

Loudness And How To Measure It



Garry Taylor, Audio Director
Sony Computer Entertainment Europe

LOUDNESS!!!!!!!!!!

Loudness is becoming a big deal!

- ITU-R BS.1770-3
- EBU-R128 (EU)
- ATSC A/85 (US)
- ARIB TR-B32 (Japan)
- CALM Act (US)



LOUDNESS!!!!!!!!!!

Loudness is becoming a big deal!

- **ITU-R BS.1770-3**
- EBU-R128 (EU)
- ATSC A/85 (US)
- ARIB TR-B32 (Japan)
- CALM Act (US)



ITU-R BS.1770

- BS1770 contains algorithms for measuring the perceived loudness of audio material.
- It describes a way to measure the 'True Peak' of an audio signal.
- It uses the units LKFS or LUFS (Loudness Units (K-Weighting) relative to digital Full Scale).



BS I 770 - How Does It Work?

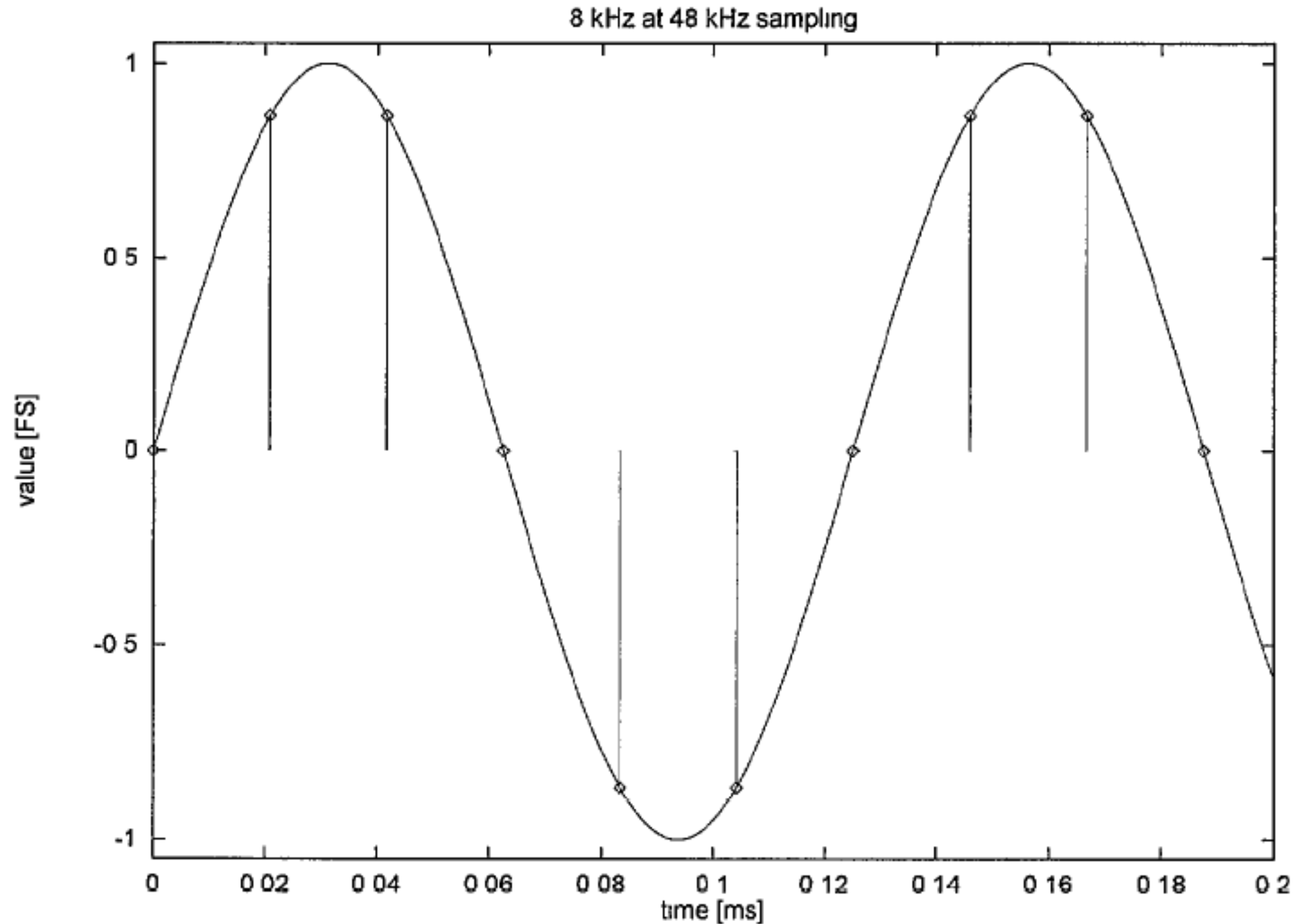
Similar to RMS, but with a few key differences:

- Two weighting filters, to take into account the acoustic effects of the head.
- A gate that disregards data that is a certain level below the moving average.
- Extra weight is added to the surrounds, to take into account the 'Tiger effect'.



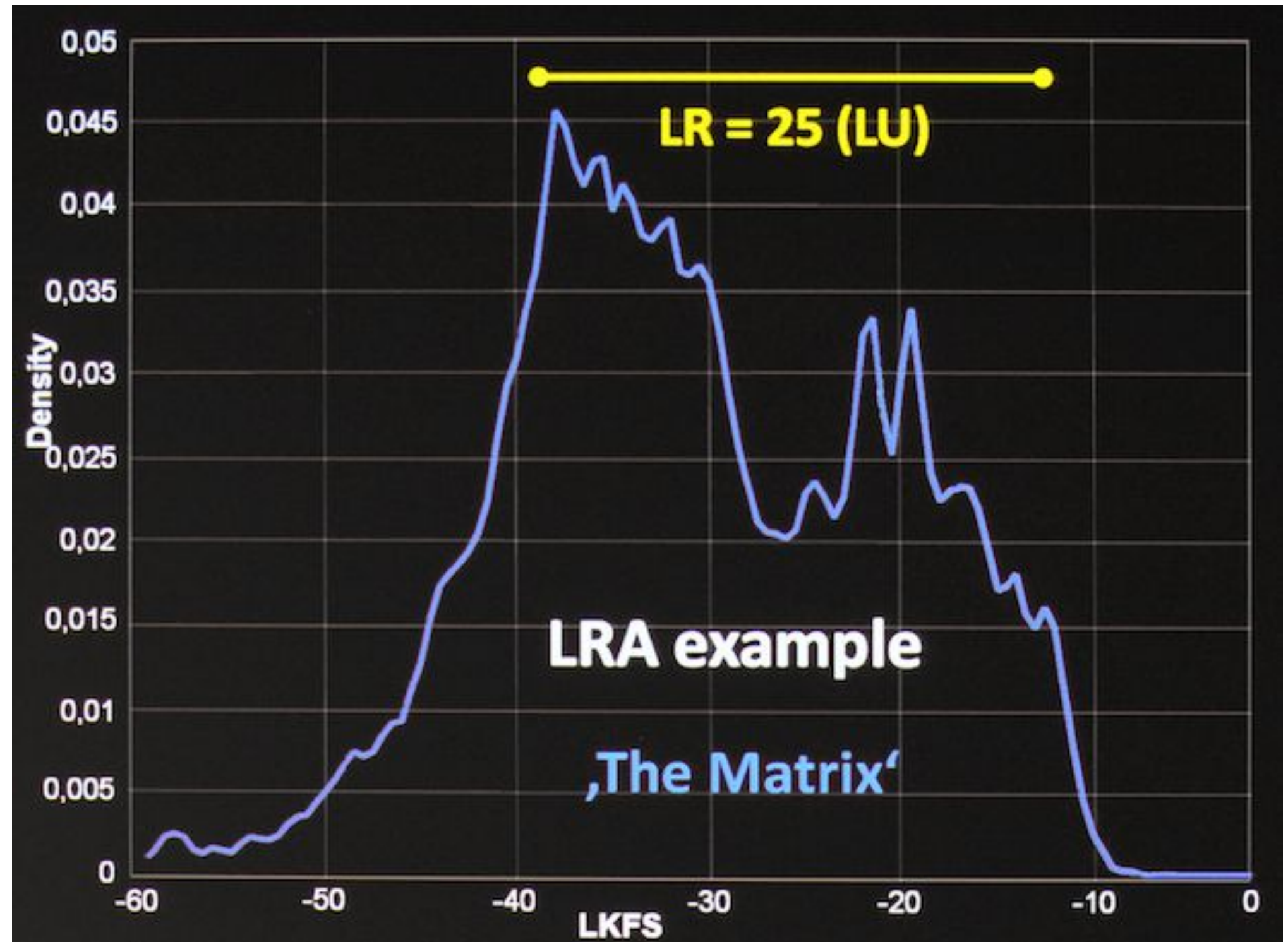
TRUE PEAK

- AV amps oversample by up to x16
- AV amps will interpolate and add in another 15 samples for each original
- Difference between True Peak and Sample Peak increases with higher frequencies
- If it doesn't clip (distort) on the console, it can still clip on the amp



LOUDNESS RANGE

- Defined in EBU Tech 3342
- A statistical measurement
- Extremes are discarded
- EBU recommends a maximum of 20 LU for living rooms



Units

- Average Loudness measured in LUFS (Loudness Units relative to digital Full Scale).
- True Peak measured in dBTP (Decibels, True Peak).
- Loudness (Dynamic) Range measured in LU (Loudness Units).



Broadcast Loudness Standards

In broadcast, all programmes are to be normalised to:

- US: -24 LKFS
- EU: -23 LUFS
- Japan: -24 LKFS

Note: LUFS=LKFS





AVERAGE LOUDNESS AND PEAK LEVELS
OF AUDIO CONTENT ON SONY COMPUTER
ENTERTAINMENT PLATFORMS

Recommendation ASWG-R001

v1.00
November 2012



Sony's Standard: ASWG-R001

Uses ITU-R BS.1770-3

- PS3/PS4 recommended loudness: -23 LUFS
- PS Vita recommended loudness: -18 LUFS
- Maximum True Peak: -1 dBTP
- Recommended Maximum Loudness (Dynamic) Range: 20 LU



How We Measure

- Loudness in interactive entertainment is an inexact science
- BS1770 was designed for linear media
- The longer you measure for, the more accurate the measurement will be



How We Measure

Sony WWS Audio Standards Working Group recommends:

“Titles must be measured for as long as is practical and for a minimum of 30 minutes, and that those sections of any title measured should be a representative cross section of all different parts of any title in terms of gameplay.”



How We Measure

- Splash screens and credits are measured separately
- Where it is not possible to play through the entire game, many measurements are taken, each for a minimum of 30 minutes, and measurements are averaged.



How To Conform

- When creating assets, leave headroom.
- Put a compressor on the master buss
 - Compressor ratio/threshold will give total control over dynamic range
 - Make-up gain will give control over final level
- Do rough pre-mixes throughout production
- Don't worry too much about levels during production. Do a final loudness pass at the mix stage (once content complete)



How To Conform

- When making changes to overall level, remember 1 LU = 1 dB
- If your target is -23 LUFS, and you're measuring -20, reduce by 3 dB.



BS I 770 measurement tools

- Dolby Media Meter 2
- Flux Pure Analyzer
- Nugen Viz-LM
- Waves WLM
- Steinberg SLM I28
- ToneBoosters EBU Loudness
- Orban Loudness Meter
- TC Electronics LM2 & LM6
- Meterplugs LCAST
- Grimm Audio LevelView



Game specific tool support

- Wwise 2013.1 features BSI770 and EBU-R128 compliant metering
- BSI770 coming soon to FMOD Studio. Also has support of 3rd party loudness plugins (iZotope)
- SCREAM v7 (internal SCE audio tool) has BSI770 metering



Adoption Within The Industry

- Loudness standards have been adopted by all Sony 1st party studios including First Party Q.A.
- Enthusiastic response from Microsoft, Nintendo, and many 3rd parties
- I.E.S.D. are to release loudness guidelines for all consoles and mobile platforms
- ‘Mastered for iTunes’ (with Soundcheck) normalises music to -16.2 LUFS on iOS devices.



Questions?

Garry Taylor - Audio Director, Sony WWS Creative Services Group

Twitter: @tetley_uk

