

 **WireScope 350** **White Paper**

*By Fanny Mlinarsky*

**Level III Tester Accuracy**

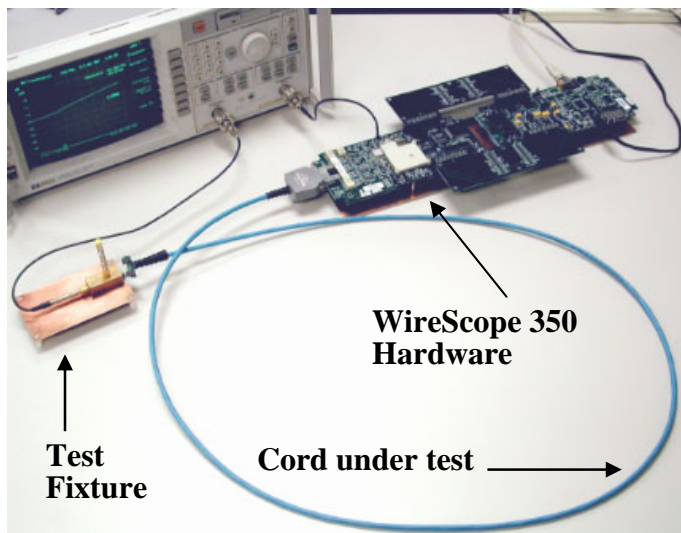
Field testers certifying category 6 installations must conform to the Level III accuracy specifications defined by TIA and ISO. When you invest time and money into the certification job you want to be sure that the certification work is valid. The best way to ensure certification validity is to use a tester that is independently verified to meet Level III. The Agilent WireScope 350 has been independently verified by ETL to meet all Level III requirements in both the Permanent Link and Channel configurations.

This white paper explains what Level III accuracy is and shows the independent verification test results for the WireScope 350.

**What's Level III Accuracy?**

Level III definition consists of an accuracy model for each swept measurement performed during certification. The model is simply a sum of error contributions from different sources within the instrument. When you add all the error contributions you get the total measurement error.

The error terms must be measured for the channel and permanent link configurations. The permanent link error terms are measured at the end of the test cord as shown in the following figure.

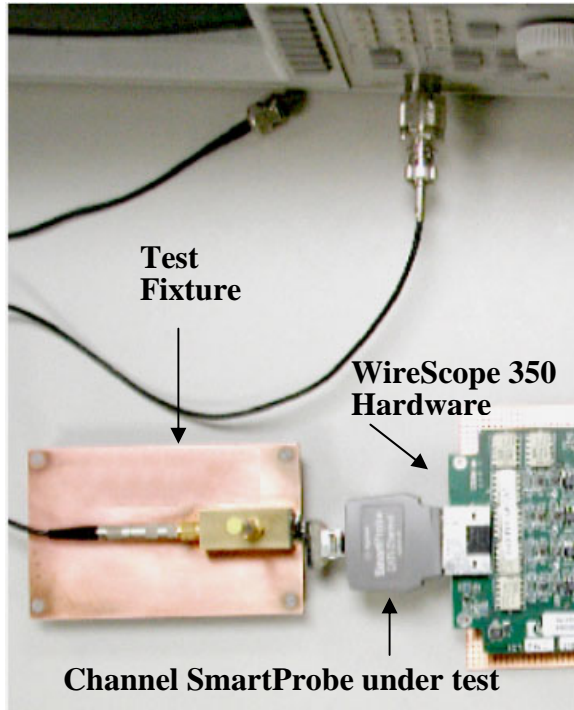


*ETL-verified accuracy testing for the WireScope 350 Permanent Link configuration.*

*Error terms for the Permanent Link configuration are measured at the end of the Agilent Universal Permanent Link SmartProbe.*



Error Terms for the Channel configuration are measured at the plug that connects to the WireScope 350 channel adapter as shown in the following figure.



*ETL-verified accuracy testing for the WireScope 350 Channel configuration.*

*Error terms for the Channel configuration are measured at the plug connected to the Agilent Universal Channel SmartProbe.*



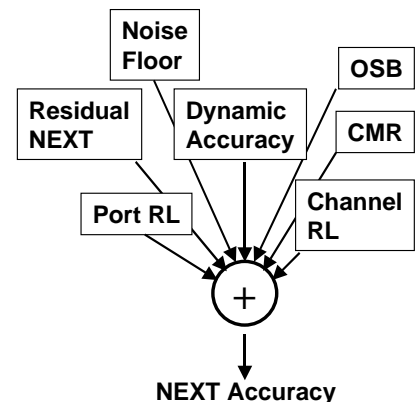
The results of the ETL-verified accuracy testing are shown below for the permanent link and channel configurations.

### Near End Crosstalk (NEXT) Accuracy

NEXT accuracy, or total measurement error, is the sum of the following error terms:

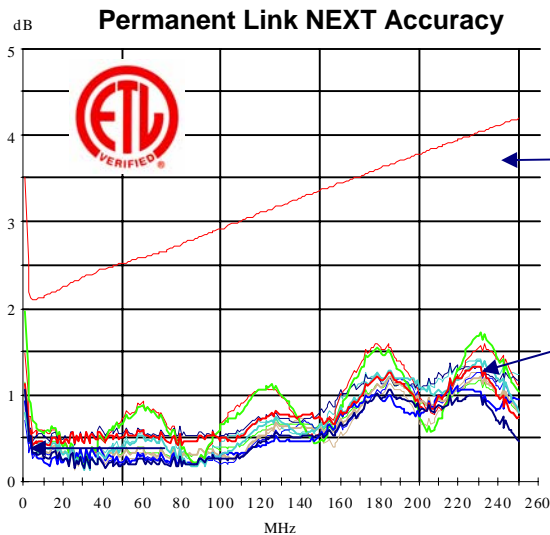
- the tester noise floor
- internal (residual) crosstalk
- dynamic accuracy of the detector
- return loss measured into the test port
- output signal balance
- common mode rejection
- return loss of the installation under test

Each of the above error terms is defined over the frequency range of the measurement and the total error is also defined over this frequency range as shown in the figure on the following page.



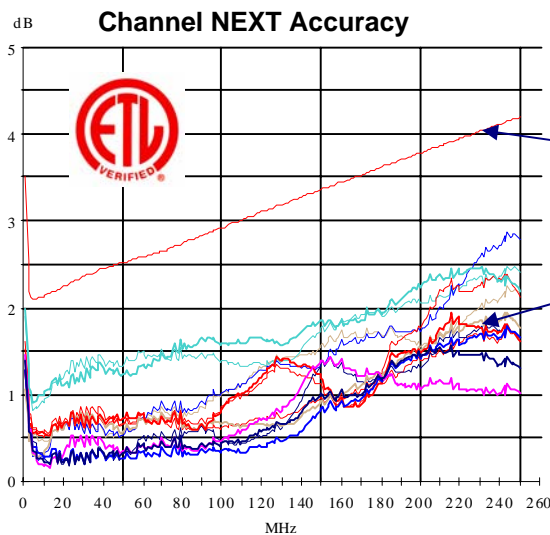


## Near End Crosstalk (NEXT) Accuracy (con't)



*Level III NEXT Permanent Link accuracy limit calculated by summing all error terms and plotting the limit over frequency*

*WireScope 350 Permanent Link NEXT accuracy on each of the pair combinations used for the NEXT measurement.*



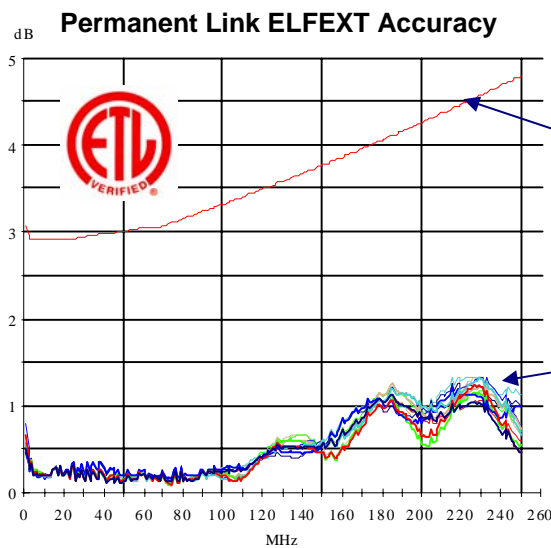
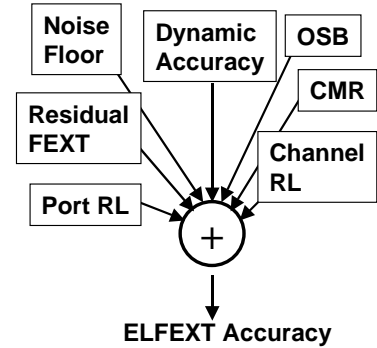
*Level III NEXT Channel accuracy limit calculated by summing all error terms and plotting the limit over frequency*

*WireScope 350 Channel NEXT accuracy on each of the pair combinations used for the NEXT measurement.*

*The WireScope accuracy margins with respect to the Level III limit are substantial.*

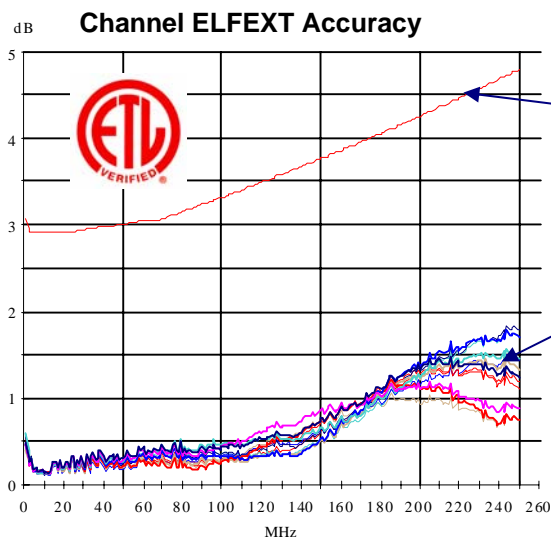
## ELFEXT Permanent Link Accuracy

ELFEXT accuracy is also determined by summing the error terms that contribute to the ELFEXT error.



*Level III ELFEXT Permanent Link accuracy limit calculated by summing all error terms and plotting the limit over frequency*

*WireScope 350 Permanent Link ELFEXT accuracy on each of the pair combinations used for ELFEXT measurement.*



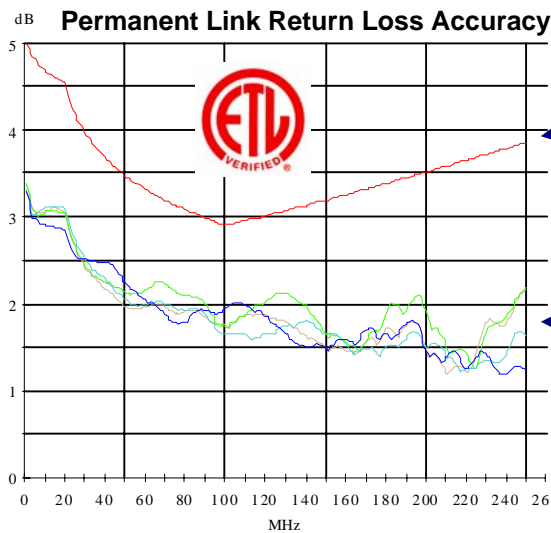
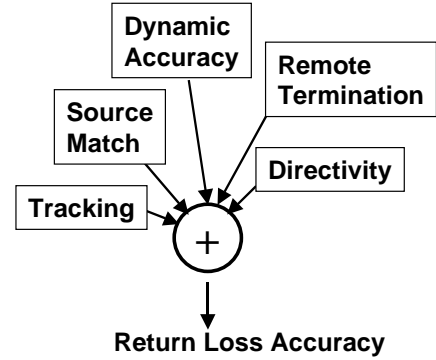
*Level III Channel accuracy limit calculated by summing all error terms and plotting the limit over frequency*

*WireScope 350 Channel ELFEXT accuracy on each of the pair combinations used for ELFEXT measurement.*

*The WireScope accuracy margin with respect to the Level III limit is substantial.*

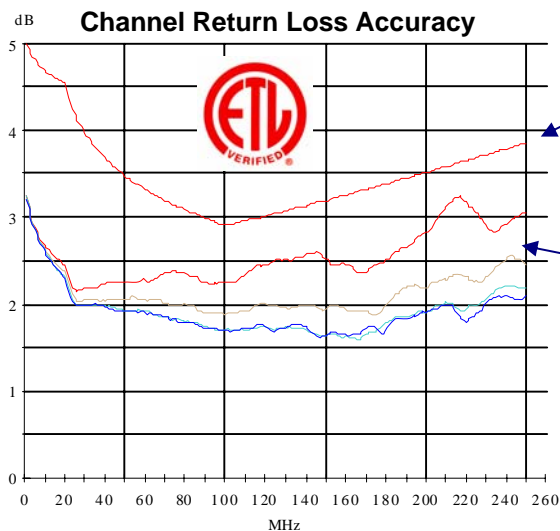
## Return Loss Accuracy

Return loss accuracy is also determined by summing the error terms that contribute to the return loss measurement error.



*Level III return loss Permanent Link accuracy limit calculated by summing all error terms and plotting the limit over frequency*

*WireScope 350 Permanent Link return loss accuracy on each pair*



*Level III return loss Channel accuracy limit calculated by summing all error terms and plotting the limit over frequency*

*WireScope 350 Channel return loss accuracy on each pair.*

*The WireScope accuracy margins with respect to the Level III limit are substantial.*

## Dynamic Range

Some manufacturers of field test equipment publish confusing accuracy specifications by specifying Dynamic Range. As should be evident from the above error models, Dynamic Range is not specified as part of the Level III accuracy model. Dynamic range can never be specified without specifying accuracy **at this range**. Generally, the higher the Dynamic Range the lower the accuracy at this range. It pays to be weary of the specmanship games some manufacturers play. To avoid getting caught, always rely on standards-based accuracy specifications.

## Conclusion

The ETL-witnessed accuracy testing of the WireScope 350 Channel and Permanent Link configurations reveal that the WireScope 350 provides accuracy above the standard requirements.

Furthermore, every WireScope and Dual Remote 350 are fully tested to Level III accuracy in production. Agilent is the only vendor measuring every single tester to Level III accuracy and our production process is also ETL-verified.

Agilent Technologies, Inc.  
WireScope Operation  
753 Forest Street  
Marlborough, MA 01752  
(800) 418-7111 • (508) 486-0400  
Fax (508) 486-0600