



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 08:13 PM UTC

PDB ID : 7KVQ / pdb_00007kvq
Title : Human CYP3A4 bound to an inhibitor
Authors : Sevrioukova, I.
Deposited on : 2020-11-28
Resolution : 2.75 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

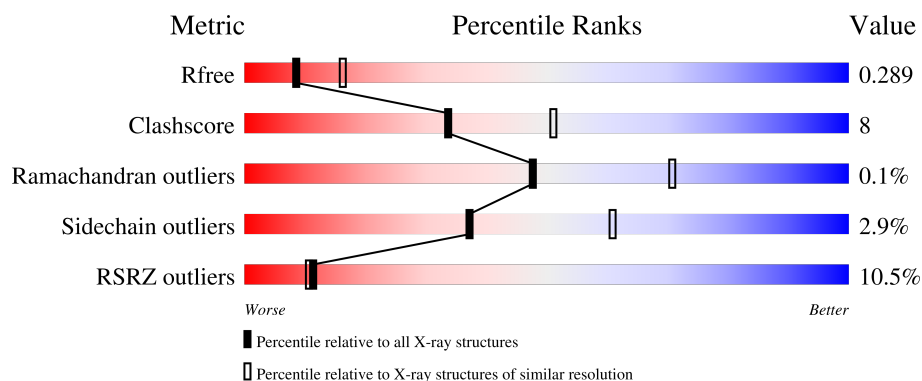
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.75 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	1009 (2.76-2.76)
Clashscore	190562	1044 (2.76-2.76)
Ramachandran outliers	187476	1024 (2.76-2.76)
Sidechain outliers	187428	1024 (2.76-2.76)
RSRZ outliers	180081	1009 (2.76-2.76)

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	487	7% 74% 18% • 7%
1	B	487	12% 75% 16% • 8%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7468 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 P450 3A4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	454	Total	C	N	O	S	0	2	0
			3669	2390	605	649	25			
1	B	448	Total	C	N	O	S	0	1	0
			3606	2353	587	642	24			

There are 48 discrepancies between the modelled and reference sequences:

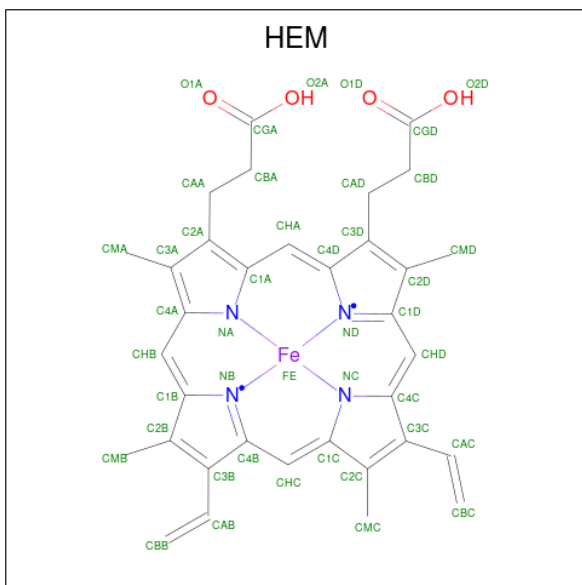
Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	LEU	deletion	UNP P08684
A	?	-	ILE	deletion	UNP P08684
A	?	-	PRO	deletion	UNP P08684
A	?	-	ASP	deletion	UNP P08684
A	?	-	LEU	deletion	UNP P08684
A	?	-	ALA	deletion	UNP P08684
A	?	-	MET	deletion	UNP P08684
A	?	-	GLU	deletion	UNP P08684
A	?	-	THR	deletion	UNP P08684
A	?	-	TRP	deletion	UNP P08684
A	?	-	LEU	deletion	UNP P08684
A	?	-	LEU	deletion	UNP P08684
A	?	-	LEU	deletion	UNP P08684
A	?	-	ALA	deletion	UNP P08684
A	?	-	VAL	deletion	UNP P08684
A	?	-	SER	deletion	UNP P08684
A	?	-	LEU	deletion	UNP P08684
A	?	-	VAL	deletion	UNP P08684
A	?	-	LEU	deletion	UNP P08684
A	?	-	LEU	deletion	UNP P08684
A	504	HIS	-	expression tag	UNP P08684
A	505	HIS	-	expression tag	UNP P08684
A	506	HIS	-	expression tag	UNP P08684
A	507	HIS	-	expression tag	UNP P08684
B	?	-	LEU	deletion	UNP P08684

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Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	ILE	deletion	UNP P08684
B	?	-	PRO	deletion	UNP P08684
B	?	-	ASP	deletion	UNP P08684
B	?	-	LEU	deletion	UNP P08684
B	?	-	ALA	deletion	UNP P08684
B	?	-	MET	deletion	UNP P08684
B	?	-	GLU	deletion	UNP P08684
B	?	-	THR	deletion	UNP P08684
B	?	-	TRP	deletion	UNP P08684
B	?	-	LEU	deletion	UNP P08684
B	?	-	LEU	deletion	UNP P08684
B	?	-	LEU	deletion	UNP P08684
B	?	-	ALA	deletion	UNP P08684
B	?	-	VAL	deletion	UNP P08684
B	?	-	SER	deletion	UNP P08684
B	?	-	LEU	deletion	UNP P08684
B	?	-	VAL	deletion	UNP P08684
B	?	-	LEU	deletion	UNP P08684
B	?	-	LEU	deletion	UNP P08684
B	504	HIS	-	expression tag	UNP P08684
B	505	HIS	-	expression tag	UNP P08684
B	506	HIS	-	expression tag	UNP P08684
B	507	HIS	-	expression tag	UNP P08684

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



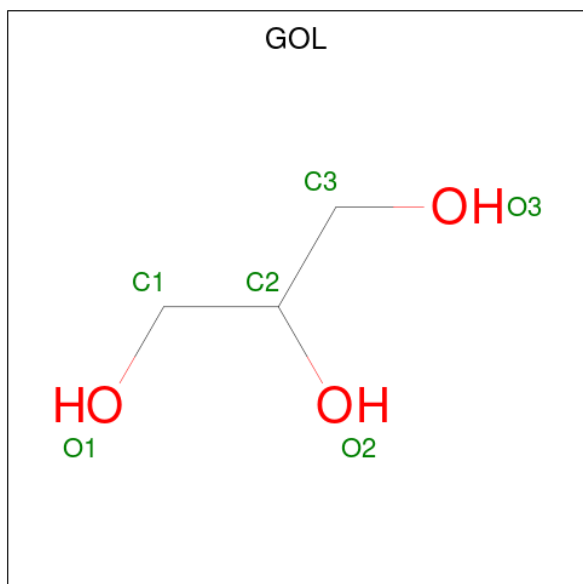
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
2	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



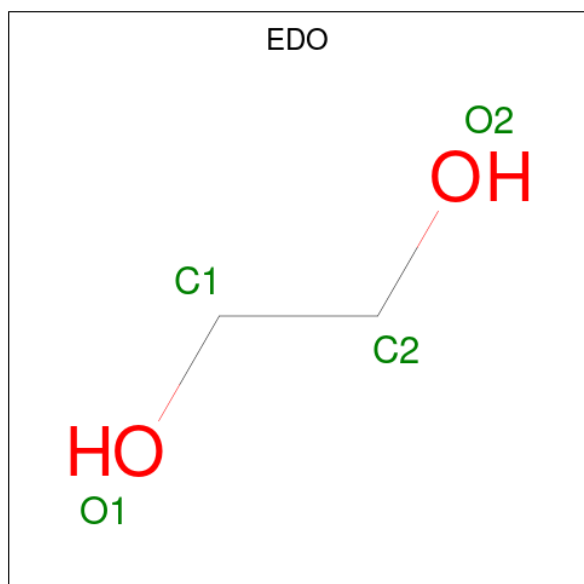
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



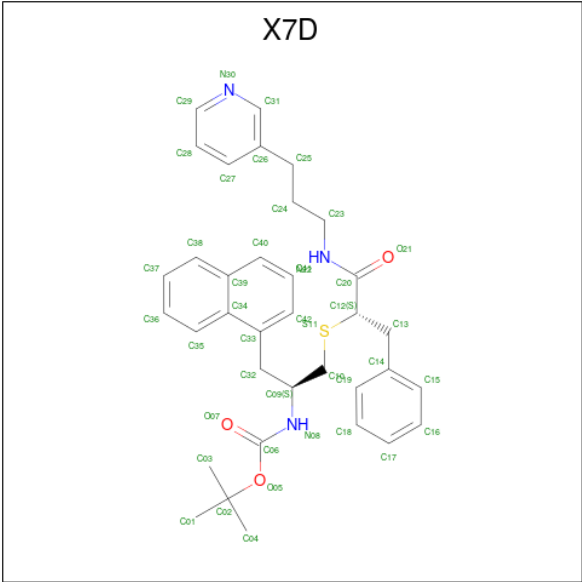
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 6 is tert-butyl [(2S)-1-(naphthalen-1-yl)-3-{[(2S)-1-oxo-3-phenyl-1-{[3-(pyridin-3-yl)propyl]amino}propan-2-yl]sulfanyl}propan-2-yl]carbamate (CCD ID: X7D) (formula: C₃₅H₄₁N₃O₃S) (labeled as "Ligand of Interest" by depositor).

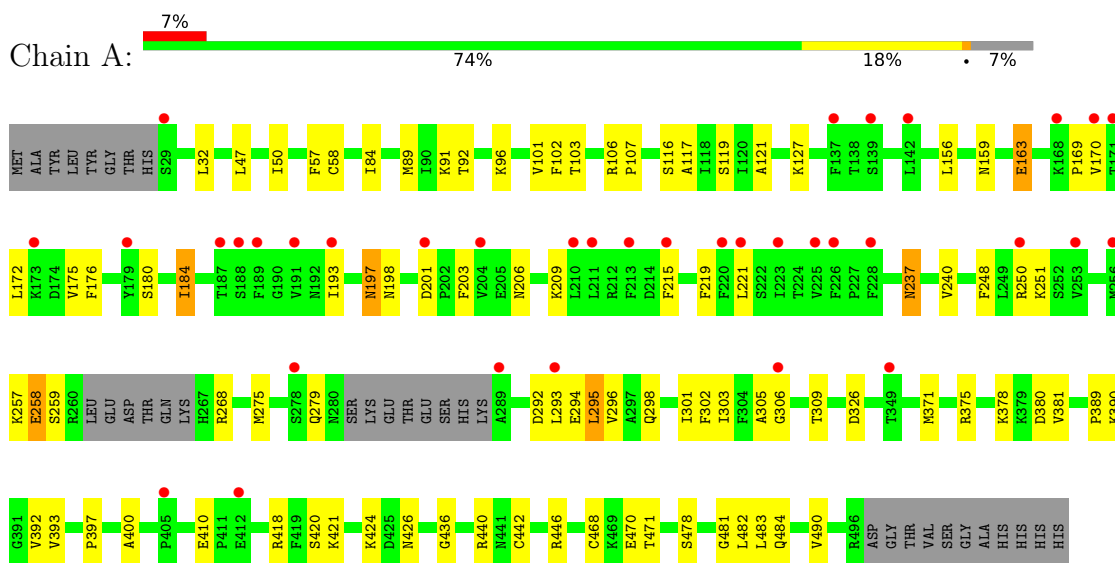


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	S	0	0
			42	35	3	3	1		
6	B	1	Total	C	N	O	S	0	0
			42	35	3	3	1		

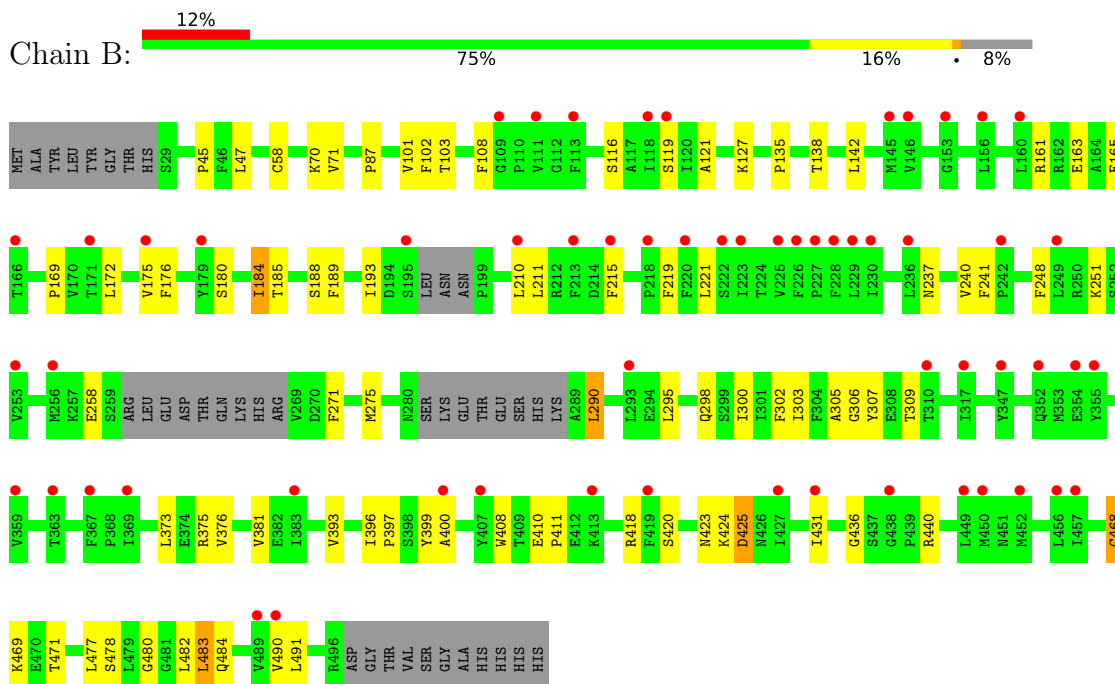
3 Residue-property plots

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: Cytochrome P450 3A4



• Molecule 1: Cytochrome P450 3A4



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	153.86Å 97.36Å 93.23Å 90.00° 124.32° 90.00°	Depositor
Resolution (Å)	63.54 – 2.75 63.54 – 2.75	Depositor EDS
% Data completeness (in resolution range)	96.0 (63.54-2.75) 96.0 (63.54-2.75)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.39 (at 2.77Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575)	Depositor
R, R_{free}	0.250 , 0.280 0.257 , 0.289	Depositor DCC
R_{free} test set	1373 reflections (4.63%)	wwPDB-VP
Wilson B-factor (Å ²)	88.7	Xtriage
Anisotropy	0.180	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 77.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.023 for -h-2*k,l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7468	wwPDB-VP
Average B, all atoms (Å ²)	133.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.30% 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: SO4, EDO, GOL, X7D, 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	0.19	0/3764	0.32	0/5089
1	B	0.16	1/3696 (0.0%)	0.32	0/4997
All	All	0.17	1/7460 (0.0%)	0.32	0/10086

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	483	LEU	C-N	-6.21	1.26	1.33

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3669	0	3765	60	0
1	B	3606	0	3695	51	0
2	A	43	0	30	7	0
2	B	43	0	30	5	0
3	A	5	0	0	0	0
4	A	6	0	8	0	0
5	A	12	0	18	1	0
6	A	42	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	42	0	0	4	0
All	All	7468	0	7546	115	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 8.

All (115) 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:106:ARG:HB3	6:A:607:X7D:C03	1.78	1.13
2:A:601:HEM:HHD	2:A:601:HEM:HBC2	1.67	0.76
2:B:601:HEM:HBC2	2:B:601:HEM:HHD	1.68	0.76
1:A:172:LEU:HB3	1:A:176:PHE:CE2	2.29	0.67
1:B:410:GLU:O	1:B:418:ARG:NH2	2.28	0.67
1:A:248:PHE:HA	1:A:251:LYS:HE2	1.78	0.66
1:B:248:PHE:HA	1:B:251:LYS:HE2	1.80	0.64
1:A:446[A]:ARG:HE	1:B:425:ASP:HB3	1.64	0.63
1:A:410:GLU:O	1:A:418:ARG:NH2	2.30	0.62
2:A:601:HEM:HMB1	2:A:601:HEM:HBB2	1.84	0.59
1:B:482:LEU:HD11	1:B:484:GLN:CD	2.28	0.58
1:A:471:THR:OG1	1:A:490:VAL:O	2.21	0.58
1:B:275:MET:HE2	1:B:290:LEU:HD21	1.84	0.58
1:A:482:LEU:H	1:A:482:LEU:HD23	1.68	0.58
1:A:421:LYS:HA	1:A:424:LYS:HG2	1.87	0.57
1:B:219:PHE:HE2	1:B:240:VAL:HG12	1.69	0.56
1:B:184:ILE:HG21	1:B:303:ILE:HA	1.87	0.55
1:A:257:LYS:NZ	1:A:292:ASP:OD1	2.40	0.55
2:B:601:HEM:HBB2	2:B:601:HEM:HMB2	1.88	0.55
1:A:101:VAL:HG21	1:A:381:VAL:HG11	1.89	0.54
1:B:102:PHE:HB3	1:B:375:ARG:HB3	1.89	0.54
1:A:206:ASN:HA	1:A:209:LYS:HE2	1.90	0.53
1:B:169:PRO:HG3	1:B:468:CYS:SG	2.49	0.52
1:B:103:THR:O	1:B:440:ARG:NH1	2.41	0.52
1:B:305:ALA:O	1:B:309:THR:OG1	2.24	0.52
1:A:258:GLU:OE1	1:A:259:SER:N	2.41	0.51
1:A:169:PRO:HG2	1:A:470:GLU:OE2	2.11	0.51
1:A:169:PRO:HG2	1:A:470:GLU:CD	2.35	0.51
1:B:397:PRO:HB2	1:B:400:ALA:HB3	1.93	0.51
1:A:159:ASN:ND2	1:A:197:ASN:OD1	2.39	0.50
1:B:408:TRP:HB2	1:B:411:PRO:HB3	1.94	0.50
1:A:184:ILE:HG21	1:A:303:ILE:HA	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:305:ALA:O	1:A:309:THR:OG1	2.26	0.50
1:B:108:PHE:HE2	1:B:240:VAL:HG21	1.77	0.50
1:A:219:PHE:HE2	1:A:240:VAL:HG12	1.77	0.50
1:A:116:SER:O	1:A:298:GLN:NE2	2.44	0.49
1:B:373:LEU:HB2	1:B:396:ILE:HB	1.94	0.49
1:B:471:THR:OG1	1:B:490:VAL:O	2.28	0.49
1:A:103:THR:O	1:A:440:ARG:NH1	2.43	0.49
1:B:420:SER:HG	1:B:423:ASN:HD22	1.58	0.49
1:B:172:LEU:HD11	1:B:491:LEU:HD12	1.95	0.49
1:A:397:PRO:HB2	1:A:400:ALA:HB3	1.95	0.48
1:B:241:PHE:CE2	6:B:602:X7D:C15	2.97	0.48
1:B:376:VAL:HG22	1:B:393:VAL:HG22	1.96	0.48
1:B:436:GLY:HA3	2:B:601:HEM:HBA1	1.94	0.48
1:B:302:PHE:CD2	2:B:601:HEM:HBC1	2.48	0.48
1:B:184:ILE:HG13	1:B:306:GLY:HA3	1.94	0.48
1:A:102:PHE:HB3	1:A:375:ARG:HB3	1.96	0.47
1:A:478:SER:N	1:A:484:GLN:O	2.41	0.47
1:A:436:GLY:HA3	2:A:601:HEM:HBA1	1.96	0.47
1:B:175:VAL:HG13	1:B:176:PHE:N	2.29	0.47
1:A:302:PHE:CD2	2:A:601:HEM:HBC1	2.49	0.47
1:B:121:ALA:O	1:B:440:ARG:NH2	2.46	0.47
1:A:275:MET:HB3	1:A:295:LEU:HD12	1.97	0.47
1:A:84:ILE:HB	1:A:89:MET:HE3	1.96	0.47
1:A:375:ARG:HH22	2:A:601:HEM:CGA	2.28	0.47
1:A:279:GLN:NE2	1:A:292:ASP:OD1	2.47	0.46
1:B:161:ARG:O	1:B:165:GLU:HG3	2.15	0.46
1:B:180:SER:HB3	1:B:307:TYR:HA	1.96	0.46
1:A:197:ASN:HA	1:A:198:ASN:HB3	1.97	0.46
1:B:70:LYS:HG3	1:B:71:VAL:HG23	1.97	0.46
1:B:101:VAL:HG21	1:B:381:VAL:HG11	1.98	0.46
2:A:601:HEM:C1D	6:A:607:X7D:C31	2.99	0.46
1:A:106:ARG:HG3	1:A:393:VAL:HG21	1.98	0.45
1:B:420:SER:O	1:B:424:LYS:N	2.49	0.45
1:A:172:LEU:HB3	1:A:176:PHE:CD2	2.51	0.45
1:A:389:PRO:HD2	1:A:392:VAL:HG21	1.98	0.45
1:A:468:CYS:HB3	1:A:470:GLU:HG2	1.98	0.45
1:B:185:THR:HA	1:B:189:PHE:HD2	1.81	0.45
1:B:210:LEU:HD21	1:B:300:ILE:HG23	1.99	0.45
1:B:211:LEU:HB3	6:B:602:X7D:C18	2.47	0.45
1:A:47:LEU:HD22	1:A:50:ILE:HD11	1.98	0.45
1:A:92:THR:HA	1:A:96:LYS:HB2	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:425:ASP:OD1	1:B:425:ASP:N	2.40	0.45
1:B:420:SER:OG	1:B:423:ASN:ND2	2.40	0.45
1:A:237:ASN:O	1:A:237:ASN:ND2	2.42	0.44
1:A:106:ARG:HG2	1:A:107:PRO:HD2	2.00	0.44
1:A:380:ASP:OD1	1:A:390:LYS:N	2.50	0.44
1:A:117:ALA:O	1:A:121:ALA:N	2.45	0.44
1:A:301:ILE:HD13	6:A:607:X7D:C16	2.48	0.44
1:A:119:SER:HB2	6:A:607:X7D:C42	2.48	0.43
1:B:172:LEU:O	1:B:176:PHE:HB2	2.18	0.43
1:B:87:PRO:HG3	1:B:431:ILE:HD11	2.00	0.43
1:B:482:LEU:HD11	1:B:484:GLN:NE2	2.34	0.43
1:A:156:LEU:CD1	1:A:175:VAL:HG22	2.49	0.43
1:A:371:MET:SD	1:A:483:LEU:HB2	2.58	0.43
1:B:58:CYS:HB3	1:B:399:TYR:CD2	2.53	0.43
1:A:294:GLU:O	1:A:298:GLN:HG2	2.19	0.43
1:A:32:LEU:HD11	1:A:389:PRO:HG2	2.01	0.43
1:A:184:ILE:HG13	1:A:306:GLY:HA3	1.99	0.43
1:B:211:LEU:HD12	6:B:602:X7D:C19	2.48	0.42
1:A:442:CYS:HB2	2:A:601:HEM:C4A	2.54	0.42
1:B:116:SER:O	1:B:298:GLN:NE2	2.46	0.42
1:A:180:SER:HB3	1:A:306:GLY:O	2.19	0.42
1:A:326:ASP:OD1	1:A:326:ASP:N	2.52	0.42
1:B:119:SER:HB3	2:B:601:HEM:HAD1	2.00	0.42
1:A:101:VAL:HA	1:A:378:LYS:HG2	2.02	0.42
1:A:163:GLU:HB3	1:A:170:VAL:CG2	2.49	0.41
1:B:185:THR:HG21	1:B:193:ILE:HD12	2.02	0.41
1:A:57:PHE:HE2	1:A:481:GLY:HA2	1.86	0.41
1:B:477:LEU:HD13	1:B:483:LEU:HD11	2.01	0.41
1:B:478:SER:C	1:B:480:GLY:H	2.28	0.41
1:A:91:LYS:HE2	1:A:96:LYS:HE3	2.03	0.41
1:B:45:PRO:O	1:B:47:LEU:N	2.50	0.41
1:B:172:LEU:HA	1:B:175:VAL:HG12	2.01	0.41
1:A:58:CYS:SG	5:A:606:EDO:H12	2.60	0.41
1:A:293:LEU:HD12	1:A:293:LEU:HA	1.82	0.41
1:B:188:SER:HA	1:B:271:PHE:HB3	2.03	0.41
1:B:175:VAL:CG1	1:B:176:PHE:N	2.84	0.41
1:B:211:LEU:HB3	6:B:602:X7D:C19	2.50	0.41
1:A:420:SER:O	1:A:424:LYS:N	2.49	0.40
1:B:135:PRO:HA	1:B:138:THR:HG23	2.03	0.40
1:A:172:LEU:HA	1:A:175:VAL:HG12	2.03	0.40
1:A:250:ARG:HA	1:A:296:VAL:HG11	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:201:ASP:OD2	1:A:203:PHE:HB2	2.21	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	450/487 (92%)	422 (94%)	27 (6%)	1 (0%)	43	64
1	B	441/487 (91%)	415 (94%)	26 (6%)	0	100	100
All	All	891/974 (92%)	837 (94%)	53 (6%)	1 (0%)	48	71

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	197	ASN

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	417/443 (94%)	406 (97%)	11 (3%)	40	63
1	B	410/443 (93%)	397 (97%)	13 (3%)	34	58
All	All	827/886 (93%)	803 (97%)	24 (3%)	37	61

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	127	LYS
1	A	163	GLU
1	A	184	ILE
1	A	193	ILE
1	A	215	PHE
1	A	221	LEU
1	A	237	ASN
1	A	258	GLU
1	A	268	ARG
1	A	295	LEU
1	A	426	ASN
1	B	127	LYS
1	B	142	LEU
1	B	163	GLU
1	B	184	ILE
1	B	215	PHE
1	B	221	LEU
1	B	237	ASN
1	B	258	GLU
1	B	290	LEU
1	B	295	LEU
1	B	425	ASP
1	B	468	CYS
1	B	469	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	267	HIS
1	A	332	GLN
1	B	484	GLN

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

9 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	SO4	A	602	-	4,4,4	0.24	0	6,6,6	0.07	0
6	X7D	B	602	2	44,45,45	1.72	8 (18%)	54,60,60	1.90	10 (18%)
4	GOL	A	603	-	5,5,5	0.39	0	5,5,5	0.24	0
6	X7D	A	607	2	44,45,45	1.83	8 (18%)	54,60,60	2.03	11 (20%)
2	HEM	A	601	1,6	50,50,50	1.43	7 (14%)	67,82,82	1.17	4 (5%)
5	EDO	A	604	-	3,3,3	0.43	0	2,2,2	0.40	0
5	EDO	A	605	-	3,3,3	0.42	0	2,2,2	0.35	0
5	EDO	A	606	-	3,3,3	0.43	0	2,2,2	0.34	0
2	HEM	B	601	1,6	50,50,50	1.45	7 (14%)	67,82,82	1.16	5 (7%)

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
6	X7D	B	602	2	-	12/33/33/33	0/4/4/4
4	GOL	A	603	-	-	2/4/4/4	-
6	X7D	A	607	2	-	17/33/33/33	0/4/4/4
2	HEM	A	601	1,6	-	2/14/54/54	-
5	EDO	A	604	-	-	1/1/1/1	-
5	EDO	A	605	-	-	0/1/1/1	-
5	EDO	A	606	-	-	0/1/1/1	-
2	HEM	B	601	1,6	-	2/14/54/54	-

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	607	X7D	C10-S11	6.63	1.88	1.82
6	B	602	X7D	C10-S11	5.75	1.87	1.82
6	A	607	X7D	C12-S11	4.98	1.88	1.83
6	B	602	X7D	C12-S11	4.13	1.87	1.83
2	B	601	HEM	FE-NB	3.57	2.05	1.94
2	A	601	HEM	FE-NB	3.42	2.05	1.94
2	A	601	HEM	FE-NC	3.40	2.06	1.95
2	B	601	HEM	FE-NC	3.31	2.06	1.95
2	B	601	HEM	FE-ND	3.29	2.05	1.94
2	A	601	HEM	CAB-C3B	3.13	1.55	1.47
2	B	601	HEM	FE-NA	3.12	2.05	1.95
2	B	601	HEM	CAB-C3B	3.12	1.55	1.47
2	A	601	HEM	FE-NA	3.10	2.05	1.95
2	A	601	HEM	FE-ND	3.08	2.04	1.94
2	A	601	HEM	CAC-C3C	2.99	1.55	1.47
2	B	601	HEM	CAC-C3C	2.97	1.55	1.47
6	B	602	X7D	C32-C09	2.83	1.59	1.53
6	B	602	X7D	C20-N22	2.74	1.40	1.33
6	A	607	X7D	C20-N22	2.72	1.40	1.33
6	A	607	X7D	C34-C39	-2.50	1.38	1.43
6	B	602	X7D	C34-C39	-2.45	1.38	1.43
6	B	602	X7D	C33-C34	2.39	1.48	1.42
6	A	607	X7D	C33-C34	2.29	1.47	1.42
6	B	602	X7D	O05-C06	2.29	1.39	1.34
6	A	607	X7D	C04-C02	2.28	1.57	1.51
6	A	607	X7D	C32-C09	2.21	1.58	1.53
2	B	601	HEM	CMB-C2B	2.13	1.55	1.50
2	A	601	HEM	CMB-C2B	2.13	1.55	1.50
6	B	602	X7D	C06-N08	2.10	1.39	1.34
6	A	607	X7D	C13-C14	2.09	1.56	1.51

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	607	X7D	O05-C06-N08	6.83	121.20	110.03
6	B	602	X7D	O05-C06-N08	6.21	120.19	110.03
6	A	607	X7D	C14-C13-C12	5.78	121.65	113.35
6	B	602	X7D	O07-C06-N08	-5.04	116.60	124.86
6	A	607	X7D	C33-C32-C09	4.99	121.08	113.75
6	A	607	X7D	O07-C06-N08	-4.88	116.87	124.86
6	B	602	X7D	C33-C32-C09	4.67	120.62	113.75
6	B	602	X7D	C14-C13-C12	4.60	119.95	113.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	607	X7D	C32-C33-C34	4.14	126.91	120.89
6	B	602	X7D	C32-C33-C34	3.86	126.50	120.89
6	A	607	X7D	O21-C20-N22	-3.00	116.62	122.98
2	A	601	HEM	C4D-ND-C1D	2.49	108.16	105.21
6	A	607	X7D	C40-C39-C38	-2.49	117.33	123.01
6	B	602	X7D	O21-C20-N22	-2.48	117.73	122.98
2	B	601	HEM	C4D-ND-C1D	2.47	108.13	105.21
6	B	602	X7D	C23-N22-C20	2.39	126.85	122.55
6	B	602	X7D	C40-C39-C38	-2.38	117.58	123.01
6	B	602	X7D	C42-C33-C34	-2.35	115.57	119.06
6	A	607	X7D	O21-C20-C12	-2.30	118.28	121.61
2	B	601	HEM	C1B-NB-C4B	2.26	107.89	105.21
2	A	601	HEM	C3D-C4D-ND	-2.21	107.75	110.17
2	A	601	HEM	C1B-NB-C4B	2.21	107.82	105.21
2	B	601	HEM	C3B-C2B-C1B	2.14	108.02	106.41
2	B	601	HEM	C3D-C4D-ND	-2.11	107.86	110.17
6	A	607	X7D	C42-C33-C34	-2.11	115.93	119.06
6	A	607	X7D	O05-C06-O07	-2.09	121.92	125.64
6	A	607	X7D	C38-C39-C34	2.07	121.80	119.12
6	B	602	X7D	C09-N08-C06	2.07	125.42	122.23
2	B	601	HEM	C2A-C1A-NA	-2.06	107.87	110.15
2	A	601	HEM	C3B-C2B-C1B	2.04	107.94	106.41

There are no chirality outliers.

All (36) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	607	X7D	O05-C06-N08-C09
6	A	607	X7D	C32-C09-C10-S11
6	A	607	X7D	C20-C12-C13-C14
6	A	607	X7D	C13-C12-S11-C10
6	A	607	X7D	C09-C32-C33-C34
6	A	607	X7D	C09-C32-C33-C42
6	B	602	X7D	O05-C06-N08-C09
6	B	602	X7D	C09-C32-C33-C34
6	B	602	X7D	C09-C32-C33-C42
6	A	607	X7D	O07-C06-N08-C09
6	B	602	X7D	O07-C06-N08-C09
6	A	607	X7D	N08-C06-O05-C02
6	B	602	X7D	C12-C13-C14-C15
6	B	602	X7D	C23-C24-C25-C26
6	A	607	X7D	C13-C12-C20-O21

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Mol	Chain	Res	Type	Atoms
6	A	607	X7D	C13-C12-C20-N22
6	B	602	X7D	C13-C12-C20-N22
6	A	607	X7D	O07-C06-O05-C02
6	A	607	X7D	N08-C09-C10-S11
6	A	607	X7D	C12-C13-C14-C15
6	A	607	X7D	C12-C13-C14-C19
6	B	602	X7D	C12-C13-C14-C19
6	B	602	X7D	C13-C12-C20-O21
5	A	604	EDO	O1-C1-C2-O2
4	A	603	GOL	O1-C1-C2-C3
6	A	607	X7D	C20-C12-S11-C10
2	A	601	HEM	C4C-C3C-CAC-CBC
2	B	601	HEM	C4C-C3C-CAC-CBC
4	A	603	GOL	O1-C1-C2-O2
6	A	607	X7D	C24-C25-C26-C31
6	B	602	X7D	C20-C12-C13-C14
6	B	602	X7D	C24-C25-C26-C31
6	B	602	X7D	C24-C25-C26-C27
6	A	607	X7D	C24-C25-C26-C27
2	A	601	HEM	CAD-CBD-CGD-O2D
2	B	601	HEM	CAA-CBA-CGA-O2A

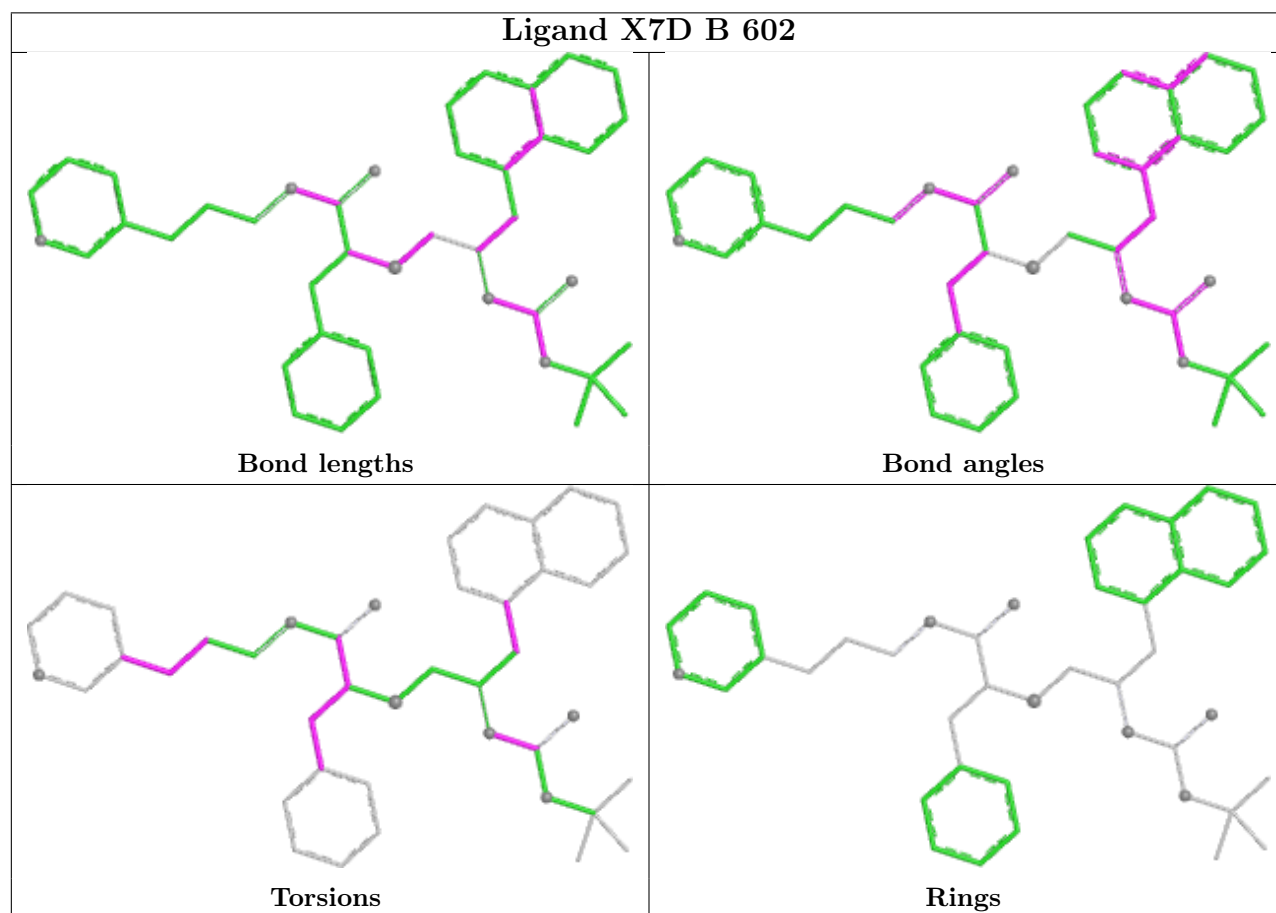
There are no ring outliers.

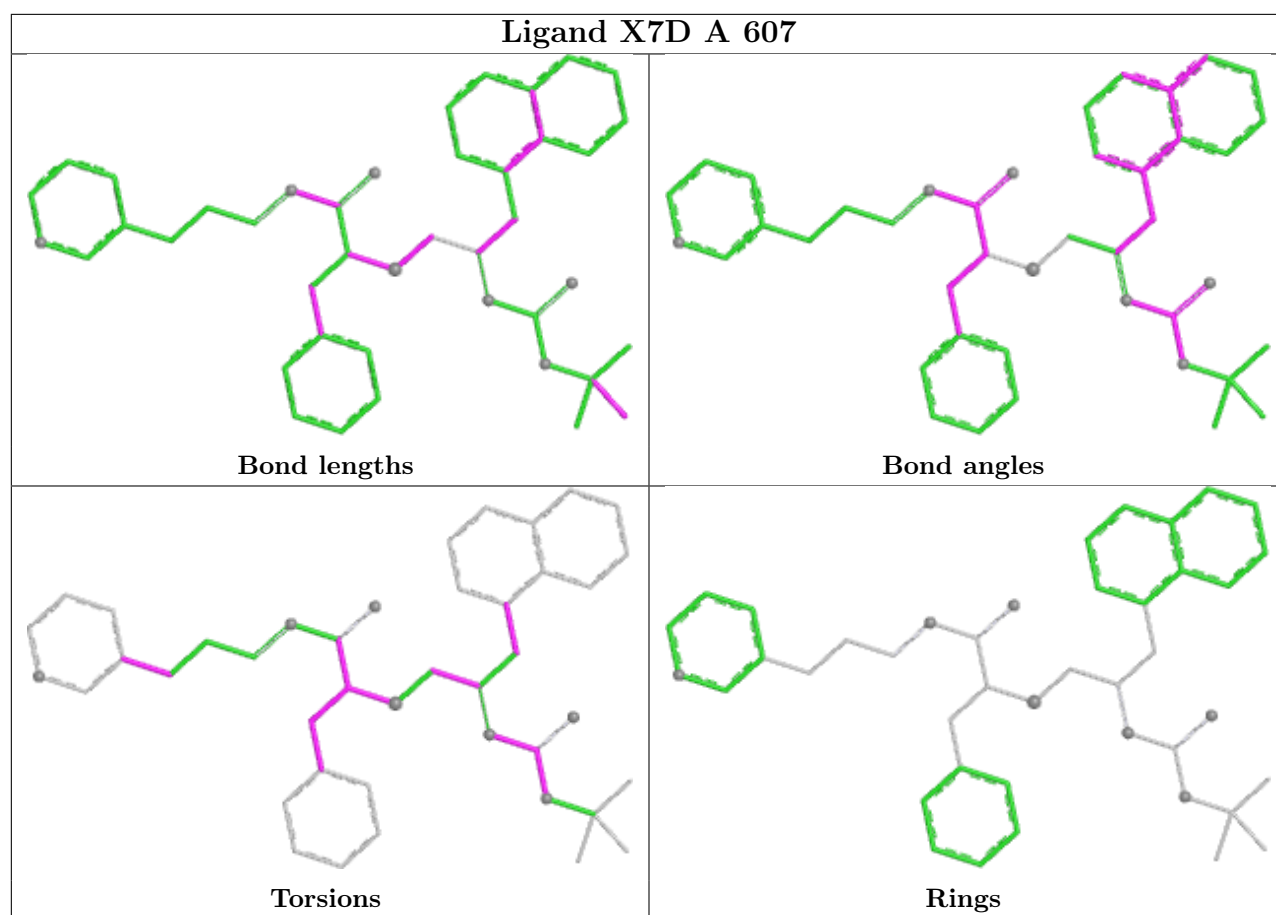
5 monomers are involved in 20 short contacts:

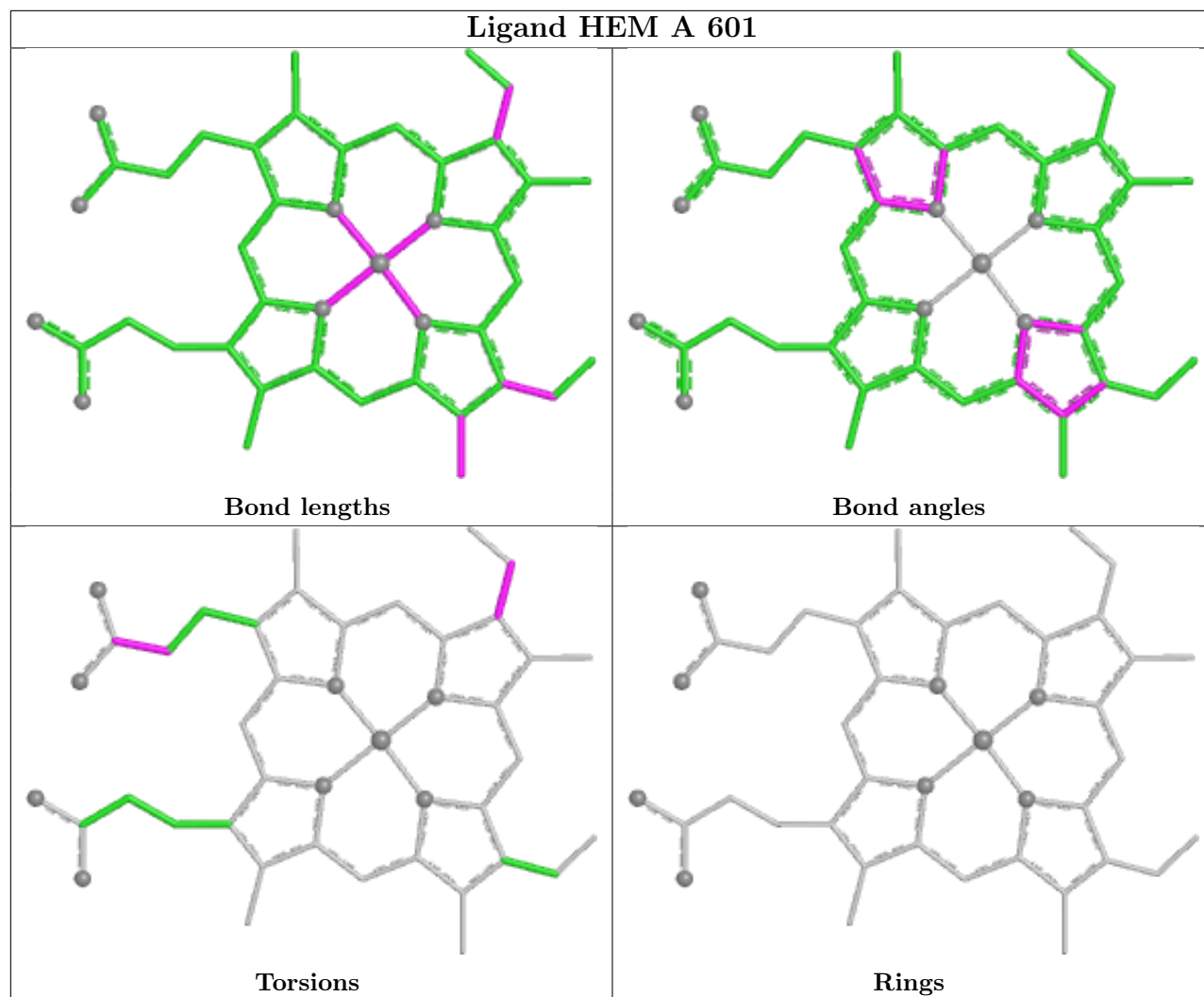
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	602	X7D	4	0
6	A	607	X7D	4	0
2	A	601	HEM	7	0
5	A	606	EDO	1	0
2	B	601	HEM	5	0

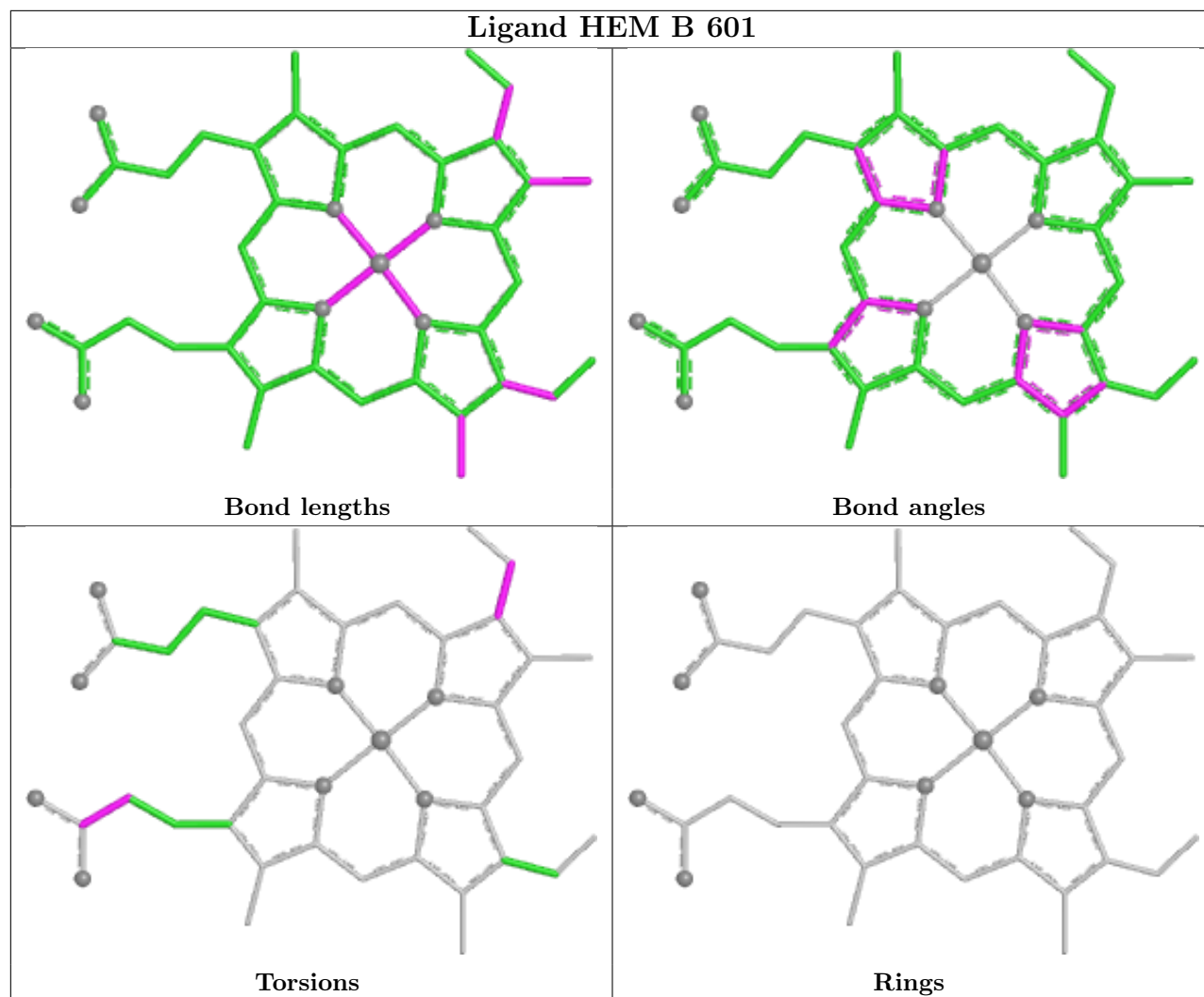
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

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	454/487 (93%)	0.54	36 (7%) 18 19	41, 91, 168, 270	2 (0%)
1	B	448/487 (91%)	1.04	59 (13%) 7 6	74, 160, 284, 463	1 (0%)
All	All	902/974 (92%)	0.79	95 (10%) 11 11	41, 119, 248, 463	3 (0%)

All (95) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	179	TYR	5.2
1	B	456	LEU	5.1
1	B	156	LEU	4.9
1	B	226	PHE	4.5
1	A	213	PHE	4.2
1	B	457	ILE	4.0
1	A	226	PHE	3.9
1	B	249	LEU	3.7
1	A	225	VAL	3.6
1	B	146	VAL	3.6
1	B	222	SER	3.5
1	B	253	VAL	3.4
1	A	170	VAL	3.4
1	A	306	GLY	3.2
1	B	215	PHE	3.2
1	B	228	PHE	3.1
1	A	193	ILE	3.1
1	B	225	VAL	3.1
1	B	352[A]	GLN	3.0
1	B	317	ILE	3.0
1	B	449	LEU	3.0
1	B	229	LEU	2.9
1	A	412	GLU	2.9
1	B	119	SER	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	118	ILE	2.9
1	B	413	LYS	2.9
1	B	175	VAL	2.8
1	B	230	ILE	2.8
1	A	179	TYR	2.8
1	A	168	LYS	2.7
1	B	452	MET	2.7
1	B	363	THR	2.7
1	B	354	GLU	2.7
1	B	355	TYR	2.7
1	B	223	ILE	2.7
1	A	210	LEU	2.6
1	B	369	ILE	2.6
1	B	427	ILE	2.6
1	A	191	VAL	2.6
1	A	278	SER	2.5
1	B	359	VAL	2.5
1	A	189	PHE	2.5
1	B	256	MET	2.5
1	A	349	THR	2.4
1	A	289	ALA	2.4
1	B	166	THR	2.4
1	B	293	LEU	2.4
1	A	188	SER	2.4
1	B	220	PHE	2.4
1	B	419	PHE	2.4
1	B	171	THR	2.3
1	B	195	SER	2.3
1	A	293	LEU	2.3
1	B	407	TYR	2.3
1	B	109	GLY	2.3
1	A	220	PHE	2.3
1	B	431	ILE	2.3
1	A	405	PRO	2.3
1	B	242	PRO	2.3
1	B	227	PRO	2.3
1	A	221	LEU	2.3
1	A	256	MET	2.2
1	B	310	THR	2.2
1	B	210	LEU	2.2
1	B	490	VAL	2.2
1	B	213	PHE	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	450	MET	2.2
1	A	29	SER	2.2
1	A	253	VAL	2.2
1	B	218	PRO	2.2
1	B	113	PHE	2.2
1	A	171	THR	2.2
1	A	250	ARG	2.2
1	B	347	TYR	2.2
1	A	142	LEU	2.2
1	A	211	LEU	2.2
1	B	145	MET	2.2
1	A	228	PHE	2.2
1	B	400	ALA	2.1
1	B	160	LEU	2.1
1	B	153	GLY	2.1
1	A	215	PHE	2.1
1	B	111	VAL	2.1
1	B	383	ILE	2.1
1	A	137	PHE	2.1
1	B	489	VAL	2.1
1	B	367	PHE	2.1
1	A	204	VAL	2.1
1	B	236	LEU	2.0
1	A	201	ASP	2.0
1	A	173	LYS	2.0
1	A	139	SER	2.0
1	A	187	THR	2.0
1	A	223	ILE	2.0
1	B	438	GLY	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 ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands

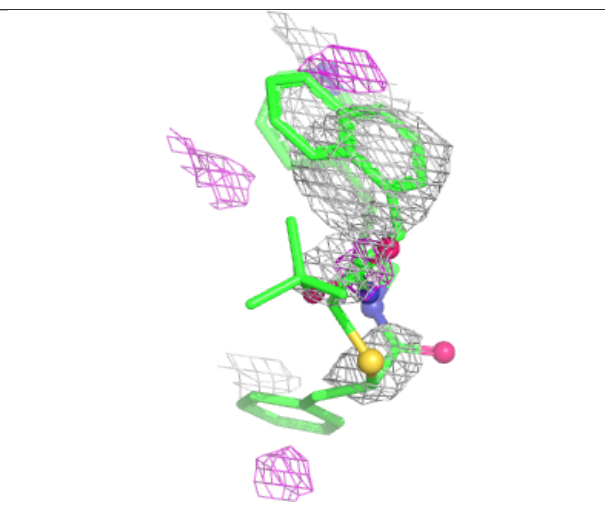
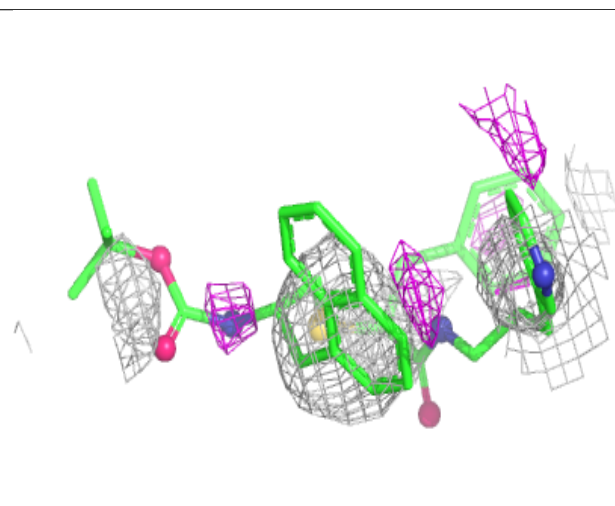
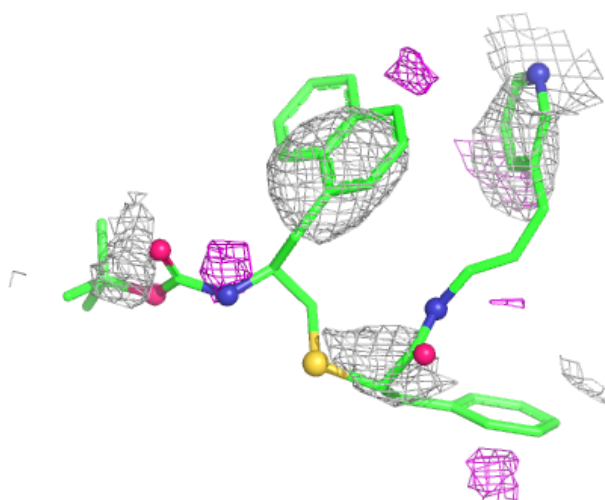
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	X7D	B	602	42/42	0.71	0.22	131,176,210,221	0
3	SO4	A	602	5/5	0.77	0.09	121,132,139,141	0
6	X7D	A	607	42/42	0.83	0.18	75,128,154,175	0
4	GOL	A	603	6/6	0.88	0.14	108,111,124,131	0
5	EDO	A	604	4/4	0.88	0.15	76,77,91,100	0
5	EDO	A	606	4/4	0.90	0.11	83,83,96,100	0
5	EDO	A	605	4/4	0.92	0.12	84,94,98,99	0
2	HEM	B	601	43/43	0.96	0.09	65,92,113,124	0
2	HEM	A	601	43/43	0.98	0.07	43,58,70,73	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.

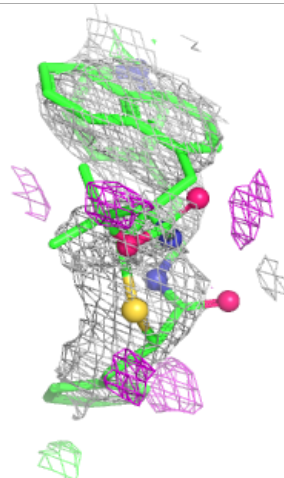
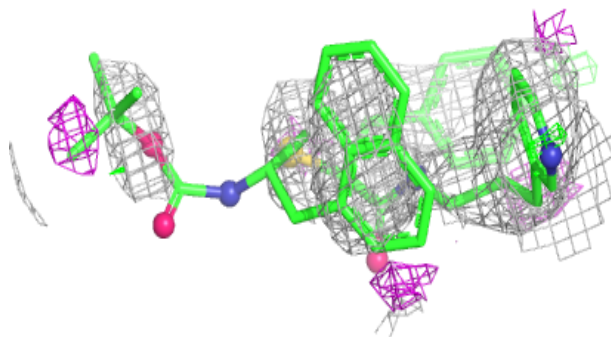
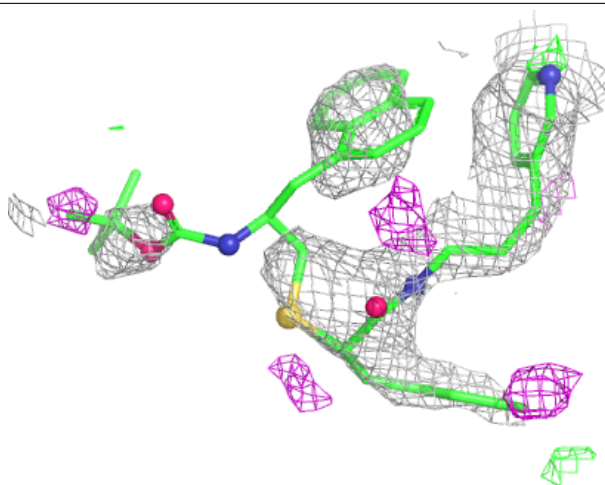
Electron density around X7D B 602:

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



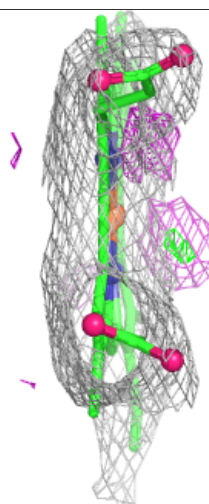
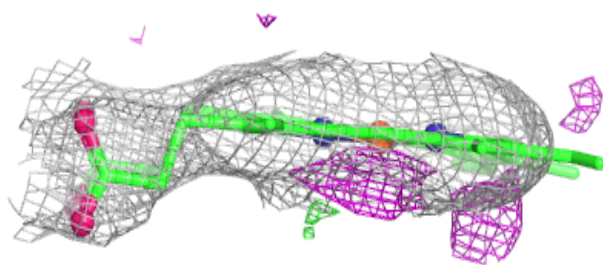
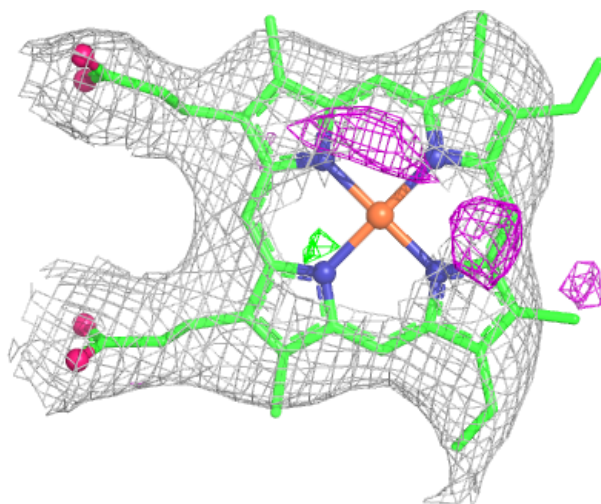
Electron density around X7D A 607:

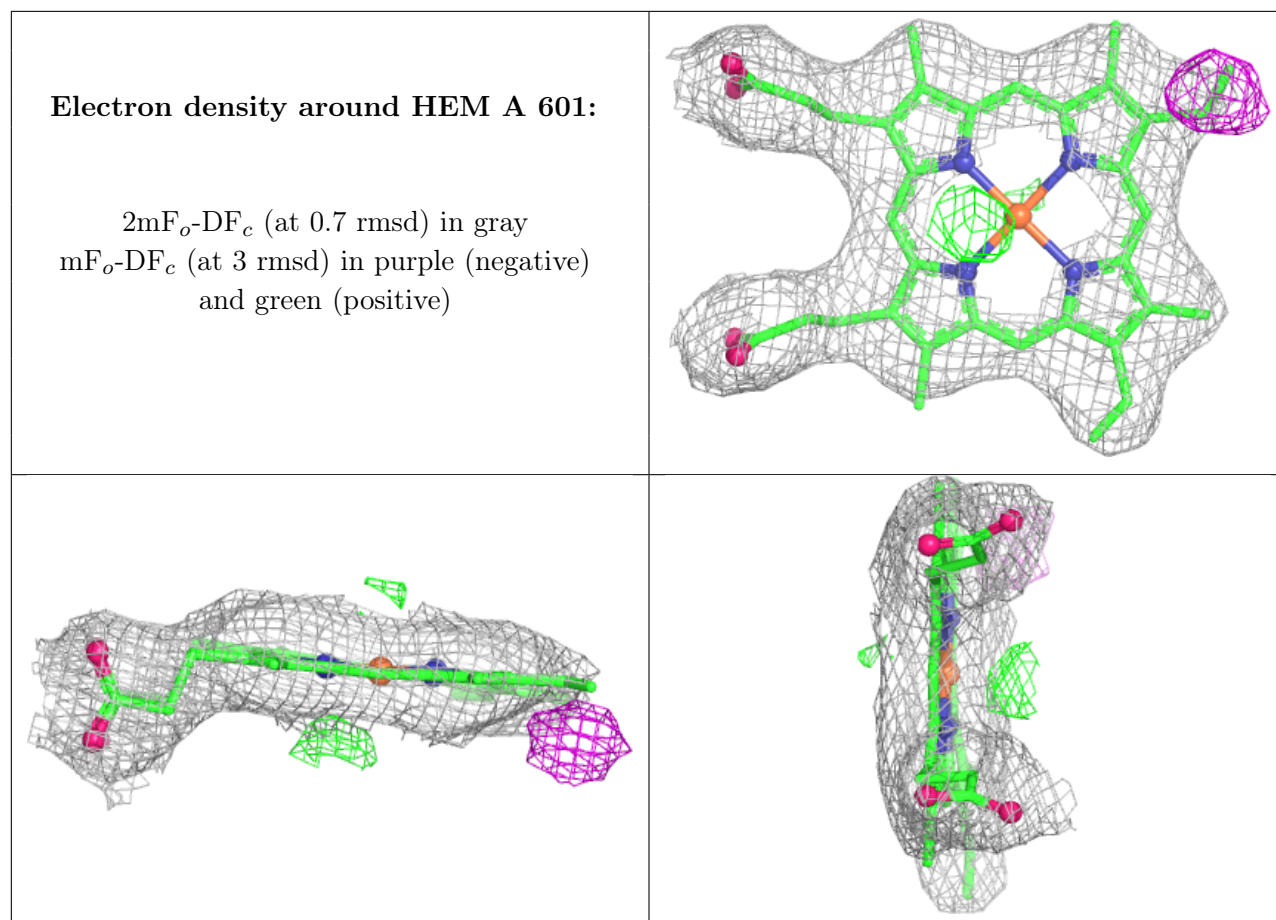
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around HEM B 601:

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





6.5 Other polymers ⓘ

There are no such residues in this entry.