TOTEM
&
RD51

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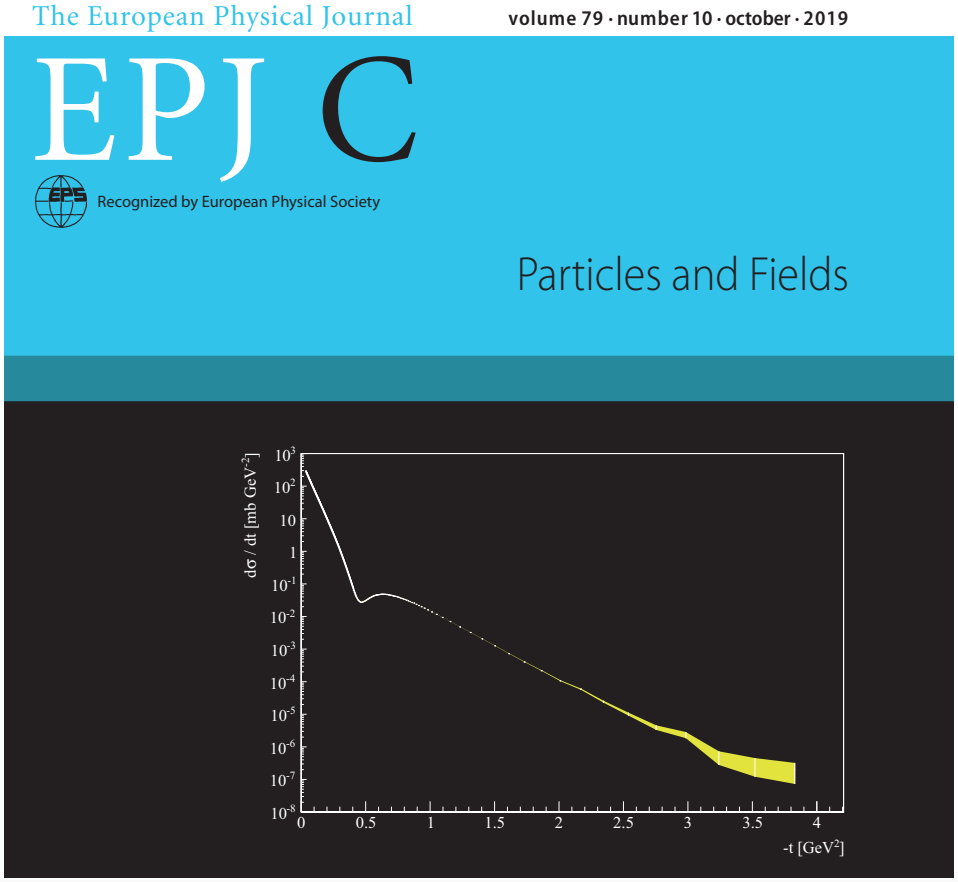
THE EUROPEAN PHYSICAL JOURNAL C

Regular Article - Experimental Physics

Published on 19.10.2019

Elastic differential cross-section measurement at $\sqrt{s} = 13$ TeV by TOTEM



Preprint submitted to EPJC: refereeing stage with the journal

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

TOTEM 2018-003
December 13, 2018

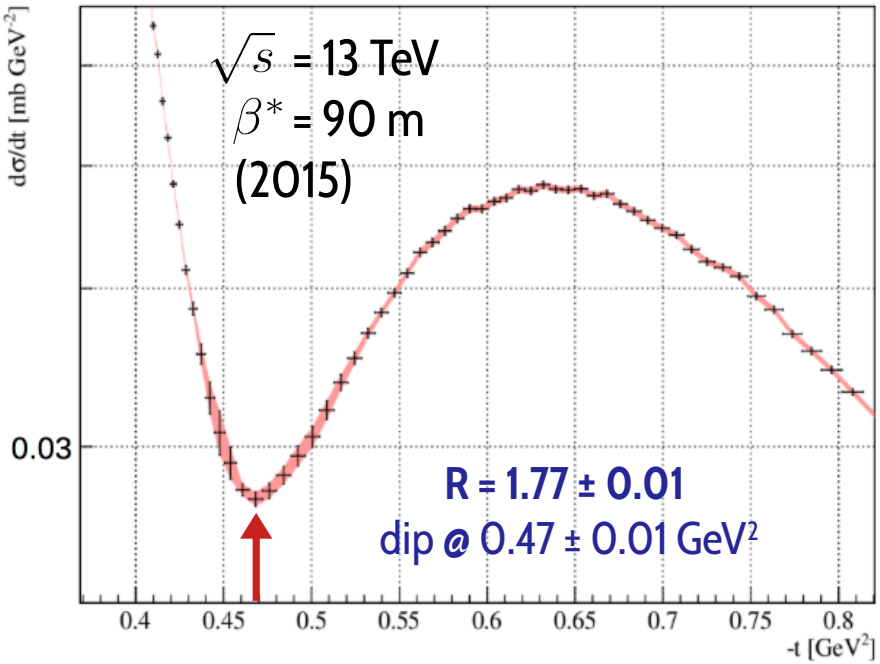
CERN-EP-2018-338
17 December 2018

Elastic differential cross-section measurement at $\sqrt{s} = 13$ TeV by TOTEM

The TOTEM Collaboration

Abstract

The TOTEM collaboration has measured the elastic proton-proton differential cross section $\mathrm{d}\sigma/\mathrm{d}t$ at $\sqrt{s} = 13$ TeV LHC energy using dedicated $\beta^* = 90$ m beam optics. The Roman Pot detectors were inserted to 10σ distance from the LHC beam, which allowed the measurement of the range $[0.04\ \mathrm{GeV}^2; 4\ \mathrm{GeV}^2]$ in four-momentum transfer squared $|t|$. The efficient data acquisition allowed to collect about 10^9 elastic events to precisely measure the differential cross-section including the diffractive minimum (dip), the subsequent maximum (bump) and the large-$|t|$ tail. The average nuclear slope has been found to be $B = (20.40 \pm 0.002^{\mathrm{stat}} \pm 0.01^{\mathrm{syst}})\ \mathrm{GeV}^{-2}$ in the $|t|$-range 0.04 GeV^2 to 0.2 GeV^2. The dip position is $|t_{\mathrm{dip}}| = (0.47 \pm 0.004^{\mathrm{stat}} \pm 0.01^{\mathrm{syst}})\ \mathrm{GeV}^2$. The differential cross section ratio at the bump vs. at the dip $R = 1.77 \pm 0.01^{\mathrm{stat}}$ has been measured with high precision. The series of TOTEM elastic pp measurements show that the dip is a permanent feature of the pp differential cross-section at the TeV scale.



R = max/dip ratio of $\mathrm{d}\sigma_{\mathrm{el}}/\mathrm{d}t$

Eur. Phys. J. C (2019) 79:785
https://doi.org/10.1140/epjc/s10052-019-7223-4

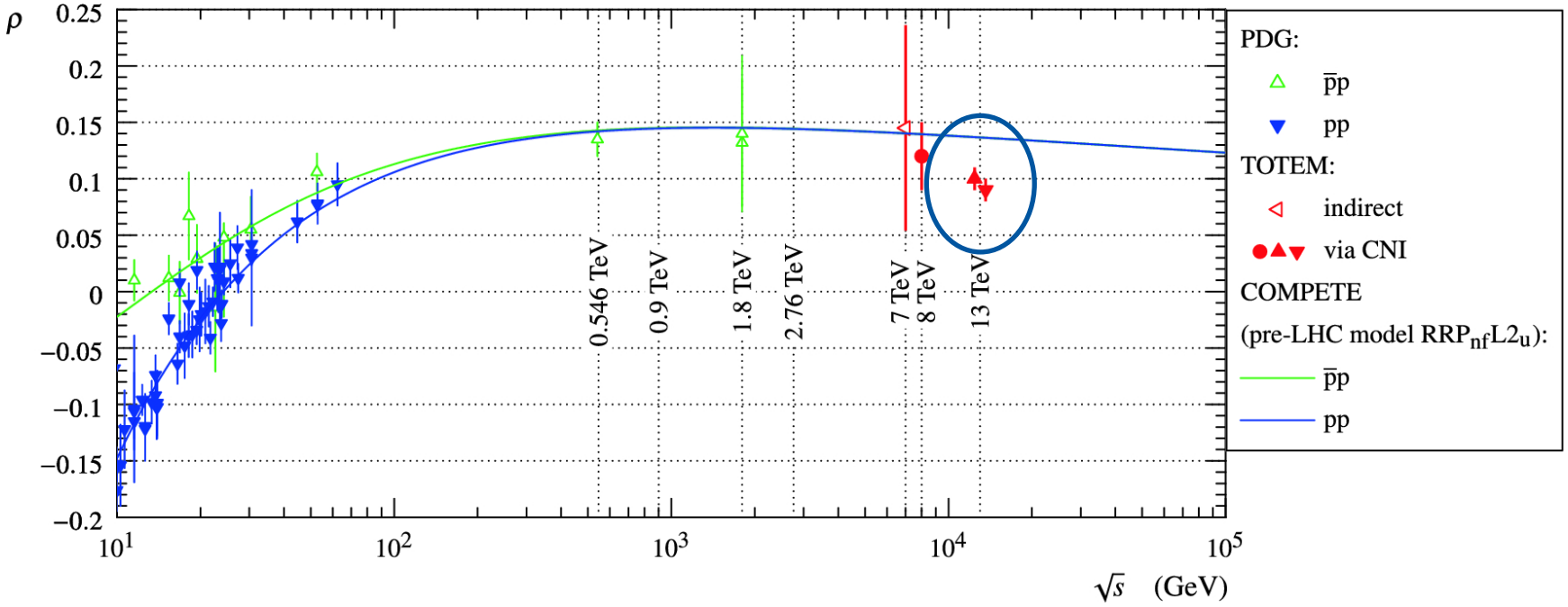
THE EUROPEAN PHYSICAL JOURNAL C

Regular Article - Experimental Physics

Published on 23.09.2019

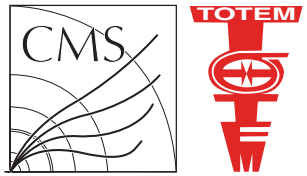
First determination of the ρ parameter at $\sqrt{s} = 13$ TeV: probing the existence of a colourless C-odd three-gluon compound state

TOTEM Collaboration



Submitted to EPJ C

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH (CERN)



CERN-EP-2019-260
2020/02/28

CMS-FSQ-12-033
TOTEM-2020-001

Measurement of single-diffractive dijet production in proton-proton collisions at $\sqrt{s} = 8\,\text{TeV}$ with the CMS and TOTEM experiments

The CMS and TOTEM Collaborations*

New T2 Forward Telescopes

- TDR **submitted** to LHCC on June;
- **Questions from referees and answers** have been included inside the TDR by September LHCC;
- **Endorsed** by LHCC in September;
- **Approved by Research Board in September;**
- Details discussed at 138th LHCC open session (June/2019).

New T2 Forward Telescopes Activities

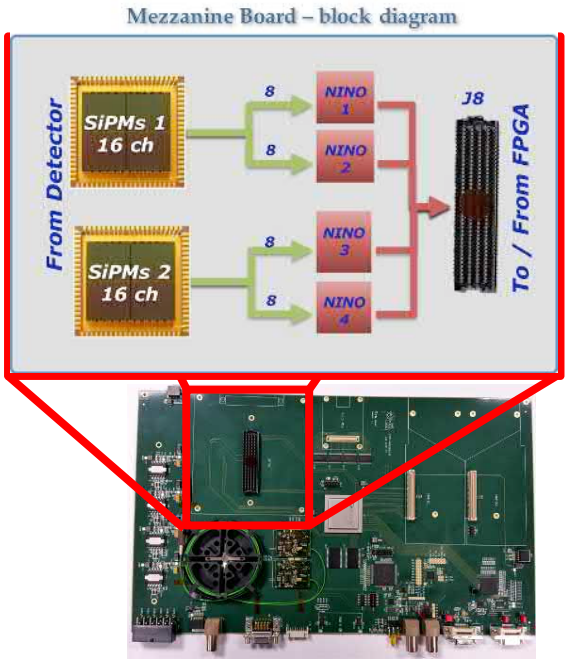
❖ Mechanical Design:

- ✓ A mock-up has been done to test integration, assembly and disassembly in CMS along with fiber and services paths.

❖ Scintillators and WLS:

- ✓ Different light collection configurations are under test using cosmic rays. Test beams are planned for 2020;
- ✓ Black box testing facility for scintillator slabs, fibers and light collectors at bdg. 226.

New T2 Forward Telescopes Activities



❖ Readout and DAQ (frontend/backend):

- ✓ The new T2 will be **readout by SiPMs** collecting the signals from the scintillator paddles;
- ✓ Different models on Multianode SiPM, MPPC (multi pixel photon counter), are being tested. Possible candidate for final production is the S13361 series;

During run 2, a "*Digitizer board*" has been used to readout data from TOTEM/PPS timing detectors:

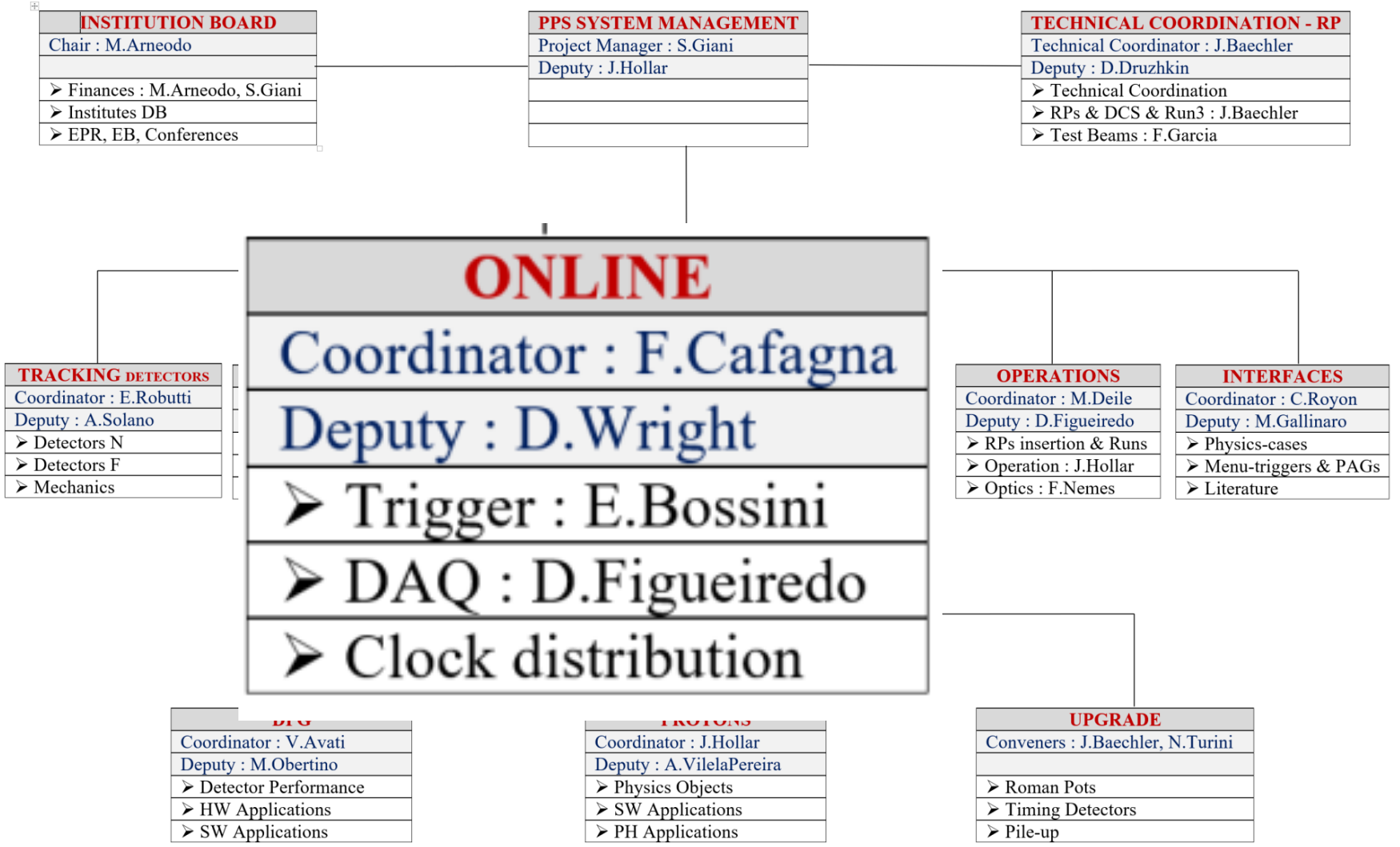
- Advantage to be **transparent under CMS DAQ environment** (slow control, configuration and readout);
- *Software* and *firmware* are very compatible with the new configuration;
- New mezzanine card including the SiPM readout (design ongoing).

New T2 is on schedule. Detectors will be prepared before run 3.

Update on LS2 activities since June 2019 (as of end 2019 …)

- Roman Pot (RP) infrastructure ready: RP210 <near> horizontal RP (high-lumi qualified) relocated to RP220 <near> horizontal RP position to double the number of timing diamond stations. **Done 20.9.2019**
- CMS has requested **3mm-beamline downshift**: implied breaking RP vacuum, mechanical movement of all RP units and safety checks (**done 27.9.2019**)
- **Laser metrology** of the RP spectrometer area is **planned to be done** in the **beginning of the next year by EN-SMM** group
- RP **movement system commissioning ongoing** (*software* and *firmware*): upgrade of the PXI low-level motor control system (more robust components)

CT-PPS → PPS (Management Plan)



PPS MANAGEMENT PLAN

responsabilità del gruppo

- Responsabilità DAQ/online (Francesco)
  - → **a cui si aggiunge ONLINE di PPS**
- chairman Editorial Board (Gabriella)
- Timing di precisione (Francesco)
- Resource coordinator & Management Board (Emilio)
- Coordinatore Nazionale (Francesco)

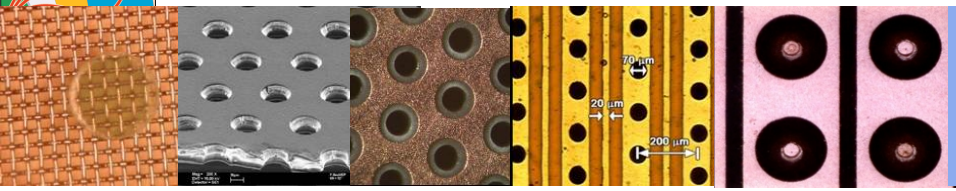
Il dominio “ONLINE” di PPS si adatta perfettamente all’attività abituale e alle competenze del gruppo: DAQ/Trigger/Clock

composizione del gruppo (invariata)

Ricercatori	%
V. Berardi	25
F. Cafagna	70
M.G. Catanesi	30
E. Radicioni	60

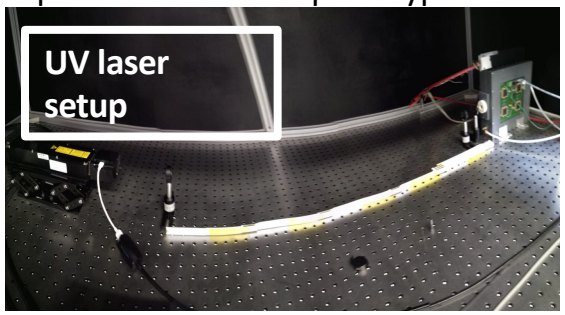
Tecnologi	%
F. De Leonardi	30
V. Passaro	50

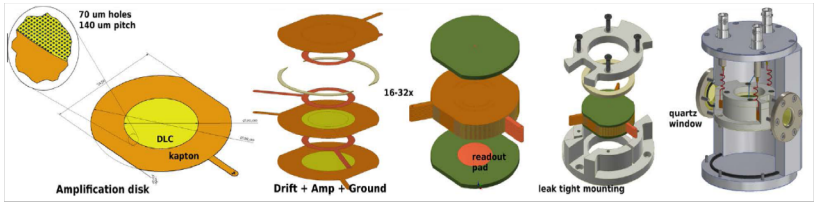
Totale FTE: 2.7 (2018: 2.6)



RD51 related Activities

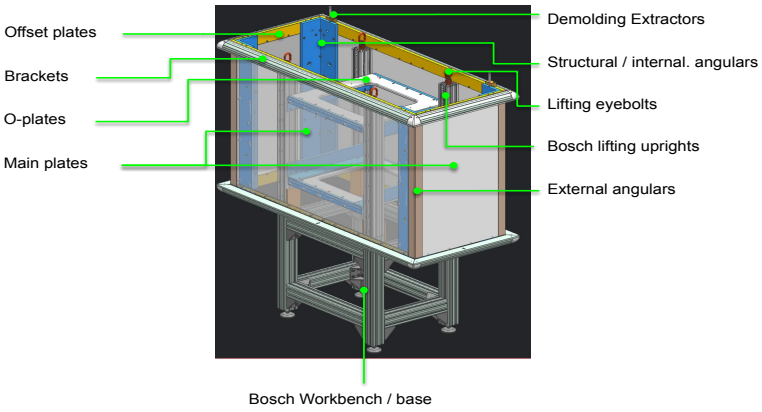
- **2019-2020:**
  - **2 sigle in CSN-V: FTM-Next & MPGD_FaTimA_UV (Grant 73** --- chiuso primavera 2020**)**
  - Diamond Like Carbon w/ Ion Beam Deposition (UniBA) & Pulsed Laser Deposition (UniSAL)
  - Development of Test-Stand with UV-laser: Test with Triple-GEM and FTM-prototype
- **2020-2021:**
  - Continua sigla FTM-Next
  - Proposals for AIDA-Innova
    - Spark studies & simulation (not selected)
    - Development of resistive electrodes (selected) collaboration with Lecce (DLC) & Chemistry dep. Bari (Graphene)
  - In RD51 DLC discussions continue (production @ CERN?)
    - DLC workshop February 2020 with important input by A. Valentini
  - Coordination of Simulation workgroup RD51
    - Overview of world-wide MPGD simulation efforts
    - More people interested in new technology: GPUs
    - Remaining Simulation/Data discrepancy for GEMs



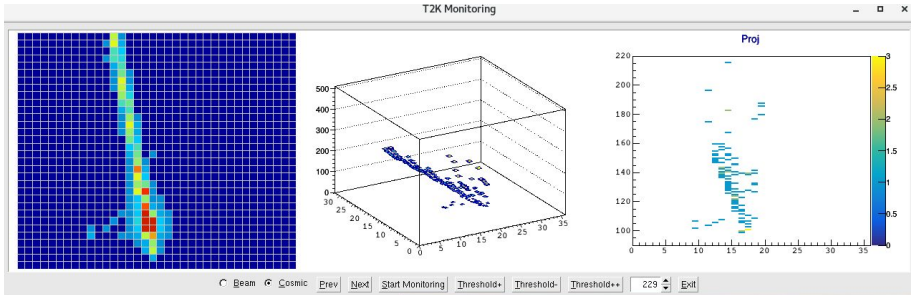


R&D per nuove TPC T2K

- Scopo:
  - sviluppare una struttura di field-cage state-of-the-art, la più sottile possibile, minimizzando al tempo stesso la zona di campo disuniforme
  - Nuove MM resistive e loro accoppiamento con la field-cage
- R&D e simulazioni per costruire field-cages a minimo ingombro (geometrico & radiation length).
- Realizzato il MOLD per i prototipi delle Field Cages (1mx0.5mx0.5) m
- Costruiti strip foils e primo prototipo field-cage prototype, ora in test al CERN
- Resistive MicroMegas: test-beam 2019 con resistività ottimizzata: OK
- Secondo prototipo in corso di realizzazione : Test beam Desy Ottobre 2020



MOLD Design



TEST Beam 2019

summary RD51

- Attività con MPGD
  - fast-timing MPGDs (Piet)
  - CMS GEMs
  - nuove TPC per T2K (field-cages + resistive micromegas)
- Responsabile locale: Gabriella
- Responsabilità di rilievo nella collaborazione:
  - Piet: co-convener per la simulazione
  - Emilio (MB)
- Nuove Attivita' in sinergia con AIDAInnova (se approvata a fine anno)
- Richieste
  - come tutti gli anni: 6k su missioni

richieste (e attività 2021)

- richieste di servizi (includono RD51):
  - 1 mese accesso camera pulita (senza supporto tecnico)
  - 0.5 mu progettazione elettronica
  - 0.5 mu officina meccanica
  - 0.5 mu tecnico elettronico
- Le richieste per il 2021 (ancora in discussione internamente) rifletteranno gli ambiti di attività del gruppo: manutenzione del sistema di DAQ TOTEM/PPS, consolidamento del sistema di timing (diamanti e clock) di PPS, ed elettronica per il nuovo T2
- Per il 2021 prevediamo richieste in linea con quelle dell'anno scorso, come consolidamento del sisitema di clock ed elettronica di acquisizione:
- M&O funds 2021 secondo RRB 2020; come d'abitudine, saranno meglio definiti a ottobre e comunicati alla CSN1.