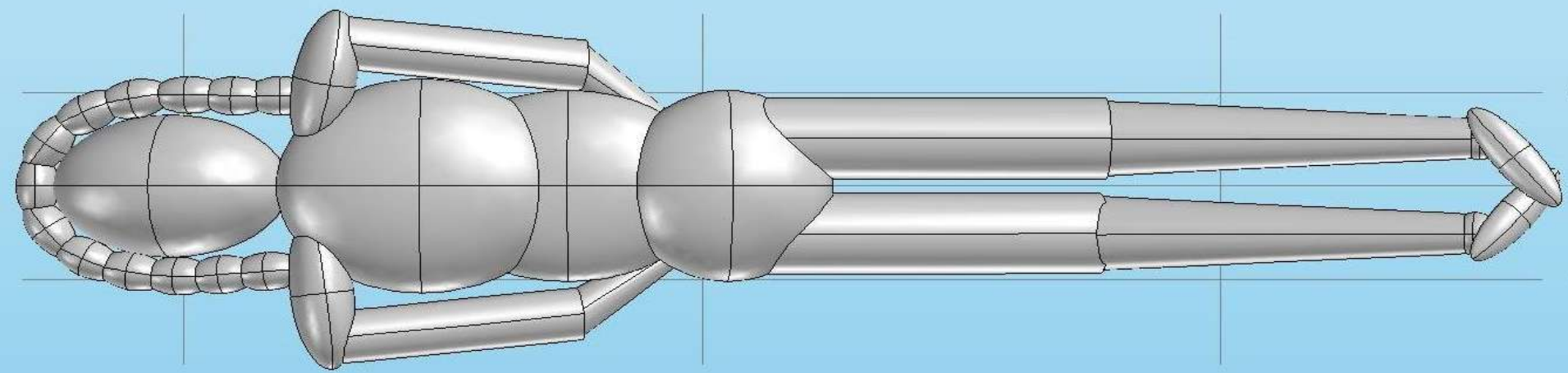
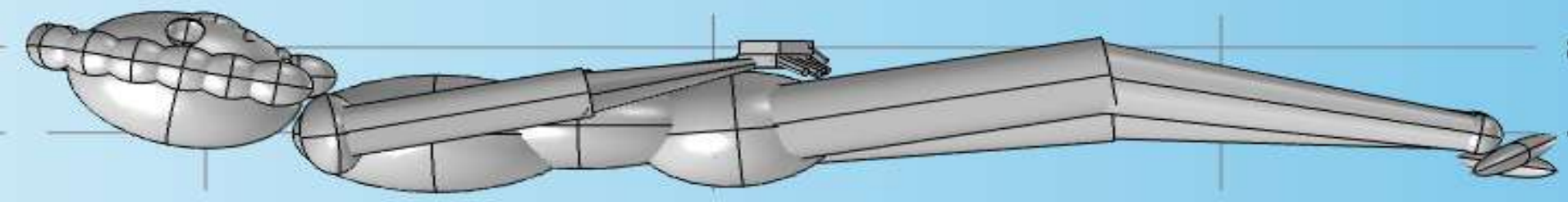
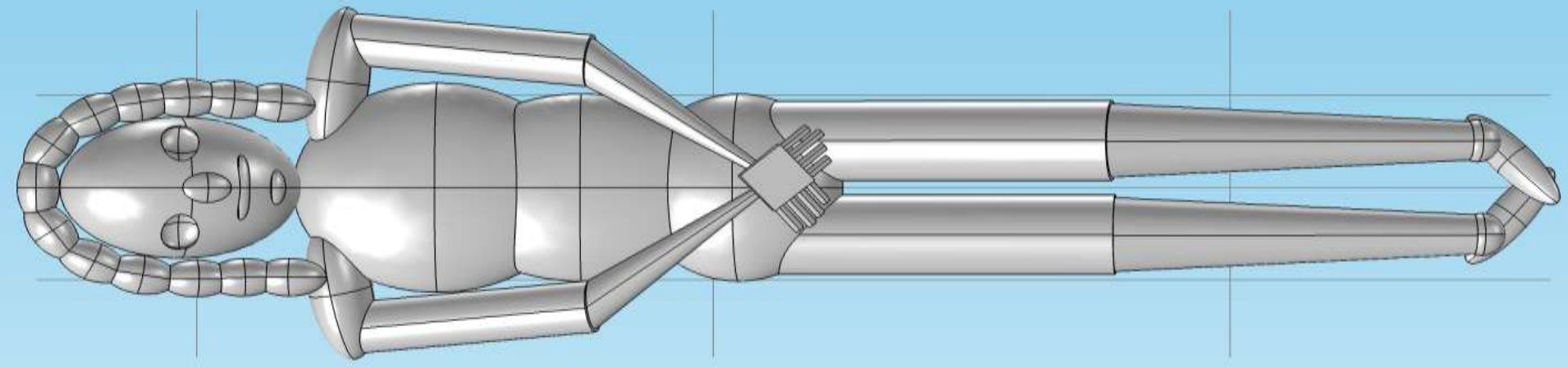


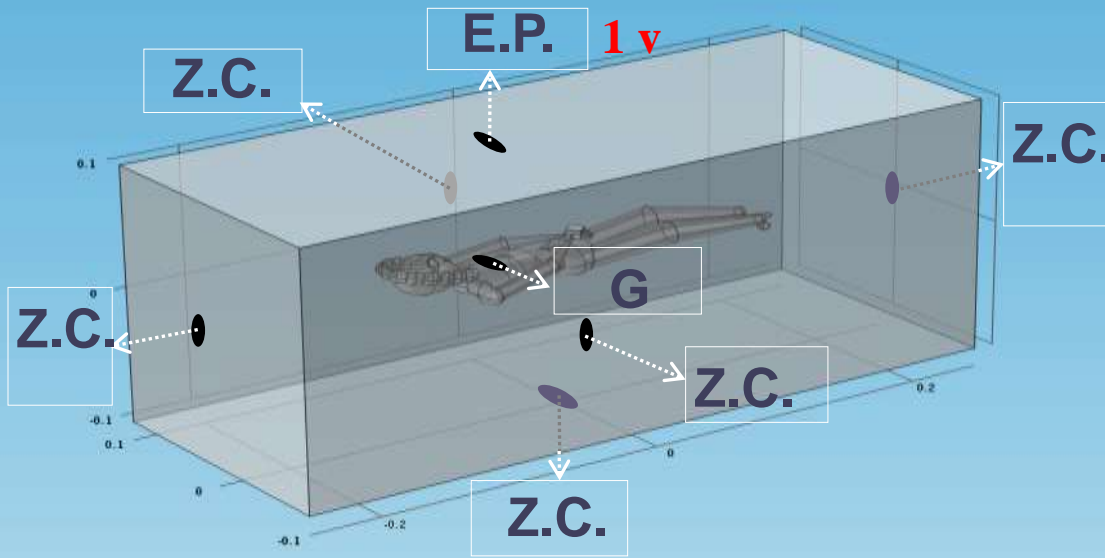
II Part: Luca Matordes.

FEM simulation to sustain the Corona Discharge hypothesis for image formation.



COMSOL MODEL WITH 46 ELEMENTS





SIMULATION "A"

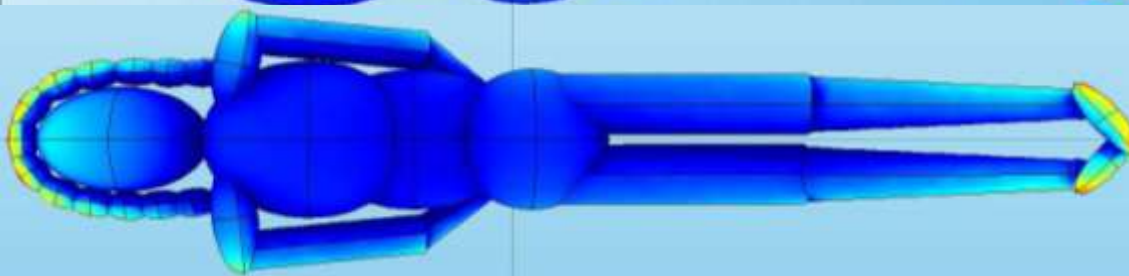
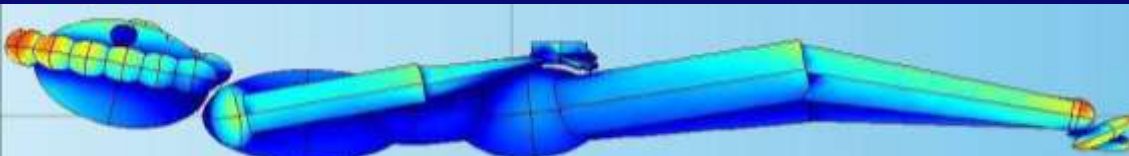
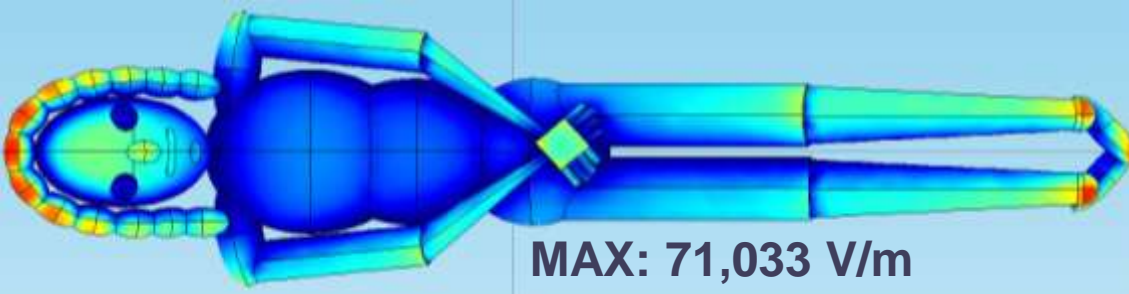
BOUNDARY CONDITION

E.P.: ELECTRIC
POTENTIAL of 1v

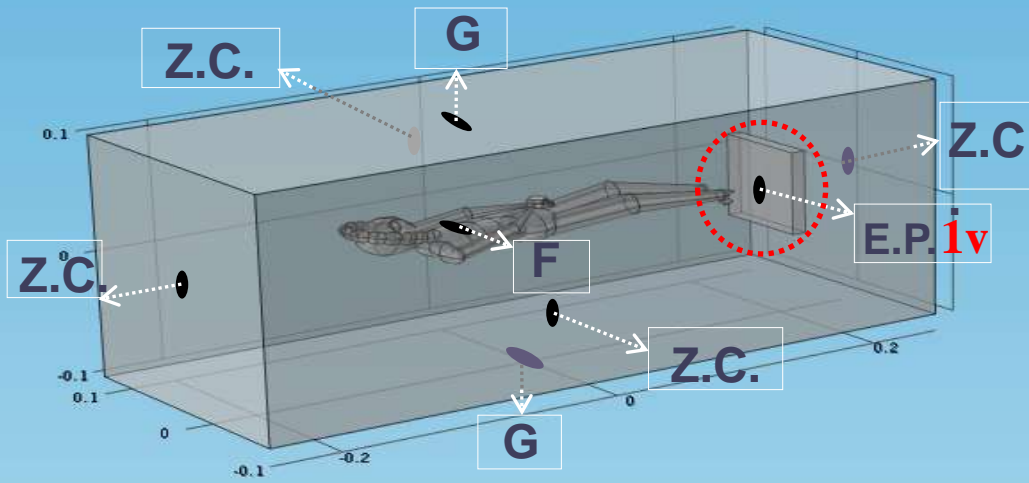
Z.C.: ZERO CHARGE

G: GROUND (manikin)

F: FLOATING



ELECTRIC FIELD DISTRIBUTION



SIMULATION "B"

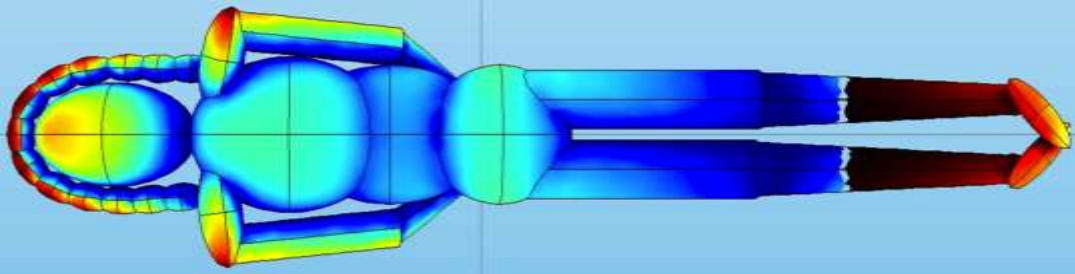
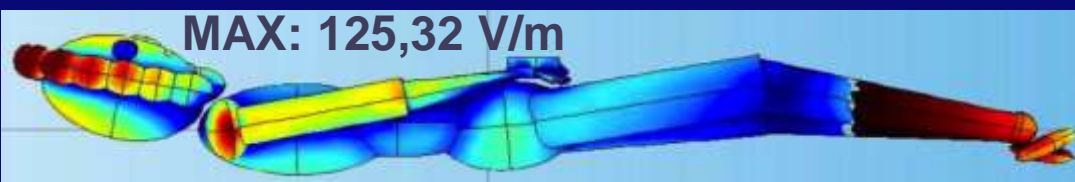
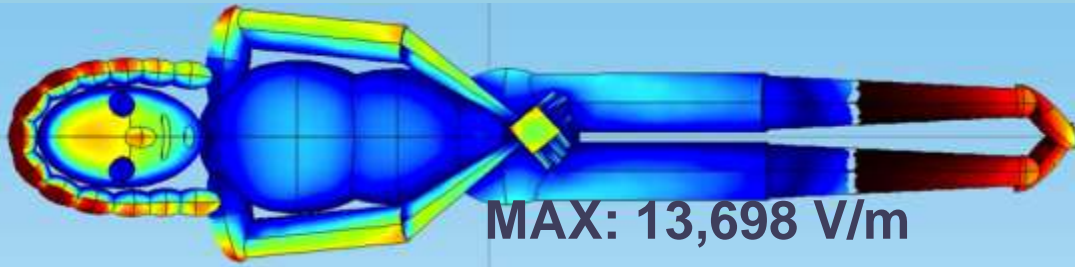
**BOUNDARY
CONDITION**

**E.P.: ELECTRIC
POTENTIAL of 1 v**

**Z.C.: ZERO
CHARGE**

G: GROUND

F: FLOATING

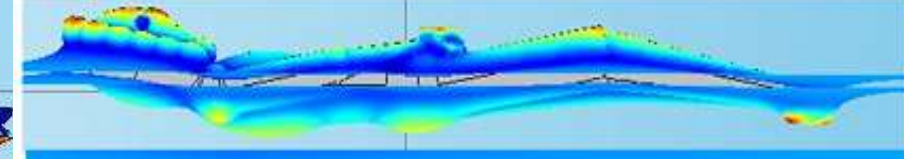
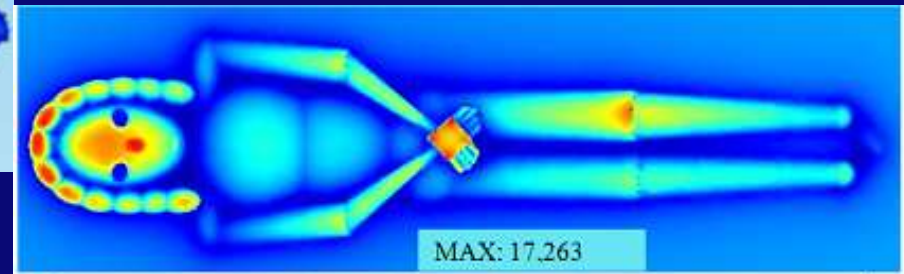
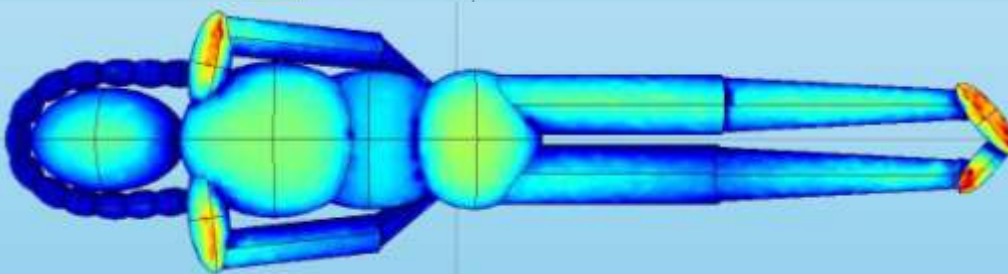
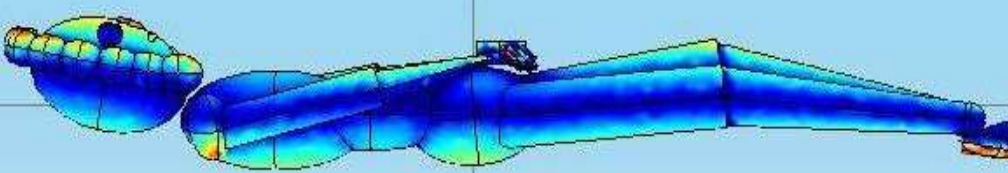
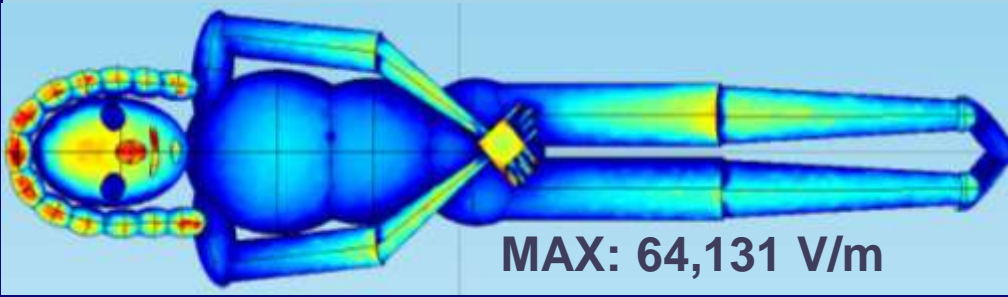
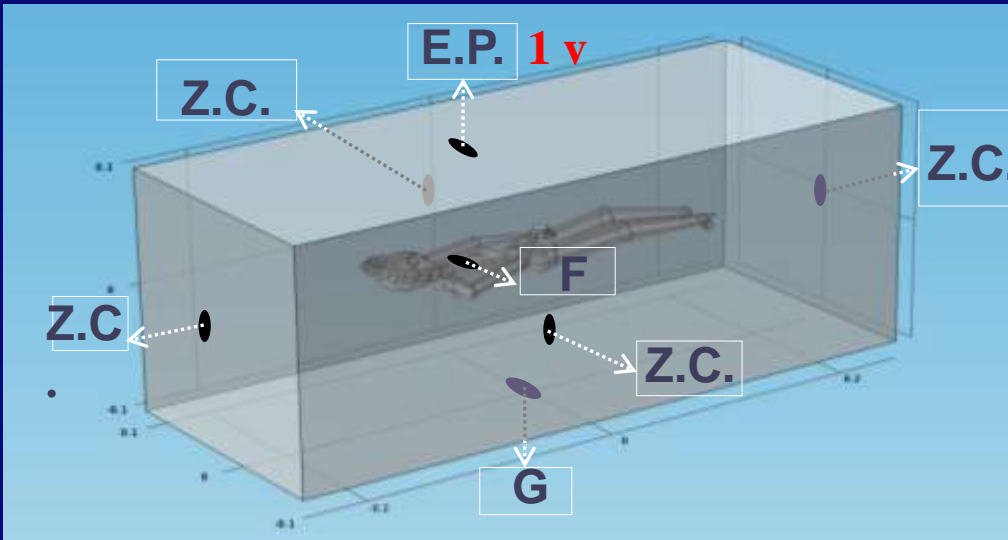


**ELECTRIC FIELD
DISTRIBUTION**

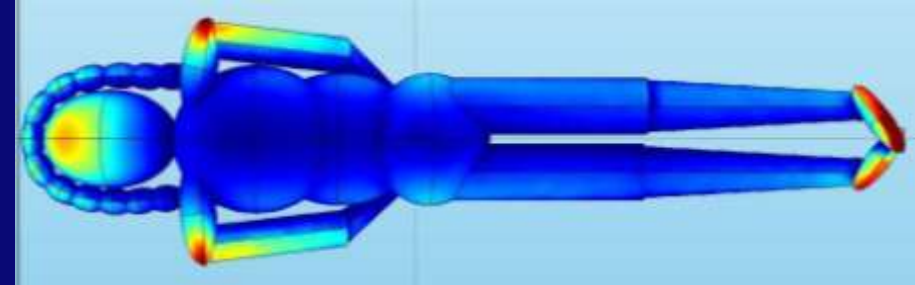
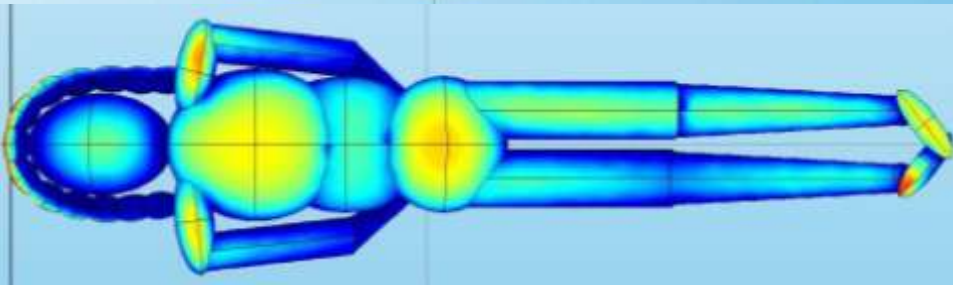
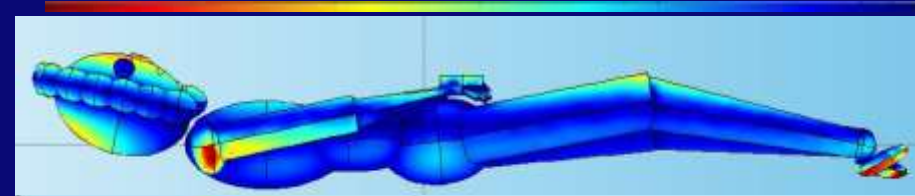
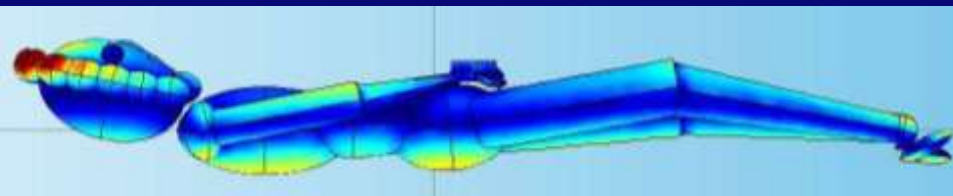
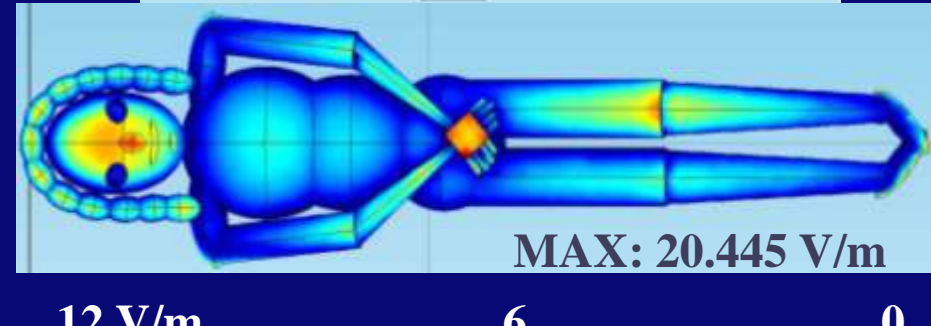
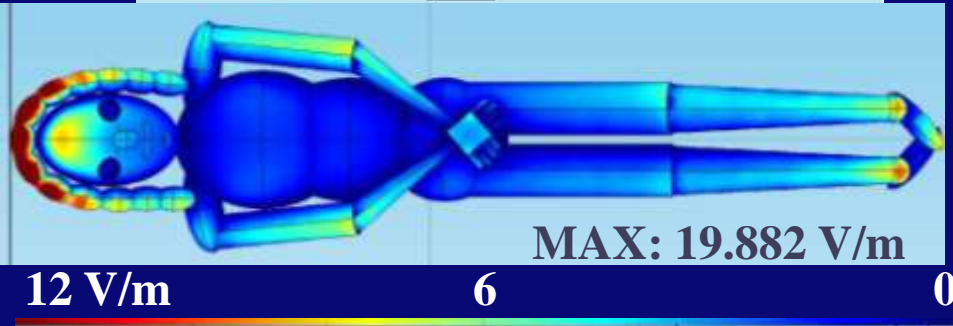
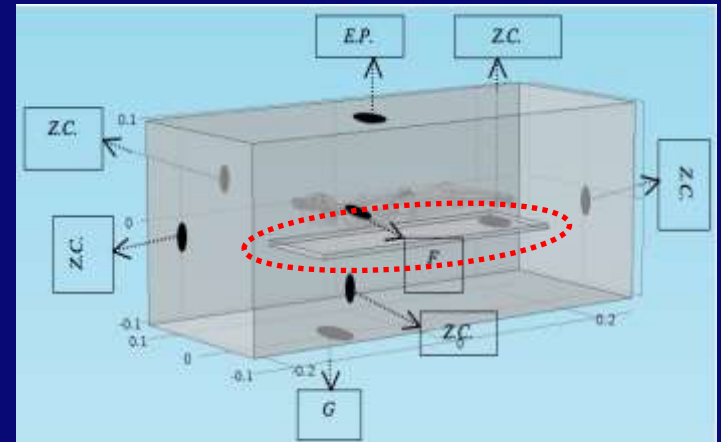
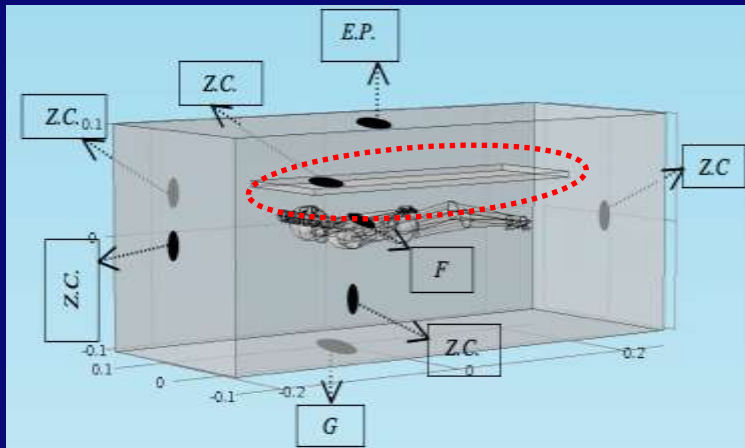
SIMULATION "C"

BOUNDARY CONDITION

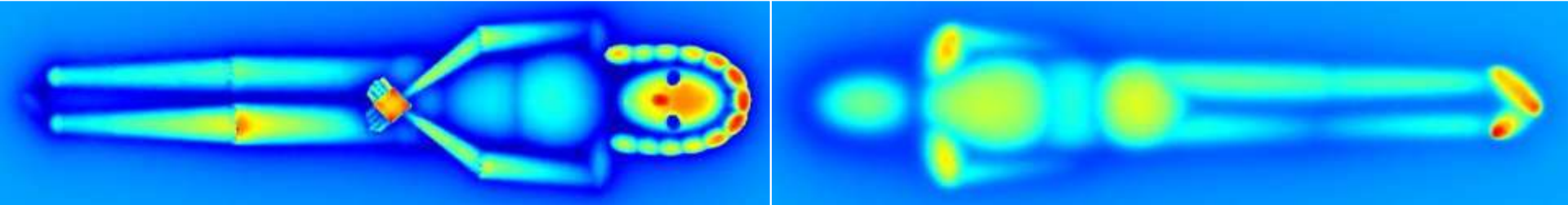
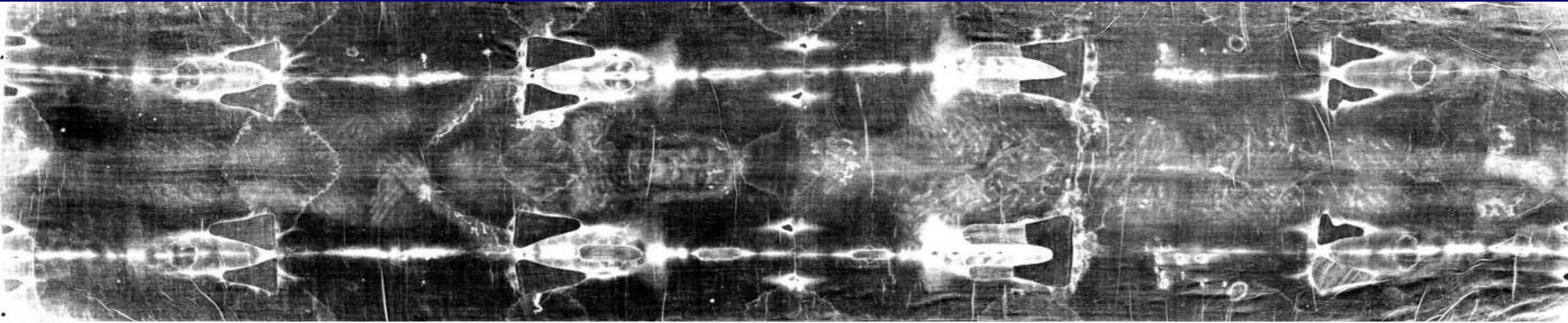
Display with "isosurface"
simulating the TS.



SIMULATION "C" with the addition of plates



CONCLUSION

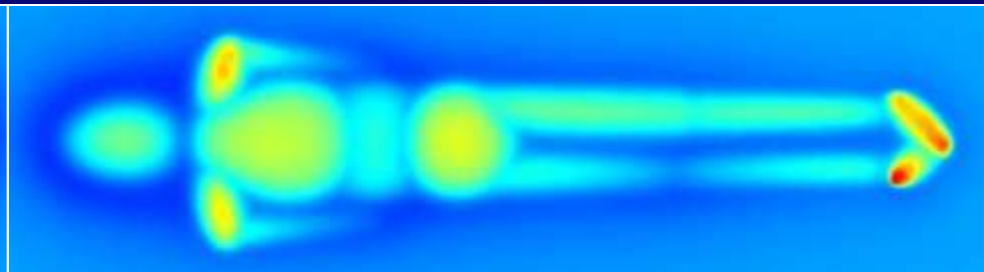
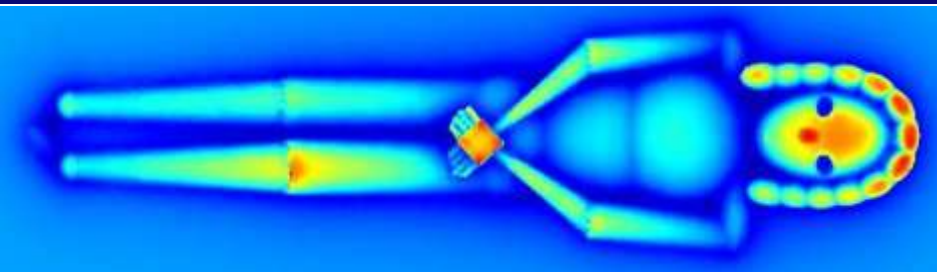
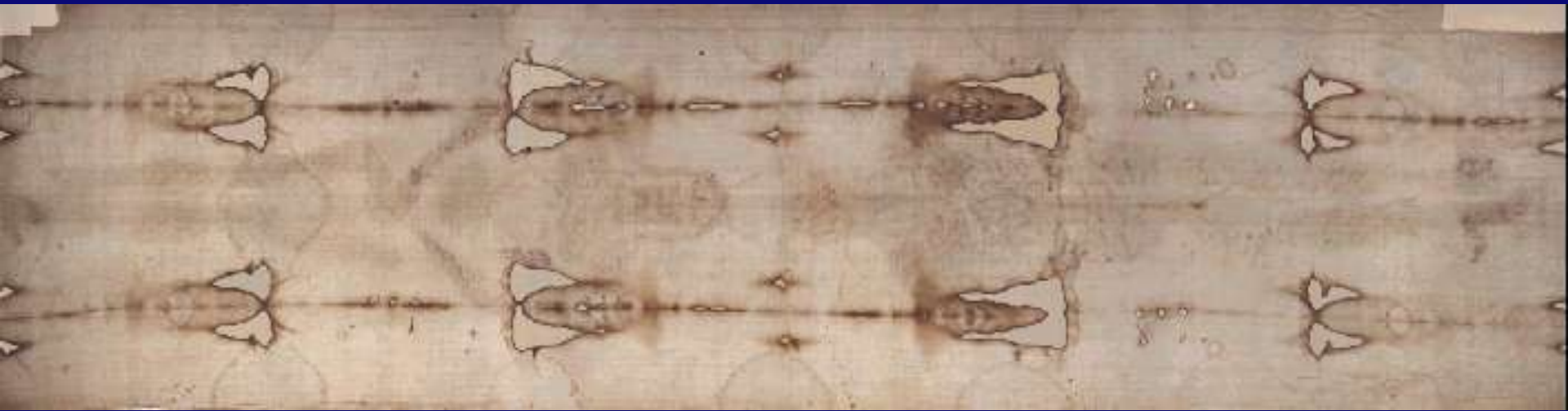


Using COMSOL sw, a 46 elements manikin was built to study the CD effects acting on the TS.

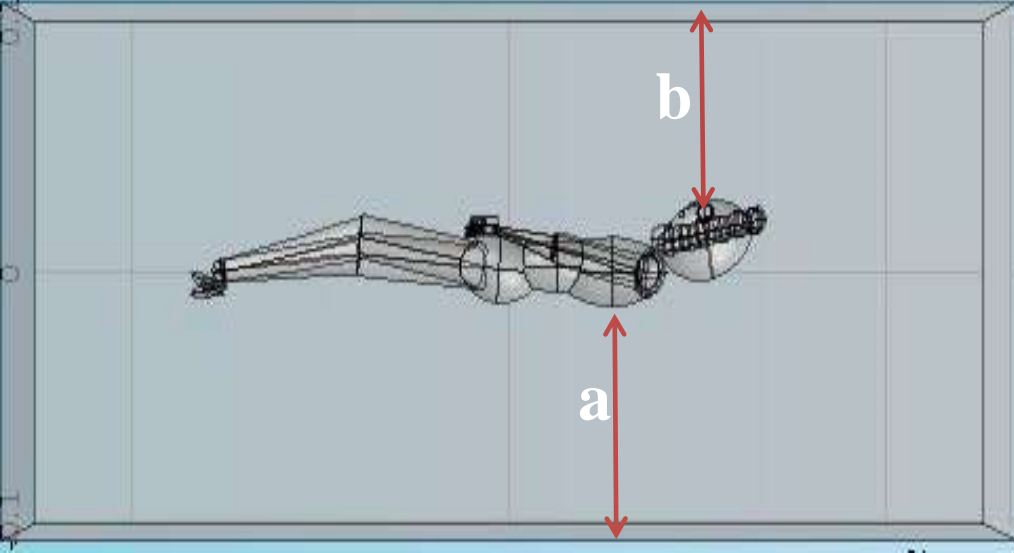
The Case “C” (floating manikin) at best represents the TS body image. The boundary conditions are: E.P.=1 v up and ground on the floor.

This results sustains the CD hypothesis for the TS body image formation and is useful for future experimental tests. But will it be possible to reproduce the TS in the future?

THANKS FOR YOUR ATTENTION !

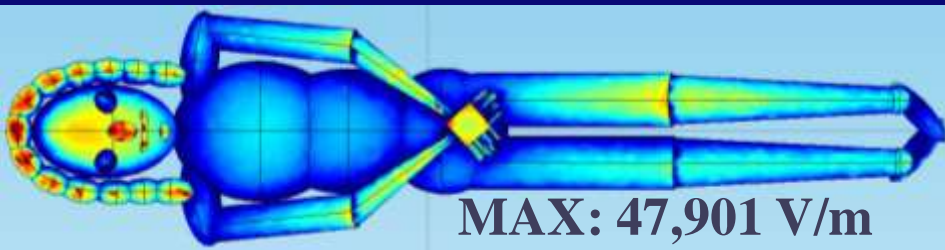


Please visit:
www.dim.unipd.it/fanti/Shroud.htm



SIMULATION "C".
THE FLOATING MANIKIN
(300 mm long in a box
500x200x200) HAS BEEN
LOWERED from $a = 100$ mm
to:

a = 40 mm

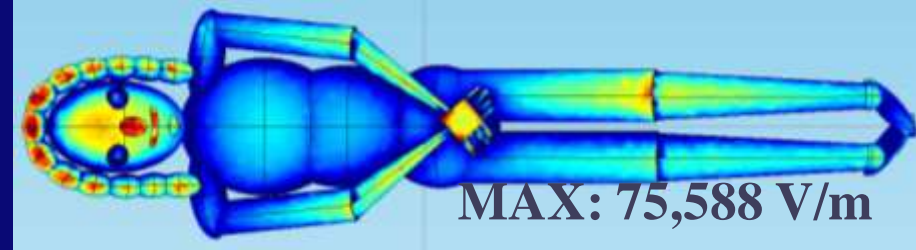


20 V/m

10

0

a = 6 mm



20 V/m

10

0

