



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 15, 2026 – 12:57 PM UTC

PDB ID : 5NKU / pdb_00005nku
Title : Joint neutron/X-ray structure of dimeric chlorite dismutase from *Cyanothece* sp. PCC7425
Authors : Puehringer, D.; Schaffner, I.; Mlynek, G.; Obinger, C.; Djinovic-Carugo, K.
Deposited on : 2017-04-03
Resolution : 2.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	FAILED
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

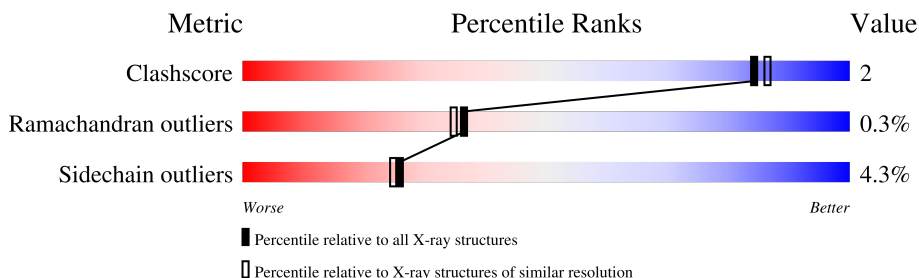
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION, NEUTRON DIFFRACTION

The reported resolution of this entry is 2.00 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$.

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	188	 90% • 5%
1	B	188	 92% • 5%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7043 atoms, of which 2997 are hydrogens and 894 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

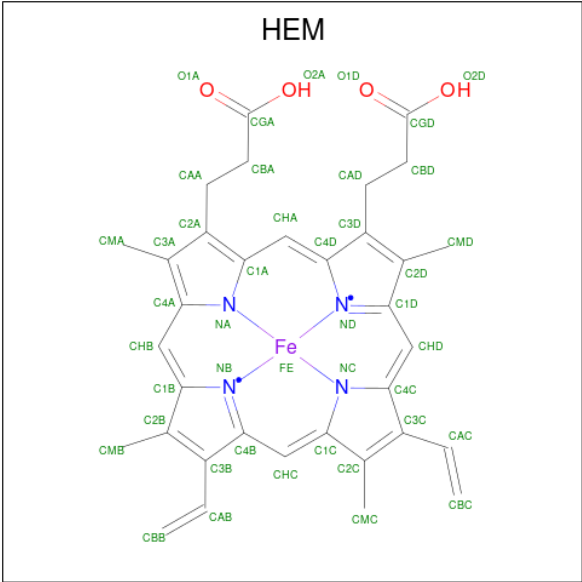
- Molecule 1 is a protein called Chlorite Dismutase.

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
1	A	179	Total	C	D	H	N	O	S	162	172	0
			3280	946	335	1468	267	260	4			
1	B	178	Total	C	D	H	N	O	S	159	171	0
			3263	941	334	1459	266	259	4			

There are 14 discrepancies between the modelled and reference sequences:

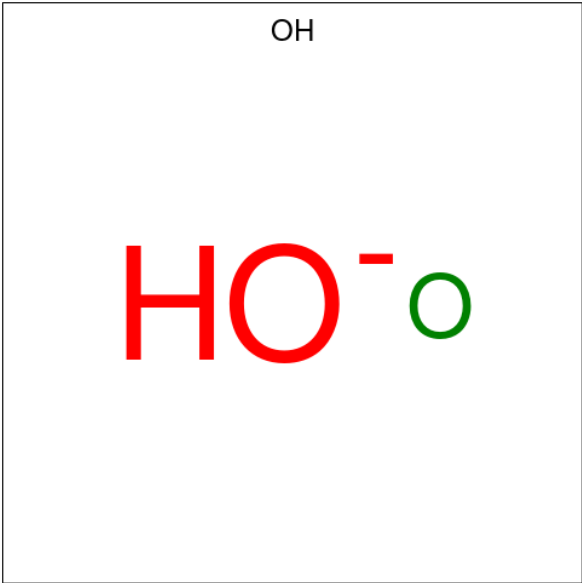
Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	GLY	-	expression tag	UNP B8HNS6
A	-4	PRO	-	expression tag	UNP B8HNS6
A	-3	GLY	-	expression tag	UNP B8HNS6
A	-2	TYR	-	expression tag	UNP B8HNS6
A	-1	GLN	-	expression tag	UNP B8HNS6
A	0	ASP	-	expression tag	UNP B8HNS6
A	1	PRO	-	expression tag	UNP B8HNS6
B	-5	GLY	-	expression tag	UNP B8HNS6
B	-4	PRO	-	expression tag	UNP B8HNS6
B	-3	GLY	-	expression tag	UNP B8HNS6
B	-2	TYR	-	expression tag	UNP B8HNS6
B	-1	GLN	-	expression tag	UNP B8HNS6
B	0	ASP	-	expression tag	UNP B8HNS6
B	1	PRO	-	expression tag	UNP B8HNS6

- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	Fe	H	N	O	0	0
			73	34	1	30	4	4		
2	B	1	Total	C	Fe	H	N	O	0	0
			73	34	1	30	4	4		

- Molecule 3 is HYDROXIDE ION (CCD ID: OH) (formula: HO).

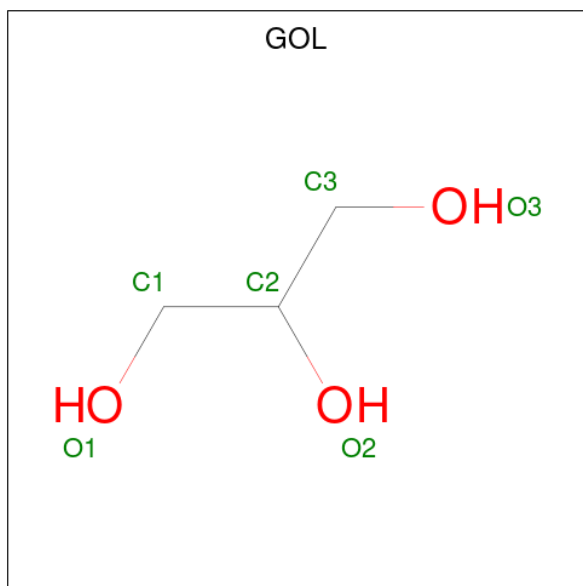


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	D	H	O	0	1
			3	1	1	1		
3	B	1	Total	D	H	O	1	1
			3	1	1	1		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Cl	0	0
			1	1		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	D	H	O	3	1
			17	3	3	8	3		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	56	Total	D	O	0	0
			168	112	56		
6	B	54	Total	D	O	0	0
			162	108	54		

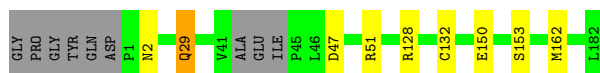
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS failed to run properly.

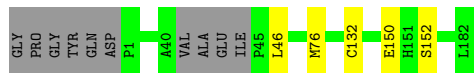
- Molecule 1: Chlorite Dismutase

Chain A:  90% . . 5%



- Molecule 1: Chlorite Dismutase

Chain B:  92% . 5%



4 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	52.43Å 53.02Å 55.34Å 107.30° 98.54° 109.86°	Depositor
Resolution (Å)	19.49 – 2.00	Depositor
% Data completeness (in resolution range)	80.7 (19.49-2.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.35 (at 2.01Å)	Xtriage
Refinement program	PHENIX (dev_2689: ???)	Depositor
R, R_{free}	0.140 , 0.186	Depositor
Wilson B-factor (Å ²)	25.0	Xtriage
Anisotropy	0.385	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	7043	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.06% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, GOL, OH, HEM

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	1.16	2/2968 (0.1%)	1.10	2/4009 (0.0%)
1	B	1.17	0/2954	1.09	0/3989
All	All	1.17	2/5922 (0.0%)	1.10	2/7998 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	29[A]	GLN	CG-CD	7.80	1.71	1.52
1	A	29[B]	GLN	CG-CD	7.80	1.71	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	29[A]	GLN	CB-CG-CD	5.61	122.13	112.60
1	A	29[B]	GLN	CB-CG-CD	5.61	122.13	112.60

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1812	1468	51	0	0
1	B	1804	1459	51	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	43	30	30	1	0
2	B	43	30	30	0	0
3	A	2	1	0	0	0
3	B	2	1	0	0	0
4	B	1	0	0	0	0
5	B	9	8	0	0	0
6	A	168	0	0	0	0
6	B	162	0	0	2	0
All	All	4046	2997	162	3	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (3) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	345/188 (184%)	335 (97%)	8 (2%)	2 (1%)	21	17
1	B	343/188 (182%)	335 (98%)	8 (2%)	0	100	100
All	All	688/376 (183%)	670 (97%)	16 (2%)	2 (0%)	36	35

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	150[A]	GLU

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Mol	Chain	Res	Type
1	A	150[B]	GLU

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	299/159 (188%)	283 (95%)	16 (5%)	20	17
1	B	297/159 (187%)	287 (97%)	10 (3%)	32	33
All	All	596/318 (187%)	570 (96%)	26 (4%)	26	24

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2[A]	ASN
1	A	2[B]	ASN
1	A	29[A]	GLN
1	A	29[B]	GLN
1	A	47[A]	ASP
1	A	47[B]	ASP
1	A	51[A]	ARG
1	A	51[B]	ARG
1	A	128[A]	ARG
1	A	128[B]	ARG
1	A	132[A]	CYS
1	A	132[B]	CYS
1	A	153[A]	SER
1	A	153[B]	SER
1	A	162[A]	MET
1	A	162[B]	MET
1	B	46[A]	LEU
1	B	46[B]	LEU
1	B	76[A]	MET
1	B	76[B]	MET
1	B	132[A]	CYS
1	B	132[B]	CYS

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Mol	Chain	Res	Type
1	B	150[A]	GLU
1	B	150[B]	GLU
1	B	152[A]	SER
1	B	152[B]	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 9 ligands modelled in this entry, 4 are modelled with single atom and 1 is monoatomic - leaving 4 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	HEM	A	500	1,3	50,50,50	1.92	16 (32%)	67,82,82	1.98	15 (22%)
2	HEM	B	203	1,3	50,50,50	1.66	13 (26%)	67,82,82	1.44	12 (17%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the

Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns.
'-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	A	500	1,3	-	3/14/54/54	-
2	HEM	B	203	1,3	-	4/14/54/54	-

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	500	HEM	FE-ND	5.70	2.12	1.94
2	A	500	HEM	C1D-ND	-4.98	1.29	1.38
2	A	500	HEM	FE-NB	3.74	2.06	1.94
2	B	203	HEM	CMD-C2D	3.73	1.58	1.50
2	B	203	HEM	O2D-CGD	-3.64	1.18	1.30
2	A	500	HEM	C1B-NB	-3.42	1.34	1.40
2	B	203	HEM	C3B-C2B	-3.38	1.30	1.37
2	B	203	HEM	C3C-C4C	3.28	1.51	1.46
2	B	203	HEM	FE-ND	3.01	2.04	1.94
2	A	500	HEM	CHC-C4B	-2.56	1.33	1.39
2	A	500	HEM	CAB-C3B	2.55	1.54	1.47
2	B	203	HEM	CMA-C3A	2.53	1.56	1.50
2	A	500	HEM	C3B-C2B	-2.45	1.32	1.37
2	A	500	HEM	O1A-CGA	2.38	1.29	1.22
2	A	500	HEM	O2D-CGD	-2.34	1.23	1.30
2	A	500	HEM	O2A-CGA	-2.31	1.23	1.30
2	B	203	HEM	CMC-C2C	2.29	1.55	1.50
2	B	203	HEM	C2A-C3A	-2.27	1.33	1.38
2	B	203	HEM	CAC-C3C	2.27	1.53	1.47
2	B	203	HEM	C1C-NC	2.26	1.43	1.39
2	B	203	HEM	CAB-C3B	2.25	1.53	1.47
2	A	500	HEM	CMA-C3A	2.20	1.55	1.50
2	B	203	HEM	O1A-CGA	2.18	1.29	1.22
2	A	500	HEM	C3D-C2D	-2.13	1.32	1.36
2	A	500	HEM	C1A-NA	2.13	1.43	1.39
2	A	500	HEM	C1D-C2D	2.07	1.48	1.44
2	A	500	HEM	CBD-CGD	2.03	1.55	1.50
2	B	203	HEM	C3D-C2D	-2.02	1.32	1.36
2	A	500	HEM	C4D-ND	-2.00	1.36	1.40

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	500	HEM	C4D-ND-C1D	6.65	113.08	105.21

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	500	HEM	CMD-C2D-C1D	-6.34	115.13	125.03
2	A	500	HEM	C3D-C4D-ND	-4.41	105.33	110.17
2	A	500	HEM	CMD-C2D-C3D	4.05	137.10	126.15
2	A	500	HEM	CHA-C4D-ND	3.95	129.25	124.37
2	B	203	HEM	C3B-C4B-NB	-3.25	107.13	109.47
2	A	500	HEM	C2D-C1D-ND	-3.24	106.16	109.90
2	A	500	HEM	CMC-C2C-C1C	3.18	130.33	124.73
2	B	203	HEM	CBD-CAD-C3D	-3.14	103.84	112.53
2	B	203	HEM	CHB-C1B-NB	3.13	128.24	124.37
2	A	500	HEM	CAC-C3C-C4C	-2.95	117.77	124.82
2	B	203	HEM	CAC-C3C-C4C	-2.95	117.77	124.82
2	A	500	HEM	CMC-C2C-C3C	-2.90	121.42	128.43
2	B	203	HEM	CHD-C1D-ND	2.77	127.40	124.42
2	B	203	HEM	O2A-CGA-CBA	2.56	122.08	114.00
2	A	500	HEM	O2D-CGD-CBD	2.55	122.05	114.00
2	A	500	HEM	CBD-CAD-C3D	-2.54	105.51	112.53
2	B	203	HEM	CMC-C2C-C1C	-2.49	120.34	124.73
2	B	203	HEM	CAA-C2A-C1A	2.49	129.80	124.94
2	B	203	HEM	CBB-CAB-C3B	-2.45	115.28	127.53
2	B	203	HEM	C3B-C2B-C1B	2.35	108.18	106.41
2	A	500	HEM	C4C-CHD-C1D	-2.29	121.16	126.02
2	A	500	HEM	CHC-C1C-NC	2.17	126.81	124.45
2	B	203	HEM	CAC-C3C-C2C	2.11	135.29	128.43
2	A	500	HEM	CMA-C3A-C4A	-2.08	122.25	125.42
2	B	203	HEM	CAB-C3B-C2B	-2.03	121.82	128.43
2	A	500	HEM	CMA-C3A-C2A	2.01	129.88	125.62

There are no chirality outliers.

All (7) torsion outliers are listed below:

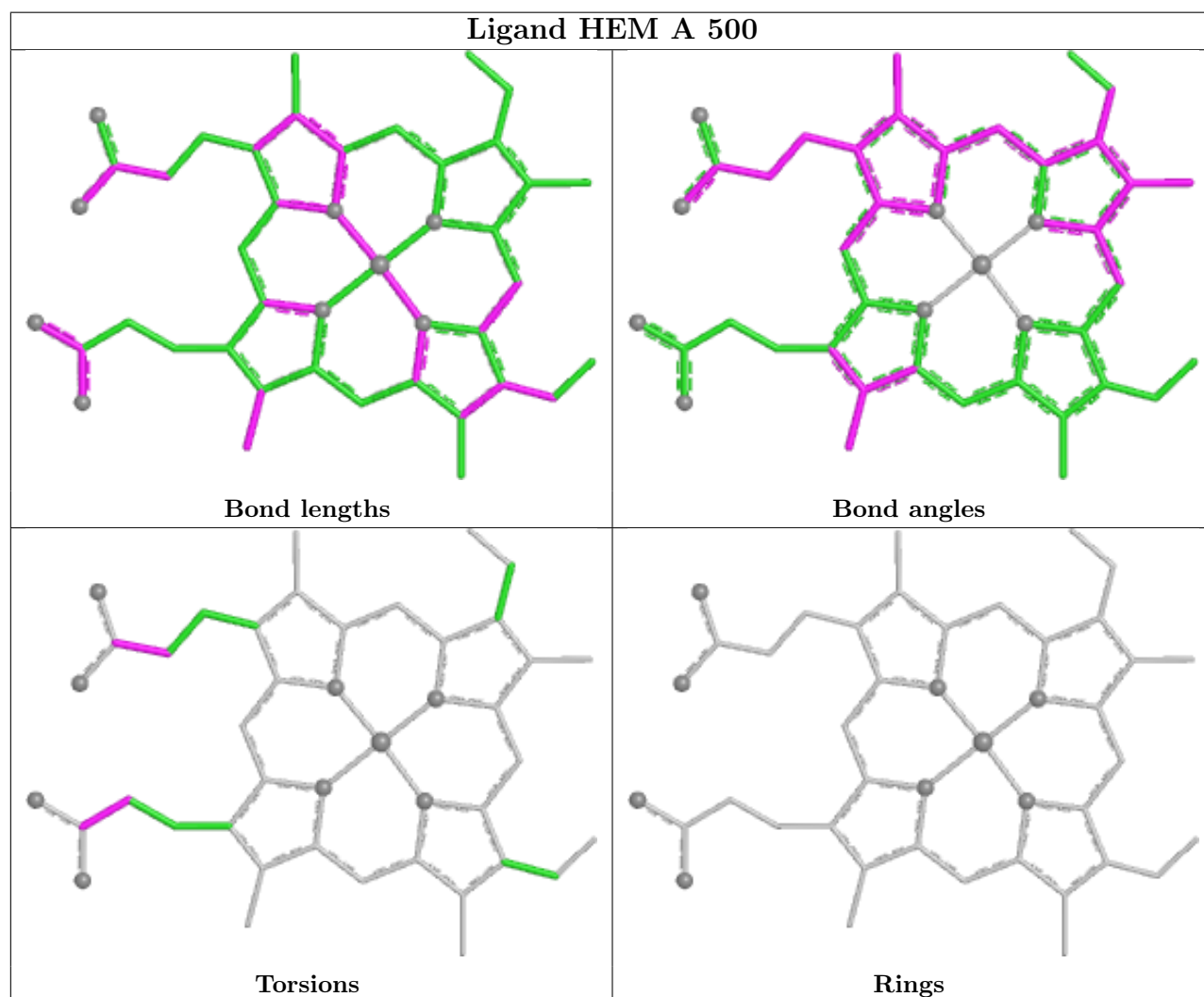
Mol	Chain	Res	Type	Atoms
2	A	500	HEM	CAA-CBA-CGA-O1A
2	A	500	HEM	CAA-CBA-CGA-O2A
2	B	203	HEM	CAA-CBA-CGA-O1A
2	B	203	HEM	CAD-CBD-CGD-O1D
2	B	203	HEM	CAA-CBA-CGA-O2A
2	A	500	HEM	CAD-CBD-CGD-O1D
2	B	203	HEM	CAD-CBD-CGD-O2D

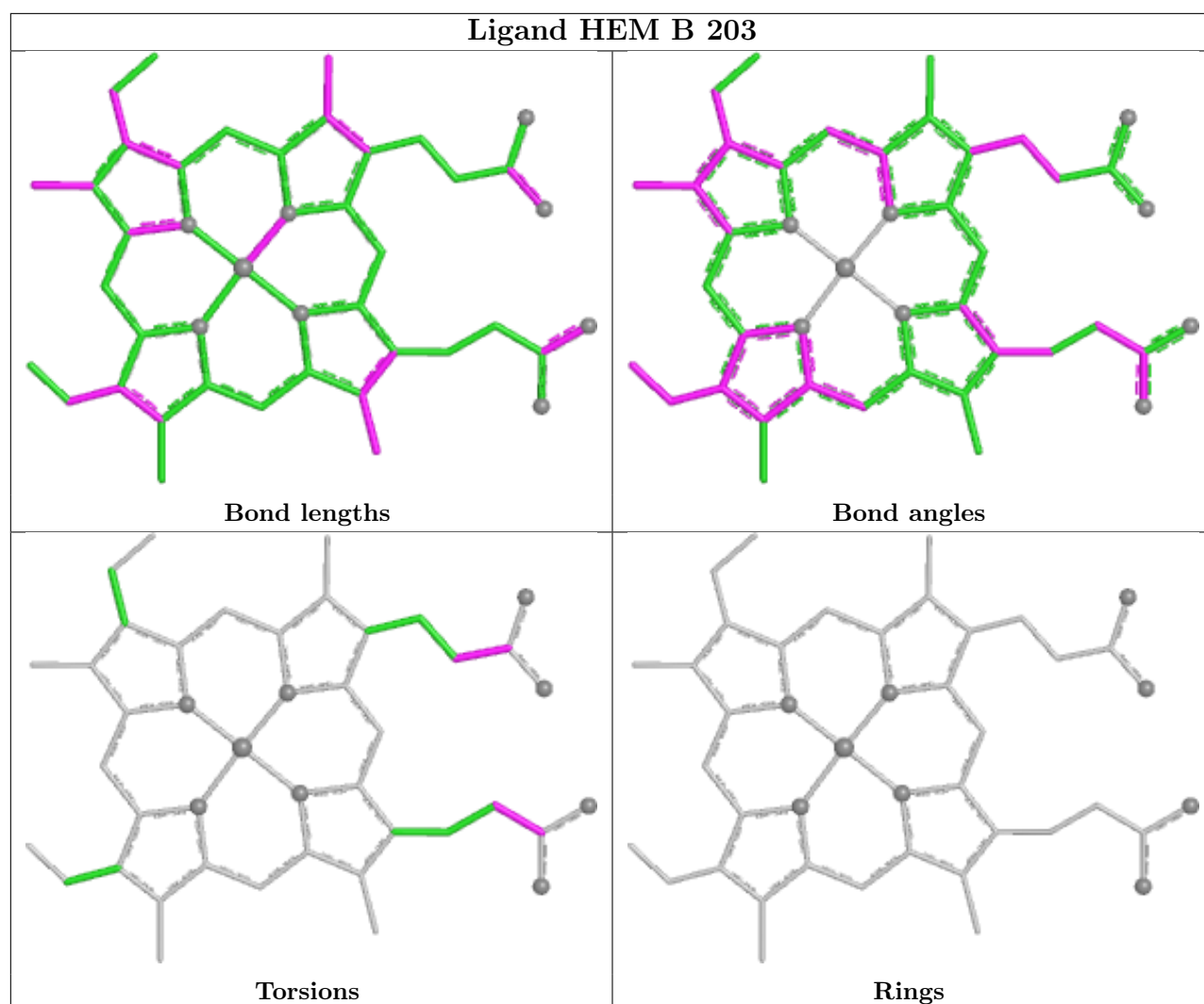
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	500	HEM	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

6.4 Ligands

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers

EDS failed to run properly - this section is therefore empty.