



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 5, 2022 – 12:34 AM JST

PDB ID : 7FI3
Title : Archaeal oligopeptide permease A (OppA) from *Thermococcus kodakaraensis* in complex with an endogenous pentapeptide
Authors : Yokoyama, H.; Kamei, N.; Konishi, K.; Hara, K.; Hashimoto, H.
Deposited on : 2021-07-30
Resolution : 2.30 Å (reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtrriage (Phenix) : 1.13
EDS : 2.27
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) : 2.27

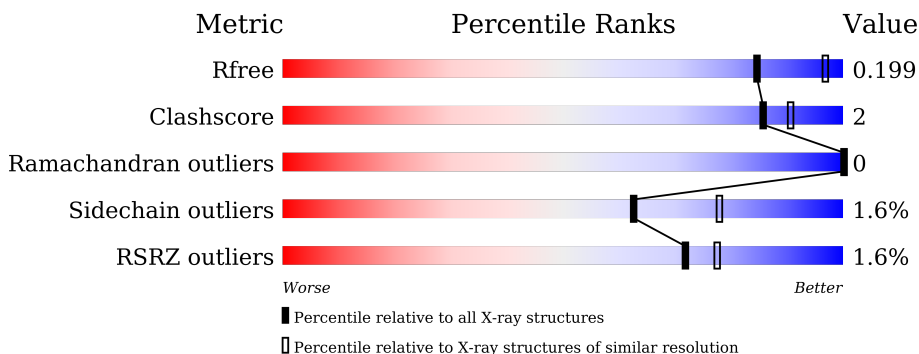
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.





Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	732	2% 92% 6% ..
1	B	732	2% 94% ..
1	C	732	2% 91% 7% ..
1	D	732	2% 92% 6% ..
2	E	5	100%
2	F	5	100%

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Mol	Chain	Length	Quality of chain
2	G	5	 100%
2	H	5	 100%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 24940 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 ABC-type dipeptide/oligopeptide transport system.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	724	5862	3773	937	1135	2	15	0	0	0
1	B	724	5862	3773	937	1135	2	15	0	0	0
1	C	724	5862	3773	937	1135	2	15	0	0	0
1	D	724	5862	3773	937	1135	2	15	0	0	0

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	302	MSE	ILE	engineered mutation	UNP Q5JJ92
A	446	MSE	LEU	engineered mutation	UNP Q5JJ92
A	557	MSE	LEU	engineered mutation	UNP Q5JJ92
A	636	MSE	LEU	engineered mutation	UNP Q5JJ92
A	754	VAL	-	expression tag	UNP Q5JJ92
A	755	GLU	-	expression tag	UNP Q5JJ92
A	756	HIS	-	expression tag	UNP Q5JJ92
A	757	HIS	-	expression tag	UNP Q5JJ92
A	758	HIS	-	expression tag	UNP Q5JJ92
A	759	HIS	-	expression tag	UNP Q5JJ92
A	760	HIS	-	expression tag	UNP Q5JJ92
A	761	HIS	-	expression tag	UNP Q5JJ92
B	302	MSE	ILE	engineered mutation	UNP Q5JJ92
B	446	MSE	LEU	engineered mutation	UNP Q5JJ92
B	557	MSE	LEU	engineered mutation	UNP Q5JJ92
B	636	MSE	LEU	engineered mutation	UNP Q5JJ92
B	754	VAL	-	expression tag	UNP Q5JJ92
B	755	GLU	-	expression tag	UNP Q5JJ92
B	756	HIS	-	expression tag	UNP Q5JJ92
B	757	HIS	-	expression tag	UNP Q5JJ92
B	758	HIS	-	expression tag	UNP Q5JJ92

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Chain	Residue	Modelled	Actual	Comment	Reference
B	759	HIS	-	expression tag	UNP Q5JJ92
B	760	HIS	-	expression tag	UNP Q5JJ92
B	761	HIS	-	expression tag	UNP Q5JJ92
C	302	MSE	ILE	engineered mutation	UNP Q5JJ92
C	446	MSE	LEU	engineered mutation	UNP Q5JJ92
C	557	MSE	LEU	engineered mutation	UNP Q5JJ92
C	636	MSE	LEU	engineered mutation	UNP Q5JJ92
C	754	VAL	-	expression tag	UNP Q5JJ92
C	755	GLU	-	expression tag	UNP Q5JJ92
C	756	HIS	-	expression tag	UNP Q5JJ92
C	757	HIS	-	expression tag	UNP Q5JJ92
C	758	HIS	-	expression tag	UNP Q5JJ92
C	759	HIS	-	expression tag	UNP Q5JJ92
C	760	HIS	-	expression tag	UNP Q5JJ92
C	761	HIS	-	expression tag	UNP Q5JJ92
D	302	MSE	ILE	engineered mutation	UNP Q5JJ92
D	446	MSE	LEU	engineered mutation	UNP Q5JJ92
D	557	MSE	LEU	engineered mutation	UNP Q5JJ92
D	636	MSE	LEU	engineered mutation	UNP Q5JJ92
D	754	VAL	-	expression tag	UNP Q5JJ92
D	755	GLU	-	expression tag	UNP Q5JJ92
D	756	HIS	-	expression tag	UNP Q5JJ92
D	757	HIS	-	expression tag	UNP Q5JJ92
D	758	HIS	-	expression tag	UNP Q5JJ92
D	759	HIS	-	expression tag	UNP Q5JJ92
D	760	HIS	-	expression tag	UNP Q5JJ92
D	761	HIS	-	expression tag	UNP Q5JJ92

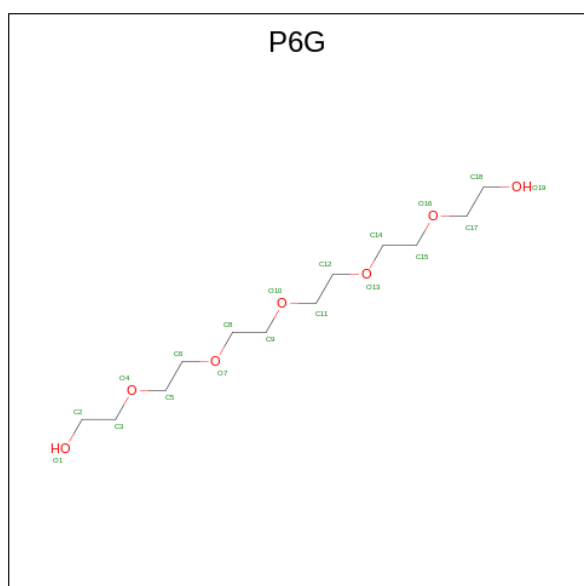
- Molecule 2 is a protein called endogenous pentapeptide.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	5	Total	C	N	O	0	0	0
			25	15	5	5			
2	F	5	Total	C	N	O	0	0	0
			25	15	5	5			
2	G	5	Total	C	N	O	0	0	0
			25	15	5	5			
2	H	5	Total	C	N	O	0	0	0
			25	15	5	5			

- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

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

- Molecule 4 is HEXAETHYLENE GLYCOL (three-letter code: P6G) (formula: C₁₂H₂₆O₇).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 19 12 7	0	0
4	B	1	Total C O 19 12 7	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 6 3 3	0	0
5	A	1	Total C O 6 3 3	0	0
5	B	1	Total C O 6 3 3	0	0
5	C	1	Total C O 6 3 3	0	0
5	C	1	Total C O 6 3 3	0	0
5	D	1	Total C O 6 3 3	0	0
5	D	1	Total C O 6 3 3	0	0

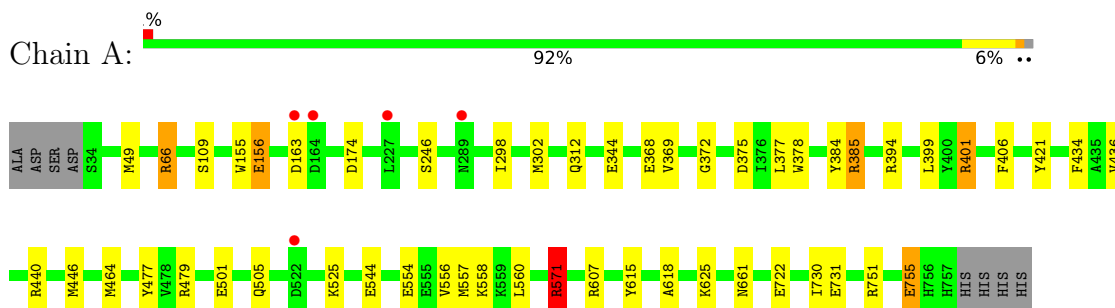
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	372	Total O 372 372	0	0
6	B	265	Total O 265 265	0	0
6	C	344	Total O 344 344	0	0
6	D	323	Total O 323 323	0	0

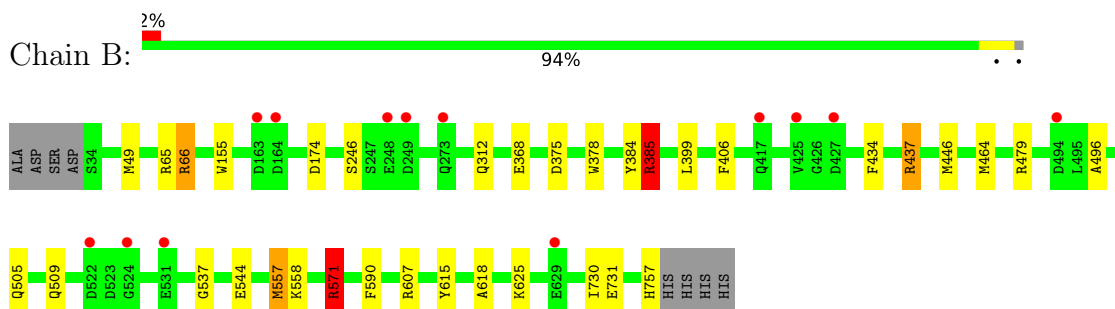
3 Residue-property plots

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.

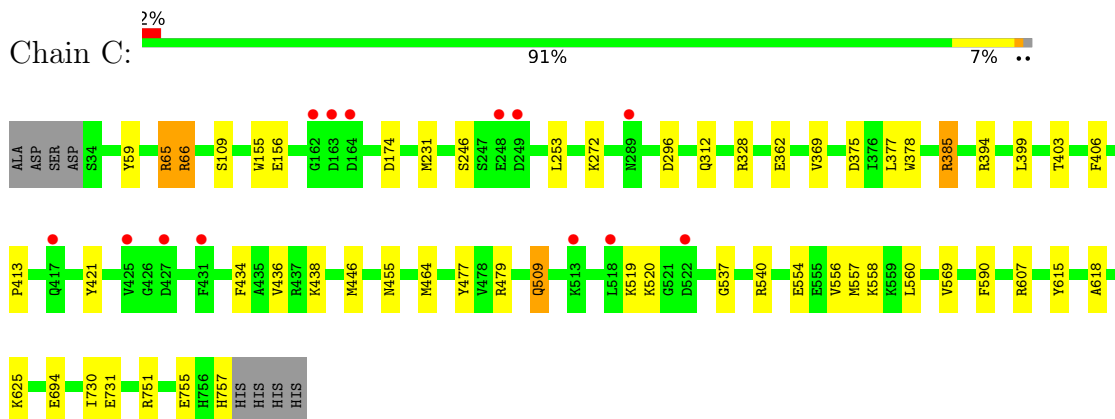
- Molecule 1: ABC-type dipeptide/oligopeptide transport system



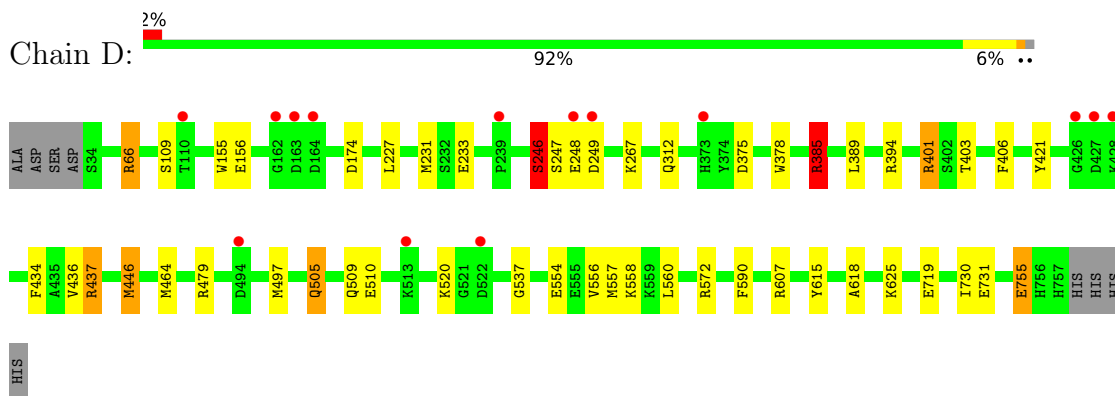
- Molecule 1: ABC-type dipeptide/oligopeptide transport system



- Molecule 1: ABC-type dipeptide/oligopeptide transport system



- Molecule 1: ABC-type dipeptide/oligopeptide transport system



- Molecule 2: endogenous pentapeptide

Chain E:  100%

There are no outlier residues recorded for this chain.

- Molecule 2: endogenous pentapeptide

Chain F:  100%

There are no outlier residues recorded for this chain.

- Molecule 2: endogenous pentapeptide

Chain G:  100%

There are no outlier residues recorded for this chain.

- Molecule 2: endogenous pentapeptide

Chain H:  100%

There are no outlier residues recorded for this chain.

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	122.66Å 118.64Å 112.72Å 90.00° 105.32° 90.00°	Depositor
Resolution (Å)	19.98 – 2.30 19.97 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.8 (19.98-2.30) 100.0 (19.97-2.30)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.49 (at 2.30Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.159 , 0.192 0.171 , 0.199	Depositor DCC
R_{free} test set	13814 reflections (10.02%)	wwPDB-VP
Wilson B-factor (Å ²)	26.0	Xtrriage
Anisotropy	0.059	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 39.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	24940	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.04% 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: GOL, P6G, NA

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	0.83	4/6027 (0.1%)	0.91	10/8194 (0.1%)
1	B	0.79	2/6027 (0.0%)	0.89	10/8194 (0.1%)
1	C	0.81	2/6027 (0.0%)	0.90	11/8194 (0.1%)
1	D	0.80	3/6027 (0.0%)	0.90	8/8194 (0.1%)
All	All	0.81	11/24108 (0.0%)	0.90	39/32776 (0.1%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	D	0	1

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	731	GLU	CD-OE2	9.45	1.36	1.25
1	B	731	GLU	CD-OE2	8.12	1.34	1.25
1	D	719	GLU	CD-OE1	-7.64	1.17	1.25
1	A	156	GLU	CD-OE2	7.62	1.34	1.25
1	B	368	GLU	CD-OE2	7.41	1.33	1.25
1	D	755	GLU	CD-OE2	-7.38	1.17	1.25
1	A	731	GLU	CD-OE2	6.28	1.32	1.25
1	A	722	GLU	CD-OE1	5.55	1.31	1.25
1	C	755	GLU	CD-OE1	-5.43	1.19	1.25
1	D	731	GLU	CD-OE1	5.18	1.31	1.25
1	A	372	GLY	C-O	-5.15	1.15	1.23

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	479	ARG	NE-CZ-NH2	-9.53	115.54	120.30
1	B	479	ARG	NE-CZ-NH2	-9.20	115.70	120.30
1	D	479	ARG	NE-CZ-NH2	-8.73	115.93	120.30
1	D	437	ARG	NE-CZ-NH1	8.44	124.52	120.30
1	C	757	HIS	CA-C-O	-8.41	102.43	120.10
1	C	479	ARG	NE-CZ-NH2	-8.40	116.10	120.30
1	D	437	ARG	NE-CZ-NH2	-8.11	116.25	120.30
1	A	571	ARG	CG-CD-NE	-7.59	95.86	111.80
1	A	401	ARG	CG-CD-NE	-7.33	96.41	111.80
1	C	328	ARG	NE-CZ-NH2	-7.27	116.66	120.30
1	A	479	ARG	NE-CZ-NH1	6.91	123.75	120.30
1	A	571	ARG	CB-CA-C	-6.90	96.60	110.40
1	A	440	ARG	NE-CZ-NH1	6.78	123.69	120.30
1	C	65	ARG	CG-CD-NE	6.62	125.70	111.80
1	B	757	HIS	CA-C-O	-6.52	106.41	120.10
1	B	437	ARG	NE-CZ-NH2	-6.28	117.16	120.30
1	D	401	ARG	CG-CD-NE	-6.27	98.63	111.80
1	B	479	ARG	NE-CZ-NH1	6.25	123.43	120.30
1	C	394	ARG	NE-CZ-NH2	6.23	123.42	120.30
1	C	328	ARG	NE-CZ-NH1	6.21	123.41	120.30
1	B	65	ARG	CG-CD-NE	-6.17	98.85	111.80
1	A	751	ARG	NE-CZ-NH2	-6.16	117.22	120.30
1	A	394	ARG	NE-CZ-NH1	-6.06	117.27	120.30
1	C	394	ARG	NE-CZ-NH1	-6.03	117.28	120.30
1	B	385	ARG	NE-CZ-NH2	6.01	123.30	120.30
1	B	571	ARG	CG-CD-NE	-5.99	99.22	111.80
1	B	437	ARG	NE-CZ-NH1	5.91	123.25	120.30
1	B	557	MSE	CG-SE-CE	5.89	111.86	98.90
1	D	446	MSE	CG-SE-CE	-5.87	85.98	98.90
1	B	571	ARG	CB-CA-C	-5.85	98.69	110.40
1	C	65	ARG	NE-CZ-NH1	5.76	123.18	120.30
1	D	401	ARG	CB-CA-C	-5.51	99.38	110.40
1	D	385	ARG	NE-CZ-NH2	5.50	123.05	120.30
1	C	509	GLN	CB-CA-C	5.43	121.25	110.40
1	C	385	ARG	NE-CZ-NH1	5.28	122.94	120.30
1	A	401	ARG	CB-CA-C	-5.22	99.96	110.40
1	D	572	ARG	NE-CZ-NH1	-5.21	117.70	120.30
1	C	751	ARG	NE-CZ-NH1	5.20	122.90	120.30
1	A	751	ARG	NE-CZ-NH1	5.17	122.89	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	246	SER	Mainchain

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	5862	0	5503	30	0
1	B	5862	0	5503	17	0
1	C	5862	0	5503	28	0
1	D	5862	0	5503	29	0
2	E	25	0	7	0	0
2	F	25	0	7	0	0
2	G	25	0	7	0	0
2	H	25	0	7	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
4	A	19	0	26	0	0
4	B	19	0	26	0	0
5	A	12	0	16	2	0
5	B	6	0	8	0	0
5	C	12	0	16	2	0
5	D	12	0	16	0	0
6	A	372	0	0	1	0
6	B	265	0	0	1	0
6	C	344	0	0	2	0
6	D	323	0	0	3	0
All	All	24940	0	22148	102	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (102) 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:446:MSE:HE3	1:A:560:LEU:HD21	1.58	0.85

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:446:MSE:HE3	1:D:560:LEU:HD21	1.59	0.83
1:C:446:MSE:HE3	1:C:560:LEU:HD21	1.59	0.82
1:A:385:ARG:HH21	1:A:385:ARG:HA	1.52	0.74
1:A:477:TYR:HE1	5:A:804:GOL:H12	1.52	0.72
1:A:174:ASP:HB3	1:A:615:TYR:O	2.01	0.60
1:D:174:ASP:HB3	1:D:615:TYR:O	2.01	0.60
1:D:401:ARG:HD2	6:D:1091:HOH:O	2.01	0.60
1:A:477:TYR:CE1	5:A:804:GOL:H12	2.34	0.60
1:B:174:ASP:HB3	1:B:615:TYR:O	2.01	0.60
1:C:477:TYR:CE1	5:C:803:GOL:H12	2.37	0.59
1:C:477:TYR:HE1	5:C:803:GOL:H12	1.67	0.59
1:C:174:ASP:HB3	1:C:615:TYR:O	2.02	0.59
1:D:406:PHE:HB2	1:D:464:MSE:HE1	1.83	0.59
1:B:49:MSE:HB2	1:B:571:ARG:HG2	1.85	0.58
1:A:49:MSE:HB2	1:A:571:ARG:HG2	1.86	0.58
1:D:505:GLN:OE1	1:D:509:GLN:NE2	2.36	0.58
1:A:406:PHE:HB2	1:A:464:MSE:HE1	1.86	0.58
1:A:385:ARG:HA	1:A:385:ARG:NH2	2.17	0.56
1:B:446:MSE:HG2	1:B:496:ALA:HB1	1.88	0.56
1:A:755:GLU:HG3	6:C:938:HOH:O	2.06	0.55
1:A:446:MSE:HG2	1:A:556:VAL:HG13	1.87	0.55
1:B:406:PHE:HB2	1:B:464:MSE:HE1	1.90	0.54
1:C:406:PHE:CD1	1:C:464:MSE:HE1	2.43	0.53
1:D:109:SER:HB3	1:D:156:GLU:HA	1.91	0.53
1:B:406:PHE:CD1	1:B:464:MSE:HE1	2.44	0.53
1:C:406:PHE:HB2	1:C:464:MSE:HE1	1.90	0.53
1:D:446:MSE:HG2	1:D:556:VAL:HG13	1.92	0.51
1:A:434:PHE:HZ	1:A:557:MSE:SE	2.44	0.51
1:C:109:SER:HB3	1:C:156:GLU:HA	1.94	0.50
1:C:434:PHE:HZ	1:C:557:MSE:SE	2.44	0.50
1:D:389:LEU:O	1:D:394:ARG:NH1	2.45	0.50
1:A:501:GLU:O	1:A:505:GLN:HG3	2.11	0.50
1:C:446:MSE:HG2	1:C:556:VAL:HG13	1.93	0.49
1:D:554:GLU:OE1	1:D:558:LYS:HE3	2.12	0.49
1:C:59:TYR:HB3	1:C:65:ARG:HD3	1.95	0.49
1:D:618:ALA:O	1:D:625:LYS:HA	2.13	0.48
1:C:446:MSE:CE	1:C:560:LEU:HD21	2.38	0.48
1:D:406:PHE:HB2	1:D:464:MSE:CE	2.44	0.48
1:B:434:PHE:HZ	1:B:557:MSE:SE	2.45	0.48
1:A:406:PHE:HB2	1:A:464:MSE:CE	2.44	0.48
1:A:446:MSE:CE	1:A:560:LEU:HD21	2.38	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:554:GLU:OE1	1:A:558:LYS:HE3	2.13	0.47
1:A:618:ALA:O	1:A:625:LYS:HA	2.14	0.47
1:A:109:SER:HB3	1:A:156:GLU:HA	1.95	0.47
1:D:406:PHE:CD1	1:D:464:MSE:HE1	2.49	0.47
1:B:384:TYR:OH	1:B:544:GLU:OE2	2.27	0.47
1:A:406:PHE:CD1	1:A:464:MSE:HE1	2.49	0.47
1:D:434:PHE:HZ	1:D:557:MSE:SE	2.48	0.47
1:A:401:ARG:HD2	6:A:947:HOH:O	2.14	0.46
1:C:66:ARG:HG2	1:C:378:TRP:CE2	2.51	0.46
1:C:375:ASP:HB3	1:C:730:ILE:CD1	2.46	0.46
1:C:554:GLU:OE1	1:C:558:LYS:HE3	2.16	0.46
1:C:618:ALA:O	1:C:625:LYS:HA	2.15	0.46
1:C:231:MSE:HE2	1:C:253:LEU:HD23	1.97	0.45
1:B:618:ALA:O	1:B:625:LYS:HA	2.15	0.45
1:D:246:SER:C	1:D:247:SER:O	2.51	0.45
1:C:607:ARG:HA	1:C:607:ARG:HD3	1.85	0.44
1:A:369:VAL:HG21	1:A:377:LEU:HB2	1.99	0.44
1:D:227:LEU:HG	1:D:231:MSE:HE2	2.00	0.44
1:D:385:ARG:NH1	6:D:920:HOH:O	2.50	0.44
1:D:233:GLU:HB3	1:D:267:LYS:HE3	2.00	0.44
1:C:406:PHE:HB2	1:C:464:MSE:CE	2.47	0.44
1:A:298:ILE:O	1:A:302:MSE:HG3	2.18	0.43
1:B:537:GLY:HA3	1:B:590:PHE:CZ	2.53	0.43
1:D:248:GLU:O	1:D:249:ASP:HB2	2.18	0.43
1:D:375:ASP:HB3	1:D:730:ILE:CD1	2.48	0.43
1:C:362:GLU:OE1	1:C:385:ARG:NH1	2.51	0.43
1:D:403:THR:HB	6:D:902:HOH:O	2.18	0.43
1:A:607:ARG:HD3	1:A:607:ARG:HA	1.87	0.43
1:C:403:THR:HB	6:C:903:HOH:O	2.18	0.43
1:D:421:TYR:CD1	1:D:436:VAL:HG22	2.54	0.42
1:D:537:GLY:HA3	1:D:590:PHE:CZ	2.54	0.42
1:B:66:ARG:HG2	1:B:378:TRP:CE2	2.54	0.42
1:C:537:GLY:HA3	1:C:590:PHE:CZ	2.54	0.42
1:D:505:GLN:HE21	1:D:505:GLN:HB3	1.68	0.42
1:A:421:TYR:CD1	1:A:436:VAL:HG22	2.54	0.42
1:B:385:ARG:HA	1:B:385:ARG:NH1	2.34	0.42
1:D:446:MSE:CE	1:D:560:LEU:HD21	2.40	0.42
1:C:455:ASN:OD1	1:D:385:ARG:NH2	2.53	0.42
1:B:505:GLN:HG2	1:B:509:GLN:NE2	2.33	0.42
1:A:344:GLU:OE2	1:C:694:GLU:OE2	2.38	0.42
1:B:385:ARG:HA	1:B:385:ARG:HH11	1.84	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:558:LYS:HE2	6:B:1136:HOH:O	2.19	0.42
1:A:525:LYS:HB3	1:A:525:LYS:HE3	1.80	0.41
1:B:607:ARG:HA	1:B:607:ARG:HD3	1.82	0.41
1:A:375:ASP:HB3	1:A:730:ILE:CD1	2.50	0.41
1:D:446:MSE:HE2	1:D:446:MSE:HB2	1.90	0.41
1:C:421:TYR:CD1	1:C:436:VAL:HG22	2.56	0.41
1:D:607:ARG:HD3	1:D:607:ARG:HA	1.85	0.41
1:A:66:ARG:HG2	1:A:378:TRP:CE2	2.55	0.41
1:A:375:ASP:HB3	1:A:730:ILE:HD11	2.03	0.41
1:B:375:ASP:HB3	1:B:730:ILE:CD1	2.51	0.41
1:D:66:ARG:HG2	1:D:378:TRP:CE2	2.56	0.41
1:C:272:LYS:HE3	1:C:296:ASP:OD1	2.21	0.41
1:C:540:ARG:HA	1:C:569:VAL:O	2.21	0.41
1:D:446:MSE:HE1	1:D:497:MSE:SE	2.71	0.41
1:A:384:TYR:OH	1:A:544:GLU:OE2	2.34	0.40
1:A:434:PHE:CZ	1:A:557:MSE:SE	3.24	0.40
1:C:464:MSE:HE2	1:C:464:MSE:HB3	2.02	0.40
1:C:369:VAL:HG21	1:C:377:LEU:HB2	2.02	0.40
1:B:406:PHE:HB2	1:B:464:MSE:CE	2.50	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	722/732 (99%)	709 (98%)	13 (2%)	0	100	100
1	B	722/732 (99%)	707 (98%)	15 (2%)	0	100	100
1	C	722/732 (99%)	711 (98%)	11 (2%)	0	100	100
1	D	722/732 (99%)	708 (98%)	14 (2%)	0	100	100
All	All	2888/2928 (99%)	2835 (98%)	53 (2%)	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	620/612 (101%)	609 (98%)	11 (2%)	59	75
1	B	620/612 (101%)	612 (99%)	8 (1%)	69	82
1	C	620/612 (101%)	610 (98%)	10 (2%)	62	78
1	D	620/612 (101%)	610 (98%)	10 (2%)	62	78
All	All	2480/2448 (101%)	2441 (98%)	39 (2%)	62	78

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	66	ARG
1	A	155	TRP
1	A	163	ASP
1	A	246	SER
1	A	312	GLN
1	A	368	GLU
1	A	385	ARG
1	A	399	LEU
1	A	571	ARG
1	A	661	ASN
1	A	755	GLU
1	B	66	ARG
1	B	155	TRP
1	B	246	SER
1	B	312	GLN
1	B	385	ARG
1	B	399	LEU
1	B	437	ARG
1	B	571	ARG
1	C	66	ARG
1	C	155	TRP
1	C	246	SER

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Mol	Chain	Res	Type
1	C	312	GLN
1	C	399	LEU
1	C	413	PRO
1	C	438	LYS
1	C	509	GLN
1	C	519	LYS
1	C	520	LYS
1	D	66	ARG
1	D	155	TRP
1	D	246	SER
1	D	312	GLN
1	D	385	ARG
1	D	437	ARG
1	D	505	GLN
1	D	510	GLU
1	D	520	LYS
1	D	755	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	661	ASN
1	B	509	GLN
1	B	529	ASN
1	C	645	ASN
1	D	505	GLN
1	D	509	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 monosaccharides in this entry.

5.6 Ligand geometry

Of 17 ligands modelled in this entry, 8 are monoatomic - leaving 9 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	P6G	A	803	-	18,18,18	0.50	0	17,17,17	0.52	0
5	GOL	B	804	-	5,5,5	0.18	0	5,5,5	0.47	0
5	GOL	A	804	-	5,5,5	0.11	0	5,5,5	0.53	0
5	GOL	C	804	-	5,5,5	0.11	0	5,5,5	0.35	0
5	GOL	D	803	-	5,5,5	0.15	0	5,5,5	0.33	0
5	GOL	D	804	-	5,5,5	0.16	0	5,5,5	0.45	0
5	GOL	A	805	-	5,5,5	0.24	0	5,5,5	0.71	0
4	P6G	B	803	-	18,18,18	0.44	0	17,17,17	0.68	0
5	GOL	C	803	-	5,5,5	0.21	0	5,5,5	0.51	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
4	P6G	A	803	-	-	5/16/16/16	-
5	GOL	B	804	-	-	0/4/4/4	-
5	GOL	A	804	-	-	2/4/4/4	-
5	GOL	C	804	-	-	3/4/4/4	-
5	GOL	D	803	-	-	1/4/4/4	-
5	GOL	D	804	-	-	4/4/4/4	-
5	GOL	A	805	-	-	4/4/4/4	-
4	P6G	B	803	-	-	4/16/16/16	-
5	GOL	C	803	-	-	0/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	804	GOL	O1-C1-C2-C3
5	A	805	GOL	O1-C1-C2-C3
5	C	804	GOL	C1-C2-C3-O3
4	B	803	P6G	O1-C2-C3-O4
4	A	803	P6G	O1-C2-C3-O4
4	B	803	P6G	O16-C17-C18-O19
5	A	805	GOL	C1-C2-C3-O3
5	D	804	GOL	O1-C1-C2-C3
5	D	804	GOL	C1-C2-C3-O3
5	A	804	GOL	O1-C1-C2-O2
5	A	805	GOL	O1-C1-C2-O2
5	D	804	GOL	O2-C2-C3-O3
5	C	804	GOL	O2-C2-C3-O3
5	D	804	GOL	O1-C1-C2-O2
5	C	804	GOL	O1-C1-C2-O2
4	B	803	P6G	C14-C15-O16-C17
4	A	803	P6G	C18-C17-O16-C15
4	A	803	P6G	O13-C14-C15-O16
4	B	803	P6G	O13-C14-C15-O16
4	A	803	P6G	C8-C9-O10-C11
5	A	805	GOL	O2-C2-C3-O3
5	D	803	GOL	C1-C2-C3-O3
4	A	803	P6G	O16-C17-C18-O19

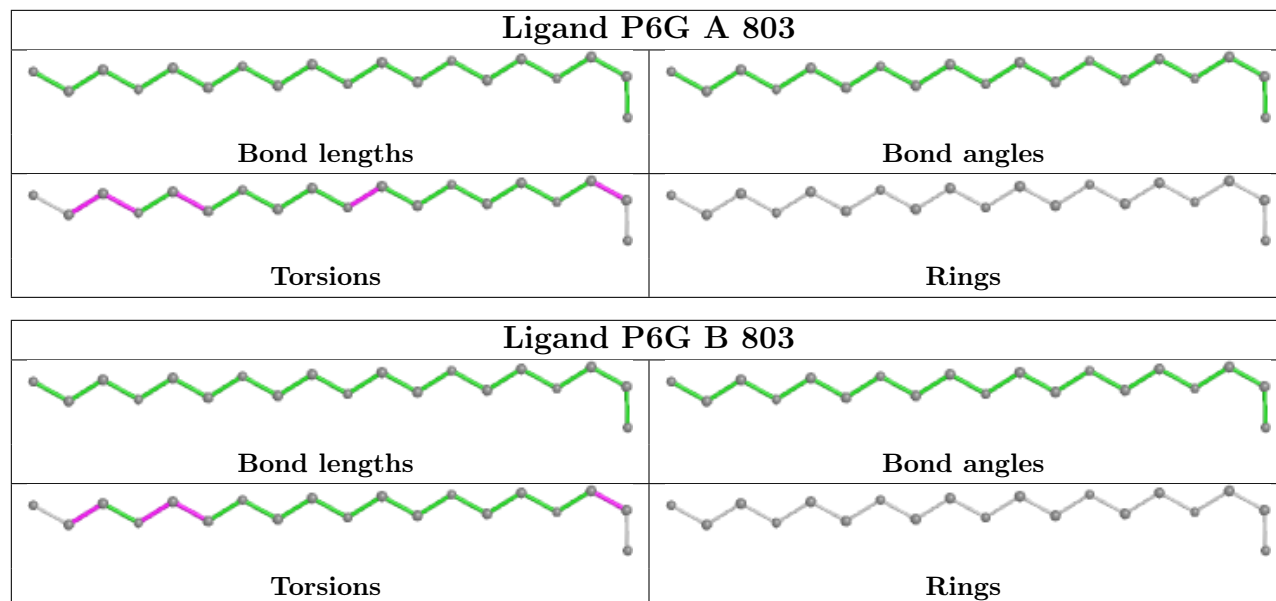
There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	804	GOL	2	0
5	C	803	GOL	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 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	709/732 (96%)	-0.31	5 (0%) 87 91	15, 23, 39, 65	0
1	B	709/732 (96%)	-0.09	13 (1%) 68 74	18, 30, 52, 77	0
1	C	709/732 (96%)	-0.22	13 (1%) 68 74	17, 24, 44, 68	0
1	D	709/732 (96%)	-0.20	14 (1%) 65 71	17, 27, 45, 90	0
2	E	0/5	-	-	-	-
2	F	0/5	-	-	-	-
2	G	0/5	-	-	-	-
2	H	0/5	-	-	-	-
All	All	2836/2948 (96%)	-0.20	45 (1%) 72 77	15, 26, 46, 90	0

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	248	GLU	4.1
1	A	163	ASP	4.1
1	C	163	ASP	4.1
1	D	163	ASP	4.1
1	B	163	ASP	3.8
1	C	164	ASP	3.8
1	D	248	GLU	3.8
1	C	248	GLU	3.6
1	D	427	ASP	3.5
1	D	164	ASP	3.5
1	C	425	VAL	3.5
1	B	427	ASP	3.5
1	C	162	GLY	3.3
1	B	522	ASP	3.2
1	B	273	GLN	3.1
1	C	427	ASP	3.1
1	B	164	ASP	3.1

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Mol	Chain	Res	Type	RSRZ
1	C	522	ASP	3.0
1	D	522	ASP	2.9
1	B	629	GLU	2.8
1	B	249	ASP	2.8
1	C	249	ASP	2.8
1	D	513	LYS	2.8
1	D	373	HIS	2.7
1	B	524	GLY	2.6
1	D	426	GLY	2.6
1	D	239	PRO	2.6
1	C	289	ASN	2.5
1	C	431	PHE	2.4
1	A	164	ASP	2.3
1	D	494	ASP	2.3
1	B	425	VAL	2.3
1	D	110	THR	2.2
1	B	417	GLN	2.2
1	B	494	ASP	2.2
1	B	531	GLU	2.1
1	A	522	ASP	2.1
1	D	249	ASP	2.1
1	D	162	GLY	2.1
1	C	518	LEU	2.1
1	A	289	ASN	2.1
1	C	513	LYS	2.0
1	C	417	GLN	2.0
1	A	227	LEU	2.0
1	D	428	LYS	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 monosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

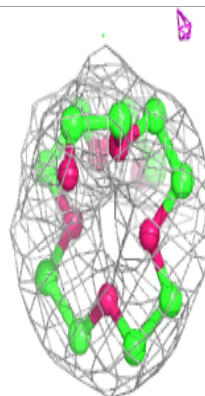
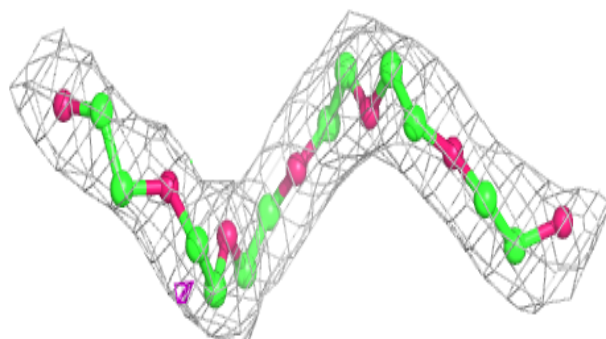
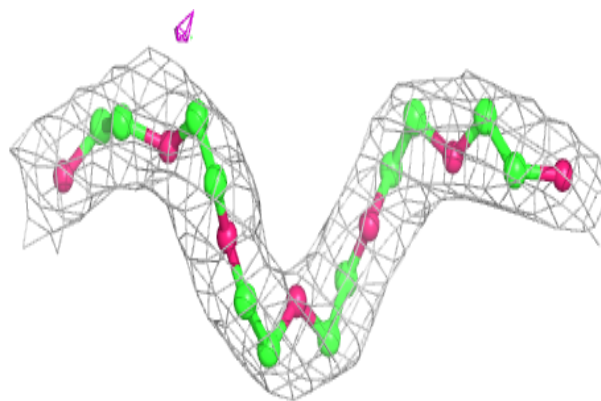
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NA	C	802	1/1	0.70	0.18	47,47,47,47	0
3	NA	D	802	1/1	0.82	0.12	38,38,38,38	0
5	GOL	C	804	6/6	0.82	0.34	43,45,48,51	0
5	GOL	A	805	6/6	0.83	0.25	41,44,48,52	0
3	NA	C	801	1/1	0.86	0.08	25,25,25,25	0
5	GOL	D	804	6/6	0.88	0.28	39,42,43,43	0
4	P6G	B	803	19/19	0.92	0.14	37,41,48,50	0
4	P6G	A	803	19/19	0.94	0.13	39,44,50,51	0
3	NA	B	801	1/1	0.95	0.04	29,29,29,29	0
5	GOL	B	804	6/6	0.95	0.16	30,33,34,36	0
5	GOL	D	803	6/6	0.96	0.11	25,27,28,30	0
5	GOL	C	803	6/6	0.96	0.13	24,26,27,30	0
3	NA	D	801	1/1	0.97	0.08	23,23,23,23	0
3	NA	A	802	1/1	0.97	0.09	34,34,34,34	0
5	GOL	A	804	6/6	0.97	0.11	22,27,28,28	0
3	NA	B	802	1/1	0.98	0.07	36,36,36,36	0
3	NA	A	801	1/1	0.99	0.07	21,21,21,21	0

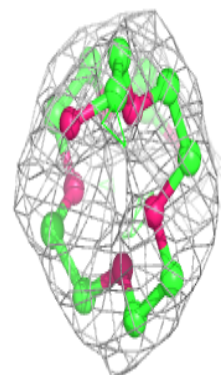
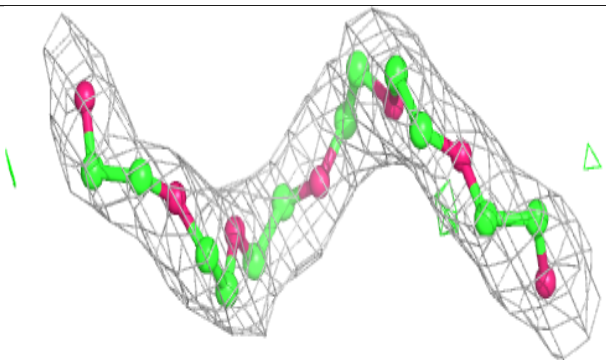
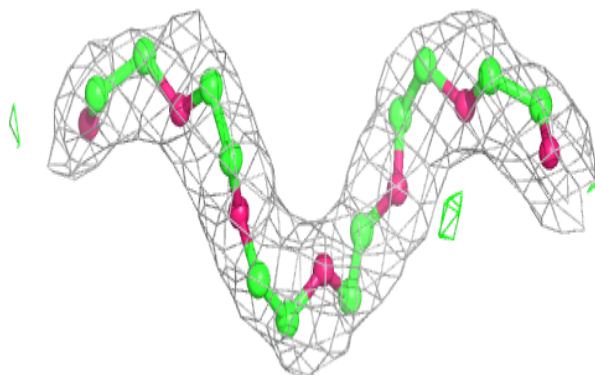
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around P6G B 803:

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

**Electron density around P6G A 803:**

$2mF_o-DF_c$ (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.