



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 04:24 PM UTC

PDB ID : 4GX5 / pdb_00004gx5
Title : GsuK Channel
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Deposited on : 2012-09-03
Resolution : 3.70 Å(reported)

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

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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
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
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)	:	2.49

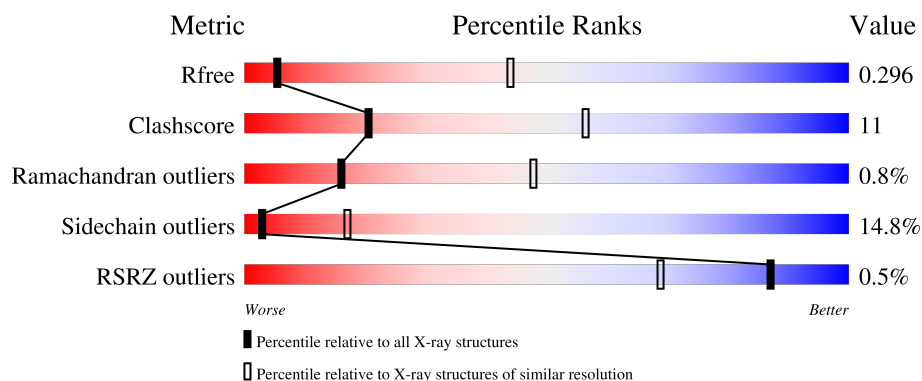
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.70 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}	180053	1131 (3.80-3.60)
Clashscore	190562	1171 (3.80-3.60)
Ramachandran outliers	187476	1129 (3.80-3.60)
Sidechain outliers	187428	1126 (3.80-3.60)
RSRZ outliers	180081	1130 (3.80-3.60)

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 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	565	46% 16% • 34%
1	B	565	64% 27% 6% •
1	C	565	% 63% 28% 5% • •
1	D	565	46% 15% 5% • 33%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 14266 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 TrkA domain protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	375	Total	C	N	O	S	0	0	0
			2922	1882	506	523	11			
1	B	548	Total	C	N	O	S	0	0	0
			4208	2695	729	769	15			
1	C	546	Total	C	N	O	S	0	0	0
			4188	2684	723	766	15			
1	D	376	Total	C	N	O	S	0	0	0
			2928	1885	507	525	11			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	4	MET	-	expression tag	UNP Q74FS9
A	5	GLN	-	expression tag	UNP Q74FS9
A	6	ARG	-	expression tag	UNP Q74FS9
A	7	GLY	-	expression tag	UNP Q74FS9
A	8	SER	-	expression tag	UNP Q74FS9
A	52	ALA	GLU	engineered mutation	UNP Q74FS9
A	77	GLU	GLN	engineered mutation	UNP Q74FS9
A	565	LEU	-	expression tag	UNP Q74FS9
A	566	VAL	-	expression tag	UNP Q74FS9
A	567	PRO	-	expression tag	UNP Q74FS9
A	568	ARG	-	expression tag	UNP Q74FS9
B	4	MET	-	expression tag	UNP Q74FS9
B	5	GLN	-	expression tag	UNP Q74FS9
B	6	ARG	-	expression tag	UNP Q74FS9
B	7	GLY	-	expression tag	UNP Q74FS9
B	8	SER	-	expression tag	UNP Q74FS9
B	52	ALA	GLU	engineered mutation	UNP Q74FS9
B	77	GLU	GLN	engineered mutation	UNP Q74FS9
B	565	LEU	-	expression tag	UNP Q74FS9
B	566	VAL	-	expression tag	UNP Q74FS9
B	567	PRO	-	expression tag	UNP Q74FS9

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Chain	Residue	Modelled	Actual	Comment	Reference
B	568	ARG	-	expression tag	UNP Q74FS9
C	4	MET	-	expression tag	UNP Q74FS9
C	5	GLN	-	expression tag	UNP Q74FS9
C	6	ARG	-	expression tag	UNP Q74FS9
C	7	GLY	-	expression tag	UNP Q74FS9
C	8	SER	-	expression tag	UNP Q74FS9
C	52	ALA	GLU	engineered mutation	UNP Q74FS9
C	77	GLU	GLN	engineered mutation	UNP Q74FS9
C	565	LEU	-	expression tag	UNP Q74FS9
C	566	VAL	-	expression tag	UNP Q74FS9
C	567	PRO	-	expression tag	UNP Q74FS9
C	568	ARG	-	expression tag	UNP Q74FS9
D	4	MET	-	expression tag	UNP Q74FS9
D	5	GLN	-	expression tag	UNP Q74FS9
D	6	ARG	-	expression tag	UNP Q74FS9
D	7	GLY	-	expression tag	UNP Q74FS9
D	8	SER	-	expression tag	UNP Q74FS9
D	52	ALA	GLU	engineered mutation	UNP Q74FS9
D	77	GLU	GLN	engineered mutation	UNP Q74FS9
D	565	LEU	-	expression tag	UNP Q74FS9
D	566	VAL	-	expression tag	UNP Q74FS9
D	567	PRO	-	expression tag	UNP Q74FS9
D	568	ARG	-	expression tag	UNP Q74FS9

- Molecule 2 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	6	Total K 6 6	0	0
2	C	6	Total K 6 6	0	0

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Zn 1 1	0	0
3	B	1	Total Zn 1 1	0	0
3	C	1	Total Zn 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	1	Total 1	Zn 1	0	0

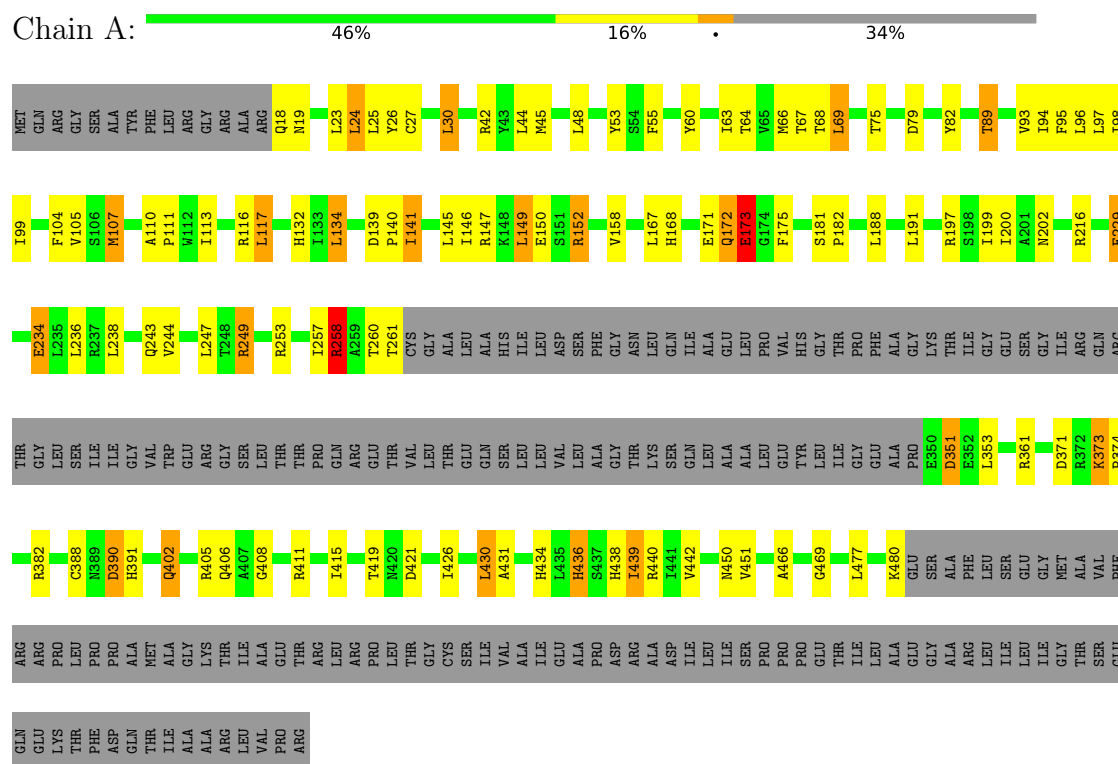
- Molecule 4 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total 1	Ca 1	0	0
4	B	1	Total 1	Ca 1	0	0
4	C	2	Total 2	Ca 2	0	0

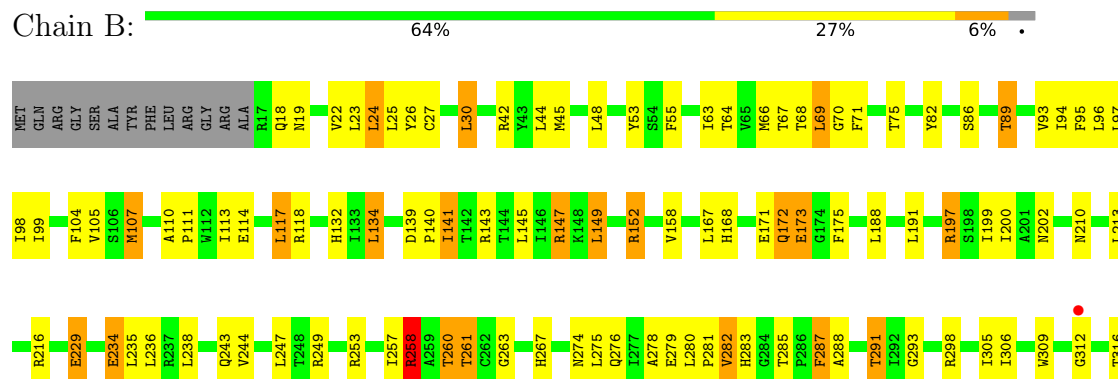
3 Residue-property plots

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: TrkA domain protein



- Molecule 1: TrkA domain protein





R361		SER	ILE
		GLU	LEU
D371		GLY	ILE
R372		MET	GLY
K373		ALA	THR
P374		VAL	SER
		PHE	GLU
R382		ARG	GLN
		ARG	GLU
C388		PRO	LYS
N389		LEU	THR
D390		PRO	PHE
H391		PRO	ASP
		ALA	GLN
Q402		MET	THR
		ALA	ILE
R405		GLY	ALA
Q406		LYS	ALA
M407		THR	ARG
G408		ILE	LEU
		ALA	VAL
R411		GLU	PRO
		THR	ARG
I415		ARG	
I416		LEU	
V417		ARG	
I418		PRO	
T419		LEU	
N420		THR	
D421		GLY	
		CYS	
I426		SER	
		ILE	
L430		VAL	
		ALA	
R433		ILE	
H434		GLU	
L435		ALA	
H436		PRO	
S437		ASP	
H438		ARG	
I439		ALA	
R440		ASP	
		ILE	
V451		LEU	
		ILE	
F461		SER	
		PRO	
A466		PRO	
		PRO	
G469		GLU	
		THR	
L477		ILE	
		LEU	
K480		ALA	
E481		GLU	
S482		GLY	
		ALA	
		PHE	
		ARG	
		LEU	

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ALA
ARG
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PRO
ARG

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	234.98Å 108.36Å 165.79Å 90.00° 134.96° 90.00°	Depositor
Resolution (Å)	45.39 – 3.70 45.39 – 3.70	Depositor EDS
% Data completeness (in resolution range)	86.8 (45.39-3.70) 86.5 (45.39-3.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.35 (at 3.67Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.3_928)	Depositor
R, R_{free}	0.261 , 0.293 0.262 , 0.296	Depositor DCC
R_{free} test set	1383 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	153.1	Xtriage
Anisotropy	0.220	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 265.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.287 for -h-2*k,h+1 0.045 for -h,-k,h+1 0.044 for -h-2*k,-k,l	Xtriage
F_o , F_c correlation	0.94	EDS
Total number of atoms	14266	wwPDB-VP
Average B, all atoms (Å ²)	229.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 38.05 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.9078e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CA, K, ZN

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	0.43	0/2982	0.96	19/4060 (0.5%)
1	B	0.42	0/4291	0.94	22/5843 (0.4%)
1	C	0.42	0/4271	0.93	18/5817 (0.3%)
1	D	0.44	0/2988	0.99	26/4068 (0.6%)
All	All	0.43	0/14532	0.95	85/19788 (0.4%)

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	1
1	B	0	1
1	C	0	1
1	D	0	1
All	All	0	4

There are no bond length outliers.

The worst 5 of 85 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	382	ARG	NE-CZ-NH2	8.54	126.88	119.20
1	A	249	ARG	NE-CZ-NH2	8.35	126.72	119.20
1	C	249	ARG	NE-CZ-NH2	8.34	126.71	119.20
1	B	258	ARG	NE-CZ-NH2	8.20	126.58	119.20
1	C	382	ARG	NE-CZ-NH2	8.03	126.43	119.20

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	173	GLU	Peptide
1	B	173	GLU	Peptide
1	C	173	GLU	Peptide
1	D	173	GLU	Peptide

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2922	0	2964	65	0
1	B	4208	0	4288	113	0
1	C	4188	0	4268	101	0
1	D	2928	0	2969	64	0
2	A	6	0	0	0	0
2	C	6	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	2	0	0	0	0
All	All	14266	0	14489	323	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 11.

The worst 5 of 323 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:117:LEU:HB2	1:D:117:LEU:HD11	1.43	1.00
1:A:117:LEU:HB2	1:B:117:LEU:HD11	1.49	0.95
1:C:523:ALA:HB3	1:C:526:ARG:HD3	1.64	0.78
1:D:19:ASN:HB3	1:D:107:MET:HG3	1.66	0.77
1:B:19:ASN:HB3	1:B:107:MET:HG3	1.67	0.76

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	371/565 (66%)	346 (93%)	23 (6%)	2 (0%)	24	56
1	B	546/565 (97%)	509 (93%)	33 (6%)	4 (1%)	18	50
1	C	544/565 (96%)	498 (92%)	40 (7%)	6 (1%)	11	42
1	D	372/565 (66%)	345 (93%)	25 (7%)	2 (0%)	24	56
All	All	1833/2260 (81%)	1698 (93%)	121 (7%)	14 (1%)	16	48

5 of 14 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	351	ASP
1	A	374	PRO
1	B	374	PRO
1	C	374	PRO
1	D	374	PRO

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	313/463 (68%)	267 (85%)	46 (15%)	3	17
1	B	449/463 (97%)	386 (86%)	63 (14%)	3	18
1	C	447/463 (96%)	380 (85%)	67 (15%)	3	16
1	D	314/463 (68%)	265 (84%)	49 (16%)	2	15
All	All	1523/1852 (82%)	1298 (85%)	225 (15%)	3	17

5 of 225 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	89	THR
1	D	451	VAL
1	C	301	THR
1	D	438	HIS
1	D	172	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	391	HIS
1	C	479	HIS
1	D	391	HIS
1	D	18	GLN
1	B	337	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](#)

Of 20 ligands modelled in this entry, 20 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 [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	375/565 (66%)	-0.79	0	100	100	126, 189, 324, 425	0
1	B	548/565 (96%)	-0.49	2 (0%)	88	72	135, 230, 370, 487	0
1	C	546/565 (96%)	-0.52	7 (1%)	75	50	124, 223, 381, 519	0
1	D	376/565 (66%)	-0.73	0	100	100	124, 187, 332, 475	0
All	All	1845/2260 (81%)	-0.61	9 (0%)	87	69	124, 205, 368, 519	0

The worst 5 of 9 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	438	HIS	5.9
1	C	516	CYS	3.6
1	B	498	PRO	3.5
1	C	437	SER	3.0
1	C	313	SER	2.8

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, 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($\text{\AA}^2$)	Q<0.9
2	K	A	608	1/1	0.92	0.26	225,225,225,225	1
2	K	A	607	1/1	0.96	0.11	199,199,199,199	1
2	K	C	601	1/1	0.97	0.07	207,207,207,207	1
2	K	C	608	1/1	0.97	0.15	241,241,241,241	1
2	K	C	602	1/1	0.99	0.05	153,153,153,153	1
2	K	A	601	1/1	0.99	0.02	166,166,166,166	1
2	K	C	609	1/1	0.99	0.14	200,200,200,200	1
3	ZN	A	605	1/1	0.99	0.03	160,160,160,160	0
4	CA	A	606	1/1	0.99	0.04	173,173,173,173	0
4	CA	C	606	1/1	0.99	0.04	185,185,185,185	0
4	CA	C	607	1/1	0.99	0.05	138,138,138,138	0
2	K	A	604	1/1	1.00	0.02	186,186,186,186	1
2	K	A	602	1/1	1.00	0.03	154,154,154,154	1
3	ZN	B	601	1/1	1.00	0.01	134,134,134,134	0
3	ZN	C	605	1/1	1.00	0.02	152,152,152,152	0
3	ZN	D	601	1/1	1.00	0.02	149,149,149,149	0
2	K	C	603	1/1	1.00	0.02	160,160,160,160	1
4	CA	B	602	1/1	1.00	0.02	175,175,175,175	0
2	K	C	604	1/1	1.00	0.02	143,143,143,143	1
2	K	A	603	1/1	1.00	0.02	169,169,169,169	1

6.5 Other polymers [i](#)

There are no such residues in this entry.