

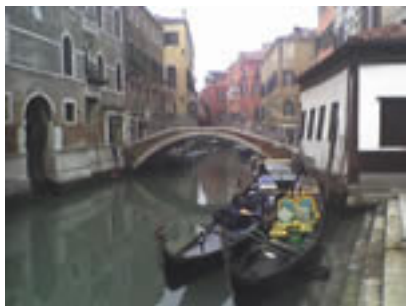


UIE working group
Power Quality

Voltage Dip Immunity of Equipment and Installations

TUTORIAL

Global Voltage Dip Statistics (Part 6)



The First International Conference on Smart Grids, Green
Communications and IT Energy-aware Technologies

ENERGY 2011

May 22-27, 2011 - Venice/Mestre, Italy



Global Voltage Dip Statistics

GOALS

- ❑ To obtain statistical information for making decisions concerning immunity requirements
- ❑ By means of:
 - Wide range of sites at several voltage levels and different geographical regions
 - Integration of measurements in a consistent database for statistic analysis



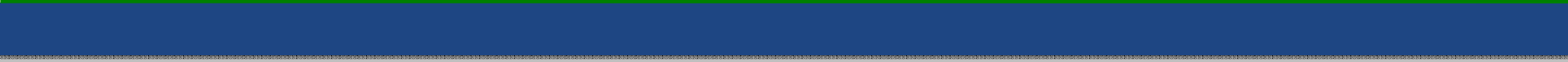
Global Voltage Dip Statistics

Data Sources (1)

- ❑ 1175 monitoring sites
- ❑ Sites from Canada, Portugal, UK, South Africa, USA, Australia, Spain...
- ❑ All data within the same database
- ❑ Presentation as Contour Charts by:
 - voltage level,
 - dip type and
 - percentile value



Global Voltage Dip Statistics Data Sources (2)

- ❑ LV, MV and HV sites.
 - ❑ Phase-to-neutral, phase-to-earth or phase-to-phase.
 - ❑ RMS values, no waveforms.
 - ❑ Three channels or just worst channel recordings.
-
- 



Global Voltage Dip Statistics Algorithms

- ❑ Conversion from phase-to-earth into phase-to-phase.
- ❑ Type I, II or III.
- ❑ Characterisation according to IEC 61000-4-34 (3A, 3B or 3C).



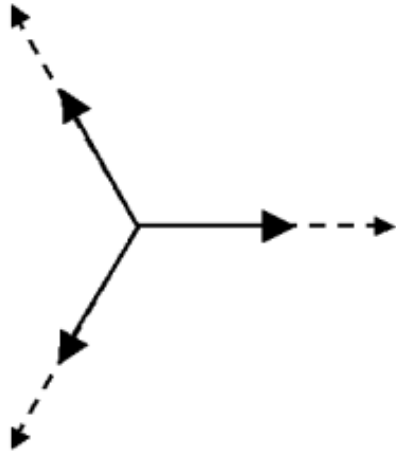
Global Voltage Dip Statistics How Dips Should be Measured?

- ❑ Between active conductors:
 - At LV → phase-to-neutral.
 - At MV and HV → phase-to-phase.
- ❑ At MV and HV some phase-to-earth records are converted into phase-to-phase measurements.

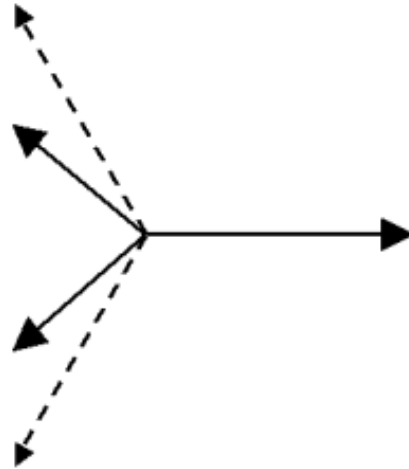


Global Voltage Dip Statistics

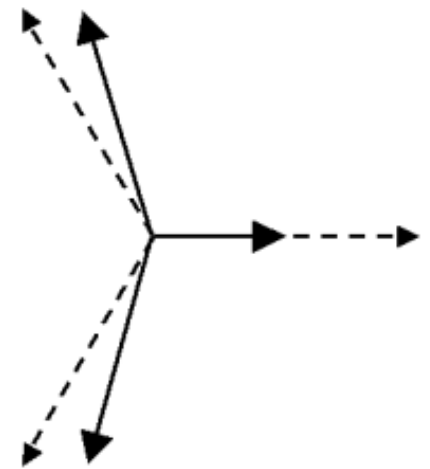
Type I, II and III Dips



Type III



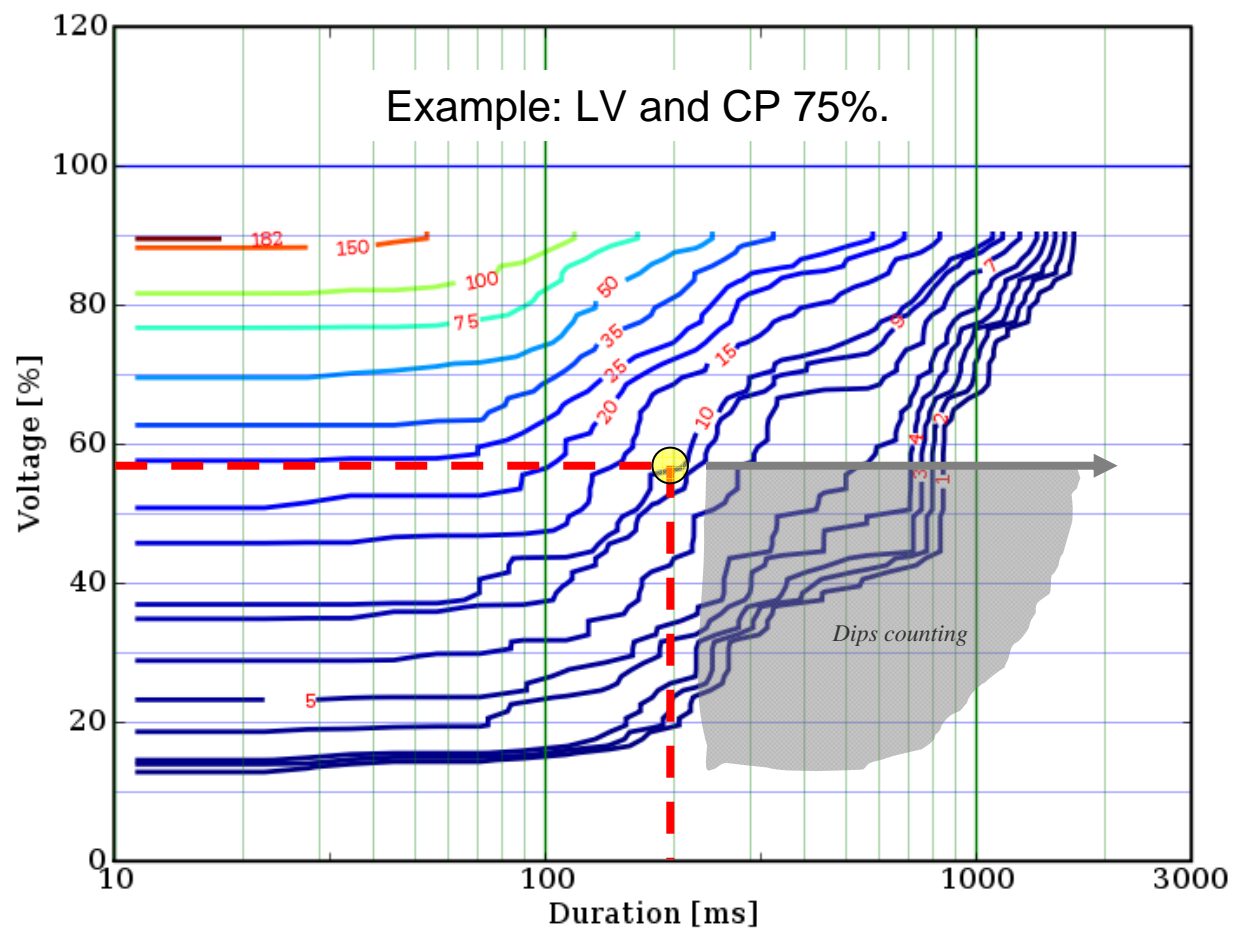
Type II



Type I



Global Voltage Dip Statistics Contour Charts (1)





Global Voltage Dip Statistics Contour Charts (2)

- For each point ($V-t$): number of dips per year and site, deeper than V and longer than t , not exceeded by 75% of sites.
- Allows easy calculation of the amount of dips outside a specific $V-t$ curve.



Global Voltage Dip Statistics Worst and Typical Sites

- ❑ CP 95% excludes the “very bad” sites.
- ❑ CP 50% corresponds to the median or “average” site.
- ❑ CP 25% corresponds to the “quite good” sites.



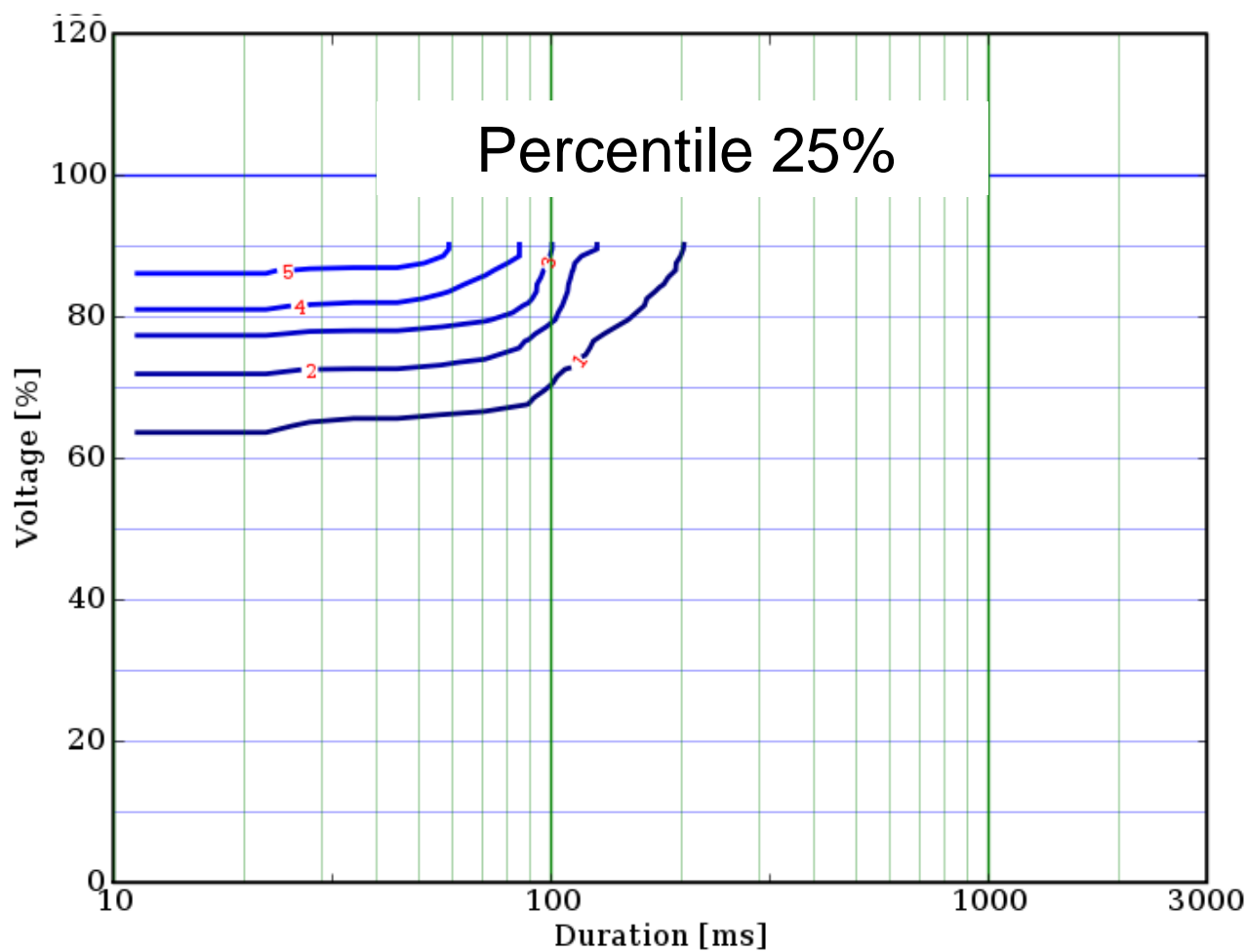
Global Voltage Dip Statistics

Some results

- Type III are around 20% of all dips
- Type II at MV+HV (51÷63%) are equivalent to type I at LV (54÷69%).

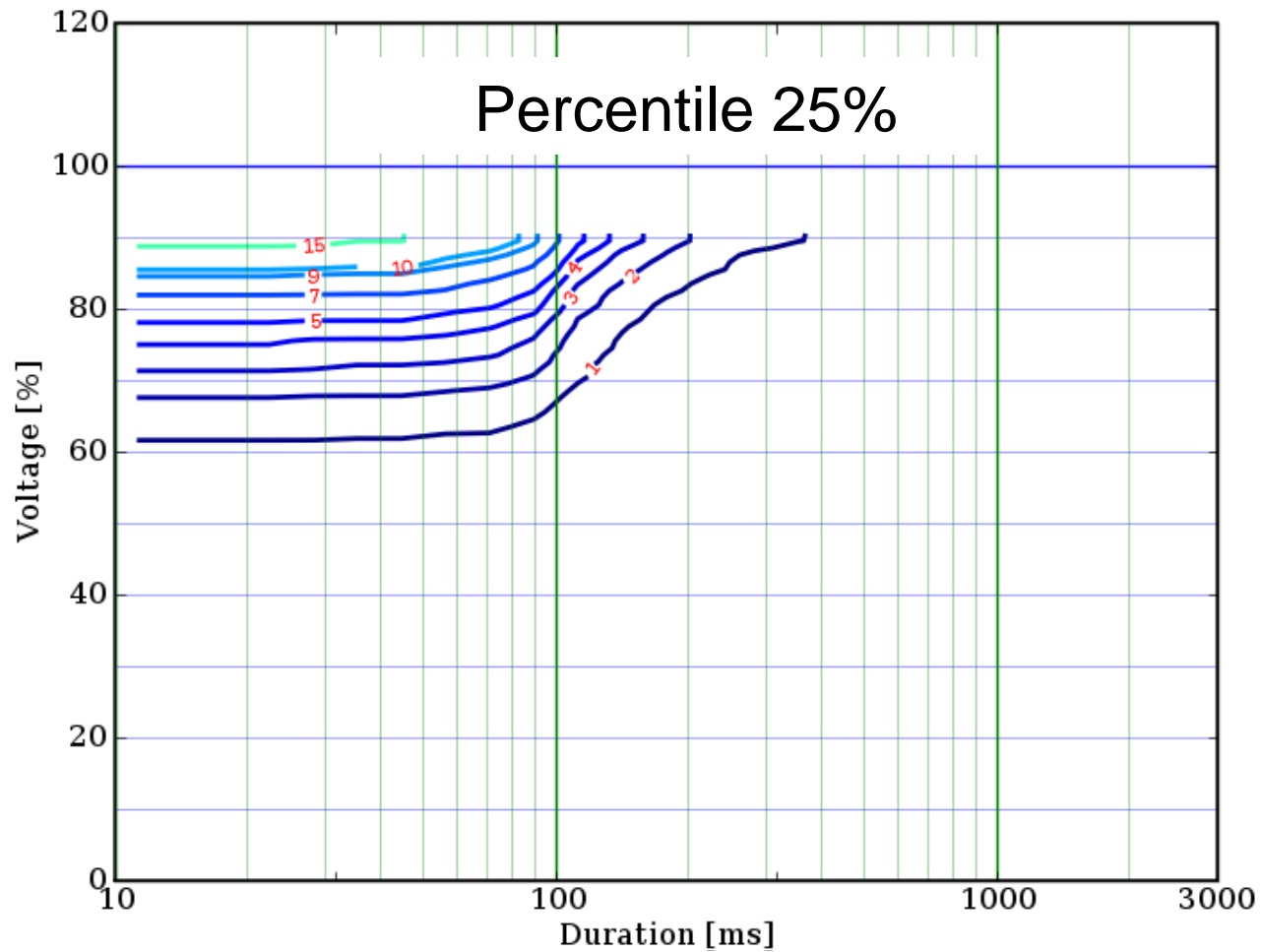


Survey Results: Type I Dips



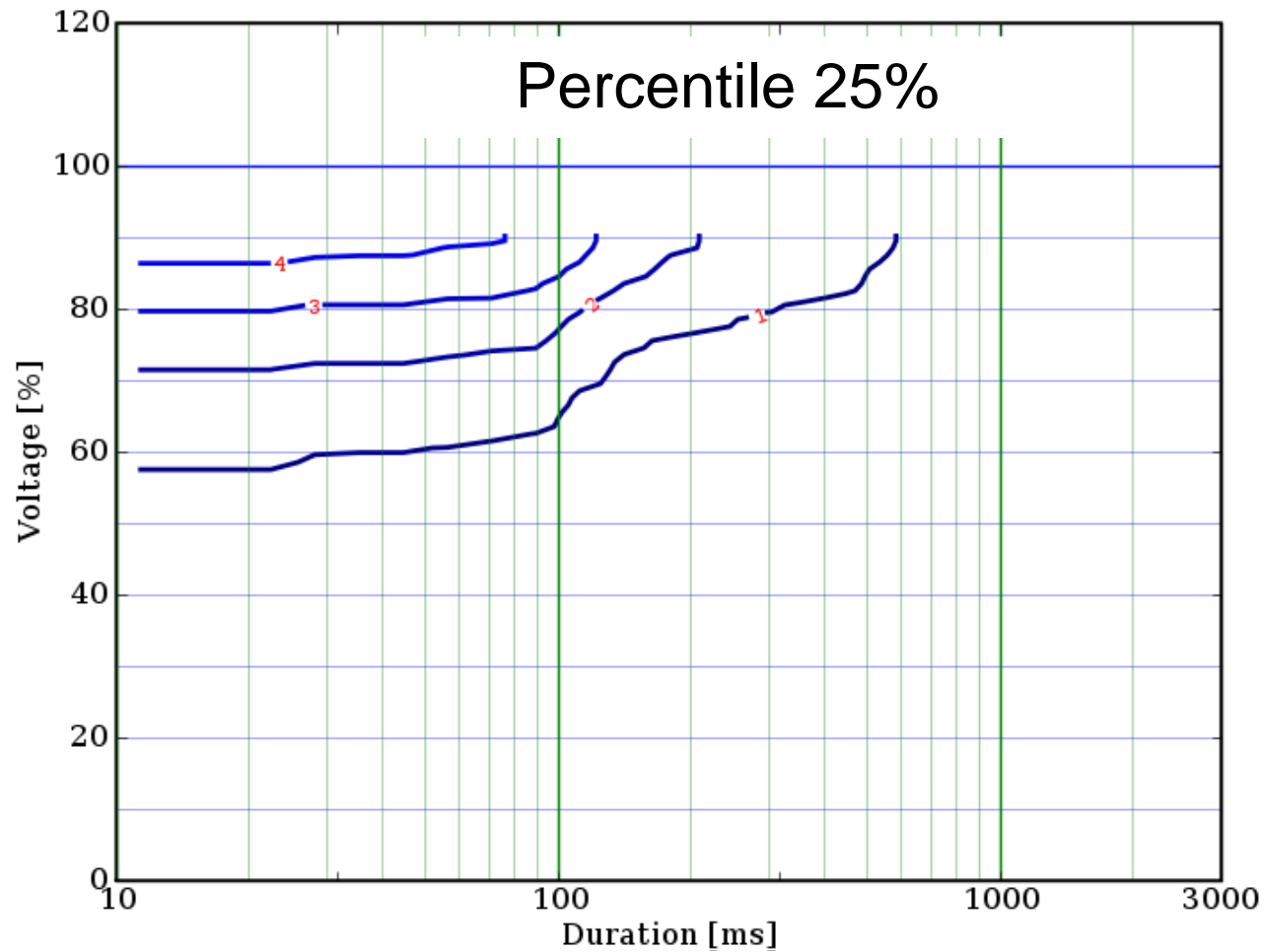


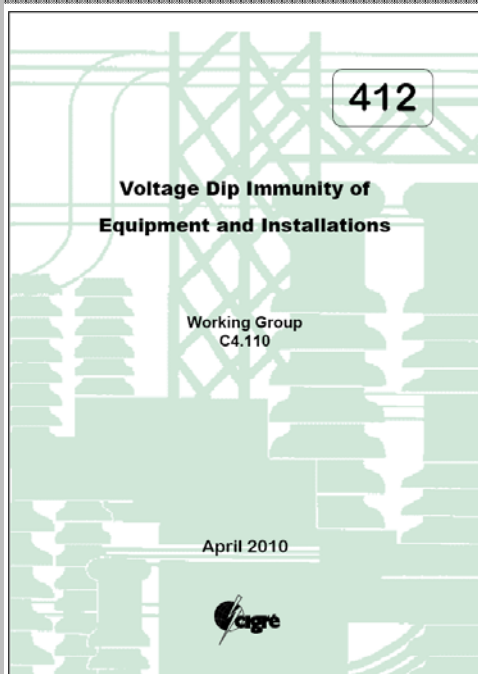
Survey Results: Type II Dips





Survey Results: Type III Dips





The report can be obtained in electronic format for free from:

www.uie.org;

a hardcopy can be purchased from

www.e-cigre.org

CIGRE/CIRE/UIE Joint Working Group C4.110

**Voltage Dip Immunity of
Equipment and Installations**

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