



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 01:43 PM UTC

PDB ID : 5Y17 / pdb_00005y17
Title : CATPO mutant - E316F
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Deposited on : 2017-07-19
Resolution : 2.30 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 : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

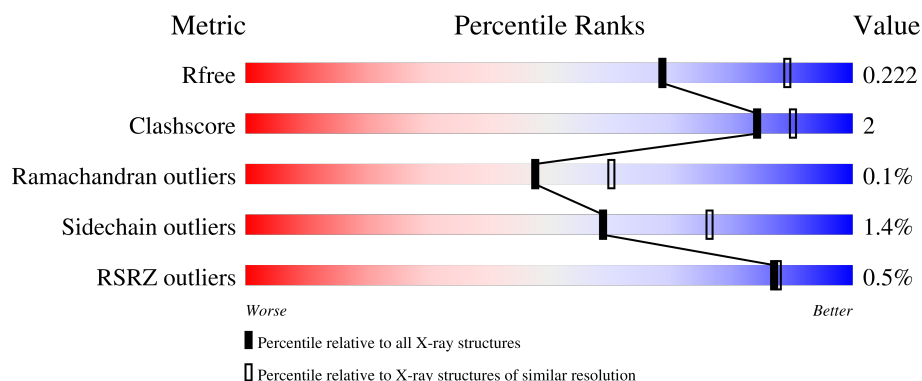
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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))
R_{free}	180053	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	678	90% 8% .
1	B	678	92% 6% .
1	C	678	92% 7%
1	D	678	92% 7%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 22190 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.

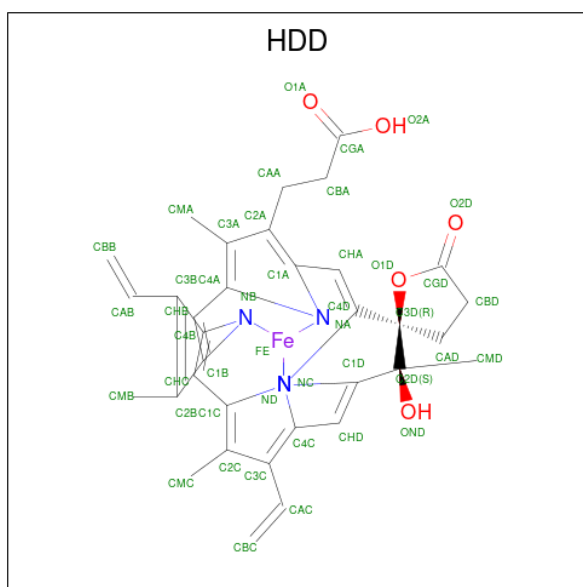
- Molecule 1 is a protein called Catalase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	675	Total	C	N	O	S	0	0	0
			5265	3328	920	1006	11			
1	B	675	Total	C	N	O	S	0	2	0
			5278	3334	922	1011	11			
1	C	675	Total	C	N	O	S	0	0	0
			5265	3328	920	1006	11			
1	D	675	Total	C	N	O	S	0	1	0
			5271	3331	921	1008	11			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	316	PHE	GLU	engineered mutation	UNP M4GGR7
B	316	PHE	GLU	engineered mutation	UNP M4GGR7
C	316	PHE	GLU	engineered mutation	UNP M4GGR7
D	316	PHE	GLU	engineered mutation	UNP M4GGR7

- Molecule 2 is CIS-HEME D HYDROXYCHLORIN GAMMA-SPIROLACTONE (CCD ID: HDD) (formula: C₃₄H₃₂FeN₄O₅).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	Fe	N	O	0	0
			44	34	1	4	5		
2	B	1	Total	C	Fe	N	O	0	0
			44	34	1	4	5		
2	C	1	Total	C	Fe	N	O	0	0
			44	34	1	4	5		
2	D	1	Total	C	Fe	N	O	0	0
			44	34	1	4	5		

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	4	Total	Ca	0	0
			4	4		
3	B	2	Total	Ca	0	0
			2	2		
3	C	2	Total	Ca	0	0
			2	2		
3	D	2	Total	Ca	0	0
			2	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	247	Total	O	0	0
			247	247		

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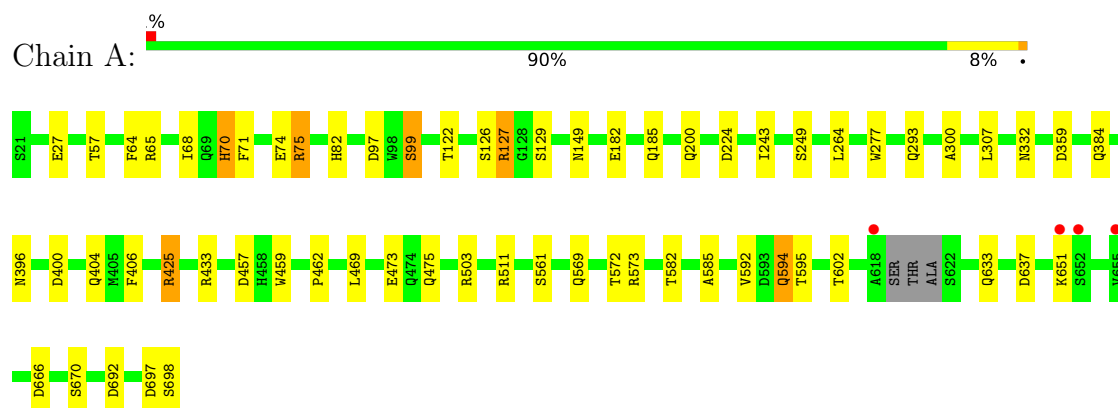
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	208	Total 208	O 208	0	0
4	C	218	Total 218	O 218	0	0
4	D	252	Total 252	O 252	0	0

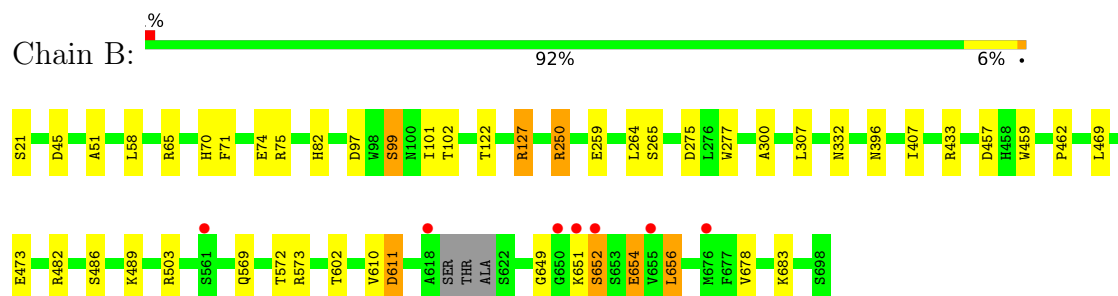
3 Residue-property plots

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

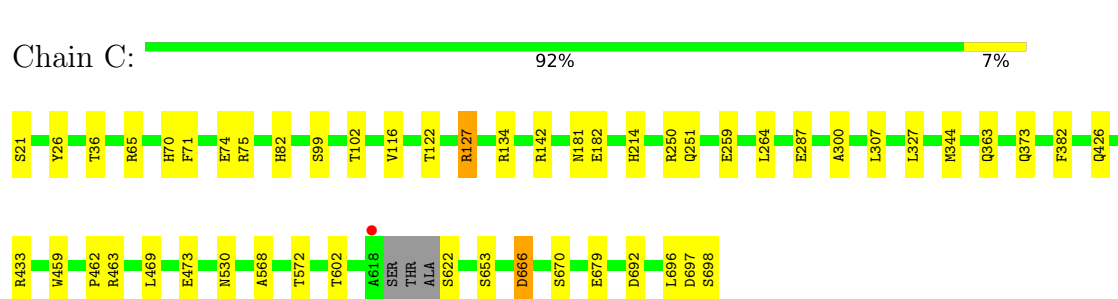
• Molecule 1: Catalase



• Molecule 1: Catalase

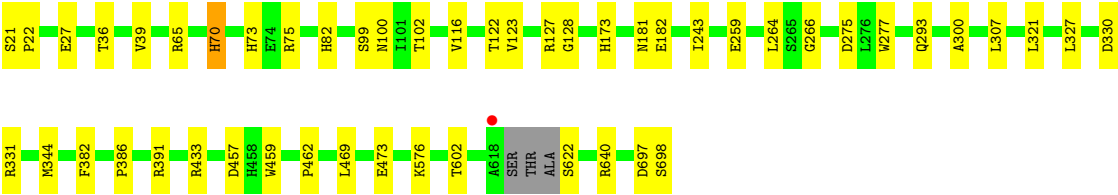


• Molecule 1: Catalase



• Molecule 1: Catalase





4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	125.73Å 120.87Å 183.80Å 90.00° 101.97° 90.00°	Depositor
Resolution (Å)	100.51 – 2.30 100.51 – 2.30	Depositor EDS
% Data completeness (in resolution range)	88.6 (100.51-2.30) 88.6 (100.51-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.19 (at 2.29Å)	Xtrriage
Refinement program	REFMAC 5.8.0222	Depositor
R, R_{free}	0.178 , 0.220 0.185 , 0.222	Depositor DCC
R_{free} test set	5236 reflections (0.97%)	wwPDB-VP
Wilson B-factor (Å ²)	28.9	Xtrriage
Anisotropy	0.633	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 33.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	22190	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 58.98 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.8891e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: CA, HDD

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	0.95	5/5400 (0.1%)	1.06	8/7342 (0.1%)
1	B	0.96	1/5413 (0.0%)	1.07	5/7358 (0.1%)
1	C	0.96	3/5400 (0.1%)	1.06	4/7342 (0.1%)
1	D	0.97	8/5406 (0.1%)	1.06	1/7350 (0.0%)
All	All	0.96	17/21619 (0.1%)	1.06	18/29392 (0.1%)

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	6
1	B	0	6
1	C	0	5
1	D	0	6
All	All	0	23

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	73	HIS	CE1-NE2	7.65	1.40	1.32
1	D	70	HIS	CE1-NE2	5.73	1.38	1.32
1	C	696	LEU	C-O	-5.61	1.17	1.23
1	A	27	GLU	C-O	-5.55	1.17	1.23
1	D	128	GLY	N-CA	5.52	1.52	1.45
1	D	321	LEU	C-O	-5.52	1.17	1.24
1	A	70	HIS	CE1-NE2	5.50	1.38	1.32
1	C	134	ARG	C-O	-5.46	1.17	1.24
1	A	592	VAL	C-O	-5.43	1.18	1.24
1	D	128	GLY	C-O	-5.42	1.20	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	101	ILE	N-CA	5.39	1.51	1.46
1	A	249	SER	C-O	-5.28	1.17	1.23
1	D	330	ASP	C-O	-5.27	1.18	1.24
1	A	75	ARG	C-O	-5.14	1.17	1.23
1	C	214	HIS	CE1-NE2	5.11	1.37	1.32
1	D	27	GLU	C-O	-5.03	1.17	1.23
1	D	173	HIS	CE1-NE2	5.03	1.37	1.32

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	572	THR	CA-CB-OG1	-6.28	100.18	109.60
1	C	530	ASN	CA-CB-CG	-5.93	106.67	112.60
1	B	259	GLU	CB-CG-CD	5.91	122.65	112.60
1	C	259	GLU	CB-CG-CD	5.82	122.49	112.60
1	D	259	GLU	CB-CG-CD	5.69	122.27	112.60
1	A	224	ASP	CA-C-N	5.65	125.49	121.65
1	A	224	ASP	C-N-CA	5.65	125.49	121.65
1	A	182	GLU	CB-CG-CD	5.60	122.12	112.60
1	C	666	ASP	CA-CB-CG	-5.54	107.06	112.60
1	B	610	VAL	CA-C-N	5.48	127.89	120.38
1	B	610	VAL	C-N-CA	5.48	127.89	120.38
1	A	425	ARG	CB-CG-CD	5.46	123.86	111.30
1	C	692	ASP	CA-CB-CG	5.46	118.06	112.60
1	A	359	ASP	CA-CB-CG	5.44	118.04	112.60
1	A	572	THR	CA-CB-OG1	-5.43	101.45	109.60
1	A	400	ASP	CA-CB-CG	5.14	117.74	112.60
1	B	611	ASP	CB-CA-C	-5.12	101.97	110.68
1	A	692	ASP	CA-CB-CG	5.07	117.67	112.60

There are no chirality outliers.

All (23) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	127	ARG	Sidechain
1	A	425	ARG	Sidechain
1	A	433	ARG	Sidechain
1	A	503	ARG	Sidechain
1	A	65	ARG	Sidechain
1	A	75	ARG	Sidechain
1	B	127	ARG	Sidechain
1	B	250	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	B	433	ARG	Sidechain
1	B	503	ARG	Sidechain
1	B	65	ARG	Sidechain
1	B	75	ARG	Sidechain
1	C	250	ARG	Sidechain
1	C	433	ARG	Sidechain
1	C	463	ARG	Sidechain
1	C	65	ARG	Sidechain
1	C	75	ARG	Sidechain
1	D	127	ARG	Sidechain
1	D	391	ARG	Sidechain
1	D	433	ARG	Sidechain
1	D	640	ARG	Sidechain
1	D	65	ARG	Sidechain
1	D	75	ARG	Sidechain

5.2 Too-close contacts

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	5265	0	5046	33	0
1	B	5278	0	5054	27	0
1	C	5265	0	5046	27	0
1	D	5271	0	5050	24	0
2	A	44	0	31	1	0
2	B	44	0	31	1	0
2	C	44	0	31	0	0
2	D	44	0	31	0	0
3	A	4	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
4	A	247	0	0	3	0
4	B	208	0	0	1	0
4	C	218	0	0	0	0
4	D	252	0	0	2	0
All	All	22190	0	20320	97	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 (97) 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:A:404:GLN:HE21	1:A:406:PHE:H	1.32	0.76
1:A:126:SER:H	1:A:185:GLN:HE22	1.32	0.76
1:C:251:GLN:HE22	1:C:287:GLU:H	1.34	0.76
1:B:654:GLU:O	1:B:656:LEU:N	2.18	0.76
1:C:697:ASP:O	1:C:698:SER:O	2.07	0.72
1:B:45:ASP:H	1:C:426:GLN:HE22	1.37	0.71
1:C:373:GLN:HE21	1:C:373:GLN:HA	1.53	0.71
4:A:920:HOH:O	1:C:127:ARG:HD2	1.93	0.69
1:D:100:ASN:HB3	4:D:1042:HOH:O	1.94	0.68
1:B:265[B]:SER:OG	1:D:266:GLY:HA2	1.94	0.67
1:A:300:ALA:HA	1:A:307:LEU:HD12	1.77	0.67
1:A:126:SER:H	1:A:185:GLN:NE2	1.93	0.66
1:B:611:ASP:HB2	1:B:649:GLY:HA3	1.77	0.66
1:A:384:GLN:HE22	1:A:404:GLN:HE22	1.44	0.65
1:A:582:THR:HG21	1:A:594:GLN:HE21	1.61	0.65
1:A:277:TRP:CZ3	1:C:181:ASN:HB3	2.31	0.65
1:C:300:ALA:HA	1:C:307:LEU:HD12	1.78	0.65
1:B:573:ARG:HG3	1:B:678:VAL:HG11	1.79	0.64
1:D:300:ALA:HA	1:D:307:LEU:HD12	1.80	0.63
1:A:277:TRP:CE3	1:C:181:ASN:HB3	2.33	0.63
1:B:569:GLN:NE2	1:B:569:GLN:HA	2.13	0.62
1:B:277:TRP:CE3	1:D:181:ASN:HB3	2.36	0.61
1:B:300:ALA:HA	1:B:307:LEU:HD12	1.82	0.61
1:A:475:GLN:NE2	1:A:697:ASP:H	2.00	0.60
1:B:277:TRP:CZ3	1:D:181:ASN:HB3	2.37	0.60
1:B:489:LYS:HD3	4:B:996:HOH:O	2.01	0.60
1:C:251:GLN:NE2	1:C:287:GLU:H	2.01	0.59
1:D:21:SER:HB3	1:D:331:ARG:NH1	2.20	0.56
1:C:373:GLN:HA	1:C:373:GLN:NE2	2.20	0.56
1:A:127:ARG:NH2	4:A:804:HOH:O	2.39	0.56
1:C:264:LEU:HD13	1:C:602:THR:HB	1.89	0.55
1:D:277:TRP:NE1	4:D:805:HOH:O	2.38	0.55
1:C:697:ASP:O	1:C:698:SER:C	2.50	0.55
1:D:264:LEU:HD13	1:D:602:THR:HB	1.87	0.55
1:B:97:ASP:OD1	1:B:99:SER:OG	2.25	0.55
1:B:264:LEU:HD13	1:B:602:THR:HB	1.88	0.54
1:A:97:ASP:OD1	1:A:99:SER:OG	2.24	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:57:THR:H	1:C:363:GLN:HE21	1.54	0.54
2:A:701:HDD:CMC	2:A:701:HDD:HBC1	2.39	0.53
1:A:264:LEU:HD13	1:A:602:THR:HB	1.90	0.52
1:C:568:ALA:O	1:C:572:THR:HG23	2.10	0.52
1:A:384:GLN:HE22	1:A:404:GLN:NE2	2.08	0.51
1:A:475:GLN:NE2	1:A:511:ARG:HH21	2.09	0.51
1:B:265[B]:SER:OG	1:D:266:GLY:CA	2.59	0.50
1:A:127:ARG:NH2	1:C:182:GLU:OE2	2.45	0.49
1:A:129:SER:HB3	1:A:185:GLN:HE21	1.77	0.49
1:B:611:ASP:OD1	1:B:652:SER:HB3	2.13	0.48
1:B:45:ASP:H	1:C:426:GLN:NE2	2.08	0.47
1:D:21:SER:N	1:D:22:PRO:HD2	2.31	0.46
1:B:407:ILE:HD12	1:C:26:TYR:HB2	1.97	0.46
1:B:459:TRP:C	1:B:462:PRO:HD2	2.41	0.46
1:B:82:HIS:HA	1:B:122:THR:O	2.16	0.46
1:C:99:SER:HA	1:C:102:THR:O	2.16	0.46
1:C:82:HIS:HA	1:C:122:THR:O	2.16	0.46
1:A:633:GLN:NE2	1:A:637:ASP:OD2	2.49	0.46
1:D:459:TRP:C	1:D:462:PRO:HD2	2.41	0.46
1:A:82:HIS:HA	1:A:122:THR:O	2.16	0.46
1:A:459:TRP:C	1:A:462:PRO:HD2	2.41	0.46
1:A:582:THR:HG21	1:A:594:GLN:NE2	2.30	0.46
1:A:71:PHE:HA	1:A:74:GLU:HG3	1.99	0.45
1:C:459:TRP:C	1:C:462:PRO:HD2	2.41	0.45
1:D:99:SER:HA	1:D:102:THR:O	2.15	0.45
1:D:697:ASP:O	1:D:698:SER:O	2.35	0.45
1:B:71:PHE:HA	1:B:74:GLU:HG3	1.99	0.45
1:D:469:LEU:HB3	1:D:473:GLU:HB3	1.99	0.45
1:A:469:LEU:HB3	1:A:473:GLU:HB3	1.99	0.44
1:A:457:ASP:OD1	1:A:457:ASP:C	2.61	0.44
1:B:99:SER:HA	1:B:102:THR:O	2.17	0.44
1:B:457:ASP:OD1	1:B:457:ASP:C	2.61	0.44
1:B:127:ARG:NH2	1:D:182:GLU:OE2	2.47	0.44
1:A:57:THR:H	1:C:363:GLN:NE2	2.15	0.44
1:C:469:LEU:HB3	1:C:473:GLU:HB3	1.99	0.43
1:D:457:ASP:OD1	1:D:457:ASP:C	2.61	0.43
1:D:82:HIS:HA	1:D:122:THR:O	2.18	0.43
1:A:149:ASN:HB2	1:D:39:VAL:HB	2.00	0.43
1:A:200:GLN:NE2	4:A:814:HOH:O	2.47	0.43
1:D:116:VAL:HG21	1:D:327:LEU:CD1	2.49	0.43
1:B:277:TRP:CZ3	1:B:332:ASN:HB3	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:469:LEU:HB3	1:B:473:GLU:HB3	2.01	0.42
1:C:71:PHE:HA	1:C:74:GLU:HG3	2.02	0.42
1:D:697:ASP:O	1:D:698:SER:C	2.62	0.42
1:A:475:GLN:HE22	1:A:697:ASP:H	1.67	0.42
1:B:51:ALA:HB2	1:B:58:LEU:HD21	2.02	0.42
1:A:64:PHE:CE1	1:A:68:ILE:HG13	2.55	0.41
2:B:701:HDD:HMD3	2:B:701:HDD:HAD2	1.88	0.41
1:A:396:ASN:HB3	1:D:36:THR:O	2.20	0.41
1:C:116:VAL:HG21	1:C:327:LEU:CD1	2.50	0.41
1:B:482:ARG:O	1:B:486:SER:HB3	2.19	0.41
1:D:82:HIS:CE1	1:D:123:VAL:HG22	2.56	0.41
1:D:344:MET:SD	1:D:382:PHE:HB2	2.61	0.41
1:A:277:TRP:CZ3	1:A:332:ASN:HB3	2.55	0.41
1:A:243:ILE:HA	1:A:293:GLN:O	2.21	0.40
1:B:396:ASN:HB3	1:C:36:THR:O	2.21	0.40
1:C:344:MET:SD	1:C:382:PHE:HB2	2.60	0.40
1:C:116:VAL:HA	1:C:142:ARG:O	2.22	0.40
1:D:243:ILE:HA	1:D:293:GLN:O	2.21	0.40
1:A:585:ALA:O	1:A:595:THR:HA	2.22	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	671/678 (99%)	655 (98%)	16 (2%)	0	100	100
1	B	673/678 (99%)	652 (97%)	19 (3%)	2 (0%)	36	46
1	C	671/678 (99%)	655 (98%)	16 (2%)	0	100	100
1	D	672/678 (99%)	654 (97%)	18 (3%)	0	100	100
All	All	2687/2712 (99%)	2616 (97%)	69 (3%)	2 (0%)	48	60

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	652	SER
1	B	654	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	560/562 (100%)	550 (98%)	10 (2%)	51	70
1	B	562/562 (100%)	554 (99%)	8 (1%)	59	76
1	C	560/562 (100%)	552 (99%)	8 (1%)	59	76
1	D	561/562 (100%)	556 (99%)	5 (1%)	70	84
All	All	2243/2248 (100%)	2212 (99%)	31 (1%)	59	76

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	70	HIS
1	A	99	SER
1	A	561	SER
1	A	569	GLN
1	A	573	ARG
1	A	594	GLN
1	A	651	LYS
1	A	666	ASP
1	A	670	SER
1	A	698	SER
1	B	21	SER
1	B	70	HIS
1	B	99	SER
1	B	250	ARG
1	B	275	ASP
1	B	651	LYS
1	B	656	LEU
1	B	683	LYS

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Mol	Chain	Res	Type
1	C	21	SER
1	C	70	HIS
1	C	127	ARG
1	C	622	SER
1	C	653	SER
1	C	666	ASP
1	C	670	SER
1	C	679	GLU
1	D	70	HIS
1	D	275	ASP
1	D	386	PRO
1	D	576	LYS
1	D	622	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	69	GLN
1	A	113	GLN
1	A	185	GLN
1	A	200	GLN
1	A	284	ASN
1	A	346	GLN
1	A	404	GLN
1	A	429	GLN
1	A	475	GLN
1	A	594	GLN
1	B	46	GLN
1	B	167	GLN
1	B	284	ASN
1	B	346	GLN
1	B	474	GLN
1	B	569	GLN
1	C	251	GLN
1	C	363	GLN
1	C	373	GLN
1	C	426	GLN
1	C	530	ASN
1	D	301	GLN
1	D	346	GLN
1	D	375	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, 10 are 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	HDD	C	701	1	46,52,52	2.21	15 (32%)	62,89,89	2.23	19 (30%)
2	HDD	B	701	1	46,52,52	2.35	22 (47%)	62,89,89	2.72	26 (41%)
2	HDD	A	701	1	46,52,52	2.29	18 (39%)	62,89,89	2.54	23 (37%)
2	HDD	D	701	1	46,52,52	2.45	19 (41%)	62,89,89	2.75	21 (33%)

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	HDD	C	701	1	-	2/9/89/89	0/1/9/9
2	HDD	B	701	1	-	2/9/89/89	0/1/9/9
2	HDD	A	701	1	-	2/9/89/89	0/1/9/9
2	HDD	D	701	1	-	2/9/89/89	0/1/9/9

All (74) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	701	HDD	C3B-C2B	6.07	1.49	1.37
2	D	701	HDD	CHA-C1A	5.78	1.52	1.39
2	D	701	HDD	O1D-CGD	5.64	1.44	1.35
2	B	701	HDD	O1D-CGD	5.37	1.44	1.35
2	C	701	HDD	CHA-C1A	5.17	1.51	1.39
2	A	701	HDD	C4C-NC	-4.90	1.30	1.39
2	B	701	HDD	C4C-NC	-4.79	1.30	1.39
2	D	701	HDD	C1B-NB	-4.57	1.31	1.39
2	A	701	HDD	O1D-CGD	4.53	1.42	1.35
2	A	701	HDD	CHA-C1A	4.41	1.49	1.39
2	C	701	HDD	O1D-CGD	4.32	1.42	1.35
2	A	701	HDD	CHC-C4B	4.31	1.46	1.38
2	D	701	HDD	CHB-C1B	4.31	1.46	1.38
2	C	701	HDD	CHB-C1B	4.23	1.46	1.38
2	A	701	HDD	O1D-C3D	4.22	1.53	1.46
2	D	701	HDD	CHD-C4C	4.09	1.48	1.39
2	A	701	HDD	C3B-C2B	3.99	1.45	1.37
2	D	701	HDD	CHC-C4B	3.98	1.46	1.38
2	B	701	HDD	CMD-C2D	-3.91	1.47	1.53
2	A	701	HDD	CHB-C4A	3.86	1.48	1.39
2	C	701	HDD	CHB-C4A	3.84	1.48	1.39
2	D	701	HDD	C4B-NB	-3.84	1.32	1.39
2	A	701	HDD	C4A-NA	-3.80	1.32	1.39
2	A	701	HDD	CHB-C1B	3.79	1.45	1.38
2	B	701	HDD	C1C-C2C	3.79	1.52	1.43
2	B	701	HDD	C4A-NA	-3.71	1.32	1.39
2	B	701	HDD	C1A-NA	-3.70	1.32	1.39
2	D	701	HDD	C1C-NC	-3.61	1.32	1.39
2	B	701	HDD	C3B-C2B	3.58	1.44	1.37
2	D	701	HDD	C3B-C2B	3.53	1.44	1.37
2	B	701	HDD	CHA-C1A	3.47	1.47	1.39
2	D	701	HDD	C4A-NA	-3.46	1.33	1.39
2	C	701	HDD	CHD-C4C	3.46	1.47	1.39
2	C	701	HDD	CHC-C4B	3.39	1.45	1.38
2	B	701	HDD	C4B-NB	-3.31	1.33	1.39
2	A	701	HDD	C1A-NA	-3.27	1.33	1.39
2	B	701	HDD	C2A-C3A	3.21	1.47	1.38
2	B	701	HDD	CHD-C4C	3.14	1.46	1.39
2	D	701	HDD	C4C-NC	-3.12	1.33	1.39
2	D	701	HDD	CAD-C3D	-3.05	1.48	1.53
2	B	701	HDD	CHC-C4B	3.05	1.44	1.38
2	C	701	HDD	C1A-C2A	3.03	1.50	1.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	701	HDD	CHB-C4A	3.02	1.46	1.39
2	A	701	HDD	CHD-C4C	2.87	1.45	1.39
2	D	701	HDD	C1A-NA	-2.85	1.34	1.39
2	C	701	HDD	C1A-NA	-2.82	1.34	1.39
2	C	701	HDD	C3C-C2C	2.75	1.50	1.41
2	D	701	HDD	OND-C2D	2.72	1.47	1.42
2	C	701	HDD	C1C-NC	-2.68	1.34	1.39
2	B	701	HDD	C1A-C2A	2.65	1.49	1.44
2	B	701	HDD	C3C-C4C	2.62	1.50	1.42
2	A	701	HDD	C2A-C3A	2.60	1.45	1.38
2	B	701	HDD	C1C-NC	-2.59	1.34	1.39
2	D	701	HDD	CHB-C4A	2.57	1.45	1.39
2	C	701	HDD	C4A-NA	-2.54	1.34	1.39
2	D	701	HDD	O2A-CGA	-2.49	1.22	1.30
2	B	701	HDD	C4A-C3A	2.47	1.48	1.43
2	B	701	HDD	CHB-C1B	2.46	1.43	1.38
2	C	701	HDD	CHC-C1C	2.46	1.44	1.39
2	B	701	HDD	CHC-C1C	2.39	1.44	1.39
2	A	701	HDD	CHC-C1C	2.33	1.44	1.39
2	C	701	HDD	O2A-CGA	-2.31	1.23	1.30
2	A	701	HDD	C1A-C2A	2.30	1.49	1.44
2	C	701	HDD	C2A-C3A	2.25	1.44	1.38
2	D	701	HDD	C2A-C3A	2.18	1.44	1.38
2	B	701	HDD	C1B-C2B	2.17	1.49	1.45
2	A	701	HDD	CHD-C1D	-2.17	1.31	1.37
2	A	701	HDD	OND-C2D	2.14	1.46	1.42
2	D	701	HDD	CHC-C1C	2.14	1.44	1.39
2	A	701	HDD	O1A-CGA	2.13	1.29	1.22
2	D	701	HDD	C4A-C3A	2.10	1.48	1.43
2	B	701	HDD	C3C-C2C	2.08	1.48	1.41
2	B	701	HDD	C1B-NB	-2.05	1.35	1.39
2	A	701	HDD	C1B-NB	-2.01	1.35	1.39

All (89) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	701	HDD	C3B-C2B-C1B	-8.60	98.91	107.05
2	D	701	HDD	O1D-CGD-O2D	8.58	128.04	120.81
2	A	701	HDD	C3B-C2B-C1B	-8.54	98.97	107.05
2	B	701	HDD	C3C-C2C-C1C	-8.19	97.51	107.17
2	D	701	HDD	C3C-C2C-C1C	-8.18	97.53	107.17
2	C	701	HDD	C3C-C2C-C1C	-6.55	99.44	107.17

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	701	HDD	C3C-C2C-C1C	-6.51	99.50	107.17
2	D	701	HDD	C3B-C2B-C1B	-6.14	101.24	107.05
2	A	701	HDD	O1D-CGD-CBD	-5.86	104.83	110.17
2	D	701	HDD	OND-C2D-CMD	-5.61	98.61	109.45
2	D	701	HDD	C2C-C1C-NC	5.47	118.91	110.14
2	C	701	HDD	C2D-C1D-CHD	-5.44	115.82	124.27
2	B	701	HDD	O1D-CGD-O2D	5.06	125.07	120.81
2	D	701	HDD	C4A-C3A-C2A	-4.75	101.38	106.82
2	B	701	HDD	C2B-C1B-NB	4.58	118.10	109.64
2	A	701	HDD	C2B-C1B-NB	4.57	118.09	109.64
2	C	701	HDD	C3B-C2B-C1B	-4.57	102.72	107.05
2	A	701	HDD	C3D-O1D-CGD	4.52	115.35	111.14
2	B	701	HDD	C2C-C1C-NC	4.47	117.31	110.14
2	B	701	HDD	OND-C2D-CMD	-4.36	101.03	109.45
2	C	701	HDD	CBD-CAD-C3D	4.31	110.13	103.98
2	B	701	HDD	CMB-C2B-C1B	4.28	132.26	124.73
2	D	701	HDD	CMA-C3A-C4A	4.22	131.85	125.42
2	D	701	HDD	CBD-CAD-C3D	4.18	109.94	103.98
2	C	701	HDD	C4B-C3B-C2B	-4.15	103.22	106.81
2	B	701	HDD	C3C-C4C-NC	4.10	113.25	109.80
2	A	701	HDD	OND-C2D-CMD	-4.08	101.57	109.45
2	D	701	HDD	C4B-C3B-C2B	-3.96	103.38	106.81
2	A	701	HDD	C2D-C1D-CHD	-3.95	118.13	124.27
2	B	701	HDD	C2D-C1D-CHD	-3.92	118.17	124.27
2	B	701	HDD	CMC-C2C-C3C	3.85	135.61	126.55
2	C	701	HDD	CMC-C2C-C3C	3.84	135.58	126.55
2	C	701	HDD	C2C-C1C-NC	3.81	116.25	110.14
2	C	701	HDD	C1A-C2A-C3A	-3.74	101.08	106.87
2	D	701	HDD	C2D-C1D-CHD	-3.68	118.55	124.27
2	C	701	HDD	C2A-C1A-NA	3.61	114.16	110.15
2	D	701	HDD	CHC-C4B-C3B	-3.60	119.14	125.21
2	B	701	HDD	CHC-C4B-C3B	-3.59	119.16	125.21
2	B	701	HDD	C4A-C3A-C2A	-3.56	102.74	106.82
2	A	701	HDD	CAA-C2A-C1A	3.54	131.86	124.94
2	D	701	HDD	C2B-C1B-NB	3.53	116.16	109.64
2	C	701	HDD	CHC-C4B-C3B	-3.52	119.27	125.21
2	D	701	HDD	CMC-C2C-C3C	3.42	134.59	126.55
2	D	701	HDD	O1D-CGD-CBD	-3.41	107.06	110.17
2	A	701	HDD	O1D-CGD-O2D	3.39	123.66	120.81
2	B	701	HDD	O1D-CGD-CBD	-3.38	107.09	110.17
2	C	701	HDD	CAA-C2A-C1A	3.36	131.51	124.94
2	C	701	HDD	CAA-CBA-CGA	-3.35	104.77	113.67

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	701	HDD	CAA-CBA-CGA	-3.31	104.88	113.67
2	D	701	HDD	C3A-C4A-NA	3.26	115.37	110.14
2	A	701	HDD	C1A-C2A-C3A	-3.24	101.85	106.87
2	B	701	HDD	CMA-C3A-C4A	3.21	130.31	125.42
2	A	701	HDD	CHB-C1B-NB	-3.15	121.03	124.45
2	A	701	HDD	C2C-C1C-NC	3.10	115.11	110.14
2	B	701	HDD	C2A-C1A-NA	3.07	113.55	110.15
2	A	701	HDD	C2A-C1A-NA	3.03	113.51	110.15
2	B	701	HDD	C4B-NB-C1B	-2.93	101.04	105.82
2	B	701	HDD	CMD-C2D-C1D	2.88	117.56	112.68
2	A	701	HDD	CBD-CAD-C3D	2.87	108.08	103.98
2	C	701	HDD	CHD-C1D-ND	2.85	128.21	124.28
2	B	701	HDD	CHB-C1B-C2B	-2.82	119.61	125.49
2	A	701	HDD	CMA-C3A-C4A	2.78	129.66	125.42
2	A	701	HDD	CMC-C2C-C1C	2.75	129.61	125.42
2	D	701	HDD	C3D-O1D-CGD	2.75	113.70	111.14
2	A	701	HDD	O1A-CGA-CBA	-2.74	114.41	123.09
2	B	701	HDD	C1A-C2A-C3A	-2.71	102.68	106.87
2	C	701	HDD	C2B-C1B-NB	2.70	114.64	109.64
2	B	701	HDD	CAA-CBA-CGA	-2.69	106.53	113.67
2	D	701	HDD	CHC-C1C-C2C	-2.62	119.82	127.43
2	C	701	HDD	C3C-C4C-NC	2.61	111.99	109.80
2	D	701	HDD	CMB-C2B-C1B	2.57	129.26	124.73
2	D	701	HDD	CHB-C1B-C2B	-2.56	120.17	125.49
2	A	701	HDD	CAD-CBD-CGD	2.54	108.25	104.48
2	B	701	HDD	CHC-C1C-C2C	-2.50	120.17	127.43
2	D	701	HDD	C3C-C4C-NC	2.49	111.90	109.80
2	C	701	HDD	CHC-C1C-C2C	-2.43	120.38	127.43
2	B	701	HDD	C3A-C4A-NA	2.41	114.00	110.14
2	A	701	HDD	CHC-C1C-C2C	-2.35	120.60	127.43
2	B	701	HDD	CHB-C4A-C3A	-2.34	120.63	127.43
2	B	701	HDD	CHA-C1A-C2A	-2.32	120.21	125.30
2	C	701	HDD	CBC-CAC-C3C	-2.23	116.39	127.53
2	A	701	HDD	CHB-C1B-C2B	-2.22	120.88	125.49
2	B	701	HDD	CAA-C2A-C1A	2.11	129.06	124.94
2	A	701	HDD	CHD-C1D-ND	2.09	127.17	124.28
2	C	701	HDD	O1D-CGD-O2D	2.08	122.56	120.81
2	C	701	HDD	C3D-C4D-CHA	-2.03	118.25	124.14
2	A	701	HDD	CBC-CAC-C3C	-2.02	117.43	127.53
2	A	701	HDD	CAB-C3B-C4B	-2.01	120.01	124.82
2	B	701	HDD	CBD-CAD-C3D	2.00	106.84	103.98

There are no chirality outliers.

All (8) torsion outliers are listed below:

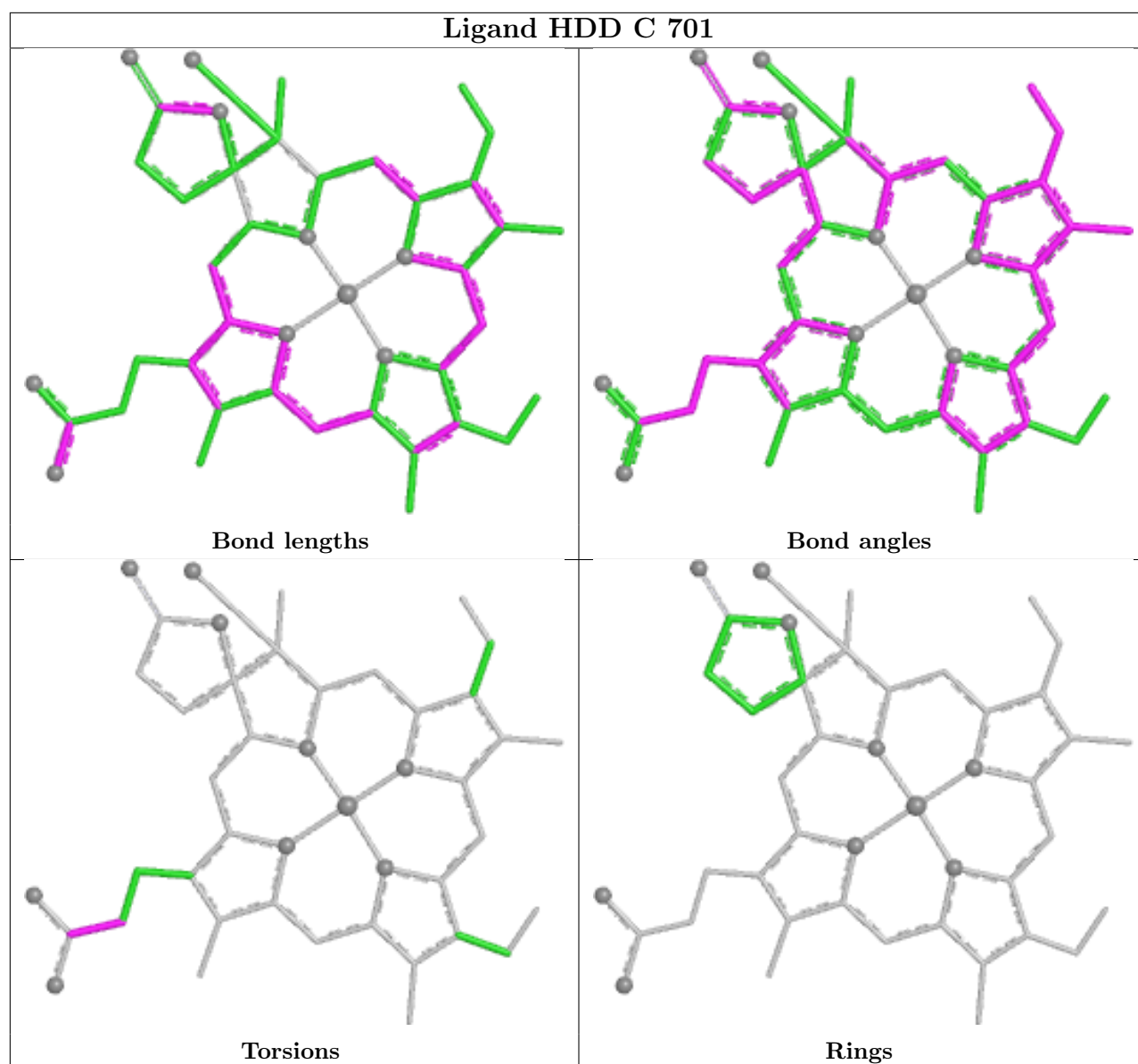
Mol	Chain	Res	Type	Atoms
2	A	701	HDD	CAA-CBA-CGA-O2A
2	D	701	HDD	CAA-CBA-CGA-O2A
2	A	701	HDD	CAA-CBA-CGA-O1A
2	B	701	HDD	CAA-CBA-CGA-O1A
2	C	701	HDD	CAA-CBA-CGA-O2A
2	B	701	HDD	CAA-CBA-CGA-O2A
2	C	701	HDD	CAA-CBA-CGA-O1A
2	D	701	HDD	CAA-CBA-CGA-O1A

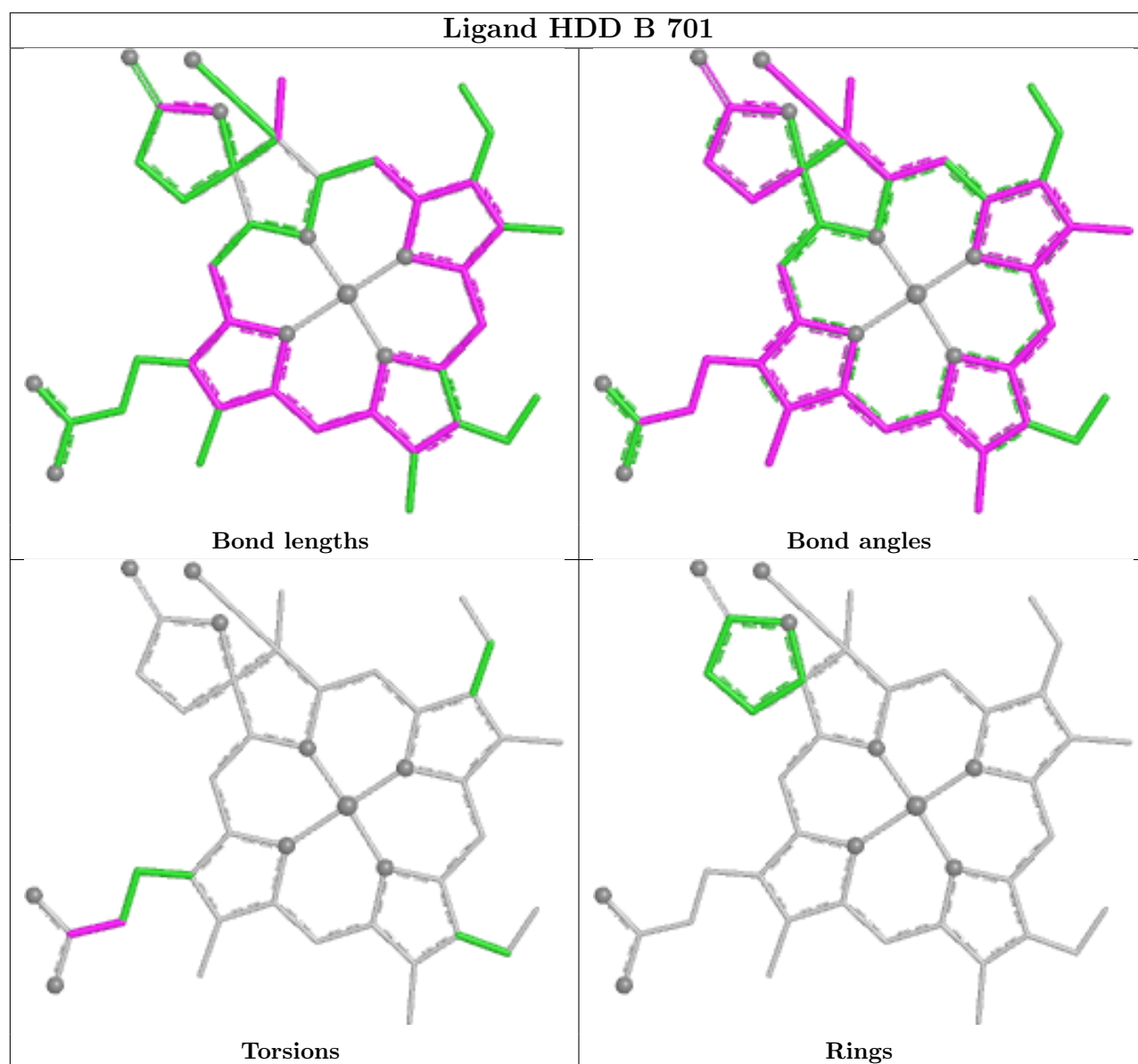
There are no ring outliers.

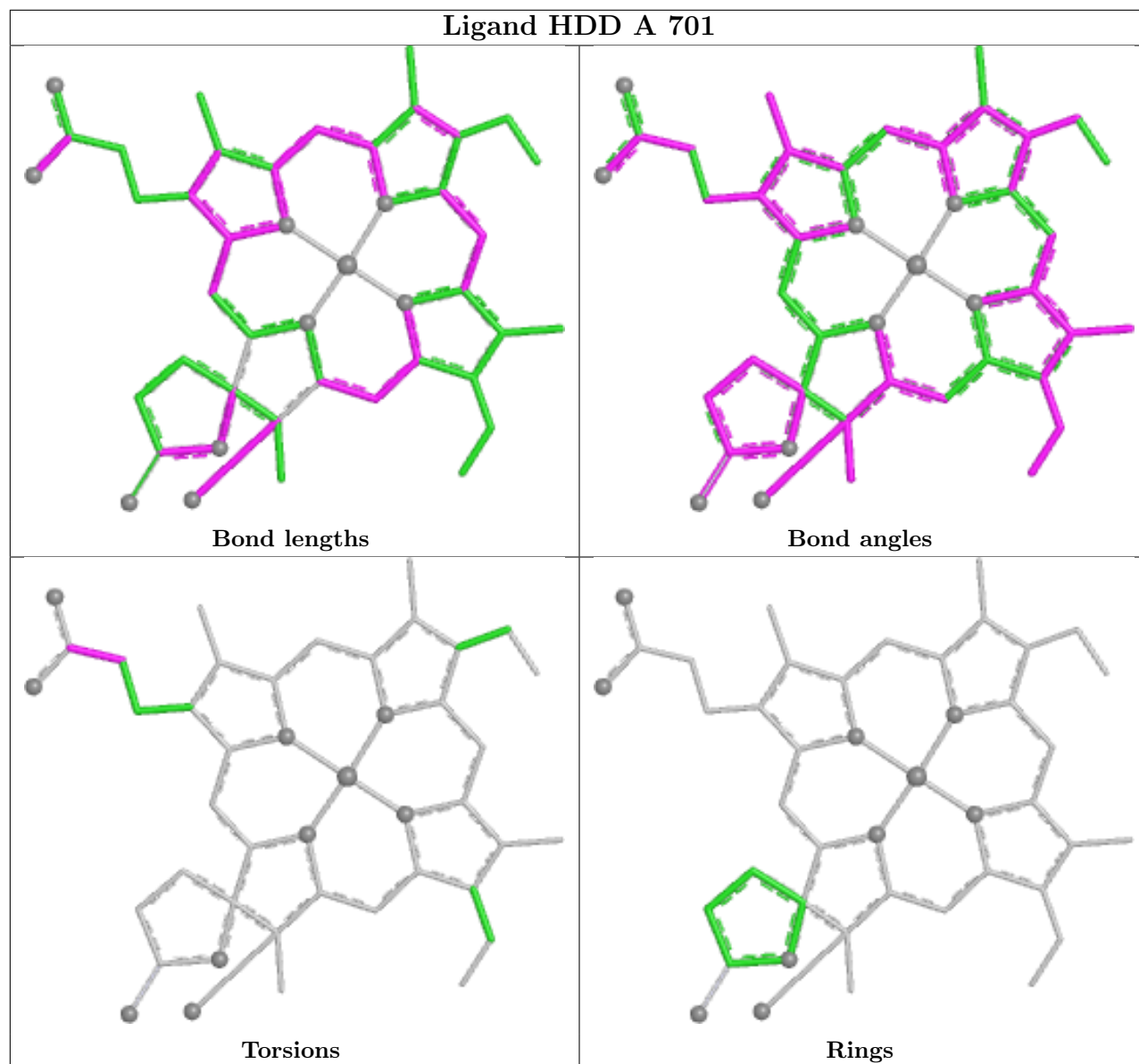
2 monomers are involved in 2 short contacts:

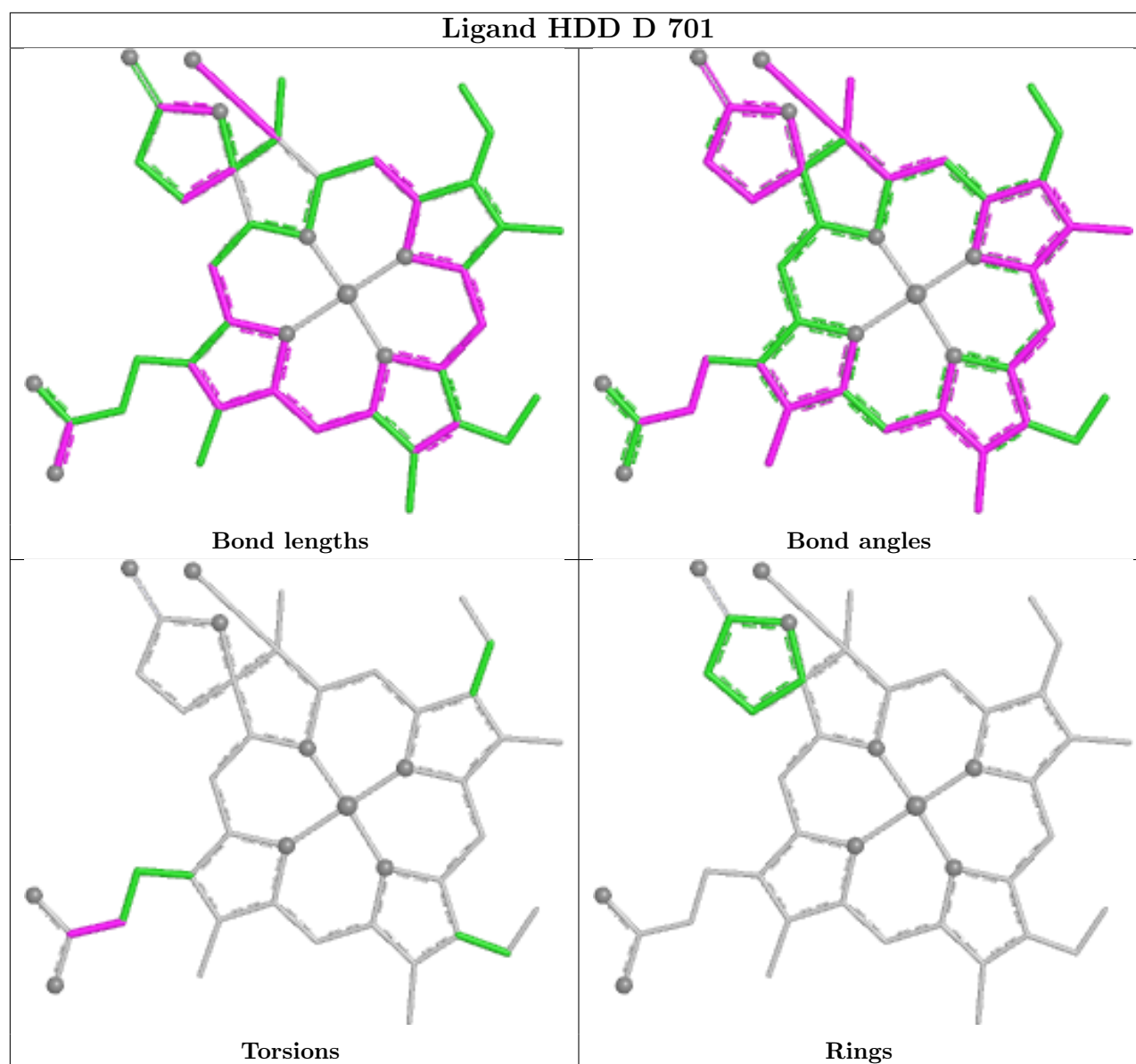
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	701	HDD	1	0
2	A	701	HDD	1	0

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	675/678 (99%)	-0.18	4 (0%) 85 86	19, 32, 56, 96	0
1	B	675/678 (99%)	-0.16	7 (1%) 79 80	16, 33, 55, 92	2 (0%)
1	C	675/678 (99%)	-0.15	1 (0%) 92 91	19, 32, 49, 63	0
1	D	675/678 (99%)	-0.17	1 (0%) 92 91	13, 32, 49, 60	1 (0%)
All	All	2700/2712 (99%)	-0.16	13 (0%) 87 87	13, 33, 52, 96	3 (0%)

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	618	ALA	4.0
1	A	618	ALA	3.7
1	A	655	VAL	3.6
1	D	618	ALA	3.5
1	B	655	VAL	2.7
1	B	652	SER	2.6
1	B	676	MET	2.6
1	B	650	GLY	2.5
1	A	651	LYS	2.3
1	C	618	ALA	2.2
1	B	561	SER	2.2
1	B	651	LYS	2.1
1	A	652	SER	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

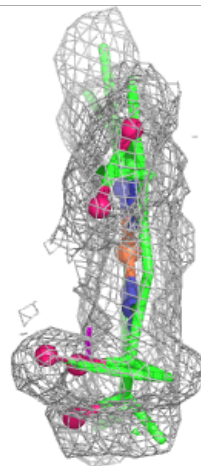
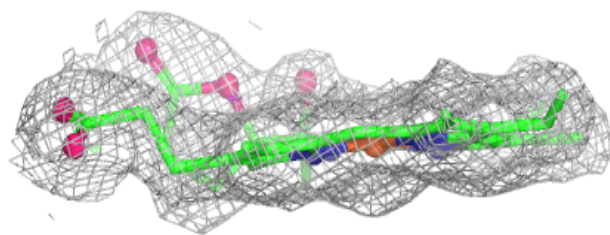
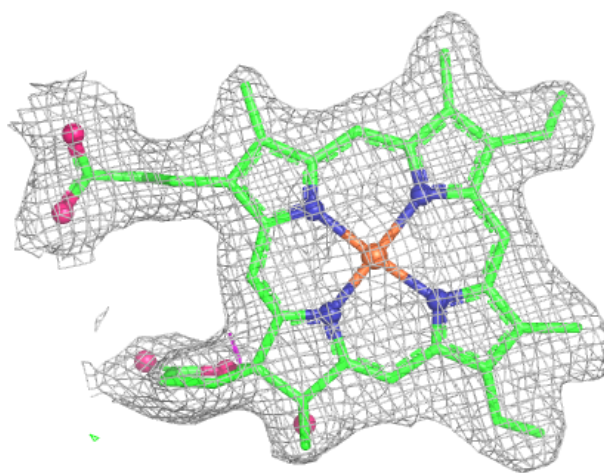
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	CA	A	705	1/1	0.94	0.06	55,55,55,55	0
3	CA	A	704	1/1	0.96	0.11	43,43,43,43	0
3	CA	B	703	1/1	0.97	0.08	48,48,48,48	0
3	CA	D	703	1/1	0.97	0.05	49,49,49,49	0
3	CA	A	703	1/1	0.98	0.08	41,41,41,41	0
2	HDD	A	701	44/44	0.98	0.06	19,22,24,27	0
2	HDD	B	701	44/44	0.98	0.06	21,23,24,25	0
2	HDD	C	701	44/44	0.98	0.06	19,25,27,29	0
3	CA	C	702	1/1	0.98	0.05	40,40,40,40	0
3	CA	C	703	1/1	0.98	0.12	51,51,51,51	0
3	CA	D	702	1/1	0.98	0.09	38,38,38,38	0
2	HDD	D	701	44/44	0.98	0.06	22,25,29,30	0
3	CA	B	702	1/1	0.99	0.07	29,29,29,29	0
3	CA	A	702	1/1	0.99	0.04	31,31,31,31	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

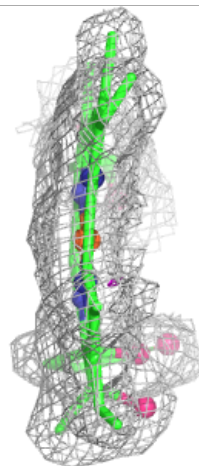
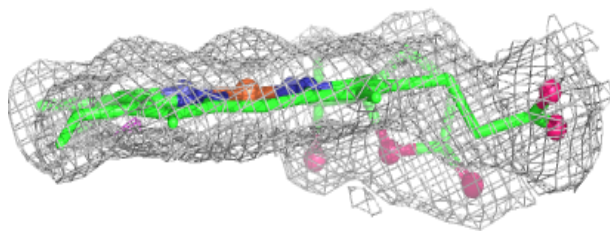
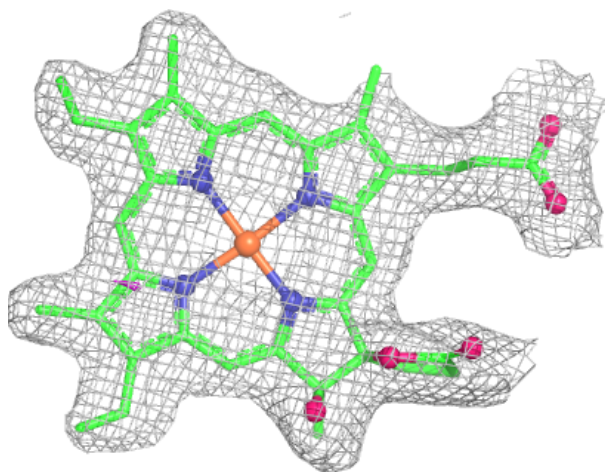
Electron density around HDD A 701:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



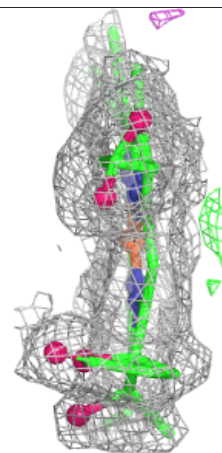
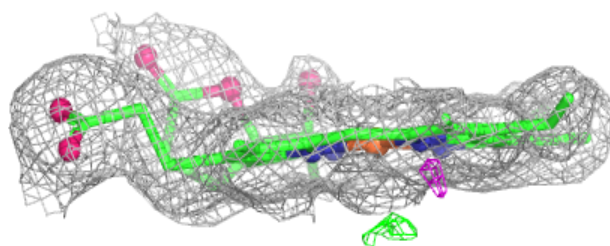
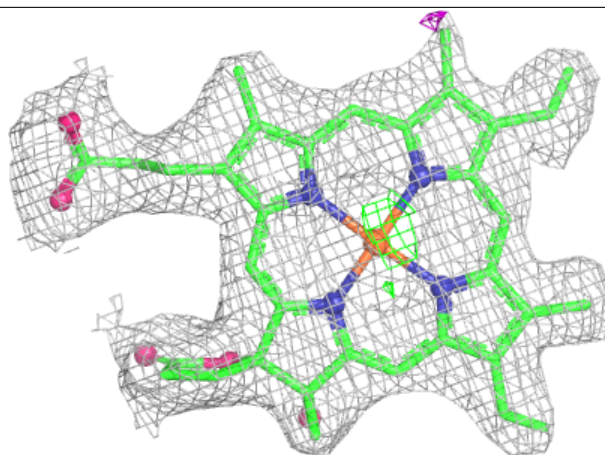
Electron density around HDD B 701:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



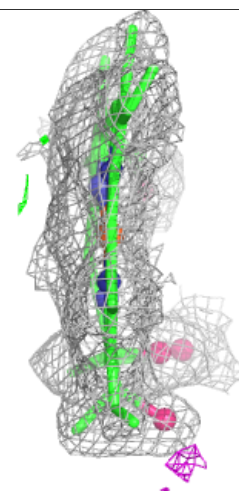
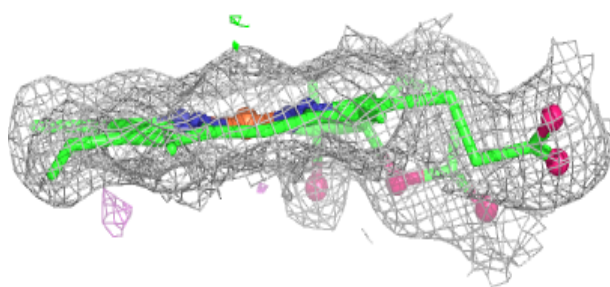
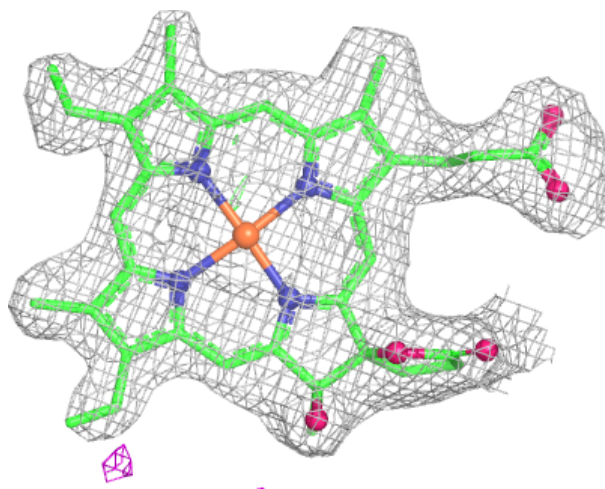
Electron density around HDD C 701:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HDD D 701:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.