

Vibration Calibration

Comparing the results of adjusting the 5160 registers using
TMC_Autotune and Chopper_Resonance Tuner vs no adjustments

GitHub's used















- <https://github.com/Frix-x/klippain-shaketune>
- https://github.com/andrewmcgr/klipper_tmc_autotune
- [https://github.com/MRX8024/chopper-resonance-tuner/blob/main/wiki/chopper tuning guide english.md](https://github.com/MRX8024/chopper-resonance-tuner/blob/main/wiki/chopper_tuning_guide_english.md)

Testing Printer

- VT 350: serial 1190
- 48v motors: ldo-sth48-2804ac
- EBB36 ADXL345 used for measurement
 - using 3 screws for ebb36 mount
- FlexTap
- XOL
- G2SA
- Canbus
- Revo 0.6 HF

Slicer Settings

Speed for print moves

Perimeters:	 	<input type="text" value="105"/>	mm/s
Small perimeters:		<input type="text" value="20"/>	mm/s or %
External perimeters:	 	<input type="text" value="60"/>	mm/s or %
Infill:		<input type="text" value="140"/>	mm/s
Solid infill:		<input type="text" value="120"/>	mm/s or %
Top solid infill:		<input type="text" value="65"/>	mm/s or %
Support material:		<input type="text" value="65"/>	mm/s
Support material interface:		<input type="text" value="100%"/>	mm/s or %
Bridges:	 	<input type="text" value="60"/>	mm/s
Gap fill:		<input type="text" value="20"/>	mm/s
Ironing:		<input type="text" value="15"/>	mm/s



Dynamic overhang speed

Enable dynamic overhang speeds:	 <input checked="" type="checkbox"/>		
speed for 0% overlap (bridge):		<input type="text" value="15"/>	mm/s or %
speed for 25% overlap:		<input type="text" value="15"/>	mm/s or %
speed for 50% overlap:		<input type="text" value="30"/>	mm/s or %
speed for 75% overlap:	 	<input type="text" value="60"/>	mm/s or %












Speed for non-print moves

Travel:		<input type="text" value="400"/>	mm/s
Z travel:		<input type="text" value="0"/>	mm/s

Modifiers

First layer speed:		<input type="text" value="45"/>	mm/s or %
Speed of object first layer over raft interface:		<input type="text" value="30"/>	mm/s or %



Acceleration control (advanced)

External perimeters:		<input type="text" value="4000"/>	mm/s ²
Perimeters:		<input type="text" value="3500"/>	mm/s ²
Top solid infill:		<input type="text" value="4000"/>	mm/s ²
Solid infill:		<input type="text" value="4000"/>	mm/s ²
Infill:		<input type="text" value="8000"/>	mm/s ²
Bridge:	 	<input type="text" value="1750"/>	mm/s ²
First layer:		<input type="text" value="2000"/>	mm/s ²
First object layer over raft interface:		<input type="text" value="0"/>	mm/s ²
Travel:		<input type="text" value="10000"/>	mm/s ²
Default:		<input type="text" value="4000"/>	mm/s ²

Auto Speed (advanced)

Max print speed:		<input type="text" value="300"/>	mm/s
Max volumetric speed:		<input type="text" value="22"/>	mm ³ /s

Pressure equalizer (experimental)

Max volumetric slope positive:		<input type="text" value="0"/>	mm ³ /s ²
Max volumetric slope negative:		<input type="text" value="0"/>	mm ³ /s ²

Extrusion width

- Default extrusion width: • 0.66 mm or %
- First layer: • 0.84 mm or %
- Perimeters: • 0.66 mm or %
- External perimeters: • 0.63 mm or %
- Infill: • 0.66 mm or %
- Solid infill: • 0.66 mm or %
- Top solid infill: • 0.66 mm or %
- Support material: • 0 mm or %

Overlap

- Infill/perimeters overlap: • 40% mm or %

Flow

- Bridge flow ratio: • 0.85

Slicing

- Slice gap closing radius: • 0.049 mm
- Slicing Mode: • Regular
- Slice resolution: • 0.0125 mm
- G-code resolution: • 0.0125 mm
- Arc fitting: • Enabled: G2/3 I J
- XY Size Compensation: • 0 mm
- Elephant foot compensation: • 0.16 mm

Slicer Settings – cont.

Filament: Printed Solid Jessie PLA Tree Brown

Filament

- Color: •
- Diameter: • 1.75 mm
- Extrusion multiplier: • 1
- Density: • 1.24 g/cm³
- Cost: • 24.99 money/kg
- Spool weight: • 0 g

Temperature

- ☐ Idle temperature: • N/A °C
- Nozzle: First layer: • 215 °C Other layers: • 225 °C
- Bed: First layer: • 60 °C Other layers: • 60 °C

No tuning

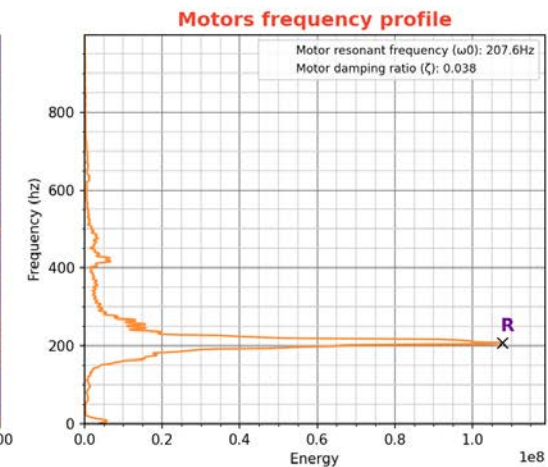
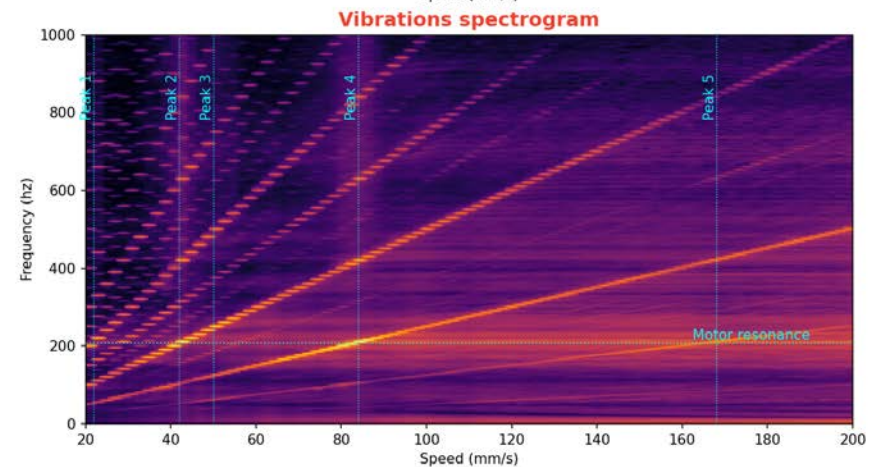
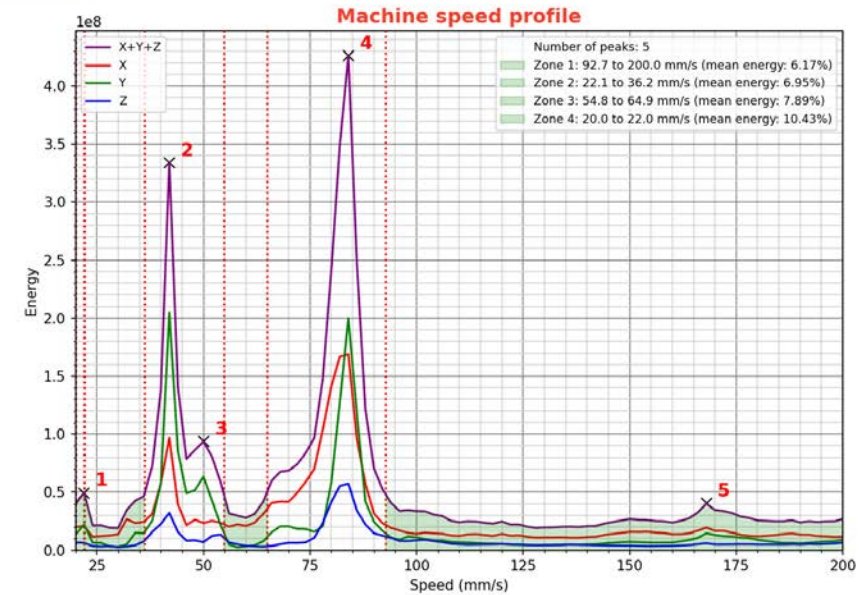
```
[tmc5160 stepper_x]
#SPI MODE 5160
cs_pin: PC10
run_current: 2
interpolate: True
sense_resistor: 0.075
stealthchop_threshold: 0
spi_software_mosi_pin: PA7
spi_software_miso_pin: PA6
spi_software_sclk_pin: PA5
```



VIBRATIONS MEASUREMENT TOOL

06/03/24 05:27:13 -- XY axis at 3000 mm/s²

v2.6.0-2-g312a9c9



TMC Dump – no tuning

===== Write-only registers =====

GLOBALSCALER: 000000a7 globalscaler=167
IHOLD_IRUN: 00061f1f ihold=31 irun=31 iholddelay=6
MSLUT0: aaaab554 mslut0=2863314260
MSLUT1: 4a9554aa mslut1=1251300522
MSLUT2: 24492929 mslut2=608774441
MSLUT3: 10104222 mslut3=269500962
MSLUT4: fbffffff mslut4=4227858431
MSLUT5: b5bb777d mslut5=3048961917
MSLUT6: 49295556 mslut6=1227445590
MSLUT7: 00404222 mslut7=4211234
MSLUTSEL: ffff8056 w0=2 w1=1 w2=1 w3=1 x1=128 x2=255 x3=255
MSLUTSTART: 00f70000 start_sin90=247
TPWMTHRS: 000fffff tpwmthrs=1048575
COOLCONF: 00000000
DRV_CONF: 00000400 bbmclks=4
PWMCONF: c40c001e pwm_ofs=30 pwm_autoscale=1
pwm_autograd=1 pwm_reg=4 pwm_lim=12
TPOWERDOWN: 0000000a tpowerdown=10

===== Queried registers =====

GCONF: 0000000c en_pwm_mode=1 multistep_filt=1
CHOPCONF: 33410153 toff=3 hstrt=5 hend=2 tbl=2 tpdf=4 mres=3(32usteps) intpol=1 dedge=1
GSTAT: 00000000
DRV_STATUS: 811f002b sg_result=43 csactual=31 stallguard=1 stst=1
FACTORY_CONF: 0000000b factory_conf=11
IOIN: 30000041 refl_step=1 sd_mode=1 version=0x30
LOST_STEPS: 00000000
MSCNT: 000002dc mscnt=732
MSCURACT: 01ca010e cur_a=-242 cur_b=-54
OTP_READ: 0000000b otp_fclktrim=11
PWM_SCALE: 0000001d pwm_scale_sum=29
PWM_AUTO: 0004001d pwm_ofs_auto=29 pwm_grad_auto=4
TSTEP: 000fffff tstep=1048575

Pictures- no tuning



Pictures- no tuning



TMC_Autotune

```
[tmc5160 stepper_x]
#SPI MODE 5160
cs_pin: PC10
run_current: 2
interpolate: True
sense_resistor: 0.075
stealthchop_threshold: 0
spi_software_mosi_pin: PA7
spi_software_miso_pin: PA6
spi_software_sclk_pin: PA5
```

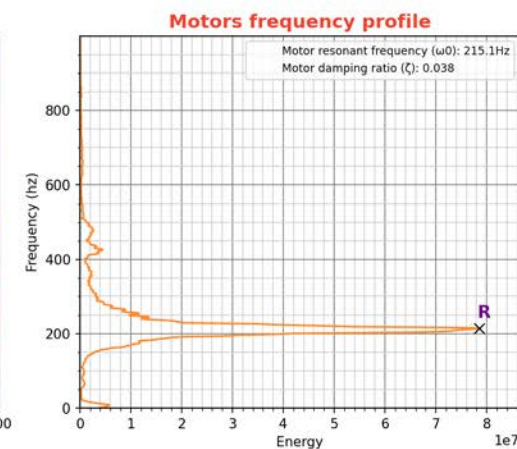
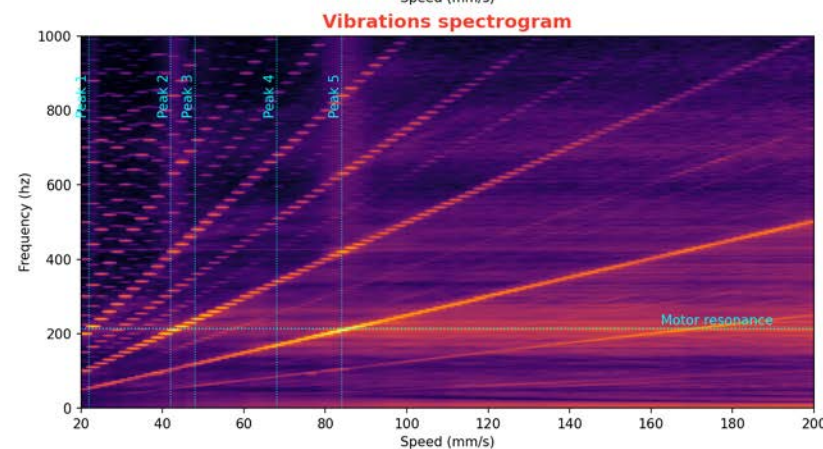
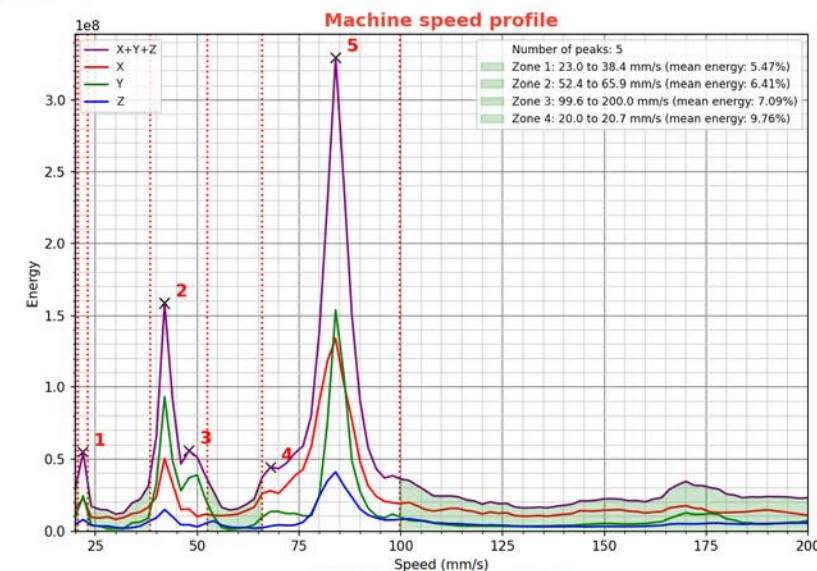
```
[autotune_tmc stepper_x]
motor: ldo-42sth48-2804ah
tuning_goal: auto
voltage: 48.0
```



VIBRATIONS MEASUREMENT TOOL

06/03/24 05:39:31 -- XY axis at 3000 mm/s²

v2.6.0-2-g312a9c9



TMC Dump – TMC_Autotune

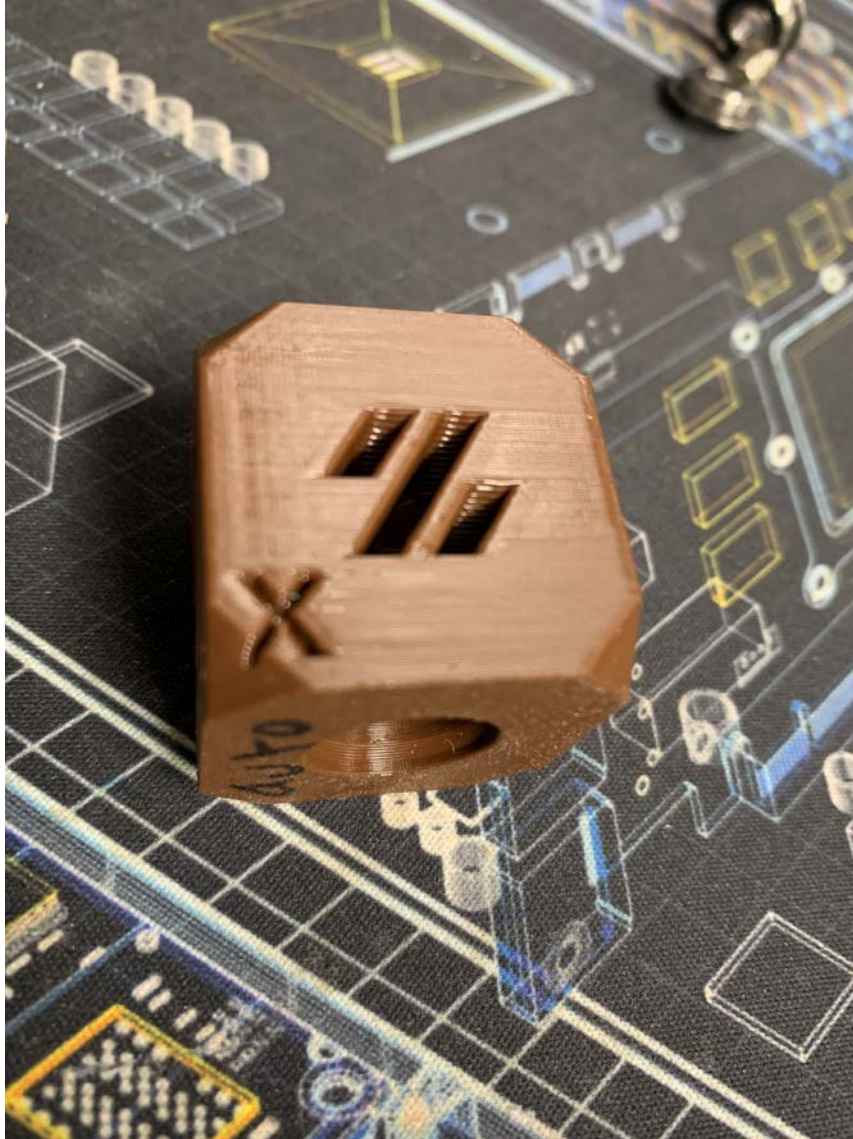
===== Write-only registers =====

GLOBALSCALER: 000000a7 globalscaler=167
IHOLD_IRUN: 000c1f1f ihold=31 irun=31 iholddelay=12
MSLUT0: aaaab554 mslut0=2863314260
MSLUT1: 4a9554aa mslut1=1251300522
MSLUT2: 24492929 mslut2=608774441
MSLUT3: 10104222 mslut3=269500962
MSLUT4: fbffffff mslut4=4227858431
MSLUT5: b5bb777d mslut5=3048961917
MSLUT6: 49295556 mslut6=1227445590
MSLUT7: 00404222 mslut7=4211234
MSLUTSEL: ffff8056 w0=2 w1=1 w2=1 w3=1 x1=128 x2=255 x3=255
MSLUTSTART: 00f70000 start_sin90=247
TPWMTHRS: 000fffff tpwmthrs=1048575
COOLCONF: 00010468 semin=8 seup=3 semax=4 sgt=1
DRV_CONF: 00000400 bbmclks=4
PWMCONF: 4f0c040b pwm_ofs=11 pwm_grad=4 pwm_autoscale=1 pwm_autograd=1
pwm_reg=15 pwm_lim=4
TPOWERDOWN: 0000000a tpowerdown=10
TCOOLTHRS: 00000125 tcoolthrs=293

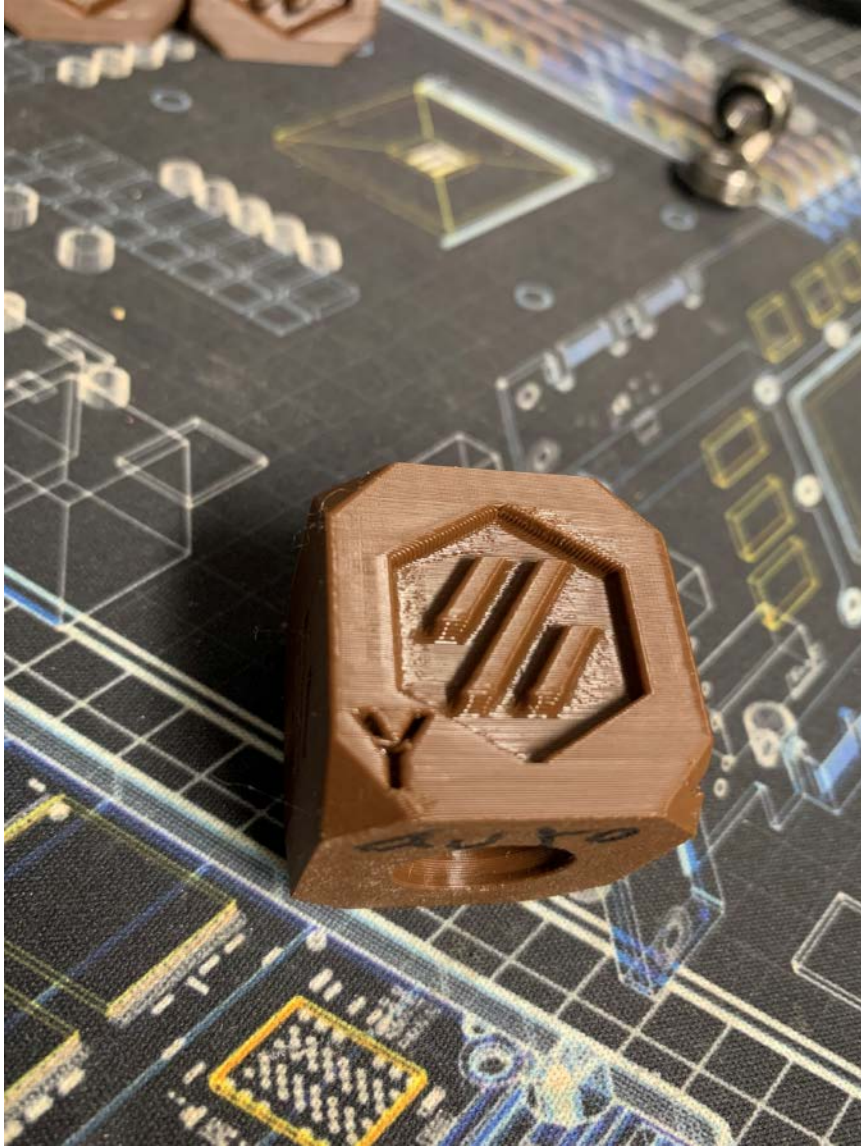
===== Queried registers =====

GCONF: 00000008 multistep_filt=1
CHOPCONF: 330084f4 toff=4 hstrt=7 hend=9 tbl=1 mres=3(32usteps) intpol=1 dedge=1
GSTAT: 00000000
DRV_STATUS: 811f0025 sg_result=37 csactual=31 stallguard=1 stst=1
FACTORY_CONF: 0000000b factory_conf=11
IOIN: 30000040 sd_mode=1 version=0x30
LOST_STEPS: 00000000
MSCNT: 00000344 mscnt=836
MSCURACT: 0064011e cur_a=-226 cur_b=100
OTP_READ: 0000000b otp_fcltrim=11
PWM_SCALE: 0000001d pwm_scale_sum=29
PWM_AUTO: 0004001d pwm_ofs_auto=29 pwm_grad_auto=4
TSTEP: 000fffff tstep=1048575

Pictures- TMC_Autotune



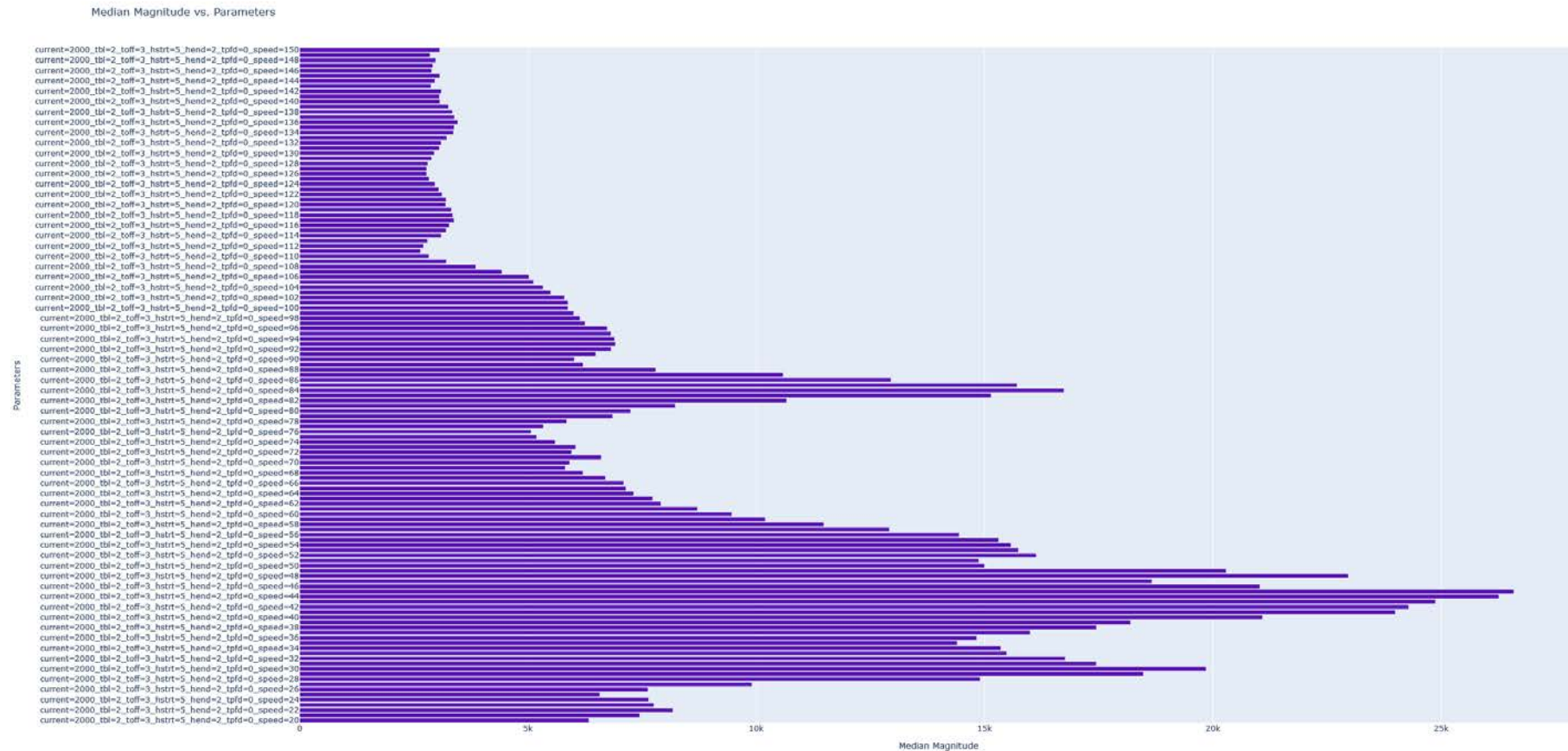
Pictures- TMC_Autotune



Chopper_Resonance_Tuner

data used to generate register values

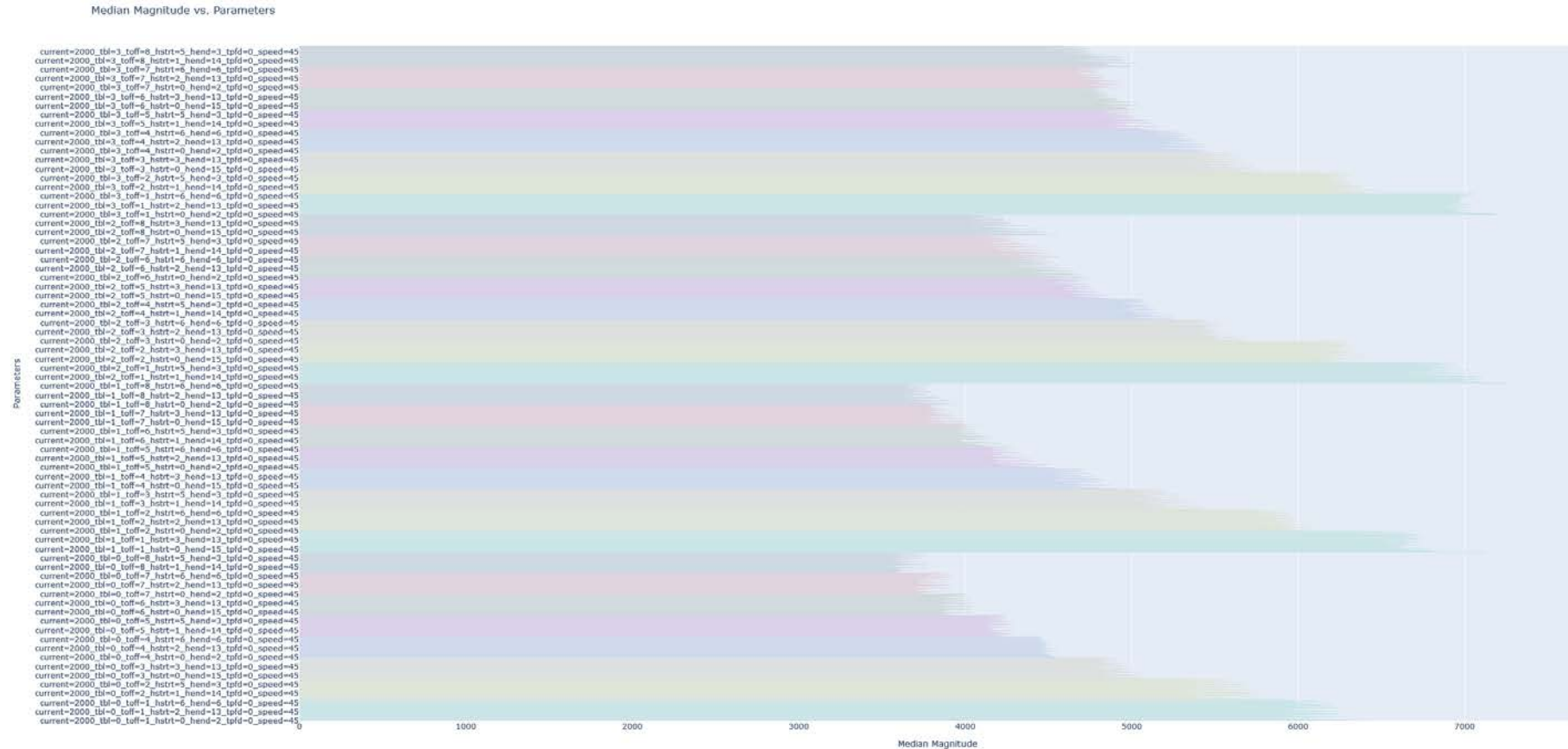
Command: CHOPPER_TUNE FIND_VIBRATIONS=1 MIN_SPEED=20 MAX_SPEED=125



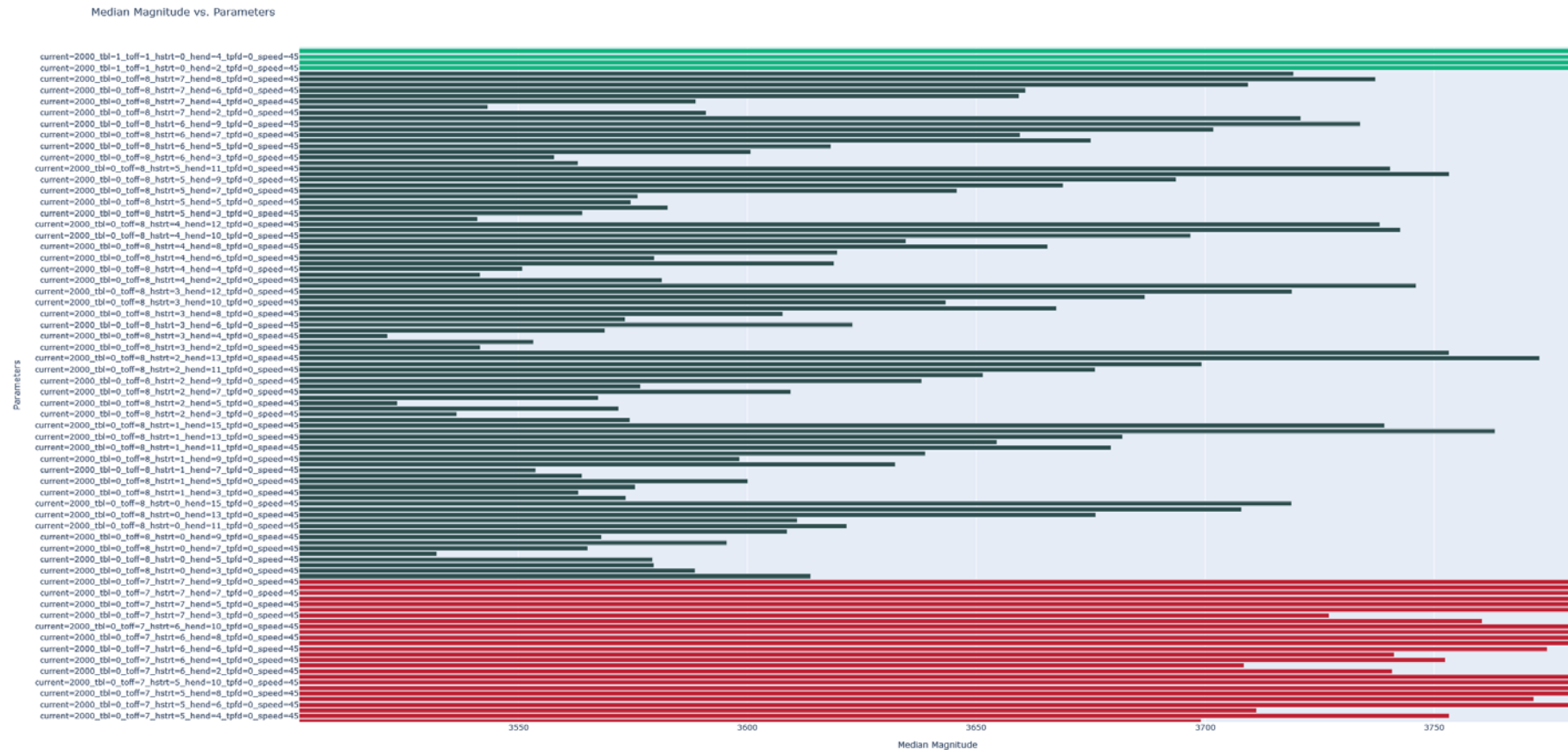
Chopper_Resonance_Tuner

data used to generate register values

Command: CHOPPER_TUNE MIN_SPEED=45 MAX_SPEED=45



Close up of previous graph of the values used



Chopper_Resonance_Tuner

data used to generate register values

Command: CHOPPER_TUNE TBL_MIN=0 TBL_MAX=0 TOFF_MIN=8 TOFF_MAX=8 HSTRT_MIN=3 HSTRT_MAX=3 HEND_MIN=4 HEND_MAX=4 TPFD_MIN=0 TPFD_MAX=15 MIN_SPEED=45 MAX_SPEED=45 ITERATIONS=2



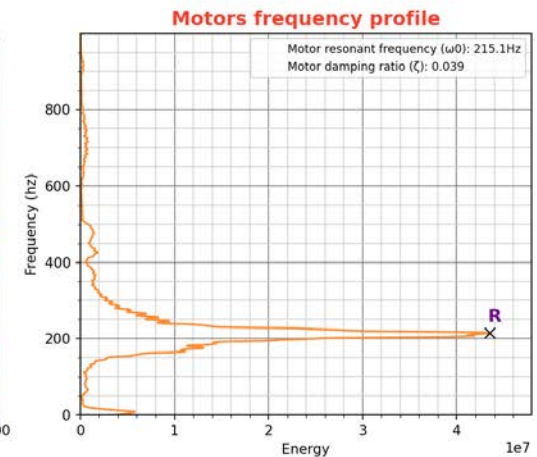
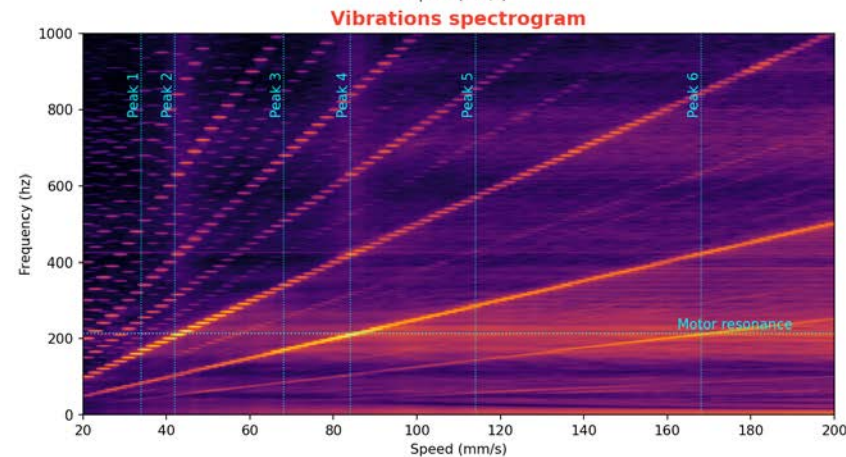
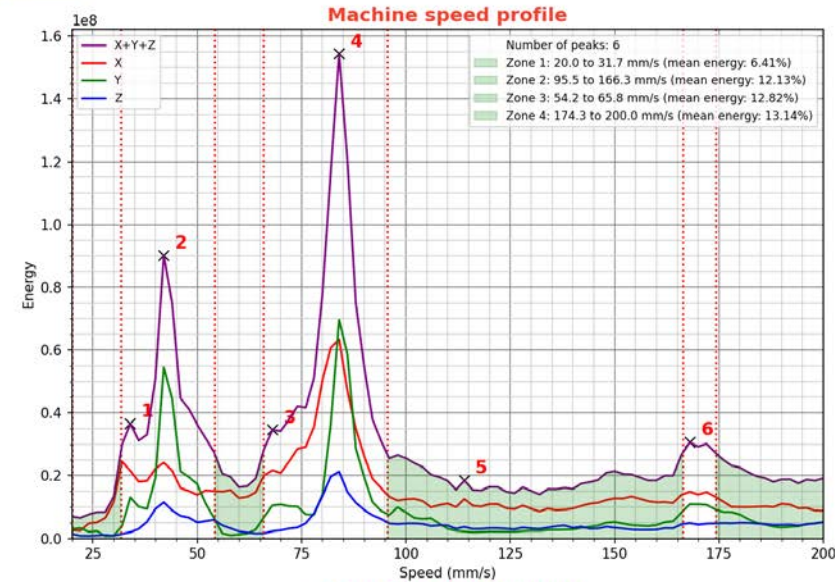
Chopper_Resonance_Tuner

```
[tmc5160 stepper_x]
#SPI MODE 5160
cs_pin: PC10
run_current: 2
interpolate: True
sense_resistor: 0.075
stealthchop_threshold: 0
spi_software_mosi_pin: PA7
spi_software_miso_pin: PA6
spi_software_sclk_pin: PA5
#####
driver_TBL: 0
driver_TOFF: 8
driver_HSTRT: 3
driver_HEND: 4
driver_TPF: 7
```



VIBRATIONS MEASUREMENT TOOL

06/03/24 05:13:23 -- XY axis at 3000 mm/s²



v2.6.0-2-g312a9c9

TMC Dump – Chopper_Resonance_Tuner

===== Write-only registers =====

GLOBALSCALER: 000000a7 globalscaler=167
I HOLD_IRUN: 00061f1f ihold=31 irun=31 iholddelay=6
MSLUT0: aaaab554 mslut0=2863314260
MSLUT1: 4a9554aa mslut1=1251300522
MSLUT2: 24492929 mslut2=608774441
MSLUT3: 10104222 mslut3=269500962
MSLUT4: fbffff mslut4=4227858431
MSLUT5: b5bb777d mslut5=3048961917
MSLUT6: 49295556 mslut6=1227445590
MSLUT7: 00404222 mslut7=4211234
MSLUTSEL: ffff8056 w0=2 w1=1 w2=1 w3=1 x1=128 x2=255 x3=255
MSLUTSTART: 00f70000 start_sin90=247
TPWMTHRS: 000ffff tpwmthrs=1048575
COOLCONF: 00000000
DRV_CONF: 00000400 bbmclks=4
PWMCONF: c40c001e pwm_ofs=30 pwm_autoscale=1 pwm_autograd=1 pwm_reg=4
pwm_lim=12
TPOWERDOWN: 0000000a tpowerdown=10

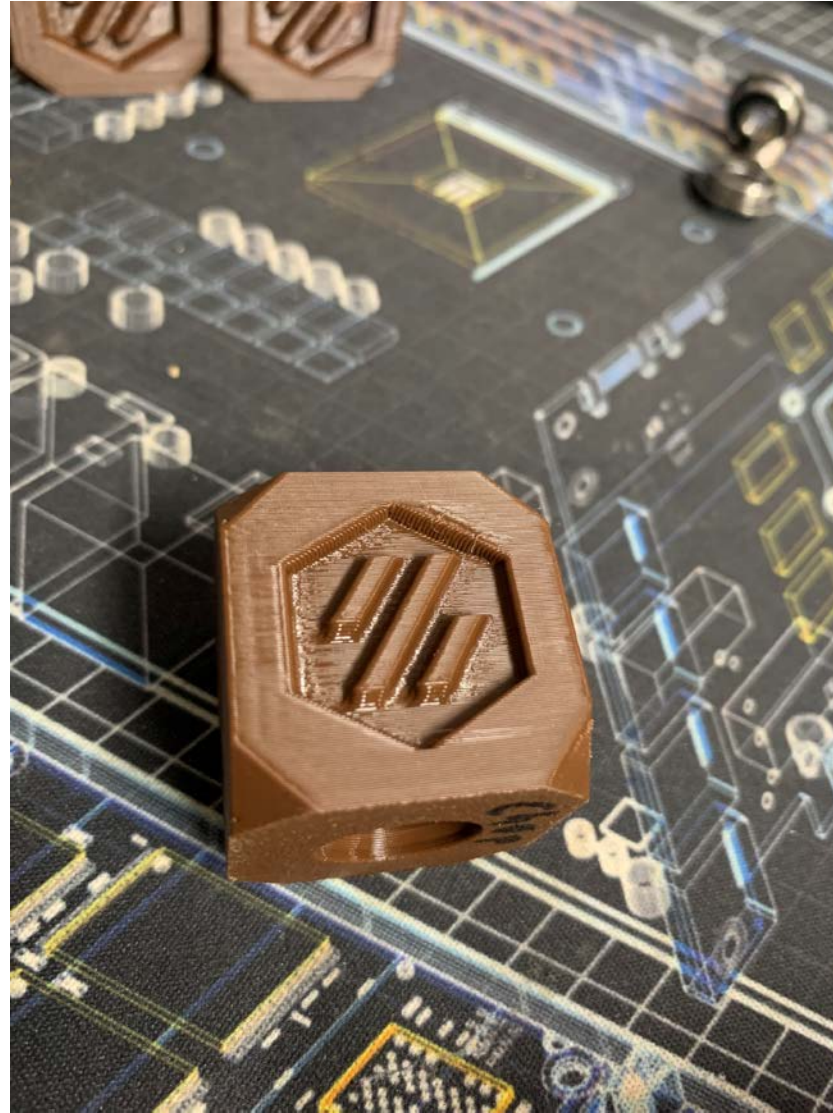
===== Queried registers =====

GCONF: 0000000c en_pwm_mode=1 multistep_filt=1
CHOPCONF: 33700238 toff=8 hstrt=3 hend=4 tpfd=7 mres=3(32usteps) intpol=1 dedge=1
GSTAT: 00000000
DRV_STATUS: 811f001e sg_result=30 csactual=31 stallguard=1 stst=1
FACTORY_CONF: 0000000b factory_conf=11
IOIN: 30000041 refl_step=1 sd_mode=1 version=0x30
LOST_STEPS: 00000000
MSCNT: 000002cc mscnt=716
MSCURACT: 01b30114 cur_a=-236 cur_b=-77
OTP_READ: 0000000b otp_fclktrim=11
PWM_SCALE: 0000001d pwm_scale_sum=29
PWM_AUTO: 0004001d pwm_ofs_auto=29 pwm_grad_auto=4
TSTEP: 000ffff tstep=1048575

Pictures- Chopper_Resonance_Tuner



Pictures- Chopper_Resonance_Tuner



TMC_Autotune update:

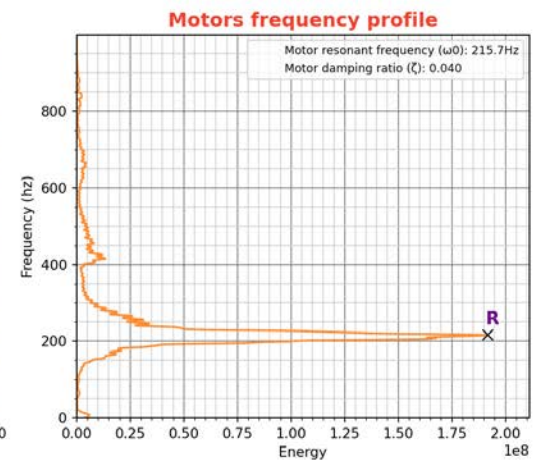
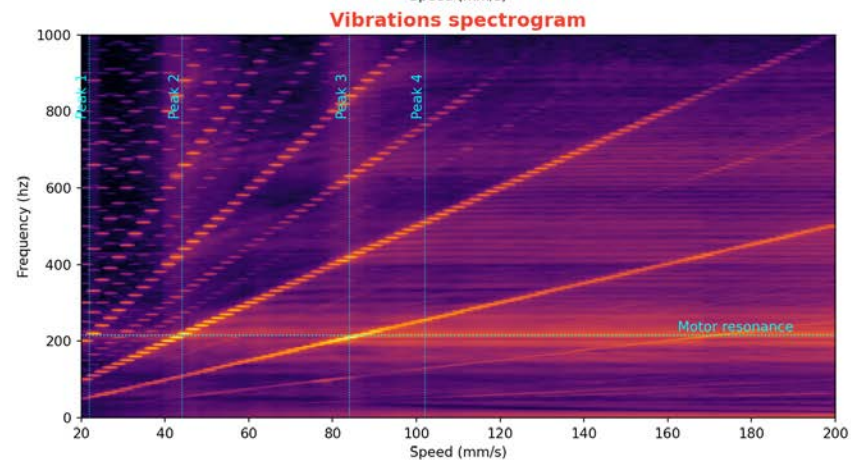
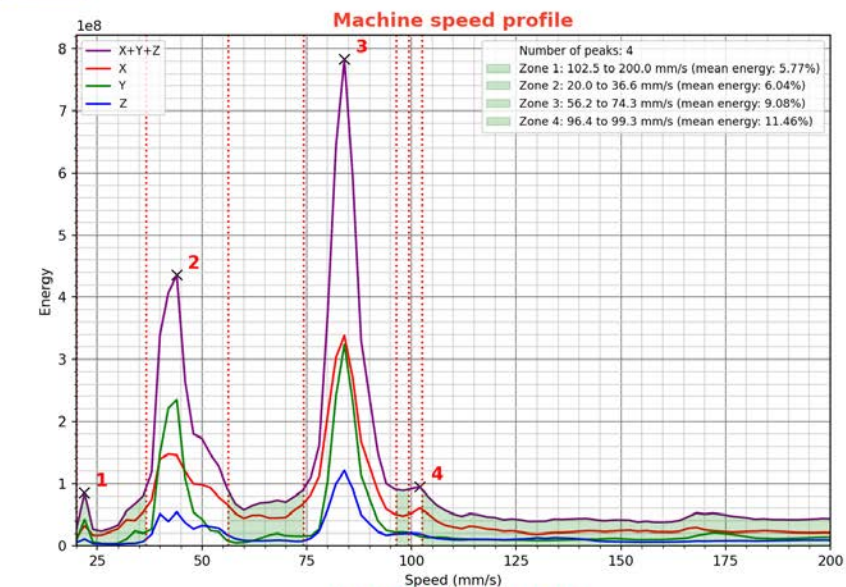
v0.2.0-160-g7aa3a528



VIBRATIONS MEASUREMENT TOOL

06/03/24 21:28:30 -- XY axis at 3000 mm/s²

v2.6.0-2-g312a9c9



TMC Dump – TMC_Autotune update

v0.2.0-160-g7aa3a528

===== Write-only registers =====

GLOBALSCALER: 000000a7 globalscaler=167

IHOLD_IRUN: 000c1f1f ihold=31 irun=31 iholddelay=12

MSLUT0: aaaab554 mslut0=2863314260

MSLUT1: 4a9554aa mslut1=1251300522

MSLUT2: 24492929 mslut2=608774441

MSLUT3: 10104222 mslut3=269500962

MSLUT4: fbffff mslut4=4227858431

MSLUT5: b5bb777d mslut5=3048961917

MSLUT6: 49295556 mslut6=1227445590

MSLUT7: 00404222 mslut7=4211234

MSLUTSEL: ffff8056 w0=2 w1=1 w2=1 w3=1 x1=128 x2=255 x3=255

MSLUTSTART: 00f70000 start_sin90=247

TPWMTHRS: 000ffff tpwmthrs=1048575

COOLCONF: 00010468 semin=8 seup=3 semax=4 sgt=1 DRV_CONF: 00000400 bbmclks=4

PWMCONF: 4f0c040b pwm_ofs=11 pwm_grad=4 pwm_autoscale=1 pwm_autograd=1

pwm_reg=15 pwm_lim=4T

POWERDOWN: 0000000a tpowerdown=10

TCOOLTHRS: 00000125 tcoolthrs=293

===== Queried registers =====

GCONF: 00000008 multistep_filt=1

CHOPCONF: 333084f1 toff=1 hstrt=7 hend=9 tbl=1 tpfd=3 mres=3(32usteps) intpol=1 dedge=1

GSTAT: 00000000

DRV_STATUS: 841f0025 sg_result=37 csactual=31 otpw=1(OvertempWarning!) stst=1

FACTORY_CONF: 0000000b factory_conf=11

IOIN: 30000040 sd_mode=1 version=0x30

LOST_STEPS: 00000000

MSCNT: 00000374 mscnt=884

MSCURACT: 00a20145 cur_a=-187 cur_b=162

OTP_READ: 0000000b otp_fcltrim=11

PWM_SCALE: 0000001d pwm_scale_sum=29

PWM_AUTO: 0004001d pwm_ofs_auto=29 pwm_grad_auto=4

TSTEP: 000ffff tstep=1048575

Pictures- TMC_Autotune update

v0.2.0-160-g7aa3a528



Pictures- TMC_Autotune update

v0.2.0-160-g7aa3a528



TMC_Autotune update 2:

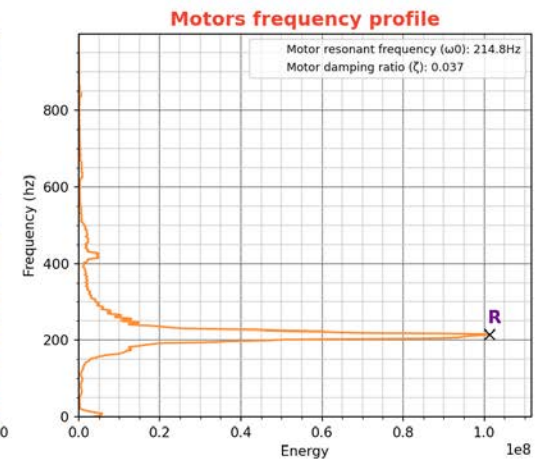
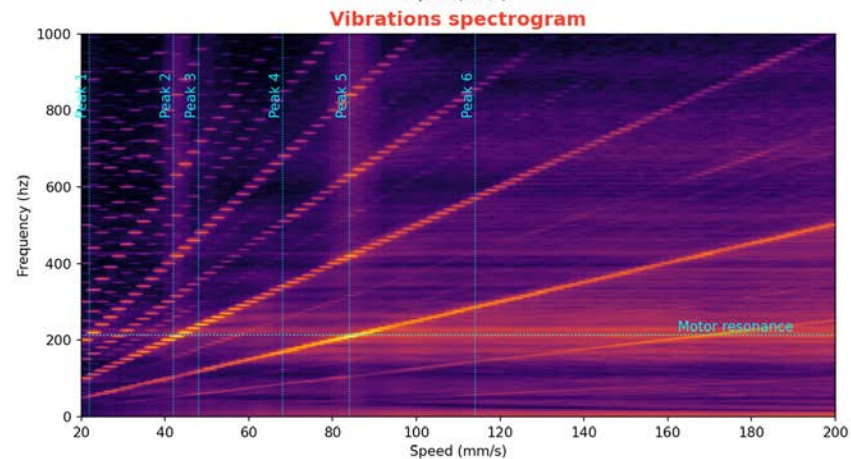
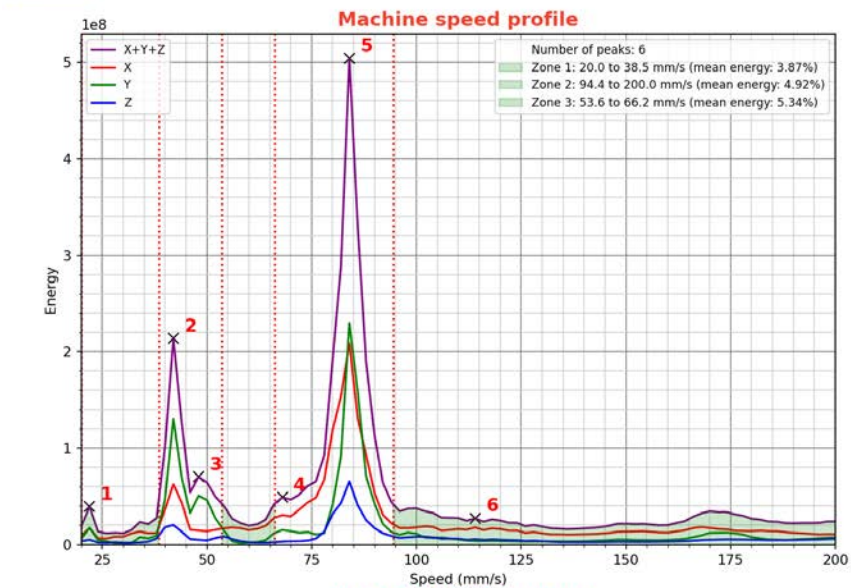
v0.2.0-161-g1de500cf



VIBRATIONS MEASUREMENT TOOL

07/03/24 08:26:15 -- XY axis at 3000 mm/s²

v2.6.0-2-g312a9c9



TMC Dump – TMC_Autotune update 2:

v0.2.0-161-g1de500cf

===== Write-only registers =====

GLOBALSCALER: 000000a7 globalscaler=167

IHOLD_IRUN: 000c1f1f ihold=31 irun=31 iholddelay=12

MSLUT0: aaaab554 mslut0=2863314260

MSLUT1: 4a9554aa mslut1=1251300522

MSLUT2: 24492929 mslut2=608774441

MSLUT3: 10104222 mslut3=269500962

MSLUT4: fbffffff mslut4=4227858431

MSLUT5: b5bb777d mslut5=3048961917

MSLUT6: 49295556 mslut6=1227445590

MSLUT7: 00404222 mslut7=4211234

MSLUTSEL: ffff8056 w0=2 w1=1 w2=1 w3=1 x1=128 x2=255

: 00f70000 start_sin90=247

TPWMTHRS: 000fffff tpwmthrs=1048575

COOLCONF: 00010468 semin=8 seup=3 semax=4 sgt=1

DRV_CONF: 00000400 bbmclks=4

PWMCONF: 4f0c040b pwm_ofs=11 pwm_grad=4 pwm_autoscale=1 pwm_autograd=1

pwm_reg=15 pwm_lim=4

TPOWERDOWN: 0000000a tpowerdown=10TCOOLTHRS: 00000125 tcoolthrs=293

===== Queried registers =====

GCONF: 00000008 multistep_filt=1

CHOPCONF: 332084f3 toff=3 hstrt=7 hend=9 tbl=1 tpfd=2 mres=3(32usteps) intpol=1 dedge=1

GSTAT: 00000000

DRV_STATUS: 811f0023 sg_result=35 csactual=31 stallguard=1 stst=1

FACTORY_CONF: 0000000b factory_conf=11

IOIN: 30000041 refl_step=1 sd_mode=1 version=0x30

LOST_STEPS: 00000000

MSCNT: 0000032c mscnt=812

MSCURACT: 00420111 cur_a=-239 cur_b=66

OTP_READ: 0000000b otp_fcltrim=11

PWM_SCALE: 0000001d pwm_scale_sum=29

PWM_AUTO: 0004001d pwm_ofs_auto=29 pwm_grad_auto=4

TSTEP: 000fffff tstep=104

Pictures- TMC_Autotune update 2:

v0.2.0-161-g1de500cf



Pictures- TMC_Autotune update 2:

v0.2.0-161-g1de500cf

