# Workshop on Vector-like Quarks 2014

## 15-16 September 2014

## Hamburg University

# Welcome!

**This workshop is a continuation of three previous workshops on fourth-generation quarks. This time the focus of the workshop is on vector-like heavy quarks.**

# history of this workshop

- there is no history
- few workshops on 4th generation in 2011 and 2012

# VLQ and 4th gen

theorist:

- “not related at all”

experimentalist:

- it’s a heavy object
- some common decay modes
- similar detector signatures
- analysis methods are the same
- same people

⇒ it’s the same

# expectations

what to expect from this workshop?

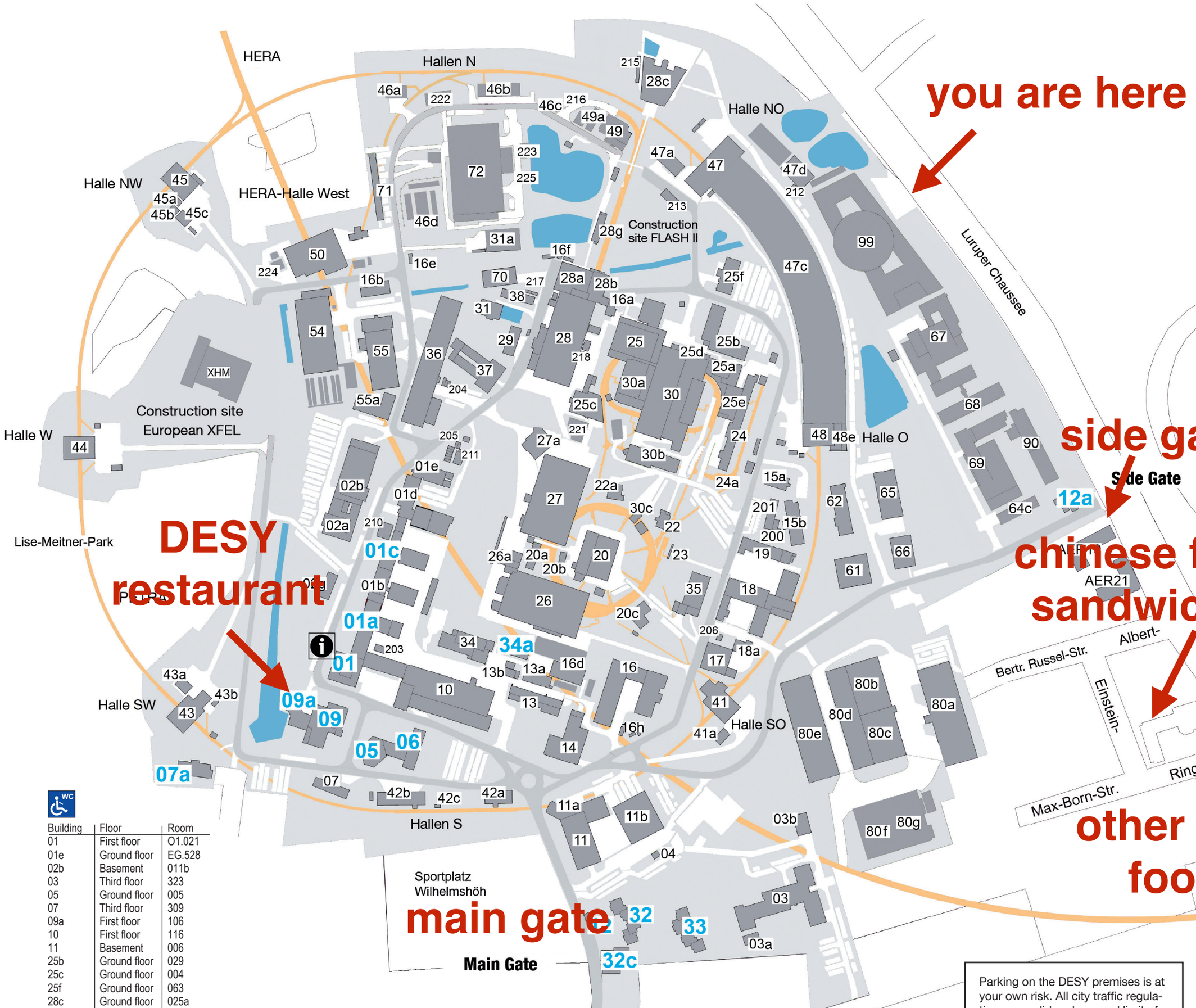
- where do we stand after LHC Run I
- landscape of searches
- progress in theory
- outlook to LHC Run II ?

- single production of VLQ!

# single production

- what are signatures?
- how to produce Monte Carlo events?
- how to interpret results of experiments?
- how should experiments present their results?
- unify approaches of ATLAS and CMS?

| | |
|---|---|
| Laboratory 1 | 01-01e |
| **Directorate** | **01** |
| **ublic relations** | **01** |
| **nedical officer** | **01a** |
| **Library** | **01d** |
| atory 2a, Theory | 02a |
| r Centre, UCO | 02b |
| Laboratory | 02g |
| Laboratory 3 | 03 |
| Caretaker | 03a |
| torage building | 03b |
| Gas station | 04 |
| ance building 6 | 05 |
| **Guest services** | **06** |
| tration building | 07 |
| **Guest house 8** | **07a** |
| **afeteria, Bank** | **09** |
| **Bistro** | **09a** |
| Workshop | 10 |
| ing department | 11 |
| tral warehouse | 11a |
| Cable hall | 11b |
| **e Notkestraße** | **12** |
| (main gate) | |
| **per Chaussee** | **12a** |
| (side gate) | |
| Liquifiying plant | 13 |
| ylinder building | 13a |
| ntainer building | 13b |
| uum laboratory | 14 |
| Office building | 15a, b |
| Power station | 16 |
| kV main station | 16a, b |
| g plant DESY II | 16d |
| work switchyard | 16e |
| r switch facility | 16f |
| torage building | 16h |
| Heating plant | 17 |
| enance building | 18, 18a |
| enters' building | 19 |
| hrotron building | 20 |
| Filtering hall | 20a |
| V substation 5a | 20b |
| er house DESY | 20c |
| um engineering | 22 |
| Universities of | 22a |
| urg and Lübeck | |
| LINAC I | 23 |
| LINAC II | 24 |
| PIA | 24a |
| LAB laboratory | 25 |
| EMBL | 25a |
| oratory 1, MPG | 25b |
| ray wiggler hall, | 25c |
| HZG / GFZ | |
| AB laboratory 4 | 25d |
| AB laboratory 5 | 25e |
| AB laboratory 2 | 25f |
| erimental hall I | 26 |
| FLA laboratory | 26a |
| erimental hall II | 27 |
| Testing area | 27 |




| | |
|---|---|
| 30 | Storage experin |
| 30a | DORIS |
| 30b | Accelen |
| 30c | Power |
| 31a | Accelen |
| **32** | **Guest** |
| **32c** | **Kinder** |
| **33** | **Guest** |
| 34 | Training |
| **34a** | **physik** |
| 35 | Safety Commu |
| 36 | Prepara experin |
| 37 | Assemb |
| 38 | Storage |
| 41, 41a | PETRA |
| 42, a-c | PETRA |
| 43a, b | PETRA |
| 44 | PETRA |
| 45, a-c | PETRA |
| 46a-c | PETRA |
| 46d | Power |
| 47, a | PETRA |
| 47c | PETRA |
| 47d | PETRA |
| 48, e | PETRA |
| 49, 49a | Office b |
| 50 | HERA |
| 54 | Refrige |
| 55 | Magnet |
| 55a | Proton |
| 61-69 | Univers |
| 61 | Auditor |
| [illegible] | Institute |
| 64c | Prepara |
| 65 | Worksh |
| 66 | Theory |
| 67 | Institute |
| 68 | Institute |
| 69 | Institute |
| 70 | Modul t |
| 71 | XTL mo |
| 72 | AMTF |
| 80a-g | Storage |
| 90 | Zentrum technol |
| 99 | CFEL |
| 200 | Office c |
| 201 | Office c |
| [illegible]-207 | Contain |
| 210-218 | Contain |
| **Off-site** | |
| 51 | HERA |

# dinner

Gröninger Braukeller, Willy-Brandt-Strasse 47

- brewery downtown
- plenty of (simple) food
- plenty of beer
- german atmosphere

how to get there:

- private bus leaving at this building **18:45**
- bus takes you back to DESY afterwards

- you are free to choose (and pay) public transport instead of course


DESY
central
Hamburg
Gröninger
Stadionstraße
Notkestraße
Bahrenfeld
Groß Flottbek
Cranachstraße
Othmarschen
Ottensen
Jenischpark
Bernadottestraße
Elbchaussee
Altona
Altonaer
Fischmarkt
Palmaille
Reeperbahn
Bubendeyweg
Antwerpenstraße
Steinwerder
Harkortstraße
Hoheluft-Ost
Hoheluft-West
Harvestehude
Mittelweg
Hofweg
Langer Zug
Außenalster
Uhlenhorst
Hamburg 60
Barmbek-Süd
Eilbek
Eilenau
Hohenfelde
Turnhalle St. Georg
Hofbräu an der Alster
eine mass bier · sonntags brunch
St. Pauli
Hamburger Dom
St. Georg
Restaurant Tschebull
Gröninger Privatbrauerei
Jens Stacklies eK
bier vom fass · krusten braten
VLET
STAGE THEATER
IM HAFEN
Norderelbe
Ellerholzdamm
Reiherdamm
Kleiner
Grasbrook
Bürgerweide
Borgfelde
Eiffestraße
Süderstraße
Google
E45
7
4
5
75
431

# wireless

various options:

- eduroam (recommended)
- DESY-Guest (limited bandwidth)
- VLQ2014 (password at reception)
- (it’s supposed to appear for the workshop, I will continue to bug IT to get it online)

# workshop agenda

| | | |
|---|---|---|
| 10:00 | **Registration (until 12:00)**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | 10:00 - 11:00 |
| 11:00 | **Welcome**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | *LACKER, Heiko et al.*<br>11:00 - 11:15 |
| | **How dead is a chiral 4th generation?**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | *EBERHARDT, Otto*<br>11:15 - 12:00 |
| 12:00 | **Lunch break** | 12:10 - 13:45 |
| 13:00 | | |
| 14:00 | **A basic guide to vector-like quarks**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | *PEREZ-VICTORIA, M.*<br>13:45 - 14:30 |
| 15:00 | **Searches in single-lepton final states at ATLAS**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | *HELSENS, Clement*<br>14:40 - 15:10 |
| | **Search for vector-like B' quarks in final states with leptons at CMS**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | *KHALIL, Sadia*<br>15:20 - 15:50 |
| 16:00 | **Coffee break**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | 16:00 - 16:30 |
| | **Model Independent Framework for Searches of Top Partners**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | *BUCHKREMER, Mathieu*<br>16:30 - 17:00 |
| 17:00 | **Motivated models predicting VLQs**<br>*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* | *WULZER, Andrea*<br>17:10 - 17:50 |

09:00

**Searches in dilepton/multilepton final states at ATLAS** — *TA, Duc Bao*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 09:00 - 09:30

10:00

**Search for vector-like T' quarks in final states with leptons at CMS** — *VAN ONSEM, Gerrit*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 09:40 - 10:10

**Vector-like Bottom Quarks in Composite Higgs Models** — *GROEBER, Ramona et al.*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 10:20 - 10:50

11:00

**Coffee break**
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 10:50 - 11:20

**Light Higgs and Vector-like Quarks without Prejudice** — *GRELJO, Admir et al.*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 11:30 - 12:00

12:00

**Search for vector-like T' and B' quarks in all-hadronic final states at CMS** — *MARCHESINI, Ivan*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 12:10 - 12:40

13:00

**Lunch break**

14:00 — 12:50 - 14:20

**Higgs physics and vector-like quarks** — *MOREAU, Gregory*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 14:30 - 15:00

15:00

**The Hunt for New Physics in the Flavour Sector with up vector-like quarks** — *NEBOT, M. et al.*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 15:05 - 15:35

16:00

**Interpretation of experimental results: discussion** — *HELSENS, Clement*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 15:45 - 16:05

**Coffee break**
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 16:05 - 16:35

17:00

**XQCAT: Model independent analysis of heavy vector-like top partners** — *PANIZZI, Luca*
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 16:35 - 17:05

**Discussion and wrap up**
*CFEL Building, Room V, University of Hamburg, Campus Bahrenfeld (DESY)* — 17:05 - 17:35