

It will be clear now that we propose to test the acoustical noise of a transformer under four conditions:

- a) clean mains at nominal mains voltage level and at defined nominal mains frequency:
unit: NC.. [dB,m,nom]
- b) clean mains at 10 % over voltage level:
unit: NC.. [dB,m, +10%AC]
- c) clean mains plus 250 mV-DCvoltage:
unit: NC.. [dB,m, +250mV-DC]
- d) clean mains plus 10 % over voltage plus 250 mV-DC voltage:
unit: NC.. [dB,m, +10%AC,+250mV-DC].

4 MEASUREMENTS

From the many transformers we tested, we now will discuss four examples:

1. a special low noise (LoNoTM) toroidal transformer, designed and manufactured at Plitron, as a result of the knowledge gained in this research (Plitron 6931 Toroid)
2. a standard Plitron toroidal transformer (Plitron 87053201 Toroid)
3. an EI transformer from unknown brand (Standard EI)
4. a low noise toroidal design from another manufacturer (Other Toroid)

The power rating of each transformer is at or close to 500kVA. See for more details Photo 15 and Table 2 where the results of the measurements are summarized.

All transformers were tested at their nominal frequency and voltage as specified by the manufacturer. All measurements were performed at 0.5 m distance. They are shown in detail in the Figures 17 and following. The conversion to one meter distance was performed by subtracting 6 dB from the measured half meter distance NC curve levels. The conditions of adverse mains are clearly defined above and given in the new units.

It is striking in Table 2 that the 250 mV DC-component causes the most noise. This is explained by the fact that in most transformer designs only over-voltage is taken into consideration. Proper dealing with a DC component asks for a totally different transformer construction. These measurements explain as well why a normally silent transformer suddenly starts humming. The most probable cause is a DC-component, caused by an asymmetrical loading somewhere on the mains.

Transformer	Plitron 6931 Toroid	Plitron 87053201 Toroid	Standard EI	Other Toroid
[dB,m,nom]	NC4	NC4	NC7	NC4
[dB,m,+10%AC]	NC4	NC4	NC14	NC4
[dB,m,+250mV-DC]	NC4	NC19	NC10	NC16
[dB,m,+10%AC,+250mV-DC]	NC8	NC20	NC23	NC17

Table 2: results of acoustical noise measurements on four different transformers