



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 05:20 PM UTC

PDB ID : 1JRY / pdb_00001jry
Title : Crystal structure of Arg402Lys mutant flavocytochrome c3 from *Shewanella frigidimarina*
Authors : Mowat, C.G.; Moysey, R.; Miles, C.S.; Leys, D.; Doherty, M.K.; Taylor, P.; Walkinshaw, M.D.; Reid, G.A.; Chapman, S.K.
Deposited on : 2001-08-15
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)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
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

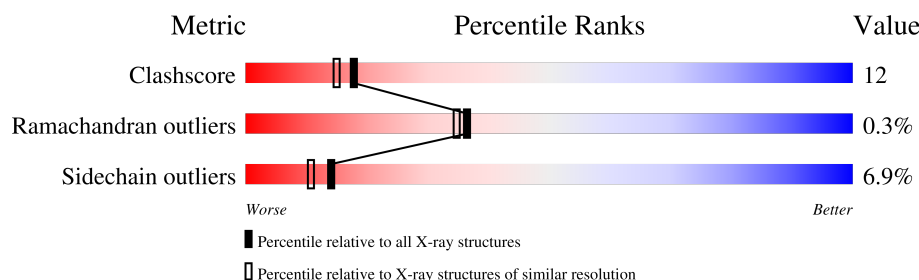
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

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 was not executed.

Mol	Chain	Length	Quality of chain
1	A	571	
1	B	571	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	FAD	A	1805	X	-	-	-
4	FAD	B	2805	X	-	-	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 10740 atoms, of which 0 are hydrogens and 0 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 FLAVOCYTOCHROME C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	568	Total	C	N	O	S	0	0	0
			4215	2615	742	833	25			
1	B	568	Total	C	N	O	S	0	0	0
			4215	2615	742	833	25			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	402	LYS	ARG	engineered mutation	UNP Q02469
B	402	LYS	ARG	engineered mutation	UNP Q02469

- Molecule 2 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Na	0	0
			1	1		
2	B	1	Total	Na	0	0
			1	1		

- Molecule 3 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: C₃₄H₃₂FeN₄O₄).



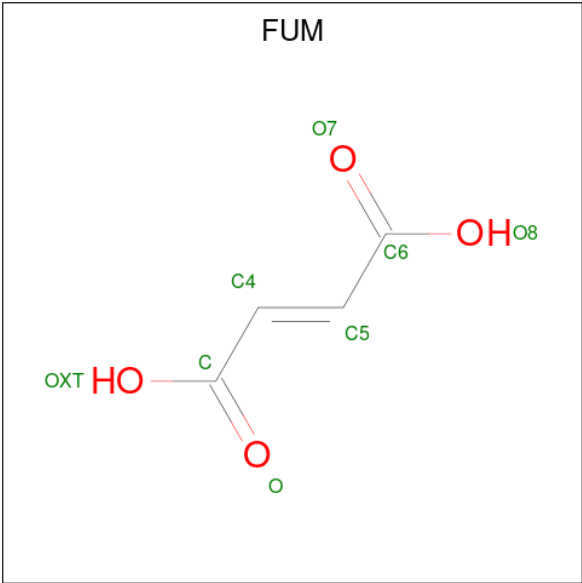
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
3	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 4 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: C₂₇H₃₃N₉O₁₅P₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total 53	C 27	N 9	O 15	P 2	0	0
4	B	1	Total 53	C 27	N 9	O 15	P 2	0	0

- Molecule 5 is FUMARIC ACID (CCD ID: FUM) (formula: C₄H₄O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			8	4	4		
5	B	1	Total	C	O	0	0
			8	4	4		

- Molecule 6 is water.

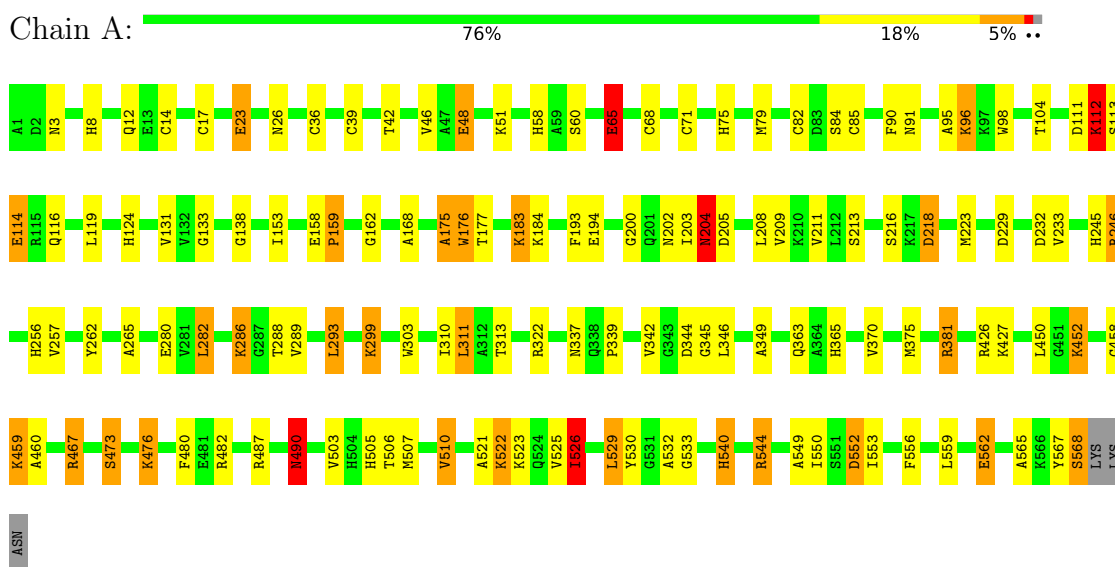
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	910	Total 910	O 910	0	0
6	B	932	Total 932	O 932	0	0

3 Residue-property plots

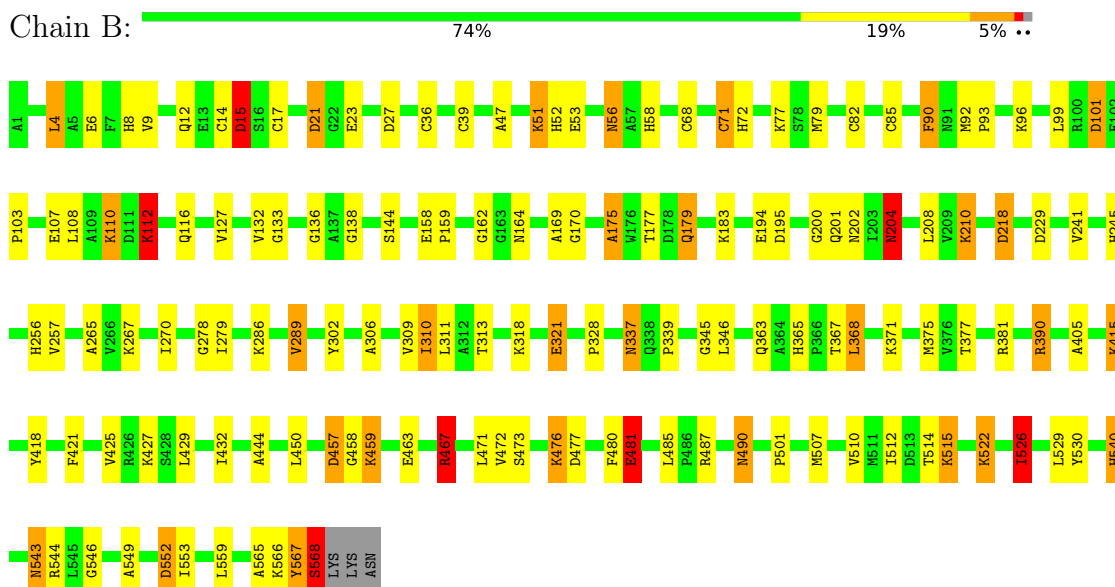
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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 was not executed.

• Molecule 1: FLAVOCYTOCHROME C



• Molecule 1: FLAVOCYTOCHROME C



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	76.61Å 86.92Å 88.98Å 90.00° 104.48° 90.00°	Depositor
Resolution (Å)	20.00 – 2.00	Depositor
% Data completeness (in resolution range)	99.9 (20.00-2.00)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC	Depositor
R, R_{free}	0.157 , 0.236	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	10740	wwPDB-VP
Average B, all atoms (Å ²)	15.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FAD, FUM, NA, 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	0.88	1/4285 (0.0%)	1.82	84/5792 (1.5%)
1	B	0.87	0/4285	1.79	66/5792 (1.1%)
All	All	0.88	1/8570 (0.0%)	1.81	150/11584 (1.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2
1	B	0	3
All	All	0	5

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	176	TRP	N-CA	-6.08	1.38	1.46

All (150) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	487	ARG	CD-NE-CZ	23.71	157.60	124.40
1	B	175	ALA	O-C-N	-14.99	102.84	122.78
1	A	567	TYR	CA-C-O	13.18	134.52	120.55
1	A	112	LYS	CA-C-N	12.59	145.59	121.54
1	A	112	LYS	C-N-CA	12.59	145.59	121.54
1	A	526	ILE	CB-CA-C	10.87	123.87	111.04
1	A	567	TYR	CA-C-N	10.84	141.22	121.70
1	A	567	TYR	C-N-CA	10.84	141.22	121.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	112	LYS	CA-C-N	10.40	145.86	121.52
1	B	112	LYS	C-N-CA	10.40	145.86	121.52
1	A	337	ASN	N-CA-C	9.42	122.68	110.53
1	A	487	ARG	NE-CZ-NH1	-9.02	112.48	121.50
1	B	490	ASN	OD1-CG-ND2	-8.94	113.67	122.60
1	A	204	ASN	CA-CB-CG	8.86	121.46	112.60
1	A	526	ILE	CA-CB-CG2	8.69	125.27	110.50
1	A	567	TYR	O-C-N	-8.59	113.01	122.12
1	A	175	ALA	CA-C-N	8.57	137.90	121.54
1	A	175	ALA	C-N-CA	8.57	137.90	121.54
1	B	175	ALA	CA-C-O	-8.40	112.07	121.40
1	B	377	THR	CA-C-O	8.29	130.34	121.55
1	B	552	ASP	CA-CB-CG	8.19	120.79	112.60
1	A	487	ARG	NE-CZ-NH2	8.16	126.54	119.20
1	B	169	ALA	CA-C-N	7.95	128.93	120.03
1	B	169	ALA	C-N-CA	7.95	128.93	120.03
1	A	293	LEU	CA-CB-CG	7.83	143.72	116.30
1	A	112	LYS	CA-C-O	7.77	129.03	120.63
1	A	467	ARG	CD-NE-CZ	7.74	135.24	124.40
1	A	23	GLU	CA-CB-CG	7.67	129.45	114.10
1	A	75	HIS	CA-CB-CG	-7.58	106.22	113.80
1	B	481	GLU	CB-CG-CD	7.43	125.23	112.60
1	B	568	SER	CA-C-O	-7.31	108.37	120.80
1	B	567	TYR	CA-C-O	7.26	128.44	120.82
1	B	194	GLU	CA-CB-CG	7.16	128.41	114.10
1	A	65	GLU	CB-CG-CD	7.14	124.74	112.60
1	A	344	ASP	CA-C-N	7.06	127.94	120.03
1	A	344	ASP	C-N-CA	7.06	127.94	120.03
1	A	293	LEU	CB-CA-C	-7.00	97.71	109.53
1	B	526	ILE	CB-CA-C	6.98	119.28	111.04
1	A	552	ASP	CA-CB-CG	6.71	119.31	112.60
1	A	540	HIS	CA-CB-CG	-6.70	107.10	113.80
1	B	368	LEU	CA-C-O	-6.69	113.42	121.05
1	B	367	THR	N-CA-C	6.69	117.97	108.54
1	B	480	PHE	CA-CB-CG	-6.68	107.12	113.80
1	A	211	VAL	N-CA-C	-6.60	104.32	110.53
1	A	159	PRO	CA-C-O	-6.58	110.11	118.86
1	B	164	ASN	OD1-CG-ND2	6.58	129.18	122.60
1	B	218	ASP	CA-CB-CG	-6.57	106.03	112.60
1	B	567	TYR	CA-C-N	6.56	133.51	121.70
1	B	567	TYR	C-N-CA	6.56	133.51	121.70
1	B	195	ASP	CA-C-O	6.55	127.49	120.55

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	337	ASN	N-CA-C	6.49	120.12	110.52
1	B	71	CYS	CA-C-N	-6.40	113.95	122.85
1	B	71	CYS	C-N-CA	-6.40	113.95	122.85
1	A	175	ALA	O-C-N	-6.39	114.91	122.96
1	A	286	LYS	CA-CB-CG	6.38	126.87	114.10
1	B	202	ASN	OD1-CG-ND2	6.37	128.97	122.60
1	B	204	ASN	CA-CB-CG	6.36	118.95	112.60
1	B	390	ARG	NE-CZ-NH2	-6.36	113.48	119.20
1	B	27	ASP	CA-CB-CG	-6.32	106.28	112.60
1	A	218	ASP	CA-CB-CG	-6.31	106.29	112.60
1	A	344	ASP	CA-CB-CG	6.28	118.88	112.60
1	A	506	THR	CA-C-O	-6.27	114.02	120.54
1	B	381	ARG	NE-CZ-NH1	6.22	127.72	121.50
1	A	525	VAL	CA-C-N	-6.21	115.77	122.85
1	A	525	VAL	C-N-CA	-6.21	115.77	122.85
1	B	241	VAL	CA-C-O	-6.21	115.55	121.64
1	A	544	ARG	NE-CZ-NH2	6.20	124.78	119.20
1	B	201	GLN	OE1-CD-NE2	-6.18	116.42	122.60
1	A	175	ALA	CA-C-O	-6.16	114.61	121.51
1	A	216	SER	CA-C-O	-6.14	114.37	120.82
1	B	457	ASP	CA-CB-CG	-6.13	106.47	112.60
1	A	365	HIS	N-CA-C	-6.11	101.95	109.65
1	A	337	ASN	CB-CG-ND2	6.11	125.56	116.40
1	B	15	ASP	CA-CB-CG	6.04	118.64	112.60
1	B	444	ALA	CA-C-O	-6.03	114.46	121.10
1	A	480	PHE	CA-CB-CG	-6.03	107.78	113.80
1	A	459	LYS	CB-CA-C	5.95	122.51	110.38
1	B	467	ARG	CD-NE-CZ	5.93	132.71	124.40
1	B	512	ILE	CA-C-O	-5.93	115.44	121.67
1	A	111	ASP	CA-C-N	5.90	128.46	120.38
1	A	111	ASP	C-N-CA	5.90	128.46	120.38
1	A	124	HIS	CA-C-O	5.88	126.73	119.79
1	A	205	ASP	CA-C-O	5.86	125.29	119.49
1	A	213	SER	N-CA-C	5.83	117.72	111.36
1	A	487	ARG	CG-CD-NE	-5.80	99.25	112.00
1	B	363	GLN	CB-CG-CD	-5.79	102.76	112.60
1	A	131	VAL	O-C-N	-5.73	116.67	123.03
1	A	8	HIS	CB-CA-C	-5.72	101.12	110.85
1	A	562	GLU	N-CA-CB	5.72	118.62	110.16
1	A	12	GLN	CA-C-O	-5.70	115.18	121.33
1	B	93	PRO	CA-C-N	5.64	130.14	122.19
1	B	93	PRO	C-N-CA	5.64	130.14	122.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	381	ARG	CA-C-N	5.64	127.19	120.14
1	B	381	ARG	C-N-CA	5.64	127.19	120.14
1	B	515	LYS	CG-CD-CE	5.62	124.22	111.30
1	B	278	GLY	CA-C-O	-5.58	115.73	120.98
1	A	532	ALA	CA-C-N	-5.58	113.14	122.62
1	A	532	ALA	C-N-CA	-5.58	113.14	122.62
1	A	458	GLY	N-CA-C	5.57	119.42	112.73
1	B	162	GLY	N-CA-C	5.51	122.37	115.21
1	B	543	ASN	OD1-CG-ND2	5.51	128.11	122.60
1	A	505	HIS	CA-C-N	-5.49	115.70	122.84
1	A	505	HIS	C-N-CA	-5.49	115.70	122.84
1	A	473	SER	N-CA-CB	5.48	118.27	110.16
1	A	58	HIS	CA-CB-CG	-5.48	108.32	113.80
1	A	556	PHE	CA-CB-CG	-5.47	108.33	113.80
1	A	3	ASN	CA-CB-CG	5.47	118.07	112.60
1	A	303	TRP	CA-C-O	5.41	127.79	121.46
1	A	510	VAL	CA-CB-CG2	-5.40	101.22	110.40
1	B	90	PHE	CA-CB-CG	5.39	119.19	113.80
1	B	310	ILE	CB-CA-C	-5.38	104.00	110.99
1	A	544	ARG	CA-C-O	-5.37	115.15	121.16
1	A	153	ILE	N-CA-CB	5.34	118.78	111.41
1	A	112	LYS	O-C-N	-5.34	116.46	122.12
1	B	337	ASN	CA-CB-CG	5.31	117.91	112.60
1	B	210	LYS	CB-CG-CD	5.30	123.50	111.30
1	B	568	SER	CB-CA-C	5.30	120.18	110.10
1	B	278	GLY	CA-C-N	-5.30	117.21	122.77
1	B	278	GLY	C-N-CA	-5.30	117.21	122.77
1	A	370	VAL	N-CA-C	-5.28	105.56	110.53
1	B	170	GLY	N-CA-C	5.28	119.27	112.83
1	B	544	ARG	NE-CZ-NH2	5.28	123.95	119.20
1	A	104	THR	CA-C-O	-5.27	115.88	121.94
1	A	202	ASN	CA-CB-CG	-5.27	107.33	112.60
1	A	322	ARG	CA-C-O	5.25	125.98	120.42
1	A	339	PRO	N-CA-C	5.23	120.64	113.84
1	B	390	ARG	NE-CZ-NH1	5.20	126.70	121.50
1	B	72	HIS	CA-C-O	-5.19	115.23	120.84
1	A	90	PHE	CA-C-O	-5.17	115.30	121.56
1	B	363	GLN	CA-C-O	5.15	126.36	120.54
1	A	265	ALA	CA-C-N	5.14	127.04	120.56
1	A	265	ALA	C-N-CA	5.14	127.04	120.56
1	A	490	ASN	OD1-CG-ND2	-5.13	117.47	122.60
1	B	540	HIS	CA-CB-CG	-5.13	108.67	113.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	162	GLY	N-CA-C	5.11	120.77	114.69
1	A	503	VAL	CA-C-O	-5.10	115.23	121.04
1	A	342	VAL	N-CA-C	5.09	117.78	112.90
1	B	418	TYR	O-C-N	5.07	129.25	123.31
1	B	289	VAL	CA-CB-CG2	5.07	119.02	110.40
1	A	288	THR	CA-C-N	-5.07	113.71	120.50
1	A	288	THR	C-N-CA	-5.07	113.71	120.50
1	B	487	ARG	CG-CD-NE	-5.07	100.85	112.00
1	A	203	ILE	CA-C-O	5.05	125.23	119.92
1	A	124	HIS	O-C-N	-5.05	115.57	122.33
1	B	77	LYS	CA-C-O	-5.05	116.20	121.55
1	A	96	LYS	CB-CG-CD	5.03	122.86	111.30
1	A	381	ARG	NE-CZ-NH1	5.03	126.53	121.50
1	B	132	VAL	CA-C-O	-5.02	114.78	120.66
1	B	405	ALA	CA-C-O	5.02	125.75	120.42
1	A	175	ALA	N-CA-CB	5.00	119.72	111.62

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	175	ALA	Peptide,Mainchain
1	B	101	ASP	Mainchain
1	B	175	ALA	Peptide,Mainchain

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	4215	0	4160	105	0
1	B	4215	0	4160	109	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	172	0	120	30	0
3	B	172	0	120	27	0
4	A	53	0	31	6	0
4	B	53	0	31	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	8	0	1	0	0
5	B	8	0	1	1	0
6	A	910	0	0	21	0
6	B	932	0	0	26	0
All	All	10740	0	8624	215	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 12.

All (215) 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)
1:B:68:CYS:SG	3:B:803:HEM:CAB	2.42	1.07
1:B:36:CYS:SG	3:B:802:HEM:CAB	2.43	1.06
1:B:82:CYS:SG	3:B:804:HEM:CAB	2.44	1.05
1:A:36:CYS:SG	3:A:802:HEM:CAB	2.45	1.04
1:A:68:CYS:SG	3:A:803:HEM:CAB	2.49	1.00
1:B:14:CYS:SG	3:B:801:HEM:CAB	2.50	1.00
1:B:17:CYS:SG	3:B:801:HEM:CAC	2.48	1.00
1:B:82:CYS:HG	3:B:804:HEM:CAB	1.72	1.00
1:A:85:CYS:SG	3:A:804:HEM:CAC	2.50	0.99
1:B:71:CYS:SG	3:B:803:HEM:CAC	2.50	0.99
1:A:14:CYS:SG	3:A:801:HEM:CAB	2.51	0.98
1:A:82:CYS:HG	3:A:804:HEM:CAB	1.76	0.97
1:B:39:CYS:SG	3:B:802:HEM:CAC	2.54	0.96
1:A:71:CYS:SG	3:A:803:HEM:CAC	2.54	0.96
1:A:82:CYS:SG	3:A:804:HEM:CAB	2.53	0.95
1:A:229:ASP:H	1:A:256:HIS:HE1	1.09	0.94
1:B:229:ASP:H	1:B:256:HIS:HE1	1.15	0.93
1:B:85:CYS:SG	3:B:804:HEM:CAC	2.56	0.93
1:A:280:GLU:HB3	1:A:293:LEU:HD13	1.51	0.93
1:A:39:CYS:SG	3:A:802:HEM:CAC	2.60	0.90
1:A:17:CYS:SG	3:A:801:HEM:CAC	2.59	0.89
1:A:282:LEU:HD11	1:A:293:LEU:HD12	1.56	0.88
1:A:14:CYS:HG	3:A:801:HEM:CAB	1.87	0.88
1:A:229:ASP:H	1:A:256:HIS:CE1	1.92	0.86
1:B:204:ASN:H	1:B:204:ASN:HD22	1.25	0.83
1:B:14:CYS:SG	3:B:801:HEM:HAB	2.20	0.82
1:B:71:CYS:HG	3:B:803:HEM:CAC	1.93	0.82
1:B:179:GLN:H	1:B:179:GLN:HE21	1.26	0.81
1:B:36:CYS:SG	3:B:802:HEM:HAB	2.21	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:218:ASP:HB3	6:A:1958:HOH:O	1.81	0.80
1:B:218:ASP:HB3	6:B:3344:HOH:O	1.80	0.79
1:B:526:ILE:HG21	6:B:3525:HOH:O	1.82	0.79
1:B:229:ASP:H	1:B:256:HIS:CE1	2.00	0.78
1:A:204:ASN:HD22	1:A:204:ASN:H	1.30	0.77
1:A:14:CYS:SG	3:A:801:HEM:HAB	2.22	0.77
1:A:427:LYS:HE3	1:B:328:PRO:HB3	1.66	0.76
1:B:522:LYS:HE2	6:B:3693:HOH:O	1.88	0.74
1:B:459:LYS:HE2	6:B:3373:HOH:O	1.89	0.72
1:B:68:CYS:SG	3:B:803:HEM:HAB	2.28	0.72
1:B:82:CYS:SG	3:B:804:HEM:HAB	2.28	0.71
1:B:183:LYS:HE2	6:B:2865:HOH:O	1.90	0.70
1:B:179:GLN:H	1:B:179:GLN:NE2	1.90	0.70
1:B:112:LYS:HG3	6:B:3624:HOH:O	1.92	0.69
1:A:36:CYS:SG	3:A:802:HEM:HAB	2.31	0.69
1:A:522:LYS:HD3	6:A:1972:HOH:O	1.93	0.68
1:B:415:LYS:HE2	6:B:3208:HOH:O	1.93	0.68
1:B:90:PHE:HB2	6:B:3736:HOH:O	1.94	0.67
1:A:200:GLY:HA3	1:A:204:ASN:HD21	1.59	0.67
1:A:459:LYS:HD2	1:A:460:ALA:N	2.10	0.66
1:B:200:GLY:HA3	1:B:204:ASN:HD21	1.61	0.65
1:A:71:CYS:SG	3:A:803:HEM:HAC	2.38	0.64
1:B:17:CYS:SG	3:B:801:HEM:HAC	2.38	0.63
1:A:299:LYS:HB3	6:A:1874:HOH:O	1.99	0.63
1:B:375:MET:HE1	4:B:2805:FAD:H6	1.80	0.62
1:A:282:LEU:CD1	1:A:293:LEU:HD12	2.27	0.61
1:B:368:LEU:HB2	6:B:3605:HOH:O	1.98	0.61
1:B:39:CYS:SG	3:B:802:HEM:HAC	2.40	0.61
1:B:71:CYS:SG	3:B:803:HEM:HAC	2.41	0.61
1:A:293:LEU:HG	6:A:2336:HOH:O	2.02	0.60
1:A:183:LYS:CE	1:A:233:VAL:H	2.14	0.60
1:A:467:ARG:HD2	6:A:2301:HOH:O	2.01	0.59
1:B:459:LYS:HD2	6:B:3357:HOH:O	2.02	0.59
1:A:568:SER:HB3	6:A:1221:HOH:O	2.02	0.59
1:A:229:ASP:N	1:A:256:HIS:HE1	1.91	0.59
1:B:4:LEU:HD22	1:B:8:HIS:CE1	2.37	0.59
1:B:51:LYS:HG3	6:B:3043:HOH:O	2.03	0.58
1:B:39:CYS:SG	3:B:802:HEM:C3C	2.96	0.58
1:A:119:LEU:HD11	1:A:293:LEU:HD11	1.85	0.58
1:A:426:ARG:HH22	1:A:427:LYS:HD3	1.69	0.57
1:A:565:ALA:O	1:A:568:SER:HA	2.05	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:476:LYS:HB2	6:B:3215:HOH:O	2.04	0.57
1:B:136:GLY:HA3	1:B:553:ILE:HD12	1.86	0.56
1:B:467:ARG:HD2	6:B:3424:HOH:O	2.05	0.56
1:A:158:GLU:HB3	1:A:159:PRO:HD2	1.87	0.56
1:B:56:ASN:HD22	1:B:58:HIS:H	1.53	0.56
1:A:177:THR:OG1	1:A:245:HIS:HE1	1.89	0.55
1:B:71:CYS:SG	3:B:803:HEM:C3C	2.99	0.55
1:A:68:CYS:SG	3:A:803:HEM:HAB	2.42	0.55
1:B:265:ALA:HA	1:B:270:ILE:HD12	1.87	0.55
1:A:204:ASN:H	1:A:204:ASN:ND2	2.03	0.55
1:A:282:LEU:HD11	1:A:293:LEU:CD1	2.35	0.55
1:B:567:TYR:O	1:B:568:SER:HB3	2.06	0.54
1:A:85:CYS:SG	3:A:804:HEM:CBC	2.96	0.54
1:B:17:CYS:SG	3:B:801:HEM:C3C	2.99	0.54
1:A:459:LYS:HD2	1:A:459:LYS:C	2.33	0.54
1:B:318:LYS:HD2	1:B:339:PRO:O	2.07	0.54
1:A:39:CYS:SG	3:A:802:HEM:C3C	3.00	0.54
1:A:183:LYS:O	1:A:184:LYS:HB2	2.08	0.54
1:A:349:ALA:CB	1:A:510:VAL:HG21	2.38	0.54
1:A:183:LYS:HZ1	1:A:233:VAL:H	1.54	0.54
1:B:311:LEU:HD22	1:B:311:LEU:N	2.23	0.54
1:B:177:THR:OG1	1:B:245:HIS:HE1	1.91	0.54
1:B:107:GLU:O	1:B:110:LYS:HG2	2.07	0.53
1:B:549:ALA:HB3	4:B:2805:FAD:N1	2.23	0.53
1:A:82:CYS:SG	3:A:804:HEM:C3B	2.98	0.53
1:A:95:ALA:HB1	6:A:2876:HOH:O	2.08	0.53
1:A:79:MET:HE1	6:A:1821:HOH:O	2.08	0.53
1:B:467:ARG:HH11	1:B:467:ARG:CB	2.22	0.53
1:A:85:CYS:SG	3:A:804:HEM:C3C	3.03	0.52
1:A:533:GLY:HA2	1:A:553:ILE:HG22	1.90	0.52
1:B:82:CYS:SG	3:B:804:HEM:C3B	2.98	0.52
1:B:68:CYS:SG	3:B:803:HEM:C3B	3.03	0.52
1:B:540:HIS:HE1	1:B:552:ASP:OD2	1.92	0.51
1:A:299:LYS:HG3	6:A:2877:HOH:O	2.11	0.51
1:A:65:GLU:HG2	1:A:262:TYR:OH	2.11	0.51
1:B:302:TYR:HA	6:B:3610:HOH:O	2.11	0.51
1:A:427:LYS:HD3	6:A:1670:HOH:O	2.11	0.50
1:A:522:LYS:HD2	6:A:2174:HOH:O	2.11	0.50
1:A:426:ARG:NH2	1:A:427:LYS:HD3	2.26	0.50
1:A:133:GLY:O	1:A:138:GLY:HA3	2.12	0.50
1:A:17:CYS:SG	3:A:801:HEM:C3C	3.05	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:346:LEU:HD23	1:A:510:VAL:HG23	1.93	0.50
1:B:371:LYS:HE3	6:B:3685:HOH:O	2.12	0.49
1:B:546:GLY:HA2	5:B:2806:FUM:O7	2.13	0.49
1:B:365:HIS:O	1:B:501:PRO:HA	2.13	0.49
1:B:56:ASN:ND2	1:B:58:HIS:H	2.10	0.49
1:A:540:HIS:HE1	1:A:552:ASP:OD2	1.95	0.49
1:A:549:ALA:HB3	4:A:1805:FAD:N1	2.27	0.49
1:A:91:ASN:HB2	6:A:2583:HOH:O	2.13	0.48
1:A:36:CYS:SG	3:A:802:HEM:CBB	3.00	0.48
1:A:375:MET:HE1	4:A:1805:FAD:H6	1.95	0.48
1:B:210:LYS:HE2	6:B:3701:HOH:O	2.14	0.48
1:B:210:LYS:HE3	6:B:3585:HOH:O	2.13	0.48
1:B:565:ALA:O	1:B:568:SER:HA	2.14	0.48
1:A:112:LYS:HE3	1:A:112:LYS:HA	1.96	0.48
1:A:183:LYS:NZ	1:A:233:VAL:H	2.10	0.48
1:A:346:LEU:CD2	1:A:510:VAL:HG23	2.44	0.48
1:B:85:CYS:SG	3:B:804:HEM:CBC	3.01	0.48
1:A:459:LYS:HG2	6:A:2766:HOH:O	2.14	0.47
1:B:540:HIS:HD2	6:B:2848:HOH:O	1.96	0.47
1:A:26:ASN:HA	1:A:299:LYS:HE3	1.96	0.47
1:B:103:PRO:HB3	6:B:3264:HOH:O	2.14	0.47
1:A:232:ASP:HB3	1:A:246:ARG:HG2	1.96	0.47
1:A:311:LEU:HD23	1:A:349:ALA:HB2	1.97	0.47
1:B:309:VAL:HG12	1:B:311:LEU:HD22	1.98	0.46
1:B:313:THR:OG1	1:B:345:GLY:HA3	2.15	0.46
1:A:68:CYS:SG	3:A:803:HEM:C3B	3.08	0.46
1:B:108:LEU:CD1	1:B:279:ILE:HD12	2.45	0.46
1:B:90:PHE:HD1	6:B:3736:HOH:O	1.98	0.46
1:A:82:CYS:HG	3:A:804:HEM:CBB	2.27	0.46
1:B:375:MET:CE	4:B:2805:FAD:H6	2.45	0.46
1:B:68:CYS:SG	3:B:803:HEM:CBB	3.03	0.45
1:B:522:LYS:N	1:B:522:LYS:HE3	2.31	0.45
1:B:85:CYS:SG	3:B:804:HEM:C3C	3.09	0.45
1:A:23:GLU:HB3	6:A:2214:HOH:O	2.15	0.45
1:A:223:MET:HE2	1:A:257:VAL:HG13	1.98	0.45
1:A:116:GLN:HB2	6:A:1608:HOH:O	2.17	0.45
1:A:427:LYS:HG3	6:A:1537:HOH:O	2.16	0.45
1:B:4:LEU:HD22	1:B:8:HIS:HE1	1.79	0.45
1:B:310:ILE:HG12	1:B:530:TYR:HB2	1.99	0.45
1:A:526:ILE:HG13	1:A:529:LEU:HB2	1.99	0.45
4:A:1805:FAD:H1'1	4:A:1805:FAD:H9	1.59	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:309:VAL:HG12	1:B:311:LEU:CD2	2.46	0.45
1:B:458:GLY:HA3	6:B:3342:HOH:O	2.17	0.45
1:A:427:LYS:HA	1:A:427:LYS:HD2	1.64	0.45
1:A:17:CYS:SG	3:A:801:HEM:CBC	3.03	0.45
1:B:47:ALA:HA	1:B:58:HIS:HB2	1.99	0.45
1:A:60:SER:HB3	3:A:804:HEM:HMB1	1.98	0.44
1:A:540:HIS:CD2	1:A:544:ARG:HG3	2.52	0.44
1:B:79:MET:HG2	1:B:96:LYS:HG3	1.99	0.44
1:A:36:CYS:SG	3:A:802:HEM:C3B	3.09	0.44
1:B:15:ASP:HB3	6:B:3282:HOH:O	2.16	0.44
1:B:133:GLY:O	1:B:138:GLY:HA3	2.18	0.44
1:A:476:LYS:N	1:A:476:LYS:HD3	2.33	0.44
1:A:71:CYS:SG	3:A:803:HEM:C3C	3.10	0.44
1:B:177:THR:HB	1:B:179:GLN:NE2	2.33	0.44
1:A:84:SER:HB3	1:A:98:TRP:CE2	2.53	0.43
1:B:421:PHE:HB2	1:B:425:VAL:HB	2.00	0.43
1:B:471:LEU:CD2	1:B:476:LYS:HZ1	2.32	0.43
1:A:42:THR:O	1:A:46:VAL:HG23	2.18	0.43
1:A:168:ALA:HA	4:A:1805:FAD:N5	2.34	0.43
1:A:193:PHE:CD2	1:A:209:VAL:HG12	2.53	0.43
1:A:490:ASN:N	1:A:490:ASN:HD22	2.16	0.43
1:A:168:ALA:HA	4:A:1805:FAD:C5X	2.49	0.43
1:B:158:GLU:HB3	1:B:159:PRO:HD2	2.00	0.43
1:A:550:ILE:HG12	4:A:1805:FAD:C2	2.49	0.43
1:B:101:ASP:HB3	6:B:3358:HOH:O	2.19	0.42
1:A:452:LYS:HE2	6:A:2148:HOH:O	2.18	0.42
1:A:521:ALA:HB3	6:A:2174:HOH:O	2.18	0.42
1:B:14:CYS:SG	3:B:801:HEM:C3B	3.12	0.42
1:A:293:LEU:CG	6:A:2336:HOH:O	2.65	0.42
1:B:514:THR:O	1:B:559:LEU:HD21	2.19	0.42
1:B:321:GLU:HB2	6:B:3397:HOH:O	2.18	0.42
1:B:472:VAL:HG22	1:B:485:LEU:HB3	2.01	0.42
1:B:8:HIS:O	1:B:12:GLN:HG2	2.19	0.42
1:B:471:LEU:HD23	1:B:476:LYS:HZ1	1.84	0.42
3:A:804:HEM:HMC1	3:A:804:HEM:HBC2	2.01	0.42
1:A:183:LYS:HD3	6:A:1982:HOH:O	2.20	0.42
1:A:363:GLN:HB2	1:A:507:MET:SD	2.60	0.42
1:A:381:ARG:O	1:A:482:ARG:NH2	2.52	0.42
1:A:39:CYS:SG	3:A:802:HEM:CBC	3.05	0.42
1:A:313:THR:OG1	1:A:345:GLY:HA3	2.20	0.42
1:B:127:VAL:O	1:B:306:ALA:HA	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:21:ASP:HB3	1:B:23:GLU:OE1	2.20	0.41
1:A:48:GLU:HA	1:A:51:LYS:HD2	2.02	0.41
1:B:477:ASP:O	1:B:481:GLU:HA	2.20	0.41
1:A:194:GLU:O	1:A:194:GLU:HG2	2.17	0.41
1:B:52:HIS:O	1:B:53:GLU:C	2.60	0.41
1:A:310:ILE:HG12	1:A:530:TYR:HB2	2.03	0.41
1:B:457:ASP:OD1	1:B:459:LYS:HE3	2.21	0.41
1:A:82:CYS:SG	3:A:804:HEM:CBB	3.05	0.41
1:A:112:LYS:HE2	6:A:2881:HOH:O	2.20	0.41
1:B:522:LYS:HD2	6:B:3123:HOH:O	2.20	0.41
1:B:92:MET:HB2	3:B:803:HEM:HMD3	2.02	0.41
1:B:311:LEU:N	1:B:311:LEU:CD2	2.84	0.41
1:A:490:ASN:HD22	1:A:490:ASN:H	1.69	0.41
1:B:204:ASN:HD22	1:B:204:ASN:N	2.05	0.41
1:B:286:LYS:HE2	6:B:3450:HOH:O	2.21	0.41
1:B:507:MET:HE3	1:B:543:ASN:HA	2.03	0.41
1:B:346:LEU:HD23	1:B:346:LEU:HA	1.92	0.40
1:B:429:LEU:HD23	1:B:432:ILE:HG13	2.02	0.40
1:B:6:GLU:HA	1:B:9:VAL:HG22	2.04	0.40
1:A:14:CYS:SG	3:A:801:HEM:C3B	3.11	0.40
1:B:112:LYS:HD2	1:B:112:LYS:HA	1.86	0.40
1:B:311:LEU:CD2	1:B:529:LEU:HD11	2.52	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	566/571 (99%)	542 (96%)	21 (4%)	3 (0%)	24	21
1	B	566/571 (99%)	546 (96%)	20 (4%)	0	100	100
All	All	1132/1142 (99%)	1088 (96%)	41 (4%)	3 (0%)	36	35

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	176	TRP
1	A	113	SER
1	A	114	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	442/445 (99%)	416 (94%)	26 (6%)	18	14
1	B	442/445 (99%)	407 (92%)	35 (8%)	11	8
All	All	884/890 (99%)	823 (93%)	61 (7%)	14	11

All (61) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	GLU
1	A	65	GLU
1	A	96	LYS
1	A	112	LYS
1	A	114	GLU
1	A	183	LYS
1	A	204	ASN
1	A	208	LEU
1	A	246	ARG
1	A	282	LEU
1	A	286	LYS
1	A	289	VAL
1	A	299	LYS
1	A	311	LEU
1	A	450	LEU
1	A	452	LYS
1	A	473	SER
1	A	476	LYS
1	A	490	ASN
1	A	522	LYS

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Mol	Chain	Res	Type
1	A	523	LYS
1	A	526	ILE
1	A	529	LEU
1	A	559	LEU
1	A	562	GLU
1	A	568	SER
1	B	4	LEU
1	B	15	ASP
1	B	21	ASP
1	B	51	LYS
1	B	56	ASN
1	B	99	LEU
1	B	110	LYS
1	B	112	LYS
1	B	116	GLN
1	B	144	SER
1	B	179	GLN
1	B	204	ASN
1	B	208	LEU
1	B	257	VAL
1	B	267	LYS
1	B	289	VAL
1	B	321	GLU
1	B	337	ASN
1	B	390	ARG
1	B	415	LYS
1	B	427	LYS
1	B	450	LEU
1	B	459	LYS
1	B	463	GLU
1	B	467	ARG
1	B	473	SER
1	B	476	LYS
1	B	481	GLU
1	B	490	ASN
1	B	510	VAL
1	B	515	LYS
1	B	522	LYS
1	B	526	ILE
1	B	566	LYS
1	B	568	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (28)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	35	GLN
1	A	56	ASN
1	A	91	ASN
1	A	204	ASN
1	A	245	HIS
1	A	256	HIS
1	A	275	ASN
1	A	363	GLN
1	A	389	ASN
1	A	412	GLN
1	A	484	ASN
1	A	490	ASN
1	A	540	HIS
1	B	10	GLN
1	B	12	GLN
1	B	35	GLN
1	B	54	HIS
1	B	56	ASN
1	B	179	GLN
1	B	202	ASN
1	B	204	ASN
1	B	245	HIS
1	B	256	HIS
1	B	363	GLN
1	B	484	ASN
1	B	490	ASN
1	B	540	HIS
1	B	543	ASN

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 14 ligands modelled in this entry, 2 are monoatomic - leaving 12 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
3	HEM	A	801	1	50,50,50	1.46	9 (18%)	67,82,82	1.22	6 (8%)
3	HEM	B	801	1	50,50,50	1.41	6 (12%)	67,82,82	1.18	5 (7%)
3	HEM	B	804	1	50,50,50	1.39	8 (16%)	67,82,82	1.27	8 (11%)
4	FAD	A	1805	-	58,58,58	1.38	8 (13%)	85,89,89	2.01	26 (30%)
5	FUM	A	1806	-	7,7,7	1.97	3 (42%)	8,8,8	1.32	0
3	HEM	A	803	1	50,50,50	1.37	7 (14%)	67,82,82	1.36	7 (10%)
3	HEM	A	802	1	50,50,50	1.29	6 (12%)	67,82,82	1.20	5 (7%)
5	FUM	B	2806	-	7,7,7	2.20	3 (42%)	8,8,8	1.46	0
4	FAD	B	2805	-	58,58,58	1.47	13 (22%)	85,89,89	2.36	29 (34%)
3	HEM	A	804	1	50,50,50	1.36	8 (16%)	67,82,82	1.18	7 (10%)
3	HEM	B	803	1	50,50,50	1.35	7 (14%)	67,82,82	1.21	8 (11%)
3	HEM	B	802	1	50,50,50	1.31	6 (12%)	67,82,82	1.52	10 (14%)

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
3	HEM	A	801	1	-	6/14/54/54	-
3	HEM	B	801	1	-	4/14/54/54	-
3	HEM	B	804	1	-	6/14/54/54	-
4	FAD	A	1805	-	2/2/9/9	9/34/50/50	0/6/6/6
5	FUM	A	1806	-	-	2/5/5/5	-
3	HEM	A	803	1	-	4/14/54/54	-
3	HEM	A	802	1	-	2/14/54/54	-
5	FUM	B	2806	-	-	2/5/5/5	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	FAD	B	2805	-	2/2/9/9	8/34/50/50	0/6/6/6
3	HEM	A	804	1	-	5/14/54/54	-
3	HEM	B	803	1	-	1/14/54/54	-
3	HEM	B	802	1	-	3/14/54/54	-

All (84) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	2805	FAD	C5'-C4'	4.09	1.57	1.51
4	A	1805	FAD	C5'-C4'	3.63	1.56	1.51
4	A	1805	FAD	PA-O3P	3.62	1.63	1.59
5	B	2806	FUM	O8-C6	-3.55	1.21	1.30
3	A	804	HEM	CAC-C3C	3.43	1.56	1.47
3	B	802	HEM	CAC-C3C	3.34	1.56	1.47
5	B	2806	FUM	O-C	3.32	1.31	1.23
3	A	801	HEM	FE-NB	3.31	2.05	1.94
4	B	2805	FAD	C9-C8	3.30	1.44	1.39
4	A	1805	FAD	O4-C4	-3.25	1.17	1.23
3	B	801	HEM	CAC-C3C	3.17	1.55	1.47
3	A	803	HEM	CAB-C3B	3.16	1.55	1.47
3	B	804	HEM	CAC-C3C	3.12	1.55	1.47
3	A	801	HEM	CAC-C3C	3.09	1.55	1.47
3	A	803	HEM	FE-NA	3.00	2.05	1.95
3	A	804	HEM	CAB-C3B	2.99	1.55	1.47
3	A	802	HEM	CAC-C3C	2.97	1.55	1.47
4	B	2805	FAD	O4-C4	-2.94	1.18	1.23
3	A	801	HEM	CAB-C3B	2.87	1.55	1.47
3	B	804	HEM	FE-NA	2.87	2.04	1.95
3	B	803	HEM	CAB-C3B	2.85	1.55	1.47
3	B	803	HEM	CAC-C3C	2.84	1.55	1.47
4	B	2805	FAD	O2-C2	-2.84	1.18	1.24
4	A	1805	FAD	O2-C2	-2.84	1.18	1.24
4	B	2805	FAD	C1'-N10	2.84	1.54	1.47
3	B	801	HEM	CAB-C3B	2.82	1.54	1.47
5	A	1806	FUM	O8-C6	-2.79	1.23	1.30
3	B	804	HEM	CAB-C3B	2.79	1.54	1.47
5	A	1806	FUM	OXT-C	-2.79	1.23	1.30
3	A	803	HEM	CAC-C3C	2.78	1.54	1.47
5	A	1806	FUM	O-C	2.78	1.29	1.23
3	B	802	HEM	FE-ND	2.68	2.03	1.94
3	A	804	HEM	FE-NB	2.67	2.03	1.94
5	B	2806	FUM	OXT-C	-2.67	1.23	1.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	802	HEM	CAB-C3B	2.66	1.54	1.47
4	B	2805	FAD	C6-C5X	2.66	1.44	1.40
4	A	1805	FAD	C10-N1	-2.64	1.27	1.33
3	B	803	HEM	C2A-C3A	-2.63	1.32	1.38
3	B	804	HEM	FE-NB	2.60	2.02	1.94
3	B	802	HEM	CMA-C3A	2.60	1.56	1.50
3	A	801	HEM	CMD-C2D	2.58	1.56	1.50
3	B	804	HEM	CAA-C2A	2.57	1.58	1.51
3	B	802	HEM	CAB-C3B	2.55	1.54	1.47
3	A	801	HEM	CMB-C2B	2.54	1.56	1.50
3	A	803	HEM	CMD-C2D	2.53	1.55	1.50
4	A	1805	FAD	C9-C8	2.48	1.43	1.39
3	A	802	HEM	FE-ND	2.40	2.02	1.94
3	B	801	HEM	FE-NB	2.38	2.02	1.94
4	B	2805	FAD	C9A-N10	-2.38	1.37	1.41
3	B	803	HEM	CMD-C2D	2.30	1.55	1.50
3	A	802	HEM	CMA-C3A	2.30	1.55	1.50
3	A	804	HEM	CMB-C2B	2.22	1.55	1.50
3	B	801	HEM	FE-ND	2.21	2.01	1.94
3	A	804	HEM	FE-ND	2.21	2.01	1.94
3	A	801	HEM	C2A-C3A	-2.21	1.33	1.38
3	A	802	HEM	C3B-C2B	-2.21	1.32	1.37
3	B	804	HEM	CMA-C3A	2.20	1.55	1.50
4	B	2805	FAD	C5X-N5	-2.20	1.35	1.39
4	A	1805	FAD	PA-O1A	-2.19	1.43	1.50
4	B	2805	FAD	C2A-N3A	2.18	1.37	1.33
3	A	803	HEM	FE-NC	2.18	2.02	1.95
3	B	801	HEM	CMC-C2C	2.17	1.55	1.50
3	B	804	HEM	C2A-C3A	-2.16	1.33	1.38
3	A	802	HEM	FE-NA	2.15	2.02	1.95
3	B	804	HEM	C3B-C2B	-2.14	1.32	1.37
3	A	801	HEM	CMA-C3A	2.13	1.55	1.50
3	B	803	HEM	C3C-C2C	-2.13	1.32	1.37
4	B	2805	FAD	O3'-C3'	-2.13	1.37	1.43
3	B	803	HEM	CMB-C2B	2.10	1.55	1.50
3	A	804	HEM	CMA-C3A	2.09	1.55	1.50
3	B	802	HEM	C2A-C3A	-2.09	1.33	1.38
3	B	803	HEM	C3B-C2B	-2.07	1.33	1.37
4	B	2805	FAD	P-O2P	-2.06	1.45	1.55
3	A	803	HEM	C2A-C3A	-2.05	1.33	1.38
3	A	804	HEM	C2A-C3A	-2.05	1.33	1.38
4	A	1805	FAD	O4'-C4'	2.05	1.47	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	801	HEM	C2A-C3A	-2.04	1.33	1.38
4	B	2805	FAD	PA-O1A	-2.04	1.43	1.50
3	A	803	HEM	CAD-C3D	2.04	1.56	1.51
3	B	802	HEM	CAA-C2A	2.03	1.56	1.51
3	A	804	HEM	CAA-C2A	2.03	1.56	1.51
3	A	801	HEM	C1B-NB	-2.02	1.36	1.40
4	B	2805	FAD	C10-N1	-2.00	1.29	1.33
3	A	801	HEM	CMC-C2C	2.00	1.54	1.50

All (111) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	2805	FAD	O4-C4-N3	9.69	138.34	120.11
4	B	2805	FAD	C5'-C4'-C3'	-6.18	100.57	112.22
4	A	1805	FAD	O4-C4-N3	5.96	131.32	120.11
4	A	1805	FAD	C5'-C4'-C3'	-5.94	101.01	112.22
4	B	2805	FAD	O4-C4-C4X	-5.37	112.37	126.53
4	B	2805	FAD	O2-C2-N1	-5.22	113.14	121.80
4	A	1805	FAD	O4B-C1B-C2B	-4.93	96.07	106.62
3	B	802	HEM	C3B-C4B-NB	-4.82	106.01	109.47
4	A	1805	FAD	C4'-C3'-C2'	4.62	121.25	113.57
4	B	2805	FAD	O3'-C3'-C4'	4.57	119.32	108.93
3	A	803	HEM	O2A-CGA-O1A	4.43	134.72	123.33
3	B	802	HEM	C1B-NB-C4B	4.42	110.44	105.21
4	B	2805	FAD	O4'-C4'-C3'	-4.06	99.75	109.25
4	B	2805	FAD	O2-C2-N3	4.02	126.30	118.58
4	A	1805	FAD	C7M-C7-C6	3.83	126.33	119.57
4	B	2805	FAD	C1'-C2'-C3'	3.82	120.02	109.66
4	B	2805	FAD	C7M-C7-C6	3.77	126.22	119.57
4	B	2805	FAD	O4B-C1B-C2B	-3.69	98.72	106.62
4	B	2805	FAD	O4B-C4B-C5B	3.52	120.61	109.33
4	A	1805	FAD	O3'-C3'-C4'	3.42	116.71	108.93
4	B	2805	FAD	C4'-C3'-C2'	3.29	119.04	113.57
3	B	804	HEM	CMB-C2B-C1B	-3.26	119.94	125.03
4	B	2805	FAD	C9-C9A-N10	-3.22	117.52	121.85
4	A	1805	FAD	O4B-C1B-N9A	-3.19	101.96	108.09
4	A	1805	FAD	C1'-N10-C9A	-3.18	114.46	120.63
4	B	2805	FAD	C1'-N10-C9A	-3.09	114.62	120.63
3	B	802	HEM	CHC-C4B-NB	3.01	127.66	124.42
4	A	1805	FAD	C9-C9A-N10	-3.00	117.82	121.85
4	A	1805	FAD	O5B-C5B-C4B	2.99	119.19	108.99
4	A	1805	FAD	O4-C4-C4X	-2.99	118.64	126.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	801	HEM	CHC-C4B-NB	2.98	127.63	124.42
3	B	804	HEM	O1A-CGA-CBA	-2.90	113.89	123.09
3	B	802	HEM	C4B-C3B-C2B	2.87	109.92	107.28
4	A	1805	FAD	C3B-C2B-C1B	-2.84	96.09	101.46
4	A	1805	FAD	O2-C2-N1	-2.80	117.15	121.80
3	A	801	HEM	CHB-C1B-NB	2.80	127.83	124.37
3	A	802	HEM	C1B-NB-C4B	2.79	108.51	105.21
3	B	804	HEM	O2A-CGA-O1A	2.79	130.50	123.33
4	A	1805	FAD	C9A-C5X-N5	-2.78	119.50	122.45
4	A	1805	FAD	C2B-C1B-N9A	-2.77	106.43	113.30
3	B	802	HEM	CHD-C4C-NC	2.74	127.44	124.45
4	B	2805	FAD	C7M-C7-C8	-2.74	115.17	120.76
3	B	801	HEM	O2D-CGD-O1D	-2.69	116.42	123.33
3	B	804	HEM	O1D-CGD-CBD	-2.69	114.58	123.09
4	A	1805	FAD	O4B-C4B-C5B	2.68	117.93	109.33
3	B	803	HEM	O2A-CGA-O1A	2.67	130.19	123.33
4	A	1805	FAD	C6-C5X-N5	2.65	122.84	118.44
4	B	2805	FAD	C3B-C2B-C1B	-2.63	96.49	101.46
3	B	802	HEM	CBB-CAB-C3B	-2.62	114.44	127.53
4	B	2805	FAD	O5B-C5B-C4B	2.60	117.86	108.99
3	A	803	HEM	CBD-CAD-C3D	-2.57	105.41	112.53
4	B	2805	FAD	C5A-C6A-N6A	2.55	129.61	123.29
4	A	1805	FAD	O2A-PA-O1A	2.55	124.29	112.44
4	A	1805	FAD	C7M-C7-C8	-2.54	115.56	120.76
3	B	803	HEM	O1A-CGA-CBA	-2.54	115.03	123.09
3	A	802	HEM	CMB-C2B-C1B	-2.54	121.06	125.03
3	A	803	HEM	CHA-C4D-ND	2.54	127.51	124.37
4	B	2805	FAD	O2A-PA-O1A	2.52	124.16	112.44
3	B	803	HEM	CMC-C2C-C1C	-2.51	120.31	124.73
3	B	801	HEM	O1A-CGA-CBA	-2.48	115.21	123.09
3	A	802	HEM	C3B-C4B-NB	-2.48	107.69	109.47
4	B	2805	FAD	C6-C5X-N5	2.48	122.56	118.44
3	B	802	HEM	O1D-CGD-CBD	-2.47	115.27	123.09
3	B	802	HEM	C2B-C1B-NB	-2.46	107.01	109.84
4	B	2805	FAD	C5B-C4B-C3B	-2.46	106.37	115.21
3	B	801	HEM	O2D-CGD-CBD	2.45	121.73	114.00
3	A	802	HEM	C2B-C1B-NB	-2.41	107.06	109.84
4	B	2805	FAD	C1B-N9A-C8A	-2.41	121.76	127.09
3	A	804	HEM	CAC-C3C-C4C	-2.37	119.16	124.82
3	B	803	HEM	CAC-C3C-C4C	-2.33	119.25	124.82
4	B	2805	FAD	C2B-C1B-N9A	-2.33	107.51	113.30
3	A	803	HEM	O1D-CGD-CBD	-2.33	115.71	123.09

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	803	HEM	CBB-CAB-C3B	-2.32	115.92	127.53
4	A	1805	FAD	O4'-C4'-C3'	-2.31	103.83	109.25
3	B	804	HEM	CBD-CAD-C3D	2.31	118.92	112.53
3	B	801	HEM	C4D-ND-C1D	2.31	107.94	105.21
3	A	804	HEM	O2D-CGD-CBD	2.31	121.29	114.00
4	A	1805	FAD	C5B-C4B-C3B	-2.29	106.96	115.21
3	A	804	HEM	CBC-CAC-C3C	-2.29	116.10	127.53
3	A	803	HEM	CAA-C2A-C1A	-2.27	120.51	124.94
4	B	2805	FAD	O4B-C1B-N9A	-2.26	103.74	108.09
3	B	804	HEM	CBC-CAC-C3C	-2.24	116.32	127.53
3	A	804	HEM	C4C-C3C-C2C	2.22	108.74	106.81
3	A	801	HEM	CHA-C4D-C3D	2.21	129.31	125.23
3	A	801	HEM	C1B-NB-C4B	2.21	107.82	105.21
4	A	1805	FAD	O2'-C2'-C3'	-2.18	104.14	109.25
3	A	802	HEM	C3B-C2B-C1B	2.16	108.03	106.41
4	B	2805	FAD	O5'-C5'-C4'	-2.16	103.61	109.36
3	B	803	HEM	C3D-C4D-ND	-2.13	107.83	110.17
4	B	2805	FAD	O4'-C4'-C5'	-2.13	105.29	109.99
3	A	804	HEM	CBD-CAD-C3D	2.13	118.42	112.53
3	B	801	HEM	C3D-C4D-ND	-2.12	107.84	110.17
3	A	801	HEM	CBB-CAB-C3B	-2.11	116.96	127.53
3	A	804	HEM	O1A-CGA-CBA	-2.11	116.40	123.09
4	A	1805	FAD	C1B-N9A-C8A	-2.11	122.41	127.09
3	B	803	HEM	O2D-CGD-O1D	2.10	128.74	123.33
4	A	1805	FAD	O2P-P-O1P	2.10	122.19	112.44
4	B	2805	FAD	O2'-C2'-C3'	-2.10	104.34	109.25
4	A	1805	FAD	O3'-C3'-C2'	2.09	113.68	108.93
4	B	2805	FAD	O3'-C3'-C2'	2.09	113.67	108.93
4	B	2805	FAD	C9A-C5X-N5	-2.09	120.24	122.45
3	B	803	HEM	C4C-C3C-C2C	2.08	108.61	106.81
3	A	801	HEM	C4A-CHB-C1B	-2.07	121.37	126.25
3	B	802	HEM	O2D-CGD-CBD	2.07	120.54	114.00
3	A	804	HEM	O1D-CGD-CBD	-2.05	116.60	123.09
3	B	803	HEM	O1D-CGD-CBD	-2.05	116.60	123.09
3	B	804	HEM	O2D-CGD-CBD	2.04	120.44	114.00
4	A	1805	FAD	C1'-C2'-C3'	2.03	115.16	109.66
3	A	803	HEM	O2D-CGD-O1D	2.02	128.53	123.33
3	B	802	HEM	CAC-C3C-C4C	-2.01	120.03	124.82
3	B	804	HEM	C1A-C2A-C3A	2.00	109.97	106.87

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
4	A	1805	FAD	C3'
4	A	1805	FAD	C4'
4	B	2805	FAD	C3'
4	B	2805	FAD	C4'

All (52) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1805	FAD	C1'-C2'-C3'-O3'
4	A	1805	FAD	C1'-C2'-C3'-C4'
4	A	1805	FAD	O2'-C2'-C3'-O3'
4	A	1805	FAD	O2'-C2'-C3'-C4'
4	A	1805	FAD	C3'-C4'-C5'-O5'
4	A	1805	FAD	O4'-C4'-C5'-O5'
4	A	1805	FAD	PA-O3P-P-O5'
4	B	2805	FAD	C1'-C2'-C3'-O3'
4	B	2805	FAD	C1'-C2'-C3'-C4'
4	B	2805	FAD	O2'-C2'-C3'-O3'
4	B	2805	FAD	O2'-C2'-C3'-C4'
4	B	2805	FAD	PA-O3P-P-O5'
5	A	1806	FUM	OXT-C-C4-C5
5	A	1806	FUM	O-C-C4-C5
5	B	2806	FUM	OXT-C-C4-C5
5	B	2806	FUM	O-C-C4-C5
3	A	803	HEM	C2A-CAA-CBA-CGA
3	A	801	HEM	C3D-CAD-CBD-CGD
4	B	2805	FAD	C3'-C4'-C5'-O5'
3	A	804	HEM	C2A-CAA-CBA-CGA
4	B	2805	FAD	P-O3P-PA-O1A
3	B	801	HEM	C3D-CAD-CBD-CGD
4	B	2805	FAD	P-O3P-PA-O2A
3	A	803	HEM	C3D-CAD-CBD-CGD
4	A	1805	FAD	P-O3P-PA-O1A
4	A	1805	FAD	P-O3P-PA-O2A
3	B	803	HEM	C3D-CAD-CBD-CGD
3	A	804	HEM	CAA-CBA-CGA-O2A
3	B	804	HEM	CAA-CBA-CGA-O1A
3	A	802	HEM	CAD-CBD-CGD-O1D
3	A	804	HEM	CAA-CBA-CGA-O1A
3	B	802	HEM	CAD-CBD-CGD-O2D
3	A	803	HEM	CAA-CBA-CGA-O2A
3	A	801	HEM	CAD-CBD-CGD-O1D
3	A	803	HEM	CAA-CBA-CGA-O1A

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Mol	Chain	Res	Type	Atoms
3	B	802	HEM	CAD-CBD-CGD-O1D
3	A	802	HEM	CAD-CBD-CGD-O2D
3	B	804	HEM	CAA-CBA-CGA-O2A
3	B	801	HEM	CAD-CBD-CGD-O1D
3	A	801	HEM	CAD-CBD-CGD-O2D
3	B	801	HEM	CAD-CBD-CGD-O2D
3	A	801	HEM	C2B-C3B-CAB-CBB
3	A	801	HEM	C4B-C3B-CAB-CBB
3	B	801	HEM	C4B-C3B-CAB-CBB
3	B	802	HEM	C4B-C3B-CAB-CBB
3	B	804	HEM	C4D-C3D-CAD-CBD
3	B	804	HEM	CAD-CBD-CGD-O2D
3	A	801	HEM	CAA-CBA-CGA-O2A
3	A	804	HEM	CAD-CBD-CGD-O1D
3	B	804	HEM	CAD-CBD-CGD-O1D
3	B	804	HEM	C2D-C3D-CAD-CBD
3	A	804	HEM	CAD-CBD-CGD-O2D

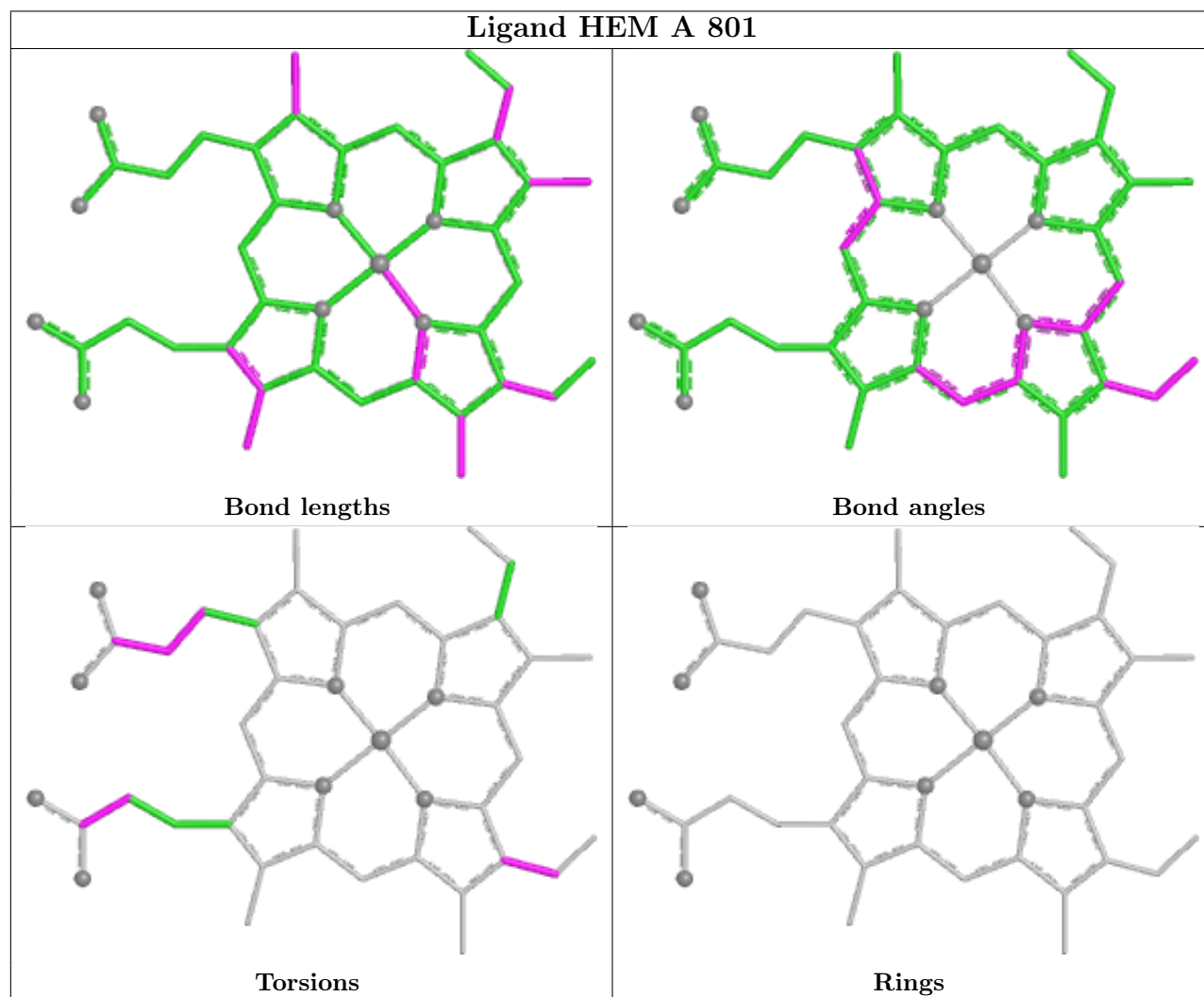
There are no ring outliers.

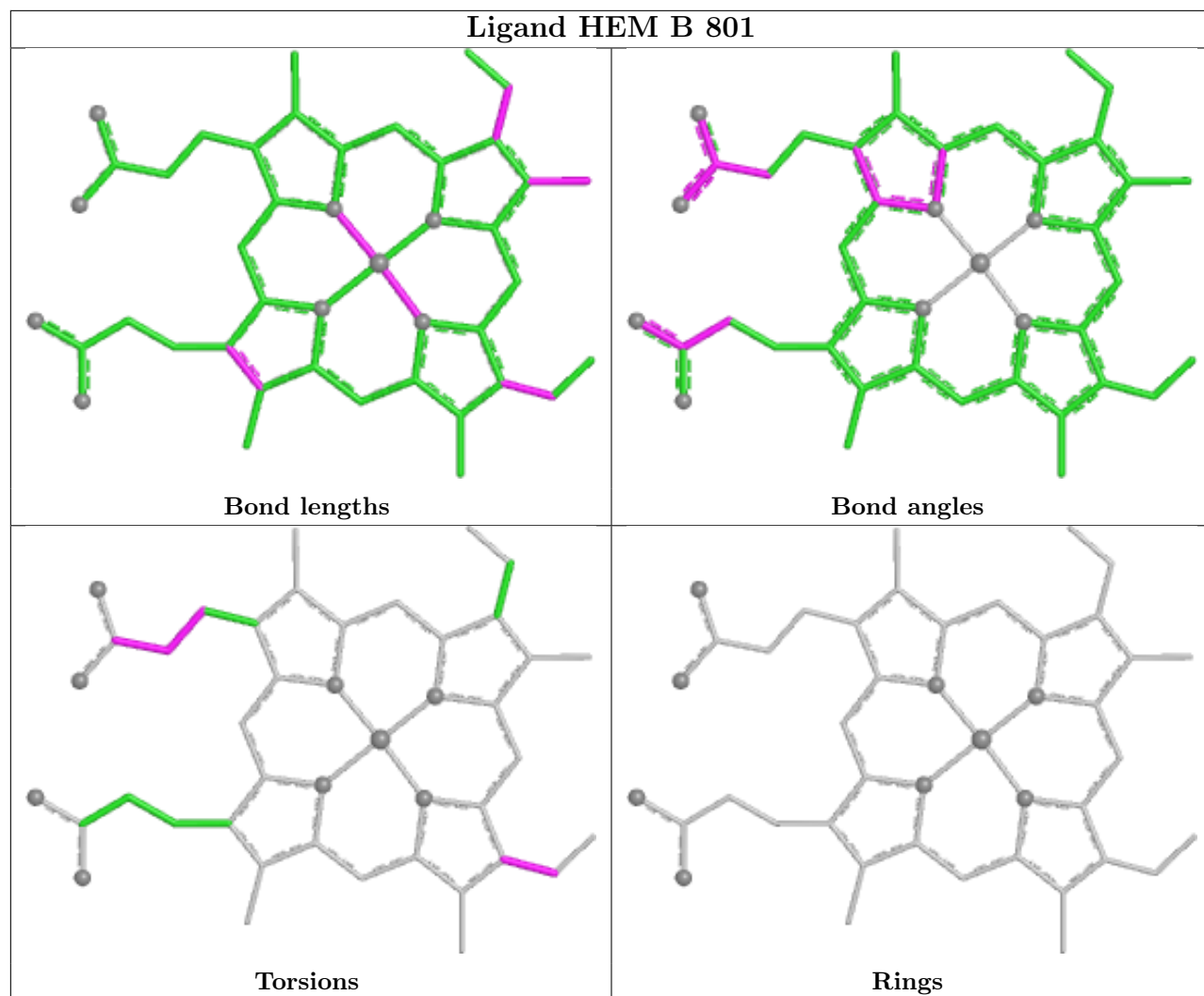
11 monomers are involved in 67 short contacts:

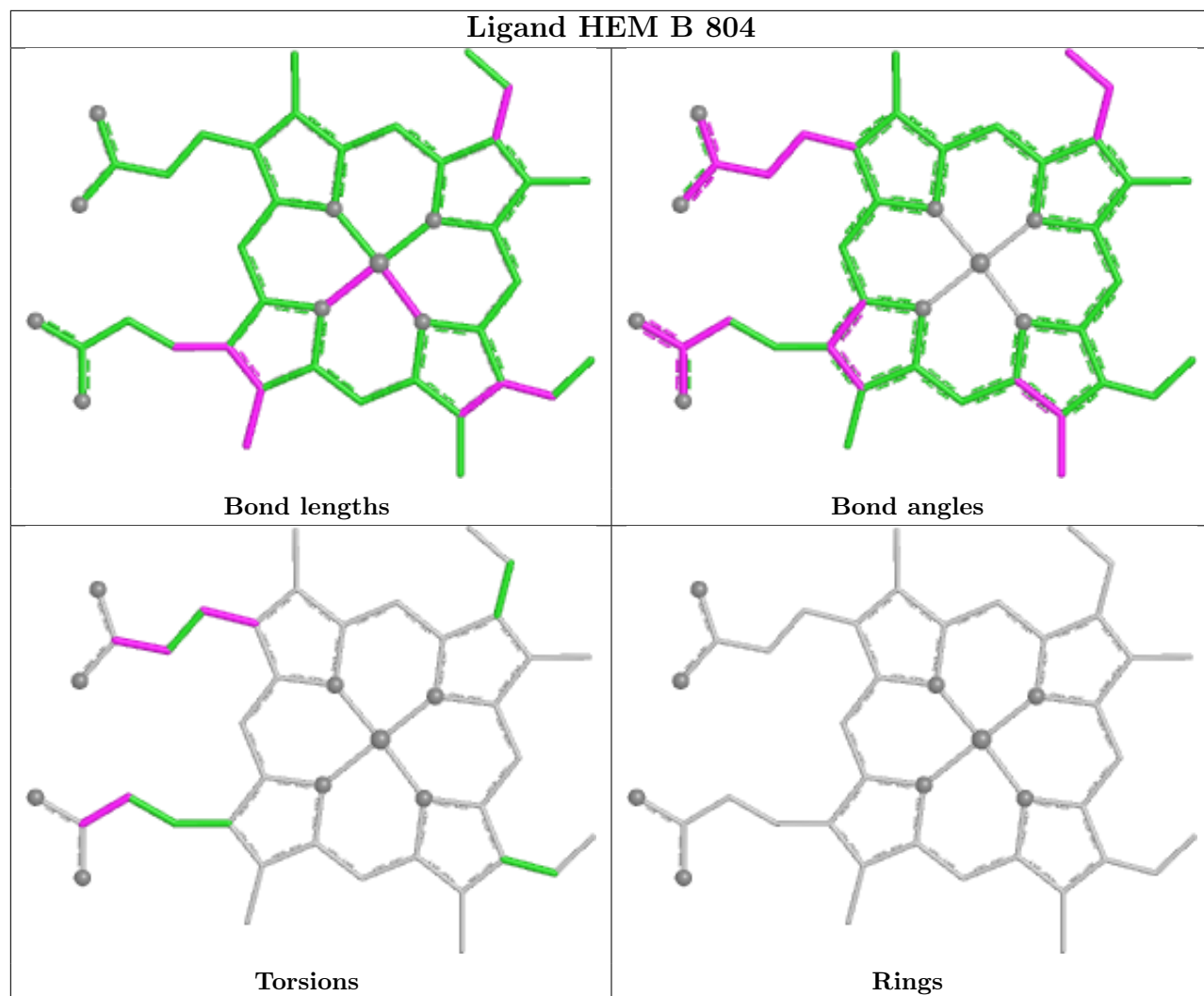
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	801	HEM	7	0
3	B	801	HEM	6	0
3	B	804	HEM	7	0
4	A	1805	FAD	6	0
3	A	803	HEM	6	0
3	A	802	HEM	7	0
5	B	2806	FUM	1	0
4	B	2805	FAD	3	0
3	A	804	HEM	10	0
3	B	803	HEM	9	0
3	B	802	HEM	5	0

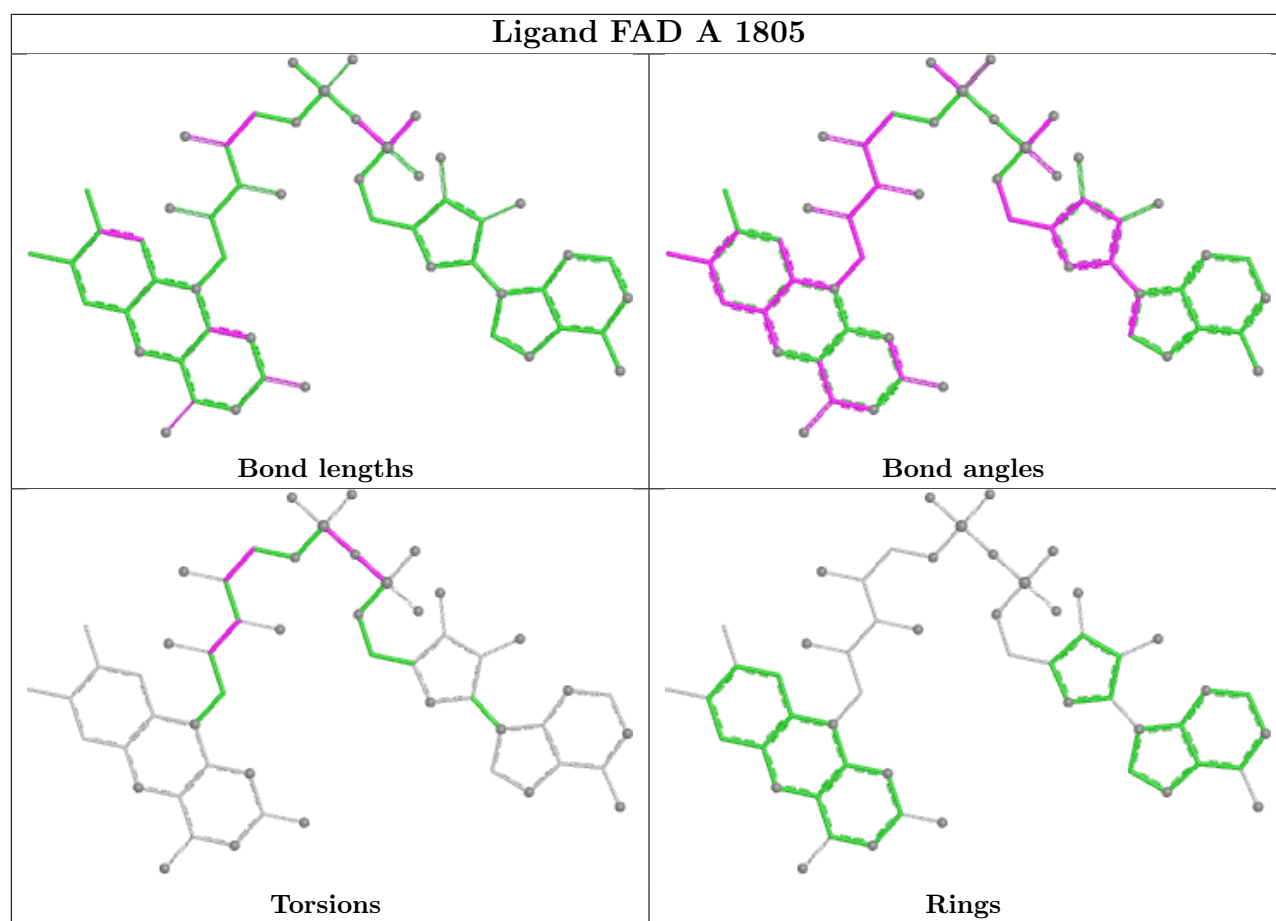
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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

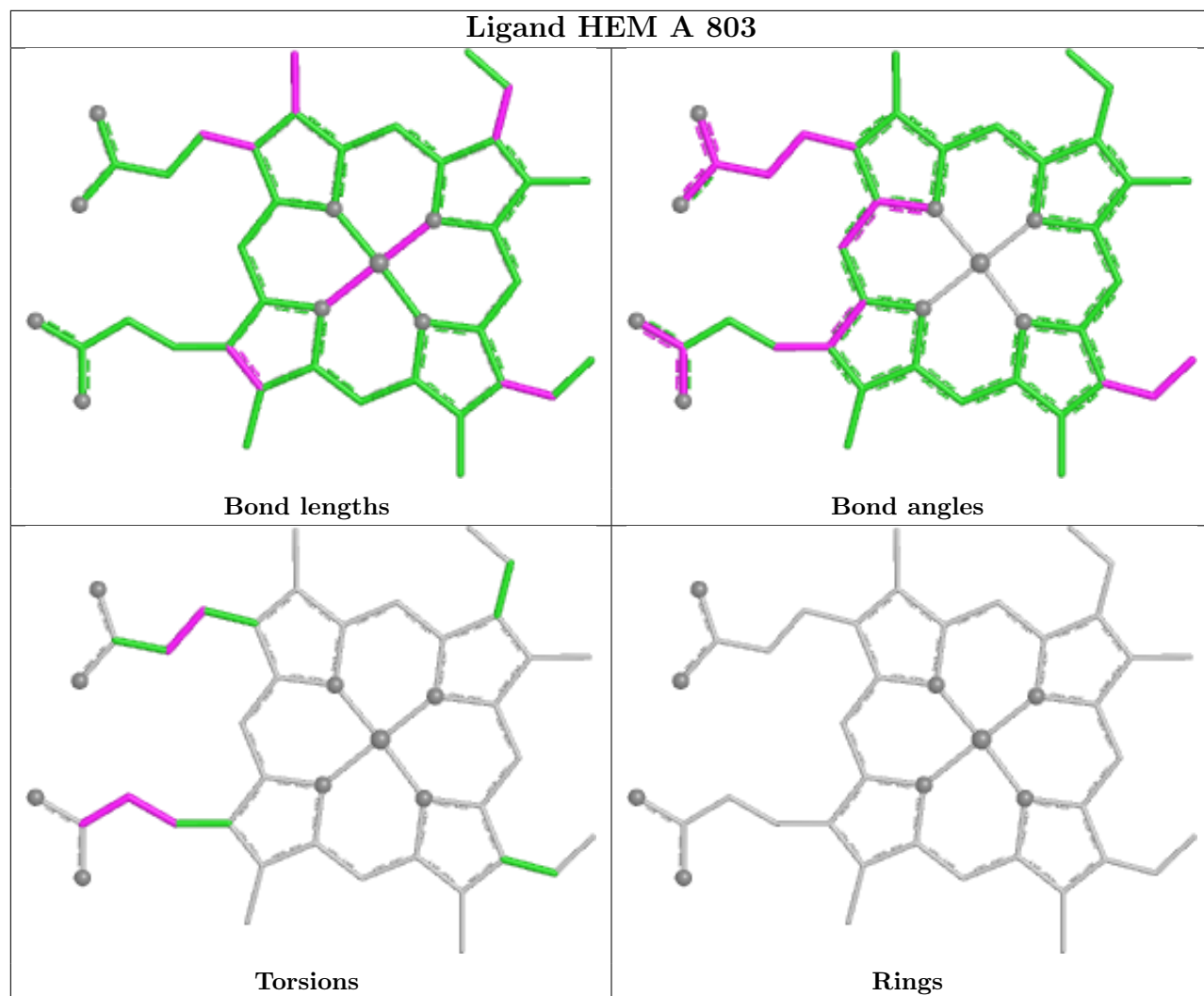
average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

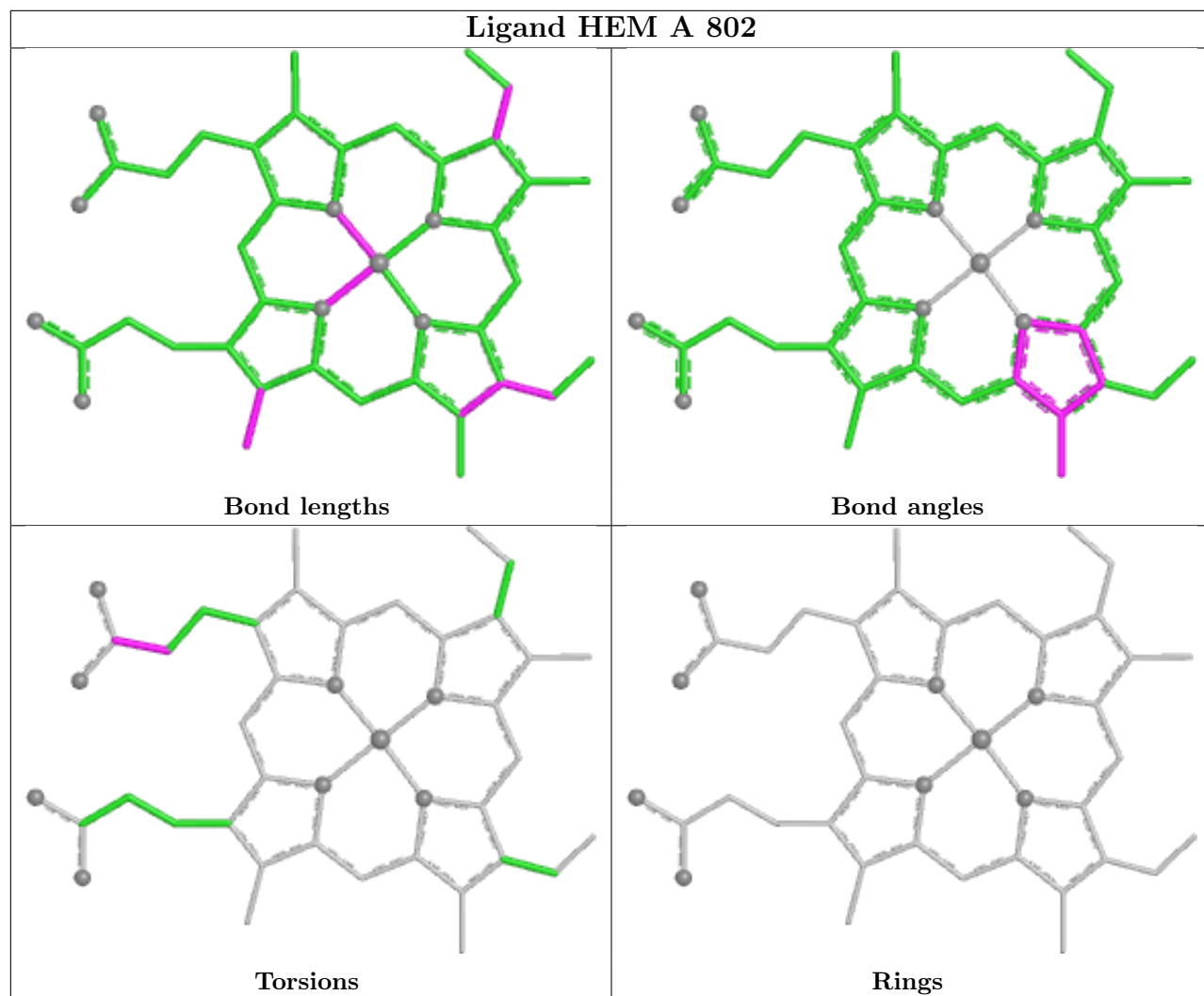


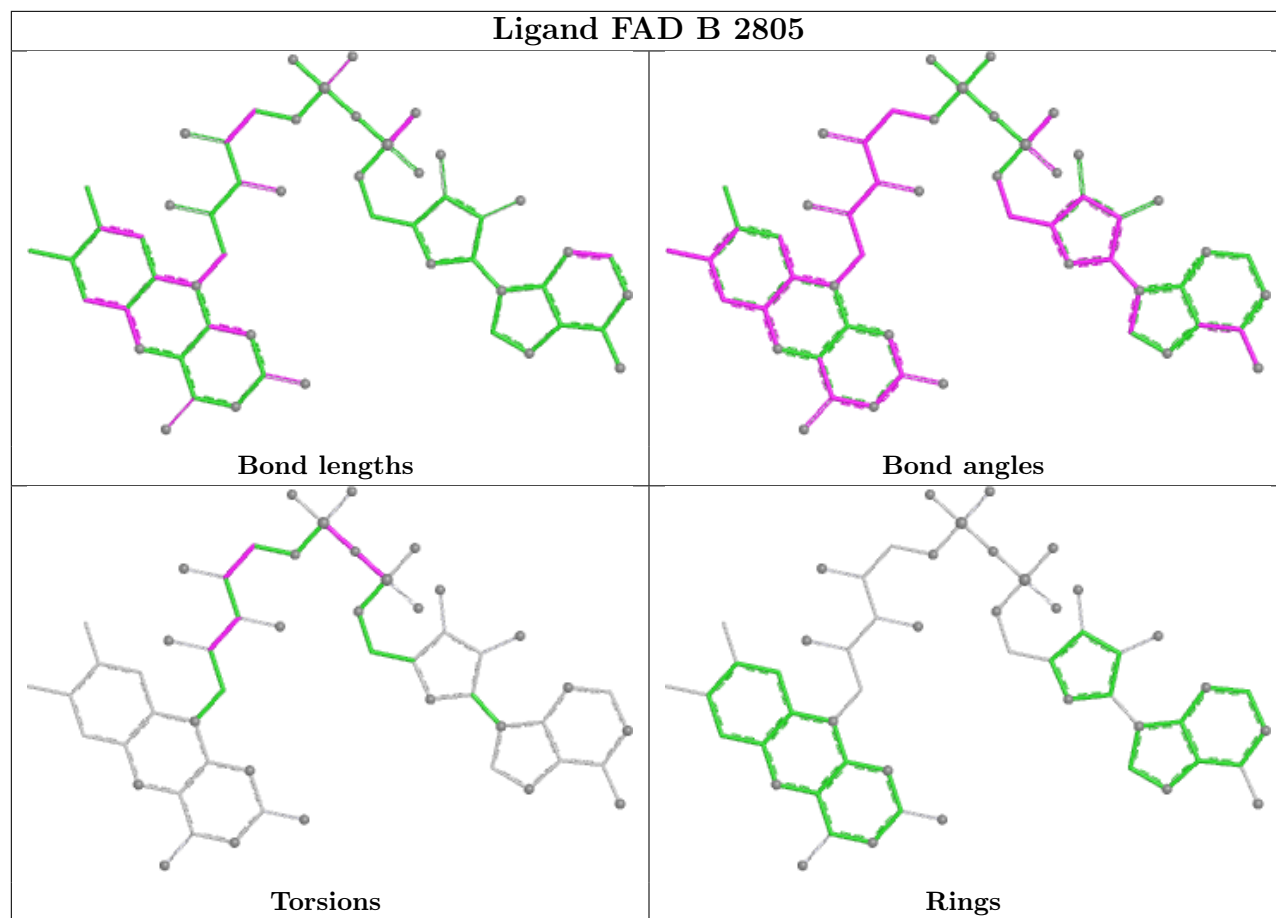


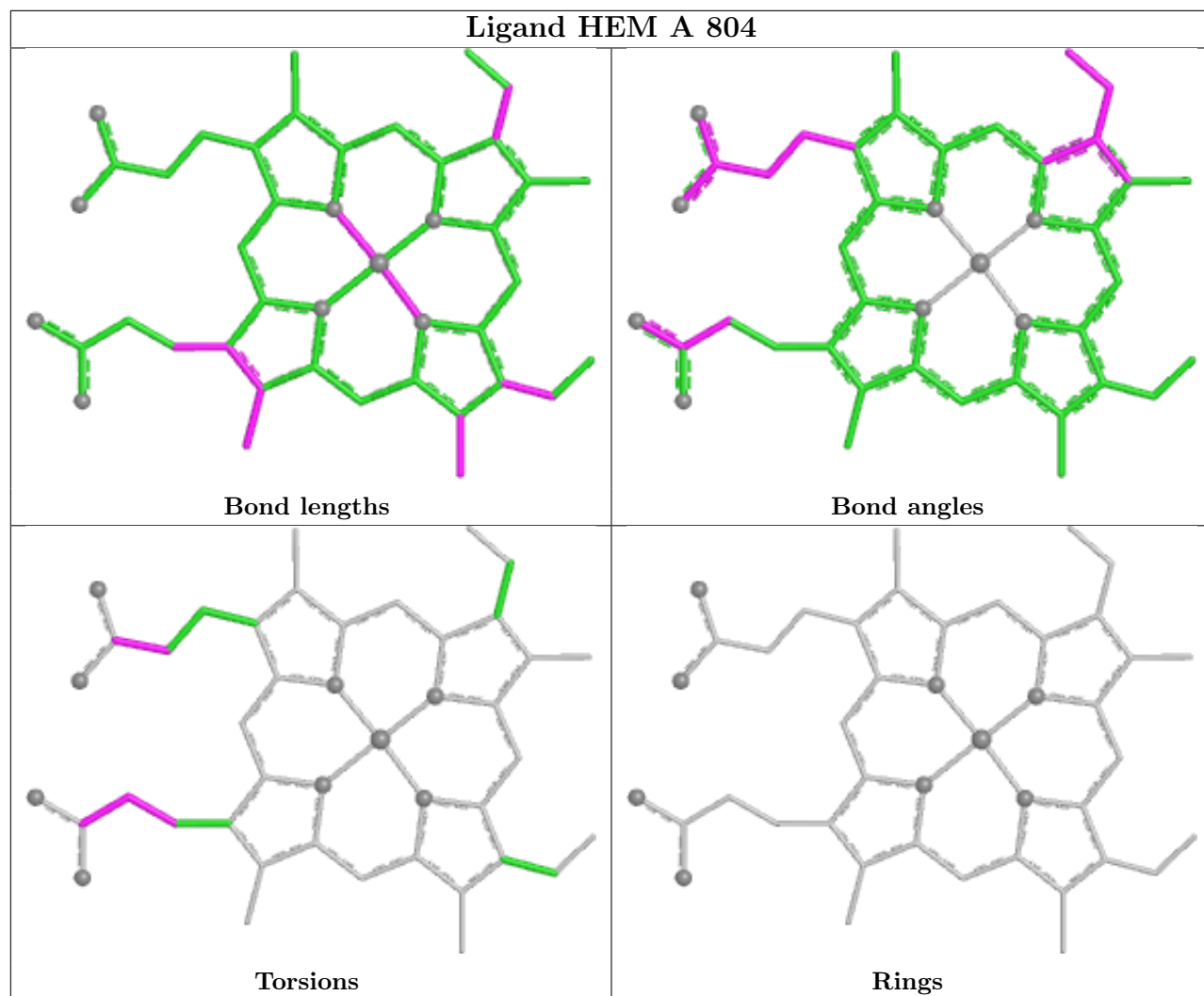


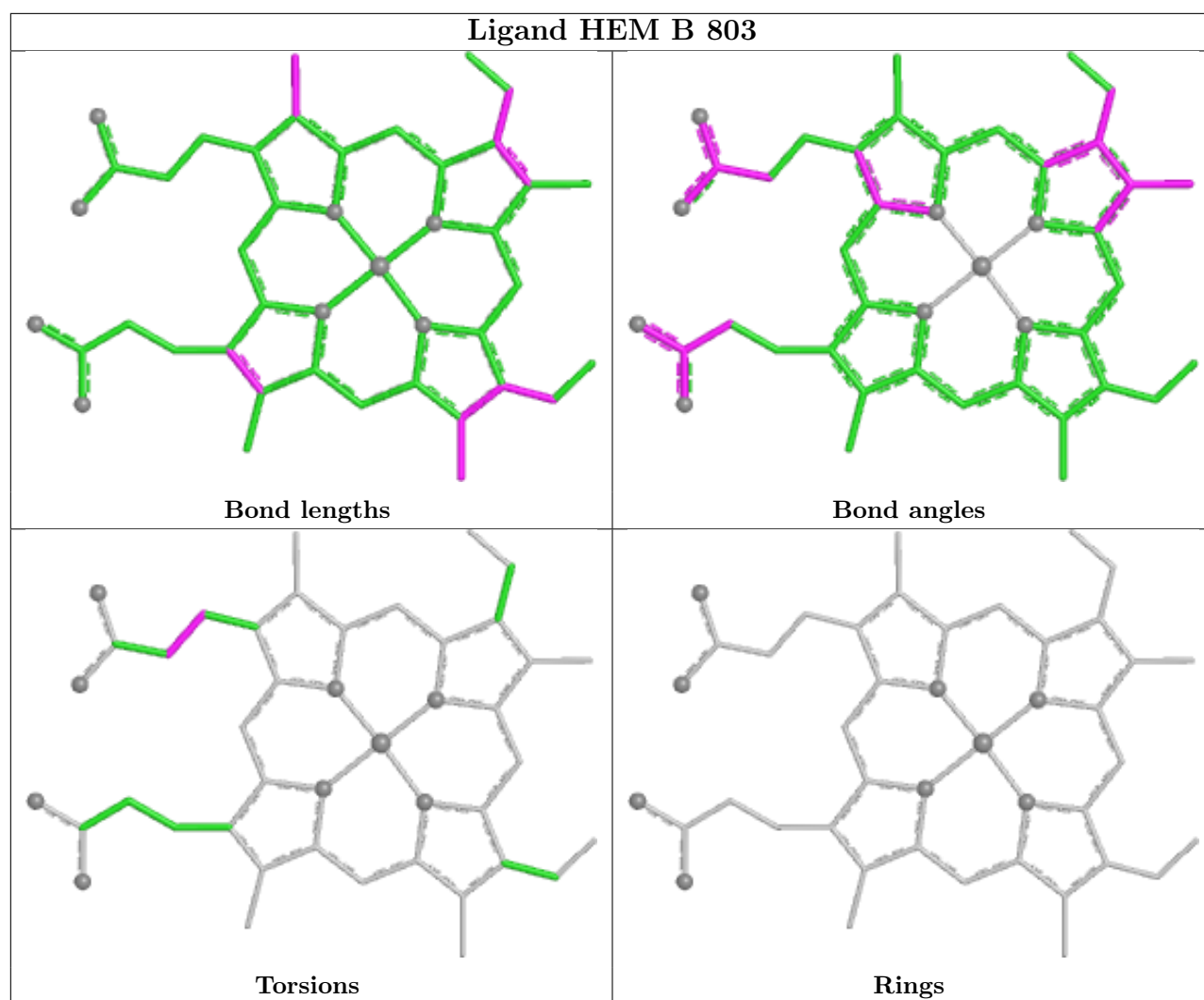


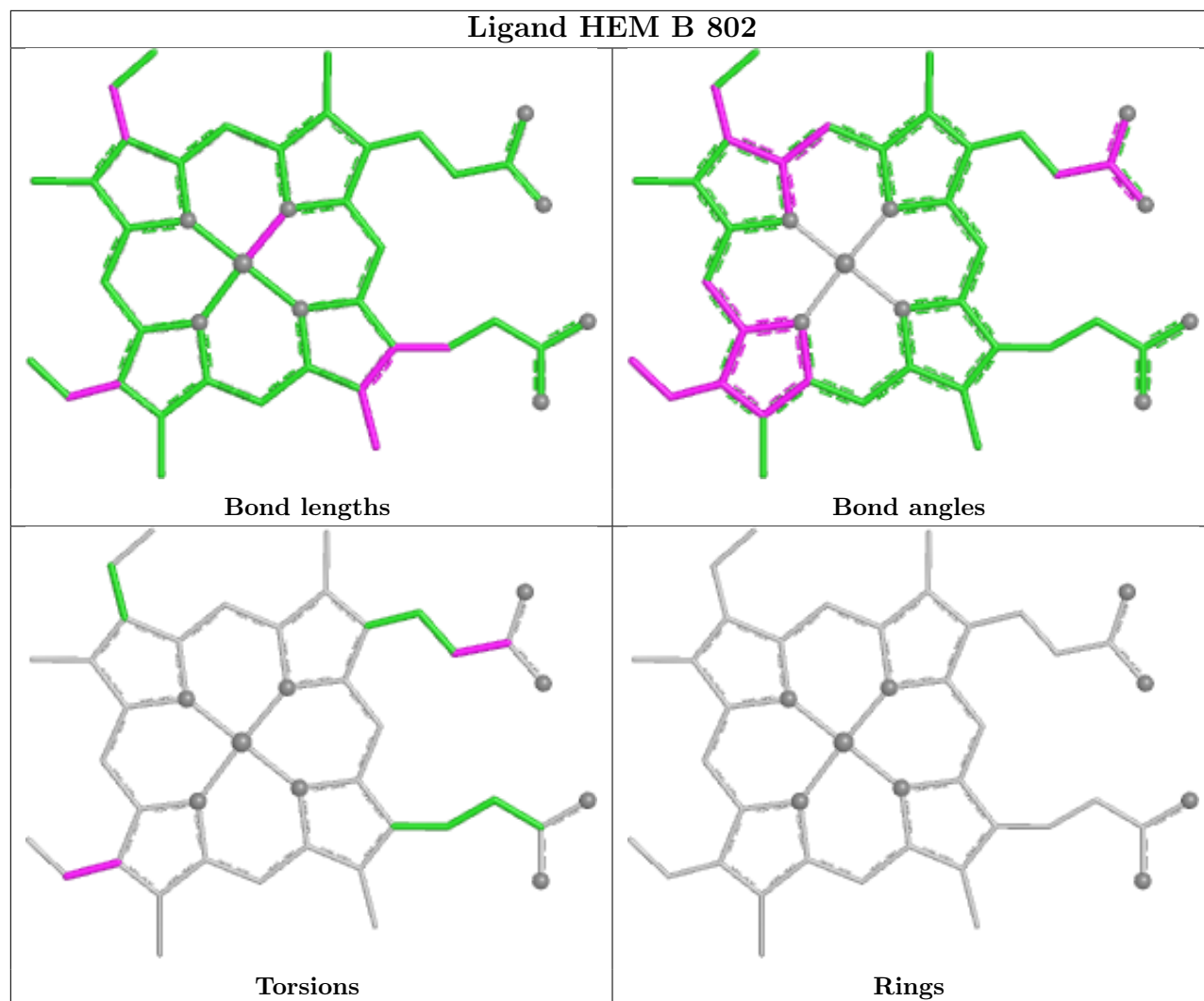












5.7 Other polymers [i](#)

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 was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.