



Nuclear Services

Improved Set-up of the Electra/Mini
44B for the Detection of ^{55}Fe

Problem

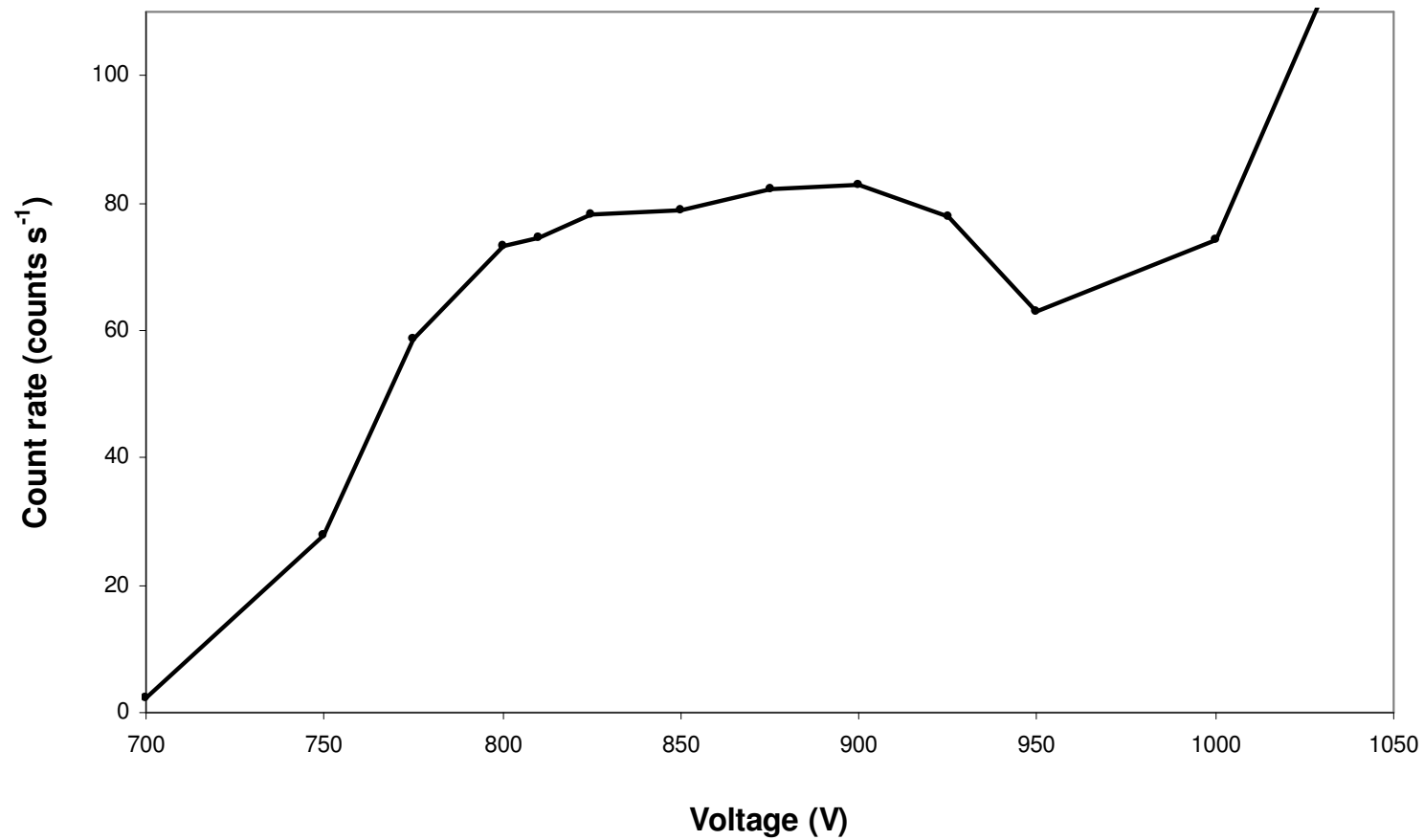
- ^{55}Fe contamination identified by IPM8 exit monitors but not detected by 44B during point of work monitoring.
- Prompted an investigation, by Nuvia and VT, into the set-up of the 44B to see whether its performance could be improved.

44B History

- 44B's traditionally paired with Mini 900 which doesn't have an upper threshold to discriminate against betas and higher energy gammas.
- Introduction of the Electra allowed significant improvements.
- Voltage set to mid-point of un-windowed plateau and upper threshold adjusted to maximise the ^{55}Fe : ^{36}Cl response.

Current set-up

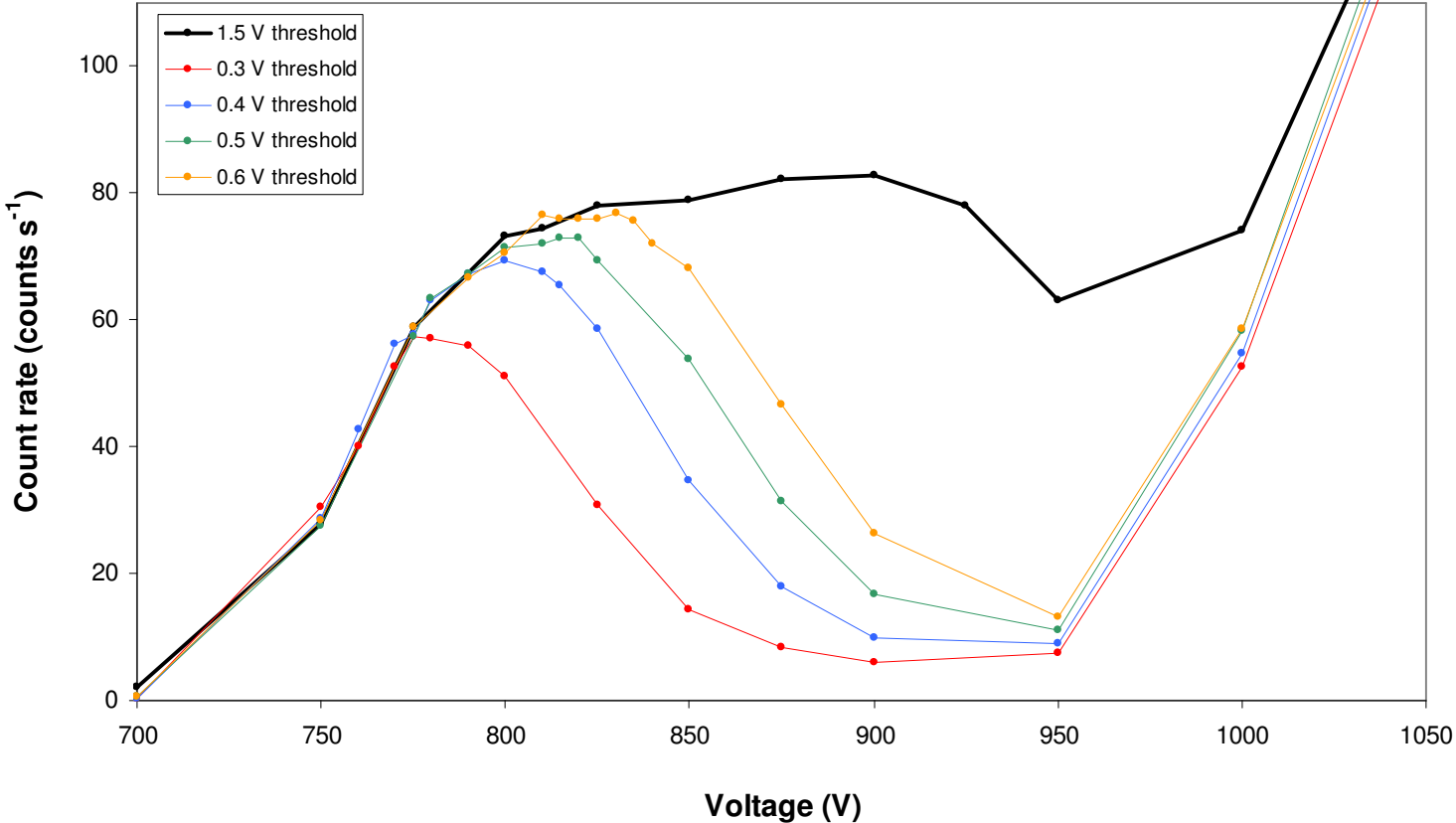
1.5 V upper threshold



Improvements

- At the start of the plateau, the trailing edge of the ^{55}Fe photopeak will just exceed the lower threshold (0.1 V).
- At this point, the leading edge of the photopeak is expected to be much lower than 1.5 V.
- Therefore, we should be able to reduce the upper threshold if we operate at a lower voltage.

Improvements



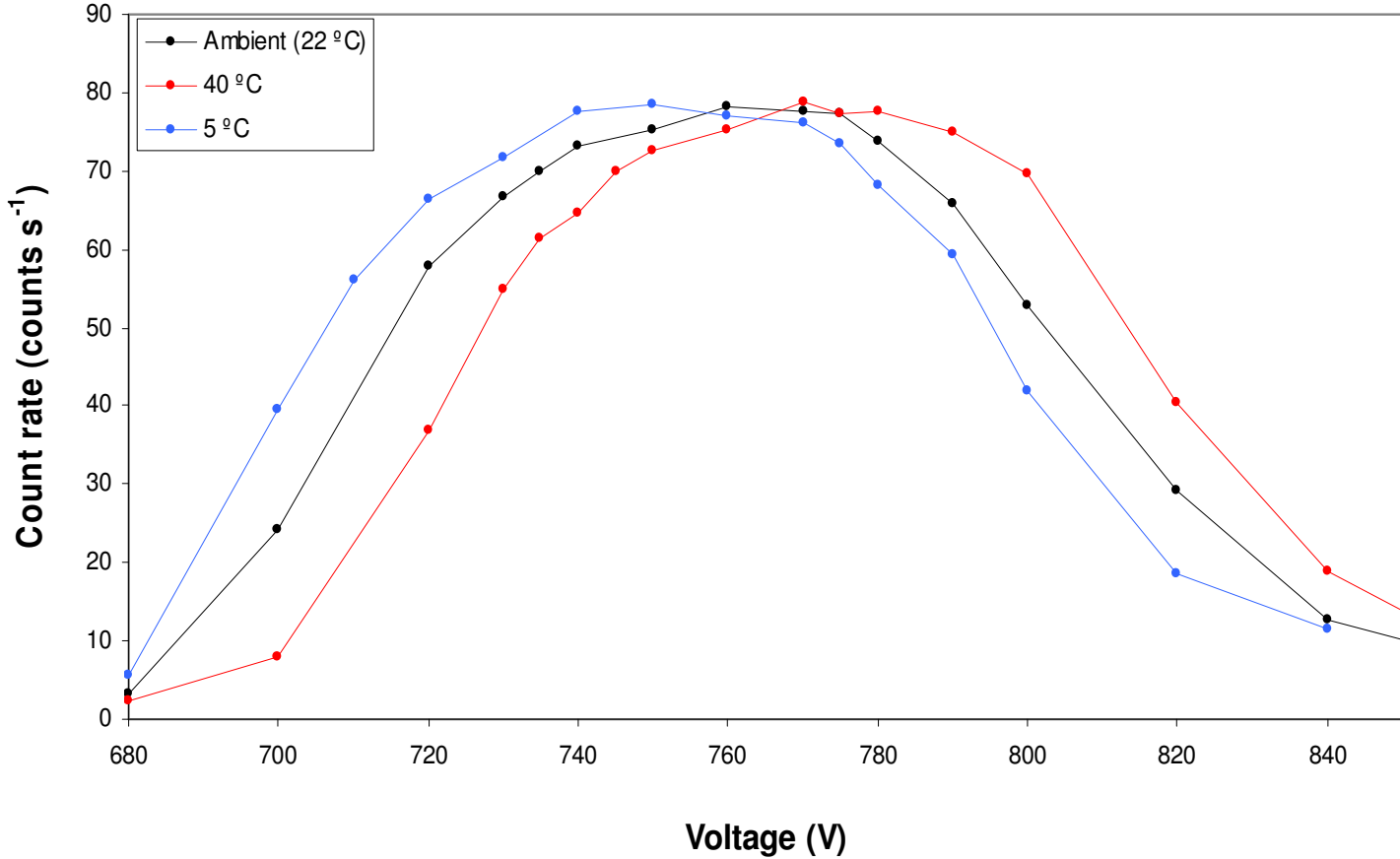
Comparison Results

Changing from 1.5 V to 0.6 V:

- Does not affect ^{55}Fe response.
- Reduces laboratory background by 60 %.
- Reduces lab MDA by 26 %
- Reduces ^{137}Cs response by 36 %.
- Reduces ^{36}Cl response by 46 %.

Reduction in gamma background expected to be significantly greater in high scatter conditions.

Temperature Effects



Conclusions

- Performance of 44B can be improved (for ^{55}Fe detection) by applying a 0.6 V threshold.
- Field data is required to determine the extent of the improvement.
- Performance is still not expected to match the exit monitors but some improvement is likely.