

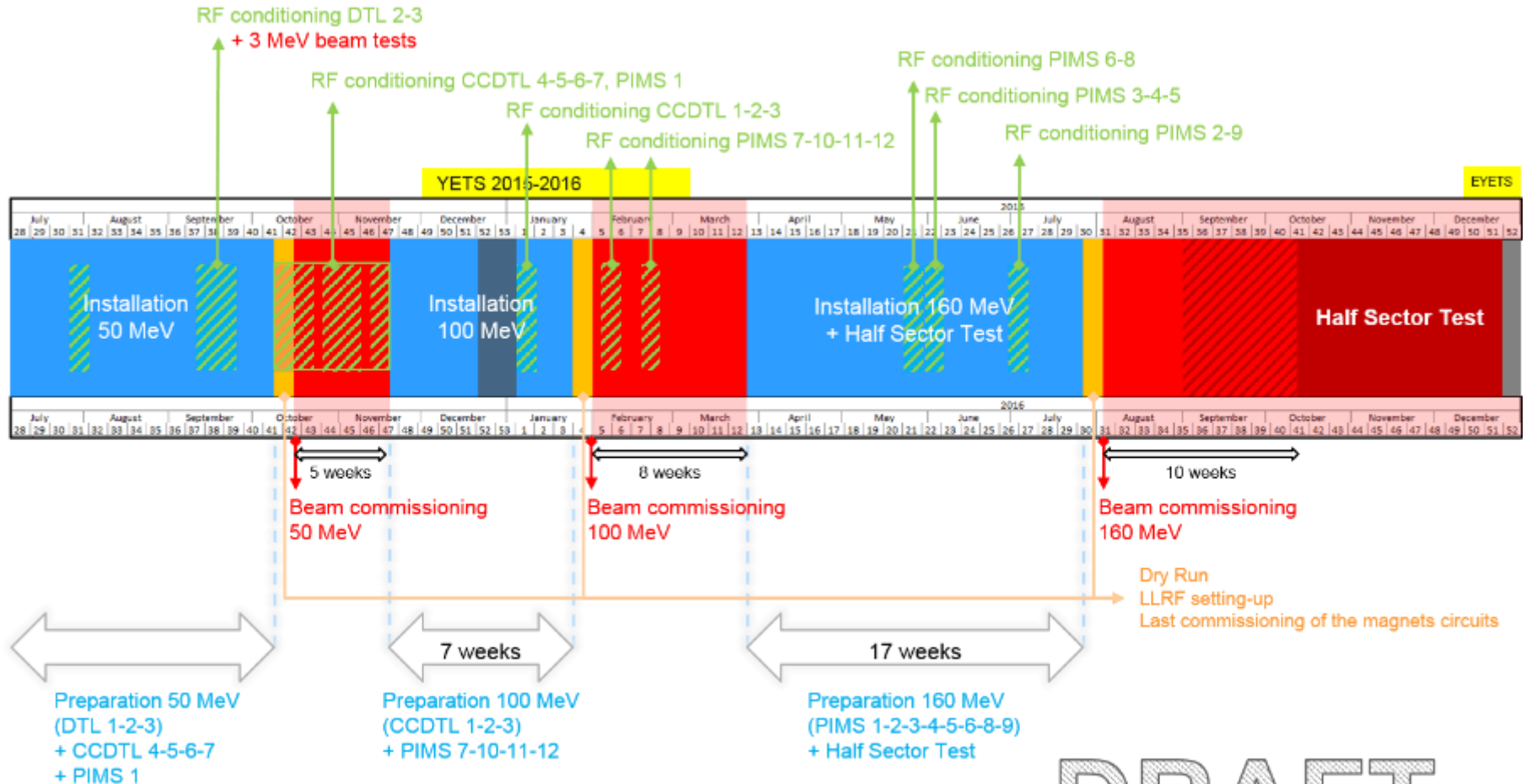


Linac4 MP commissioning

status, experience and strategy

David Nisbet
MPP, 25 September 2015

LINAC4 schedule



DRAFT

Status

- Hardware commissioning
 - 50MeV DTL1-2-3 conditioning ongoing
 - Complete ~5th October
 - 50MeV beam from ~23rd October
 - Mixed and progressive hardware and beam commissioning will continue into 2016
 - including HST
- Beam commissioning with 3MeV H- ongoing
 - Special mode – see following slides
 - Already successful 80% transmission to 3MeV

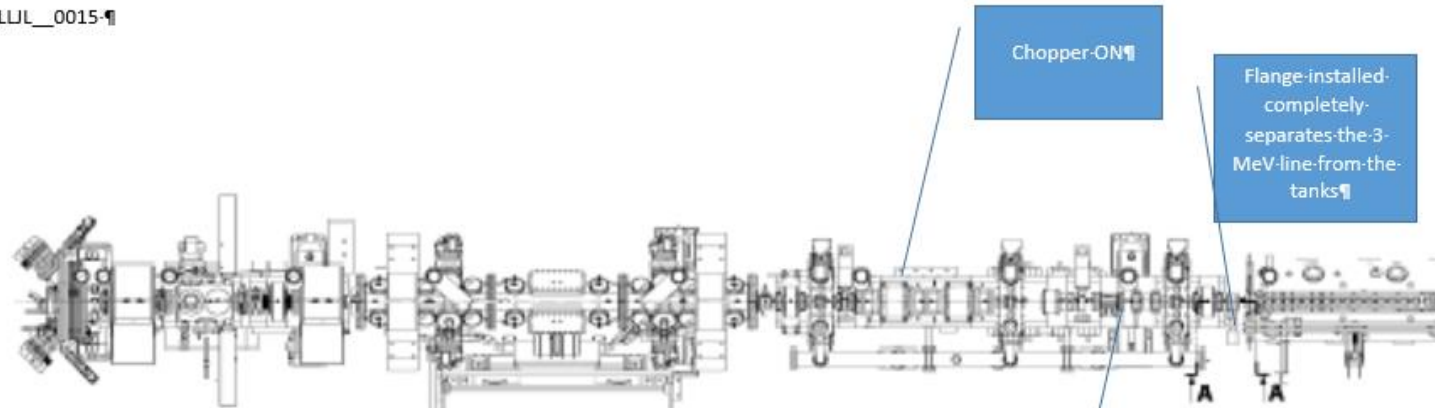
3MeV Reduced Beam Permit

- 50MeV discussed in MPP Meeting 111
 - [Indico event 404834](#)
- Request to operate the beam at 3 MeV in the 50MeV set-up when DTL tanks are not yet installed and/or operational
 - No beam dump -> use chopper beam dump in normal mode
 - Quads off to dilute beam
 - vacuum end-cap accepted as diluted beam stop in accident scenario
 - Requires FBCT watchdog to be functional
 - Latch and activate pre-chopper if current detected after chopper
 - Source not cut but beam further diluted by pre-chopper
 - Special BIS configuration required (see following slides)

3MeV Reduced Beam Permit

From-SPLJL_0015

¶



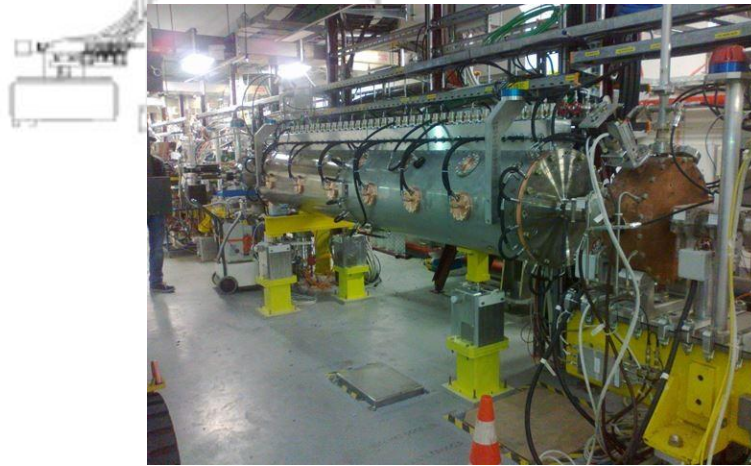
Source

LEBT

RFQ

MEBT

DTL1



¶

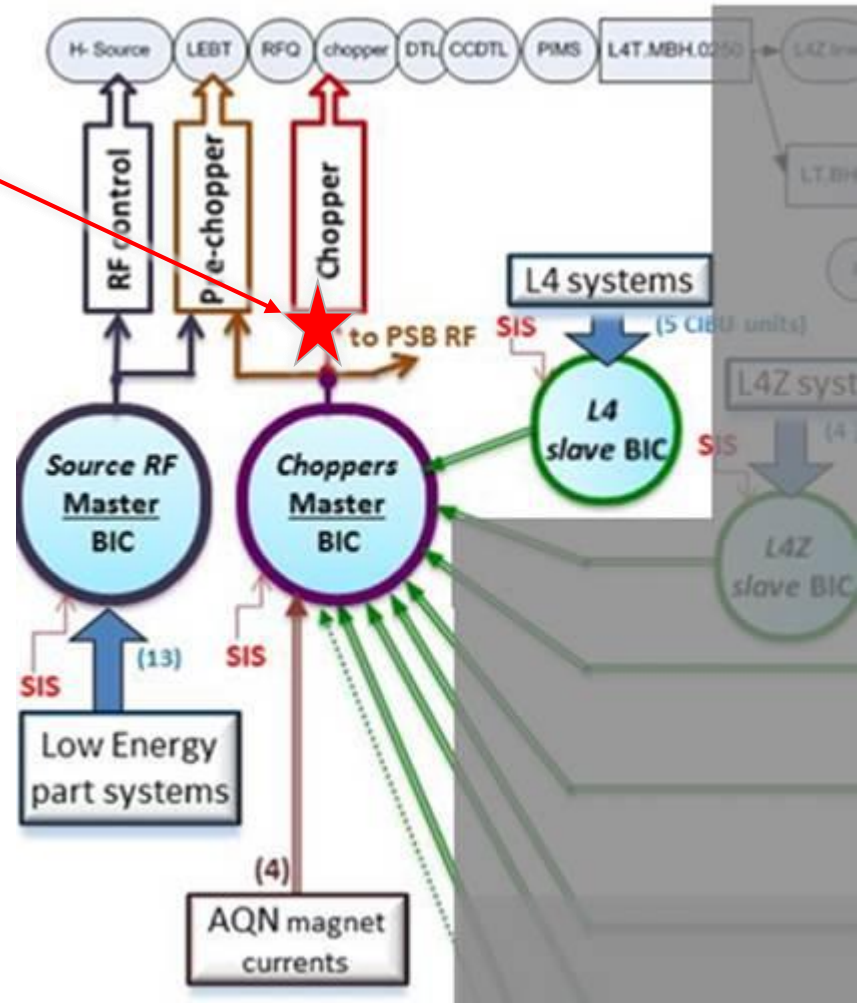
¶

No-beam-after-this-point

bearing cent
A TA

Modified 50MeV BIC

- Chopper disconnected
 - Always 500us chopping
- L4L.MQD.3810 to L4L.MQF.4110
 - off and condemned
- FBCT WD temporary connection
 - Check beam current after chopper
 - If $I_{beam} > \text{threshold (5mA)}$ -> pre-chop
- Vacuum
 - masking of downstream valves
- RF
 - masking of downstream systems



Source RF Master BIC

- SIS not yet in operation
- Source will not stop the beam...
- Quads not yet in operation
- Chopper
 - No power interlock (Ampli, vacuum, etc...)
 - No Lowlevel issues (Alim, init, etc...)
 - Not yet monitoring the voltage
 - Bypass of power input signal exists on the chopper LL input...

Temporary conditions to provide the User_Permit (see par.2.2.3)	1	1	1	SIS	0
Normal conditions to provide the User_Permit	1	0	0	Source Start	1
Set permanently TRUE by the User_System	x	1	1	Source Internal	2
Forced to TRUE by TE-MPE	x	1	1	Source HV	3
Normal conditions to provide the User_Permit	x	x	1	Pre-chopper	4
Temporary conditions to provide the User_Permit (as only the first Beam Stopper will be taken into account)	0	0	1	Source Beam Stoppers Out/Mov_CH	5
	1	1	0	Source Beam Stoppers In_CH	6
Normal conditions to provide the User_Permit	x	x	1	Chopper	7
Normal conditions to provide the User_Permit	x	x	1	L4 Low-Energy Watchdog	8
Normal conditions to provide the User_Permit	x	1	1	L4 Low-Energy Vacuum Waiver	9
Forced to TRUE by TE-MPE	x	x	1	L4L.ChopperQuads	10
Normal conditions to provide the User_Permit	x	x	1	RFQ	11
Normal conditions to provide the User_Permit	x	x	1	Commissioning Dump status	12
Normal conditions to provide the User_Permit	x	x	1	L4 Operator Veto	13

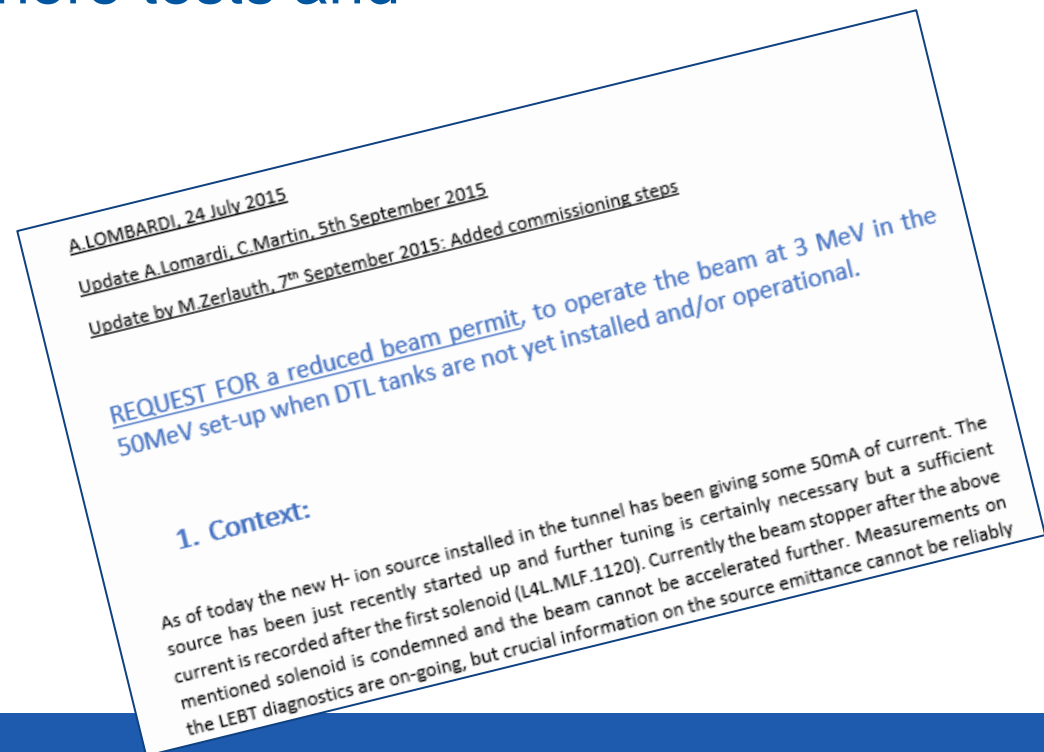
LINAC4 Slave BIC

- Temporary WD implementation in standalone, comparing losses with a reference value
- WD will activate the pre-chopper
 - Beam diluted
- Need to validate the masking status of Vacuum, WIC and RF
 - Phased startup of many systems

		Interlock Element	h	C
Temporary conditions to provide the User_Permit	→	SIS	0	
Input Disabled by TE-MPE (via jumpers)	X	External Conditions (full pulse)	1	
Normal conditions to provide the User_Permit	→	L4 Vacuum Valves + L4T.VVGS.0101	2	
Input Disabled by TE-MPE (via jumpers)	X	BLMs L4+L4Z	3	
Temporary input added for the "reduce" 50 MeV phase	X	WD Chopper (temporary)	4	
Normal conditions to provide the User_Permit	→	WIC L4	5	
Input Disabled (via jumpers)	X	not used	6	
Input Disabled (via jumpers)	X	not used	7	
Normal conditions to provide the User_Permit	→	L4 RF	8	
Input Disabled (via jumpers)	X	not used	9	
Input Disabled (via jumpers)	X	not used	10	
Input Disabled (via jumpers)	X	not used	11	
Input Disabled (via jumpers)	X	not used	12	

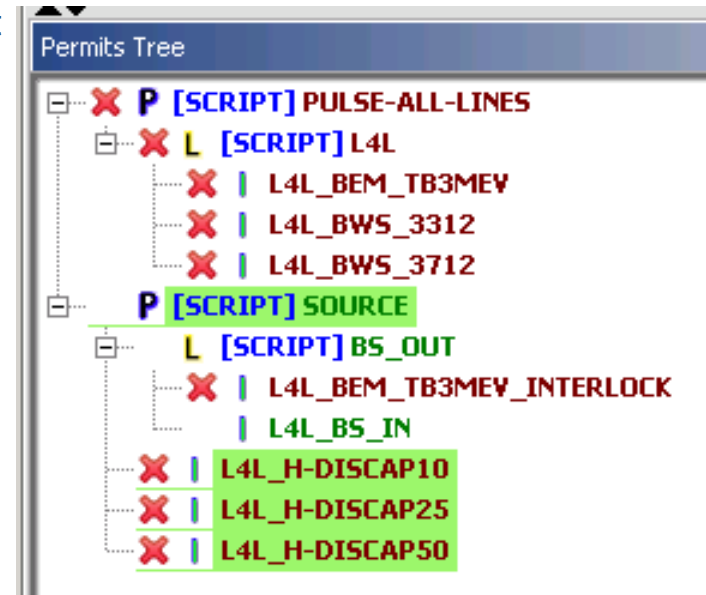
BIS commissioning

- Basic tests defined to validate requirement
 - Documented both in LN4OP logbook and in Beam Permit document (AL, CM, MZ)
- Need to define place where tests and status are available
 - Probably linac4 website



SIS

- Not functioning for LINAC4
 - BEM_TB3MEV obsolete
 - BWS_3312 and BWS_3712 subscriptions incorrect
 - H-DISCAP subscriptions incorrect
- BI requirements: comprehensive list received from F. Roncarlo
 - All SEM grids and Wire Scanners with conditions
 - Essentially limit beam to 100us if in beam
- Need to manage phased commissioning settings and final operational settings
 - 'easily' changeable (or relaxed) settings?



LN4 MP Strategy

- SIS
 - Make 3MeV part operational again
 - Define requirements for 50MeV and beyond
- WIC
 - Actual configuration limits parallel beam and commissioning activities
- BIS
 - User stability to be monitored
 - User functional spec and update/intervention procedures to be developed
 - SBF? Currently forced TRUE.
 - Many maskable channels are always available
 - **50MeV validation -> see next slide**

LN4 MP Strategy – 50MeV

- Return to nominal BIS setup
 - Chopper
 - WD
- Re-validate modified inputs
- Validate new inputs
 - SIS
 - Source Start
 - Quads
 - WIC + RF + Vacuum masked inputs
- Agree user settings for 50MeV commissioning
- Check requirements for testbench (particularly BI)

Conclusion

- LINAC4 MP validated for reduced beam permit at 3MeV
 - useful data obtained from 2 weeks of operation
- Useful experience indicating areas for development
 - BIS User settings
 - SIS setup
- Need to implement a repository for easy access to configurations (current and future) and related documentation

