

Loudness normalisation in distribution

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Production

Broadcasting

Distribution



For
everyone!



*Analogue
modulation*

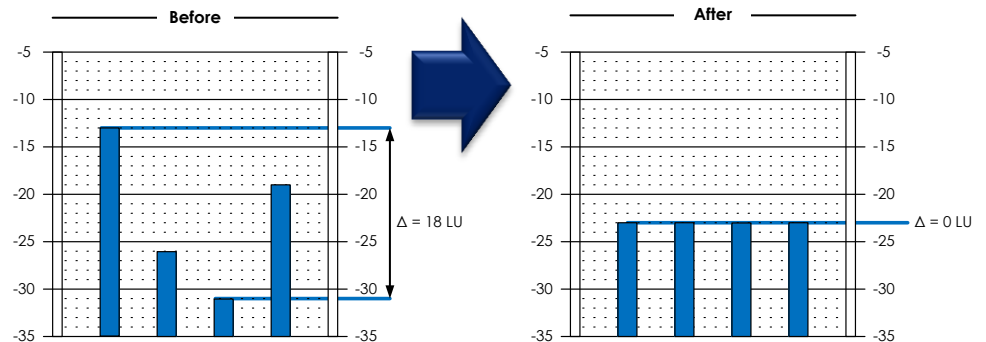
DOLBY
DIGITAL

MPEG2

DOLBY
DIGITAL PLUS

NICAM
DIGITAL STEREO

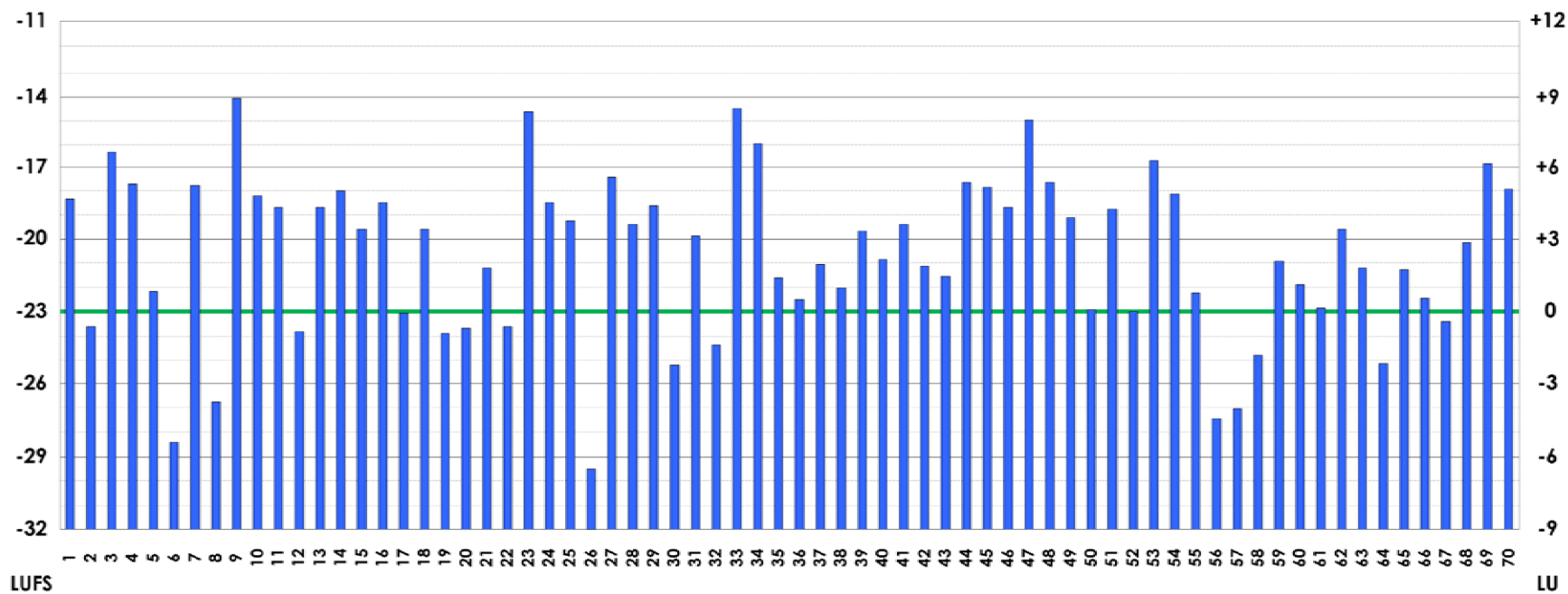
AAC

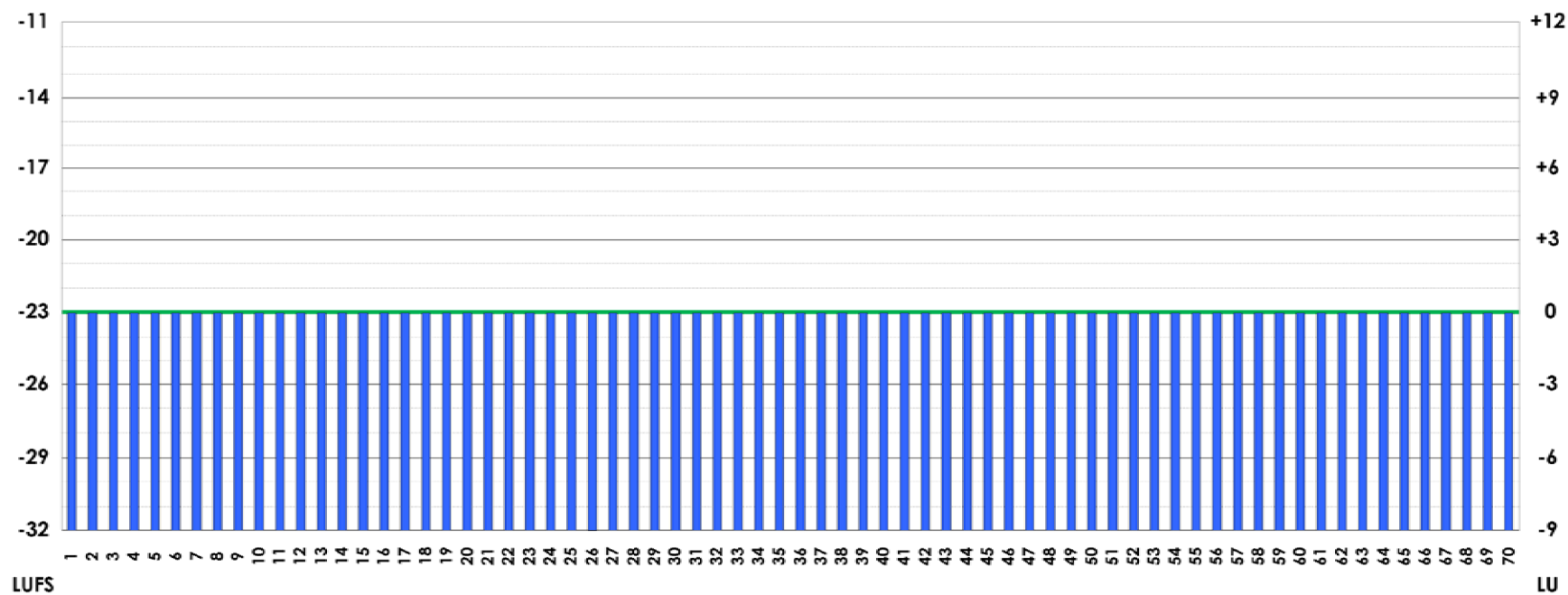


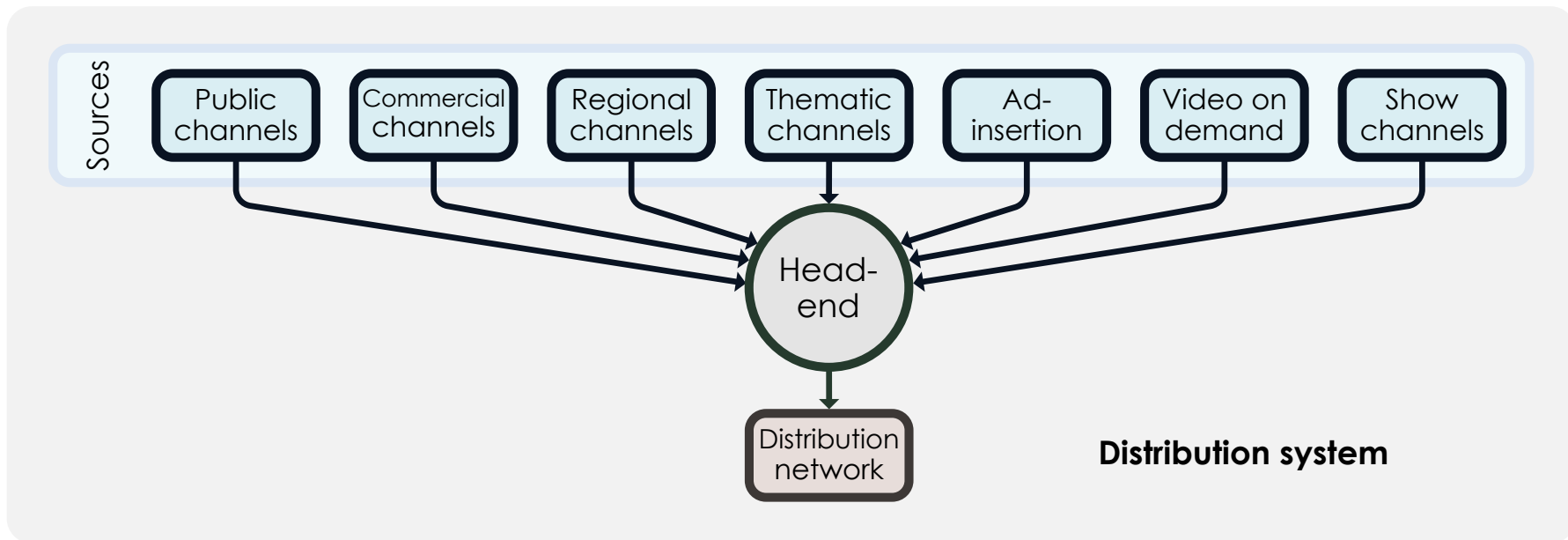
Loudness
normalisation

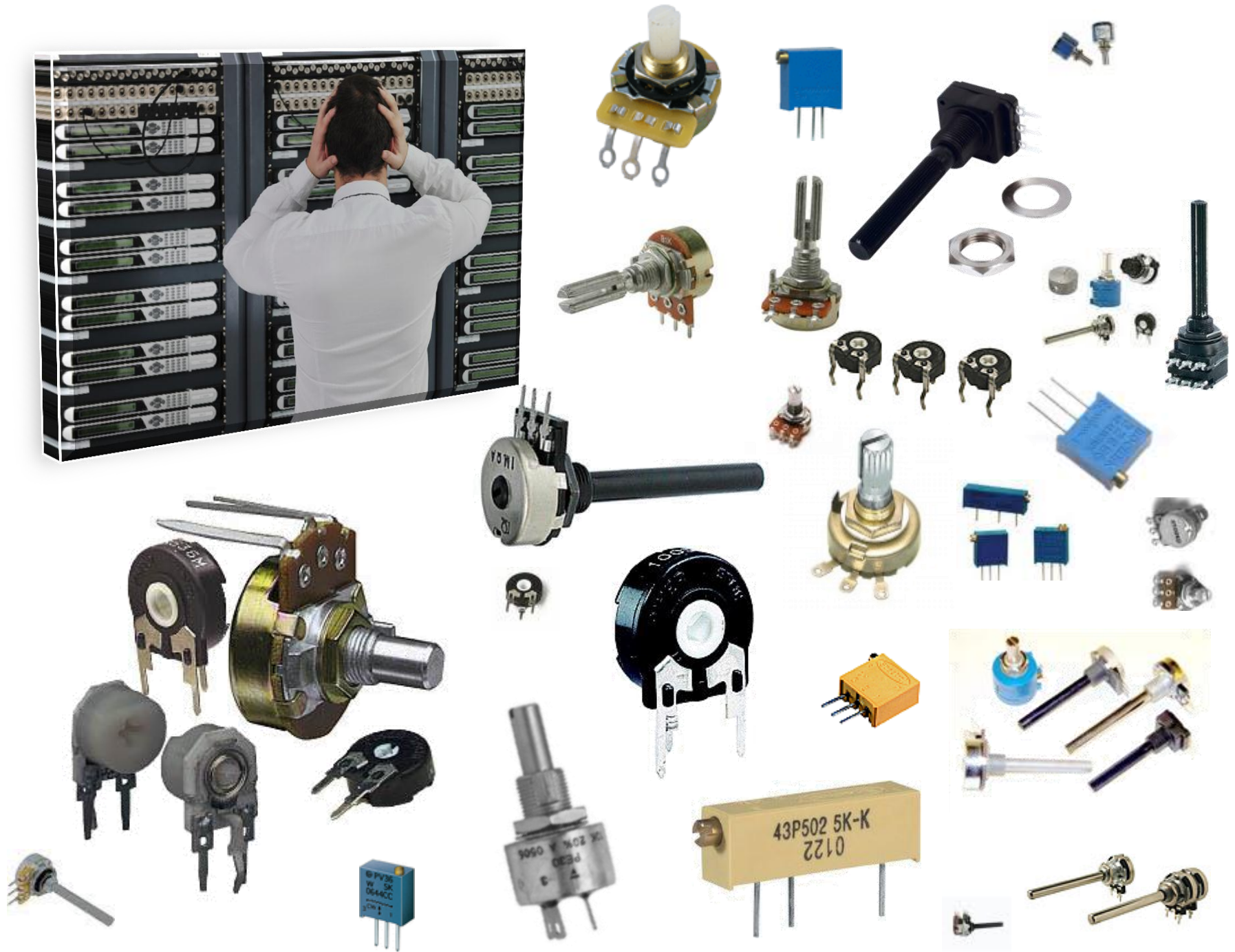


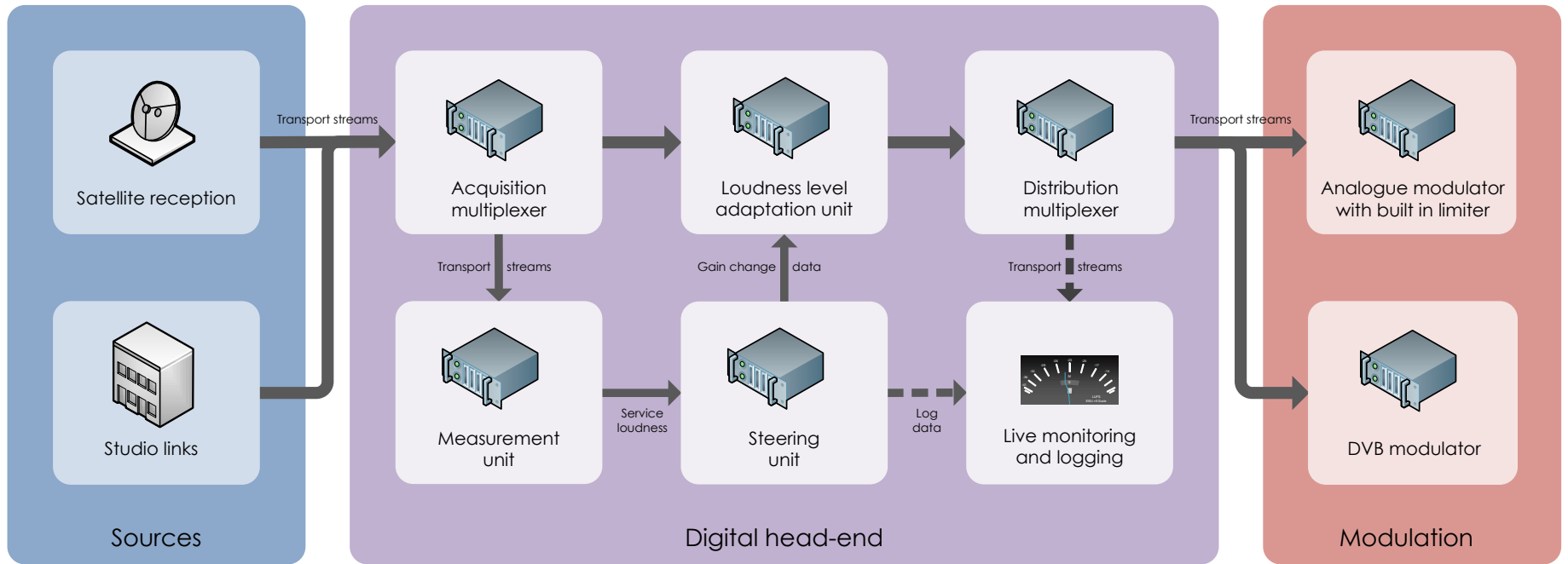












START

24 hour loudness
measurement

03:00 a.m.
Block 1

04:00 a.m.
Block 2

05:00 a.m.
Block 3

06:00 a.m.
Block 4

07:00 a.m.
Block 5

08:00 a.m.
Block 6

09:00 a.m.
Block 7

10:00 a.m.
Block 8

11:00 a.m.
Block 9

12:00 p.m.
Block 10

01:00 p.m.
Block 11

02:00 p.m.
Block 12

03:00 p.m.
Block 13

04:00 p.m.
Block 14

05:00 p.m.
Block 15

06:00 p.m.
Block 16

07:00 p.m.
Block 17

08:00 p.m.
Block 18

09:00 p.m.
Block 19

10:00 p.m.
Block 20

11:00 p.m.
Block 21

12:00 p.m.
Block 22

01:00 a.m.
Block 23

02:00 p.m.
Block 24

Selection of highest
blocks within ± 1 LU

-22.8 LUFS

-24.8 LUFS

-26.5 LUFS

-25.2 LUFS

-22.1 LUFS

-22.2 LUFS

-22.9 LUFS

-22.4 LUFS

-21.9 LUFS

-22.7 LUFS

-22.5 LUFS

-20.1 LUFS

-23.5 LUFS

-24.4 LUFS

-21.5 LUFS

-22.2 LUFS

-22.3 LUFS

-20.9 LUFS

-20.4 LUFS

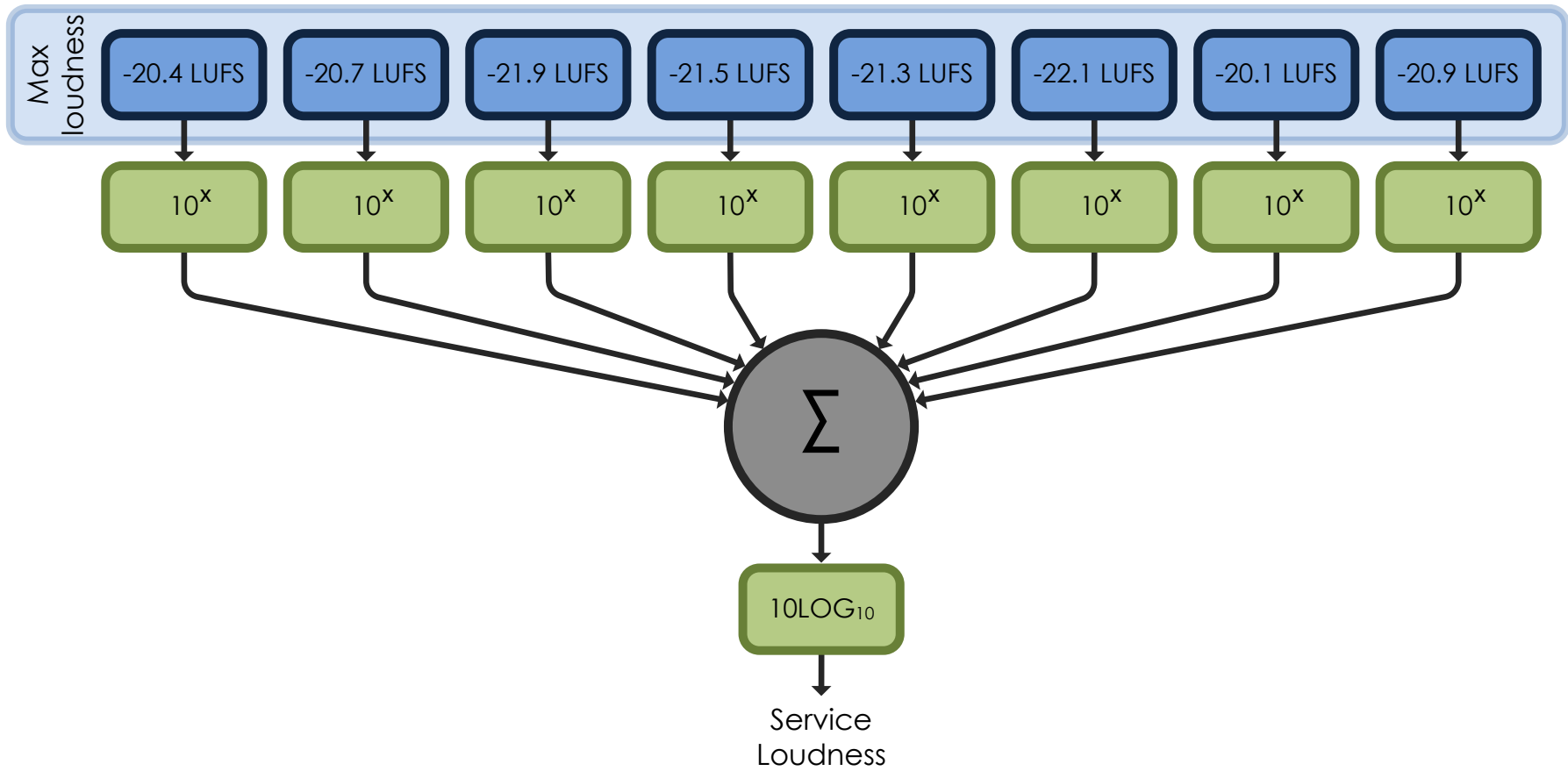
-20.7 LUFS

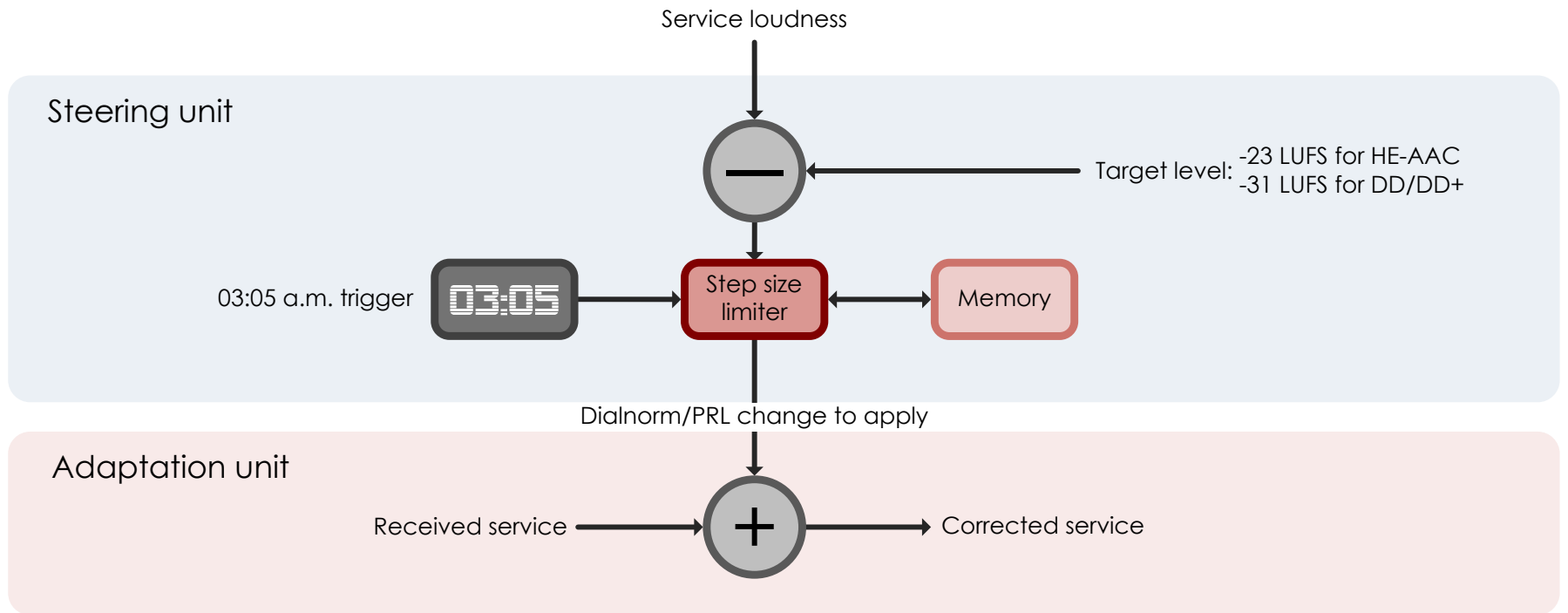
-22.3 LUFS

-21.3 LUFS

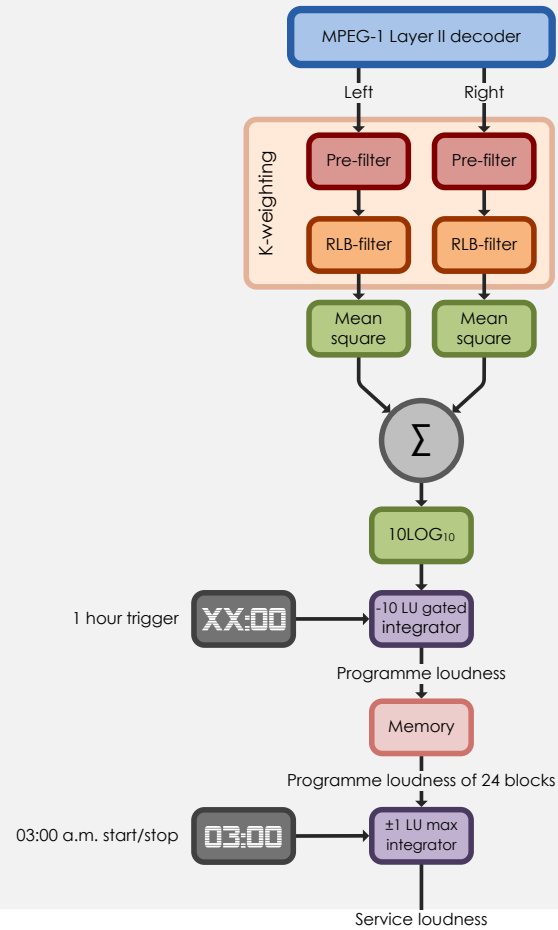
-23.1 LUFS

-22.9 LUFS

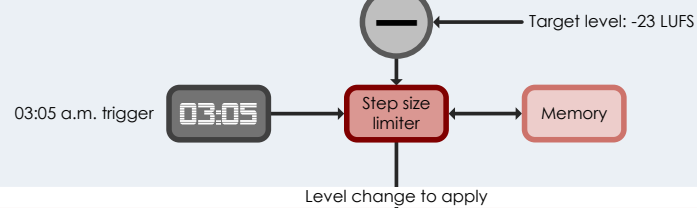




Measurement unit



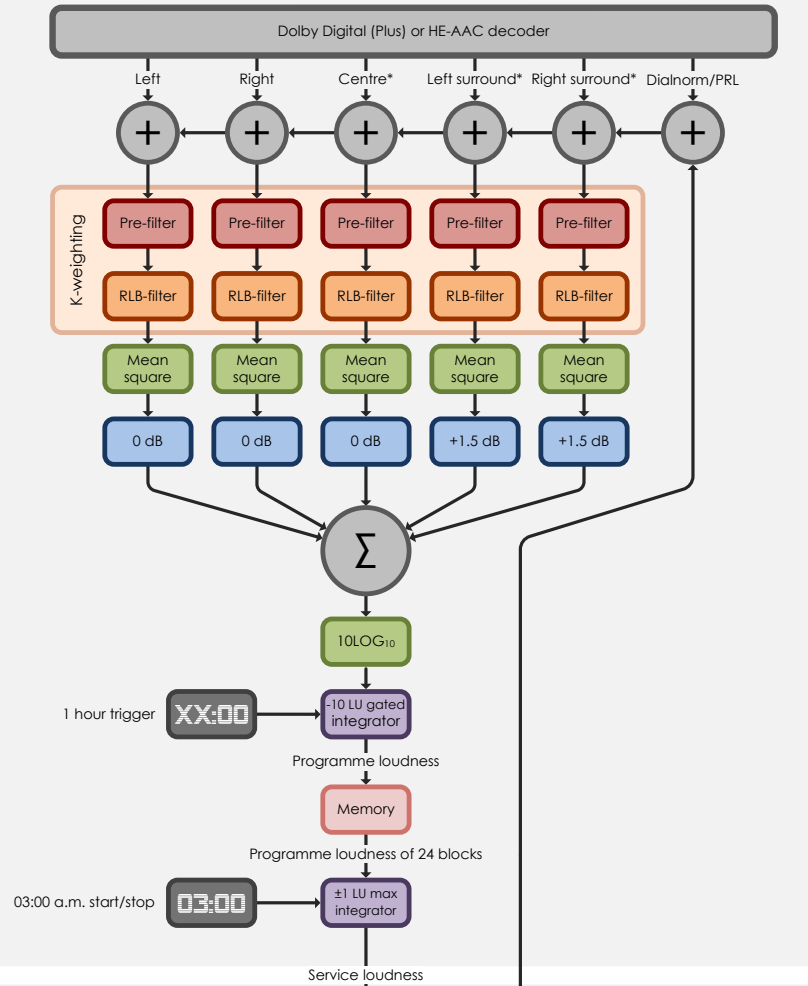
Steering unit



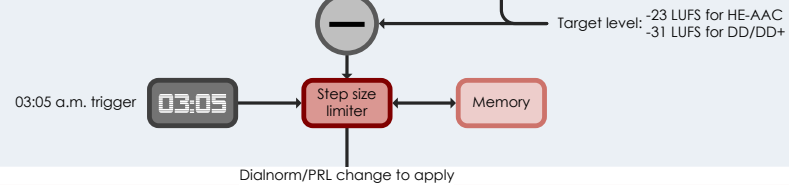
Adaptation unit



Measurement unit



Steering unit



Adaptation unit



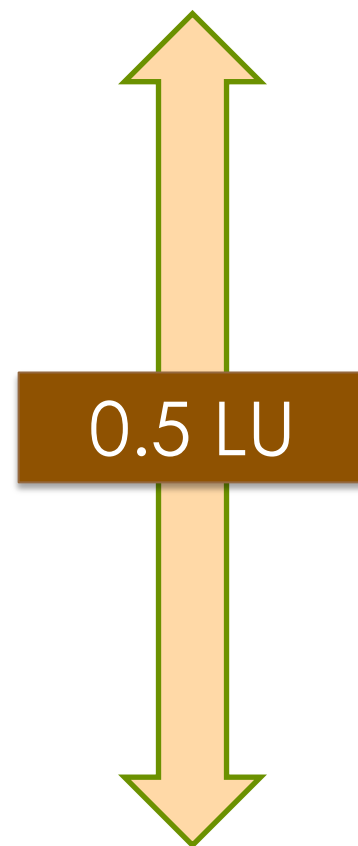


Table 1: Gain adaptation for MPEG-1 Layer II bitstream adaptation systems

Input loudness ⁽¹⁾ LUFS	Loudness error LU	Level change to apply ⁽²⁾ , LU	Corrected loudness LUFS
-5.0	+18.0	-18	-23.0
-6.0	+17.0	-18	-24.0
-7.0	+16.0	-16	-23.0
-8.0	+15.0	-16	-24.0
-9.0	+14.0	-14	-23.0
-10.0	+13.0	-14	-24.0
-11.0	+12.0	-12	-23.0
-12.0	+11.0	-12	-24.0
-13.0	+10.0	-10	-23.0
-14.0	+9.0	-10	-24.0
-15.0	+8.0	-8	-23.0
-16.0	+7.0	-8	-24.0
-17.0	+6.0	-6	-23.0
-18.0	+5.0	-6	-24.0
-19.0	+4.0	-4	-23.0
-20.0	+3.0	-4	-24.0
-21.0	+2.0	-2	-23.0
-21.9	+1.1	-2	-23.9
-22.0	+1.0	0	-22.0
-23.0	0.0	0	-23.0
-24.0	-1.0	0	-24.0
-24.1	-1.1	+2	-22.1
-25.0	-2.0	+2	-23.0
-26.0	-3.0	+4	-22.0
-27.0	-4.0	+4	-23.0
-28.0	-5.0	+6	-22.0
-29.0	-6.0	+6	-23.0
-30.0	-7.0	+8	-22.0
-31.0	-8.0	+8	-23.0
-32.0	-9.0	+10	-22.0

2 LU

↑
Unity gain range
↓

Table 2: Gain adaptation for DD/DD+ metadata adaptation systems

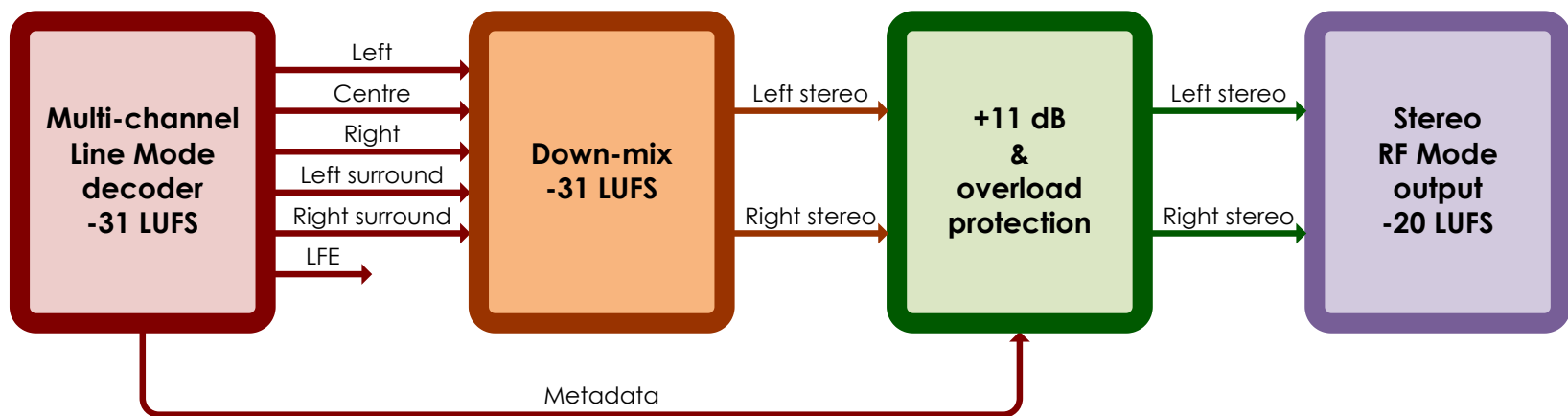
Input loudness ^(1, 2) LUFS	Loudness error LU	Dialnorm change to apply ⁽³⁾	Corrected loudness LUFS	
-13.0	+18.0	+18	-31.0	
-14.0	+17.0	+17	-31.0	
-15.0	+16.0	+16	-31.0	
-16.0	+15.0	+15	-31.0	
-17.0	+14.0	+14	-31.0	
-18.0	+13.0	+13	-31.0	
-19.0	+12.0	+12	-31.0	
-20.0	+11.0	+11	-31.0	
-21.0	+10.0	+10	-31.0	
-22.0	+9.0	+9	-31.0	
-23.0	+8.0	+8	-31.0	
-24.0	+7.0	+7	-31.0	
-25.0	+6.0	+6	-31.0	
-26.0	+5.0	+5	-31.0	
-27.0	+4.0	+4	-31.0	
-28.0	+3.0	+3	-31.0	
-29.0	+2.0	+2	-31.0	
-29.9	+1.1	+1	-30.9	
-30.0	+1.0	0	-30.0	<div>↑</div> <div>Unity gain range</div> <div>↓</div>
-31.0	0.0	0	-31.0	
-32.0	-1.0	0	-32.0	
-32.1	-1.1	-1	-31.1	
-33.0	-2.0	-2	-31.0	
-34.0	-3.0	-3	-31.0	
-35.0	-4.0	-4	-31.0	
-36.0	-5.0	-5	-31.0	
-37.0	-6.0	-6	-31.0	
-38.0	-7.0	-7	-31.0	
-39.0	-8.0	-8	-31.0	
-40.0	-9.0	-9	-31.0	

1 LU

Table 3: Gain adaptation for HE-AAC metadata adaptation system

Input loudness ^(1, 2) LUFS	Loudness error LU	PRL change to apply ⁽³⁾	Corrected loudness LUFS	
-5.0	+18.0	+18	-23.0	
-6.0	+17.0	+17	-23.0	
-7.0	+16.0	+16	-23.0	
-8.0	+15.0	+15	-23.0	
-9.0	+14.0	+14	-23.0	
-10.0	+13.0	+13	-23.0	
-11.0	+12.0	+12	-23.0	
-12.0	+11.0	+11	-23.0	
-13.0	+10.0	+10	-23.0	
-14.0	+9.0	+9	-23.0	
-15.0	+8.0	+8	-23.0	
-16.0	+7.0	+7	-23.0	
-17.0	+6.0	+6	-23.0	
-18.0	+5.0	+5	-23.0	
-19.0	+4.0	+4	-23.0	
-20.0	+3.0	+3	-23.0	
-21.0	+2.0	+2	-23.0	
-21.9	+1.1	+1	-22.9	
-22.0	+1.0	0	-22.0	↑
-23.0	0.0	0	-23.0	Unity gain range
-24.0	-1.0	0	-24.0	↓
-24.1	-1.1	-1	-23.1	
-25.0	-2.0	-2	-23.0	
-26.0	-3.0	-3	-23.0	
-27.0	-4.0	-4	-23.0	
-28.0	-5.0	-5	-23.0	
-29.0	-6.0	-6	-23.0	
-30.0	-7.0	-7	-23.0	
-31.0	-8.0	-8	-23.0	
-32.0	-9.0	-9	-23.0	

1 LU



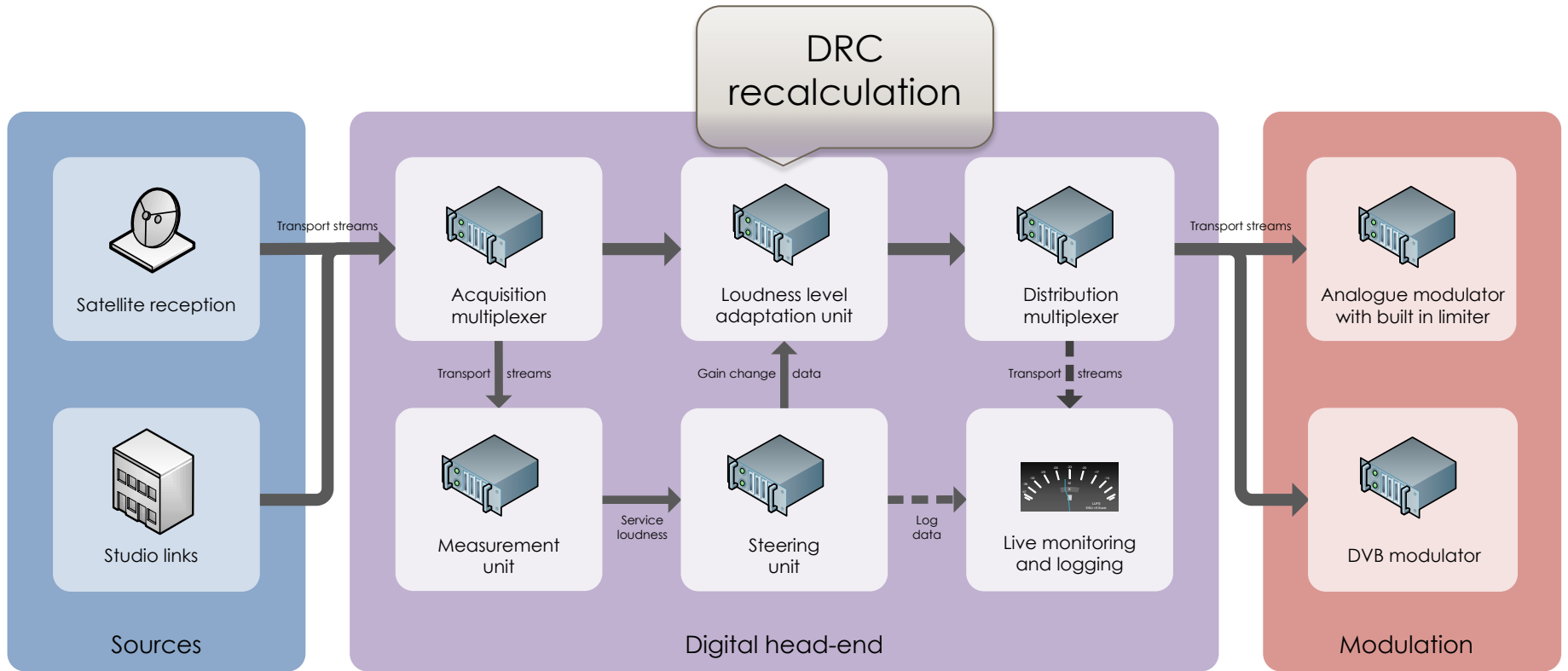
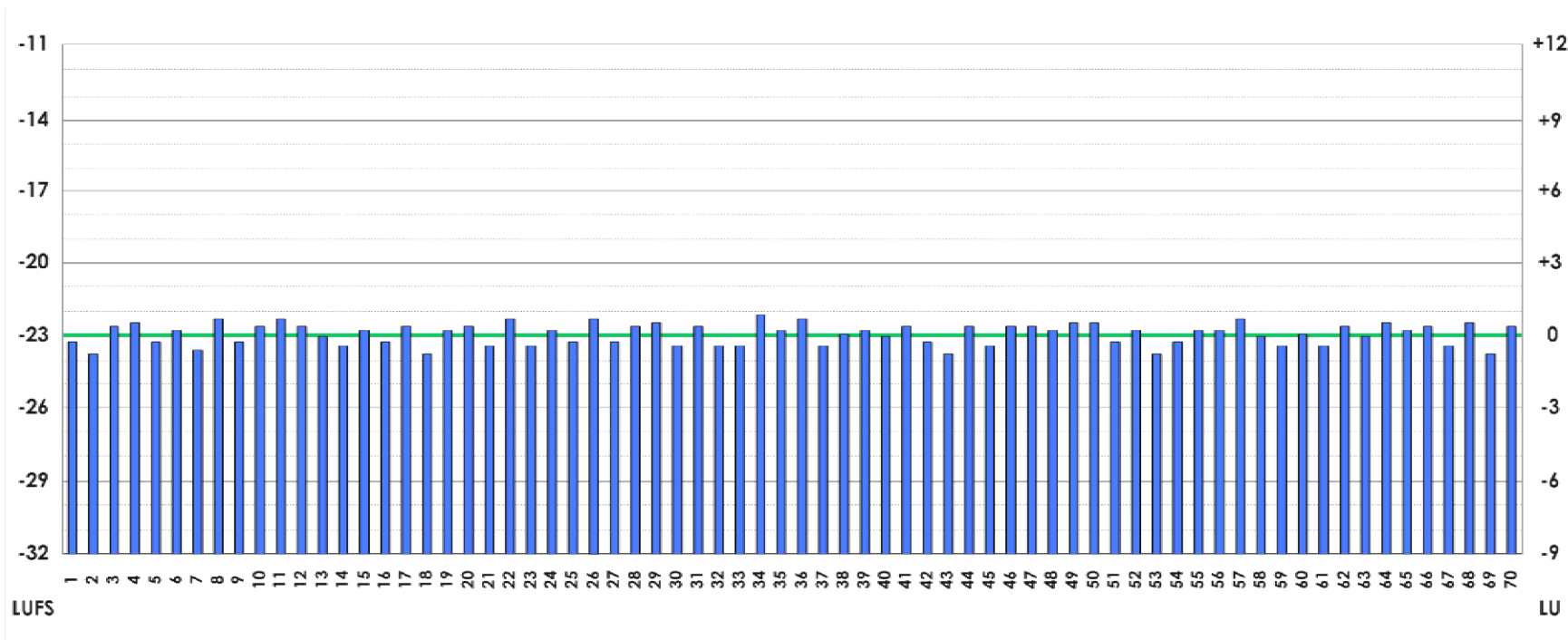


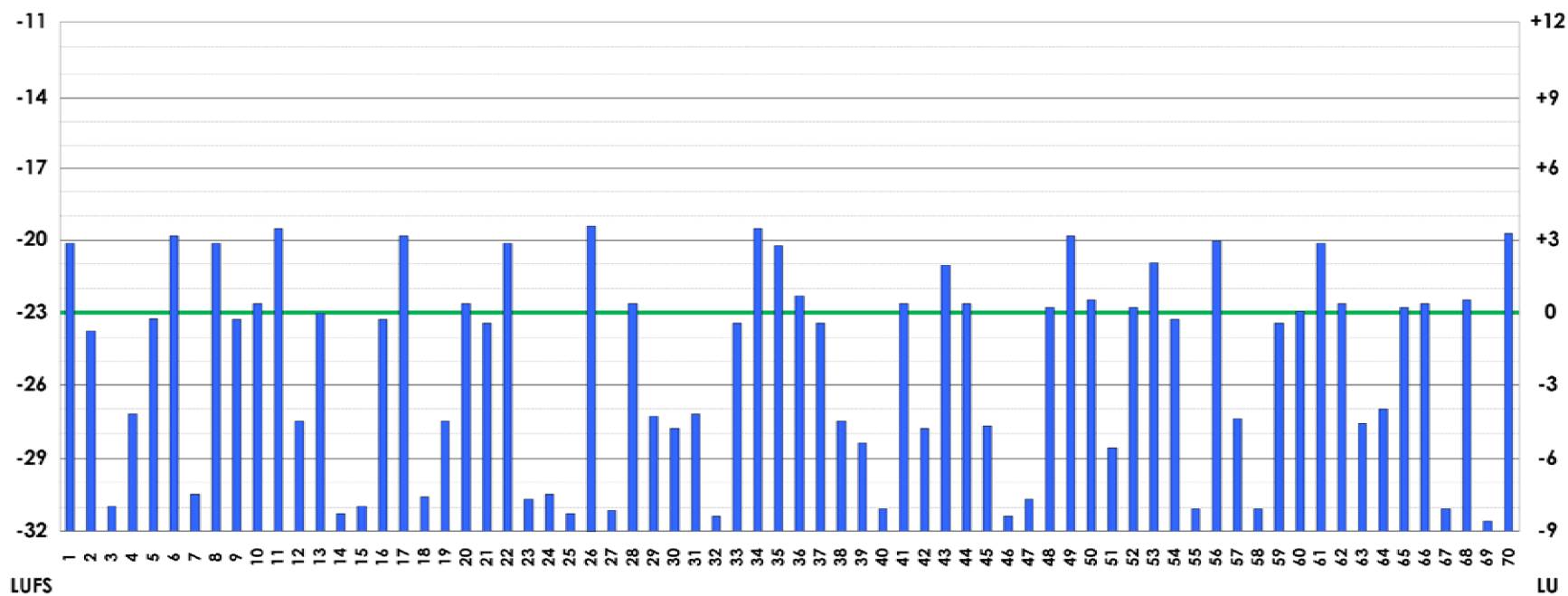
Table 2: Gain adaptation for DD/DD+ metadata adaptation systems

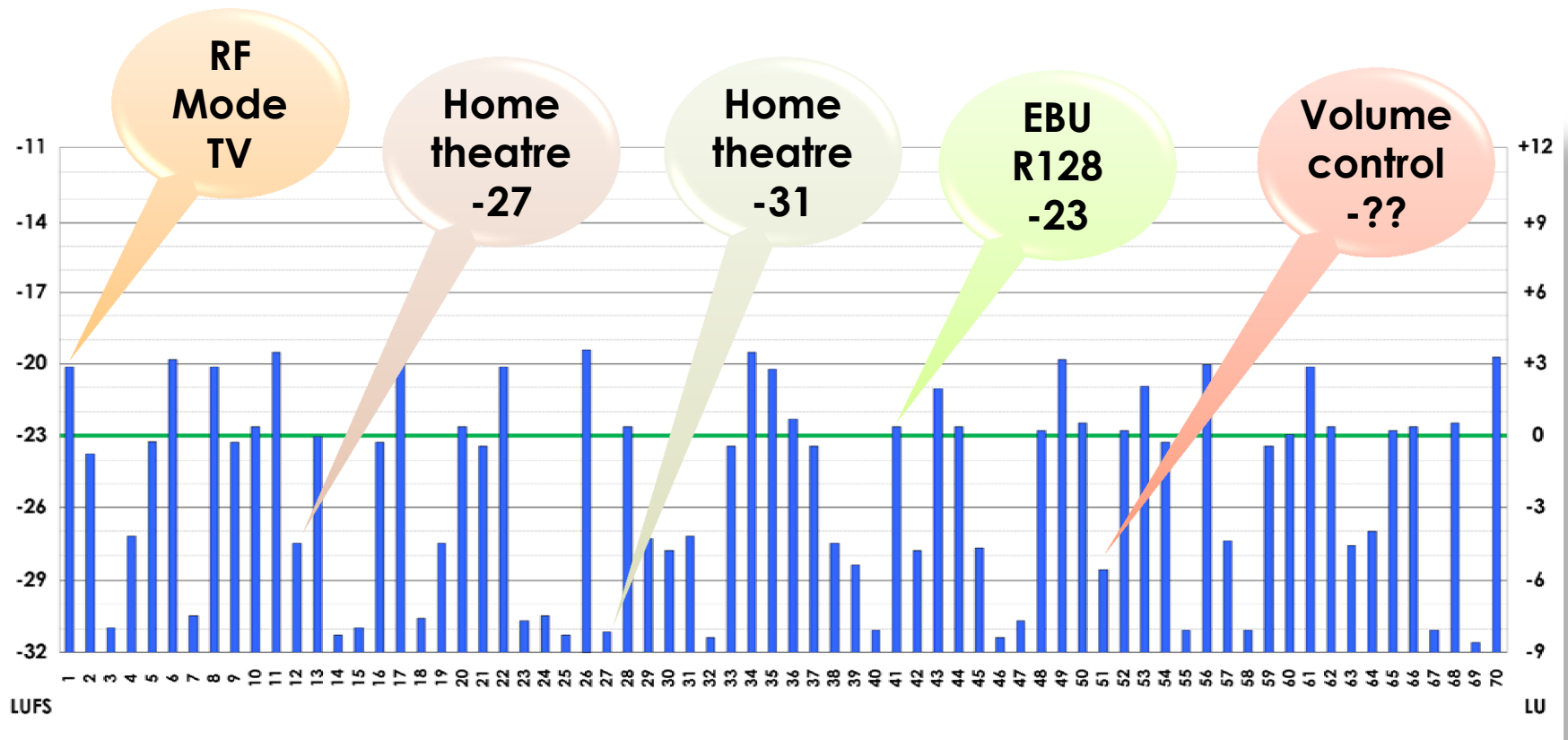
Input loudness ^(1, 2) LUFS	Loudness error LU	Dialnorm change to apply ⁽³⁾	Corrected loudness LUFS	
-13.0	+18.0	+18	-31.0	
-14.0	+17.0	+17	-31.0	
-15.0	+16.0	+16	-31.0	
-16.0	+15.0	+15	-31.0	
-17.0	+14.0	+14	-31.0	
-18.0	+13.0	+13	-31.0	
-19.0	+12.0	+12	-31.0	
-20.0	+11.0	+11	-31.0	
-21.0	+10.0	+10	-31.0	
-22.0	+9.0	+9	-31.0	
-23.0	+8.0	+8	-31.0	
-24.0	+7.0	+7	-31.0	
-25.0	+6.0	+6	-31.0	
-26.0	+5.0	+5	-31.0	
-27.0	+4.0	+4	-31.0	
-28.0	+3.0	+3	-31.0	
-29.0	+2.0	+2	-31.0	
-29.9	+1.1	+1	-30.9	
-30.0	+1.0	0	-30.0	↑
-31.0	0.0	0	-31.0	Unity gain range
-32.0	-1.0	0	-32.0	↓
-32.1	-1.1	-1	-31.1	
-33.0	-2.0	-2	-31.0	
-34.0	-3.0	-3	-31.0	
-35.0	-4.0	-4	-31.0	
-36.0	-5.0	-5	-31.0	
-37.0	-6.0	-6	-31.0	
-38.0	-7.0	-7	-31.0	
-39.0	-8.0	-8	-31.0	
-40.0	-9.0	-9	-31.0	

Table 3: Gain adaptation for HE-AAC metadata adaptation system

Input loudness ^(1, 2) LUFS	Loudness error LU	PRL change to apply ⁽³⁾	Corrected loudness LUFS	
-5.0	+18.0	+18	-23.0	
-6.0	+17.0	+17	-23.0	
-7.0	+16.0	+16	-23.0	
-8.0	+15.0	+15	-23.0	
-9.0	+14.0	+14	-23.0	
-10.0	+13.0	+13	-23.0	
-11.0	+12.0	+12	-23.0	
-12.0	+11.0	+11	-23.0	
-13.0	+10.0	+10	-23.0	
-14.0	+9.0	+9	-23.0	
-15.0	+8.0	+8	-23.0	
-16.0	+7.0	+7	-23.0	
-17.0	+6.0	+6	-23.0	
-18.0	+5.0	+5	-23.0	
-19.0	+4.0	+4	-23.0	
-20.0	+3.0	+3	-23.0	
-21.0	+2.0	+2	-23.0	
-21.9	+1.1	+1	-22.9	
-22.0	+1.0	0	-22.0	↑
-23.0	0.0	0	-23.0	Unity gain range
-24.0	-1.0	0	-24.0	↓
-24.1	-1.1	-1	-23.1	
-25.0	-2.0	-2	-23.0	
-26.0	-3.0	-3	-23.0	
-27.0	-4.0	-4	-23.0	
-28.0	-5.0	-5	-23.0	
-29.0	-6.0	-6	-23.0	
-30.0	-7.0	-7	-23.0	
-31.0	-8.0	-8	-23.0	
-32.0	-9.0	-9	-23.0	















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www.tech.ebu.ch/loudness

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