



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 6, 2026 – 10:37 PM UTC

PDB ID : 3V93 / pdb_00003v93
Title : unliganded structure of TcrPDEC1 catalytic domain
Authors : Wang, H.; Kunz, S.; Chen, G.; Seebeck, T.; Wan, Y.; Robinson, H.; Martinelli, S.; Ke, H.
Deposited on : 2011-12-23
Resolution : 2.00 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:

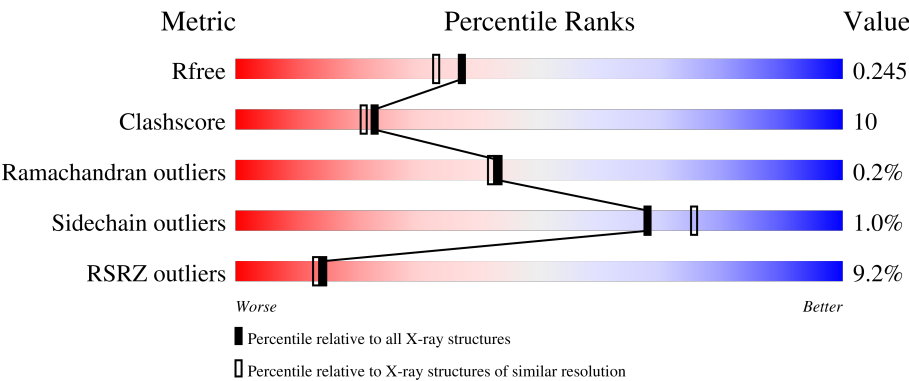
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

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 2.00 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}	180053	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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	345	3% 80% 14% • 5%
1	B	345	6% 80% 16% • •
1	C	345	6% 77% 19% • •
1	D	345	25% 65% 28% • 6%
1	E	345	11% 77% 18% • 5%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	F	345	
1	G	345	
1	H	345	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 21499 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 Cyclic nucleotide specific phosphodiesterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	329	Total	C	N	O	S	0	0	0
			2553	1635	437	472	9			
1	B	333	Total	C	N	O	S	0	0	0
			2579	1650	441	479	9			
1	C	333	Total	C	N	O	S	0	0	0
			2579	1650	441	479	9			
1	D	324	Total	C	N	O	S	0	0	0
			2525	1618	432	467	8			
1	E	329	Total	C	N	O	S	0	0	0
			2555	1634	437	475	9			
1	F	334	Total	C	N	O	S	0	0	0
			2586	1654	442	481	9			
1	G	334	Total	C	N	O	S	0	0	0
			2586	1654	442	481	9			
1	H	328	Total	C	N	O	S	0	0	0
			2545	1629	436	471	9			

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	G	1	Total 1	Zn 1	0	0
2	H	1	Total 1	Zn 1	0	0

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	178	Total 178	O 178	0	0
4	B	140	Total 140	O 140	0	0
4	C	136	Total 136	O 136	0	0
4	D	35	Total 35	O 35	0	0
4	E	90	Total 90	O 90	0	0
4	F	168	Total 168	O 168	0	0
4	G	147	Total 147	O 147	0	0

Continued on next page...

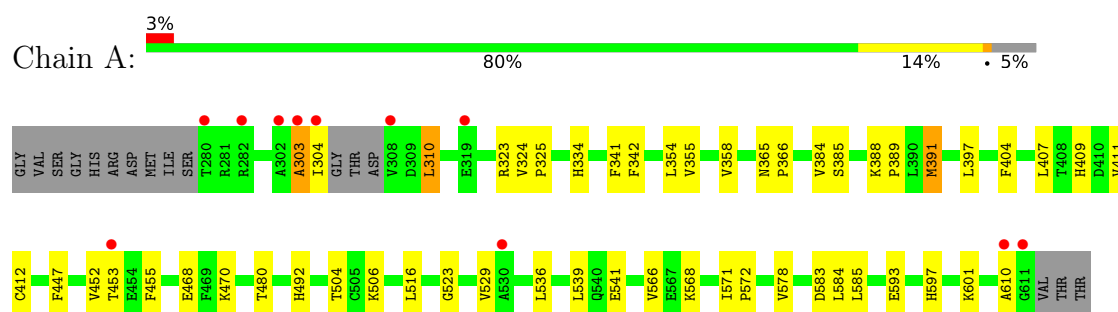
Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	81	Total	O	0	0
			81	81		

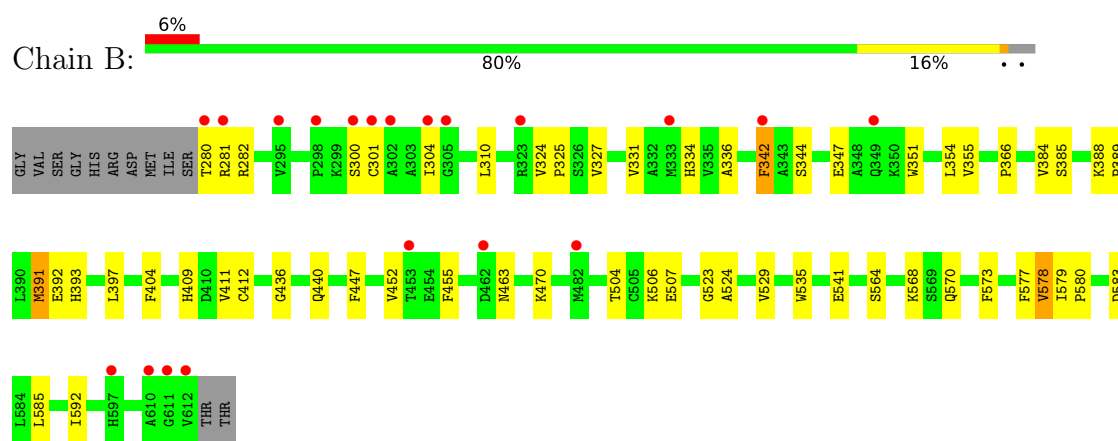
3 Residue-property plots [i](#)

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.

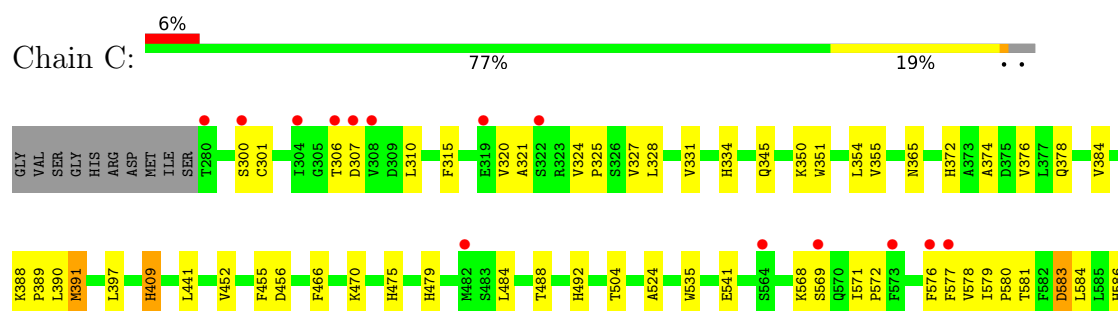
- Molecule 1: Cyclic nucleotide specific phosphodiesterase



- Molecule 1: Cyclic nucleotide specific phosphodiesterase

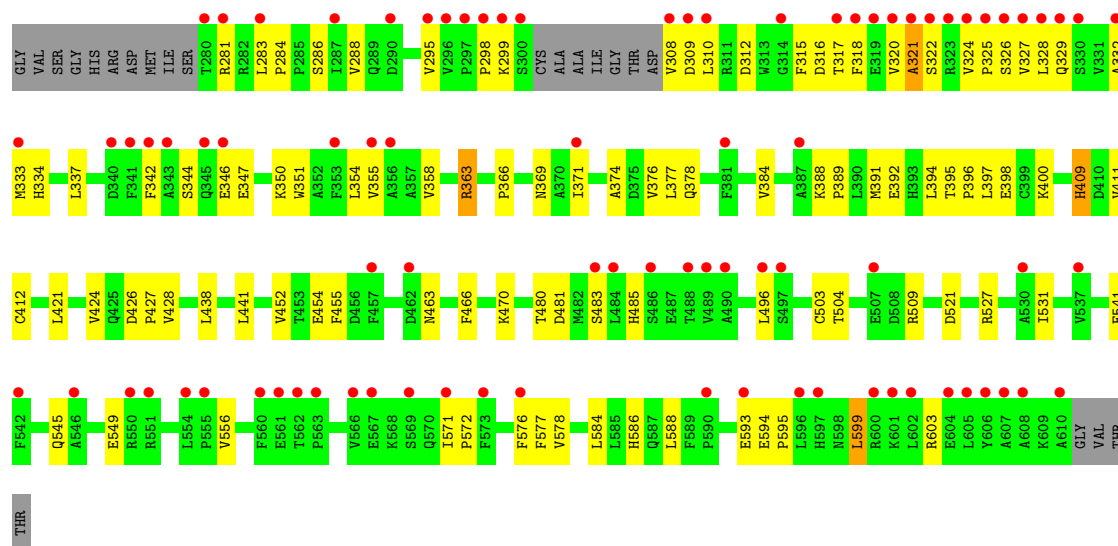


- Molecule 1: Cyclic nucleotide specific phosphodiesterase

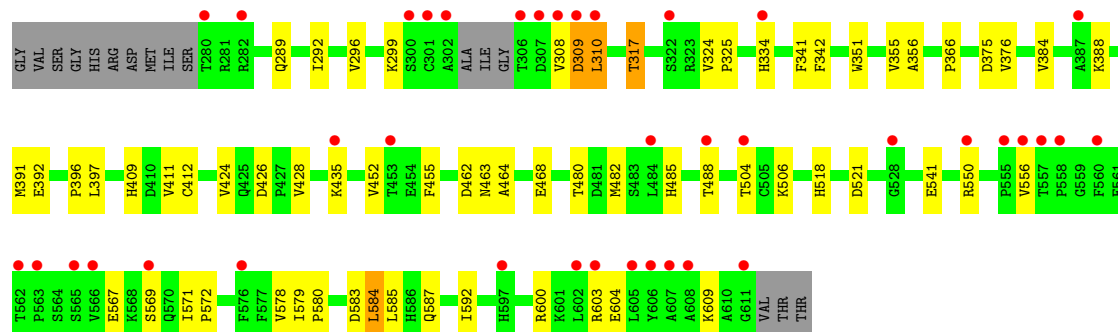
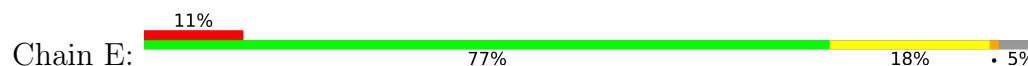




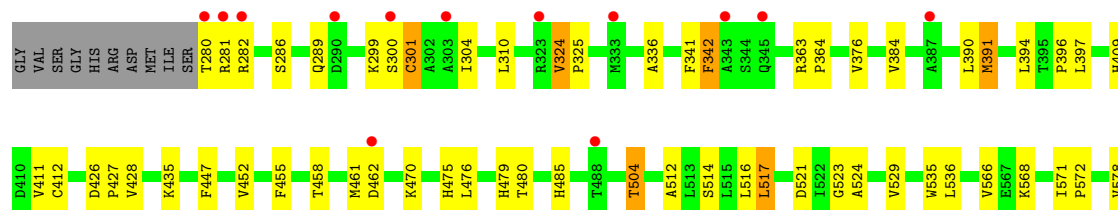
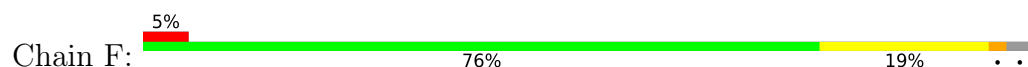
• Molecule 1: Cyclic nucleotide specific phosphodiesterase



• Molecule 1: Cyclic nucleotide specific phosphodiesterase

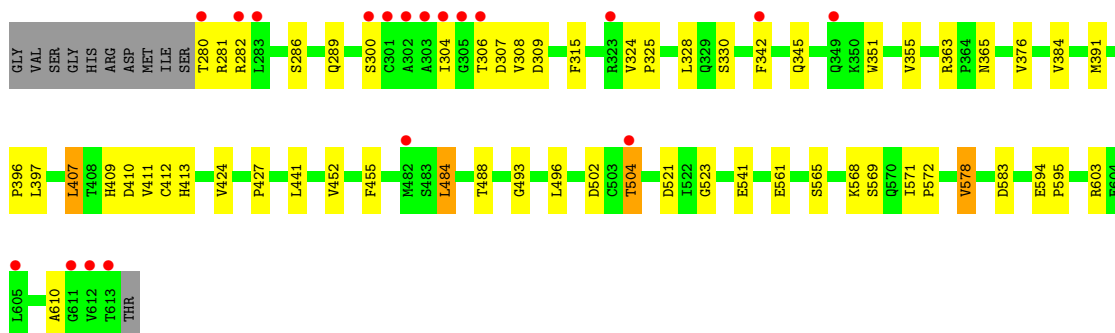
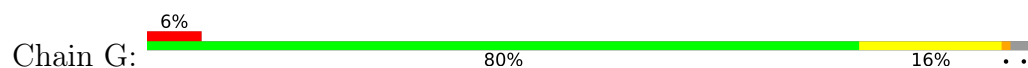


• Molecule 1: Cyclic nucleotide specific phosphodiesterase

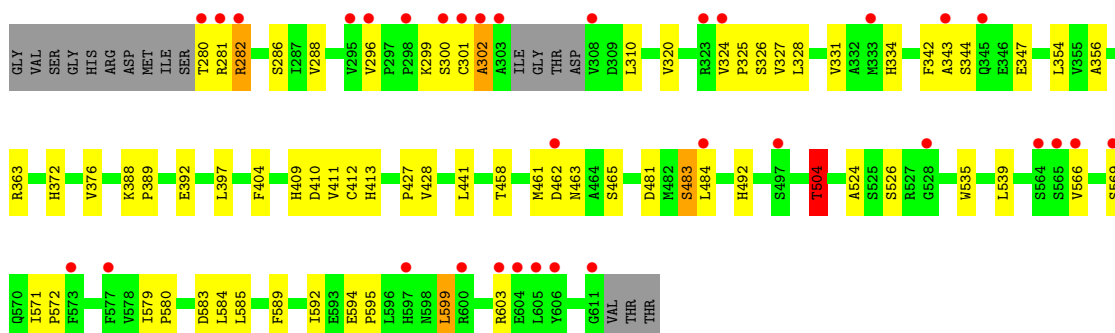
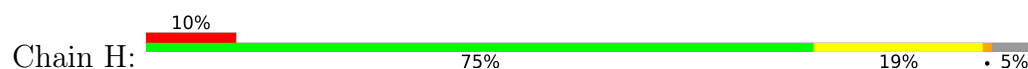




- Molecule 1: Cyclic nucleotide specific phosphodiesterase



- Molecule 1: Cyclic nucleotide specific phosphodiesterase



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	130.34Å 130.34Å 388.85Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.00 30.00 – 2.00	Depositor EDS
% Data completeness (in resolution range)	(Not available) (30.00-2.00) 91.1 (30.00-2.00)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.91 (at 1.97Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.216 , 0.226 0.215 , 0.245	Depositor DCC
R_{free} test set	21151 reflections (9.66%)	wwPDB-VP
Wilson B-factor (Å ²)	23.9	Xtriage
Anisotropy	0.433	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 40.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	21499	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.36% 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

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

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	0/2617	0.84	9/3560 (0.3%)
1	B	0.40	0/2644	0.85	8/3599 (0.2%)
1	C	0.39	0/2644	0.82	4/3599 (0.1%)
1	D	0.33	0/2589	0.81	7/3522 (0.2%)
1	E	0.38	0/2619	0.85	8/3563 (0.2%)
1	F	0.41	0/2651	0.86	10/3609 (0.3%)
1	G	0.40	0/2651	0.84	6/3609 (0.2%)
1	H	0.36	0/2609	0.82	7/3549 (0.2%)
All	All	0.39	0/21024	0.83	59/28610 (0.2%)

There are no bond length outliers.

The worst 5 of 59 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	435	LYS	N-CA-C	11.63	123.64	110.97
1	B	578	VAL	N-CA-C	9.48	119.52	110.42
1	F	578	VAL	N-CA-C	9.28	119.33	110.42
1	G	578	VAL	N-CA-C	7.93	118.00	110.30
1	A	578	VAL	N-CA-C	7.65	117.76	110.42

There are no chirality outliers.

There are no planarity outliers.

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	2553	0	2514	35	0
1	B	2579	0	2538	50	0
1	C	2579	0	2538	58	0
1	D	2525	0	2485	78	0
1	E	2555	0	2509	51	0
1	F	2586	0	2545	50	0
1	G	2586	0	2545	55	0
1	H	2545	0	2503	59	0
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
2	G	1	0	0	0	0
2	H	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
3	E	1	0	0	0	0
3	F	1	0	0	0	0
3	G	1	0	0	0	0
3	H	1	0	0	0	0
4	A	178	0	0	2	0
4	B	140	0	0	1	0
4	C	136	0	0	2	0
4	D	35	0	0	1	0
4	E	90	0	0	5	0
4	F	168	0	0	5	0
4	G	147	0	0	10	0
4	H	81	0	0	1	0
All	All	21499	0	20177	422	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 10.

The worst 5 of 422 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:G:571:ILE:HG23	1:G:603:ARG:HH12	0.99	1.12
1:G:571:ILE:HG23	1:G:603:ARG:NH1	1.66	1.10

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:571:ILE:HG23	1:C:603:ARG:HH12	1.19	1.08
1:E:299:LYS:HD3	1:E:325:PRO:HB2	1.44	1.00
1:D:571:ILE:HG23	1:D:603:ARG:HH12	1.31	0.96

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	325/345 (94%)	321 (99%)	3 (1%)	1 (0%)	36	35
1	B	331/345 (96%)	322 (97%)	9 (3%)	0	100	100
1	C	331/345 (96%)	324 (98%)	7 (2%)	0	100	100
1	D	320/345 (93%)	307 (96%)	11 (3%)	2 (1%)	21	17
1	E	325/345 (94%)	314 (97%)	11 (3%)	0	100	100
1	F	332/345 (96%)	325 (98%)	6 (2%)	1 (0%)	36	35
1	G	332/345 (96%)	328 (99%)	4 (1%)	0	100	100
1	H	324/345 (94%)	311 (96%)	12 (4%)	1 (0%)	36	35
All	All	2620/2760 (95%)	2552 (97%)	63 (2%)	5 (0%)	43	42

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	303	ALA
1	H	302	ALA
1	D	485	HIS
1	F	301	CYS
1	D	321	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	273/286 (96%)	271 (99%)	2 (1%)	76	82
1	B	276/286 (96%)	274 (99%)	2 (1%)	76	82
1	C	276/286 (96%)	274 (99%)	2 (1%)	76	82
1	D	271/286 (95%)	269 (99%)	2 (1%)	76	82
1	E	274/286 (96%)	271 (99%)	3 (1%)	65	73
1	F	277/286 (97%)	274 (99%)	3 (1%)	65	73
1	G	277/286 (97%)	273 (99%)	4 (1%)	59	66
1	H	272/286 (95%)	267 (98%)	5 (2%)	51	58
All	All	2196/2288 (96%)	2173 (99%)	23 (1%)	68	75

5 of 23 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	309	ASP
1	G	578	VAL
1	G	484	LEU
1	H	282	ARG
1	D	363	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 47 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	360	ASN
1	F	360	ASN
1	E	440	GLN
1	E	587	GLN
1	F	479	HIS

5.3.3 RNA ⓘ

There are no RNA molecules 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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 16 ligands modelled in this entry, 16 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 ⓘ

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 [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	329/345 (95%)	-0.07	11 (3%)	49	48	12, 20, 38, 70	0
1	B	333/345 (96%)	0.31	20 (6%)	27	26	16, 25, 47, 72	0
1	C	333/345 (96%)	0.24	20 (6%)	27	26	13, 25, 50, 74	0
1	D	324/345 (93%)	1.36	85 (26%)	1	1	20, 45, 64, 69	0
1	E	329/345 (95%)	0.55	39 (11%)	9	8	17, 29, 61, 72	0
1	F	334/345 (96%)	0.07	17 (5%)	33	32	14, 22, 40, 68	0
1	G	334/345 (96%)	0.16	19 (5%)	29	28	15, 24, 46, 64	0
1	H	328/345 (95%)	0.48	33 (10%)	12	11	17, 32, 54, 73	0
All	All	2644/2760 (95%)	0.38	244 (9%)	14	13	12, 27, 55, 74	0

The worst 5 of 244 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	612	VAL	8.0
1	H	308	VAL	7.3
1	A	303	ALA	7.1
1	B	610	ALA	6.6
1	C	612	VAL	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 oligosaccharides in this entry.

6.4 Ligands

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, 95th 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(Å ²)	Q<0.9
3	MG	E	702	1/1	0.94	0.06	26,26,26,26	0
3	MG	D	702	1/1	0.95	0.13	31,31,31,31	0
3	MG	B	702	1/1	0.95	0.07	21,21,21,21	0
3	MG	F	702	1/1	0.96	0.10	19,19,19,19	0
3	MG	G	702	1/1	0.96	0.07	18,18,18,18	0
3	MG	A	702	1/1	0.97	0.08	18,18,18,18	0
2	ZN	D	701	1/1	0.97	0.04	34,34,34,34	0
3	MG	H	702	1/1	0.97	0.10	25,25,25,25	0
3	MG	C	702	1/1	0.98	0.05	15,15,15,15	0
2	ZN	C	701	1/1	0.99	0.02	19,19,19,19	0
2	ZN	A	701	1/1	0.99	0.02	18,18,18,18	0
2	ZN	E	701	1/1	0.99	0.03	25,25,25,25	0
2	ZN	F	701	1/1	0.99	0.01	20,20,20,20	0
2	ZN	G	701	1/1	0.99	0.02	22,22,22,22	0
2	ZN	H	701	1/1	0.99	0.02	25,25,25,25	0
2	ZN	B	701	1/1	0.99	0.03	21,21,21,21	0

6.5 Other polymers

There are no such residues in this entry.