Supplementary Methods

In all experiments, task difficulty was controlled by adjusting the phase range from which phases of individual elements (Gabor, windmills, disks, or gratings — depending on the experiment) were randomly selected. As the phase range increases, phase differences between individual elements increase making it easier to detect incoherent oscillations. For any phase range smaller than 180º, the expected value of the phase differences between individual elements is 1/3 of the phase range (Supplementary Fig. 1, dashed line). That is, the task difficulty increases linearly with the phase range. As the phase range exceeds 180º, increasing the phase range has progressively smaller effects on the expected value of the phase differences between individual elements. This is due to the periodic nature of the phase differences and the fact that the maximum possible phase difference between two elements is 180º.

To characterize this non-linearity, we computed phase difference between two phases randomly selected from a given phase range. This was repeated 1,000,000 times for each phase range between 180º to 360º (at 1º increments). The result (Supplementary Fig. 1) is a negatively accelerated function. When phase range equals 360º, phases are selected without any bounds and the expected phase difference attains its maximum possible value of 90º. Based on this result, phase range values were linearized and normalized (Supplementary Fig. 1, left y-axis). This new measure (Transformed phase range) allows for more efficient selection of stimulus levels for the method of constant stimuli and more accurate depiction of results.