



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 25, 2025 – 01:31 PM JST

PDB ID : 8Z2B
Title : Crystal structure of apo *Aspergillus terreus* glutamate dehydrogenase (At-GDH) in the partially closed conformation (form II)
Authors : Godsora, B.K.J.; Bhaumik, P.
Deposited on : 2024-04-12
Resolution : 2.85 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

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>.

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

MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.2

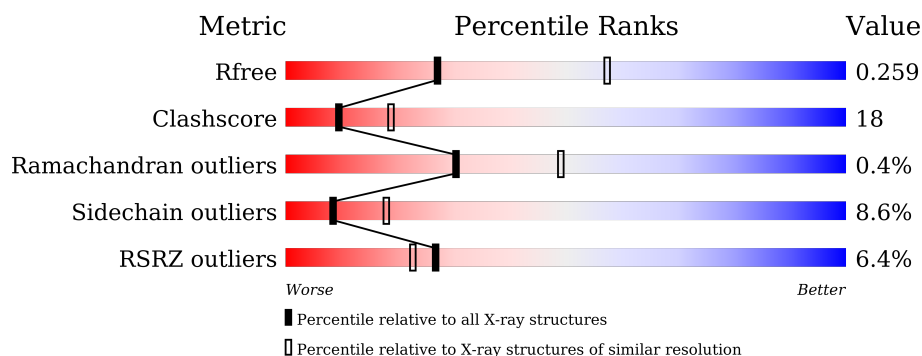
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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}	164625	1268 (2.88-2.84)
Clashscore	180529	1351 (2.88-2.84)
Ramachandran outliers	177936	1318 (2.88-2.84)
Sidechain outliers	177891	1319 (2.88-2.84)
RSRZ outliers	164620	1269 (2.88-2.84)

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 ≥ 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	460	<div> <div>5%</div> <div> <div>66%</div> <div>30%</div> <div>5%</div> </div> </div>
1	B	460	<div> <div>4%</div> <div> <div>66%</div> <div>31%</div> <div>•</div> </div> </div>
1	C	460	<div> <div>5%</div> <div> <div>60%</div> <div>37%</div> <div>•</div> </div> </div>
1	D	460	<div> <div>8%</div> <div> <div>65%</div> <div>31%</div> <div>•</div> </div> </div>
1	E	460	<div> <div>9%</div> <div> <div>61%</div> <div>33%</div> <div>5%</div> </div> </div>
1	F	460	<div> <div>7%</div> <div> <div>68%</div> <div>29%</div> <div>•</div> </div> </div>

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 20860 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 Glutamate dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	460	Total	C	N	O	S	0	1	0
			3473	2193	604	663	13			
1	B	460	Total	C	N	O	S	0	1	0
			3469	2190	603	663	13			
1	C	460	Total	C	N	O	S	0	3	0
			3482	2198	605	666	13			
1	D	460	Total	C	N	O	S	0	2	0
			3473	2192	604	664	13			
1	E	460	Total	C	N	O	S	0	1	0
			3469	2190	603	663	13			
1	F	460	Total	C	N	O	S	0	1	0
			3471	2190	604	664	13			

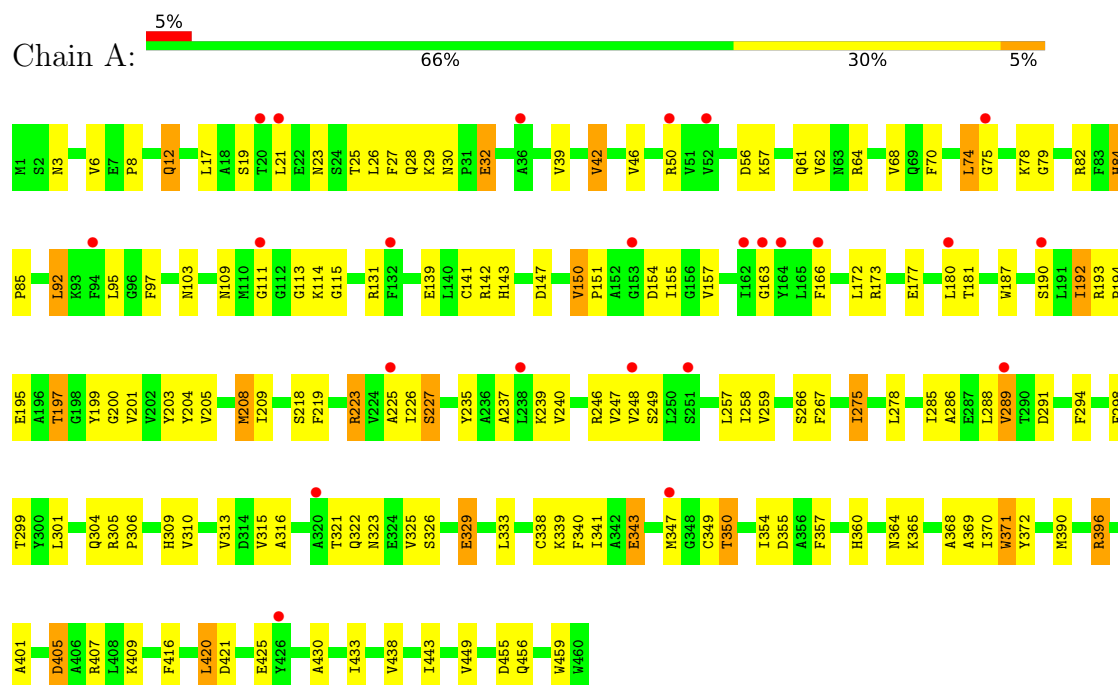
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	6	Total	O	0	0
			6	6		
2	B	3	Total	O	0	0
			3	3		
2	C	3	Total	O	0	0
			3	3		
2	D	4	Total	O	0	0
			4	4		
2	E	2	Total	O	0	0
			2	2		
2	F	5	Total	O	0	0
			5	5		

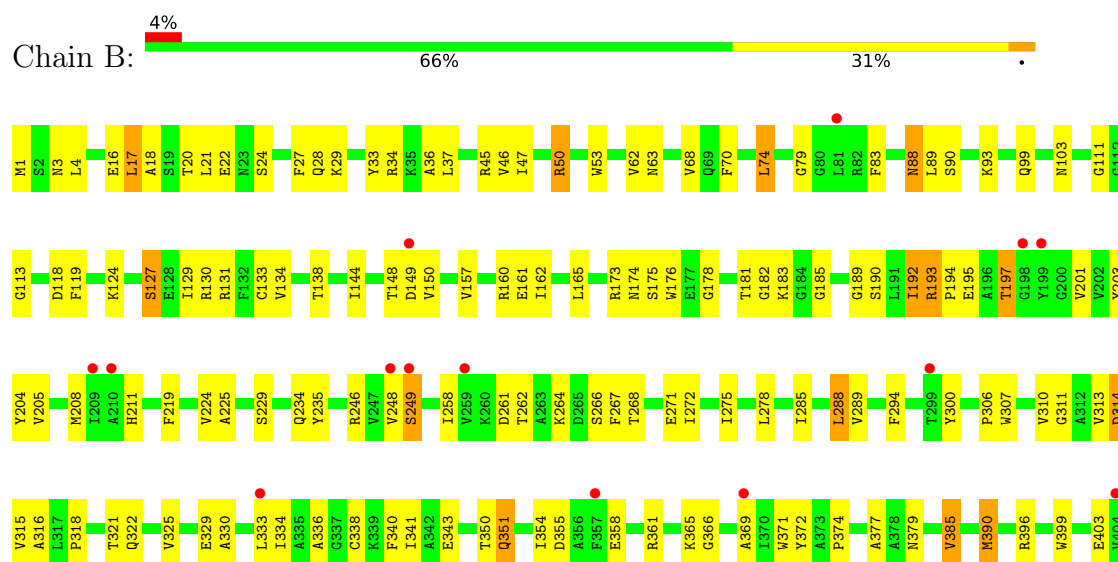
3 Residue-property plots [i](#)

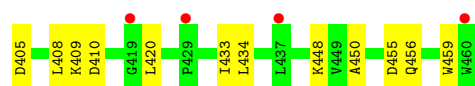
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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

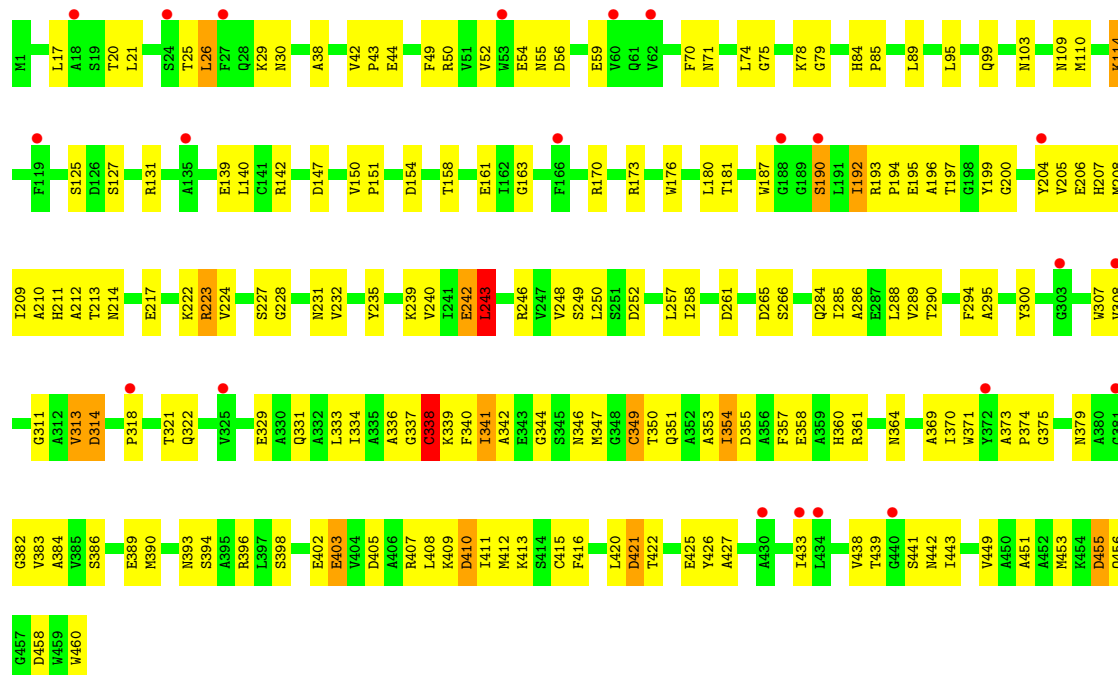


• Molecule 1: Glutamate dehydrogenase

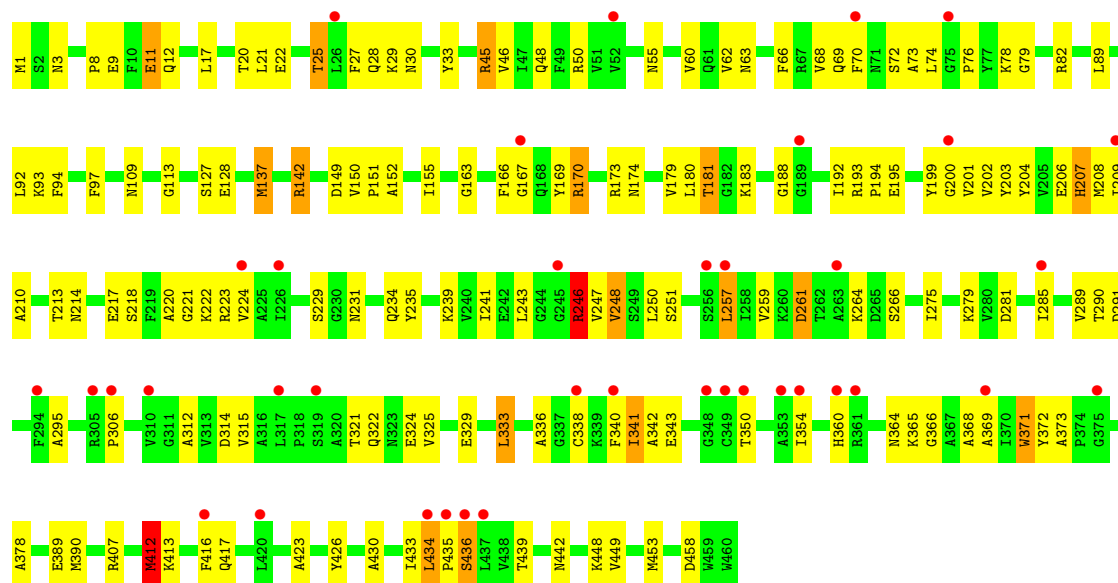




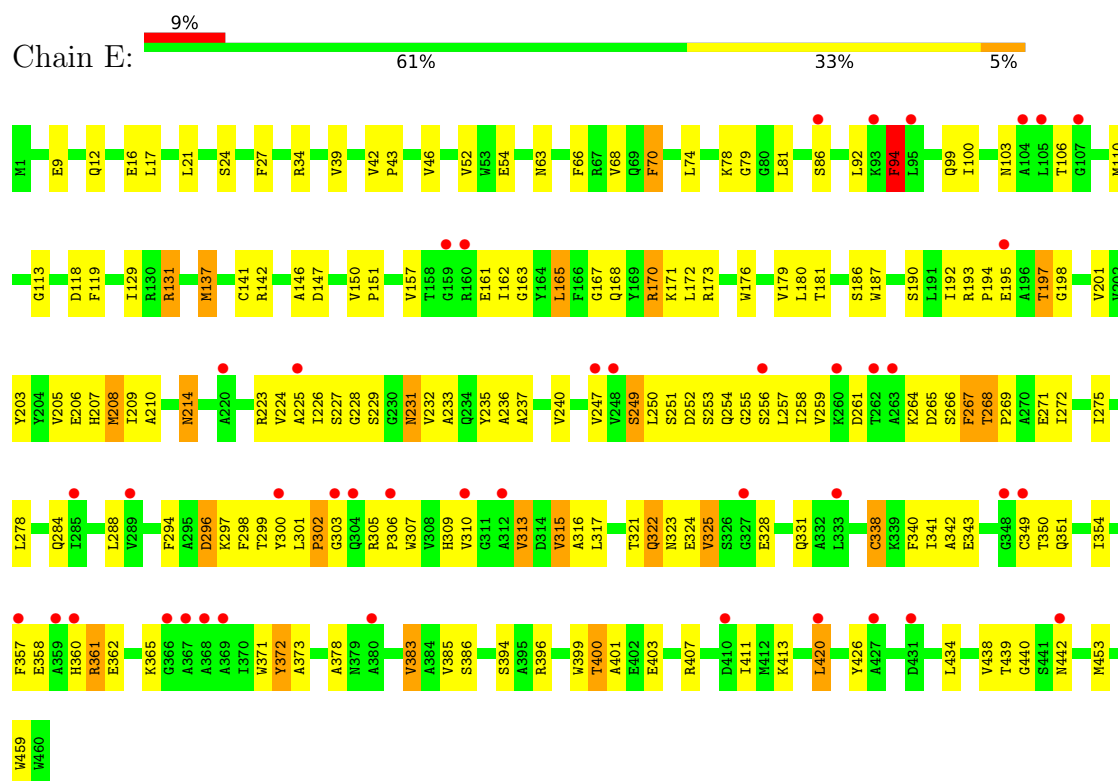
• Molecule 1: Glutamate dehydrogenase



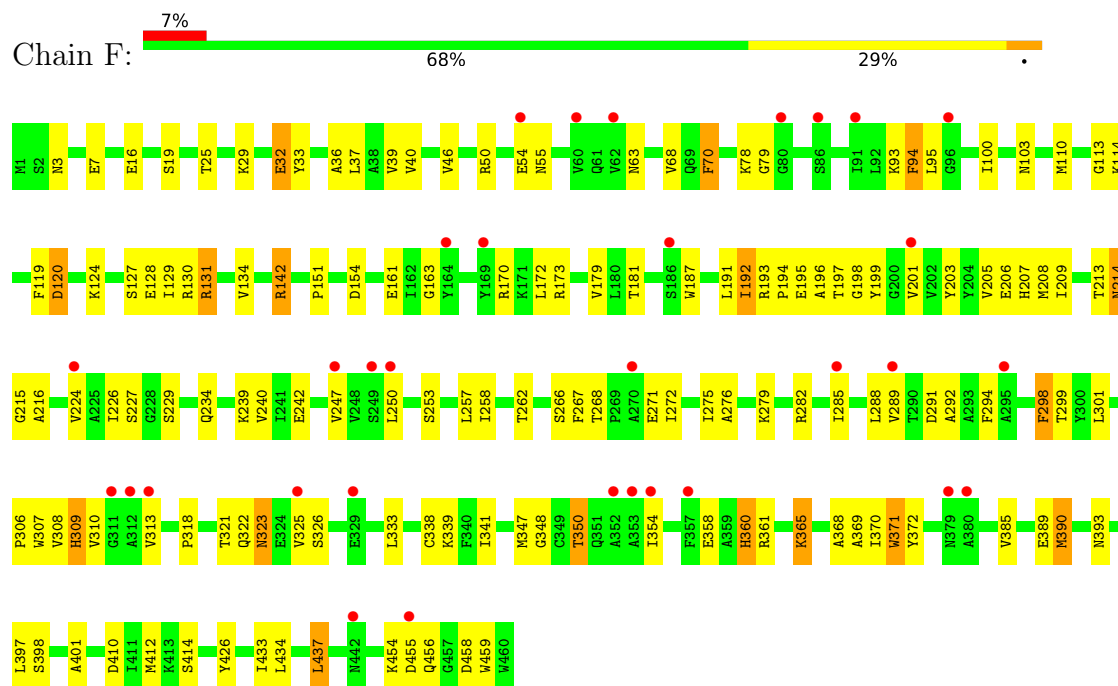
• Molecule 1: Glutamate dehydrogenase



• Molecule 1: Glutamate dehydrogenase



● Molecule 1: Glutamate dehydrogenase



4 Data and refinement statistics

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α , β , γ	101.69Å 101.69Å 271.68Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	29.89 – 2.85 29.89 – 2.85	Depositor EDS
% Data completeness (in resolution range)	100.0 (29.89-2.85) 99.9 (29.89-2.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.18 (at 2.85Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.192 , 0.268 0.197 , 0.259	Depositor DCC
R_{free} test set	3801 reflections (5.14%)	wwPDB-VP
Wilson B-factor (Å ²)	52.2	Xtriage
Anisotropy	0.096	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 72.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.031 for -h,-k,l 0.053 for h,-h-k,-l 0.059 for -k,-h,-l	Xtriage
Reported twinning fraction	0.256 for H, K, L 0.248 for K, H, -L 0.246 for -h,-k,l 0.250 for -K, -H, -L	Depositor
Outliers	0 of 73338 reflections	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	20860	wwPDB-VP
Average B, all atoms (Å ²)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.53% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

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	0.44	0/3546	0.92	4/4795 (0.1%)
1	B	0.43	0/3542	0.90	4/4791 (0.1%)
1	C	0.43	0/3558	0.89	2/4811 (0.0%)
1	D	0.42	0/3546	0.91	6/4796 (0.1%)
1	E	0.44	0/3542	0.93	8/4791 (0.2%)
1	F	0.43	0/3541	0.90	5/4789 (0.1%)
All	All	0.43	0/21275	0.91	29/28773 (0.1%)

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	3
1	B	0	2
1	C	0	4
1	D	0	4
1	E	0	4
1	F	0	3
All	All	0	20

There are no bond length outliers.

The worst 5 of 29 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	412	MET	CG-SD-CE	9.50	115.39	100.20
1	E	137	MET	CG-SD-CE	9.01	114.61	100.20
1	D	137	MET	CG-SD-CE	7.97	112.96	100.20
1	E	453	MET	CG-SD-CE	-7.81	87.70	100.20
1	E	94	PHE	N-CA-CB	7.75	124.56	110.60

There are no chirality outliers.

5 of 20 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	246	ARG	Sidechain
1	A	396	ARG	Sidechain
1	A	407	ARG	Sidechain
1	B	160	ARG	Sidechain
1	B	50	ARG	Sidechain

5.2 Too-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 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	3473	0	3425	122	0
1	B	3469	0	3417	123	0
1	C	3482	0	3431	145	0
1	D	3473	0	3419	135	8
1	E	3469	0	3417	143	8
1	F	3471	0	3414	122	0
2	A	6	0	0	1	0
2	B	3	0	0	0	0
2	C	3	0	0	0	0
2	D	4	0	0	0	0
2	E	2	0	0	0	0
2	F	5	0	0	0	0
All	All	20860	0	20523	728	8

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 18.

The worst 5 of 728 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:C:213:THR:HG21	1:C:217:GLU:HB2	1.33	1.08
1:F:267:PHE:CZ	1:F:298:PHE:HZ	1.79	1.00
1:D:48:GLN:HE22	1:D:89:LEU:HD22	1.28	0.98
1:A:42:VAL:O	1:B:50:ARG:NH1	1.96	0.97
1:C:248:VAL:O	1:C:258:ILE:HG23	1.64	0.96

The worst 5 of 8 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:D:246:ARG:NH2	1:E:328:GLU:O[3_465]	1.34	0.86
1:D:214:ASN:ND2	1:E:299:THR:OG1[3_465]	1.74	0.46
1:D:364:ASN:OD1	1:E:302:PRO:CG[3_465]	1.89	0.31
1:D:246:ARG:CZ	1:E:328:GLU:O[3_465]	1.90	0.30
1:D:223:ARG:N	1:E:328:GLU:OE1[3_465]	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	459/460 (100%)	436 (95%)	22 (5%)	1 (0%)	44	63
1	B	459/460 (100%)	437 (95%)	20 (4%)	2 (0%)	30	49
1	C	461/460 (100%)	435 (94%)	23 (5%)	3 (1%)	19	36
1	D	460/460 (100%)	428 (93%)	31 (7%)	1 (0%)	44	63
1	E	459/460 (100%)	429 (94%)	28 (6%)	2 (0%)	30	49
1	F	459/460 (100%)	441 (96%)	15 (3%)	3 (1%)	19	36
All	All	2757/2760 (100%)	2606 (94%)	139 (5%)	12 (0%)	30	49

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	192	ILE
1	C	192	ILE
1	F	192	ILE
1	A	192	ILE
1	B	174	ASN

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	352/351 (100%)	322 (92%)	30 (8%)	8	18
1	B	351/351 (100%)	322 (92%)	29 (8%)	9	19
1	C	353/351 (101%)	322 (91%)	31 (9%)	8	17
1	D	351/351 (100%)	320 (91%)	31 (9%)	8	17
1	E	351/351 (100%)	315 (90%)	36 (10%)	6	11
1	F	351/351 (100%)	326 (93%)	25 (7%)	12	26
All	All	2109/2106 (100%)	1927 (91%)	182 (9%)	8	18

5 of 182 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	333	LEU
1	E	313	VAL
1	D	434	LEU
1	E	231	ASN
1	E	371	TRP

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	393	ASN
1	E	323	ASN
1	C	284	GLN
1	F	393	ASN
1	E	63	ASN

5.3.3 RNA ⓘ

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](#)

There are no ligands in this entry.

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, 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	460/460 (100%)	0.29	24 (5%)	34	29	16, 42, 66, 89	2 (0%)
1	B	460/460 (100%)	0.28	18 (3%)	44	38	18, 43, 70, 102	1 (0%)
1	C	460/460 (100%)	0.34	22 (4%)	36	32	12, 44, 69, 92	4 (0%)
1	D	460/460 (100%)	0.53	38 (8%)	19	16	14, 49, 89, 133	2 (0%)
1	E	460/460 (100%)	0.52	42 (9%)	16	14	12, 52, 90, 144	1 (0%)
1	F	460/460 (100%)	0.39	32 (6%)	24	20	17, 46, 75, 102	2 (0%)
All	All	2760/2760 (100%)	0.39	176 (6%)	27	23	12, 46, 79, 144	12 (0%)

The worst 5 of 176 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	107	GLY	8.7
1	D	256	SER	6.4
1	D	349	CYS	6.0
1	F	380	ALA	5.6
1	C	372	TYR	5.1

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.