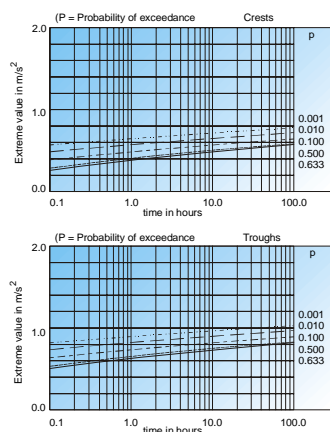


## Statistical, spectral and response analysis of time series

# STATAN/CROSCOR

Simulation programs such as MOORSIM, LIFSIM, DPSIM and DYNFLX generate time records of motions and forces. At MARIN several post-processing programs are available for the analysis of time domain simulation results. Most important are the programs STATAN and CROSCOR.



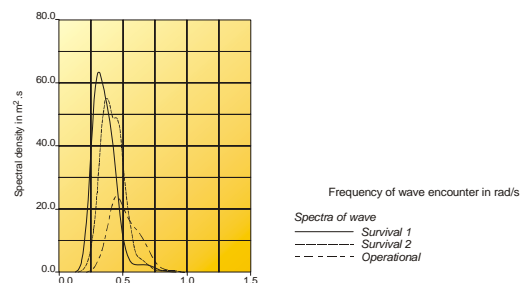
STATAN performs a statistical and spectral analysis of a single time series. The statistics consist of:

- statistical tests for (weakly) stationarity and normality;
- mean, standard deviation, minimum and maximum value;
- distribution function of the time series samples;
- distribution functions of the peak and trough values, the double amplitudes and the peak-peak periods;
- normal, Rayleigh and Weibull distribution plots;
- prediction of extreme values.

The spectral analysis consists of the computation of the spectral density function and the auto-correlation function of the time series. In STATAN the so-called 'direct Fast Fourier Transform technique' is used to estimate the spectrum.

Cross spectral analysis and response analysis are performed in the program CROSCOR. Linear relationships in physical input-output systems (e.g. wave-roll motion) are defined in terms of frequency response functions. The following frequency operators are calculated in CROSCOR:

- auto-spectral density functions of input and output time-series;
- cross-spectral density function;
- phase angle;
- Response Amplitude Operator (RAO);
- coherence function.



The time series to be analysed are stored in the standard MARIN database management system, called MANDAT file, so that thus data analysis techniques can be applied as well on measurement time signals.

The output options consist of print output of the statistical and spectral results. Additionally, plots can be generated of:

- normal, Rayleigh and Weibull distributions;
- prediction of extremes;
- spectral density functions;
- response amplitude and phase operators.

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