



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 03:01 PM GMT

PDB ID : 4B84
Title : Mus musculus Acetylcholinesterase in complex with N-(2-Diethylamino-ethyl)-3-trifluoromethyl-benzenesulfonamide
Authors : Andersson, C.D.; Forsgren, N.; Akfur, C.; Allgardsson, A.; Berg, L.; Qian, W.; Ekstrom, F.; Linusson, A.
Deposited on : 2012-08-24
Resolution : 2.60 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
<http://wwpdb.org/validation/2016/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 : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

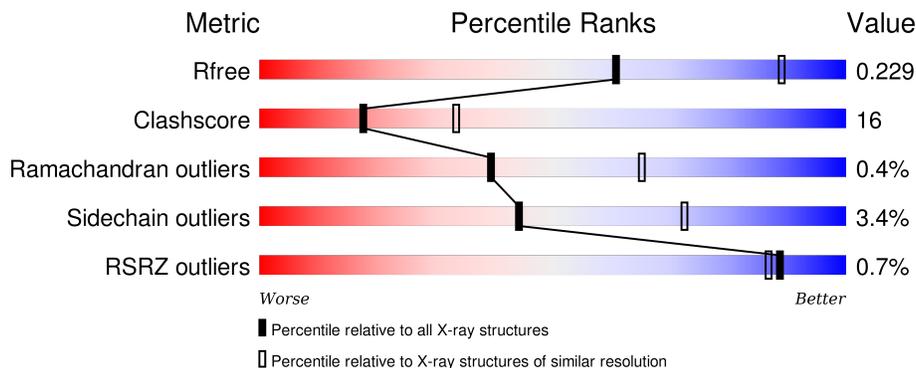
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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}	91344	2328 (2.60-2.60)
Clashscore	102246	2679 (2.60-2.60)
Ramachandran outliers	100387	2635 (2.60-2.60)
Sidechain outliers	100360	2635 (2.60-2.60)
RSRZ outliers	91569	2334 (2.60-2.60)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	548	
1	B	548	

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	P3G	B	1542	-	-	-	X
5	Z5K	B	1545	-	-	-	X
6	P6G	B	1546	-	-	-	X

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 8863 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.

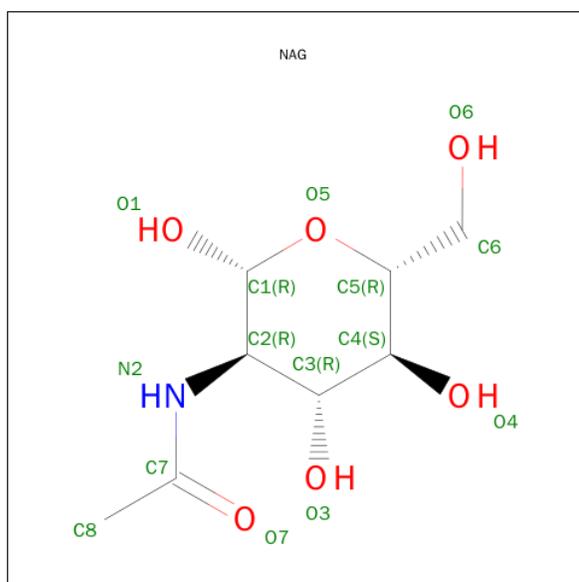
- Molecule 1 is a protein called ACETYLCHOLINESTERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	536	4193	2693	728	758	14	0	4	0
1	B	533	4151	2668	720	749	14	0	2	0

There are 14 discrepancies between the modelled and reference sequences:

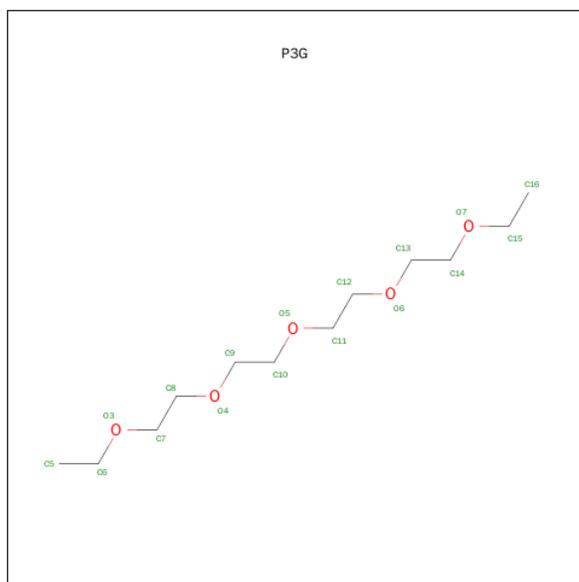
Chain	Residue	Modelled	Actual	Comment	Reference
A	544	ALA	-	EXPRESSION TAG	UNP P21836
A	545	THR	-	EXPRESSION TAG	UNP P21836
A	546	GLU	-	EXPRESSION TAG	UNP P21836
A	547	ALA	-	EXPRESSION TAG	UNP P21836
A	548	PRO	-	EXPRESSION TAG	UNP P21836
A	263	ALA	GLY	CONFLICT	UNP P21836
A	264	ALA	GLY	CONFLICT	UNP P21836
B	544	ALA	-	EXPRESSION TAG	UNP P21836
B	545	THR	-	EXPRESSION TAG	UNP P21836
B	546	GLU	-	EXPRESSION TAG	UNP P21836
B	547	ALA	-	EXPRESSION TAG	UNP P21836
B	548	PRO	-	EXPRESSION TAG	UNP P21836
B	263	ALA	GLY	CONFLICT	UNP P21836
B	264	ALA	GLY	CONFLICT	UNP P21836

- Molecule 2 is SUGAR (N-ACETYL-D-GLUCOSAMINE) (three-letter code: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 3 is 3,6,9,12,15-PENTAOXAHEPTADECANE (three-letter code: P3G) (formula: $C_{12}H_{26}O_5$).



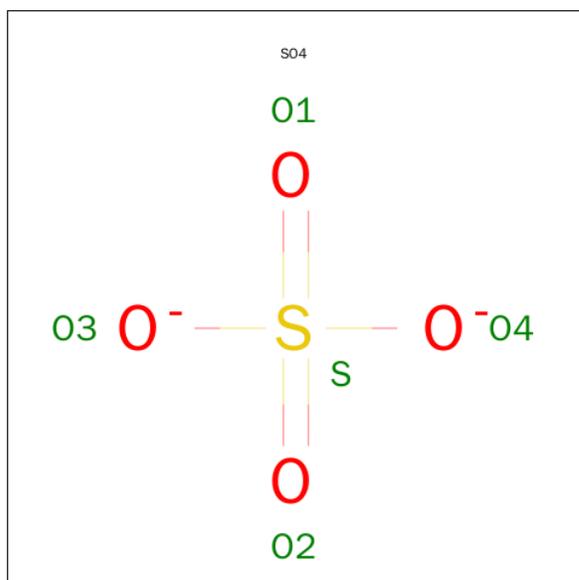
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			9	6	3		
3	A	1	Total	C	O	0	0
			9	6	3		

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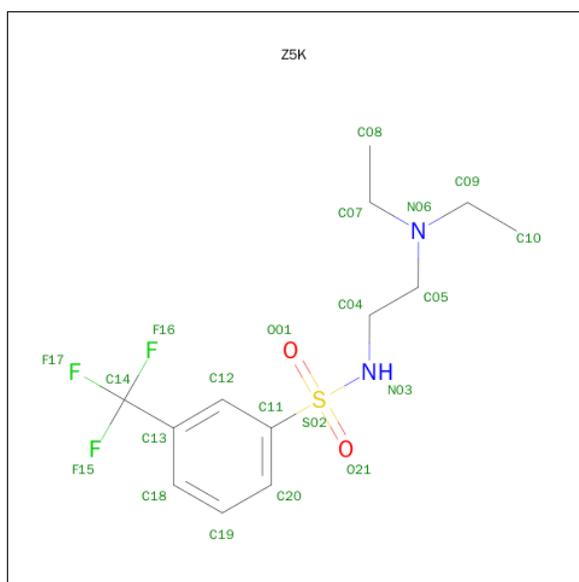
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 6 4 2	0	0
3	B	1	Total C O 7 4 3	0	0

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



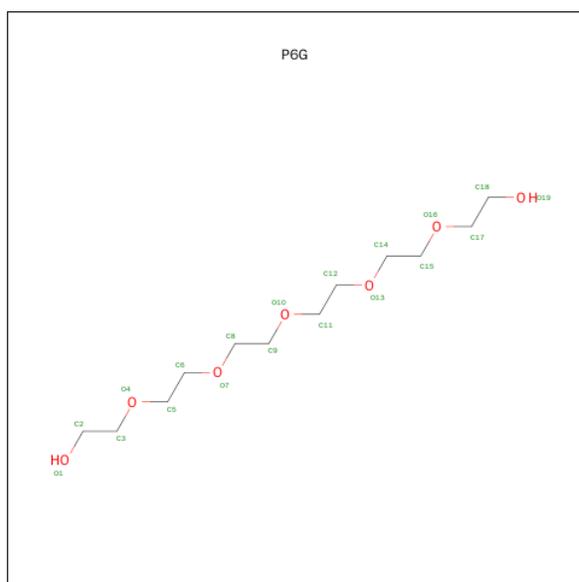
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0

- Molecule 5 is N-[2-(DIETHYLAMINO)ETHYL]-3-(TRIFLUOROMETHYL)BENZENESULFONAMIDE (three-letter code: Z5K) (formula: C₁₃H₁₉F₃N₂O₂S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf		
			Total	C	F	N	O			S	
5	A	1	Total	21	13	3	2	2	1	0	0
5	B	1	Total	21	13	3	2	2	1	0	0
5	B	1	Total	21	13	3	2	2	1	0	0

- Molecule 6 is HEXAETHYLENE GLYCOL (three-letter code: P6G) (formula: C₁₂H₂₆O₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
			Total	C	O			
6	B	1	Total	17	11	6	0	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	209	Total 209	O 209	0	0
7	B	175	Total 175	O 175	0	0

ALA
THR
GLU
ALA
PRO

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	79.16Å 112.36Å 227.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.08 – 2.60 29.75 – 2.60	Depositor EDS
% Data completeness (in resolution range)	90.6 (29.08-2.60) 90.7 (29.75-2.60)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.24 (at 2.61Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE: 1.7.3_928)	Depositor
R, R_{free}	0.176 , 0.235 0.177 , 0.229	Depositor DCC
R_{free} test set	1257 reflections (2.24%)	DCC
Wilson B-factor (Å ²)	52.2	Xtriage
Anisotropy	0.201	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 61.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 57267 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8863	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.05% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: Z5K, SO4, NAG, P6G, P3G

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	0.47	0/4328	0.62	1/5914 (0.0%)
1	B	0.43	0/4277	0.60	0/5849
All	All	0.45	0/8605	0.61	1/11763 (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	A	258	PRO	N-CA-CB	5.79	110.24	103.30

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	4193	0	4077	113	0
1	B	4151	0	4022	150	0
2	A	14	0	13	1	0
3	A	24	0	29	0	0
3	B	7	0	8	0	0
4	A	5	0	0	0	0
4	B	5	0	0	0	0
5	A	21	0	19	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	42	0	38	7	0
6	B	17	0	21	5	0
7	A	209	0	0	11	0
7	B	175	0	0	7	0
All	All	8863	0	8227	265	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 16.

The worst 5 of 265 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:B:494:ASP:HA	1:B:495:SER:CB	1.71	1.21
1:B:497:SER:CB	1:B:498:PRO:CD	2.48	0.91
1:A:440:PRO:HD2	1:A:443:MET:HE3	1.52	0.91
1:B:494:ASP:CA	1:B:495:SER:CB	2.50	0.90
1:B:360:LEU:CD1	1:B:379:VAL:HG21	2.06	0.84

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	536/548 (98%)	510 (95%)	24 (4%)	2 (0%)	39 65
1	B	531/548 (97%)	492 (93%)	37 (7%)	2 (0%)	39 65
All	All	1067/1096 (97%)	1002 (94%)	61 (6%)	4 (0%)	39 65

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	497	SER
1	A	525	ARG
1	B	498	PRO
1	A	104	PRO

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	438/446 (98%)	427 (98%)	11 (2%)	55	81
1	B	431/446 (97%)	413 (96%)	18 (4%)	36	65
All	All	869/892 (97%)	840 (97%)	29 (3%)	44	73

5 of 29 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	105	TYR
1	B	149	MET
1	B	441	LEU
1	B	107	ARG
1	B	187	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

11 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	P3G	A	1542	-	8,8,16	0.60	0	7,7,15	1.45	0
3	P3G	A	1543	-	8,8,16	0.60	0	7,7,15	1.51	0
4	SO4	A	1544	-	4,4,4	0.22	0	6,6,6	0.14	0
3	P3G	A	1545	-	5,5,16	0.54	0	4,4,15	1.31	0
5	Z5K	A	1546	-	21,21,21	1.64	1 (4%)	30,30,30	3.39	11 (36%)
2	NAG	A	701	1	14,14,15	0.57	0	15,19,21	1.72	2 (13%)
3	P3G	B	1542	-	6,6,16	0.52	0	5,5,15	1.51	1 (20%)
5	Z5K	B	1543	-	21,21,21	1.51	1 (4%)	30,30,30	3.89	9 (30%)
4	SO4	B	1544	-	4,4,4	0.13	0	6,6,6	0.20	0
5	Z5K	B	1545	-	21,21,21	1.64	2 (9%)	30,30,30	3.10	6 (20%)
6	P6G	B	1546	-	16,16,18	0.65	0	15,15,17	1.61	2 (13%)

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	P3G	A	1542	-	-	0/6/6/14	0/0/0/0
3	P3G	A	1543	-	-	0/6/6/14	0/0/0/0
4	SO4	A	1544	-	-	0/0/0/0	0/0/0/0
3	P3G	A	1545	-	-	0/3/3/14	0/0/0/0
5	Z5K	A	1546	-	-	0/23/23/23	0/1/1/1
2	NAG	A	701	1	-	0/6/23/26	0/1/1/1
3	P3G	B	1542	-	-	0/4/4/14	0/0/0/0

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	Z5K	B	1543	-	-	0/23/23/23	0/1/1/1
4	SO4	B	1544	-	-	0/0/0/0	0/0/0/0
5	Z5K	B	1545	-	-	0/23/23/23	0/1/1/1
6	P6G	B	1546	-	-	0/14/14/16	0/0/0/0

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	1545	Z5K	C18-C13	2.04	1.42	1.39
5	B	1543	Z5K	S02-N03	5.79	1.69	1.61
5	B	1545	Z5K	S02-N03	6.49	1.70	1.61
5	A	1546	Z5K	S02-N03	7.02	1.70	1.61

The worst 5 of 31 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1546	Z5K	O21-S02-O01	-15.53	98.94	119.54
5	B	1543	Z5K	O21-S02-O01	-14.91	99.76	119.54
5	B	1545	Z5K	O21-S02-O01	-13.91	101.09	119.54
5	B	1543	Z5K	C11-S02-N03	-6.78	98.93	107.49
5	A	1546	Z5K	F15-C14-C13	-2.73	107.12	112.95

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1546	Z5K	2	0
2	A	701	NAG	1	0
5	B	1543	Z5K	4	0
5	B	1545	Z5K	3	0
6	B	1546	P6G	5	0

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	536/548 (97%)	-0.59	5 (0%) 85 83	27, 46, 75, 148	0
1	B	533/548 (97%)	-0.51	2 (0%) 93 91	31, 55, 86, 158	0
All	All	1069/1096 (97%)	-0.55	7 (0%) 89 87	27, 51, 81, 158	0

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	493	ARG	3.1
1	A	497	SER	2.9
1	B	264	ALA	2.7
1	A	318	THR	2.4
1	A	229	SER	2.4

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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(\AA^2)	Q<0.9
3	P3G	B	1542	7/17	0.88	0.19	3.14	55,73,78,83	0
6	P6G	B	1546	17/19	0.93	0.19	3.10	51,63,94,99	0
5	Z5K	B	1545	21/21	0.92	0.29	2.25	68,93,132,137	0
5	Z5K	A	1546	21/21	0.95	0.25	1.85	46,67,120,121	0
3	P3G	A	1543	9/17	0.95	0.14	1.27	57,61,71,80	0
5	Z5K	B	1543	21/21	0.96	0.18	0.47	50,77,115,123	0
4	SO4	A	1544	5/5	0.96	0.17	0.27	78,78,92,100	0
3	P3G	A	1542	9/17	0.97	0.10	-0.52	61,67,72,78	0
4	SO4	B	1544	5/5	0.99	0.13	-0.81	60,86,90,96	0
3	P3G	A	1545	6/17	0.96	0.15	-	57,59,69,70	0
2	NAG	A	701	14/15	0.86	0.30	-	76,102,108,109	0

6.5 Other polymers [i](#)

There are no such residues in this entry.