DMCS-LUT status report

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In-Kind project scope

Task no.	Deliverables	Delivery Deadline / Delivery MS
WU 1	MTCA.4 RTM Carrier board integration	2021-06-01
WU 2	icBLM and nBLM controls and realization	2021-06-01
WU 3	IPMI EPICS integration	2021-06-01

- In-kind project deadline extended (till 06.2021) – full schedule adjustement proces finished last month – new decision from Ministry of Science (long processing due to Covid-19),
- New schedule should allow for on-time project completion even in case of pandemic limitations.

WU 1 RTM Carrier integration

- **WU1 – MTCA.4 RTM Carrier board integration**

In the LLRF system of ESS there will be an AMC board for supporting the RTMs dedicated to the Local Oscillator and the piezo-driver. Partner's contribution will consist of the following contributions

- Development of kernel drivers and user space drivers to allow the AMC integration,

- Development of EPICS device support and basic OPI for the management of the AMC board.

WU 1 RTM Carrier integration – updated milestones (1/3)

MS ID	Short Description	Planned/ Baseline Date	Location	Comment
MS0	Kick-off meeting	2018.03.15	DMCS, Lodz	
MS1	Specification and requirement analysis phase	2019.03.01	Video conference	
MS2	Conceptual design for software	2019.03.01	ESS, Lund	
MS3	Prototype version of the FW and software components	2020.06.01	Video conference	Driver and API for command line tools prepared for evaluation, EPICS layer missing. External dependency: BSP FW for board – to be delivered by ACC-PEG
MS5	Progress meetings	Quarterly	ESS, Lund/Partner Premises	

WU 1 RTM Carrier integration – updated milestones (2/3)

MS ID	Short Description	Planned/ Baseline Date	Location	Comment
MS6	Test plan and report	2020.07.01	Video conference	
MS7	CDR of WU 1	2020.07.01	Partner premises	Include in the MS6
MS8	Production FW and software version delivery	2020.10.01	ESS, Lund	Ready for M-Beta and TS2 operation, if Cov19 allows to resume TS2 efforts in summer
MS9.1	SAR	2020.11.01	ESS, Lund	Connects to MS8
MS8.2	Production FW and software version delivery	2021.04.01	ESS, Lund	Final version delivery
MS9.2	SAR	2021.05.01	ESS, Lund	Connects to MS8.2
MS10	Final report	2021.06.01		

WU 1 RTM Carrier integration – deliverables

Del. ID	Short Description	Delivery MS	Acceptance Criteria type	Comments
D1.1	Investigation report	MS1	Review	
D1.2	Driver part	MS10	Review	
D1.3	EPICS device support and OPI	MS10	Review	
D1.4	Test plan and report	MS10	Test report	

WU 1 – Deliverables – Status (2/2)

- Deliverables review needed form ESS-ICS side,
- Acceptance protocols for deliverables required for Ministry reporting procces and in-kind final delivery,
- Test report and final report guidelines and expectations needed (ESS)
- Limitations:
  - RTM Carrier hardware:
    - HW access limited – shared between different development activities,
    - On-going work on BSP firmware (by NCBJ) for the RTM carrier, synchronized with FW framework (by Christian) – to be delivered...
  - Piezo Driver board:
    - HW setup needed for „Production software and firmware delivery”,
    - HW specification is being modified – next step for prototyping and evaluation is needed – schedule change for production, delivery and installation,
  - On-going work on BSP firmware (by NCBJ) for the RTM carrier, synchronized with FW framework (by Christian) – to be delivered ….. ,

WU 2 - nBLM controls and realization

- **WU2 – icBLM and nBLM controls and realization**

The Beam Loss Monitor system for ESS comprises two types of devices to detect beam loss. A system based on ionization chambers (icBLM) is the primary method to detect beam losses in the superconducting linac. This system is crucial for machine protection. In the low-energy part of the linac, a different system will be used that is based on detection of neutrons, called the neutron Beam Loss Monitor (nBLM) system. Developing (FPGA) firmware for the nBLM system is also a part of this task.

The Partner shall:

- Develop FPGA firmware that runs on the icBLM and nBLM back-end electronics (BEE) and has the following tasks:
    - Process the incoming data (from ADC or other front-end electronics)
    - Provide the data to the (EPICS) control system for monitoring purposes
    - Run algorithms for machine protection purposes that assess the beam conditions and in case of unacceptable beam losses inform the Beam Interlock System by dropping the BEAM_PERMIT signal and also providing data that is needed to analyse the conditions that led to dropping the beam permit
    - Perform checks to verify that the system components and functions are working properly.

The firmware development and implementation, which includes integration of the nBLM and icBLM systems in the ESS firmware framework, shall be compliant with the standards set by ESS ERIC and performed in collaboration with the Beam Diagnostic section of the Accelerator Division at the ESS ERIC.

WU 2 - icBLM controls and realization

- Develop and implement the following software:
  - icBLM specific algorithms for data processing that run on the icBLM BEE CPU,
  - the low-level drivers to interface to the (EPICS) control system,
  - implement EPICS databases to store and process the data,
  - Develop graphical user interfaces to visualize the icBLM specific data.

The software development and implementation, which includes software integration of the icBLM system in the ESS ERIC standard control system, shall be compliant with the standards set by ESS ERIC and performed in collaboration with the Beam Diagnostic section of the Accelerator Division at the ESS ERIC.

(Software development for the nBLM system is covered by a separate contract and is not in the scope of this contract.)

WU 2 - nBLM controls and realization – Milestones

Milestone ID	Short Description	Planned/ Baseline Date	Location	Comment
MS0	Kick-off meeting	2018.03.15	DMCS, Lodz	
MS1	Specification and requirement analysis phase	2018.10.01	Video conference	
MS2	Conceptual design for software	2018.11.01	ESS, Lund	
MS3	Prototype version of the FW and software components	2018.12.01	Video conference	Finished - tested in Linac4.
MS5	Progress meetings	Quarterly	ESS, Lund/Partner Premises	
MS7	CDR of WU 2 nBLM	2019.02.06	Partner premises	Done
MS6	Test plan and report	2020.06.01	Video conference	

WU 2 - nBLM controls and realization – Milestones

Milestone ID	Short Description	Planned/ Baseline Date	Location	Comment
MS8.1	Production FW and software version delivery	2020.01.01	ESS, Lund	nBLM FW version delivery for warm accelerator commissioning
MS9.1	SAR	2020.01.01	ESS, Lund	
MS8.2	Production FW and software version delivery	2021.04.01	ESS, Lund	Final version - ready for deployment and commissioning (with FBIS interface, LLL, and integration of ICS-ESS components)
MS9.2	SAR	2021.05.01	ESS, Lund	
MS10	Final report	2021.06.01		

WU 2 – nBLM controls and realization – Deliverables

Del. ID	Main deliverables	Delivery MS	Acceptance Criteria type	Comment
D2.1	Specification revision	MS1	Review	
D2.2	Firmware with functionallity realization	MS10	Review	
D2.3	Device driver and User space driver	MS10	Review	
D2.4	~~Epics device suport~~	~~MS10~~	~~Review~~	
D2.5	~~OPI GUI~~	~~MS10~~	~~Review~~	
D2.6	Test Plan	MS10	Test report	

WU 2 – Deliverables - Status

- **nBLM dedicated FW/SW development mostly finalized on the DMCS side,**
- **Solutions evaluated in two LINAC 4 tests – last -> Dec. 2019,**

- Unresolved issues:
  - input to interlock system,
  - smart trigger,
  - timing,
  - DOD, etc…
- Progress and issues discussed on the weekly meetings

- Decisions concerning in-kind completion needed:
  - Scenario for missing components (final) implementation,
  - Scope swap and extension for commissioning activities.

WU 2 - icBLM controls and realization – Milestones

Milestone ID	Short Description	Planned /Baseline Date	Location	Comment
MS0	Kick-off meeting	2018.03.15	DMCS, Lodz	
MS7	CDR of WU 2 icBLM	2019.02.01	Partner premises	CDR have been done at the same time but limited to the HW platform evaluation
MS1	Specification and requirement analysis phase	2019.05.01	Video conference	
MS7.2	CDR follow-up	2019.05.01	ESS, Lund	Finalizing digitizer board integration on the carrier board.
MS2	Conceptual design for software	2019.06.01	ESS, Lund	
MS3	Prototype version of the FW and software components	2019.07.01	Video conference	
MS5	Progress meetings	Quarterly	ESS, Lund/Partner Premises	

WU 2 - icBLM controls and realization – Milestones

Milestone ID	Short Description	Planned /Baseline Date	Location	Comment
MS6	Test plan and report	2020.06.01	Video conference	
MS8.1	Production FW and software version delivery	2020.09.01	ESS, Lund	Ready for warm linac commissioning. Taking into account Cov-19 delay and readiness of other subsystems (eq. High voltage PS with modulation)
MS9.1	SAR	2020.10.01	ESS, Lund	icBLM FW/SW version acceptance review for warm accelerator commissioning
MS8.2	Production FW and software version delivery	2021.03.01	ESS, Lund	Final version delivery (with adjustments from first delivery operation experience)
MS9.2	SAR	2021.04.01	ESS, Lund	
MS10	Final report	2021.06.01		

WU 2 – icBLM controls and realization – Deliverables

Del. ID	Main deliverables	Delivery MS	Acceptance Criteria type	Comment
D2.1	Specification revision	MS1	Review	
D2.2	Firmware with functionallity realization	MS10	Review	
D2.3	Device driver and User space driver	MS10	Review	
D2.4	Epics device suport	MS10	Review	
D2.5	OPI GUI	MS10	Review	
D2.6	Test Plan	MS10	Test report	

WU 2 icBLM – Deliverables - Status

- **icBLM dedicated FW/SW development in progress,**
- **Most components FW/SW provided according to the specification,**
- **IOC for icBLM – under development and evaluation,**
- **FW/SW available in the ESS GIT repositories for testing and evaluation,**

- Real (*in-situ)* verification required for the system to identify solution weak points – possible updates,
- Multiple board configuration – under test
- Backplane distributed clock based timestamp
- Feedback on the user side GUI requirements is required (single drawing from blackboard is still a reference),
- Set of „Issues” to be defined in Gitlab in order to track missing/open points

WU 3 – IPMI EPICS integration - Milestones

Milestone ID	Short Description	Planned/Baseline Date	Location	Comment
MS1	Specification and requirement analysis phase	2019.03.01	Video conference	
MS2	Conceptual design for software	2019.03.01	ESS, Lund	
MS3	Prototype version of the software components	2019.10.01	Video conference	
MS4	Progress meetings	Quarterly	ESS, Lund/Partner Premises	
MS6	CDR of WU 3	2020.10.01	Partner premises	to be clarified?

WU 3 – IPMI EPICS integration - Milestones

Milestone ID	Short Description	Planned/ Baseline Date	Location	Comment
MS6	Production software version delivery	2020.10.01	ESS, Lund	
MS7	SAR	2020.11.01	ESS, Lund	
MS5	Test plan and report	2020.01.01	Video conference	
MS6.2	Production software version delivery	2020.06.01	ESS, Lund	Ready for single MTCA system proposed by ESS-ICS (example crate).
MS7.2	SAR	2020.08.01	ESS, Lund	
MS10	Final report	2020.09.01		

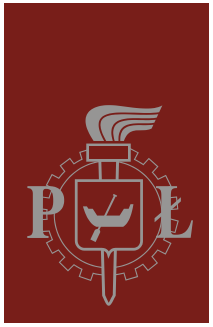
- Do We need to proceed with the CDR?
- Current state – MS6 to be completed within days, minor modifications and testing needed,
- MS7 –SAR – maybe it can be realized as a dedicated setu-up test on the ESS side by Anders?

WU 3 – IPMI EPICS integration – Deliverables

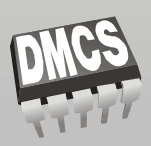
Del. ID	Main deliverables	Delivery MS	Acceptance Criteria type	Comment
D3.1	Specification revision	MS1	Review	
D3.2	Low Level library (communication with MCH)	MS10	Review	
D3.3	Daemon service for constant monitoring	MS10	Review	
D3.4	Epics device support	MS10	Review	
D3.5	IOC integration	MS10	Review	
D3.6	OPI GUI	MS10	Review	
D3.7	Test Plan	MS10	Test report	

WU 3 E4I – Deliverables - Status

- Epics 4 IPMI functionallity provided according to the TA scope,
- All software components - nearly done,
- Solution (library, ASYN based IOC – as E3 modules, revised OPIs) evaluated locally (LLRF Golden Crate) and @ESS side – Fabio, Anders,
- See Wojtek/Kacper/Piotr presentation for details,
- Question about the future of this effort – DMCS involvement in the deployment/commissioning process.



Thank you for your attention



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