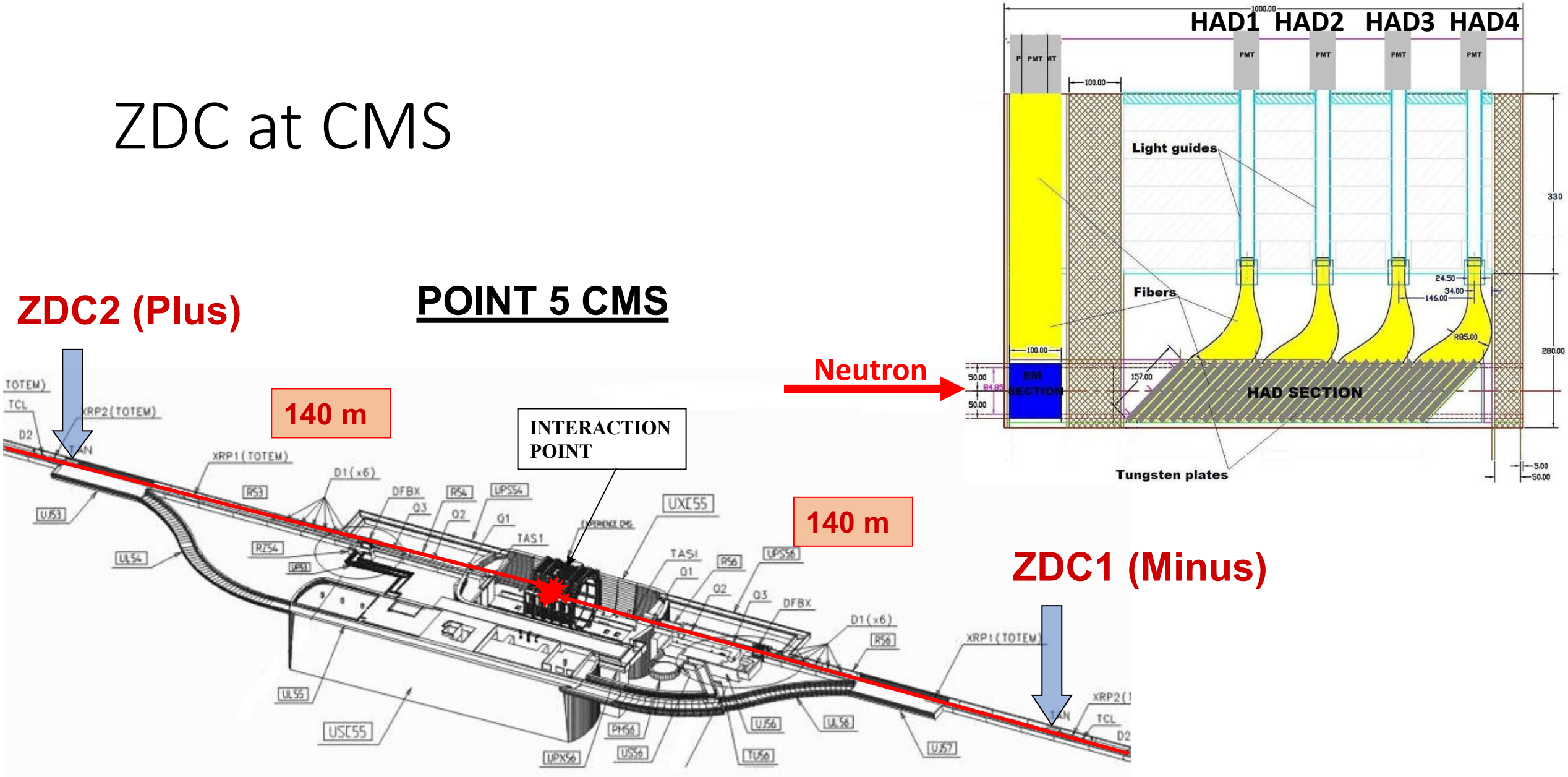
Zero Degree Calorimeters

Quan Wang

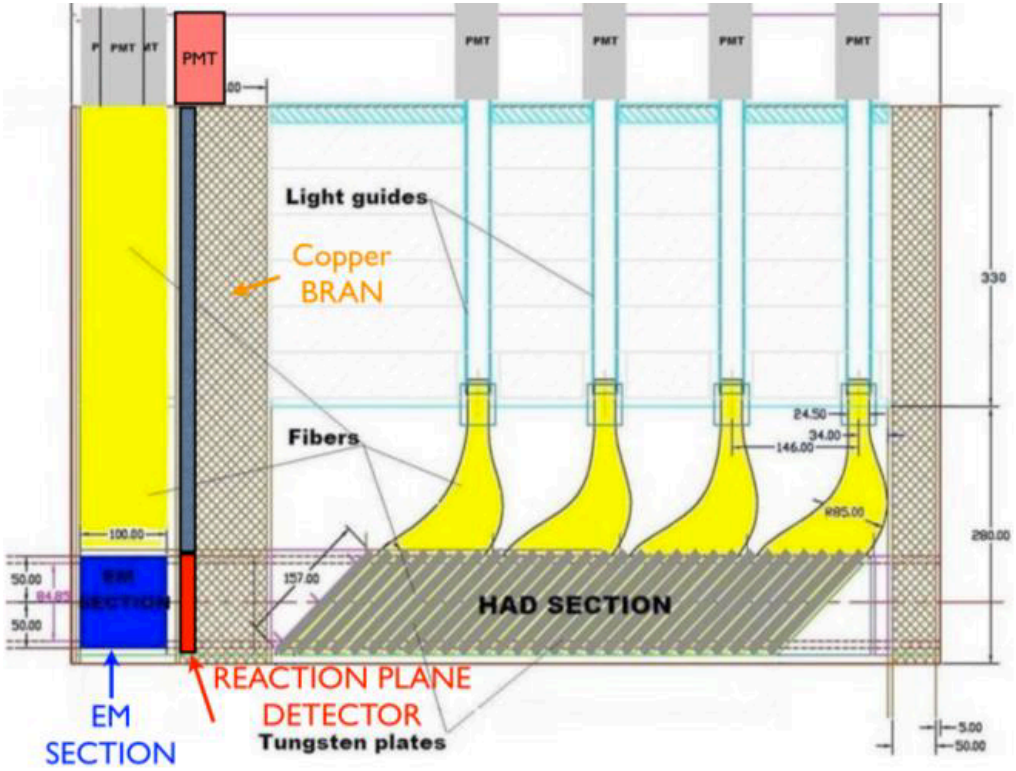
KU

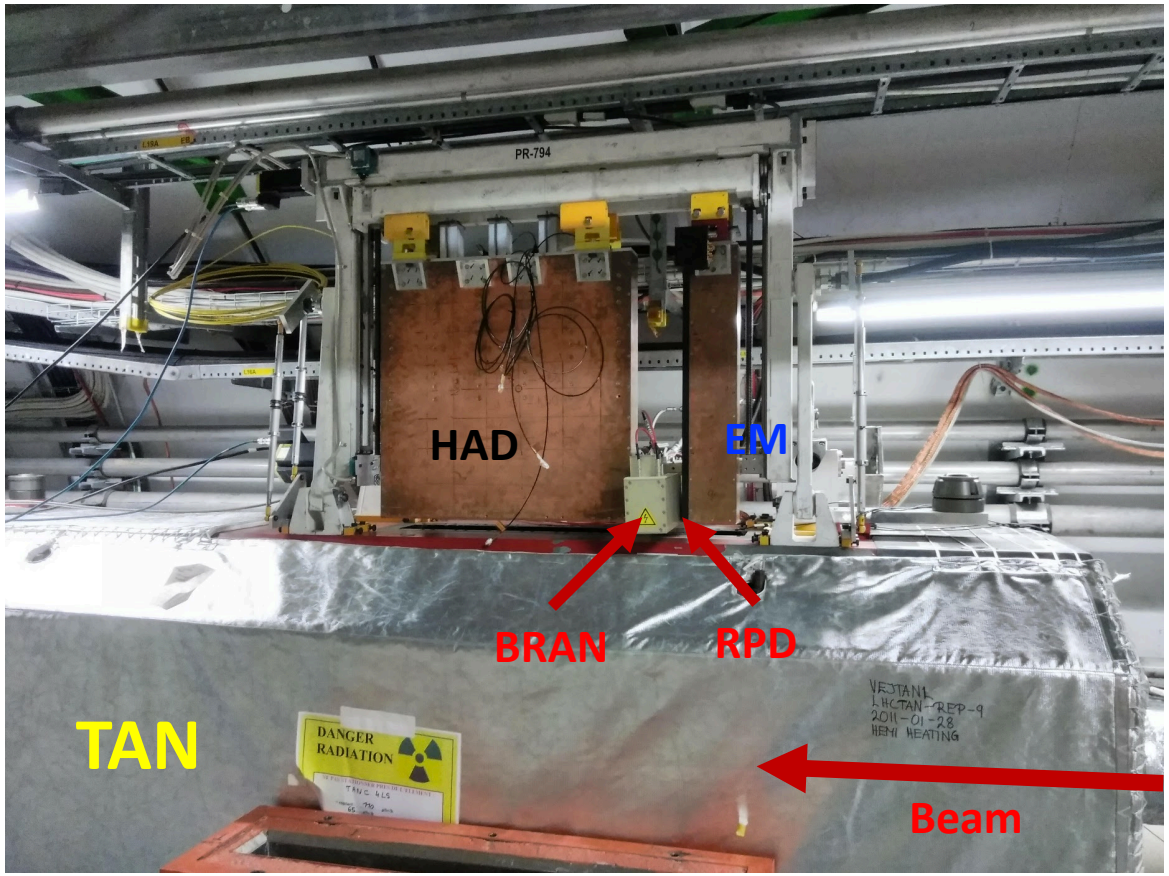
ZDC at CMS


HAD1 HAD2 HAD3 HAD4
PMT
Light guides
Fibers
Tungsten plates
EM SECTION
HAD SECTION
1000.00
100.00
330
280.00
24.50
34.00
146.00
R85.00
157.00
50.00
5.00
ZDC2 (Plus)
POINT 5 CMS
Neutron
140 m
INTERACTION POINT
140 m
ZDC1 (Minus)
TOTEM)
TCL
D2
XRP2(TOTEM)
XRP1(TOTEM)
D1(x6)
DFBX
Q3
Q2
Q1
TAS1
R53
R54
UPS54
UJ53
UL54
RZ54
UPS1
UXC55
R56
UPS56
UL55
USC55
PM56
US56
UJ56
TU56
UL56
UJ57
UPX56

ZDC at CMS

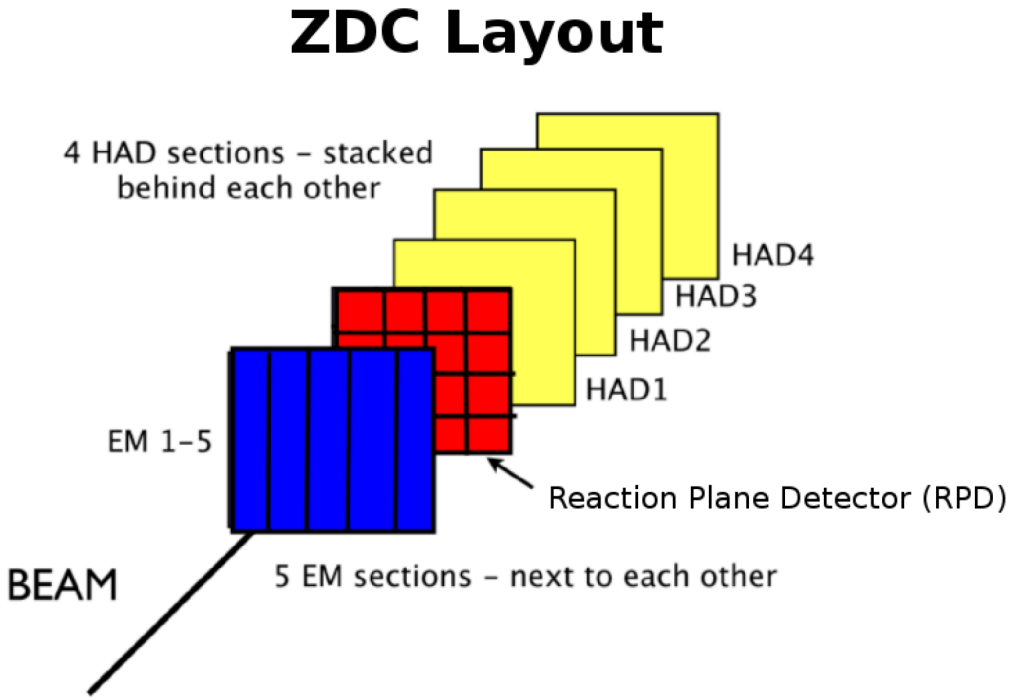
- ZDC consists of EM, RPD and HAD sect.
- RPD, reaction plane detector. (4x4)





ZDC at CMS

- Active region
  - 8cm x 10cm
- EM Section
  - 5 segments in X-axis (~16mm)
- RPD Section
  - 4x4 in XY plane (2x2cm quartz pixel)
- Had Section
  - 4 segments in Z-axis
- Combined hadron inter. Len. ~7λ



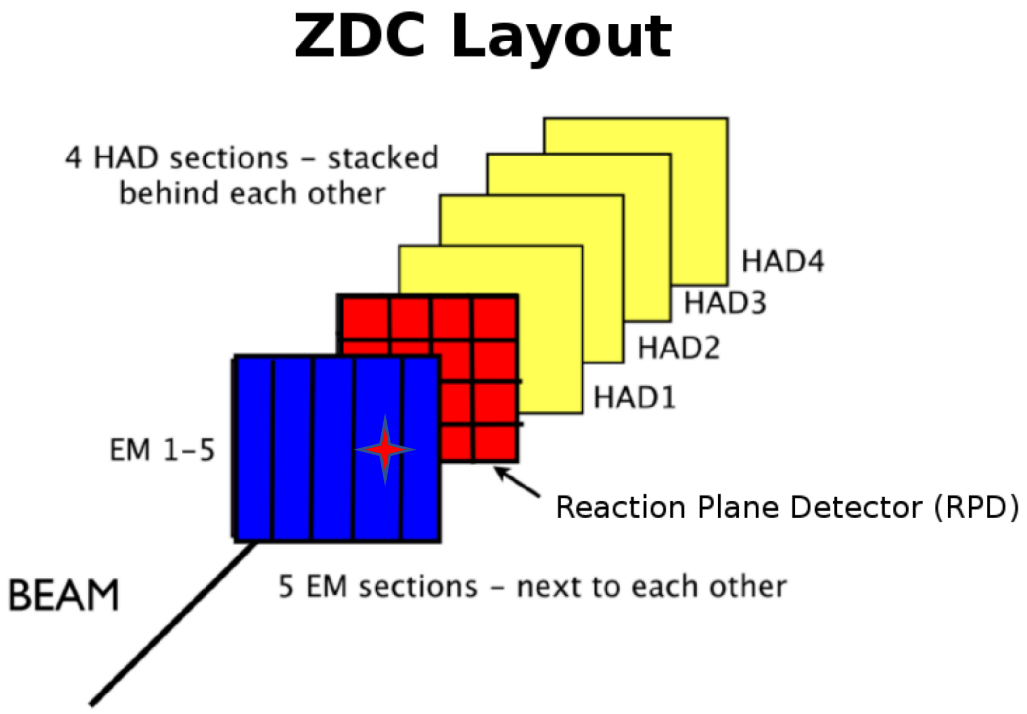
ZDC at CMS

- Active region
  - 8cm x 10cm
- EM Section
  - 5 segments in X-axis (~16mm)
- RPD Section
  - 4x4 in XY plane (2x2cm quartz pixel)
- Had Section
  - 4 segments in Z-axis
- Combined hadron inter. Len. ~7λ

- Hadron energy resolution EM+Had
  - 2.51 TeV (2018 PbPb): ~25%
  - 300 GeV (pion): ~21% (0807.0785)
  - 200 GeV (pion): ~25%
- Hadron energy resolution EM+RPD+Had
  - 2.51 TeV (2018 PbPb): ~19%
- Linearity (e+)
  - 10—150 GeV within 2—3%

ZDC at CMS

- Half crossing angle
  - PbPb 5.02 TeV: 160µrad
  - pPb 8.16 TeV: 140µrad
- 140m * 160µrad ~ 2cm
- Fermi motion 38MeV
- 140m x 38MeV / 2.51TeV~ 2mm



EIC Forward ZDC

- Fermi motion 38MeV
- 40m * 38MeV / 100GeV~ 15mm
- Less space constraint
  - 60cm x 60cm x ?m
  - High granularity calorimeter
- Less radiation
- Transverse and depth granularity
  - Shower shape
- Timing