10-Jul-2015
Kobayashi Toshio (Tohoku Univ.)

last report: 22-May-2015

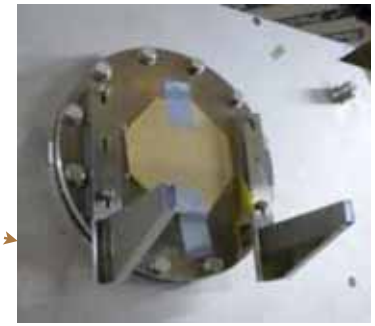
Memo

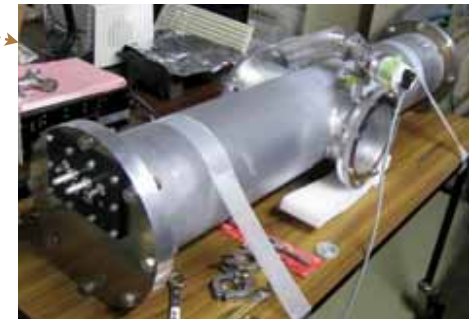
- Standard detectors
  - FDC1, FDC2, HODF24, PDC, Upstream stand/SBT T-pipe
- Upstream configurations for autumn runs
- FDC0 bench test
  - using β & μ (MIP)
  - gas
    - P10, He+50%C_2H_6, He+60%CH_4 at P= 1 atm
    - i-C_4H_{10}, P= 50, 75, 100, 150, 200 Torr
  - efficiency, position resolution, STC
- KDC240 bench test
  - using β & μ (MIP)
  - gas : i-C_4H_{10}, P= 50, 75, 100, 150, 200 Torr
  - efficiency
  - strip position information

Standard detectors

with Chiga & Kisamori

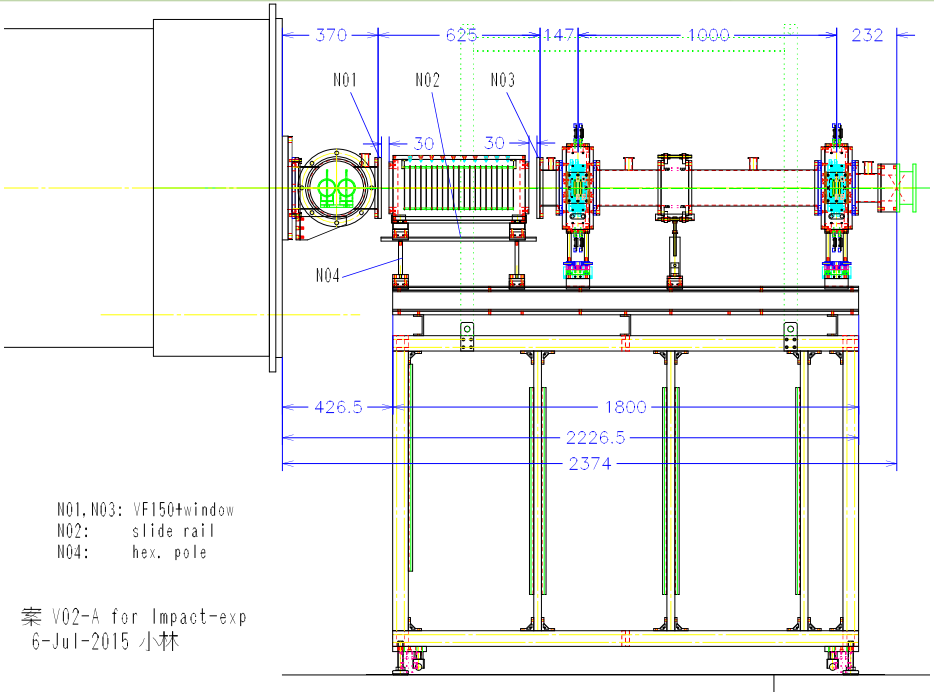
- FDC1
  - AC, HV, signal cables disconnected : 22-Jun-2015(Mon)
- FDC2
  - AC, HV, gas disconnected, bolts removed : 22-Jun-2015(Mon)
  - moved to temporary location : 30-Jun-2015(Tue)
  - swapped to 2 high-power NIM bins : 6-Jul-2015(Mon)
- HODF24
  - 5 slats installed : 6-Jul-2015(Mon)
  - average pitch ~ 100.8 mm
- PDC
  - high-power NIM bin moved to right side, under VME crate : 6-Jul-2015(Mon)
- Upstream stand
  - moved downstream : 6-Jul-2015(Mon)
  - Jig/flange for SBT T-pipe fixed to STQ
- SBT T-pipe
  - vacuum test at F3 (Chiga)
    - 6.6×10^{-4} Torr w blank Al flanges, 6.3×10^{-4} Torr w connector flanges



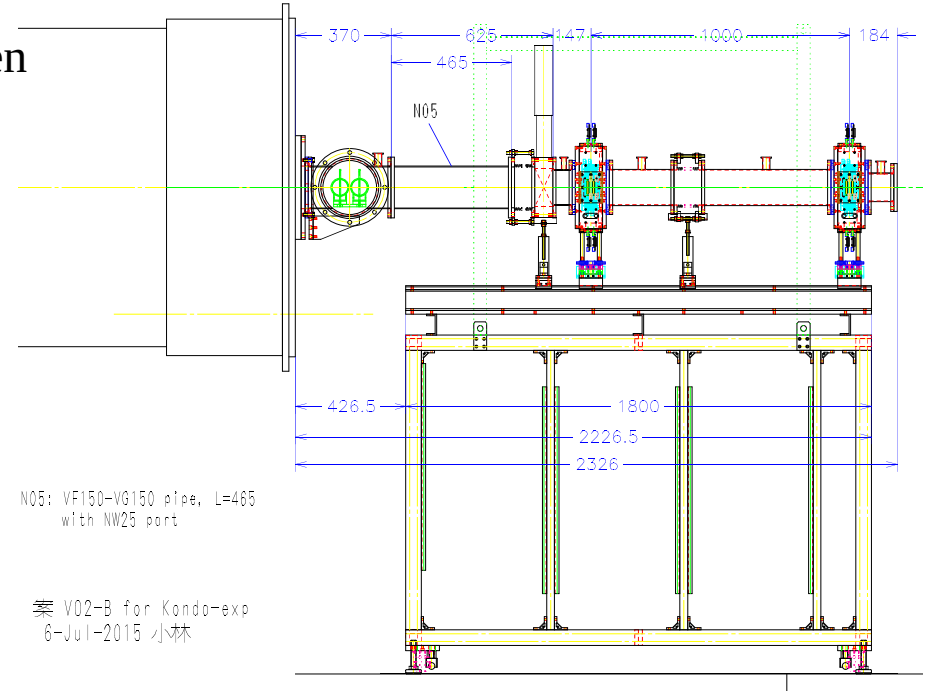


Upstream setup design v02 : Impact <--> Oxygen

- Impact



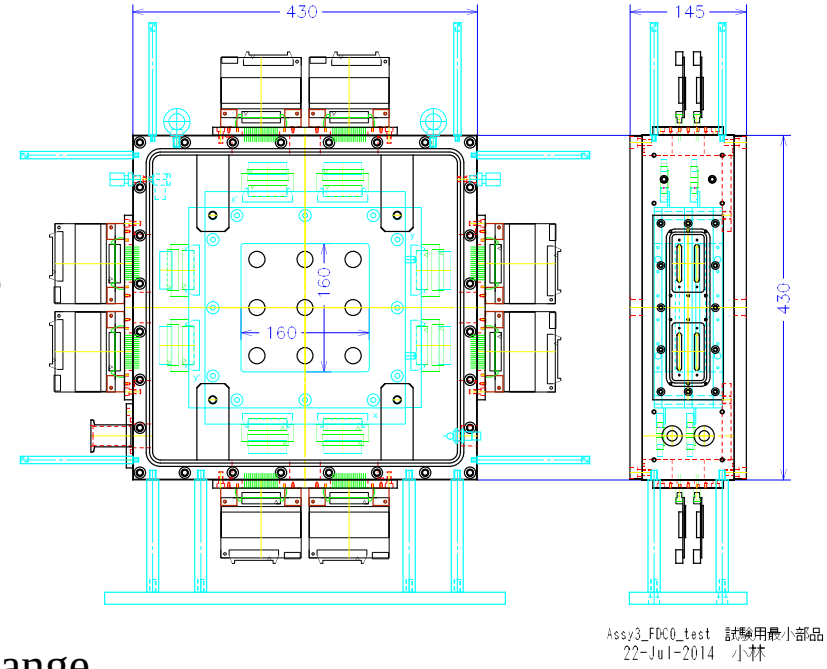
- Oxygen



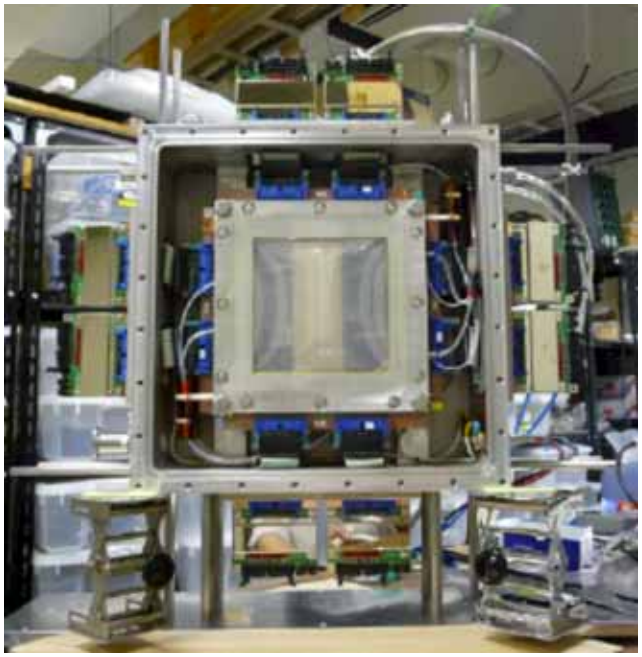
- parts to be built
  - N1,N3: VF150+window
  - N2: slide rail
  - N4: hex pole
  - N5: VF150-VG150 pipe, L=465, w NW25 port
- demerit
  - 2 x125um thick vac. windows
- procedure
  - remove ICB
  - remove 2 VF150 vac. windows
  - remove DN100 GV & put V100 vac. window
  - put DN160 GV & V150 bellows
  - put VF150-VG150 pipe
- if more space is available
  - connect ICB w vac. pipes.

FDC0 Assembly

- location
  - between target & FDC1
- narrow-cell drift chamber in low-pressure box
  - drift distance= 2.5 mm, half gap= 2.5 mm
    - same structure as BDC1 & BDC2, for high-rate
  - effective area: 160 mm x 160 mm
  - configuration: xx'yy'xx'yy'
  - #readout channels : 256 ch (32ch/plane x8)
  - gas : i-C_4H_{10} , P= 20~200 torr
  - HV : cathode (-), potential (-)



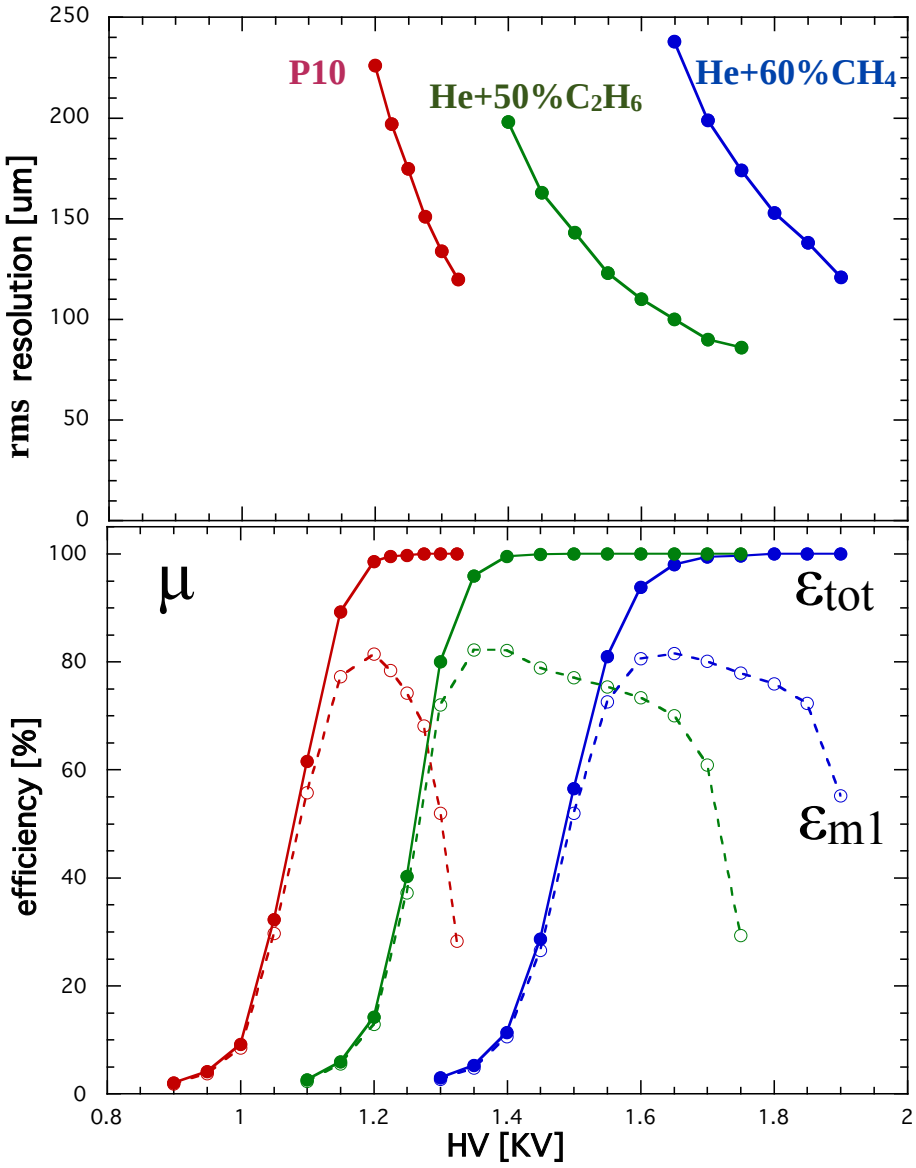
drift chamber in low-pressure box



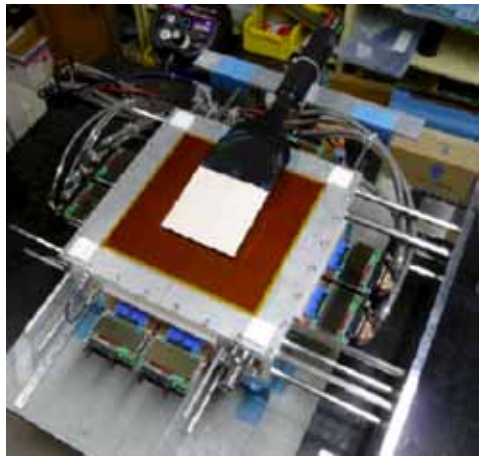
with test flange

FDC0 bench test @P= 1 atm

- Cosmic ray (μ, MIP) data



- conditions
  - 32ch/plane x 4 planes :
    - x1, x1', x2, x2' or y1, y1', y2, y2'
  - TDC: LRS3377 x 4 modules
    - 0.5nsec/ch, leading edge (no width)
  - LV: V_{th} = -0.4 V
  - HV: ΔV_{pot} = 50 V
  - gas :
    - Ar + 10%CH_4 (P10) L_r= 119 m
    - He + 60%CH_4 L_r= 997 m
    - He + 50%C_2H_6 L_r= 638 m
- misc.
  - $\varepsilon_{m1}(\beta) > \varepsilon_{m1}(\mu)$



- position resolution: σ~ 200 μm at the beginning of plateau → σ~ 100 μm

FDC0 : drift time to distance

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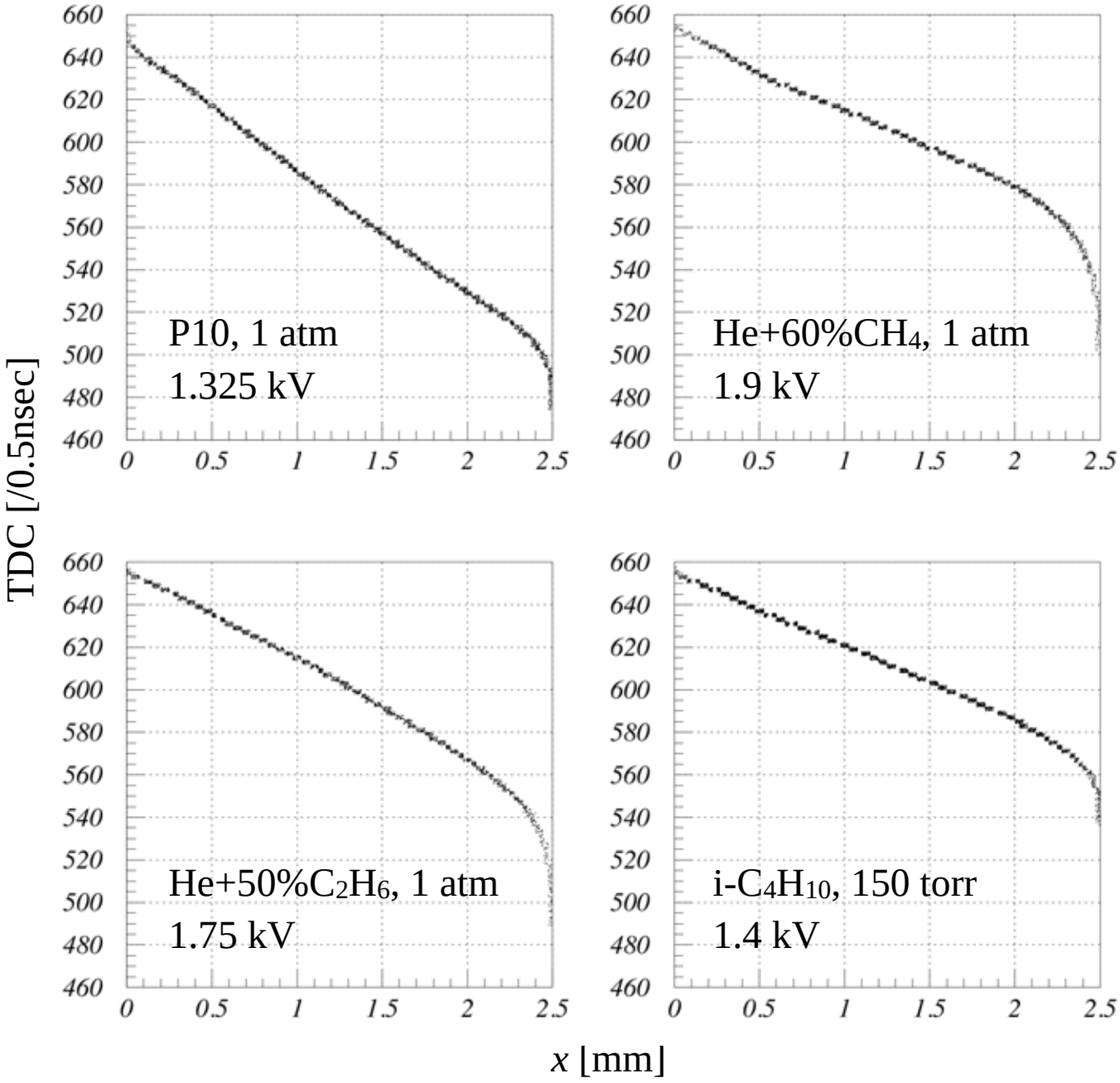
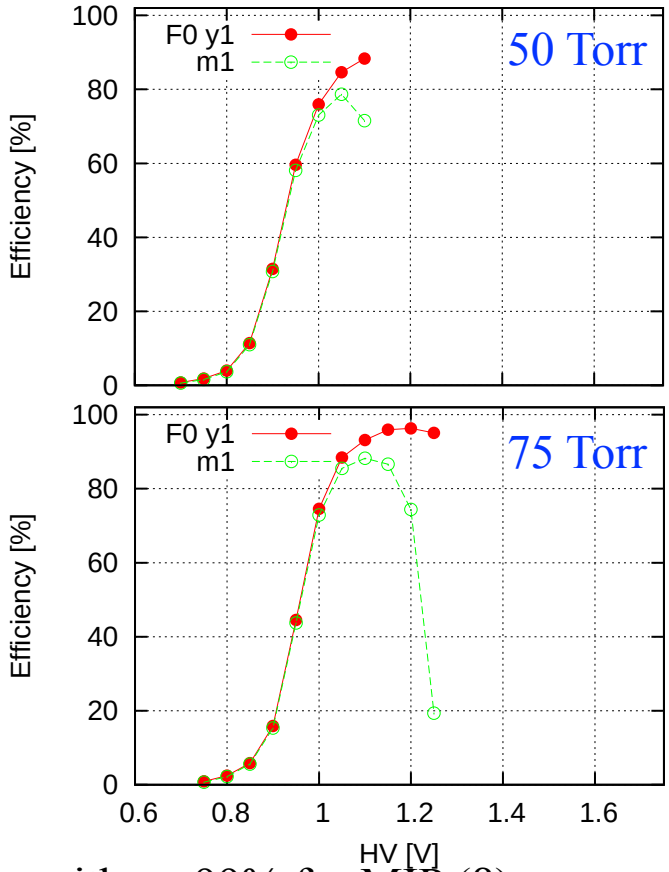
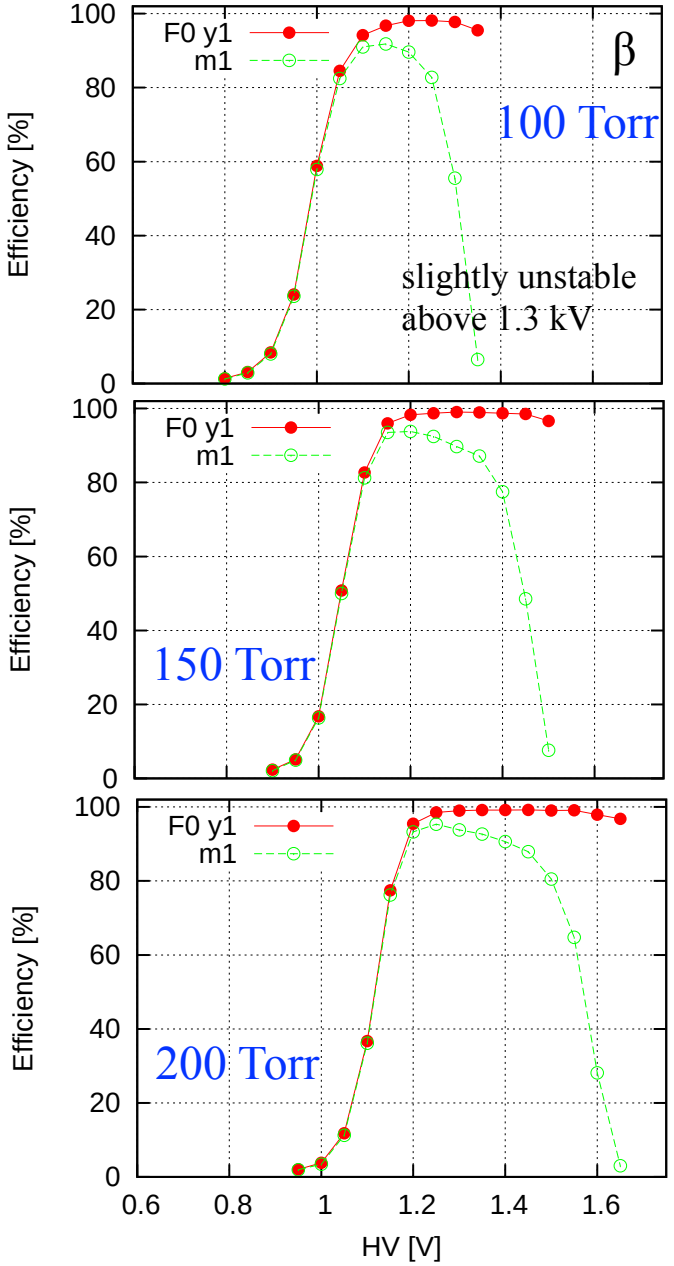


- drift time width
  - P10
    - > He/C_2H_6
    - > He/CH_4
    - > $i\text{-}C_4H_{10}$ @low pressure

FDC0 bench test @ low pressure : efficiency

- efficiency : for β-ray (MIP), P(i-C_4H_{10})= 50~200 Torr

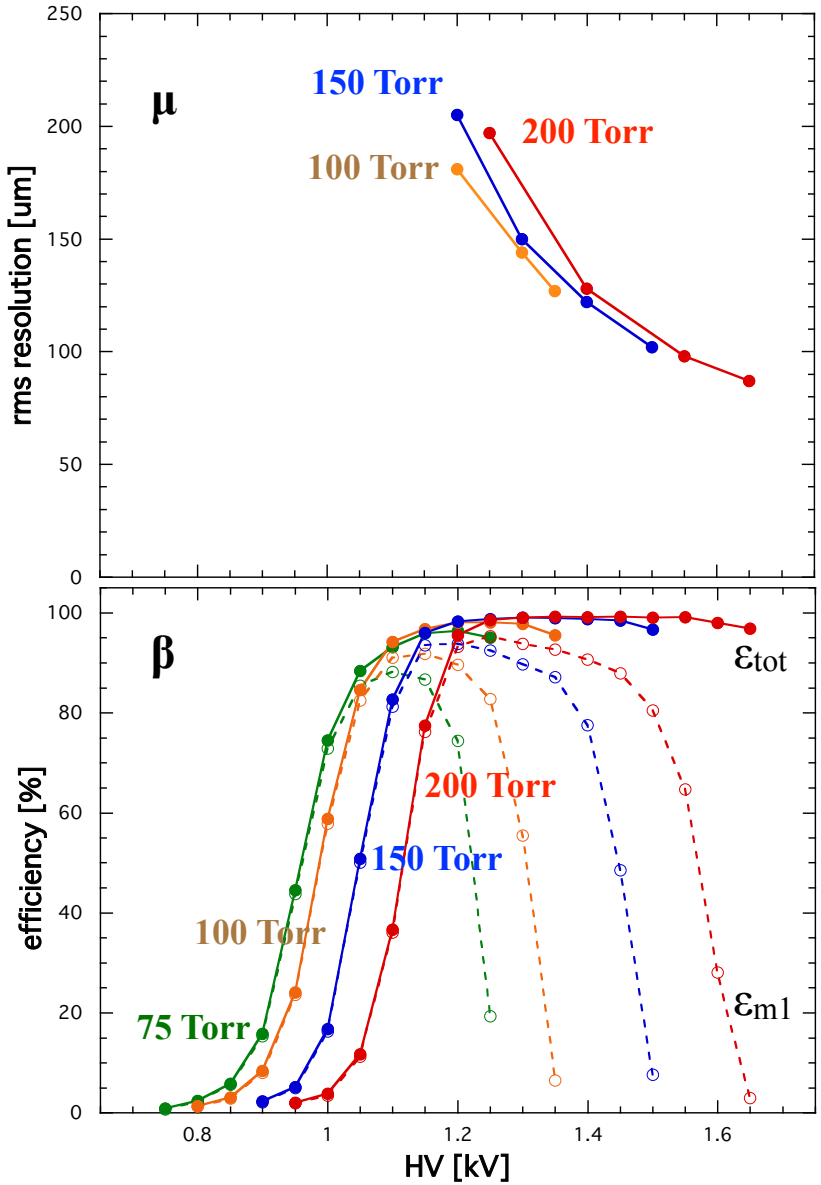




- stable plateau with ε >99% for MIP (β)
  - P(i-C_4H_{10}) ≅ 150 Torr
  - $\varepsilon_{m1}(\beta) \cong \varepsilon_{m1}(\mu)$?
- efficiency loss at higher HV ?
  - change of amplification mode or
  - buffer in 3377 or DAQ

FDC0 bench test @ low pressure : position resolution

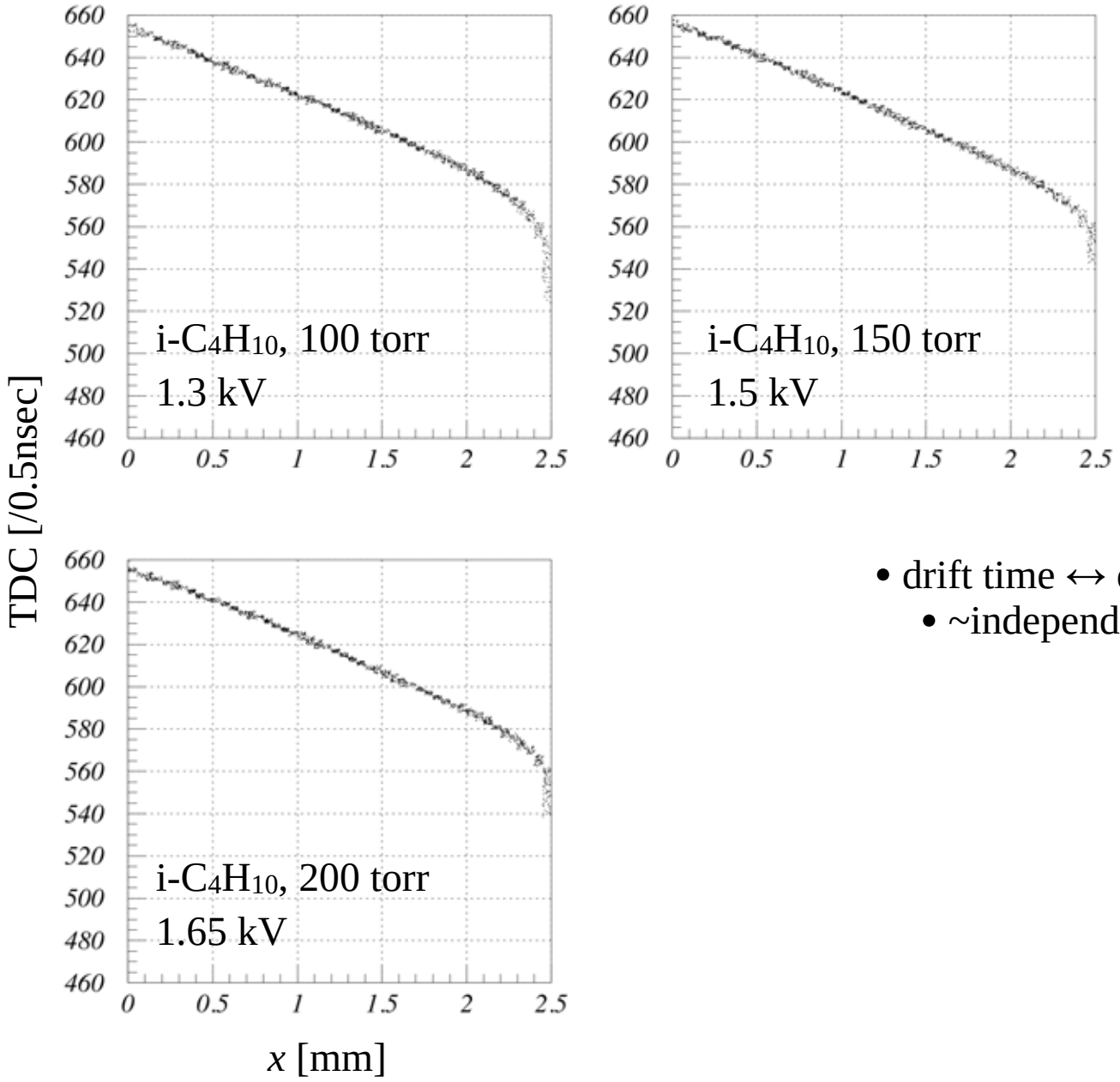
- position resolution at P(i-C_4H_{10})= 50~200 Torr
  - tested by cosmic ray (μ, MIP)



- position resolution:
  - σ~ 200 μm at the beginning of plateau

  → σ~ 100 μm
  - higher pressure
    - better resolution & stability

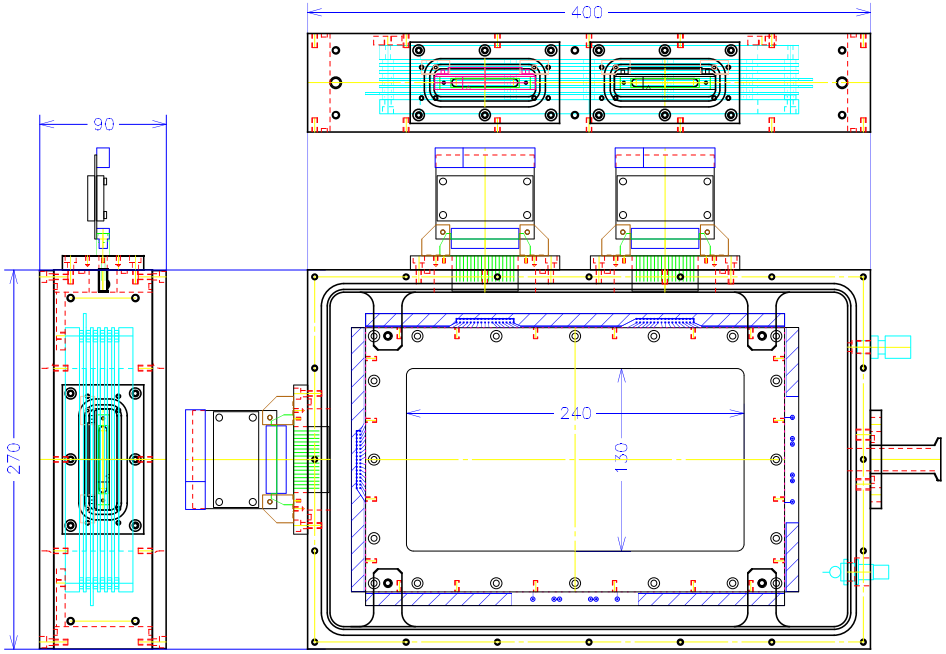
FDC0 : drift time to distance at low pressure, i-C_4H_{10}



- drift time ↔ distance
  - ~independent of pressure

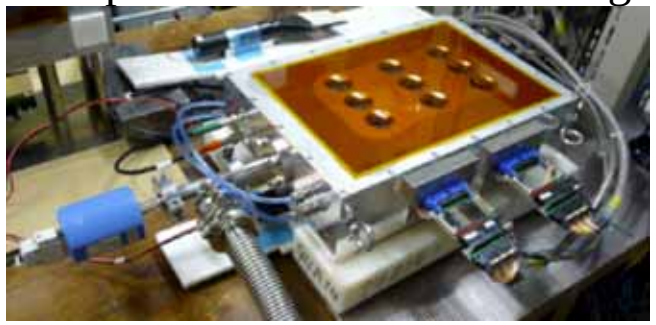
KDC240 Assembly

- purpose
  - beam monitor at F5, F7 etc.
  - for low-Z beams including proton, moderate rate, moderate #readout channels
- cathode-readout drift chamber (KDC) in low-pressure box
  - effective area : 240 mm x 130 mm
  - drift distance= 5 mm, half gap= 5 (5.5) mm, cathode strip pitch= 8 mm
  - configuration : cathode_x, anode_y, cathode_com, anode_x, cathode_y
  - readout : cathode_x : 32ch, cathode-y : 16ch
  - HV : anode (+), potential (-)
  - ASD (x3) in vacuum
  - gas : i-C_4H_{10} at low pressure
- assembly (2 sets)



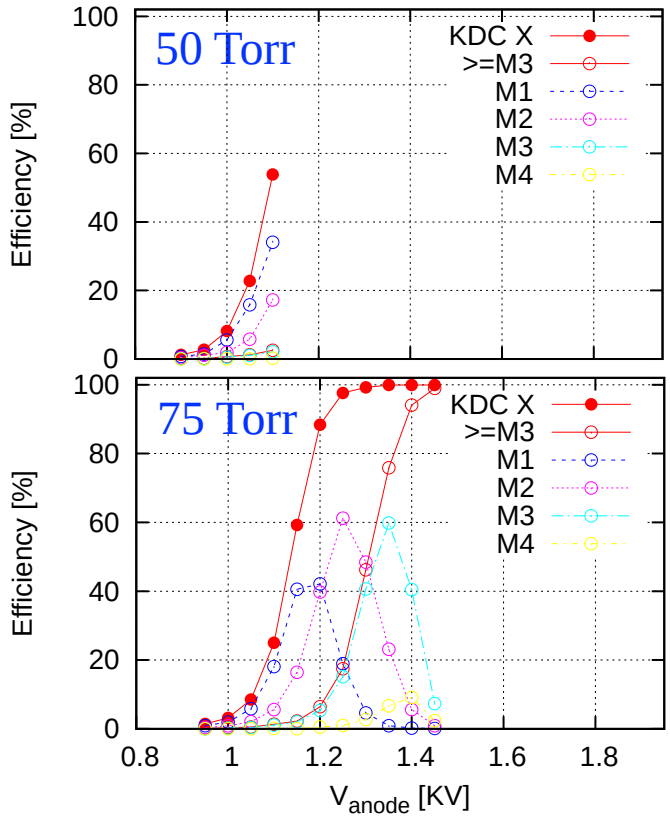
KDC240 in low-pressure box

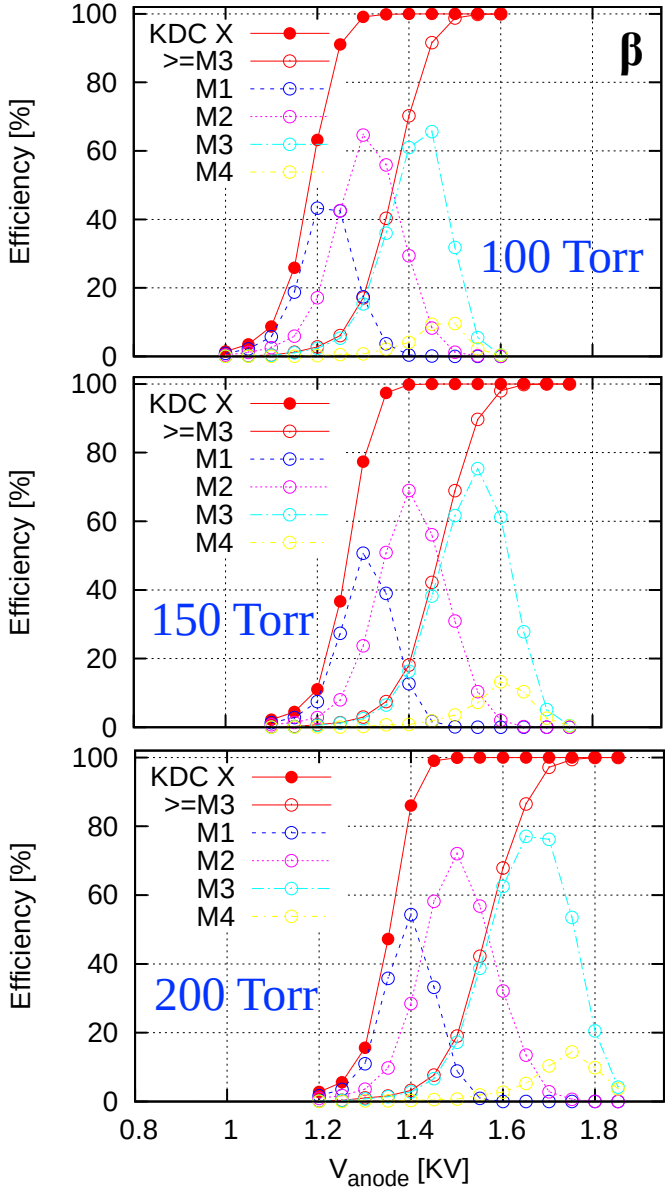
low-pressure box with test flange



KDC240 bench test : Efficiency for β rays (MIP)

- conditions : P(i-C_4H_{10})=50~200 Torr, V_p= -50V, V_{th}= +0.4V

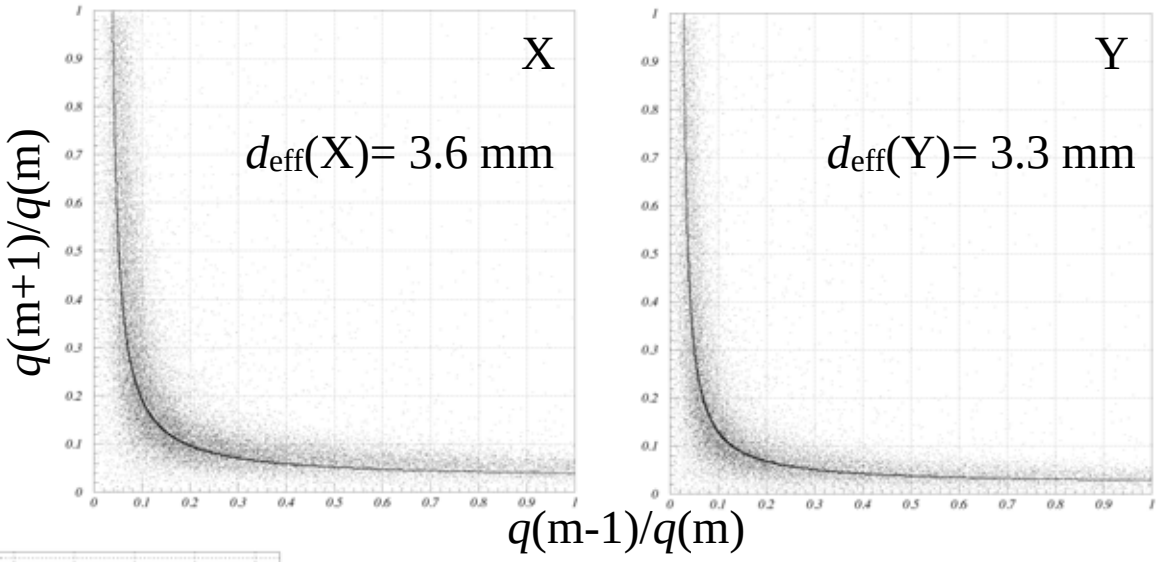




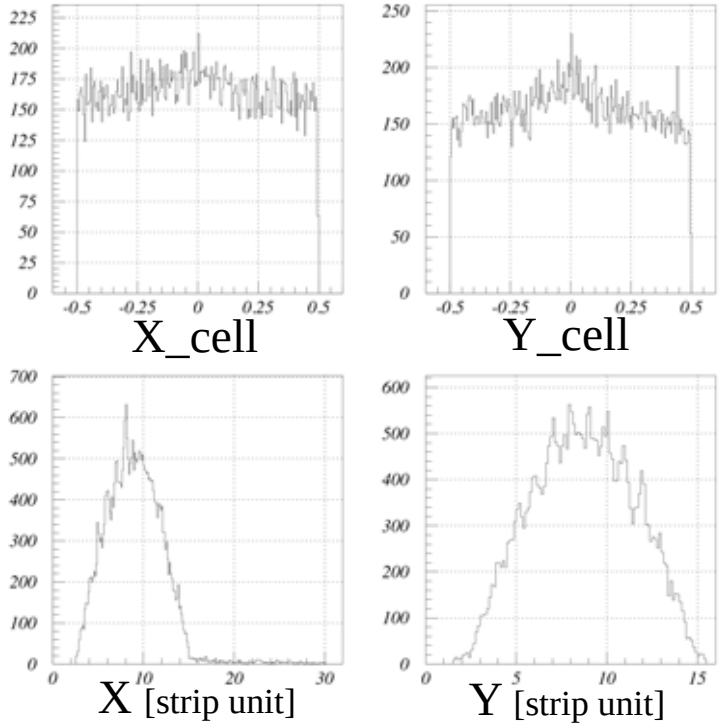
- readout
  - 32ch (x) + 16ch (y), 16ch ASD x3
  - LRS3377
    - 2 modules
    - 2 nsec/ch, 1024 nsec-range, both edge
- ε(M≧3 for CRM) ~ 100%
  - for P ≧ 100 Torr

KDC240 bench test : position for μ

- conditions: P(i-C_4H_{10})=150 Torr, V_A=1.6kV, V_p= -50V, V_{th}= +0.4V
- position determination
  ←charge ratio method (CRM)
  - strip charge ratio
    - $d_{eff}(X) \neq d_{eff}(Y)$; C?



- position



- position resolution
  - difficult with reference chambers using cosmic rays
  - beam test necessary