## **BEAM SCRAPING FOR LHC INJECTION** (E. VEYRUNES-CERN)

Injection into the LHC requires well defined high intensity beams to be extracted from the SPS. A SPS fast scraper system is used to remove any existing halo prior to beam extraction, thereby providing beams of well defined transverse size and regulated intensity, ensuring clean beam transfer to the LHC and minimizing the risk of superconducting magnet quenches at injection.

What the Scraper looks like





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## **Scraper Application**

SPS Scraper (BSHV.51659) v1.0.8 - July. 2010 📕 🔜 🛆 11 Aug 2010 17:40:40 SPS - LHC

<u>F</u> ile <u>R</u> eferences Analyze Help			
SCRAPER Status	SCRAPER Settings		
Current User			
LHC2			
Status control		Demanded	Acquired
RETRACT			
Demanded status	Scraper Status		
Scraping H and V		Scraping H and V 🗸 👻	Scraping H and V
Current status			
SLEEP	Scraper delay (ms)	14000	14000
SCRAPER Mode			
REMOTE	Scraper h Position (mm)		
SwitchFastV		1.9	1.9
OUT			
SwitchFastH	Scraper v Position (mm)	7.1	7.1
SwitchSlowV			
OUT	Scraper Park Position (mm)		
SwitchSlowH	Scruper Function (min)	30	30
		·]	
Delay Trigger Fast	Scraper Out Position (mm)	40	40
14,000			
Acquire Description Start Monitoring Stop Stop			
17:40:41 – Scraper updated. 🔨 🔨			

Scraper motion is done by stepper motors and uses the same technologies and infrastructure as the LHC collimator system. This implies step resolution of 100 um and a step speed of 3 cm/s.

The SPS Scraper Control is a Java application developed in conjunction with the hardware and is used in both Machine development and regular operation of the SPS. The application allows for the operators to Maintain the transverse beam size of 3.5+-0.5 S. Beam blow-up (both in H and V) from the RF Damper mean readjustment is necessary before injecting into the LHC.



## Scraper effect on LHC beam (1 bunch, Intensity = 1.1 e11 protons)



**Regulation of Beam Intensity Scraping** used to set the intensity of the extracted beam.

**2010 :Scraper jaws changed from copper** to graphite to allow for scrapping of nominal intensity LHC beams and shielding has been added to mitigate the radiation levels and reduce losses in the SPS.

