



E-linac Equipment Commissioning Plan

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1	2014-06-19	Equipment commissioning plan with and without beam for ELBT and ELBD but no EINJ	M. Marchetto
2	2014-09-05	Equipment commissioning plan with and without beam for EMBT and EMBD but no EINJ	M. Marchetto
3	2014-07-22	Updated role assignments on paragraph 2 and 3. Corrected some typos.	M. Marchetto

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1 Introduction

This document is the commissioning plan for the installed equipment; the present plan follows the directives of the E-linac Commissioning Plan (document-108335).

The execution of this plan follows the commissioning plan of each individual e-linac sub-system where applicable.

The equipment commissioning plan is divided in two parts: without and with beam. The equipment commissioning with beam is only meant to verify the functionality of specific equipment and not to accept equipment based on beam property (this last is responsibility of the E-linac Beam Commissioning Plan).

1.1 Purpose

The goal of the equipment commissioning is to integrate all the e-linac sub-system after they are commissioned by the relative system expert.

This plan covers also the commissioning of sub-systems where only a pre-requisite list is required from the system expert; this is for example the case of beam line magnets sub-system and related power supply sub-system where an integration is not foreseen prior to this plan.

Ultimately, this plan aims to verify that the equipment as a whole is controllable from the e-linac control room (ELCR) and ready for beam commissioning.

1.2 Referenced documents

This document refers to the following TRIUMF document:

- E-linac commissioning Plan: [document-108335](#)
- E-linac beam commissioning Plan: document-109780
- All pre-requisite and commissioning documents of individual sub-system as listed in paragraph 4
- ELBT/ELBD beam line drawings:
 - E-GUN/ELBT/ELBD/EINJ overall assembly: TEL2955.dwg
 - E-GUN DB1: TEL 2886.dwg
 - ELBT DB0: TEL 2887.dwg
 - ELBT DB2: TEL 2888.dwg
 - ELBD DB0: TEL 2889.dwg
 - ELBD DB1: TEL 2926.dwg
- EMBT/EMBD beam line drawings:
 - EMBT/EMBD overall assembly: TEL3010.dwg

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- EMBD:MB0: TMD0010.dwg
- EMBT:MB5A: TMD0011.dwg
- EMBT:MB5C: TMD0012.dwg
- EMBT Section 1: TEL4120.dwg
 - EMBT:DB0: TEL2738.dwg
- EMBT Section 2: TEL4121.dwg
- EMBT Section 3: TEL4122.dwg
 - EMBT:DB4: TEL2739.dwg
- EMBT Section 4: TEL4123.dwg
 - EMBT:DB5A: TEL2741.dwg
 - EMBT:DB5B: TEL2742.dwg
- EMBT Section 5: TEL4124.dwg
 - EMBT:DB6: TEL2743.dwg
- EMBD Section 1: TEL4125.dwg
 - EMBD:DB2: TEL2740.dwg

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2 System to be commissioned

The following list contains the sub-systems required to be ready in order to complete this equipment commissioning plan. For each of them it is indicated the relative system expert, and whether a commissioning plan or a pre-requisites list is requested. A commissioning plan is preceded by the relative pre-requisites list approved by the system expert.

- Buncher and deflector cavity: Vladimir Zvyagintsev, commissioning plan
- Cryogenic systems (Liquid Helium Storage and Distribution, Liquid Nitrogen and Sub-Atmospheric): Alexey Koveshnikov commissioning plans
- Diagnostic: Victor Verzilov, commissioning plan
- E-gun: Friedhelm Ames, commissioning plan
- EPICS controls system: Jane Richards, pre-requisite list
- High Power RF: Vladimir Zvyagintsev, commissioning plan
- EINJ cryostat system: Robert Laxdal, commissioning plan
- EACA cryostat system: Robert Laxdal, commissioning plan
- Machine protection system: Don Dale, commissioning plan
- Magnet power supplies: Dan Louie, pre-requisite list
- Magnets: Doug Preddy, pre-requisite list
- Radiation monitor system: John Drozdoff, commissioning plan
- Oxygen deficiency system: Anne Trudel, commissioning plan
- Vacuum: Dimo Yosifov, commissioning plan

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3 Commissioning team

The commissioning team is composed by:

- Head of Commissioning (HC): Shane Koscielniak
- Equipment Coordinator (EC): Marco Marchetto
- Beam Coordinator (BC): Thomas Planche
- Training Coordinator (TC): Violeta Toma
- Seconded Operator (SO): Brandon Humphries

The following persons are delegates:

- Iouri Bylinskii
- Friedhelm Ames
- Suresh Saminathan

3.1 Overall responsibility

According to the E-linac commissioning plan (paragraph “*Head of Commissioning (HC)*”), the overall responsibility for the commissioning plan lies with the head of the commissioning team.

3.2 Specific responsibility

According to the E-linac commissioning plan (paragraph “*Equipment Coordinator (EC)*”) the responsibility for the equipment commissioning plan and its execution lies with the equipment commissioning coordinator.

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4 Pre-requisites

There are two types of prerequisites documents required in order to proceed with the equipment commissioning plan. The type depends on the sub system as reported in the following paragraph of the present chapter 4. The required prerequisites are grouped by area.

It is responsibility of the equipment commissioning coordinator to verify that a commissioning record for each system exists.

Each document existence is verified by writing the released document number on the related table.

4.1 Sub-system prerequisites list for magnets and power supplies

The list of sub-system prerequisites (Table 1) for magnets and power supplies must be complete before proceeding with the magnets and power supplies commissioning plan (see 8.1).

Table 1. Sub-system prerequisites list for magnets and power supplies.

Sub-system	Prerequisites list document			
	ELBT-ELBD	EMBT-EMBD	EABT-EABD	EHAT-EHDT
Magnet power supply				
Magnets				
Controls				

4.2 Sub-system commissioning plan records

The list of commissioning plan records forms the pre-requisites to proceed with this commissioning plan. The columns in Table 2, Table 3 and Table 4 must be completed where applicable prior to execute the equipment commissioning plan for a certain area (see 8.2).

Table 2. Stand-alone sub-system commissioning records.

Sub-system	Commissioning record document
E-gun	
Cryogenic	

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Sub-system	Commissioning record document
Oxygen deficiency	
Radiation monitor	
Machine protection	

Table 2. Stand-alone sub-system commissioning records.

Table 3. Beam lines sub-system commissioning records.

Sub-system	Commissioning record document			
	ELBT-ELBD	EMBT-EMBD	EABT-EABD	EHAT-EHDT
HPRF (buncher and deflector)				
Beam operating envelope				
Diagnostic				
Vacuum				
Controls				

Table 4. Accelerating modules sub-system commissioning record.

Sub-system	Commissioning record document		
	EINJ	EACA	EACB
Cryogenic			
Cryostat			
SRF cavity			
HPRF (klystron and distribution)			

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5 Acceptance criteria

The following are acceptance criteria considered in this commissioning plan:

1. The device is operable (safely) through EPICS: it has been exercised through (and found compliant with) all the states required for beam delivery; in particular, its status can be changed by using commands and/or setpoints and verified by LED status and/or readbacks and it is limited to values that are safe for equipment.
2. The magnet (quadrupole, dipole, correction bender or solenoid) has polarity compliant with beam delivery; in particular, the polarity, beam line orientation and GUI are all consistent with right handed coordinate system. The polarity is reversible where required. Verification of the strength of the magnets is recorded elsewhere, see the following link http://beamphys.triumf.ca/~tplanche/magnetic_measurements/.
3. Each Faraday cup is capable of measuring the peak current, as needed for diagnosis and monitoring of beam transport. The peak current is the current measured in a 17ns timeframe.
4. Each view screen is capable of producing a transverse image of the beam spot.
5. Each profile monitor (linear profile monitor or fast wire scanner) is capable of measuring the beam horizontal and vertical transverse profiles.
6. Each RF shield is capable of measuring the beam current (after calibration against a FC), as needed for diagnosis and monitoring of beam transport.
7. Each RF system (buncher, deflector cavity, injector and accelerator cryomodes) are capable of changing the longitudinal beam properties of the beam according to their functionality. The buncher is expected to reduce the time spread. The deflector cavity is expected to rotate the longitudinal phase space into a transverse. The injector and accelerator cryomodes are expected to increase the beam energy.
8. The vacuum system status is readable through EPICS, as is required to verify vacuum compatibility with beam transport. Verification of the control of vacuum components is recorded elsewhere, see vacuum commissioning report document in Table 3.

The acceptance criteria are validated through a number of steps with and without beam as listed in the tables of paragraphs 8 and 9. The validation requests in these tables are formulated such that a positive response (yes) is equivalent to pass. A positive outcome of all validation requests for a single component or sub-system translates into acceptance.

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6 Records of commissioning

The commissioning report will include the filled tables of paragraph 8 and 9 according to the result of the commissioning. The report may also include any additional relevant information acquired during commissioning.

Upon completion of the commissioning plan for the first section, a commissioning report will be produced as first release. Subsequent releases of the same document will be produced in accordance with the completion of the equipment commissioning of other sections.

7 Safety

Access to the vault is required during equipment commissioning without beam. Precautions must be taken to prevent personnel to come into contact with equipment under commissioning (example, when energizing an optics element or actuating a diagnostic device); precautions can range from roping off the beam line, post sign or having a member of the commissioning team close by the equipment.

8 Equipment commissioning plan without beam

The following paragraphs contain the commissioning plan grouped by area. Plan in different area may be executed at different stages.

8.1 Magnets and power supply commissioning plan

This is the commissioning plan for the beam lines magnets and power supply system. The plan is organized in tables divided by geographic area: ELBT-ELBD, EMBT-EMBD, EABT-EABD and EHAT-EHDT. The columns of the following tables contain (left to right): the element to be commissioned, the step of the sequence, the action to be performed at the relative step, the acceptance request, the acceptance outcome and possible comments.

Each element is operated through EPICS. For handedness purposes the beam moves in a right handed coordinate system; at the gun location x is horizontal oriented to the left, y is vertical oriented upward with the beam moving longitudinally along positive z.

8.1.1 ELBT-ELBD magnet and power supply commissioning plan

This is the commissioning plan for the ELBT and ELBD area. As starting point, all the ELBT and ELBD magnetic elements are turned off and degaussed where applicable.

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:HC	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Measured the magnetic field above the ELBT buncher	N/A		
	3	Set current to +40 A	Is the field at the measured buncher location decreased?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:HC	4	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EGUN:XCBO	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +0.3 A	Is the EPICS readback the same as the relative power supply?		
	3	Set current -0.3 A	Is the polarity reversed?		
	4	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EGUN:YCB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +0.3 A	Is the EPICS readback the same as the relative power supply?		
	3	Set current -0.3 A	Is the polarity reversed?		
	4	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EGUN:SOL1	1	Locate the element in the EPICS GUI	Is the element present?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EGUN:SOL1	2	Set current to +5 A	Is the magnetic field direction going from negative to positive z?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EGUN:XCBI	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EGUN:YCB1	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:XCBO	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:XCB0	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:YCB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:SOL1	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction going from negative to positive z?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:SOL1	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:XCB1A	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:YCB1A	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:YCB1A	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:XCB1B	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:YCB1B	1	Locate the element in the EPICS GUI	Is the element present?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:YCB1B	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:SOL2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction going from negative to positive z?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:XCB2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:YCB2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		

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Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:YCB2	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBD:MB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +0.5 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +0.5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -0.5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
	6	Degauss the solenoid via EPICS	Is the solenoid degaussed?		
ELBD:YCB0A	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBD:YCB0A	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBD:XCB0B	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBD:YCB0B	1	Locate the element in the EPICS GUI	Is the element present?		

Table 5. ELBT/ELBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBD:YCB0B	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBD:SOL1	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction going from negative to positive z?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

8.1.2 EMBT-EMBD magnet and power supply commissioning plan

This is the commissioning plan for the EMBT and EMBD area. As starting point, all the EMBT and EMBD magnetic elements are turned off and degaussed where applicable.

The polarity of a quadrupole is checked by looking along the beam direction (from downstream to upstream) at the field direction between the two top (positive y) poles. Also for any quadrupole a positive current is going to produce a focusing field along the x axis.

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:HC	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Measured the magnetic field above the ELBT buncher	N/A		
	3	Set current to +40 A	Is the field at the measured buncher location decreased?		
	4	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:XCBO	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:XCB0	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:YCB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:Q1	1	Locate the element in the EPICS GUI	Is the element present?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:Q1	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:XCBI	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:YCB1	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:XCB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
ELBT:XCBO	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
ELBT:YCB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:Q2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		

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Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:Q2	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:XCB2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:YCB2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:YCB2	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:Q3	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:XCB3	1	Locate the element in the EPICS GUI	Is the element present?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:XCB3	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:YCB3	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBD:MB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +0.5 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +0.5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -0.5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
	6	Degauss the solenoid via EPICS	Is the solenoid degaussed?		
EMBT:Q4	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:Q4	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:XCB4	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:YCB4	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:YCB4	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:Q5	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:MB5A	1	Locate the element in the EPICS GUI	Is the element present?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:MB5A	2	Set current to +0.5 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +0.5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -0.5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
	6	Degauss the solenoid via EPICS	Is the solenoid degaussed?		
EMBT:YCB5A	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:YCB5A	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:Q5B	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:XCB5B	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:XCB5B	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:YCB5B	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:YCB5B2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:YCB5B2	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:MB5C	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +0.5 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +0.5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -0.5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
	6	Degauss the solenoid via EPICS	Is the solenoid degaussed?		
EMBT:YCB5C	1	Locate the element in the EPICS GUI	Is the element present?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:YCB5C	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:Q6	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:Q7	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:XCB7	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBT:XCB7	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBT:YCB7	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBD:YCB0	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBD:YCB0	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBD:Q1	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBD:XCB1	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBD:XCB1	3	Set current to +1A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBD:YCB1	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBD:Q2	1	Locate the element in the EPICS GUI	Is the element present?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBD:Q2	2	Set current to +5 A	Is the magnetic field direction between the top poles going from positive to negative x?		
	3	Set current to +5 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -5 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		
EMBD:XCB2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from negative to positive y?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

Table 6. EMBT/EMBD magnet and power supply commissioning plan.

Element	Step	Action	Validation request	Passed	Comment
EMBD:YCB2	1	Locate the element in the EPICS GUI	Is the element present?		
	2	Set current to +1 A	Is the magnetic field direction going from positive to negative x?		
	3	Set current to +1 A	Is the EPICS readback the same as the relative power supply?		
	4	Set current -1 A	Is the polarity reversed?		
	5	Enter current numerically above the slider limit	Does the current setpoint stop at the slider limit?		

8.1.3 EABT-EABD magnet and power supply commissioning plan

8.1.4 EHAT-EHDT magnet and power supply commissioning plan

8.2 Commissioning plan for sub-systems

The following paragraphs contain the commissioning plans without beam for sub-system. The plans are subdivided by areas.

8.2.1 ELBT-ELBD sub-system

This is the commissioning plan for the ELBT and ELBD area, each action (third column of Table 7) is referred exclusively to this area. The goal is the test only the basic operational functionality for different sub-system since the detailed check of every element of each sub-system has already been performed during the relative commissioning plan (see Table 3).

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Vacuum	1	Locate the vacuum overview page	Is the vacuum overview page present?		
	2		Is the isolation valve status readable?		
	3		Is the vacuum in each section readable?		
	4		Is the pumping system status readable?		
Magnets	1	Check element sequence	Are the magnets displayed in the correct sequence?		
	2		Is a setpoint slider present for each magnet?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Magnets	3		Does each slider have the correct limits?		
	4		Is a readback present for each magnet?		
	5		Is a call up windows present for each magnet?		
	6		Is the device note present?		
Diagnostic	1	Check element sequence, starting from EGUN optics page	Is the diagnostics displayed in the correct sequence?		Based on TEL2955 sheet 3
Diagnostic EGUN:FC1	1	Check EGUN:FC1 ¹	Is a call up window present?		
	2	Open the call up window	Are an IN and an OUT button present for each FC?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		
	5	Drive the FC IN and OUT	Does the FC go IN and OUT?		

¹ FC stands for Faraday cup

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EGUN:VS1	1	Check EGUN:VS1 ²	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		
	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		

² VS stands for View screen

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Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EGUN:VS1	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		
Diagnostic EGUN:RFSH1	1	Check EGUN:RFSH1	Is a call up windows present?		
	2	Call up the window	Are an IN and an OUT button present for each FC?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		
Diagnostic EGUN:BPM1 ³	1	Check ELBT:BMP1	Is a call up windows present?		

³ BPM stands for beam position monitor

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EGUN:BPM1	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic ELBT:VS0	1	Check ELBT:VS0	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		
	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBT:VS0	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		
Diagnostic ELBT:RFSH0	1	Check ELBT:RFSH0	Is a call up windows present?		
	2	Call up the window	Are an IN and an OUT button present for each FC?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBT:MCOL0 ⁴	1	Check ELBT:MCOL0	Is a call up window present?		
	2	Open the call up window	Are multiple positions button present for each COL?		
	3		Are position readbacks present?		
	5		Is the device note present?		
	6	Drive the COL IN and OUT through different positions	Does the LPM go IN and OUT?		
Diagnostic ELBT:BMP1	1	Check ELBT:BMP1	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic ELBT:FC2	1	Check ELBT:FC2	Is a call up window present?		
	2	Open the call up window	Are an IN and an OUT button present for each FC?		

⁴ MCOL stand for multiple collimators.

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBT:FC2	3		Are readback and gain selection present?		
	4		Is the device note present?		
	5	Drive the FC IN and OUT	Does the FC go IN and OUT?		
Diagnostic ELBT:VS2	1	Check ELBT:VS2	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		
	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBT:VS2	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		
Diagnostic ELBT:RFSH2	1	Check ELBT:RFSH2	Is a call up windows present?		
	2	Call up the window	Are an IN and an OUT button present for each FC?		
	3		Are readback and gain selection present?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBT:RFSH2	4		Is the device note present?		
Diagnostic ELBT:BPM2	1	Check ELBT:BMP2	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic ELBD:VS0	1	Check ELBD:VS0	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		
	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBD:VS0	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		
Diagnostic ELBD:LPM0 ⁵	1	Check ELBT:LPM0	Is a call up window present?		
	2	Open the call up window	Are an IN , X, Y and OUT button present for each LPM?		
	3		Are position readbacks present?		

⁵ LPM stands for linear profile monitor

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Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBD:LPM0	4		Is a graph window present?		
	5		Is the device note present?		
	6	Drive the LPM IN and OUT through different positions	Does the LPM go IN and OUT?		
Diagnostic ELBD:BPM0	1	Check ELBD:BPM0	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic ELBD:VS1	1	Check ELBD:VS1	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		
	4		Are the VS position readbacks present?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBD:VS1	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		
Diagnostic ELBD:FC1	1	Check ELBD:FC1	Is a call up window present?		

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Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic ELBD:FC1	2	Open the call up window	Are readback and gain selection present?		
	3	Check ELBD:COL1	Is a call up window present?		
	4	Open the call up window	Are readback and gain selection present?		
	5		Is the device note present?		
Buncher and deflector cavities	1	Check element sequence	Are the buncher and deflector cavity displayed in the correct sequence?		
Buncher cavity	1		Is the call up window present for the buncher?		
	2	Call up the buncher window	Is an RF ON/OFF and AUTO ON button present?		
	3		Is an RF amplitude slider and relative radback present?		

Table 7. ELBT and ELBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Buncher cavity	4		Is an RF phase slider and relative readback present?		
	5		Is the device note present?		
Deflector cavity	1		Is the call up window present for the deflector?		
	2	Call up the deflector window	Is an RF ON/OFF and AUTO ON button present?		
	3		Is an RF amplitude slider and relative readback present?		
	4		Is an RF phase slider and relative readback present?		
	5		Is the device note present?		

8.2.2 EMBT-EMBD sub-system

This is the commissioning plan for the EMBT and EMBD area, each action is (third column of Table 8) is referred exclusively to this area. The goal is the test only the basic operational functionality for different sub-system since the detailed check of every element of each sub-system has already been performed during the relative commissioning plan (see Table 3).

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Vacuum	1	Locate the vacuum overview page	Is the vacuum overview page present?		
	2		Is the isolation valve status readable?		
	3		Is the vacuum in each section readable?		
	4		Is the pumping system status readable?		
Magnets	1	Check element sequence	Are the magnets displayed in the correct sequence?		
	2		Is a setpoint slider present for each magnet?		
	3		Does each slider have the correct limits?		

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Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Magnets	4		Is a readback present for each magnet?		
	5		Is a call up windows present for each magnet?		
	6		Is the device note present?		
Diagnostic	1	Check element sequence, starting from EMBT optics page	Is the diagnostics displayed in the correct sequence?		Based on TEL3010 sheet 1
Diagnostic EMBT:BPM0	1	Check EMBT:BMP0	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic EMBT:VS0	1	Check EMBT:VS0	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:VS0	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:RFSH0	1	Check EMBT:RFSH0	Is a call up windows present?		
	2	Call up the window	Are an IN and an OUT button present for each RFSH?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		
Diagnostic EMBT:BPM2	1	Check EMBT:BPM2	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic EMBT:VS4	1	Check EMBT:VS4	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:VS4	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:RFSH4	1	Check EMBT:RFSH0	Is a call up windows present?		
	2	Call up the window	Are an IN and an OUT button present for each RFSH?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		
Diagnostic EMBT:FWS4	1	Check EMBT:FWS4	Is a call up windows present?		
	2	Call up the window	Is a scan button present for each FWS?		
	3		Are profile graph and gain selection present?		
	4		Is the device note present?		
Diagnostic EMBT:BPM4	1	Check EMBT:BPM4	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:VS5B	1	Check EMBT:VS5B	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		
	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		

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Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:VS5B	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		
Diagnostic EMBT:RFSH5B	1	Check EMBT:RFSH5B	Is a call up windows present?		
	2	Call up the window	Are an IN and an OUT button present for each RFSH?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		
Diagnostic EMBT:FWS5B	1	Check EMBT:FWS5B	Is a call up windows present?		
	2	Call up the window	Is a scan button present for each FWS?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:FWS5B	3		Are profile graph and gain selection present?		
	4		Is the device note present?		
Diagnostic EMBT:BPM5B	1	Check EMBT:BPM5B	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic EMBT:BPM5C	1	Check EMBT:BPM5C	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic EMBT:VS6	1	Check EMBT:VS6	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:VS6	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		
	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		

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Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:RFSH6	1	Check EMBT:RFSH6	Is a call up windows present?		
	2	Call up the window	Are an IN and an OUT button present for each RFSH?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		
Diagnostic EMBT:FC6	1	Check EMBT:FC6	Is a call up window present?		
	2	Open the call up window	Are an IN and an OUT button present for each FC?		
	3		Are readback and gain selection present?		
	4		Is the device note present?		
	5	Drive the FC IN and OUT	Does the FC go IN and OUT?		
Diagnostic EMBT:BPM7	1	Check EMBT:BPM7	Is a call up windows present?		

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Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBT:BPM7	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic EMBD:BPM1	1	Check EMBD:BPM1	Is a call up windows present?		
	2	Call up the window	Are position and intensity readbacks present?		
	3		Is the device note present?		
Diagnostic EMBD:VS2	1	Check EMBT:VS5B	Is a call up window present?		
	2	Call up the window	Are OUT, target1, target2, target3 and IN buttons present?		
	3		Is the setpoint entry present?		
	4		Are the VS position readbacks present?		
	5		Is the camera button present?		
	6	Call up the camera	Is the camera window present?		

Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBD:VS2	7	Turn the camera ON	Is the ladder image visible?		
	8	Move the ladder in all the target positions and fully IN	Does the ladder move in all the positions?		
	9	Turn the camera OFF	Does the camera turn off?		
	10	Check the exposure time	Does the readback follow the setpoint?		
	11	Check the iris opening	Does the readback follow the setpoint?		
	12	Check the trigger delay time	Does the readback follow the setpoint?		
	13	Check the saturation indicator	Is it present?		
	14		Is the device note present?		
Diagnostic EMBD:FWS2	1	Check EMBD:FWS2	Is a call up windows present?		
	2	Call up the window	Is a scan button present for each FWS?		

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Table 8. EMBT and EMBD commissioning plan without beam.

Sub-system	Step	Action	Validation request	Passed	Comment
Diagnostic EMBD:FWS2	3		Are profile graph and gain selection present?		
	4		Is the device note present?		

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9 Equipment commissioning plan with beam

The following paragraphs contain the commissioning plans with beam for sub-system. The plans are subdivided by area. This part of the plan is executed in collaboration with system experts where applicable.

The beam parameters are selected in order to operate safely any diagnostic device. An average beam power of 0.3W is deemed safe for the view screen. This implies an average beam current of 0.1 μ A that can be achieved with a 0.1 mA peak current and 0.1% duty factor for 100V cathode bias. A 1 kHz repetition rate will produce then a 1 μ s pulse length.

9.1 ELBT/ELBD equipment commissioning plan with beam

Prior to commence the equipment commissioning with beam it is necessary to check the initial settings for optics and diagnostic. Since the optics settings depend on the final destination, we distinguish between ELBT and ELDB commissioning plan.

9.1.1 ELBT equipment commissioning plan with beam

The initial optics and diagnostic settings for the ELBT commissioning plan are listed in Table 9. For completeness we list also the source setting.

Table 9. ELBT initial settings.

DEVICE	Setting	Checked
EGUN:CATHB	100 V	
Repetition rate	1 kHz	
Duty factor	0.1 %	
RF amplitudes	enough to produce 0.1mA peak current (~ -24.5 dBm)	
All correction bender	set at 0A unless otherwise specified	
EGUN:HC	Enough to produce +3 G	
EGUN:SOL1	+3.15 A	
EGUN:YCB0	-0.09 A	
EGUN:FC1	IN set at 5mA gain	
ELBT buncher	Buncher off and detuned	
ELBT:RFSH0	IN	
ELBT:SOL1	+3.87 A	

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ELBD:MB0	Degaussed and 0 A	
ELBT:SOL2	+3.26 A	
ELBT:FC2	Locked IN set at 5mA gain	

Table 9. ELBT initial settings.

The ELBT equipment commissioning plan is contained in the following Table 10.

Table 10. ELBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Diagnostic	1	EGUN:FC1	Check EGUN:FC1	Is the readback 0.1mA?		
	2	EGUN:FC1	Change to 20 mA gain	Is the readback 0.1mA?		
	1	ELBT:FC2	Check ELBT:FC2	Is the readback 0.1mA?		
	2	ELBT:FC2	Change to 20 mA gain	Is the readback 0.1mA?		
	1	ELBT:FC2	Insert EGUN:VS1	Is the beam visible on the screen?		
	1	ELBT:FC2	Check EGUN:BPM1	Are the signals readable above background?		
Magnets	1	ELBT:FC2	Change EGUN:SOL1 current?	Does the beam spot change at EGUN:VS1?		

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Table 10. ELBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Magnets	1	ELBT:FC2	Exercise EGUN:XCB0 with EGUN:SOL1 off	Does the beam move along x on EGUN:VS1?		
	2	ELBT:FC2	Exercise EGUN:YCB0 with EGUN:SOL1 off	Does the beam move along y on EGUN:VS1?		
Diagnostic	1	ELBT:FC2	Insert the EGUN:RFSH1	Is a current signal visible above background?		
	1	ELBT:FC2	Striptool the ELBT:FC2 and a ELBT:MCOL position readback, then move ELBT:MCOL to the IN limit	Is the current profile on the striptool consistent with the transit of the different collimators?		
	1	ELBT:FC2	Insert ELBT:VS0	Is the beam visible on the screen?		
Magnets	1	ELBT:FC2	Exercise EGUN:XCB1	Does the beam move along x on ELBT:VS0?		
	2	ELBT:FC2	Exercise EGUN:YCB1	Does the beam move along y on ELBT:VS0?		

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Table 10. ELBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Diagnostic	1	ELBT:FC2	Insert the ELBT:RFSH0	Is a current signal visible above background?		
	1	ELBT:FC2	Check ELBT:BPM1	Are the signals readable above background?		
	1	ELBT:FC2	Check ELBT:BPM2	Are the signals readable above background?		

9.1.2 ELBD equipment commissioning plan with beam

The initial optics and diagnostic settings for the ELBD commissioning plan are listed in Table 11. For completeness we list also the source setting. The RF commissioning will be done only in a no-beam loading regime; commissioning at different current regimes will be performed during the beam commissioning (see document-109780).

Table 11. ELBD initial settings.

DEVICE	Setting	Checked
EGUN:CHT	100 V	
Repetition rate	1 kHz	
Duty factor	0.1 %	
RF amplitudes	enough to produce 0.1mA peak current (~ -24.5 dBm)	
All correction bender	set at 0A unless otherwise specified	
EGUN:HC	Enough to produce +3 G	
EGUN:SOL1	+2.6 A	
EGUN:XCB0	0 A	

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EGUN:YCB0	-0.09A	
EGUN:FC1	IN set at 5mA gain	
ELBT buncher	Buncher off and detuned	
ELBT:RFSH0	IN	
ELBT:SOL1	off	
ELBD:MB0	+0.4 A	
ELBD:VS0	OUT	
ELBD:LPM0	OUT	
ELBD:SOL1	+2.6 A	
ELBD:VS1	OUT	
ELBT:FC2	Locked IN set at 5mA gain	

Table 11. ELBD initial settings.

The ELBD equipment commissioning plan is contained in the following Table 12.

Table 12. ELBD equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Magnets	1	ELBD:FC1	Set ELBD:MB0 to xxx A	Is the beam present at ELBD:FC1?		
Diagnostic	1	ELBD:FC1	Check ELBD:FC1	Is the readback 0.1mA?		
	2	ELBD:FC1	Change to 20 mA gain	Is the readback 0.1mA?		
	3	ELBD:FC1	Check ELBD:COL1	Is a current present on the collimator?		
	1	ELBD:FC1	Insert ELBD:VS0	Is the beam visible on the screen?		

Table 12. ELBD equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Diagnostic	1	ELBD:FC1	Run ELBD:LPM0 to the IN limit	Is the beam profile visible on the graph?		
	2	ELBD:FC1	Run ELBD:LPM0 to the OUT limit	Is the LPM out?		
	1	ELBD:FC1	Check ELBD:BPM0	Are the signals readable above background?		
	1	ELBD:FC1	Insert ELBD:VS1	Is the beam visible on the screen?		
Magnets	1	ELBD:FC1	Change ELBD:SOL1 current?	Does the beam spot change at ELBD:VS1?		
RF	1	ELBD:FC1	Turn on the ELBT buncher	Has the beam moved horizontally on ELBD:VS1?		
	2	ELBD:FC1	Change the buncher phase to center the beam back on ELBD:VS1	Does the beam move back to the center?		
	3	ELBD:FC1	Off set the phase of 45 degree with respect to the previous step and change the buncher amplitude	Does the beam move as the amplitude change?		

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Table 12. ELBD equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
RF	1	ELBD:FC1	Turn on the ELBD deflector	Has the beam moved vertically on ELBD:VS1?		
	2	ELBD:FC1	Change the deflector phase to center the beam back on ELBD:VS1	Does the beam move back to the center?		
	3	ELBD:FC1	Change the deflector amplitude	Does the vertical width change?		

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9.2 EMBT/EMBD equipment commissioning plan with beam

Prior to commence the equipment commissioning with beam it is necessary to check the initial settings for optics and diagnostic. Since the optics settings depend on the final destination, we distinguish between EMBT and EMBD commissioning plan.

9.2.1 EMBT equipment commissioning plan with beam

The initial optics and diagnostic settings for the EMBT commissioning plan are listed in Table 13. For completeness we list also the source setting.

Table 13. EMBT initial settings.

DEVICE	Setting	Checked
EGUN:CATHB	100 V	
Repetition rate	1 kHz	
Duty factor	0.1 %	
RF amplitudes	enough to produce 0.2mA peak current	
All correction bender	set at 0A unless otherwise specified	
ELBT:HC	Enough to produce +3 G	
EMBT:HC	Enough to produce +3 G	
EGUN:SOL1	+2.43 A	
EGUN:YCB0	-0.09 A	
EGUN:FC1	IN set at 5mA gain	
ELBT:RFSH0	IN	
ELBT:SOL1	0 A	
ELBD:MB0	Degaussed and 0 A	
ELBT:SOL2	+1.36 A	
EMBT:Q1	+0.1051 A	
EMBT:Q2	-0.1441 A	
EMBT:Q3	+0.1527 A	
EMBD:MB0		
EMBT:Q4	-0.057 A	
EMBT:Q5	+0.145 A	

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EMBT:MB5A		
EMBT:Q5B	-0.0525 A	
EMBT:MB5C		
EMBT:Q6	+0.128 A	
EMBT:FC6	Locked IN set at 5mA gain	

Table 13. EMBT initial settings.

The EMBT equipment commissioning plan is contained in the following Table 14. This plan include also elements of the ELBT section that could not be commissioned in the previous stage due to the condition that ELBT:FC2 was forced in.

Table 14. EMBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Diagnostic	1	EMBT:FC6	Insert ELBT:VS2	Is the beam visible on the screen?		
Magnets	1	EMBT:FC6	Exercise ELBT:XCB0 with ELBT:SOL1 and ELBT:SOL2 off	Does the beam move along x on ELBT:VS2?		
	2	EMBT:FC6	Exercise ELBT:YCB0 with ELBT:SOL1 and ELBT:SOL2 off	Does the beam move along x on ELBT:VS2?		
	1	EMBT:FC6	Change ELBT:SOL1 current?	Does the beam spot change at ELBT:VS2?		

Table 14. EMBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Magnets	1	EMBT:FC6	Exercise ELBT:XCB1A with ELBT:SOL1 off	Does the beam move along x on ELBT:VS2?		
	2	EMBT:FC6	Exercise ELBT:YCB1A with ELBT:SOL1 off	Does the beam move along x on ELBT:VS2?		
	1	EMBT:FC6	Exercise ELBT:XCB1B with ELBT:SOL1 off	Does the beam move along x on ELBT:VS2?		
	2	EMBT:FC6	Exercise ELBT:YCB1B with ELBT:SOL1 off	Does the beam move along x on ELBT:VS2?		
	1	EMBT:FC6	Change ELBT:SOL2 current?	Does the beam spot change at ELBT:VS2?		
Diagnostic	1	EMBT:FC6	Insert the ELBT:RFSH2	Is a current signal visible above background?		
	1	EMBT:FC6	Check EMBT:BPM0	Are the signals readable above background?		
	1	EMBT:FC6	Insert EMBT:VS0	Is the beam visible on the screen?		

Table 14. EMBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Magnets	1	EMBT:FC6	Exercise ELBT:XCB2 with EINJ off	Does the beam move along x on EMBT:VS0?		
	2	EMBT:FC6	Exercise ELBT:YCB2 with EINJ off	Does the beam move along x on EMBT:VS0?		
Diagnostic	1	EMBT:FC6	Insert the EMBT:RFSH0	Is a current signal visible above background?		
	1	EMBT:FC6	Check EMBT:BPM2	Are the signals readable above background?		
	1	EMBT:FC6	Insert EMBT:VS4	Is the beam visible on the screen?		
Magnets	1	EMBT:FC6	Change EMBT:Q1 current?	Does the beam spot change at EMBT:VS4?		
	1	EMBT:FC6	Exercise EMBT:XCB1 with EMBT:Q2-Q4 off	Does the beam move along x on EMBT:VS4?		
	2	EMBT:FC6	Exercise EMBT:YCB1 with EMBT:Q2-Q4 off	Does the beam move along x on EMBT:VS4?		

Table 14. EMBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Magnets	1	EMBT:FC6	Change EMBT:Q2 current?	Does the beam spot change at EMBT:VS4?		
	1	EMBT:FC6	Exercise EMBT:XCB2 with EMBT:Q3-Q4 off	Does the beam move along x on EMBT:VS4?		
	2	EMBT:FC6	Exercise EMBT:YCB2 with EMBT:Q3-Q4 off	Does the beam move along x on EMBT:VS4?		
	1	EMBT:FC6	Change EMBT:Q3 current?	Does the beam spot change at EMBT:VS4?		
	1	EMBT:FC6	Exercise EMBT:XCB3 with EMBT:Q4 off	Does the beam move along x on EMBT:VS4?		
	2	EMBT:FC6	Exercise EMBT:YCB3 with EMBT:Q4 off	Does the beam move along x on EMBT:VS4?		
	1	EMBT:FC6	Change EMBT:Q4 current?	Does the beam spot change at EMBT:VS4?		
	Diagnostic	1	EMBT:FC6	Insert the EMBT:RFSH4	Is a current signal visible above background?	

Table 14. EMBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Diagnostic	1	EMBT:FC6	Insert EMBT:FWS4	Is the beam profile visible on the screen?		
	1	EMBT:FC6	Check EMBT:BPM4	Are the signals readable above background?		
	1	EMBT:FC6	Insert EMBT:VS5B	Is the beam visible on the screen?		
Magnets	1	EMBT:FC6	Change EMBT:Q5 current?	Does the beam spot change at EMBT: VS5B?		
	1	EMBT:FC6	Exercise EMBT:YCB5A with EMBT:Q5B off	Does the beam move along x on EMBT: VS5B?		
	1	EMBT:FC6	Change EMBT:Q5B current?	Does the beam spot change at EMBT: VS5B?		
Diagnostic	1	EMBT:FC6	Insert the EMBT:RFSH5B	Is a current signal visible above background?		
	1	EMBT:FC6	Insert EMBT:FWS5B	Is the beam profile visible on the screen?		
	1	EMBT:FC6	Check EMBT:BPM5B	Are the signals readable above background?		

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Table 14. EMBT equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Diagnostic	1	EMBT:FC6	Check EMBT:BPM5C	Are the signals readable above background?		

9.2.2 EMBD equipment commissioning plan with beam

The initial optics and diagnostic settings for the EMBD commissioning plan are listed in Table 11. For completeness we listed also the source setting. The RF commissioning will be done only in a no-beam loading regime; commissioning at different current regimes will be performed during the beam commissioning (see document-109780).

Table 15. EMBD initial settings.

DEVICE	Setting	Checked
EGUN:CATHB	100 V	
Repetition rate	1 kHz	
Duty factor	0.1 %	
RF amplitudes	enough to produce 0.2mA peak current	
All correction bender	set at 0A unless otherwise specified	
ELBT:HC	Enough to produce +3 G	
EMBT:HC	Enough to produce +3 G	
EGUN:SOL1	+2.43 A	
EGUN:XCB0	0	
EGUN:YCB0		
EGUN:FC1	IN set at 5mA gain	
ELBT:RFSH0	IN	
ELBT:SOL1	0 A	
ELBT:SOL2	+1.36 A	
EMBT:Q1	+0.905A	

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EMBT:Q2	-0.1665 A	
EMBT:Q3	0.1028 A	
EMBD:MB0		
EMBD:Q1	-0.1423 A	
EMBT:Q2	+0.1552 A	

Table 15. EMBD initial settings.

The ELBD equipment commissioning plan is contained in the following Table 16.

Table 16. EMBD equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Diagnostic	1	EMBD DUMP	Check EMBD DUMP	Is the beam present at EMBD DUMP?		
	1	EMBD DUMP	Check EMBD:BPM1	Are the signals readable above background?		
	1	EMBD DUMP	Insert EMBD:VS2	Is the beam visible on the screen?		
Magnets	1	EMBD DUMP	Change EMBD:Q1 current	Does the beam spot change at EMBT:VS4?		
	1	EMBD DUMP	Exercise EMBT:XCB2 with EMBT:Q2 off	Does the beam move along x on EMBD:VS2?		
	2	EMBD DUMP	Exercise EMBT:YCB2 with EMBT:Q2 off	Does the beam move along y on EMBD:VS2?		

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Table 16. EMBD equipment commissioning plan with beam.

Sub-system	Step	Beam stopper	Action	Validation request	Passed	Comment
Magnets	1	EMBD DUMP	Change EMBT:Q2 current	Does the beam spot change at EMBT:VS4?		
	1	EMBD DUMP	Exercise EMBT:XCB3	Does the beam move along x on EMBD:VS2?		
	2	EMBD DUMP	Exercise EMBT:YCB3	Does the beam move along y on EMBD:VS2?		
Diagnostic	1	EMBD DUMP	Insert EMBD:FWS2	Is the beam profile visible on the screen?		

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