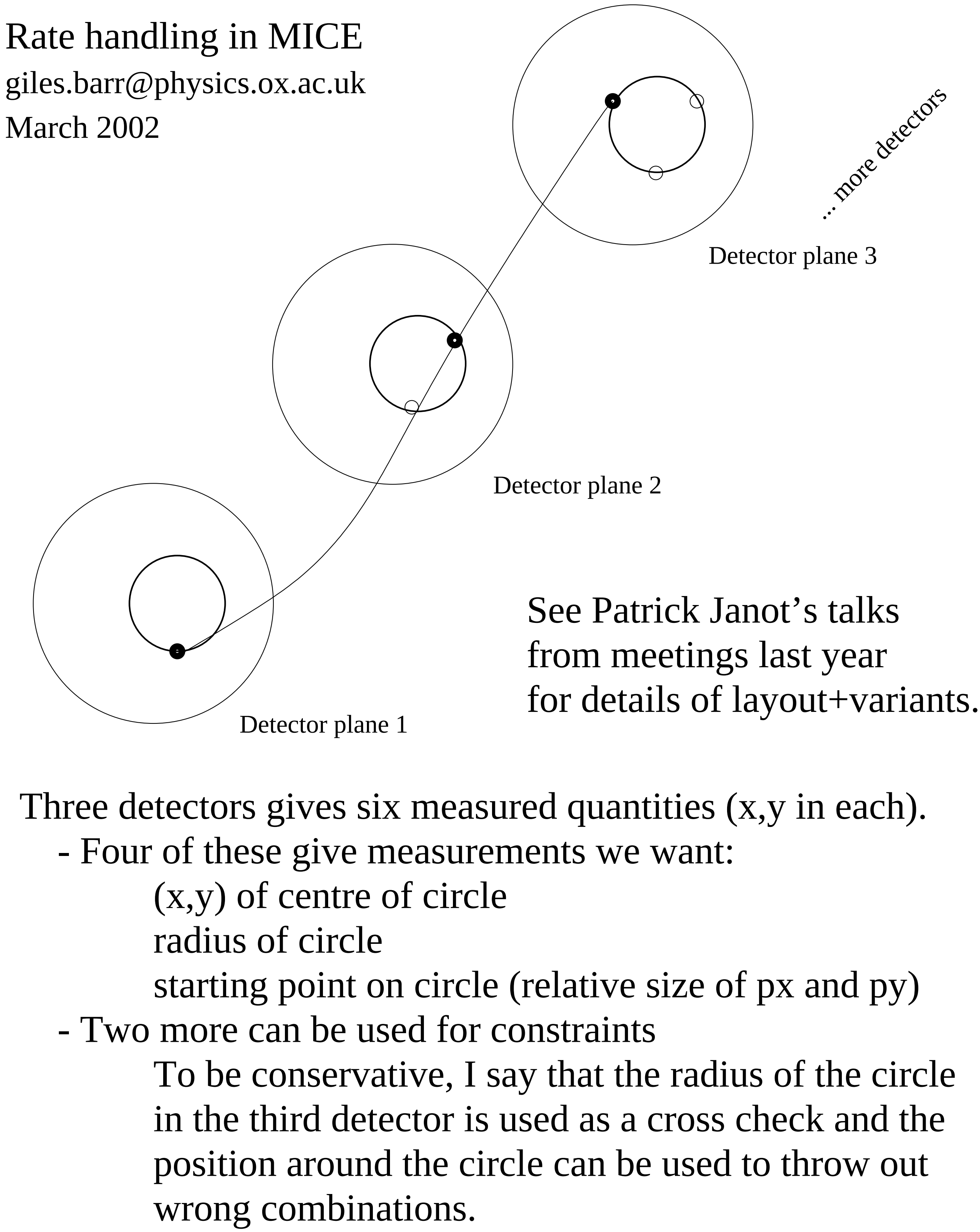


Figure 1: slide 1

(This complication was motivated by somehow thinking that background from straight tracks is more nasty than curly ones).

Now, the probability that three random points satisfy this criterion is:

P3 = md/c = 4 x 0.5 / 500
= 0.4%

c = circumference of circle
m = 'roadwidth' for finding track in units of pixels/fibres
d = size of each pixel

If we add another detector, we get two more constraints we can use to eliminate fake combinations of points. Generalising to N detectors,

$$PN = (md/c)^{N-2} (md\ 2\pi / c)^{N-3}$$

Now calculate some numbers. Let

a = #hits in *EACH* detector within time window

	N=3	N=4	N=5
PN	4 e −3	4 e −7	1 e −10
a= 2	0.032	6 e −6	1 e −9
a = 10	4	4 e −3	4 e −7
a = 100	4000	40	0.4

(This is with c = 500mm (r = 15cm), d = 0.5mm, m = 4)

Figure 2: slide 2

That was all where ‘hit’ meant spacepoints. OK for pixels, but for fibres (or other projective detector), we have to combine hits on each fibre to make spacepoints.

[*Discussion ommitted*]

f = fraction of detector area within ‘roadwidth’

3 planes, no inefficiencies	$p_3 = f a^3 + a(1-f)$
3 planes, one inefficiency	$q_3 = 3a^2 - 2a$
4 planes, no inefficiencies	$p_4 = f^2 a^4 + a(1-f^2)$
4 planes, one inefficient plane	$q_4 = 4 f a^3 + a(1-4f)$

... Slightly more sophistication...

... Plots combining these probabilities to make spacepoints from hits with the probabilities to make tracks from spacepoints (as on previous slide).

Conclusions

* Calculations of combinations of spacepoints to tracks and (for fibres) hits to spacepoints.
* No matter what happens, we are dead very quickly as the rate goes up.
* We are discussing the difference of whether a=3 is the limit or a=5, but not a=10. Therefore, we cannot beat a high rate with the detectors − the rate must not be there in the first place.
* a depends on the time window and the road width − these should be made small if we fear a high rate.

Figure 3: slide 3

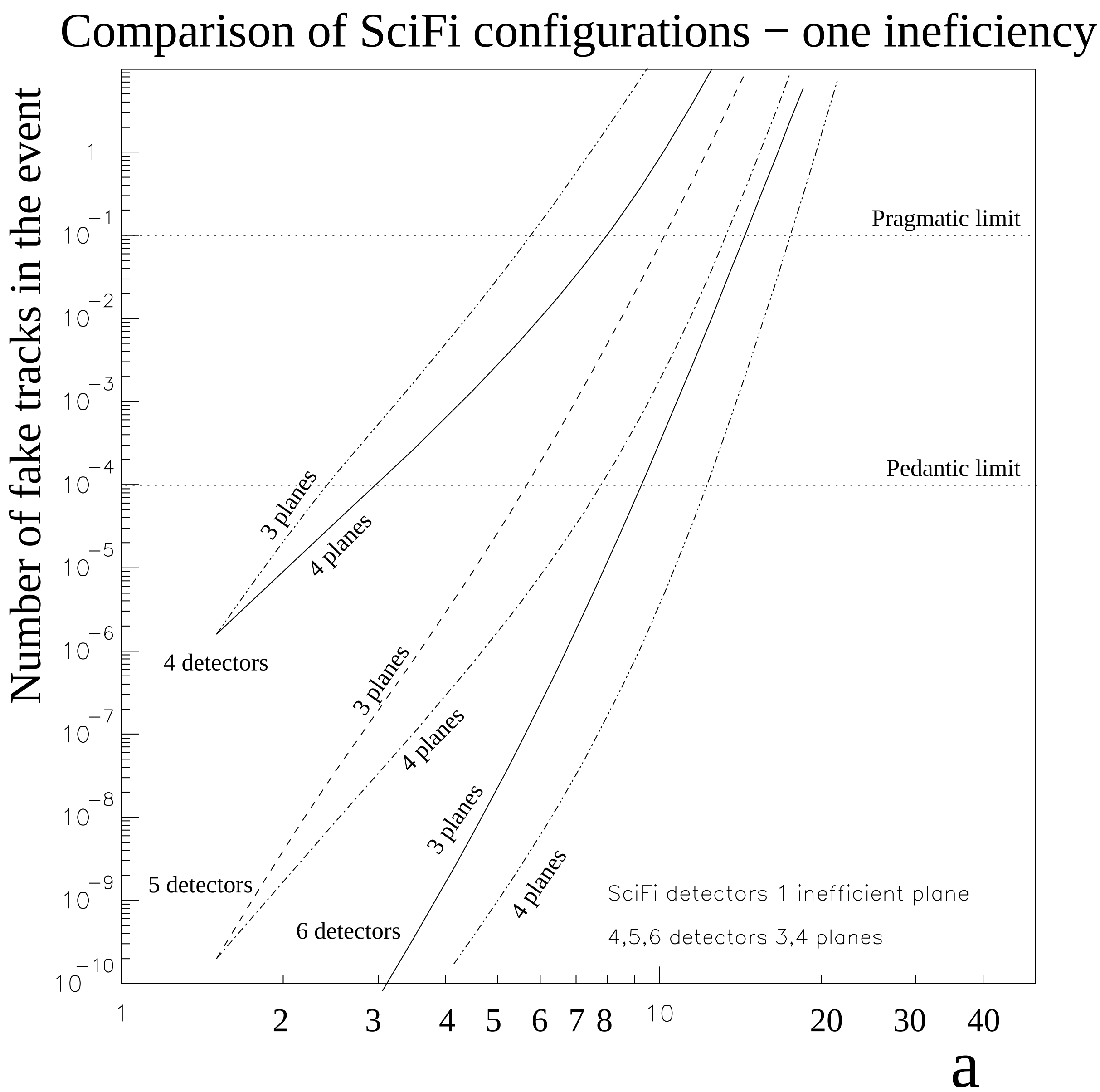
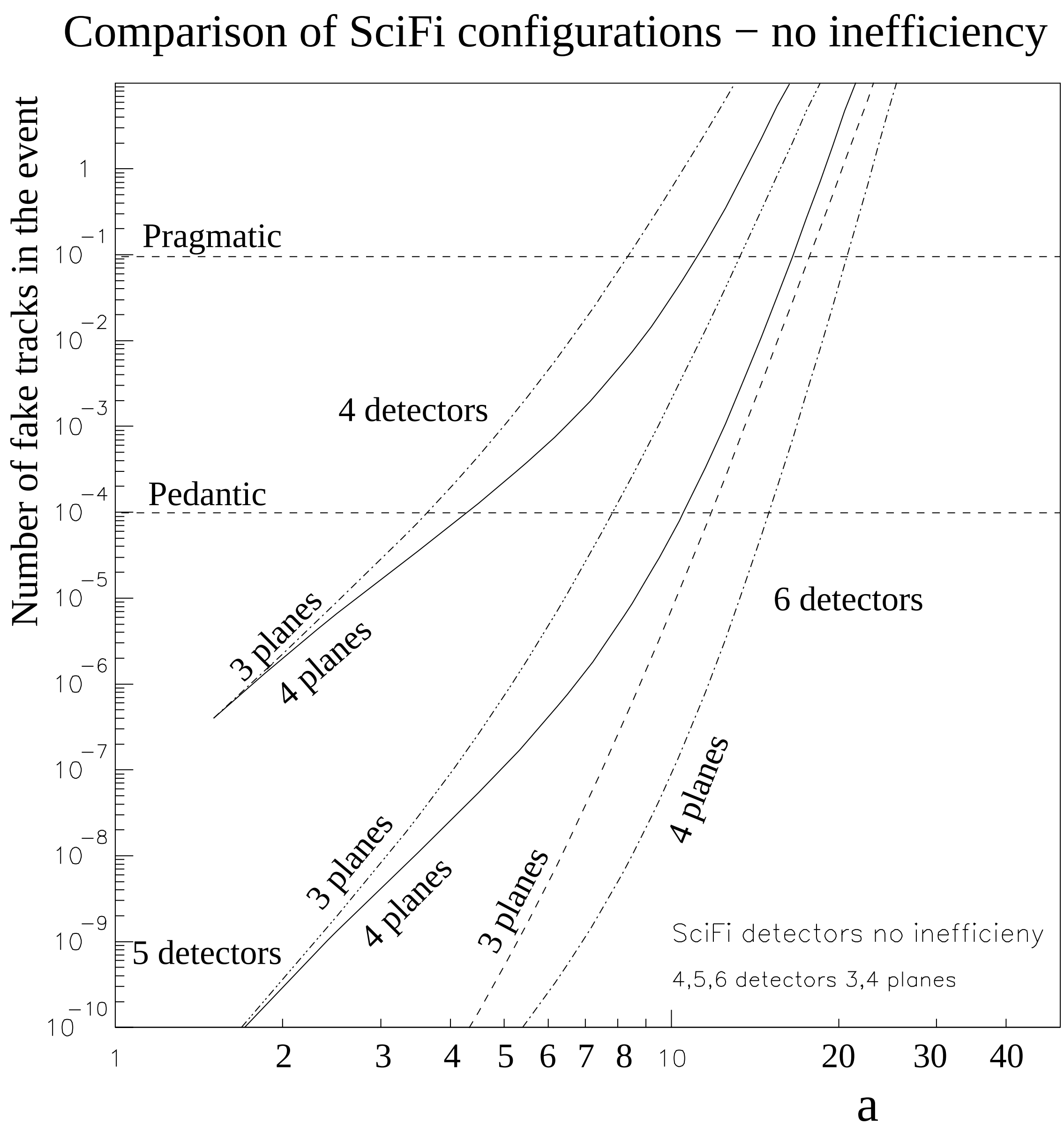

Comparison of SciFi configurations − one ineficiency
Number of fake tracks in the event
Pragmatic limit
Pedantic limit
3 planes
4 planes
4 detectors
3 planes
4 planes
5 detectors
3 planes
4 planes
6 detectors
SciFi detectors 1 inefficient plane
4,5,6 detectors 3,4 planes
a

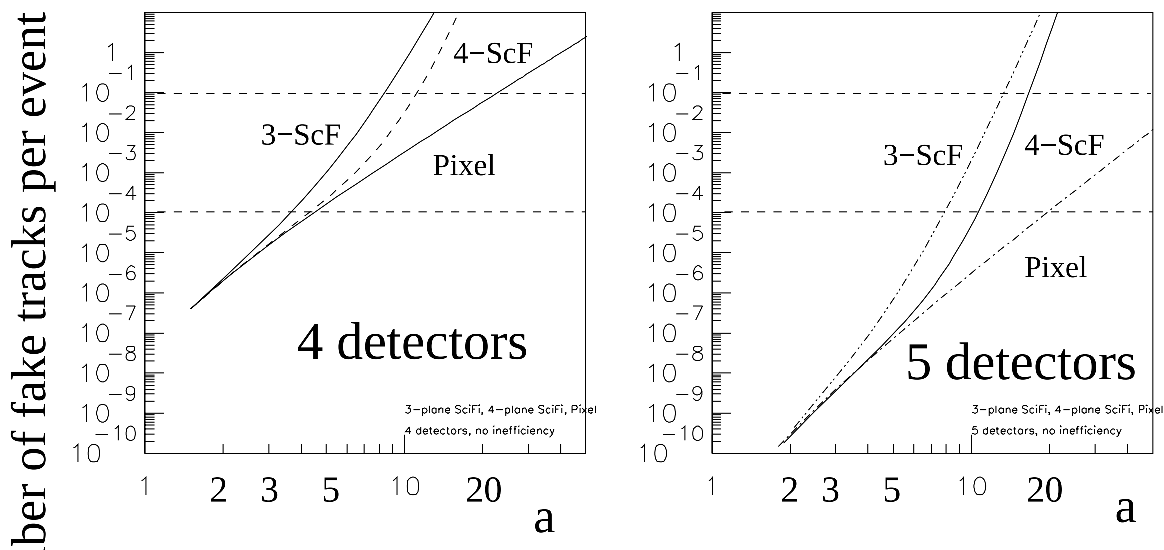
Figure 4:

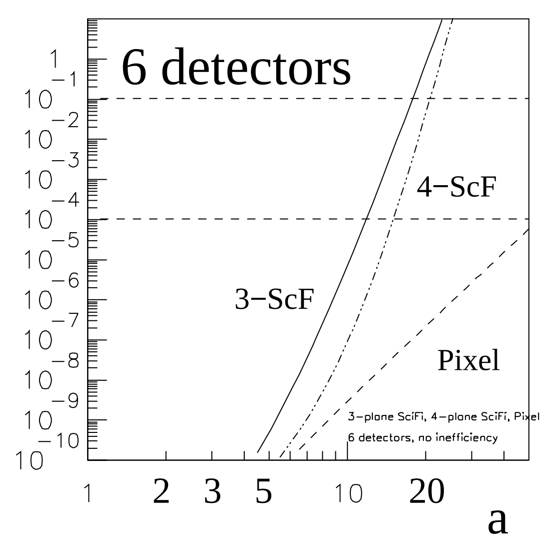


Comparison of SciFi configurations − no inefficiency
Number of fake tracks in the event
a
Pragmatic
Pedantic
4 detectors
5 detectors
6 detectors
3 planes
4 planes
3 planes
4 planes
3 planes
4 planes
SciFi detectors no inefficieny
4,5,6 detectors 3,4 planes

Figure 5:

Compare detector types with same number of detectors of each type.





Note: a depends on the time window obtainable with each detector type.
a = (rate) x (time window)

Figure 6:

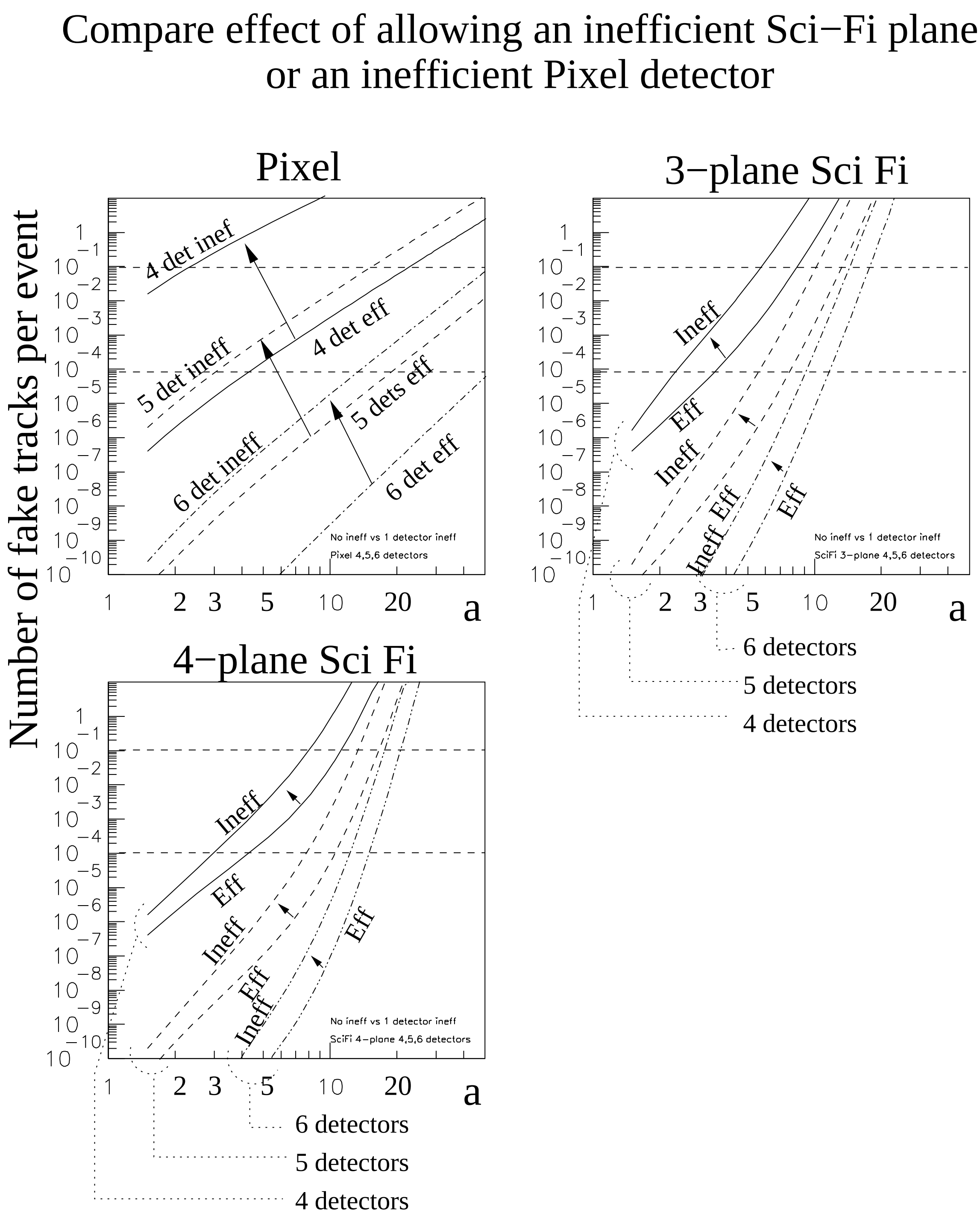

Compare effect of allowing an inefficient Sci−Fi plane
or an inefficient Pixel detector
Pixel
3−plane Sci Fi
4−plane Sci Fi
Number of fake tracks per event
a
4 det inef
4 det eff
5 det ineff
5 dets eff
6 det ineff
6 det eff
No ineff vs 1 detector ineff
Pixel 4,5,6 detectors
Ineff
Eff
SciFi 3−plane 4,5,6 detectors
SciFi 4−plane 4,5,6 detectors
6 detectors
5 detectors
4 detectors

Figure 7: