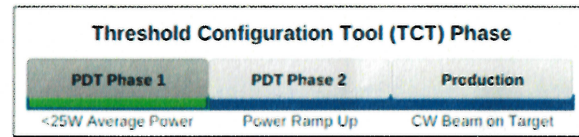


Cheat Sheet: Diagnostics Threshold Configuration Tool (TCT)

V2.0 2024-09-30

Operation in one of three phases:

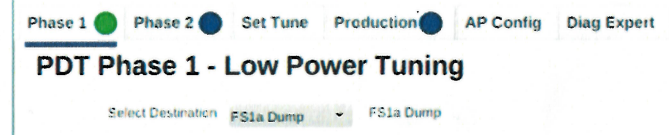
- PDT Phase 1:** < 25W Average Power
- PDT Phase 2:** up to 10 kW Average Power
- Production:** CW Beam on Target



All TCT Phase changes and TCT parameter changes trigger immediate recalculation of diagnostic thresholds. When moving between phases, beam should be **Disabled**. For example, at the end of PDT Phase 1, AP has confirmed the beam tune is good to go to Phase 2, 500 W on target. The procedure is to **Disable Beam**, Move TCT to PDT Phase 2, enter 500 W for the Phase 2 TCT power parameter; then it is ready for **Enable Beam** up to 500 W.

PDT Phase 1: < 25 W

- Limited BLM protections to avoid false trips
- SRF Cavities protected with BLMs
- 25W BCM Power Limit is enforced
- Operators:** Select beam destination as necessary
- AP:** Fill out charge state and stripping efficiency prior to PDT Phase 2.



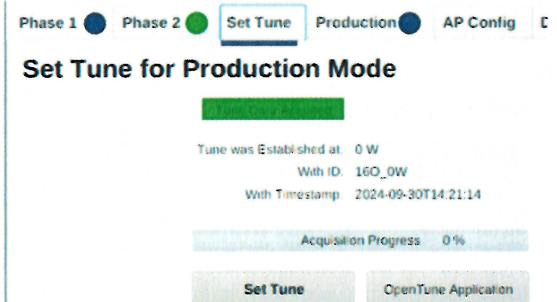
PDT Phase 2: Power Ramp, up to 10 kW

- BLM protections estimate expected losses and baseline losses, according to *Destination* and *Power* parameters.
- Like the previous tool, expected BLM losses can be scaled up by adjusting *Margin Factors*. (Operators: Auto-Scale targets 30% margin above peak losses.)
- 10 kW BCM Power Limit is enforced
- Operators:** Update beam destination and power as necessary
- AP:** Under *AP Config*, specific BLMs thresholds can be scaled up, or disabled.



Set Tune: Prepare for Production Operation

- While in PDT Phase 2, with ~10 kW on Target, record the tune.
- AP:** Press *Set Tune* to record 30 seconds of beam data.
- This tune will be used to set expected BLM loss profiles while in *Production* phase.

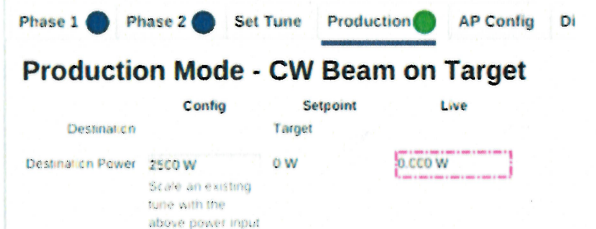


Production: CW Beam on Target (from < 1W to 20 kW)

- BLM protections based on losses measured with *Beam Tune*.
- Operators:** Update beam power as necessary. (On Target)
- Operators:** Move back to *PDT Phase 2* if necessary.

Returning to *PDT Phase 1* will reset *Beam Tune*.

- AP:** Under *AP Config*, specific BLMs thresholds can be scaled up, or disabled.



BCM Configuration:

Specific differential BCMs are named and automatically enabled depending on TCT Phase and Beam Destination.

Power Limit BCMs:

- * D1120 handled automatically
- * D2449 handled automatically
- * D5789 Operator managed

BCM Configuration									
Differential BCMs									
Differential Name	AVG Time	LAVG	10+ ms	150 us	15 us	BCMA SF	BCMB SF	Description	
DIAG MTCA06:BCM STRIPEFF	1.00 s	Avg	0.0014E-3	0.0000E-3	n/a	n/a	0.7500	1.0000	Stripping Efficiency
DIAG MTCA06:BCM LS1TRANS	1.00 s	Avg	0.0010E-3	0.0000E-3	0.0000E-3	0.0000	4.0000	4.0000	LS1 Transmission
DIAG MTCA06:BCM CHRGSTATE	1.00 s	Avg	0.0000E-3	0.0000E-3	n/a	n/a	4.0000	0.7500	Charge State
DIAG MTCA06:BCM LS2TRANS	1.00 s	Avg	0.0010E-3	0.0000E-3	0.0000E-3	0.0000	1.0000	1.0000	LS2 Transmission
DIAG MTCA06:BCM LS3TRANS	1.00 s	Avg	0.0010E-3	0.0000E-3	0.0000E-3	0.0000	1.0000	1.0000	LS3 Transmission
DIAG MTCA06:BCM LINACBDS	1.00 s	Avg	0.0000E-3	0.0000E-3	n/a	n/a	4.0000	1.0000	MEBT to BDS Dump
DIAG MTCA06:BCM UNACTGT	1.00 s	Avg	0.0000E-3	0.0000E-3	0.0000E-3	0.0000	1.0000	1.0000	Whole LINAC MEBT to Target
Power Limit BCMs									
Differential Name	AVG Time	LAVG Thresh	LAVG Readback	Power Limit Equivalent	Description				
FE MEBT:BCM D1120	1.00 s	Avg	0.00 uA	10000 W	BCM D1120 Limiting MEBT Power				
FS1 BTS:BCM D2449	1.00 s	Avg	0.00 uA	500 W	BCM D2449 Limiting FS1b Power				
BDS FFS:BCM D5789	1.00 s	Avg	0.00 uA	~ACS_DIAG MPS, TC	BCM D5789 Limiting Power Through BDS				