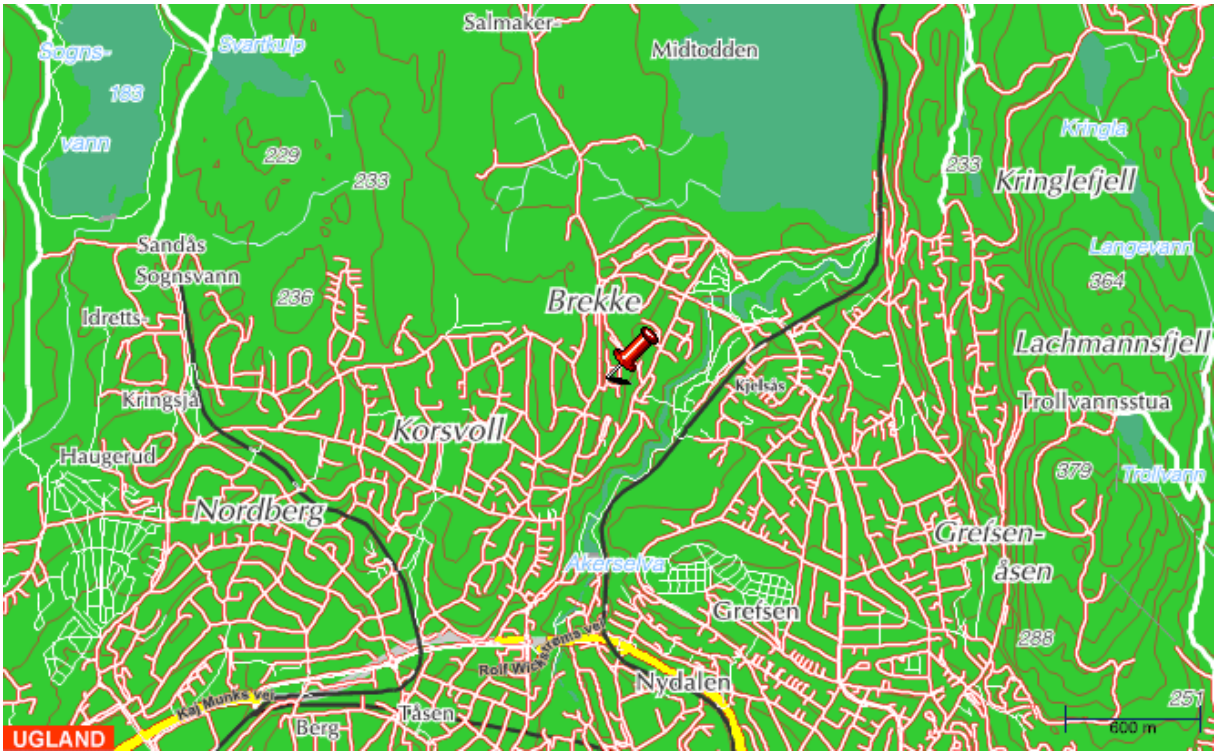
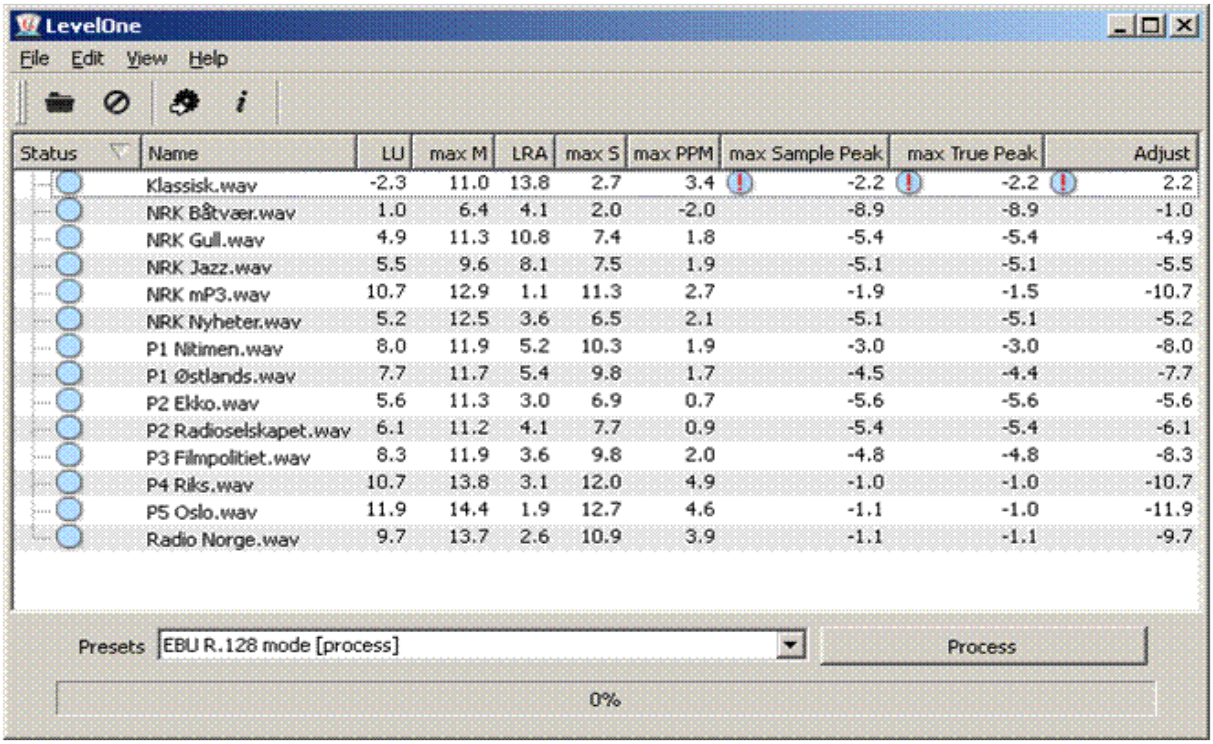
Loudness normalization on DAB in Norway

The setup used for measuring was very simple: A DAB-receiver, a sound card and a PC. The receiver did not scale the levels and the audio never left the digital domain. One other tuner I tested had audio levels on its digital outputs that followed the volume settings on the remote control.

The DAB signal strength at my home address is very good, so a simple antenna was used. The picture shows predicted coverage, where dark green equals “very good coverage”.



I selected a number of stations to check and then recorded about 15 minutes of each (this is about 70% of the stations available). The recordings were then analyzed and normalized with Grimm Audio's LevelOne in EBU mode, i.e. 0 LU = -23 LUFS.

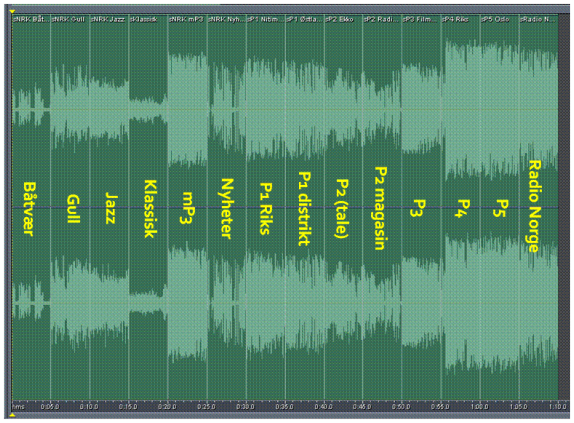


Status	Name	LU	max M	LRA	max S	max PPM	max Sample Peak	max True Peak	Adjust
	Klassisk.wav	-2.3	11.0	13.8	2.7	3.4	-2.2	-2.2	2.2
	NRK Båtvær.wav	1.0	6.4	4.1	2.0	-2.0	-8.9	-8.9	-1.0
	NRK Gull.wav	4.9	11.3	10.8	7.4	1.8	-5.4	-5.4	-4.9
	NRK Jazz.wav	5.5	9.6	8.1	7.5	1.9	-5.1	-5.1	-5.5
	NRK mP3.wav	10.7	12.9	1.1	11.3	2.7	-1.9	-1.5	-10.7
	NRK Nyheter.wav	5.2	12.5	3.6	6.5	2.1	-5.1	-5.1	-5.2
	P1 Nitimen.wav	8.0	11.9	5.2	10.3	1.9	-3.0	-3.0	-8.0
	P1 Østlands.wav	7.7	11.7	5.4	9.8	1.7	-4.5	-4.4	-7.7
	P2 Ekko.wav	5.6	11.3	3.0	6.9	0.7	-5.6	-5.6	-5.6
	P2 Radioselskapet.wav	6.1	11.2	4.1	7.7	0.9	-5.4	-5.4	-6.1
	P3 Filmpolitiet.wav	8.3	11.9	3.6	9.8	2.0	-4.8	-4.8	-8.3
	P4 Riks.wav	10.7	13.8	3.1	12.0	4.9	-1.0	-1.0	-10.7
	P5 Oslo.wav	11.9	14.4	1.9	12.7	4.6	-1.1	-1.0	-11.9
	Radio Norge.wav	9.7	13.7	2.6	10.9	3.9	-1.1	-1.1	-9.7

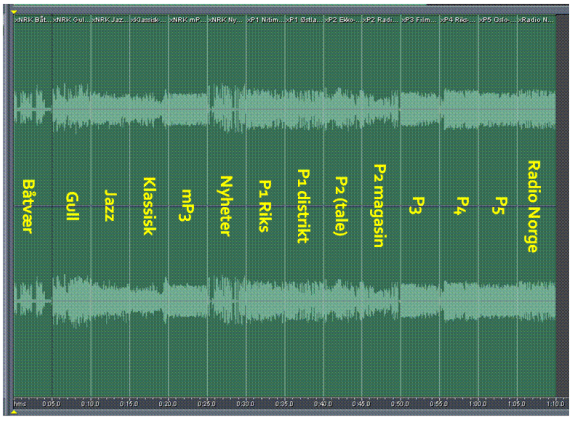
The measurements show a difference in loudness of 14.2 LU. That is quite a jump in level! As expected, NRK's classical station (top row) came out with the lowest level (-25.3 LUFS) and largest loudness range (LRA = 13.8 LU), but also with the highest peaks, so high that LevelOne gives a warning. This channel cannot be normalized to -23 LUFS without peak limiting.

The loudest stations are those that also use heavy compression. So their output levels are very consistent and therefore easy to normalize.

Then I made a "zapper" demo to mimic the situation when you switch between stations on your tuner. Without listening to the raw recordings on beforehand, I decided to copy 5 seconds from each station recording, starting 60 seconds into each recording. I did this on both the original files and on the normalized files. It is important to note that I used the full length recordings for normalization, not the 5 seconds clips.

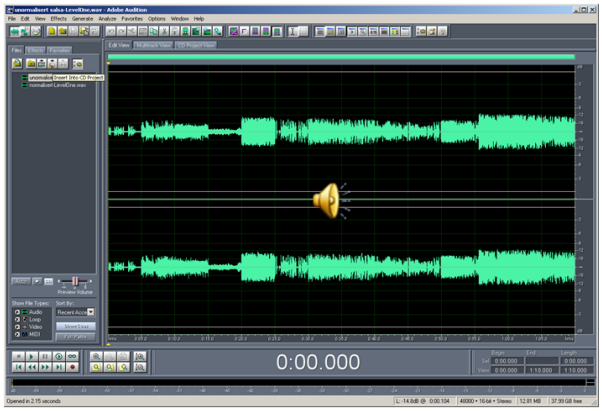


Before normalization

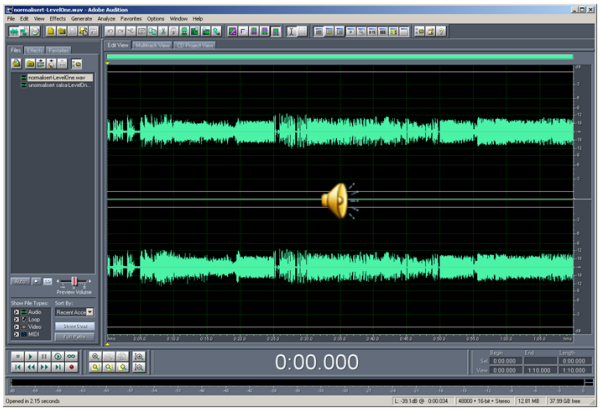


After normalization

To match the levels before and after normalization, I made a new normalization….



Before normalization



After normalization

This crude way of editing audio is not very artistic, but it clearly shows what loudness normalization can do for the listeners. I have included the “before” and “after” audio files in 160 kbps MP3 format. Oh – by the way – the crappy sounding first 5 seconds is from a low bitrate weather service ☺

Why we chose -15 LUFS as target level.

You may wonder why we did not settle for -23 LUFS right away. This has to do with several aspects, the most important one is the level matching between DAB and FM/WiFi in multiformat receivers. Unlike FM, there is no established standard for levels on DAB. So the levels you get out of your receiver are decided by the manufacturer.

In Norway, people like to listen to radio when they are on the move. Our topology is great for skiing but bad for radio reception. So we have many road tunnels, most with FM coverage but so far no DAB coverage. When you listen to DAB in your car and enter a road tunnel, your receiver then switches to FM. A level jump of 5 to 10 dB would be dangerous! From our (not very scientific) findings, the best match in level between DAB and FM seem to be with DAB @ -15 LUFS.

With FM switch off in Norway in 2017 (may be) or 2019 (definitely), this level matching problem will soon be history and we can back down towards -23 LUFS.

We also decided to exclude the classical channel from normalization. We do not want to compromise their sound quality. And people expect the level to be lower when they switch to a classical station. (BTW: This channel is not a “light classical channel” as we have observed in some other countries, they offer full symphonic works, operas etc.)

What I would like to see in the near future is that the previously loud channels start to back down on their hyper compression. There is no need for such high levels of compression on DAB now that the loudness war is over. I know that this is part of their “sound” and they may sound the same on DAB as on FM, but….. On the other hand, we also know how hyper compressed the music can be from some of the record companies providing us with “music”. Garbage in, garbage out!

What if…..

Unlike FM, there is no “level police” on DAB. So what if one channels decides to pull up their level? Well, so far we have had a very good cooperation between the big broadcasters in Norway, starting some years ago with agreements on how to behave on FM. And the smaller broadcasters are not on DAB – yet….

We have agreed to monitor each other and recommend level changes if we find that someone is too loud or too soft. There may come some new kids on the block and we might have to deal with them in the future. But so far the results are very promising and everyone is happy!

EBU Tech 3344 describes in detail how to measure and how to alter levels. We (the NRK) will probably implement this within the next two years.

Picture from the “historic” loudness meeting at Lillehammer. From left to right: Olav Fostås (MTG), Dag Gulbrandsen (NRK), Kristoffer Løkke-Sørensen (MTG), John-Arne Sviggum (MTG), Henning Lie (SBS), Hans Petter Danielsen (MTG), Petter Hox (NRK), Bjørn Aarseth (NRK).

BTW, if you want to know more about DAB I Norway, please click this link:
http://www.digitalradionorge.no/in-english

Oslo, Norway, Sunday, February 12, 2012

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