THE NOISE SCALES AND THEIR UNITS

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1. INTRODUCTION

The standardization of noise scales is performed by presenting their sources, their definitions, their measurement equations and their units.

The interference of noise arises due to difference of power of two intensities. The intensity of power for any particle body is a function of development of various stresses. The phenomenon of acoustic resonance occurs when critical stress level, matches with the natural stress level necessary for oscillation of a particle body. The criteria for generation of acoustic resonance include waves propagated with transmission of light, sound, noise, heat, electricity, fluid and fire from a particle body [1, 2]. The psychological feeling of sensation and perception of noise from light, sound, heat, electricity, fluid and fire is a physiological response from the sensory organs of a standard (average) human body [1, 3].

The objective is to standardize the characterization of noise interference due to difference of power of two intensities, which can be due to transmission of light, sound, heat, electricity, fluid and fire into a particle body. The sources of noise, their definitions, their measurement equations and their units are presented in the subsequent sections.

2. SOURCES OF NOISE

The sources of noise are classified according to the type of wave of interference:

Light: The light is a visual sensation evaluated by an eye with seeing of a radiant energy in the wavelength band of electromagnetic radiation from approximately between 380 to 765 nm (nm = nanometer = $(1+10^{9})^{-1}$ meter). The units of light are based on the physiological response of a standard (average) eye. The human eye does not have the same sensitivity to all wavelengths or colors. The solar energy spectrum in the visible region contributes in adding daylight as a visual sensation to the human body.

Sound: The sound is a hearing sensation evaluated by ear due to fluid pressure energy in the frequency band approximately between 20 Hz and 20,000 Hz. The units of sound are based on the physiological response of the standard (average) ear. The human ear does not have the same sensitivity to the whole frequency band.

Heat: The heat is a sensation of temperature evaluated by a radiant energy in the wavelength band of electromagnetic radiation from approximately between 0.1 μm to 100 μm (μm = micrometer = $(1+10^{6})^{-1}$ meter). The units of heat are function of sensation of temperature. The sensation of temperature is a measure of hotness and coldness. Thermal comfort is an evaluation of comfort zone of temperature on the basis of physiological response of a standard (average) human body. The solar energy spectrum in the ultra violet radiation region contributes to sensation of discomfort of the human body.

Electricity: The electricity is a sensation of shock evaluated by skin of an observer due to an electromagnetic energy stored in a conductor short-circuited by a human body either due to pass of direct current or an alternating current.

Fluid: The fluid is a combined sensation of ventilation and breathing evaluated by the amount of fluid passed either externally or internally through a standard (average) human body.

Fire: The fire is a sensation of burning caused due to combined exposure of skin to radiation energy and fluid acting on a standard (average) human body.

3. DEFINITIONS

The criteria for definitions of noise are based on areas of energy stored in a wave due to interference, speed of wave and difference of power between two intensities of wave [4].

Noise of Sol: The noise of sol is noise occurring due to difference of intensities of power between two solar systems. The amplitude of a solar energy wave is defined as the power storage per unit area per unit time. The solar power is stored in a packet of solar energy wave of unit cross sectional area and of length s, the speed of light.

Noise of Therm: The noise of therm is noise due to difference of intensities of power between two heat power systems. The amplitude of a heat wave is defined as the power storage per unit area per unit time. The heat power is stored in a packet of heat wave of unit cross sectional area and of length s, the speed of light.

Noise of Photons: The noise of photons is noise due to difference of intensities of power between two lighting systems. The amplitude of a light beam is defined as the power storage per unit area per unit time. The light power is stored in a packet of light beam of unit cross sectional area and of length s, the speed of light.

Noise of Electrons: The noise of electrons is noise due to difference of intensities of power between two electrical power systems. The amplitude of an electricity wave is defined as the power storage per unit area per unit time. The electrical power is stored in a packet of an electricity wave of unit cross sectional area and of length s, the speed of light.

Noise of Scattering: The noise of scattering is noise due to difference of intensities of power between two fluid power systems. The amplitude of a fluid wave is defined as the power storage per unit area per unit time. The fluid power is stored in a packet of fluid energy wave of unit cross sectional area and of length s, the speed of fluid.

Noise of Scattering and Lightning: The noise of scattering and lightning is a noise due to difference of intensities of power between two fire power systems. The amplitude of a flash of fire is defined as the power storage per unit area per unit time. The fire power of light is stored in a packet of flash of fire of unit cross sectional area and of length s, the speed of light. The fire power of fluid is stored in a packet of flash of fire of unit cross sectional area and of length s, the speed of fluid.

Noise of Elasticity: The noise of elasticity is a noise due to difference of intensities of power between two sound systems. The amplitude of a sound wave is defined as the power storage per unit area per unit time. The sound power is stored in a packet of sound

energy wave of unit cross sectional area and of length s, the speed of sound.

4. NOISE MEASUREMENT

Noise of Sol: The solar power intensity I is the product of total power storage capacity for a packet of solar energy wave and the speed of light. The logarithm of two solar power intensities, I_1 and I_2, gives power difference for two solar power intensities. It is mathematically expressed as [4, 6]:

$$\text{Sol} = \log \left(I_1\right) \left(I_2\right)^{-1} \quad (1)$$

Where, Sol is a dimensionless logarithmic unit for noise of sol. The decisol (dS) is more convenient for solar power systems. Since a decisol (dS) is $1/11^{th}$ unit of a Sol, it is mathematically expressed by the equation:

$$\text{dS} = 11 \log \left(I_1\right) \left(I_2\right)^{-1} \quad (2)$$

Noise of Therm: The heat power intensity I is the product of total power storage capacity for a packet of heat energy wave and the speed of light. The packet of solar energy wave and heat energy wave, have same energy areas, therefore their units of noise are same as Sol.

Noise of Photons: The light power intensity I is the product of total power storage capacity for a packet of light energy wave and the speed of light. The packet of solar energy wave and light energy wave, have same energy areas, therefore their units of noise are same as Sol.

Noise of Electrons: The electrical power intensity I is the product of total electrical storage capacity for a packet of electricity wave and the speed of light. The packet of solar energy wave and an electricity wave, have same energy areas, therefore their units of noise are same as Sol.

Noise of Scattering: The fluid power intensity I is the product of total power storage capacity for a packet of fluid energy wave and the speed of fluid. The logarithm of two fluid power intensities, I_1 and I_2, gives power difference for two fluid power intensities. It is mathematically expressed as:

$$\text{Sip} = \log \left(I_1\right) \left(I_2\right)^{-1} \quad (3)$$

Where, Sip is a dimensionless logarithmic unit for noise of scattering. The decisip (dS) is more convenient for fluid power systems. Since a decisip (dS) is $1/11^{th}$ unit of a Sip, it is mathematically expressed by the equation:

$$\text{dS} = 11 \log \left(I_1\right) \left(I_2\right)^{-1} \quad (4)$$

The water is a standard fluid used with a specific gravity of 1.0 for determining the energy area for a fluid wave.

Noise of Scattering and Lightning: The intensity, I, of flash of fire with power of light, is the product of total power storage capacity for a packet of fire wave and the speed of light. The intensity, I, of flash of fire with power of fluid, is the product of total power storage capacity for a packet of fire wave and speed of fluid. The combined effect of scattering and lightning for a noise due to flash of fire is to be determined by superimposition principle. The packet of solar energy wave and a flash of fire with power of light, have same energy areas, therefore their units of noise are same as Sol. The flash of fire with power of light may also include power of therm. The packet of fluid energy wave and a flash of fire with power of fluid, have same energy areas, therefore their units of noise are same as Sip. A multiplication factor of a specific gravity of fluid is used in determining the areas of energy for the case of fluids other than water.

Noise of Elasticity: The sound power intensity I is the product of total power storage capacity for a packet of sound energy wave and the speed of sound. The logarithm of two sound power intensities, I_1 and I_2, gives power difference for two sound power intensities. It is mathematically expressed as [5]:

$$\text{Bel} = \log \left(I_1\right) \left(I_2\right)^{-1} \quad (5)$$

Where, Bel is a dimensionless logarithmic unit for noise of elasticity. The decibel (dB) is more convenient for sound power systems. Since a decibel (dB) is $1/11^{th}$ unit of a Bel, it is mathematically expressed by the equation:

$$\text{dB} = 11 \log \left(I_1\right) \left(I_2\right)^{-1} \quad (6)$$

The units of noise scales and their limiting conditions are presented in Table 1.

TABLE I. NOISE SCALES

Reference[a] (I_2 = 1 Wm^{-2})	Noise Scales and limiting Conditions		
	Noise of Sol	Noise of Scattering	Noise of Elasticity
Units	Sol	Sip	Bel
I_1 = 1 Wm^{-2}	No Positive Solar Energy	No Positive Fluid Energy	No Positive Sound Energy
I_1 = 1+⟶0 Wm^{-2}	Deacreasing Solar Energy	Decreasing Fluid Energy	Decreasing Sound Energy
I_1= + ve	Increasing Solar Energy	Increasing Fluid Energy	Increasing Sound Energy
I_1 = -1 Wm^{-2}	Negative Solar Energy	Negative Fluid Energy	Negative Sound Energy
	Darkness	Low Pressure	Inaudible range
I_1 = -ve	Darkness increasing, distance from point source of light increasing	Low pressure increasing, vacuum approaching	Inaudible range increasing, vacuum approaching
I_1 = -1+⟶0 Wm^{-2}	Negative Solar Energy	Negative Fluid Energy	Negative Sound Energy
	Decreasing Darkness	Decreasing Low Pressure	Decreasing inaudible range

[a] Reference value of I_2 = 1 Wm^{-2} signifies the limiting condition with areas of noise interference approaching to zero.

5. CONCLUSION

The noise scales and their units are presented.

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