**dB Meter Test Report**

**Overview**

This report provides a comprehensive analysis of a dB meter's performance, focusing on its capability to accurately measure sound levels. The device was tested in a controlled environment using a consistent sound source and compared against a reference device for validation.

**Equipment used:**

Frequency Sound Generator android app by LuxDeLux for noise signal generation.

KY-038 Big Sound Sensor in an ESP-12K microcontroller.

**1.  Accuracy & Calibration Test:**

•   Compare the decibel readings from your device with a known, calibrated sound level meter. Test at various sound levels to ensure accuracy across the device's entire range.

•   Verify that the device can be correctly calibrated using a known sound source. This might involve adjusting settings or using reference equipment.

**2.  Repeatability Test:**

•   Verify that the device can measure the same signal the same way a multiple times.

**3.  Range & Frequency Response Test:**

•   Determine the effective range of sound levels that the device can accurately measure. Test the lower and upper limits of its measurement capability.

•   Check how well the device responds to different frequencies. Sound meters can have varying sensitivity to different frequency ranges.

The original plan for testing was to test 3 different signals, from 3 different distances from the sensor, with 3 different sensors. As the low frequency tests were non-compatible and performance was low even with 10 centimeters distance, tests were done with the signal generator as close as possible to the sensors.

**Test Environment**

* **Location**: Soundproof Audio Lab
* **Ambient Conditions**: 21°C (Room Temperature)

**Test Methodology**

* The dB meter was tested using sound signals generated at full volume from a smartphone speaker.
* Three different KY-038 sound sensors were used interchangeably to ensure the accuracy and reliability of the sensors themselves.
* A reference device with a different optimal frequency range was used for comparison.

**Test Results**

**General Observations**

* Tests focused on a frequency range from 200Hz to 10kHz.
* The dB meter showed a consistent performance in the specified optimal range (3-6kHz), with satisfactory results extending to frequencies as low as 2,5kHz.
* Measurements below 2kHz and over 7kHz indicated poor performance, leading to the conclusion that these results are non-compatible or void.
* The reference device struggled to accurately read frequencies around 5kHz, suggesting a potential blind spot or noise cancellation effect at these frequencies.

**Sensor Validation**

* The use of three different KY-038 sensors confirmed that the observed performance characteristics were not due to sensor faults but are inherent to the device's design and capabilities.

**Specific Findings**

* At 200Hz, the device showed readings between 50-51 dB across all sensors. Reference device showed that these measurements cannot be true.
* At 500Hz, readings varied slightly depending on the voltage (3.3V or 5.0V), with measurements ranging from 49 to 51 dB. Reference device showed that these measurements cannot be true.
* The device demonstrated its peak performance within the 3kHz to 6kHz range, accurately capturing sound levels with a maximum cap observed at 83 dB. Reference device had a maximum cap of 84,8 dB in the same circumstances.

**Conclusion**

The dB meter, equipped with KY-038 sound sensors, is proficient in measuring sound levels within and slightly below its optimal range of 3-6kHz. The device's performance at frequencies below 1kHz is limited, rendering it unsuitable for accurate measurements in this lower range. The consistency in sensor performance across multiple KY-038 units substantiates the reliability of the meter within its effective operational range.