International Telecommunication Union

ITU-T Study Group 05

Equipment Resistibility

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Introduction

- Protection of an installation may require a combination of:
  - Lightning protection of the building
  - Protection of incoming lines
  - Resistibility of equipment
  - Earthing and bonding of installation
- This presentation is about the resistibility of equipment

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Introduction

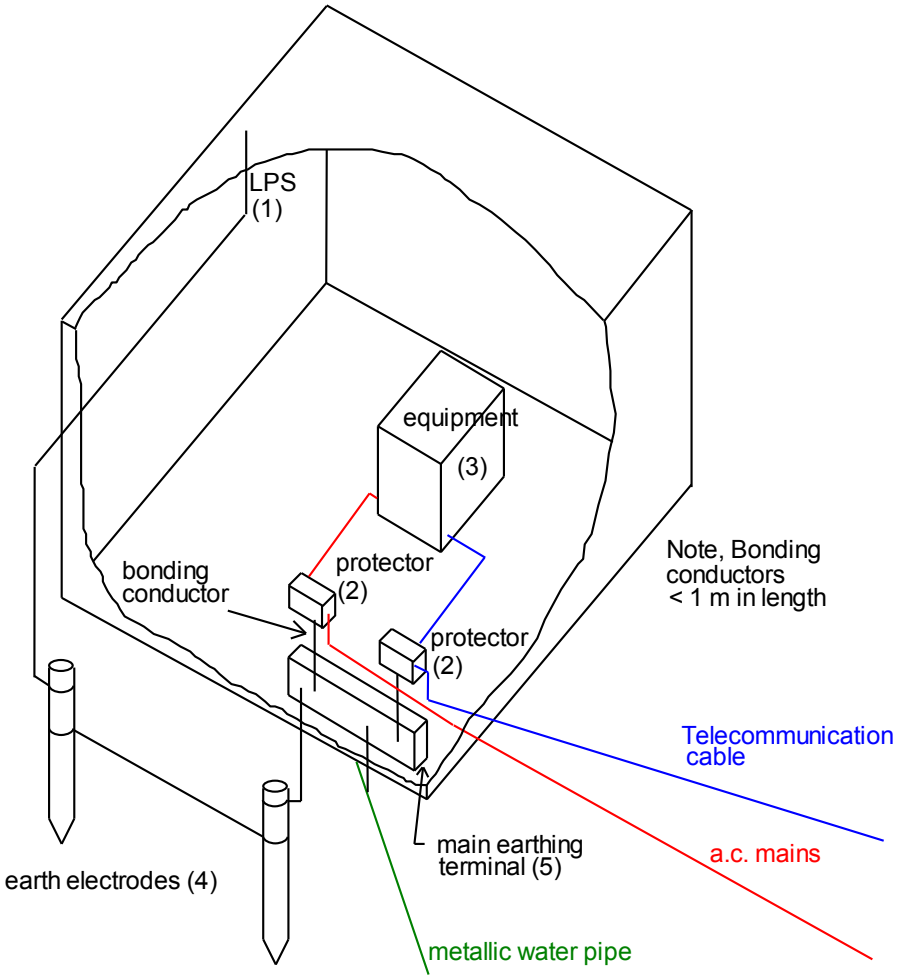

Figure 1

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Introduction

- This presentation will cover three areas as follows:
  - Relevant recommendations and standards
  - Coordination between equipment and external protection
  - Installation practices and impact on resistibility requirements

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Introduction

- There are both ITU-T recommendations and IEC standards related to damage of equipment
  - ITU-T Resistibility Recommendations
    - K.44: Resistibility test method
    - K.20, K.21 and K.45: Test requirements
  - IEC Immunity Standard
    - IEC 61000-4-5

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Relevant Recommendations

- Recommendations are environment based as follows:
  - Telecommunications centre (K.20)
    - Controlled earthing and bonding
  - Access Network structure (K.45)
    - Small installation, with excellent bonding
  - Customer premises building (K.21)
    - Uncontrolled earthing and bonding

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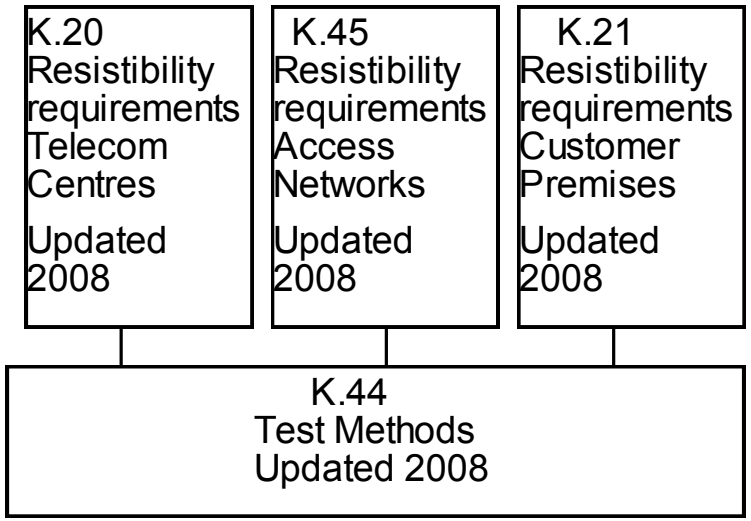
Relevant Recommendations (cont)

Existing Recommendations



Proposed Recommendation

K.hnwr

Requirements for Home Networks in Customer premises

To include all protection requirements for home networks

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Relevant Recommendations (cont)

- Has two levels of resistibility; “basic” and “enhanced”
- Operator can choose the basic or enhanced requirement
- In exceptional circumstances “special” requirements can be specified.

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Requirements

- The resistibility Recommendations include the following ports:
  - Ports connected to both internal and external cables as follows:
  - External port types
    - Symmetric pair
    - Coaxial (under study)
    - Dedicated Power Feed (DPF)
    - Mains

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Requirements (cont)

- External ports have to pass both an “inherent” and a “coordination” test
- Internal port types
  - Unshielded
  - Shielded (includes coaxial)
  - d.c. power interface
- Internal ports have to pass an “inherent” test only

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Requirements (cont)

- Inherent Test. Ensures a minimum level of resistibility.
  - This allows the equipment to be used in low surge activity areas without primary protection
  - Protects against induction into internal wiring

Requirements (cont)

- Coordination Test. Has different requirements for
  - Lightning
  - Power induction and
  - Mains power contact

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Requirements (cont)

- Lightning. The primary protector must operate and protect the equipment
- Power induction. The equipment must not be damaged during the test. The primary protector does not have to operate.
- Mains power contact. The primary protector does not have to operate and, under some conditions, the equipment is allowed to be damaged

Requirements (cont)

- Primary protector replaced by a special test protector (SPT)
  - Test performed from 0 to Ucmax (generator voltage) to check for blind spots
  - SPT firing voltage 15% higher than maximum firing voltage of agreed primary protector
    - Allows “over” testing of the port to take into account variations in equipment protection components

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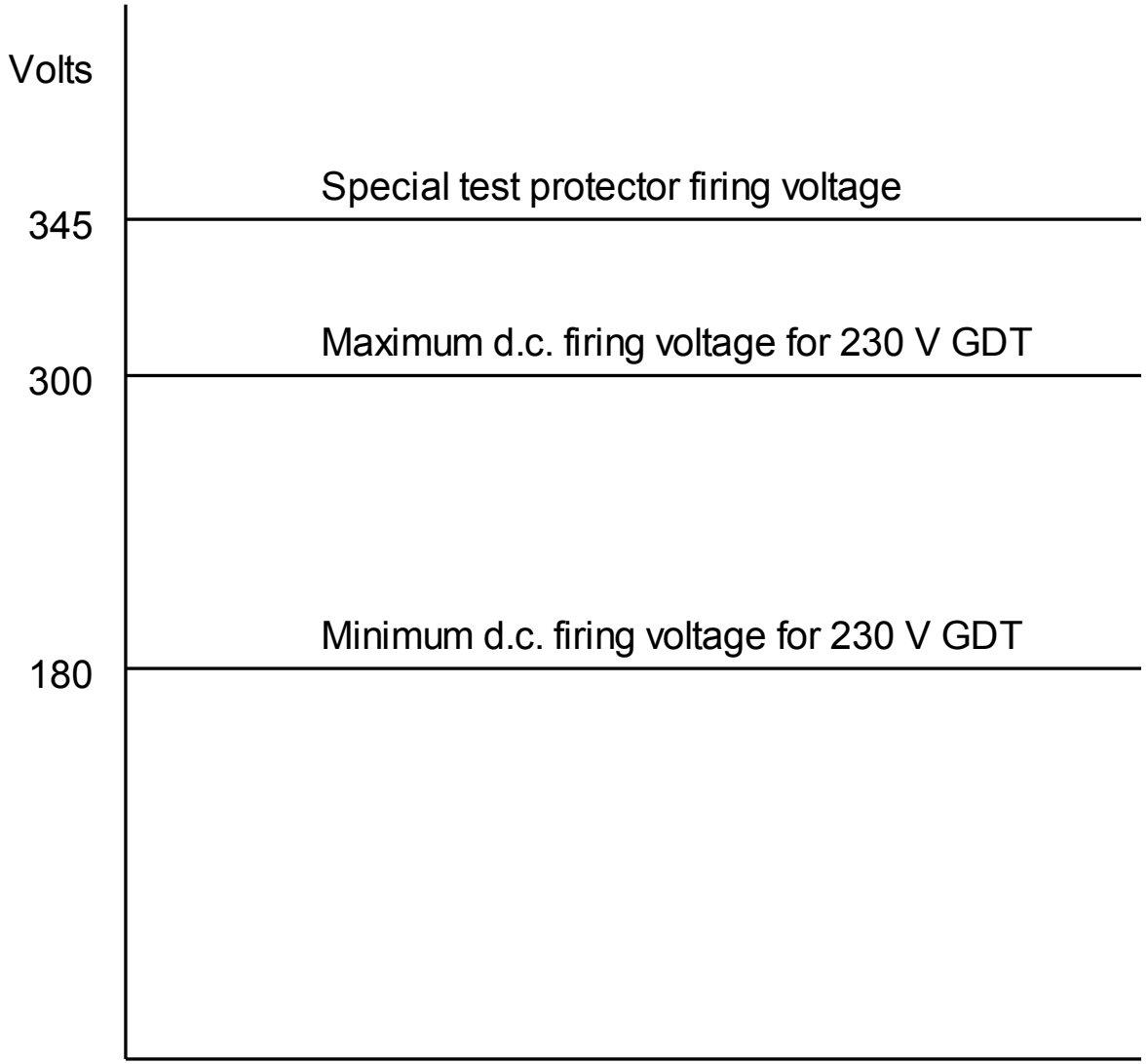
Requirements (cont)



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Requirements (cont)

- IEC 61000-4-5.
  - Has 6 set levels of resistibility and a 7th level that can be specified in the product specification
  - Effectively has both an inherent and coordination test but the GDT does not have to operate.
  - Specifies that the test magnitude may need to be varied up to the maximum test voltage. To also check for blind spots.
  - Does not “over” test

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K Recommendations Consider Installation practices

- The following installation practices were considered when preparing the K series recommendations
  - Special requirements for equipment connected to TT or IT mains system
    - Separated earth systems
    - Earth and neutral potential rise

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K Recommendations Consider Installation practices (cont)

- Protection length. Physical cable length between the primary protector and the equipment.
  - Increase in primary protector voltage spike due to reflection for high input impedance equipment. Not an issue. Limited to double the voltage and very short, < 1 μs width
  - Increase in equipment inherent protection current due to reflection for low impedance equipment. Not an issue. Limited to double the current and width relatively short

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K Recommendations Consider Installation practices (cont)

- Induction in loop formed by telecoms and earth wire. Still under study, but inherent protection of equipment provides a level of resistibility

- Where bonding cannot be achieved between telecoms and mains earths, special resistibility requirements are allowed.
  - Up to 13 kV insulation proposed between telecom and power port.

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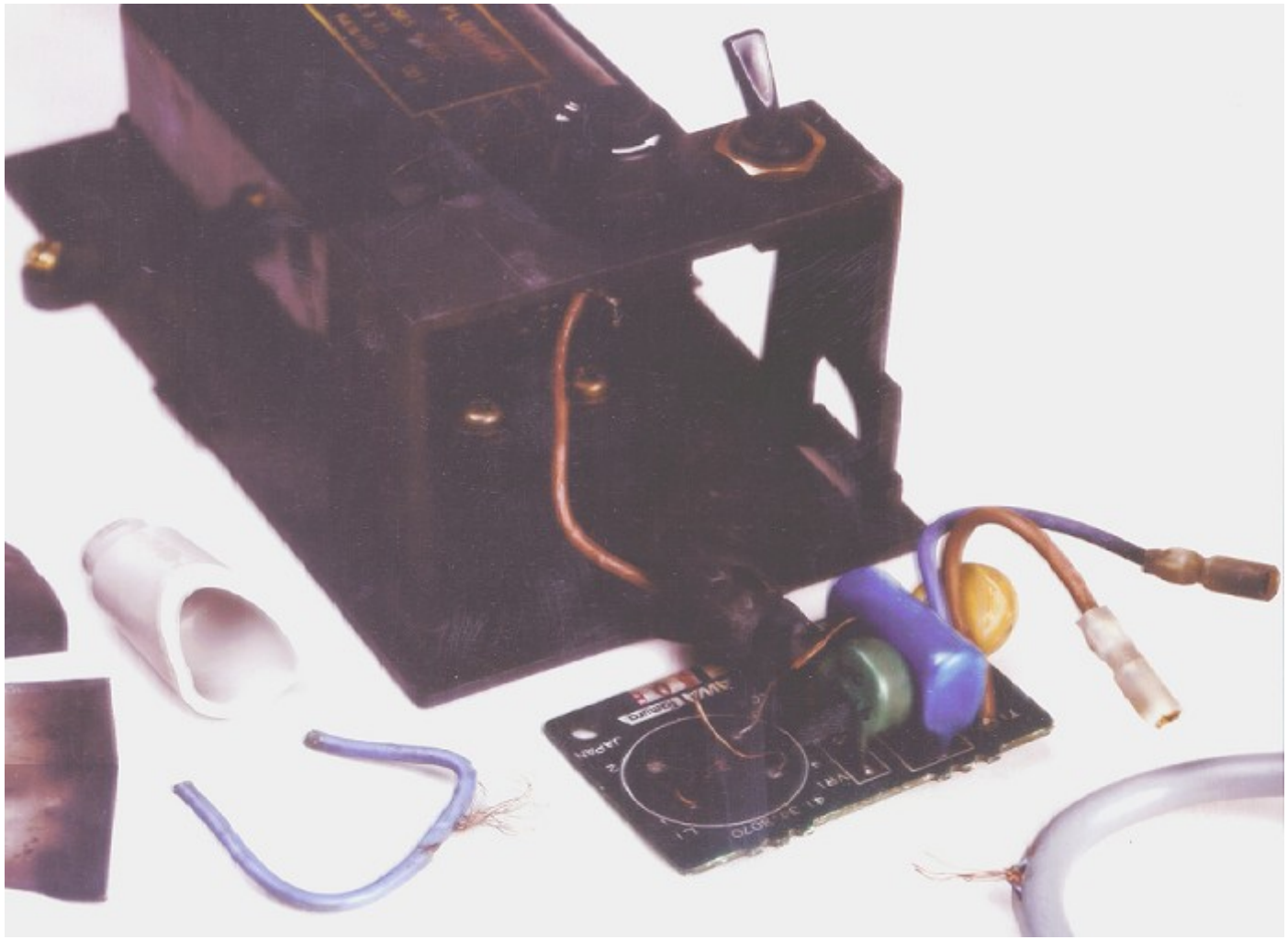
Damage due to non bonding of earths



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Future work – K.hnwr

- K.hnwr (home network requirements) to include the followings:
  - Resistibility
  - Safety
  - Earthing
  - Risk Assessment
  - Installation of Overvoltage Protection
  - Wiring Installation

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Question time

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