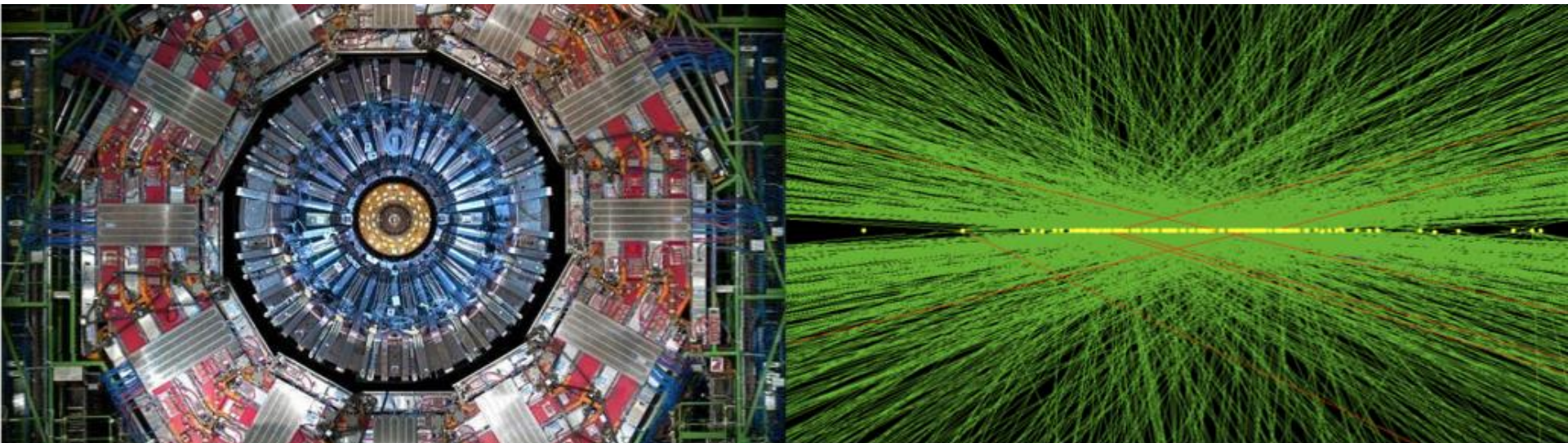


GE2/1 Status Update

Mykhailo Dalchenko

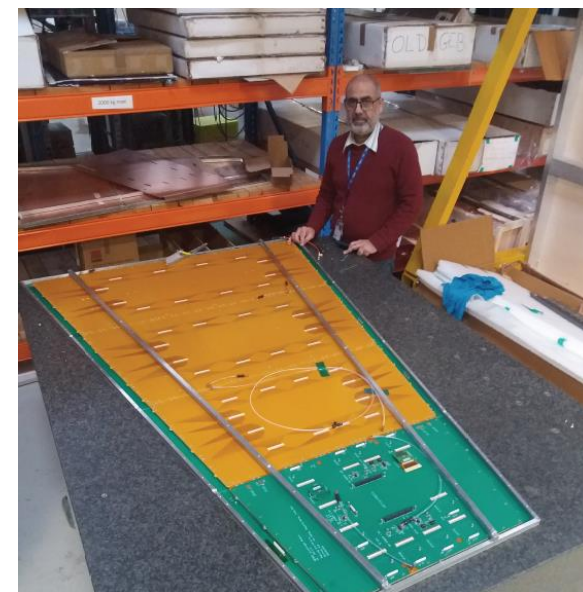
Upgrade @XXIV GEM Workshop

October 4, 2019



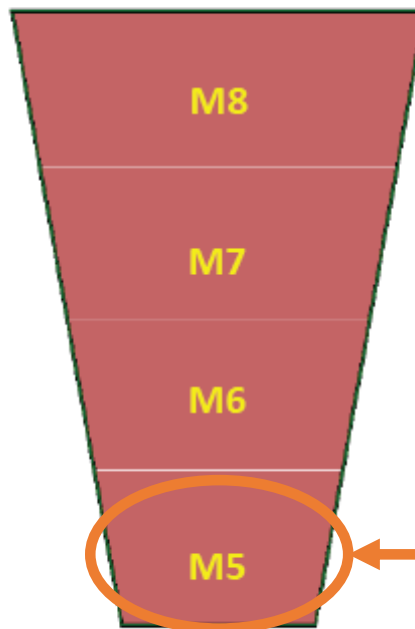
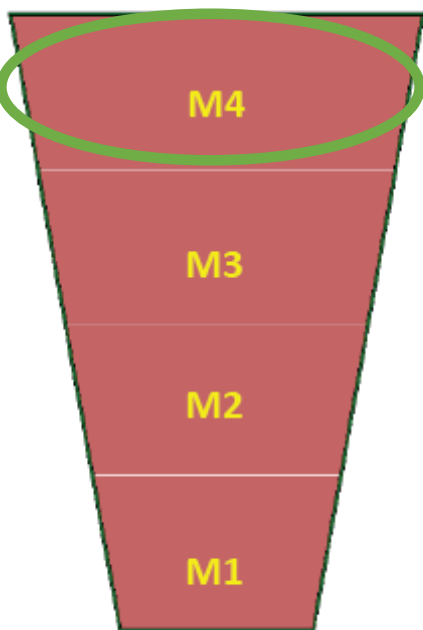
- GE2/1 Test Stands Equipment
 - GE2/1 Test Stand @904
 - GE2/1 Test Stand @FIT
- GE2/1 Integration and Tests Results
 - Integration Procedure
 - Noise Optimization
 - Grounding schemes study
 - Copper vs No-Copper ROB
- Planning
 - Electronics Components Updates
 - Operational needs
 - Equipment/budget
 - Manpower

- Hardware: M1-M8 modules with frames
 - Baseline:
 - No Foil Segmentation
 - No-copper ROB
 - Special Parts: M4, M5



Back Chamber

Front Chamber



Double Segmented Foils

Copper ROB

- Services - AOK
 - Power supplies
 - LV Power Supply: LV Easy Crate + 4 A3016 modules
 - HV Mainframe and Power Supply: SY1527+A1515
 - Gas – together with coffin setup
 - Premixed bottle – enough till the end of the year
 - Gas panel
 - Cooling
 - Foreseen with water outlet from blue racks
 - Fibers
 - LC-LC between detector and patch panel
 - 4 pairs per module, reuse Slice Test fibers
 - Patch panel
 - MTP48-LC fiber for trigger

■ Electronics

■ Front-end:

- GEBs M1-M5: two of each kind
- M5 is fully LpGBT-compatible and has correct powering scheme
- M1-M4 needs design modifications:
 - Correct placement of power standoffs
 - Correct placement of FEASTs for master-slave cable
 - Addition of addressing resistors for LpGBT
- 20 FEASTs
- Four GE2/1 Optohybrids
 - One with modified master-slave connector to fit existing M2 GEB
- 48 VFAT3-V2 hybrids (no protection) with FlexPCBs
 - Will be replaced by PlugIn cards with packaged VFAT3 chips upon availability

■ Back-end:

- One uTCA crate + eagle64 CTP7 board
 - Will be replaced by ATCA + APT upon availability

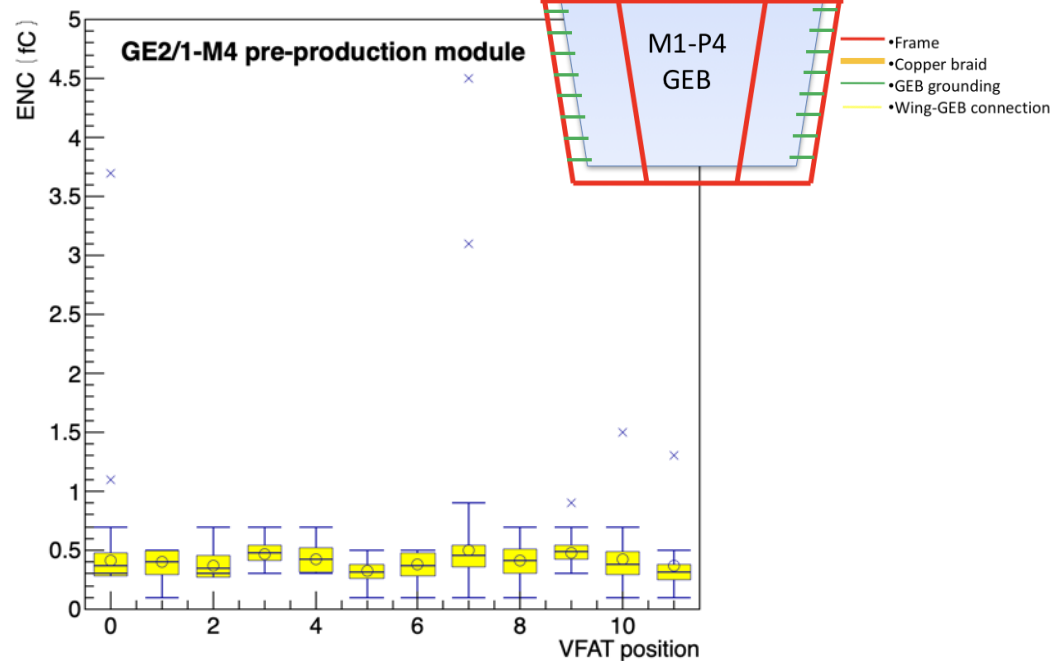
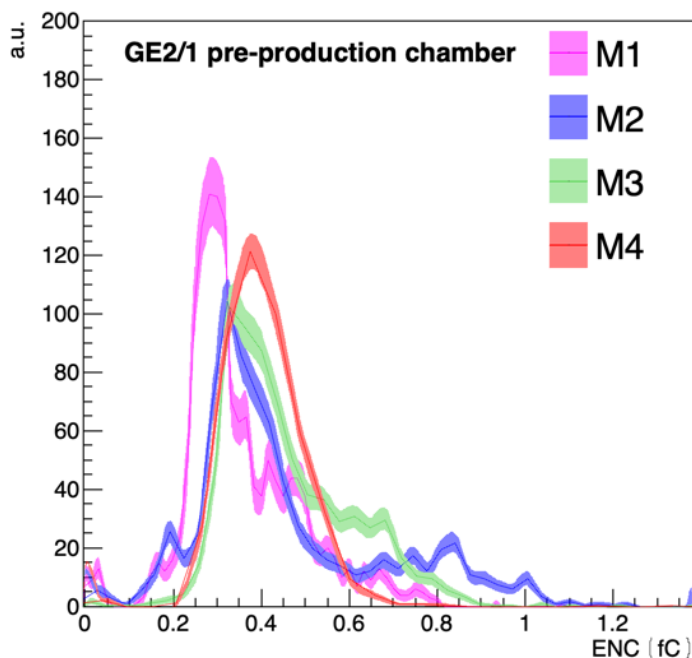
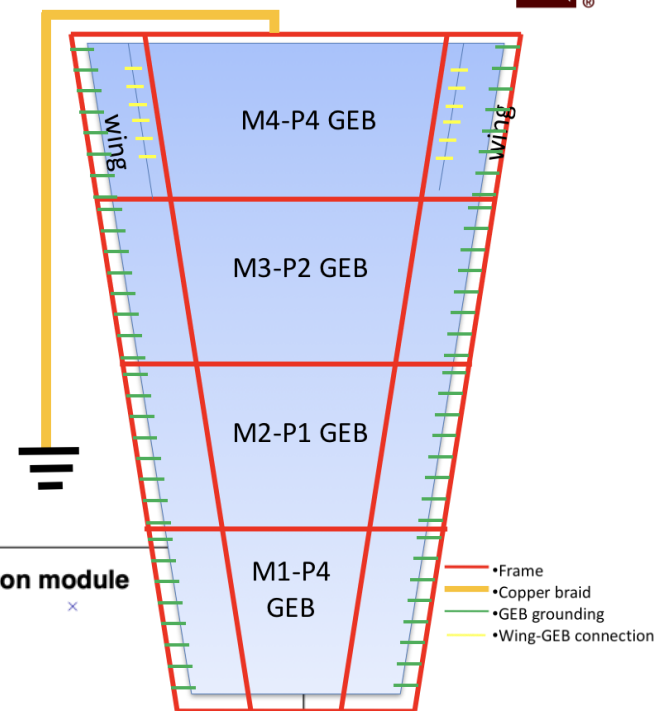
GE2/1 Test Stand @FIT

- Hardware: to be discussed, nothing at the moment
- Services
 - Power supplies
 - LV Power Supply: A2519 board
 - HV Mainframe and Power Supply: SY5527+A1515
 - Gas – to be confirmed
 - Premixed bottle
 - Pressure regulator + gas panel
 - Cooling - ???
 - Fibers
 - LC-LC to interface with GLIB
 - 4 pairs per module
- Electronics
 - Front-end:
 - GEBs M1 and M5
 - One OptoHybrid
 - 60 VFAT3-V3 hybrids, 40 FlexPCBs
 - 5+1 FEASTs
 - Back-end:
 - uTCA crate without AMC13
 - GLIB

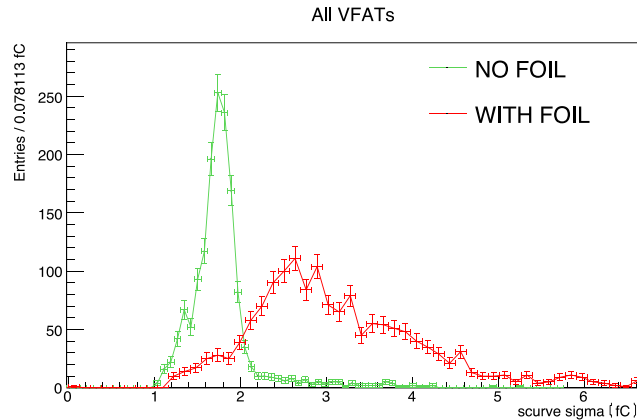
- Integration test procedure
 - Visual Inspection and connectors cleaning
 - Power-up test:
 - Install FEASTs and power lines
 - Check for short circuits
 - Measure voltage in test points (tolerance: 2% - TBC)
 - Install OH and VFAT3s and check communication
 - Use *testConnectivity* tool as QC7
 - check that all frontend components answers to slow control
 - Provided communication is stable, perform GBT phase scan
 - Program the OH, check trigger link status for stability/errors
 - Perform DAC calibration and take s-curves

So far all the components are in working order with some non-critical issues

- Ultimate grounding configuration is identified
 - Requires the use of all pads
 - Not very convenient for production
 - Optimization studies are ongoing

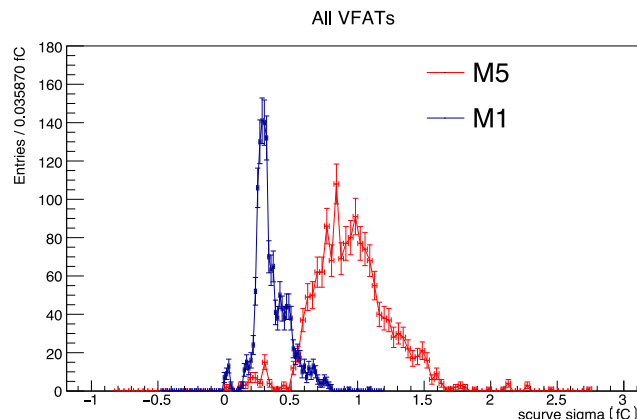


- Two tests conducted
 - Using a copper foil to mimic copper layer on ROB – M4



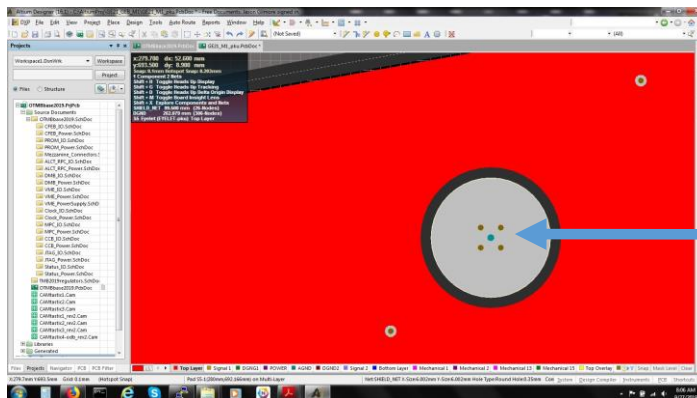
- Test conducted with suboptimal grounding
- Equal grounding setup used for both runs
- Preference to go without copper foil

- Using M5 Copper ROB (compare with M1)



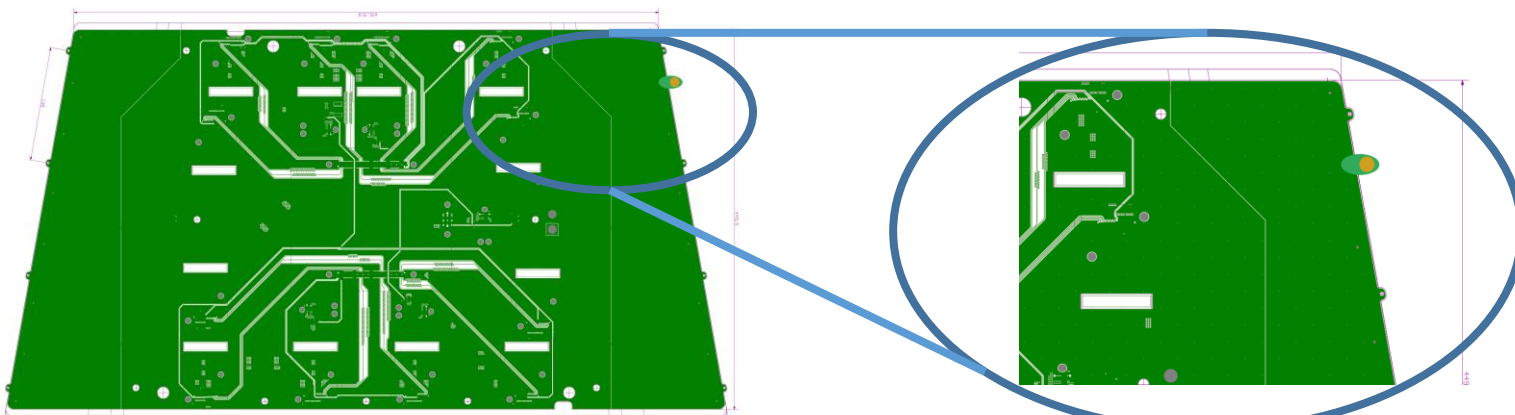
- Start with optimal grounding
- Use same front-end on M5 (VFATs, FEASTs)
- Try to further optimize M5 noise
- Preference to No-Copper ROB
 - *Caveat: noise level with copper ROB is higher than expected...*

- Electronics update (frontend)
 - GEB update for grounding studies request
 - Provide a GEB with one of the grounding pads with as many as possible vias to shielding layer



- Standard is 5
- Request: >20

- Provide a GEB with a 1x2cm flange with exposed shield layer on its side

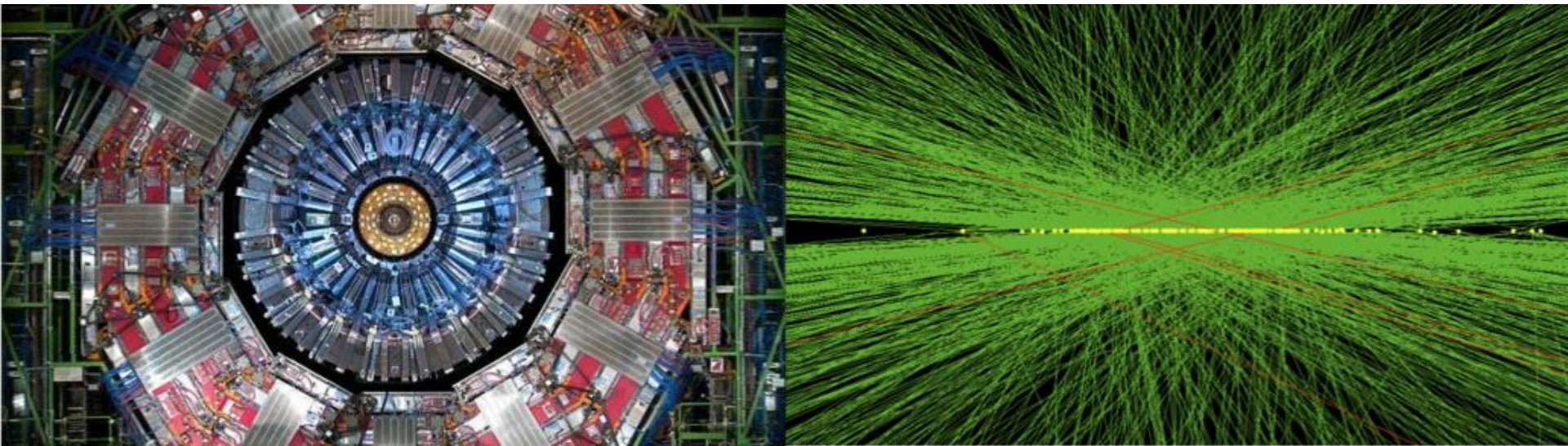


- Electronics update (frontend)
 - M6-M8 GEBs to arrive by the end of the year (need asap)
 - Possibly with modifications requested on previous slide
 - M1-M4 GEBs required modifications:
 - Feast relocation to provide room for master-slave cable
 - Correct power standoffs
 - Addition of addressing resistors for LpGBT compatibility
 - PlugIn cards prototypes
 - To be discussed...
 - Converge on GND scheme and VFAT input protection
 - Special camp is scheduled on 18-22 Nov. 2019
 - OptoHybrid V2 – by the end of the year

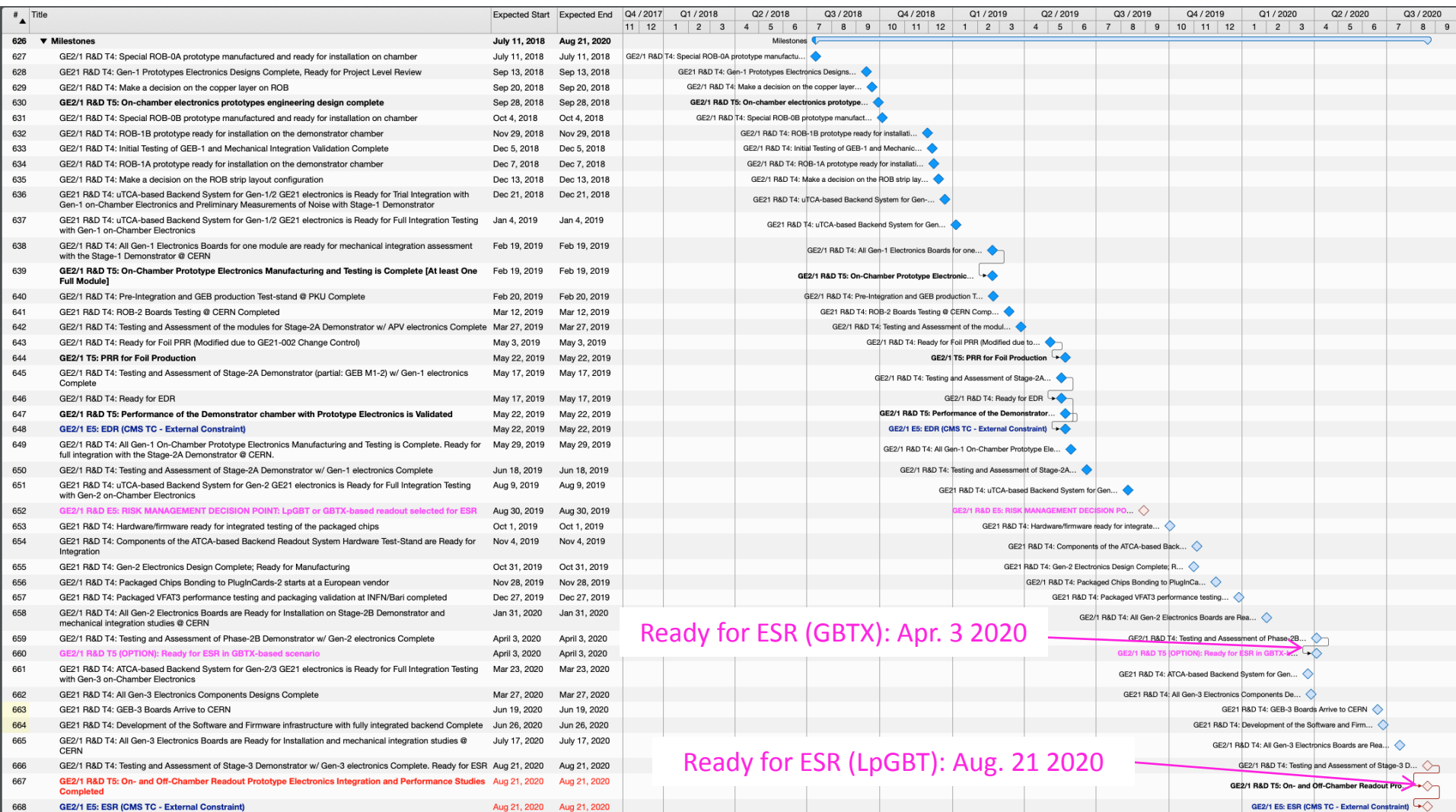
- Electronics update (backend)
 - ATCA crate – November 2019
 - APX card – as soon as possible, probably in November 2019
 - Need final optical and network interfaces
 - Expect MTP12 and Ethernet, should be no issue
 - Expect to be almost PlugNPlay
 - May require additional SW/FW development
- HV/Gas integration, efficiency studies
 - October 2019
- Cooling
 - Test scheduled on 4-8 Nov. 2019
- Hardware migration to FIT
 - Provide initial testing with M5-M8 chamber
 - Ship to FIT when they are ready from the backend perspective

- Current gas supply is sufficient till the end of 2019
 - Need budget for gas in 2020
- Need budget for water pipes and eventually filter (2020)
- Need budget to order a pivoting support table (2020)
- Total cost estimate under 5-6kCHF
 - 200 CHF/gas bottle – enough for 2 months of operations
 - 2.5-3kCHF for pivoting table
- Manpower
 - Need someone to keep an eye during tests with HV
 - Don't need many people at once, prefer a small crew on rotation basis
 - For next month test stand operation is covered by me and Rafik
- Migration to new test stand area – TBD (services???)

Backup



■ The “waterfall” plot for the updated R&D schedule



Ready for ESR (GBTX): Apr. 3 2020

Ready for ESR (LpGBT): Aug. 21 2020