Controlling cells with RF

- Want to make cells controllable using radio frequencies

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Zeeman–Stark Modeling of the RF EMF Interaction With Ligand Binding

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•Shows in theory radiofrequencies can induce calcium binding to a hydrophobic crevice of a protein

•Can we use this induced binding of ca^{2+} to cause a conformational change in a protein

•Can just do a proof of concept, but work can be extended by linking it up to some interesting effect

Since last time…..

- Got through the theory paper.
- Important points/implications.
  - RF effect heavily dependent on metabolic flux
  - Model requires membrane localised protein
  - ΔP: up or down. Mostly down.
  - Max ΔP: 0.2 - 0.3. Detectable level?
  - Increase signal power, increase ΔP.

How might we do the experiment?

- FRET

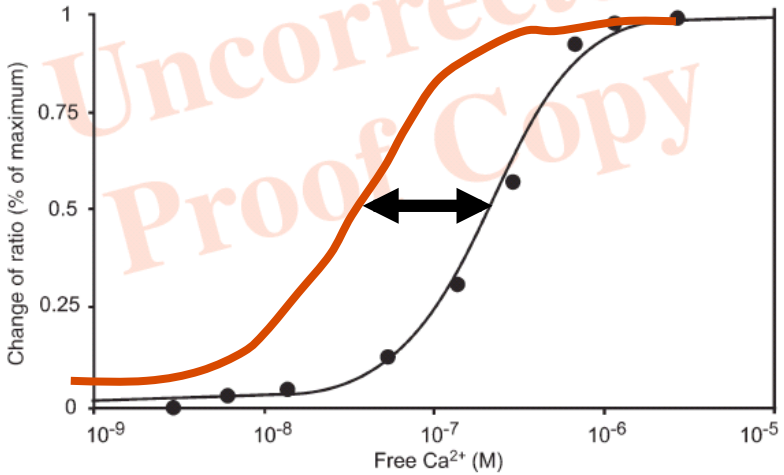

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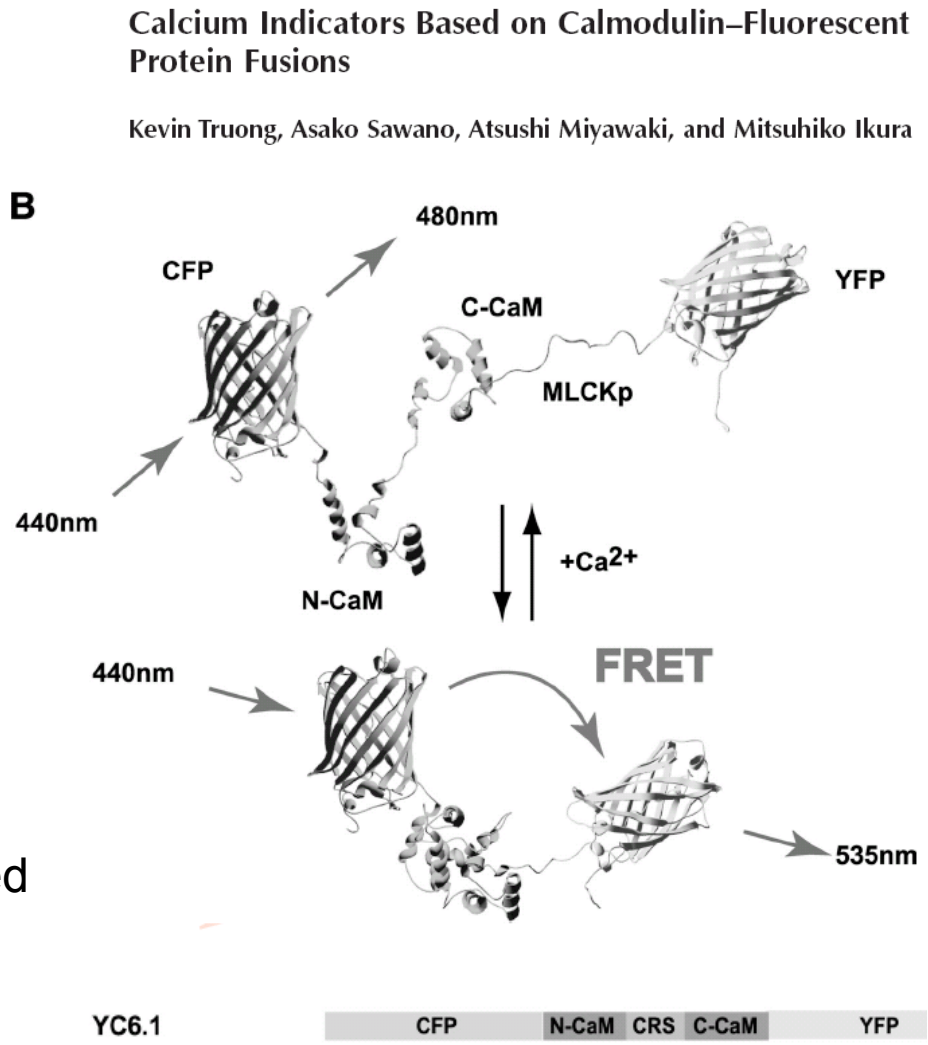
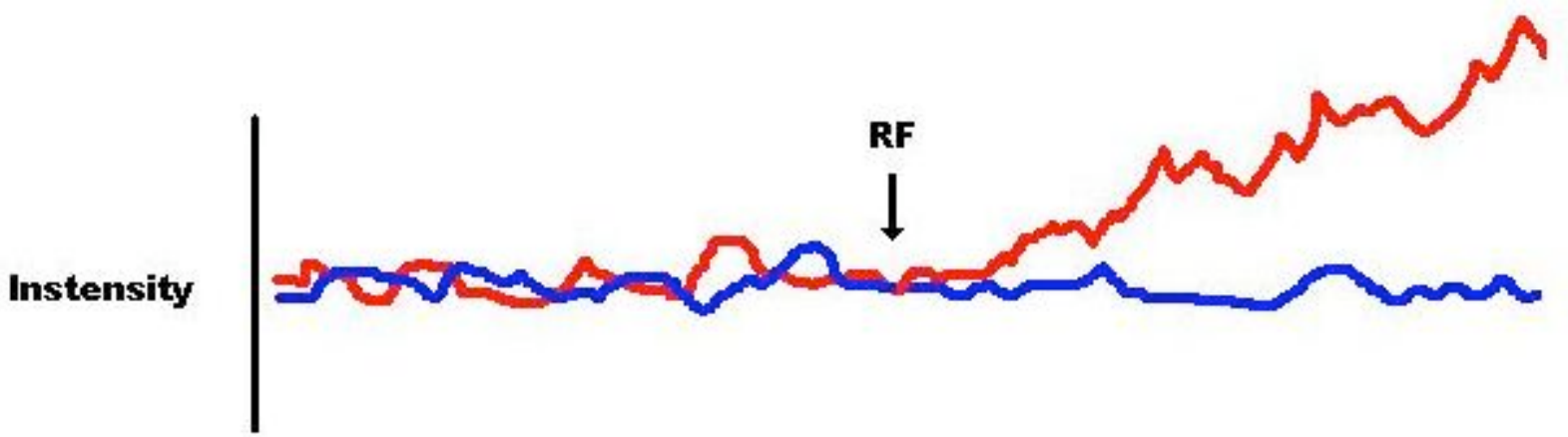
Fig. 4. Example Ca^{2+}-binding curve of YC6.1.



- This is in vitro
- We need in vivo – membrane localised
- in vivo – Ca++ levels fluctuate.
- Cant generate binding curve?

Instead of Binding curve

- Two cell pops: Control population – Blue. RF population – Red.
- Observe for long enough to get average behaviour of intracellular Ca++ fluctuations.
- Can subtract out differences in intensity caused by diffs in pop size.



- This would also work using Aequorin?
- CFP/YFP not looked at yet.

Other issues

- Will need to try all frequencys. But…
  - Can start with large range of freqs.
  - If get an effect – narrow down to frequency giving effect.
- How much work will this be?
  - Needs to be done for all Variants.