Full wwPDB X-ray Structure Validation Report ⓘ

Nov 17, 2025 – 07:27 PM JST

PDB ID	:	9KP3 / pdb_00009kp3
Title	:	Ligand binding domain of Pseudomonas Aeruginosa PAO1 chemoreceptor TlpQ in complex with MHF
Authors	:	Songying, O.; Yanbo, Z.; Lei, Z.; Xinyu, Q.
Deposited on	:	2024-11-22
Resolution	:	2.74 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:

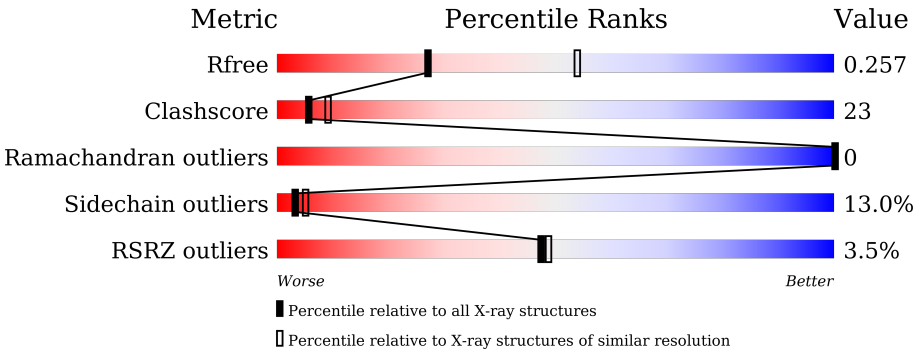
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.74 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}	164625	1649 (2.76-2.72)
Clashscore	180529	1744 (2.76-2.72)
Ramachandran outliers	177936	1710 (2.76-2.72)
Sidechain outliers	177891	1711 (2.76-2.72)
RSRZ outliers	164620	1649 (2.76-2.72)

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	360	3% 42% 30% 7% • 21%
1	B	360	2% 41% 31% 7% • 21%

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	4XX	B	401	-	-	X	-

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 4568 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 Chemotaxis transducer.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	286	Total	C	N	O	S	0	0	0
			2206	1397	380	423	6			
1	B	286	Total	C	N	O	S	0	0	0
			2207	1400	381	420	6			

There are 58 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	4	HIS	-	expression tag	UNP A0A2U2Y0U1
A	5	HIS	-	expression tag	UNP A0A2U2Y0U1
A	6	HIS	-	expression tag	UNP A0A2U2Y0U1
A	7	HIS	-	expression tag	UNP A0A2U2Y0U1
A	8	HIS	-	expression tag	UNP A0A2U2Y0U1
A	9	HIS	-	expression tag	UNP A0A2U2Y0U1
A	10	SER	-	expression tag	UNP A0A2U2Y0U1
A	11	SER	-	expression tag	UNP A0A2U2Y0U1
A	12	GLY	-	expression tag	UNP A0A2U2Y0U1
A	13	LEU	-	expression tag	UNP A0A2U2Y0U1
A	14	VAL	-	expression tag	UNP A0A2U2Y0U1
A	15	PRO	-	expression tag	UNP A0A2U2Y0U1
A	16	ARG	-	expression tag	UNP A0A2U2Y0U1
A	17	GLY	-	expression tag	UNP A0A2U2Y0U1
A	18	SER	-	expression tag	UNP A0A2U2Y0U1
A	19	HIS	-	expression tag	UNP A0A2U2Y0U1
A	20	MET	-	expression tag	UNP A0A2U2Y0U1
A	21	ALA	-	expression tag	UNP A0A2U2Y0U1
A	22	SER	-	expression tag	UNP A0A2U2Y0U1
A	23	MET	-	expression tag	UNP A0A2U2Y0U1
A	24	THR	-	expression tag	UNP A0A2U2Y0U1
A	25	GLY	-	expression tag	UNP A0A2U2Y0U1
A	26	GLY	-	expression tag	UNP A0A2U2Y0U1
A	27	GLN	-	expression tag	UNP A0A2U2Y0U1
A	28	GLN	-	expression tag	UNP A0A2U2Y0U1

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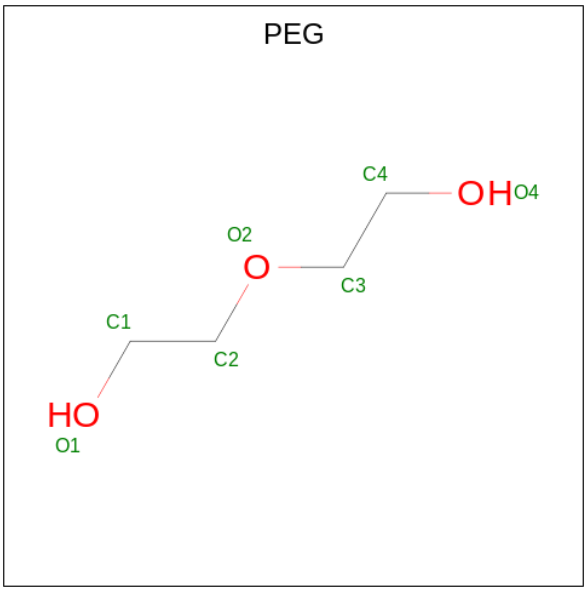
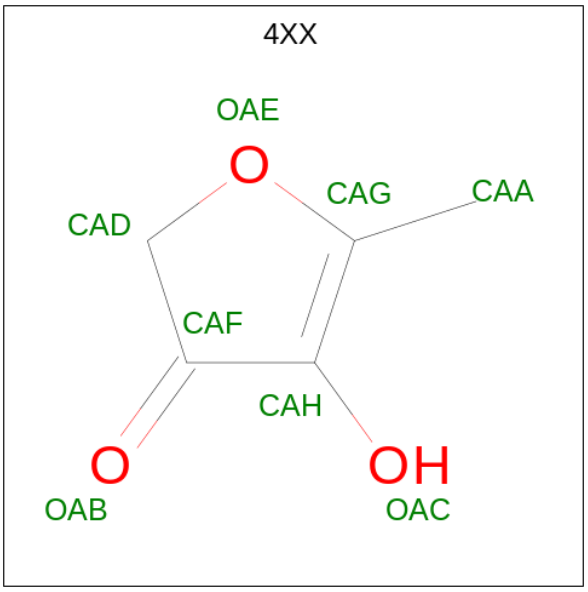
Chain	Residue	Modelled	Actual	Comment	Reference
A	29	MET	-	expression tag	UNP A0A2U2Y0U1
A	30	GLY	-	expression tag	UNP A0A2U2Y0U1
A	31	ARG	-	expression tag	UNP A0A2U2Y0U1
A	32	GLY	-	expression tag	UNP A0A2U2Y0U1
B	4	HIS	-	expression tag	UNP A0A2U2Y0U1
B	5	HIS	-	expression tag	UNP A0A2U2Y0U1
B	6	HIS	-	expression tag	UNP A0A2U2Y0U1
B	7	HIS	-	expression tag	UNP A0A2U2Y0U1
B	8	HIS	-	expression tag	UNP A0A2U2Y0U1
B	9	HIS	-	expression tag	UNP A0A2U2Y0U1
B	10	SER	-	expression tag	UNP A0A2U2Y0U1
B	11	SER	-	expression tag	UNP A0A2U2Y0U1
B	12	GLY	-	expression tag	UNP A0A2U2Y0U1
B	13	LEU	-	expression tag	UNP A0A2U2Y0U1
B	14	VAL	-	expression tag	UNP A0A2U2Y0U1
B	15	PRO	-	expression tag	UNP A0A2U2Y0U1
B	16	ARG	-	expression tag	UNP A0A2U2Y0U1
B	17	GLY	-	expression tag	UNP A0A2U2Y0U1
B	18	SER	-	expression tag	UNP A0A2U2Y0U1
B	19	HIS	-	expression tag	UNP A0A2U2Y0U1
B	20	MET	-	expression tag	UNP A0A2U2Y0U1
B	21	ALA	-	expression tag	UNP A0A2U2Y0U1
B	22	SER	-	expression tag	UNP A0A2U2Y0U1
B	23	MET	-	expression tag	UNP A0A2U2Y0U1
B	24	THR	-	expression tag	UNP A0A2U2Y0U1
B	25	GLY	-	expression tag	UNP A0A2U2Y0U1
B	26	GLY	-	expression tag	UNP A0A2U2Y0U1
B	27	GLN	-	expression tag	UNP A0A2U2Y0U1
B	28	GLN	-	expression tag	UNP A0A2U2Y0U1
B	29	MET	-	expression tag	UNP A0A2U2Y0U1
B	30	GLY	-	expression tag	UNP A0A2U2Y0U1
B	31	ARG	-	expression tag	UNP A0A2U2Y0U1
B	32	GLY	-	expression tag	UNP A0A2U2Y0U1

- Molecule 2 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			7	4	3		

- Molecule 3 is 4-hydroxy-5-methylfuran-3(2H)-one (CCD ID: 4XX) (formula: $C_5H_6O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			8	5	3		

- Molecule 4 is water.

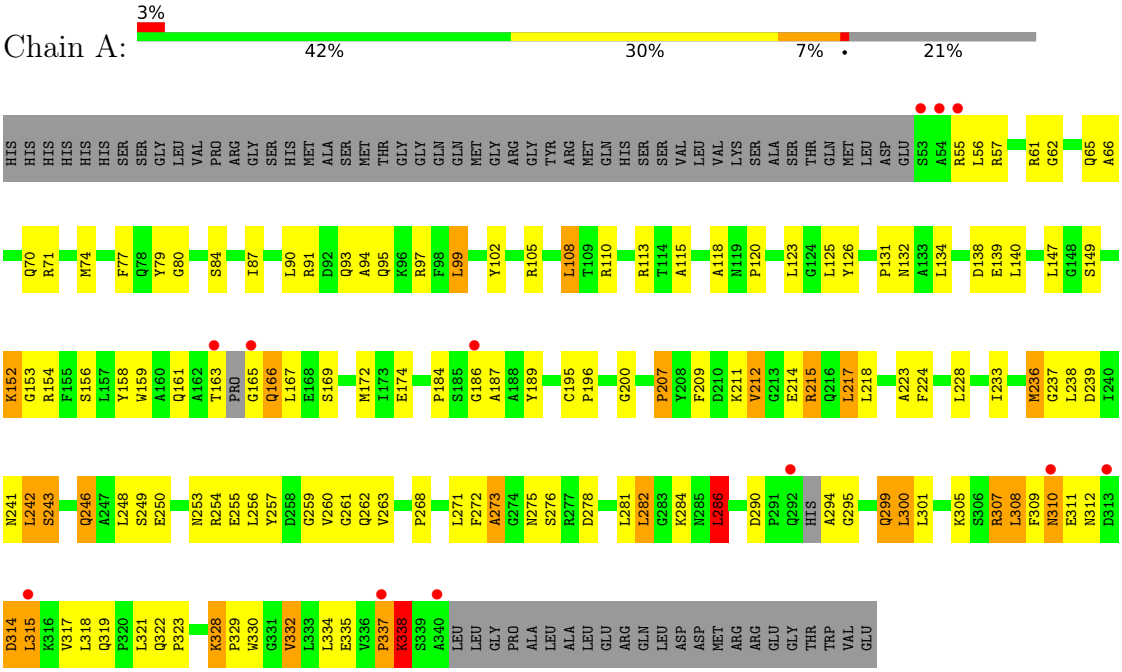
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	67	Total O 67 67	0	0
4	B	73	Total O 73 73	0	0

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.

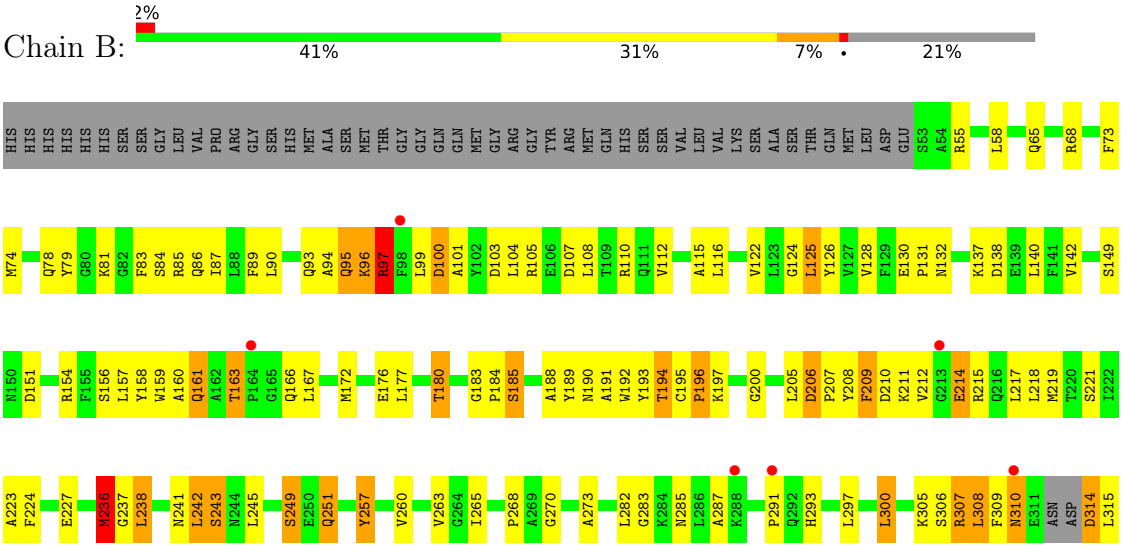
• Molecule 1: Chemotaxis transducer

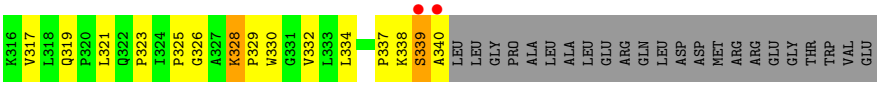
Chain A:



• Molecule 1: Chemotaxis transducer

Chain B:




K316
V317
L318
Q319
P320
L321
Q322
P323
I324
P325
G326
A327
K328
P329
W330
G331
V332
L333
L334
P337
K338
S339
A340
LEU
LEU
GLY
PRO
ALA
LEU
ALA
LEU
GLU
ARG
GLN
LEU
ASP
ASP
MET
ARG
ARG
GLU
GLY
THR
TRP
VAL
GLU

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	48.80Å 124.91Å 58.34Å 90.00° 99.41° 90.00°	Depositor
Resolution (Å)	40.31 – 2.74 40.31 – 2.74	Depositor EDS
% Data completeness (in resolution range)	96.2 (40.31-2.74) 95.8 (40.31-2.74)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.88 (at 2.73Å)	Xtriage
Refinement program	PHENIX v1.18.2-3874	Depositor
R, R_{free}	0.222 , 0.259 0.222 , 0.257	Depositor DCC
R_{free} test set	1818 reflections (10.01%)	wwPDB-VP
Wilson B-factor (Å^2)	27.4	Xtriage
Anisotropy	0.002	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 45.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.89	EDS
Total number of atoms	4568	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.64% of the height of the origin peak. No significant pseudotranslation is detected.*

[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: 4XX, PEG

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	1.01	3/2245 (0.1%)	1.40	16/3034 (0.5%)
1	B	1.06	8/2249 (0.4%)	1.38	15/3042 (0.5%)
All	All	1.04	11/4494 (0.2%)	1.39	31/6076 (0.5%)

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

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

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	323	PRO	C-O	-8.06	1.14	1.24
1	A	189	TYR	C-O	-7.70	1.14	1.24
1	B	251	GLN	C-O	-6.44	1.16	1.24
1	A	184	PRO	C-O	-6.36	1.16	1.24
1	B	196	PRO	C-O	-6.12	1.16	1.24
1	B	194	THR	C-O	-6.04	1.16	1.24
1	B	200	GLY	C-O	-5.55	1.16	1.24
1	B	257	TYR	C-O	-5.47	1.17	1.23
1	A	187	ALA	C-O	-5.34	1.17	1.23
1	B	329	PRO	C-O	-5.20	1.17	1.23
1	B	325	PRO	C-O	-5.16	1.17	1.23

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	312	ASN	CB-CA-C	-9.73	105.35	116.54
1	A	257	TYR	CA-C-O	-8.71	110.91	121.28
1	B	97	ARG	N-CA-C	-8.29	100.79	113.89
1	B	185	SER	N-CA-C	-7.62	100.26	110.55
1	B	339	SER	N-CA-C	-7.42	104.75	113.88
1	B	273	ALA	N-CA-C	-6.57	104.89	113.17
1	B	73	PHE	CA-CB-CG	6.55	120.35	113.80
1	A	286	LEU	CA-C-N	6.48	130.97	120.60
1	A	286	LEU	C-N-CA	6.48	130.97	120.60
1	B	236	MET	CA-C-N	-6.41	114.75	121.35
1	B	236	MET	C-N-CA	-6.41	114.75	121.35
1	A	200	GLY	N-CA-C	-6.15	106.75	115.43
1	B	180	THR	N-CA-C	-5.87	105.43	112.59
1	B	163	THR	CB-CA-C	5.85	116.51	109.31
1	B	209	PHE	CA-CB-CG	5.72	119.52	113.80
1	A	273	ALA	N-CA-C	-5.68	105.66	112.59
1	A	255	GLU	N-CA-C	-5.66	106.23	113.02
1	B	206	ASP	CA-CB-CG	5.58	118.17	112.60
1	A	338	LYS	N-CA-C	-5.48	106.43	113.01
1	A	329	PRO	N-CA-C	5.42	119.38	111.03
1	A	246	GLN	N-CA-C	-5.42	105.45	111.36
1	B	329	PRO	N-CA-C	5.41	119.36	111.03
1	B	184	PRO	CB-CA-C	5.40	121.53	112.62
1	A	207	PRO	N-CA-CB	-5.38	98.43	103.27
1	B	328	LYS	N-CA-C	-5.33	103.06	109.83
1	A	186	GLY	CA-C-N	5.27	130.14	121.39
1	A	186	GLY	C-N-CA	5.27	130.14	121.39
1	A	207	PRO	CB-CA-C	5.26	118.27	111.64
1	A	248	LEU	N-CA-CB	-5.24	102.41	110.12
1	B	95	GLN	N-CA-C	-5.24	103.57	110.33
1	A	243	SER	N-CA-C	-5.11	106.89	113.23

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	215	ARG	Sidechain
1	A	71	ARG	Sidechain
1	B	215	ARG	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	2206	0	2189	103	0
1	B	2207	0	2194	99	0
2	A	7	0	8	2	0
3	B	8	0	6	6	0
4	A	67	0	0	5	0
4	B	73	0	0	4	0
All	All	4568	0	4397	202	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 23.

All (202) 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:131:PRO:HD3	1:A:154:ARG:HH21	1.16	1.05
1:A:131:PRO:HD3	1:A:154:ARG:NH2	1.79	0.98
1:B:218:LEU:HD21	1:B:283:GLY:HA3	1.52	0.92
1:B:263:VAL:HG22	1:B:334:LEU:HG	1.53	0.86
1:A:212:VAL:HG13	1:A:217:LEU:HD22	1.55	0.85
1:A:139:GLU:HG3	1:A:140:LEU:HD22	1.59	0.82
1:B:126:TYR:CZ	1:B:237:GLY:HA3	2.19	0.78
1:B:205:LEU:HD12	1:B:221:SER:HB2	1.65	0.78
1:A:132:ASN:ND2	1:A:138:ASP:H	1.83	0.77
1:A:62:GLY:HA2	1:A:334:LEU:HD11	1.66	0.76
1:A:300:LEU:HD21	1:A:307:ARG:HE	1.50	0.75
1:A:84:SER:HB3	1:A:236:MET:HE2	1.68	0.75
1:B:180:THR:HG22	1:B:190:ASN:HD21	1.51	0.74
1:A:79:TYR:HD2	1:A:238:LEU:HD21	1.53	0.74
1:B:68:ARG:NH2	4:B:501:HOH:O	2.21	0.73
1:B:242:LEU:HD23	1:B:282:LEU:HD22	1.72	0.72
1:A:214:GLU:HG3	1:A:214:GLU:O	1.89	0.71
1:B:132:ASN:ND2	1:B:138:ASP:H	1.89	0.69
1:B:112:VAL:HG11	1:B:157:LEU:CD2	2.22	0.69
1:A:123:LEU:HD21	1:A:212:VAL:HG11	1.74	0.68
1:A:242:LEU:HD21	1:A:273:ALA:HA	1.76	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:160:ALA:HB3	1:B:212:VAL:HG13	1.76	0.67
1:A:315:LEU:HD21	1:A:338:LYS:HE2	1.76	0.66
1:B:128:VAL:HG22	1:B:156:SER:CB	2.26	0.66
1:B:160:ALA:CB	1:B:212:VAL:HG13	2.26	0.66
1:B:211:LYS:HD2	1:B:214:GLU:HA	1.77	0.66
1:A:62:GLY:CA	1:A:334:LEU:HD11	2.25	0.65
1:A:253:ASN:ND2	1:A:262:GLN:HA	2.11	0.65
1:B:65:GLN:HG3	1:B:332:VAL:HG21	1.77	0.65
1:A:132:ASN:HD21	1:A:138:ASP:H	1.44	0.65
1:B:172:MET:HG2	3:B:401:4XX:H1	1.79	0.64
1:A:301:LEU:HD13	1:A:318:LEU:HD11	1.80	0.64
1:B:209:PHE:CD1	1:B:218:LEU:HD13	2.33	0.63
1:B:112:VAL:HG11	1:B:157:LEU:HD21	1.80	0.63
1:A:260:VAL:HG22	1:A:337:PRO:HG2	1.80	0.63
1:A:323:PRO:HG3	1:A:330:TRP:CD1	2.34	0.62
1:B:137:LYS:HB3	1:B:140:LEU:HD13	1.82	0.62
1:A:242:LEU:HD23	1:A:282:LEU:HG	1.82	0.62
1:A:91:ARG:HG2	1:A:91:ARG:HH11	1.65	0.61
1:B:74:MET:O	1:B:78:GLN:HG2	2.00	0.61
1:B:328:LYS:HB3	4:B:565:HOH:O	2.00	0.61
1:A:272:PHE:HB2	1:A:281:LEU:O	2.01	0.60
1:A:218:LEU:HD23	1:A:242:LEU:HD22	1.83	0.59
1:A:91:ARG:HG2	1:A:91:ARG:NH1	2.17	0.59
1:B:94:ALA:O	1:B:97:ARG:HB3	2.02	0.59
1:A:262:GLN:HG3	1:A:335:GLU:HB3	1.83	0.59
1:A:91:ARG:HD2	1:A:134:LEU:HD12	1.84	0.58
1:B:89:PHE:O	1:B:93:GLN:HG2	2.05	0.57
1:B:189:TYR:O	1:B:192:TRP:CD1	2.57	0.57
1:A:310:ASN:HA	1:A:315:LEU:HD22	1.86	0.57
1:B:55:ARG:HH21	1:B:308:LEU:HD13	1.69	0.57
1:B:319:GLN:HB3	1:B:332:VAL:HG12	1.87	0.57
1:A:163:THR:HG1	1:A:166:GLN:H	1.52	0.57
1:B:125:LEU:HD12	1:B:238:LEU:HD22	1.87	0.56
1:A:196:PRO:HG3	1:A:223:ALA:HB1	1.87	0.56
1:A:207:PRO:HD2	1:A:271:LEU:HD12	1.86	0.56
1:B:188:ALA:HB1	1:B:190:ASN:OD1	2.05	0.56
1:A:161:GLN:NE2	4:A:506:HOH:O	2.38	0.56
1:A:93:GLN:NE2	4:A:505:HOH:O	2.38	0.56
1:A:163:THR:HG1	1:A:165:GLY:N	2.04	0.56
1:A:126:TYR:HB3	1:A:158:TYR:HD1	1.70	0.55
1:A:113:ARG:HD3	4:A:524:HOH:O	2.05	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:263:VAL:HG22	1:A:334:LEU:HD23	1.87	0.55
1:B:180:THR:HG22	1:B:190:ASN:ND2	2.20	0.55
1:B:112:VAL:HG11	1:B:157:LEU:HD23	1.88	0.55
1:B:210:ASP:OD1	3:B:401:4XX:CAD	2.55	0.55
1:B:268:PRO:HD3	1:B:330:TRP:CD1	2.41	0.55
1:A:195:CYS:HB3	1:A:196:PRO:CD	2.37	0.55
1:B:192:TRP:HA	1:B:205:LEU:HD11	1.88	0.55
1:B:142:VAL:HG13	1:B:151:ASP:O	2.08	0.54
1:A:295:GLY:O	1:A:299:GLN:HB2	2.08	0.54
1:B:149:SER:HA	1:B:154:ARG:O	2.08	0.53
1:B:210:ASP:OD1	3:B:401:4XX:OAE	2.26	0.53
1:A:224:PHE:HE1	1:A:238:LEU:HD13	1.74	0.53
1:A:290:ASP:O	1:A:294:ALA:HB2	2.08	0.53
1:A:113:ARG:HB2	1:A:159:TRP:CE2	2.42	0.53
1:A:300:LEU:HD23	1:A:305:LYS:CB	2.37	0.53
1:A:102:TYR:CE1	1:A:147:LEU:HD11	2.44	0.52
1:A:300:LEU:HD23	1:A:305:LYS:HB2	1.91	0.52
1:A:253:ASN:HD21	1:A:262:GLN:HA	1.73	0.52
1:B:130:GLU:OE1	1:B:197:LYS:HE3	2.08	0.52
1:B:209:PHE:CE1	1:B:218:LEU:HD13	2.45	0.52
1:B:126:TYR:CE2	1:B:237:GLY:HA3	2.44	0.52
1:A:268:PRO:HB3	1:A:328:LYS:HD3	1.91	0.52
1:A:79:TYR:CD2	1:A:238:LEU:HD21	2.40	0.52
1:B:84:SER:HB3	1:B:236:MET:HE2	1.92	0.52
1:B:218:LEU:CD2	1:B:283:GLY:HA3	2.35	0.52
1:B:151:ASP:N	1:B:151:ASP:OD1	2.43	0.52
1:B:125:LEU:CD1	1:B:238:LEU:HD22	2.40	0.51
1:A:118:ALA:O	1:A:120:PRO:HD3	2.09	0.51
1:A:125:LEU:HD21	1:A:238:LEU:HG	1.92	0.51
1:B:122:VAL:HG21	1:B:238:LEU:CD1	2.41	0.51
1:B:122:VAL:HG11	1:B:238:LEU:HD13	1.93	0.51
1:B:124:GLY:HA3	1:B:158:TYR:CE1	2.46	0.51
1:A:87:ILE:HG23	1:A:108:LEU:HD21	1.92	0.51
1:A:228:LEU:HA	4:A:513:HOH:O	2.10	0.50
1:B:65:GLN:HG2	1:B:334:LEU:HD11	1.92	0.50
1:A:66:ALA:HA	1:A:332:VAL:HG11	1.92	0.50
1:B:176:GLU:OE2	3:B:401:4XX:H2	2.11	0.50
1:B:314:ASP:HB3	1:B:337:PRO:HA	1.94	0.50
1:A:55:ARG:HB2	1:A:308:LEU:HD13	1.94	0.50
1:A:126:TYR:CZ	1:A:237:GLY:HA3	2.47	0.50
1:A:139:GLU:HG3	1:A:140:LEU:N	2.27	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:57:ARG:O	1:A:61:ARG:HG2	2.12	0.49
1:B:130:GLU:CD	1:B:197:LYS:HE3	2.37	0.49
1:A:152:LYS:HD3	1:A:174:GLU:HG3	1.94	0.49
1:B:287:ALA:O	1:B:291:PRO:HB3	2.11	0.49
1:B:86:GLN:O	1:B:90:LEU:HG	2.13	0.49
1:A:65:GLN:NE2	1:A:256:LEU:HB2	2.28	0.48
1:B:326:GLY:N	4:B:503:HOH:O	2.28	0.48
1:B:95:GLN:C	1:B:97:ARG:H	2.21	0.48
1:B:95:GLN:O	1:B:96:LYS:HB2	2.12	0.48
1:B:158:TYR:CZ	1:B:160:ALA:HB2	2.48	0.48
1:A:272:PHE:CZ	1:A:286:LEU:HD23	2.49	0.48
1:B:97:ARG:HH21	1:B:97:ARG:HB2	1.78	0.48
1:B:310:ASN:ND2	1:B:315:LEU:HD11	2.28	0.48
1:B:257:TYR:O	1:B:260:VAL:HG13	2.13	0.48
1:A:308:LEU:HG	1:A:317:VAL:HG22	1.94	0.48
1:A:172:MET:SD	2:A:401:PEG:H31	2.53	0.47
1:A:241:ASN:C	1:A:243:SER:H	2.22	0.47
1:B:268:PRO:HD3	1:B:330:TRP:CG	2.50	0.47
1:B:249:SER:OG	1:B:265:ILE:HG13	2.15	0.47
1:B:125:LEU:CD1	1:B:238:LEU:CD2	2.93	0.47
1:B:55:ARG:HD3	1:B:308:LEU:HD22	1.96	0.47
1:A:163:THR:O	1:A:165:GLY:N	2.47	0.47
1:A:254:ARG:HD2	1:A:254:ARG:N	2.30	0.47
1:B:310:ASN:O	1:B:314:ASP:O	2.33	0.47
1:A:253:ASN:HB3	1:A:254:ARG:NH2	2.30	0.46
1:A:271:LEU:HA	1:A:284:LYS:O	2.16	0.46
1:B:191:ALA:C	1:B:193:TYR:H	2.23	0.46
1:B:128:VAL:HG22	1:B:156:SER:HA	1.97	0.46
1:A:275:ASN:HB3	1:A:278:ASP:O	2.16	0.46
1:B:128:VAL:HG22	1:B:156:SER:HB2	1.97	0.46
1:A:212:VAL:HG13	1:A:217:LEU:CD2	2.36	0.45
1:B:160:ALA:CB	1:B:212:VAL:CG1	2.93	0.45
1:A:80:GLY:HA3	1:A:238:LEU:HD11	1.98	0.45
1:B:195:CYS:SG	4:B:554:HOH:O	2.61	0.45
1:B:241:ASN:OD1	1:B:243:SER:HB2	2.16	0.45
1:A:139:GLU:CG	1:A:140:LEU:HD22	2.39	0.45
1:A:246:GLN:O	1:A:250:GLU:HG3	2.15	0.45
1:B:196:PRO:HG3	1:B:223:ALA:HB1	1.97	0.45
1:A:94:ALA:HA	1:A:99:LEU:HD22	1.99	0.45
1:A:250:GLU:O	1:A:254:ARG:HD2	2.17	0.45
1:A:308:LEU:HG	1:A:317:VAL:CG2	2.47	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:190:ASN:O	1:B:194:THR:HG23	2.16	0.45
1:B:227:GLU:H	1:B:227:GLU:HG2	1.62	0.45
1:A:138:ASP:O	1:A:153:GLY:HA3	2.17	0.45
1:B:160:ALA:HB1	1:B:212:VAL:CG1	2.47	0.44
1:B:224:PHE:CD2	1:B:236:MET:CE	3.01	0.44
1:B:300:LEU:HD23	1:B:305:LYS:HB2	1.99	0.44
1:A:268:PRO:HD3	1:A:330:TRP:CE2	2.53	0.44
1:A:253:ASN:OD1	1:A:259:GLY:HA2	2.17	0.44
1:B:108:LEU:O	1:B:112:VAL:HG12	2.18	0.44
1:B:128:VAL:HG21	1:B:177:LEU:HD21	2.00	0.44
1:B:210:ASP:OD1	3:B:401:4XX:H5	2.17	0.44
1:A:79:TYR:OH	1:A:115:ALA:O	2.30	0.44
1:A:250:GLU:O	1:A:254:ARG:CD	2.66	0.43
1:B:83:PHE:CE2	1:B:87:ILE:HD11	2.53	0.43
1:A:212:VAL:HG22	1:A:212:VAL:O	2.18	0.43
1:B:339:SER:O	1:B:340:ALA:HB2	2.18	0.43
1:B:209:PHE:CG	1:B:218:LEU:HD13	2.54	0.43
1:A:77:PHE:HA	1:A:224:PHE:HZ	1.83	0.43
1:B:94:ALA:HB1	1:B:99:LEU:HD23	2.00	0.43
1:B:125:LEU:HD11	1:B:238:LEU:HD21	2.01	0.43
1:A:322:GLN:HA	1:A:323:PRO:HD2	1.83	0.43
1:B:112:VAL:HG13	1:B:159:TRP:CD1	2.53	0.43
1:A:97:ARG:HB2	1:A:99:LEU:HD22	2.00	0.43
1:B:307:ARG:HG3	1:B:308:LEU:H	1.83	0.42
1:A:159:TRP:CE3	1:A:169:SER:HB3	2.54	0.42
1:A:105:ARG:NH1	1:A:149:SER:OG	2.45	0.42
1:A:239:ASP:OD2	2:A:401:PEG:H11	2.20	0.42
1:B:297:LEU:HD21	1:B:309:PHE:CZ	2.54	0.42
1:B:270:GLY:O	1:B:285:ASN:HA	2.19	0.42
1:A:246:GLN:O	1:A:249:SER:HB2	2.20	0.42
1:B:101:ALA:O	1:B:105:ARG:HG3	2.20	0.42
1:B:183:GLY:O	1:B:185:SER:O	2.37	0.42
1:A:195:CYS:HB3	1:A:196:PRO:HD2	2.00	0.42
1:A:209:PHE:CE2	1:A:218:LEU:HD13	2.54	0.42
1:B:100:ASP:HB3	1:B:103:ASP:H	1.85	0.41
1:B:172:MET:HG2	3:B:401:4XX:CAA	2.48	0.41
1:A:253:ASN:HB3	1:A:254:ARG:HH21	1.84	0.41
1:B:116:LEU:HD21	1:B:161:GLN:HG2	2.02	0.41
1:B:125:LEU:HD11	1:B:238:LEU:CD2	2.50	0.41
1:B:206:ASP:O	1:B:207:PRO:C	2.62	0.41
1:A:91:ARG:O	1:A:95:GLN:HG2	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:93:GLN:O	1:A:97:ARG:HB2	2.20	0.41
1:A:123:LEU:HD11	1:A:212:VAL:HG21	2.02	0.41
1:A:307:ARG:HB3	1:A:309:PHE:CE2	2.55	0.41
1:A:311:GLU:O	1:A:314:ASP:O	2.38	0.41
1:A:161:GLN:HE21	1:A:167:LEU:HD11	1.86	0.41
1:A:218:LEU:N	4:A:507:HOH:O	2.46	0.41
1:A:228:LEU:HB2	1:A:233:ILE:HD13	2.02	0.41
1:B:81:LYS:O	1:B:84:SER:OG	2.36	0.41
1:A:261:GLY:HA2	1:A:337:PRO:HD3	2.03	0.41
1:A:126:TYR:HB3	1:A:158:TYR:CD1	2.54	0.41
1:B:208:TYR:CE1	1:B:219:MET:HG3	2.55	0.40
1:B:314:ASP:OD1	1:B:314:ASP:N	2.53	0.40
1:A:55:ARG:CG	1:A:56:LEU:N	2.85	0.40
1:A:70:GLN:O	1:A:74:MET:HG2	2.20	0.40
1:B:58:LEU:HD12	1:B:58:LEU:HA	1.88	0.40
1:A:90:LEU:N	1:A:90:LEU:HD23	2.36	0.40
1:B:79:TYR:OH	1:B:115:ALA:O	2.31	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	280/360 (78%)	262 (94%)	18 (6%)	0	100	100
1	B	282/360 (78%)	268 (95%)	14 (5%)	0	100	100
All	All	562/720 (78%)	530 (94%)	32 (6%)	0	100	100

There are no Ramachandran outliers to report.

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	230/292 (79%)	202 (88%)	28 (12%)	4 6
1	B	230/292 (79%)	198 (86%)	32 (14%)	3 4
All	All	460/584 (79%)	400 (87%)	60 (13%)	3 5

All (60) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	99	LEU
1	A	108	LEU
1	A	110	ARG
1	A	152	LYS
1	A	156	SER
1	A	166	GLN
1	A	211	LYS
1	A	212	VAL
1	A	215	ARG
1	A	217	LEU
1	A	236	MET
1	A	242	LEU
1	A	276	SER
1	A	282	LEU
1	A	286	LEU
1	A	299	GLN
1	A	300	LEU
1	A	307	ARG
1	A	308	LEU
1	A	310	ASN
1	A	314	ASP
1	A	315	LEU
1	A	319	GLN
1	A	321	LEU
1	A	328	LYS
1	A	332	VAL
1	A	337	PRO

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Mol	Chain	Res	Type
1	A	338	LYS
1	B	85	ARG
1	B	96	LYS
1	B	97	ARG
1	B	100	ASP
1	B	104	LEU
1	B	107	ASP
1	B	110	ARG
1	B	125	LEU
1	B	131	PRO
1	B	161	GLN
1	B	163	THR
1	B	166	GLN
1	B	167	LEU
1	B	214	GLU
1	B	217	LEU
1	B	236	MET
1	B	238	LEU
1	B	242	LEU
1	B	243	SER
1	B	245	LEU
1	B	249	SER
1	B	251	GLN
1	B	293	HIS
1	B	300	LEU
1	B	306	SER
1	B	307	ARG
1	B	308	LEU
1	B	310	ASN
1	B	314	ASP
1	B	317	VAL
1	B	321	LEU
1	B	338	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	93	GLN
1	A	132	ASN
1	A	161	GLN
1	A	253	ASN
1	A	292	GLN

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Mol	Chain	Res	Type
1	A	312	ASN
1	A	319	GLN
1	B	132	ASN
1	B	161	GLN
1	B	166	GLN
1	B	292	GLN
1	B	310	ASN
1	B	319	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

2 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	4XX	B	401	-	6,8,8	3.89	4 (66%)	7,11,11	3.86	5 (71%)
2	PEG	A	401	-	6,6,6	1.14	0	5,5,5	1.29	0

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	4XX	B	401	-	-	-	0/1/1/1
2	PEG	A	401	-	-	2/4/4/4	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	401	4XX	OAE-CAD	7.35	1.57	1.44
3	B	401	4XX	CAH-CAG	4.15	1.45	1.35
3	B	401	4XX	OAB-CAF	-3.02	1.17	1.23
3	B	401	4XX	CAH-CAF	-2.67	1.41	1.46

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	401	4XX	CAA-CAG-CAH	-8.24	119.92	133.13
3	B	401	4XX	OAE-CAG-CAA	3.52	118.25	113.61
3	B	401	4XX	OAC-CAH-CAG	-3.02	119.62	128.43
3	B	401	4XX	OAB-CAF-CAH	2.66	128.04	125.46
3	B	401	4XX	OAC-CAH-CAF	-2.01	119.02	122.61

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	PEG	C4-C3-O2-C2
2	A	401	PEG	O1-C1-C2-O2

There are no ring outliers.

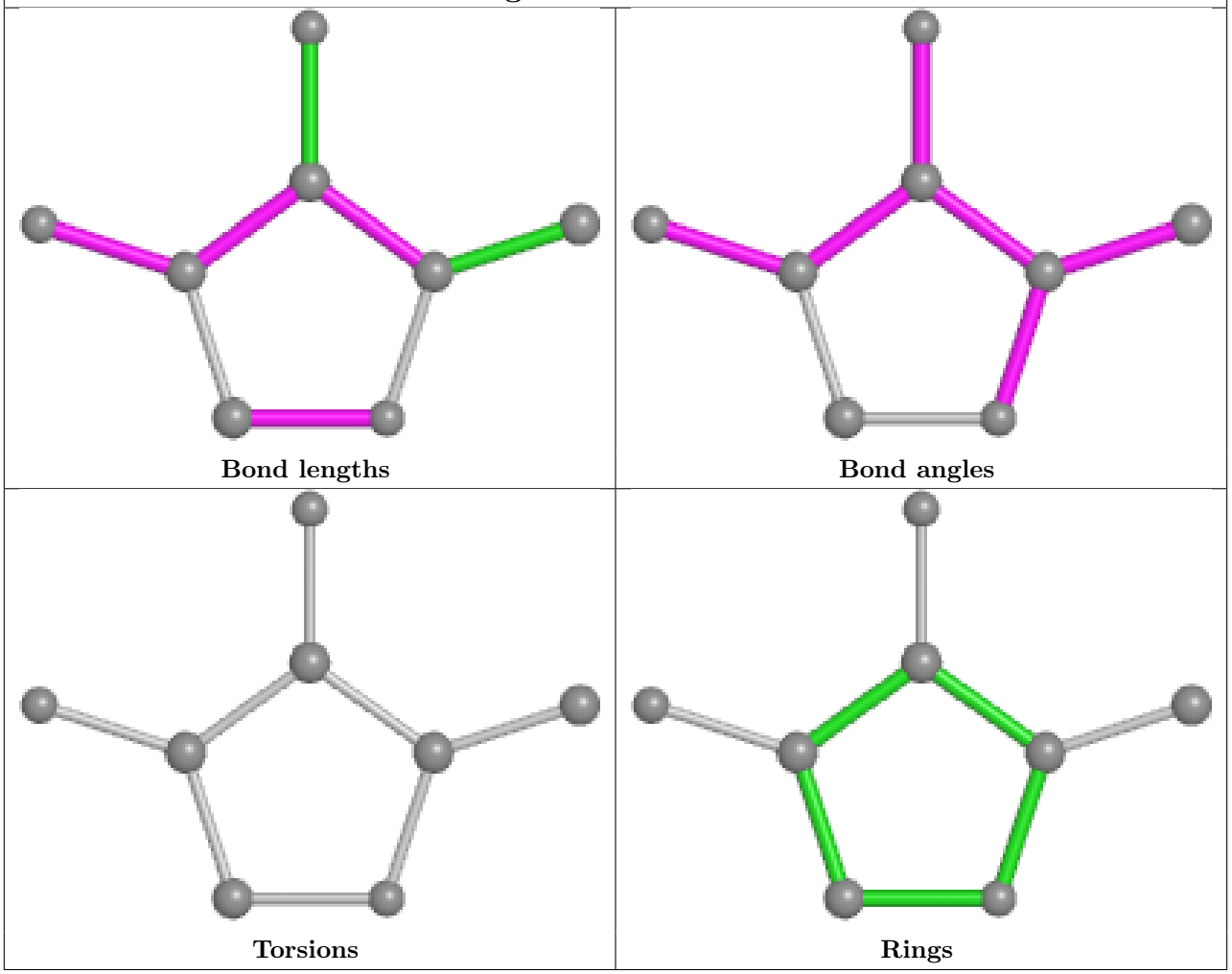
2 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	401	4XX	6	0
2	A	401	PEG	2	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 4XX B 401



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, 95^{th} 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	286/360 (79%)	0.30	12 (4%) 41 42	11, 25, 55, 80	0
1	B	286/360 (79%)	0.18	8 (2%) 55 55	10, 24, 57, 81	0
All	All	572/720 (79%)	0.24	20 (3%) 47 49	10, 25, 57, 81	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	340	ALA	3.6
1	A	340	ALA	3.0
1	A	54	ALA	3.0
1	A	310	ASN	3.0
1	A	53	SER	3.0
1	A	163	THR	2.9
1	A	292	GLN	2.9
1	B	310	ASN	2.9
1	A	313	ASP	2.8
1	B	288	LYS	2.7
1	B	98	PHE	2.6
1	B	213	GLY	2.5
1	A	165	GLY	2.4
1	A	55	ARG	2.4
1	A	186	GLY	2.3
1	A	315	LEU	2.3
1	A	337	PRO	2.2
1	B	291	PRO	2.1
1	B	164	PRO	2.0
1	B	339	SER	2.0

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

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

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

6.4 Ligands (i)

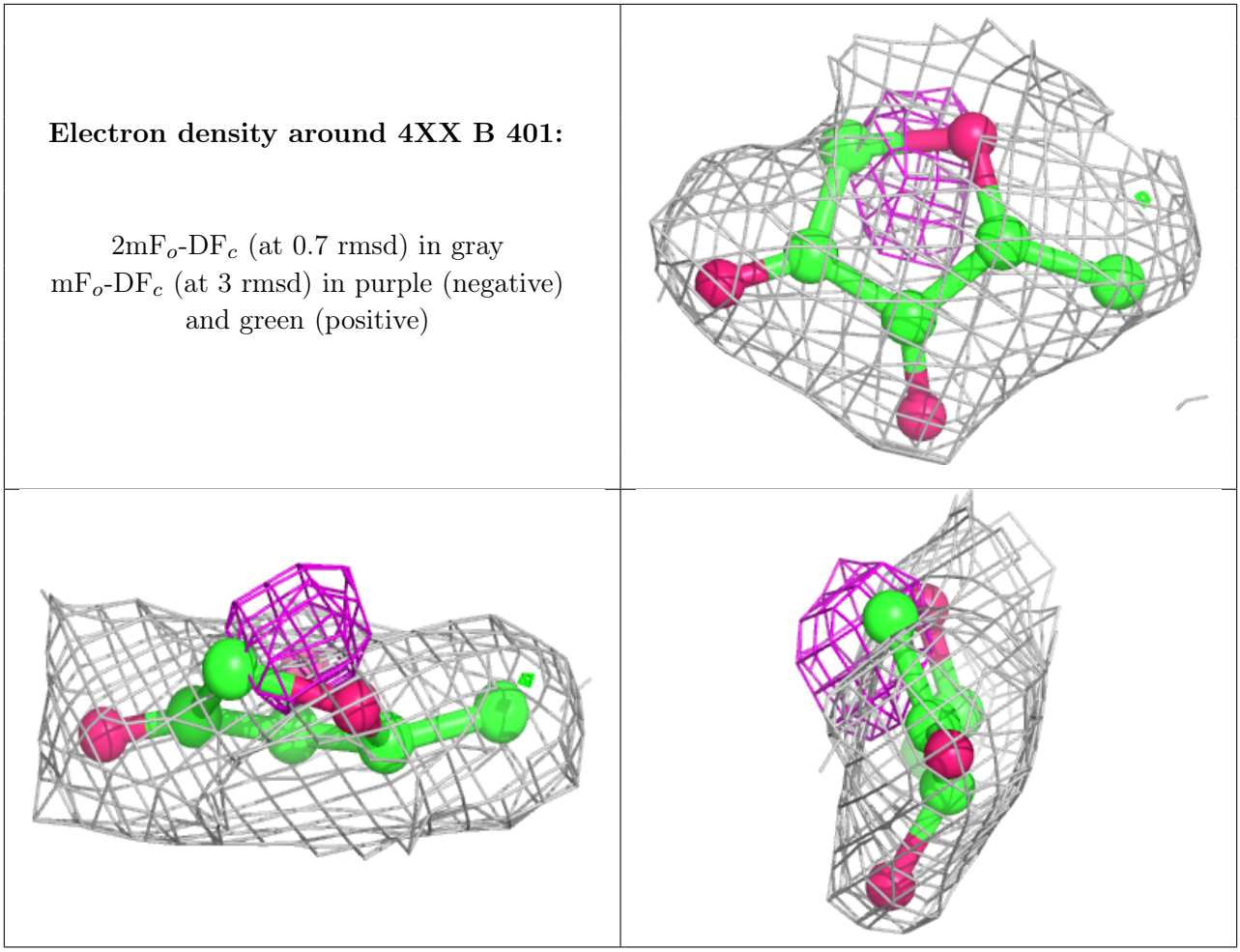
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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	4XX	B	401	8/8	0.84	0.20	21,23,33,41	0
2	PEG	A	401	7/7	0.88	0.13	27,29,36,38	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 4XX B 401:

$2mF_o$-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.