

Conceptual Design of Power Supply Control System for ILSF



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Abstract

The Iranian Light Source Facility (ILSF) project is a first large scale accelerator facility which is currently under planning in Iran. On the basis of the present design, circumference of the 3 GeV storage ring is 528 m. Beam current and natural beam emittance are 400 mA and 0.27 nm.rad respectively. The facility will be built on a land of 100 hectares area in the city of Qazvin, located 150 km West of Tehran. In this paper the conceptual design of power supply control system is presented.

OVERVIEW OF ILSF PS

Table 1: ILSF Storage ring power supplies

Storage Ring P.S.	Dipole	Quadrupole	Sextupole(S4)
Output current	364.3A	132.3A	125 A
Output voltage	640V	15 V	1108.8 V
No. of Power Supplies	2	240	6

Table 2: ILSF Booster ring power supplies

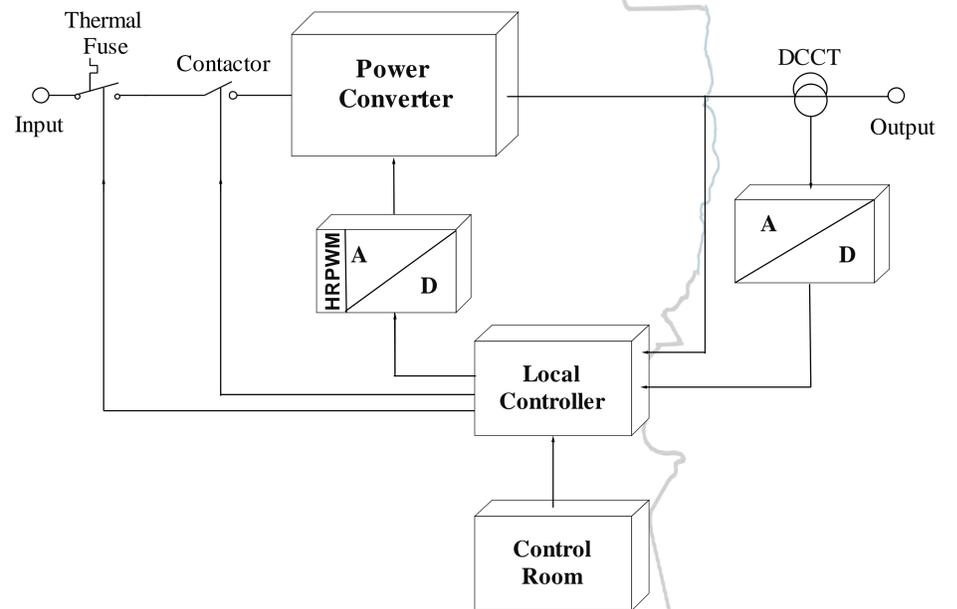
Booster Ring P.S.	Dipole	Quadrupole	Sextupole
Output current	484A	202.4A	22.82 A
Output voltage	1135.41V	401.45 V	101 V
No. of Power Supplies	1	1	1

Overview of power supply control system

The PS control system consists of three parts:

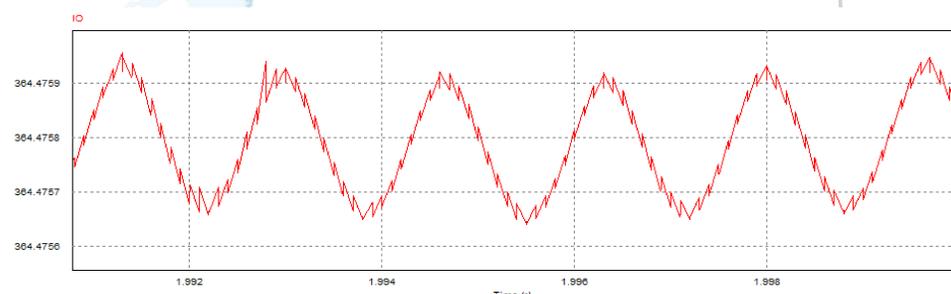
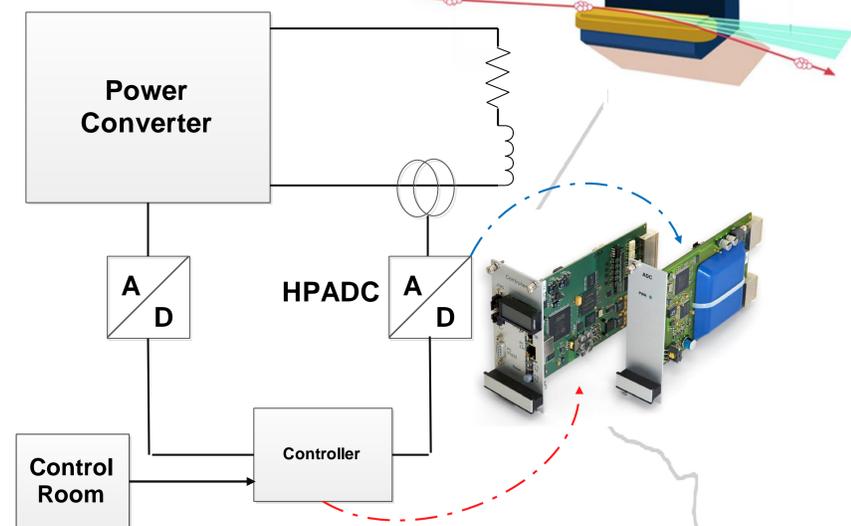
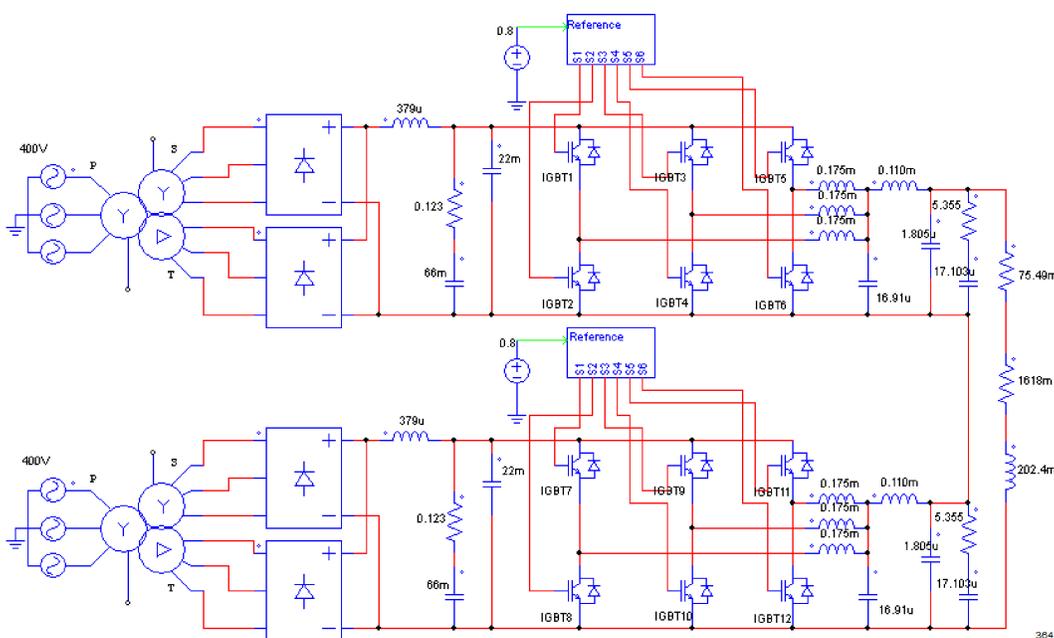
- ✓ Internal control system
- ✓ Analog to digital converter
- ✓ Digital to analog converter or high resolution PWM

The shape below proposes an architecture of digital current regulator intended to be used to control the power supplies of the Iranian light source facility called ILSF. It is based on a high-precision Digital to Analog Converter and a high performance digital control system. this control structure will be used to control the current of the most types of power supplies eather in storage or booster ring.



ILSF dipole magnet storage ring P.S.

The designed power supply is based on interleaved multi-phase buck converter. Picture below shows the p.s. schematic and it's simulation results.



References:

- [1] ILSF - Iranian Light Source Facility webpage, <http://ilsf.ipm.ac.ir/>.
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- [3] L. Tanner*, F. Jenni*, Paul Scherrer Institute, Villigen, Switzerland , DIGITAL CONTROL FOR HIGHEST PRECISION ACCELERATOR POWER SUPPLIES , 2001IEEE