

**AMI 6-3-1 T**

**INTEGRATED CRYOGEN-FREE**

**SUPERCONDUCTING MAGNET SYSTEM**

**MAGNET SPECIFICATIONS**

**AND**

**PERFORMANCE SHEET**

**#15623**

July 1, 2022

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# 1 Magnet Specifications and System Layout

## American Magnetics, Inc.

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 Phone: (865) 482-1056 Fax: (865) 482-5472  
 Internet: <http://www.americanmagnetics.com> E-mail: [sales@americanmagnetics.com](mailto:sales@americanmagnetics.com)



### MAGNET SPECIFICATIONS

AMI System Serial Number: 15623  
 Type: CC-MX-631-076-100-LD Vector Magnet  
 For: BlueFors Cryogenics Oy Ltd.  
 Test Date: 24 May 2022

#### Simultaneous Magnet Operation

Rated Y/Z Vector @ 4.2K<sup>1</sup> ..... 30 kG  
 Rated X/Z Vector @ 4.2K<sup>1</sup> ..... 10 kG  
 Rated X/Y Vector @ 4.2K<sup>1</sup> ..... 10 kG  
 Rated X/Y/Z Vector @ 4.2K<sup>1</sup> ..... 10 kG  
 Ramp Rate ..... 0.0353 Amps/Second

#### Note

*This magnet system produces a rotatable field vector by appropriate combinations of fields from the 3-axis system.*

#### Independent Solenoid (Z-Axis)

Rated Central Field @ 4.2K<sup>2</sup> ..... 60 kG  
 Rated Operating Current ..... 61.98 Amperes  
 Ramp Rate ..... 0.0909 Amps/Second  
 Field to Current Ratio ..... 0.9680 kG/Amp  
 Homogeneity over 1 cm DSV ..... +/-0.1%  
 Inductance ..... 11.0 Henries  
 Clear Bore ..... 76 mm [ 3.0"]  
 Recommended Persistent Switch Heater Current ..... 20.1 mA  
 Persistent Switch Heater Nominal Resistance<sup>3</sup> ..... 168 Ohms  
 Total Magnet and Switch Resistance<sup>3</sup> ..... 36 Ohms

1. Magnets not warranted for simultaneous operation of resultant field magnitudes above rated vector.
2. Magnet not warranted for independent operation of Z-Axis magnet above 60 kG, Y-Axis magnet above 30 kG, and X-Axis magnet above 10 kG.
3. All resistance measurements made at room temperature.

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Figure 1: Magnet specification sheet for 6-3-1T 3D Magnet (I)

**Independent Split Coil (Y-Axis)**

Rated Central Field @ 4.2K <sup>2</sup>	30 kG
Rated Operating Current	79.77 Amps
Ramp Rate	0.0353 Amps/Second
Field to Current Ratio	0.3761 kG/Amp
Homogeneity over 1 cm DSV	+/-1.0%
Inductance	28.3 Henries
Recommended Persistent Switch Heater Current	N/A
Persistent Switch Heater Nominal Resistance <sup>3</sup>	N/A
Magnet Resistance <sup>3</sup>	1802 Ohms

**Independent Split Coil (X-Axis)**

Rated Central Field @ 4.2K <sup>2</sup>	10 kG
Rated Operating Current	65.32 Amps
Ramp Rate	0.2220 Amps/Second
Field to Current Ratio	0.1531 kG/Amp
Homogeneity over 1 cm DSV	+/-1.5%
Inductance	4.5 Henries
Recommended Persistent Switch Heater Current	N/A
Persistent Switch Heater Nominal Resistance <sup>3</sup>	N/A
Magnet Resistance <sup>3</sup>	658 Ohms

**Overall Magnet Dimensions**

Magnet Height (overall)	371 mm [14.6"]
Mounting Plate Diameter	352 mm [13.86"]
Weight	66 kg [146 lbs]

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Figure 2: Magnet specification sheet for 6-3-1T 3D Magnet (2)



CC-MX136-76LD1.DSN

PROPRIETARY INFORMATION - DO NOT DISCLOSE WITHOUT AMI PERMISSION

6 AUG 2021

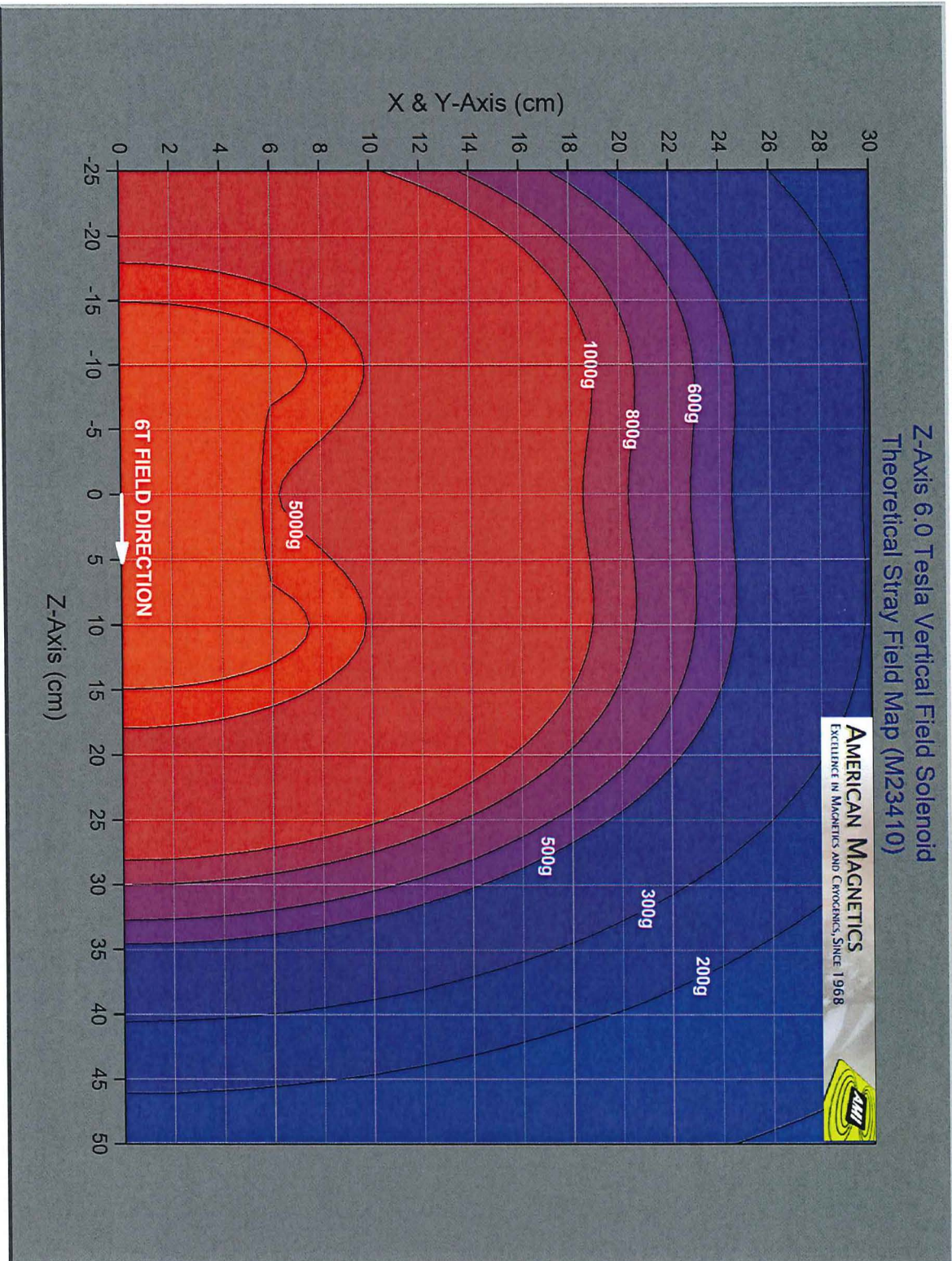


Figure 3: Theoretical stray field map for Z -axis



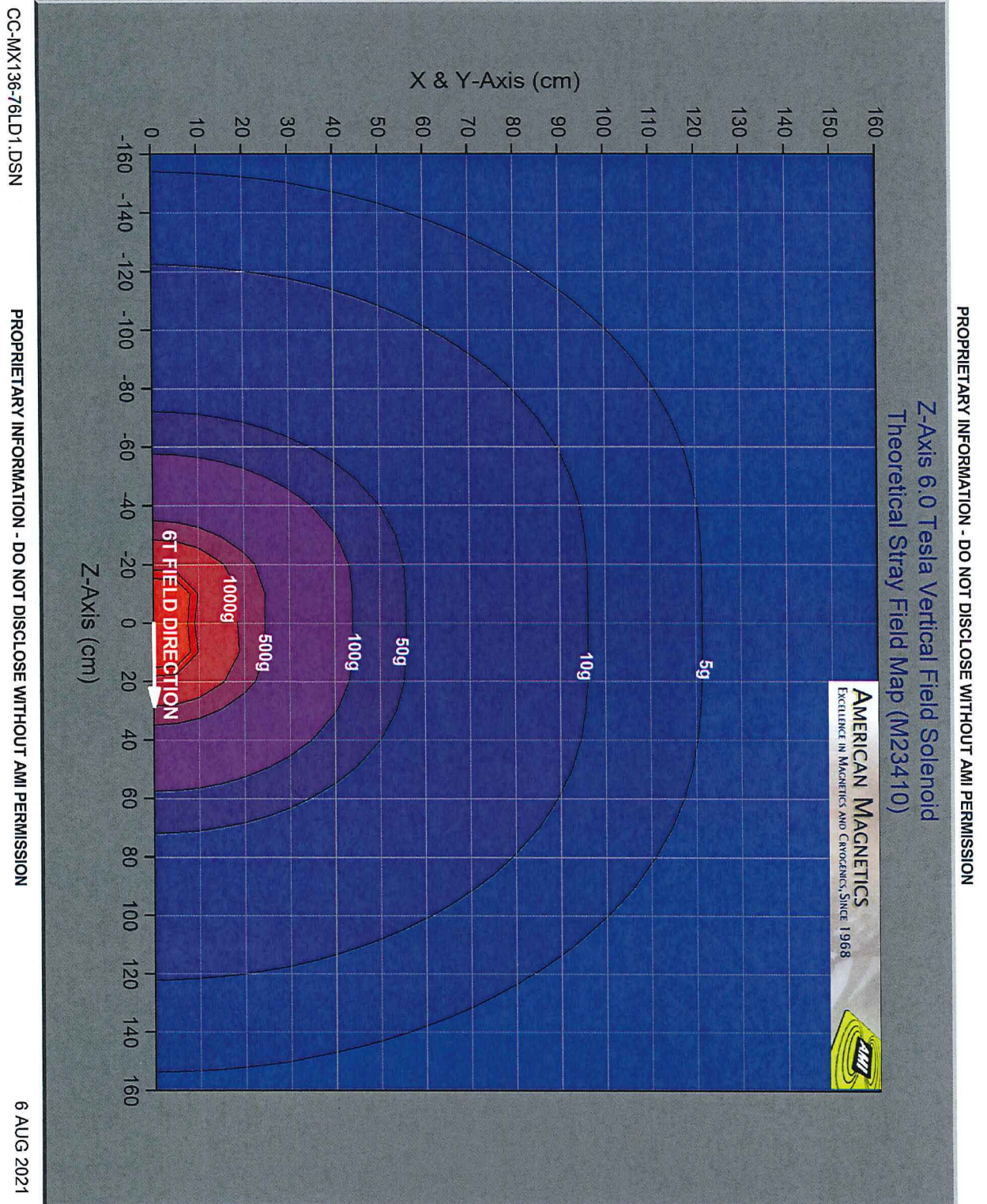


Figure 4: Theoretical stray field map for Z -axis (5g)



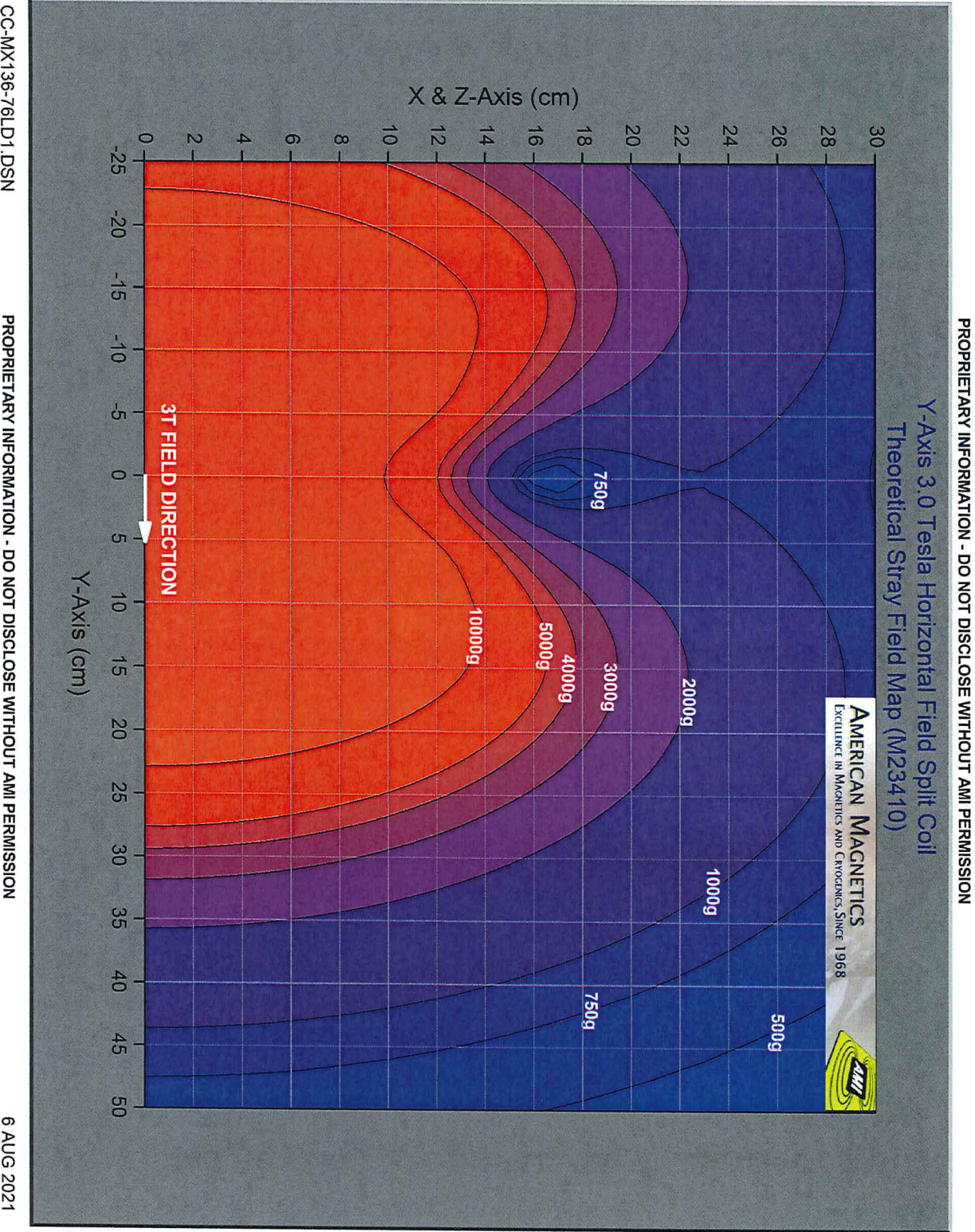


Figure 5: Theoretical stray field map for Y-axis



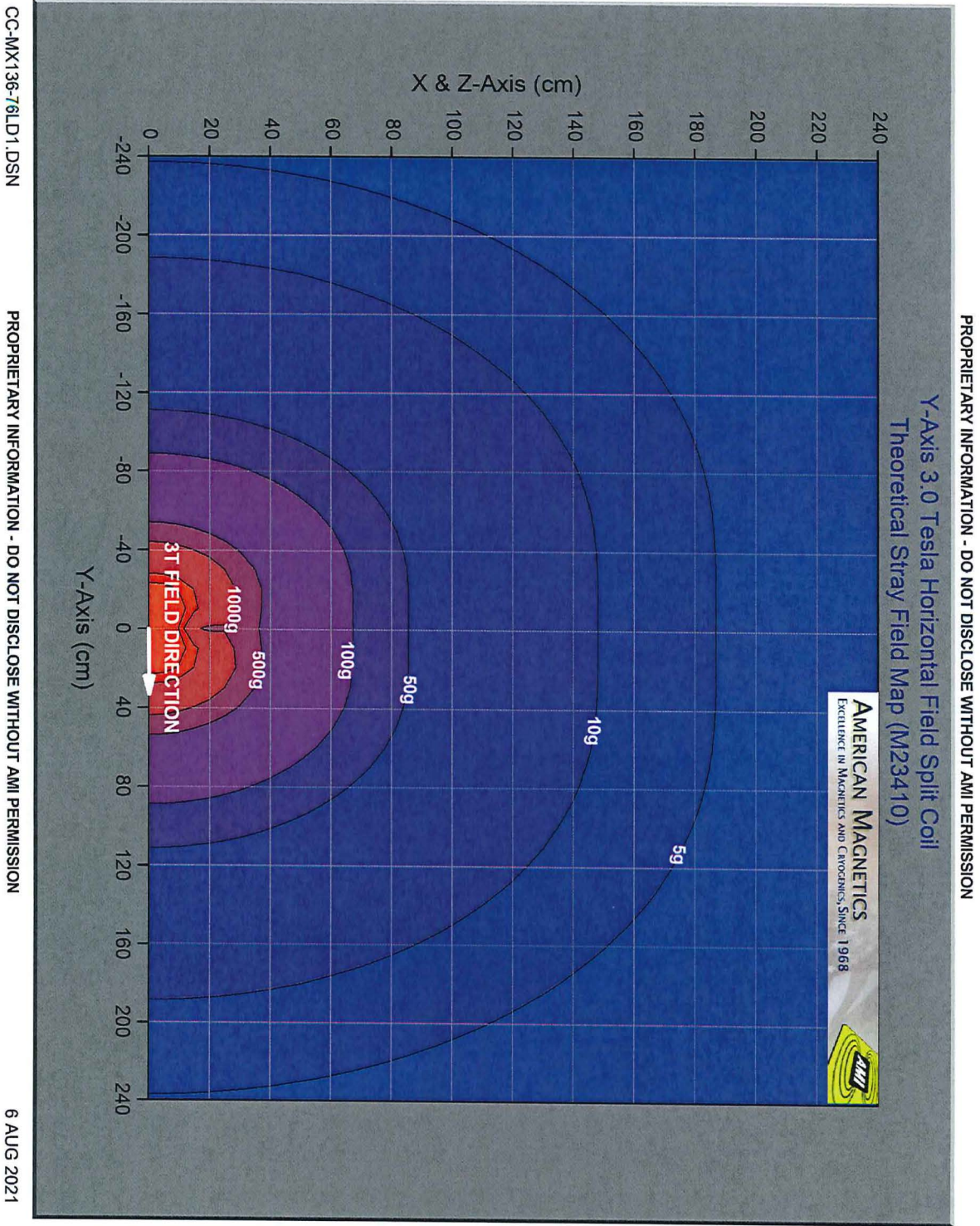


Figure 6: Theoretical stray field map for Y -axis (5g)



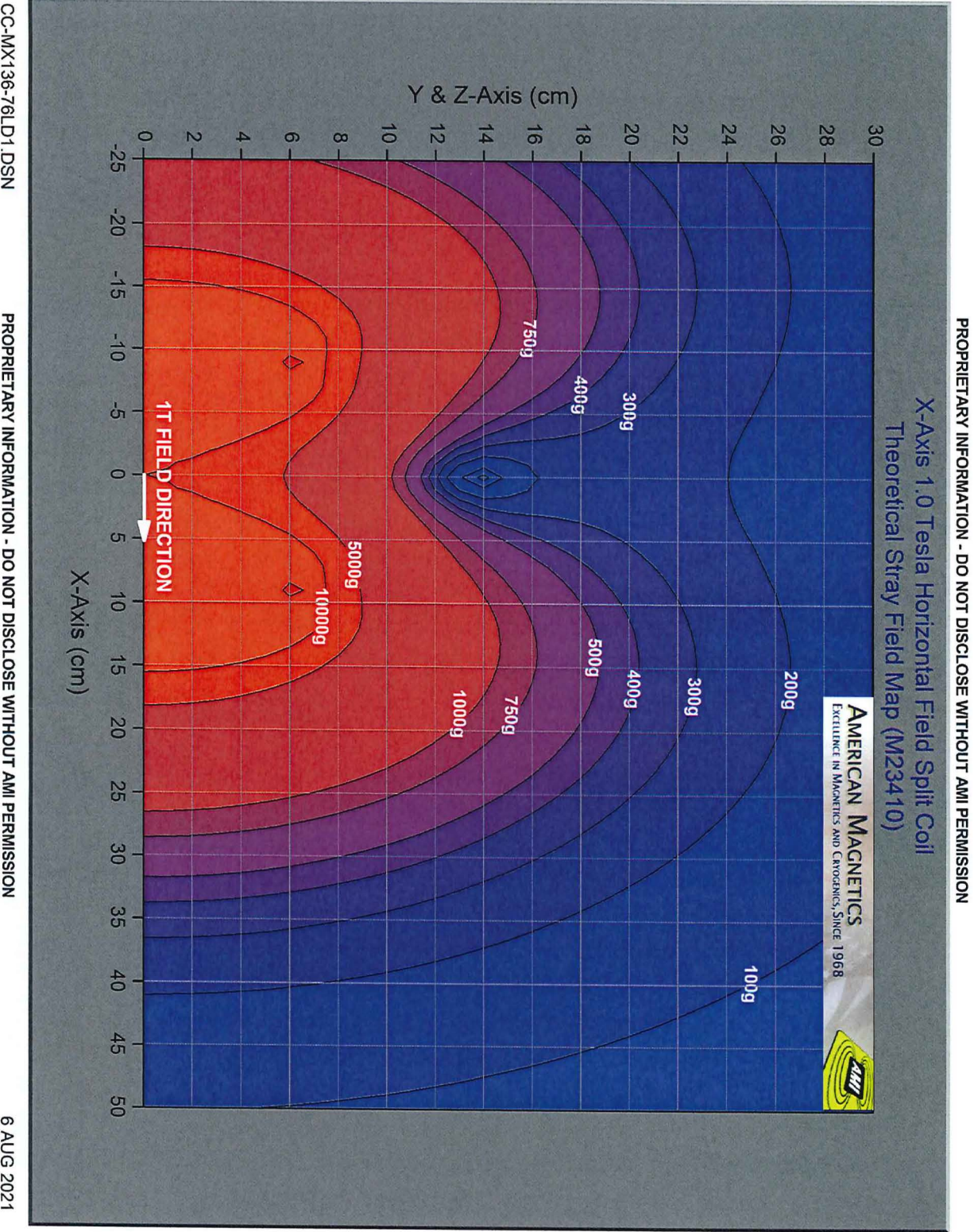


Figure 7: Theoretical stray field map for X -axis



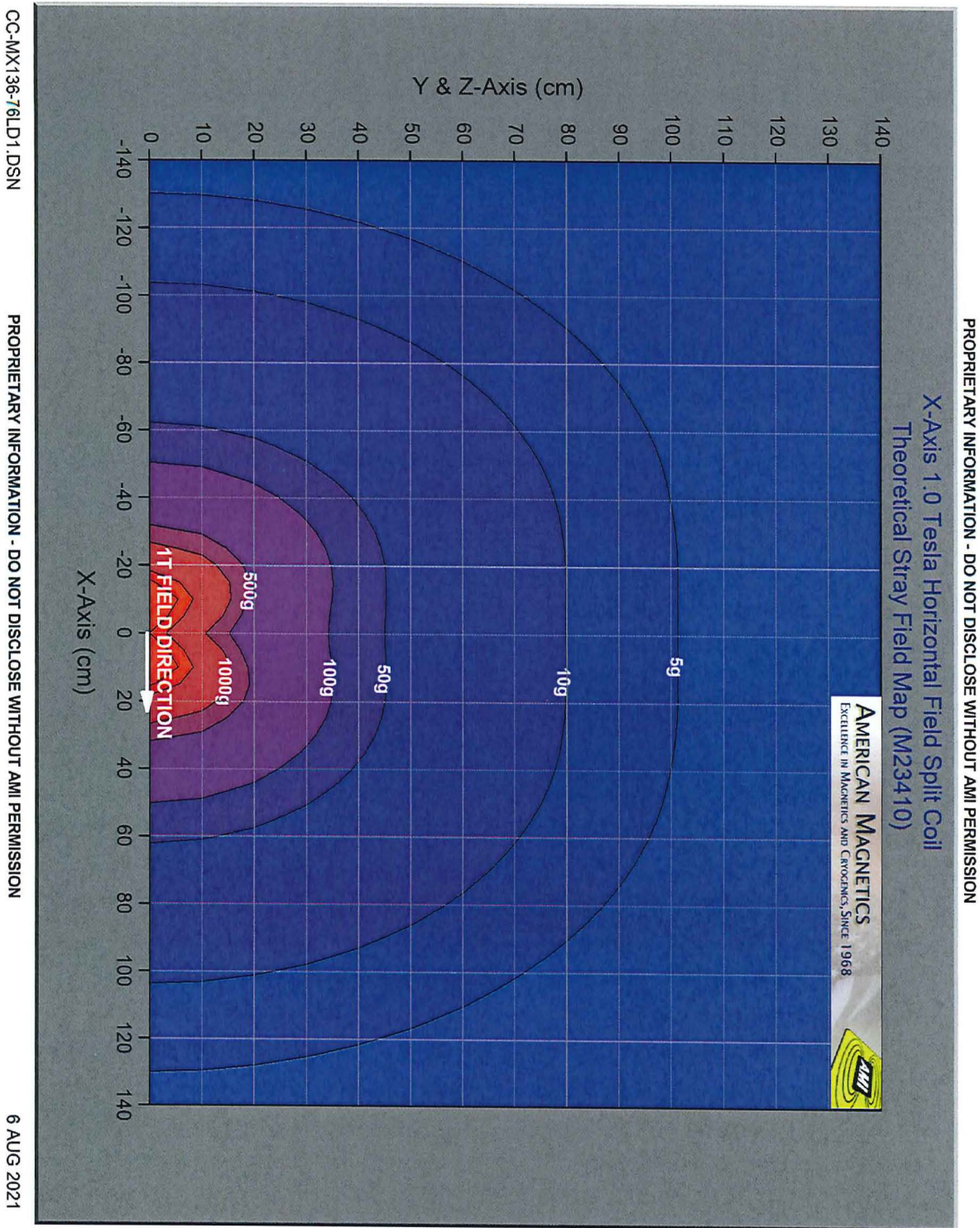


Figure 8: Theoretical stray field map for X -axis (5g)



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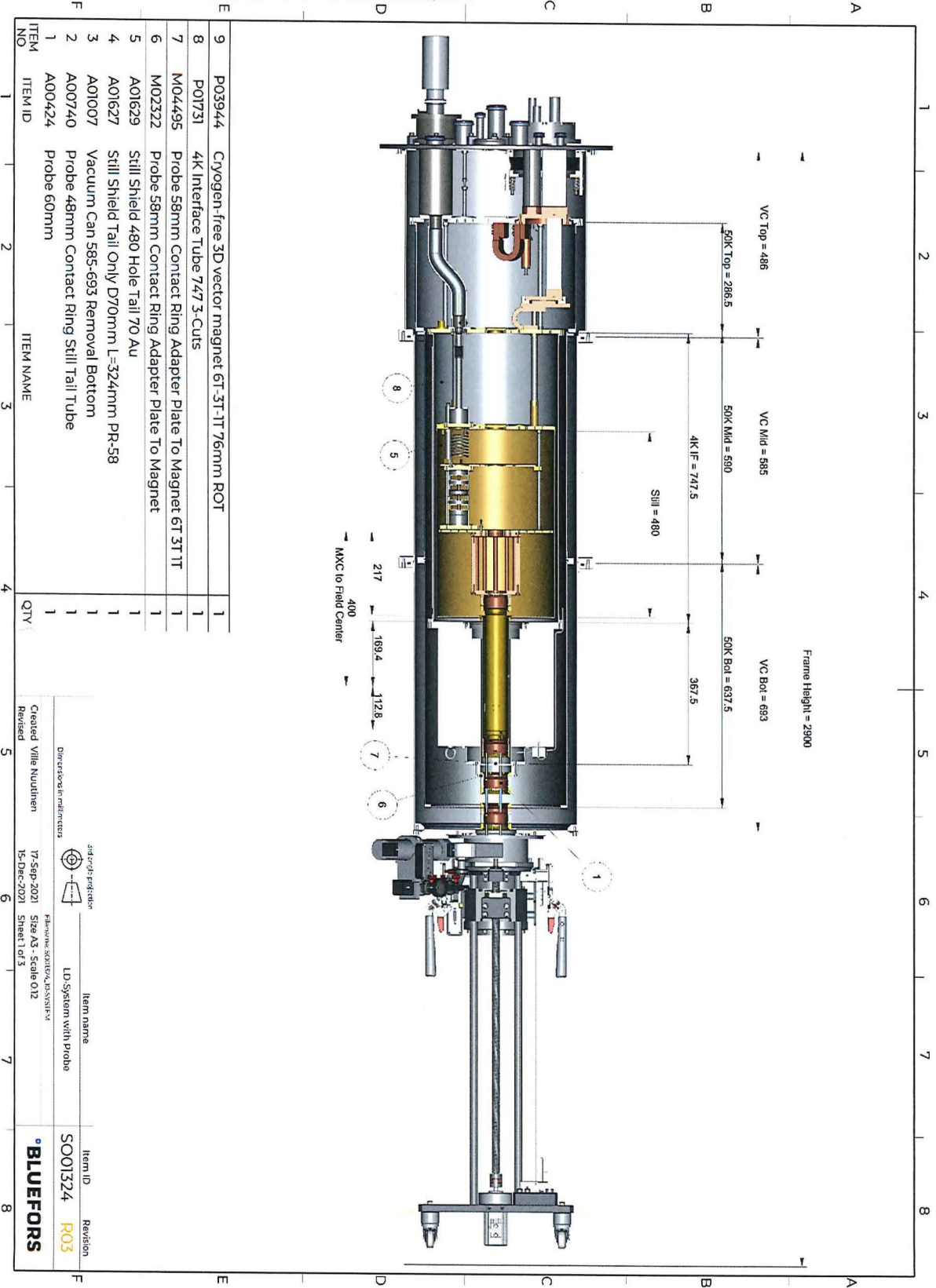


Figure 9: Cryostat layout picture

## 2 Performance Test

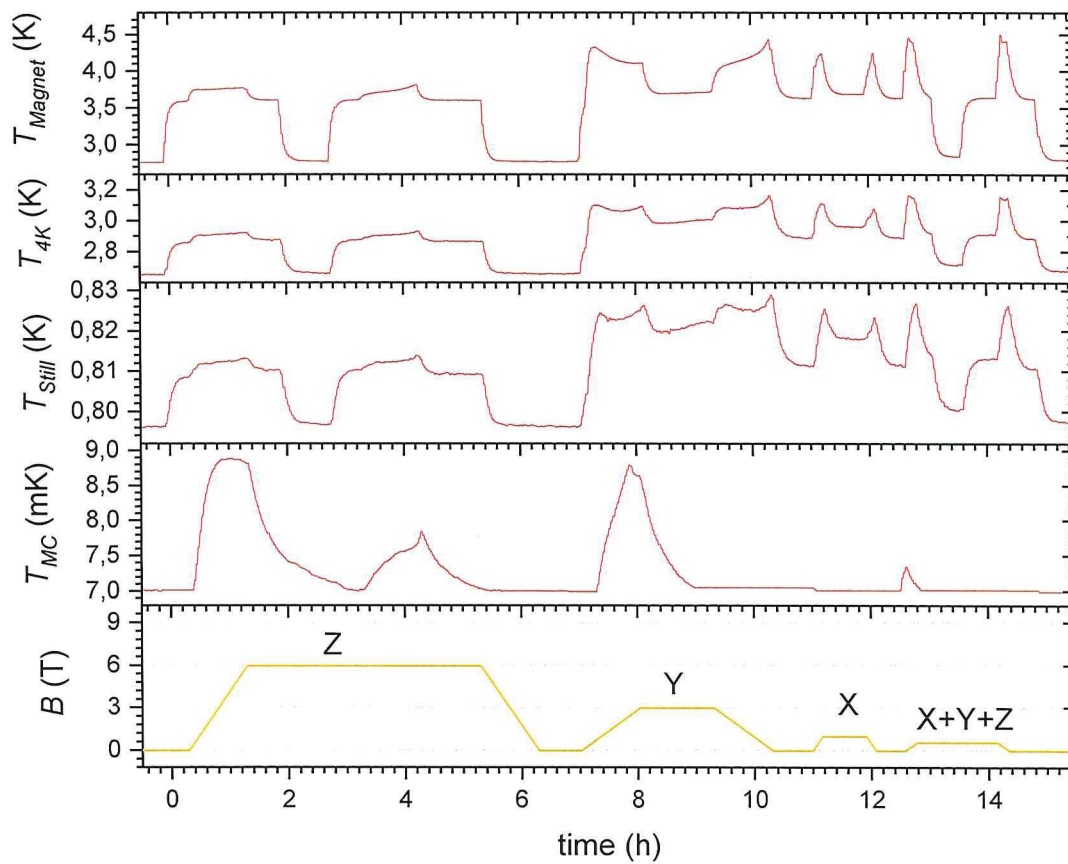


Figure 10: Magnet temperature graph of Z, Y, X and X/Y/Z vector ramp



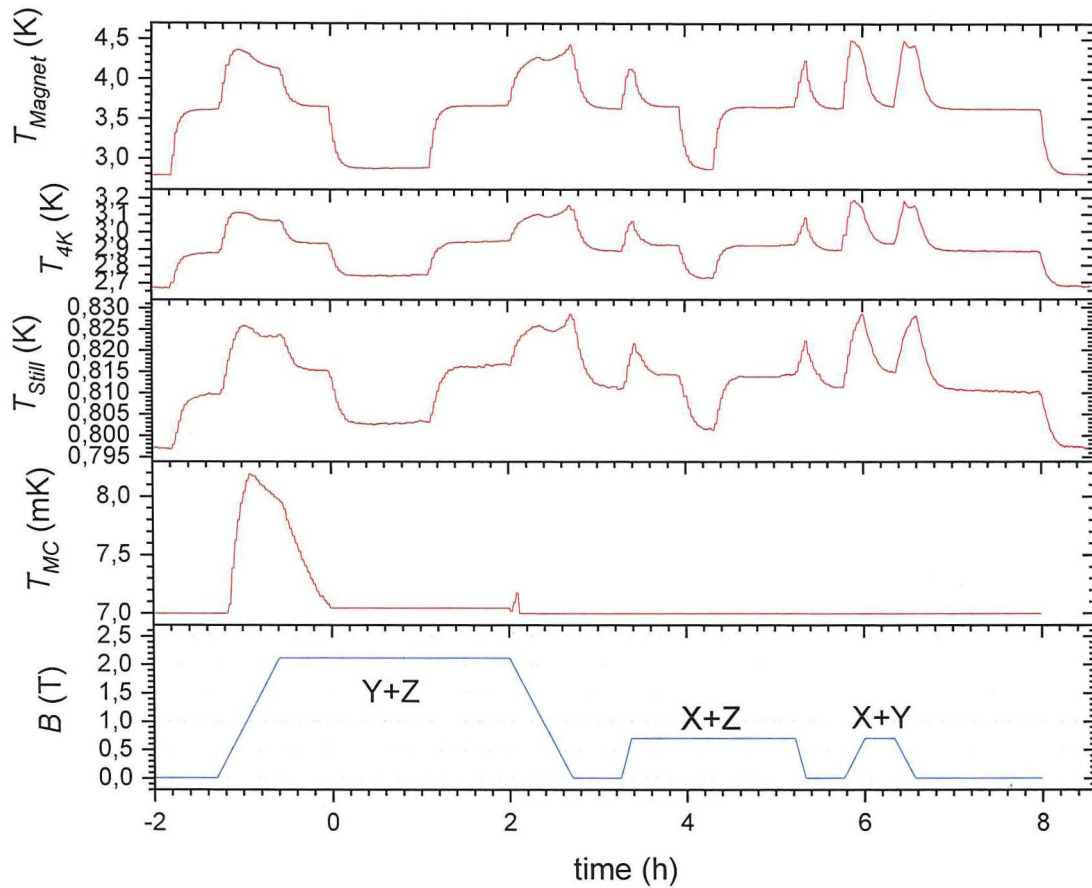


Figure 11: Magnet temperature graph of Y/Z, X/Z and X/Y vector ramp

Sweep rates used:	Individual coils: Z-axis (6T):	0,1T/min
	Y-axis (3T):	0,05T/min
	X-axis (1T):	0,1T/min
	3D-vector: X+Y+Z (0.57 T):	0,05 T/min
	Y+Z (2.12 T):	0,05 T/min
	X+Z (0.7 T):	0,1T/min
	X+Y (0.7 T):	0,05 T/min

Date measured: June 17, 2022

Operator: S.R

Signature: *Sajed R*

## 3 Thermometers

### 3.1 Thermometers

Location	Type	S.N.	Cal. Range [Kelvin]	Default channel BFTC <sup>1</sup>	BFTC Excitation
Magnet-main-coil**	Cernox CX-1010	X158199	310 – 0.1	3	200 $\mu$ V

Figure 12

\*\*NOTE: THERMOMETER MUST SHOW < 4.2 K WHEN OPERATING THE MAGNET

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<sup>1</sup> BFTC – Bluefors Temperature Controller



## 3.2 Temperature Sensor Calibration

### Temperature Sensor X158199 Calibration Report

#### Sensor Information:

Model	Cernox
Serial Number	X158199
Data format	4 (Log Ohms/Kelvin)
Setpoint limit	325.0 (Kelvin)
Temperature coefficient	1 (Negative)
No. of breakpoints	180

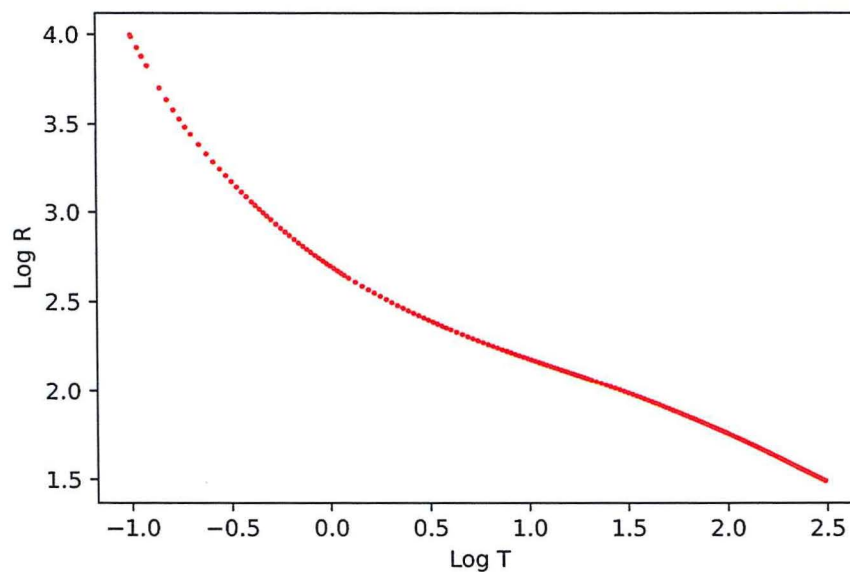
#### Calibration Instruments

##### Measurement device:

Model	Bluefors Temperature Controller
Serial number	85
-	-

##### Reference sensors:

Range	Type	Serial Number
308K-200mK	Cernox	X54138
200mK-7mK	Noise thermometer	156



Calibration Date: 05/05/2022

Signature:

