International Telecommunication Union

Countermeasures against overvoltage in Japan and Proposals to SG5

T. Sato

CIAJ

ITU-T Workshop "Resistibility Requirements and Testing"
22 May 2006, Osaka, Japan

Outline

- Resistibility and Immunity
- History of countermeasures against lightning
- Countermeasures in Japan
  - Difference of infrastructure
  - Measures applied by manufacturers
  - Measured resistibility of terminal equipment
- Requests and proposal to ITU-T SG5

Forward

- This presentation is feelings, complaints, opinions and so on gathered from member (manufacturers) of working group on resistibility requirement.
- The opinions are not agreed or selected one. Great differences are there among the member.
- Even so, we hope this presentation can be reflected on establishment of Recommendations.

Resistibility and Immunity

- Safety requirements
  - Insulation against malfunction in power system (leakage of high voltage power transmission)
  - Insulation against lightning surge

  Manufactures make their own requirement based on experiences and refers IEC 60950
- Reliability of equipment
  - Immunity (ESD, radiated, conducted, EFT, Surge etc.)
  - Resistibility (lightning surge, power induction, power contact)

  Manufacturers mainly make measures against lightning

History of measures against lightning

- Lighting surge protection has been developed as follows

1. Plane telephone
   - small number of troubles
   - damage of terminal by power contact was rare
2. FAX/Key telephone
   - Arresters began to be introduced into the telephone set
3. ISDN
   - Great number of terminals are damaged – News on TV
   - CIAJ has studied however agreement has not been obtained
4. ADSL
   - Less problems have occurred comparing to ISDN because preparation has been well done.

Analysis and prediction

- Problems occurred as new system is developed.
- ADSL had less problems because the requirement agreed between Operator and manufacturer was severer than K.21.
- A limited number of manufacturers are producing ADSL equipment.
- Countermeasures may get difficult for FTTH equipment, because it will be produced by large number of manufacturers and its network configuration is more complex.

Condition in Japan

- Earthing and bonding are no ideal in Japan
  - Telecommunication line protector is connected to independent earth.
  - SPD is not installed on the power line and no earth terminal at outlet in user building usually (TT power system).
- Manufacturers producing telecommunication and information systems have not applied the same requirement.
  - Telecommunication: ITU-T K.21
  - Information system: IEC 6100-4-5

Establishment of K.66 and reaction in Japan

- Appropriate requirement could not find and each manufacturer has applied their own method based on experience.
- Appropriate description for deciding application of the "Basic" or "Enhanced" levels.
- Recommendation K.66 was established and be confused more.

  Example
  - Is the requirement in K.21 insufficient?
  - The resistibility of 15 kV in K.66 is much higher than enhanced and basic levees 6 kV and 1.5 kV respectively.
  - The resistibility level is in Appendix (informative), therefore it is unclear if manufacturers should apply or not.

Measurement data of various terminal equipment (1)

	PBX							
EUT	A		B		C			D
Telecom.-power 13kV 10/700µs	Analog port F (12kV) >6kV	Digital port F (12kV) >6kV	Analog port G	Digital port G	Analog port G	Digital port F (13kV) >9kV	Lowbitrate Digital F (10kV)	Analog port G
Telecom. transverse 4kV 10/700 µs	Analog port G	Digital port G	Analog port G	Digital port G	Analog port G	Digital port G	Lowbitrate Digital G	Analog port G
Power - Earth 10kV Combination	NA	NA	G		G			G
Power transvese 10kV Combination	NA	NA	F (10kV) >9kV		F(8kV)			F(8kV) > 6 kV

G: Good, F: Failed, Test level: 13 kV

Measurement data of various terminal equipment (2)

	Telephone		FAX				ADSL
EUT	E	F	G		H	I	J
Telecom.-power 13kV 10/700µs	NA	Analog port (hang up) G	Analog port (hang up) G	Analog port (lift up) F(13kV)	Analog port G	Analog port F(13kV) >10kV	PSTN G (20kV)
Telecom. transverse 4kV 10/700 µs	Analog port G	Analog port (hang up) G	Analog port (hang up) G	Analog port (lift up) G	Analog port G	Analog port G	PSTN G (6kV)
Power - Earth 10kV Combination	NA	F	G		F (10kV)	NA	G (15kV) G AC adapter
Power transvese 10kV Combination	G	F(9kV)	F(10kV)		F (8kV)	NA	G (12kV)

Measurement data of various terminal equipment (3)

	Home Gateway	Gateway				
EUT	K	L	M		N	
Telecom.-power 13kV 10/700µs	PSTN G (15 kV)	LAN port F(4kV) >2kV	LAN port F(4kV)	PRI (ISDN) port F(4kV)	Analog port F (13kV)	Analog port F (13kV)
Telecom. transverse 4kV 10/700 µs	PSTN G (6kV)	NA	NA	NA	Analog port G	NA
Power - Earth 10kV Combination	G	F(8kV) >6kV	G		NA	NA
Power transvese 10kV Combination	F (10kV)	NA	F (6kV) >1kV		F(5kV)	

Analysis of test data

1. Interface for internal line (LAN port) is lower than 4 kV.
   - Testing configuration and requirements should be reconsidered.
2. The test levels for power port seems to be too high.
   - The output impedance of test generator for combination wave is very low. The test current is too large as contact of modular connector melt.

Analysis of test data (2)

3. Spark occurred in the AC outlet in the test setup a little higher than 10 kV.
   - Keeping enough insulation in AC outlet is important to obtain reliable data.
4. The termination method at ports other than the test port should be defined well.
5. Many ports other than for telephone has less resistibility than the requirement.

Proposals

1. It is difficult to understand the relationship between K.21, K.44, and K.66. We are keen to enlightenment.
2. The relationship between K.surege, K.interface and other Recommendations should be well described. It should be defined when new Recommendation is established.
3. It is difficult to read Recommendations because they are referring many Recommendations each other. Also the description of Recommendation should be adjusted as well as possible.

Proposal (2)

4. Coordination between IEC standard is indispensable.
   - According to the IEC60664-1, impulse resistibility is 1.5 kV for apparatus on category II of 100V AC line. However, 2.5 kV and 6 kV are required in K.21.Coordination is necessary.
   - Liaison between IEC should be enhanced.
5. Test method using primary protector is unclear and description is not enough. We want simple and clear description of application method.
6. Numerical specification of primary protector is not described. Manufacturers want actual specification of primary protector.