DRC: Permanent (Traditional) and Hybrid Approaches

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Traditional or Permanent Dynamic Range Control (DRC)

• Automatic Gain Control (AGC)
  – Narrows peak to average ratio
  – Detect level, adjust gain
  – Simplest is wideband
    • Single detector and single gain element
    • Multiple detectors (and speeds) and gain elements

  – Process permanently modifies content
Simple Automatic Gain Control (AGC)
Advanced Wideband DRC

- **Input**
- **Gain**
- **Detector Fast**
- **Detector Slow**
- **Weighting Filter**
- **Peak Limiter**
- **Output**
Traditional or Permanent Dynamic Range Control (DRC)

• Automatic Gain Control (AGC)
  – More advanced:
    • Multiple frequency bands
    • Multiple stages
    • Can fix focused problem areas
    • Can modify spectral balance (good and bad)
  – Still permanently modifies content
Traditional Multiband DRC

- Crossover
- LF AGC
- Look Ahead Limiter
- HMF AGC
- Look Ahead Limiter
- HMF Level
- LMF AGC
- Look Ahead Limiter
- LMF Level
- ULF AGC
- Look Ahead Limiter
- Upper LF Level
- LLF AGC
- Look Ahead Limiter
- Low LF Level
- Wideband AGC (Weighted)
- Output
Loudness and Metadata

Relative Loudness (in dB) of the Listening levels investigated, with 95% confidence intervals

Target (-24 dBLKFS)

-19.1  Annoyingly Soft
-10.2  Turn Volume Up
-5.4   Softer, but Acceptable
2.4    Louder, but Acceptable
5.6    Turn Volume Down
10.8   Annoyingly Loud
Original Program Example

Relative Loudness (in dB) of the Listening levels investigated, with 95% confidence intervals.
“Light” Permanent DRC

Relative Loudness (in dB) of the Listening levels investigated, with 95% confidence intervals
“General (Med.)” Permanent DRC

Relative Loudness (in dB) of the Listening levels investigated, with 95% confidence intervals

-19.1 ➔ Annoyingly Soft
-10.2 ➔ Turn Volume Up
-5.4 ➔ Softer, but Acceptable
2.4 ➔ Louder, but Acceptable
5.6 ➔ Turn Volume Down
10.8 ➔ Annoyingly Loud

Target (-24 dBLKFS)
“Heavy” Permanent DRC

Relative Loudness (in dB) of the Listening levels investigated, with 95% confidence intervals
NTSC?

Relative Loudness (in dB) of the Listening levels investigated, with 95% confidence intervals.

- 10.8: Annoyingly Loud
- 5.6: Turn Volume Down
- 2.4: Louder, but Acceptable
- Target (-24 dBLKFS)
- -5.4: Softer, but Acceptable
- -10.2: Turn Volume Up
- -19.1: Annoyingly Soft
NTSC.

-10.8 ← Annoyingly Loud
-5.6 ← Turn Volume Down
-3.8 ← Louder, but Acceptable
-2.4 ← Target (-24 dBLKFS)
-5.4 ← Softer, but Acceptable
-10.2 ← Turn Volume Up
-19.1 ← Annoyingly Soft

Relative Loudness (in dB) of the Listening levels investigated, with 95% confidence intervals
Short Term - All Modes

Summary - Target -24dBLKFS +/-2dB

![Graph showing the summary of target levels for various modes over time.](image-url)
Hybrid Approach

• Intimate combination of permanent and metadata control, infinitely adjustable
• Combines best of both worlds
• Allows recovery of original program dynamics to a degree determined by the broadcaster for those who want it
• Utilizes features already present in systems
• Original content can be preserved, DRC target attained
Hybrid Permanent/Metadata

Hybrid Traditional /Metadata DRC

Metadata

5.1 Input

LI/Rf
C/LFE
Ls/Rs

Metadata  Aware Multiband Processor (i.e. AERO)

Proc.

Orig.

5.1

5.1

5.1

DRC

Formatter

Fixed MD Values

DRC MD

Permanent vs. Metadata

Dolby Digital (AC-3) Encoder

MD Mux

Dolby Digital (AC-3) Out

Metadata

AC-3

MD

Orig.

MDPerm.

DRC MD

MDMUX

Formatter

Hybrid Traditional /Metadata DRC
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THANK YOU!

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