Brüel & Kjær Vibro

Encyclopedia

N

Narrow-band filter

A bandpass filter with a small frequency range. In addition a high quality measurement is necessary.

Natural frequency

Frequency of the free oscillation of a system. In a system with many degrees of freedom, the frequencies of the natural modes are the N. each frequency, in which in a physical system, free vibrations can be present after the excitation has been eliminated.

The vibrations with the natural frequencies become excited with weakly damped systems if a force acts on it for a short time.

Natural frequency, damped

Frequency of the free vibration of a damped linear system.

Natural frequency, undamped

Frequency of the free vibration which is due only to flexible and inertia forces which act on the system.

Natural vibration; natural oscillation

The free oscillation of a closed, expanded system, with which condition variables in all spatial points vibrate synchronously with a characteristic frequency - the natural frequency - that is dependent upon the characteristics of the system. Every system which is able to oscillated has one of the number of the N which corresponds to its degrees of freedom, and this is differentiated by its natural frequency, as well as the vibration type (e.g. bending or torsion vibration).From an outside impact a number of N are excited simultaneously; the resulting oscillation can be represented by an overlay of the excited N.

Brüel & Kjær Vibro

Encyclopedia

N

With weakly absorbed systems the natural frequency is equal to one of the possible resonant frequencies, with which an outside periodic excitation in the system forces maximum amplitudes. Every machine, every building exhibits N; they can grow with resonance so strongly that a construction part eventually breaks.

Negative peak value

See Peak value

Neper

Abbr.: Np
Characteristic value for the Naperian logarithm of the relationship of the values of two variables of the same kind, e.g. two oscillations. The N. is used like a unit. With reference to the decibel the following conversion is valid:

$$1\ Np = 20 \ln(1\ dB) \approx 8{,}86\ dB$$

See also Damping

Network

A system for the transfer of information (LAN).

Brüel & Kjær Vibro

Encyclopedia

N

Network transition

Technical equipment which interconnects several LANs or segments and/or different protocols. Due to the hierarchical layer structuring of LAN a N has. in each couple-layer a special character. In the lowest (physical) layer the signals are only regenerated (e.g. Ethernet Repeater). In the higher transport-oriented layers sub-networks are logically decoupled from each other, and addressing mechanisms are used to select the paths (e.g. Bridges, Routers). In these layers access protocols can also be transformed. In the higher application-orientated layers N. are used for the conversion of different application protocols and are generally called Gateways. The N. has a special significance in heterogeneous communication systems, since they can substantially increase the communication possibilities.

Nodal point

The point within a natural mode with the smallest (or none) shaft deflection. The N. is locally variable e.g. with changing unbalance distribution, with other excitations or changes in axial clearance. Often here also the absolute shaft vibration is smallest. The vibrations on either side of a nodal point are shifted by $180°$ from one another.

Noise

A variable physical feature, which contains no obvious information and which can overlay an information signal or be combined with it.

Note 1: N. can in certain cases supply information about some characteristics of its source, e.g. the type and location.

Note 2: A group of signals can appear as N. if the signals are not individually identifiable.

Note 3: The English-language designation “noise “is translated in German as “Geräusch“ or with “Rauschen“, whereby a different meaning is attached to the two German-language designations.

Brüel & Kjær Vibro

Encyclopedia

N

See also Sound

Noise amplification

An amplification of noise appearance in digital filtering. Through the application of filter algorithms, amplification of the noise appearance can occur. The cause lies in the nature of digital signal processing.

Noise bandwidth; effective noise bandwidth

The valid bandwidth for the noise of a filter, a receiver or an amplifier. The N. is given by the width of a rectangle which has the same height as the transmission curve of a given four-pole network in the locations of maximum power amplification and which allows the identical noise output as the original curve to pass through.

Noise, coloured

Noise with a continuous spectrum and a periodical power density spectrum in the regarded frequency band.

Noise event

A N. is a stochastic process which is constant but not periodic and which can only be described with the help of statistical characteristic values. Such are the linear and the quadratic average value as known constants, the power density and the autocorrelation function linked with it, as known functions in the frequency and time domain (see frequency and time domain).
According to the progress of the power spectrum one distinguishes between the following basic types of noise events:

Brüel & Kjær Vibro

Encyclopedia

N

- White noise (a) with constant (frequency independent) power density as idealised borderline;
- Broadband noise (b) with frequency independent course of power density up to an upper power density border frequency f_g, e.g. 3 dB border frequency;
- Coloured noise (c), results from linear filtering of broad-band noise ($A\{f\}$ is the frequency response of the filter);
- Narrrow-band noise (d); its power density is grouped closely around a centre frequency f_m ($\Delta f \ll f_m$)
- Pink noise (e), whereby the power density in inversely proportional to frequency.

Noise factor; Noise measure

A characteristic quantity for the noise of an electronic circuit (4-pole) and/or electronic constructional element. The N. gives the relationship of input to output noise and is dimensionless.

Noise gap

See also Signal-to-noise ratio

Noise, Gaussian

Noise whose values with n arbitrary conditions according to the Gaussian probability function are distributed with n variables.

Note: N. G. is completely defined by its time-dependent mean and by its covariance function of two time points. If the noise is stationary, the mean is time-independent, the covariance becomes a correlation function and only depends on the difference between the two regarded times, and the knowledge of the correlation function is equivalent to the knowledge of the power density spectrum.

Brüel & Kjær Vibro

Encyclopedia

N

Noise generator

A functional unit for the creation of coincidental signals with known statistical characteristics of amplitude distribution and spectral density (spectral power density). Usually the mean value is zero and the amplitude distribution corresponds to a Gaussian distribution (Gaussian function). The frequency spectrum extends into the kilo-Hertz range. From this, other distribution densities can be achieved through filtering, if this is necessary [23].

Noise immunity

The feature of a transmission system which minimises or excludes the effect of the overlaid disturbance on information signals.
The feature which allows equipment to operate during an electromagnetic disturbance without function impairment.

See also Radio interference immunity

Noise measure

See also Noise factor

Noise; Noise sound

Vibrations or oscillations (and/or sound) whose time curve can only be statistically described.

Noise, pink (signals)

Oscillations (and/or noise sound) at which the quotient of oscillation intensity (and/or sound intensity) and frequency bandwidth over a regarded frequency range is inversely proportional to the frequency.

Brüel & Kjær Vibro

Encyclopedia

N

Noise with a continuous spectrum of a type where the values of the power density spectrum are proportional to the reciprocal values of the frequencies in the regarded frequency band.

Noise; random noise

Noise, the value of which is predictable at given times. Unordered, statistical laws underlying fluctuation symptoms. The N. forms a natural lower limit for the evidence of acoustic or electrical signals. Only probability data is possible about the value of statistical fluctuation symptoms. Fluctuation processes characterized as N. are stationary and ergodic.
The stochastically varying magnitude obeys, in the most frequent case, a normal distribution, i.e. it is also arbitrary magnitudes of values of a fluctuation with a finite, although very small probability present. Due to the statistical nature of temporal fluctuations, only the power spectrum can be indicated for the N. The autocorrelation function (correlation) indicates in which measure a fluctuation value is linked at time *t* with the value at time $t + \tau$ (correlated).
If the Fourier transform (Fourier transform) of the autocorrelation function, the power spectrum, is frequency dependent, i.e. all possible frequencies occur with the same spectral power density and obeys the fluctuation values of normal distribution, one speaks of white N. and - analogous with it - at a stronger frequency dependence, of coloured N.

Noise signal

Noise supplied by a noise generator, in analogy to the signal of a measuring generator.

Noise source

See also Noise generator

Brüel & Kjær Vibro

Encyclopedia

N

Noise spectrum

Power spectrum of a temporal fluctuation process which results in noise. The N. is used, because due to the statistical nature of temporal fluctuation procedures, no amplitude spectra can be given.

Noise suppression

The reduction or elimination of the appearance of noise in electronic circuits and/or electronic elements. A primitive form of N. is, e.g. the switching in of a lowpass filter.

Noise voltage

See Noise factor

Noise, weighted

Noise whose power density spectrum is modified by a given frequency-selective filter.

Noise, white (signals); flat random noise

Oscillations (and/or noise sound) at which the quotient of oscillation intensity (and/or sound intensity) and frequency bandwidth is constant over a regarded frequency range. Noise with a continuous spectrum and constant power density spectrum in the regarded frequency band.

Nominal load operation

Operation of a unit during nominal demand

Brüel & Kjær Vibro

Encyclopedia

N

Nominal position

With installed equipment, the position or location in which equipment, especially a measuring instrument, is to be operated, in order to fulfil the agreed upon or guaranteed technical data.

Non-contacting displacement sensor

A sensor with a non-contact measurement principle for measuring the path and position of an object as a function of the point of attachment of the sensor (relative movement).

Applications: Contact-less path sensors are used for capturing relative shaft vibrations from machines and gear boxes with sliding bearings. A distinction is made between the eddy current and inductive measurement principles where the eddy current measurement principle is preferred for monitoring shaft vibrations.

Non-stationary signals

Signals which are not stationary, i.e. they are continuously variable

Non-synchronous

Designates two time-dependent features, time-slot patterns or signals, whose corresponding significant times are separated from each other by time intervals which are not of the same duration.

NOR function

The negated OR operation of two binary variables, thus the non-OR function (NOR)

$$f = \overline{a \vee b}$$

Brüel & Kjær Vibro A/S, Skodsborgvej 307 B, 2850 Naerum, Denmark, phone: + 45 77 41 25 00, Fax: +45 45 80 29 37 - Brüel & Kjær Vibro GmbH, Leydheckerstrasse 10, 64293 Darmstadt, Germany, phone: +49 6151 428 0, fax: +49 6151 428 10 00 - info@bkvibro.com, www.bkvibro.com

Encyclopedia

N

a	b	f
0	0	1
1	0	0
0	1	0
1	0	0

Table of the NOR function

Normal

<standard; etalon>

Measuring instrument, equipment or reference material which has the purpose to represent a unit or one or more known values of a variable, in order to pass these on to other measuring instruments for comparison.

Normal distribution

The distribution of a rising coincidental variable with the density function

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2};\ -\infty \le x \le \infty;\ \sigma > 0$$

Is called N. It is clearly determined by the expectancy value μ and the standard deviation σ. The great importance of the N. in the statistics is based on the central limit theorem, according to which under very general conditions the distribution of a sum of stochastically independent variates is approximately normally distributed with a large number of addends.

In signal processing and pattern recognition, the multi-dimensional generalisation of the N. plays an important role. Thereby a vector variable occurs at the place of the scalar variable *x*, and the parameters expectation vector and co-variance matrix at the place of the two parameters expectancy value and variance. See also Gaussian distribution.

Brüel & Kjær Vibro

Encyclopedia

N

Normal modes, of oscillation

A form of free vibration of an undamped system.

Note: In principle each compound movement of a system can be extracted into the sum of its N., of which every one can occur independently of the others.

Normally energized principle

A function of information plants, in which a current flows so long, as no signal will transfer. The converse is the normally de-energized principle.

n^{th} modal unbalance

The unbalance condition that only prompts the nth normal mode of the rotor-bearing system. The unbalance in the n^{th} normal mode is not the only unbalance but is an unbalance distribution corresponding to this normal mode.

Numeric

Refers to a character set, which predominantly serves for a figure-oriented number notation. It consists either only of numbers or of numbers supplementing letters and special characters which are necessary for such a number notation.

Numeric characters

See Characters, numeric

Brüel & Kjær Vibro

Encyclopedia

N

Nyquist curve

If one illustrates several vectors (amount and phase) in a polar diagram and is limited during the representation to the connecting lines of the vector peaks under indication of the parametering, then one speaks of an O.

Note: The term “Nyquist diagram“, which is common in electro-technology for the representation of the transient characteristic of electrical systems, should not be used the representation of vibration measured values in polar form.

Nyquist diagram

A graphic representation in a polar diagram applied in electronics. This term should not be used for similar representation of the vectors of sinusoidal oscillations. In this case the term Nyquist curve is to be used.

Nyquist frequency

The N. is characterised as the half-sampling rate during digital signal scanning.

See also Shannon sampling theorem