



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 15, 2017 – 01:00 am GMT

PDB ID : 3KTS  
Title : CRYSTAL STRUCTURE OF GLYCEROL UPTAKE OPERON ANTITERMINATOR REGULATORY PROTEIN FROM LISTERIA MONOCYTOGENES STR. 4b F2365  
Authors : Patskovsky, Y.; Toro, R.; Freeman, J.; Do, J.; Sauder, J.M.; Burley, S.K.; Almo, S.C.; New York SGX Research Center for Structural Genomics (NYS-GXRC)  
Deposited on : 2009-11-25  
Resolution : 2.75 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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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)	:	1.9-1692
EDS	:	trunk28620
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
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)	:	recalc28949

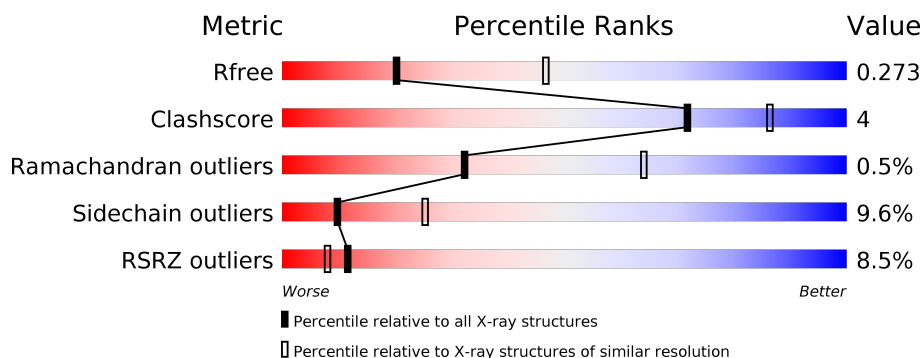
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.75 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))
$R_{free}$	100719	3666 (2.80-2.72)
Clashscore	112137	4174 (2.80-2.72)
Ramachandran outliers	110173	4103 (2.80-2.72)
Sidechain outliers	110143	4106 (2.80-2.72)
RSRZ outliers	101464	3697 (2.80-2.72)

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  $\geq 3$ , 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	192	<div> <div>8%</div> <div> <div></div> <div>80%</div> <div>14%</div> <div>• •</div> </div> </div>
1	B	192	<div> <div>6%</div> <div> <div></div> <div>83%</div> <div>13%</div> <div>• •</div> </div> </div>
1	C	192	<div> <div>5%</div> <div> <div></div> <div>80%</div> <div>10%</div> <div>5%</div> <div>5%</div> </div> </div>
1	D	192	<div> <div>5%</div> <div> <div></div> <div>78%</div> <div>15%</div> <div>• 5%</div> </div> </div>
1	E	192	<div> <div>10%</div> <div> <div></div> <div>81%</div> <div>15%</div> <div>• •</div> </div> </div>
1	F	192	<div> <div>11%</div> <div> <div></div> <div>75%</div> <div>19%</div> <div>• •</div> </div> </div>

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Mol	Chain	Length	Quality of chain
1	G	192	
1	H	192	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 11436 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 Glycerol uptake operon antiterminator regulatory protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	185	Total	C	N	O	S	0	0	0
			1425	909	242	264	10			
1	B	185	Total	C	N	O	S	0	0	0
			1425	909	242	264	10			
1	C	182	Total	C	N	O	S	0	0	0
			1403	895	237	261	10			
1	D	183	Total	C	N	O	S	0	0	0
			1411	901	238	262	10			
1	E	185	Total	C	N	O	S	0	0	0
			1425	909	242	264	10			
1	F	184	Total	C	N	O	S	0	0	0
			1415	903	239	263	10			
1	G	185	Total	C	N	O	S	0	0	0
			1425	909	242	264	10			
1	H	185	Total	C	N	O	S	0	0	0
			1425	909	242	264	10			

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	SER	-	expression tag	UNP Q71ZR5
A	1	LEU	-	expression tag	UNP Q71ZR5
A	183	GLU	-	expression tag	UNP Q71ZR5
A	184	GLY	-	expression tag	UNP Q71ZR5
A	185	HIS	-	expression tag	UNP Q71ZR5
A	186	HIS	-	expression tag	UNP Q71ZR5
A	187	HIS	-	expression tag	UNP Q71ZR5
A	188	HIS	-	expression tag	UNP Q71ZR5
A	189	HIS	-	expression tag	UNP Q71ZR5
A	190	HIS	-	expression tag	UNP Q71ZR5
B	0	SER	-	expression tag	UNP Q71ZR5
B	1	LEU	-	expression tag	UNP Q71ZR5
B	183	GLU	-	expression tag	UNP Q71ZR5

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Chain	Residue	Modelled	Actual	Comment	Reference
B	184	GLY	-	expression tag	UNP Q71ZR5
B	185	HIS	-	expression tag	UNP Q71ZR5
B	186	HIS	-	expression tag	UNP Q71ZR5
B	187	HIS	-	expression tag	UNP Q71ZR5
B	188	HIS	-	expression tag	UNP Q71ZR5
B	189	HIS	-	expression tag	UNP Q71ZR5
B	190	HIS	-	expression tag	UNP Q71ZR5
C	0	SER	-	expression tag	UNP Q71ZR5
C	1	LEU	-	expression tag	UNP Q71ZR5
C	183	GLU	-	expression tag	UNP Q71ZR5
C	184	GLY	-	expression tag	UNP Q71ZR5
C	185	HIS	-	expression tag	UNP Q71ZR5
C	186	HIS	-	expression tag	UNP Q71ZR5
C	187	HIS	-	expression tag	UNP Q71ZR5
C	188	HIS	-	expression tag	UNP Q71ZR5
C	189	HIS	-	expression tag	UNP Q71ZR5
C	190	HIS	-	expression tag	UNP Q71ZR5
D	0	SER	-	expression tag	UNP Q71ZR5
D	1	LEU	-	expression tag	UNP Q71ZR5
D	183	GLU	-	expression tag	UNP Q71ZR5
D	184	GLY	-	expression tag	UNP Q71ZR5
D	185	HIS	-	expression tag	UNP Q71ZR5
D	186	HIS	-	expression tag	UNP Q71ZR5
D	187	HIS	-	expression tag	UNP Q71ZR5
D	188	HIS	-	expression tag	UNP Q71ZR5
D	189	HIS	-	expression tag	UNP Q71ZR5
D	190	HIS	-	expression tag	UNP Q71ZR5
E	0	SER	-	expression tag	UNP Q71ZR5
E	1	LEU	-	expression tag	UNP Q71ZR5
E	183	GLU	-	expression tag	UNP Q71ZR5
E	184	GLY	-	expression tag	UNP Q71ZR5
E	185	HIS	-	expression tag	UNP Q71ZR5
E	186	HIS	-	expression tag	UNP Q71ZR5
E	187	HIS	-	expression tag	UNP Q71ZR5
E	188	HIS	-	expression tag	UNP Q71ZR5
E	189	HIS	-	expression tag	UNP Q71ZR5
E	190	HIS	-	expression tag	UNP Q71ZR5
F	0	SER	-	expression tag	UNP Q71ZR5
F	1	LEU	-	expression tag	UNP Q71ZR5
F	183	GLU	-	expression tag	UNP Q71ZR5
F	184	GLY	-	expression tag	UNP Q71ZR5
F	185	HIS	-	expression tag	UNP Q71ZR5

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Chain	Residue	Modelled	Actual	Comment	Reference
F	186	HIS	-	expression tag	UNP Q71ZR5
F	187	HIS	-	expression tag	UNP Q71ZR5
F	188	HIS	-	expression tag	UNP Q71ZR5
F	189	HIS	-	expression tag	UNP Q71ZR5
F	190	HIS	-	expression tag	UNP Q71ZR5
G	0	SER	-	expression tag	UNP Q71ZR5
G	1	LEU	-	expression tag	UNP Q71ZR5
G	183	GLU	-	expression tag	UNP Q71ZR5
G	184	GLY	-	expression tag	UNP Q71ZR5
G	185	HIS	-	expression tag	UNP Q71ZR5
G	186	HIS	-	expression tag	UNP Q71ZR5
G	187	HIS	-	expression tag	UNP Q71ZR5
G	188	HIS	-	expression tag	UNP Q71ZR5
G	189	HIS	-	expression tag	UNP Q71ZR5
G	190	HIS	-	expression tag	UNP Q71ZR5
H	0	SER	-	expression tag	UNP Q71ZR5
H	1	LEU	-	expression tag	UNP Q71ZR5
H	183	GLU	-	expression tag	UNP Q71ZR5
H	184	GLY	-	expression tag	UNP Q71ZR5
H	185	HIS	-	expression tag	UNP Q71ZR5
H	186	HIS	-	expression tag	UNP Q71ZR5
H	187	HIS	-	expression tag	UNP Q71ZR5
H	188	HIS	-	expression tag	UNP Q71ZR5
H	189	HIS	-	expression tag	UNP Q71ZR5
H	190	HIS	-	expression tag	UNP Q71ZR5

- Molecule 2 is UNKNOWN LIGAND (three-letter code: UNL) (formula: ).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	G	1	Total	C	O	P	0	0
			10	3	6	1		
2	D	1	Total	C	O	P	0	0
			10	3	6	1		
2	E	1	Total	C	O	P	0	0
			10	3	6	1		
2	H	1	Total	C	O	P	0	0
			10	3	6	1		
2	B	1	Total	C	O	P	0	0
			10	3	6	1		
2	C	1	Total	C	O	P	0	0
			10	3	6	1		
2	A	1	Total	C	O	P	0	0
			10	3	6	1		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	F	1	Total	C	O	P	0	0
			10	3	6	1		

- Molecule 3 is water.

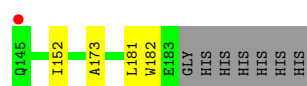
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	G	2	Total	O	0	0
			2	2		



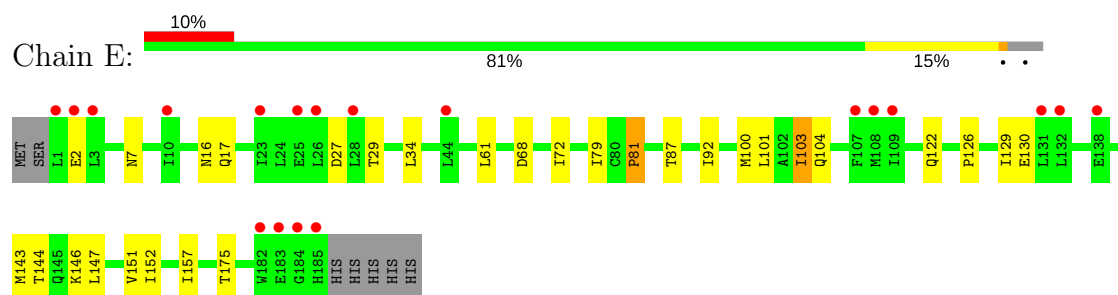
- Molecule 1: Glycerol uptake operon antiterminator regulatory protein



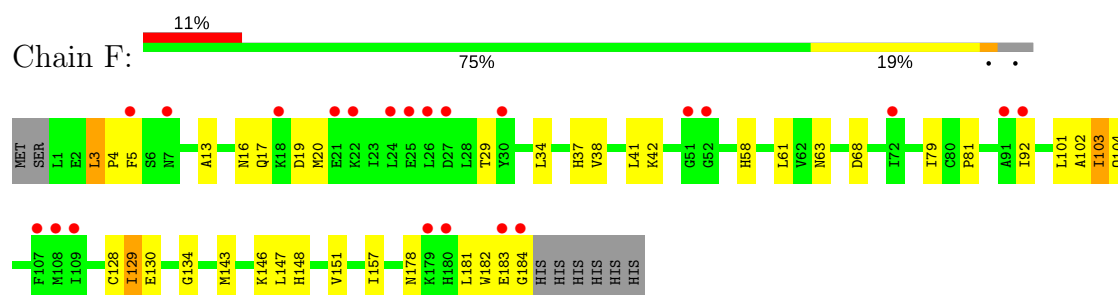




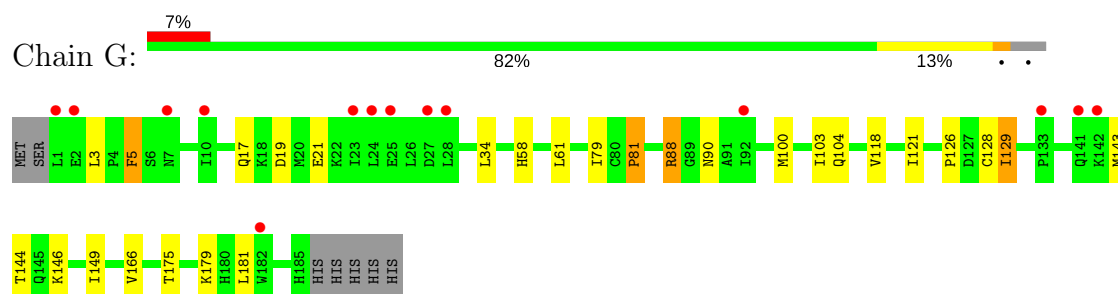
- Molecule 1: Glycerol uptake operon antiterminator regulatory protein



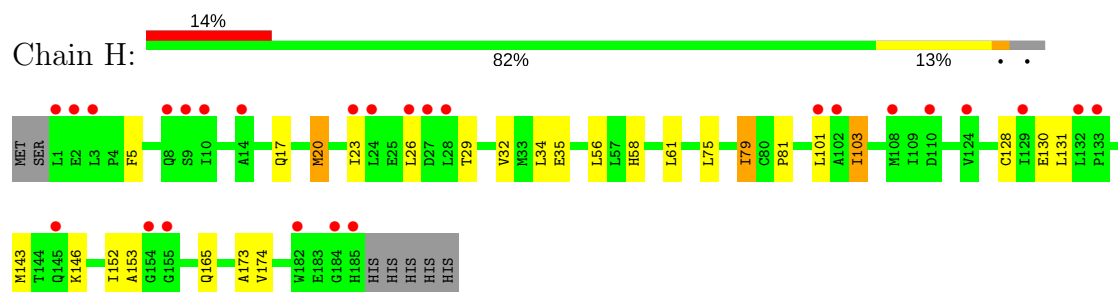
- Molecule 1: Glycerol uptake operon antiterminator regulatory protein



- Molecule 1: Glycerol uptake operon antiterminator regulatory protein



- Molecule 1: Glycerol uptake operon antiterminator regulatory protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	137.60Å 110.60Å 130.97Å 90.00° 116.44° 90.00°	Depositor
Resolution (Å)	20.00 – 2.75 39.09 – 2.75	Depositor EDS
% Data completeness (in resolution range)	99.0 (20.00-2.75) 98.9 (39.09-2.75)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.64	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.51 (at 2.77Å)	Xtriage
Refinement program	REFMAC 5.3.0034	Depositor
R, $R_{free}$	0.218 , 0.272 0.222 , 0.273	Depositor DCC
$R_{free}$ test set	1408 reflections (3.22%)	DCC
Wilson B-factor (Å <sup>2</sup> )	92.1	Xtriage
Anisotropy	0.025	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 73.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	11436	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	99.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.33% 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

### 5.1 Standard geometry

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

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	0.35	0/1447	0.57	0/1957
1	B	0.35	0/1447	0.58	0/1957
1	C	0.35	0/1424	0.57	0/1926
1	D	0.35	0/1432	0.59	0/1937
1	E	0.35	0/1447	0.58	0/1957
1	F	0.35	0/1436	0.57	0/1942
1	G	0.32	0/1447	0.53	0/1957
1	H	0.35	0/1447	0.57	0/1957
All	All	0.35	0/11527	0.57	0/15590

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	2
1	C	0	3
All	All	0	5

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	147	LEU	Peptide
1	A	148	HIS	Peptide
1	C	3	LEU	Peptide

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Mol	Chain	Res	Type	Group
1	C	5	PHE	Peptide
1	C	7	ASN	Peptide

## 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	1425	0	1482	12	0
1	B	1425	0	1482	9	0
1	C	1403	0	1458	9	0
1	D	1411	0	1472	12	0
1	E	1425	0	1482	8	0
1	F	1415	0	1475	19	0
1	G	1425	0	1482	14	0
1	H	1425	0	1482	11	0
2	A	10	0	0	0	0
2	B	10	0	0	0	0
2	C	10	0	0	0	0
2	D	10	0	0	0	0
2	E	10	0	0	0	0
2	F	10	0	0	0	0
2	G	10	0	0	0	0
2	H	10	0	0	0	0
3	G	2	0	0	0	0
All	All	11436	0	11815	92	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 4.

The worst 5 of 92 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:149:ILE:HG23	1:A:150:PRO:HD2	1.27	1.09
1:G:129:ILE:HG22	1:G:149:ILE:CG2	1.83	1.09
1:G:129:ILE:HG22	1:G:149:ILE:HG22	1.39	1.05
1:A:149:ILE:CG2	1:A:150:PRO:HD2	1.94	0.98

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:181:LEU:HD12	1:F:181:LEU:O	1.67	0.93

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	183/192 (95%)	177 (97%)	6 (3%)	0	100	100
1	B	183/192 (95%)	169 (92%)	12 (7%)	2 (1%)	17	43
1	C	180/192 (94%)	171 (95%)	8 (4%)	1 (1%)	28	59
1	D	181/192 (94%)	171 (94%)	9 (5%)	1 (1%)	28	59
1	E	183/192 (95%)	172 (94%)	10 (6%)	1 (0%)	32	64
1	F	182/192 (95%)	168 (92%)	13 (7%)	1 (0%)	32	64
1	G	183/192 (95%)	174 (95%)	8 (4%)	1 (0%)	32	64
1	H	183/192 (95%)	173 (94%)	10 (6%)	0	100	100
All	All	1458/1536 (95%)	1375 (94%)	76 (5%)	7 (0%)	32	64

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	4	PRO
1	B	68	ASP
1	D	4	PRO
1	G	81	PRO
1	C	68	ASP

### 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	157/164 (96%)	139 (88%)	18 (12%)	6	17
1	B	157/164 (96%)	148 (94%)	9 (6%)	24	53
1	C	155/164 (94%)	138 (89%)	17 (11%)	7	19
1	D	156/164 (95%)	141 (90%)	15 (10%)	10	25
1	E	157/164 (96%)	140 (89%)	17 (11%)	7	20
1	F	156/164 (95%)	140 (90%)	16 (10%)	8	22
1	G	157/164 (96%)	142 (90%)	15 (10%)	10	25
1	H	157/164 (96%)	144 (92%)	13 (8%)	13	33
All	All	1252/1312 (95%)	1132 (90%)	120 (10%)	10	25

5 of 120 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	101	LEU
1	E	101	LEU
1	H	29	THR
1	D	123	LYS
1	E	7	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	104	GLN
1	E	15	HIS
1	G	104	GLN
1	D	145	GLN
1	E	17	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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 8 are unknown - 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	185/192 (96%)	0.52	16 (8%) 11 8	69, 87, 121, 149	0
1	B	185/192 (96%)	0.56	11 (5%) 23 18	70, 94, 126, 157	0
1	C	182/192 (94%)	0.48	9 (4%) 30 24	67, 91, 124, 150	0
1	D	183/192 (95%)	0.49	9 (4%) 30 24	66, 90, 120, 150	0
1	E	185/192 (96%)	0.56	19 (10%) 7 5	64, 94, 131, 148	0
1	F	184/192 (95%)	0.70	22 (11%) 5 3	73, 100, 128, 142	0
1	G	185/192 (96%)	0.60	14 (7%) 15 10	73, 104, 140, 149	0
1	H	185/192 (96%)	0.87	26 (14%) 3 2	80, 106, 132, 153	0
All	All	1474/1536 (95%)	0.60	126 (8%) 11 8	64, 96, 131, 157	0

The worst 5 of 126 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1	LEU	11.1
1	H	185	HIS	7.8
1	G	1	LEU	6.8
1	E	185	HIS	6.4
1	A	1	LEU	6.3

### 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, 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	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
2	UNL	D	191	10/-	0.96	0.21	-0.06	78,100,105,119	0
2	UNL	A	191	10/-	0.96	0.18	-0.55	77,96,105,105	0
2	UNL	G	191	10/-	0.95	0.18	-0.59	106,113,120,123	0
2	UNL	B	191	10/-	0.96	0.19	-0.64	68,92,96,106	0
2	UNL	F	191	10/-	0.95	0.19	-0.78	100,115,125,132	0
2	UNL	E	191	10/-	0.97	0.13	-1.69	105,123,132,137	0
2	UNL	H	191	10/-	0.93	0.15	-1.83	92,105,117,119	0
2	UNL	C	191	10/-	0.98	0.12	-1.95	71,99,107,111	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.