Neutron Imaging Detectors

The signal chain

Now let's do it backwards:

- We have a sample that attenuates the neutron beam by 50%.
- We want to detect a 2% variation in the sample.
  (Say, a crack or bubble within the sample.)
- This means 1% of the full neutron fluence (without sample) on one pixel.
- The poisson noise in any particle distribution is sqrt(N), and our signal must be above the noise.
- sqrt(100) =10, sqrt(1,000)= 31.6 , sqrt(10,000)=100
- so we must DETECT at least 10,000 neutrons per pixel to be equal to noise level !
- The detection efficiency of the screen is in the order of 20-30%, say 25%.
- This means we need 40,000 incoming neutrons on one pixel !

Slide courtesy: Dr. Burkhard Schillinger (FRM-II, Munich, Germany)