LCR News

ISSUE THREE

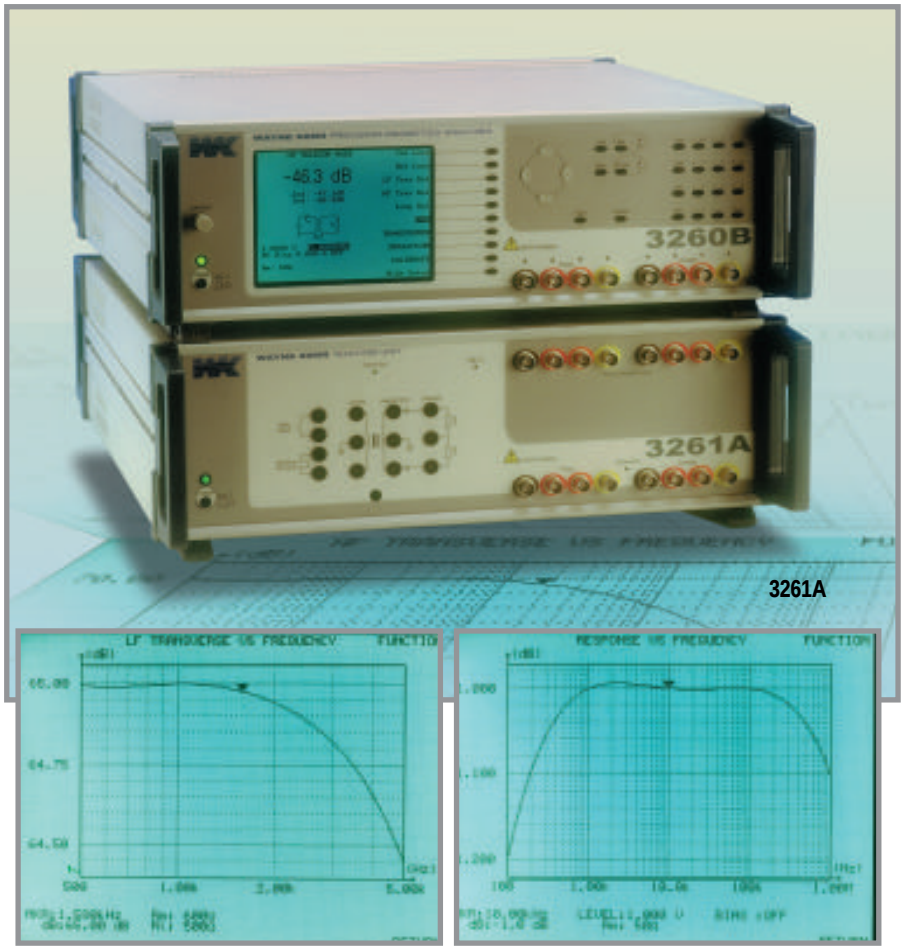
Complete production and design testing of ADSL, HDSL, ISDN and Analogue line matching transformers including Total Harmonic Distortion measurement

The new Wayne Kerr 3261A Telecom Unit meets all the requirements for testing ADSL, HDSL, ISDN and Analogue Line Matching Transformers. A requirement that has come about as a result of increasing demand for high speed data communications.

Providing a full range of measurement functions from a single integrated unit, the Wayne Kerr 3261A Telecom Unit can measure Total Harmonic Distortion, Longitudinal and Transverse Balance and Insertion and Return Loss, using a single fixture and at the touch of a button.

Replacing many discreet instruments, which require complex test jigs and highly skilled operators making measurements slow and complicated with high levels of uncertainty, the 3261A Telecom Unit provides fast, accurate and repeatable measurements in a single fixture, enabling for the first time, these measurements to be made in a production environment.

In a design or development environment the Analysis Mode provides real help. By graphing Longitudinal and Transverse Balance and Insertion and Return Loss against frequency the user can completely characterize a development transformer. The 3261A Telecom Unit provides all this capability at a fraction of the cost of comparable equipment.



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Wayne Kerr introduces new range of low cost products under the brand

Wayne Kerr has introduced a new range of test equipment designed specifically for manufacturers. These new products offer exceptional value for money, simple straightforward operation and provide only functions the user needs. They also deliver high speed testing with a connect-and-test philosophy - essential in a production environment.

Introducing three new products - the 6815 Impulse Winding Tester, 6885 Transformer Tester and 6890 Automatic Transformer Tester, these new products all provide excellent value for money, high speed test and straightforward operation.

The 6885 Transformer Tester and 6890 Automatic Transformer Tester are aimed at transformer manufacturers. Providing a basic accuracy of 0.5% and frequencies up to 500kHz both products provide the basic measurement capability for production testing of transformers. In addition the 6885 has a high voltage capability allowing HIPOT and Surge testing.

The 6815 Impulse Winding Tester offers a completely new concept for testing wound components. By providing a high voltage impulse, typically 5kV, and analyzing the decaying waveform, manufacturing defects such as change in material, shorted or damaged windings can be accurately identified without destroying the component.


6815


6885

6890

Wayne Kerr 6430A and 6440A Precision Component Analysers deliver leading edge capability at lowest market prices

Designed to allow complete and accurate characterization of any component, Wayne Kerr's 6430A and 6440A Precision Component Analyzers provide a full complement of measurement functions, industry-leading accuracy, frequency range to 3 MHz and the ability to graph measurement parameters versus frequency. Aimed at users involved in the design or manufacture of components, or those who use components as part of their equipment designs, these instruments provide the complete component test solution at the lowest market prices.

F O W A R D L O O K

Bill Griffiths - Quality Manager looks at the new requirements for ISO 9000 approval. Over the next 2 years, all organisations that were certified to the 1994 version of the ISO 9000 series of quality management system standards will have to be re-certified to ISO 9001:2000. This new version "9k - 2k" has some fundamental changes to the previous one and is based around 8 key principals:

1. ***Customer focus***
2. ***Leadership***
3. ***Involvement of people***
4. ***Process approach***
5. ***System approach to management***
6. ***Continual improvement***
7. ***Factual approach to decision making***
8. ***Mutually beneficial supplier relationships***

The process approach means that there is an increased emphasis on the collection and analysis of meaningful information and a subsequent improvement.

The specific requirement for customer focus in the standard is **Top management shall ensure that customer requirements are determined and met with the aim of enhancing customer satisfaction**. Examples of these are dependability, availability, post-sales support, price and life-cycle costs.

Wayne Kerr Electronics'certification to the new standard means that all of the require-ments, as well as many more, will be formally considered and managed in order to achieve and even exceed the real aim of the new standard - customer satisfaction.

New Measurement Requirements for Telecommunications Transformers

David Sheath Applications Engineer Wayne Kerr Electronics

With increased use of the Internet and mobile communications has come the need to transmit digital information at higher speeds. This need has put new requirements on transformer manufacturers and presented new challenges to test equipment designers. This paper looks at the new measurement requirements and provides a technical overview.

The measurements looked at in this paper include;

- **Total Harmonic Distortion (THD),**
- **Insertion Loss (IL),**
- **Return Loss (RL),**
- **Longitudinal Balance (LB) and**
- **Transverse Balance (TB).**

Background

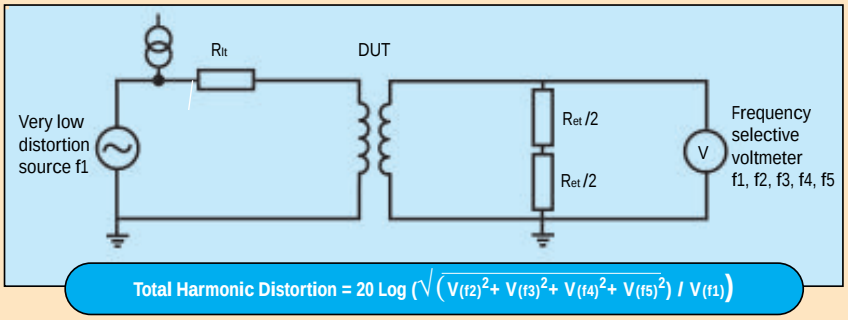
Transformers can be grouped into two broad classes - Power and Signal Transformers. Linear power transformers generally operate at a single line frequency, and high drive levels, SMPS (switch mode power supplies) require transformers to work under similar conditions at higher frequencies. Signal transformers are required to operate from low to high drive levels and multiple frequencies; they have been traditionally used to transmit signals at audio frequencies. However in recent years the requirement has been changing to transmit high-speed digital data. Typical technologies today include ISDN, HDSL and most recently ADSL.

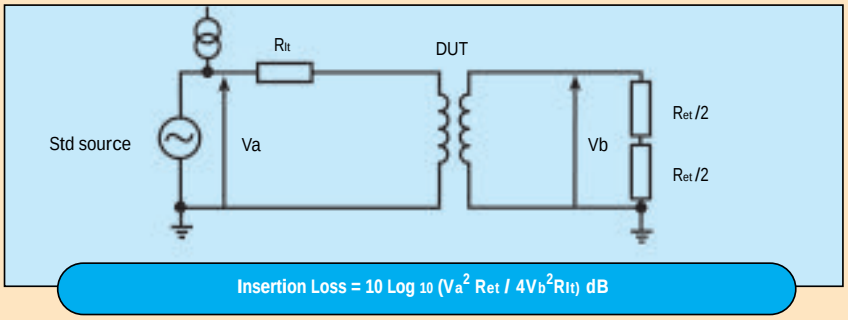
Telecom Transformer Measurements

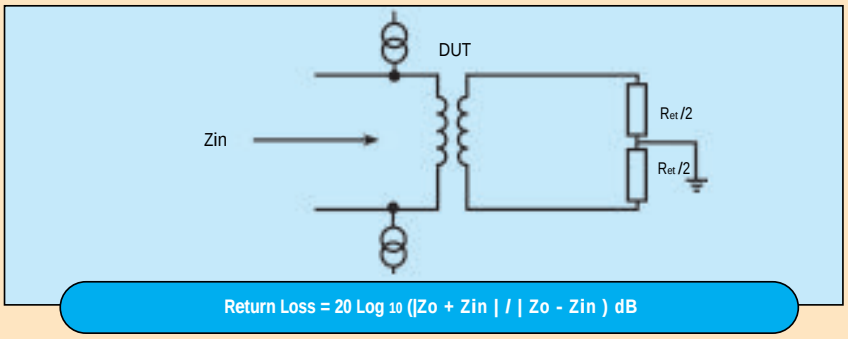
Total Harmonic Distortion (THD)

A critical measurement for digital line matching transformers and always asked for by transformer designers. THD can be measured using the technique shown over.

By applying a very low distortion signal at a known frequency across the input of the DUT and then making a series of measurements, at the fundamental frequency and the harmonics, to the fifth, across the output load, it is possible to calculate the THD. A telecommunications transformer with a poor THD will result in a distorted output signal. When using the 3261A the distortion at each of the measured harmonics is displayed.







This allows a more detailed analysis in the event of a failure. Telecommunication transformers require very good THD performance of typically 80-90dB. THD is also required to be measured in the presence of small amounts of DC bias current, which can significantly affect the distortion performance of the transformer.

InsertionLoss (IL)

Insertion Loss is the ratio of the maximum power available at the source to the power delivered to the load with the transformer inserted in to the circuit. By measuring IL with the above method the result shows the total loss.
This includes the true dissipated losses caused by the transformer and the losses as a result of any impedance mismatch at the input. The other advantage of this method is that, because the source and load impedance does not have to match, the turns ratio does not have to be one to one.

Insertion Loss is a measure of the signal attenuation by the transformer. Typical IL values would be between 0.5 and 1.5dB. 1dB equates to a signal power loss of approximately 20%.

Return Loss (RL)

Return Loss is a comparison of the reflected power and incident power caused by an impedance mismatch between the line and DUT. An RL value of 0dB would mean that 100% of the signal passed to the DUT had been reflected.

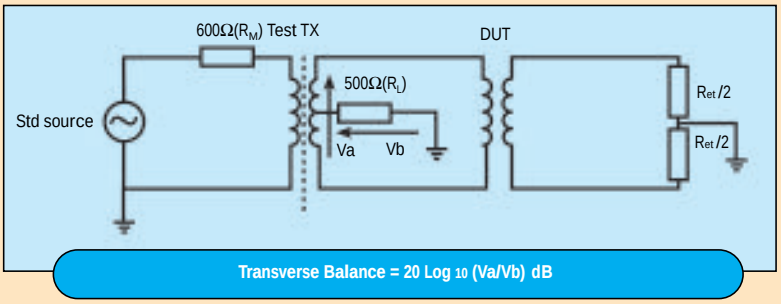
Balance measurements

The term Longitudinal (Transverse) Balance is often used to describe two slightly different tests. The first Transverse Balance (also called Longitudinal Transverse Balance) and the second Longitudinal Balance. Both are used to test the transformers winding symmetry with respect to ground. A poor winding symmetry will result in hum, imbalance related noise and crosstalk. Balance is expressed as a ratio in dB's. It is the ratio of the metallic (differential) signal with respect to the longitudinal (common mode) signal appearing between the transformer's winding and ground.

LF Transverse Balance

(Analog voice band)

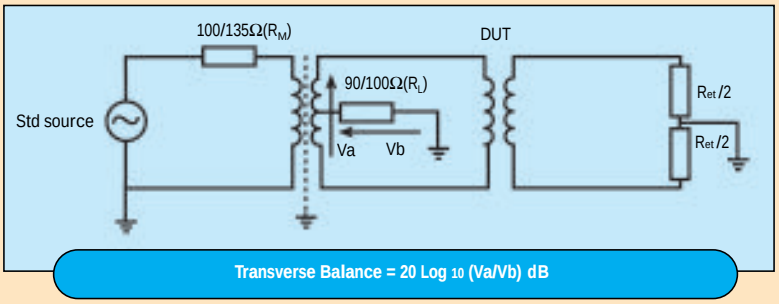
The method to the right is based on the FCC68.310(a) standard. A test transformer is used to apply a balanced voltage to the DUT. Any out of balance impedance to ground causes a current to flow in RL, generating the voltage Vb.



HF Transverse Balance

(Digital)

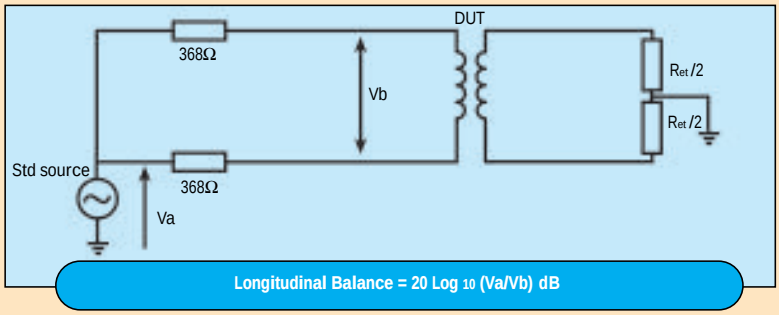
The method to the right is based on FCC68.310(b). This test is carried out in a similar way to the method used in LF Transverse Balance. The only differences being that the metallic (R_M) and longitudinal (R_L) impedance values are selectable and the standard transformer is replaced with a transformer that is more suitable for the higher frequencies involved.



Longitudinal Balance

(Analogue voice band)

The method to the right is based on ANSI/IEEE455 1985. By applying the longitudinal voltage Va to the DUT, in the way shown, and then measuring the signal at Vb, it is possible to detect the imbalance caused by the DUT. The need to manually trim the balance prior to testing is removed by use of software controlled trim routines.



Conclusion

Line matching transformers used for xDSL applications require more complicated and varied measurements than their predecessors. Whilst requiring the more usual parametric measurements such as winding inductance, DC resistance and leakage inductance, they also require Total Harmonic Distortion, Longitudinal and Transverse Balance, and Insertion and Return Loss. The challenge for the test equipment designer has been to develop a test solution able to provide all the required measurement capability in an integrated package and reduce the complexity and uncertainty of the measurements. Wayne Kerr Electronics have achieved this with their 3261A Telecom Unit. It provides all the measurement capability identified in this paper, meets the stringent specifications of the relevant standards , reduces measurement complexity using software trims and correction and does so in an integrated unit. All the measurements are taken using a single terminated fixture allowing for the first time measurements such as Total harmonic Distortion and Longitudinal and Transverse Balance to be made in a production environment.

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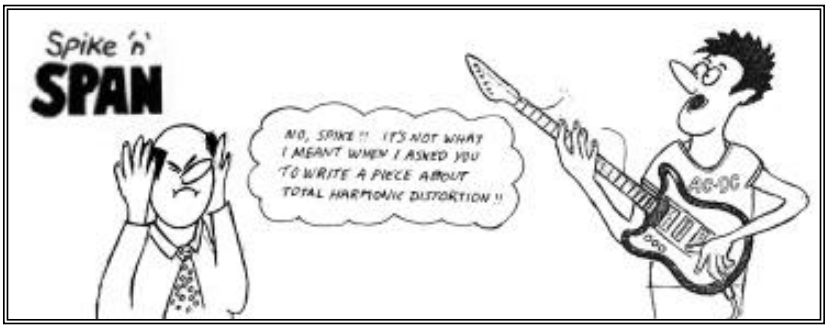

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