

Summary of working group 4: beam dynamics

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goals:

- review design choices,
- define tasks, which need to be answered in the near future,
- define contribution of partners and interactions between partners,
- list untreated subjects and collect suggestions for addressing them,
- prioritise the work program

#	task	description	interested institute	Session	deadline
1	transverse collimation (Linac4 + SPL)	beam scraping within the linac and the transfer line to localize losses and avoid injection loss	Cockroft institute + IPJ	WP4/3	end 2009
2	impact of cavity performance	define maximum allowed gradient spread, scenarios for failing cavities,..	?	WP4/2	end 2010
3	HOM, protons	study possibility for BBU	TRIUMF + CERN (AB/RF) for comparison	WP2/1	end 2009
4	beam distribution EURISOL + beam extraction SPL	beam shaving via magnetic H- stripping for beam distribution to EURISOL targets, design of transverse H- deflection from SPL at 2.5 GeV	?	WP4/2	end 2009
5	quadrupole specs	define limits for higher harmonics, fringe fields	CERN	--	mid 2009
6	general machine layout	including: lattice design, error studies, extraction at intermediate energies, reduction of energy spread	ESS-S/CERN	WP4/2	
7	transfer line	H- stripping by magnetic fields & blackbody radiation, longitudinal momentum collimation, vertical bendings	CERN (AB/BT) + ?	WP4/2, WP4/3	mid 2009

identification of tasks (see INDICO)

List of topics (Thursday, 11 December 2008)

- **Do we need HOM dampers on SC cavities in p-linacs?**, Joachim Tuckmantel (CERN),
- **Beam dynamics in the SPL**, Mohammad Eshraqi (CERN),
- **H- beam splitting for EURISOL targets**, Mats Lindroos (CERN),
- **Discussion on:**
 - HOM damping requirements,
 - adaptation of EURISOL beam splitting for SPL parameters,
 - H- stripping via blackbody radiation,

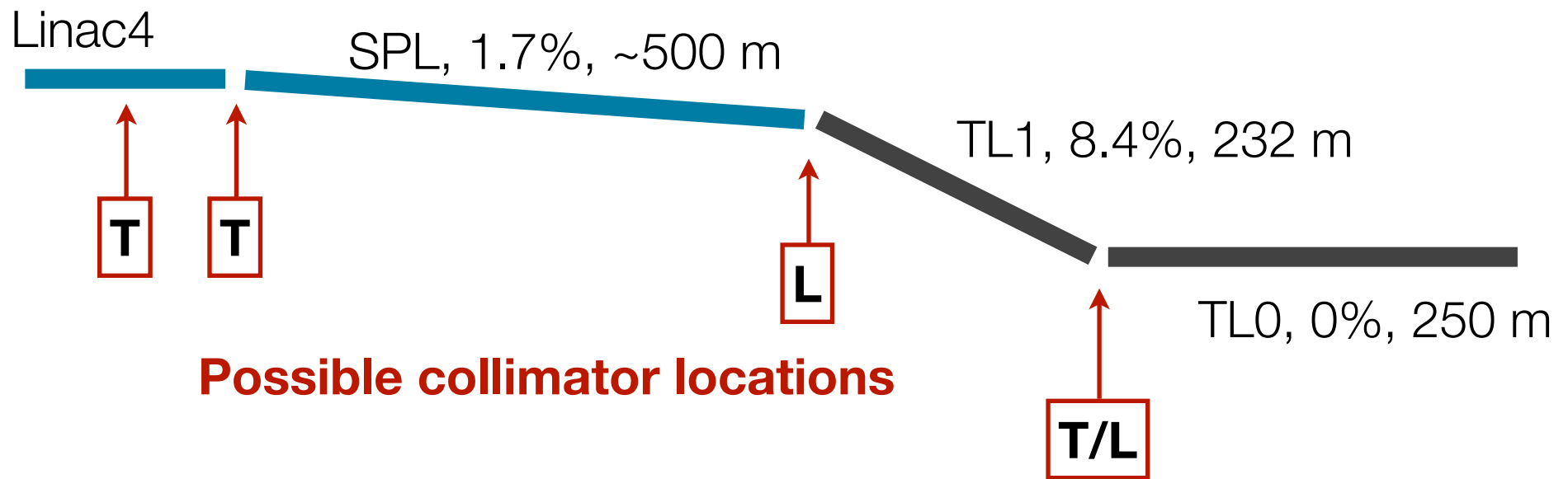
HOM dampers or not?

- **It is difficult to foresee all effects that can be driven by HOMs, e.g:**
 - they can “talk” to the beam, even if they do not sit on a machine line (Joachim),
 - they can make cavities “talk” to each other,
- **HOM couplers add a certain complexity and cost to the project, but:**
 - given sufficient R&D they can work reliably (LEP, LHC),
 - the actual cost seems small compared to the risk for operation,
 - they can be used as BPM, which saves the cost of additional BPMs,
- **amount of required damping (Q_{ex}) will be studied by TRIUMF (BBU),**
deadline: end 2009,
- **BBU study should not delay the design of the dampers!**

List of topics (Friday, 12 December 2008)

- **Collimation for Linac4**, Juan Fernandez-Hernando (STFC, UK)
- **Collimation and radiation protection , experience at the Soltan Institute**, Slawomir Wronka (Soltan Insitute, Poland)
- **Discussion on:**
 - collimation concepts for Linac4/SPL,
 - collimator materials,
 - transverse/longitudinal collimation,
 - task splitting between STFC/Soltan,

Collimation approach Linac4/SPL



Collimation approach Linac4/SPL

1. Study if longitudinal collimation after SPL is possible in the suggested locations (STFC), **proposed method**: stripping of transverse halo with foils + diversion of halo to dedicated dumps, **questions**: distance of dumps from beam line, shielding requirements, **deadline**: < mid 2009
2. Transverse collimation in Linac4 covered by STFC, **proposed method**: shielded carbon collimators (~10 W) between linac sections and/or between Linac4 and SPL, **deadline**: end 2009
3. Transverse collimation in SPL + radiation protection simulations for SPL covered by Soltan Institute, **proposed method**: stripping of transverse halo with foils + diversion of halo to dedicated dumps, **question**: amount of beam power to be intercepted (input from error studies), **deadline**: end 2009

open questions/jobs

- **impact of variable cavity performance on longitudinal stability**, questions: i) failure of one or multiple cavities, ii) missing cryomodule (needs a spare quadrupole doublet to be installed), iii) maximum acceptable gradient spread,
- **physics model for H- stripping via blackbody radiation**, verification/re-assessment of FNAL model,
- **definition of diagnostics layout**,
- **alignment precision for cavities/magnets/BPMs**,
- **EURISOL beam splitting** (probably done within EURISOL collaboration),