

### Test Question 1

If subjects produce rapidly changing forces the beta activity recorded above primary motor areas is much weaker as compared to the beta activity during static force production even if, on average, the amount of force is the same in both tasks.

- What can possibly explain the difference in beta activity?
- What is the common idea about the functional relevance of beta activity in static versus dynamic force production?
- How does the activity in the mu-(or alpha-)band typically differ between the two force conditions?

### Test Question 2

The Kuramoto-model for phase oscillators reads

$$\dot{\phi}_j = \omega_j + \frac{\kappa}{N} \sum_{k=1}^N \sin(\phi_k - \phi_j)$$

- What is the meaning of the individual phases?
- Describe in words how this model can in principle be deduced from a networks of, for instance, leaky-integrate-and-fire neurons. Hint: What types of connections are needed to generate stable oscillatory activity?
- Give an explicit example of a neurophysiological setting for which the Kuramoto model provides a proper description. Motivate your choice.

### Test Question 3

M/EEG recordings often employ an event-related design.

- Explain briefly how an event-related design in general looks like.
- What is the quantitative benefit of the event-related design over, e.g., assessing ongoing activity?
- Sketch an explicit example of an experiment using an event-related design for assessing effects of acoustic pacing on finger tapping.

### Test Question 4

Models of neural activity can be very complicated. The Hodgkin & Huxley model (HH-model) is seminal of the dynamics of the membrane potential of excitable cells and falls into the category of complicated models.

- What qualitative characteristics does the HH-model describe?
- An (over-)simplified version of the HH-model is the so-called leaky-integrate-and-fire (LIF)-model. Which qualitative features does the HH-model and LIF-model share?
- How would you (qualitatively) modify the LIF-model in order to mimic more realist features of the HH-model?