Warm magnets typically saturate as the field approaches 1 tesla (10k gauss). Figure 1 illustrates this effect for the CERN proton synchrotron (CPS) main magnets:

\\cern.ch\dfs\Users\q\qking\Desktop\Bayard.CERN-71-20.p3.tif

Figure 1 - Inductance and energy for CERN PS main magnets

The inductance declines dramatically and if this is not compensated, the performance of a current regulator will be reduced. Libreg includes a simple compensation algorithm based on a linear model of the inductance:

Inductance

Current

*L*

*Lsat*

*Isat\_start*

*Isat\_end*

Figure 2: Linear magnet saturation model.

The model requires four parameters to be defined:

* LOAD.HENRYS
* LOAD.HENRYS\_SAT
* LOAD.I\_SAT\_START
* LOAD.I\_SAT\_END

**Exercise 1** : Compensating the saturation

The reduction in the inductance can be hidden from the RST algorithm by a simple equation that modifies *Vref* to derive *Vref\_sat*

and

OHMS\_SER 0.01

OHMS\_PAR 1.0E8

OHMS\_MAG 0.04

HENRYS 0.5

HENRYS\_SAT 0.2

I\_SAT\_START 500.0

I\_SAT\_END 850.0

GAUSS\_PER\_AMP 1.0

I\_MEAS\_DELAY 1.3E-4

PERTURB\_VOLTS 0.0

PERTURB\_TIME 0.0

SIM\_TC\_ERROR 0.0

# EOF