

## Supplementary listeners' notes for the 2L Test bench

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For some time 2L has maintained a webpage giving access to high definition music files. Recently both MQA and CD release versions have been added for some tracks. <http://www.2l.no/hires/index.html>

Where provided, MQA is available in only one form, having been encoded directly from the original master in its native resolution. The test bench includes several encoded from DXD as well as:

- 2L-120-01 Carl Nielsen: Chaconne op 32 (originally recorded at 44.1 kHz)
- 2L-048 Ola Gjeilo: North Country II (originally recorded at 96 kHz)

### Playback

To get the best result it is important to ensure that your computer is not modifying the output and that you are using a bit-accurate player without post-processing or level control.<sup>1</sup>

If you have an MQA decoder then the light or display will confirm MQA playback. When the MQA indicator shows then the signal path is bit accurate.

### About the MQA files

MQA uses a process called 'music origami' to 'fold' a high-sample-rate signal down to a smaller, lower-data-rate file which can be played back without a decoder. 2L-048 is folded once to 48 kHz 24 bit; 2L-120 has no folds; the others are folded three times from 352.8 to 44.1 kHz 24 bit.

An MQA decoder will restore the original recording and 'unfold' it to optimally match its D/A converter. So, for example, on a mobile device, 2L-111 (which is from DXD) can be unwrapped to 44.1, 88.2 or 176.4 kHz whereas a higher-performance DAC can unfold all the way to 352.8 kHz. The ability of one file to be used in several contexts adds considerably to convenience; you don't need to make a down-sample of big download files to play them in your car, 'phone or 'legacy' equipment. If you have an MQA file it can be listened to without any decoder, it's a simple FLAC file.

The 'origami' process embeds processes that make each version and the undecoded rendering highly optimal. For that reason, MQA claims that the sound quality of the MQA file, when played without a decoder, is at least equal to CD. To facilitate this comparison, 2L have added their CD release of the songs in question.

If you have an MQA decoder then the sound quality will be extremely high and in most cases will avoid shortcomings in the original PCM and uncompensated DAC.

### Morten's notes

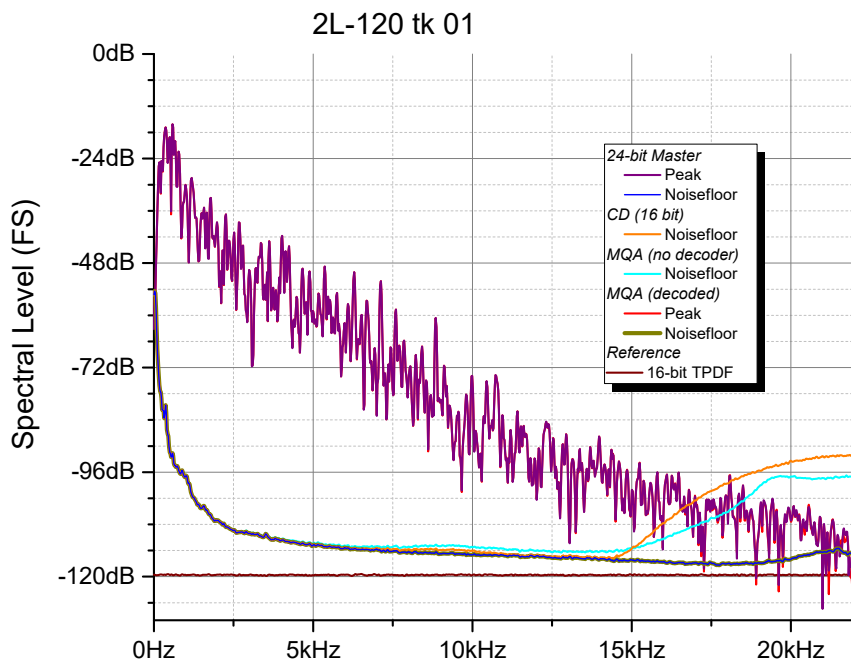
Listening with the Prime I would range the listening quality in the following order:

Ranking	With Decoder ( <i>Meridian Prime</i> )	No Decoder ( <i>Oppo HA-1</i> )
1	MQA	DXD
2	DXD	MQA
3	CD 44.1 /16	CD 44.1 /16

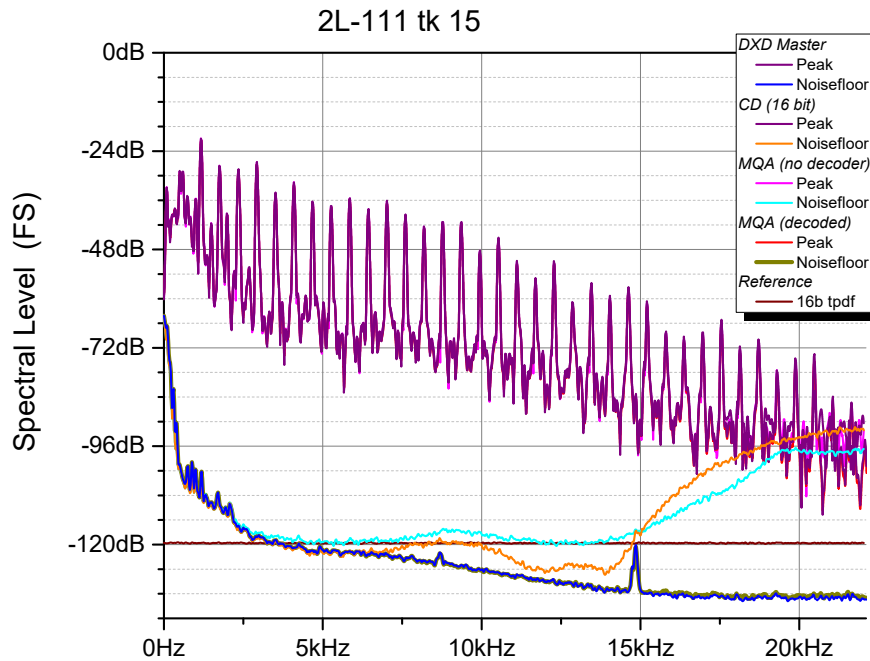
In this ranking therefore the un-decoded MQA is preferred to the CD and with a decoder it is preferred to the original.

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<sup>1</sup> There are notes on the webpage to help MAC users. PC users can safely use *Foobar*, also in Exclusive mode.



Note: the 24-bit Master and MQA (decoded) peak noise curves overlay and are not separately visible.



These graphs confirm that 2L's Original, CD and MQA versions of the files are consistent in level and response. Of course spectral plots using FFT have no time-domain information, but we can use them to compare the peak spectrum of the Original, CD, and MQA with and without a decoder. Also shown is a comparison of the background noise throughout each version and the reference level for 16-bit tpdf dither in a channel sampled at 44.1 kHz.<sup>2 3</sup>

In both graphs the peak and noise-floor curves overlay for both MQA decoded and Original master. In 2L-111-15 we can see that the noise floor in the recording approaches the 18 bit level by 20 kHz and is reproduced by MQA.

We can also see that the shaped HF noise introduced by the MQA encoder and 'heard' without a decoder is removed by the decoder and is also below that of the CD release, even without decoding.

<sup>2</sup> The analysis uses 21.53Hz bins (=44100/2048 and 351800/16384) giving an offset of +13.33 dB wrt 1Hz.

<sup>3</sup> 2L sensibly use shaped quantisation for their CD releases.