Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS) V.1.2 Using the R&S® SFU

Application Note

The FLO in MediaFLO stands for “forward link only”. MediaFLO technology covers transmission of files and multimedia content to handheld devices.

The FLO device minimum performance specification (MPS) was created to ensure that FLO receivers can receive a FLO service that fulfills the compatibility guidelines of the FLO air interface specification. This Application Note shows how the Broadcast Test System R&S® SFU from Rohde & Schwarz can be used to generate all test scenarios required by the minimum performance specification.
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1 Overview

The FLO in MediaFLO stands for "forward link only". MediaFLO technology covers transmission of files and multimedia content to handheld devices.

As with DVB-H, MediaFLO uses OFDM transmission with approximately 4000 (4K) carriers with either QPSK or 16QAM modulation of the carriers. MediaFLO also uses time division multiplexing, which is similar to what DVB-H refers to as time-slicing, to transmit specific content at specific time intervals. This allows the receiver to be shut down in between these intervals to save power. MediaFLO is mainly used in the USA.

The FLO device minimum performance specification (MPS) [1] was created to ensure that FLO receivers can receive a FLO service that fulfils the guidelines of the FLO air interface specification [2].

The FLO device minimum performance specification contains definitions, test methods and minimum requirements for FLO receivers.

This Application Note shows how the Broadcast Test System R&S® SFU from Rohde & Schwarz can be used to generate all test scenarios stipulated in the minimum performance specification.

In addition, the Rohde & Schwarz MediaFLO device certification system will be briefly presented.

2 General Information About MediaFLO

Numerous brochures and white papers about MediaFLO can be found on the websites of Qualcomm and the FLO Forum. They give readers a better understanding of the technology and the market, and also include comparisons showing the extent to which MediaFLO differs from other mobile TV standards.

For further information, refer to [3] and [4].
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

3 The Broadcast Test System R&S® SFU

The Broadcast Test System R&S® SFU was designed as a platform for different applications and for future options.

It provides a number of instruments and applications in a cabinet of only four height units and offers unrivaled RF and baseband characteristics.

Due to its modular design, the R&S® SFU can be optimally adapted to the requirements of different applications. It is an ideal research and development tool for making improvements to introduced standards and for generating new standard signals. Applications that previously required many different instruments are now fully covered by the R&S® SFU.

The system’s main features:

- Test transmitter for all digital and analog standards
- Bit error ratio meter
- Channel simulator
- Transport stream signal source
- I/Q signal generator
- Power measurement
- High output power
- I/Q interface
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

4 Test Cases in Accordance with MPS Version 1.2 and R&S® SFU Requirements

The Broadcast Test System R&S® SFU allows you to generate a MediaFLO signal that can be used to operate MediaFLO terminals. The test system must have the following minimum configuration:

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S® SFU</td>
<td>Broadcast Test System (base unit)</td>
</tr>
<tr>
<td>R&amp;S® SFU-K22</td>
<td>TRP Player</td>
</tr>
<tr>
<td>R&amp;S® SFU-B10</td>
<td>Coder Extension 10</td>
</tr>
<tr>
<td>R&amp;S® SFU-K10</td>
<td>MediaFLO Coder</td>
</tr>
</tbody>
</table>

In this document, the test system configuration shown in the above table is referred to as the base configuration.

**Important:**

Please note that the required test streams for MediaFLO™ are provided through Qualcomm.

The minimum performance specification describes the five basic test setups listed below, which will be presented in detail in the following:

1. Data/OIS channel testing with fading (7.5.1-1)
2. Co-channel interference tests (7.5.1-2)
3. Tests without fading (7.5.1-3)
4. Tests for adjacent channel selectivity (7.5.1-4)
5. Tests for receiver sensitivity (7.5.1-5)

Besides a test schematic and the R&S SFU options that are required in addition to the base configuration in order to perform the tests, the references to the described test setup within the MPS will be indicated.
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

1st Test Setup: Data/OIS Channel Testing with Fading (7.5.1-1)

Fig. 1: Test schematic for data/OIS channel testing with fading

Necessary R&S® SFU Configuration for Test Setup 1

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
<td></td>
</tr>
<tr>
<td>R&amp;S® SFU-K40</td>
<td>AWGN Noise</td>
</tr>
<tr>
<td>R&amp;S® SFU-B30</td>
<td>Fading Simulator (20 paths)</td>
</tr>
<tr>
<td>R&amp;S® SFU-K30</td>
<td>Enhanced Fading</td>
</tr>
</tbody>
</table>

References to Test Setup 1 within the MPS

- Section 3.1.2.1.2 “Wide-Area Data Channel Demodulation in Multipath Fading Channel”
- Section 3.1.2.2.2 “Wide-Area OIS Channel Demodulation in Multipath Fading Channel”
- Section 4.1.1.1 “Performance of Wide-Area Data Channel with Reed-Solomon Coding in Multipath Fading Channel”
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

2nd Test Setup: Co-channel Interference Tests (7.5.1-2)

Fig. 2: Test schematic for co-channel interference tests

Necessary R&S® SFU Configuration for Test Setup 2

Important:
Please note that two R&S SFU are used for the described test setup.

FLO signal source 1: R&S SFU no. 1

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
<td></td>
</tr>
<tr>
<td>R&amp;S® SFU-B30</td>
<td>Fading Simulator (20 paths)</td>
</tr>
<tr>
<td>R&amp;S® SFU-K30</td>
<td>Enhanced Fading</td>
</tr>
</tbody>
</table>

FLO signal source 2: R&S SFU no. 2

<table>
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<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
<td></td>
</tr>
<tr>
<td>R&amp;S® SFU-B30</td>
<td>Fading Simulator (20 paths)</td>
</tr>
<tr>
<td>R&amp;S® SFU-K30</td>
<td>Enhanced Fading</td>
</tr>
</tbody>
</table>

References to Test Setup 2 within the MPS

- Section 3.1.2.1.3 "Wide-Area Data Channel Demodulation under Fading and Co-channel Interference"
- Section 3.1.2.1.4 “Wide-Area Data Channel Demodulation under Local-Area Changes”
- Section 3.1.2.1.5 “Wide-Area Data Channel Demodulation following Wide-Area Change”
- Section 3.1.2.1.6 “Local-Area Data Channel Demodulation following Local-Area Changes”
- Section 3.1.2.2.3 “Local-Area OIS Channel Demodulation Under Fading and Co-Channel Interference”
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

- Section 3.1.2.3.1 “WIC and LIC Demodulation in Multipath Fading and Co-Channel Interference”

3rd Test Setup: Tests without Fading (7.5.1-3)

Fig. 3: Test schematic for tests without fading

Necessary R&S® SFU Configuration for Test Setup 3

For I) the following R&S SFU configuration must be used:

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
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</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
<td></td>
</tr>
<tr>
<td>R&amp;S® SFU-K40</td>
<td>AWGN Noise</td>
</tr>
<tr>
<td>R&amp;S® SFU-B30</td>
<td>Fading Simulator (20 paths)</td>
</tr>
<tr>
<td>R&amp;S® SFU-K30</td>
<td>Enhanced Fading</td>
</tr>
</tbody>
</table>

For II) the following R&S SFU configuration must be used:

Important:

Please note that the described test setup includes one to two CW generators in addition to the R&S SFU.

FLO signal source 1: R&S SFU

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
<td></td>
</tr>
<tr>
<td>R&amp;S® SFU-B30</td>
<td>Fading Simulator (20 paths)</td>
</tr>
<tr>
<td>R&amp;S® SFU-K30</td>
<td>Enhanced Fading</td>
</tr>
</tbody>
</table>

CW generators:

The CW generators used must meet the specifications under 7.4.4 “CW Generator” of the MPS. CW signals must be capable of being generated at frequencies of up to 6 GHz depending on the test case. For more details, refer to the following MPS references.
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

- The two CW signals in section 3.1.3.2 can be generated using the ARB generator of an additional R&S SFU with the following possible configuration:

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S® SFU-K81</td>
<td>Realtime coder disable</td>
</tr>
<tr>
<td>R&amp;S® SFU-B3</td>
<td>Memory extension 1</td>
</tr>
<tr>
<td>R&amp;S® SFU-K35</td>
<td>ARB generator</td>
</tr>
</tbody>
</table>

- The CW signal described in section 3.1.3.4 can be generated using the R&S SMA100.

References to Test Setup 3 within the MPS

- Section 3.1.2.1.1 “Wide-Area Data Channel Demodulation in AWGN”
- Section 3.1.2.2.1 “Wide-Area OIS Channel Demodulation in AWGN”
- Section 3.1.3.2 “Intermodulation Spurious Response Attenuation”
  (2 x CW; up to 1 GHz)
- Section 3.1.3.4 “Receiver Blocking Characteristics”
  (1 x CW; up to 6 GHz)
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

4th Test Setup: Tests for Adjacent Channel Selectivity (7.5.1-4)

![Test schematic for adjacent channel selectivity]

Fig. 4: Test schematic for adjacent channel selectivity

Necessary R&S® SFU Configuration for Test Setup 4

Important:
Please note that two R&S SFUs are used for the described test setup.

FLO signal source: R&S SFU no. 1

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
<td></td>
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</tbody>
</table>

Interferer source: R&S SFU no. 2

<table>
<thead>
<tr>
<th>Rohde &amp; Schwarz designation</th>
<th>Product designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
<td></td>
</tr>
<tr>
<td>R&amp;S® SFU-B3</td>
<td>Memory Extension 1</td>
</tr>
<tr>
<td>R&amp;S® SFU-K199</td>
<td>Multi ATV Predefined</td>
</tr>
</tbody>
</table>

References to Test Setup 4 within the MPS

- Section 3.1.3.3 “Adjacent Channel Selectivity”
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

5th Test Setup: Tests for Receiver Sensitivity (7.5.1-5)

![FLO signal source](image)

Fig. 5: Test schematic for receiver sensitivity

Necessary R&S® SFU Configuration for Test Setup 5

R&S SFU no. 1: FLO signal source 1

<table>
<thead>
<tr>
<th>Product designation</th>
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</thead>
<tbody>
<tr>
<td>R&amp;S SFU in the base configuration (see page 5)</td>
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</table>

References to Test Setup 5 within the MPS

- Section 3.1.3.1 "Receiver Sensitivity and Dynamic Range"
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

5. The Rohde & Schwarz MediaFLO Device Certification System (FDCS)

The MediaFLO device certification system from Rohde & Schwarz provides manufacturers of MediaFLO terminals with a comprehensive solution for research and development.

The automated FDCS test system ensures that the test scenarios for terminals provided by the FLO Forum are performed correctly in accordance with the minimum performance specification.

The R&S TU8980 is a FLO device certification system of this kind:

For further information about the Device Certification Systems please contact info@rsa.rohde-schwarz.com.
Creating MediaFLO™ Test Scenarios in Accordance with the Minimum Performance Specification (MPS)

6 References


7 Additional Information


Please send any comments or suggestions about this Application Note to Broadcasting-TM-Applications@rohde-schwarz.com.
8 Ordering Information

BROADCAST TEST SYSTEM
R&S® SFRU 2110.2600.02

DOCUMENTATION
R&S® SFRU-DCV 2083.0400.30

EXTENSION BOARD 1
R&S® SFRU-B1 2110.7424.02

MEMORY-ERWEITERUNG 1
R&S® SFRU-B5 2110.7424.02

MEMORY-ERWEITERUNG 2
R&S® SFRU-B4 2110.7447.02

USER I/O
R&S® SFRU-B6 2110.7447.02

2nd HARD DISK
R&S® SFRU-B6 2110.7551.02

EXTENSION BOARD 10
R&S® SFRU-B10 2110.7747.02

ET INPUT
R&S® SFRU-B11 2110.7747.02

FADING SIMULATOR, 20 PATHS
R&S® SFRU-B9 2110.7551.02

FADING SIMULATOR EXTENSION
R&S® SFRU-C1 2110.7551.02

HIGHER OUTPUT POWER
R&S® SFRU-C5 2110.8000.02

CODER DVBT-TM, 2K4K/6K-COFDM
R&S® SFRU-K1 2110.7331.02

CODER DVBC
R&S® SFRU-K2 2110.7324.02

CODER DVB-S2/G3E/DSING
R&S® SFRU-K3 2110.7330.02

CODER ATSC/8VSB
R&S® SFRU-K4 2110.7353.02

CODER J330
R&S® SFRU-K5 2110.7353.02

CODER TDS-OFDM (DMB-T CHINA)
R&S® SFRU-K7 2110.7382.02

CODER DVB-SZ BROADCAST SERVICE
R&S® SFRU-K8 2110.7382.02

CODER DIRECTV
R&S® SFRU-K9 2110.7401.02

CODER MEDIAFLO
R&S® SFRU-K10 2110.7524.02

CODER T-DMB/DBS
R&S® SFRU-K11 2110.7515.02

TSC GENERATOR, SDTV TEST- IMPRIMITIVE AND PLAYER
R&S® SFRU-K20 2110.7475.02

TRP REORDER AND PLAYER
R&S® SFRU-K21 2110.7482.02

TRP PLAYER
R&S® SFRU-K22 2110.7495.02

DYNAMICAL FADING UND ERHOhte
R&S® SFRU-K20 2110.7550.02

INTERFERER MANAGEMENT
R&S® SFRU-K27 2110.7847.02

NOISE GENERATOR A/VON, DIGITAL
R&S® SFRU-K40 2110.7652.02

PHASE NOISE IMPULSE NOISE
R&S® SFRU-K41 2110.7650.02

MULTIVOX
R&S® SFRU-K42 2110.7675.02

SW FOR POWER MEASUREMENT
R&S® SFRU-K45 2110.7742.02

BER MEASUREMENT
R&S® SFRU-K50 2110.7782.02

EXTENDED ANALOG-KQ IN
R&S® SFRU-K50 2110.7853.02

REALTIME DISABLED
R&S® SFRU-K51 2110.7880.02

REALTIME ENABLED
R&S® SFRU-K52 2110.7979.02

MULTIVOX FREEDRIVEN
R&S® SFRU-K100 2110.7410.02

T-DMB STREAMS
R&S® SFRU-K21 2110.4285.02

T-DMB WAVEMFORM
R&S® SFRU-K25 2110.4277.02

OGB-H
R&S® SFRU-K100 2110.4425.02

DRM
R&S® SFRU-K253 2110.4880.02

DTV INTERFERER
R&S® SFRU-K354 2083.0400.30

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