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CERN-TED Meeting High Efficiency Klystron Preliminary TED view

11 APRIL 2017

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Key Parameters impacting prototype schedule and cost

Main Parameters	FCC	TH2182 (SPL)	High Efficiency Prototype TED preferred parameters	TED Comments
Frequency (MHz)	800	704	704	Allows reuse of RF window / ESS frequency
Peak Output Power (kW)	1400	1500	1500	Compatibility with ESS need
Average Output Power (kW)	1400	125	125	Reuse of existing collector + cavity cooling
Input Power (W)		50	< 200	
Vk (kV)	133	108	110	Existing modulator limit = 115 kV
Ik (A)	12.6	21	18	Current needed if efficiency is only 75%
Perveance (μPerv)	0.26	0.60	0.50	Trade-off between lower perveance and gun redesign effort to be analyzed
Efficiency	83%	66% measured	> 75%	
Gun	New	Existing	Derived from TH2182 gun	Design modification for lower perveance
Magnetic field (Gauss)		375 (450 end)	Derived from TH2182 magnet	Reuse of same coil technology
Cathode Magnetic field (G)		50	50	
Cathode Diameter (mm)		65	65	
Drift Tube Diameter (mm)	32	40	40	
Beam Diameter (mm)	16	24	24	
Interaction Length (m)	1.72	1.96 ($0.52 \lambda_q$)	≤ 1.96	
RF Output	New WG window	Coaxial window + Cross bar transition	TH2182 RF Output	Reuse of existing window and output transition
Collector Dissipation (kW)	1700	300	TH2182 collector	Reuse of existing collector
Dressing / Support Frame	New	Horizontal	Horizontal or Vertical TBD	Trade-off between CERN constraints and ESS compatibility

Horizontal or Vertical Position

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Scenarios & Preliminary Schedule Estimate

Example of TH2182 Schedule (1.5MWp 704 MHz for SPL)

- Contract notification in June 2012 , Design report (simulations) at T0+5 months
- First Prototype at T0+22 months – RF window breakdown
- Prototype repair, acceptance and delivery at T0+28 months

High Efficiency Klystron – Assumption T0 = 1 June 2017, T1= contract start

- Scenario 1 (TH2182 base, 704 MHz 110 kV): Design report and Proposal ~ Dec 2017
Prototype at ~ T1+ 12 months (best case)
- Scenario 2 (Completely New design): Design report and Proposal ~ February 2018
Prototype at ~ T1+ 18 months (best case)
- Additional time in case of klystron recycling ~ 6 months
- See Excel file with return on experience on past projects (TH1803 for CLIC, TH2182 for SPL)+ Preliminary Schedule for Scenario 1