


# Run 1 Spectrometer (2017-now)

## 2x Quadrupole magnet - shunted

Parameter	Value	Unit
Design type	PXMQNBRNWP	
Description	Quadrupole magnet, type 320, LHC calibration	
Old Name	Type 320	
Family	Quadrupole	
Function	Normal	
Cooling system	Water	
Aperture width	70.0	mm
Aperture height	70.0	mm
Iron length	285.0	mm
Total length	320.0	mm
Total width	500.0	mm
Total height	500.0	mm
Dielectric test tension	5.0	kV
Peak current (cycled)	362.0	A
RMS current	362.0	A
Resistance 20 degrees C	20.8	mΩ
Inductance	11.8	mH
Quadrupole gradient nominal field at peak current	18.1	T m <sup>-1</sup>

<https://normadb.web.cern.ch/magdesign/idcard/?id=1261>

Power converter: RPADA.BB4.RQNI.412432  
**120V/500Apeak/500Arms**

## 1x Dipole magnet

Parameter	Value	Unit
Name	CERN HB4	
Weight	8.5	T
Power consumption	15 rms, 24 cycled	kW
Integrated field (BL)	1.2 rms, 1.6 cycled	T m
Max. magnetic field	1.2 rms, 1.5 cycled	T
Horizontal iron width	320.0	mm
Vertical aperture	80.0	mm
Iron length	1000.0	mm
Total length	1585.0	mm
Total width	1320	mm
Current	400.0 rms, 400.0 cycled	A
Resistance	94.0	mΩ

<https://normadb.web.cern.ch/magnet/idcard/?id=2642>

Power converter: RPPEF.BB4.RBIH.412435  
**360V/720Apeak/720Arms**

# Spectrometer Upgrade Needed for Run 2c

For Run 2c, goal: emittance control at ~10 GeV energies

Therefore, AWAKE expects higher electron beam energies (~10 GeV)

→ Require larger  $B [T] * L [m]$  dipole magnetic field

→ Larger focusing strength for the quadrupoles

AWAKE will more flexibility to measure emittance (key diagnostic)

→ Quadrupole triplet (3x) instead of a doublet (2x)

# Run 2c Spectrometer Desired

## 3x Quadrupole magnet

Metric	Value needed
Integrated magnetic field	~20 T
Good-field-region (GFR) dimensions and field quality within	
Required minimum gap height and width or beam stay clear area	
Maximum mechanical dimensions	-
Alignment tolerances	

## 1x Dipole magnet

Metric	Value needed
Integrated magnetic field	~3.5 Tm
Good-field-region (GFR) dimensions and field quality within	
Required minimum gap height and width or beam stay clear area	~80mm
Maximum mechanical dimensions	- Weight
Alignment tolerances	

- + Power converters to power these magnets
- + Option to have real zero current
- + CW operation