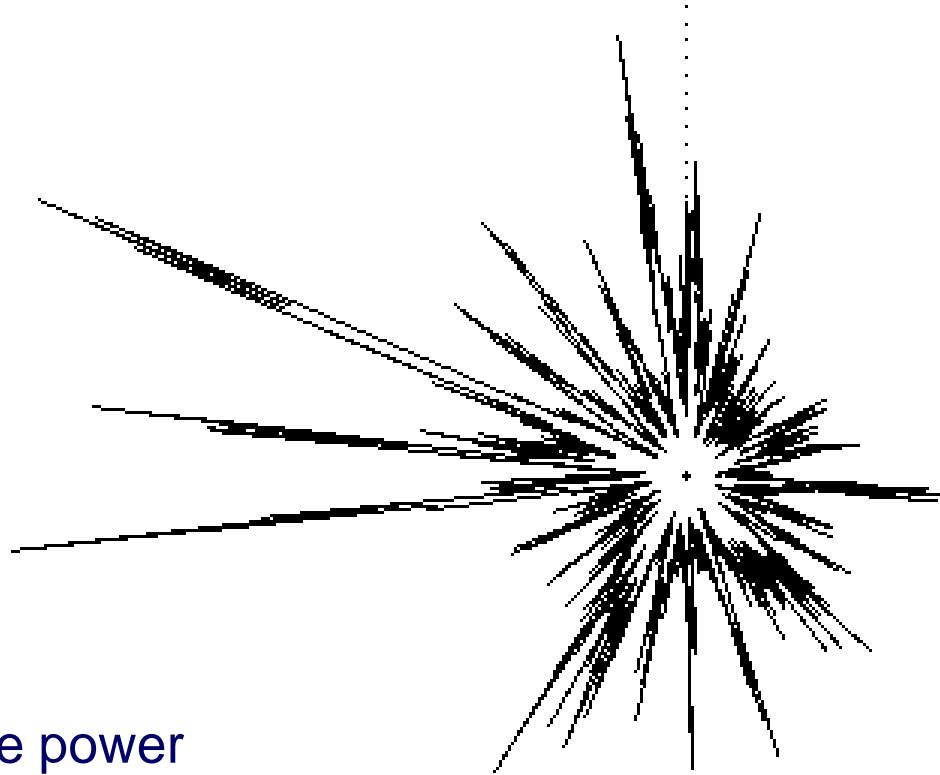


Cavitation noise modulation

Raw data for multidimensional analysis, both in diagnostic tests and in monitoring, consists of a collection of functions describing the dependence of cavitation noise power on the instantaneous angular position of the runner. These modulation curves describe the variations in cavitation intensity generated while runner blades are passing through the disturbed flow behind guide vanes.

Modulation curve in the polar format:

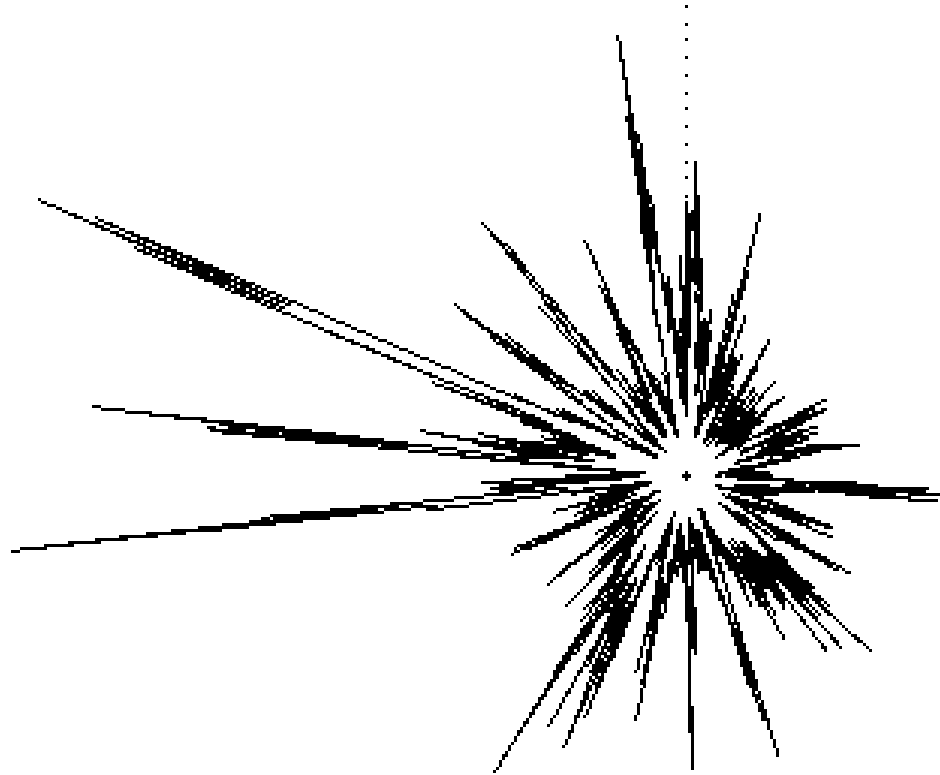


Normalised noise power
(radial co-ordinate)

vs.

Instantaneous runner position
(angular co-ordinate)

The patterns vary depending on sensor location and turbine-power setting.



An illustration of the turbine-power dependence follows.

Turbine
power

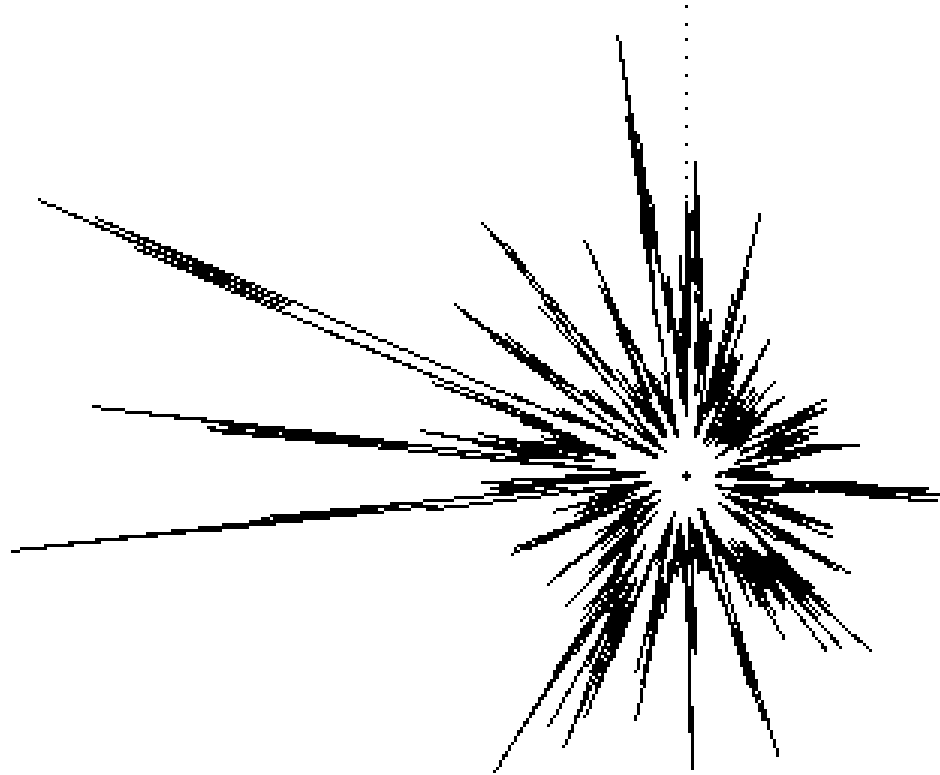
70 MW

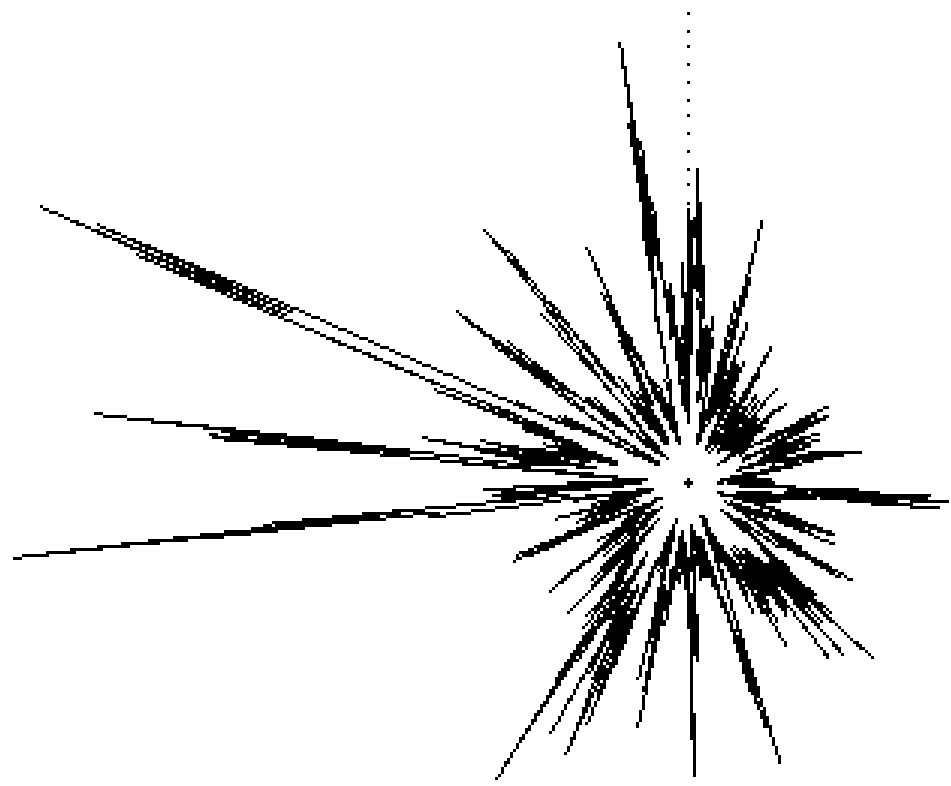
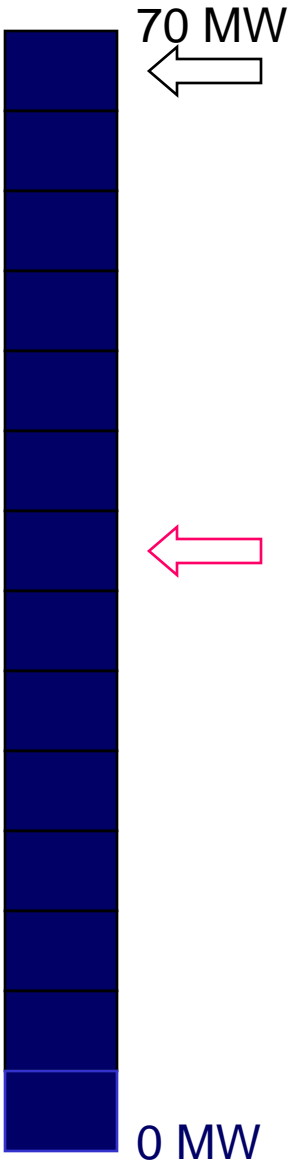


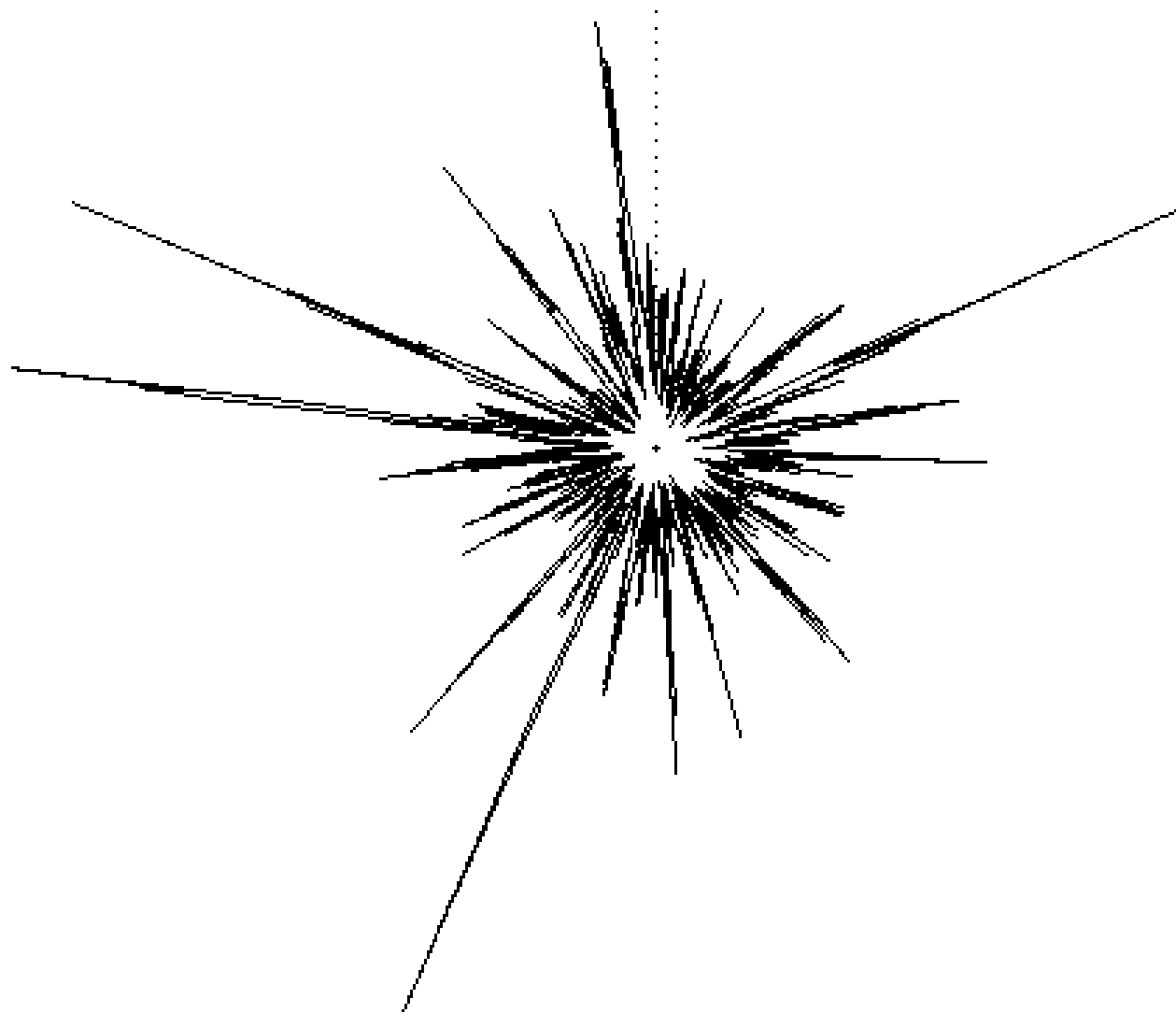
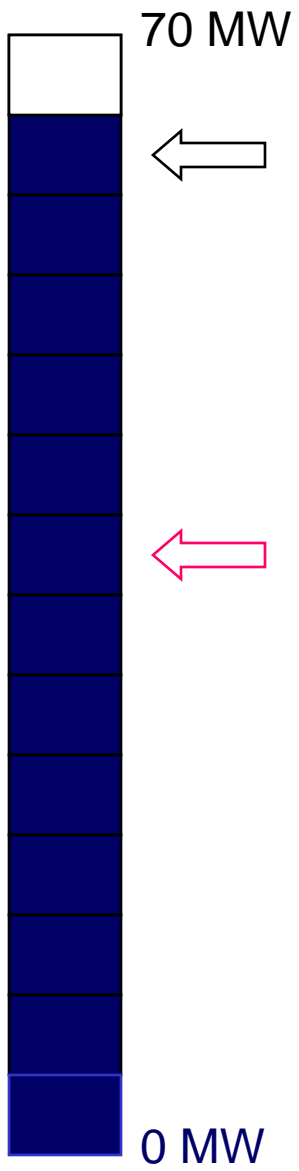
0 MW

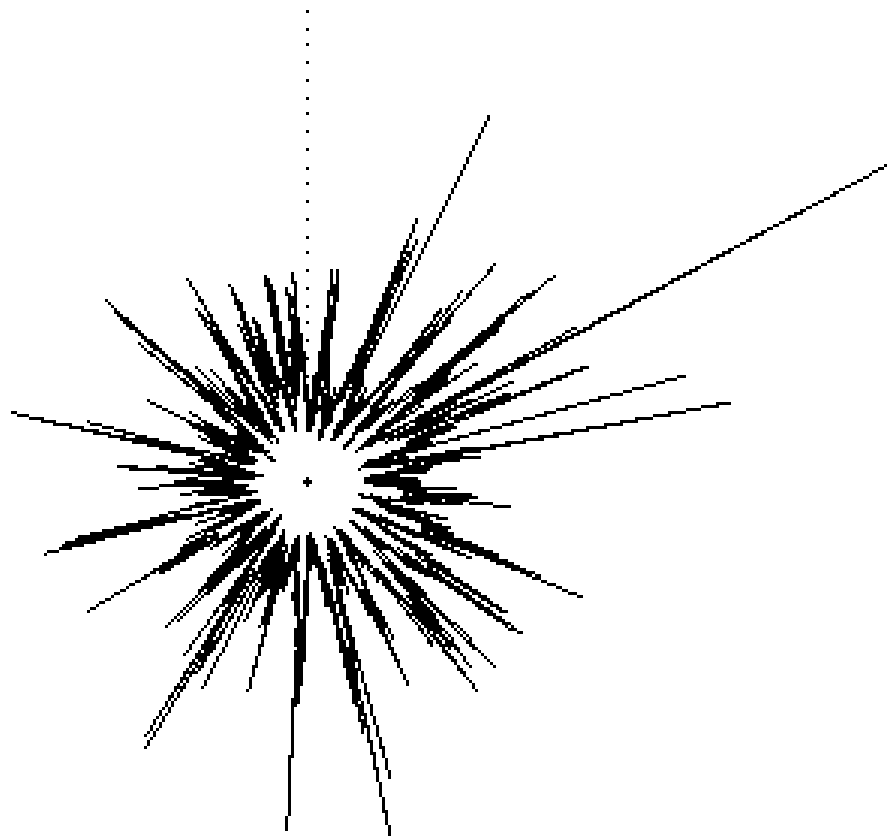
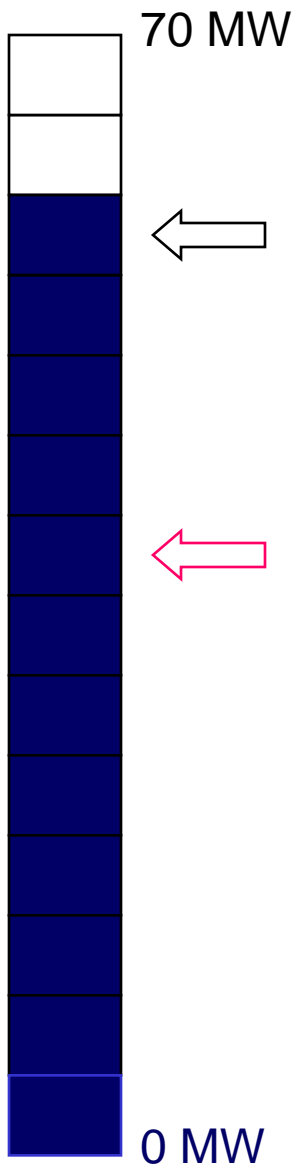


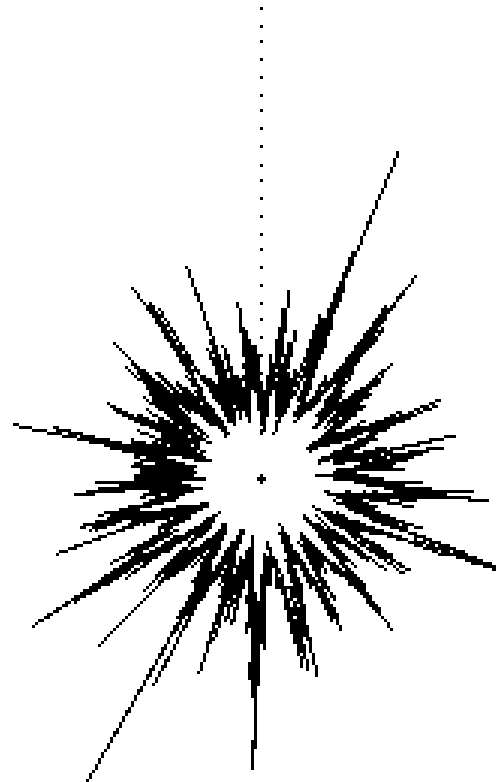
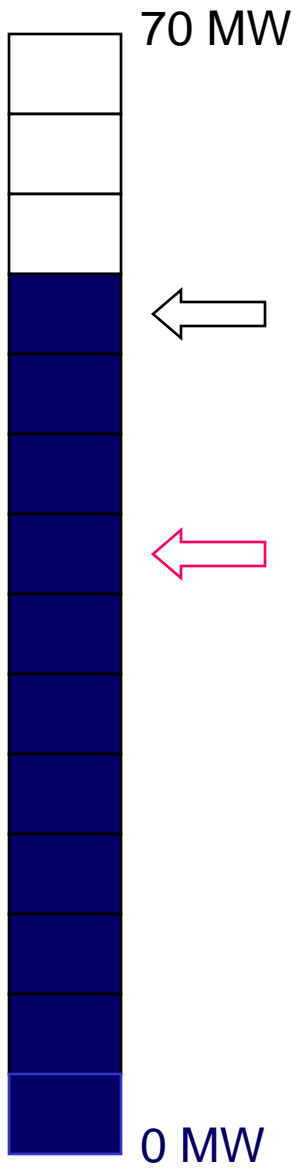
Cavitation
threshold

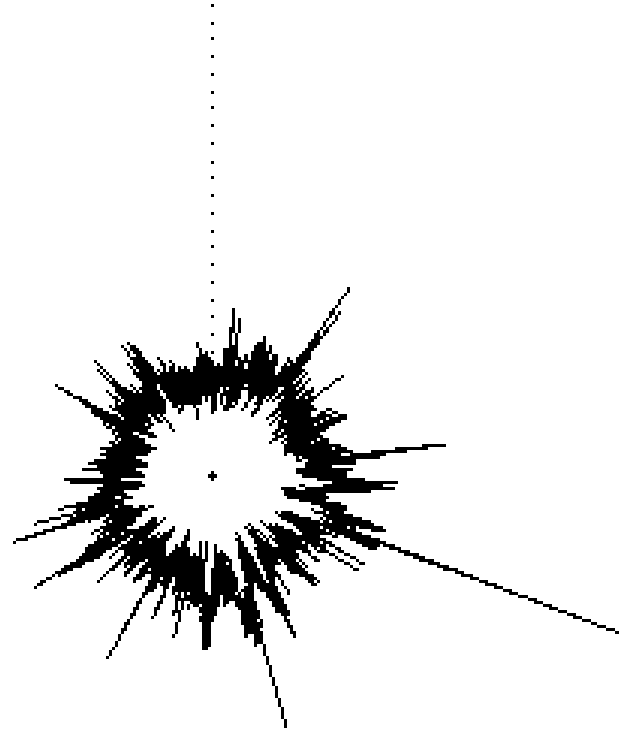
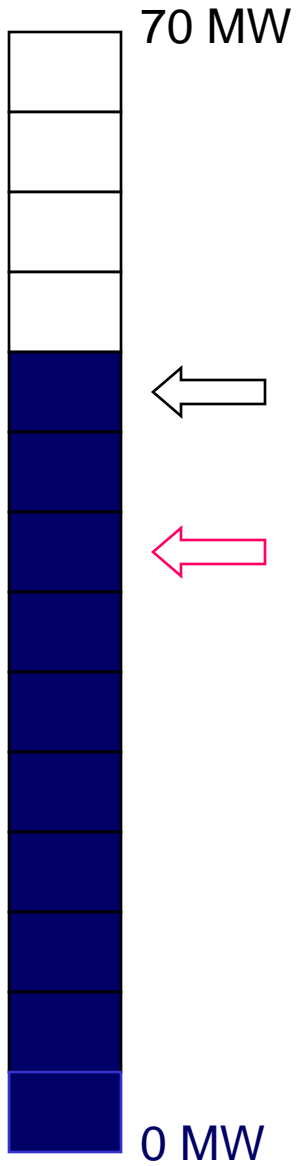


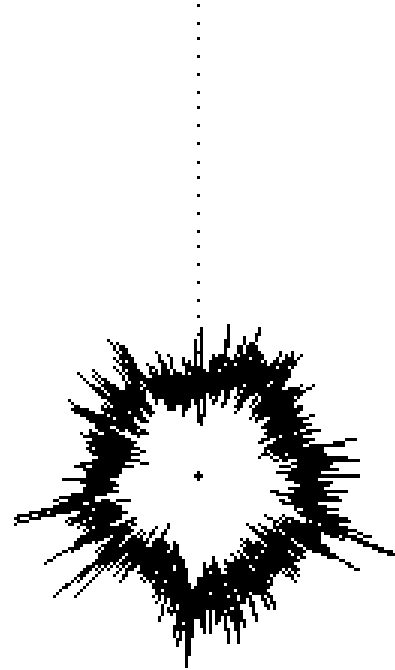
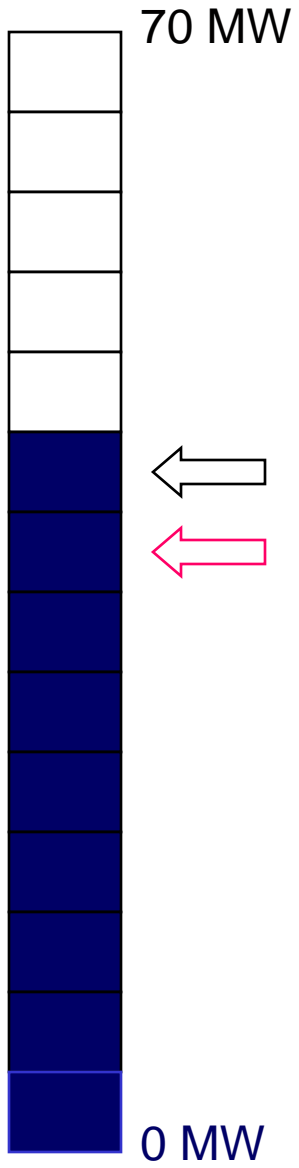


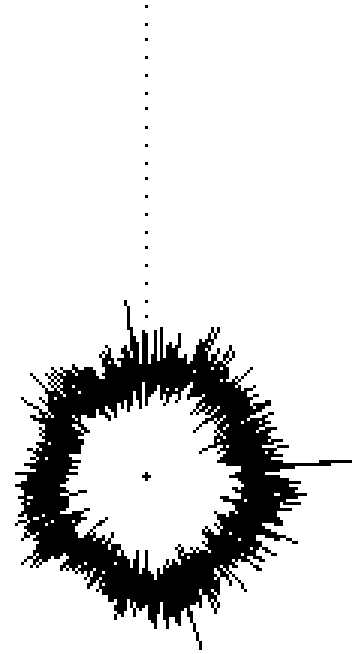
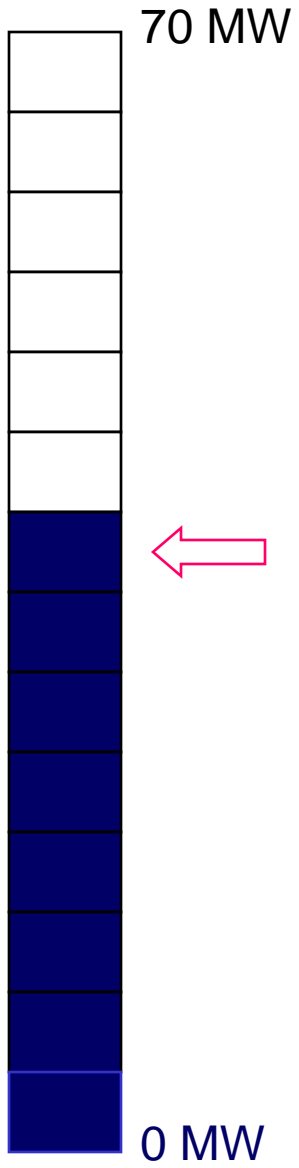


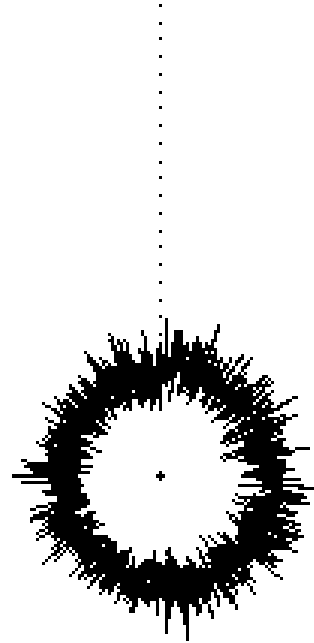
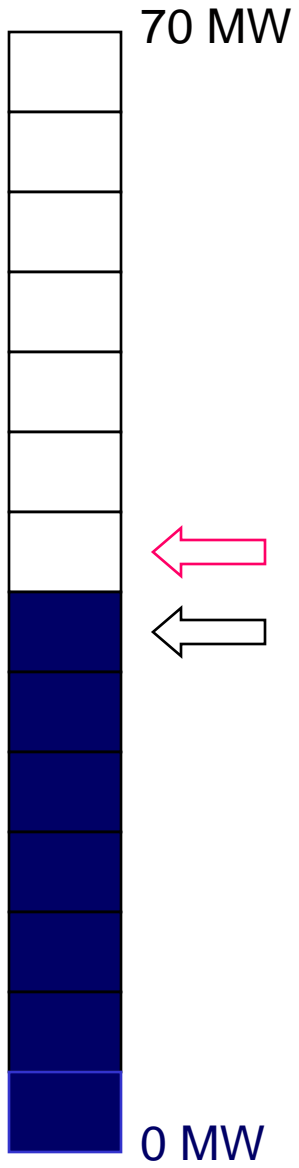


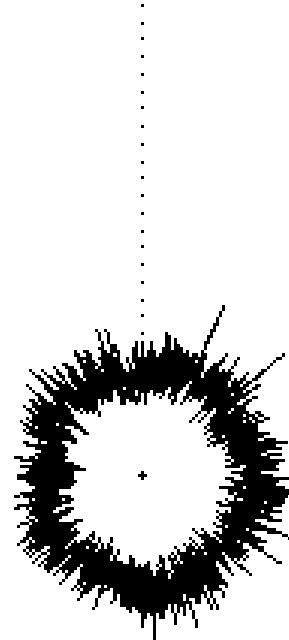
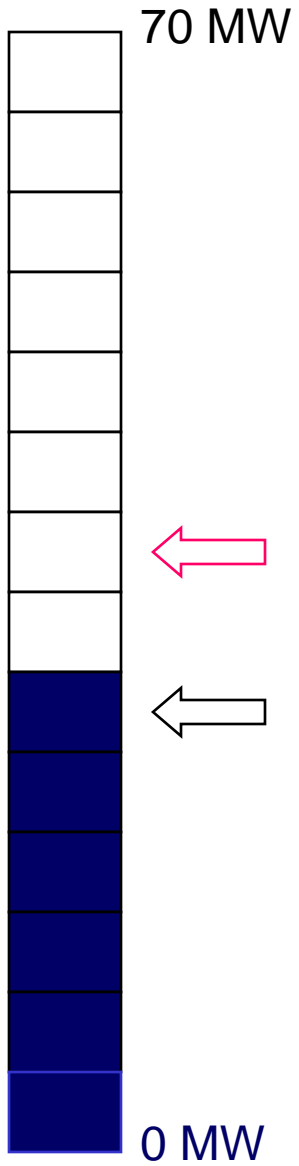


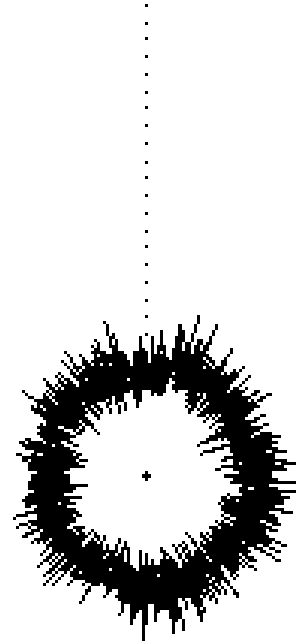
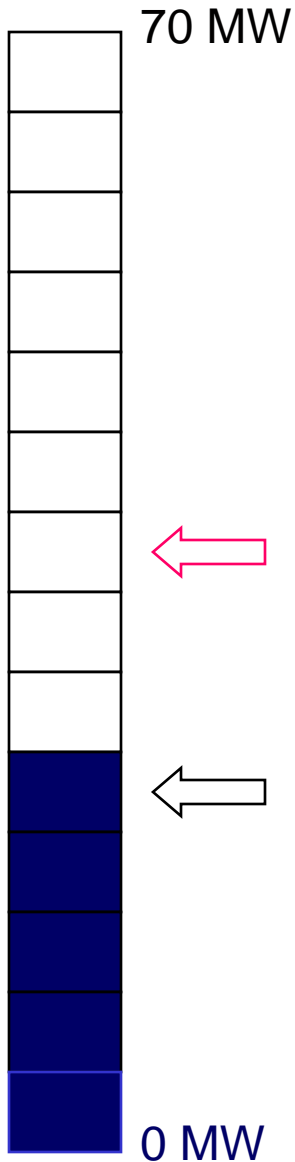






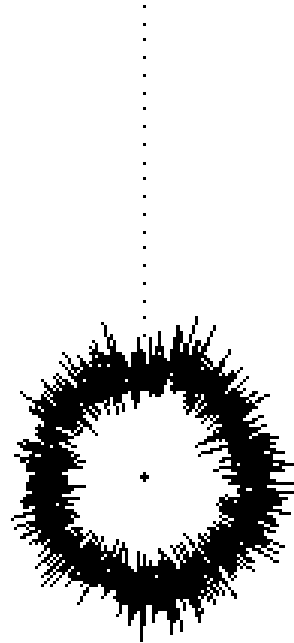
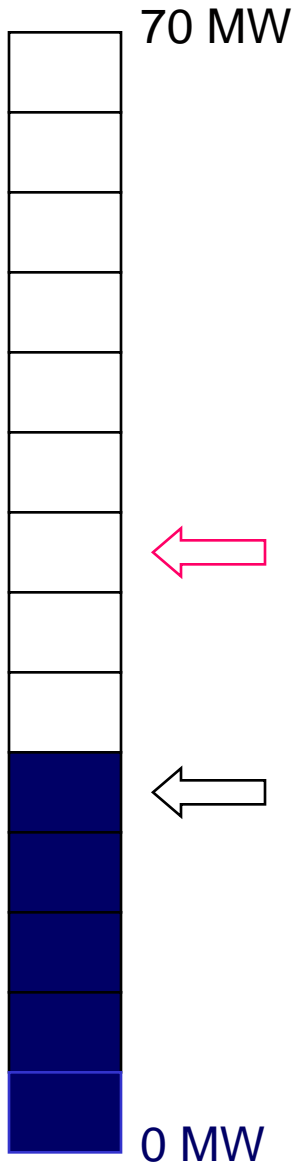




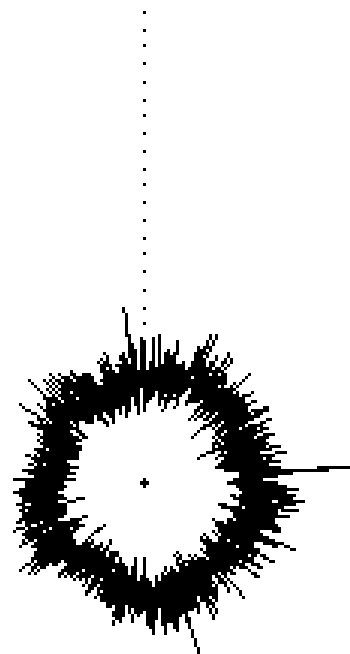
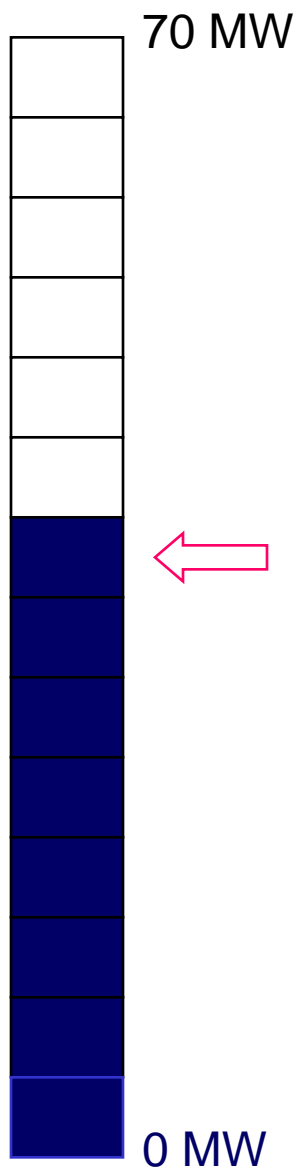


Below the cavitation threshold, the patterns are almost circular since flow noise and other sources of background noise do not depend on the instantaneous runner position.

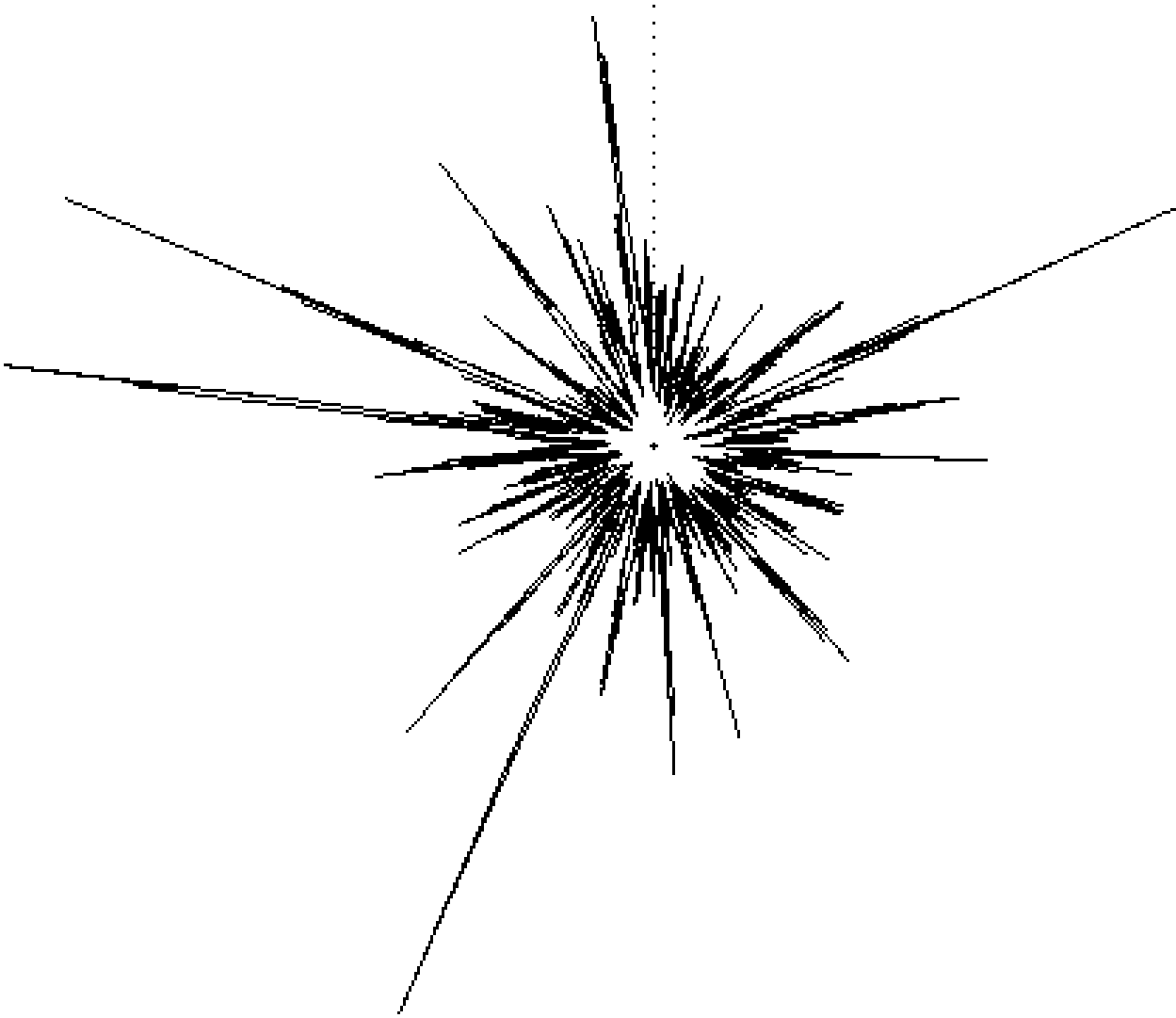
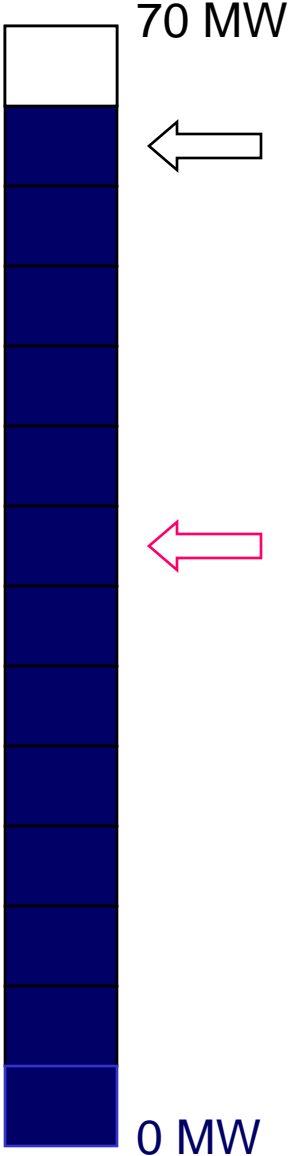
Once again: Below the threshold



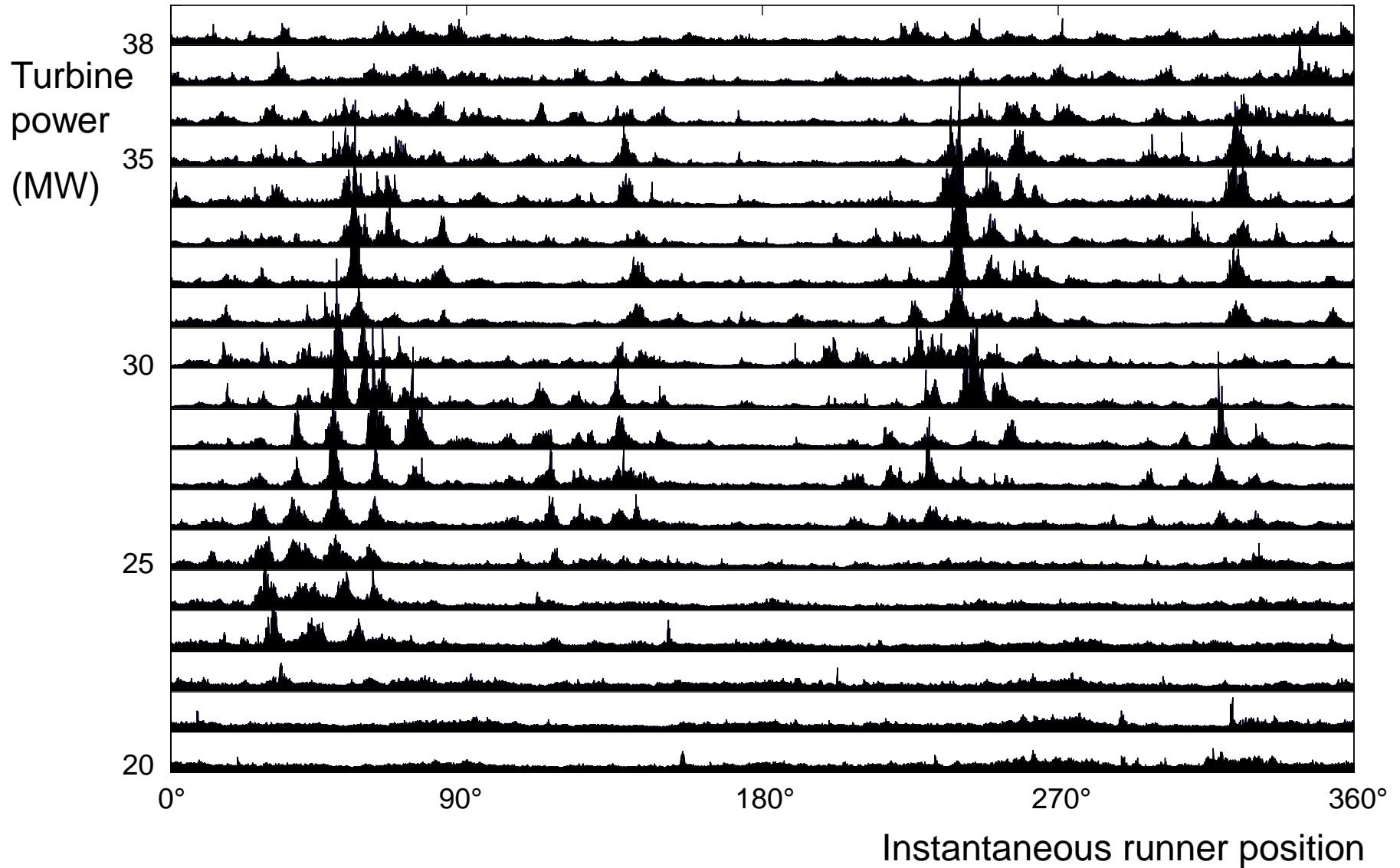
At the threshold



High above the threshold



Review of such results recorded in one sensor location:



Interpretation:

