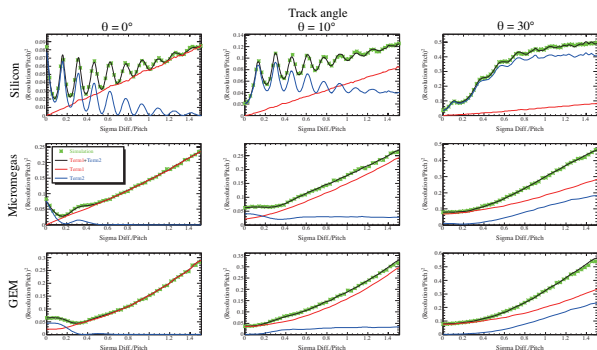


# Study of the spatial resolution for binary readout detectors

In spatial resolution plots as a function of the width of diffusion cloud, **bump structure** is found.

$$\left(\frac{\sigma_{\bar{x}}}{\text{pitch}}\right)^2 = \text{Term 1} + \text{Term 2}$$

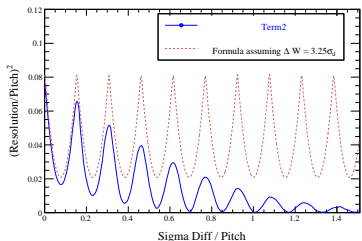
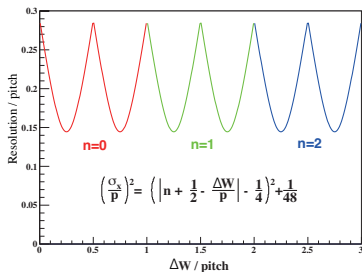
To understand the behaviors, we divide the resolution form into 2 terms.



Left plots show the sum of **Term1** and **Term2** can correctly reproduce our independent simulation results for several conditions.

Physical interpretation:

- Term 1:** Diffusion effect.  
Monotonic increasing.
- Term 2:** Systematic effect.  
bump structure.



**Top** : Newly developed formula to explain **Term 2** behaviors

The formula derivation clarifies that periodic structure comes from the readout strip pitches.

**Bottom** : Comparing the formula with the actual **Term 2**. The discrepancy seen in the large diffusion region can be reasonably explained by the assumption used in the derivation.

This basic understanding could help ...

- to **optimize** detector parameters,
- to bring ideas for **new** detectors.