



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 12, 2021 – 03:30 PM EDT

PDB ID : 2B11
Title : Crystal structure of the protein-protein complex between F82W cytochrome c and cytochrome c peroxidase
Authors : Kang, S.A.; Crane, B.R.
Deposited on : 2005-09-15
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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.23.2
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.2

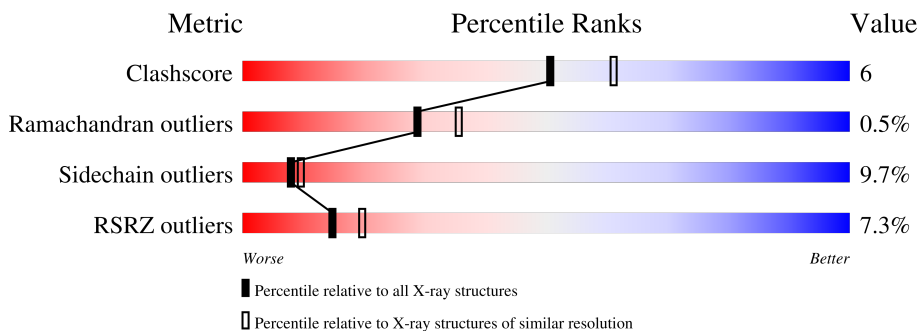
1 Overall quality at a glance

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))
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (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	294	
1	C	294	
2	B	108	
2	D	108	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 7111 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 Cytochrome c peroxidase, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	294	2370	1512	395	457	6	0	0	0
1	C	294	2370	1512	395	457	6	0	0	0

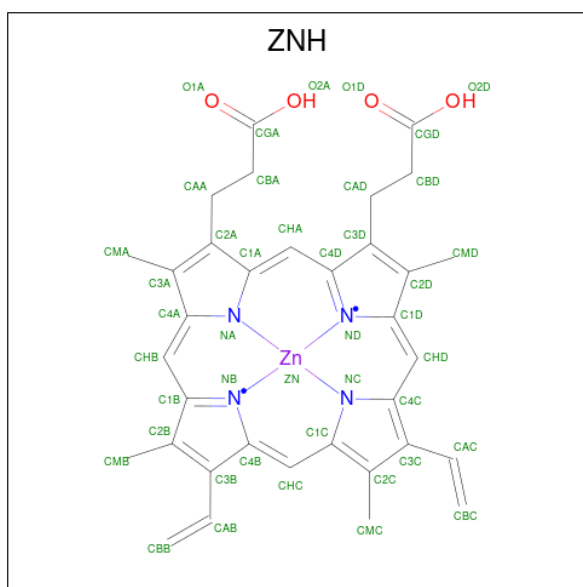
- Molecule 2 is a protein called Cytochrome c iso-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	108	850	536	152	157	5	0	0	0
2	D	108	850	536	152	157	5	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

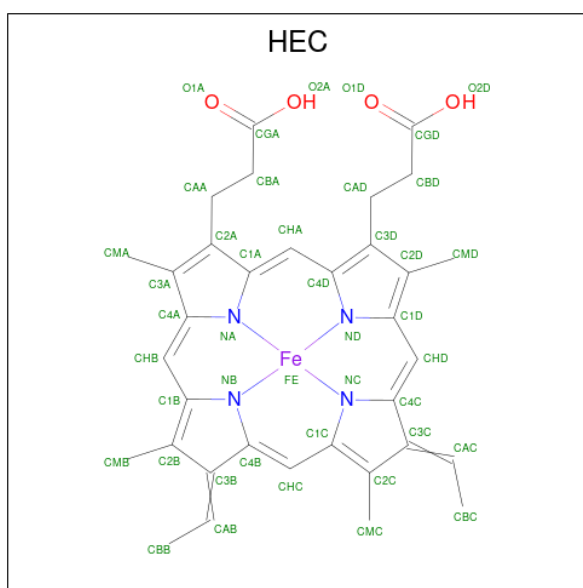
Chain	Residue	Modelled	Actual	Comment	Reference
B	382	TRP	PHE	engineered mutation	UNP P00044
D	882	TRP	PHE	engineered mutation	UNP P00044

- Molecule 3 is PROTOPORPHYRIN IX CONTAINING ZN (three-letter code: ZNH) (formula: $C_{34}H_{32}N_4O_4Zn$).



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

- Molecule 4 is HEME C (three-letter code: HEC) (formula: $C_{34}H_{34}FeN_4O_4$).



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

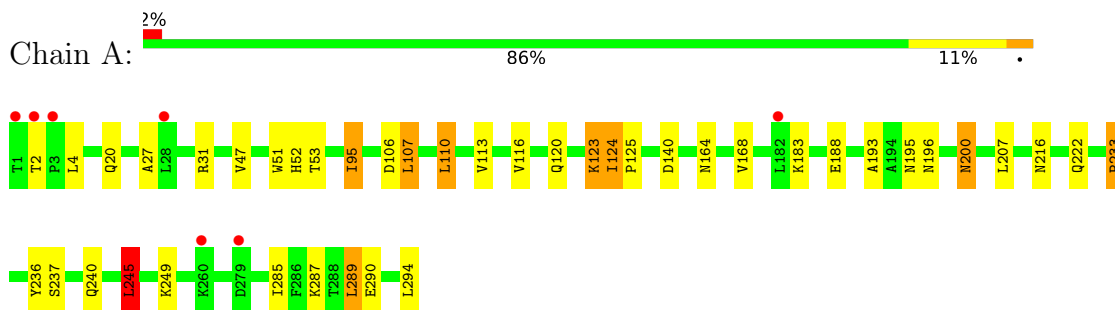
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	248	Total 248	O 248	0	0
5	B	70	Total 70	O 70	0	0
5	C	152	Total 152	O 152	0	0
5	D	29	Total 29	O 29	0	0

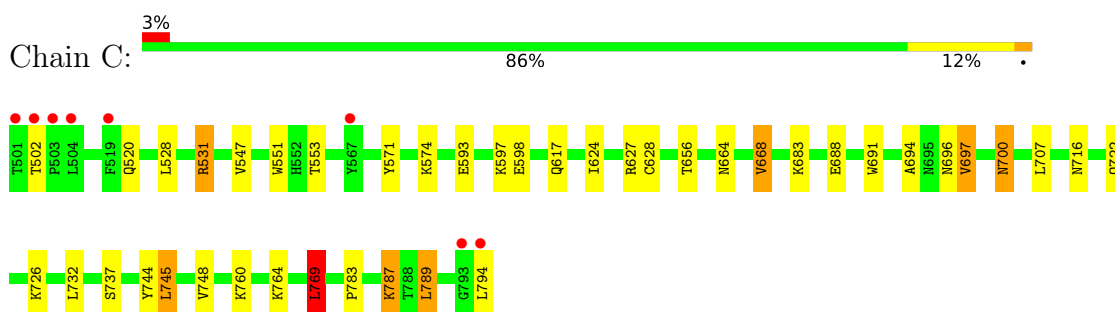
3 Residue-property plots [i](#)

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 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.

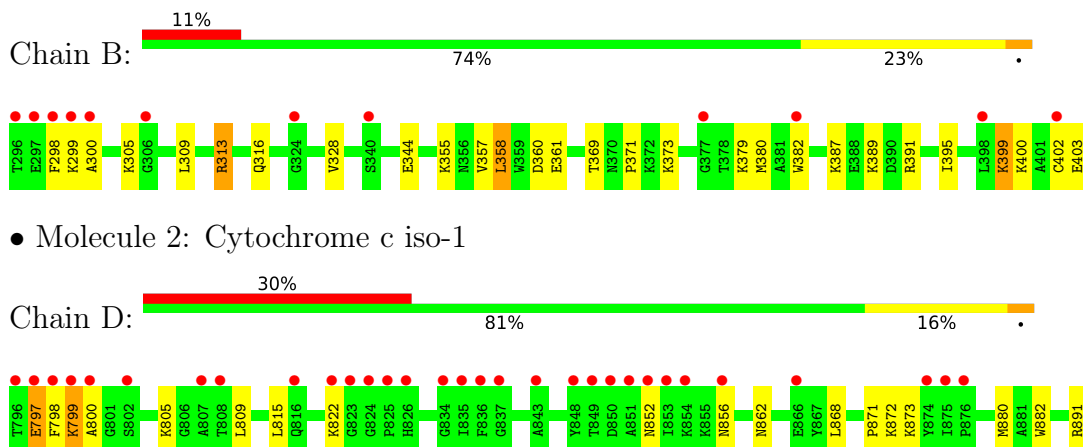
- Molecule 1: Cytochrome c peroxidase, mitochondrial



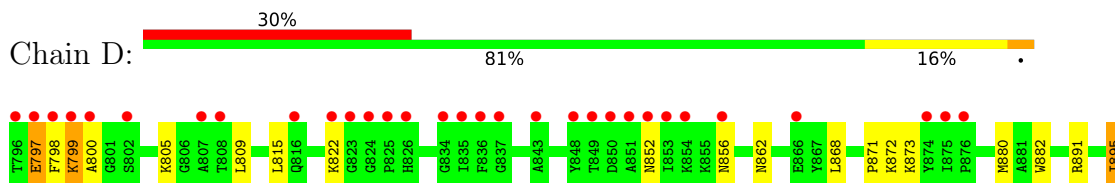
- Molecule 1: Cytochrome c peroxidase, mitochondrial



- Molecule 2: Cytochrome c iso-1



- Molecule 2: Cytochrome c iso-1





4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	44.88Å 117.86Å 88.47Å 90.00° 104.23° 90.00°	Depositor
Resolution (Å)	30.00 – 2.30 29.16 – 2.31	Depositor EDS
% Data completeness (in resolution range)	94.1 (30.00-2.30) 90.3 (29.16-2.31)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.35 (at 2.31Å)	Xtrriage
Refinement program	CNS	Depositor
R, R_{free}	0.265 , 0.293 0.249 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	30.9	Xtrriage
Anisotropy	0.793	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.27 , 24.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	0.097 for h,-k,-h-l	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	7111	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.91% 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: ZNH, HEC

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	0.76	1/2437 (0.0%)	0.80	1/3301 (0.0%)
1	C	0.76	1/2437 (0.0%)	0.78	2/3301 (0.1%)
2	B	1.02	1/869 (0.1%)	0.88	1/1163 (0.1%)
2	D	1.05	1/869 (0.1%)	0.81	0/1163
All	All	0.84	4/6612 (0.1%)	0.81	4/8928 (0.0%)

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	C	0	1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	902	CYS	CB-SG	-24.01	1.41	1.82
2	B	402	CYS	CB-SG	-22.86	1.43	1.82
1	C	553	THR	CB-OG1	5.44	1.54	1.43
1	A	53	THR	CB-OG1	5.35	1.53	1.43

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
2	B	358	LEU	CA-CB-CG	7.70	133.00	115.30
1	C	745	LEU	CA-CB-CG	5.85	128.75	115.30
1	A	245	LEU	CA-CB-CG	5.67	128.34	115.30
1	C	769	LEU	CA-CB-CG	5.27	127.42	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	571	TYR	Sidechain

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	2370	0	2246	26	0
1	C	2370	0	2243	25	0
2	B	850	0	847	11	0
2	D	850	0	847	6	0
3	A	43	0	30	1	0
3	B	43	0	28	2	0
4	C	43	0	32	3	0
4	D	43	0	28	1	0
5	A	248	0	0	10	0
5	B	70	0	0	3	0
5	C	152	0	0	10	0
5	D	29	0	0	3	0
All	All	7111	0	6301	73	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 6.

All (73) 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:27:ALA:HB2	5:A:1842:HOH:O	1.60	1.02
1:C:617:GLN:HE21	1:C:624:ILE:H	1.20	0.85
2:B:313:ARG:HH21	2:B:313:ARG:HG2	1.43	0.83
2:B:380:MET:HE3	5:B:1840:HOH:O	1.79	0.82
1:C:520:GLN:HE22	1:C:787:LYS:H	1.26	0.80
1:A:95:ILE:HD11	1:A:107:LEU:HD21	1.64	0.79
1:A:233:PRO:HA	5:A:1763:HOH:O	1.83	0.78
1:A:236:TYR:HB3	5:A:1763:HOH:O	1.83	0.78

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:20:GLN:HE22	1:A:287:LYS:H	1.29	0.77
1:A:188:GLU:H	1:A:222:GLN:HE22	1.33	0.73
1:C:531:ARG:HG3	1:C:531:ARG:HH21	1.55	0.70
1:C:716:ASN:HD22	1:C:722:GLN:HE21	1.41	0.69
1:C:688:GLU:H	1:C:722:GLN:HE22	1.39	0.67
1:C:732:LEU:HD11	5:C:1878:HOH:O	1.95	0.66
1:A:216:ASN:HD22	1:A:222:GLN:NE2	1.94	0.66
2:B:382:TRP:CG	5:B:1840:HOH:O	2.49	0.66
1:C:789:LEU:HG	1:C:794:LEU:HD22	1.80	0.63
1:C:716:ASN:HD22	1:C:722:GLN:NE2	1.98	0.61
2:B:391:ARG:O	2:B:395:ILE:HG12	2.02	0.59
1:C:598:GLU:HG2	5:C:1860:HOH:O	2.03	0.57
1:A:196:ASN:OD1	5:A:1833:HOH:O	2.18	0.56
1:A:106:ASP:O	1:A:110:LEU:HB2	2.04	0.56
1:A:47:VAL:HG22	3:A:1001:ZNH:HMD2	1.86	0.56
1:C:694:ALA:HB1	1:C:697:VAL:HG13	1.87	0.55
4:D:1301:HEC:HHA	5:D:1426:HOH:O	2.06	0.55
2:B:371:PRO:HG2	2:B:382:TRP:HD1	1.71	0.54
1:A:200:ASN:H	1:A:200:ASN:HD22	1.55	0.54
1:A:193:ALA:HB3	5:A:1841:HOH:O	2.08	0.54
1:C:617:GLN:NE2	1:C:624:ILE:H	1.98	0.53
1:C:691:TRP:HZ2	5:C:1878:HOH:O	1.91	0.53
5:A:1841:HOH:O	3:B:1101:ZNH:HBC2	2.09	0.53
2:B:313:ARG:HG2	2:B:313:ARG:NH2	2.19	0.51
4:C:1201:HEC:C1A	5:C:1878:HOH:O	2.58	0.51
2:B:355:LYS:HZ3	2:B:357:VAL:HG11	1.76	0.51
1:C:664:ASN:O	1:C:668:VAL:HG13	2.10	0.51
1:C:656:THR:HG22	5:C:1409:HOH:O	2.12	0.50
1:A:216:ASN:HD22	1:A:222:GLN:HE21	1.59	0.49
1:C:744:TYR:O	1:C:748:VAL:HG23	2.13	0.49
2:B:399:LYS:O	2:B:403:GLU:OXT	2.31	0.49
1:A:164:ASN:O	1:A:168:VAL:HG13	2.14	0.48
1:C:691:TRP:CZ2	5:C:1878:HOH:O	2.55	0.48
1:C:531:ARG:HH12	1:C:794:LEU:HB3	1.79	0.47
1:C:628:CYS:N	5:C:1481:HOH:O	2.46	0.47
2:D:871:PRO:HG2	2:D:882:TRP:HD1	1.78	0.47
1:A:116:VAL:HG21	5:A:1776:HOH:O	2.14	0.47
1:A:289:LEU:HG	1:A:294:LEU:HD12	1.96	0.47
2:D:799:LYS:HB3	2:D:800:ALA:H	1.60	0.47
1:A:123:LYS:HG2	1:A:285:ILE:HG23	1.97	0.45
1:A:113:VAL:HG22	1:A:124:ILE:HD12	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:183:LYS:HG2	5:A:1452:HOH:O	2.17	0.45
1:C:794:LEU:HD12	1:C:794:LEU:N	2.31	0.45
1:C:700:ASN:H	1:C:700:ASN:HD22	1.65	0.45
2:D:797:GLU:HG3	2:D:862:ASN:ND2	2.32	0.44
1:C:531:ARG:NH1	1:C:794:LEU:HB3	2.33	0.44
1:A:27:ALA:CB	5:A:1842:HOH:O	2.40	0.44
2:B:313:ARG:HB3	2:B:382:TRP:CH2	2.53	0.43
4:C:1201:HEC:C4A	5:C:1878:HOH:O	2.66	0.43
1:C:627:ARG:HH11	1:C:783:PRO:HD3	1.82	0.43
4:C:1201:HEC:C2A	5:C:1878:HOH:O	2.66	0.43
1:A:237:SER:HA	1:A:240:GLN:HE21	1.83	0.43
2:D:868:LEU:HA	5:D:1448:HOH:O	2.19	0.43
2:D:871:PRO:HG3	5:D:1448:HOH:O	2.18	0.43
2:B:328:VAL:O	3:B:1101:ZNH:HMD3	2.19	0.42
1:A:113:VAL:HG13	1:A:124:ILE:HG23	2.01	0.42
1:C:783:PRO:HG2	5:C:1678:HOH:O	2.18	0.42
2:D:891:ARG:O	2:D:895:ILE:HG13	2.20	0.42
2:B:361:GLU:O	5:B:1891:HOH:O	2.22	0.42
1:A:124:ILE:HA	1:A:125:PRO:HD3	1.89	0.42
1:C:531:ARG:HG3	1:C:531:ARG:NH2	2.30	0.42
1:A:236:TYR:HA	5:A:1419:HOH:O	2.19	0.42
1:A:245:LEU:HD22	1:A:249:LYS:HE2	2.02	0.40
1:A:200:ASN:HD22	1:A:200:ASN:N	2.18	0.40
1:C:551:TRP:HE3	1:C:769:LEU:HD11	1.87	0.40

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	292/294 (99%)	281 (96%)	11 (4%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	292/294 (99%)	284 (97%)	8 (3%)	0	100	100
2	B	106/108 (98%)	99 (93%)	5 (5%)	2 (2%)	8	7
2	D	106/108 (98%)	98 (92%)	6 (6%)	2 (2%)	8	7
All	All	796/804 (99%)	762 (96%)	30 (4%)	4 (0%)	29	35

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	856	ASN
2	B	299	LYS
2	B	300	ALA
2	D	799	LYS

5.3.2 Protein sidechains [i](#)

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	252/253 (100%)	233 (92%)	19 (8%)	13	17
1	C	252/253 (100%)	231 (92%)	21 (8%)	11	14
2	B	89/89 (100%)	74 (83%)	15 (17%)	2	2
2	D	89/89 (100%)	78 (88%)	11 (12%)	4	5
All	All	682/684 (100%)	616 (90%)	66 (10%)	8	9

All (66) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	THR
1	A	4	LEU
1	A	31	ARG
1	A	51	TRP
1	A	52	HIS
1	A	95	ILE
1	A	107	LEU

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Mol	Chain	Res	Type
1	A	110	LEU
1	A	120	GLN
1	A	123	LYS
1	A	124	ILE
1	A	140	ASP
1	A	195	ASN
1	A	200	ASN
1	A	207	LEU
1	A	233	PRO
1	A	245	LEU
1	A	289	LEU
1	A	290	GLU
2	B	298	PHE
2	B	305	LYS
2	B	309	LEU
2	B	313	ARG
2	B	316	GLN
2	B	344	GLU
2	B	358	LEU
2	B	360	ASP
2	B	369	THR
2	B	373	LYS
2	B	379	LYS
2	B	387	LYS
2	B	389	LYS
2	B	399	LYS
2	B	400	LYS
1	C	502	THR
1	C	528	LEU
1	C	531	ARG
1	C	547	VAL
1	C	574	LYS
1	C	593	GLU
1	C	597	LYS
1	C	668	VAL
1	C	683	LYS
1	C	696	ASN
1	C	697	VAL
1	C	700	ASN
1	C	707	LEU
1	C	726	LYS
1	C	737	SER

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Mol	Chain	Res	Type
1	C	745	LEU
1	C	760	LYS
1	C	764	LYS
1	C	769	LEU
1	C	787	LYS
1	C	789	LEU
2	D	797	GLU
2	D	798	PHE
2	D	805	LYS
2	D	809	LEU
2	D	815	LEU
2	D	822	LYS
2	D	852	ASN
2	D	872	LYS
2	D	873	LYS
2	D	880	MET
2	D	895	ILE

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	20	GLN
1	A	24	ASN
1	A	52	HIS
1	A	82	ASN
1	A	181	HIS
1	A	200	ASN
1	A	222	GLN
1	A	240	GLN
1	A	292	GLN
2	B	392	ASN
1	C	506	HIS
1	C	520	GLN
1	C	524	ASN
1	C	562	ASN
1	C	617	GLN
1	C	641	ASN
1	C	696	ASN
1	C	700	ASN
1	C	705	ASN
1	C	708	ASN
1	C	722	GLN

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Mol	Chain	Res	Type
1	C	753	ASN
1	C	792	GLN
2	D	816	GLN
2	D	826	HIS
2	D	833	HIS
2	D	852	ASN
2	D	862	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 ligands are modelled in this entry.

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	ZNH	B	1101	2	35,50,50	4.46	21 (60%)	18,82,82	1.75	5 (27%)
3	ZNH	A	1001	1,5	35,50,50	4.45	22 (62%)	18,82,82	2.72	10 (55%)
4	HEC	C	1201	1,5	26,50,50	1.43	8 (30%)	18,82,82	2.28	11 (61%)
4	HEC	D	1301	2	26,50,50	1.27	3 (11%)	18,82,82	2.12	6 (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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	ZNH	B	1101	2	-	2/8/94/94	-
3	ZNH	A	1001	1,5	-	0/8/94/94	-
4	HEC	C	1201	1,5	-	0/6/54/54	-
4	HEC	D	1301	2	-	0/6/54/54	-

All (54) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1001	ZNH	CHA-C4D	-9.46	1.37	1.53
3	B	1101	ZNH	C4D-ND	-8.52	1.35	1.49
3	B	1101	ZNH	CHA-C4D	-8.30	1.39	1.53
3	A	1001	ZNH	CHB-C1B	-8.29	1.39	1.53
3	B	1101	ZNH	CHB-C1B	-7.66	1.40	1.53
3	A	1001	ZNH	C1B-NB	-7.63	1.36	1.49
3	A	1001	ZNH	C1D-ND	-7.57	1.36	1.49
3	B	1101	ZNH	CHD-C1D	-7.54	1.40	1.53
3	A	1001	ZNH	CHD-C1D	-7.42	1.40	1.53
3	B	1101	ZNH	C1B-NB	-7.16	1.37	1.49
3	B	1101	ZNH	C2D-C3D	7.10	1.39	1.34
3	B	1101	ZNH	C4B-NB	-7.01	1.37	1.49
3	A	1001	ZNH	CHC-C4B	-6.90	1.41	1.53
3	B	1101	ZNH	C4A-C3A	6.81	1.47	1.38
3	B	1101	ZNH	C1D-ND	-6.49	1.38	1.49
3	B	1101	ZNH	C1A-C2A	6.16	1.46	1.38
3	A	1001	ZNH	C4D-ND	-6.02	1.39	1.49
3	A	1001	ZNH	C1C-NC	5.97	1.41	1.34
3	A	1001	ZNH	C1C-C2C	5.47	1.45	1.38
3	A	1001	ZNH	C4A-NA	5.24	1.40	1.34
3	A	1001	ZNH	CHB-C4A	-4.98	1.39	1.51
3	A	1001	ZNH	CHA-C1A	-4.79	1.39	1.51
3	B	1101	ZNH	CHA-C1A	-4.71	1.39	1.51
3	A	1001	ZNH	CHC-C1C	-4.65	1.39	1.51
3	A	1001	ZNH	C4C-NC	4.64	1.40	1.34
3	B	1101	ZNH	CHB-C4A	-4.48	1.40	1.51
3	B	1101	ZNH	C4B-C3B	-4.30	1.44	1.51
3	A	1001	ZNH	CHD-C4C	-4.14	1.41	1.51
3	A	1001	ZNH	C1A-C2A	4.11	1.43	1.38
3	B	1101	ZNH	C1C-C2C	3.98	1.43	1.38
3	B	1101	ZNH	CHD-C4C	-3.81	1.41	1.51
3	B	1101	ZNH	CHC-C4B	-3.65	1.47	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1101	ZNH	C3C-CAC	-3.53	1.40	1.47
3	A	1001	ZNH	CMD-C2D	3.20	1.55	1.50
4	D	1301	HEC	CBC-CAC	-3.18	1.37	1.49
3	B	1101	ZNH	C3C-C2C	-3.17	1.36	1.40
4	D	1301	HEC	CBB-CAB	-3.11	1.37	1.49
3	A	1001	ZNH	C4B-NB	-3.08	1.44	1.49
3	B	1101	ZNH	CHC-C1C	-2.93	1.44	1.51
4	C	1201	HEC	C3C-C2C	-2.68	1.38	1.40
3	A	1001	ZNH	C2D-C3D	2.59	1.36	1.34
4	C	1201	HEC	CBC-CAC	-2.53	1.40	1.49
3	A	1001	ZNH	C3C-CAC	-2.45	1.42	1.47
4	C	1201	HEC	C3B-C4B	2.43	1.47	1.43
4	D	1301	HEC	C3C-C4C	2.40	1.47	1.43
3	B	1101	ZNH	CMB-C2B	2.37	1.54	1.50
3	B	1101	ZNH	C1C-NC	2.33	1.37	1.34
3	A	1001	ZNH	CMC-C2C	2.28	1.56	1.51
4	C	1201	HEC	C1B-NB	2.24	1.40	1.36
4	C	1201	HEC	C3C-C4C	2.20	1.47	1.43
3	A	1001	ZNH	C4B-C3B	-2.17	1.47	1.51
4	C	1201	HEC	CBB-CAB	-2.16	1.41	1.49
4	C	1201	HEC	C4D-ND	2.07	1.40	1.36
4	C	1201	HEC	CMC-C2C	2.03	1.56	1.51

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1001	ZNH	C3C-C4C-NC	6.31	111.88	107.55
3	A	1001	ZNH	CAA-C2A-C1A	-4.50	124.14	127.30
4	C	1201	HEC	CMB-C2B-C1B	-4.41	121.69	128.46
4	D	1301	HEC	CMB-C2B-C3B	4.33	130.91	125.82
3	B	1101	ZNH	C3C-C4C-NC	4.16	110.41	107.55
4	D	1301	HEC	CMB-C2B-C1B	-3.85	122.55	128.46
4	C	1201	HEC	CMB-C2B-C3B	3.32	129.72	125.82
3	A	1001	ZNH	CBA-CAA-C2A	3.23	118.44	112.49
3	B	1101	ZNH	CHC-C1C-C2C	-3.19	123.93	129.45
3	A	1001	ZNH	CMC-C2C-C3C	3.16	130.58	124.68
3	A	1001	ZNH	CHB-C4A-C3A	-3.15	123.99	129.45
4	C	1201	HEC	CMC-C2C-C1C	-2.99	123.87	128.46
4	D	1301	HEC	CMD-C2D-C1D	-2.96	123.91	128.46
4	C	1201	HEC	CBA-CAA-C2A	2.94	117.89	112.48
3	A	1001	ZNH	CHC-C1C-C2C	-2.76	124.67	129.45
3	A	1001	ZNH	CMA-C3A-C2A	2.72	130.06	124.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	1201	HEC	C4C-C3C-C2C	-2.68	103.46	106.35
4	C	1201	HEC	C4B-C3B-C2B	-2.66	103.48	106.35
4	D	1301	HEC	CMD-C2D-C3D	2.61	129.87	124.94
4	C	1201	HEC	CMC-C2C-C3C	2.53	128.80	125.82
4	D	1301	HEC	C4C-C3C-C2C	-2.53	103.62	106.35
4	C	1201	HEC	CMA-C3A-C2A	2.48	129.61	124.94
3	A	1001	ZNH	CHD-C4C-C3C	-2.41	126.31	129.55
4	D	1301	HEC	CBA-CAA-C2A	-2.37	108.11	112.48
3	B	1101	ZNH	CMC-C2C-C3C	2.35	129.08	124.68
3	A	1001	ZNH	CBD-CAD-C3D	-2.34	110.20	114.35
3	B	1101	ZNH	CHD-C4C-C3C	-2.34	126.41	129.55
3	B	1101	ZNH	CMD-C2D-C3D	2.33	131.47	128.33
4	C	1201	HEC	CMD-C2D-C1D	-2.24	125.02	128.46
4	C	1201	HEC	C1D-C2D-C3D	-2.18	105.48	107.00
3	A	1001	ZNH	C1A-C2A-C3A	2.13	109.11	105.93
4	C	1201	HEC	CMD-C2D-C3D	2.13	128.96	124.94

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	1101	ZNH	C4B-C3B-CAB-CBB
3	B	1101	ZNH	C2B-C3B-CAB-CBB

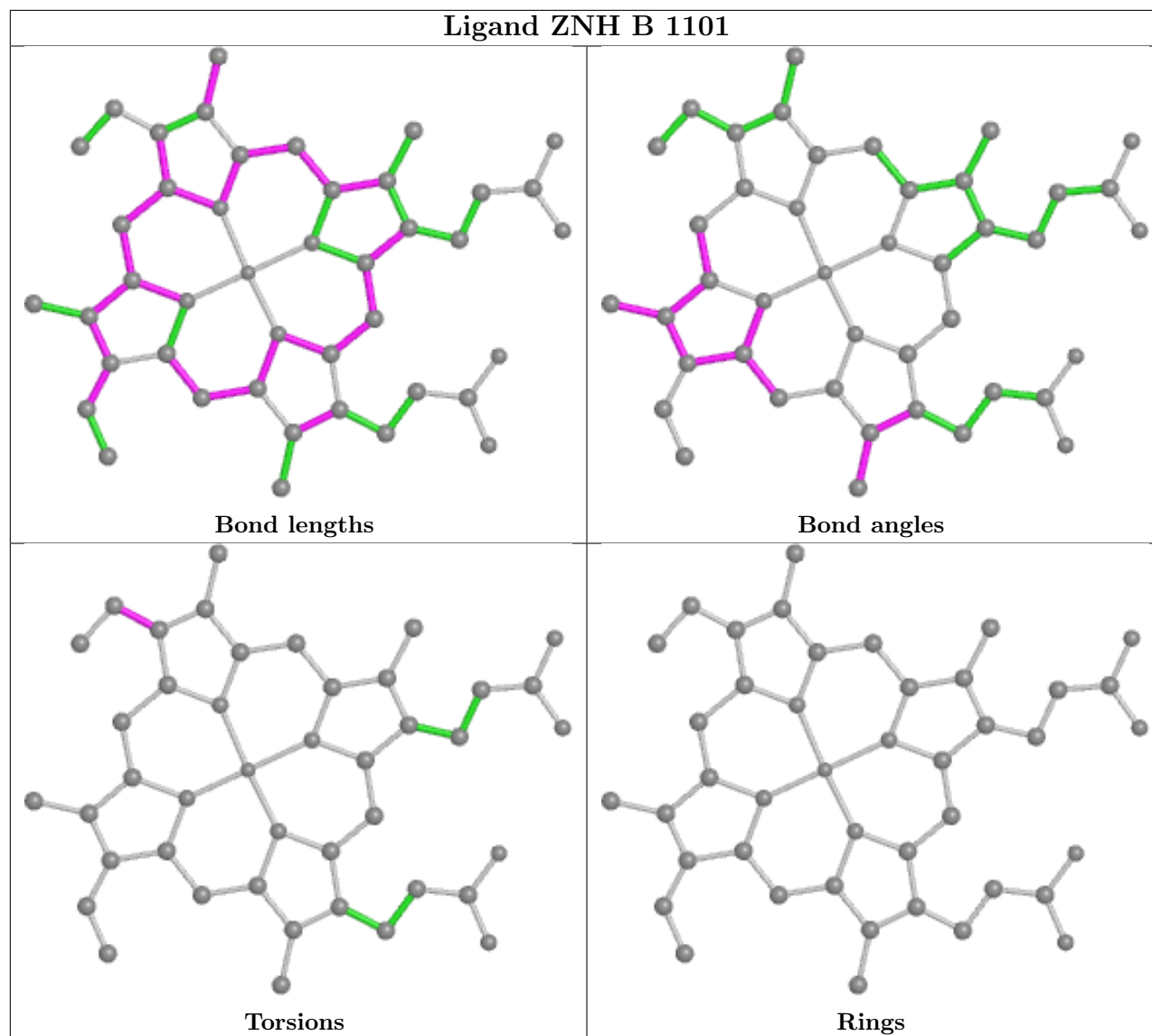
There are no ring outliers.

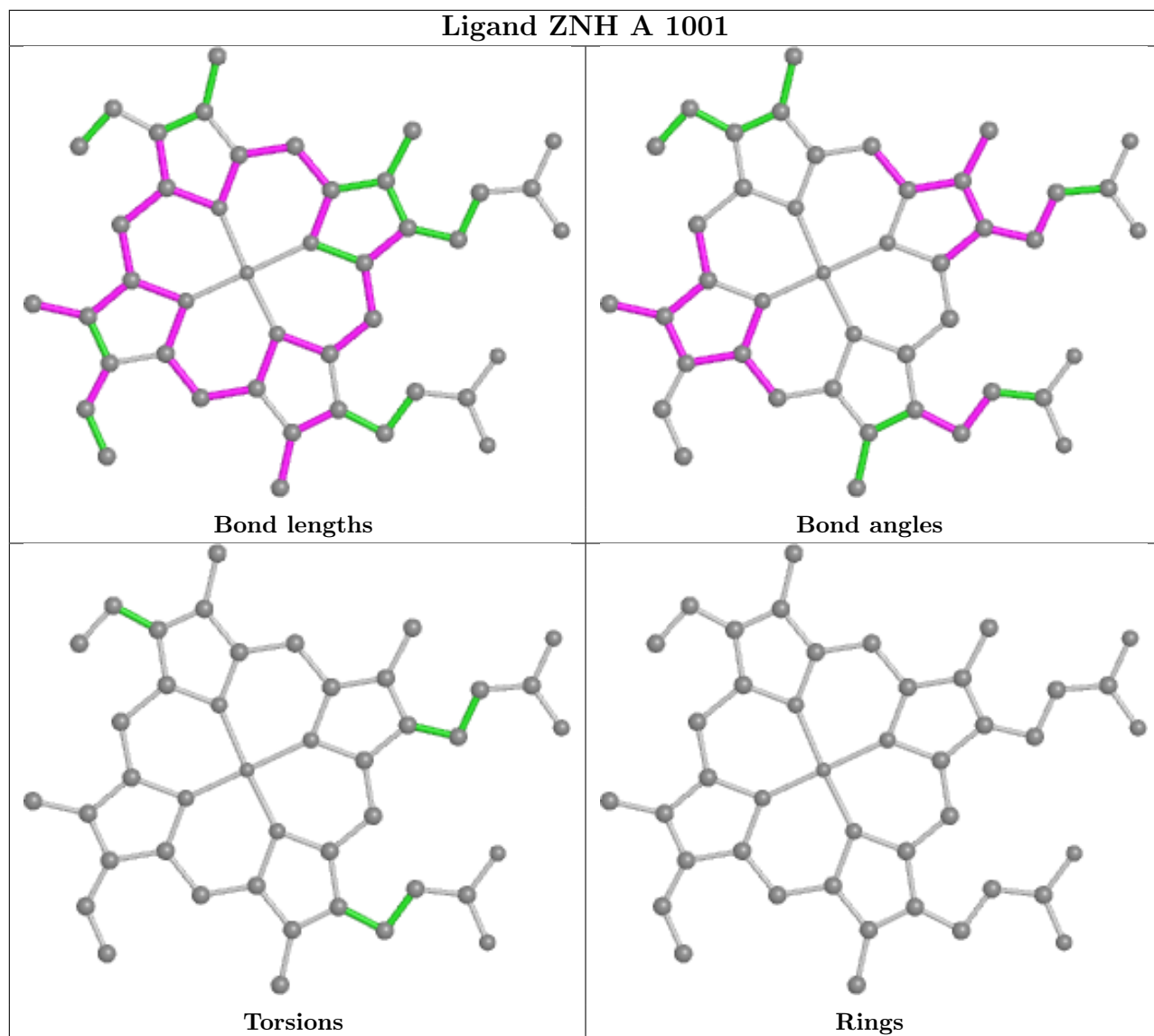
4 monomers are involved in 7 short contacts:

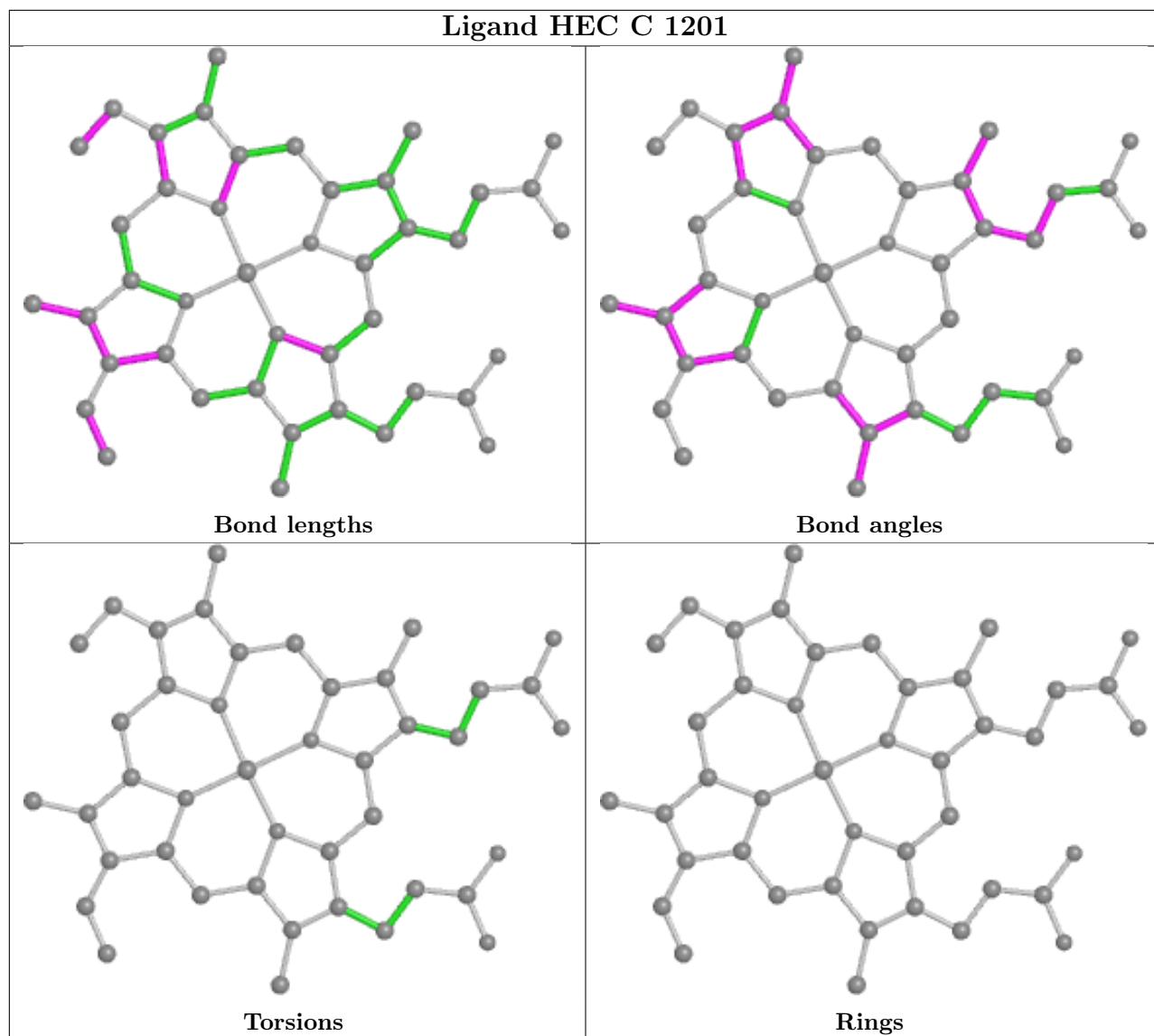
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	1101	ZNH	2	0
3	A	1001	ZNH	1	0
4	C	1201	HEC	3	0
4	D	1301	HEC	1	0

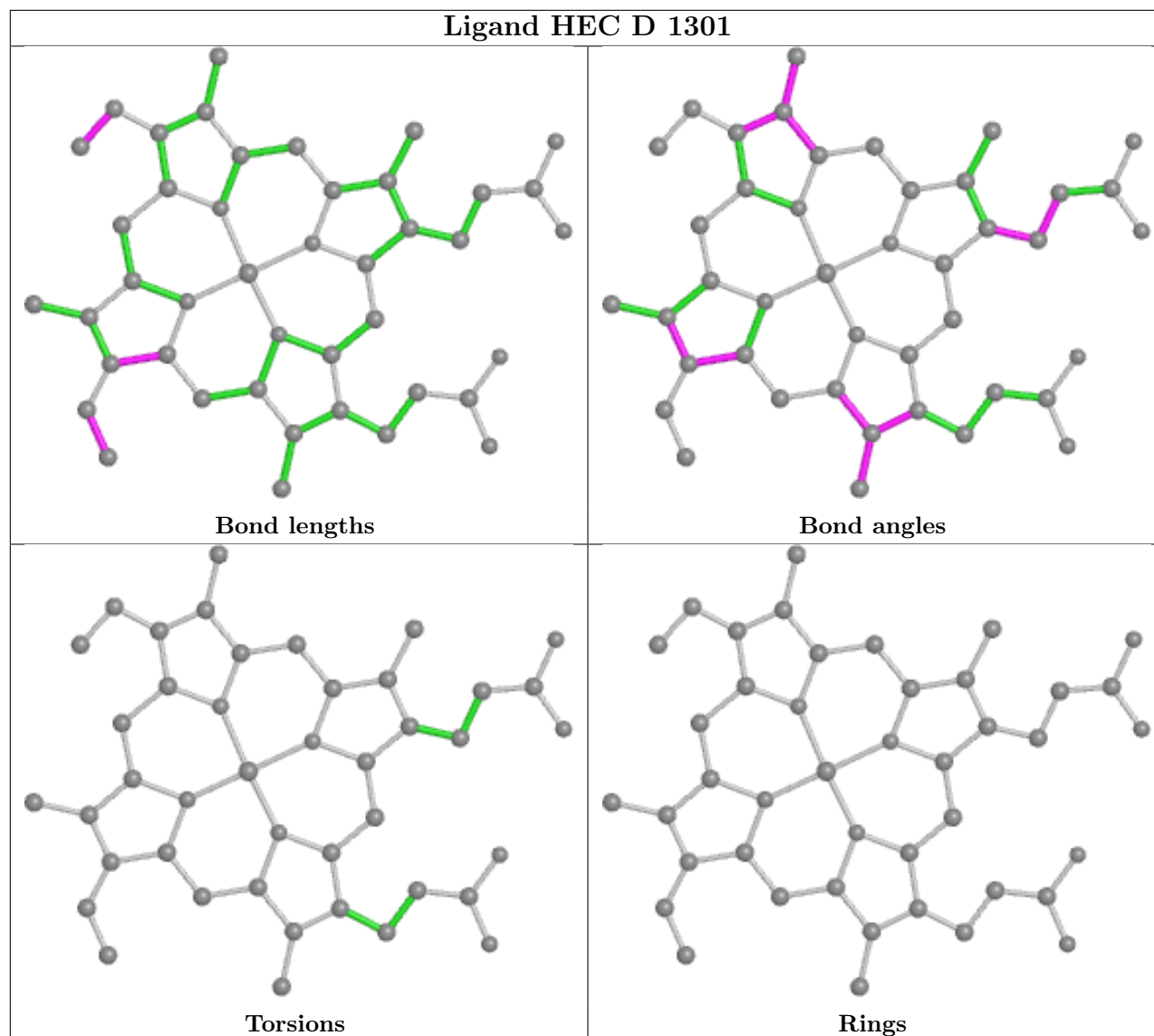
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

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	294/294 (100%)	0.32	7 (2%) 59 66	13, 33, 54, 105	0
1	C	294/294 (100%)	0.38	8 (2%) 54 62	12, 33, 54, 109	0
2	B	108/108 (100%)	0.88	12 (11%) 5 7	28, 50, 83, 113	0
2	D	108/108 (100%)	1.77	32 (29%) 0 0	30, 64, 85, 108	0
All	All	804/804 (100%)	0.61	59 (7%) 15 20	12, 37, 76, 113	0

All (59) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	796	THR	13.3
2	D	797	GLU	8.3
2	B	296	THR	8.1
1	C	501	THR	8.1
2	D	853	ILE	7.1
1	C	794	LEU	7.0
1	A	2	THR	6.8
1	A	3	PRO	6.0
2	D	799	LYS	6.0
1	C	793	GLY	6.0
2	D	798	PHE	5.5
2	D	822	LYS	5.3
1	C	502	THR	5.3
2	B	297	GLU	4.9
2	D	837	GLY	4.9
2	B	402	CYS	4.9
2	D	874	TYR	4.4
2	D	843	ALA	4.3
2	D	875	ILE	4.2
1	A	1	THR	3.8
2	B	340	SER	3.7

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Mol	Chain	Res	Type	RSRZ
1	C	503	PRO	3.6
2	D	800	ALA	3.6
2	D	852	ASN	3.5
1	A	182	LEU	3.5
2	D	824	GLY	3.5
2	D	807	ALA	3.4
2	D	848	TYR	3.2
2	D	854	LYS	3.2
2	B	300	ALA	3.1
2	D	823	GLY	3.0
2	D	826	HIS	3.0
2	B	298	PHE	2.9
2	B	306	GLY	2.9
2	D	836	PHE	2.9
1	C	519	PHE	2.7
2	D	834	GLY	2.7
2	D	856	ASN	2.6
2	D	808	THR	2.6
1	C	504	LEU	2.6
2	B	382	TRP	2.6
2	D	835	ILE	2.6
2	D	850	ASP	2.5
2	D	866	GLU	2.5
1	A	260	LYS	2.5
2	D	851	ALA	2.4
2	B	299	LYS	2.4
2	D	903	GLU	2.3
2	D	802	SER	2.3
1	C	567	TYR	2.2
1	A	279	ASP	2.2
2	B	324	GLY	2.2
2	B	377	GLY	2.1
1	A	28	LEU	2.1
2	B	398	LEU	2.1
2	D	825	PRO	2.0
2	D	876	PRO	2.0
2	D	849	THR	2.0
2	D	816	GLN	2.0

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

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

6.3 Carbohydrates [i](#)

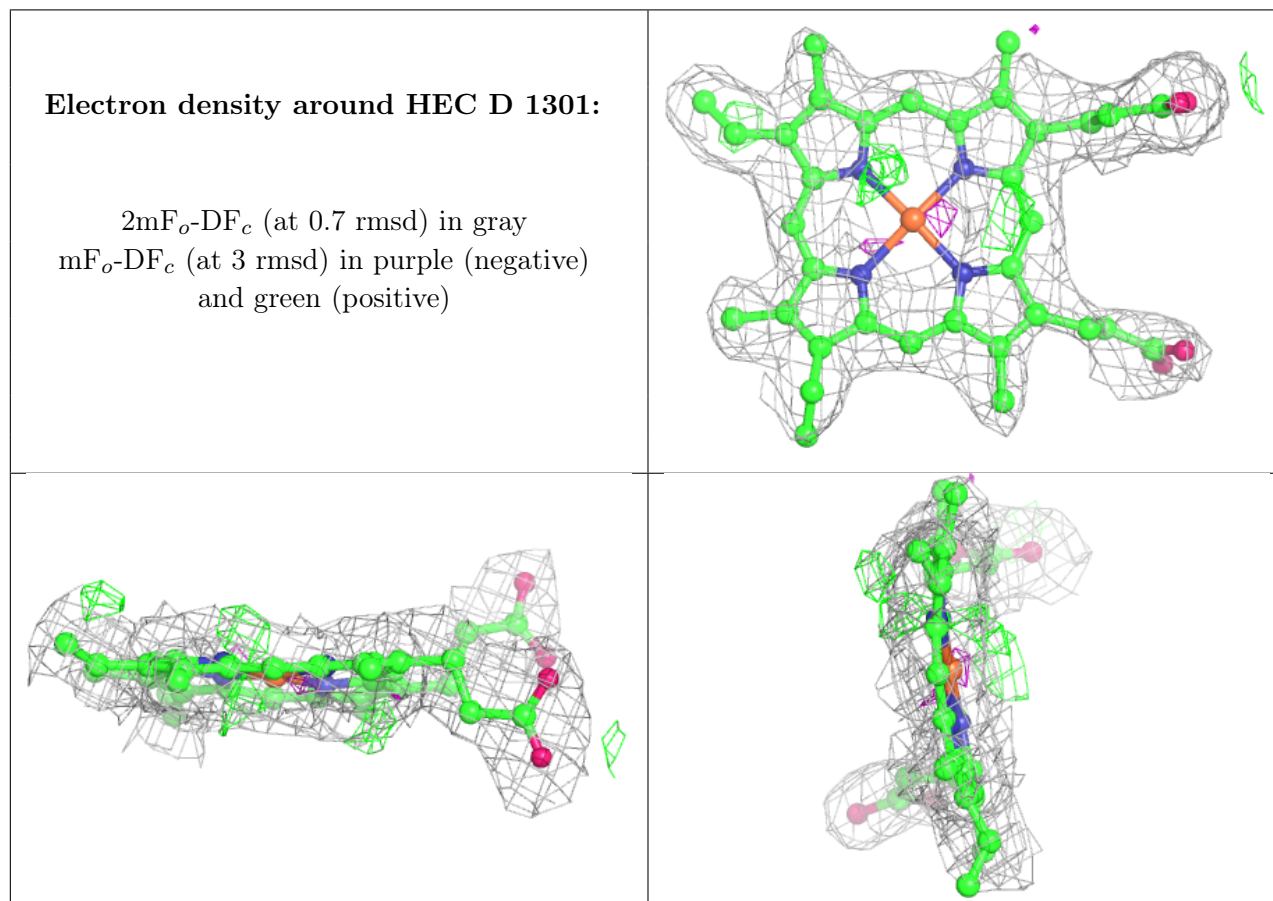
There are no monosaccharides in this entry.

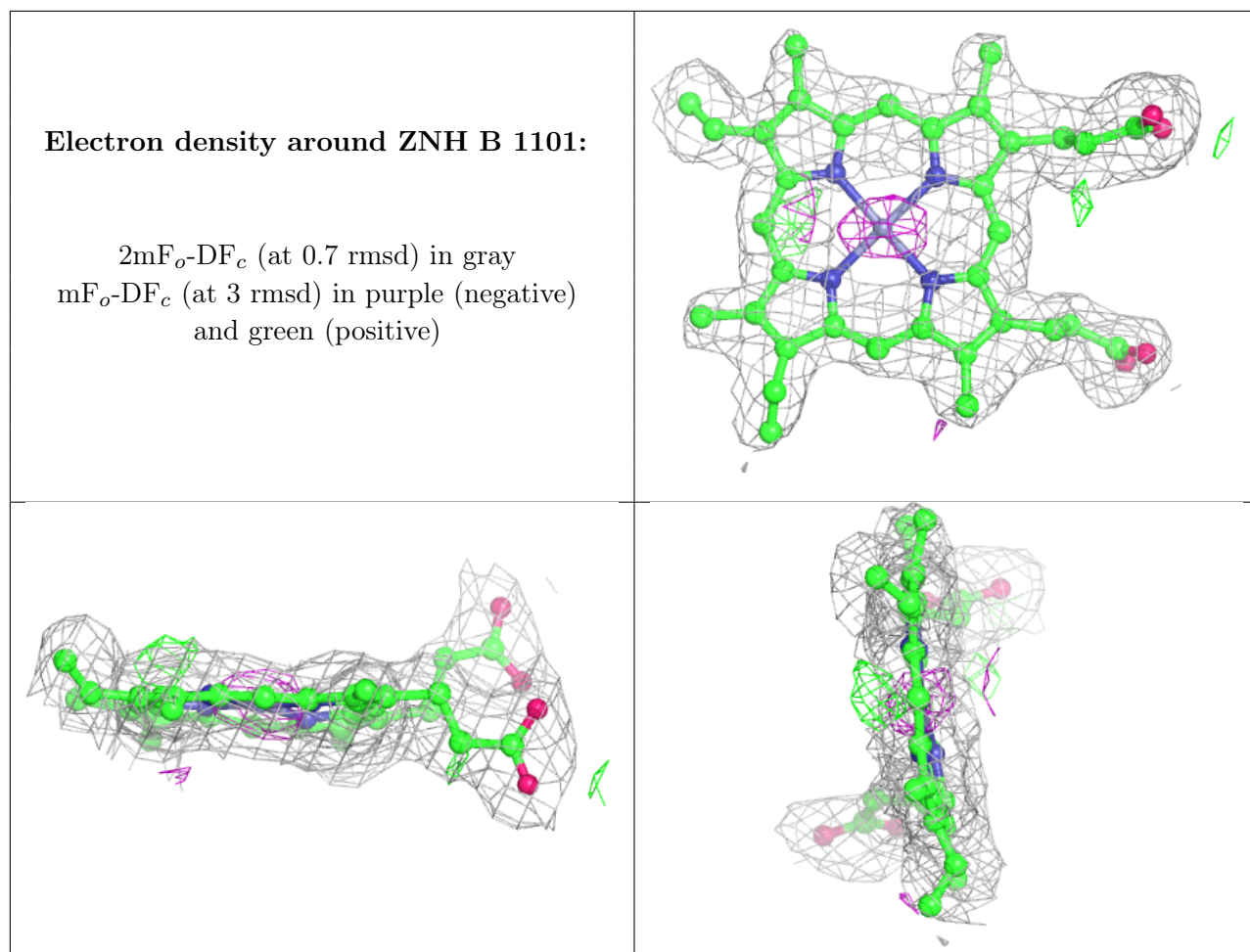
6.4 Ligands [i](#)

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(\AA^2)	Q<0.9
4	HEC	D	1301	43/43	0.92	0.16	26,39,47,53	0
3	ZNH	B	1101	43/43	0.93	0.14	24,34,44,45	0
4	HEC	C	1201	43/43	0.96	0.13	2,13,27,32	0
3	ZNH	A	1001	43/43	0.96	0.12	5,17,33,45	0

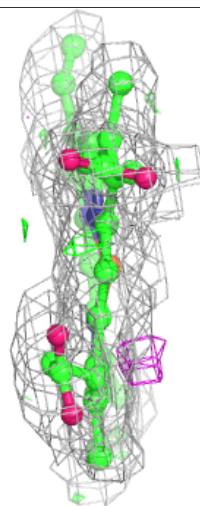
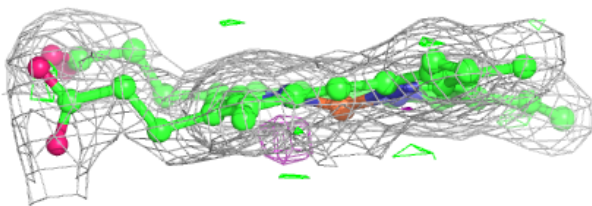
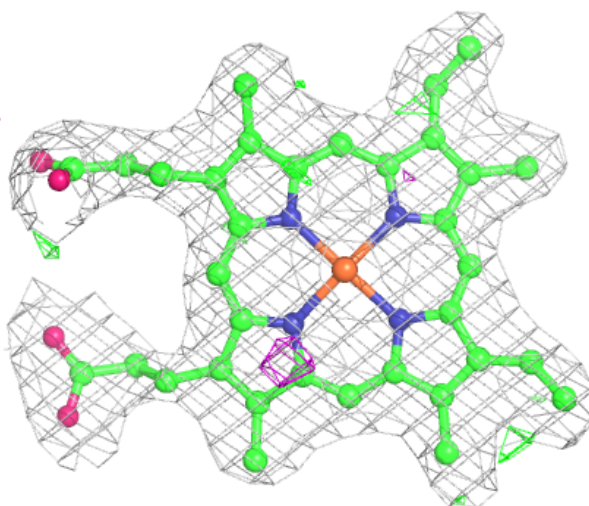
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

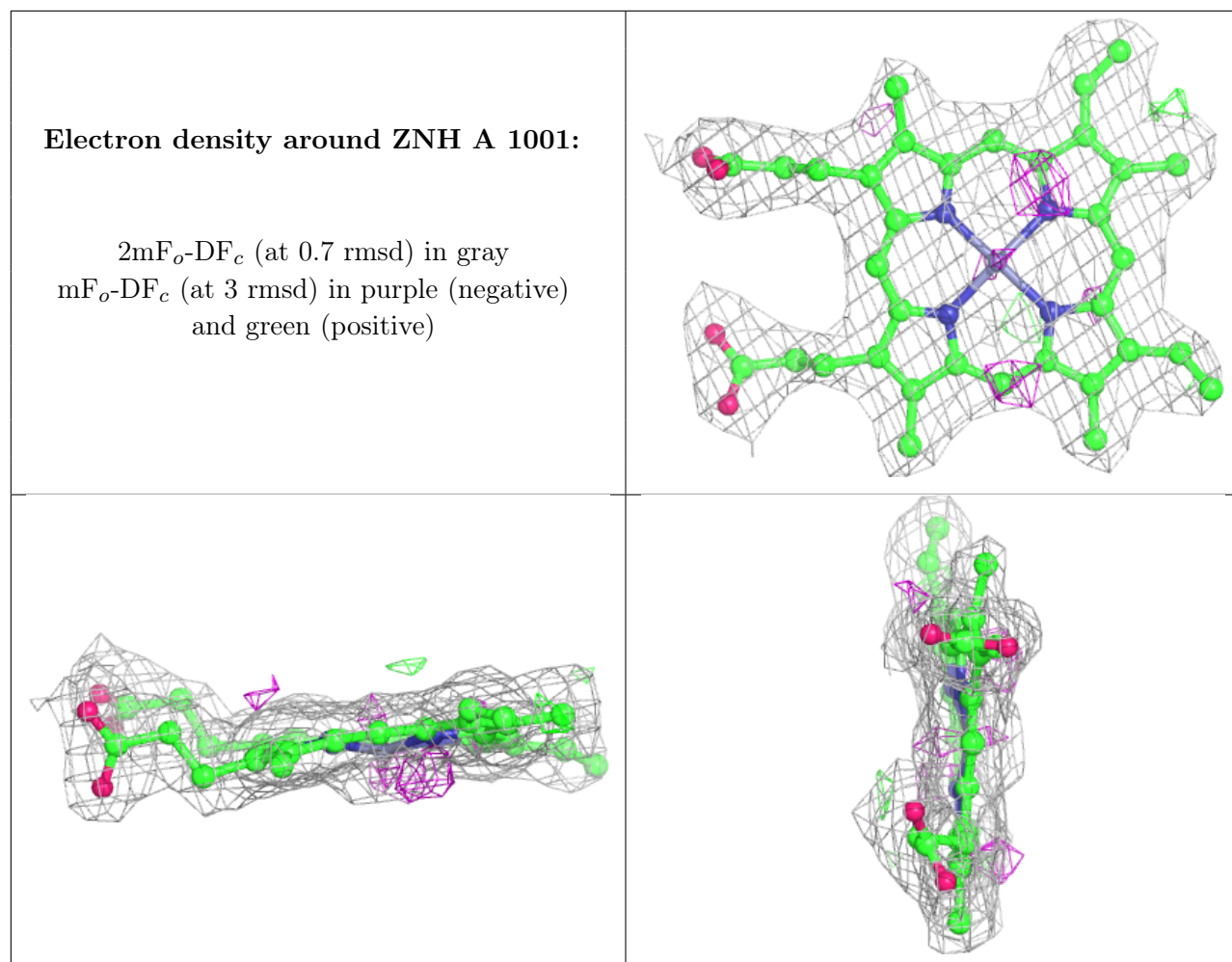




Electron density around HEC C 1201:

$2mF_o-DF_c$ (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.