To see why the voltage across the inductor spikes to -5V, take t = 0 to be at 0.5s.

\[ I_o = 11.4 \text{mA} \quad I_f = -11.4 \text{mA} \quad \text{from Fig. 2.} \]

\[ I(t) = -11.4 + 22.8 e^{(-22,000 t)} \text{mA} \]

\[ V_L = L \frac{di}{dt} \]

\[ V_L = -5 e^{(-22,000 t)} V \]
Fig. 2 – Current
ngspice Circuit Listing

* rlsq.cir
* RL circuit with square wave input
* Michael F. Hutt
* 4/5/2011
*
* ngspice -b rlsq.cir -o rlsq.out -r rlsq.raw
* ngnutmeg rlsq.raw
* ngnutmeg 1 -> plot v(1) v(2)
* ngnutmeg 1 -> plot l1#branch
* or with octave spice
* k=spice_readfile("rlsq.raw")
* plot(k)

vin 1 0 pulse (-2.5 2.5 0ns 0ns 0ns 0.5ms 1ms)
r1 1 2 220
L1 2 0 10mH
.tran 0.001m 2m
.end

ngnutmeg plot

[rlsq.ntmg ]
set color0=white
set color1=black
set color2=firebrick
set color3=navyblue
set color4=mediumseagreen
let Vg = v(1)
let VL = v(2)
let Vr = v(1)-v(2)
plot Vg VL Vr

let Inductor_Current = l1#branch
plot Inductor_Current

[run ngnutmeg ]
ngnutmeg rlsq.raw

*****
** ngnutmeg-17 : data analysis and manipulation program
** The U. C. Berkeley CAD Group
** Copyright 1985-1994, Regents of the University of California.
** Please submit bug-reports to: ngspice-bugs@lists.sourceforge.net
** Creation Date: Tue Sep  2 08:59:21 EDT 2008
*****
Loading raw data file ("rlsq.raw") . . . done.
Title:  * rlsq.cir
Name: Transient Analysis
Date: Mon Apr 11 09:29:21 2011

ngnutmeg 1 -> source rlsq.ntmg