

STEPS IN PREPARING YOUR UNIT UNDER TEST FOR ESD TESTING

By Rick Candelas
Extron Electronics
April 23, 2013

AGENDA

This presentation will focus on how to be better prepared ourselves for ESD testing.

- Understand the standard.
- Organizing a test plan.
- What will the pass/fail criteria be?
- Where will the testing be performed?
- What do you do after the test?

STANDARD

- Read and understand the standards yourself.
- Watching how a test lab performs the test and documents the data is a good way of learning how to do your own tests.

STANDARD – Test Levels

IEC 61000-4-2 Test Levels

Level	Contact Discharge Test Voltage (kV)	Air Discharge Test Voltage (kV)
1	2	2
2	4	4
3	6	8
4	8	15
x	Special	Special

Note 1: Test can be performed to extended levels (1.5 times the standard level).

Note 2: Refer to product specific standard to determine what level to use. Test level depends on end use & installation environment.

STANDARD – Test Levels

Refer to each product specific standard for details & actual test levels .

EN 55024 ITE (Contact: 4kV, Air: 8kV)

- Testing at lower levels not required for contact discharges.

EN 55103-2 Pro Audio/Video (Contact: 4kV, Air: 8kV except for E4 Contact: 2kV, Air: 4kV)

- E1: Residential (home use)
- E2: Commercial & light industrial (theaters)
- E3: Urban outdoors (stages)
- E4: Controlled EMC Environment (recording studio)
- E5: Heavy Industrial (close to broadcast transmitters)

EN 60601-1-2 Medical(Contact: 6kV, Air: 8kV)

- Test performed with the power at any one of its nominal input voltages and frequencies.

STANDARD – Test

- Configure the EUT as close as possible to its typical use.
- Environmental conditions.
 - Temp: 15-35° C, Humidity: 30-60%, Pressure: 86-106kPa.
- **Number of discharges** – 10 in each polarity at each point , 1 discharge/sec.
- Test generator must be perpendicular to the surface of the EUT;
 - air discharge, the tip must approach the EUT as fast as possible & touch the EUT;
 - contact, the tip must touch the EUT before the discharge switch is operated

STANDARD – Test

- Verify waveform.
- 470k Ω bleeder cable – Used to isolate the HCP & VCP from the ground ref plane. Verify before test.
- Table top vs. floor standing - Floor standing is placed on the ref ground plane with insulating support & HCP is not tested.

TEST PLAN

- Used to make sure all the cables, connectors, software, support equipment, etc. are ready prior to testing so that expensive lab time isn't wasted.
- It is best to create a test plan in the early stages of the product.
- Usually a test lab can assist with the test plan.

TEST PLAN – Items to Include

- Product details
 - name, model, serial number and brief description.
- Test setup
 - Block diagram
 - Explain in further detail special arrangements
 - List all support equipment (CE approved)
 - Cabling (shielded or non-shielded).

TEST PLAN – Items to Include

- Standard that will be tested to.
 - Include date.
- Test levels
 - Standard or extended
- Pass / fail criteria

PERFORMANCE CRITERIA

- Monitor your EUT against a defined performance.
- Criteria requires that a product operate as intended after the test.
- No degradation or loss of function is allowed below a performance level specified by the manufacturer.

TESTING

- Limit cost with pre-compliance testing.
- We can discover if there are any issues before a mass-produced item goes for full compliance testing.

TESTING – Development

- Typically performed in-house.
- Low-cost checks
- Might be cost effective to purchase or rent a used ESD generator.
- Evaluate potential test points and problems.
 - Ex. LCD screens are notorious for having ESD issues. Possible fix could be conductive film

TESTING – Pre-Compliance

- Product has finally come together in its intended enclosure.
 - Check for over spray or Excess paint
 - Grounding
- In-House or at a test lab

TESTING – Pre-Compliance

- At this stage the EUT can still be modified quickly and re-tested.
- Design engineers should be present with the necessary equipment & components to do re-work in a hurry.

TESTING – Full Compliance

- Performed at an accredited test lab.
- Testing that meets the requirements of test accreditation bodies.
- More expensive per day and allows little to no disruption in the test.
- Take schematics / layout
- Troubleshooting Kit with resistors, capacitors, TVS, etc.
- Take more than 1 sample just in case first one get damaged

TESTING – Sustaining

- If 1 sample tested passed, does it mean that every sample shipped will pass?
 - Absolutely not. Unless there are proper procedures in place.
- Procedure should include the following:
 - Control all changes.
 - Sample test
 - Pre-compliance setup in-house.

TESTING – Completed

- Documentation
- Test notes
- Setup pictures
- Data Sheets
- Report (Accredited)
- Test Sample. Keep it.

THIRD PARTY LABS

- Know how you are getting billed.
- Test plan comes in very handy to ensure the test lab & the manufacturer are on the same page.

AUDIT THE LAB

- Correct test equipment, procedures, standards, certificate & scope of accreditation.
- Skilled engineer/technician or ESD troubleshooting expert.
- Check bleeder resistors
- Waveform verification
- Setups

AUDIT THE LAB

- HCP size (1.6m x 0.8m)
- Check environmental conditions
- Watch them perform test
- ESD generator calibrated?
- How do they handle their equipment?

SUMMARY

- Understanding the standard is critical.
- The Test plan is your best friend.
- Know where & how the test will be performed.
- Get the proper documentation and save your golden sample for future reference.

- Goal is not necessarily to get passing results but to get valid and repeatable results.

REFERENCES

- IEC 61000-4-2:2008 (identical to EN 61000-4-2:2009)
- European Harmonized Standards - http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/index_en.htm
- IHS - <http://global.ihs.com/>
- BSI - <http://shop.bsigroup.com/>

QUESTIONS?

rcandelas@extron.com