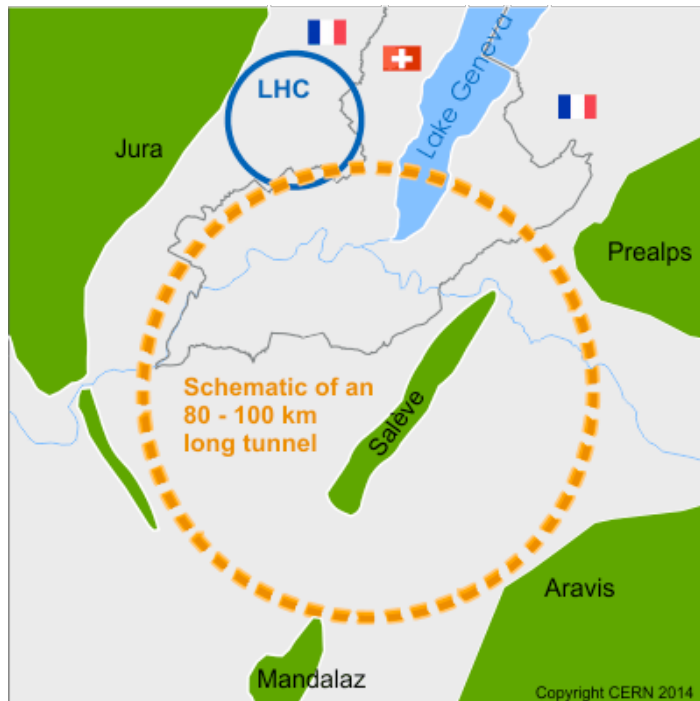




# Superconductors as accelerators wall coatings in FCC-hh: impedance and compatibility with collective effects issues.

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parameter	LHC	HL-LHC	FCC-hh
c.m. energy [TeV]		14	100
dipole magnet field [T]		8.33	16 (20)
circumference [km]		36.7	100 (83)
luminosity [ $10^{34} \text{ cm}^{-2}\text{s}^{-1}$ ]	1	5	5 [ $\rightarrow 20?$ ]
bunch spacing [ns]		25	25 {5}
<b>events / bunch crossing</b>	<b>27</b>	<b>135</b>	<b>170 {34}</b>
bunch population [ $10^{11}$ ]	1.15	2.2	1 {0.2}
norm. transverse emitt. [ $\mu\text{m}$ ]	3.75	2.5	2.2 {0.44}
IP beta-function [m]	0.55	0.15	1.1
IP beam size [ $\mu\text{m}$ ]	16.7	7.1	6.8 {3}
synchrotron rad. [W/m/aperture]	0.17	0.33	28 (44)
critical energy [keV]		0.044	4.3 (5.5)
<b>total syn.rad. power [MW]</b>	<b>0.0072</b>	<b>0.0146</b>	<b>4.8 (5.8)</b>
<b>longitudinal damping time [h]</b>		<b>12.9</b>	<b>0.54 (0.32)</b>



- FCC-hh effort on the reduction of the machine impedance: use of superconductors as accelerator wall coating.
- Wall coatings must not to induce  $e^-$  cloud related instabilities.

R. Cimino and T. Demma “Electron cloud in Accelerators”, Int. J. Mod. Phys. A 29 (2014) 1430023 (pag. 65).

- Studies on Surface chemistry, Secondary Electron Yield (SEY), Photoelectron Yield (PY), photon Reflectivity (R) are required to qualify superconductor coatings as a potential solution to impedance issues.
- First studies on  $Nb_3Sn$  samples at RT taken at LNF-INFN, indicate that such surface is not fully compatible with  $e^-$  cloud mitigation requirements.
- Further studies are required on this and other types of SC's to verify eventual effects on SEY of the SC transition.

## SEY from $Nb_3Sn$

