# Run statistics and results in last H8 run

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# Outline

- Objectives for the run
- Schedule of the run
- People involved
- Major achievements
- List of crystal characterized
- Data availability
- Improvements for next runs

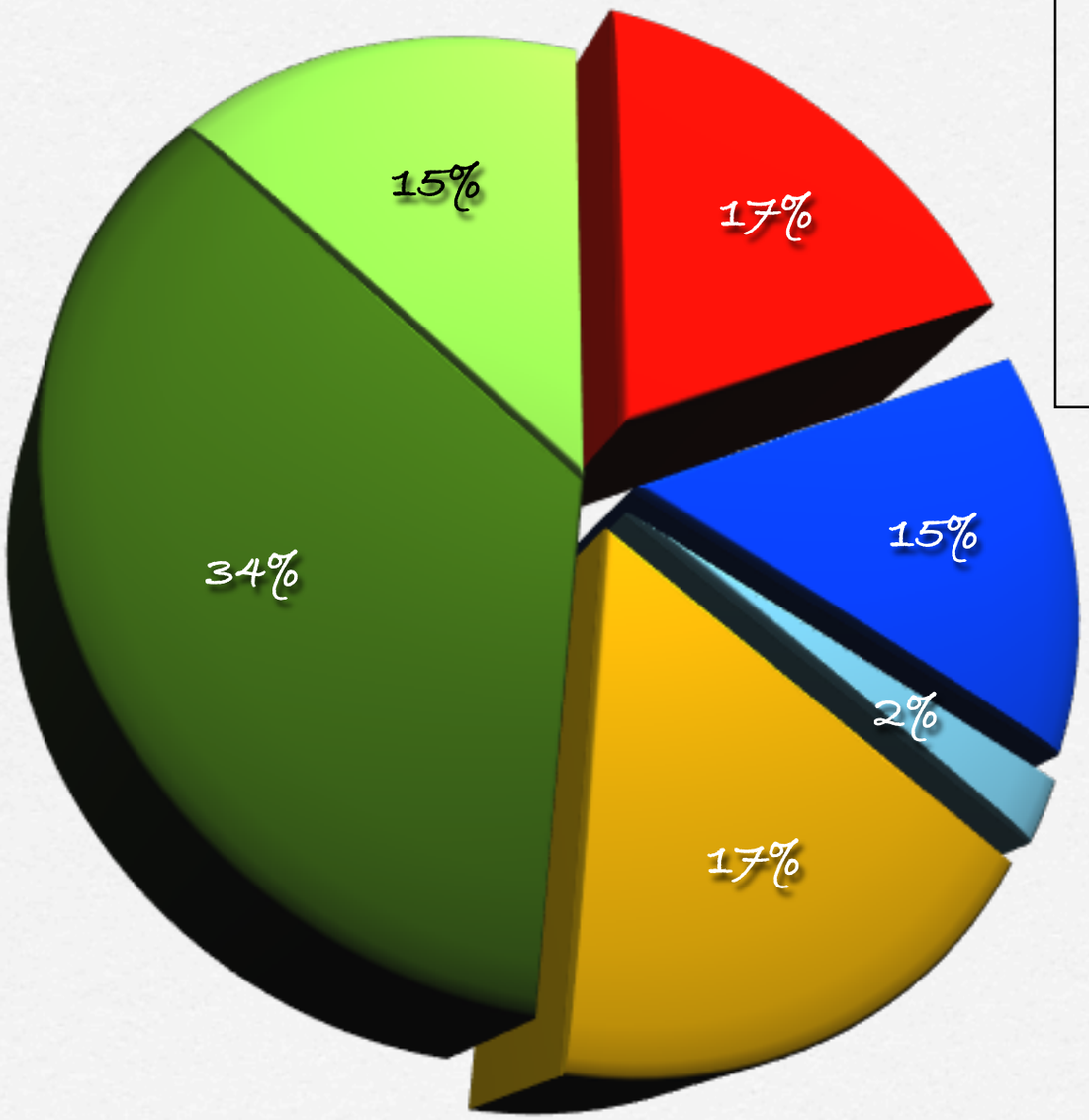
# Objectives for the run

- Install the new tracking system and new DAQ software
- Test crystals with very small torsion and new adjustable supports
- Study PXR radiation emitted in channeling orientation
- Test unbent crystal scatterer ($t = \lambda/4$) and crystal mirror ($t = \lambda/2$)

# Milestones of the run

- Run started:
  Sep 16 h. 8:00
- First beam:
  Sep 17 h. 18:45
- Beam setup completed:
  Sep 21 h. 18:10
- 1st crystal installed:
  22 Sep h. 16:43
- Stable version of DAQ:
  24 Sep h. 21:00
- 4th crystal installed:
  28 Sep h. 00:00
- DAQ upgrade:
  29 Sep h. 8:30
- New alignment system:
  30 Sep h. 10:00
- 10th crystal installed:
  2 Oct h. 4:52
- End of the run:
  4 Oct h. 8:39

# Sharing of the beam time




- NO beam (17%)
- Hardware installation and removal (15%)
- Beam setup (2%)
- DAQ setup and improvement (17%)
- Scanning (34%)
- Statistics & PXR (15%)

- TOTAL TIME was 18 days (432 hours)
- The only "lost" time was the "no beam" time
- DAQ setup was done once forever
- Installation time will decrease next time:
  - cables have been left in place
  - new alignment system makes crystal installation faster

MORE TIME FOR PHYSICS IN FUTURE RUNS

# People involved

| Institutes | People @CERN | Number of shifts | Experts* (days) | Installation (days) | TOTAL | TOTAL (COUNTRY) |
|---|---|---|---|---|---|---|
| CERN** | 4 | 10 | 33 | 4 | 47 | 47 |
| Ferrara | 2 | 5 | 6 | | 11 | 25 |
| Napoli | 1 | 5 | | | 5 | |
| Frascati | 1 | | | 2 | 2 | |
| Legnaro | 2 | 1 | | | 1 | |
| Roma | 3 | 4 | | 2 | 6 | |
| IHEP | 2 | | 18 | | 18 | 89 |
| JINR | 2 | 7 | 21 | | 28 | |
| PNPI | 2 | 14 | 27 | 2 | 43 | |
| I. College | 6 | 15 | 35 | 6 | 56 | 56 |
| BNL | 1 | 3 | | | 3 | 3 |
| SLAC | 1 | | | | 0 | |

* crystal installation -- DAQ debugging -- PXR -- run coordination -- on call

** technical support from EN/STI-ECE and EN/STI-TCD not included in the count

# Major achievements

- ☑ New tracking system (next presentation)
- ☑ New software (next presentation)
- ☑ DAQ 4x faster than previous runs
- ☑ On-line monitoring plots
- ☑ Prompt offline analysis
- ☑ New alignment system for crystal installation (Y. Gavrikov presentation)
- ☑ 14 crystal tested
- ☑ PXR on 3 crystals: ST21, QM27, ST40A
- ☑ torsion correction for ST45A
- ☑ lateral scan for 4 QM crystals
- ☑ mirror effect studied

# Analyzed crystals - Ferrara

| Crystal name | Description | Measurements | Run numbers |
|---|---|---|---|
| **ST21** | 5 mm strip crystal | channeling from skew planes,<br>angular scan,<br>cradle scan,<br>PXR (several conditions) | 292 --> 312 |
| **ST40A** | Crystal suitable for LHC<br>Channeling planes: (110)<br>Thickness along the beam: 5mm<br>bending angle: 100urad<br>torsion: < 1 urad/mm | angular scan,<br>statistics in channeling,<br>PXR in channeling | 381-->386 |
| **ST45A** | Crystal suitable for SPS<br>Channeling planes: (110)<br>Channeling axis: <111><br>Thickness along the beam: 2mm<br>bending angle: 150urad<br>torsion: 0.7 urad/mm | angular scan,<br>torsion adjustment,<br>statistic in channeling,<br>channeling efficiency | 391-->415 ; 434-->450 |
| **TFI1** | Beam mirror<br>Unbent crystal<br>lateral size 5x5 $mm^2$<br>Thickness in the range 28-29 μm | angular scan | 469-->484 |
| **ST38A** | Crystal suitable for SPS<br>Channeling planes: (110)<br>Channeling axis: <110><br>Thickness along the beam: 2mm | angular scan | 545 - 546 |

# Analyzed crystals - PNPI - I

| Crystal name | Description | Measurements | Run numbers |
|---|---|---|---|
| **QM2** | 0.8 mm | angular scan | |
| **QM26SPS** | SPS, 11 mm | angular scan | 317 - 318 |
| **QM27** | 1.7 mm | angular scan,<br>PXR (several conditions) | 321-->326 - 344 - 348 |
| **TFP1** | 25 um flat crystal | several angular scans | 378 - 379 - 547-->552 |
| **TFP2** | flat crystal | | |

# Analyzed crystals - PNPI - II

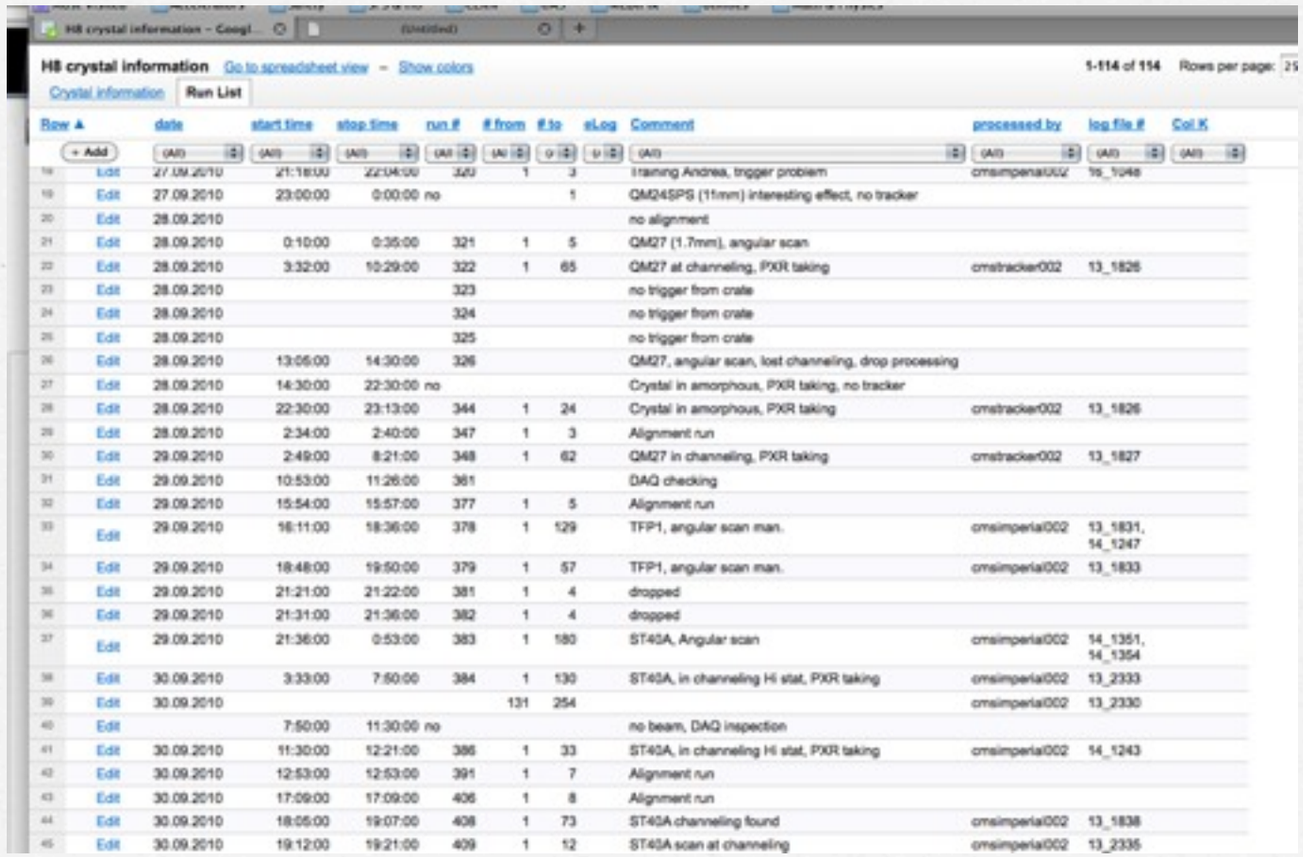
| Crystal name | Description | Measurements | Run numbers |
|---|---|---|---|
| **QM28** | 6 mm | angular scan<br>lateral scan | 416-->424 |
| **QM29** | 10 mm | angular scan<br>lateral scan | 425-->433 |
| **QM30** | 6 mm | angular scan<br>lateral scan | 453 --> 456 |
| **QM31** | | angular scan<br>lateral scan | 457-->464 |

# Data availability

- Several different data formats exist:
  - PXR data, Tracking data, Medipix data, GEM data
- Tracking data are the largest set:
  - reconstruction done by Y. Gavrikov and M. Pesaresi
  - output available as ROOT files and csv files
  - instruction for analysis prepared by M. Pesaresi
    - a mail will be sent to the collaboration

# Data availability

- Data are ready to be analyzed!
- In order to help in data analysis:
  - Catalog of runs with description



H8 crystal information Go to spreadsheet view – Show colors 1-114 of 114 Rows per page: 25

Crystal information | Run List

| Row ▲ | date | start time | stop time | run # | # from | # to | eLog | Comment | processed by | log file # | Col K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| + Add | (All) | (All) | (All) | (All) | (All) | (All) | (All) | (All) | (All) | (All) | (All) |
| Edit | 27.09.2010 | 21:18:00 | 22:04:00 | 320 | 1 | 3 | | training Andrea, trigger problem | cmsimperial002 | 76_1048 | |
| Edit | 27.09.2010 | 23:00:00 | 0:00:00 | no | | 1 | | QM24SPS (11mm) interesting effect, no tracker | | | |
| Edit | 28.09.2010 | | | | | | | no alignment | | | |
| Edit | 28.09.2010 | 0:10:00 | 0:35:00 | 321 | 1 | 5 | | QM27 (1.7mm), angular scan | | | |
| Edit | 28.09.2010 | 3:32:00 | 10:29:00 | 322 | 1 | 65 | | QM27 at channeling, PXR taking | cmstracker002 | 13_1826 | |
| Edit | 28.09.2010 | | | 323 | | | | no trigger from crate | | | |
| Edit | 28.09.2010 | | | 324 | | | | no trigger from crate | | | |
| Edit | 28.09.2010 | | | 325 | | | | no trigger from crate | | | |
| Edit | 28.09.2010 | 13:05:00 | 14:30:00 | 326 | | | | QM27, angular scan, lost channeling, drop processing | | | |
| Edit | 28.09.2010 | 14:30:00 | 22:30:00 | no | | | | Crystal in amorphous, PXR taking, no tracker | | | |
| Edit | 28.09.2010 | 22:30:00 | 23:13:00 | 344 | 1 | 24 | | Crystal in amorphous, PXR taking | cmstracker002 | 13_1826 | |
| Edit | 28.09.2010 | 2:34:00 | 2:40:00 | 347 | 1 | 3 | | Alignment run | | | |
| Edit | 29.09.2010 | 2:49:00 | 8:21:00 | 348 | 1 | 62 | | QM27 in channeling, PXR taking | cmstracker002 | 13_1827 | |
| Edit | 29.09.2010 | 10:53:00 | 11:26:00 | 361 | | | | DAQ checking | | | |
| Edit | 29.09.2010 | 15:54:00 | 15:57:00 | 377 | 1 | 5 | | Alignment run | | | |
| Edit | 29.09.2010 | 16:11:00 | 18:36:00 | 378 | 1 | 129 | | TFP1, angular scan man. | cmsimperial002 | 13_1831, 14_1247 | |
| Edit | 29.09.2010 | 18:48:00 | 19:50:00 | 379 | 1 | 57 | | TFP1, angular scan man. | cmsimperial002 | 13_1833 | |
| Edit | 29.09.2010 | 21:21:00 | 21:22:00 | 381 | 1 | 4 | | dropped | | | |
| Edit | 29.09.2010 | 21:31:00 | 21:36:00 | 382 | 1 | 4 | | dropped | | | |
| Edit | 29.09.2010 | 21:36:00 | 0:53:00 | 383 | 1 | 180 | | ST40A, Angular scan | cmsimperial002 | 14_1351, 14_1354 | |
| Edit | 30.09.2010 | 3:33:00 | 7:50:00 | 384 | 1 | 130 | | ST40A, in channeling Hi stat, PXR taking | cmsimperial002 | 13_2333 | |
| Edit | 30.09.2010 | | | | 131 | 254 | | | cmsimperial002 | 13_2330 | |
| Edit | | 7:50:00 | 11:30:00 | no | | | | no beam, DAQ inspection | | | |
| Edit | 30.09.2010 | 11:30:00 | 12:21:00 | 386 | 1 | 33 | | ST40A, in channeling Hi stat, PXR taking | cmsimperial002 | 14_1243 | |
| Edit | 30.09.2010 | 12:53:00 | 12:53:00 | 391 | 1 | 7 | | Alignment run | | | |
| Edit | 30.09.2010 | 17:09:00 | 17:09:00 | 406 | 1 | 8 | | Alignment run | | | |
| Edit | 30.09.2010 | 18:05:00 | 19:07:00 | 408 | 1 | 73 | | ST40A channeling found | cmsimperial002 | 13_1838 | |
| Edit | 30.09.2010 | 19:12:00 | 19:21:00 | 409 | 1 | 12 | | ST40A scan at channeling | cmsimperial002 | 13_2335 | |

  - Data quality checks
    - MD data taking stopped the effort
    - Volunteers needed!
- Central place for data storage (?)
  NB: tracking data are 100 Gb

# Toward next runs

- Several remarks noted down during operations:
  - a document will be shared, in order to allow every one to add more improvements
    - it will be just a place were notes are collected, decisions will be taken by the collaboration
  - many things are just "obvious" and will be put in place, if possible (f.e. "rotate the granite table" )
  - some improvements are subject to feasibility studies (f.e. "store trigger counts in data" )
  - other requests involve the whole collaboration (see next slide...)

# Toward next runs

- In order to optimize the preparation of the runs, It would be advisable to:
  - receive new scientific proposals three months in advance
    - late request will be satisfied according to the availability of technical resources.
  - prepare the list of crystals to be analyzed (with relative tests) one month in advance
  - confirm people presence at CERN, in order to propose calendars for shifters and for experts before the start of data taking

# Conclusions

- September run in H8 allowed to introduce important upgrades in our experiment:
  - Tracking and DAQ
  - Alignment system
- 14 crystals were characterized
  - Data are ready to be analyzed
- Few improvements in hardware, software and organization will be introduced in next runs