LRAD SAFETY FACTSHEET FOR PROTESTERS

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GET OFF-AXIS FIRST
GET FAR AWAY SECOND

Folks out in the streets: this is a short guide below to staying safe from LRADs (Long Range Acoustical Device), which is a form of sonic weaponry that police have deployed in recent protests to disperse crowds. I am sharing what I know not to cause alarm, but so that people are aware of what LRADs are and can act to protect themselves, should they be deployed at any point. I am writing this as an electrical engineer working in audio and do not claim to be an expert on LRADs or sonic weaponry. This fact sheet has been cobbled together from available information online (LRAD instruction manuals, marketing datasheets, interviews, other disparate online sources) and from professional experience working in audio.

LRADs (Long Range Acoustical Device) have been deployed at actions in many major US cities. They produce high-frequency, highly directional sound to disperse crowds. Typical LRAD maximum SPLs (Sound Pressure Level) are 140dB-160dB. **This is enough to burst eardrums even at a distance.** The longer you are subjected to the sound, the more severe the damage to your hearing may be. Depending on proximity, permanent hearing damage is very possible.

The best safety measure is getting as off-axis and as far away as possible before it's activated. If you can't do that:

First priority is still to get as off-axis (i.e., out of its "spotlight") as you can, as far away as possible, as quickly as possible. Side-step the beam first, move away from it second. Try not to panic and abandon caution when trying to do this.

Bring earplugs, but keep in mind they alone will not be sufficient protection for prolonged periods of time. Inventor Woody Norris said in a 2008 AP interview, "What if they wear earplugs or put their fingers in their ears? The device is designed with sufficient intensity... That doesn't do a heck of a lot." Despite that, the LRAD 100x, 500x, and 1000x instruction manuals indicate that the operator (who is standing behind the beam) and people way off to the side of the beam should wear hearing protection (such as foam plugs). Having them will be better than nothing, but do not rely on them solely.

Given the high directionality of the sound, sufficiently large obstacles create effective acoustical shadows. Treat the LRAD almost like a spotlight and find large, dense cover. That said, remember that sound is a wave: it will reflect off of hard surfaces. Account for reflection when trying to take cover.

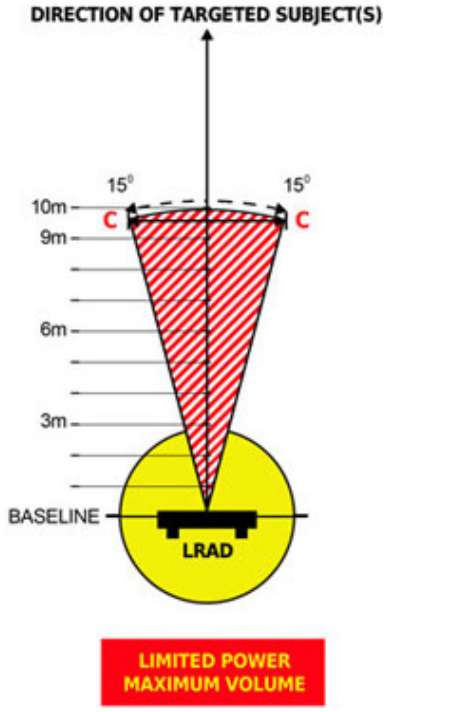
There is a video circulating suggesting signs (depending on their construction) may provide effective acoustical shielding. There are significant trade-offs and risks with this method. It should go without saying that if you block your face with a sign, you will not be able to see in front of you, leaving you vulnerable to both projectiles and to direct attacks by police. Additionally, the sign will reflect the signal, potentially at another innocent party. Bear this in mind if you are forced to use this method.

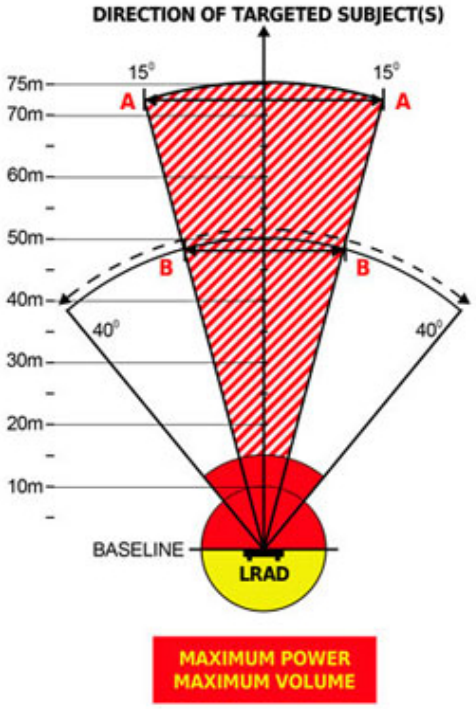
Additionally, an LRAD is not as directional as a spotlight, and depending on the model, the beam angle can be arbitrarily focused or widened. It is safest to be behind one. Since that won't be possible (that's where the police will be), getting perpendicular to the LRAD's beam (not perpendicular to the LRADs face) will also provide cover. That may also be difficult since police will likely occupy that space too. LRADs are often mounted on a pivoting stand too and can be pointed and aimed. Keep this in mind when finding cover.

NYPD using an LRAD 100; larger models may be mounted on vehicles

LRAD Hazard Areas

(from Acoustic Deterrent Systems website - a distributor of LRAD)





Tone Hazard Area
Hearing damage may result in tone mode. Do not use tone if individuals are within Tone Hazard Area. Use voice mode only.

Voice-Tone Hazard Area
Hearing damage may result in both tone mode and voice modes.

Operator Hazard Area
Hearing protection recommended for sustained operations.

Tone Beam Width:
A 38m at range of 75m
B 25m at range of 50m
C 5m at range of 10m

Typical Sound	(LRAD max.) Decibel (dB)	Impact
No sound perceptible to human ear	0	Threshold of hearing
Normal breathing	10	
Whisper	20	
Library / Quiet office / Watch ticking	30	
Quiet residential/rural area	40	
Quiet suburban area / Rainfall / Fridge	50	
Dishwasher / Air conditioner	60	Normal conversation
Highway traffic / Vacuum cleaner	70	
Alarm clock / Doorbell / Ringing phone	80	
Noisy restaurant / Heavy traffic	85	Maximum permitted level in work-place (8 hours)
Tractor / Bus or truck	90	
Electric drill / Underground train	95	Sustained exposure may result in hearing loss
Motorbike / Walkman (max. volume)	100	
Disco / Pneumatic drill / Car horn	110	
Chain saw / Rock concert / Stadium	115	
Jet plane taking off / Thunder	120	Threshold of pain
Vuvuzela horn (world cup)	127	
Power drill / Orchestra percussion	130	
Air-raid siren	135	
LRAD-100X	137	Brief exposure can cause permanent damage
Firearms / Gunshot	140	
LRAD-300X	143	
LRAD-500X	149	
Artillery fire (at 500 ft / 150m)	150	
LRAD-1000X	153	
Balloon pop (at 3ft / 1m)	157	
LRAD-2000X	162	
Rocket launch	180	Death of hearing tissue