LARP LHC 4.8 GHz Schottky System Initial commissioning with Beam

Ralph J. Pasquinelli
Fermilab
Tevatron Schottky System
Operational 2003

LHC Schottky System
Approved by LARP 2004
LARP LHC Schottky

Pickup Designed @ Fermilab in 2005

Figure 2. Impedance of LHC Schottky pickup

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Pickups Fabricated at CERN Autumn 2006

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Pickup tanks installed at LHC Point 4, Spring 2007
LHC Schottky Triple Heterodyne Block Diagram
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Pickup Plate Hardware

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Measured 100 dB instantaneous dynamic range in Signal processing, +10 dBm to -90 dBm input

10 dB per division

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Importance of low phase noise in local oscillators

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LARP LHC Schottky

Crated up and on its way to CERN April 2007!
LARP LHC Schottky

Pickup Hardware
Installed May 2007

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Point 4  Alcove  Hardware  May 2007

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Touring Hardware Installation
May 2007

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Installation of controls interface

May 2008
Two Beam Commissioning Trips to CERN

April 2010

October 2010
Fermilab LARP LHC Schottky
Interactive Graphics Control of Hardware
Automated gating control allows any number of bunch configurations.
Remote Control of Gate Timing Oscilloscope

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Built In Calibration Capability
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Spectra Reveal Coherent Phenomena

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3.4x10^{12} Protons 450 GeV
Fit eliminates coherence
Lead Ions $1.1 \times 10^{12}$ at 3.5 TeV

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Chromaticity Measurements Protons during Energy Ramp

B1H
Snapback
B1V
B2H
Ramp
B2V

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Data Logged Tunes

Luminosity

Beam 2V
Beam 2H
Beam 1V
Beam 1H

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Capabilities and Commissioning

- Non invasive measurements
- Bunch by bunch transverse measurements
- Measures single bunch with $10^{11}$ protons/bunch
- Verified tunes track with other tune measurements
- Chromaticities and Momentum spread measured
- Signal tracking for ramped beam measurements
October 2010