PHEROSYS MEETING

09:00-09:15. Welcome

WP1:

09:15-09:30. Jean-Pierre Rospars (INRA) : Introduction to WP1 (objectives and achievements)
09:30-10:00. Yuqiao Gu (INRA) : Biophysical models of sensillum and action potential generator
10:00-10:30. Alexandre Gremiaux (INRA) : A statistical analysis of pheromonal ORN responses
10:30-10:45. Break

WP2:

10:45-11:00. Thomas Nowotny (SUSSEX): Introduction to WP2 (objectives and achievements)
11:00-11:30. Andrei Zavada (SUSSEX) : A remix of the competition-based model with variable number of LN per glomerulus
11:30-12:00. Christopher Buckley (SUSSEX): Transient winner-take-all dynamics in the pheromone system of the moth
12:00-13:45. Free discussions and lunch

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WP3:

13:45-14:00. Dominique Martinez (LORIA&INRA) : Introduction to WP3 (objectives and achievements)
14:00-14:30. Antoine Chaffiols (INRA) : Spike timing precision in MGC neurons sensitive to pheromone
14:30-14:45. Break
14:45-15:15. Hana Belmabrouk (LORIA) : A detailed model of the PN : the role of the SK channel
15:15-15:45. Thomas Voegtlin (LORIA): Oscillations and learning in excitatory-inhibitory coupled neurons
15:45-17:00. Discussions

Workpackage 3. Several glomeruli: network properties, oscillation, synchronization and inhibition

Task 3a. Organization of the multi-glomerular neural network

Objective : theoretically reproduce the diversity of the MGC PN responses

Achievements: detailed model of the PN with intrinsic properties (Hana Belmabrouk)

Future work: experimental validation by using GABA and SK blockers

Task 3b. Emergence of LFP oscillations

Task 3c. Computational role of olfactory oscillations

Objective : We modified the original objective to the study of synchrony between neurons and firing precision of individual neurons (over trials)

Achievements:

-Satistical tools to (i) segment the response and (ii) quantify the firing precision (Dominique Martinez)

- Synchrony and high timing precision during the response (Antoine chaffiol)

Future work: Investigate possible mechanisms (network or intrinsic properties) allowing such a precision

Task 3d. Role of inhibition in shaping PN synchrony

Objective : Investigate the role of the inhibitory network (effects of GABA antagonists, modeling work)

Achievements: No clear effect of Picrotoxin and Bicuculline -> task 3d cancelled

Future work: Investigate the role of intrinsic PN properties (see task 3a).

Satistical tool 1.
Segmenting the neural response

- Detection of changes between two ISI distributions

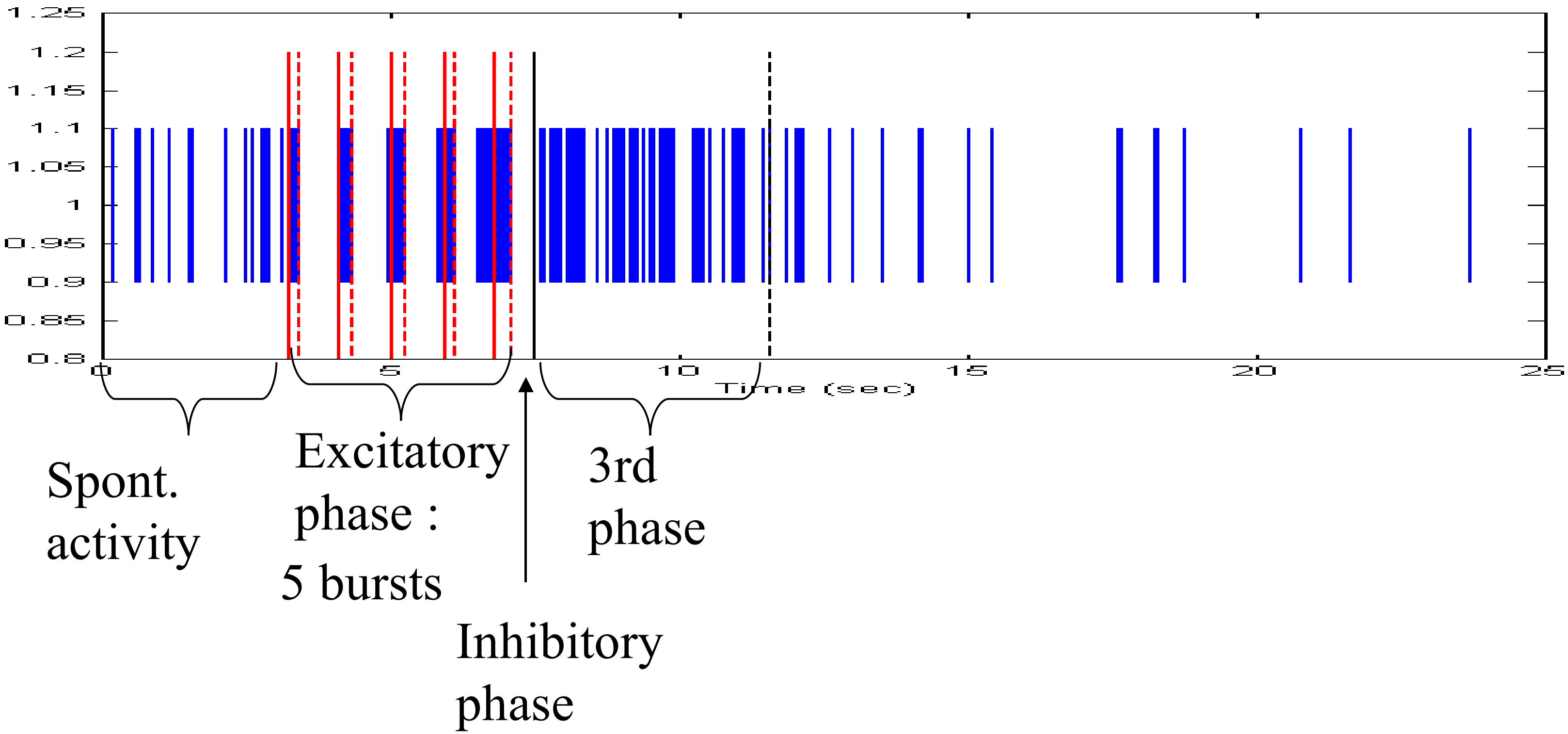
- Detection based on the likelihood ratio at time k if

log P1(ISI_k)/P2(ISI_k) > detection threshold

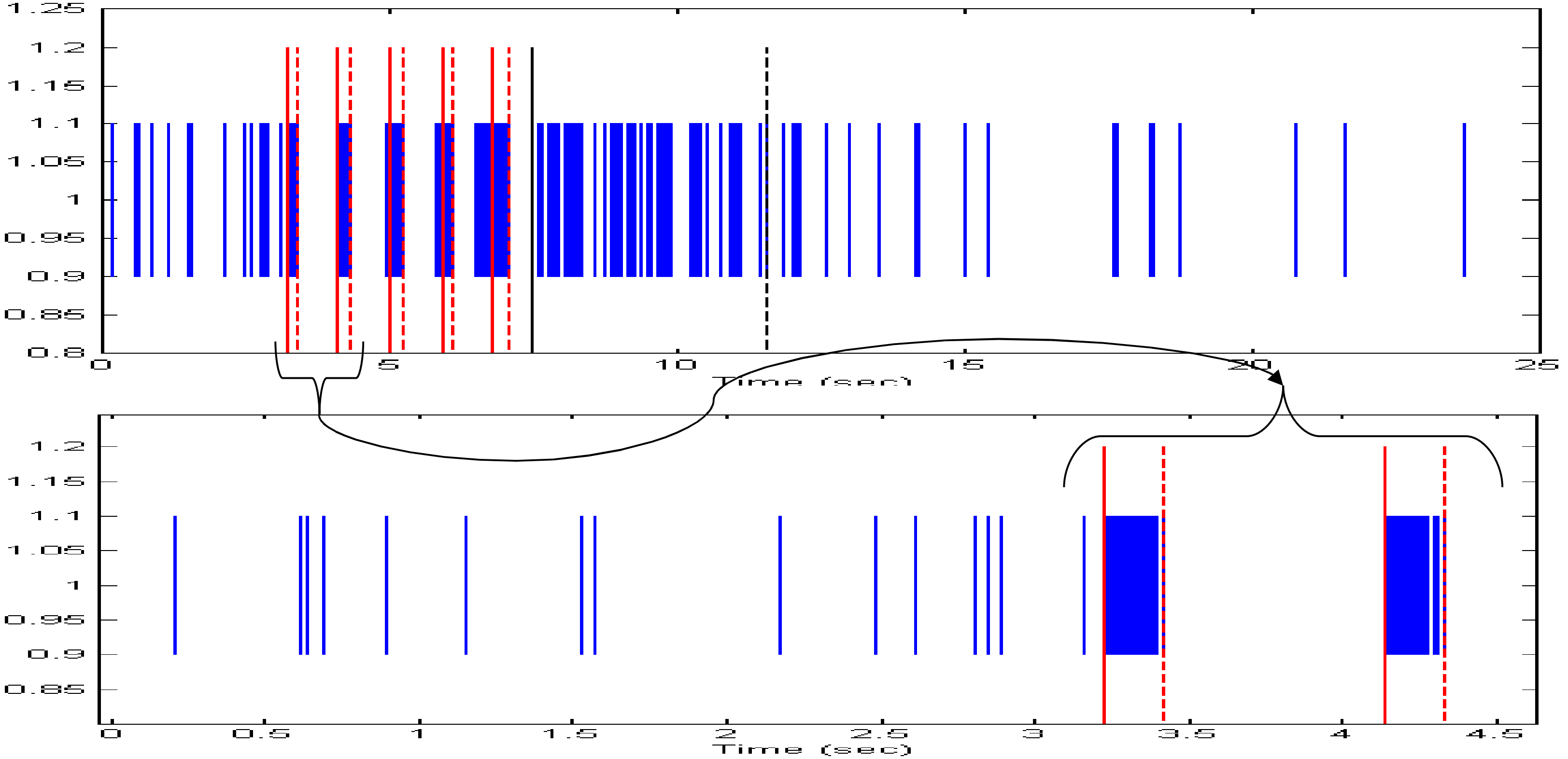
where P1 and P2 are the probability that ISI_k comes from the distributions before and after the change, respectively

Reference: M. Basseville, I.V. Nikiforov, Detection of abrupt changes, Prentice-Hall, 1993

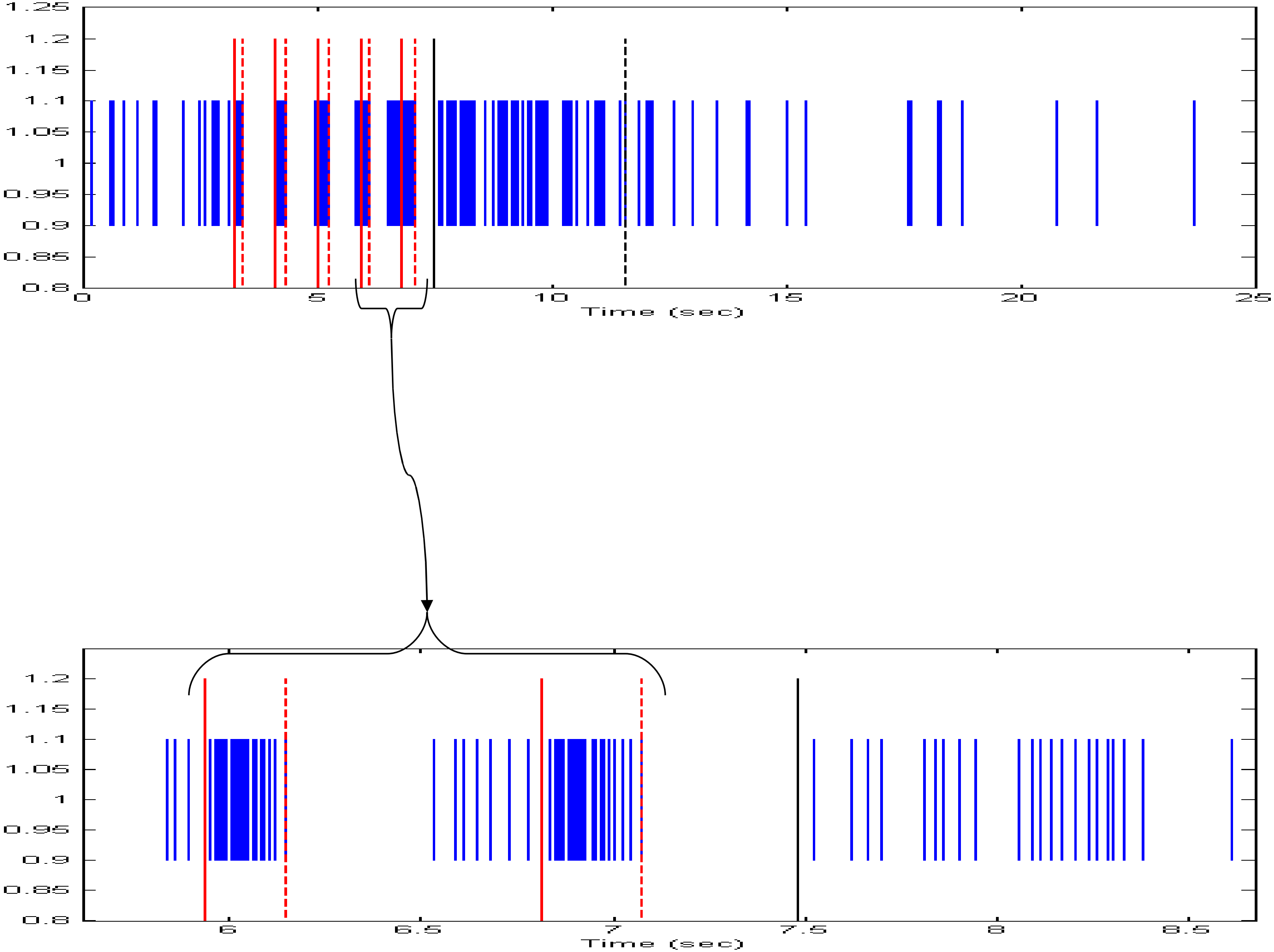
Segmentation : 5 puffs separated by 700 ms



Zoom on the first two bursts



Zoom on the last two busts



Satistical tool 2.
Quantifying neural synchrony

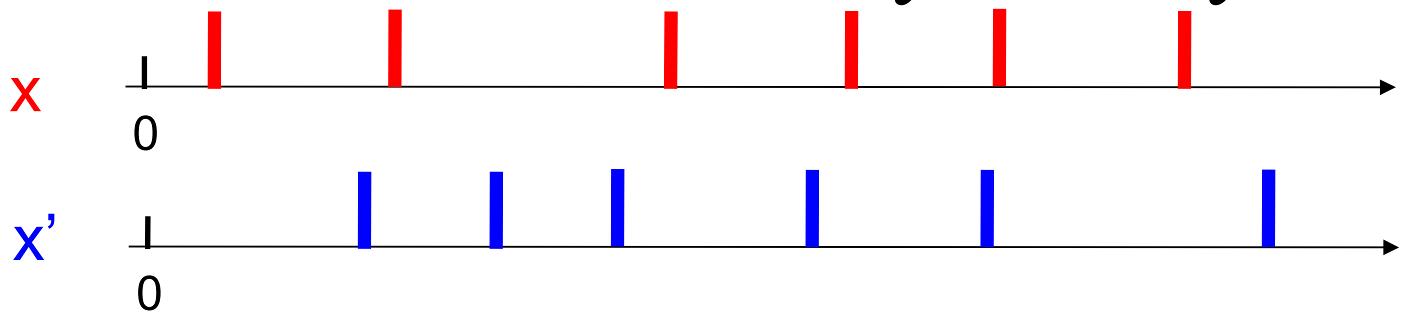
Two aspects of synchrony

Analogy: waiting for a train

- Train may not **arrive** (e.g., mechanical problem)
  = Event reliability (Robustness)

- Train may or may not be on **time**
  = Timing precision

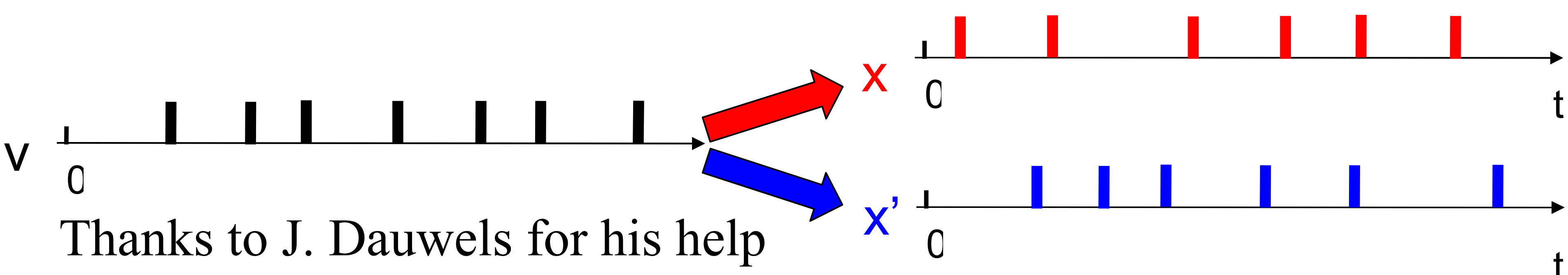
Stochastic Event Synchrony



How synchronous/similar?

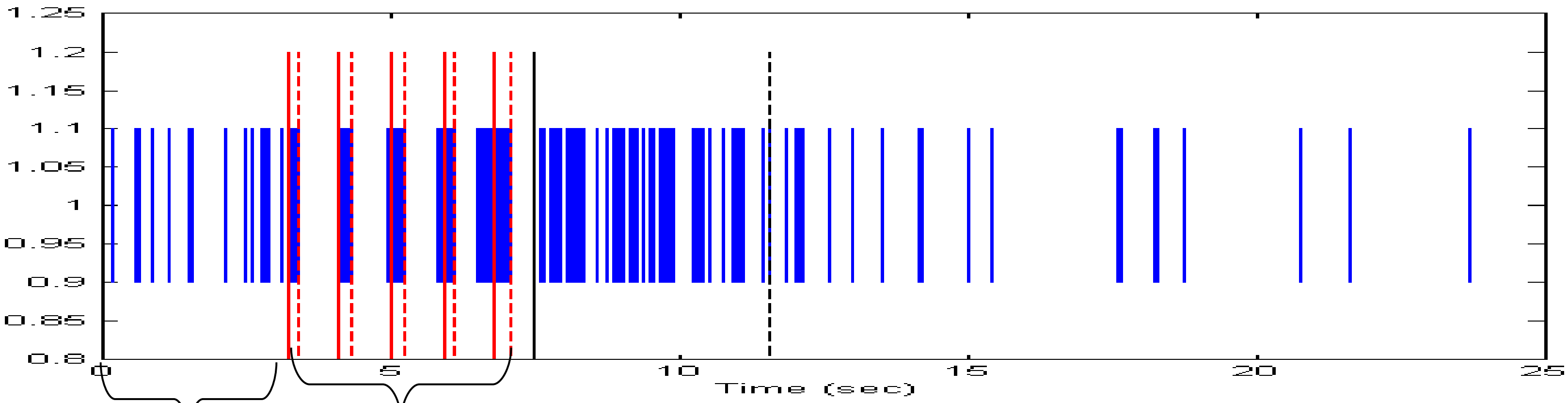
- x and x' synchronous if identical apart from
  - delay
  - little timing jitter
  - few deletions/insertions

- based on generative statistical model



Thanks to J. Dauwels for his help

Firing precision



Spont. activity

Excitatory phase : 5 bursts

σ = 52ms
P = 0.3

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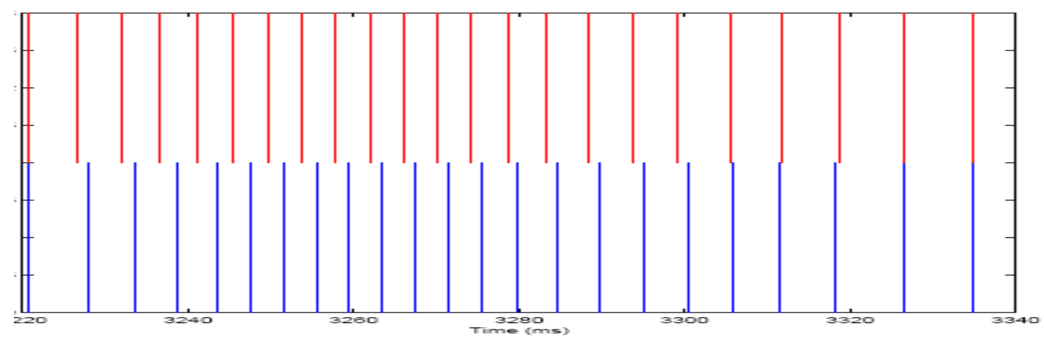
σ = 4ms
P = 0.06

2 repeated trials (excitatory phase)



Is excitatory phase more precise?

However Fspont=10Hz < Fexc=100Hz => surrogate data to answer