Ultimate Sound Pressure Level Decibel Table

Decibel's (dB) are units of ratios; in this table they are expressed in atmospheric decibels and also are expressed as being REPRESENTATIVE OF THE OBJECT (N), and not necessarily what the listener or sound level meter experiences (P).

(N) = Normalized total air power, energy level of sound plus any wind, watts or joules per second. These levels have been converted into:

(P) = Actual peak pressure meter readings, i.e. a force per unit area.

(NP) = Normalized pressure used in explosive measurements, blast wind is not included.

(Q) = Blast wind dynamic pressure created by the peak shock front overpressure (P).

(REF) = Reference number of data source and year in available appendix.

Decibel Level - (N = Normalized) (P = Actual Pressure) (NP = Bomb Pressure).

-80dB (P) - Underwater nuclear submarine microphones listening to shrimp chewing on food at 100 meters distance.

-30dB (N) - One human talking 20 miles away (60 dB/meter at a distance of 20 miles) - REF 1.2003.

-4 TO +4dB (N) - The ticking of an ordinary wristwatch at 1 meter - REF.1 2003.

0dB (N) - Beginning of hearing, a mosquito 10 feet away, the eardrum moves less than $1/100^{th}$ the length of an air molecule - REF.1.1990.

10dB (P) - Absolute silence, level in Bell Laboratory "Quite Room".

13dB (P) - Ordinary light bulb hum.

15dB (N) - A pin drop from a height of 1 CM at a distance of 1 meter - REF.1.2003.

30dB (P) - Totally quiet night time in desert, impossible anywhere near a city.

35dB (P) - Anechoic hearing test room - REF.1.1998.

40dB - A whisper, a normal conversation is 60dB - REF.1.1983.

73.98dB (P) - 1 uBAR = 1 microbar pressure.

85dB - Beginning of hearing damage, earplugs should be worn.

93.98dB (P) - 1 Pascal pressure.

100dB - Normal, average car or home stereo at maximum volume - REF.1.1982.

107 - 104 (P) The beginning of human pain at the ear's most sensitive frequency of 2750Hz - REF.1.1982.

109dB - One sound watt radiating as a perfect sphere, 4 Pi square meters - REF.1.1986.

110dB – A car stereo with two 6 X 9” speakers and 100 watts REF.1.1982.

114 - 117dB – A very large, powerful portable radio music system at close range - REF.1.1982.

116dB – Human body begins to perceive vibration in the low frequency range - REF.1.1986.

117 - 123dB – Home stereo system, very loud and powerful 200 – 20,000 watts - REF.1.1983.

120.24dB (P) – One pure acoustic watt flowing through 1 square meter, electric amplifier required to produce this may be 3000 watts - REF.1.1986.

120 - 130dB – Front row seat at rock concert – up to 200 refrigerator sized speakers and 50,000 – 300,000 watts of undistorted full frequency power - REF.1.1981.

125dB – Drum set at the moment of striking, continuous level – 115dB.

126 - 130dB – Typical professional DJ system - REF.1.1984.

127dB – Human tinnitus (ringing in the ear) begins - REF.1.1984.

127.48dB – 1 pound per square foot.

128dB (P) – Loudest human scream, measured at a distance of 8 feet 2 inches.

128dB – Human head hair begins to detect vibration - REF.1.1983.

128dB – Humans can begin to detect a very slow “blast wind” of 0.124 meters/second - REF.1.1983.

130dB (N) – Marching band – overall level. 100 – 200 members - REF.1.1996.

132dB – Eardrum “flex” totally noticeable - REF.1.1982.

133dB (N) – Gunshot – ear level, may vary greatly as to size and type of gun, duration converted to one second, peak level may reach 140 – 160dB (P).

133.98dB (P) – 1 Millibar pressure.

135 - 122dB (P) – “Very loud” car stereo, only bass level. Highs rarely reach above 115dB (P) - REF.1.1983.

135 - 130dB (N) – Large train horn - REF.1.1985.

135dB – Humans begin to notice a slight “cooling effect” from air expansion - REF.1.1983.

137dB – Human body vibration is strong - REF.1.1983.

137 - 140dB – Human ear, all frequencies are painful - REF.1.1983.

140dB – Extremely damaging to human hearing, no matter how short the time exposure.

140dB – Blast wind = U = (particle velocity) is 0.49 meters per second or about 1 MPH.

140dB – Human throat and vocal cord vibration begins - REF.1.1983.

141dB – Human body begins to feel nausea after a few minutes - REF.1.1983.

141.918dB (P) – 1 inch of water pressure.

142dB – Human body chest pounding is intense - REF.1.1983.

142dB (P) – Inside a car with two “professional” 18 inch woofers and 300 watts for each driver - REF.1.1983.

143dB – Human body feels as if someone football tackled you around your chest - REF.1.1983

144dB – Human nose itching begins - REF.1.1983.

145dB – Human vision begins to vibrate making it slightly blurry, 1 – 3 degrees of vision shift - REF.1.1983.

136-145dB (P) – “Competition” car stereo, sixteen 12 or eight 15 or four 18 inch woofers - REF.1.1983.

146.1dB (P) – Air particle velocity (wind) is 1 meter per second or about 2 miles per hour.

147dB (N) – Formula One race car, 700 horsepower – chest pounding and suction forces easily felt. On a calm, quiet day can clearly be heard six miles away - REF.1.1991.

148dB – Human body vibration very uncomfortable and becoming slightly painful - REF.1.1986.

149dB – Human lungs and breathing itself begin vibrating to the sound pressure - REF.1.1986.

150dB (N) – Rock concert, “The Who” – two 10 story speaker stacks consisting of 144 double refrigerator sized speakers. Actual peak measured level reached 120dB at a distance of 32 meters for this normalized reading of 150dB. Continuous level reached 114 – 118dB (P) at 32 meters - REF.1.1982.

150dB – Rock concert speaker at 1600 watts, on the actual vibrating surface - REF.1.1991.

150dB – Human sensation of being compressed, as if underwater becomes overwhelming - REF.1.1983.

152dB – Human vibration is painful and also felt in all body joints - REF.1.1983.

153dB – Human throat begins to vibrate so hard it becomes almost impossible to swallow - REF.1.1983.

155dB – Human body compression and expansion in sympathy with the vibration is to the “core” - REF.1.1983.

155dB – Human “cooling effect” is high – as a guess, 10 to 25 degrees Fahrenheit - REF.1.1983.

156dB (P) – SPL in a mini-van with twenty 12 inch woofers and 19,000 watts of amplifier power. Each speaker driver is displacing (pumping back and forth) 0.75 inches. If a long haired person were to sit in the van their hair would fly out of the open window. The windshield wipers fly off the glass ½ to 2 inches. Door and windshield flexion may be up to +/- 2 to 4 inches peak to peak. Even with earplugs (-30dB) and over the ear sound mufflers (-24dB) the sound level is still very loud - REF.1.1997.

156.498dB (P) = 1 Centimeter mercury = 0.01 meters mercury.

158dB – Human body vibration is violent, nausea becomes intense - REF.1.1983.

158dB (P) – Inside a rock concert type, refrigerator sized speaker enclosure driven by a 5,000 watt amplifier - REF.1.1983.

160dB (P) – Flashlights exhibit electromagnetic pulsing – EMP (dimming during SPL pulsations) - REF.1.1983.

162dB - U.S.A. Festival rock concert, 1983. 10 separate loudspeaker enclosure stacks, 400,000 watts of amplifier power - (N) -REF.1.1983.

163 - 153dB (N) – N.H.R.A. Dragsters – 5,000 to 7,000 horsepower, liquid nitroglycerin fuel, earth shaking at 50 feet, humans find it difficult to see and breath (140dB (P)) REF.1.1987.

163dB (P) – Glass breaking level, minimum. It is very hard to break glass windows with sound pressure. Many stories come from breaking glass but it is highly variable. Glass is easier to break if it is already cracked, is very large, or old or brittle. Car safety glass is most difficult to break because it can flex massively. An opera singer may, at 110dB, break a wine glass but this is an example of frequency resonance, not high SPL damage - REF.1.1987.

164dB (P) – Internal SPL of a large jet aircraft turbine engine - REF.1.1993.

164.568dB (P) – 1 Inch mercury pressure.

145 - 165dB (NP) – Common type fireworks barrage at professional fireworks shows - REF.1.1988.

165dB (N) – Jet airplane at takeoff, Boeing 727 – 15,000 lbs of thrust (somewhat dependant upon takeoff) - REF.1.1982.

165dB (P) – Motor driven piston headphone.

166dB – Air particle velocity is 10 meters per second or about 20 miles per hour.

170.75dB – Pressure (P) = 1 P.S.I. = 1 Pound per square inch. Most sound pressure readings higher than this refer to P.S.I. instead of dB. Buildings and houses exposed to this level of pressure have approximately a 50% chance of survival.

150 - 171dB (P) – Worlds loudest car stereos, up to 80 speaker drivers, thirty-two 12 volt car batteries, 100,000 watts (125-138 (N).

172dB (N) – Boeing aircraft types 727, 737, 747, 757, 767 cruising at 6 miles high, at Mach 0.84. At the ground (sea level) loses an additional 6dB because air density is only half sea level at a height of 6 miles.

172dB – Fog is created, depending on the temperature, dew point and humidity.

164 - 173dB (P) – Bass injection tests, experimental electromagnetic type speakers - REF.1.1987.

174dB – Air begins to heat up due to compression. Most shock waves are very hot.

175dB (N) – Quarter stick of dynamite, very close blast pressure may exceed 210dB (P).

175.8dB (P) – 1 Ton TNT at 250 feet.

177dB (P) = 2 P.S.I., Damage to structures are significant, 30% structure survival.

180dB (P) – 1 Pound TNT at 15 feet.

180dB (P) = 3 P.S.I., Damage to structures is catastrophic. When a shock wave hits a structure its momentum and pressure more than double, especially at high dB levels. Dynamic wind is approximately 103 MPH and causes a large portion of the damage. 15% object survival rate.

182dB (P) – 1 Ton TNT at 150 feet, exactly182.2dB.

183dB (P) = 6 P.S.I. Total destruction of all structures, particle velocity (blast wind) is 180 MPH. 0.9 Miles from Hiroshima Atomic Bomb and 3.3 miles from 1 megaton nuclear bomb. Less than 0.1% survival.

186.1dB (P) – 1 Pound T.N.T at a distance of 10 feet.

187dB (P) – 1 Ton T.N.T. at 100 feet, exactly 186.8 dB.

190.60dB (NP) – Riechter scale 0 (zero) earthquake.

191dB (N) – Bomb – very small, 1 lb – or hand grenade, very close, pressure may exceed 210dB (P).

193.806dB (P) = 1 Kilogram per square centimeter.

193.979dB (P) = 1 Bar pressure = 14.504 Pounds per square inch (P.S.I.).

194.09dB (P) = 1 (one) air atmosphere = 14.6962 pounds per square inch (P.S.I.) = 1 ATM. Sound waves distort and are now defined as shock waves and they begin to follow shock wave behavior patterns. Particle velocity (blast wind) = 590 feet per second, 180 meters per second, 402 MPH.

194.1dB (P) – Exactly 1 pound of TNT at 6 feet.

195 - 190dB (P) – Human eardrums rupture 50% of the time.

195.2dB (P) – 1 Ton T.N.T. at 60 feet.

200.59dB (NP) – 63.24 pounds of TNT, Riechter scale 1.

202 - 198dB (P) – Human death from sound (shock) wave alone.

205.29dB (NP) – 320 Pounds of TNT, Riechter 1.5.

207dB (N) – Small size bomb, 250 pounds, 14-foot wide crater, nearby SPL may exceed 238dB.

207.46dB (P) = 68.48 P.S.I.= (Q), Critical Pressure , the shock wave pressure (P) and the dynamic (blast wind) pressure (Q) are equal. Louder than this the dynamic pressure (Q) will always be more than the Shock Pressure (P). Blast wind (particle velocity = U) is 1697 feet per second, 518 meters per second, 1157 MPH. 400 feet from a 1000 ton TNT explosion.

209dB (N) – Medium bomb, 500 pounds, 18 foot wide crater, nearby SPL may exceed 240dB (P).

210dB – N.A.S.A. 400,000 Acoustic watt experimental noise making device.

210.6dB (NP) – Earthquake Riechter scale 2.0.

210.6dB (NP) – 1 Ton of TNT, 23.40 foot crater.

212dB (N) – Average sonic boom from jet aircraft.

213dB (N) – Sonic boom generates approximately 1.2 gigawatts or 1.6 million horsepower - REF.1.2002.

213dB (N) – 1 Ton of TNT, 23 foot wide crater or 175.8dB (P) at 250 feet (exactly 213.44dB).

215dB – Space shuttle launch, exhaust, at approximately 3 miles per second take-off velocity.

215dB (N) – Thunder, the largest positive giant thunder-head strikes. Ordinary thunder is 165 – 180dB. Lightning strike on ocean surface, 234dB (P).

215dB (N) – Battleship New Jersey firing all 9 of its sixteen inch guns.

216dB (P) – Inside a normal car engine cylinder with a 9 to 1 compression ratio.

216 dB (NP) (+/-0.3dB) - 6.5 Tons of TNT. Exact, extremely accurate high technology measurement.

218.2dB (NP) – Sonic boom from an F-16 fighter jet at 100 feet above the ground = 3.92 lbs. per square foot = 139.6db, +78.6db = 8536.5 meters high - REF.1.10. 2002.

220dB (N) – Bomb, largest conventional explosive type used in WW II, weighing 11 tons and 25 feet long - REF.1.3. 2001.

220dB (N) – Saturn 5 rocket, capable of melting concrete and burning grass one mile away, reached a velocity of five miles per second during launch. Put man on the moon.

220dB (N) – US Space shuttle sonic boom while landing, velocity of Mach 20 - REF.1. 1998.

225dB (P) – Inside a standard diesel engine cylinder @ 25 to 1 compression ratio.

228.1dB (P) – Exactly one pound of TNT at a distance of one foot.

230.59dB (NP) – Earthquake, Riechter Scale 4.0.

230.59dB (NP) – 1000 Tons OF TNT.

232dB (N) – Large non-nuclear explosion, 500 tons, 1917, destruction of German WW I tunnels in Messines Ridge area of Belgium. Heard and felt in London.

234.09dB (P) = 100 Atmospheres, blast wind = 241.46dB (Q).

235 (P) – 1 Ton TNT at 10 feet, exactly 235.3dB.

235.19dB (NP) – Earthquake, Riechter Scale 5.0.

235.19dB (NP) – 31,624 Tons of TNT.

240dB (N) – One kiloton of TNT, 233 foot wide crater, 29 feet deep, 10 PSI at 1000 feet (P), 230dB at 10,000 feet.

240dB (N) – Tornado, Fujitsu Scale 5, energy guess based on 300 MPH wind, one mile wide - REF.1.1997

243dB (N) – Largest non-nuclear explosion ever, 1947 destruction of Nazi U-boat pens. Used 7,100 tons of explosives.

248dB (N) – Atomic bomb, Hiroshima and Nagasaki, Japan, August 6, 9, 1945. Tragically killed estimated 300,000 people. Totally disintegrated 18 square miles, cracked distant concrete walls 12 inches thick. Equal to 20,000 tons of TNT, blast wind was approximately 300 MPH, destroyed 28 inch thick walls at one mile distance. Developed the power to make a crater 633 feet wide and 80 feet deep.

255dB (N) – 600 Kiloton atomic blast. Ground burst crater is 2,112 feet wide and 211 feet deep.

257dB (N) – Nuclear bomb, 1 Megaton (1million tons of TNT equivalent).

278dB (N) – Nuclear bomb, “Bravo” test, 15 Megatons, 1954, Bikini Atoll, Marshall Islands.

282dB (N) – Nuclear bomb, 57 Megatons, Hydrogen type, largest bomb ever detonated, 1961. Shock wave circled the earth 3 times, first orbit took 36 hours, 27 minutes.

286dB (N) – Mt. Saint Helens eruption. Blew down trees 16 miles away. Could be seen from outer space by Shuttle astronauts. Blew out windows in Seattle, 200 miles away.

296dB (N) – Earthquake, 8.6 Riechter Scale, ground moved up and down 13 feet - REF.1.3. 1988.

300dB (N) – Hurricane – average extreme energy is “diluted” by covering some 500,000 square miles. Energy dissipated roughly equal to 1,000 nuclear booms per second.

302dB (N) – Tunguska, Siberia meteor blast, blew down houses 600 miles away - REF.1.3. 1989.

310dB (N) – Krakatau volcano eruption, 1883 AD. Cracked 12 inch thick concrete at 300 miles, eruption heard 3,100 miles away. Sound pressure caused barometers to fluctuate wildly at 100 miles distance indicating levels of at least 170 – 190dB (P). At 100 miles even shouting in someone’s ear could not be heard. Caused fog to appear and disappear instantly at hundreds of miles distance. Rocks were thrown to a height of 34 miles. Dust and debris fell continuously for 10 days after the eruption. Produced very colorful sunsets for 1 year. Ejected approximately 4 cubic miles of earth. Created an anti-node of negative pressure at the exact opposite side of the earth. Sound waves covered 1/10 of the earth’s surface. Shock (sound) waves echoed around the earth 36 times and lasted for 1 month.

316dB (N) – Volcano eruption, Sorantini, Italy, 1740 BC. Although more energy was released than Krakatau, it blew up over a longer period of time but not as violently. Hence, the distant peak pressure is believed to have been lower than Krakatau. 15 Cubic miles of earth ejected, created tidal wave 165 feet high at a distance of 80 miles.

320dB (N) – Volcano eruption, Tambora, Indonesia, 1815. Ejected 36 cubic miles of earth, approximately equal to 14,000 megaton bomb (14 Gigaton) based upon ejected volume If it was a nuclear bomb it would have created a crater approximately 12.4 miles wide and 1.33 miles deep. Internal pressure was believed to have been 47 million PSI = 347dB.

REFERENCE APPENDIX:

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