The Micro Vertex Detector (MVD) of CBM

The task of the MVD of CBM
1) Open Charm reconstruction → Provide ~50 μm sec. vertex reconstruction.
2) Support e/π+ spectroscopy → Provide excellent low momentum tracking.
3) Charged reconstruction in HIC (first time)
Operate at 100 kHz Au+Au (10 AGeV) and 10 MHz p+Au (30 GeV)

The technological challenge
• Needs ultra thin (0.3% X0) stations.
• Operation in target vacuum needed.
• High track density (700 kHz/mm² peak)
• High radiation load: ~$3 \times 10^{11}$ n/cm²
• ~3 Mrad

The sensor technology
CMOS Monoloytic Active Pixel Sensor
• Excellent compromise between high precision tracking and high rate capability.
• Used in STAR/HFT and ALICE/ITS (upgrade).
• Dedicated sensor required for CBM (MimoSIS): ALICE ALPIDE

Pixel count 512 x 1024
Pixel pitch 52.2 μm x 26.9 μm
Special resolution 1.7 x 10^{-6} cm
Time resolution 5 - 10 μs
Radiation load NIEL 504 x 10^{12} eq/n/cm²
Radiation load TID < 5 μm
Peak hit rate > 12 kHz/mm²

The integration concept
• Place sensors on carbon based cooling support
• Evacuate dissipated power to liquid cooled heat sink outside of acceptance

Tracking performance simulations

Aim - Test MVD geometry options

1. Station @ 5 cm
   - Expect improved IP resolution,
   - Tracking complicated by high track density.
2. First station @ 8 cm
   - Reduced track density
   - Expect robust tracking
   - Expect reduced pointing resolution

Results

• Integration feasible.
• Excellent tracking performance > 99% det. eff.
  (with Mimosa26 @ CERN SPS)
• Long term vacuum operation under study

Conclusion: Both geometries provide robust performances.
Next step: Full physics case simulation