



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 03:52 PM GMT

PDB ID : 4DPM  
Title : Structure of malonyl-coenzyme A reductase from crenarchaeota in complex with CoA  
Authors : Demmer, U.; Warkentin, E.; Srivastava, A.; Kockelkorn, D.; Fuchs, G.; Ermler, U.  
Deposited on : 2012-02-13  
Resolution : 2.30 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  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
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) : trunk26865

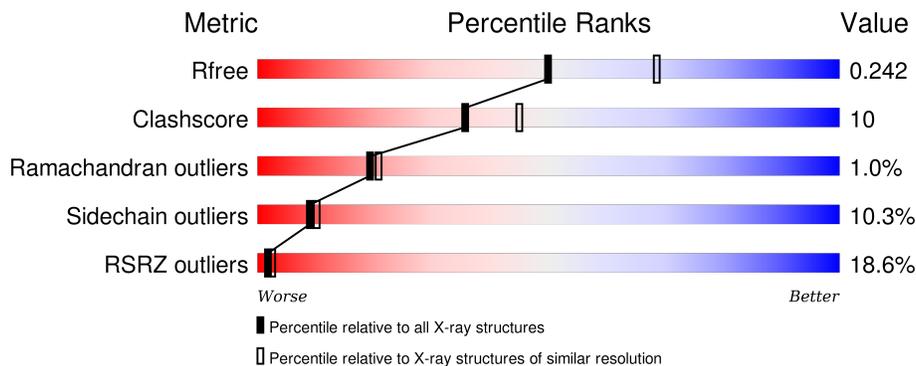
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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))
$R_{free}$	91344	3852 (2.30-2.30)
Clashscore	102246	4452 (2.30-2.30)
Ramachandran outliers	100387	4410 (2.30-2.30)
Sidechain outliers	100360	4409 (2.30-2.30)
RSRZ outliers	91569	3857 (2.30-2.30)

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	359	
1	B	359	
1	C	359	
1	D	359	
1	E	359	

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Mol	Chain	Length	Quality of chain
1	F	359	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into three segments: a red segment on the left labeled '28%', a green segment in the middle labeled '74%', and a yellow segment on the right labeled '22%'. The green segment is the largest, followed by the red segment, and then the yellow segment. There are two small black dots at the end of the bar.</p>

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 17284 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.

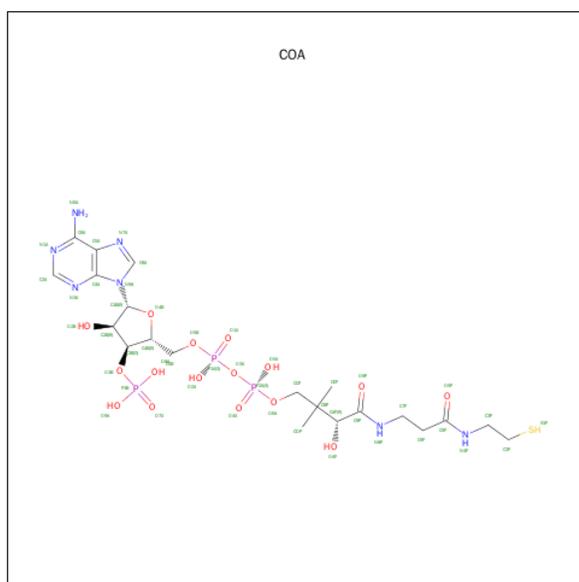
- Molecule 1 is a protein called Malonyl-CoA/succinyl-CoA reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	354	2743	1759	466	510	8	0	0	0
1	B	354	2743	1759	466	510	8	0	0	0
1	C	354	2743	1759	466	510	8	0	0	0
1	D	354	2743	1759	466	510	8	0	0	0
1	E	353	2732	1753	462	509	8	0	0	0
1	F	353	2732	1753	462	509	8	0	0	0

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

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

- Molecule 3 is COENZYME A (three-letter code: COA) (formula: C<sub>21</sub>H<sub>36</sub>N<sub>7</sub>O<sub>16</sub>P<sub>3</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
3	A	1	48	21	7	16	3	1	0	0
3	B	1	48	21	7	16	3	1	0	0
3	C	1	48	21	7	16	3	1	0	0
3	D	1	48	21	7	16	3	1	0	0
3	E	1	48	21	7	16	3	1	0	0
3	F	1	48	21	7	16	3	1	0	0

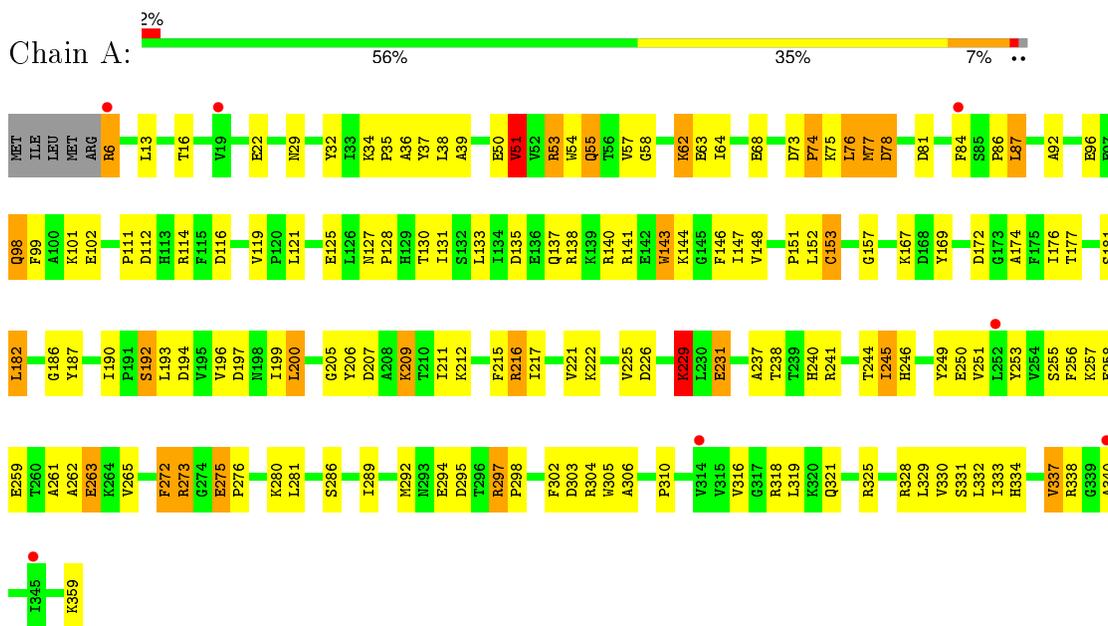
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	184	Total	O	0	0
			184	184		
4	B	172	Total	O	0	0
			172	172		
4	C	59	Total	O	0	0
			59	59		
4	D	57	Total	O	0	0
			57	57		
4	E	52	Total	O	0	0
			52	52		
4	F	30	Total	O	0	0
			30	30		

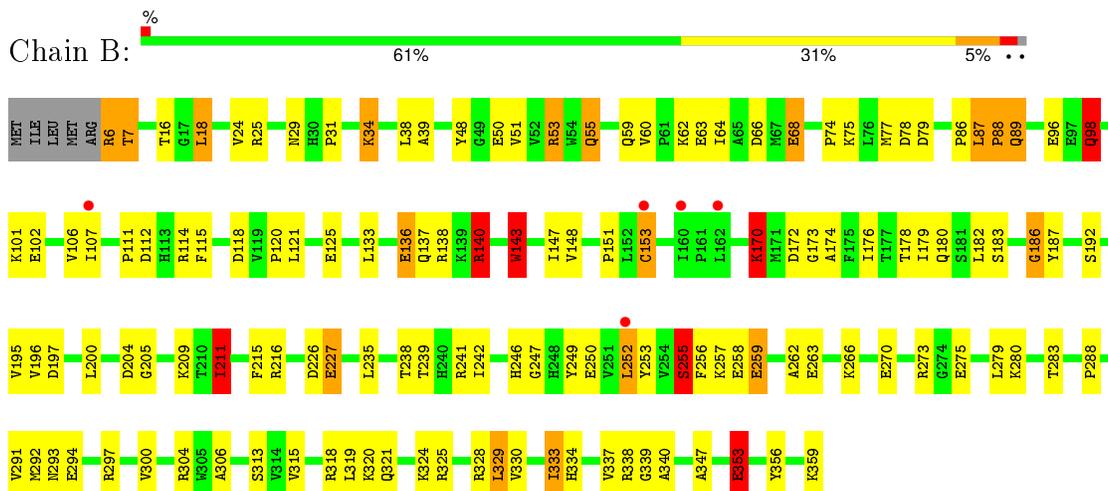
### 3 Residue-property plots [\(i\)](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

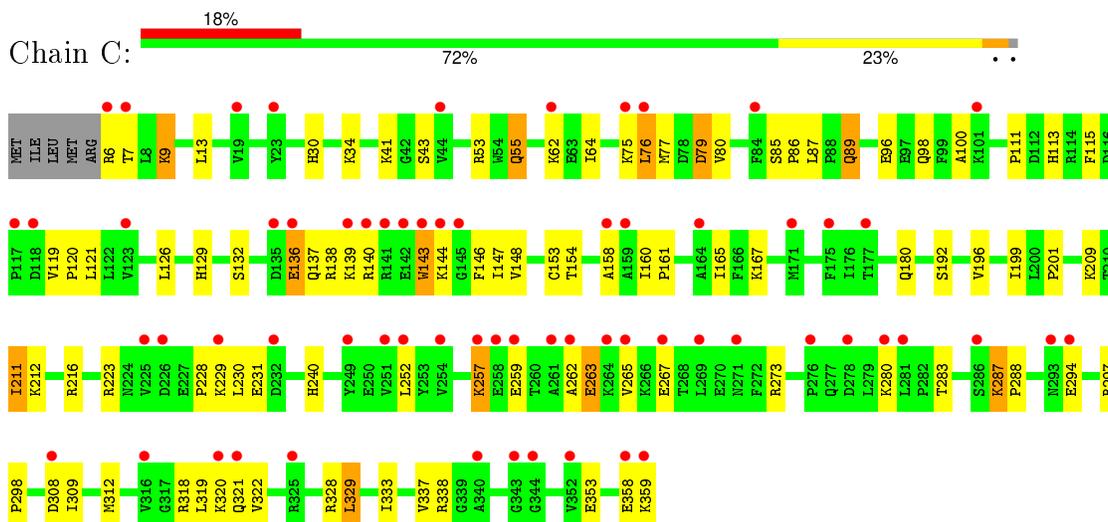
- Molecule 1: Malonyl-CoA/succinyl-CoA reductase



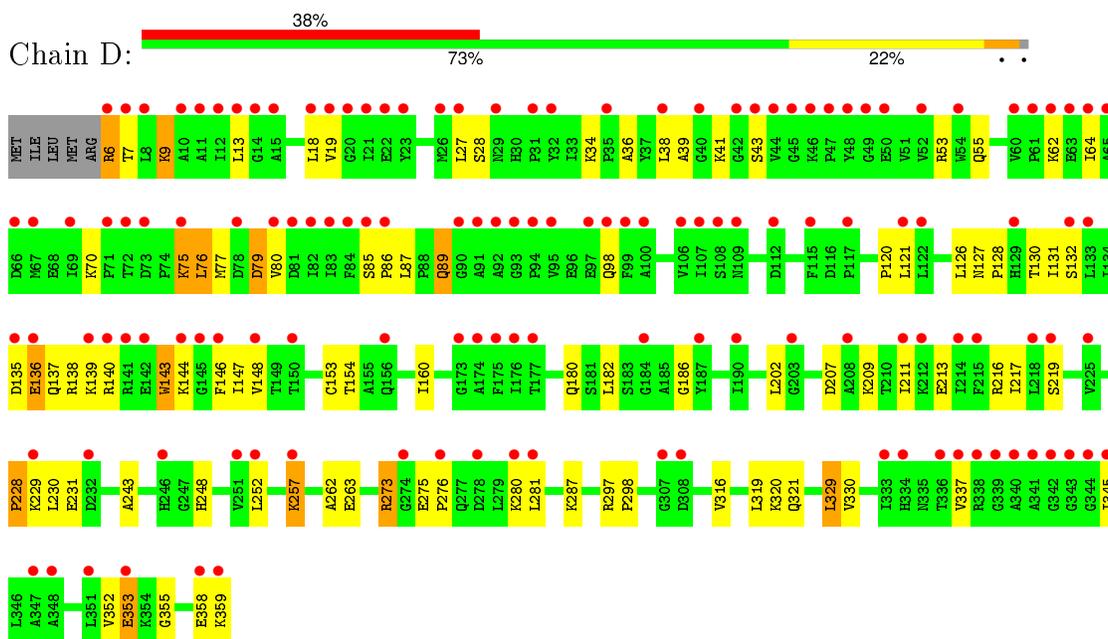
- Molecule 1: Malonyl-CoA/succinyl-CoA reductase



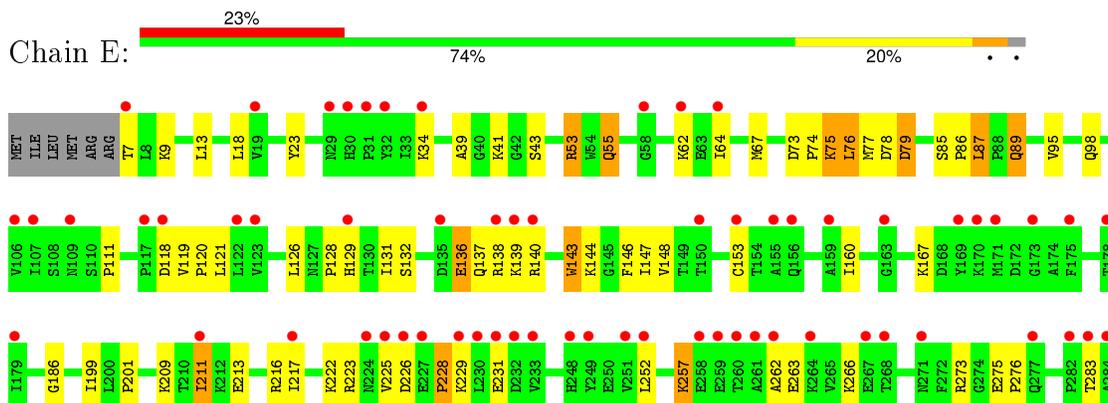
- Molecule 1: Malonyl-CoA/succinyl-CoA reductase



- Molecule 1: Malonyl-CoA/succinyl-CoA reductase

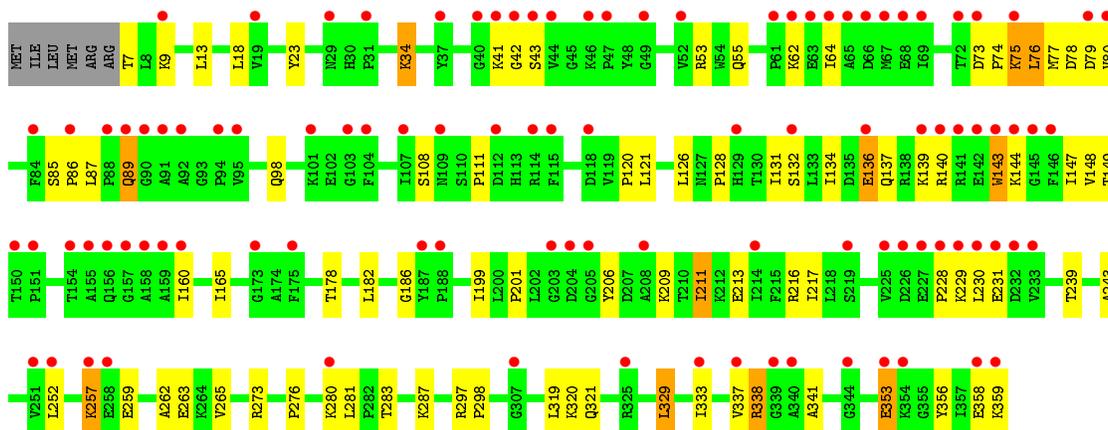


- Molecule 1: Malonyl-CoA/succinyl-CoA reductase





● Molecule 1: Malonyl-CoA/succinyl-CoA reductase



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	111.63Å 137.62Å 362.01Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.30 29.89 – 2.30	Depositor EDS
% Data completeness (in resolution range)	87.9 (30.00-2.30) 87.9 (29.89-2.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.31 (at 2.31Å)	Xtrriage
Refinement program	REFMAC 5.6.0095	Depositor
R, $R_{free}$	0.198 , 0.247 0.195 , 0.242	Depositor DCC
$R_{free}$ test set	6243 reflections (6.06%)	DCC
Wilson B-factor (Å <sup>2</sup> )	41.7	Xtrriage
Anisotropy	0.420	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.27 , 47.2	EDS
Estimated twinning fraction	No twinning to report.	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Outliers	1 of 108584 reflections (0.001%)	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	17284	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	84.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.74% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: COA, 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	2.14	89/2804 (3.2%)	1.64	55/3808 (1.4%)
1	B	2.00	76/2804 (2.7%)	1.53	34/3808 (0.9%)
1	C	0.90	0/2804	0.83	0/3808
1	D	0.76	0/2804	0.76	1/3808 (0.0%)
1	E	0.84	0/2793	0.82	2/3794 (0.1%)
1	F	0.70	0/2793	0.75	1/3794 (0.0%)
All	All	1.36	165/16802 (1.0%)	1.12	93/22820 (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

The worst 5 of 165 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	353	GLU	CB-CG	14.56	1.79	1.52
1	A	302	PHE	CE1-CZ	12.24	1.60	1.37
1	A	255	SER	CB-OG	-11.06	1.27	1.42
1	A	53	ARG	CG-CD	10.35	1.77	1.51
1	A	187	TYR	CD2-CE2	10.24	1.54	1.39

The worst 5 of 93 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	114	ARG	NE-CZ-NH2	-15.06	112.77	120.30
1	B	328	ARG	NE-CZ-NH2	13.87	127.23	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	255	SER	N-CA-CB	-11.24	93.64	110.50
1	A	141	ARG	NE-CZ-NH2	-11.07	114.77	120.30
1	B	318	ARG	NE-CZ-NH1	10.37	125.49	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	237	ALA	Mainchain

## 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	2743	0	2799	55	0
1	B	2743	0	2799	56	0
1	C	2743	0	2799	63	1
1	D	2743	0	2799	50	0
1	E	2732	0	2786	53	0
1	F	2732	0	2786	44	1
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
2	F	1	0	0	0	0
3	A	48	0	32	1	0
3	B	48	0	32	3	0
3	C	48	0	32	1	0
3	D	48	0	32	4	0
3	E	48	0	32	1	0
3	F	48	0	32	2	0
4	A	184	0	0	13	0
4	B	172	0	0	5	0
4	C	59	0	0	20	0
4	D	57	0	0	14	0
4	E	52	0	0	10	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	F	30	0	0	12	0
All	All	17284	0	16960	326	1

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 10.

The worst 5 of 326 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:53:ARG:CD	1:A:53:ARG:CG	1.77	1.61
1:B:353:GLU:CG	1:B:353:GLU:CB	1.79	1.58
1:A:200:LEU:CG	1:A:200:LEU:CD1	1.85	1.54
1:B:88:PRO:CD	1:B:88:PRO:CG	1.75	1.51
1:C:223:ARG:HA	4:C:656:HOH:O	1.19	1.29

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:9:LYS:NZ	1:F:353:GLU:OE2[3_555]	2.01	0.19

## 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	352/359 (98%)	333 (95%)	15 (4%)	4 (1%)	17 18
1	B	352/359 (98%)	332 (94%)	17 (5%)	3 (1%)	21 24
1	C	352/359 (98%)	334 (95%)	14 (4%)	4 (1%)	17 18
1	D	352/359 (98%)	334 (95%)	15 (4%)	3 (1%)	21 24
1	E	351/359 (98%)	334 (95%)	14 (4%)	3 (1%)	21 24

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	F	351/359 (98%)	335 (95%)	12 (3%)	4 (1%)	17	18
All	All	2110/2154 (98%)	2002 (95%)	87 (4%)	21 (1%)	19	21

5 of 21 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	76	LEU
1	A	86	PRO
1	D	76	LEU
1	F	76	LEU
1	A	231	GLU

### 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	297/302 (98%)	276 (93%)	21 (7%)	18	23
1	B	297/302 (98%)	276 (93%)	21 (7%)	18	23
1	C	297/302 (98%)	262 (88%)	35 (12%)	6	7
1	D	297/302 (98%)	261 (88%)	36 (12%)	6	6
1	E	296/302 (98%)	261 (88%)	35 (12%)	6	7
1	F	296/302 (98%)	261 (88%)	35 (12%)	6	7
All	All	1780/1812 (98%)	1597 (90%)	183 (10%)	9	10

5 of 183 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	43	SER
1	D	231	GLU
1	F	230	LEU
1	D	64	ILE
1	D	132	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 42 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	321	GLN
1	D	180	GLN
1	F	180	GLN
1	D	55	GLN
1	D	129	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 carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 for Mogul analysis.

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	$\# Z  > 2$
3	COA	A	402	2	40,50,50	1.60	10 (25%)	50,75,75	3.91	28 (56%)
3	COA	B	402	2	40,50,50	1.18	3 (7%)	50,75,75	4.05	30 (60%)
3	COA	C	402	2	40,50,50	0.88	1 (2%)	50,75,75	2.68	13 (26%)
3	COA	D	402	2	40,50,50	0.79	0	50,75,75	2.19	10 (20%)
3	COA	E	402	2	40,50,50	0.87	1 (2%)	50,75,75	2.46	14 (28%)
3	COA	F	402	2	40,50,50	0.83	1 (2%)	50,75,75	2.36	10 (20%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	COA	A	402	2	-	0/44/64/64	0/3/3/3
3	COA	B	402	2	-	0/44/64/64	0/3/3/3
3	COA	C	402	2	-	0/44/64/64	0/3/3/3
3	COA	D	402	2	-	0/44/64/64	0/3/3/3
3	COA	E	402	2	-	0/44/64/64	0/3/3/3
3	COA	F	402	2	-	0/44/64/64	0/3/3/3

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	402	COA	O4B-C1B	-3.33	1.37	1.41
3	A	402	COA	C4A-N3A	-3.25	1.30	1.35
3	A	402	COA	C5A-N7A	-2.56	1.30	1.39
3	A	402	COA	P3B-O9A	-2.19	1.46	1.54
3	A	402	COA	O6A-CCP	-2.09	1.36	1.43

The worst 5 of 105 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	402	COA	N3A-C2A-N1A	-11.88	119.80	128.89
3	D	402	COA	N3A-C2A-N1A	-10.09	121.17	128.89
3	F	402	COA	N3A-C2A-N1A	-10.08	121.18	128.89
3	B	402	COA	N3A-C2A-N1A	-9.41	121.69	128.89
3	C	402	COA	CDP-CBP-CCP	-9.27	96.48	108.50

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	402	COA	1	0
3	B	402	COA	3	0
3	C	402	COA	1	0
3	D	402	COA	4	0
3	E	402	COA	1	0
3	F	402	COA	2	0

## 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	354/359 (98%)	-0.07	7 (1%) 68 75	11, 29, 59, 105	0
1	B	354/359 (98%)	-0.03	5 (1%) 78 83	14, 34, 63, 94	0
1	C	354/359 (98%)	0.96	64 (18%) 2 3	53, 87, 132, 173	0
1	D	354/359 (98%)	2.02	137 (38%) 0 0	64, 116, 187, 220	0
1	E	353/359 (98%)	1.20	81 (22%) 1 1	53, 98, 162, 193	0
1	F	353/359 (98%)	1.36	101 (28%) 1 1	61, 114, 181, 216	0
All	All	2122/2154 (98%)	0.91	395 (18%) 2 2	11, 84, 164, 220	0

The worst 5 of 395 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	84	PHE	11.1
1	D	94	PRO	9.6
1	D	65	ALA	9.1
1	D	344	GLY	8.9
1	D	67	MET	8.8

### 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 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
3	COA	A	402	48/48	0.95	0.12	-0.42	31,40,58,72	0
3	COA	B	402	48/48	0.96	0.11	-0.46	31,43,61,70	0
3	COA	E	402	48/48	0.94	0.12	-0.65	63,73,97,106	0
3	COA	C	402	48/48	0.95	0.12	-0.83	63,69,100,108	0
3	COA	F	402	48/48	0.92	0.15	-0.96	133,144,156,160	0
3	COA	D	402	48/48	0.88	0.17	-1.07	120,144,169,175	0
2	MG	C	401	1/1	0.94	0.12	-	75,75,75,75	0
2	MG	E	401	1/1	0.92	0.08	-	78,78,78,78	0
2	MG	D	401	1/1	0.62	0.16	-	125,125,125,125	0
2	MG	A	401	1/1	0.56	0.17	-	52,52,52,52	0
2	MG	B	401	1/1	0.92	0.10	-	48,48,48,48	0
2	MG	F	401	1/1	0.89	0.11	-	127,127,127,127	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.