Do we need pixel TPC?

This is NOT academic talk
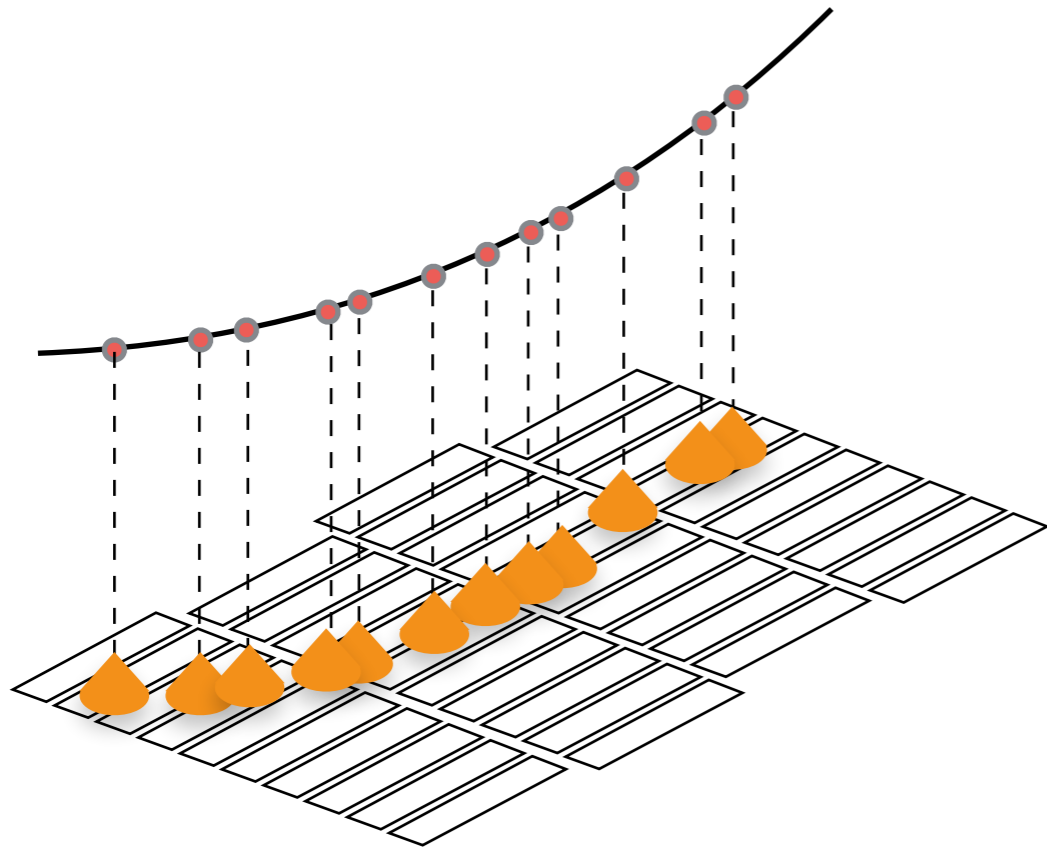   is just my personal opinion
We don't participate pixel TPC R&D yet
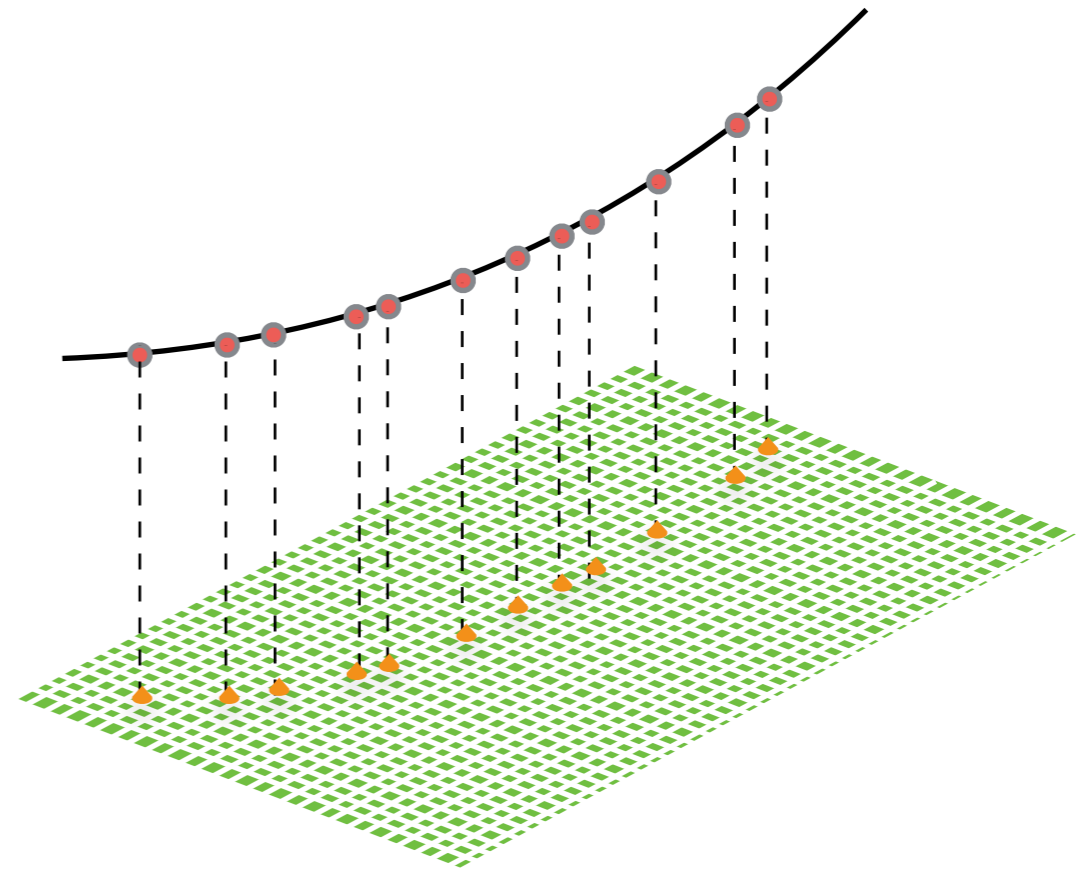But we have to consider this possibility a little bit seriously NOW

What is different?

electron clusters -> pad
position = ADC weighted mean

each electron -> pixel
position = pixel x,y

position is digitized here

Status of pixel TPC

Bonn U. is working on Ingrid Timepix using more than 100 chips
sizable area operation is not fiction anymore

   We may have to consider pixel as equal candidate as GEM/MM module
           rather than future upgrade if it has merit

People may say "Multi hit is important
           "Large scale readout is not …
           "Stability is not sufficient
           "dead space is …
           " ……

But
conventional GEM/MM doesn't have RO electronics design yet
                      no detail discussion is possible
                      no clear cooling system

       Is there big difference ??

Comparison

What is merit to use pixel TPC?

performance?

position resolution

ultimate old tech. TPC can perform good.

optimized to tracks from IP

pixel : all directional tracking perf.

small Pt tracking is improved

good for degenerated charged Higgs case

though there are many aspects to be verified for pixel TPC

high QC : semiconductor production technology

Marcelo will not say old tech anymore.

cost?   this is the only possibility Pixel can exceed

Technical merit of pixel

natural digitization of position info.
     no further treatment

       reduce load to electronics -> simpler electronics
       No ADC   ->   low power consumption
                             -> easy to cool
             No high heat conductive material
             No complicated cooling system

Contradiction to LP1 scheme

However pixel TPC would not fit in LP1 scheme
   LP1 module shape is reflecting the fan shape of pad
   there is no meaning to pixel readout

realization under LP1 may provide demerit (dead space…)

Cost

highly integrated PCB
CMOS chip
cooling system

VS.

chip production
post process
fabrication

reduction by mass production

Why MPCC become useful?

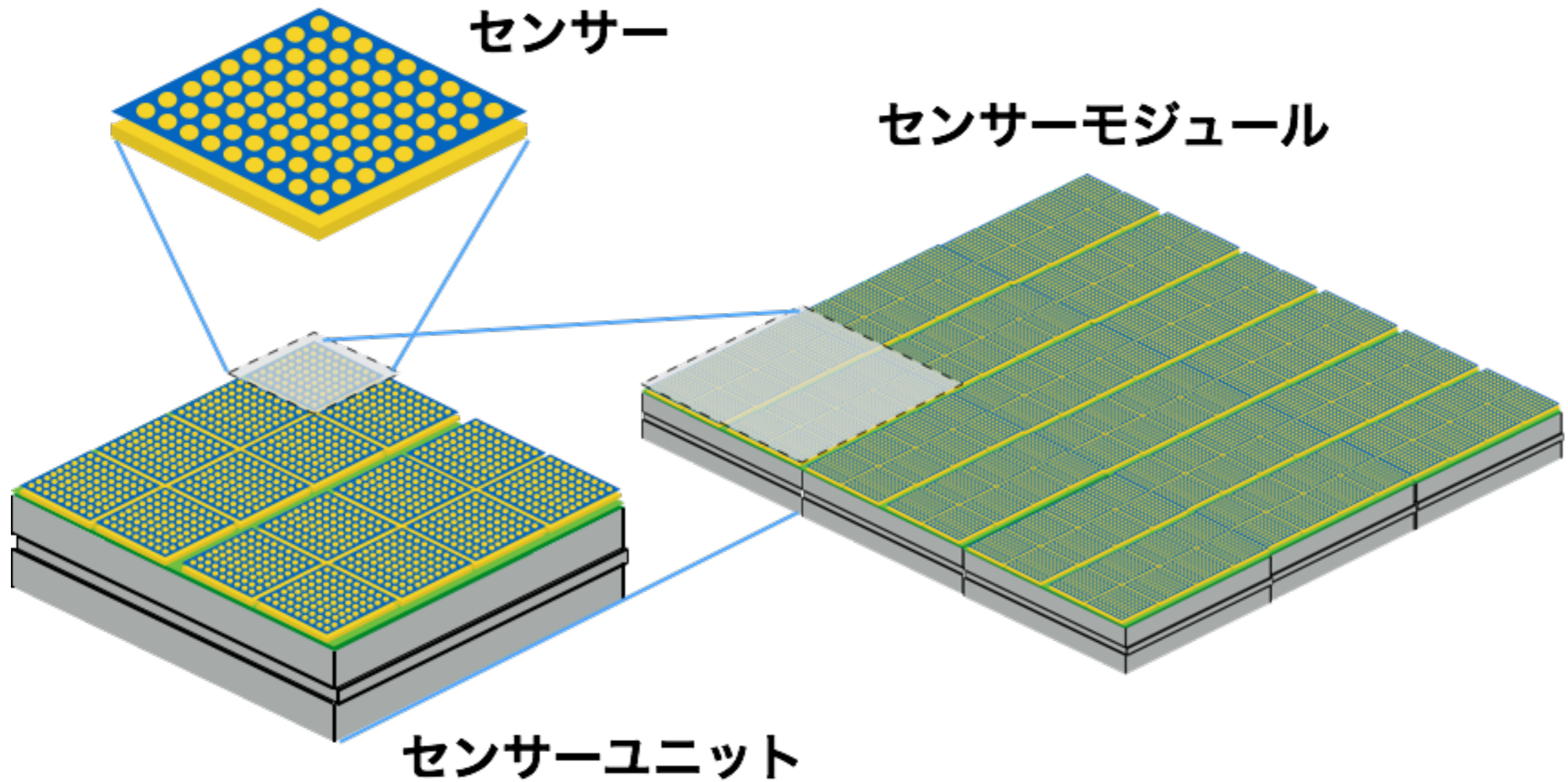cheap but performance is as good as
single photon counting is possible

In order to maximize volume efficiency
pixel gas sensor should be a standard sensor
anyone can use like MPPC

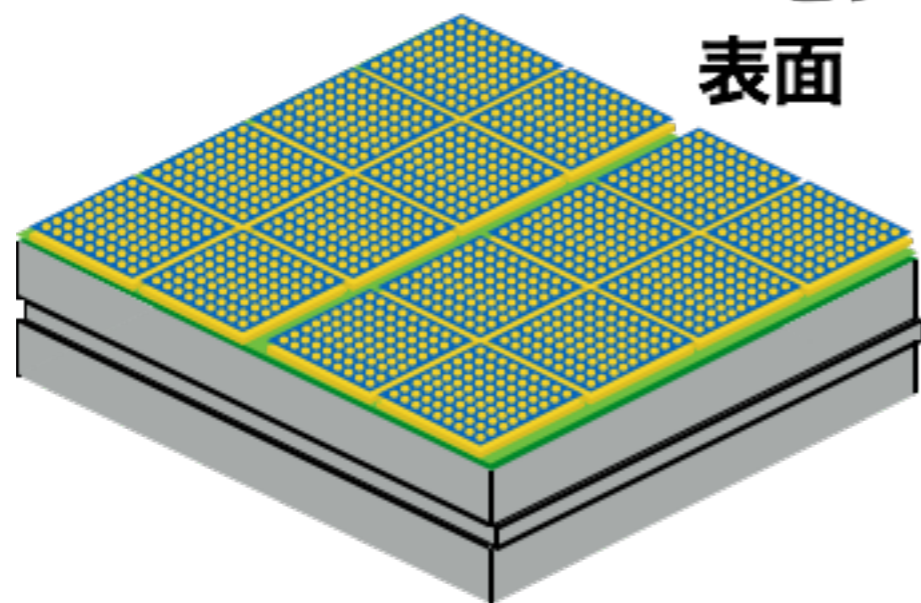cheap & high quality gas sensor will be accepted
to whom??

target cost   100$/cm2
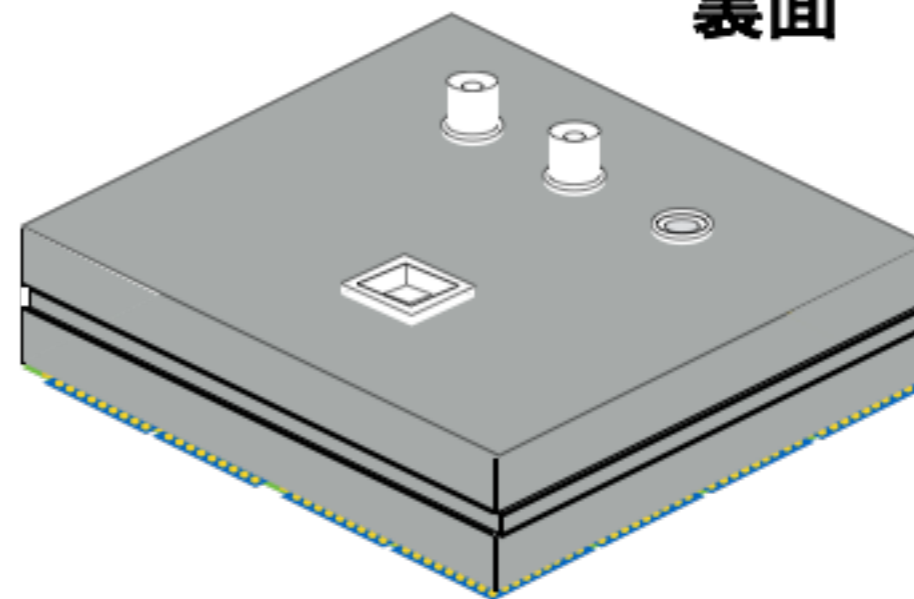
Image

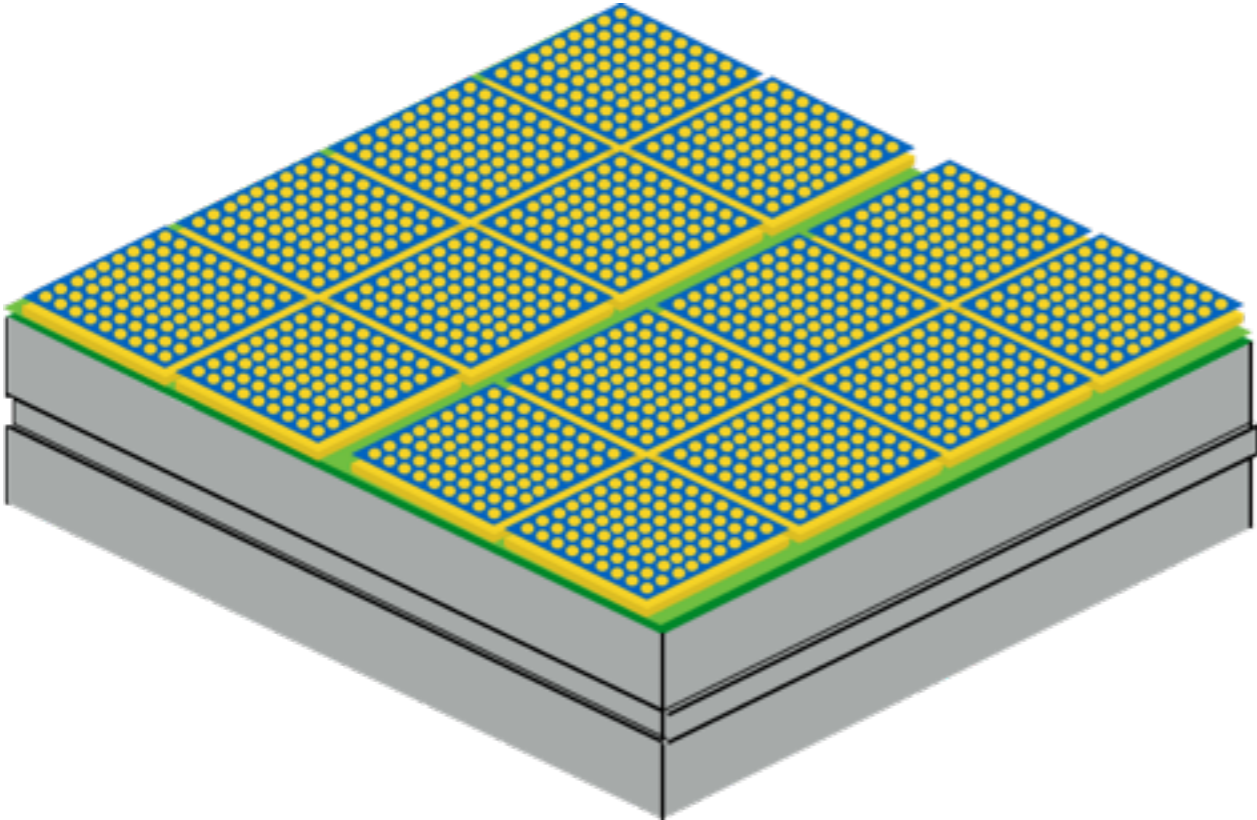Ingrid + Timepix or new one

センサー

センサーモジュール

センサーユニット

センサーユニット

表面

裏面

Standard Gas sensor can become common?

In order to make this standard / common sensor
what is necessary ?
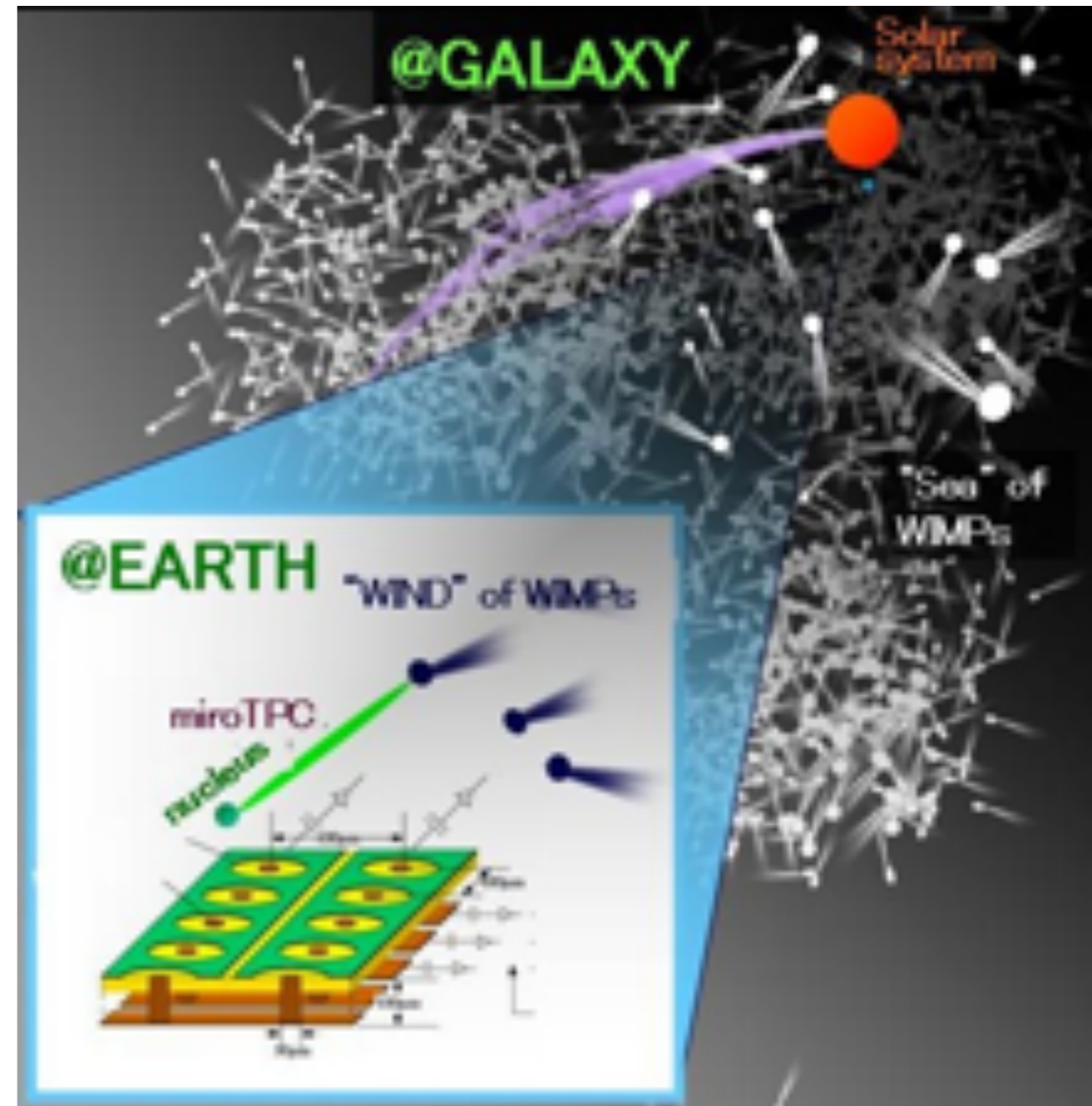function/spec./cost
for academic use
for general(?) use

Possible to reduce cost ???????????????

Another motivation

If we build LCTPC with pixel,
  why not we use TPC as directional dark mater search exp.

DM expert (Prof. Miuchi) told me
  it is very stupid idea
    to do it with ILC exp.
    Don't underestimate BKG

Note

Pixel is attractive technique,
but merit is not sure
(if we can build ultimate conv. TPC)
besides COST.

Cost reduction scheme !!

pixel will be a competitive choice