



# wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 13, 2024 – 07:16 AM EST

PDB ID : 4KSA  
Title : Crystal Structure of Malonyl-CoA decarboxylase from Rhodopseudomonas palustris, Northeast Structural Genomics Consortium Target RpR127  
Authors : Forouhar, F.; Neely, H.; Seetharaman, J.; Sahdev, S.; Xiao, R.; Patel, D.J.; Ciccocanti, C.; Wang, D.; Everett, J.K.; Acton, T.B.; Montelione, G.T.; Hunt, J.F.; Tong, L.; Northeast Structural Genomics Consortium (NESG)  
Deposited on : 2013-05-17  
Resolution : 2.70 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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

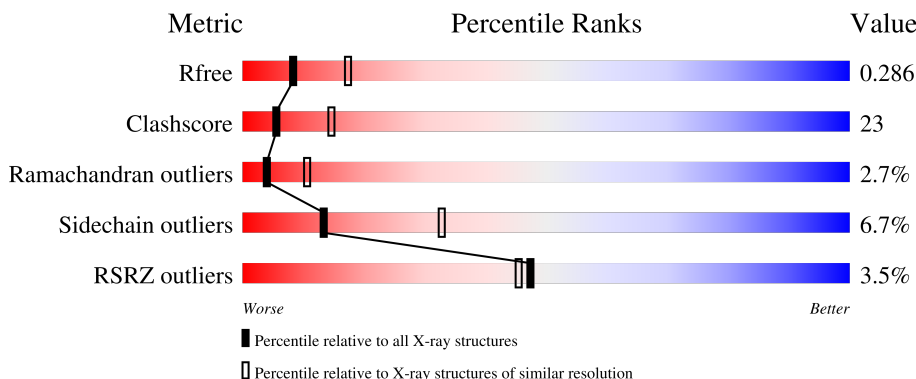
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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))
$R_{free}$	164625	3333 (2.70-2.70)
Clashscore	180529	3684 (2.70-2.70)
Ramachandran outliers	177936	3633 (2.70-2.70)
Sidechain outliers	177891	3633 (2.70-2.70)
RSRZ outliers	164620	3333 (2.70-2.70)

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	453	<div> <div>0%</div> <div>58% 32% 5% .</div> </div>
1	B	453	<div> <div>6%</div> <div>51% 34% 6% 9%</div> </div>
1	C	453	<div> <div>3%</div> <div>57% 36% . .</div> </div>
1	D	453	<div> <div>3%</div> <div>51% 35% 5% 9%</div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 13442 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 Malonyl-CoA decarboxylase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	437	Total	C	N	O	S	Se	0	0	0
			3405	2151	611	638	1	4			
1	B	411	Total	C	N	O	S	Se	0	0	0
			3208	2031	574	598	1	4			
1	C	436	Total	C	N	O	S	Se	0	0	0
			3398	2147	610	636	1	4			
1	D	413	Total	C	N	O	S	Se	0	0	0
			3222	2041	576	600	1	4			

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	7	MSE	-	initiating methionine	UNP Q6NCB2
A	452	LEU	-	expression tag	UNP Q6NCB2
A	453	GLU	-	expression tag	UNP Q6NCB2
A	454	HIS	-	expression tag	UNP Q6NCB2
A	455	HIS	-	expression tag	UNP Q6NCB2
A	456	HIS	-	expression tag	UNP Q6NCB2
A	457	HIS	-	expression tag	UNP Q6NCB2
A	458	HIS	-	expression tag	UNP Q6NCB2
A	459	HIS	-	expression tag	UNP Q6NCB2
B	7	MSE	-	initiating methionine	UNP Q6NCB2
B	452	LEU	-	expression tag	UNP Q6NCB2
B	453	GLU	-	expression tag	UNP Q6NCB2
B	454	HIS	-	expression tag	UNP Q6NCB2
B	455	HIS	-	expression tag	UNP Q6NCB2
B	456	HIS	-	expression tag	UNP Q6NCB2
B	457	HIS	-	expression tag	UNP Q6NCB2
B	458	HIS	-	expression tag	UNP Q6NCB2
B	459	HIS	-	expression tag	UNP Q6NCB2
C	7	MSE	-	initiating methionine	UNP Q6NCB2
C	452	LEU	-	expression tag	UNP Q6NCB2
C	453	GLU	-	expression tag	UNP Q6NCB2

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Chain	Residue	Modelled	Actual	Comment	Reference
C	454	HIS	-	expression tag	UNP Q6NCB2
C	455	HIS	-	expression tag	UNP Q6NCB2
C	456	HIS	-	expression tag	UNP Q6NCB2
C	457	HIS	-	expression tag	UNP Q6NCB2
C	458	HIS	-	expression tag	UNP Q6NCB2
C	459	HIS	-	expression tag	UNP Q6NCB2
D	7	MSE	-	initiating methionine	UNP Q6NCB2
D	452	LEU	-	expression tag	UNP Q6NCB2
D	453	GLU	-	expression tag	UNP Q6NCB2
D	454	HIS	-	expression tag	UNP Q6NCB2
D	455	HIS	-	expression tag	UNP Q6NCB2
D	456	HIS	-	expression tag	UNP Q6NCB2
D	457	HIS	-	expression tag	UNP Q6NCB2
D	458	HIS	-	expression tag	UNP Q6NCB2
D	459	HIS	-	expression tag	UNP Q6NCB2

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Mg 1 1	0	0
2	C	1	Total Mg 1 1	0	0

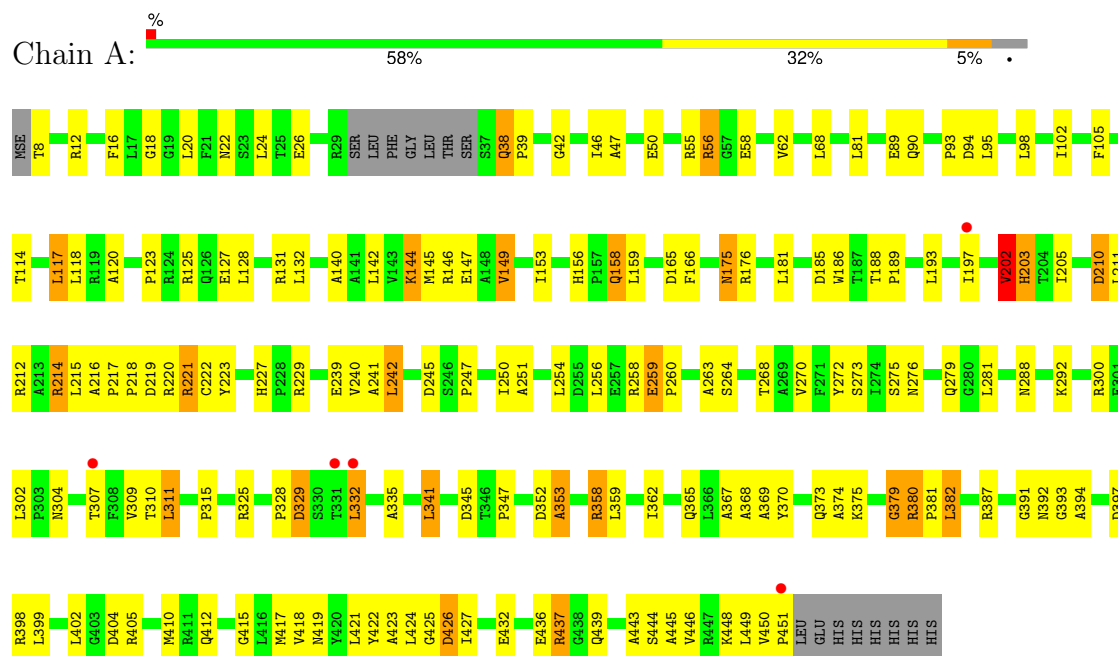
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	54	Total O 54 54	0	0
3	B	40	Total O 40 40	0	0
3	C	58	Total O 58 58	0	0
3	D	55	Total O 55 55	0	0

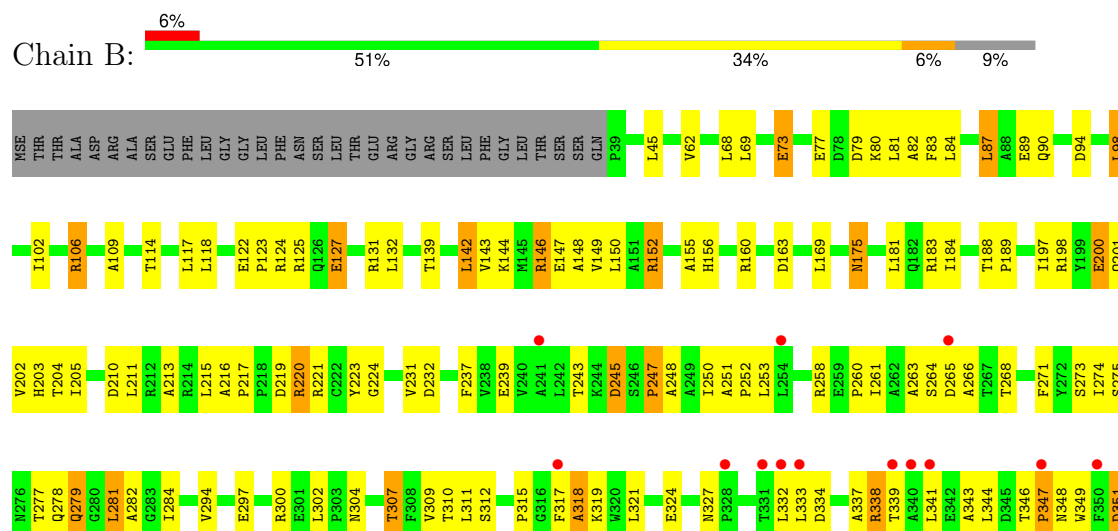
### 3 Residue-property plots

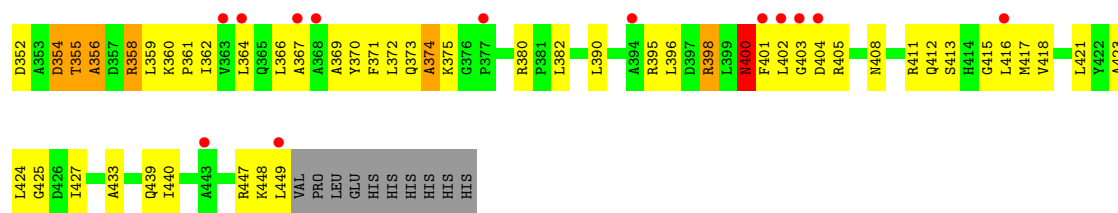
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Malonyl-CoA decarboxylase

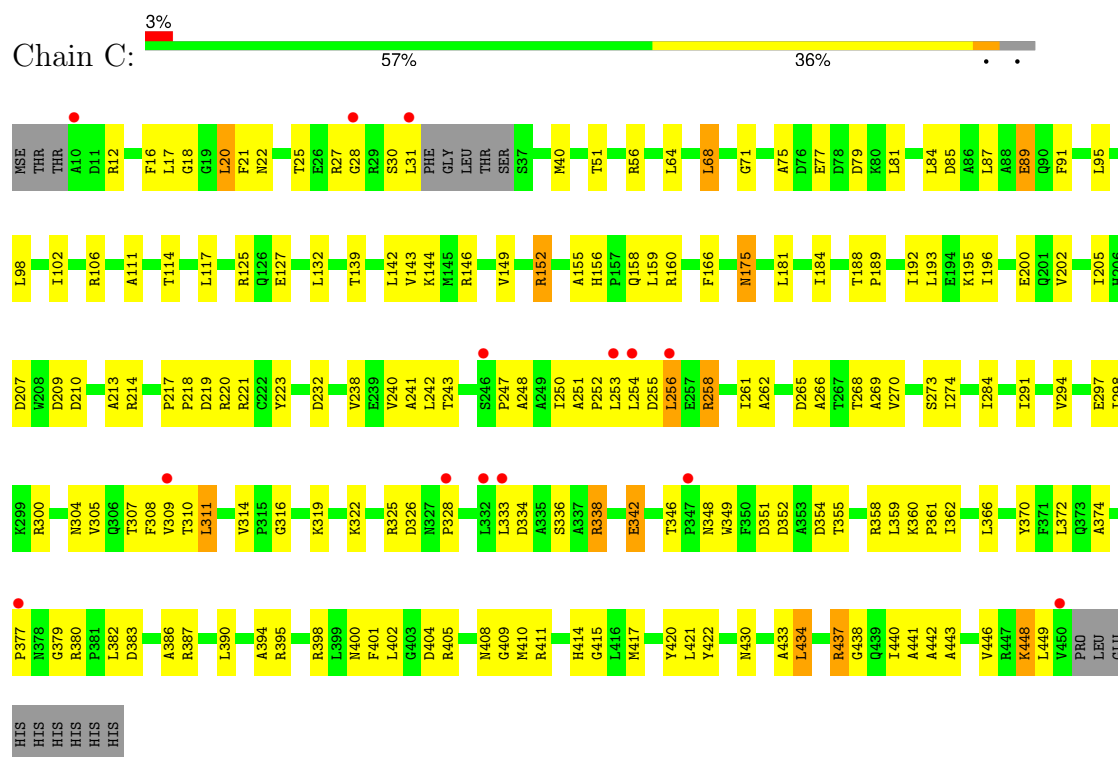


#### • Molecule 1: Malonyl-CoA decarboxylase

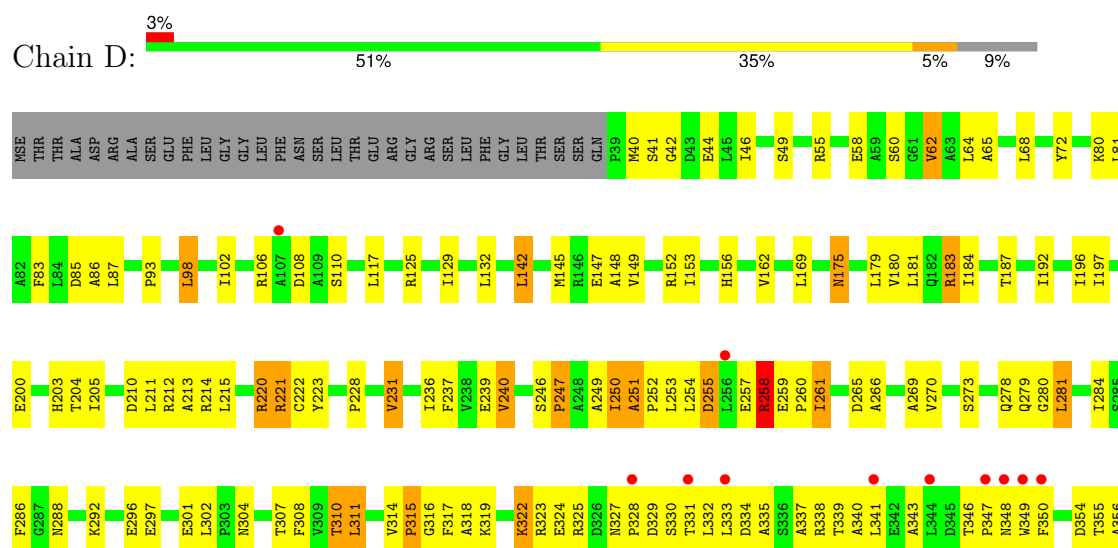


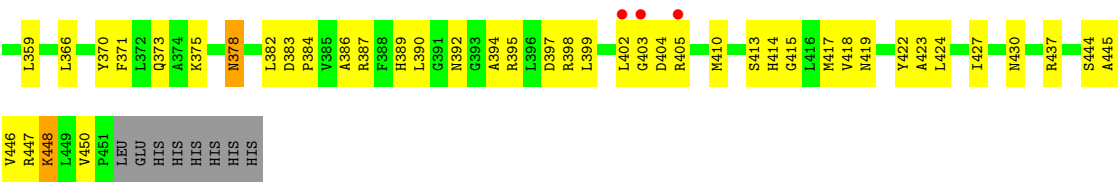


● Molecule 1: Malonyl-CoA decarboxylase



● Molecule 1: Malonyl-CoA decarboxylase





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	141.50Å 159.76Å 108.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.89 – 2.70 29.89 – 2.70	Depositor EDS
% Data completeness (in resolution range)	94.7 (29.89-2.70) 94.8 (29.89-2.70)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.04	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.64 (at 2.68Å)	Xtriage
Refinement program	CNS 1.3	Depositor
R, $R_{free}$	0.225 , 0.279 0.232 , 0.286	Depositor DCC
$R_{free}$ test set	6709 reflections (9.83%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	56.9	Xtriage
Anisotropy	0.275	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 52.0	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	0.93	EDS
Total number of atoms	13442	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	69.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.63% 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: MG

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	0.42	0/3472	0.63	0/4711
1	B	0.37	0/3273	0.61	1/4443 (0.0%)
1	C	0.38	0/3464	0.58	0/4698
1	D	0.39	0/3288	0.61	1/4465 (0.0%)
All	All	0.39	0/13497	0.61	2/18317 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	277	THR	N-CA-C	5.75	126.51	111.00
1	D	311	LEU	N-CA-C	-5.07	97.30	111.00

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	3405	0	3369	142	0
1	B	3208	0	3180	176	0
1	C	3398	0	3364	142	0
1	D	3222	0	3196	163	0
2	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	1	0	0	0	0
3	A	54	0	0	5	0
3	B	40	0	0	0	0
3	C	58	0	0	1	0
3	D	55	0	0	1	0
All	All	13442	0	13109	611	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 23.

The worst 5 of 611 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:8:THR:HG22	1:A:12:ARG:HB2	1.43	0.98
1:B:318:ALA:HB2	1:B:412:GLN:HA	1.43	0.98
1:A:380:ARG:HH11	1:A:380:ARG:HB3	1.26	0.98
1:A:56:ARG:HB2	1:A:56:ARG:HH21	1.31	0.96
1:C:256:LEU:HD23	1:C:256:LEU:H	1.34	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	433/453 (96%)	388 (90%)	38 (9%)	7 (2%)	8	21
1	B	409/453 (90%)	358 (88%)	37 (9%)	14 (3%)	3	7
1	C	432/453 (95%)	374 (87%)	48 (11%)	10 (2%)	5	14
1	D	411/453 (91%)	359 (87%)	38 (9%)	14 (3%)	3	7
All	All	1685/1812 (93%)	1479 (88%)	161 (10%)	45 (3%)	4	10

5 of 45 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	202	VAL
1	B	354	ASP
1	B	355	THR
1	D	260	PRO
1	D	354	ASP

### 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	350/360 (97%)	323 (92%)	27 (8%)	10	26
1	B	329/360 (91%)	304 (92%)	25 (8%)	11	27
1	C	349/360 (97%)	330 (95%)	19 (5%)	18	42
1	D	331/360 (92%)	311 (94%)	20 (6%)	16	38
All	All	1359/1440 (94%)	1268 (93%)	91 (7%)	13	33

5 of 91 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	127	GLU
1	D	62	VAL
1	C	144	LYS
1	C	258	ARG
1	D	175	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 30 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	419	ASN
1	D	412	GLN
1	C	158	GLN
1	D	419	ASN
1	D	175	ASN

### 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 2 ligands modelled in this entry, 2 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	433/453 (95%)	-0.13	5 (1%) 76 76	30, 57, 92, 109	0
1	B	407/453 (89%)	0.35	26 (6%) 27 24	32, 70, 152, 158	0
1	C	432/453 (95%)	0.23	14 (3%) 50 48	29, 70, 122, 136	0
1	D	409/453 (90%)	0.12	14 (3%) 48 46	31, 61, 128, 143	0
All	All	1681/1812 (92%)	0.14	59 (3%) 47 45	29, 63, 127, 158	0

The worst 5 of 59 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	332	LEU	5.7
1	C	450	VAL	4.5
1	D	333	LEU	4.0
1	B	340	ALA	3.9
1	D	350	PHE	3.8

### 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 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( $\text{\AA}^2$ )	Q<0.9
2	MG	C	501	1/1	0.74	0.23	75,75,75,75	0
2	MG	A	501	1/1	0.78	0.22	64,64,64,64	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.