

# The Loudness Standardize for audio in FPS Genre

장규식

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**RED DUCK**

RED DUCK INC. GAMES INFINITY

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1. I am
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# 1. I am

- Career
  - Working in the game audio field since 1995
  - Worked in the commercial music (popular music, AD, etc.)
- Now
  - Sound Director, working at the Redduck Inc.
  - Audio Consultant, the Nuvoton Israel R&D & Waves
- Education
  - MA : Music Technology, Sang-myung Univ.
  - PhD: Audio Signal Processing, Chung-ang Univ.
- Papers & Research area
  - 2007. Video game console audio: Evolution & Future Trend, Bangkok, Thailand
  - 2009. Audio Dynamic Range Control for STB, ICCE, USA

## 2. Background

### 1. Academic Research

- 2004. Establishing a Reference Playback Level for Video Games

### 2. AES 129<sup>th</sup> Conv. ([www.aes.org](http://www.aes.org))

- 2010. Nov.,

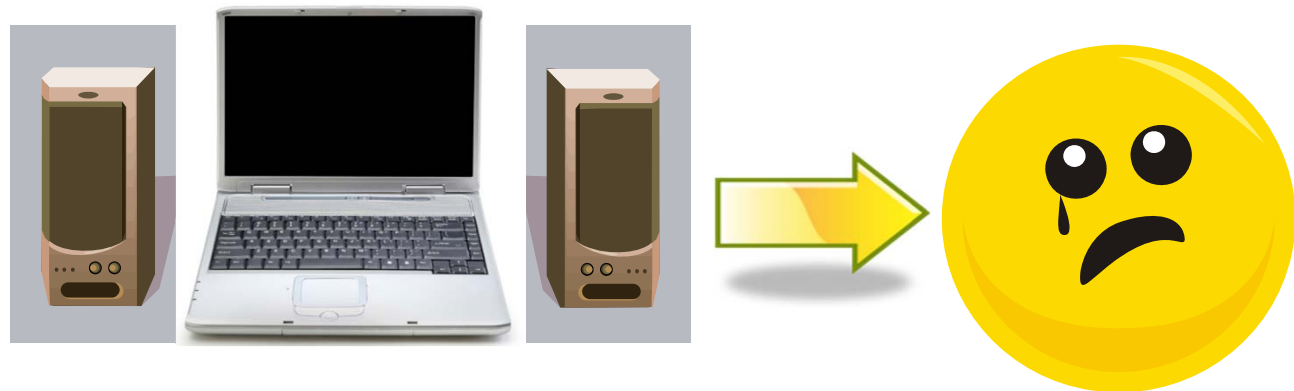
### 3. GDC ([www.gdconf.com](http://www.gdconf.com))

Activision, Sony, Microsoft, EA and Ubisoft

Developing Sensible Reference Level Standards

- GDC 2009 Meeting
- GDC 2010 Meeting: 1<sup>st</sup> Public Discussion

# 3. Current – Monitor System of Users



## 4. Solutions for Consumer Devices


- Waves: MaxxAudio
  - PC, TVs, Cell Phone, etc..

 **MAXXAUDIO 3**

 **MAXX EQ**

 **MAXX BASS®**

 **MAXX TREBLE**

 **MAXX STEREO**

 **MAXX DIALOG**

 **MAXX VOLUME®**

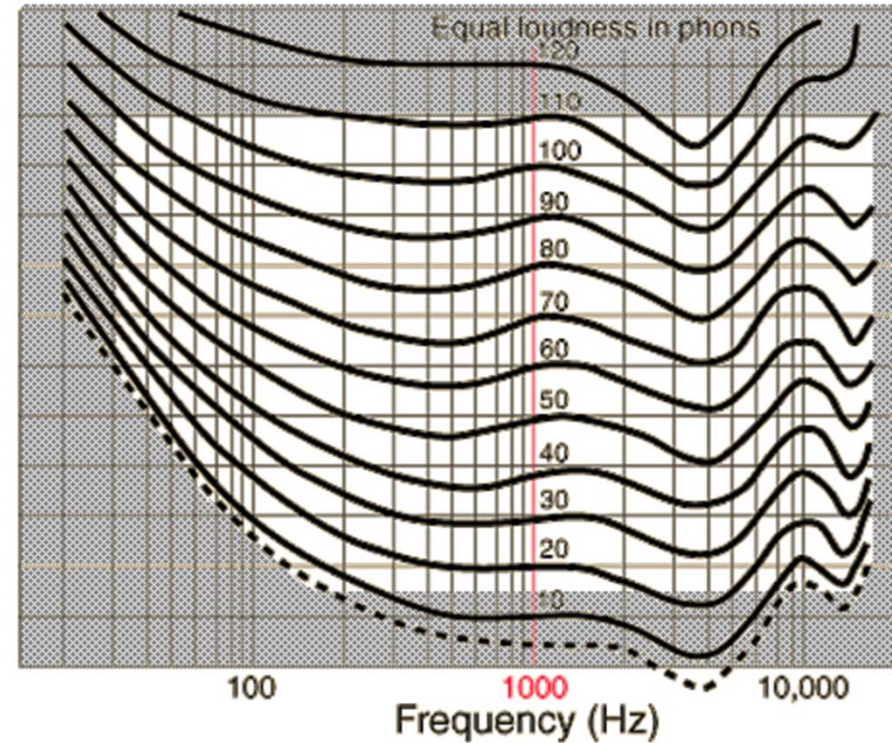
- SRS : How many user satisfied ?
- Etc..

# 5. Equal Loudness Contour



**Human Hearing**

Freq. Response **20 Hz to 20,000 Hz**  
 Dynamic Range ATH to **120 dB**

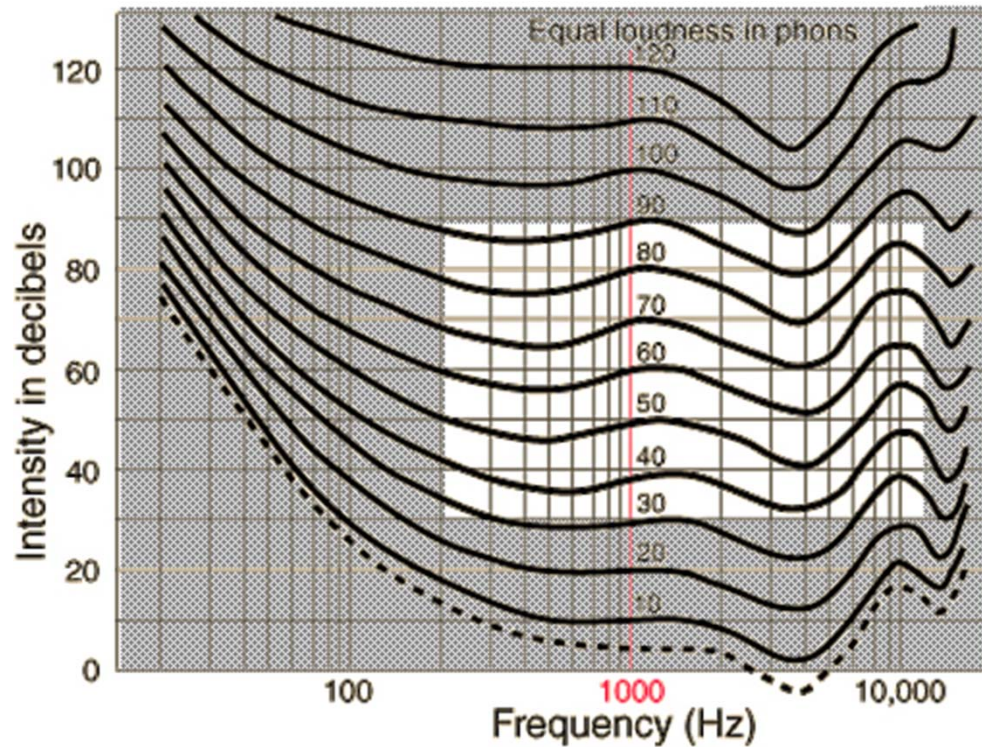


**Audio Perception Window in Cinema**

Freq. Response **30 Hz to 20,000 Hz**  
 Dynamic Range **15 to 110 dB**

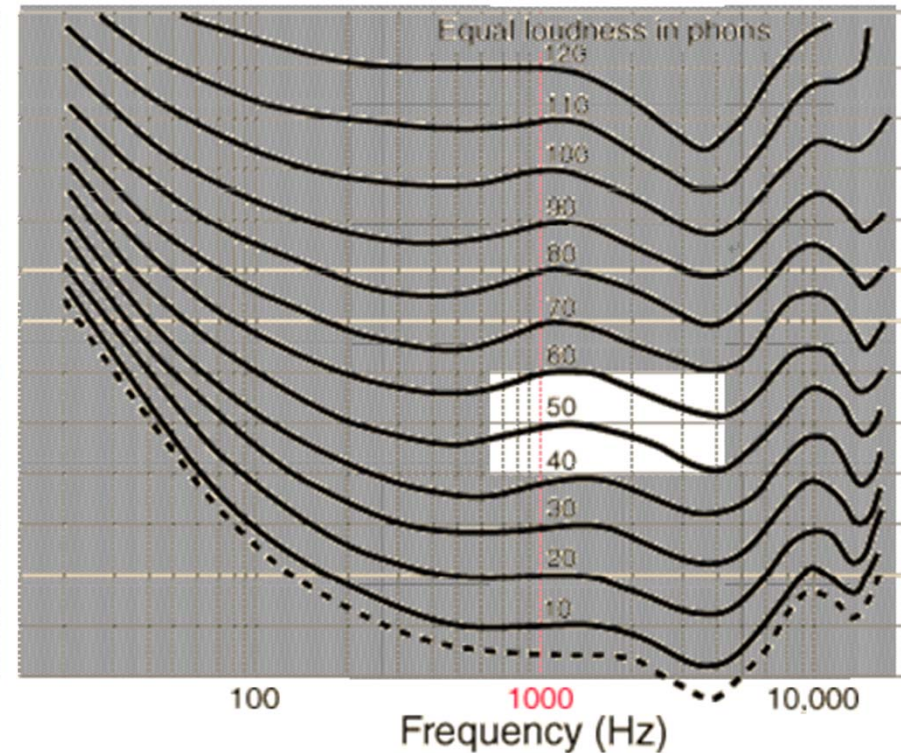


# 5. Equal Loudness Contour



**LCD TVs**

Freq. Response **200 Hz to 14kHz**  
 Dynamic Range **90dB to 30dB**



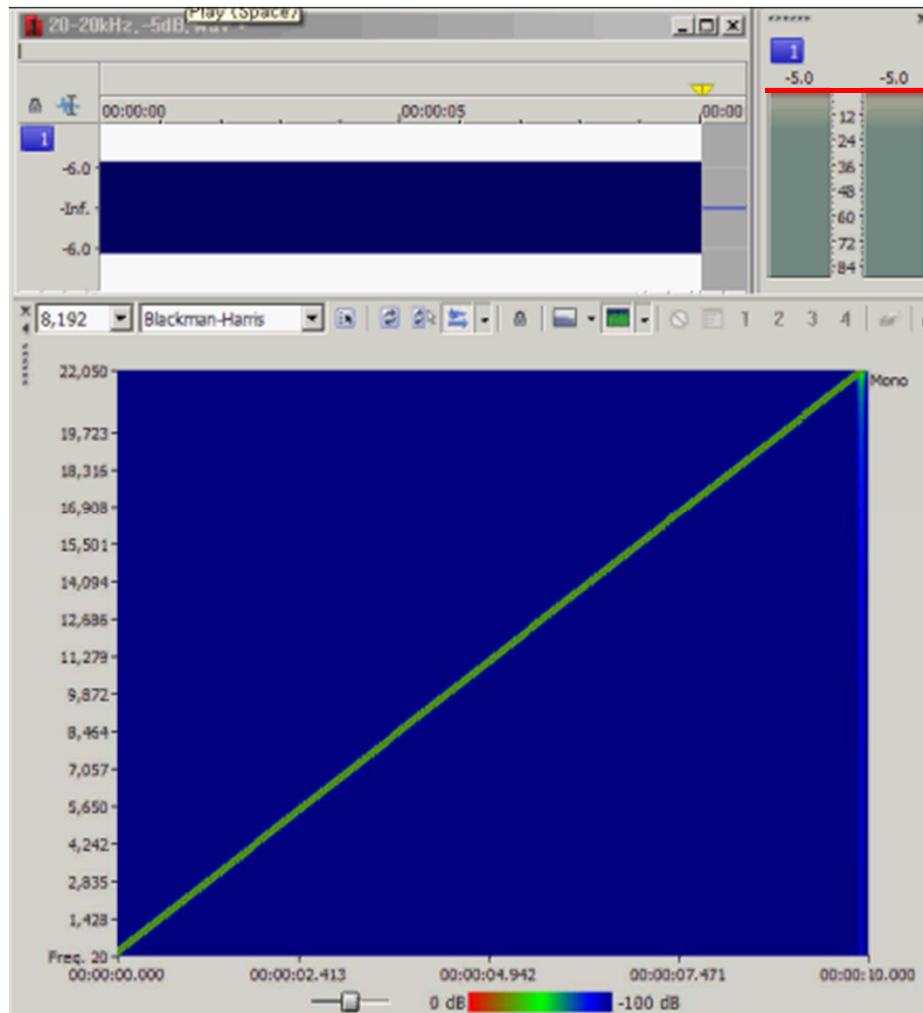
**Wireless Handset Speakerphones**

Freq. Response **600 Hz to 3.2kHz**  
 Dynamic Range **15 to 110dB**

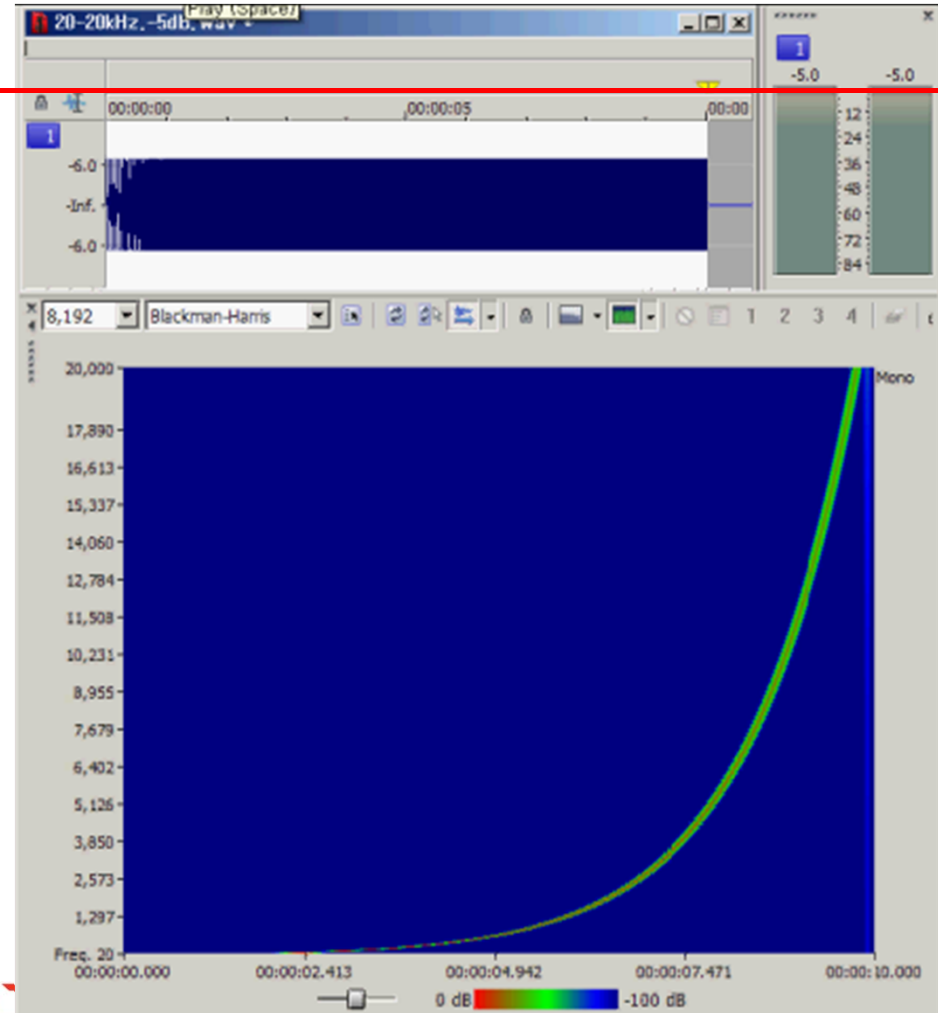


# 6. Evidence- Listen & Recognize

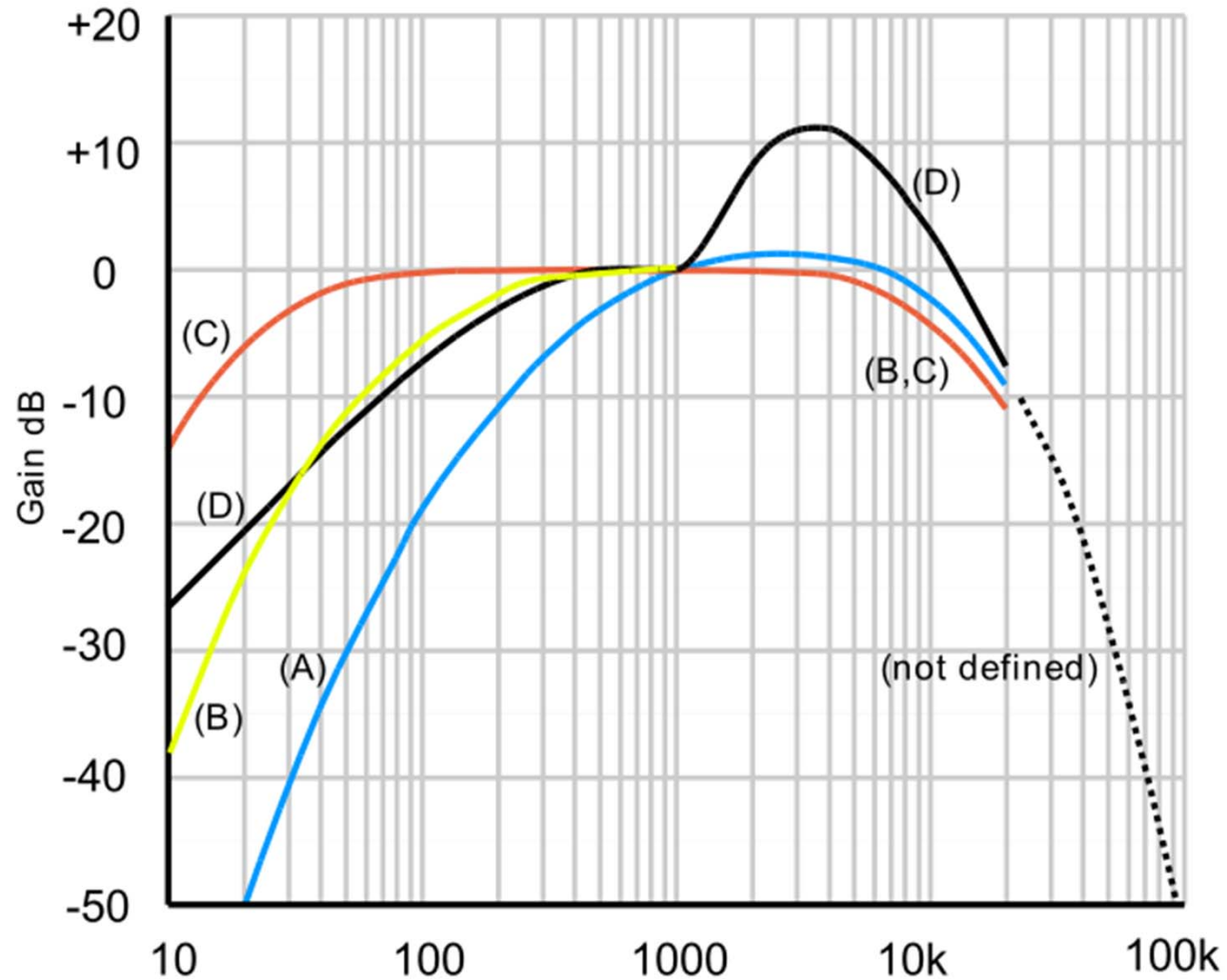
- Liner 20~20kHz



- Log 20~20kHz



# 7. Weighting



A-weighting (blue), B (yellow), C (red), and D-weighting (blk)

## 8. 분석 대상 게임

### A. 온라인게임

1. 국내개발사: Ava, Special Force2, Sudden Attack, Crossfire, Combat Arms
2. 해외개발사: Counter Strike, Battlefield Online, Soldier of fortune online

### B. 해외콘솔 (추후 진행예정)

1. Call of Duty: MW3, Battlefield 3 등..



구분1	계열명	업명	종기	Max dB	RMS	
Sudden Attack	스톤게슈		M4A1	-3.809	-11.547	
			Dragunov	-4.388	-10.588	
			MP5	-3.139	-11.452	
			C_USP	-2.877	-13.178	
			프로그래스	M4A1	-0.492	-10.775
	스포츠	팔하무스	Dragunov	-1.053	-9.805	
			MP5	-1.708	-10.778	
			C_USP	-0.711	-12.031	
			M4	-1.147	-10.603	
			PSG	-0.061	-6.699	
아바	스네이크아이	M4	M4	-3.762	-14.143	
			M24	-1.304	-6.35	
			MP5	-0.021	-8.988	
			Stechkin	-3.658	-15.799	
			M4	-3.846	-14.325	
	카스	황구	M4	M24	-1.432	-6.214
				MP5	-4.608	-13.433
				Stechkin	-4.659	-15.776
				M4	-0.826	-10.01
				AWP	-0.424	-5.388
솔저오브존	대스트	M4	MP5	-1.058	-12.764	
			USP	-0.62	-8.805	
			M4	-0.355	-10.242	
			AWP	-1.203	-5.046	
			MP5	-0.929	-12.428	
	크로스라이어	스네이크	M4	USP	-0.894	-8.849
				M4	-0.736	-14.263
				M40A3	-0.174	-5.621
				MP7	-0.902	-12.073
				MK23	-0.423	-12.11
럼벳임즈	트랙인	M4	M4	-0.54	-14.102	
			M40A3	-0.39	-6.216	
			MP7	-0.467	-12.062	
			MK23	-0.481	-11.575	
			M4	-6.996	-14.422	
	카칸드	M700	MP5	M700	-2.944	-13.938
				MP5	-4.867	-15.036
				DesertEagle		
				M4	-4.418	-14.222
				M700	-3.153	-13.939
렘벳임즈	위도우	M4	MP5	-2.098	-14.453	
			DesertEagle	-4.727	-12.18	
			M4	-7.088	-14.423	
			M700	-3.211	-13.926	
			MP5	-4.739	-15.033	
	렘벳임즈	부타워즈	M4	DesertEagle	-4.733	-12.174
				M4	-0.43	-8.455
				M24	-0.157	-5.352
				MP5	0	-8.415
				M92FS	-1.997	-9.702
렘벳임즈	그레이브디가	M4	M92FS	-1.997	-9.702	
			M4	-1.127	-8.378	
			M24	0	-5.021	
			MP5	-0.743	-8.288	
			M92FS	-2.346	-9.686	
	렘벳임즈	브라시우드	M4	M4	-0.972	-8.365
				M24	-0.129	-5.062
				MP5	-0.748	-8.292
				M92FS	-1.267	-9.685
				M16	-3.673	-14.194
베를힐드	카칸드	M24	M24	-2.54	-13.913	
			Type85	-3.578	-22.536	
			92FS	-4.98	-17.877	
			M16	-3.991	-15.522	
			M24	-5.176	-14.127	
	베를힐드	렘파	Type85	Type85	-6.597	-23.078
				92FS	-3.335	-17.493

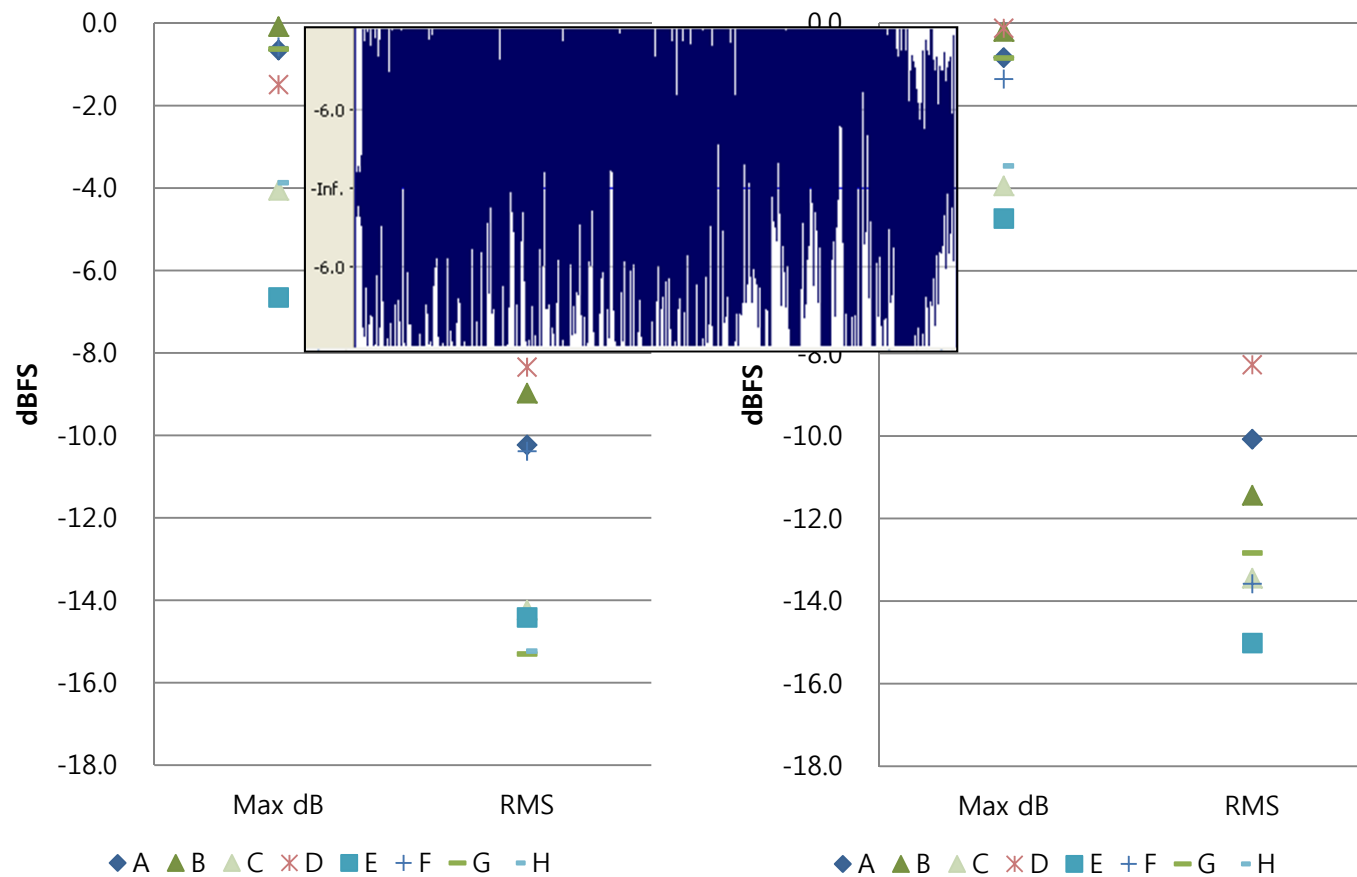
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				MP5	-1.708	-10.778
				C_USP	-0.711	-12.031
				M4	-1.147	-10.603
				PSG	-0.061	-6.699
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				Stechkin	-4.659	-15.776
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	카칸드	M700	MP5	M700	-2.944	-13.938
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				MP5	-0.748	-8.292
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			Type85	-3.578	-22.536	
			92FS	-4.98	-17.877	
			M16	-3.991	-15.522	
			M24	-5.176	-14.127	
	베를힐드	렘파	Type85	Type85	-6.597	-23.078
				92FS	-3.335	-17.493

실내

# 8.1 Differences of gun sound

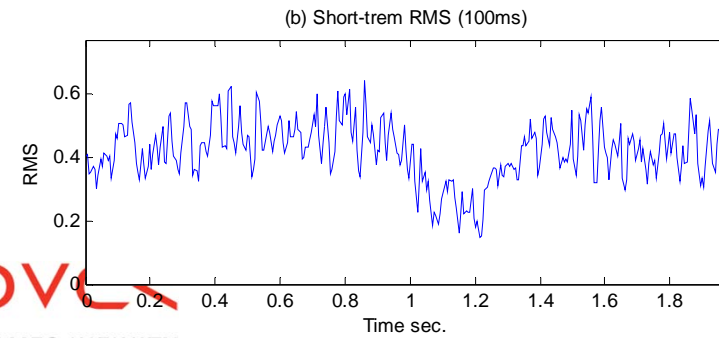
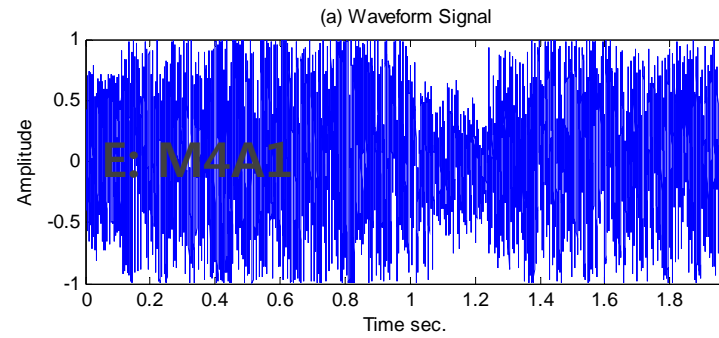
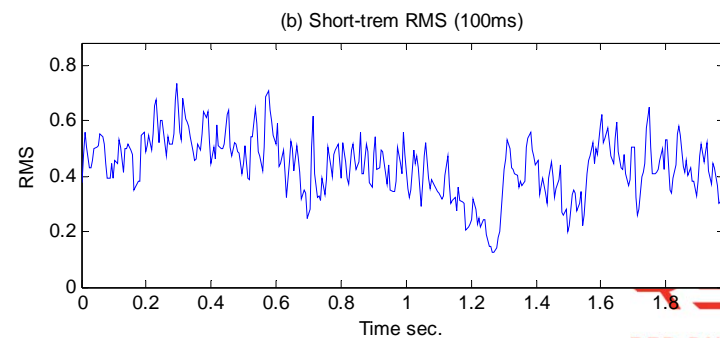
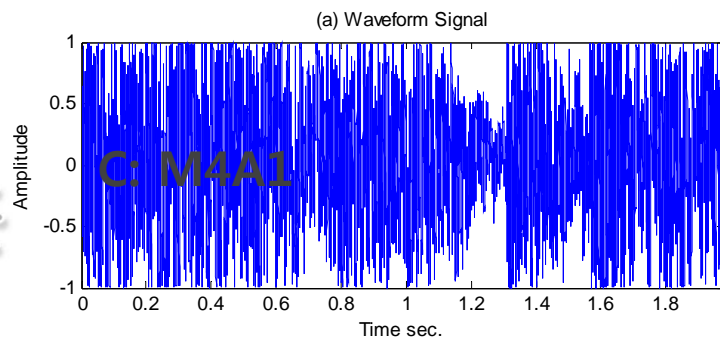
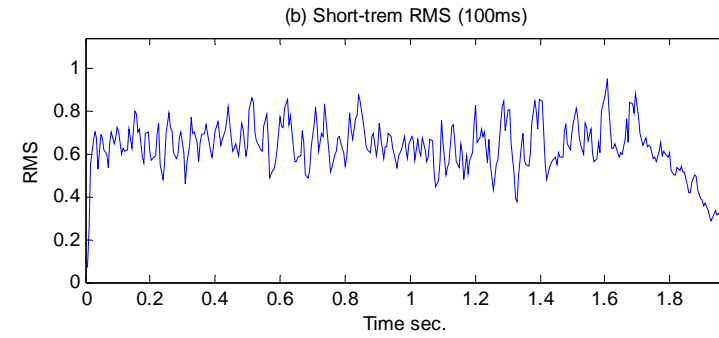
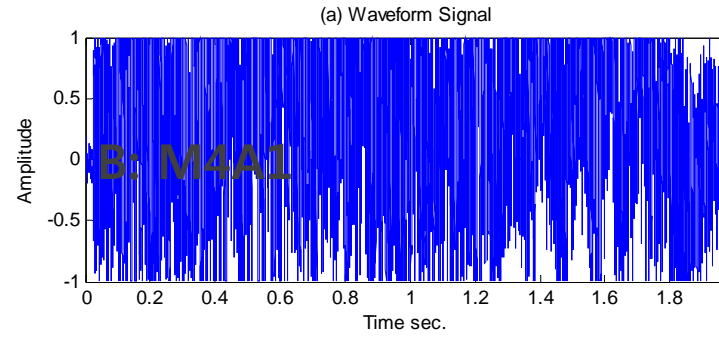
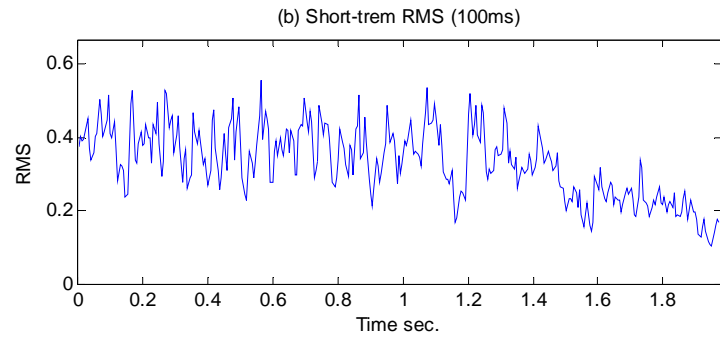
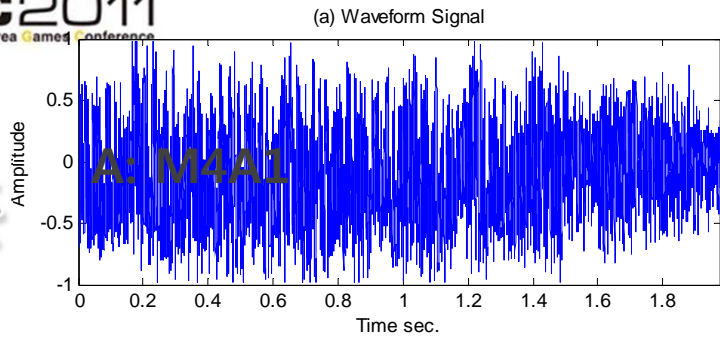
실내 M4 격발음 비교

실내 MP5 격발음 비교



# 8-2. Differences of playing volume (2sec.)





# 9. Standards

## 1) Trailers

1. [TASA](#) - Trailers Audio Standards Association
2. [CALM](#) - Commercial Advertisement Loudness Mitigation Act

# 9. Standards

## 2) TV (NTSC)

1. Peak/RMS based "Program Level" Standardization
  - A. Reference : -20dBFS
  - B. Average Loudness between -28dBFS and 20dBFS(RMS/VU)
  - C. Average Loudness not to exceed: -17dBFS(RMS/VU)
  - D. SD: -10dBFS
  - E. HD: -3dBFS

# 9. Standards

## 3) FILM

### 1. "Playback Level" Standardization

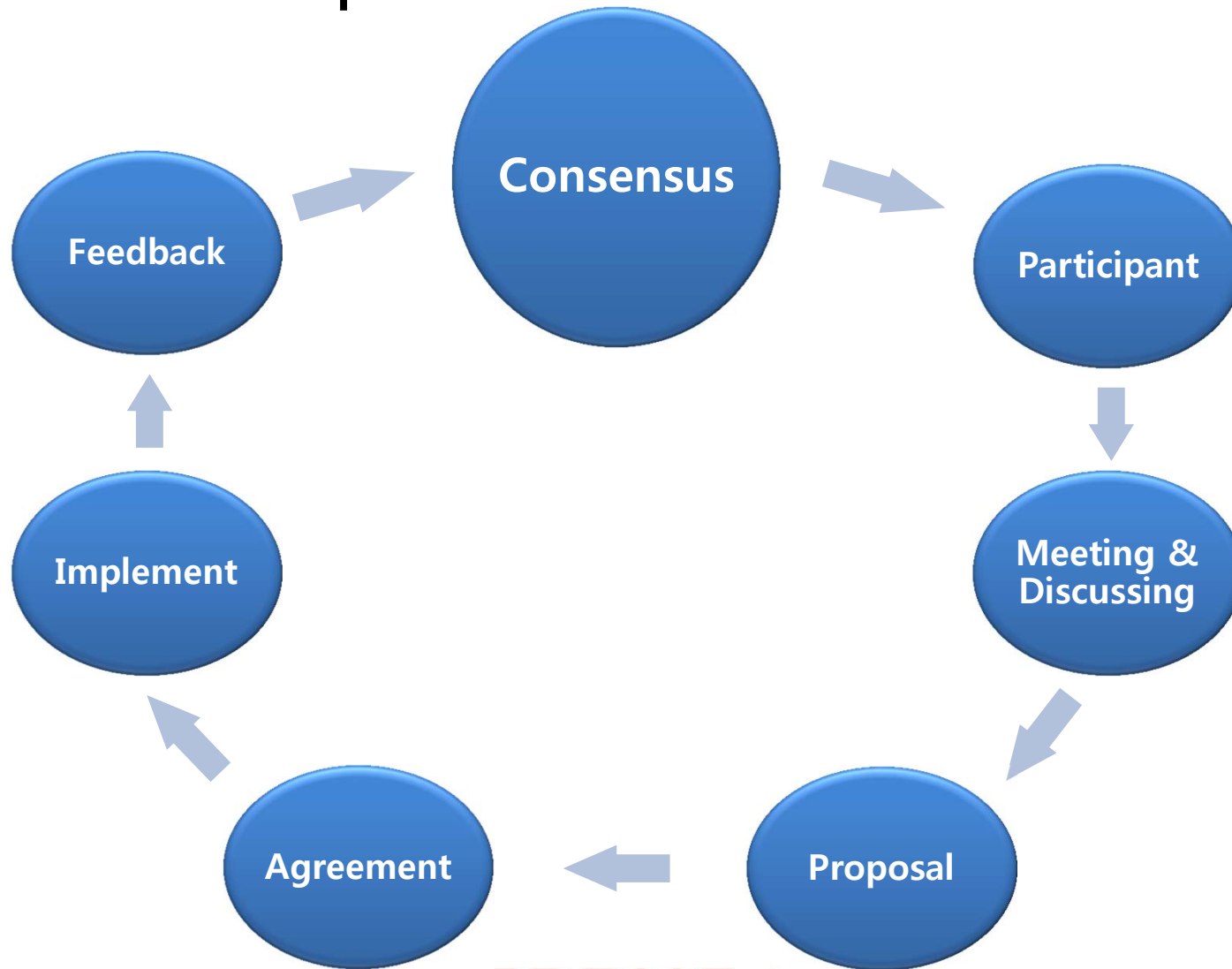
- A. Reference : -20dBFS per channel = 85dBFS @1kHz
- B. No real rules, studio/producer preference
- C. Standardization of playback level is common ref point

# 9. Standardizing

## 4) Gaming

1. "Average over Time" Standardization
2. "Playback Level" Standardization
3. Peak/RMS based "Program Level" Standardization

# 10. Roadmap



# Conclusion

- 1.
- 2.
- 3.
- 4.

# Thank you

&

# Q & A

# References

- SMPTE EG 9-1995, "Audio Recording Reference Level for Post-Production of Motion-Picture Related Materials"
- SMPTE RP 155-1997, "Audio Levels for Digital Audio Records for Digital Television Tape Recorders"
- 2004. Establishing a Reference Playback Level for Video Games
- 2007. DSP Compensation Algorithms for Small Loudspeakers, Meir Shashoua, Waves Audio, Israel