

Mastering

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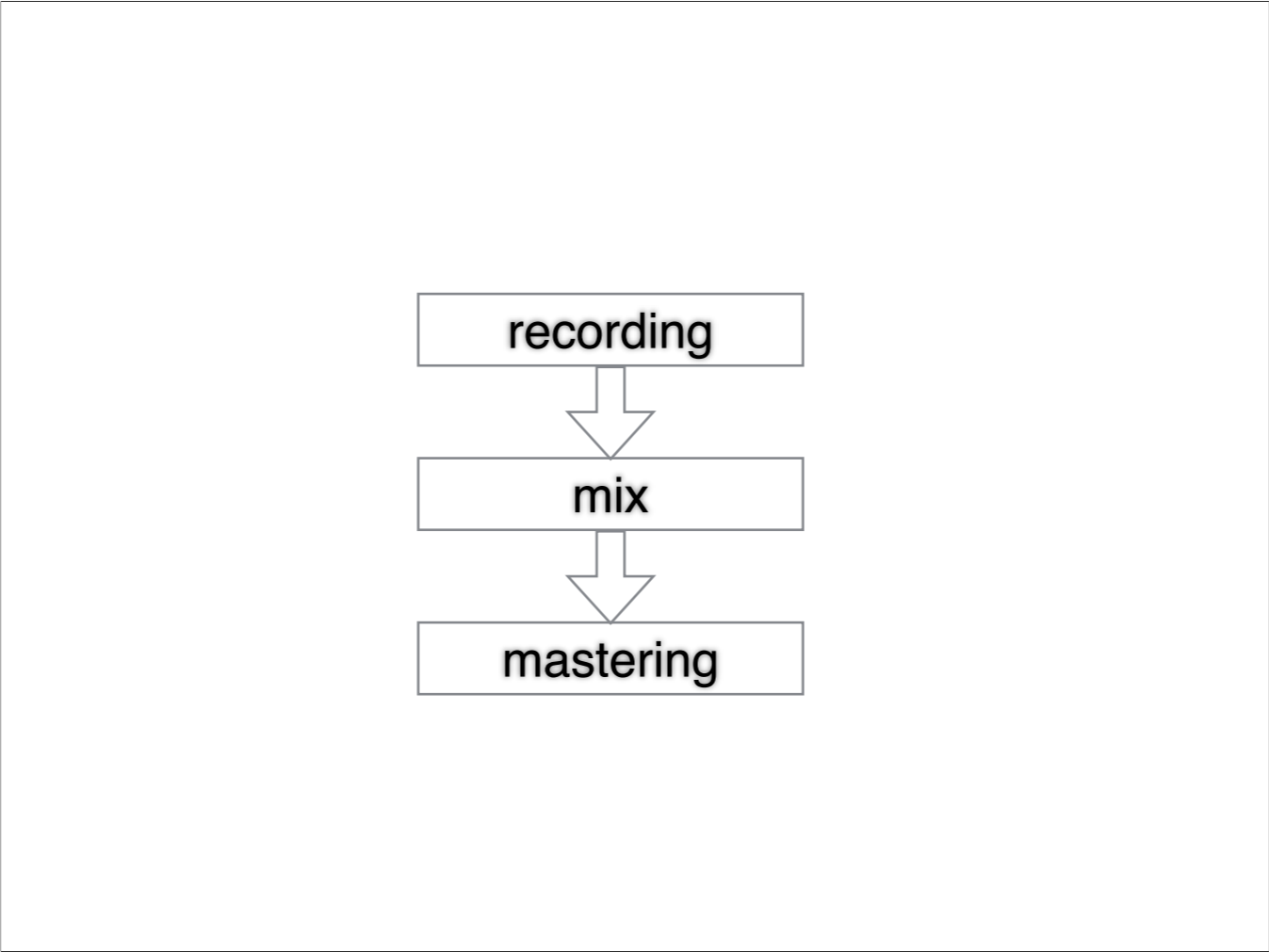
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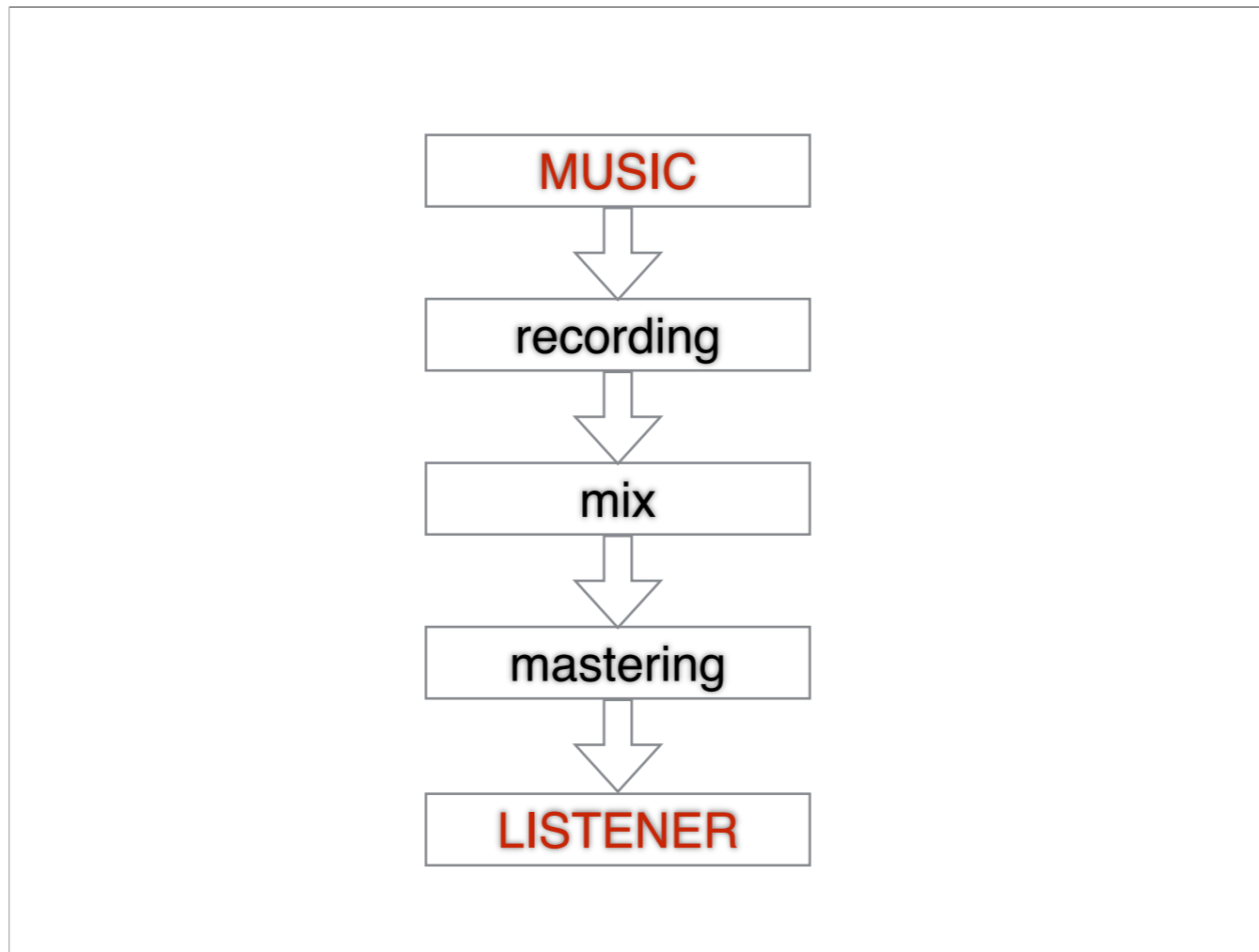
This lecture demystifies process of mastering and shows technical and artistic motivations behind it.

PLAN

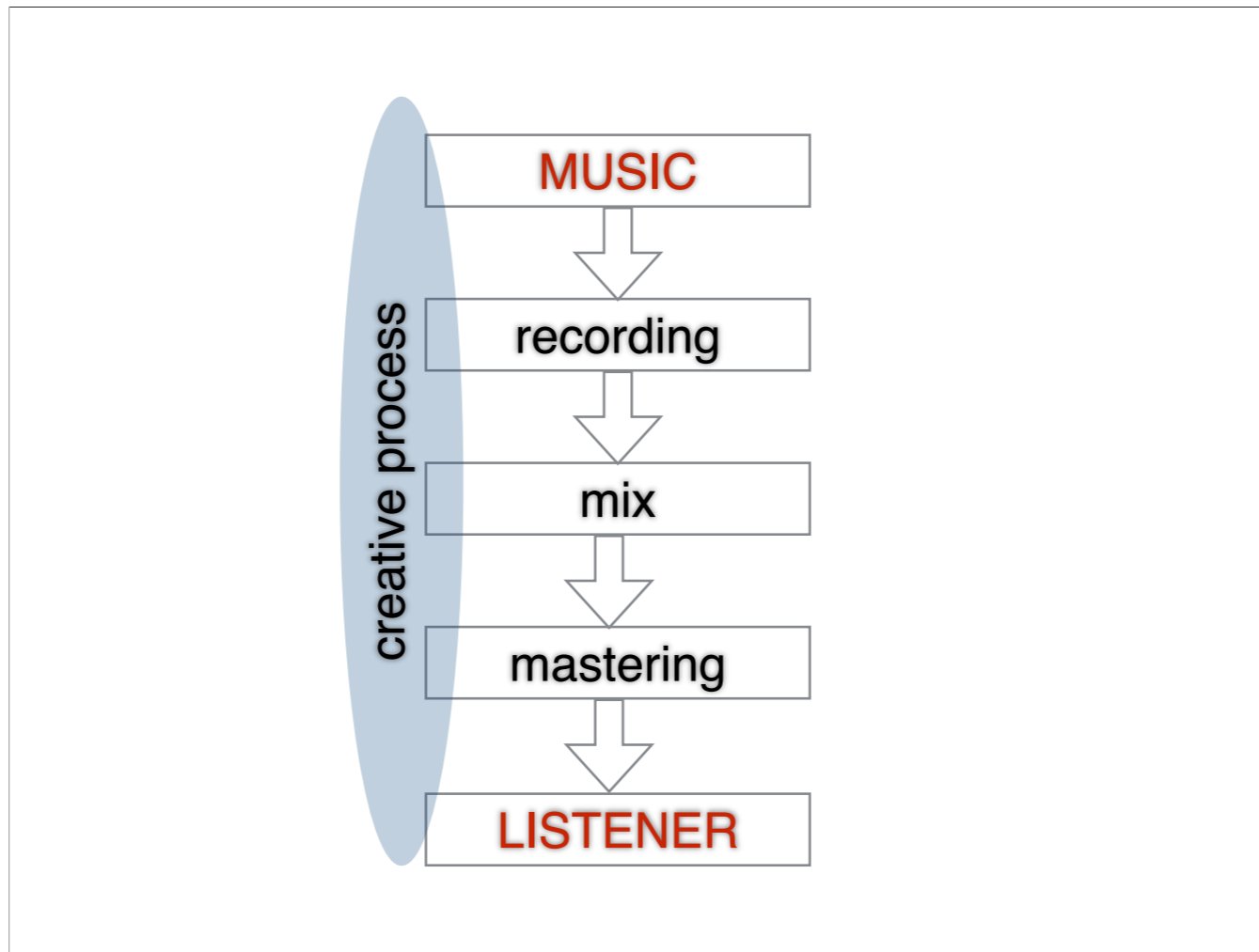
- history
- what is mastering?
- tools
- who is a mastering engineer?
- levels
- formats
- resources



Mastering in the production process.



Mastering in the production process.



Mastering in the production process.

HISTORY

MASTERING

- a practice dedicated to transferring a recording from one medium to another to make it available for a wider audience

History of mastering – definitely was not an artistic process!

HISTORY

„In the early days of vinyl, mastering was a black art practiced by technical curmudgeons who mysteriously made the transfer from the electronic medium of magnetic audio tape to the physical medium of vinyl.”

[Bobby Owsinski]

HISTORY

- mastering (transfer) engineers found ways to make the disks louder (and less noisy) by equalization and compression
- producers and artists began notice that certain records would actually sound louder (for general public usually better)
- new breed of mastering engineer was born, with creative control and ability to influence the final sound of a record (not only a transfer)

Evolution and development of mastering as a part of the creative process.

“Mastering is the process of creating an optimal form of a recording so that it can be copied for distribution”

[Jonathan Wyner]

“It is difficult [...]. Two steps:
the end of creative process,
prep for manufacturing and
distribution”

[Adam Ayan]

“...giving the recording the final polish. [...]make sure that the sound translates well on multiple systems.”

[Randy Merrill]

“...a sonic version of photo
retouching”

[Kevin Gray]

**“...optimization of the
transfer of information
between the artist and the
listener”**

[Brayan Martin]

**“last creative step in music
production and first step in
manufacturing”**

[Darcy Proper]

other metaphors

People tend to use different metaphors when describing sound and the process (especially connected to visual experiences)

- photo retouching
- color correction in video

“Mastering brings your
music closer to the
listener.”

MASTERING

- QC (Quality Control)
- preparing for distribution/medium
- the most important aspects of music are delivered to the listener
- respects decisions made at earlier stages of the process



technicalities

MASTERING

esthetics

TOOLS

TOOLS

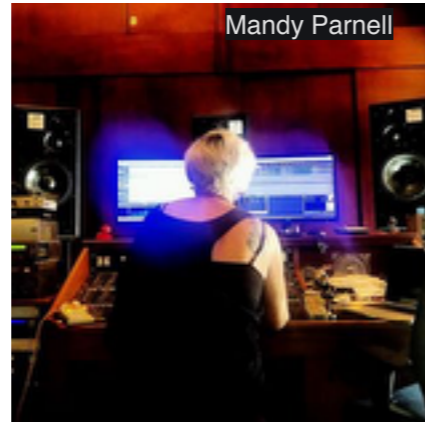
- ears
- monitoring system
- room
- equipment and software
- technical knowledge
- artistic point of view

LISTEN!

- critical listening
- whole picture
- do not listen for the weak but for the strong ones!
- emphasize what is good
- analysis vs synthesis

MONITORING

- accurate
- full range
- calibration
- know your room and speakers!





ROOM



SOFTWARE

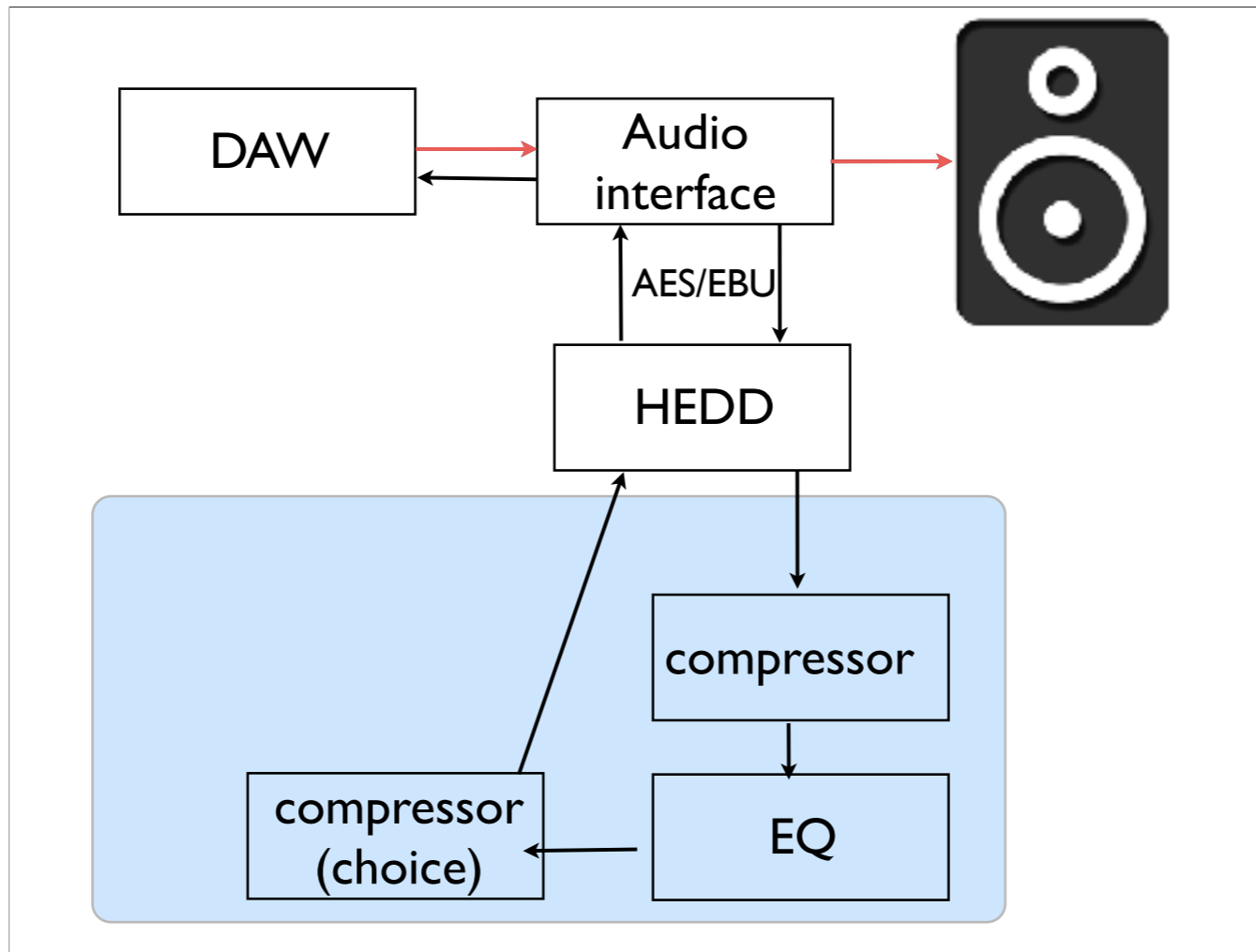
- DAW
- plugins
- formats & meta data



HARDWARE

- converters
- dynamic processors
- equalizers
- other





Hybrid mastering system including digital and analog processing.

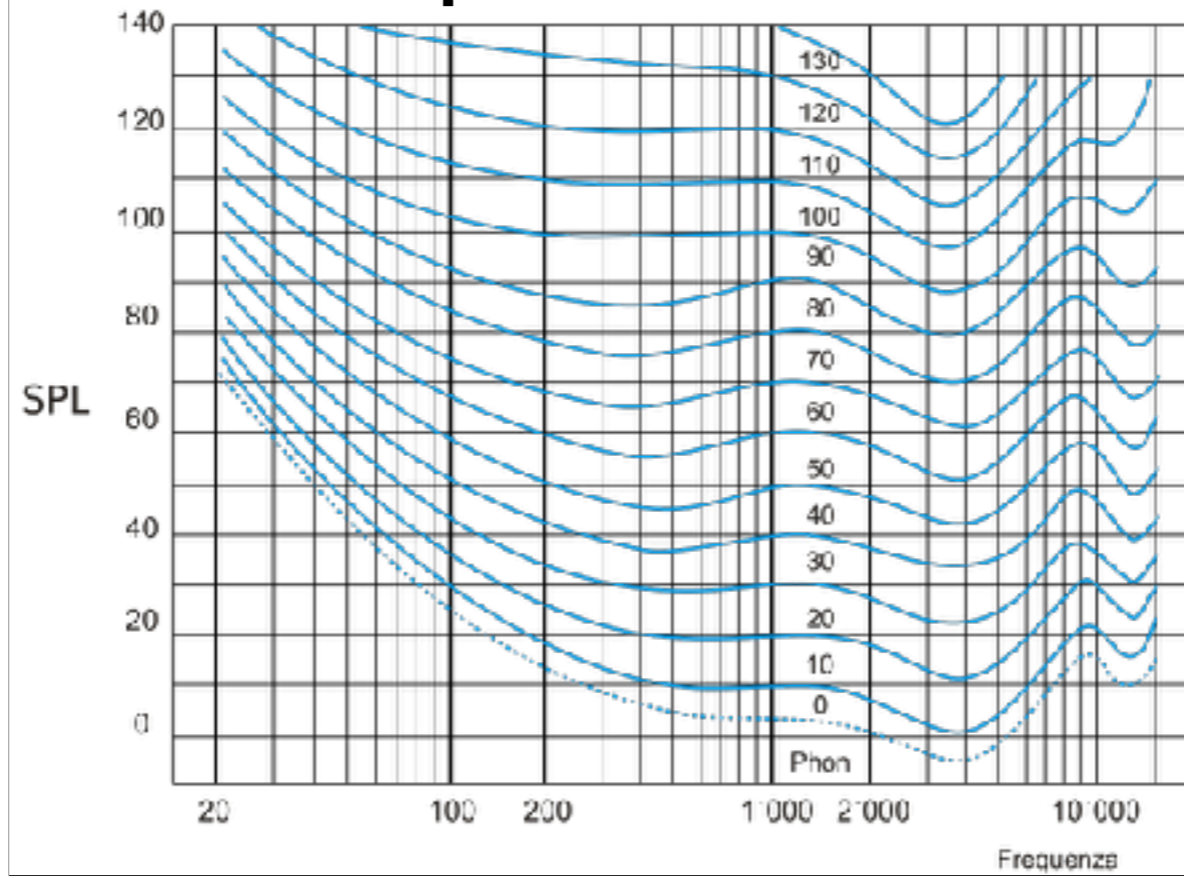
IMPORTANT

- gain staging
- EQ - corrective and creative
- dynamics (macro & micro)

RESULTS

louder & brighter?

Isophonic curves



comparing pears & apples (mix & master)

Importance of level matching track before and after mastering when comparing the sound.

Due to characteristics of our sense of hearing, in most of cases louder sound is evaluated as better one. Because of isophonic curves, we perceive louder sounds to have more bass and high frequencies. To perform fair comparison of two versions (unmastered and mastered) it is important to turn down the louder (most likely mastered one) down so they are perceived as the same loudness. Otherwise, louder version is in favor and it is difficult to valuate other sonic changes introduced in the process of mastering.

listening copy

Mixing with bus processing on the master bus.

**Is mastering the same
thing as bus processing?**

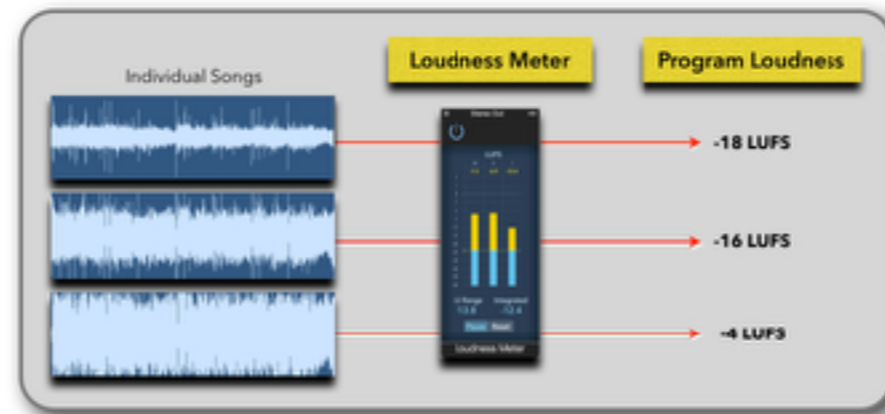
“
IT'S NOT HOW
LOUD YOU MAKE IT.
IT'S HOW
YOU MAKE
IT LOUD.”

— BOB KATZ

LEVELS

LOUDNESS WAR

LOUDNESS NORMALIZATION



Loudness normalization adjusts the recordings based on perceived loudness, in most cases measured using LUFS (Loudness Units Full Scale). As a result louder songs are turned down to the reference level (different for different services).

While peak normalization adjusts the recording based on the highest signal level present in the recording, loudness normalization adjusts the recording based on perceived loudness.

<https://www.loudnesspenalty.com>

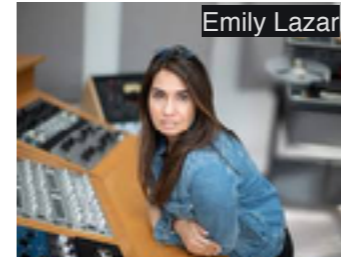
MASTERING ENGINEER



Bob Ludwig



Greg Calbi



Emily Lazar



Darcy Proper



Bob Katz



Ray Staff

Formats

- streaming (different platforms)
- youtube
- vinyl
- CD
- cassette
- 360° video
- ...

Optimizing for different formats. One file is not suitable for for different media!

Formats

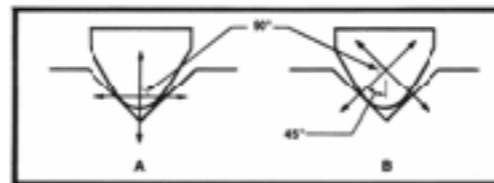
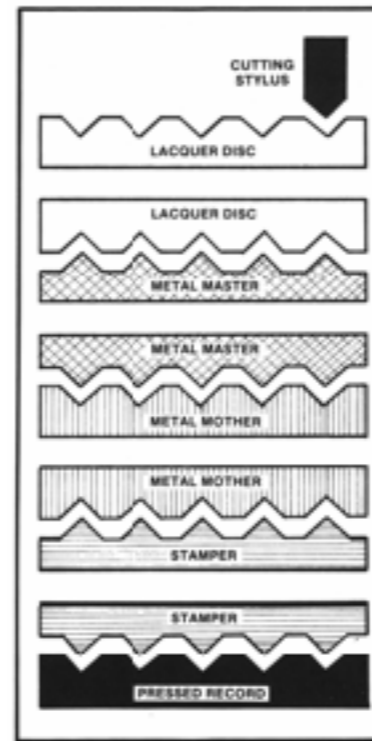
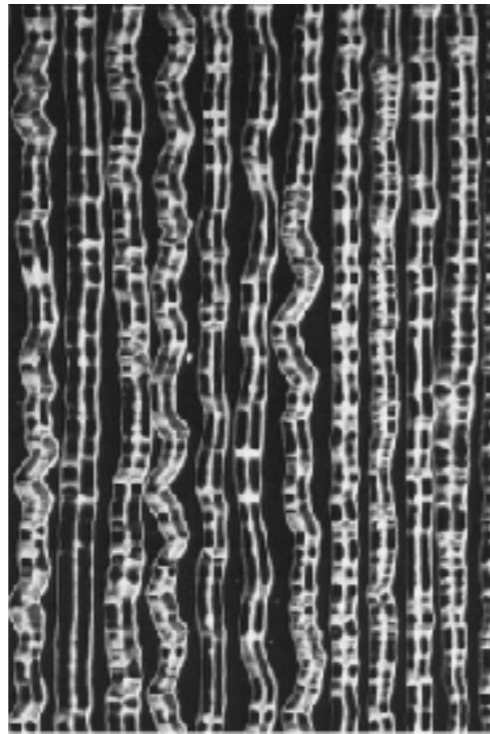
- streaming (different platforms)
- youtube
- vinyl
- CD
- cassette
- 360° video
- ...

Blue are digital.

Digital

- understanding digital processing
- levels
- clipping and coding
- no control

good for vinyl, cassette
and streaming at the
same time?



Mastering for new formats

(VR, ambisonics, multichannel,
museums...)



technicalities

MASTERING

esthetics

FIX ISSUES

- distortion
- clicks, pops etc.
- editing artifacts
- noise
- restoration
- too loud/too soft

RESOURCES

- books
- interviews
- podcasts (<http://themasteringshow.com>, <https://www.20k.org>)
- FB Group - Mastering Engineers Worldwide
- aes.org
- internships
- listen
- try yourself!

Books

Mastering Audio: The Art and the Science by Bob Katz

Audio Mastering – Essential Practices by Jonathan Wyner

Audio Mastering: The Artists by Hepworth–Sawyer, Russ

YT interviews and tutorials

<https://www.youtube.com/watch?v=JoCYNPqPsEw>

<https://www.youtube.com/watch?v=E-6Lnp8RB00>

https://www.youtube.com/watch?v=64dY_HZ6Tck

<https://www.youtube.com/watch?v=Aot-sWlIDjU>

<https://www.youtube.com/watch?v=TV8a0Bx7R78>

<https://www.youtube.com/watch?v=e1-RStv92Ds>

<https://www.youtube.com/watch?v=hT1JQG4t1YA>

<https://www.youtube.com/watch?v=y2YGnMkyFqs>

<https://www.youtube.com/watch?v=SJlfEhMjt5M>

Try yourself!

<https://www.youtube.com/watch?v=x1swZY0yRw8>