



The Institute of Sound and
Communications Engineers

Engineering Note 1.2

Measuring noise voltages in different ways

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The following tables show the effects of measuring white and pink noise voltages with different meters and frequency weightings. The first table explains what the various meters and weightings are, and the second shows the results of measuring **the same white or pink noise voltage** with the different meters. The fact that they are different does **not** mean that only one is the 'right' value. The only ones that are not generally valid are the 'ARM' ones, which were originally introduced by Dolby Laboratories to help explain the effects of Dolby B noise reduction to a semi-technical hi-fi enthusiast market. They **should not** be used for any other purpose, as that could be considered to be deliberately misleading.

Table 1: Description of the meters and weightings

Meter/Weighting	Description
Quasi-peak/CCIR weighted	Meter with a fast but not instantaneous response. Weighting based on the subjective disturbing effect of noise on programme signals
RMS/flat 20Hz –20 kHz	Meter with r.m.s. response. Weighting consists of controlled roll-off of response below 20 Hz and above 20 kHz.
RMS/CCIR weighted	See above descriptions
'CCIR-ARM 2 kHz'	Meter responds to the average of the full-wave rectified voltage. Weighting as CCIR but with 5.6 dB attenuation.
'CCIR-ARM 1 kHz'	Meter responds to the average of the full-wave rectified voltage. Weighting as CCIR.
RMS/A-weighted	Meter with r.m.s. response. Weighting originally used for measuring acoustic noise by itself at low SPLs, but now at all SPLs.
vu/A-weighted	Meter with an empirical, fairly slow response, originally developed for telecoms line communication in USA. Weighting as above
vu/flat 20Hz – 20kHz	See above descriptions
BBC PPM/ flat 20Hz – 20kHz	Meter with a fast but not instantaneous response and a much slower fall-time, originally developed for controlling modulation depth of transmitters. Weighting as described above.
Quasi-peak/ flat 20Hz – 20kHz	See above descriptions.

Table 2: Results of measurements made with a Lindos LA102 test-set.

The noise source was a Brüel & Kjær 1402 noise generator (very old but checked out as still good!).

Meter/Weighting	White noise, 20 Hz – 20 kHz Relative level in dB	Pink noise, 20 Hz – 20 kHz Relative level in dB
Quasi-peak/CCIR weighted	+7.95	+7.22
RMS/flat 20Hz –20 kHz	0 dB reference	0 dB reference
RMS/CCIR weighted	+5.7	+4.0
'CCIR-ARM 2 kHz'	-0.5	-2.5
'CCIR-ARM 1 kHz'	+4.9	+3.0
RMS/A-weighted	-2.3	-3.0
vu/A-weighted	-3.4	-4.5
vu/flat 20Hz – 20kHz	-1.4	-1.3
BBC PPM/ flat 20Hz – 20kHz	+3.5	+4
Quasi-peak/ flat 20Hz – 20kHz	+3.4	+3.5

The fewer decimal places in the results, the more jittery the meter reading was.