



wwPDB X-ray Structure Validation Summary Report

Mar 1, 2014 – 01:57 AM GMT

PDB ID : 2AF7
Title : Crystal structure of the gamma-carboxymuconolactonedecarboxylase from Methanobacterium thermoautotrophicum. Northeast Structural Genomics Consortium target TT747.
Authors : Vorobiev, S.M.; Kuzin, A.; Skarina, T.; Savchenko, A.; Semesi, A.; Arrow-smith, C.; Edwards, A.; Montelione, G.T.; Tong, L.; Northeast Structural Genomics Consortium (NESG)
Deposited on : 2005-07-25
Resolution : 2.81 Å(reported)

This is a wwPDB validation summary report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

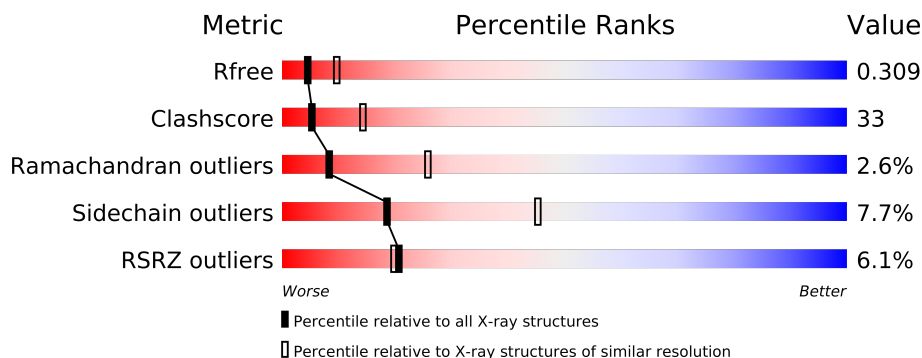
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.81 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}	66092	1963 (2.84-2.80)
Clashscore	79885	2478 (2.84-2.80)
Ramachandran outliers	78287	2429 (2.84-2.80)
Sidechain outliers	78261	2431 (2.84-2.80)
RSRZ outliers	66119	1966 (2.84-2.80)

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 ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	125	
1	B	125	
1	C	125	
1	D	125	
1	E	125	
1	F	125	
1	G	125	
1	H	125	
1	I	125	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8293 atoms, of which 0 are hydrogen and 0 are deuterium.

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 gamma-carboxymuconolactonedecarboxylase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	119	Total	C	N	O	S	Se	0	0	0
			909	576	162	165	1	5			
1	B	118	Total	C	N	O	S	Se	0	0	0
			900	571	158	166	1	4			
1	C	118	Total	C	N	O	S	Se	0	0	0
			910	576	161	168	1	4			
1	D	122	Total	C	N	O	S	Se	0	0	0
			935	590	166	173	1	5			
1	E	120	Total	C	N	O	S	Se	0	0	0
			908	575	160	167	1	5			
1	F	120	Total	C	N	O	S	Se	0	0	0
			888	566	153	164	1	4			
1	G	118	Total	C	N	O	S	Se	0	0	0
			914	578	161	170	1	4			
1	H	119	Total	C	N	O	S	Se	0	0	0
			922	582	163	172	1	4			
1	I	120	Total	C	N	O	S	Se	0	0	0
			913	578	161	169	1	4			

There are 45 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
A	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
A	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
A	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
A	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
B	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
B	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
B	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
B	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
B	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
C	1	MSE	MET	MODIFIED RESIDUE	UNP O26336

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Chain	Residue	Modelled	Actual	Comment	Reference
C	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
C	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
C	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
C	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
D	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
D	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
D	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
D	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
D	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
E	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
E	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
E	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
E	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
E	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
F	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
F	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
F	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
F	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
F	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
G	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
G	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
G	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
G	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
G	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
H	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
H	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
H	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
H	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
H	97	MSE	MET	MODIFIED RESIDUE	UNP O26336
I	1	MSE	MET	MODIFIED RESIDUE	UNP O26336
I	8	MSE	MET	MODIFIED RESIDUE	UNP O26336
I	14	MSE	MET	MODIFIED RESIDUE	UNP O26336
I	94	MSE	MET	MODIFIED RESIDUE	UNP O26336
I	97	MSE	MET	MODIFIED RESIDUE	UNP O26336

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	13	Total O 13 13	0	0
2	B	8	Total O 8 8	0	0

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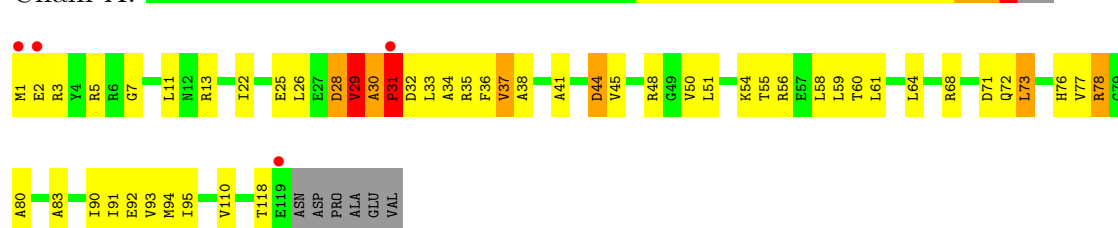
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	C	12	Total 12	O 12	0	0
2	D	11	Total 11	O 11	0	0
2	E	5	Total 5	O 5	0	0
2	F	9	Total 9	O 9	0	0
2	G	10	Total 10	O 10	0	0
2	H	13	Total 13	O 13	0	0
2	I	13	Total 13	O 13	0	0

3 Residue-property plots

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.

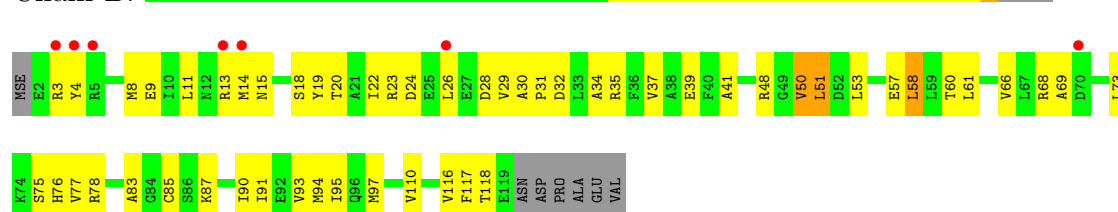
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain A:



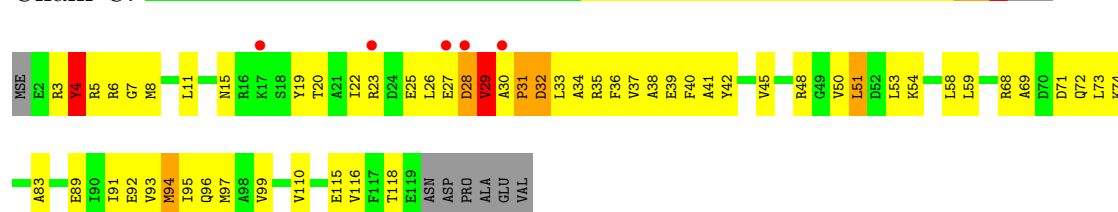
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain B:



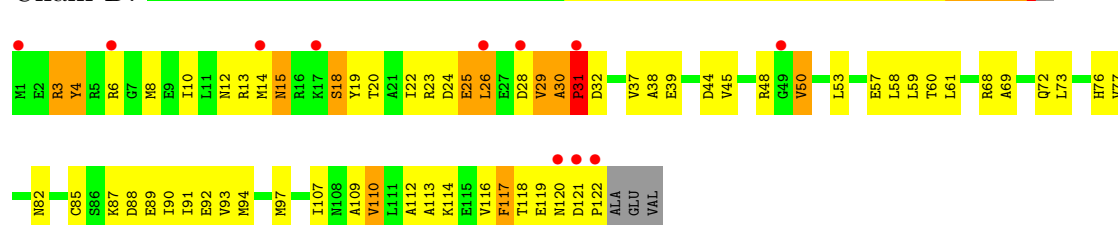
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain C:



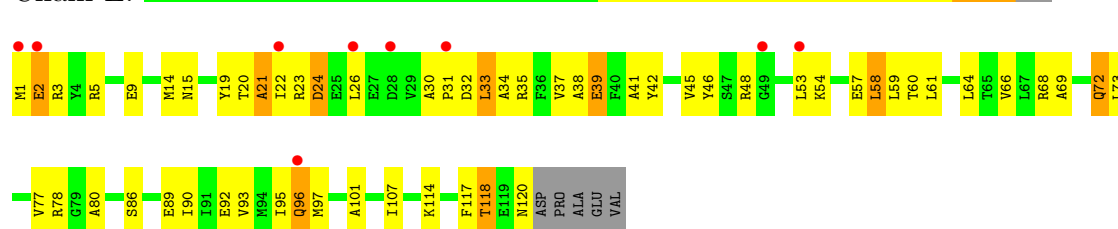
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain D:



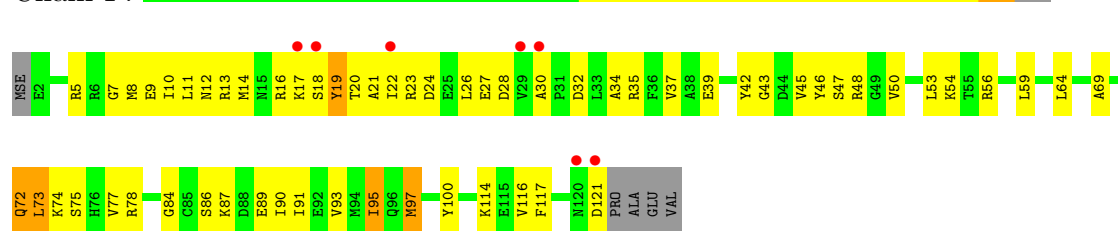
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain E:



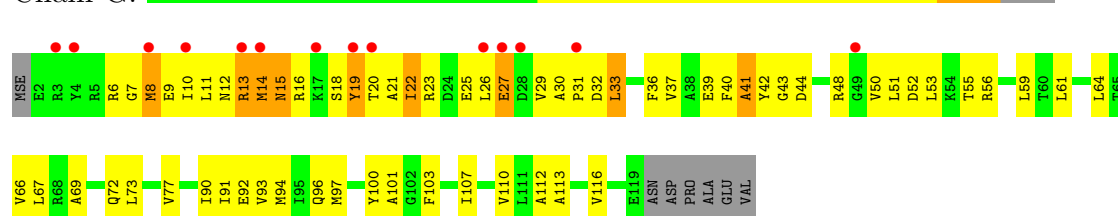
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain F:



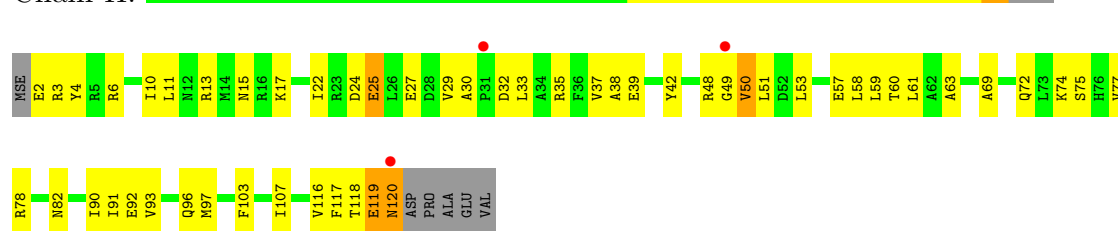
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain G:



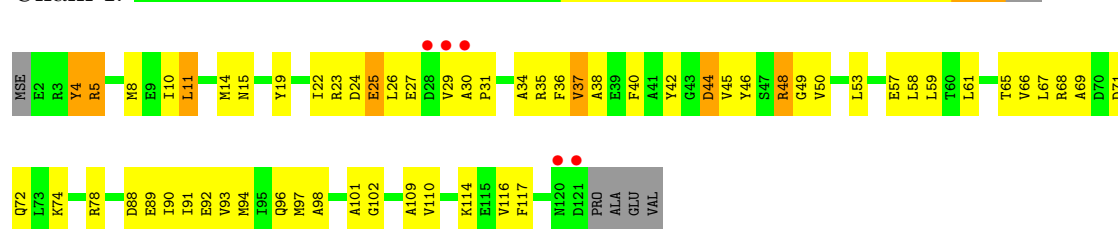
- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain H:



- Molecule 1: gamma-carboxymuconolactonedecarboxylase

Chain I:



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	183.31Å 119.11Å 73.62Å 90.00° 102.80° 90.00°	Depositor
Resolution (Å)	29.97 – 2.81 29.97 – 2.81	Depositor EDS
% Data completeness (in resolution range)	80.3 (29.97-2.81) 96.4 (29.97-2.81)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.20 (at 2.80Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.245 , 0.292 0.257 , 0.309	Depositor DCC
R_{free} test set	1438 reflections (3.97%)	DCC
Wilson B-factor (Å ²)	46.3	Xtriage
Anisotropy	0.287	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 32.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	1 of 73346 reflections (0.001%)	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	8293	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.65% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

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	0.64	2/916 (0.2%)	0.90	5/1229 (0.4%)
1	B	0.38	0/907	0.69	0/1219
1	C	0.42	0/917	0.80	1/1231 (0.1%)
1	D	0.51	0/943	0.85	5/1267 (0.4%)
1	E	0.45	0/915	0.77	2/1231 (0.2%)
1	F	0.45	0/895	0.75	1/1207 (0.1%)
1	G	0.40	0/921	0.68	0/1236
1	H	0.47	0/929	0.75	2/1247 (0.2%)
1	I	0.44	0/920	0.73	1/1237 (0.1%)
All	All	0.47	2/8263 (0.0%)	0.77	17/11104 (0.2%)

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
1	D	0	1
1	G	0	1
All	All	0	3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	29	VAL	CA-C	-8.35	1.31	1.52
1	A	30	ALA	CA-CB	-8.31	1.34	1.52

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	29	VAL	N-CA-C	9.74	137.30	111.00
1	A	28	ASP	N-CA-C	-7.94	89.56	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	32	ASP	N-CA-C	-7.02	92.05	111.00
1	A	29	VAL	CB-CA-C	-6.87	98.35	111.40
1	A	30	ALA	C-N-CA	-6.51	94.65	122.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	29	VAL	Mainchain
1	D	28	ASP	Peptide
1	G	100	TYR	Sidechain

5.2 Close contacts ⓘ

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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	909	0	919	84	0
1	B	900	0	905	58	0
1	C	910	0	920	72	0
1	D	935	0	938	71	0
1	E	908	0	908	71	0
1	F	888	0	872	67	0
1	G	914	0	924	82	0
1	H	922	0	930	62	0
1	I	913	0	913	66	0
2	A	13	0	0	1	0
2	B	8	0	0	0	0
2	C	12	0	0	1	0
2	D	11	0	0	0	0
2	E	5	0	0	1	0
2	F	9	0	0	1	0
2	G	10	0	0	2	0
2	H	13	0	0	0	0
2	I	13	0	0	2	0
All	All	8293	0	8229	540	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 33.

The worst 5 of 540 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:30:ALA:HB1	1:A:33:LEU:H	1.01	1.10
1:B:29:VAL:HG22	1:B:30:ALA:H	1.16	1.05
1:F:91:ILE:HD11	1:F:117:PHE:HE2	1.22	1.03
1:A:30:ALA:HB1	1:A:33:LEU:N	1.76	1.01
1:A:56:ARG:NH2	1:C:96:GLN:HB2	1.73	1.00

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone ⓘ

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	117/125 (94%)	108 (92%)	7 (6%)	2 (2%)	14	41
1	B	116/125 (93%)	99 (85%)	15 (13%)	2 (2%)	14	41
1	C	116/125 (93%)	95 (82%)	18 (16%)	3 (3%)	8	26
1	D	120/125 (96%)	96 (80%)	20 (17%)	4 (3%)	6	19
1	E	118/125 (94%)	96 (81%)	20 (17%)	2 (2%)	14	41
1	F	118/125 (94%)	92 (78%)	23 (20%)	3 (2%)	9	27
1	G	116/125 (93%)	95 (82%)	14 (12%)	7 (6%)	2	6
1	H	117/125 (94%)	105 (90%)	11 (9%)	1 (1%)	25	61
1	I	118/125 (94%)	101 (86%)	14 (12%)	3 (2%)	9	27
All	All	1056/1125 (94%)	887 (84%)	142 (13%)	27 (3%)	8	26

5 of 27 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	28	ASP
1	B	50	VAL
1	D	29	VAL

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Mol	Chain	Res	Type
1	F	27	GLU
1	G	41	ALA

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	89/96 (93%)	83 (93%)	6 (7%)	23	55
1	B	89/96 (93%)	84 (94%)	5 (6%)	30	64
1	C	91/96 (95%)	81 (89%)	10 (11%)	9	26
1	D	93/96 (97%)	87 (94%)	6 (6%)	24	56
1	E	89/96 (93%)	82 (92%)	7 (8%)	18	44
1	F	84/96 (88%)	77 (92%)	7 (8%)	16	42
1	G	92/96 (96%)	86 (94%)	6 (6%)	24	56
1	H	93/96 (97%)	86 (92%)	7 (8%)	19	47
1	I	90/96 (94%)	82 (91%)	8 (9%)	14	38
All	All	810/864 (94%)	748 (92%)	62 (8%)	18	45

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	15	ASN
1	F	19	TYR
1	I	15	ASN
1	E	58	LEU
1	F	72	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 27 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	72	GLN
1	F	72	GLN
1	H	120	ASN

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Mol	Chain	Res	Type
1	E	15	ASN
1	B	15	ASN

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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	119/125 (95%)	-0.18	4 (3%)	43	44	11, 39, 76, 102	0
1	B	118/125 (94%)	0.19	7 (5%)	22	21	20, 56, 95, 102	0
1	C	118/125 (94%)	-0.14	5 (4%)	35	35	11, 42, 91, 101	0
1	D	122/125 (97%)	0.29	11 (9%)	10	8	17, 49, 102, 102	0
1	E	120/125 (96%)	0.13	9 (7%)	14	12	13, 52, 102, 102	0
1	F	120/125 (96%)	0.00	7 (5%)	22	22	18, 48, 97, 102	0
1	G	118/125 (94%)	0.35	14 (11%)	5	4	15, 49, 102, 102	0
1	H	119/125 (95%)	-0.11	3 (2%)	54	55	14, 40, 81, 102	0
1	I	120/125 (96%)	0.17	5 (4%)	35	35	21, 52, 96, 102	0
All	All	1074/1125 (95%)	0.08	65 (6%)	21	20	11, 47, 99, 102	0

The worst 5 of 65 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	14	MSE	5.1
1	I	28	ASP	5.1
1	A	1	MSE	4.6
1	G	49	GLY	4.6
1	H	31	PRO	4.3

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.