



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 7, 2024 – 12:34 pm GMT

PDB ID : 5OAD
Title : Crystal structure of mutant AChBP in complex with HEPES (T53F, Q74R, Y110A, I135S, G162E)
Authors : Dawson, A.; Hunter, W.N.; de Souza, J.O.; Trumper, P.
Deposited on : 2017-06-21
Resolution : 2.10 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

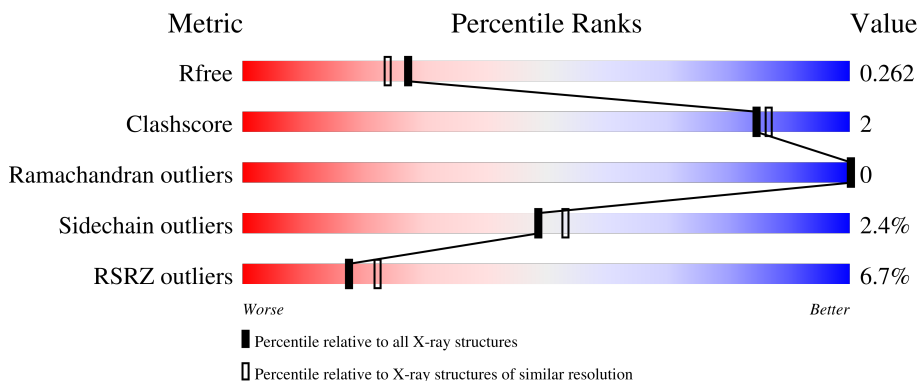
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	249	 5% 76% 7% 17%
1	B	249	 5% 77% 5% 18%
1	C	249	 5% 75% 8% 17%
1	D	249	 8% 76% 6% 18%
1	E	249	 5% 79% 1% 17%

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
2	NAG	E	301	-	-	-	X

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 8505 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 Soluble acetylcholine receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	206	Total 1649	C 1042	N 272	O 326	S 9	0	0	0
1	B	205	Total 1642	C 1038	N 269	O 326	S 9	0	1	0
1	C	206	Total 1649	C 1042	N 272	O 326	S 9	0	0	0
1	D	205	Total 1638	C 1036	N 268	O 325	S 9	0	0	0
1	E	207	Total 1654	C 1045	N 273	O 327	S 9	0	0	0

There are 100 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	53	PHE	THR	engineered mutation	UNP Q8WSF8
A	60	VAL	ALA	conflict	UNP Q8WSF8
A	74	ARG	GLN	engineered mutation	UNP Q8WSF8
A	110	ALA	TYR	engineered mutation	UNP Q8WSF8
A	135	SER	ILE	engineered mutation	UNP Q8WSF8
A	155	VAL	ALA	conflict	UNP Q8WSF8
A	162	GLU	GLY	engineered mutation	UNP Q8WSF8
A	237	GLU	-	expression tag	UNP Q8WSF8
A	238	ASN	-	expression tag	UNP Q8WSF8
A	239	LEU	-	expression tag	UNP Q8WSF8
A	240	TYR	-	expression tag	UNP Q8WSF8
A	241	PHE	-	expression tag	UNP Q8WSF8
A	242	GLN	-	expression tag	UNP Q8WSF8
A	243	GLY	-	expression tag	UNP Q8WSF8
A	244	HIS	-	expression tag	UNP Q8WSF8
A	245	HIS	-	expression tag	UNP Q8WSF8
A	246	HIS	-	expression tag	UNP Q8WSF8
A	247	HIS	-	expression tag	UNP Q8WSF8
A	248	HIS	-	expression tag	UNP Q8WSF8

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Chain	Residue	Modelled	Actual	Comment	Reference
A	249	HIS	-	expression tag	UNP Q8WSF8
B	53	PHE	THR	engineered mutation	UNP Q8WSF8
B	60	VAL	ALA	conflict	UNP Q8WSF8
B	74	ARG	GLN	engineered mutation	UNP Q8WSF8
B	110	ALA	TYR	engineered mutation	UNP Q8WSF8
B	135	SER	ILE	engineered mutation	UNP Q8WSF8
B	155	VAL	ALA	conflict	UNP Q8WSF8
B	162	GLU	GLY	engineered mutation	UNP Q8WSF8
B	237	GLU	-	expression tag	UNP Q8WSF8
B	238	ASN	-	expression tag	UNP Q8WSF8
B	239	LEU	-	expression tag	UNP Q8WSF8
B	240	TYR	-	expression tag	UNP Q8WSF8
B	241	PHE	-	expression tag	UNP Q8WSF8
B	242	GLN	-	expression tag	UNP Q8WSF8
B	243	GLY	-	expression tag	UNP Q8WSF8
B	244	HIS	-	expression tag	UNP Q8WSF8
B	245	HIS	-	expression tag	UNP Q8WSF8
B	246	HIS	-	expression tag	UNP Q8WSF8
B	247	HIS	-	expression tag	UNP Q8WSF8
B	248	HIS	-	expression tag	UNP Q8WSF8
B	249	HIS	-	expression tag	UNP Q8WSF8
C	53	PHE	THR	engineered mutation	UNP Q8WSF8
C	60	VAL	ALA	conflict	UNP Q8WSF8
C	74	ARG	GLN	engineered mutation	UNP Q8WSF8
C	110	ALA	TYR	engineered mutation	UNP Q8WSF8
C	135	SER	ILE	engineered mutation	UNP Q8WSF8
C	155	VAL	ALA	conflict	UNP Q8WSF8
C	162	GLU	GLY	engineered mutation	UNP Q8WSF8
C	237	GLU	-	expression tag	UNP Q8WSF8
C	238	ASN	-	expression tag	UNP Q8WSF8
C	239	LEU	-	expression tag	UNP Q8WSF8
C	240	TYR	-	expression tag	UNP Q8WSF8
C	241	PHE	-	expression tag	UNP Q8WSF8
C	242	GLN	-	expression tag	UNP Q8WSF8
C	243	GLY	-	expression tag	UNP Q8WSF8
C	244	HIS	-	expression tag	UNP Q8WSF8
C	245	HIS	-	expression tag	UNP Q8WSF8
C	246	HIS	-	expression tag	UNP Q8WSF8
C	247	HIS	-	expression tag	UNP Q8WSF8
C	248	HIS	-	expression tag	UNP Q8WSF8
C	249	HIS	-	expression tag	UNP Q8WSF8
D	53	PHE	THR	engineered mutation	UNP Q8WSF8

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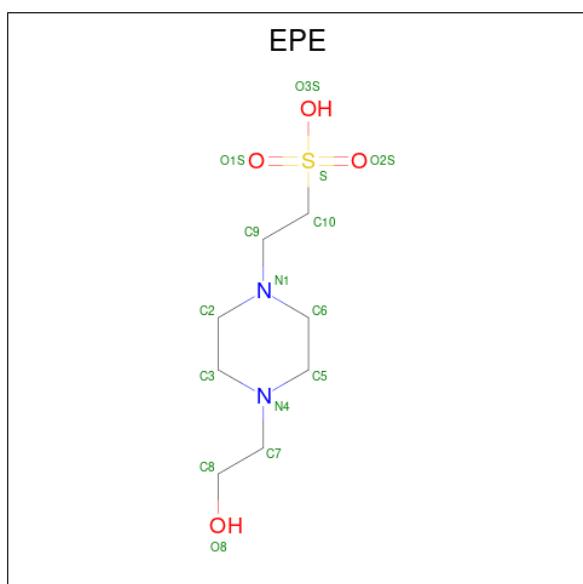
Chain	Residue	Modelled	Actual	Comment	Reference
D	60	VAL	ALA	conflict	UNP Q8WSF8
D	74	ARG	GLN	engineered mutation	UNP Q8WSF8
D	110	ALA	TYR	engineered mutation	UNP Q8WSF8
D	135	SER	ILE	engineered mutation	UNP Q8WSF8
D	155	VAL	ALA	conflict	UNP Q8WSF8
D	162	GLU	GLY	engineered mutation	UNP Q8WSF8
D	237	GLU	-	expression tag	UNP Q8WSF8
D	238	ASN	-	expression tag	UNP Q8WSF8
D	239	LEU	-	expression tag	UNP Q8WSF8
D	240	TYR	-	expression tag	UNP Q8WSF8
D	241	PHE	-	expression tag	UNP Q8WSF8
D	242	GLN	-	expression tag	UNP Q8WSF8
D	243	GLY	-	expression tag	UNP Q8WSF8
D	244	HIS	-	expression tag	UNP Q8WSF8
D	245	HIS	-	expression tag	UNP Q8WSF8
D	246	HIS	-	expression tag	UNP Q8WSF8
D	247	HIS	-	expression tag	UNP Q8WSF8
D	248	HIS	-	expression tag	UNP Q8WSF8
D	249	HIS	-	expression tag	UNP Q8WSF8
E	53	PHE	THR	engineered mutation	UNP Q8WSF8
E	60	VAL	ALA	conflict	UNP Q8WSF8
E	74	ARG	GLN	engineered mutation	UNP Q8WSF8
E	110	ALA	TYR	engineered mutation	UNP Q8WSF8
E	135	SER	ILE	engineered mutation	UNP Q8WSF8
E	155	VAL	ALA	conflict	UNP Q8WSF8
E	162	GLU	GLY	engineered mutation	UNP Q8WSF8
E	237	GLU	-	expression tag	UNP Q8WSF8
E	238	ASN	-	expression tag	UNP Q8WSF8
E	239	LEU	-	expression tag	UNP Q8WSF8
E	240	TYR	-	expression tag	UNP Q8WSF8
E	241	PHE	-	expression tag	UNP Q8WSF8
E	242	GLN	-	expression tag	UNP Q8WSF8
E	243	GLY	-	expression tag	UNP Q8WSF8
E	244	HIS	-	expression tag	UNP Q8WSF8
E	245	HIS	-	expression tag	UNP Q8WSF8
E	246	HIS	-	expression tag	UNP Q8WSF8
E	247	HIS	-	expression tag	UNP Q8WSF8
E	248	HIS	-	expression tag	UNP Q8WSF8
E	249	HIS	-	expression tag	UNP Q8WSF8

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



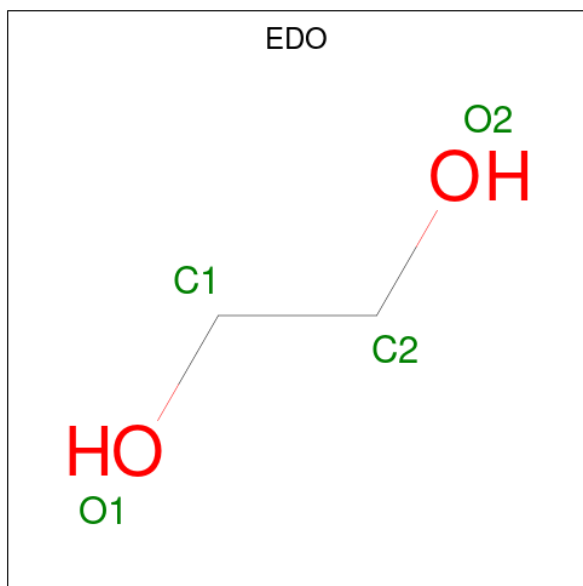
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	14	8	1	5	0	0
2	C	1	14	8	1	5	0	0
2	D	1	14	8	1	5	0	0
2	E	1	14	8	1	5	0	0

- Molecule 3 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: C₈H₁₈N₂O₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	S	0	0
			15	8	2	4	1		
3	B	1	Total	C	N	O	S	0	0
			15	8	2	4	1		
3	D	1	Total	C	N	O	S	0	0
			15	8	2	4	1		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	O	0	0
			4	2	2		
4	D	1	Total	C	O	0	0
			4	2	2		

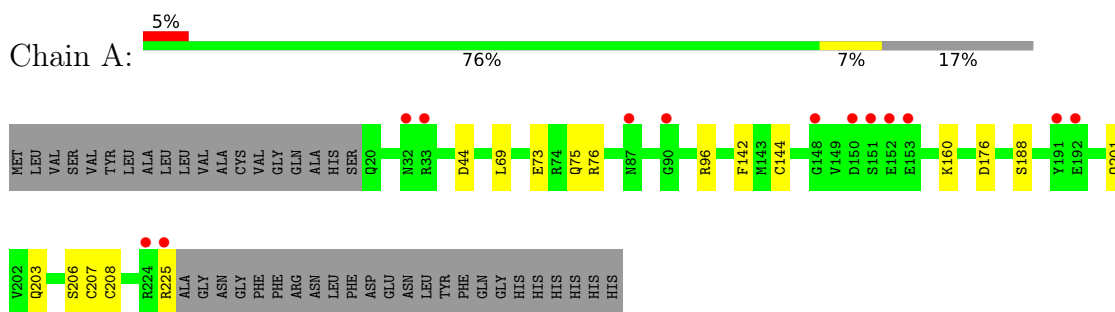
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	33	Total	O	0	0
			33	33		
5	B	27	Total	O	0	0
			27	27		
5	C	40	Total	O	0	0
			40	40		
5	D	35	Total	O	0	0
			35	35		
5	E	29	Total	O	0	0
			29	29		

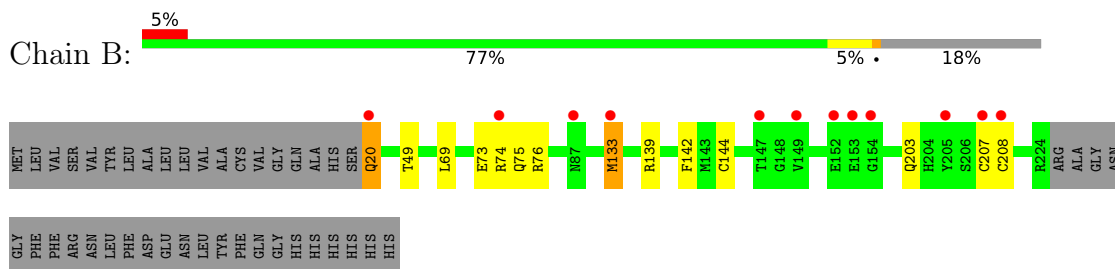
3 Residue-property plots [i](#)

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.

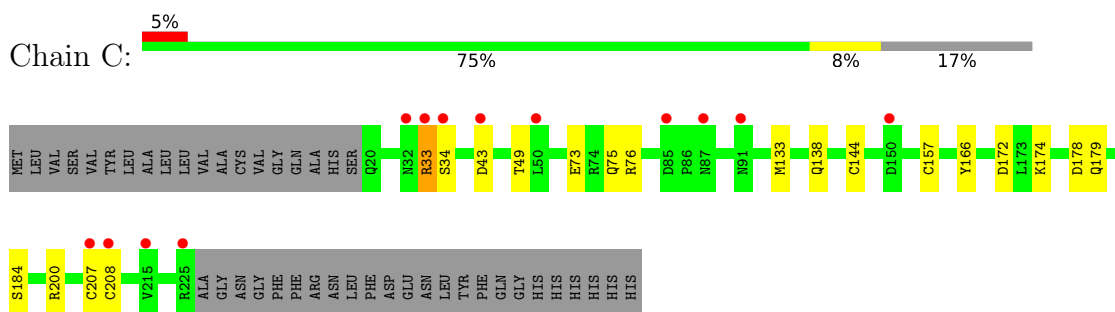
- Molecule 1: Soluble acetylcholine receptor



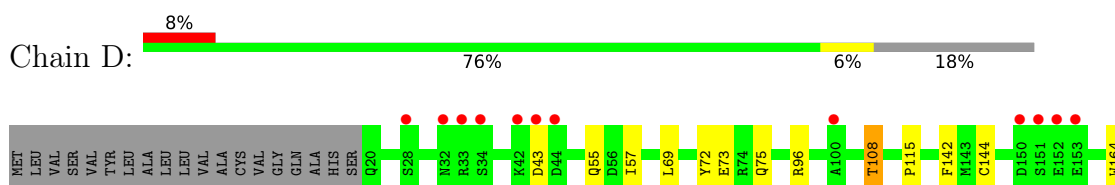
- Molecule 1: Soluble acetylcholine receptor

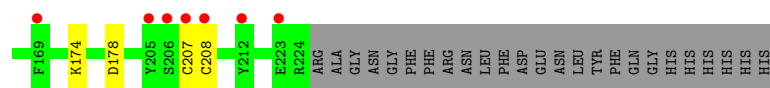


- Molecule 1: Soluble acetylcholine receptor

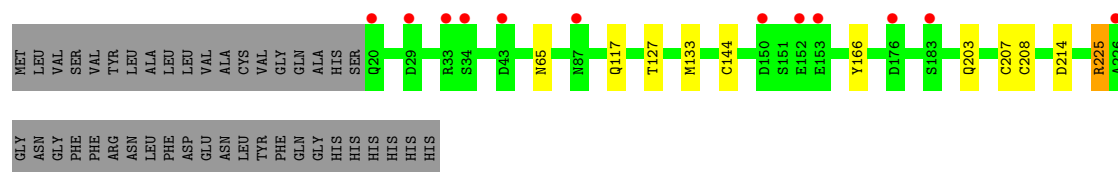
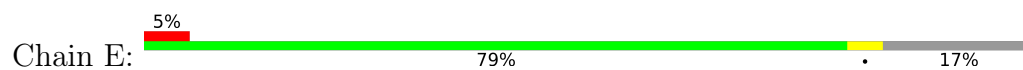


- Molecule 1: Soluble acetylcholine receptor





- Molecule 1: Soluble acetylcholine receptor



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	73.17Å 118.46Å 123.77Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.36 – 2.10 33.46 – 2.10	Depositor EDS
% Data completeness (in resolution range)	97.8 (33.36-2.10) 97.8 (33.46-2.10)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.47 (at 2.10Å)	Xtrriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.226 , 0.255 0.232 , 0.262	Depositor DCC
R_{free} test set	3159 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	33.4	Xtrriage
Anisotropy	0.524	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 49.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	0.022 for -h,l,k	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8505	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.60% 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: NAG, EPE, EDO

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	0.54	0/1689	0.80	0/2302
1	B	0.51	0/1686	0.77	1/2299 (0.0%)
1	C	0.59	0/1689	0.81	0/2302
1	D	0.56	0/1678	0.76	0/2288
1	E	0.53	0/1694	0.78	0/2309
All	All	0.55	0/8436	0.79	1/11500 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	139	ARG	NE-CZ-NH1	5.77	123.19	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1649	0	1581	9	0
1	B	1642	0	1571	6	0
1	C	1649	0	1581	11	0
1	D	1638	0	1568	8	0
1	E	1654	0	1586	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	14	0	13	0	0
2	C	14	0	13	0	0
2	D	14	0	13	0	0
2	E	14	0	13	0	0
3	A	15	0	18	0	0
3	B	15	0	18	2	0
3	D	15	0	18	0	0
4	B	4	0	6	0	0
4	D	4	0	6	0	0
5	A	33	0	0	0	0
5	B	27	0	0	0	0
5	C	40	0	0	3	0
5	D	35	0	0	0	0
5	E	29	0	0	1	0
All	All	8505	0	8005	37	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 (37) 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:76:ARG:NH1	1:A:176:ASP:OD2	2.19	0.76
1:C:178:ASP:O	5:C:401:HOH:O	2.05	0.73
1:E:203:GLN:CG	1:E:214:ASP:OD1	2.58	0.52
1:C:166:TYR:CE1	1:D:96:ARG:HD3	2.45	0.51
1:C:73:GLU:OE2	1:C:75:GLN:NE2	2.43	0.49
1:A:188:SER:O	1:E:65:ASN:ND2	2.46	0.48
1:B:133:MET:CE	3:B:601:EPE:H62	2.44	0.47
1:A:44:ASP:CG	1:B:20:GLN:HE22	2.19	0.46
1:C:33:ARG:HG3	1:C:34:SER:H	1.82	0.45
1:A:73:GLU:OE2	1:A:75:GLN:NE2	2.43	0.45
1:C:49:THR:OG1	1:C:76:ARG:HB2	2.17	0.45
1:D:55:GLN:NE2	1:D:72:TYR:CD1	2.85	0.44
1:B:73:GLU:OE2	1:B:75:GLN:NE2	2.43	0.44
1:D:115:PRO:HG3	1:E:117:GLN:HB3	1.99	0.44
1:E:207:CYS:SG	1:E:208:CYS:N	2.91	0.43
1:B:49:THR:HB	1:B:76:ARG:HG2	2.01	0.43
1:C:138:GLN:NE2	5:C:404:HOH:O	2.47	0.43
1:D:108:THR:HG21	1:D:164:TRP:CE3	2.54	0.42
1:A:207:CYS:SG	1:A:208:CYS:N	2.92	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:57:ILE:HG12	1:D:69:LEU:CD2	2.50	0.42
1:E:203:GLN:HG3	1:E:214:ASP:OD1	2.17	0.42
1:C:172:ASP:OD2	1:C:174:LYS:HE3	2.20	0.42
1:B:69:LEU:HG	1:B:142:PHE:HE1	1.85	0.42
1:E:225:ARG:O	1:E:225:ARG:HG2	2.19	0.42
1:C:33:ARG:HG3	1:C:34:SER:N	2.35	0.41
1:C:157:CYS:HB2	5:C:435:HOH:O	2.19	0.41
1:A:160:LYS:HE3	1:A:201:GLN:NE2	2.36	0.41
1:B:74:ARG:HD3	3:B:601:EPE:H72	2.03	0.41
1:A:160:LYS:HE2	1:A:203:GLN:HE22	1.86	0.41
1:D:207:CYS:SG	1:D:208:CYS:N	2.94	0.41
1:D:73:GLU:OE2	1:D:75:GLN:NE2	2.42	0.40
1:C:200:ARG:HH21	1:C:200:ARG:HD2	1.71	0.40
1:C:207:CYS:SG	1:C:208:CYS:N	2.94	0.40
1:A:96:ARG:HD3	1:E:166:TYR:CE1	2.56	0.40
1:E:127:THR:HG23	5:E:415:HOH:O	2.20	0.40
1:A:69:LEU:HG	1:A:142:PHE:HE1	1.85	0.40
1:D:69:LEU:HG	1:D:142:PHE:HE1	1.87	0.40

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	204/249 (82%)	201 (98%)	3 (2%)	0	100	100
1	B	204/249 (82%)	199 (98%)	5 (2%)	0	100	100
1	C	204/249 (82%)	199 (98%)	5 (2%)	0	100	100
1	D	203/249 (82%)	198 (98%)	5 (2%)	0	100	100
1	E	205/249 (82%)	200 (98%)	5 (2%)	0	100	100
All	All	1020/1245 (82%)	997 (98%)	23 (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	189/224 (84%)	186 (98%)	3 (2%)	62	69
1	B	189/224 (84%)	183 (97%)	6 (3%)	39	41
1	C	189/224 (84%)	183 (97%)	6 (3%)	39	41
1	D	188/224 (84%)	183 (97%)	5 (3%)	44	48
1	E	189/224 (84%)	186 (98%)	3 (2%)	62	69
All	All	944/1120 (84%)	921 (98%)	23 (2%)	49	53

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	144	CYS
1	A	206	SER
1	A	225	ARG
1	B	20	GLN
1	B	133	MET
1	B	144	CYS
1	B	203	GLN
1	B	207	CYS
1	B	208	CYS
1	C	33	ARG
1	C	43	ASP
1	C	133	MET
1	C	144	CYS
1	C	179	GLN
1	C	184	SER
1	D	43	ASP
1	D	108	THR
1	D	144	CYS
1	D	174	LYS
1	D	178	ASP
1	E	133	MET

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Mol	Chain	Res	Type
1	E	144	CYS
1	E	225	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	32	ASN
1	A	122	GLN
1	A	201	GLN
1	A	203	GLN
1	A	216	ASN
1	B	20	GLN
1	B	32	ASN
1	B	122	GLN
1	B	201	GLN
1	C	20	GLN
1	C	32	ASN
1	C	122	GLN
1	C	201	GLN
1	D	32	ASN
1	D	122	GLN
1	E	20	GLN
1	E	32	ASN
1	E	122	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

9 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	A	301	1	14,14,15	0.69	1 (7%)	17,19,21	1.25	2 (11%)
4	EDO	B	602	-	3,3,3	0.52	0	2,2,2	0.17	0
2	NAG	E	301	1	14,14,15	0.70	0	17,19,21	1.42	2 (11%)
3	EPE	D	601	-	15,15,15	1.83	1 (6%)	18,20,20	1.56	3 (16%)
2	NAG	C	301	1	14,14,15	0.56	0	17,19,21	1.21	1 (5%)
2	NAG	D	603	1	14,14,15	0.40	0	17,19,21	1.42	3 (17%)
3	EPE	A	302	-	15,15,15	1.88	1 (6%)	18,20,20	1.54	3 (16%)
3	EPE	B	601	-	15,15,15	2.07	1 (6%)	18,20,20	1.98	4 (22%)
4	EDO	D	602	-	3,3,3	0.53	0	2,2,2	0.21	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
2	NAG	A	301	1	-	1/6/23/26	0/1/1/1
4	EDO	B	602	-	-	0/1/1/1	-
2	NAG	E	301	1	-	1/6/23/26	0/1/1/1
3	EPE	D	601	-	-	4/9/19/19	0/1/1/1
2	NAG	C	301	1	-	0/6/23/26	0/1/1/1
2	NAG	D	603	1	-	2/6/23/26	0/1/1/1
3	EPE	A	302	-	-	3/9/19/19	0/1/1/1
3	EPE	B	601	-	-	8/9/19/19	0/1/1/1
4	EDO	D	602	-	-	1/1/1/1	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	601	EPE	C10-S	-7.56	1.66	1.77
3	A	302	EPE	C10-S	-6.90	1.67	1.77
3	D	601	EPE	C10-S	-6.61	1.68	1.77
2	A	301	NAG	C1-C2	2.04	1.55	1.52

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	601	EPE	O1S-S-C10	6.20	114.38	106.92
2	E	301	NAG	C1-O5-C5	3.55	117.00	112.19
3	A	302	EPE	O2S-S-C10	3.51	111.14	106.92
3	D	601	EPE	C5-C6-N1	3.15	117.10	110.64
3	D	601	EPE	O3S-S-C10	3.11	110.80	105.77
2	D	603	NAG	C4-C3-C2	2.87	115.22	111.02
2	A	301	NAG	C1-O5-C5	2.75	115.92	112.19
2	C	301	NAG	C1-C2-N2	2.63	114.98	110.49
3	A	302	EPE	C3-C2-N1	-2.60	105.31	110.64
2	A	301	NAG	C2-N2-C7	2.58	126.57	122.90
2	D	603	NAG	C3-C4-C5	2.56	114.80	110.24
3	B	601	EPE	O2S-S-C10	-2.47	103.94	106.92
3	B	601	EPE	C7-N4-C3	2.46	117.53	111.23
2	D	603	NAG	C1-C2-N2	-2.24	106.66	110.49
3	A	302	EPE	C5-N4-C3	2.21	113.79	108.83
2	E	301	NAG	C4-C3-C2	2.12	114.13	111.02
3	D	601	EPE	O2S-S-C10	2.11	109.46	106.92
3	B	601	EPE	O3S-S-C10	2.04	109.07	105.77

There are no chirality outliers.

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	302	EPE	C9-C10-S-O1S
3	A	302	EPE	C9-C10-S-O2S
3	B	601	EPE	C8-C7-N4-C3
3	B	601	EPE	S-C10-C9-N1
3	B	601	EPE	C9-C10-S-O2S
3	B	601	EPE	C9-C10-S-O3S
3	D	601	EPE	C9-C10-S-O1S
2	D	603	NAG	C4-C5-C6-O6
2	D	603	NAG	O5-C5-C6-O6
2	A	301	NAG	O5-C5-C6-O6
3	D	601	EPE	N4-C7-C8-O8

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Mol	Chain	Res	Type	Atoms
3	B	601	EPE	C10-C9-N1-C2
3	B	601	EPE	C10-C9-N1-C6
3	A	302	EPE	C9-C10-S-O3S
4	D	602	EDO	O1-C1-C2-O2
3	B	601	EPE	C9-C10-S-O1S
3	D	601	EPE	C9-C10-S-O2S
3	B	601	EPE	C8-C7-N4-C5
3	D	601	EPE	C9-C10-S-O3S
2	E	301	NAG	C4-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	601	EPE	2	0

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	206/249 (82%)	0.48	13 (6%) 20 24	24, 40, 64, 96	0
1	B	205/249 (82%)	0.63	12 (5%) 22 27	26, 44, 70, 98	0
1	C	206/249 (82%)	0.60	13 (6%) 20 24	24, 38, 63, 92	0
1	D	205/249 (82%)	0.55	19 (9%) 8 11	23, 37, 65, 93	0
1	E	207/249 (83%)	0.54	12 (5%) 23 28	24, 40, 69, 97	0
All	All	1029/1245 (82%)	0.56	69 (6%) 17 22	23, 40, 65, 98	0

All (69) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	152	GLU	5.7
1	D	207	CYS	5.4
1	D	43	ASP	5.2
1	B	207	CYS	5.0
1	A	225	ARG	4.6
1	E	33	ARG	4.4
1	E	226	ALA	4.3
1	C	33	ARG	4.1
1	E	150	ASP	3.9
1	D	153	GLU	3.8
1	E	43	ASP	3.7
1	D	33	ARG	3.7
1	A	153	GLU	3.6
1	D	208	CYS	3.6
1	D	152	GLU	3.5
1	D	206	SER	3.5
1	C	34	SER	3.4
1	D	150	ASP	3.3
1	E	176	ASP	3.2
1	A	32	ASN	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	208	CYS	3.2
1	C	87	ASN	3.1
1	E	153	GLU	3.1
1	A	150	ASP	3.1
1	D	212	TYR	3.0
1	C	91	ASN	3.0
1	D	44	ASP	3.0
1	D	32	ASN	3.0
1	C	207	CYS	2.9
1	B	20	GLN	2.8
1	C	50	LEU	2.8
1	B	153	GLU	2.8
1	B	149	VAL	2.7
1	C	32	ASN	2.7
1	A	152	GLU	2.7
1	D	223	GLU	2.7
1	C	225	ARG	2.7
1	B	87[A]	ASN	2.7
1	A	148	GLY	2.6
1	D	34	SER	2.6
1	E	20	GLN	2.6
1	C	150	ASP	2.5
1	C	215	VAL	2.5
1	B	74	ARG	2.5
1	E	34	SER	2.5
1	D	100	ALA	2.5
1	A	33	ARG	2.4
1	E	29	ASP	2.4
1	A	90	GLY	2.4
1	A	191	TYR	2.4
1	C	208	CYS	2.4
1	C	43	ASP	2.4
1	A	151	SER	2.4
1	B	154	GLY	2.4
1	A	192	GLU	2.3
1	D	169	PHE	2.3
1	D	151	SER	2.3
1	D	205	TYR	2.2
1	C	85	ASP	2.2
1	B	205	TYR	2.2
1	A	224	ARG	2.2
1	B	147	THR	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	87	ASN	2.2
1	E	87	ASN	2.2
1	B	133	MET	2.1
1	E	183	SER	2.0
1	E	152	GLU	2.0
1	D	28	SER	2.0
1	D	42	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
2	NAG	E	301	14/15	0.34	0.42	73,89,93,96	0
2	NAG	A	301	14/15	0.56	0.30	80,86,89,91	0
2	NAG	C	301	14/15	0.59	0.28	69,81,88,88	0
2	NAG	D	603	14/15	0.71	0.32	77,87,95,102	0
4	EDO	B	602	4/4	0.83	0.33	56,57,58,59	0
3	EPE	B	601	15/15	0.86	0.20	65,69,75,76	0
4	EDO	D	602	4/4	0.87	0.28	48,48,50,53	0
3	EPE	A	302	15/15	0.88	0.20	43,51,78,78	0
3	EPE	D	601	15/15	0.89	0.19	66,70,78,79	0

6.5 Other polymers [i](#)

There are no such residues in this entry.