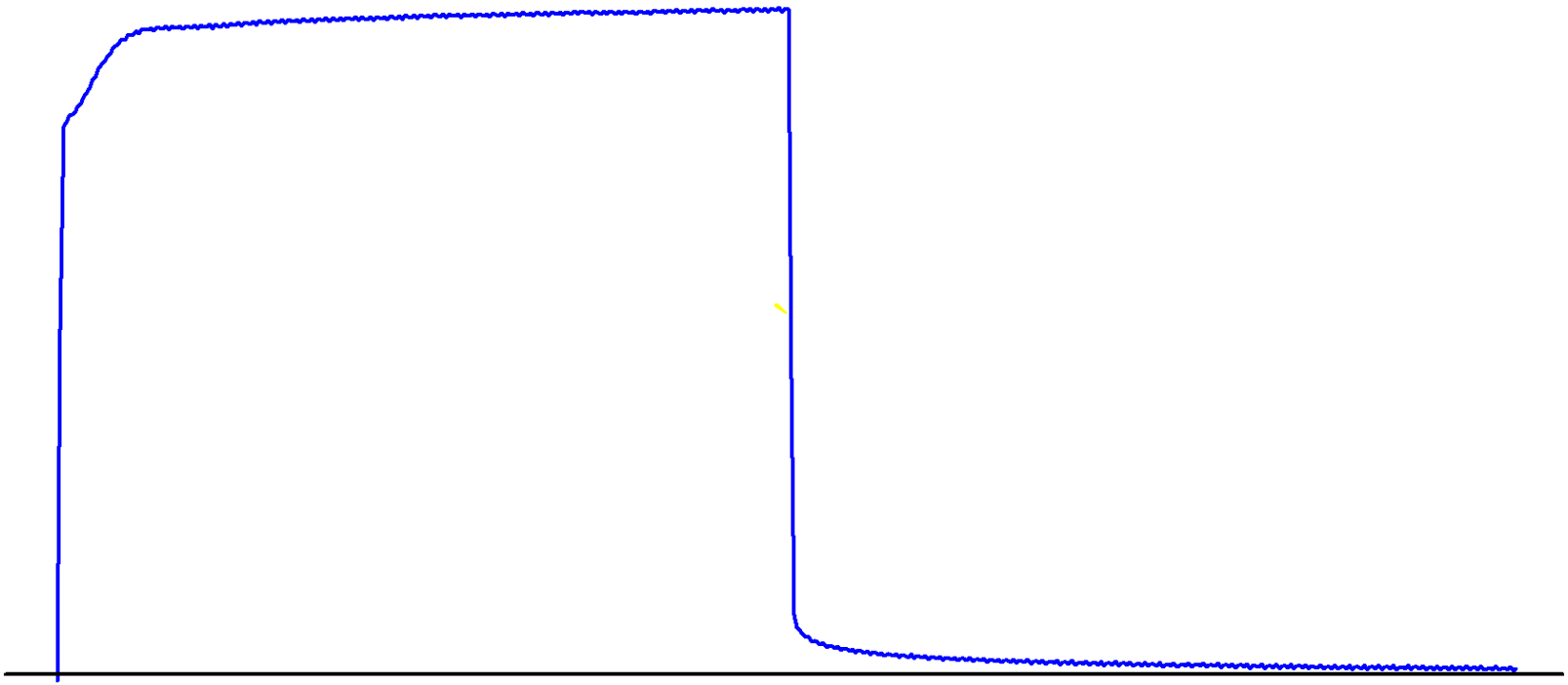
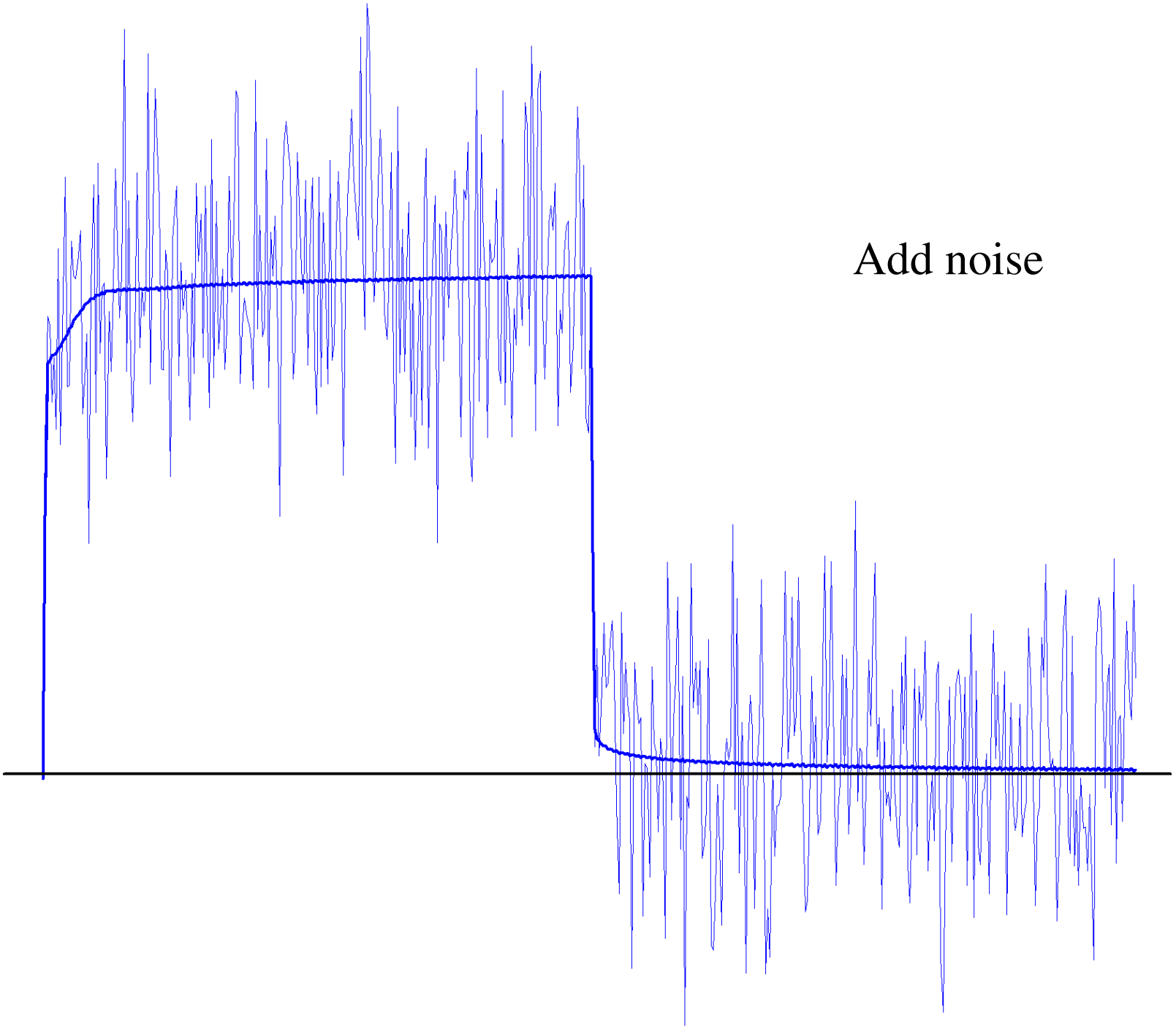
Take a typical decay

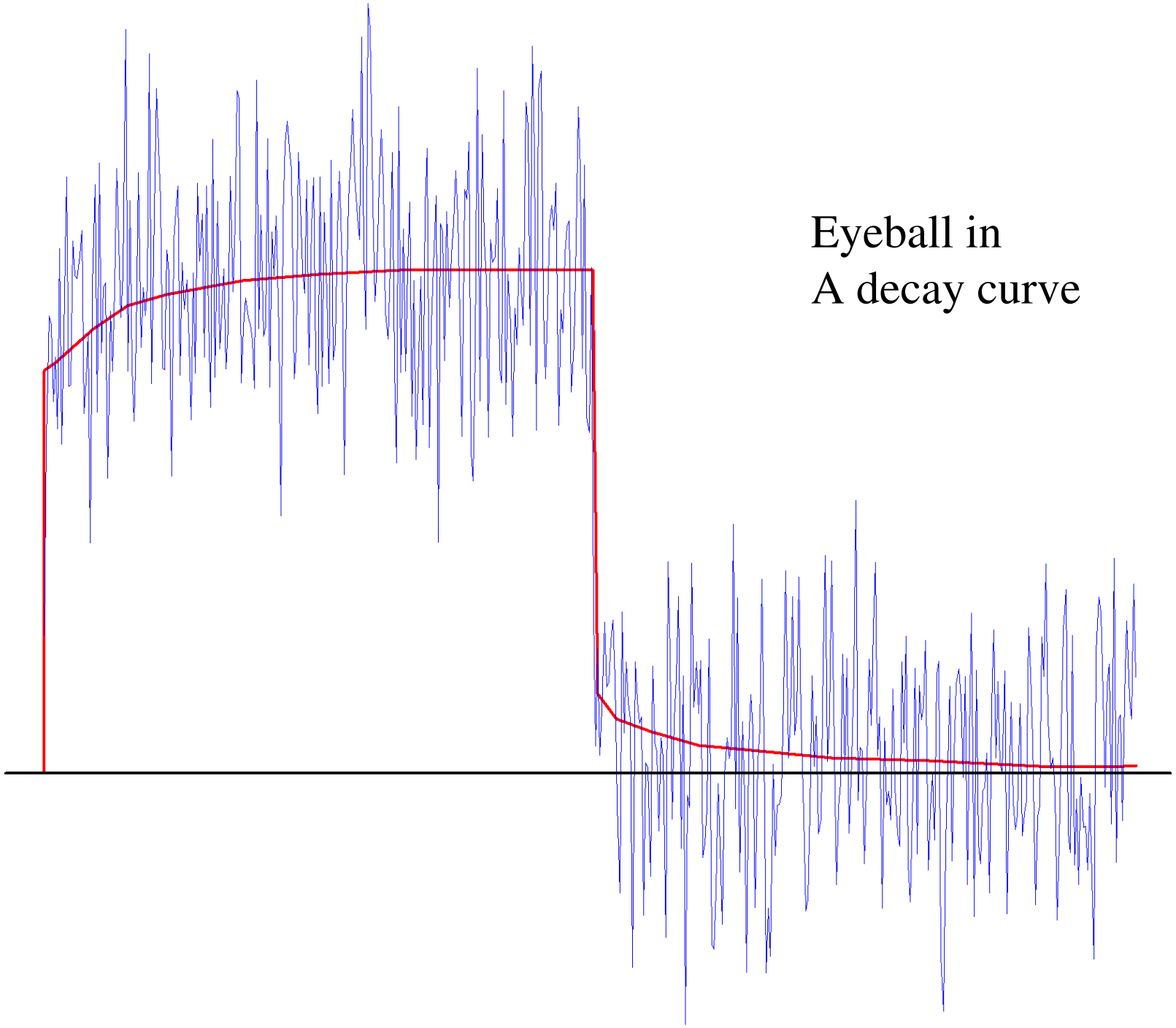
Add some noise

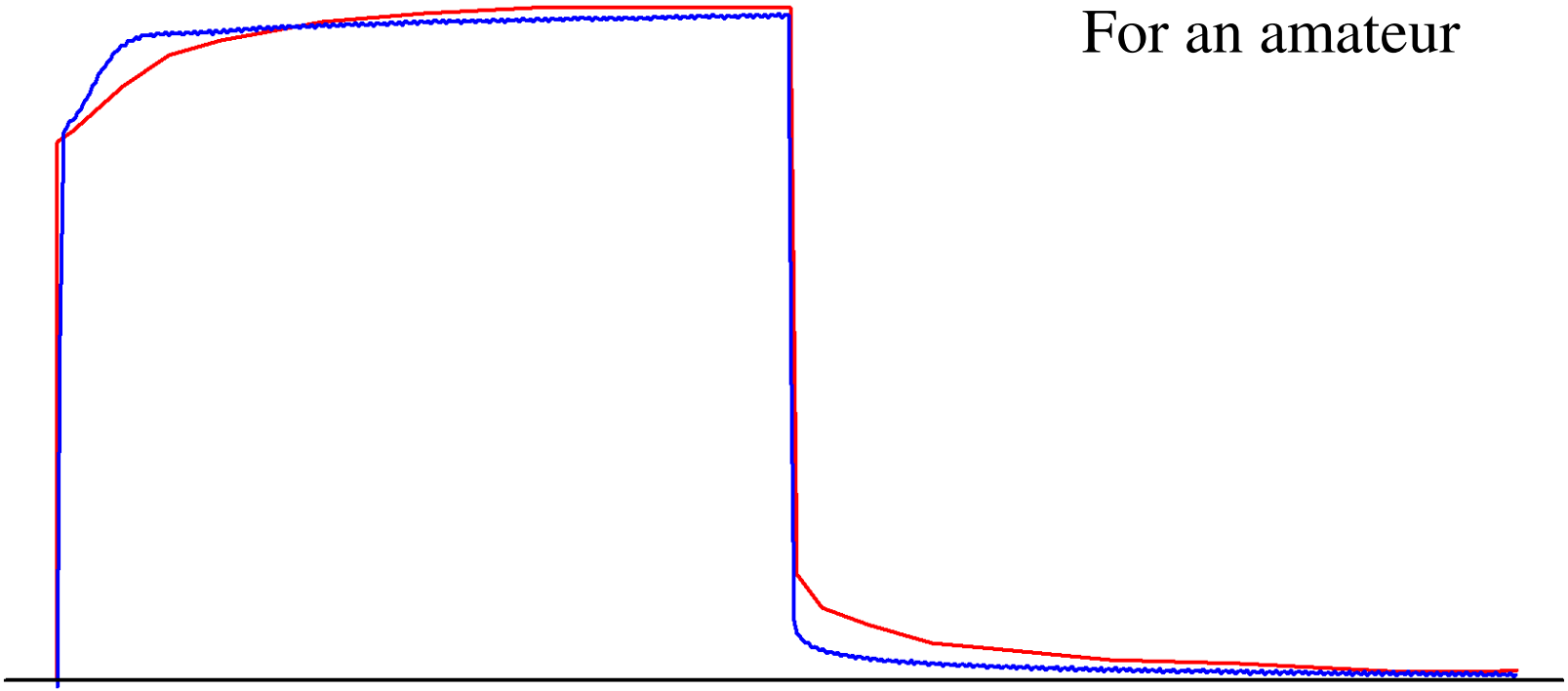
And try to guess what the original looked like

Raw decay




Add noise


Eyeball in
A decay curve

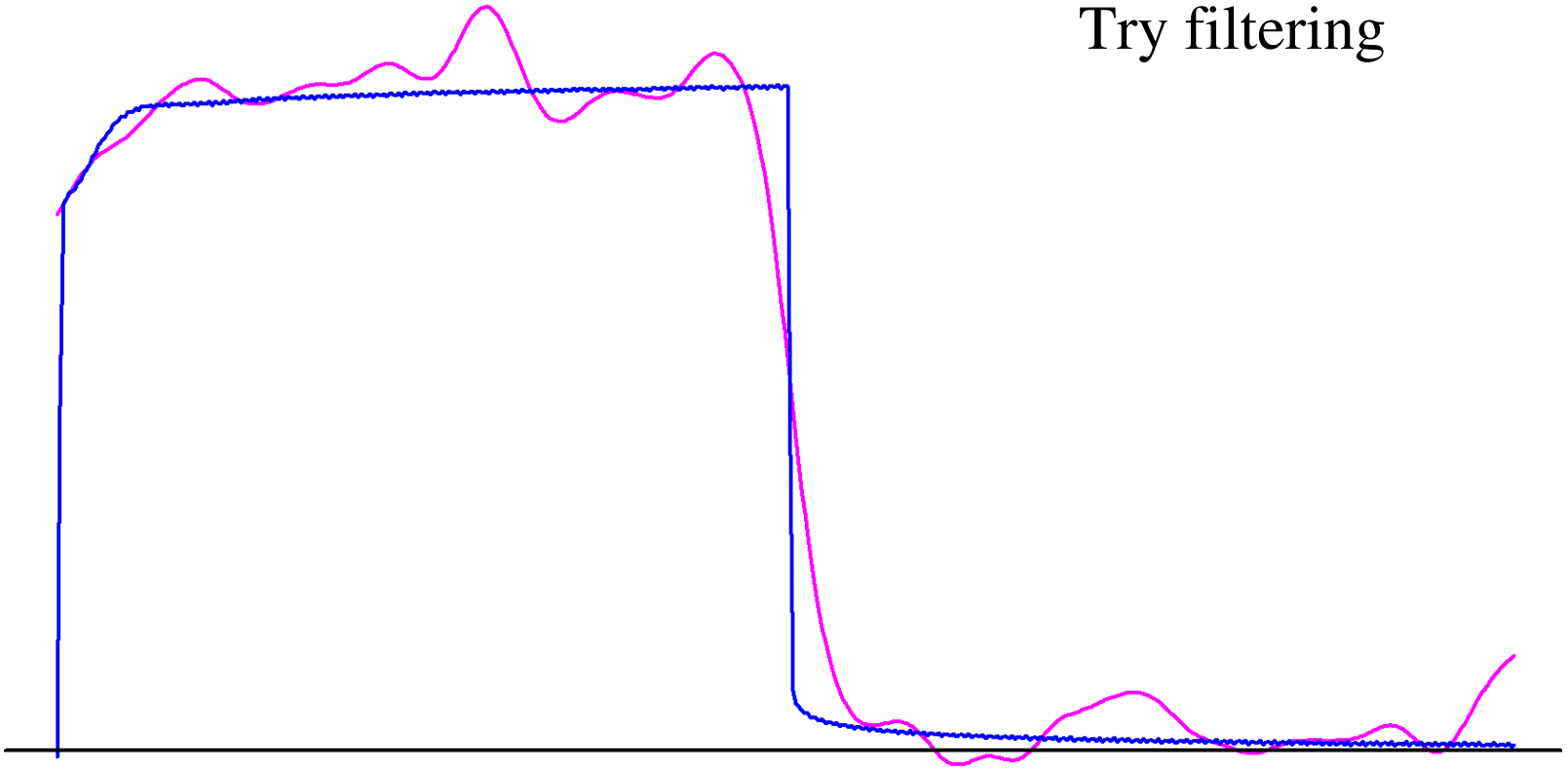


Not bad
For an amateur

But...

We can't do that well with simple linear filtering techniques.

Try filtering



So what is the difference?

What has an eyeball got
That Windows 8 hasn't?

An eyeball knows what it is looking for!

How can we give Windows some intuition?

Suggested methods
Are there others?

1 Curve fitting – modelling – inversion

2 Pattern recognition – neural networks

3 Statistical – dimension reduction

Curve fitting

Possible and worth a try but probably won't be stable for extreme noise.

A transformation if it could be devised may be more stable than a model.

A transformation could be used to force horrible decays into a form that at least looked reasonable.

These could then be stacked and binned.

Would that help????

Pattern recognition

How is looking for a decay in amongst noise any different to searching for a camouflaged tank in the jungle?

Or a face in a crowd?

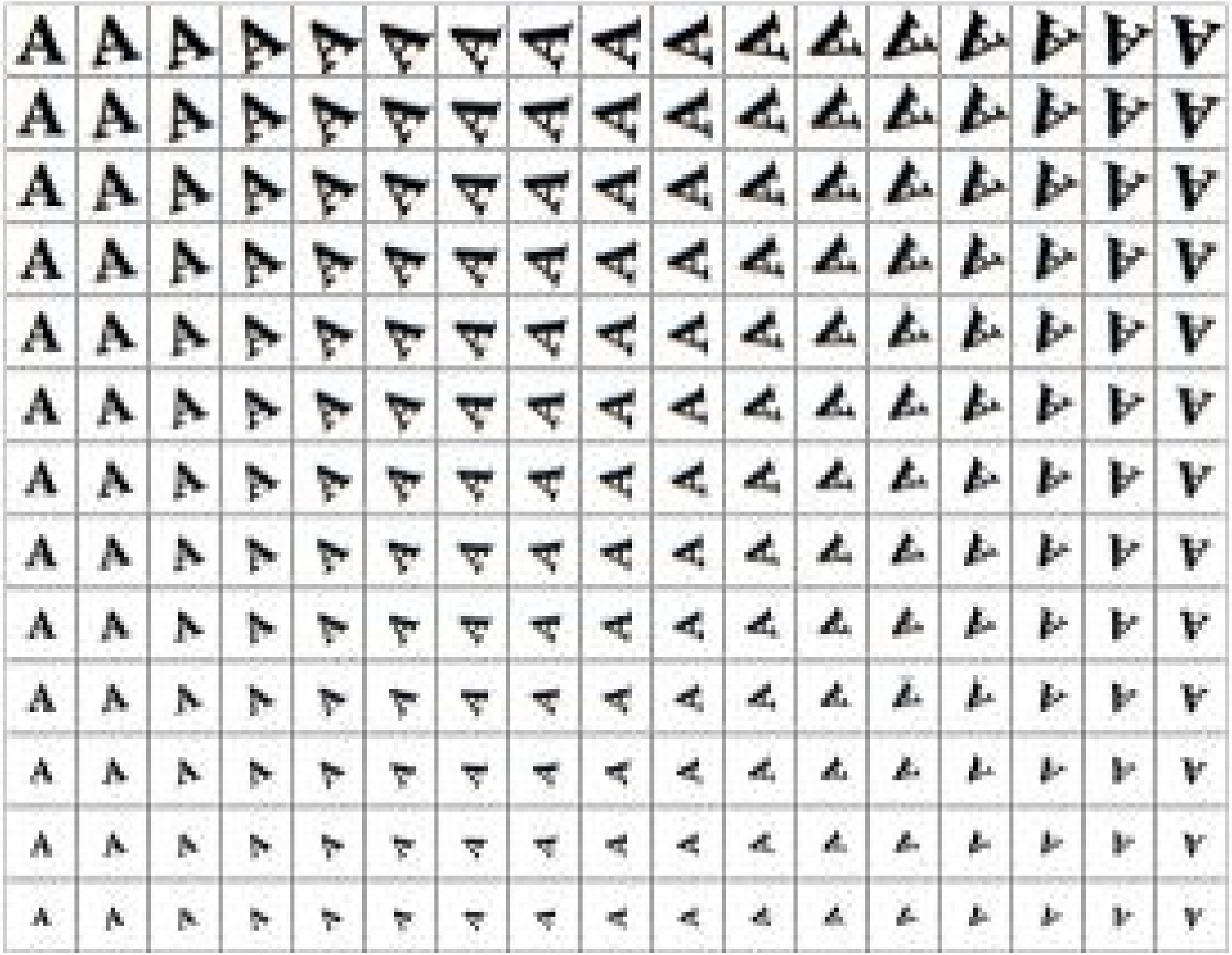
There must be thousands of clever algorithms around that could be tried on IP decays.

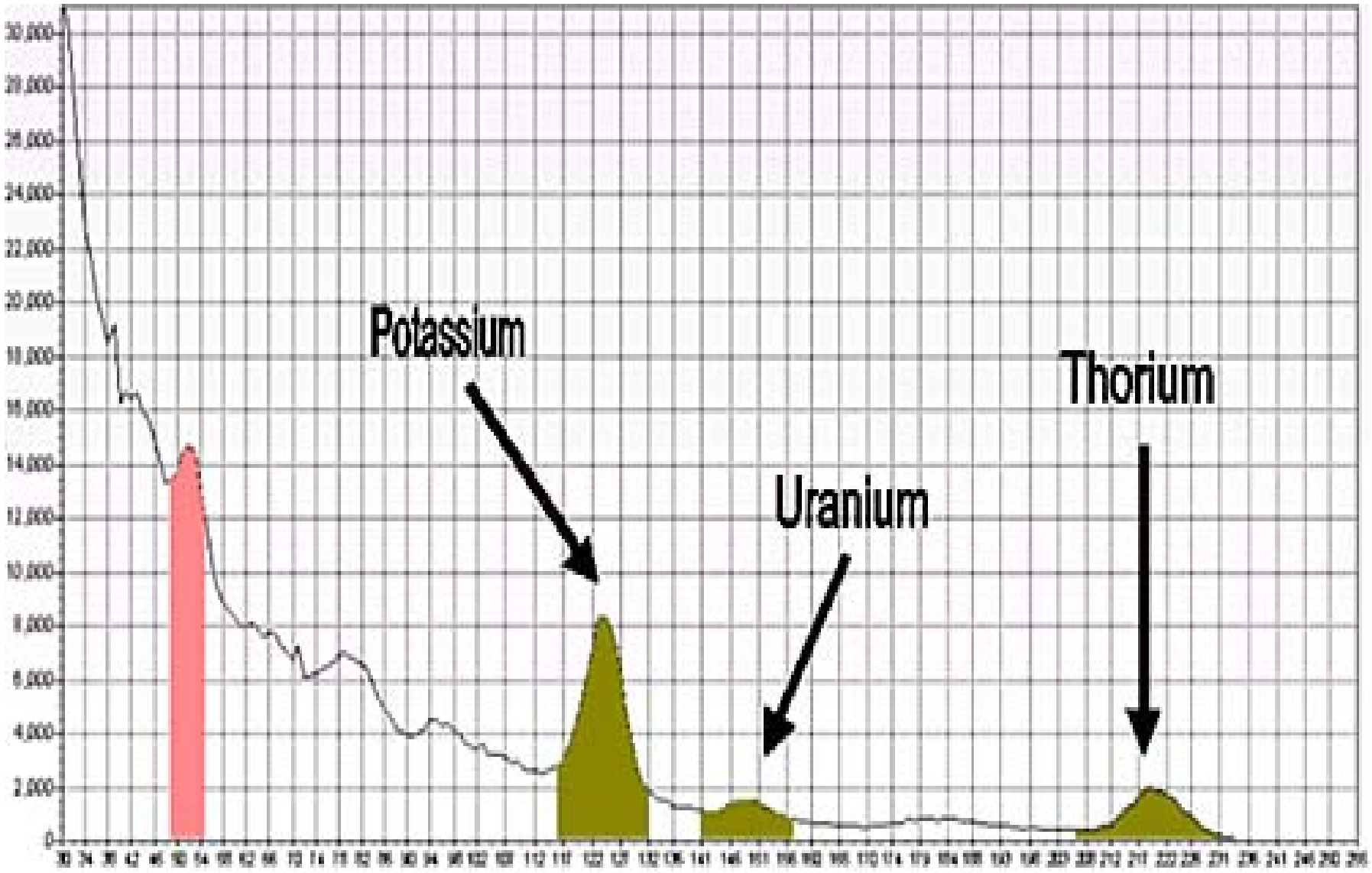
Statistics – dimension reduction

There are only a few independent variables
And thousands of measurements at each reading

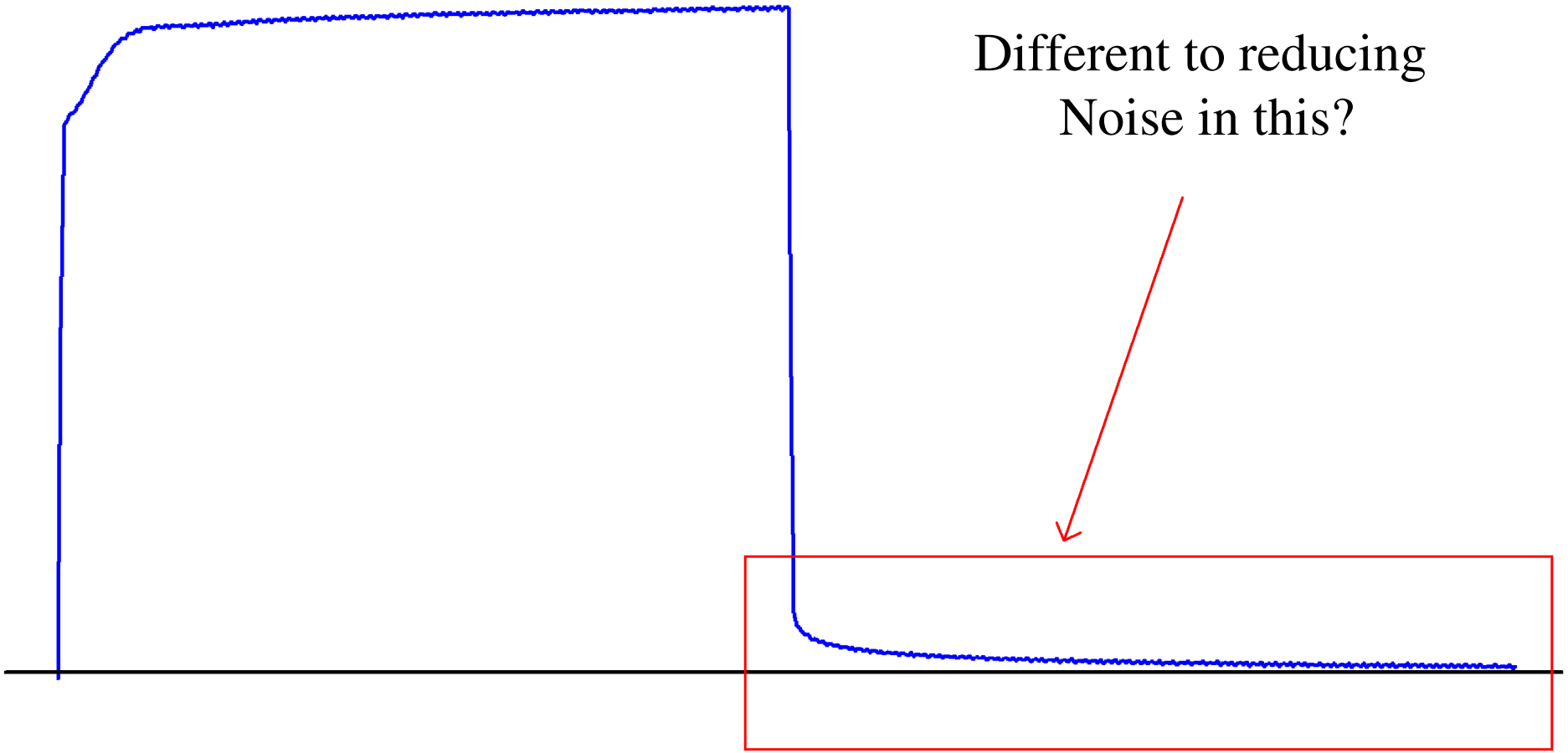
An interesting example of non-linear dimension reduction from Wikipedia.

Imagine the invariant letter A is a standard decay and the Resistivity, IP, EM parameters are the variations superimposed on it.





How is reducing noise in this.....


Different to reducing
Noise in this?

Perhaps we can use this to generate useful transformations.

Why not calculate rotation angles, in multi-dimension sample space, from the whole dataset or from models And use these to transform each decay, throw away all the noise dimensions and rotate back?

Who knows? This whole area needs further research. This approach worked for radiometrics – why not IP?