

SCTE | **STANDARDS**

Network Operations Subcommittee

SCTE OPERATIONAL PRACTICE

SCTE 289 2024

Operational Practice for Building and Using Calibrated Leaks

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Document Tags

☐ Specification	☐ Checklist	☐ Facility
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☒ Procedure, Process or Method		

Document Release History

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Note: Standards that are released multiple times in the same year use: a, b, c, etc. to indicate normative balloted updates and/or r1, r2, r3, etc. to indicate editorial changes to a released document after the year.

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1. Introduction

1.1. Executive Summary

This operational practice describes two methods to verify the calibration of signal leakage detection equipment: 1) directly-connected radio frequency (RF) signal source, and 2) a calibrated field strength (also known as a calibrated leak) method. It helps cable operators ensure that compliance with Part 76 of the Federal Communications Commission's (FCC) leakage rules is maintained accurately.

This operational practice helps the cable industry ensure reliable network operation and subscriber satisfaction. Some key points are:

- Detailed procedure for using a directly-connected RF source to calibrate leakage detection equipment
- Recommendations on equipment types and configurations
- Detailed procedure for using a resonant half-wave dipole antenna and suitable signal source as a calibrated leak for testing leakage equipment as deployed and used
- Theoretical calculations to support the approach, and explanations for expected variations in results obtained.

1.2. Scope

Calibration of signal leakage detection equipment on a regular basis is mandatory to ensure measurement accuracy. This document covers two general types of calibration that can be used: directly-connected RF signal source and calibrated field strength (aka calibrated leak). The first technique is used to establish the general measurement accuracy of a piece of leakage detection equipment, and the second gauges its ability to measure a known signal leakage field strength in the outdoor environment.

1.3. Benefits

The immediate and long-term benefits of this Operational Practice are:

- Providing methods that can be used by technical personnel at the cable system level to check the accuracy of signal leakage detection equipment
- Ensuring the accuracy of signal leakage field strength measurements, in order to maintain the integrity of cable networks, and to comply with relevant FCC Rules

1.4. Intended Audience

The intended audience for this document is cable system-level technical personnel who are involved with the use of signal leakage detection equipment, their supervisors, and content developers of training material

1.5. Areas for Further Investigation or to be Added in Future Versions

Among the topics to consider for future versions of this document are creating a calibrated leak for leakage detector-equipped aircraft used for flyover measurements.

2. Normative References

The following documents contain provisions which, through reference in this text, constitute provisions of this document. The editions indicated were valid at the time of subcommittee approval. All documents are subject to revision and, while parties to any agreement based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents might not be compatible with the referenced version.

2.1. SCTE References

No normative references are applicable.

2.2. Standards from Other Organizations

No normative references are applicable.

2.3. Other Published Materials

3. Informative References

The following documents might provide valuable information to the reader but are not required when complying with this document.

3.1. SCTE References

- [SMRP] SCTE 183 2023 SCTE Measurement Recommended Practices for Cable Systems, available from <https://www.scte.org/standards/library/catalog/scte-183-scte-measurement-recommended-practices-for-cable-systems/>
- [Field Strength] SCTE 221 2020 Field Strength & Calculation of LTE User Equipment Field Strength
- [Leakage] SCTE 222 2020 Useful Signal Leakage Formulas
- [Math] SCTE 270 2021r1 Mathematics of Cable

3.2. Standards from Other Organizations

No informative references are applicable.

3.3. Other Published Materials

- [Hranac1] Hranac, R. "How to build a calibrated leak." June 1990 *Communications Technology*
- [Johnson] Johnson, R., Jasik, H. (1984). *Antenna Engineering Handbook, Second Edition*. New York: McGraw-Hill
- [Kraus] Kraus, J., R. Marhefka, (2001). *Antennas, Third Edition*. New York: McGraw-Hill
- [Part 76] Title 47, Code of Federal Regulations, Part 76

- [SCTE BDF] “BDF 17 Leakage/LTE interference measurement,” from SCTE Broadband Distribution Fundamentals training course, available from www.scte.org.
- [SEGURA] Segura, N. “OUDP Bursts for High-Split RF Leakage Detection.” Summer 2022 *Broadband Library*. <https://broadbandlibrary.com/oudp-bursts-for-high-split-rf-leakage-detection/>

4. Compliance Notation

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5. Abbreviations and Definitions

5.1. Abbreviations

BNC	bayonet Neill Concelman [connector]
CM	cable modem
CMTS	cable modem termination system
CTA	Consumer Technology Association
CW	continuous wave
dB	decibel
dB _i	decibel isotropic
dBmV	decibel millivolt
d _{km}	distance in kilometers
DOCSIS	Data-Over-Cable Service Interface Specifications
E _{μV/m}	field strength in microvolts per meter
f	frequency
FCC	Federal Communications Commission
FDD	frequency division duplex
FDX	full duplex [DOCSIS]
f _{MHz}	frequency in megahertz
G _{dB_i}	gain, decibel isotropic
G _r	numerical gain of receive antenna
G _t	numerical gain of transmit antenna
IUC	interval usage code