Welcome to the 35th RD50 Workshop

CERN, Geneva, 18-20.11.2019

- Outline
  - Some recent RD50 news
  - This Workshop

The RD50 Collaboration

- RD50: 60 *institutes and 360 members*

50 European institutes

Austria (HEPHY), **Belarus** (Minsk), **Czech Republic** (Prague (3x)), **Finland** (Helsinki, Lappeenranta), **France** (Marseille, Paris, Orsay), **Germany** (Bonn, Dortmund, Freiburg, Göttingen, Hamburg (2x), Karlsruhe, Munich(2x)), **Greece** (Demokritos), **Italy** (Bari, Perugia, Pisa, Trento, Torino), **Croatia** (Zagreb), **Lithuania** (Vilnius), **Netherlands** (NIKHEF), **Poland** (Krakow), **Romania** (Bucharest), **Russia** (Moscow, St.Petersburg), **Slovenia** (Ljubljana), **Spain** (Barcelona(3x), Santander, Sevilla (2x), Valencia), **Switzerland** (CERN, PSI, Zurich), **United Kingdom** (Birmingham, Glasgow, Lancaster, Liverpool, Oxford, Manchester, RAL)

New members 11/2018 and 06/2019

7 North-American institutes

USA (BNL, Brown Uni, Fermilab, LBNL, New Mexico, Santa Cruz, Syracuse)

1 Middle East institute

Israel (Tel Aviv)

2 Asian institutes

China (Beijing-IHEP), **India** (Delhi)

Full member list: www.cern.ch/rd50

RD50 Organizational Structure

Co-Spokespersons

Gianluigi Casse (Liverpool University, UK & FBK-CMM, Trento, Italy) and *Michael Moll* (CERN EP-DT)

Defect / Material Characterization

Ioana Pintilie (NIMP Bucharest)

- Characterization of microscopic properties of standard-, defect engineered and new materials; pre- and post- irradiation
- DLTS, TSC, ….
- SIMS, SR, …
- NIEL (calculations)
- Cluster and point defects
- Boron related defects
- SiC based detectors

Detector Characterization

Eckhart Fretwurst (Hamburg University)

- Characterization of test structures (IV, CV, CCE, TCT,.)
- Development and testing of defect engineered devices
- EPI, MCZ and other materials
- NIEL (experimental)
- Device modeling
- Operational conditions
- Common irradiations

- Wafer procurement (M.Moll)
- Acceptor removal (Kramberger)
- TCAD modeling (J.Schwandt)

New Structures

Giulio Pellegrini (CNM Barcelona)

- 3D detectors
- Thin detectors
- Cost effective solutions
- Other new structures
- Detectors with internal gain
- LGAD:Low Gain Avalanche Det.
- Deep Depleted Avalanche Det.
- Slim Edges
- HVCMOS

- LGAD (S.Hidalgo)
- HVCMOS (E. Vilella)
- Slim Edges (V.Fadeyev)

Full Detector Systems

Gregor Kramberger (Ljubljana University)

- LHC-like tests
- Links to HEP (LHC P2, FCC)
- Links electronics R&D
- Low rho strips
- Sensor readout (Alibava)
- Comparison:
  - pad-mini-full detectors
  - different producers
- Radiation Damage in HEP detectors
- Timing detectors

- Test beams (M.Bomben & G.Casse)

Collaboration Board Chair & Deputy: G.Kramberger (Ljubljana) & J.Vaitkus (Vilnius), Conference committee: U.Parzefall (Freiburg)
CERN contact: M.Moll (EP-DT), Secretary: V.Wedlake (EP-DT), Budget holder: M.Moll & M.Glaser (EP-DT) , EXSO: R.Costanzi (EP-DT)

RD50: New GLIMOS

- GLIMOS
  - GLIMOS – Group Leader in Matters of Safety
  - EXSO – Experimental Safety Officer
  - **RD50 GLIMOS (since 8/2019) : Ruddy Costanzi (CERN EP-DT-DD)**

Laboratory Technical Engineer
in the SSD (Solid State Detector)
Lab and the DSF
(Departmental Silicon Facility)

RD50-MOU

- Status
  - 60 versions signed by Eckhart Elsen (CERN Research Director) in May 2019
  - 31 signed versions returned (26.8.2019)

- CERN Document Server (CDS) – official number
  - CERN-MOU-2019-023
    - http://cds.cern.ch/record/2670537
  - Proofed to be very useful already in invoicing collaboration members for RD50 common projects.

LHCC and Research Board

- RD50 was extended for **5 years** in May 2018
- 11 September 2019: Last LHCC review for RD50
  - LHCC presentation https://indico.cern.ch/event/835603/
- LHCC minutes (CERN/LHCC-2019-010; LHCC-139)
  - **RD50 is a diverse but well-structured collaboration,** with four separate activity areas on defect and material characterisation, detector characterisation, new detector structures, and the construction of full detector systems. **RD50 has strong ties to the LHC experiments, which have already benefitted significantly from RD50 developments, in particular for the HL-LHC silicon detector upgrades. The collaboration is commended for its excellent progress over the last year.**
  - Recent highlights include the proof of concept of a table-top TPA-TCT system, which allows for scanning of silicon sensors with excellent 3D spatial resolution, studies of the time resolution of LGAD sensors as foreseen for the timing layers in ATLAS and CMS and a workshop on radiation effects in LHC experiments.
  - **The milestones of the programme underway have been largely achieved, with some well-motivated changes and delays. The RD50 model of collaboration between institutes and industry works remarkably well** even with minimal funding (2kCHF/year per institute). The relation of the collaboration to the R&D initiative of the CERN EP-Department has been clarified and the access to the solid state detector lab secured.

RD50 – 5 Year Work Plan

- **5 year work program submitted in May 2018**
  - Approved by CERN Research Board in June 2018
- **Workplan [70 milestones]**
  - **Defect and Material Characterization [16 MS]**
    - p-type silicon [7 MS]
    - Cluster defects [4 MS]
    - Theory of defects [5 MS]
  - **Device Characterization & Device Simulation [21MS]**
    - Silicon materials [5 MS]
    - Extreme fluences [5 MS]
    - Experimental techniques [3 MS]
    - Surface damage [1 MS]
    - TCAD simulations [7 MS]
  - **New structures [21 MS]**
    - 3D sensors [6 MS] ; LGAD [4 MS]
    - CMOS [6 MS] ; New Materials [5 MS]
  - **Full Detector Systems [12 MS]**
    - LHC [7 MS]; HL-LHC [3 MS]
    - FCC [2 MS]

RD50 Prolongation Request: May 2018

CERN, 31 May 2018

RD50

RD50 Prolongation Request

– May 2018 –

The RD50 Collaboration

CERN-LHCC-2018-017 / LHCC-SR-007
31/05/2018

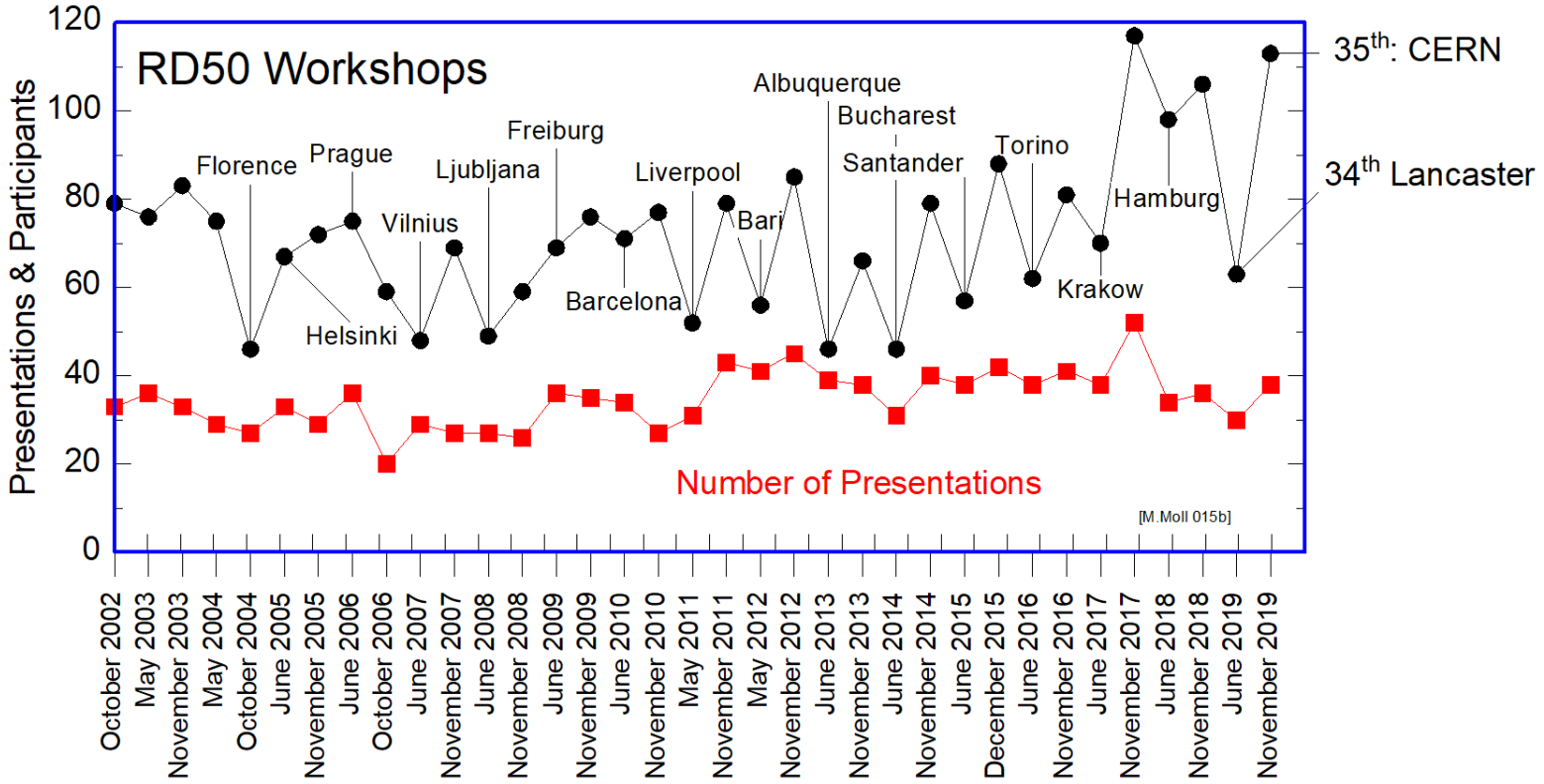
Abstract

With this document, we request the prolongation of the CERN RD50 research program for 5 years. A very brief historical review of the RD50 research program since the RD50 project approval by the Research Board in the year 2002 is presented and the biggest RD50 achievements are highlighted. The present composition of the collaboration, its organizational structure, and the research methodology are described. The role of RD50 in the present various upgrade and research programs of the LHC Experiments community is given and the overall work plan explained. Finally, a detailed 5-years work program with precise milestones and deliverables for the various research activities is presented. We conclude with our prolongation request towards the LHCC.

https://cds.cern.ch/record/2320882/files/LHCC-SR-007.pdf

Workshop statistics

- CERN – November 2019



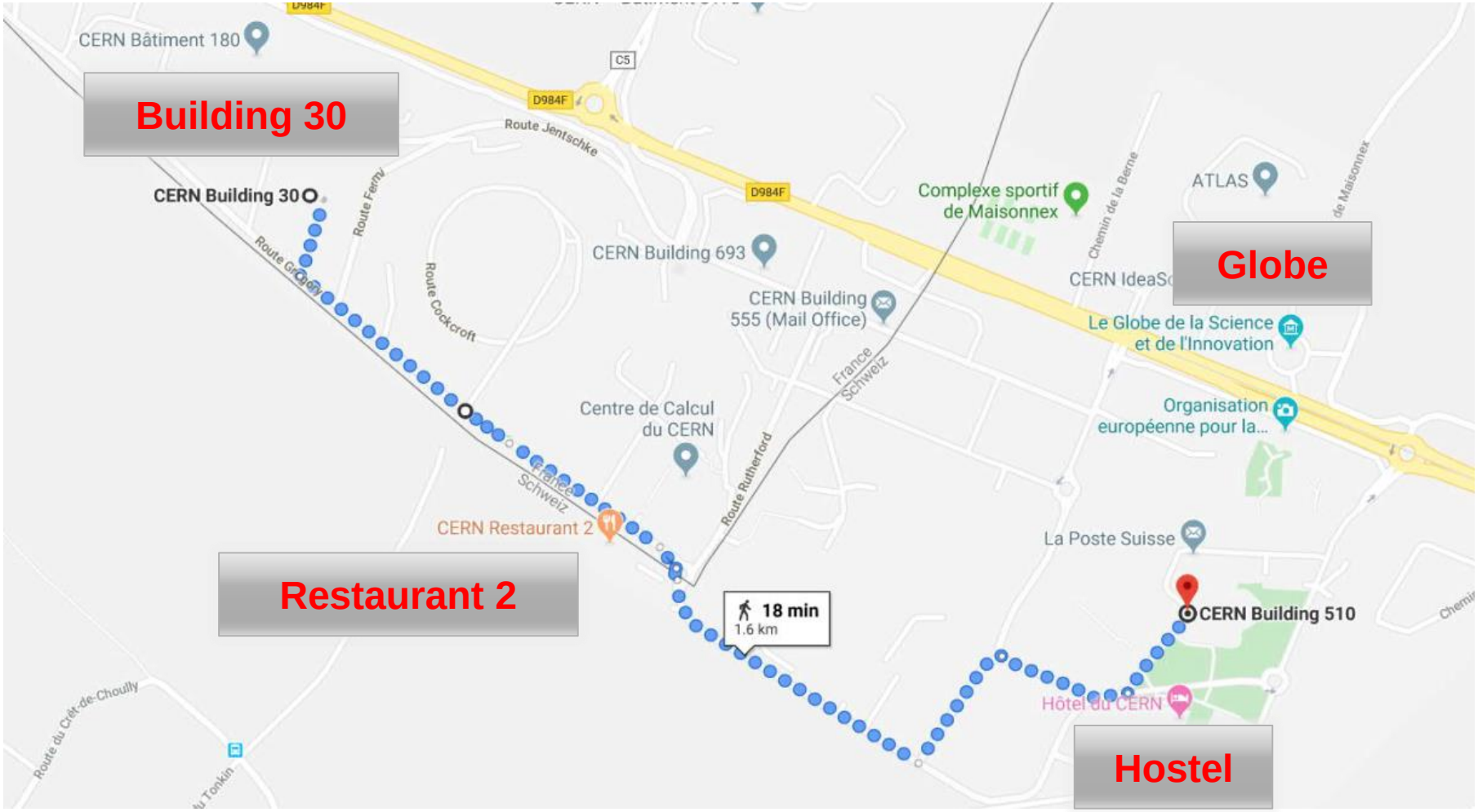
- This workshop: 113 registered participants; 38 talks + 4 discussion sessions
  - Average numbers for RD50 Workshops since 2002: <35 talks> <72 participants>
- Next workshops:
  - June 2020: Zagreb, Croatia and November 2020 CERN

Program: 35th Workshop

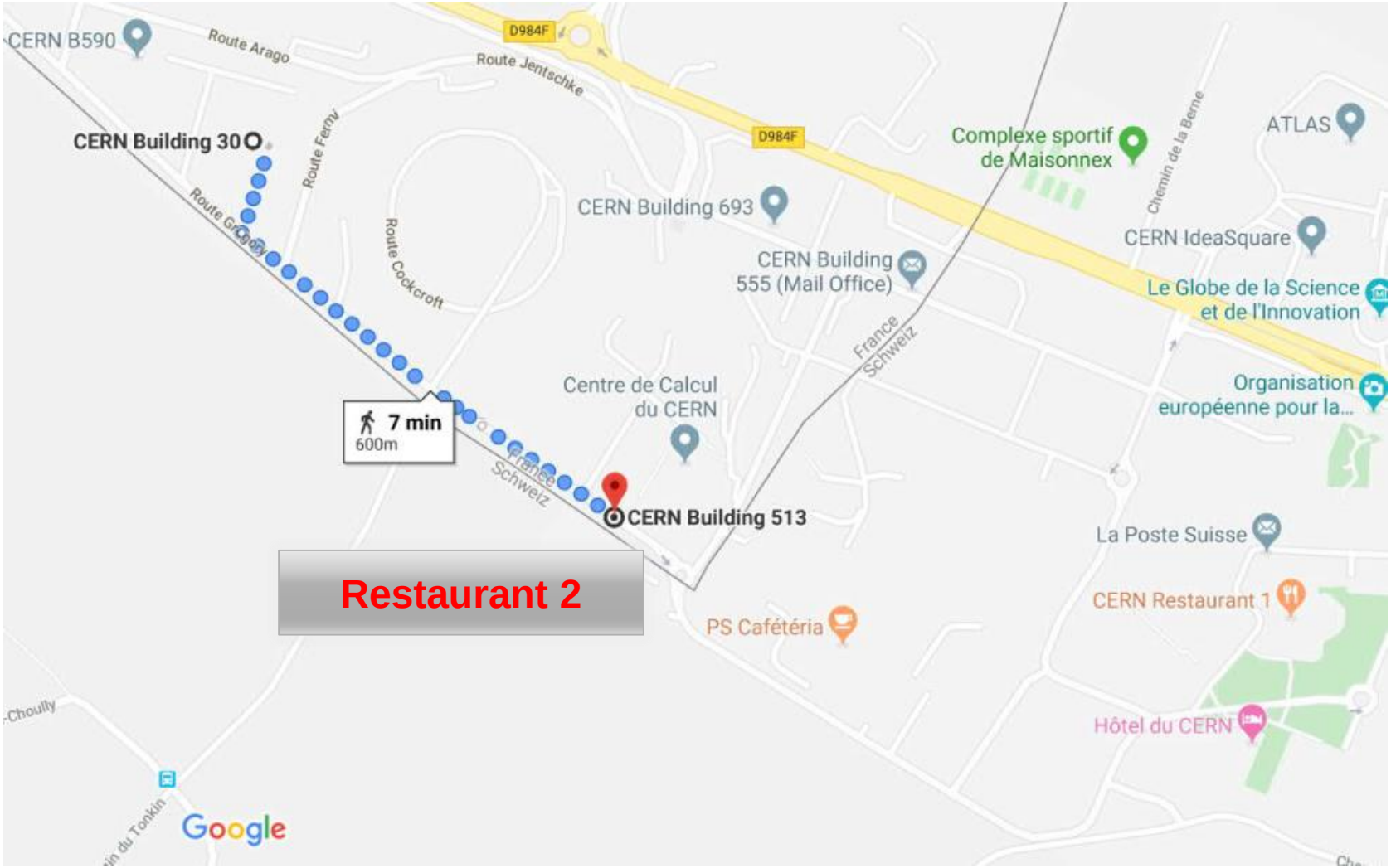
- Monday 18.11.2019
  - Full Detector Systems
  - Defect, Material and Sensor Characterization
  - *Collaboration Board (closed session)*
- Tuesday 19.11.2019
  - LGAD – Low Gain Avalanche Detectors
  - CMOS sensors
  - *Workshop Dinner (Detailed information in registration documents)*
- Wednesday morning 20.11.2019
  - Sensor characteristics after extreme fluences
  - Transient Current Technique

Workshop venue

- CERN Bldg. 30, 7th Floor



Lunch – Resto 2



Shuttle Line 1

- There is shuttle bus going from the main building to building 30 (takes 9 minutes)
- https://smb-dep.web.cern.ch/en/ShuttleService/Circuit_1

Morning

BLDG. 300 Synchro-Cyclotron	BLDG. 500 Main Building	BLDG. 39 Hotel	BLDG. 22	BLDG. 101	BLDG. 504 Restaurant 2	BLDG. 585 ISR	BLDG. 30	BLDG. 36	BLDG. 188	BLDG. 530	BLDG. 54	BLDG. 855	BLDG. 57 Medical Service	BLDG. 300 Synchro-Cyclotron
08:15	08:18	08:19	08:20	08:21	08:22	08:23	08:24	08:25	08:26	08:27	08:29	08:30	08:31	08:35
08:35	08:38	08:39	08:40	08:41	08:42	08:43	08:44	08:45	08:46	08:47	08:49	08:50	08:51	08:55
08:55	08:58	08:59	09:00	09:01	09:02	09:03	09:04	09:05	09:06	09:07	09:09	09:10	09:11	09:15
09:15	09:18	09:19	09:20	09:21	09:22	09:23	09:24	09:25	09:26	09:27	09:29	09:30	09:31	09:35

Afternoon

BLDG. 300 Synchro-Cyclotron	BLDG. 57 Medical Service	BLDG. 855	BLDG. 54	BLDG. 530	BLDG. 36	BLDG. 188	BLDG. 30	BLDG. 585 ISR	BLDG. 504 Restaurant 2	BLDG. 101	BLDG. 22	BLDG. 500 Main Building	Entrance A	BLDG. 39 Hotel	BLDG. 300 Synchro-Cyclotron
17:00	17:01	17:02	17:03	17:04	17:06	17:07	17:08	17:09	17:10	17:11	17:12	17:13	17:14	17:17	17:20
17:20	17:21	17:22	17:23	17:24	17:26	17:27	17:28	17:29	17:30	17:31	17:32	17:33	17:34	17:37	17:40
17:40	17:41	17:42	17:43	17:44	17:46	17:47	17:48	17:49	17:50	17:51	17:52	17:53	17:54	17:57	18:00
18:00	18:01	18:02	18:03	18:04	18:06	18:07	18:08	18:09	18:10	18:11	18:12	18:13	18:14	18:17	18:20

Enjoy the Workshop!

- *…many thanks to the organization team*

  Yana, Julian, Isidre, …and especially to Veronique Wedlake!