BWEC status report

L. Capozza, *F. Maas, O. Noll, D. Rodríguez, S. Wolff*

Helmholtz-Institut Mainz

Johannes Gutenberg-Universität Mainz

PANDA Meeting, November 2019, GSI

Outline

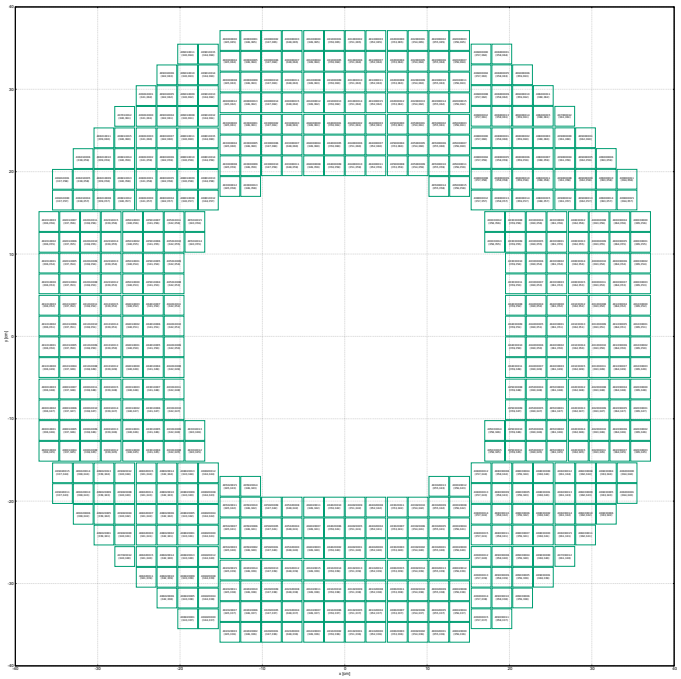
- Production readiness review
- Submodule components
- Production preparation

Production Readiness Review

- Main subject: status of the submodule production readiness
- One day review on 31/10
- External participants: Lars, Tassos (GSI) and Tom (Bochum)
- Presentations (morning) and Lab visits (afternoon)
- Topics:
  - Description of components
  - Manufacturing procedure of components
  - Assembling procedure of submodule
  - Tests and quality assurance
  - Calibration measurements
  - Documentation
  - Timeline estimates

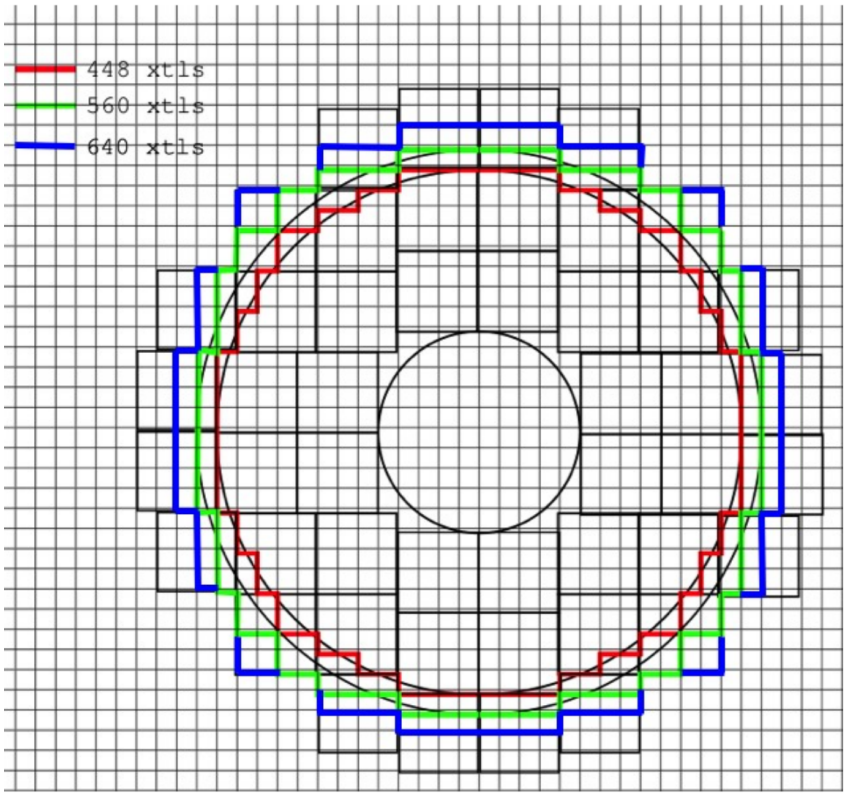
Submodule production

PANDA



- ∼500 crystals
- submodules of various shapes
- 36 submodules

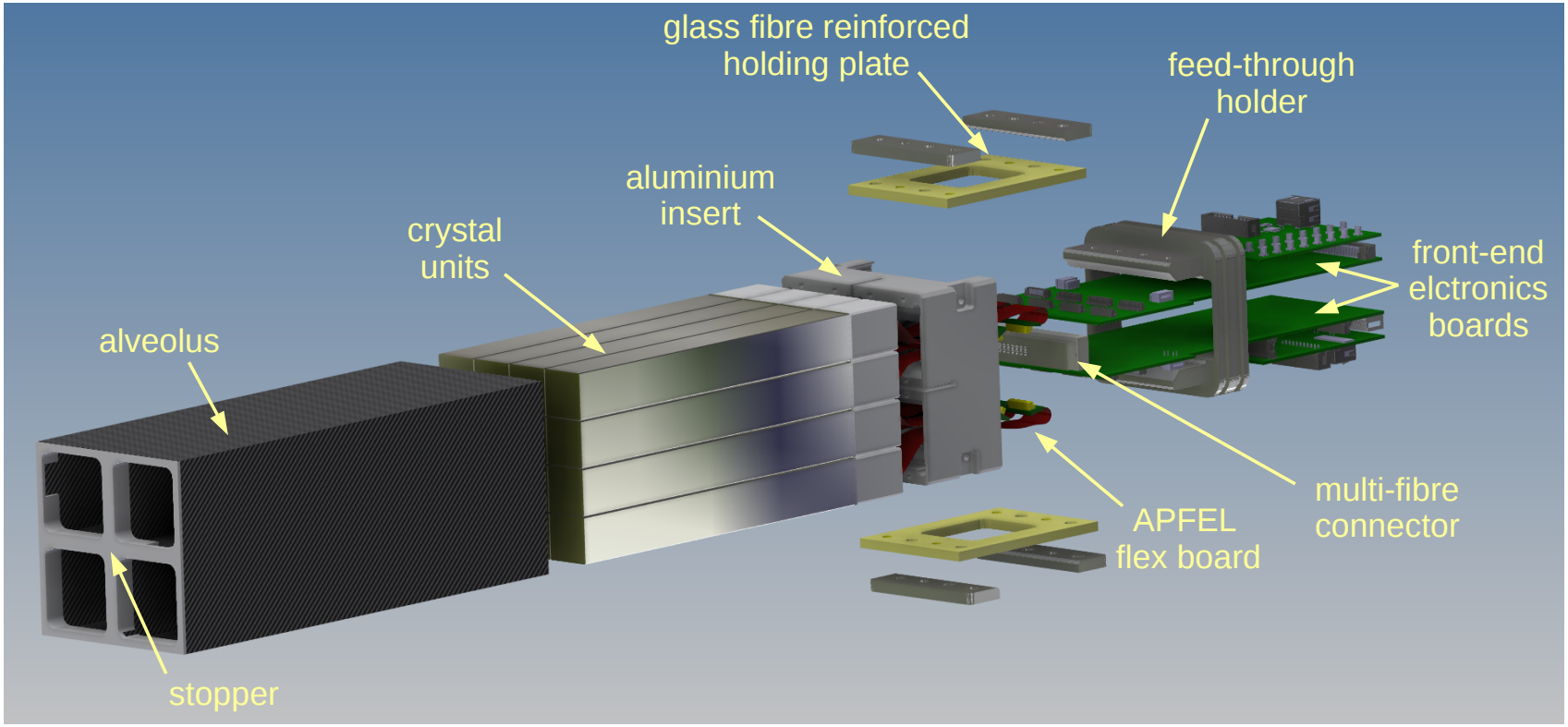
Phase-0



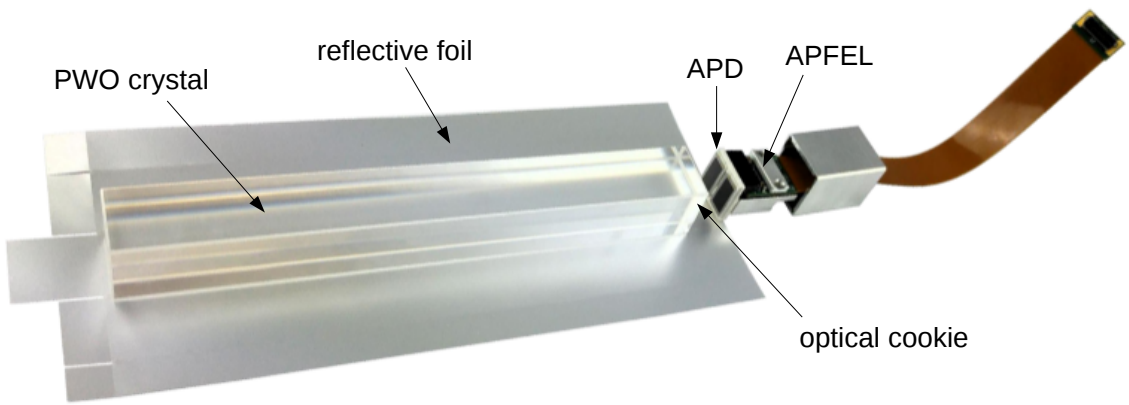
- Aim: 640 crystals
- only 4×4 submodules (some partially equipped)
- 48 submodules

  ⇒preparing series production

Submodule components

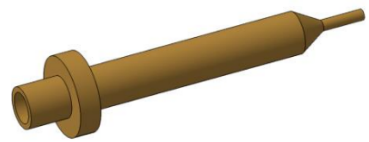


Crystal unit:

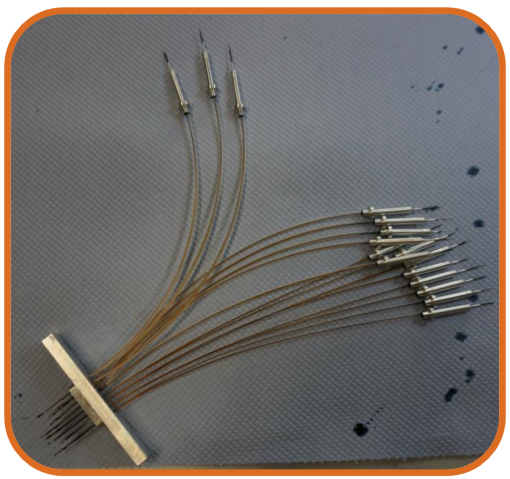


Optical fibre system

- 1 fibre per crystal from light source
- pluggable connector at mounting plate



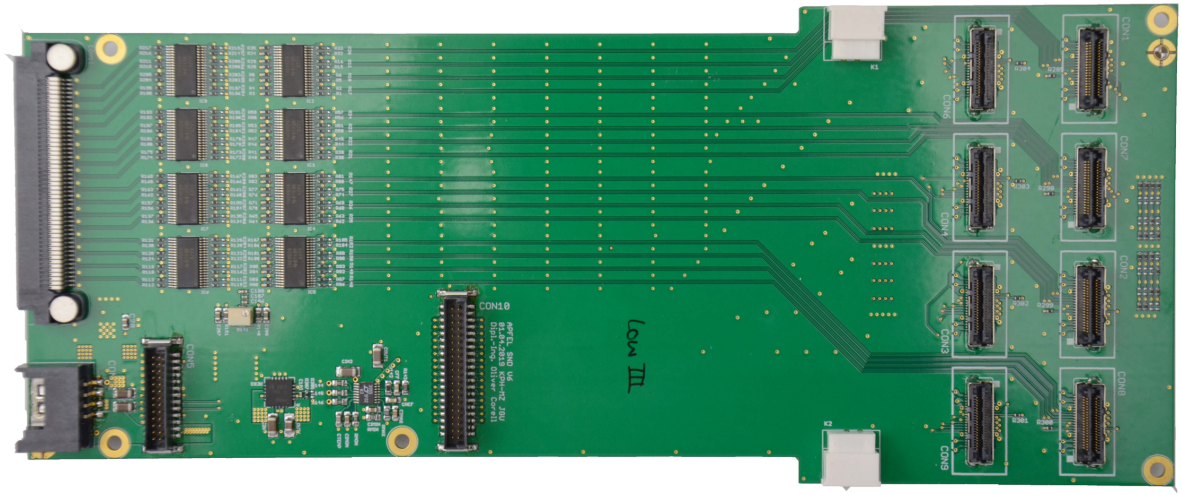
- one fibre bundle per submodule
- multifibre connector



New front-end boards

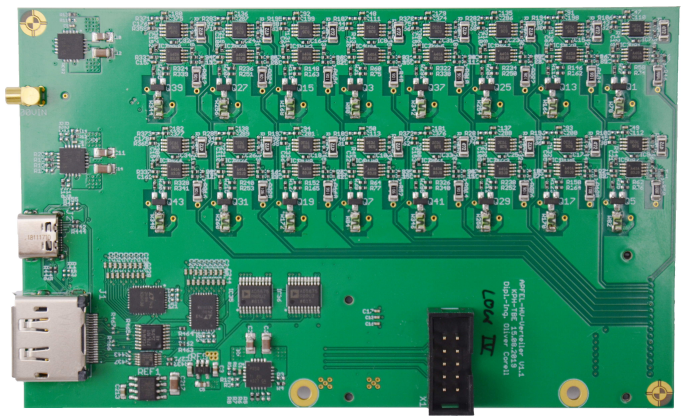
Line driver board

- 8 APFEL (crystals)
- 2 Pt100 sensors
- New:
  - some fixes in channel ordering
  - supply for LED on APFEL board

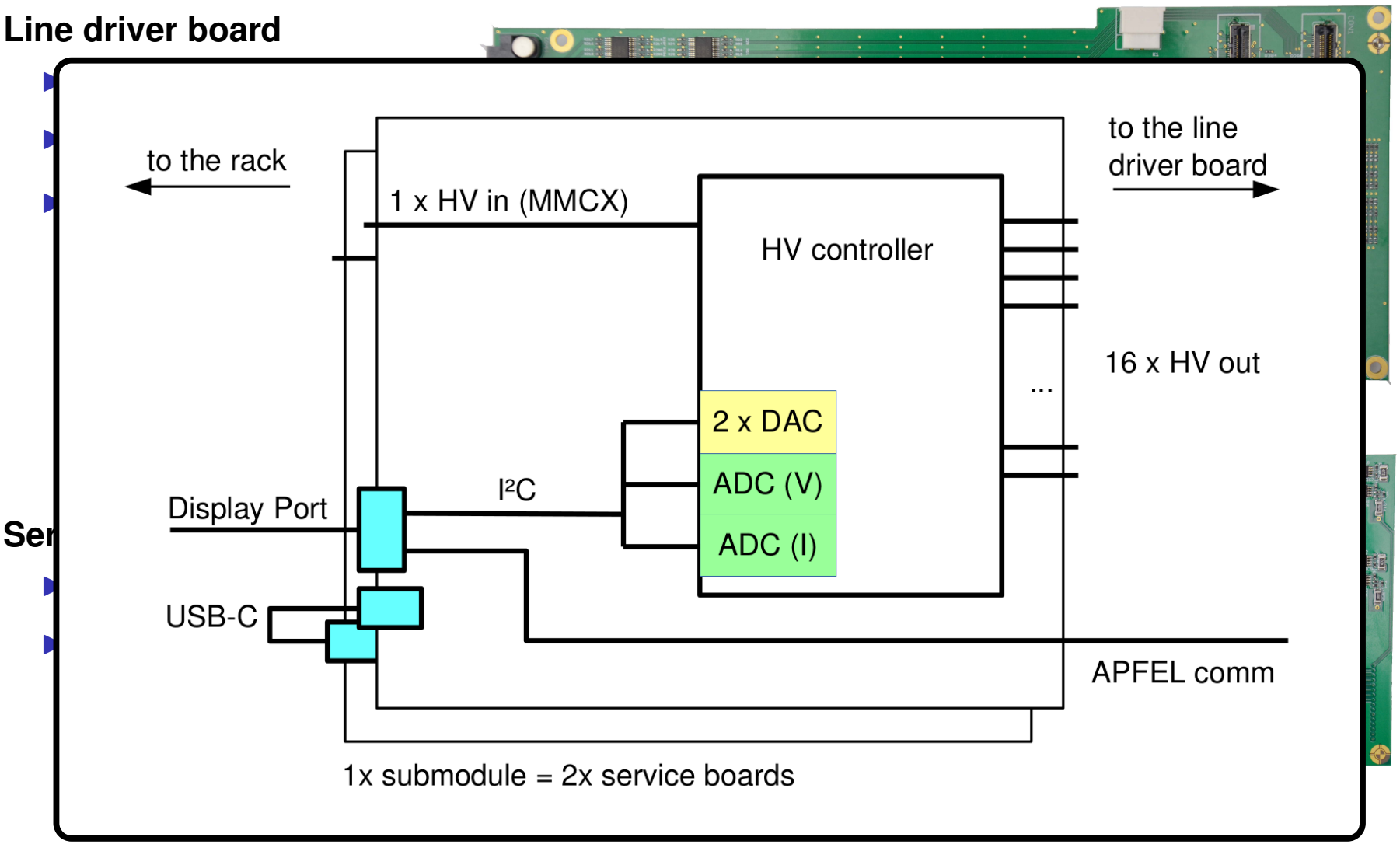


Service board

- HV splitter and controller
- Communication interface for APFEL and HV (I2C) on same cable



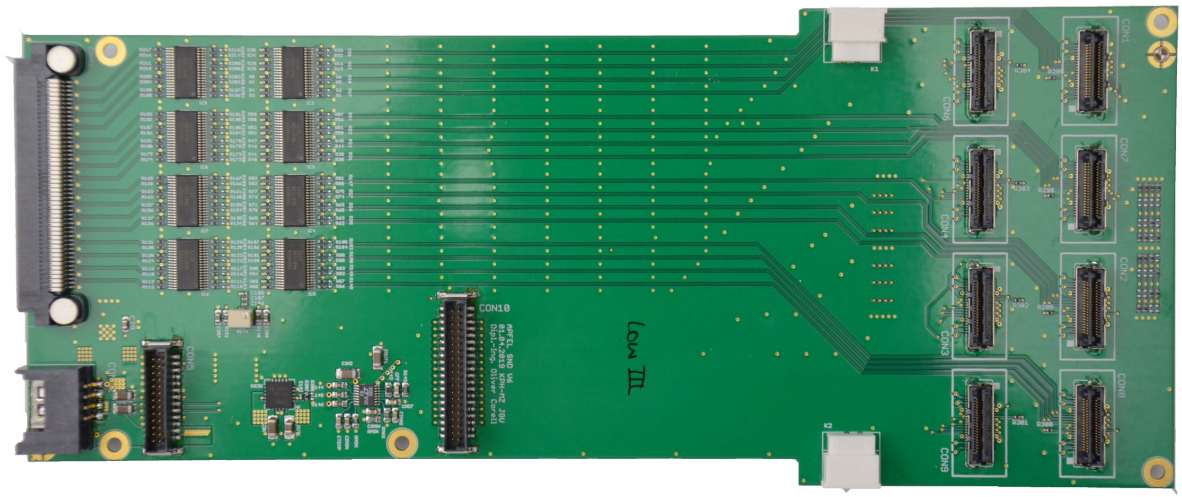
New front-end boards



New front-end boards

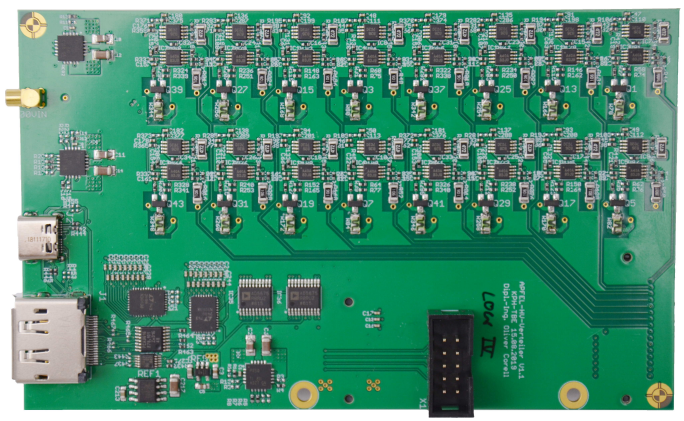
Line driver board

- 8 APFEL (crystals)
- 2 Pt100 sensors
- New:
  - some fixes in channel ordering
  - supply for LED on APFEL board



Service board

- HV splitter and controller
- Communication interface for APFEL and HV (I2C) on same cable



Status

- 8 pairs assembled and under test
- Series production starting in January

List of parts

Purchased Parts

- Crystals ✓
- APD ✓
- reflective foils ✓
- APD plastic case
- optical cookies
- APFEL boards
- APFEL Al capsules
- inserts + feed-through holders

To be shipped to Mainz

- still some crystals
- 1300 APD (matching not critical)

Manufactured parts

- **Alveoli**
  - 1 piece per day
  - total time (48 pieces): 4 months
- **Temperature sensors**
  - few sensors per hour
  - total time (160 pcs): 3 weeks
- **Fibre bundles**
  - idea: outsourcing
  - cost: 30 kEuro
  - one sample ordered (to check the quality)
  - full order in January
  - total time: 6-7 weeks
- **Front-end boards**
  - prototype boards under test
  - start of series production: January

Component deliveries

Part	Expected order date	Ordered	Expected delivery date	Delivered	Manufacturing start date	Manufacturing end date
Core						
Crystals				✓		
APD (not in Mainz!)				✓		
Crystal equipment						
APD capsules	November		November			
APFEL Al capsules		✓	December			
Foils				✓		
Optical cookies	November		December			
Temperature sensors					started	November
Fibres and connectors	January		February			
Submodule mechanics						
Alveoli					November	March
Inserts	December		February			
Feedthroughs	December		February			
Electronics						
APFEL boards					November	December
Frontend boards	January		March			

Time estimates

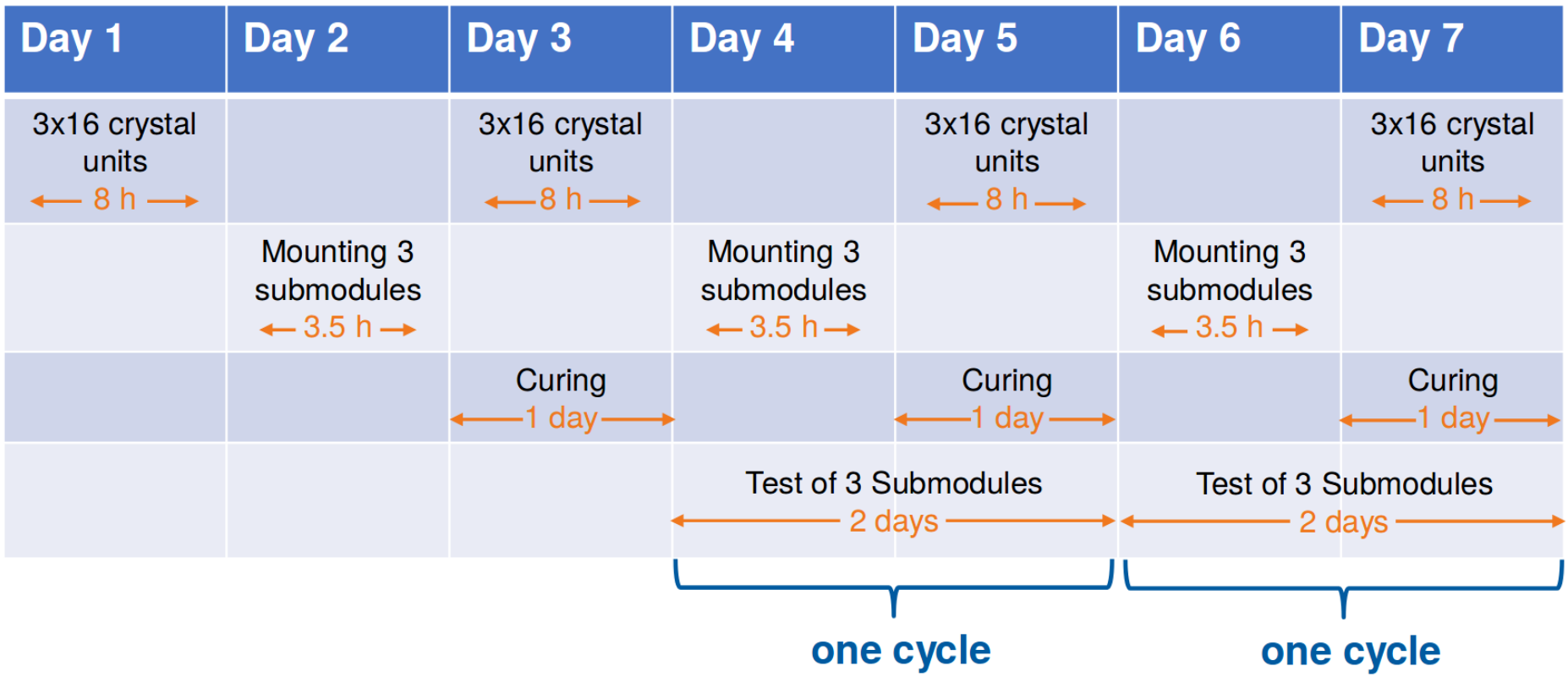
Submodule assembling

- **Preparation of crystal units**
  - wrapping crystals
  - attaching APDs and Al capsule
  - 2 persons required
  - about 10 minutes per crystal
- **Submodule mounting**
  - filling alveolus
  - connecting electronics/fibres
  - assembling holding structure
  - glue stopper
  - 2 persons required
  - about 70 minutes + 1 day for drying

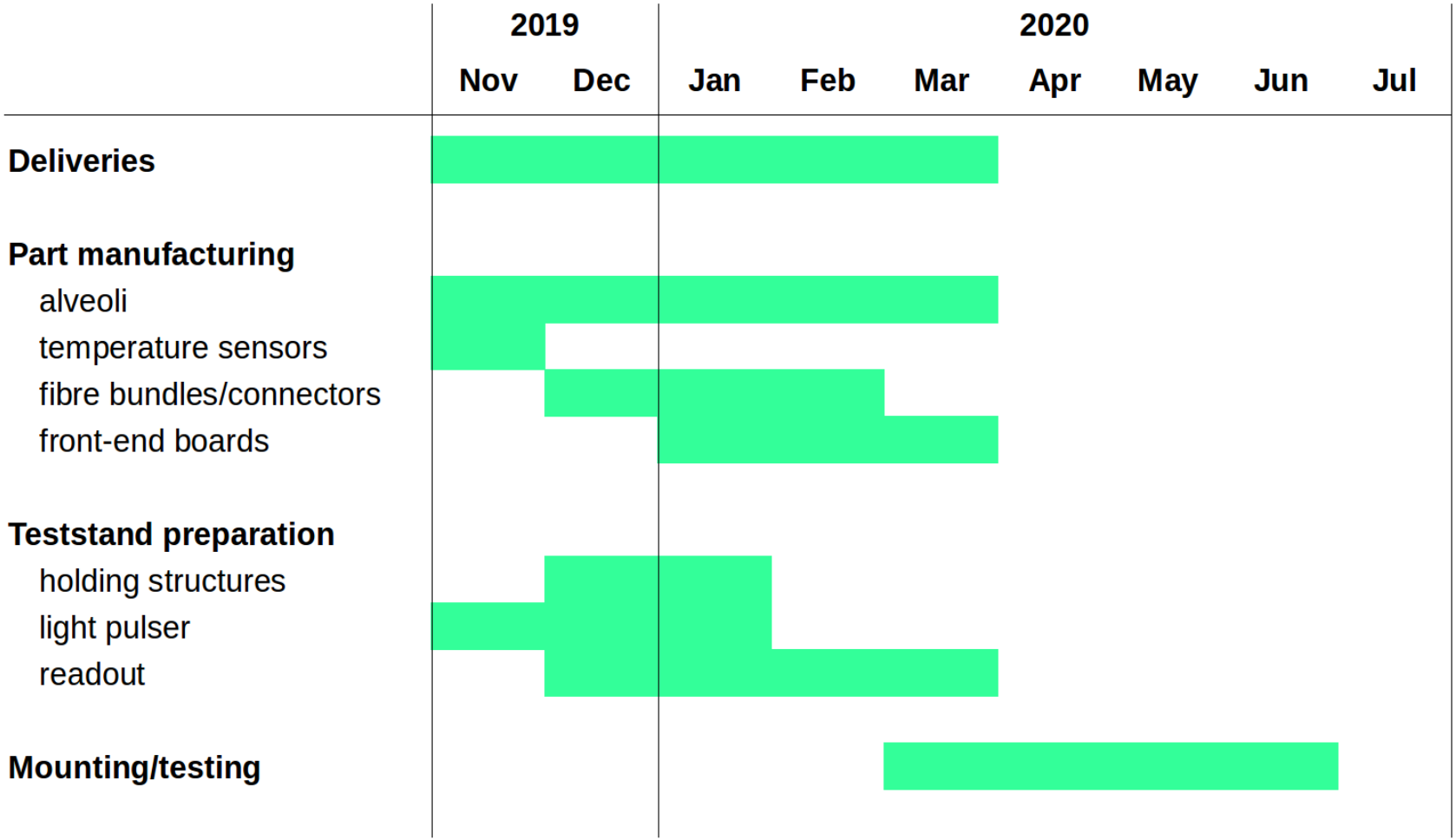
Mounting and testing

- **Mounting**
  - idea: unpack only parts for submodules under construction
  - final mounting slower but “loose time” for sensitive parts (crystals and APD) minimised
  - aim: 3 submodules every 2 days
- **Testing in a climate chamber**
  - 3 submodules simultaneously
  - temperature sensor calibration: 30 h
  - HV scan: 2 h
  - cosmics: 12 h
  - total throughput: 3 submodules in 48 h or 6 per week
  - duration for 48 submodules: 8 weeks

Submodule production cycle



Submodule production timeline



Summary

- Submodule series production in preparation
- All components are getting delivered/manufactured
- Start of production foreseen for March 2020
- All submodules should be done by summer 2020

Backup

HV controller