WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 26, 2023 – 08:31 PM EDT

PDB ID	:	3G5N
Title	:	Triple ligand occupancy crystal structure of cytochrome P450 2B4 in complex with the inhibitor 1-biphenyl-4-methyl-1H-imidazole
Authors	:	Gay, S.C.; Sun, L.; Maekawa, K.; Halpert, J.R.; Stout, C.D.
Deposited on	:	2009-02-05
Resolution	:	2.50 Å(reported)

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	:	2.35
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)	:	2.35

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 2.50 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.
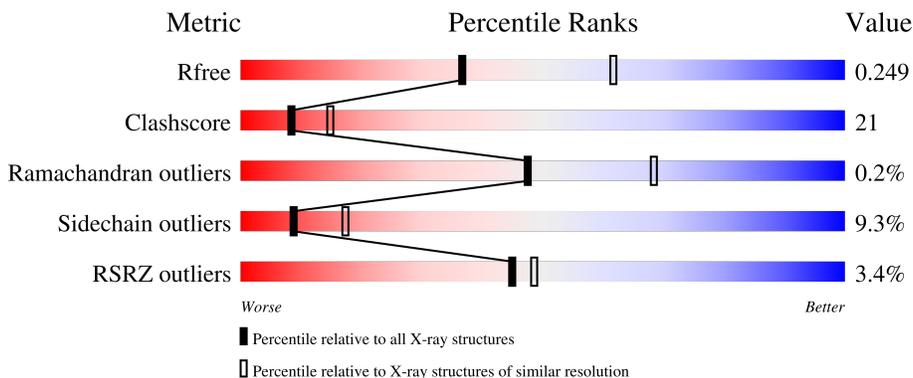
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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 <=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	476	4% 67% 24% 5% •
1	B	476	2% 65% 25% • 5%
1	C	476	5% 61% 29% 5% 5%
1	D	476	3% 64% 27% • 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	PB2	A	503	-	-	X	-
3	PB2	B	502	-	-	X	-
3	PB2	B	503	-	-	X	-
3	PB2	C	502	-	-	X	-
3	PB2	C	503	-	-	X	X
3	PB2	D	502	-	-	X	-
3	PB2	D	503	-	-	X	-

2　Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 14746 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 2B4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	456	Total 3573	C 2310	N 607	O 646	S 10	0	0	0
1	B	451	Total 3511	C 2269	N 596	O 637	S 9	0	1	0
1	C	452	Total 3504	C 2265	N 599	O 631	S 9	0	1	0
1	D	451	Total 3526	C 2277	N 600	O 639	S 10	0	0	0

There are 132 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	21	ALA	GLU	engineered mutation	UNP P00178
A	?	-	PHE	deletion	UNP P00178
A	?	-	SER	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	ALA	deletion	UNP P00178
A	?	-	PHE	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	ALA	deletion	UNP P00178
A	?	-	GLY	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	LEU	deletion	UNP P00178
A	?	-	PHE	deletion	UNP P00178
A	?	-	ARG	deletion	UNP P00178
A	22	LYS	GLY	engineered mutation	UNP P00178

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Chain	Residue	Modelled	Actual	Comment	Reference
A	23	LYS	HIS	engineered mutation	UNP P00178
A	24	THR	PRO	engineered mutation	UNP P00178
A	25	SER	LYS	engineered mutation	UNP P00178
A	26	SER	ALA	engineered mutation	UNP P00178
A	27	LYS	HIS	engineered mutation	UNP P00178
A	29	LYS	ARG	engineered mutation	UNP P00178
A	221	SER	PRO	SEE REMARK 999	UNP P00178
A	226	TYR	HIS	engineered mutation	UNP P00178
A	492	HIS	-	expression tag	UNP P00178
A	493	HIS	-	expression tag	UNP P00178
A	494	HIS	-	expression tag	UNP P00178
A	495	HIS	-	expression tag	UNP P00178
B	21	ALA	GLU	engineered mutation	UNP P00178
B	?	-	PHE	deletion	UNP P00178
B	?	-	SER	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	ALA	deletion	UNP P00178
B	?	-	PHE	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	ALA	deletion	UNP P00178
B	?	-	GLY	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	LEU	deletion	UNP P00178
B	?	-	PHE	deletion	UNP P00178
B	?	-	ARG	deletion	UNP P00178
B	22	LYS	GLY	engineered mutation	UNP P00178
B	23	LYS	HIS	engineered mutation	UNP P00178
B	24	THR	PRO	engineered mutation	UNP P00178
B	25	SER	LYS	engineered mutation	UNP P00178
B	26	SER	ALA	engineered mutation	UNP P00178
B	27	LYS	HIS	engineered mutation	UNP P00178
B	29	LYS	ARG	engineered mutation	UNP P00178
B	221	SER	PRO	SEE REMARK 999	UNP P00178
B	226	TYR	HIS	engineered mutation	UNP P00178
B	492	HIS	-	expression tag	UNP P00178

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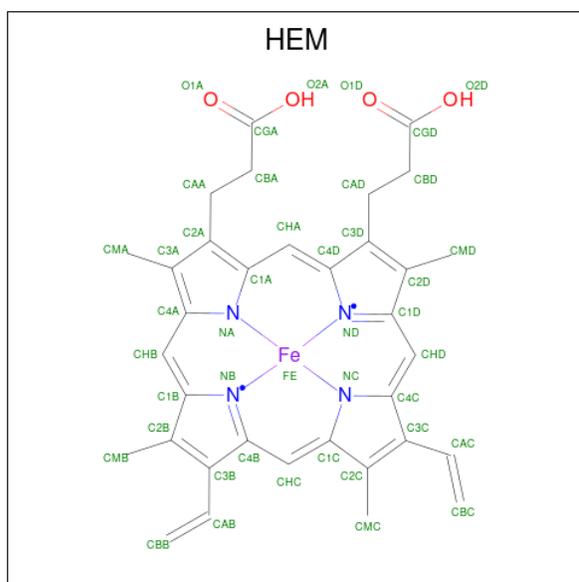
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Chain	Residue	Modelled	Actual	Comment	Reference
B	493	HIS	-	expression tag	UNP P00178
B	494	HIS	-	expression tag	UNP P00178
B	495	HIS	-	expression tag	UNP P00178
C	21	ALA	GLU	engineered mutation	UNP P00178
C	?	-	PHE	deletion	UNP P00178
C	?	-	SER	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	ALA	deletion	UNP P00178
C	?	-	PHE	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	ALA	deletion	UNP P00178
C	?	-	GLY	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	LEU	deletion	UNP P00178
C	?	-	PHE	deletion	UNP P00178
C	?	-	ARG	deletion	UNP P00178
C	22	LYS	GLY	engineered mutation	UNP P00178
C	23	LYS	HIS	engineered mutation	UNP P00178
C	24	THR	PRO	engineered mutation	UNP P00178
C	25	SER	LYS	engineered mutation	UNP P00178
C	26	SER	ALA	engineered mutation	UNP P00178
C	27	LYS	HIS	engineered mutation	UNP P00178
C	29	LYS	ARG	engineered mutation	UNP P00178
C	221	SER	PRO	SEE REMARK 999	UNP P00178
C	226	TYR	HIS	engineered mutation	UNP P00178
C	492	HIS	-	expression tag	UNP P00178
C	493	HIS	-	expression tag	UNP P00178
C	494	HIS	-	expression tag	UNP P00178
C	495	HIS	-	expression tag	UNP P00178
D	21	ALA	GLU	engineered mutation	UNP P00178
D	?	-	PHE	deletion	UNP P00178
D	?	-	SER	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178

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Chain	Residue	Modelled	Actual	Comment	Reference
D	?	-	LEU	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	ALA	deletion	UNP P00178
D	?	-	PHE	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	ALA	deletion	UNP P00178
D	?	-	GLY	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	LEU	deletion	UNP P00178
D	?	-	PHE	deletion	UNP P00178
D	?	-	ARG	deletion	UNP P00178
D	22	LYS	GLY	engineered mutation	UNP P00178
D	23	LYS	HIS	engineered mutation	UNP P00178
D	24	THR	PRO	engineered mutation	UNP P00178
D	25	SER	LYS	engineered mutation	UNP P00178
D	26	SER	ALA	engineered mutation	UNP P00178
D	27	LYS	HIS	engineered mutation	UNP P00178
D	29	LYS	ARG	engineered mutation	UNP P00178
D	221	SER	PRO	SEE REMARK 999	UNP P00178
D	226	TYR	HIS	engineered mutation	UNP P00178
D	492	HIS	-	expression tag	UNP P00178
D	493	HIS	-	expression tag	UNP P00178
D	494	HIS	-	expression tag	UNP P00178
D	495	HIS	-	expression tag	UNP P00178

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

HEM

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

- Molecule 3 is 1-(biphenyl-4-ylmethyl)-1H-imidazole (three-letter code: PB2) (formula: $C_{16}H_{14}N_2$).

PB2
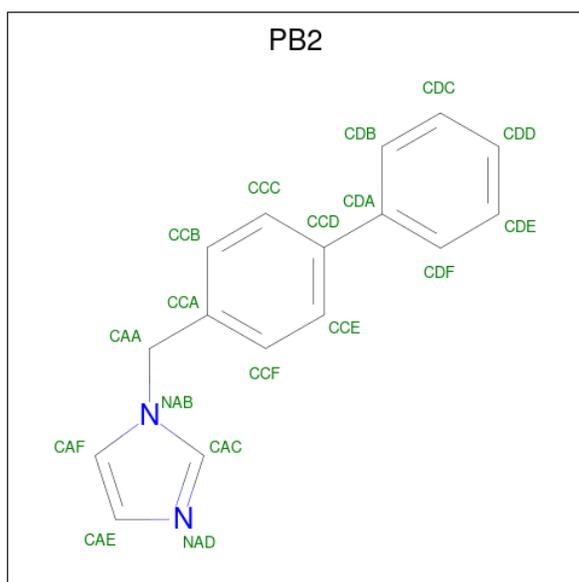
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total 18	C 16	N 2	0	0
3	A	1	Total 12	C 12		0	0
3	B	1	Total 18	C 16	N 2	0	0
3	B	1	Total 18	C 16	N 2	0	0
3	B	1	Total 18	C 16	N 2	0	0
3	B	1	Total 12	C 12		0	0
3	C	1	Total 18	C 16	N 2	0	0
3	C	1	Total 18	C 16	N 2	0	0
3	C	1	Total 12	C 12		0	0
3	D	1	Total 18	C 16	N 2	0	0
3	D	1	Total 18	C 16	N 2	0	0
3	D	1	Total 12	C 12		0	0

- Molecule 4 is 5-CYCLOHEXYL-1-PENTYL-BETA-D-MALTOSIDE (three-letter code: CM5) (formula: $C_{23}H_{42}O_{11}$).

CM5
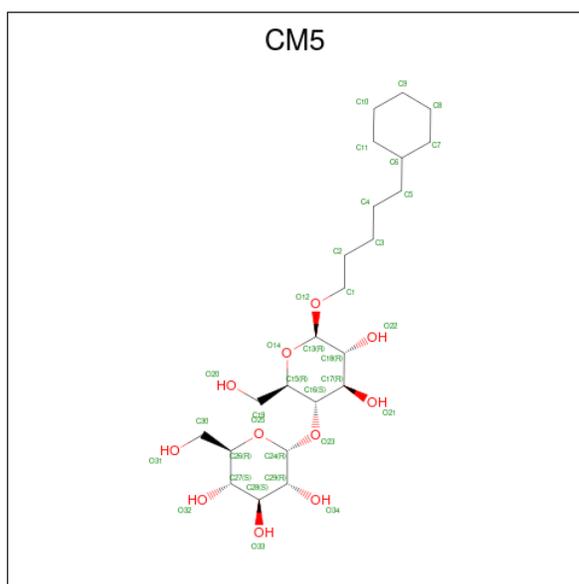
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total 22	C 17	O 5	0	0
4	B	1	Total 22	C 17	O 5	0	0
4	C	1	Total 22	C 17	O 5	0	0
4	D	1	Total 22	C 17	O 5	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	56	Total 56	O 56	0	0
5	B	40	Total 40	O 40	0	0
5	C	30	Total 30	O 30	0	0
5	D	54	Total 54	O 54	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: Cytochrome P450 2B4

- Molecule 1: Cytochrome P450 2B4

I468 T471 P472 R473 E474 S475 G476 V477 R487 F488 R491 H492 HIS HIS HIS

• Molecule 1: Cytochrome P450 2B4

Chain C:

MET ALA LYS LYS THR SER S26 K27 N42 L43 L44 Q45 M46 D47 R48 K49 R53 S54 F55 L58 V68 Y69 L70 R73 P74 V75 V76 V77 L78 G97 R98 G99 K100 I107 Y111 R120 F127 S128 L129 A130 T131 M132 R133 D134 PHE GLY MET GLY K139 R140

S141 V142 E143 E144 R145 I146 Q147 E148 E149 A150 L153 E156 L157 R158 K159 S160 L164 L165 L169 L170 I174 T175 I178 S181 I182 V183 F188 D189 Y190 K191 D192 P193 V194 F195 L196 R197 L198 L199 D200 L201 F202 F203 Q204 S211 F212 Q215 L224 K225 Y226

F227 T230 H231 R232 Q233 R236 N237 L238 I241 F244 S248 K251 H252 R253 A254 T255 L256 D257 P258 S259 N260 P261 R262 D263 F264 I265 D266 V267 Y268 L269 L270 R271 M272 E273 LYS ASP LYS SER ASP PRO SER GLU PHE HIS H285 Q286 N287 L288 I289 L290 T291 V292 L293

S294 L295 F296 F297 A298 G299 T300 E301 R308 L313 M314 L315 K316 Y317 V320 R323 V324 E327 I328 E329 Q330 V331 I332 G333 P338 D341 D342 R343 M346 P347 Y348 V352 I356 L359 P368 H369 T370 V388 F408 N409 P410 G411 L414 D415 A416

N417 G418 S430 E439 R443 T444 E445 F449 F450 T451 T452 I453 L454 S458 I459 A460 S461 P464 P465 E466 D467 I468 D469 L470 T471 P472 S475 G476 V477 G478 N479 V480 P481 I486 R487 F488 L489 A490 R491 H492 HIS HIS HIS

• Molecule 1: Cytochrome P450 2B4

Chain D:

MET ALA LYS LYS THR SER SER LYS G28 L37 N42 L43 L44 Q45 M46 D47 R48 K49 G50 L51 L52 F55 L56 R57 K61 V68 Y69 L70 R73 P74 V75 L78 C79 G97 V104 Y111 F127 S128 L129 D134 F135 GLY MET GLY LYS R140 S141

R145 A150 V154 E155 E156 L157 R158 L164 L165 L169 L170 I174 T175 I178 S181 I182 V183 Y190 K191 D192 P193 V194 F195 L196 R197 L198 L199 D200 L201 Q204 S211 Q215 V216 F217 E218 L219 F220 S221 G222 F223 L224 K225 Y226 F227 P228 G229 T230 Q233

I234 N237 L238 I241 F244 I245 S248 H252 R253 A254 T255 L256 D257 P258 S259 N260 P261 R262 D263 F264 I265 D266 V267 Y268 L269 L270 R271 M272 E273 LYS ASP LYS SER ASP PRO SER SER GLU PHE H284 H285 Q286 N287 L288 I289 L290 L293 S294 L295 F296 F297 A298 G299

T303 L307 R308 L315 V320 R323 V324 S334 D341 Y348 V352 T370 K384 N385 T386 E387 V388 F389 D398 P399 R400 T404 T407 F429 S430 C436 E439 A442 R443 T444 E445 L446 F449 F450 T451 T452 F457 S458 I459 A460 S461

P462 V463 P464 P465 T471 P472 R473 E474 S475 G476 V477 V480 P481 R491 H492 HIS HIS HIS

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	86.70Å 152.53Å 181.90Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.48 – 2.50 45.48 – 2.50	Depositor EDS
% Data completeness (in resolution range)	97.0 (45.48-2.50) 97.0 (45.48-2.50)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	0.08	Depositor
$< I/\sigma(I) >$ [1]	1.79 (at 2.51Å)	Xtriage
Refinement program	PHENIX (phenix.refine)	Depositor
R, R_{free}	0.218 , 0.247 0.222 , 0.249	Depositor DCC
R_{free} test set	4089 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	56.1	Xtriage
Anisotropy	0.010	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 52.6	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	14746	wwPDB-VP
Average B, all atoms (Å^2)	62.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.54% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: PB2, HEM, CM5

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	2/3661 (0.1%)	0.92	3/4974 (0.1%)
1	B	0.90	1/3598 (0.0%)	0.86	2/4893 (0.0%)
1	C	0.90	2/3592 (0.1%)	0.91	4/4888 (0.1%)
1	D	0.90	2/3613 (0.1%)	0.88	3/4912 (0.1%)
All	All	0.91	7/14464 (0.0%)	0.89	12/19667 (0.1%)

The worst 5 of 7 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	75	VAL	CB-CG1	-5.96	1.40	1.52
1	D	79	CYS	CB-SG	-5.94	1.72	1.81
1	A	388	VAL	CB-CG1	-5.76	1.40	1.52
1	B	388	VAL	CB-CG1	-5.56	1.41	1.52
1	C	388	VAL	CB-CG1	-5.25	1.41	1.52

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	111	TYR	N-CA-C	-5.81	95.32	111.00
1	D	198	LEU	CA-CB-CG	5.74	128.50	115.30
1	C	98	ARG	NE-CZ-NH1	-5.70	117.45	120.30
1	D	111	TYR	N-CA-C	-5.68	95.67	111.00
1	C	443	ARG	NE-CZ-NH2	-5.66	117.47	120.30

There are no chirality outliers.

There are no planarity outliers.

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	3573	0	3494	146	0
1	B	3511	0	3429	139	0
1	C	3504	0	3407	183	0
1	D	3526	0	3440	139	0
2	A	43	0	30	9	0
2	B	43	0	30	11	0
2	C	43	0	30	5	0
2	D	43	0	30	12	0
3	A	30	0	23	11	0
3	B	66	0	51	22	0
3	C	48	0	37	19	0
3	D	48	0	37	18	0
4	A	22	0	30	1	0
4	B	22	0	30	4	0
4	C	22	0	30	7	0
4	D	22	0	30	1	0
5	A	56	0	0	3	0
5	B	40	0	0	6	0
5	C	30	0	0	0	0
5	D	54	0	0	3	0
All	All	14746	0	14158	600	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 21.

The worst 5 of 600 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:C:141:SER:OG	1:C:144:GLU:HG3	1.33	1.26
1:B:56:LEU:HD12	1:B:56:LEU:O	1.35	1.21
1:C:164:LEU:HD23	1:C:487:ARG:CG	1.72	1.19
1:A:141:SER:OG	1:A:144:GLU:HG3	1.42	1.19
1:C:327:GLU:O	1:C:331:VAL:HG23	1.43	1.18

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	450/476 (94%)	427 (95%)	21 (5%)	2 (0%)	34	54
1	B	446/476 (94%)	417 (94%)	29 (6%)	0	100	100
1	C	447/476 (94%)	418 (94%)	27 (6%)	2 (0%)	34	54
1	D	445/476 (94%)	417 (94%)	28 (6%)	0	100	100
All	All	1788/1904 (94%)	1679 (94%)	105 (6%)	4 (0%)	47	68

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	477	VAL
1	C	286	GLN
1	C	261	PRO
1	A	261	PRO

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	381/421 (90%)	344 (90%)	37 (10%)	8	16
1	B	372/421 (88%)	336 (90%)	36 (10%)	8	16
1	C	368/421 (87%)	335 (91%)	33 (9%)	9	19
1	D	376/421 (89%)	343 (91%)	33 (9%)	10	19
All	All	1497/1684 (89%)	1358 (91%)	139 (9%)	9	17

5 of 139 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	127	PHE
1	D	158	ARG
1	D	290	LEU
1	B	129	LEU
1	B	128	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	319	HIS
1	D	233	GLN
1	B	456	ASN
1	D	287	ASN
1	C	287	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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

20 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	PB2	D	503	-	12,13,20	1.86	5 (41%)	12,16,26	1.15	1 (8%)
3	PB2	C	502	-	18,20,20	1.89	6 (33%)	20,26,26	0.92	0
3	PB2	B	502	-	18,20,20	1.87	6 (33%)	20,26,26	0.97	1 (5%)
4	CM5	D	504	-	23,23,36	0.52	0	28,29,49	2.36	9 (32%)
2	HEM	D	500	3,1	41,50,50	2.10	9 (21%)	45,82,82	1.59	8 (17%)
3	PB2	C	503	-	12,13,20	1.80	4 (33%)	12,16,26	1.58	2 (16%)
3	PB2	D	501	2	18,20,20	2.02	8 (44%)	20,26,26	1.36	3 (15%)
4	CM5	C	504	-	23,23,36	0.48	0	28,29,49	1.66	4 (14%)
4	CM5	B	504	-	23,23,36	0.54	0	28,29,49	2.09	9 (32%)
3	PB2	C	501	2	18,20,20	1.91	8 (44%)	20,26,26	1.14	1 (5%)
2	HEM	A	500	3,1	41,50,50	2.11	10 (24%)	45,82,82	1.63	9 (20%)
4	CM5	A	504	-	23,23,36	0.49	0	28,29,49	2.06	9 (32%)
2	HEM	C	500	3,1	41,50,50	2.28	11 (26%)	45,82,82	1.62	8 (17%)
3	PB2	D	502	-	18,20,20	1.81	8 (44%)	20,26,26	0.60	0
3	PB2	A	501	2	18,20,20	2.00	9 (50%)	20,26,26	0.68	0
2	HEM	B	500	3,1	41,50,50	2.11	11 (26%)	45,82,82	1.45	6 (13%)
3	PB2	B	503	-	12,13,20	1.78	3 (25%)	12,16,26	1.18	2 (16%)
3	PB2	A	503	-	12,13,20	1.77	3 (25%)	12,16,26	0.97	0
3	PB2	B	501	2	18,20,20	2.20	8 (44%)	20,26,26	0.90	2 (10%)
3	PB2	B	496	-	18,20,20	1.88	9 (50%)	20,26,26	1.23	2 (10%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PB2	D	503	-	-	0/0/4/8	0/2/2/3
3	PB2	C	502	-	-	1/4/8/8	0/3/3/3
3	PB2	B	502	-	-	0/4/8/8	0/3/3/3
4	CM5	D	504	-	-	5/11/35/65	0/2/2/3
2	HEM	D	500	3,1	-	6/12/54/54	-
3	PB2	C	503	-	-	0/0/4/8	0/2/2/3
3	PB2	D	501	2	-	0/4/8/8	0/3/3/3
4	CM5	C	504	-	-	7/11/35/65	1/2/2/3
4	CM5	B	504	-	-	8/11/35/65	0/2/2/3
3	PB2	C	501	2	-	0/4/8/8	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEM	A	500	3,1	-	6/12/54/54	-
4	CM5	A	504	-	-	8/11/35/65	0/2/2/3
2	HEM	C	500	3,1	-	2/12/54/54	-
3	PB2	D	502	-	-	0/4/8/8	0/3/3/3
3	PB2	A	501	2	-	0/4/8/8	0/3/3/3
2	HEM	B	500	3,1	-	4/12/54/54	-
3	PB2	B	503	-	-	0/0/4/8	0/2/2/3
3	PB2	A	503	-	-	0/0/4/8	0/2/2/3
3	PB2	B	501	2	-	0/4/8/8	0/3/3/3
3	PB2	B	496	-	-	2/4/8/8	0/3/3/3

The worst 5 of 118 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	500	HEM	C3C-C2C	-8.61	1.28	1.40
2	C	500	HEM	C3C-C2C	-8.35	1.28	1.40
2	D	500	HEM	C3C-C2C	-7.87	1.29	1.40
2	B	500	HEM	C3C-C2C	-7.69	1.29	1.40
2	D	500	HEM	C3D-C2D	6.50	1.50	1.36

The worst 5 of 76 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	D	504	CM5	C13-O14-C15	-7.07	105.30	113.13
4	B	504	CM5	C13-O14-C15	-4.86	107.75	113.13
4	A	504	CM5	C13-O14-C15	-4.54	108.11	113.13
4	A	504	CM5	C1-O12-C13	-4.53	106.33	113.84
4	A	504	CM5	O14-C15-C19	4.51	114.06	106.83

There are no chirality outliers.

5 of 49 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	504	CM5	C18-C13-O12-C1
4	A	504	CM5	O14-C13-O12-C1
4	A	504	CM5	O14-C15-C19-O20
4	A	504	CM5	C16-C15-C19-O20
4	B	504	CM5	C2-C1-O12-C13

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	504	CM5	C13-C15-C16-C17-C18-O14

19 monomers are involved in 115 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	503	PB2	10	0
3	C	502	PB2	13	0
3	B	502	PB2	10	0
4	D	504	CM5	1	0
2	D	500	HEM	12	0
3	C	503	PB2	10	0
3	D	501	PB2	2	0
4	C	504	CM5	7	0
4	B	504	CM5	4	0
3	C	501	PB2	1	0
2	A	500	HEM	9	0
4	A	504	CM5	1	0
2	C	500	HEM	5	0
3	D	502	PB2	7	0
2	B	500	HEM	11	0
3	B	503	PB2	7	0
3	A	503	PB2	11	0
3	B	501	PB2	2	0
3	B	496	PB2	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 then 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.

Ligand CM5 D 504

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM D 500

Bond lengths

Bond angles

Torsions

Rings

Ligand CM5 C 504

Bond lengths

Bond angles

Torsions

Rings

Ligand CM5 B 504

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM A 500

Bond lengths

Bond angles

Torsions

Rings

Ligand CM5 A 504

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM C 500

Bond lengths

Bond angles

Torsions

Rings

Ligand HEM B 500

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	456/476 (95%)	0.06	17 (3%)	41	45	34, 59, 97, 128	0
1	B	451/476 (94%)	-0.00	8 (1%)	68	71	27, 61, 98, 125	0
1	C	452/476 (94%)	0.14	22 (4%)	29	31	31, 62, 100, 123	0
1	D	451/476 (94%)	0.04	14 (3%)	49	52	27, 60, 96, 121	0
All	All	1810/1904 (95%)	0.06	61 (3%)	45	48	27, 61, 98, 128	0

The worst 5 of 61 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	475	SER	6.7
1	C	416	ALA	6.2
1	A	283	PHE	5.9
1	C	130	ALA	4.9
1	C	26	SER	4.8

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 monosaccharides 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
3	PB2	C	503	12/18	0.78	0.40	57,66,72,72	12
3	PB2	D	503	12/18	0.82	0.44	62,69,83,85	12
4	CM5	B	504	22/34	0.86	0.34	20,20,20,20	0
4	CM5	C	504	22/34	0.86	0.45	20,20,20,20	0
3	PB2	A	503	12/18	0.87	0.36	53,63,77,78	12
4	CM5	A	504	22/34	0.88	0.28	20,20,20,20	0
3	PB2	B	503	12/18	0.90	0.24	61,73,81,85	12
3	PB2	C	502	18/18	0.91	0.29	54,78,87,89	0
4	CM5	D	504	22/34	0.91	0.37	20,20,20,20	0
3	PB2	D	502	18/18	0.93	0.17	43,65,73,74	0
3	PB2	B	502	18/18	0.94	0.18	53,68,82,87	0
3	PB2	B	496	18/18	0.95	0.21	53,60,74,76	0
3	PB2	C	501	18/18	0.97	0.15	30,46,52,52	0
2	HEM	C	500	43/43	0.98	0.14	32,51,61,66	0
2	HEM	D	500	43/43	0.98	0.17	36,51,59,63	0
3	PB2	B	501	18/18	0.98	0.16	30,40,46,51	0
3	PB2	D	501	18/18	0.98	0.19	27,39,50,51	0
2	HEM	A	500	43/43	0.98	0.13	31,42,51,63	0
3	PB2	A	501	18/18	0.99	0.15	32,35,47,49	0
2	HEM	B	500	43/43	0.99	0.13	31,43,58,63	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.
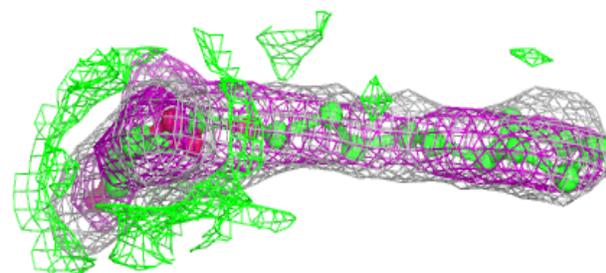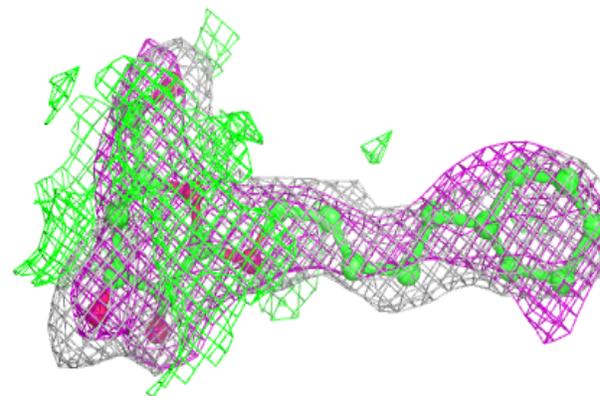
Electron density around CM5 B 504:

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

Electron density around CM5 C 504:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
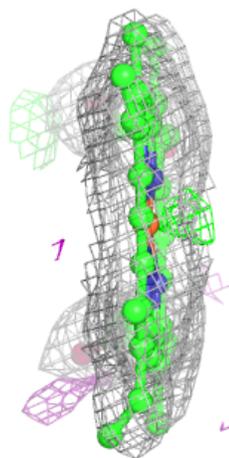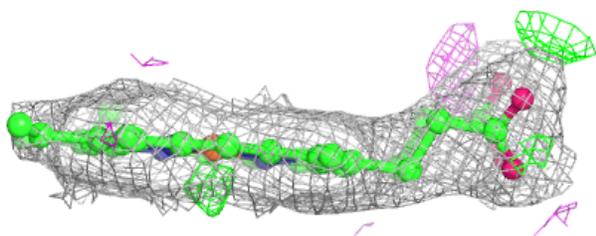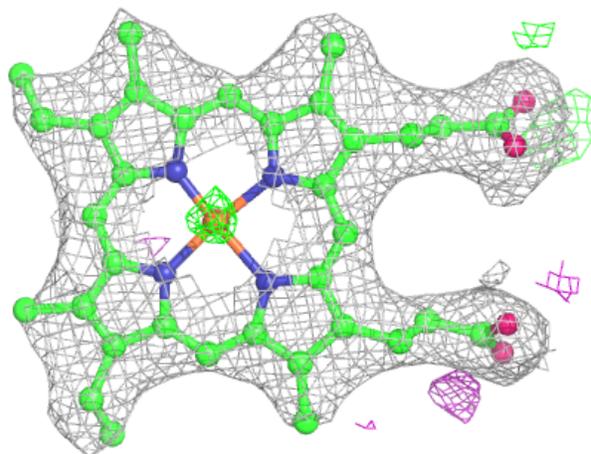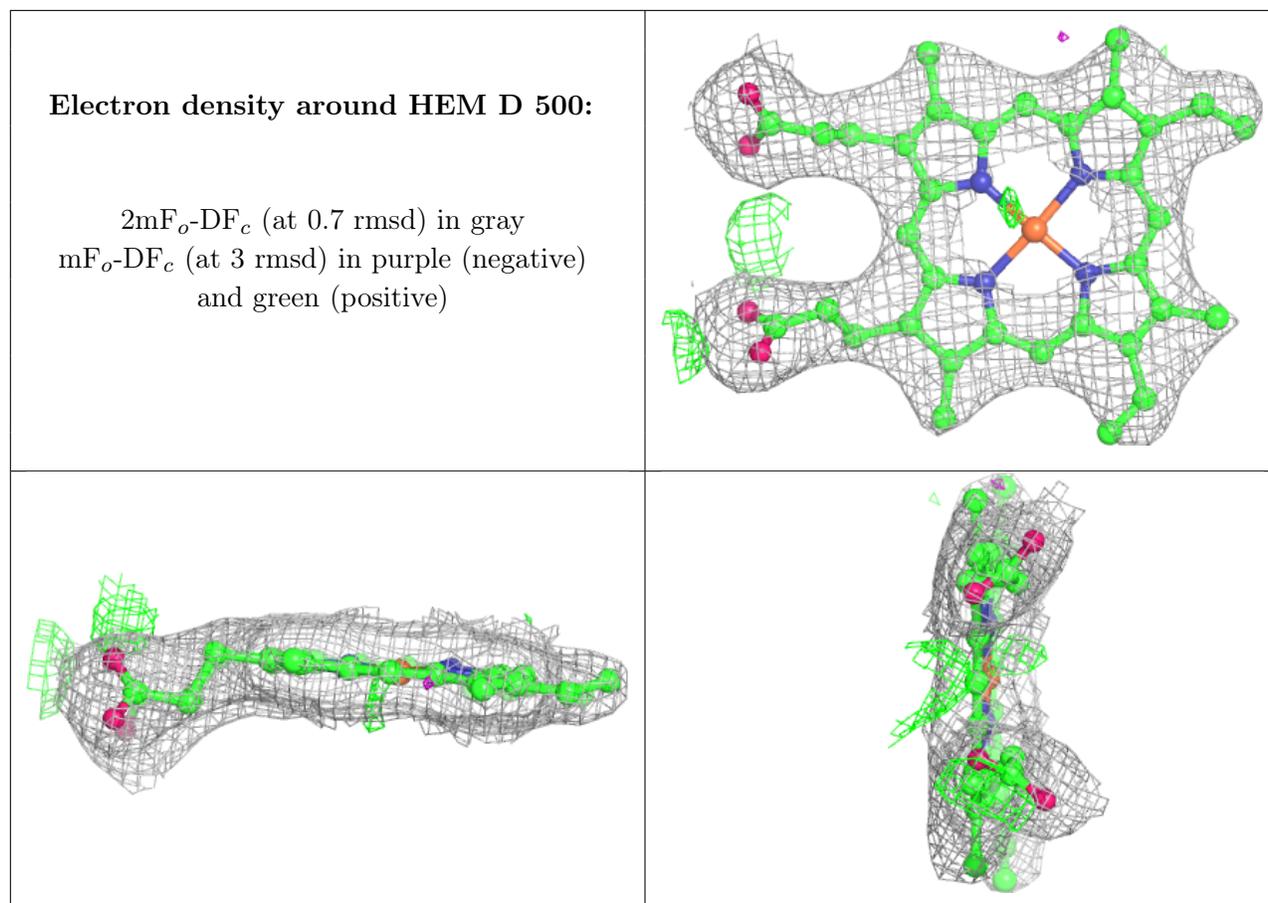$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
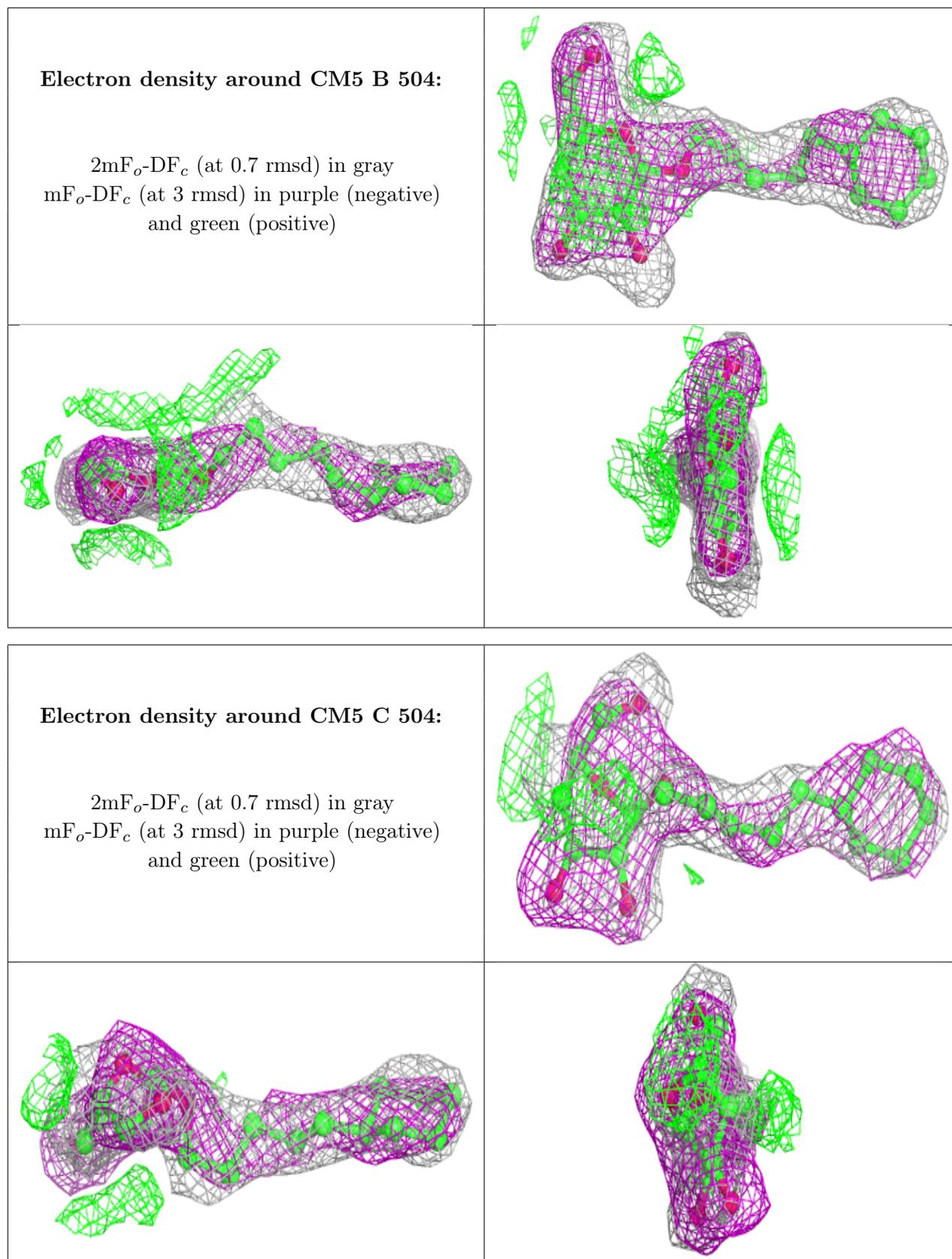
Electron density around CM5 A 504:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
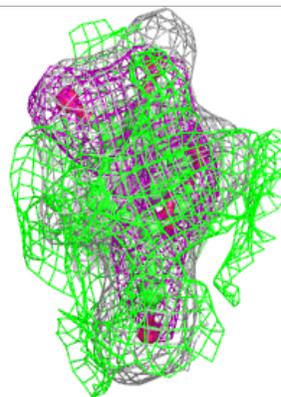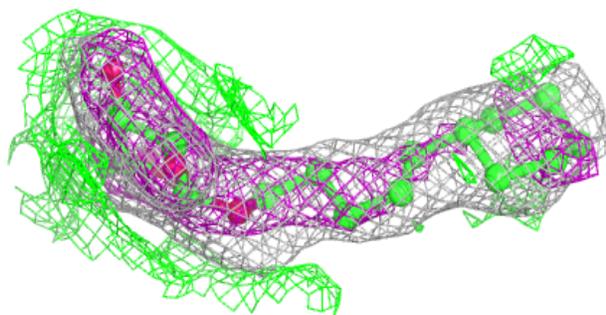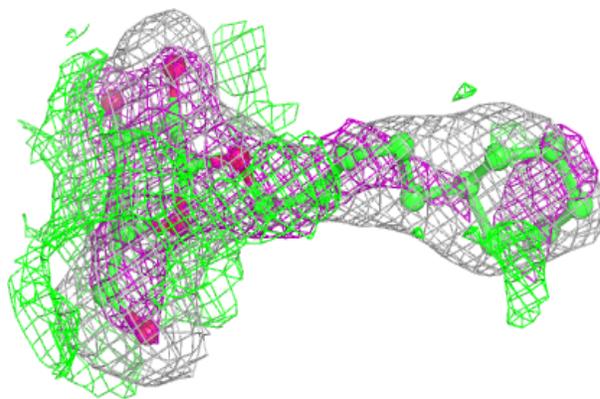
Electron density around CM5 D 504:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
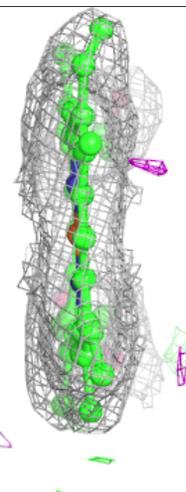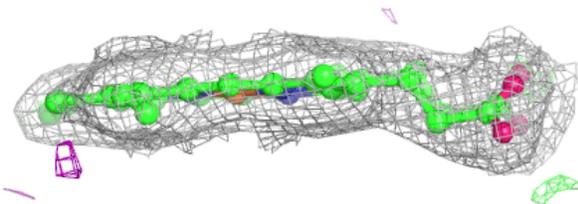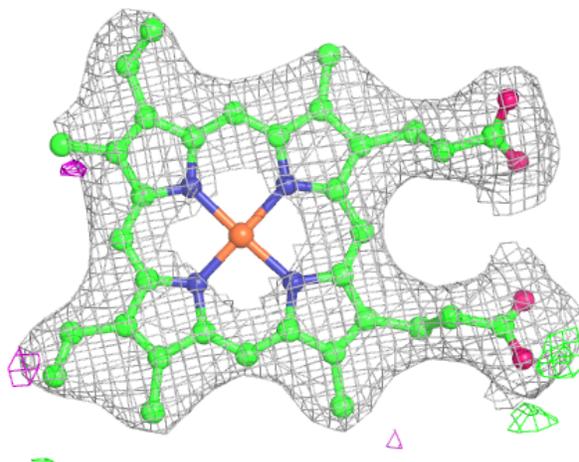and green (positive)
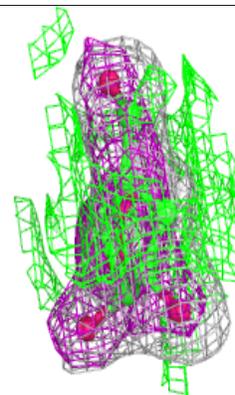
Electron density around HEM C 500:

$2mF_o$-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 D 500:

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

Electron density around HEM A 500:

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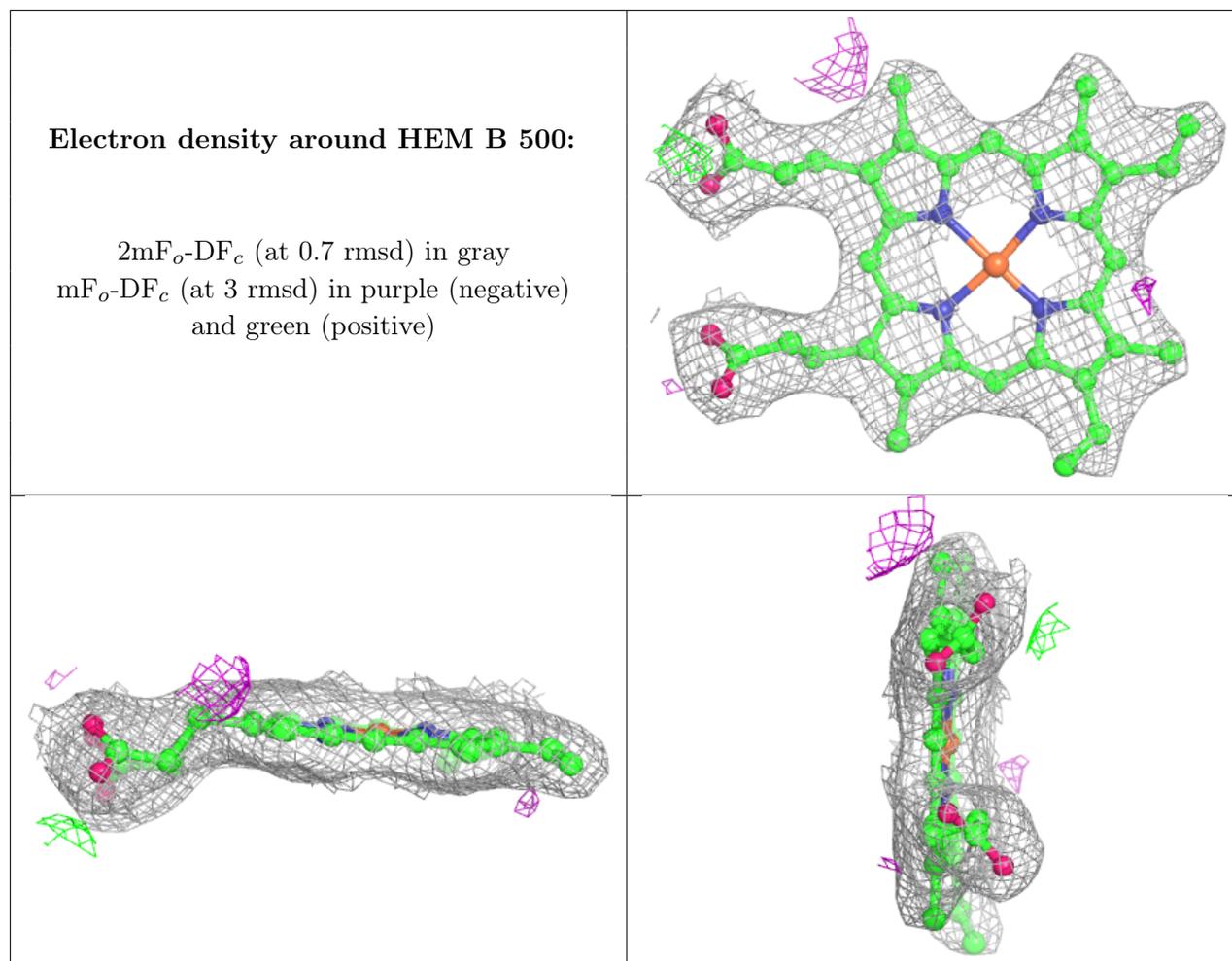mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around HEM B 500:

$2mF_o$-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.