STEPS FOR PREDICTING MAXIMUM SURFACE VOLTAGES FOR GARMENTS

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1. PREPARATION:

1.1) Instrumentation requirements:

- JCI 155v5 Charge Decay Test Unit
- JCI 176 Charge Measuring Sample Support
- Facility in which samples can be conditioned and tested at set levels of temperature and humidity

1.2) Cable connect JCI 155v5 Charge Decay Test Unit to JCI 176 charge Measuring Sample Support. Check memory card in position. Charge batteries fully charged then disconnect battery charging power supply and allow to stand (off the JCI 176) for 2 hours before start of measurements.

1.3) Set up sample of fabric, or sample area of garment, in controlled environment together with JCI 155v5 and JCI176 – for example 20-23C 40%RH. Leave for 24 hours for fabric acclimatisation. Measurements will need to be made in the same environmental conditions and directly after acclimatisation.

1.4) Prepare to record features of observations. Start by recording serial numbers of JCI 155v5 and JCI 176 with the date and starting time. Record identification details of first sample to be tested.

1.5) Mount the JCI 155v5 on the JCI 176. Connect cable between either socket on JCI 176 to 'charge measurement' socket in back of JCI 155v5.

1.6) Switch on JCI 155v5. Check led in back of JCI 176 lights up (if not check 8w DIN lead fully inserted). On JCI 155v5 move to corona settings menu. Check corona is 'on' and the duration is set to 20ms. Set an initial corona voltage of 5.0kV. Confirm settings. Set polarity to +ve.

2. TESTING:

2.1) Mount first sample area between mounting plates of JCI 176. Check sample is single layer of material, is taut and is without seams or wrinkles.

2.2) Switch on JCI 155v5. Press 'Run' key to make a test. Store data

> *Note: Observe fall of surface voltage on display from initial peak value to 36.8% (1/e). Allow surface voltage to fall below 10% if this will happen in a reasonable time. Terminate run..*

2.3) Make 3 test runs for each of the following sets of test conditions with each test preferably on a fresh area of fabric. Store data at end of each run before moving sample. Make a written record of sample identity, test conditions and features of test results. If negative polarity measurements at 2.7kV give more than 100V initial peak voltage then make an additional 3 test runs with –2.5kV corona.

2.4) Make sure surface voltage is low before starting a test – preferably below 5% of initial peak voltage expected or observed for the current test conditions.

Step	Polarity	Corona voltage
1	+ve	5.0kV
2	+ve	4.0kV
3	+ve	3.5kV
4	+ve	3.0kV
5	+ve	2.7kV
6	-ve	5.0kV
7	-ve	4.0kV
8	-ve	3.5kV
9	-ve	3.0kV
10	-ve	2.7kV

2.5) On one area make 2 successive measurements with a low corona exposure (say 3kV), then 2 with a high corona exposure (say 9kV) followed by 2 again at low exposure (say 3kV). The values after the high exposure should be similar to the initial values. Report results.

2.6) Repeat above procedure (2.1 to 2.4) for any further samples that have been acclimatised.

2.7) Remove memory card from JCI 155v5 and pass out of controlled environment with minimum disturbance to conditions in case additional testing will be needed.

3. ANALYSIS:

3.1) Set up JCI-Graph in PC with port for reading PCMCIA cards (e.g. a Notebook computer). Put memory card into card slot. Start JCI-Graph. Extract files from memory card to a set Destination folder. (JCI-Graph may now be left open or may be closed).

3.2) Use Windows Explorer to inspect the set Destination folder. Find and click on the folder of the instrument serial number. Find and click on the date at which the tests were made. Find the last item in the list of files and check this is a 'summary.csv' file. Double click this to open it via Excel. This provides a table of all the results taken.

> *Note: Layout appearance and clarity may be improved by adjusting column widths and making cells in the Vpk, Q, CL, T and RH columns to 1 decimal place, and the decay times to 1/e and to the % to 3 decimal places.*

3.3) Check that the positive and negative corona voltage results are grouped together (if not then arrange them to be so). Make a graph of CL vs Q for all the positive charge readings, and then on the same graph plot all the negative charge readings.

3.4) If the positive and the negative points seem to be clustered reasonably closely along straight lines then add separate trendlines for positive and negative sets of points. Print out graph.

> *Note: If the results are not on a reasonable straight line then return memory card to JCI 155v5 and make such further tests as appropriate.*

3.5) Extrapolate the trendlines to the zero charge axis. Record the values of CL+ve and CL-ve at zero charge and record these values.

4. PREDICTION:

4.1) Note the lower of the capacitance loading values CL+ and CL- values at q = 0. Calculate values for V_{max} for q = 10nC and for q = 50nC using the formula, with the factor f = 75:

$$V_{max} = q\ f / (CL_{q=0})$$

4.2) Record values along with fabric/garment identification.