



wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 3, 2023 – 10:42 AM EDT

PDB ID : 3SS4
Title : Crystal structure of mouse Glutaminase C, phosphate-bound form
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Deposited on : 2011-07-07
Resolution : 2.85 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

<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 : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35
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) : 2.35

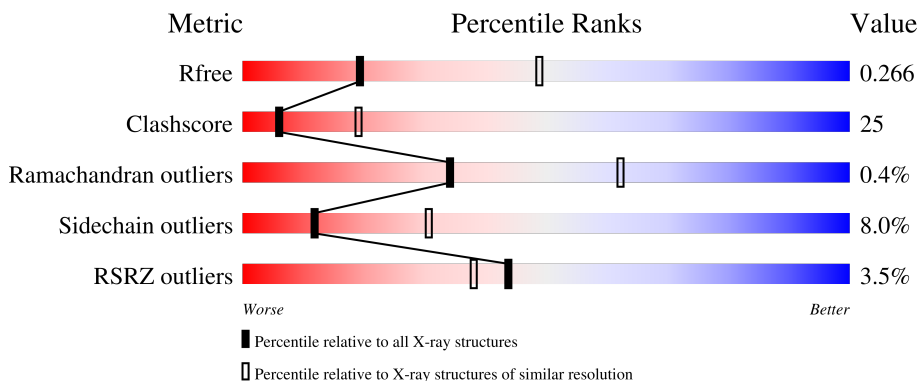
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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	479	
1	B	479	
1	C	479	
1	D	479	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 12470 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 Glutaminase C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	390	3051	1952	513	558	28	4	0	0
1	B	388	3036	1941	511	556	28	4	0	0
1	C	394	3083	1970	519	566	28	5	0	0
1	D	387	3025	1930	510	557	28	4	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	125	GLY	-	expression tag	UNP Q69ZX9
A	126	SER	-	expression tag	UNP Q69ZX9
A	127	HIS	-	expression tag	UNP Q69ZX9
B	125	GLY	-	expression tag	UNP Q69ZX9
B	126	SER	-	expression tag	UNP Q69ZX9
B	127	HIS	-	expression tag	UNP Q69ZX9
C	125	GLY	-	expression tag	UNP Q69ZX9
C	126	SER	-	expression tag	UNP Q69ZX9
C	127	HIS	-	expression tag	UNP Q69ZX9
D	125	GLY	-	expression tag	UNP Q69ZX9
D	126	SER	-	expression tag	UNP Q69ZX9
D	127	HIS	-	expression tag	UNP Q69ZX9

- Molecule 2 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total O P 5 4 1	0	0
2	B	1	Total O P 5 4 1	0	0
2	C	1	Total O P 5 4 1	0	0
2	D	1	Total O P 5 4 1	0	0

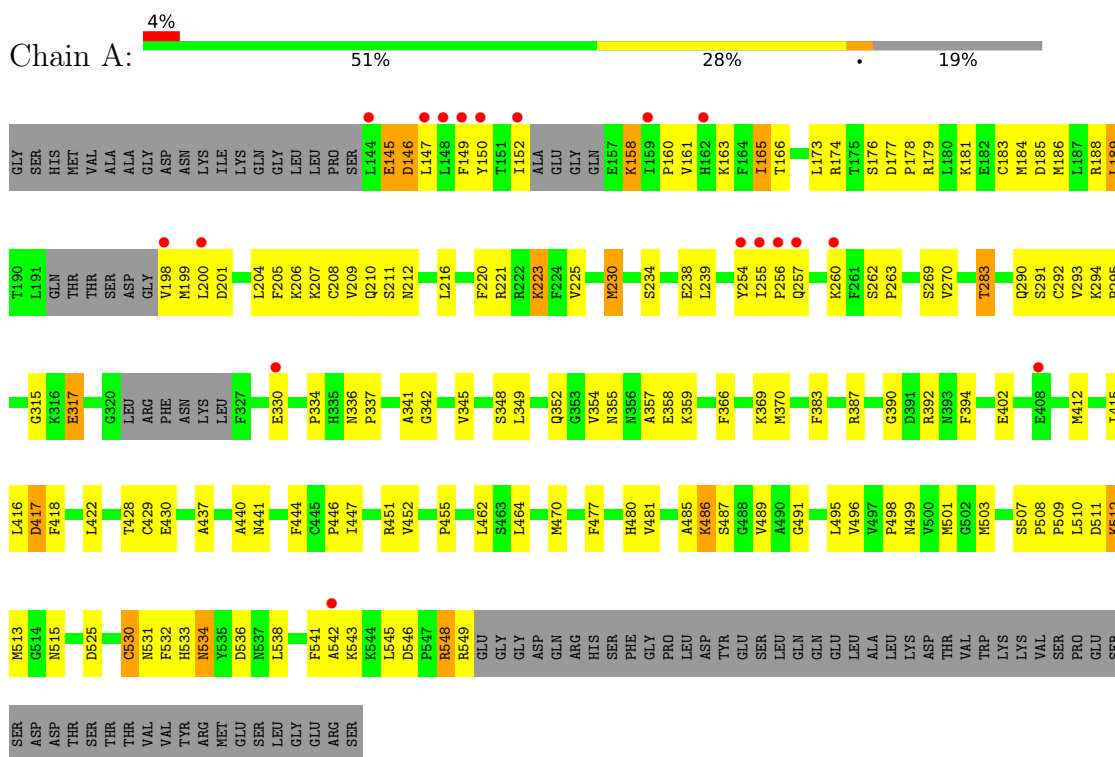
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	63	Total O 63 63	0	0
3	B	71	Total O 71 71	0	0
3	C	53	Total O 53 53	0	0
3	D	68	Total O 68 68	0	0

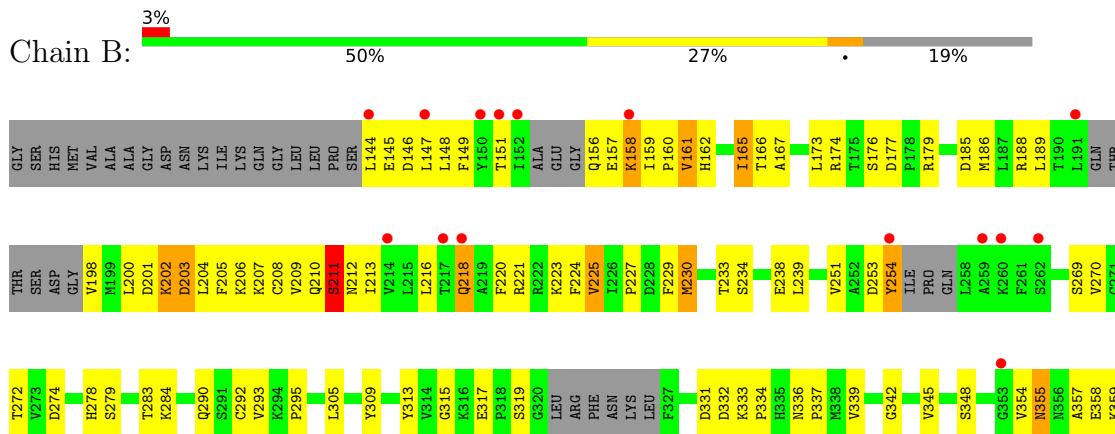
3 Residue-property plots i

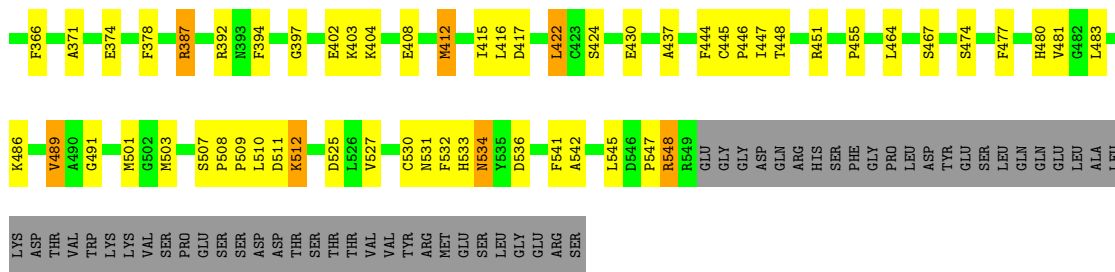
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Glutaminase C

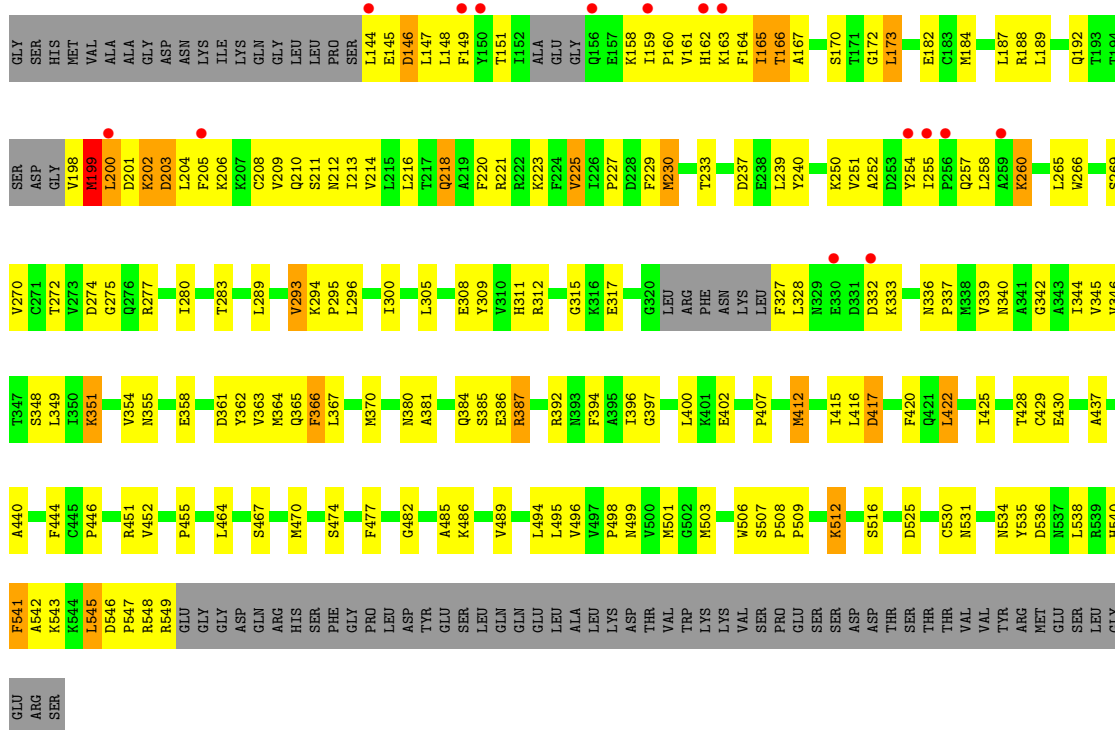
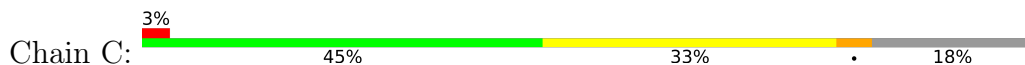


• Molecule 1: Glutaminase C

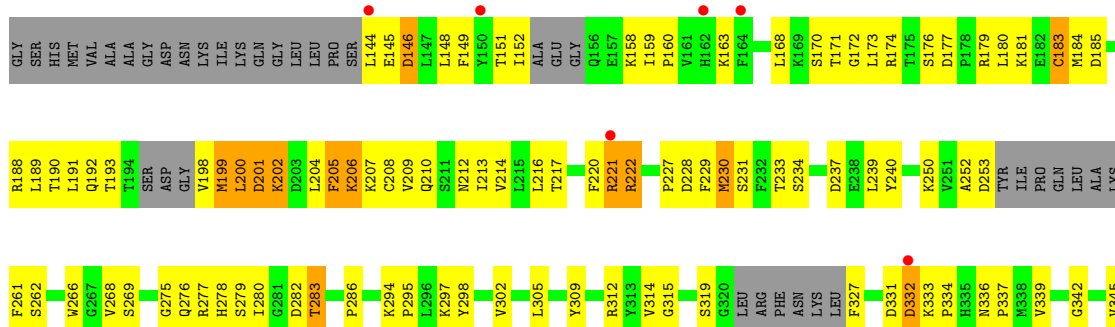




• Molecule 1: Glutaminase C



• Molecule 1: Glutaminase C



V346	I347	L447	A542	ARG
S348	R451	R451	K543	SER
L349	V452	L545	L545	
V354	P455	D546	D546	
E388	E456	P547	P547	
K359	A457	E548	E548	
F360	N460	E549	E549	
M364	N460	GLU	GLU	
Q365	N460	GLY	GLY	
F366	S467	GLY	GLY	
L367	M470	ASP	ASP	
N368	M470	GLN	GLN	
K369	S474	ARG	ARG	
M370	S474	HIS	HIS	
A371	F477	PHE	PHE	
E374	F477	GLY	GLY	
F378	V481	PRO	PRO	
F383	V481	LEU	LEU	
R387	A485	LEU	LEU	
F394	V489	ASP	ASP	
Y399	G492	TYR	TYR	
E402	I493	GLU	GLU	
K403	L494	LEU	LEU	
K404	L495	ALA	ALA	
P407	V496	LEU	LEU	
I412	V497	LEU	LEU	
M412	P498	LYS	LYS	
L416	N499	ASP	ASP	
D417	M503	THR	THR	
F418	M504	VAL	VAL	
Q421	C503	TRP	TRP	
L422	C504	VAL	VAL	
C423	C505	LYS	LYS	
S424	W506	LYS	LYS	
I425	S507	VAL	VAL	
E426	P508	PRO	PRO	
V427	K512	GLU	GLU	
I428	K518	SER	SER	
C429	C523	SER	SER	
E430	H524	ASP	ASP	
S431	D525	THR	THR	
A440	I526	SER	SER	
F444	V527	THR	THR	
	C530	VAL	VAL	
	N531	VAL	VAL	
	F532	TYR	TYR	
	H533	ARG	ARG	
	N534	MET	MET	
	Y535	GLI	GLI	
	D536	SER	SER	
	F541	LEU	LEU	
		GLY	GLY	
		GLU	GLU	

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	97.72Å 136.28Å 176.06Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.91 – 2.85 37.55 – 2.85	Depositor EDS
% Data completeness (in resolution range)	93.3 (19.91-2.85) 93.0 (37.55-2.85)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	0.15	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.97 (at 2.85Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.7.1_743)	Depositor
R, R_{free}	0.227 , 0.270 0.222 , 0.266	Depositor DCC
R_{free} test set	2640 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	44.8	Xtrriage
Anisotropy	0.321	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 50.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.26$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	12470	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 52.35 % 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 4.9224e-05. 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PO4

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	0.65	3/3118 (0.1%)	0.53	0/4205
1	B	0.57	2/3101 (0.1%)	0.53	0/4179
1	C	0.62	3/3150 (0.1%)	0.55	1/4249 (0.0%)
1	D	0.59	0/3089	0.53	1/4164 (0.0%)
All	All	0.61	8/12458 (0.1%)	0.54	2/16797 (0.0%)

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	225	VAL	CB-CG2	-5.57	1.41	1.52
1	B	489	VAL	CB-CG1	-5.54	1.41	1.52
1	C	362	TYR	CE2-CZ	-5.38	1.31	1.38
1	C	362	TYR	CD2-CE2	-5.32	1.31	1.39
1	A	225	VAL	CB-CG1	-5.22	1.41	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	200	LEU	CA-CB-CG	5.10	127.03	115.30
1	D	200	LEU	CA-CB-CG	5.07	126.97	115.30

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	3051	0	3036	147	0
1	B	3036	0	3017	131	0
1	C	3083	0	3066	176	0
1	D	3025	0	3001	159	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
2	D	5	0	0	0	0
3	A	63	0	0	0	0
3	B	71	0	0	0	0
3	C	53	0	0	2	0
3	D	68	0	0	0	0
All	All	12470	0	12120	603	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 25.

The worst 5 of 603 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:200:LEU:HD12	1:A:204:LEU:CD2	1.62	1.28
1:C:148:LEU:HD13	1:C:148:LEU:O	1.41	1.18
1:C:387:ARG:HG2	1:C:387:ARG:HH11	1.01	1.15
1:A:200:LEU:HD12	1:A:204:LEU:HD21	1.19	1.14
1:A:548:ARG:HG3	1:A:548:ARG:HH11	1.08	1.13

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	382/479 (80%)	366 (96%)	16 (4%)	0	100	100
1	B	378/479 (79%)	366 (97%)	10 (3%)	2 (0%)	29	57
1	C	386/479 (81%)	378 (98%)	6 (2%)	2 (0%)	29	57
1	D	377/479 (79%)	362 (96%)	13 (3%)	2 (0%)	29	57
All	All	1523/1916 (80%)	1472 (97%)	45 (3%)	6 (0%)	34	62

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	202	LYS
1	C	202	LYS
1	D	205	PHE
1	D	206	LYS
1	B	211	SER

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	339/415 (82%)	314 (93%)	25 (7%)	13	35
1	B	337/415 (81%)	308 (91%)	29 (9%)	10	27
1	C	343/415 (83%)	316 (92%)	27 (8%)	12	31
1	D	337/415 (81%)	309 (92%)	28 (8%)	11	29
All	All	1356/1660 (82%)	1247 (92%)	109 (8%)	12	31

5 of 109 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	166	THR
1	C	366	PHE
1	D	327	PHE
1	C	199	MET
1	C	260	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	335	HIS
1	B	156	GLN
1	C	540	HIS

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 [i](#)

4 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	PO4	A	1	-	4,4,4	0.87	0	6,6,6	0.48	0
2	PO4	D	4	-	4,4,4	0.85	0	6,6,6	0.47	0
2	PO4	C	3	-	4,4,4	0.87	0	6,6,6	0.38	0
2	PO4	B	2	-	4,4,4	0.88	0	6,6,6	0.40	0

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	390/479 (81%)	0.01	18 (4%) 32 27	26, 40, 75, 88	4 (1%)
1	B	388/479 (81%)	0.01	15 (3%) 39 34	26, 40, 78, 94	4 (1%)
1	C	394/479 (82%)	0.05	15 (3%) 40 35	24, 43, 82, 105	4 (1%)
1	D	387/479 (80%)	0.02	6 (1%) 72 70	24, 41, 77, 95	4 (1%)
All	All	1559/1916 (81%)	0.02	54 (3%) 44 38	24, 41, 78, 105	16 (1%)

The worst 5 of 54 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	150	TYR	6.8
1	A	150	TYR	5.9
1	C	149	PHE	5.7
1	A	200	LEU	4.7
1	A	257	GLN	4.6

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(\AA^2)	Q<0.9
2	PO4	D	4	5/5	0.94	0.12	43,52,68,84	0
2	PO4	A	1	5/5	0.96	0.13	40,49,56,71	0
2	PO4	C	3	5/5	0.97	0.11	45,49,58,74	0
2	PO4	B	2	5/5	0.98	0.08	49,50,67,69	0

6.5 Other polymers [i](#)

There are no such residues in this entry.