Power supply comparison and field stability

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Background

M2 is set up right now to measure sagging on its mounts. All measurements done on M1 w/ power going to main coil.

- Goal: to see what power supply is best to use based on reduction of RMS
  - Does the DC filter connected to the TDK-Delta make a difference?
  - Minimize noise and variation for a more stable field (limit of 0.001)
- Measured at different currents:
  - 0.35 A
  - 0.40 A
  - 0.45 A

DC filter

Data for Magnet 1

- 3 trials for downstream side, only one for the upstream side.
  - Mean ± σ of the three measurements are shown
- Percent decrease calculated by Old-New/Old
- RMS with no power on M1's DS side is 0.0741

Power Supply	Side	Current (A)	Bx (μT)	RMS Bx	RMS/Bx
Old Supply	US	0.35 (27.78 G)	-388.9	0.279	0.0007
No filter		0.4 (~30G)	-455.6	0.2823	0.0006
		0.45 (~30 G)	-528.2	0.2814	0.0005
	DS	0.35	-668.5	0.0917 ± 0.008	0.0001
		0.4	-774.4	0.0883 ± 0.001	0.0001
		0.45	-885.2	0.1274 ± 0.054	0.0001
TDK-Delta	US	0.35	-385.2	0.2774	0.0007
With DC filter		0.4	-456.7	0.2789	0.0006
		0.45	-526.5	0.2758	0.0005
	DS	0.35	-676.4	0.0666 ± 0.004	0.0001
		0.4	-785.1	0.0652 ± 0.001	0.0001
		0.45	-891.5	0.0697 ± 0.01	0.0001

For nTMM stability requirement

Need stability better than ½ of the resonance's FWHM for a 25 Gauss field.

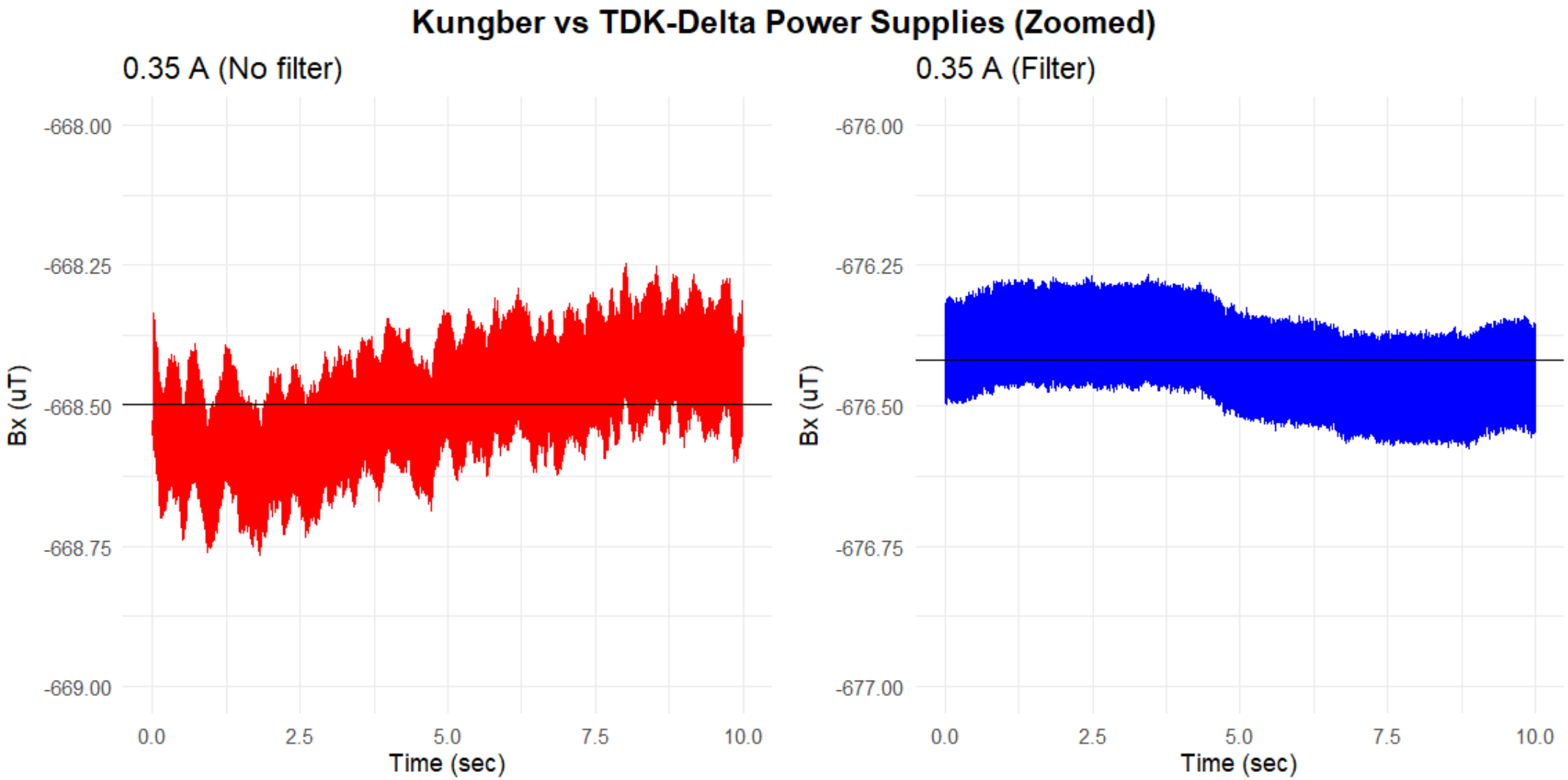
$\frac{0.14G}{5} \approx 0.025\text{G}$

$\frac{0.025}{25} = 0.001G$

All current measurements are well below (better than) this value ☺

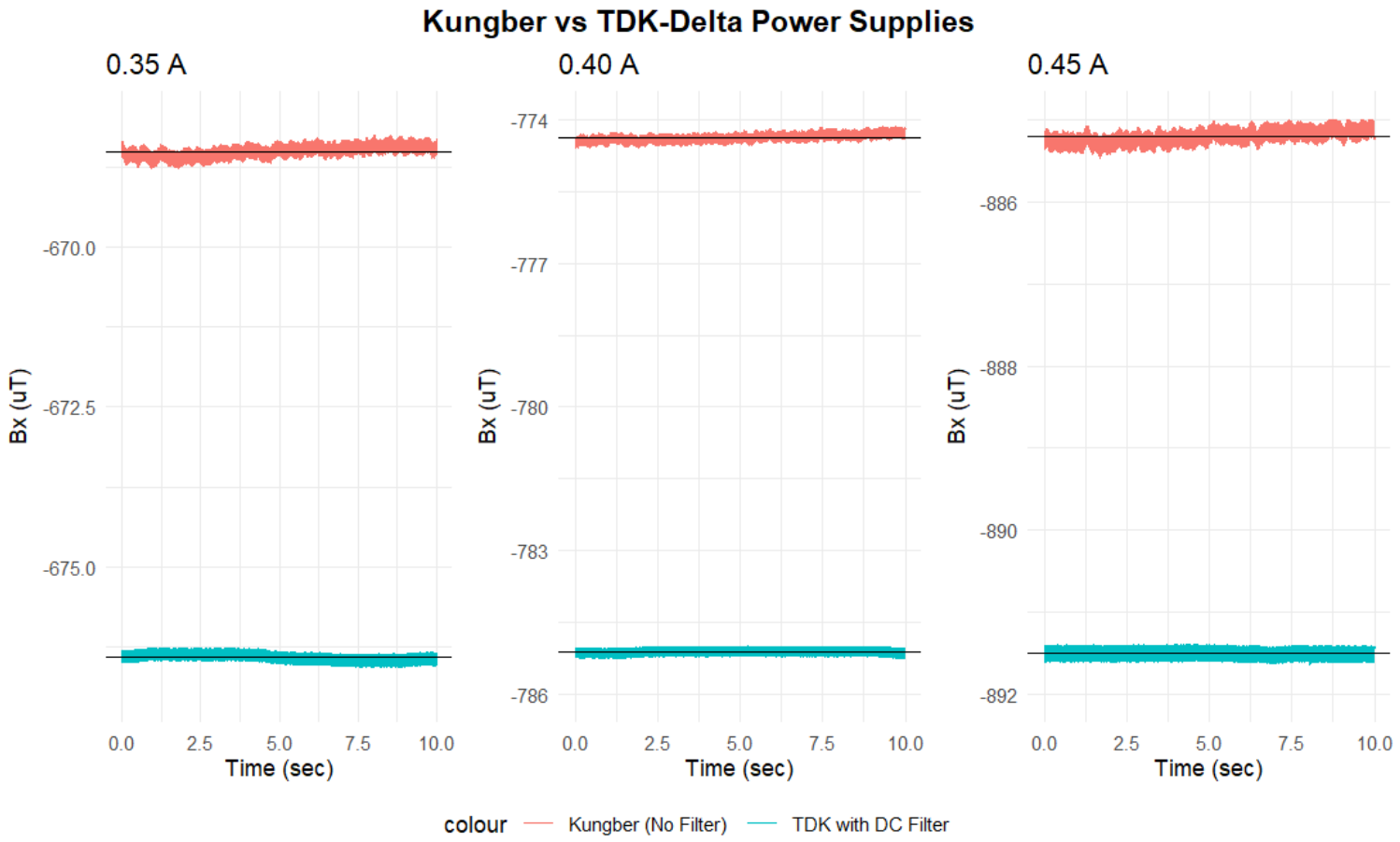
RMS reduction with filter

Side	Current (A)	% Decrease
US	0.35	0.57%
	0.4	1.20%
	0.45	1.99%
DS	0.35	27.37%
	0.4	26.16%
	0.45	45.29%


Kungber vs TDK-Delta Power Supplies (Zoomed)
0.35 A (No filter)
0.35 A (Filter)
Bx (uT)
-668.00
-668.25
-668.50
-668.75
-669.00
-676.00
-676.25
-676.50
-676.75
-677.00
0.0
2.5
5.0
7.5
10.0
Time (sec)

Conclusions

- Reduction of RMS more significant at larger window sizes
- At 0.35A, the TDK-Delta power supply with the DC filter connected gives a ~26% lower RMS than the old one with no filter. Bx visibly more stable.
- Expecting this behavior to be consistent on M2



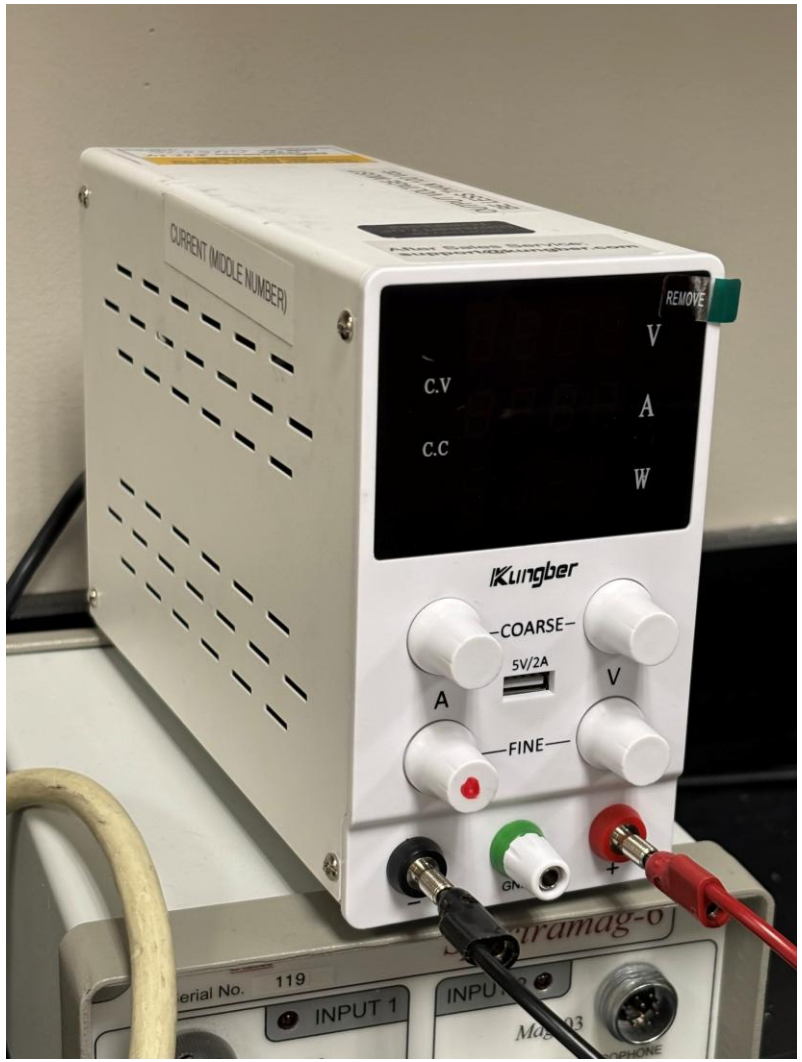
To do

Repeat measurements on M2

Quantify difference in RMS with and without magnet powered on (almost done)

Photos


VOLTAGE
CURRENT
MENU
PROT
FINE
PREV
REM
OUTPUT
POWER
TDK·Lambda


CURRENT (MIDDLE NUMBER)
REMOVE
C.V
C.C
V
A
W
Klingber
COARSE
5V/2A
FINE
INPUT 1