

Decomposition of the same set of signals by three different groups

Kevin C McGill



**Rehabilitation Research and Development Center
VA Palo Alto Health Care System
US Department of Veterans Affairs**

Methods



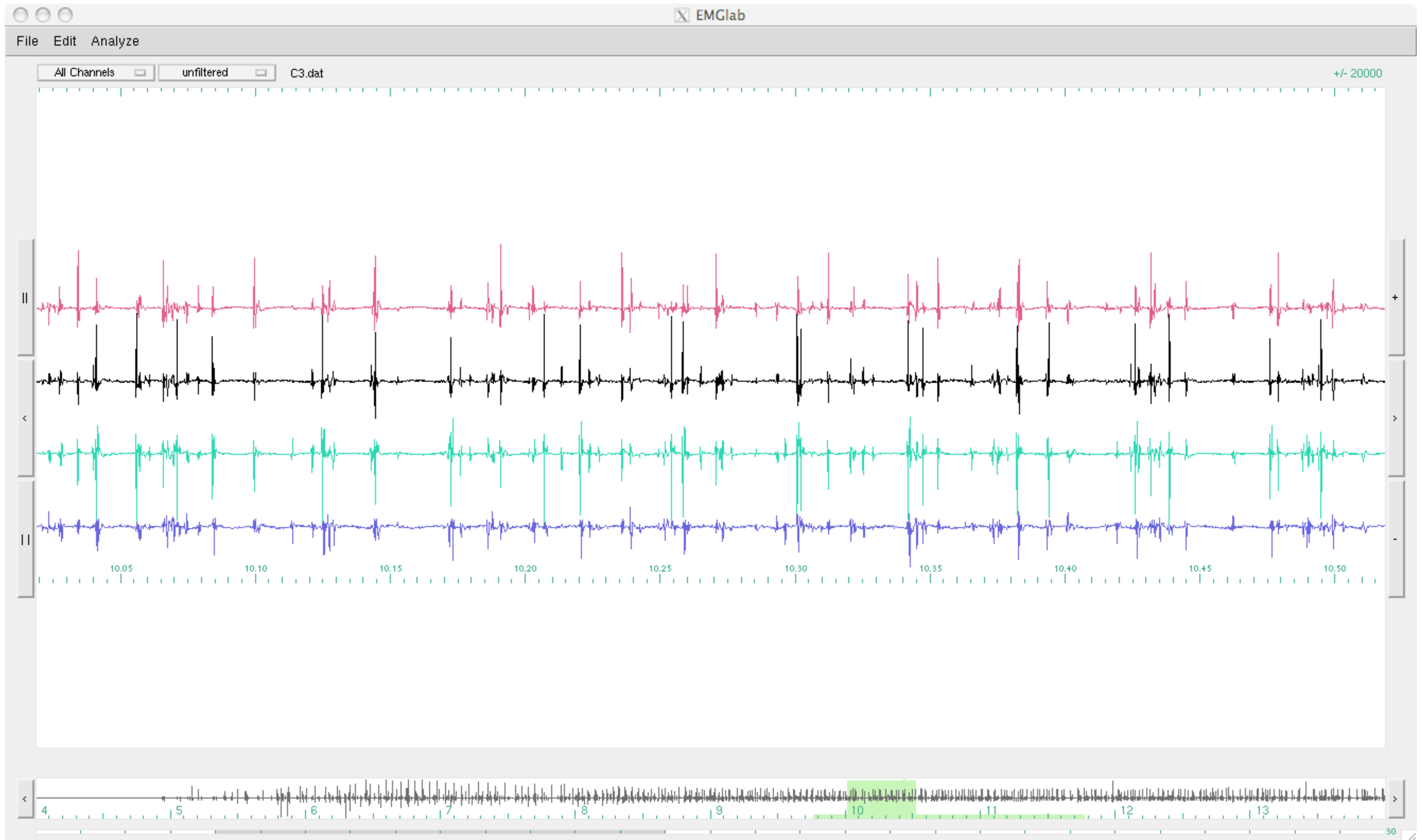
- Methods:

- *normal subject*
- *first dorsal interosseous muscle*
- *trapezoidal contraction to 20% MVC*
- *quadrifilar needle electrode*
- *filters: ?, sampling rate: 25 kHz*

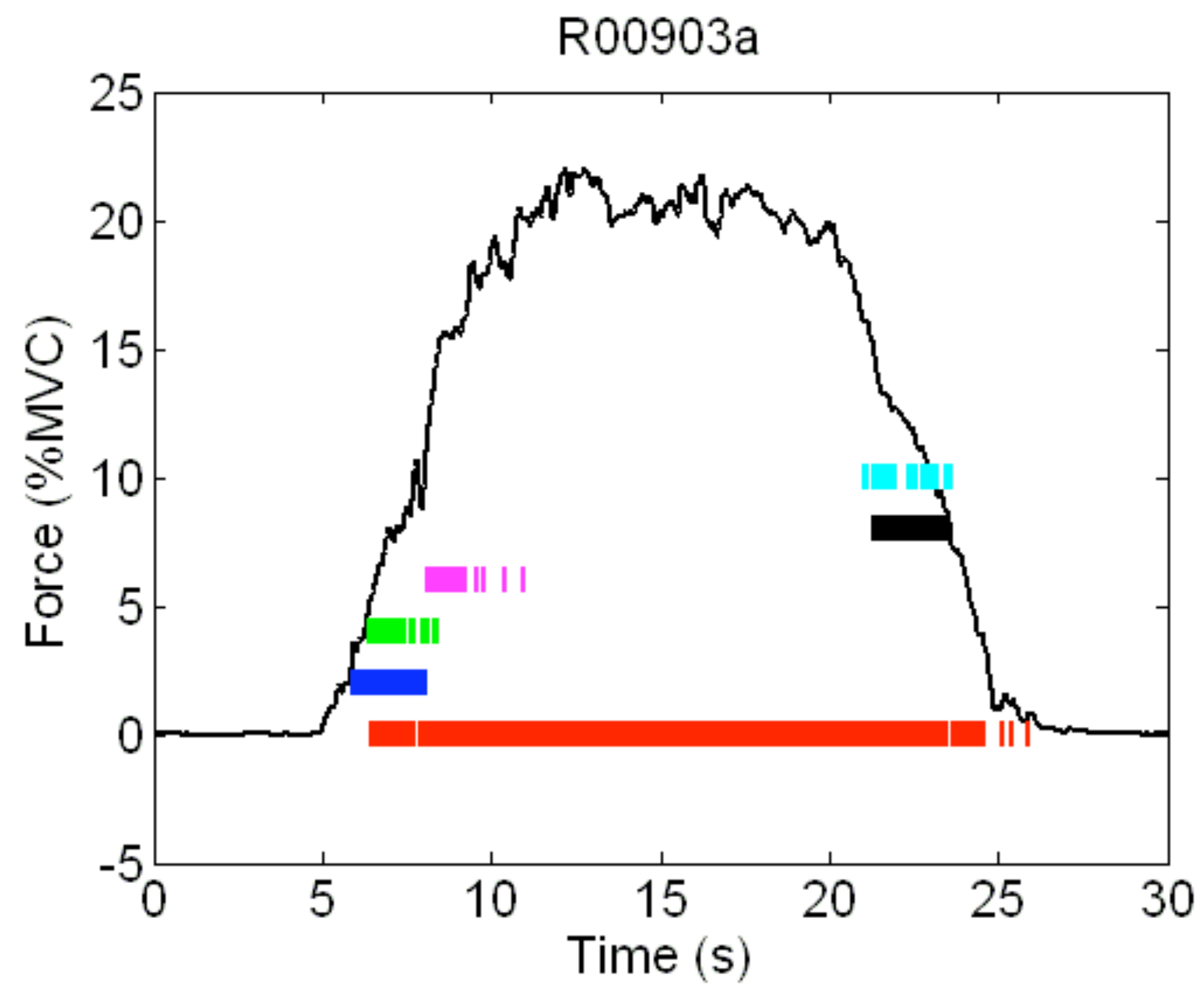
- Programs:

- *Motor Unit Tools*
- *Fuzzy Expert*
- *EMGLab (2 operators)*

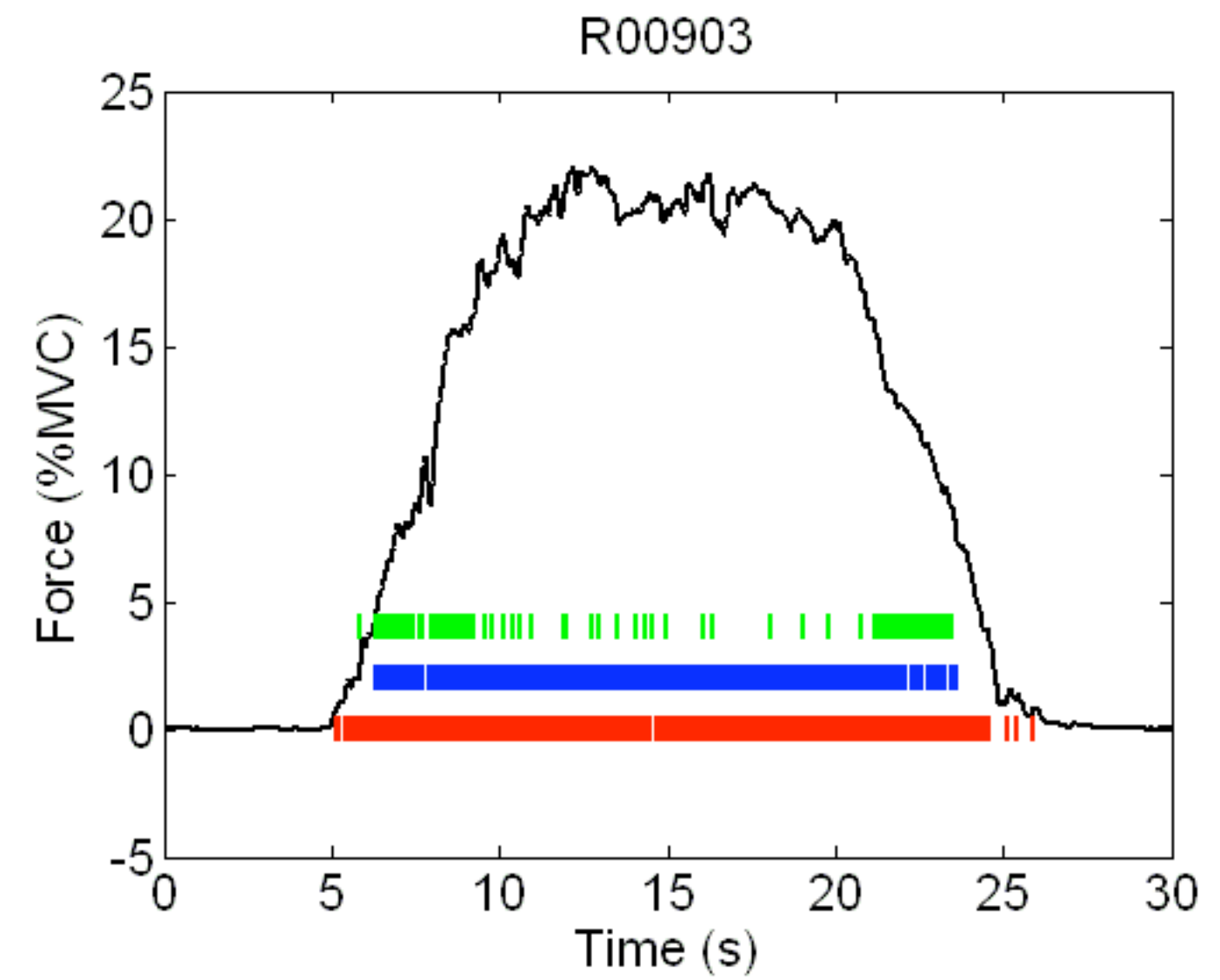
Quadrifilar signal



Results: Motor-Unit Tools

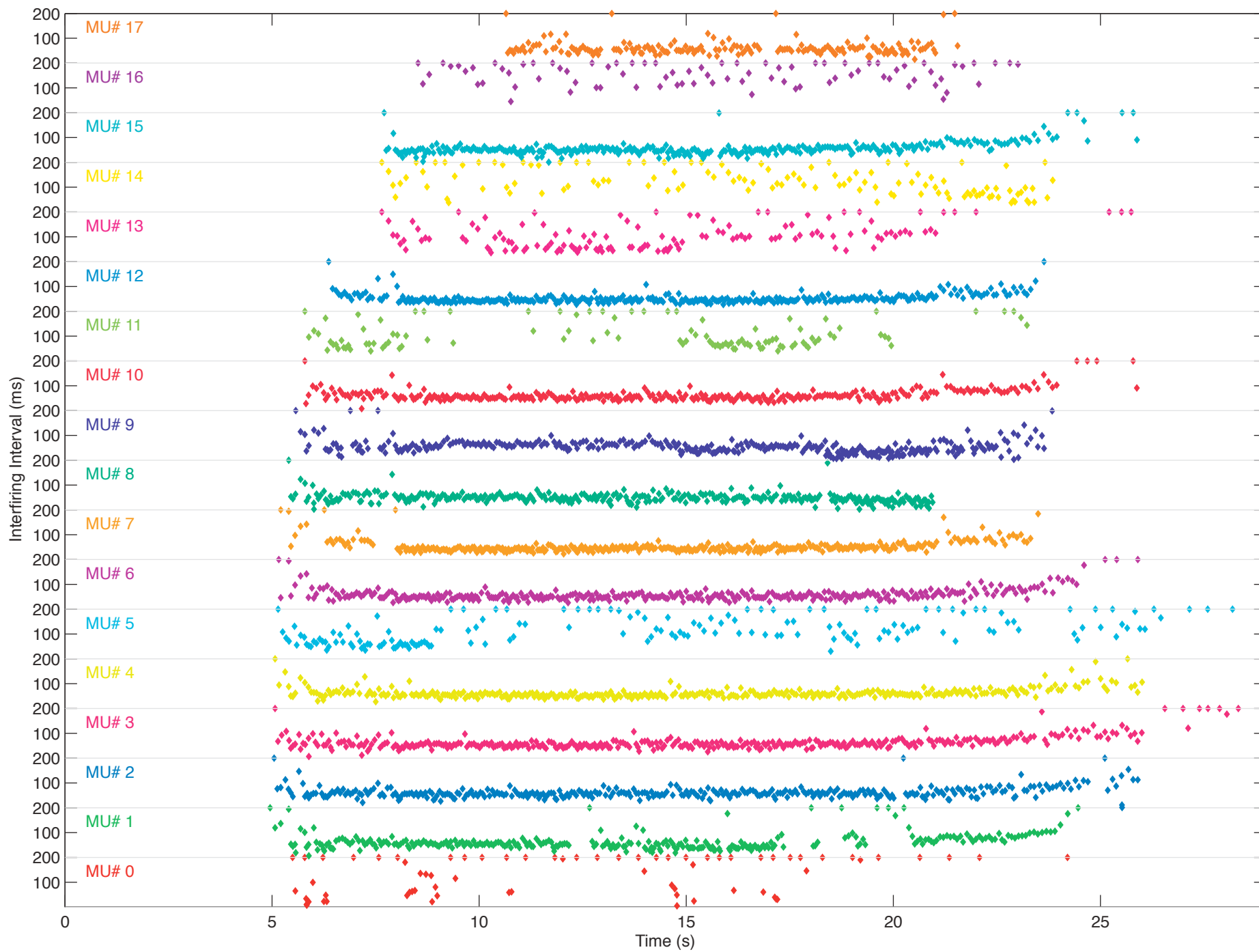


Automatic analysis

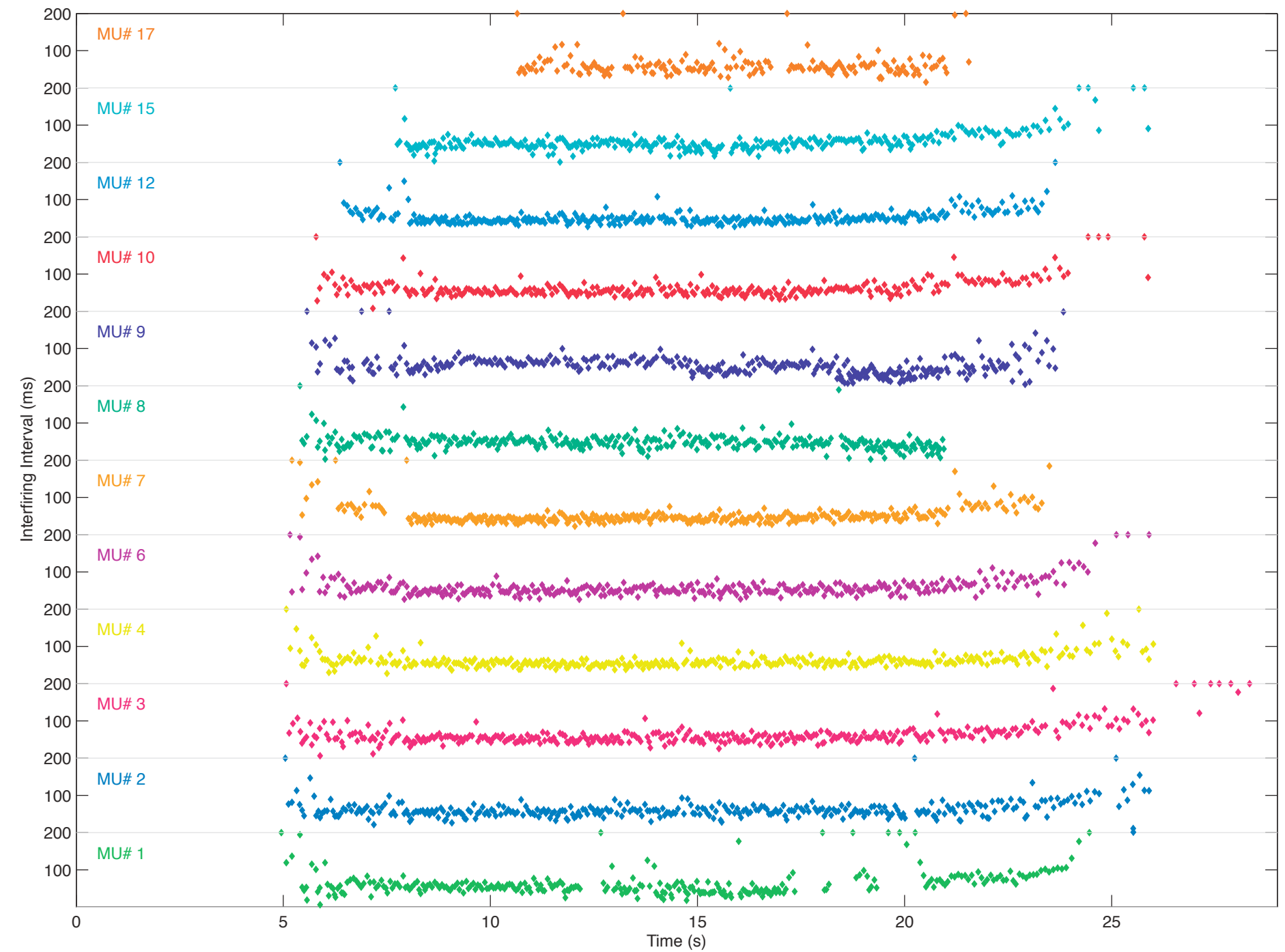


Manual editing

Results: Fuzzy Expert

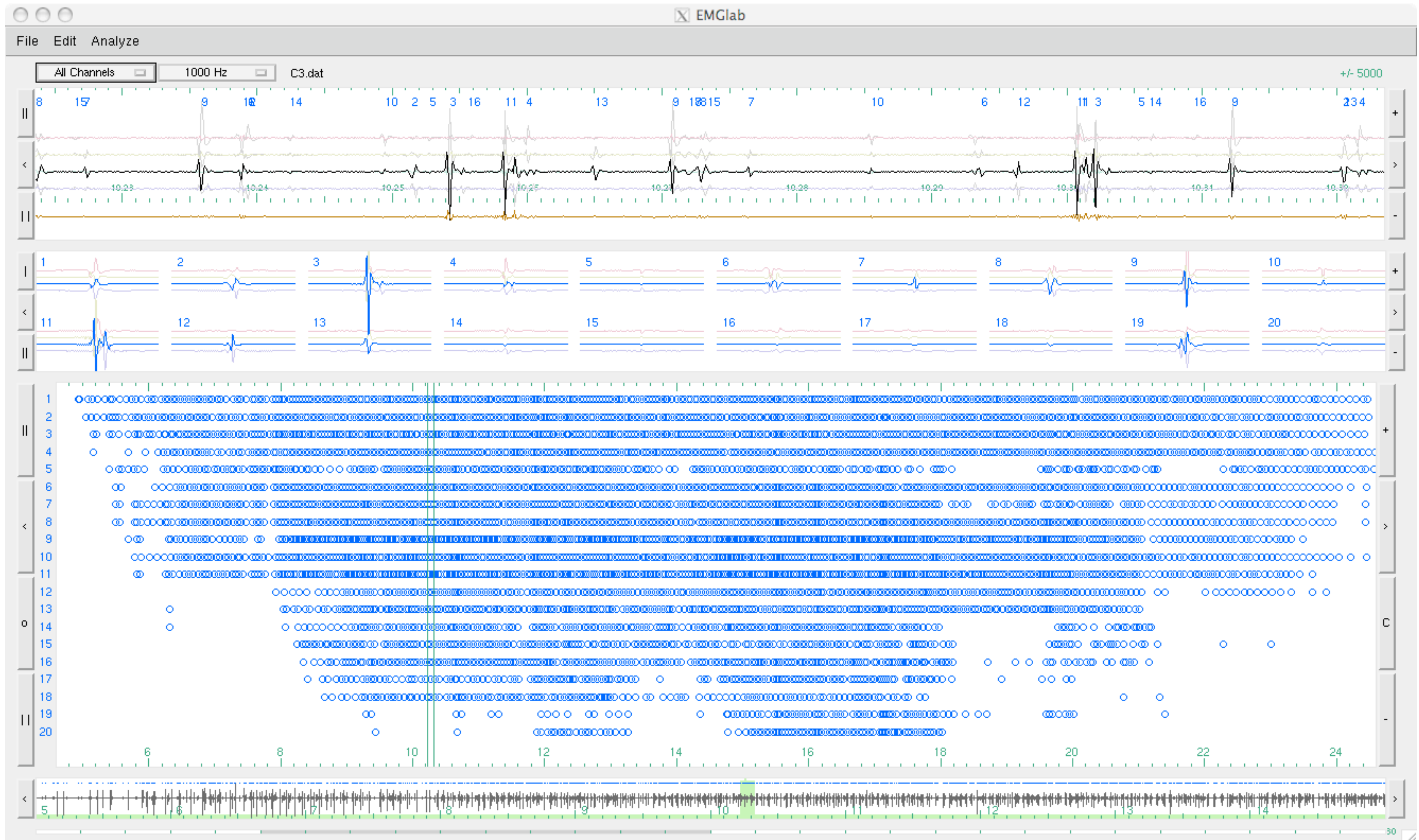


Automatic analysis

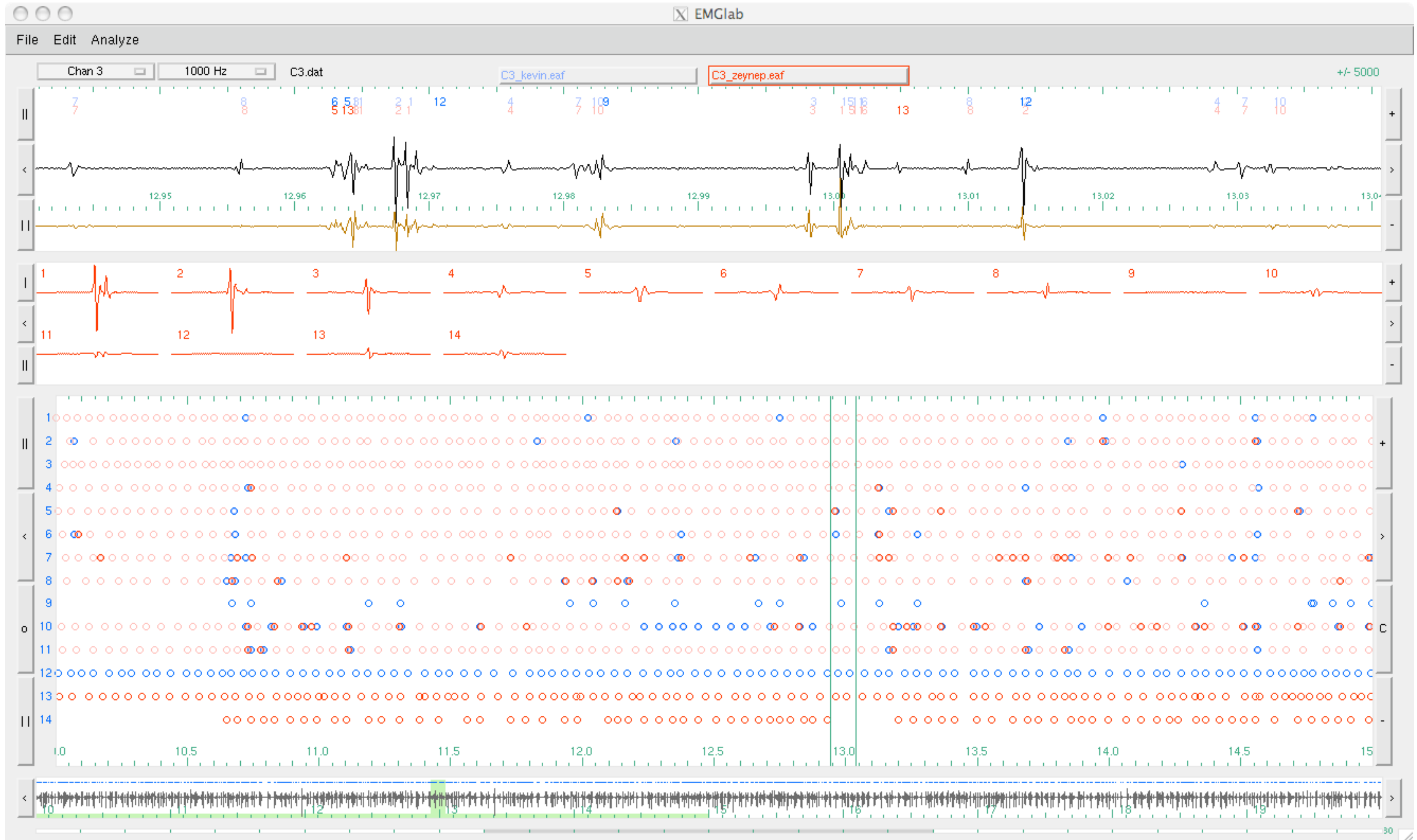


12 stable units selected

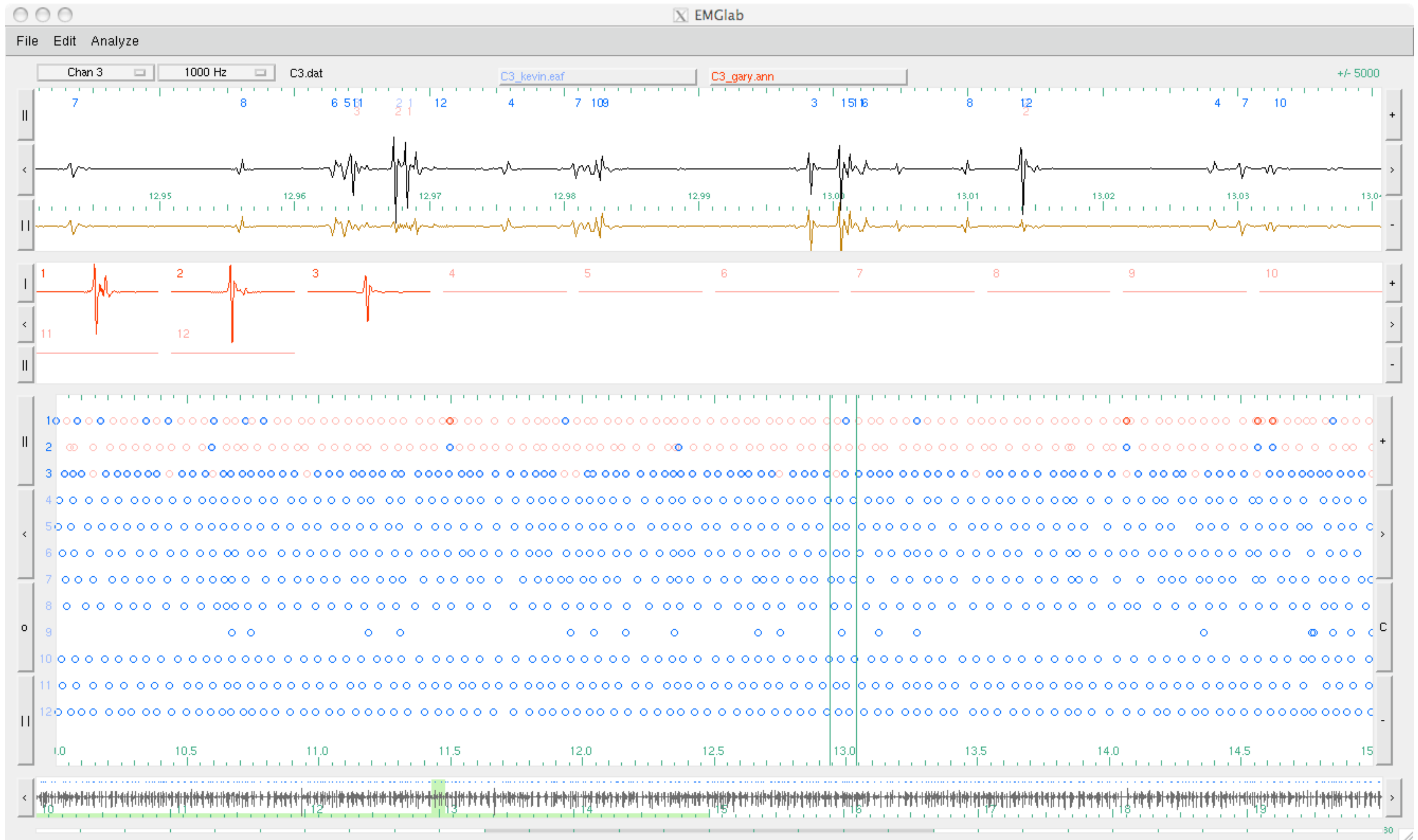
Results: EMGlab with manual editing



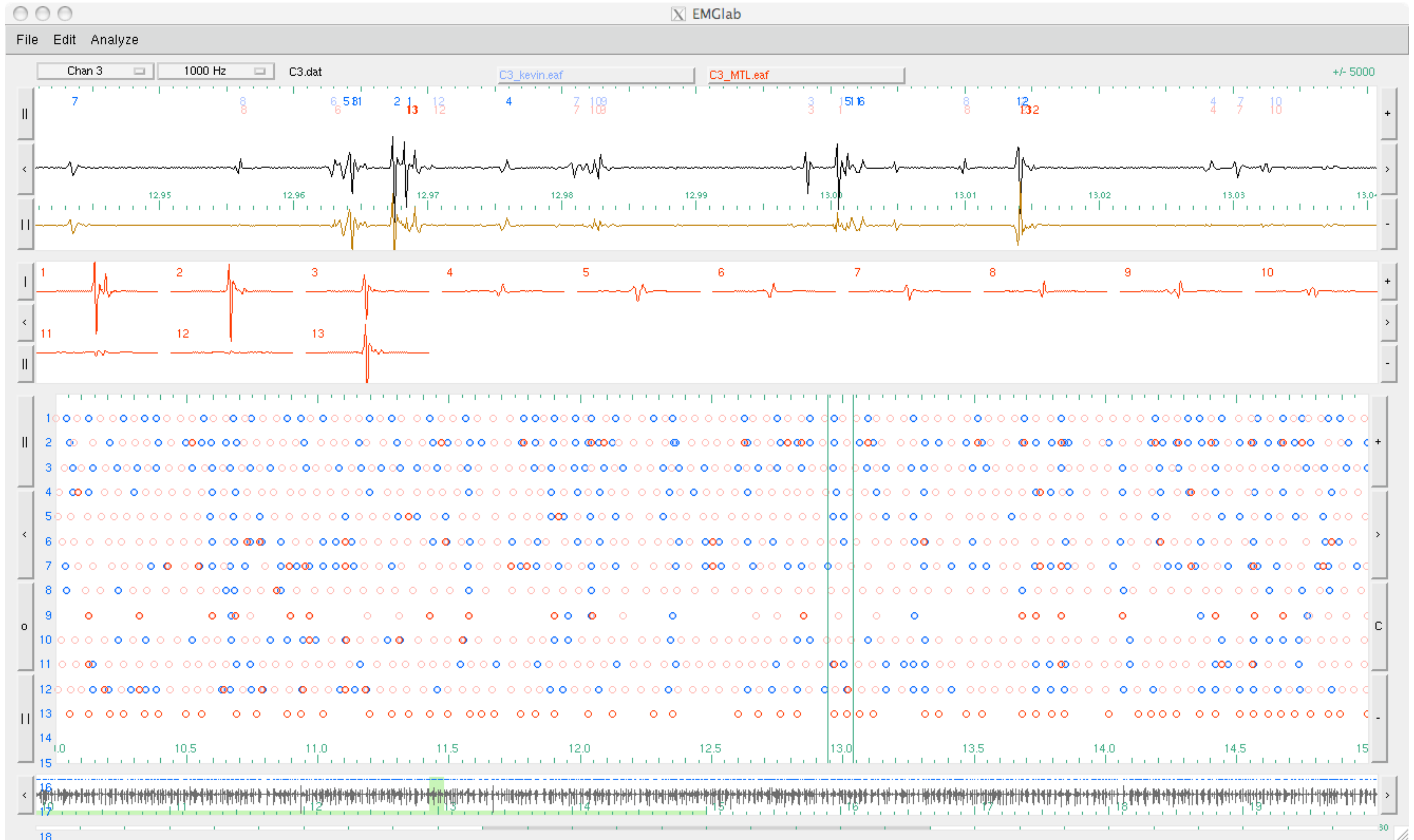
Fuzzy Expert / EMGlab



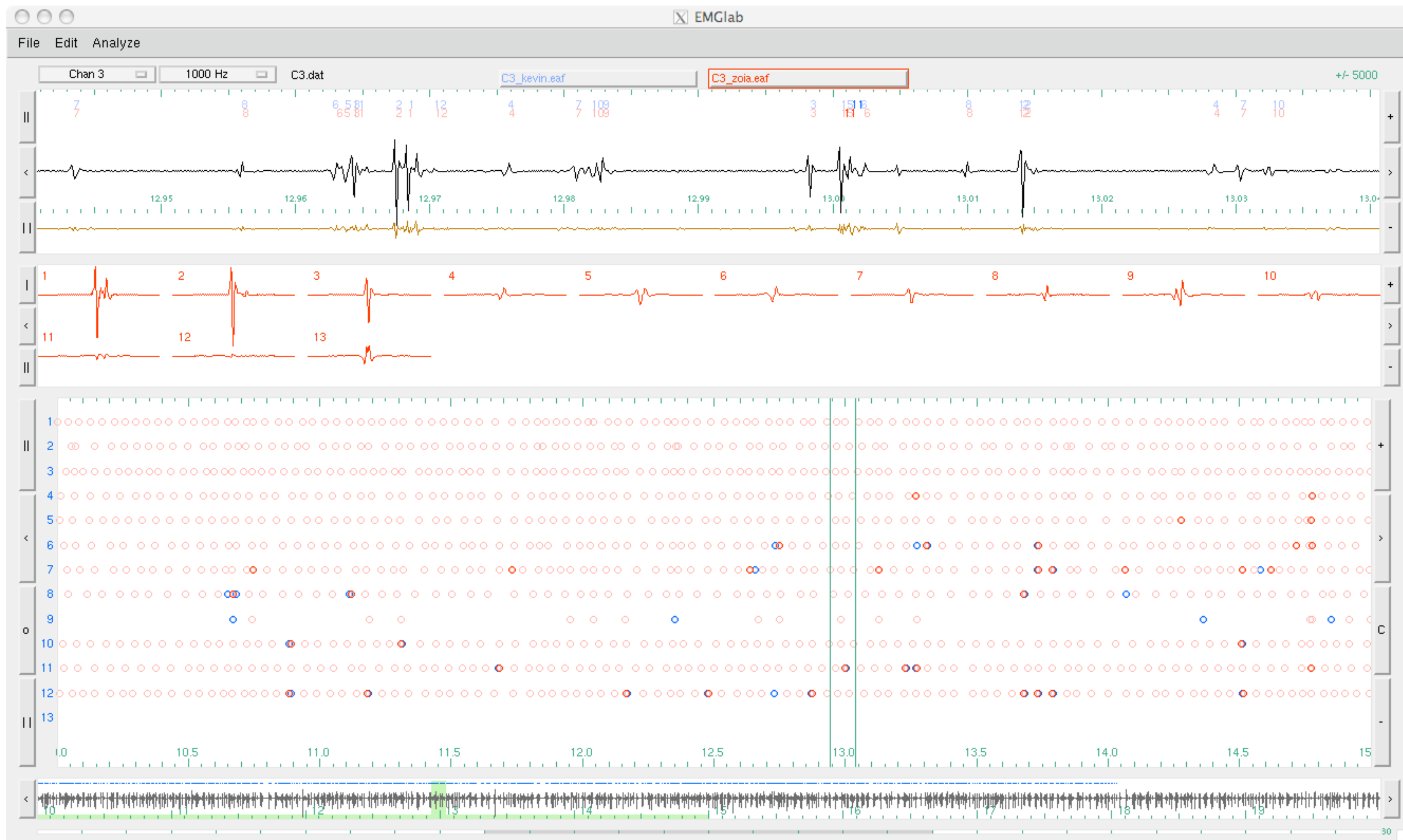
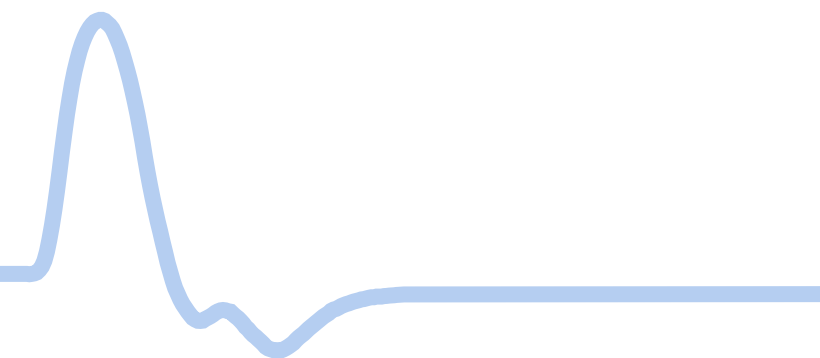
MUTools / EMGlab



EMGlab: Auto / Manual



EMGlab: different operators



Agreement on discharges.



Unit 1

	EL-K	EL-Z	FE	MUT
EL-K		1.00	0.95	0.86
EL-Z	0.99		0.95	0.86
FE	0.94	0.95		0.81
MUT	0.77	0.77	0.75	

Unit 2

over interval 10–15 s

	EL-K	EL-Z	FE	MUT
EL-K		1.00	0.92	0.94
EL-Z	0.99		0.92	0.94
FE	0.95	0.95		0.88
MUT	0.93	0.93	0.90	

Unit 3

	EL-K	EL-Z	FE	MUT
EL-K		1.00	0.99	0.11
EL-Z	0.97		0.99	0.11
FE	0.94	0.95		0.11
MUT	0.34	0.31	0.29	

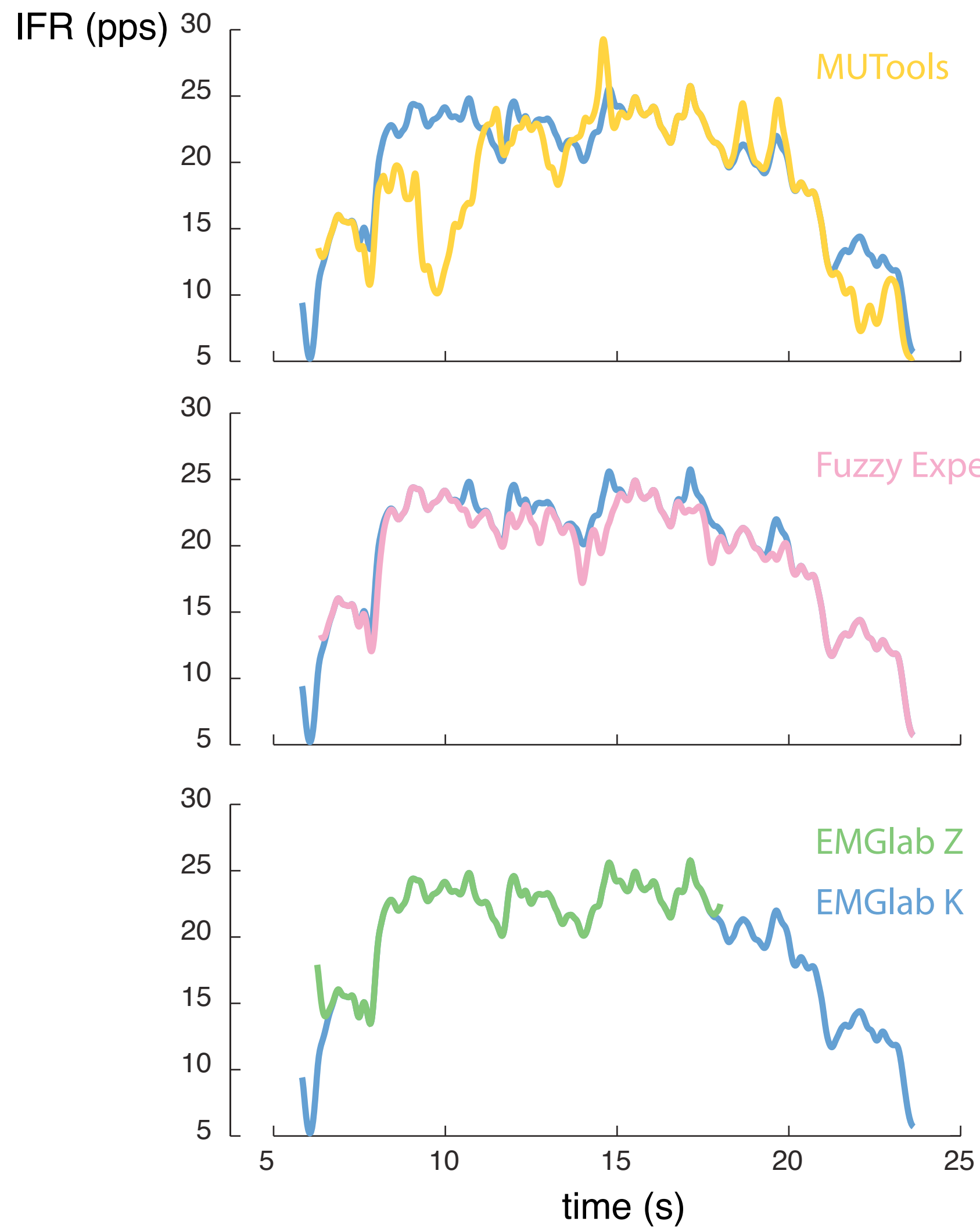
Unit 4

	EL-K	EL-Z	FE	MUT
EL-K		0.98	0.94	–
EL-Z	0.97		0.92	–
FE	0.86	0.87		–
MUT	–	–	–	

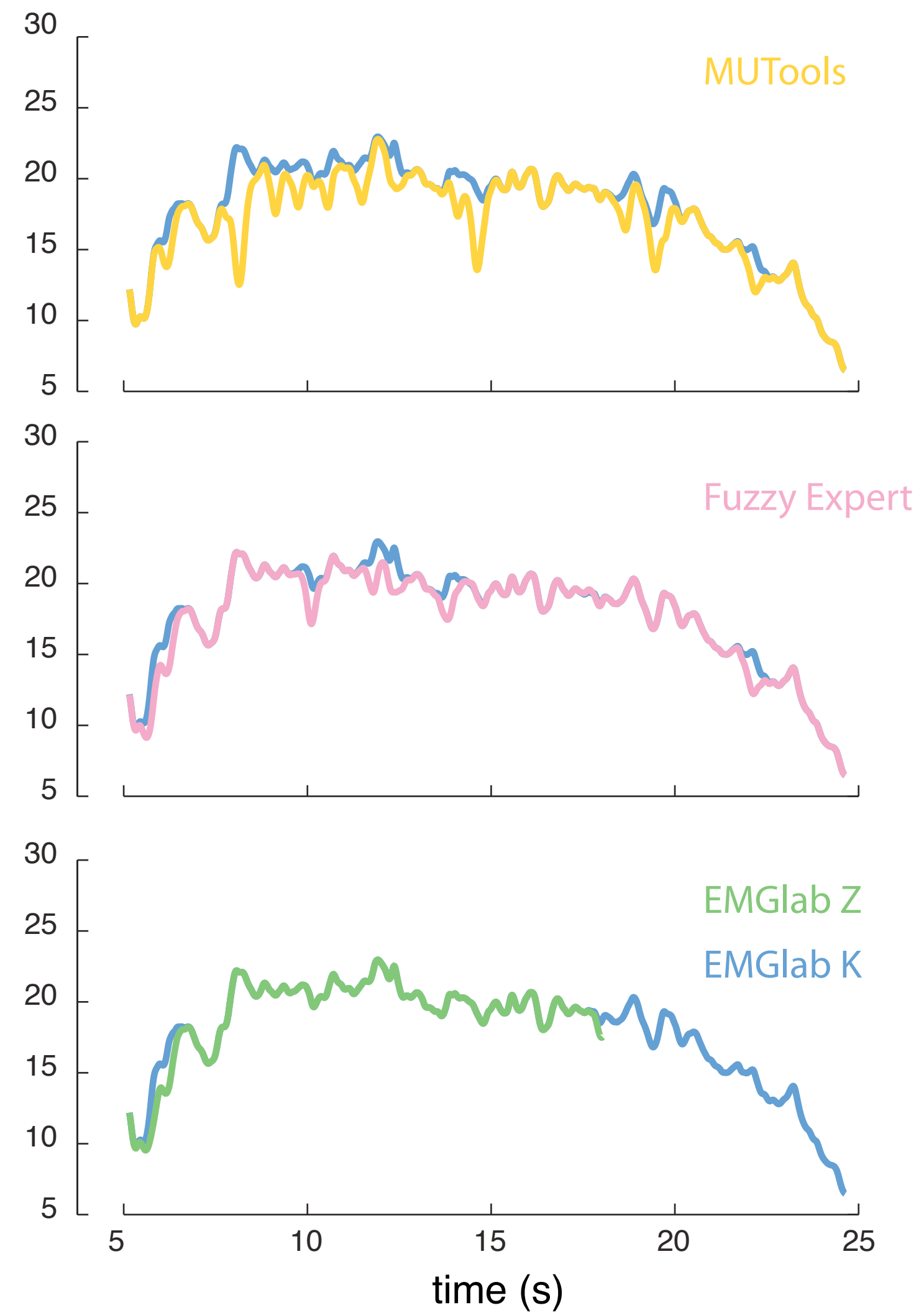
over interval 0–15 s

Instantaneous firing rates

unit 1



unit 2

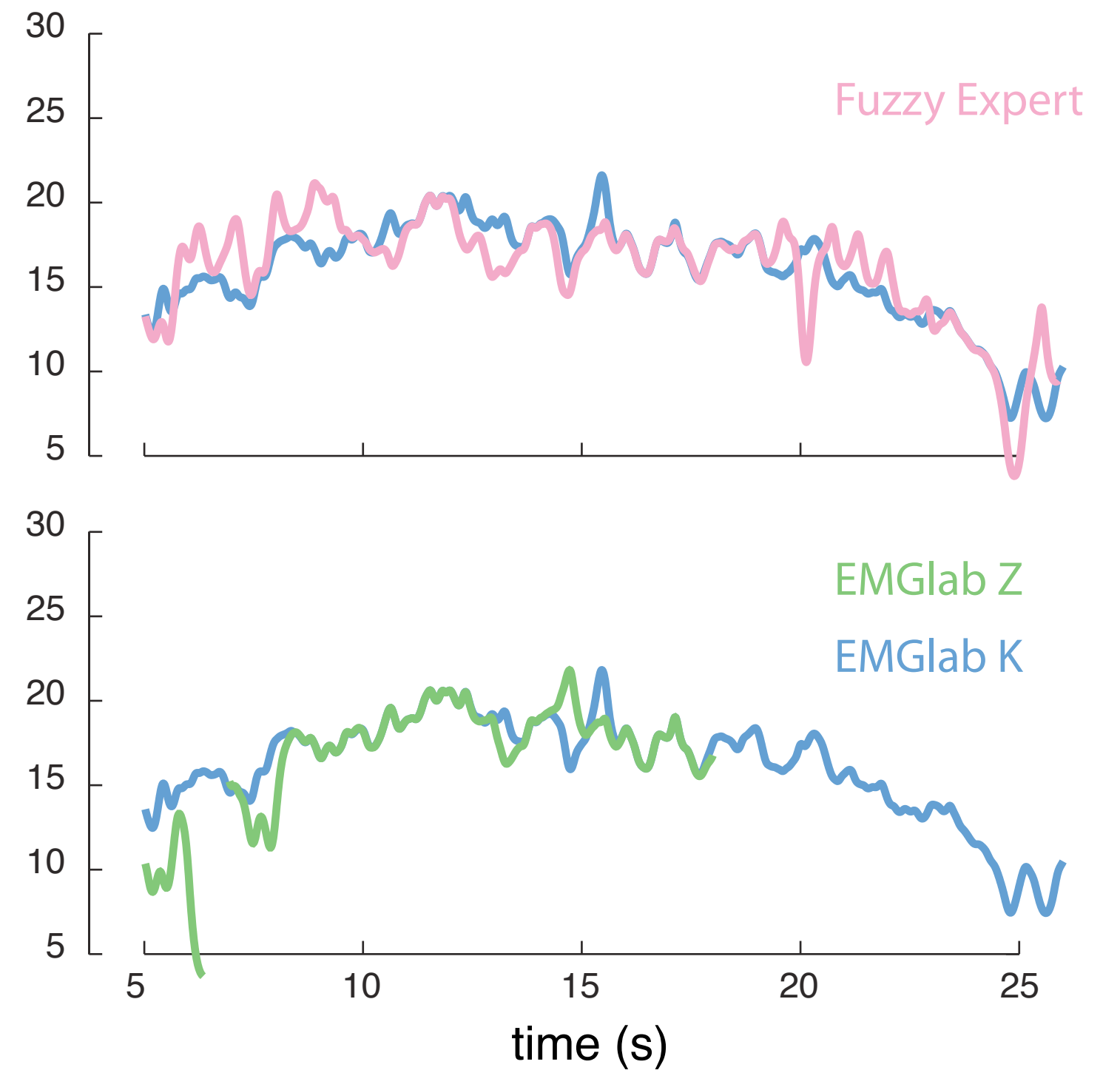
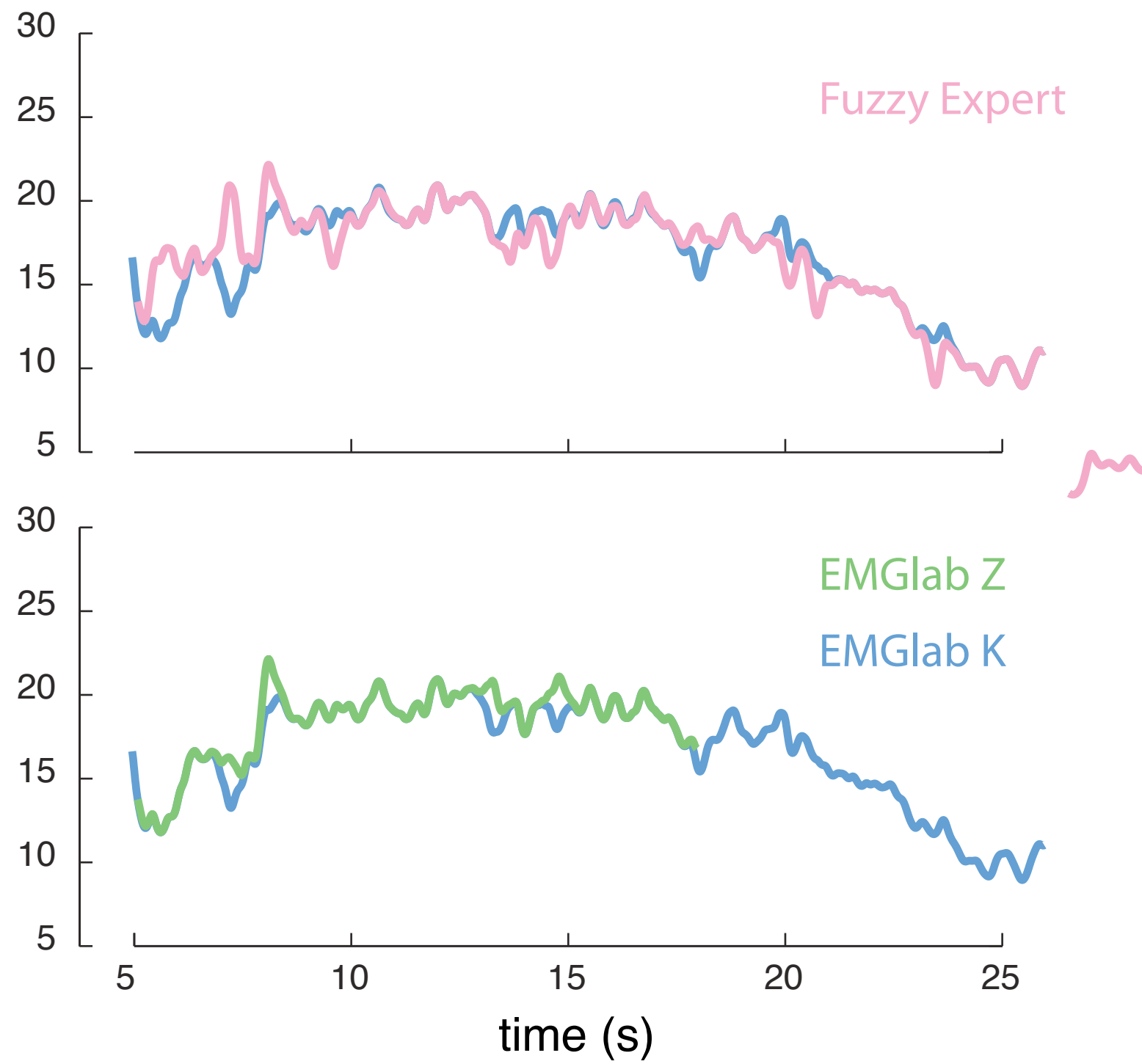


Instantaneous firing rates

unit 4

unit 6

IFR (pps)

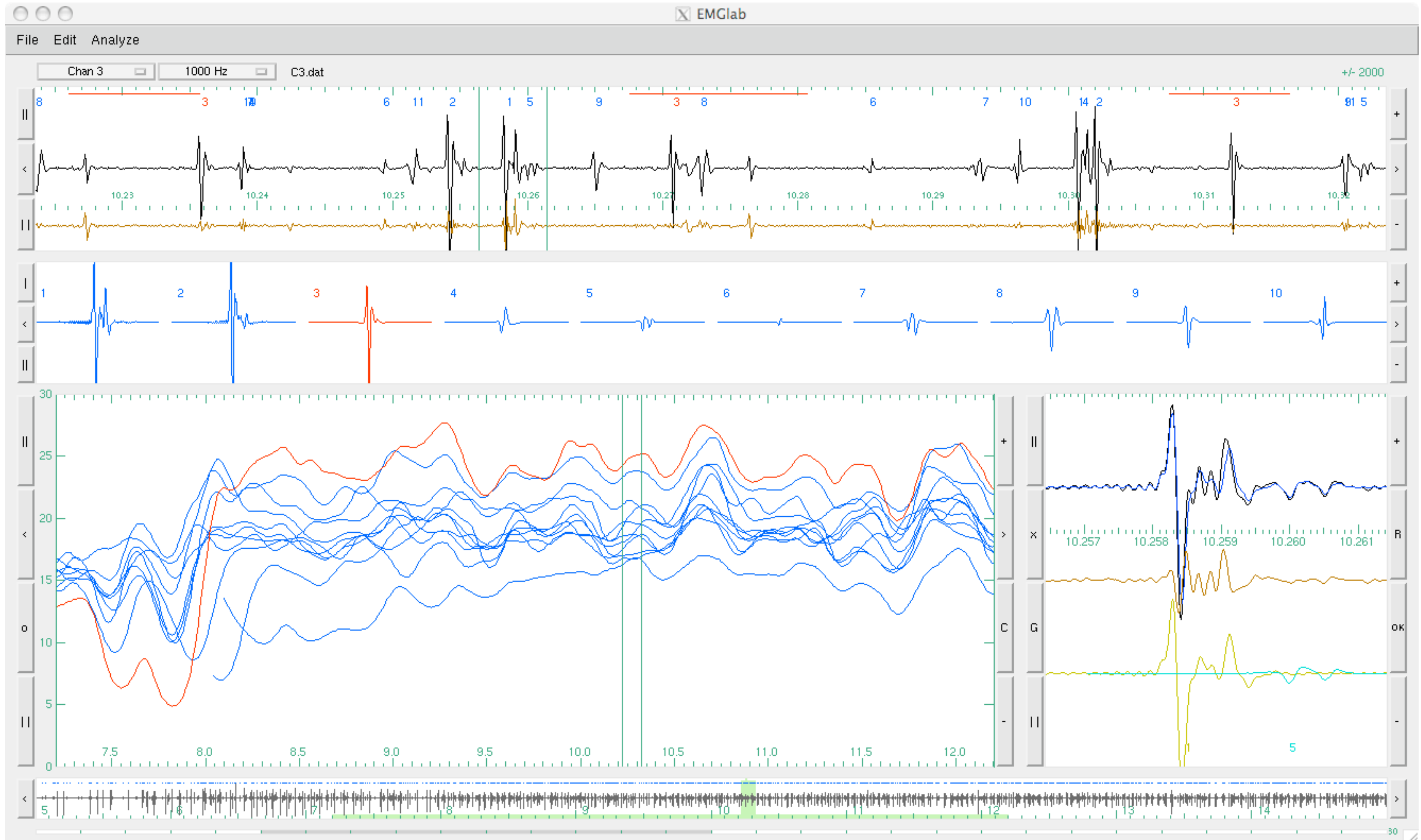


Factors that affect decomposability



- *Signal complexity*
- *Electrode selectivity*
- *MUAP variability*
 - *shapes changed considerably during recruitment*
 - *changed slightly during plateau*
 - *inter-component jitter*
- *High incidence of superposition*
- *Small MUAPs add to baseline noise*
- *Common drive*

Factors that affect decomposition



Conclusions



- *Challenging signal.*
- *Fuzzy Expert and MTLEMG automatically found 12 MUs.*
- *Substantial agreement between firing patterns.*
- *Manual editing necessary.*
- *Recruitment problematic.*
- *Difficult to be 100% confident.*