Disturbance Emission Level Assessment Techniques
(CIGRE-CIRED Joint Working Group C4.109)

SLIDE 2: The context of the works
IEC published in early 2008 Technical Reports 61000-3-6, 61000-3-7 and 61000-3-13, giving guidelines for the assessment of emission limits, respectively for harmonics, flicker and voltage fluctuations, and unbalance. Complementary to the specification of disturbances emission limits, network operators must be in state of verifying if these limits are well respected or not.

SLIDES 3, 4 and 5: The concept of harmonic emission level
The harmonic current emission level is defined as the harmonic current established between the considered installation and the network, after connection. On the other hand, the harmonic voltage emission level is defined as the vector difference between the harmonic voltage measured at the point of evaluation (POE) - which can be the point of common coupling or the point of connection or any other point specified by the system operator - when the installation is connected and operating, and the background harmonic voltage (i.e. the harmonic voltage caused by all the other disturbing loads present in the grid).

SLIDE 6: Statistical approach towards the assessment of harmonic individual emission level
The figure shows a typical plot area of harmonic voltage vs. the harmonic current. The slopes of the straight lines indicate respectively the harmonic impedance of the network at the POE and the impedance of the transformer connecting the installation to the grid. This one is in fact a lower boundary for the considered consumer’s installation harmonic impedance.

SLIDES 7, 8 and 9: Statistical approach: several practical examples

SLIDE 10: Typical configuration for individual flicker emission level assessment.
The emission level from an installation into the power system is the magnitude of flicker which the considered installation gives rise at the point of evaluation (POE). As far as flicker is concerned, emission level must then be interpreted as the level resulting from the considered fluctuating load alone, without any interaction with the other disturbing loads present elsewhere in the grid.
SLIDE 11: The basic principle of the voltage drop approach

In the “Difference Method”, a known impedance, in most cases the transformer impedance feeding the particular load, between points A (= consumer) and B (= point of common coupling) is used to assess the emission of the fluctuating load. Simultaneous voltage measurements in points A and B have to be made to calculate the emission level. The emission level is related to the known impedance $Z_2$ and must be transposed afterwards to the impedance corresponding with the contractual or agreed short-circuit level.

SLIDES 12 and 13: The basic principle of the load current approach

The “Load Current” approach relies on simultaneous waveform measurements of the load current $i_{\text{LOAD}}(t)$ and the voltage $u_m(t)$ at the POE. The calculation of the emission level of the fluctuating load is done in two steps.