

## END TO END BEAM DYNAMICS OF THE ESS LINAC

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## Abstract

The European Spallation Source, ESS, uses a linear accelerator to deliver the high intensity proton beam to the target station. The nominal beam power is 5 MW at an energy of 2.5 GeV. The individual accelerating structures in the linac and the transport lines are briefly described, and the beam is tracked from the source throughout the linac to the target. This paper will present a review of the beam dynamics from the source to the target.





## **Phase law**

The improved phase advance monotonicity and smoothness between spokes and medium beta is achieved by ramping the synchronous phase from -20 degrees down to -33 degrees in the last seven periods of the spoke section. The additional effect of this change is improved acceleration in the downstream structure as well as decreasing the range of required power to accelerate the beam in medium beta cavities.



	Δε <sub>x</sub>	Δε <sub>γ</sub>	$\Delta \varepsilon_z$
MEBT	19.3 %	9.5 %	13.9 %
DTL	4.4 %	10.5 %	2.9 %
Spokes	2.0 %	0.1 %	0.1 %
Medium β	3.2 %	5.3 %	0.0 %
High β	0.9 %	-0.6 %	5.4 %
Conclusion			