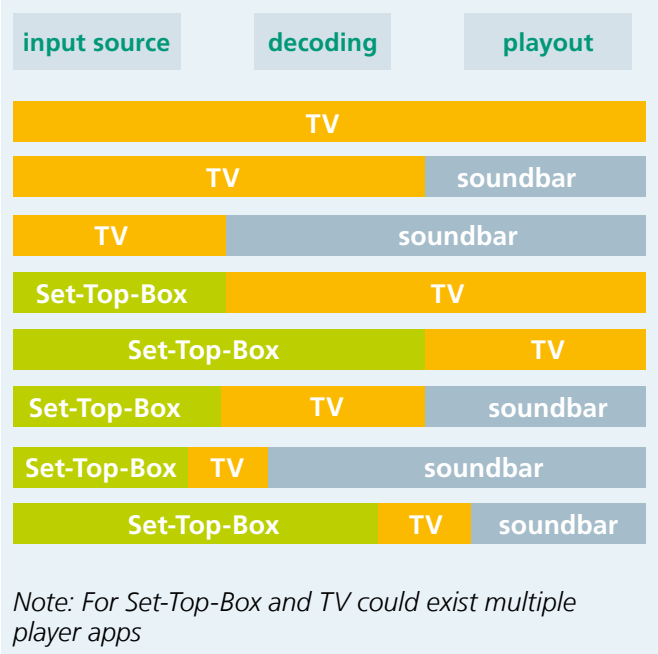
Loudness Verification Guide

TEST STREAMS

The test set consists of 12 test streams, three for each AAC-LC, MPEG-H Audio, AC-3, and E-AC-3. All test streams contain 500 Hz to 2 kHz pink noise at three different loudness levels, namely, -16, -24, and -31 LKFS.

If the loudness normalization of the MPEG-H Audio, AC-3, and E-AC-3 codecs works, all 3 test streams play at the same volume, despite having different audio levels (-16, -24, and -31 LKFS). If the loudness normalization for each codec is set to the same level, all nine test streams should play at the same volume.

AAC-LC does not contain loudness information. That means the test streams should play out on three different volume levels (matching -16, -24, -31 LKFS).



Note: For Set-Top-Box and TV could exist multiple player apps

TESTING CONCEPT

If the MPEG-H Audio, AC-3, and E-AC-3 test signals are played at the same level as the -31 LKFS AAC-LC test signal, the target loudness of the playout device is most likely -31 LKFS and all codecs normalize to it. In addition to that, normalization to -31 LKFS indicates a high-quality playout device, which can reproduce the maximum loudness or peak level (-1dB) of a content piece up to 30dB louder than its average loudness (-31dB).

High-end speakers, soundbars, AVRs, and other devices meant to deliver a theatrical experience require a high peak sound pressure level (SPL) capability of min. 110 dB. They can therefore be expected to normalize to -31 LKFS.

Mobile devices like tablets have limited peak sound pressure levels. Their maximum loudness or peak level for content playback is usually only 15dB more than the average loudness. Therefore, they should be set to a target loudness of -16 LKFS and match the -16 LKFS AAC-LC file.

For more information and recommendations regarding target levels for devices based on their maximum SPL, please refer to ANSI/CTA-2075.

TESTING PROCESS

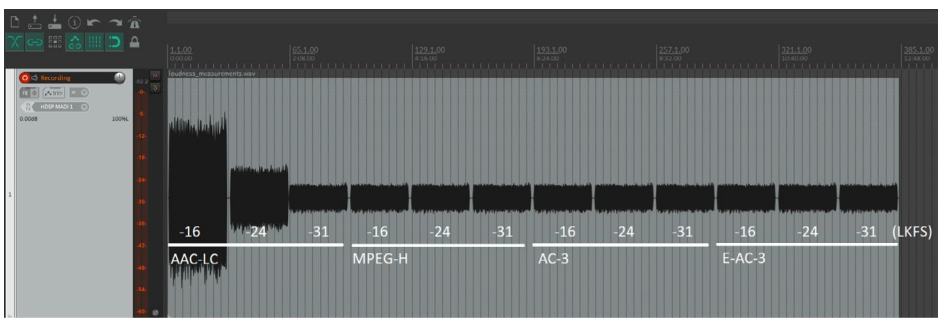
1 Download test signals and save them on the playout device.

2 Take some time to check your setup:

- **A** This can include just one device if you play the files on a TV or PC.
- **B** This can include two devices if you play from a Set-Top-Box to a TV, or from a TV to a soundbar.
- **C** This can include many devices if you play from a Set-Top-Box to a TV which outputs audio to a soundbar.
- **D** In complex setups, it's important to be aware of which device is decoding and which passes the audio trough. For example, AC-3 could be passed through a TV to a soundbar while AAC-LC is decoded in the TV and PCM is sent to the soundbar. In cases like this, make sure all devices sending PCM have an output loudness level of 100%.
- **E** Modern high-end devices may come with virtualizer, leveler, or DRC modes like »late night". Please deactivate these tools for this test. Most AVRs, for example, have a »Pure Direct"-option which plays out the signal as is.

3 Play all items.

- **A** Listening to the audio output is sufficient to do a rough test, particularly if everything works fine and all non-AAC-LC audio is at the same level.
- **B** A more precise measurement setup includes an audio recording device with DAW software to show the amplitude on a dB scale. The result for a measurement with an AVR could look like this:



4 Results:

- **A** If test streams of one codec (not AAC-LC) play out at the same loudness the internal loudness normalization works.
- **B** If all codecs (not AAC-LC) play at the same loudness, they are all set to the same target device class. This ensures that there are no loudness jumps when switching between codecs.
- **C** If all codecs play at the same level, the AAC-LC item indicates the class of the playback device. Their playing at the level of the -31 LKFS AAC-LC item, for example, indicates the target class of -31 LKFS, which usually stands for high-end devices.
- **D** In case of errors, check the device menu or app for settings to activate loudness normalization. It's helpful to search for the term 'normalization' in the device PDF manual. Another solution could be to update your device to the latest firmware.