



# wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 24, 2023 – 02:27 PM EDT

PDB ID : 5UAX  
Title : Structure of apo human PYCR-1 crystallized in space group C2  
Authors : Tanner, J.J.  
Deposited on : 2016-12-20  
Resolution : 1.85 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](mailto: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>.

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

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.35.1  
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

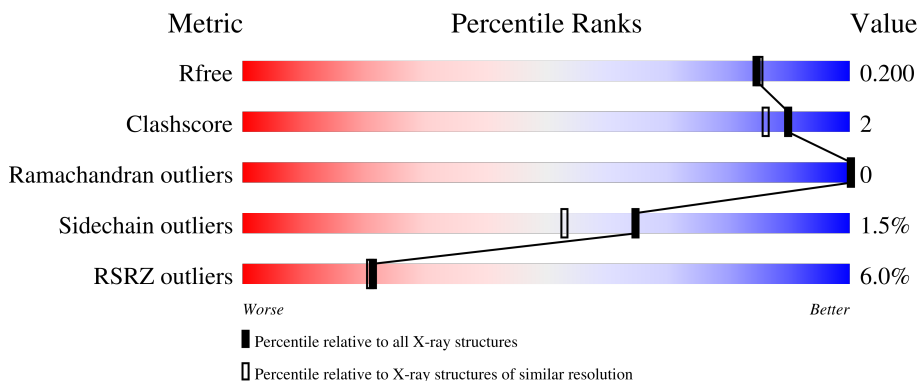
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.85 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	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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  $\geq 3$ , 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	322	 3% 81% 14%
1	B	322	 81% 15%
1	C	322	 79% 6% 15%
1	D	322	 2% 81% 16%
1	E	322	 19% 74% 5% 21%

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 10002 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 Pyrroline-5-carboxylate reductase 1, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	278	1992	1256	349	375	12	0	3	0
1	B	273	1946	1228	340	366	12	0	2	0
1	C	274	1932	1220	335	365	12	0	2	0
1	D	270	1912	1206	336	359	11	0	1	0
1	E	255	1713	1078	304	322	9	0	0	0

There are 110 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-21	MET	-	initiating methionine	UNP P32322
A	-20	HIS	-	expression tag	UNP P32322
A	-19	HIS	-	expression tag	UNP P32322
A	-18	HIS	-	expression tag	UNP P32322
A	-17	HIS	-	expression tag	UNP P32322
A	-16	HIS	-	expression tag	UNP P32322
A	-15	HIS	-	expression tag	UNP P32322
A	-14	SER	-	expression tag	UNP P32322
A	-13	SER	-	expression tag	UNP P32322
A	-12	GLY	-	expression tag	UNP P32322
A	-11	VAL	-	expression tag	UNP P32322
A	-10	ASP	-	expression tag	UNP P32322
A	-9	LEU	-	expression tag	UNP P32322
A	-8	GLY	-	expression tag	UNP P32322
A	-7	THR	-	expression tag	UNP P32322
A	-6	GLU	-	expression tag	UNP P32322
A	-5	ASN	-	expression tag	UNP P32322
A	-4	LEU	-	expression tag	UNP P32322
A	-3	TYR	-	expression tag	UNP P32322

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	PHE	-	expression tag	UNP P32322
A	-1	GLN	-	expression tag	UNP P32322
A	0	SER	-	expression tag	UNP P32322
B	-21	MET	-	initiating methionine	UNP P32322
B	-20	HIS	-	expression tag	UNP P32322
B	-19	HIS	-	expression tag	UNP P32322
B	-18	HIS	-	expression tag	UNP P32322
B	-17	HIS	-	expression tag	UNP P32322
B	-16	HIS	-	expression tag	UNP P32322
B	-15	HIS	-	expression tag	UNP P32322
B	-14	SER	-	expression tag	UNP P32322
B	-13	SER	-	expression tag	UNP P32322
B	-12	GLY	-	expression tag	UNP P32322
B	-11	VAL	-	expression tag	UNP P32322
B	-10	ASP	-	expression tag	UNP P32322
B	-9	LEU	-	expression tag	UNP P32322
B	-8	GLY	-	expression tag	UNP P32322
B	-7	THR	-	expression tag	UNP P32322
B	-6	GLU	-	expression tag	UNP P32322
B	-5	ASN	-	expression tag	UNP P32322
B	-4	LEU	-	expression tag	UNP P32322
B	-3	TYR	-	expression tag	UNP P32322
B	-2	PHE	-	expression tag	UNP P32322
B	-1	GLN	-	expression tag	UNP P32322
B	0	SER	-	expression tag	UNP P32322
C	-21	MET	-	initiating methionine	UNP P32322
C	-20	HIS	-	expression tag	UNP P32322
C	-19	HIS	-	expression tag	UNP P32322
C	-18	HIS	-	expression tag	UNP P32322
C	-17	HIS	-	expression tag	UNP P32322
C	-16	HIS	-	expression tag	UNP P32322
C	-15	HIS	-	expression tag	UNP P32322
C	-14	SER	-	expression tag	UNP P32322
C	-13	SER	-	expression tag	UNP P32322
C	-12	GLY	-	expression tag	UNP P32322
C	-11	VAL	-	expression tag	UNP P32322
C	-10	ASP	-	expression tag	UNP P32322
C	-9	LEU	-	expression tag	UNP P32322
C	-8	GLY	-	expression tag	UNP P32322
C	-7	THR	-	expression tag	UNP P32322
C	-6	GLU	-	expression tag	UNP P32322
C	-5	ASN	-	expression tag	UNP P32322

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-4	LEU	-	expression tag	UNP P32322
C	-3	TYR	-	expression tag	UNP P32322
C	-2	PHE	-	expression tag	UNP P32322
C	-1	GLN	-	expression tag	UNP P32322
C	0	SER	-	expression tag	UNP P32322
D	-21	MET	-	initiating methionine	UNP P32322
D	-20	HIS	-	expression tag	UNP P32322
D	-19	HIS	-	expression tag	UNP P32322
D	-18	HIS	-	expression tag	UNP P32322
D	-17	HIS	-	expression tag	UNP P32322
D	-16	HIS	-	expression tag	UNP P32322
D	-15	HIS	-	expression tag	UNP P32322
D	-14	SER	-	expression tag	UNP P32322
D	-13	SER	-	expression tag	UNP P32322
D	-12	GLY	-	expression tag	UNP P32322
D	-11	VAL	-	expression tag	UNP P32322
D	-10	ASP	-	expression tag	UNP P32322
D	-9	LEU	-	expression tag	UNP P32322
D	-8	GLY	-	expression tag	UNP P32322
D	-7	THR	-	expression tag	UNP P32322
D	-6	GLU	-	expression tag	UNP P32322
D	-5	ASN	-	expression tag	UNP P32322
D	-4	LEU	-	expression tag	UNP P32322
D	-3	TYR	-	expression tag	UNP P32322
D	-2	PHE	-	expression tag	UNP P32322
D	-1	GLN	-	expression tag	UNP P32322
D	0	SER	-	expression tag	UNP P32322
E	-21	MET	-	initiating methionine	UNP P32322
E	-20	HIS	-	expression tag	UNP P32322
E	-19	HIS	-	expression tag	UNP P32322
E	-18	HIS	-	expression tag	UNP P32322
E	-17	HIS	-	expression tag	UNP P32322
E	-16	HIS	-	expression tag	UNP P32322
E	-15	HIS	-	expression tag	UNP P32322
E	-14	SER	-	expression tag	UNP P32322
E	-13	SER	-	expression tag	UNP P32322
E	-12	GLY	-	expression tag	UNP P32322
E	-11	VAL	-	expression tag	UNP P32322
E	-10	ASP	-	expression tag	UNP P32322
E	-9	LEU	-	expression tag	UNP P32322
E	-8	GLY	-	expression tag	UNP P32322
E	-7	THR	-	expression tag	UNP P32322

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Chain	Residue	Modelled	Actual	Comment	Reference
E	-6	GLU	-	expression tag	UNP P32322
E	-5	ASN	-	expression tag	UNP P32322
E	-4	LEU	-	expression tag	UNP P32322
E	-3	TYR	-	expression tag	UNP P32322
E	-2	PHE	-	expression tag	UNP P32322
E	-1	GLN	-	expression tag	UNP P32322
E	0	SER	-	expression tag	UNP P32322

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Cl 1 1	0	0
2	B	1	Total Cl 1 1	0	0
2	C	1	Total Cl 1 1	0	0
2	D	1	Total Cl 1 1	0	0
2	E	1	Total Cl 1 1	0	0

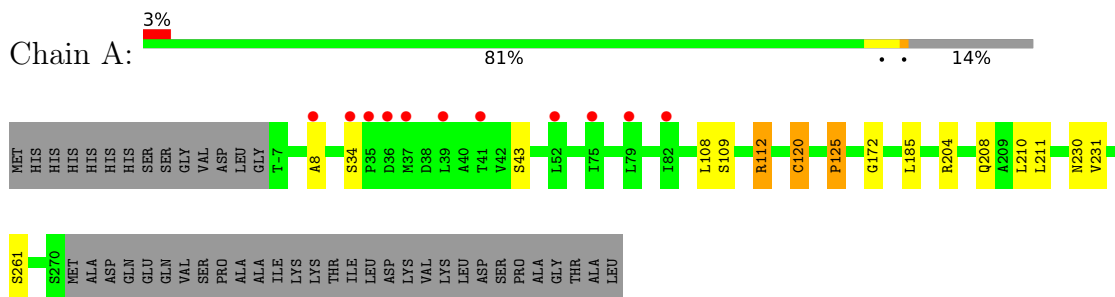
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	109	Total O 109 109	0	0
3	B	118	Total O 118 118	0	0
3	C	93	Total O 93 93	0	0
3	D	116	Total O 116 116	0	0
3	E	66	Total O 66 66	0	0

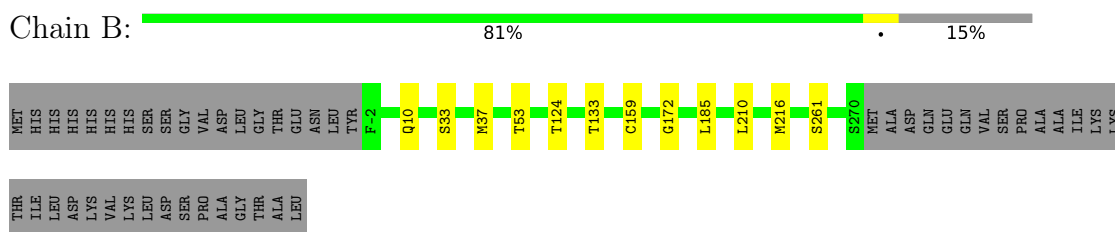
### 3 Residue-property plots [i](#)

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.

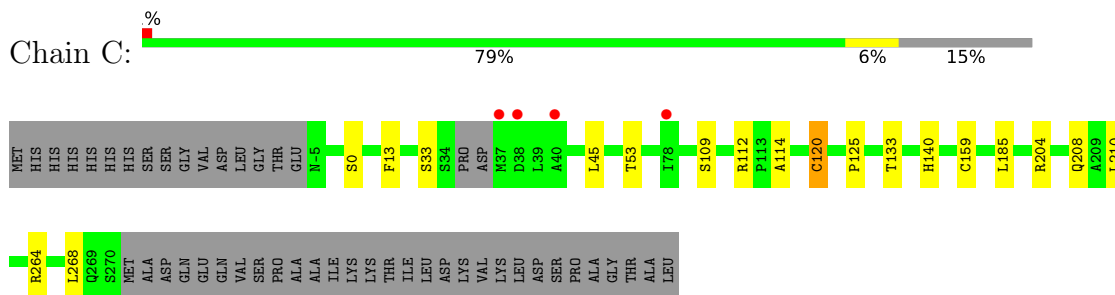
- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial



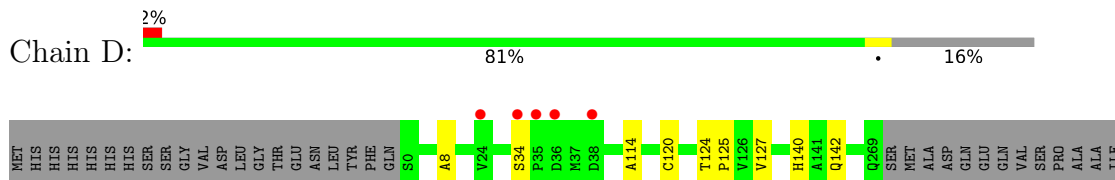
- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial



- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial




- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial



LYS  
LYS  
THR  
ILE  
LEU  
ASP  
LYS  
VAL  
LYS  
ASP  
SER  
PRO  
ALA  
GLY  
THR  
THR  
ALA  
LEU

- Molecule 1: Pyrroline-5-carboxylate reductase 1, mitochondrial

Chain E: 

MET  
HIS  
HIS  
HIS  
HIS  
HIS  
HIS  
SER  
SER  
GLY  
VAL  
ASP  
LEU  
GLY  
THR  
GLU  
ASN  
LEU  
TYR  
PHE  
GLN  
SER  
M1  
S2  
V3  
G4  
F5  
I6  
G7  
A8  
L11  
A12  
F13  
A14  
F19  
T20  
A21  
A22  
L25  
A26  
A27  
H28  
K29  
I30  
M31  
A32  
S33  
S34  
PRO  
ASP  
MET  
ASP  
LEU  
ALA  
THR  
VAL  
SER

ALA  
LEU  
ARG  
LYS  
MET  
GLY  
W50  
K51  
L52  
T53  
P54  
H55  
H62  
S63  
D64  
V65  
L66  
F67  
L68  
A69  
F72  
H73  
I74  
I75  
F76  
F77  
I78  
L79  
G83  
A84  
D85  
I86  
H90  
I91  
V92  
V93  
S94  
V99  
S102  
L108  
S109  
A110  
F111  
R112  
P113  
A114  
P115  
R119  
C120  
R129

T133  
T139  
H140  
A141  
V143  
E144  
D145  
L148  
M149  
C159  
C177  
Y180  
M216  
S270  
MET  
ALA  
ASP  
GLN  
GLU  
GLN  
VAL  
SER  
PRO  
ALA  
ALA  
ILE  
LYS  
LYS  
THR  
ILE  
LEU  
LEU  
ASP  
VAL  
LYS  
LEU  
ASP  
SER  
PRO  
ALA  
GLY  
THR  
ALA  
LEU



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	183.85Å 120.69Å 88.14Å 90.00° 109.25° 90.00°	Depositor
Resolution (Å)	60.34 – 1.85 60.35 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.3 (60.34-1.85) 99.3 (60.35-1.85)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.71 (at 1.86Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155)	Depositor
R, $R_{free}$	0.172 , 0.200 0.173 , 0.200	Depositor DCC
$R_{free}$ test set	7616 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.2	Xtrriage
Anisotropy	0.522	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 62.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	10002	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.76% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: CL

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	0.69	0/2033	0.73	1/2768 (0.0%)
1	B	0.68	0/1983	0.74	0/2700
1	C	0.63	1/1968 (0.1%)	0.73	0/2682
1	D	0.71	1/1945 (0.1%)	0.75	0/2647
1	E	0.55	0/1737	0.66	0/2373
All	All	0.66	2/9666 (0.0%)	0.72	1/13170 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	120	CYS	CB-SG	-6.16	1.71	1.82
1	D	127	VAL	CB-CG1	5.59	1.64	1.52

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	120	CYS	CA-CB-SG	5.03	123.06	114.00

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	1992	0	1973	11	0
1	B	1946	0	1935	7	0
1	C	1932	0	1888	9	0
1	D	1912	0	1899	3	0
1	E	1713	0	1612	7	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
3	A	109	0	0	0	0
3	B	118	0	0	0	0
3	C	93	0	0	0	0
3	D	116	0	0	0	0
3	E	66	0	0	0	0
All	All	10002	0	9307	34	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.

The worst 5 of 34 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:231:VAL:HG12	1:B:124[B]:THR:HG21	1.87	0.57
1:A:204[A]:ARG:NH1	1:A:208:GLN:HB2	2.21	0.56
1:E:33:SER:HA	1:E:53:THR:O	2.10	0.51
1:A:204[A]:ARG:HH12	1:A:208:GLN:HB2	1.75	0.51
1:A:8:ALA:HB3	1:A:34:SER:HB2	1.92	0.51

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	279/322 (87%)	271 (97%)	8 (3%)	0	100	100
1	B	273/322 (85%)	269 (98%)	4 (2%)	0	100	100
1	C	272/322 (84%)	263 (97%)	9 (3%)	0	100	100
1	D	269/322 (84%)	264 (98%)	5 (2%)	0	100	100
1	E	251/322 (78%)	243 (97%)	8 (3%)	0	100	100
All	All	1344/1610 (84%)	1310 (98%)	34 (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	200/254 (79%)	195 (98%)	5 (2%)	47	31
1	B	196/254 (77%)	194 (99%)	2 (1%)	76	69
1	C	190/254 (75%)	188 (99%)	2 (1%)	73	65
1	D	190/254 (75%)	188 (99%)	2 (1%)	73	65
1	E	152/254 (60%)	149 (98%)	3 (2%)	55	40
All	All	928/1270 (73%)	914 (98%)	14 (2%)	65	53

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	0	SER
1	C	120	CYS
1	E	216	MET
1	E	94	SER
1	E	120	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	222	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 [i](#)

Of 5 ligands modelled in this entry, 5 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	278/322 (86%)	0.18	11 (3%) 38 36	15, 31, 58, 76	0
1	B	273/322 (84%)	-0.13	0 100 100	13, 29, 55, 85	0
1	C	274/322 (85%)	0.09	4 (1%) 73 74	16, 33, 61, 85	0
1	D	270/322 (83%)	-0.06	5 (1%) 66 66	15, 30, 56, 87	0
1	E	255/322 (79%)	0.91	61 (23%) 0 0	17, 45, 80, 88	0
All	All	1350/1610 (83%)	0.19	81 (6%) 21 21	13, 32, 69, 88	0

The worst 5 of 81 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	143	VAL	6.2
1	E	54	PRO	5.1
1	E	111	PHE	5.1
1	E	75	ILE	4.9
1	E	84	ALA	4.9

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	CL	E	401	1/1	0.96	0.10	36,36,36,36	0
2	CL	D	401	1/1	0.97	0.12	29,29,29,29	0
2	CL	B	401	1/1	0.98	0.10	34,34,34,34	0
2	CL	C	401	1/1	0.98	0.13	28,28,28,28	0
2	CL	A	401	1/1	0.99	0.12	25,25,25,25	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.