



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 1, 2026 – 03:37 PM UTC

PDB ID : 4FO2 / pdb_00004fo2
Title : Heat-labile enterotoxin LT-IIb-B5(T13I) mutant
Authors : Cody, V.; Pace, J.; Nawar, H.; Liang, S.; Connell, T.; Hajishengallis, G.
Deposited on : 2012-06-20
Resolution : 1.50 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
Mogul : 2022.3.0, CSD as543be (2022)
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

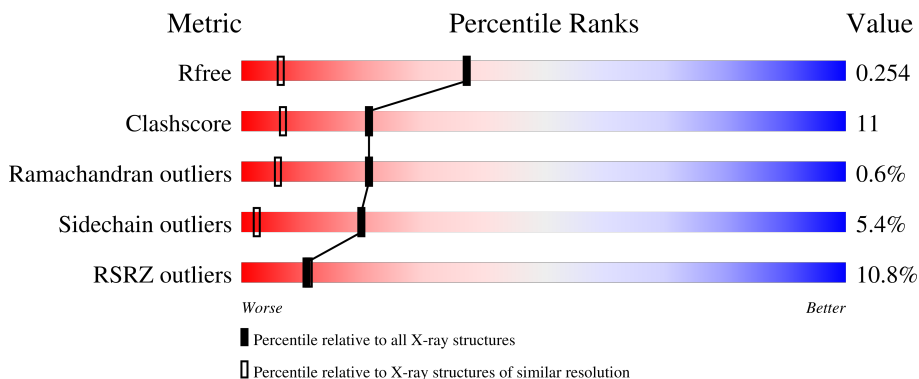
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.50 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	4037 (1.50-1.50)
Clashscore	190562	4235 (1.50-1.50)
Ramachandran outliers	187476	4153 (1.50-1.50)
Sidechain outliers	187428	4150 (1.50-1.50)
RSRZ outliers	180081	4039 (1.50-1.50)

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	98	
1	B	98	
1	C	98	
1	D	98	
1	E	98	

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Mol	Chain	Length	Quality of chain
1	F	98	
1	G	98	
1	H	98	
1	I	98	
1	J	98	
1	K	98	
1	L	98	
1	M	98	
1	N	98	
1	O	98	
1	P	98	
1	Q	98	
1	R	98	
1	S	98	
1	T	98	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	ACT	N	101	-	X	X	-
3	ACT	Q	102	-	-	X	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 15396 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 Heat-labile enterotoxin IIB, B chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	D	98	Total 757	C 469	N 131	O 148	S 9	0	2	0
1	E	98	Total 741	C 460	N 128	O 145	S 8	0	0	0
1	F	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	G	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	H	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	A	98	Total 741	C 460	N 128	O 145	S 8	0	0	0
1	B	98	Total 760	C 471	N 133	O 147	S 9	0	2	0
1	C	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	I	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	J	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	K	98	Total 741	C 460	N 128	O 145	S 8	0	0	0
1	L	98	Total 749	C 466	N 129	O 146	S 8	0	1	0
1	M	98	Total 765	C 475	N 131	O 148	S 11	0	3	0
1	N	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	O	98	Total 735	C 457	N 125	O 145	S 8	0	0	0
1	P	98	Total 749	C 465	N 129	O 146	S 9	0	1	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	Q	98	Total 749	C 464	N 129	O 148	S 8	0	1	0
1	R	98	Total 757	C 470	N 130	O 147	S 10	0	2	0
1	S	98	Total 749	C 465	N 129	O 146	S 9	0	1	0
1	T	98	Total 749	C 465	N 129	O 146	S 9	0	1	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	13	ILE	THR	engineered mutation	UNP P43529
E	13	ILE	THR	engineered mutation	UNP P43529
F	13	ILE	THR	engineered mutation	UNP P43529
G	13	ILE	THR	engineered mutation	UNP P43529
H	13	ILE	THR	engineered mutation	UNP P43529
A	13	ILE	THR	engineered mutation	UNP P43529
B	13	ILE	THR	engineered mutation	UNP P43529
C	13	ILE	THR	engineered mutation	UNP P43529
I	13	ILE	THR	engineered mutation	UNP P43529
J	13	ILE	THR	engineered mutation	UNP P43529
K	13	ILE	THR	engineered mutation	UNP P43529
L	13	ILE	THR	engineered mutation	UNP P43529
M	13	ILE	THR	engineered mutation	UNP P43529
N	13	ILE	THR	engineered mutation	UNP P43529
O	13	ILE	THR	engineered mutation	UNP P43529
P	13	ILE	THR	engineered mutation	UNP P43529
Q	13	ILE	THR	engineered mutation	UNP P43529
R	13	ILE	THR	engineered mutation	UNP P43529
S	13	ILE	THR	engineered mutation	UNP P43529
T	13	ILE	THR	engineered mutation	UNP P43529

- Molecule 2 is SODIUM ION (CCD ID: NA) (formula: Na).

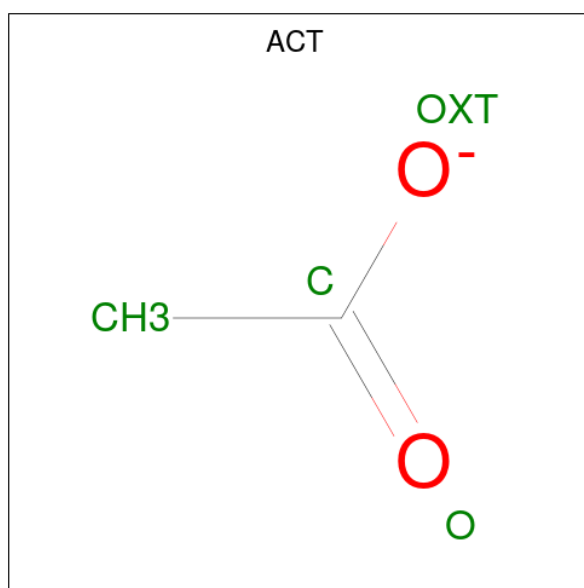
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	E	1	Total 1	Na 1	0	0
2	F	1	Total 1	Na 1	0	0
2	B	1	Total 1	Na 1	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	C	1	Total Na 1 1	0	0
2	L	1	Total Na 1 1	0	0
2	M	1	Total Na 1 1	0	0
2	Q	1	Total Na 1 1	0	0
2	R	1	Total Na 1 1	0	0

- Molecule 3 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	N	1	Total C O 4 2 2	0	0
3	Q	1	Total C O 4 2 2	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	D	6	Total O 6 6	0	0
4	E	21	Total O 21 21	0	0

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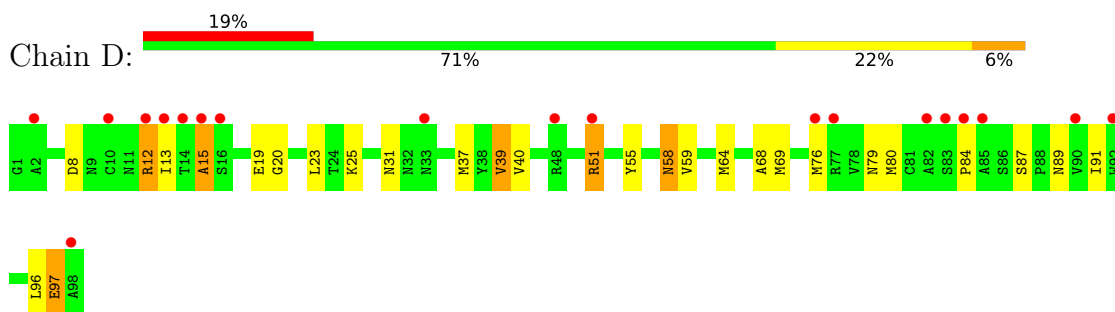
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	F	34	Total O 34 34	0	0
4	G	25	Total O 25 25	0	0
4	H	17	Total O 17 17	0	0
4	A	9	Total O 9 9	0	0
4	B	24	Total O 24 24	0	0
4	C	29	Total O 29 29	0	0
4	I	25	Total O 25 25	0	0
4	J	17	Total O 17 17	0	0
4	K	2	Total O 2 2	0	0
4	L	16	Total O 16 16	0	0
4	M	33	Total O 33 33	0	0
4	N	29	Total O 29 29	0	0
4	O	11	Total O 11 11	0	0
4	P	3	Total O 3 3	0	0
4	Q	13	Total O 13 13	0	0
4	R	33	Total O 33 33	0	0
4	S	34	Total O 34 34	0	0
4	T	14	Total O 14 14	0	0

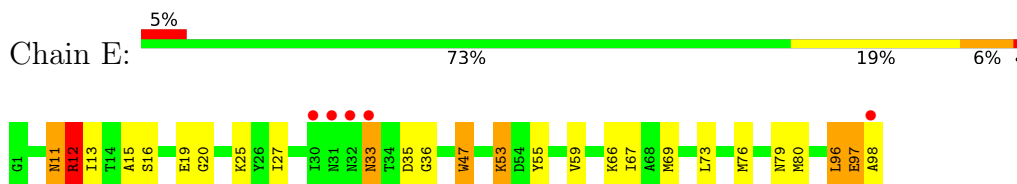
3 Residue-property plots [i](#)

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.

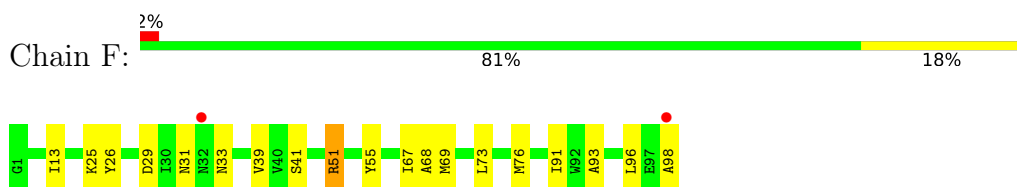
- Molecule 1: Heat-labile enterotoxin IIB, B chain



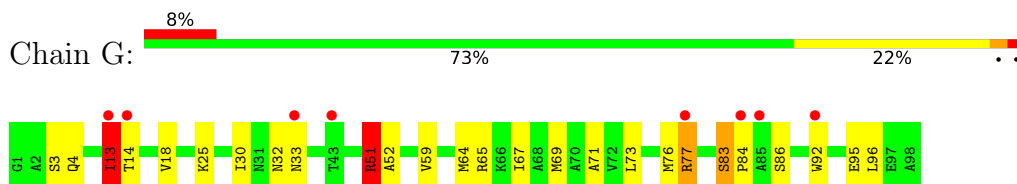
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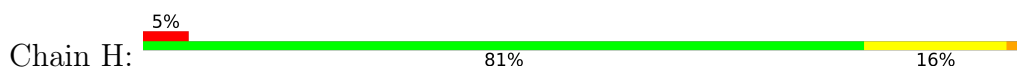
- Molecule 1: Heat-labile enterotoxin IIB, B chain



- Molecule 1: Heat-labile enterotoxin IIB, B chain

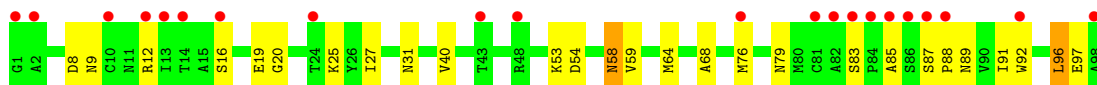
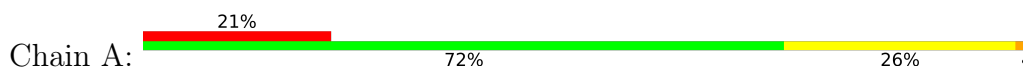


- Molecule 1: Heat-labile enterotoxin IIB, B chain

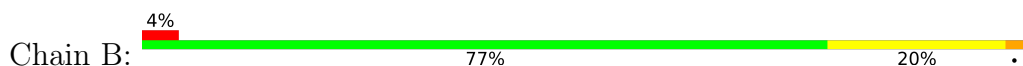




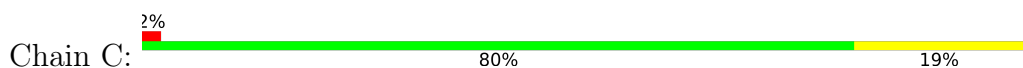
- Molecule 1: Heat-labile enterotoxin IIB, B chain



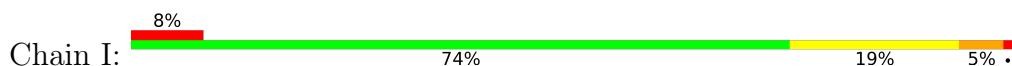
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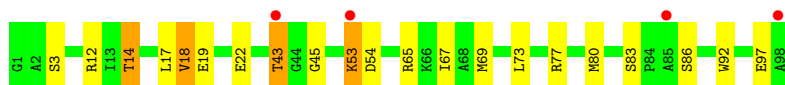
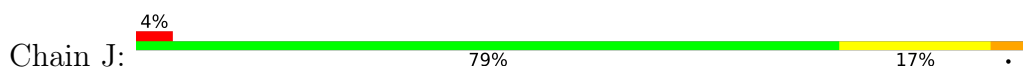
- Molecule 1: Heat-labile enterotoxin IIB, B chain



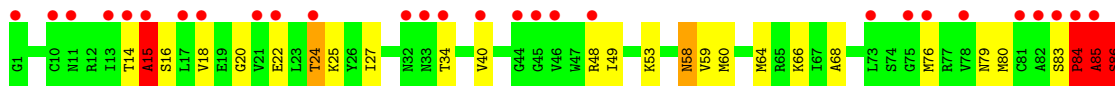
- Molecule 1: Heat-labile enterotoxin IIB, B chain

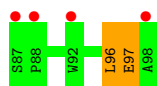


- Molecule 1: Heat-labile enterotoxin IIB, B chain

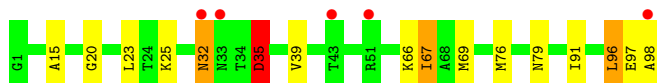
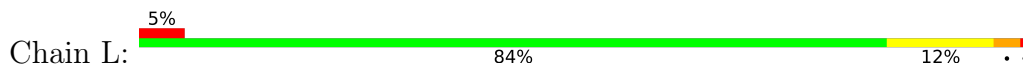


- Molecule 1: Heat-labile enterotoxin IIB, B chain

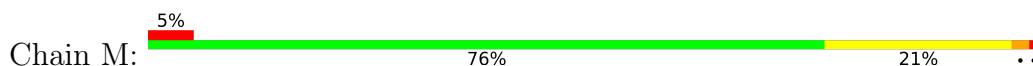




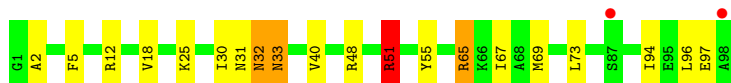
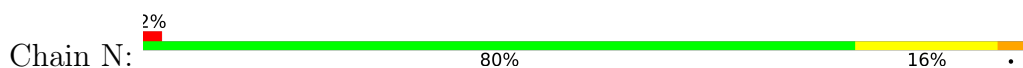
- Molecule 1: Heat-labile enterotoxin IIB, B chain



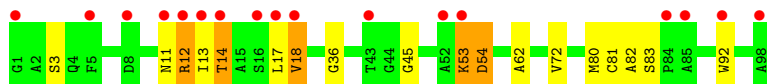
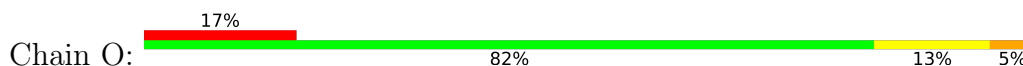
- Molecule 1: Heat-labile enterotoxin IIB, B chain



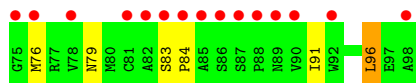
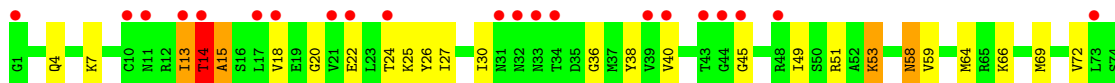
- Molecule 1: Heat-labile enterotoxin IIB, B chain



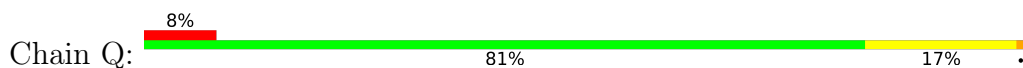
- Molecule 1: Heat-labile enterotoxin IIB, B chain

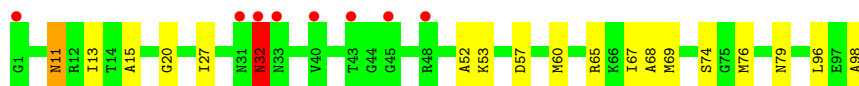


- Molecule 1: Heat-labile enterotoxin IIB, B chain

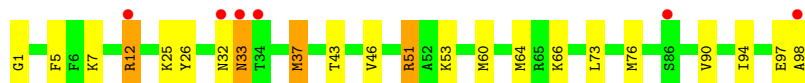
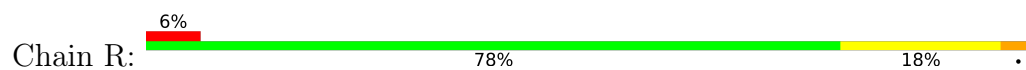


- Molecule 1: Heat-labile enterotoxin IIB, B chain

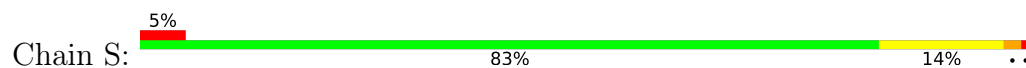




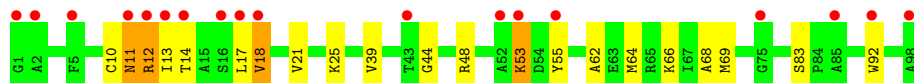
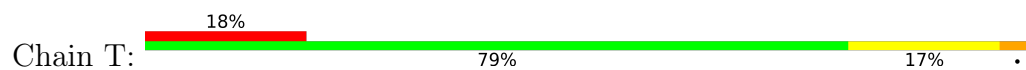
- Molecule 1: Heat-labile enterotoxin IIB, B chain



- Molecule 1: Heat-labile enterotoxin IIB, B chain



- Molecule 1: Heat-labile enterotoxin IIB, B chain



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	119.31Å 119.98Å 142.45Å 90.00° 90.05° 90.00°	Depositor
Resolution (Å)	45.74 – 1.50 45.74 – 1.50	Depositor EDS
% Data completeness (in resolution range)	97.9 (45.74-1.50) 97.9 (45.74-1.50)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.04	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.40 (at 1.50Å)	Xtrriage
Refinement program	REFMAC 5.5.0088	Depositor
R, R_{free}	0.223 , 0.259 0.220 , 0.254	Depositor DCC
R_{free} test set	15748 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	22.3	Xtrriage
Anisotropy	0.041	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 25.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.032 for k,h,-l 0.029 for -k,-h,-l 0.477 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	15396	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.55% 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 i

5.1 Standard geometry i

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

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	1.31	2/752 (0.3%)	1.27	0/1018
1	B	1.48	2/771 (0.3%)	1.22	2/1042 (0.2%)
1	C	1.64	4/760 (0.5%)	1.44	3/1028 (0.3%)
1	D	1.34	2/768 (0.3%)	1.22	0/1039
1	E	1.54	5/752 (0.7%)	1.37	4/1018 (0.4%)
1	F	1.65	5/760 (0.7%)	1.45	1/1028 (0.1%)
1	G	1.68	6/760 (0.8%)	1.65	11/1028 (1.1%)
1	H	1.52	3/760 (0.4%)	1.37	3/1028 (0.3%)
1	I	1.80	14/760 (1.8%)	1.64	8/1028 (0.8%)
1	J	1.51	2/760 (0.3%)	1.38	4/1028 (0.4%)
1	K	1.38	3/752 (0.4%)	1.36	7/1018 (0.7%)
1	L	1.47	5/760 (0.7%)	1.36	2/1029 (0.2%)
1	M	1.54	6/776 (0.8%)	1.46	6/1048 (0.6%)
1	N	1.65	10/760 (1.3%)	1.52	8/1028 (0.8%)
1	O	1.61	5/746 (0.7%)	1.41	4/1011 (0.4%)
1	P	1.34	2/760 (0.3%)	1.34	4/1028 (0.4%)
1	Q	1.45	3/760 (0.4%)	1.35	2/1029 (0.2%)
1	R	1.52	5/768 (0.7%)	1.36	1/1038 (0.1%)
1	S	1.66	4/760 (0.5%)	1.52	2/1028 (0.2%)
1	T	1.54	3/760 (0.4%)	1.48	10/1028 (1.0%)
All	All	1.54	91/15205 (0.6%)	1.41	82/20570 (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	K	0	2
1	T	0	1
All	All	0	3

The worst 5 of 91 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	I	92	TRP	CB-CG	-11.01	1.16	1.50
1	G	51	ARG	CG-CD	8.65	1.78	1.52
1	G	51	ARG	CZ-NH1	8.15	1.44	1.32
1	N	48	ARG	CZ-NH1	7.69	1.43	1.32
1	M	35	ASP	CB-CG	-7.67	1.32	1.52

The worst 5 of 82 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	I	51	ARG	NE-CZ-NH2	-17.07	103.84	119.20
1	G	51	ARG	NE-CZ-NH2	-15.53	105.22	119.20
1	L	35	ASP	CB-CA-C	-10.81	88.91	110.42
1	E	35	ASP	N-CA-CB	-10.20	93.25	110.49
1	G	51	ARG	NE-CZ-NH1	9.48	130.99	121.50

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	K	83	SER	Peptide
1	K	85	ALA	Peptide
1	T	11	ASN	Peptide

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	741	0	733	23	0
1	B	760	0	753	24	0
1	C	749	0	741	11	0
1	D	757	0	746	26	0
1	E	741	0	733	29	0
1	F	749	0	741	17	0
1	G	749	0	741	21	1
1	H	749	0	741	16	0
1	I	749	0	741	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	J	749	0	741	20	0
1	K	741	0	733	26	0
1	L	749	0	743	12	0
1	M	765	0	757	15	0
1	N	749	0	741	12	0
1	O	735	0	722	13	0
1	P	749	0	741	25	0
1	Q	749	0	736	17	0
1	R	757	0	749	18	1
1	S	749	0	741	12	0
1	T	749	0	741	22	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
2	L	1	0	0	0	0
2	M	1	0	0	0	0
2	Q	1	0	0	0	0
2	R	1	0	0	0	0
3	N	4	0	3	4	0
3	Q	4	0	3	3	0
4	A	9	0	0	1	0
4	B	24	0	0	1	0
4	C	29	0	0	1	0
4	D	6	0	0	2	0
4	E	21	0	0	0	0
4	F	34	0	0	1	0
4	G	25	0	0	1	0
4	H	17	0	0	0	0
4	I	25	0	0	3	0
4	J	17	0	0	1	0
4	K	2	0	0	0	0
4	L	16	0	0	1	0
4	M	33	0	0	3	0
4	N	29	0	0	2	0
4	O	11	0	0	0	0
4	P	3	0	0	1	0
4	Q	13	0	0	1	0
4	R	33	0	0	4	0
4	S	34	0	0	4	0
4	T	14	0	0	0	0
All	All	15396	0	14821	327	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 11.

The worst 5 of 327 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:I:51:ARG:CG	1:I:51:ARG:CD	1.74	1.62
1:G:51:ARG:CD	1:G:51:ARG:CG	1.78	1.59
1:T:11:ASN:CB	1:T:12:ARG:HA	1.54	1.24
1:H:53:LYS:HD2	1:H:53:LYS:N	1.55	1.20
1:H:53:LYS:H	1:H:53:LYS:CD	1.56	1.16

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:G:4:GLN:CG	1:R:12:ARG:NH1[2_655]	1.63	0.57

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	96/98 (98%)	93 (97%)	2 (2%)	1 (1%)	12	2
1	B	98/98 (100%)	98 (100%)	0	0	100	100
1	C	97/98 (99%)	92 (95%)	4 (4%)	1 (1%)	12	2
1	D	98/98 (100%)	97 (99%)	0	1 (1%)	12	2
1	E	96/98 (98%)	95 (99%)	1 (1%)	0	100	100
1	F	97/98 (99%)	92 (95%)	5 (5%)	0	100	100
1	G	97/98 (99%)	97 (100%)	0	0	100	100
1	H	97/98 (99%)	94 (97%)	3 (3%)	0	100	100
1	I	97/98 (99%)	97 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	J	97/98 (99%)	94 (97%)	3 (3%)	0	100	100
1	K	96/98 (98%)	90 (94%)	3 (3%)	3 (3%)	3	0
1	L	97/98 (99%)	96 (99%)	0	1 (1%)	12	2
1	M	99/98 (101%)	93 (94%)	5 (5%)	1 (1%)	12	2
1	N	97/98 (99%)	96 (99%)	1 (1%)	0	100	100
1	O	96/98 (98%)	94 (98%)	1 (1%)	1 (1%)	12	2
1	P	97/98 (99%)	94 (97%)	1 (1%)	2 (2%)	5	0
1	Q	97/98 (99%)	97 (100%)	0	0	100	100
1	R	98/98 (100%)	93 (95%)	4 (4%)	1 (1%)	12	2
1	S	97/98 (99%)	97 (100%)	0	0	100	100
1	T	97/98 (99%)	94 (97%)	3 (3%)	0	100	100
All	All	1941/1960 (99%)	1893 (98%)	36 (2%)	12 (1%)	21	6

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	85	ALA
1	C	32	ASN
1	K	15	ALA
1	P	15	ALA
1	R	32	ASN

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	81/81 (100%)	78 (96%)	3 (4%)	30	6
1	B	83/81 (102%)	79 (95%)	4 (5%)	23	3
1	C	82/81 (101%)	79 (96%)	3 (4%)	30	6
1	D	83/81 (102%)	76 (92%)	7 (8%)	10	1
1	E	81/81 (100%)	75 (93%)	6 (7%)	13	1

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	F	82/81 (101%)	82 (100%)	0	100	100
1	G	82/81 (101%)	77 (94%)	5 (6%)	17	1
1	H	82/81 (101%)	77 (94%)	5 (6%)	17	1
1	I	82/81 (101%)	77 (94%)	5 (6%)	17	1
1	J	82/81 (101%)	76 (93%)	6 (7%)	13	1
1	K	81/81 (100%)	72 (89%)	9 (11%)	6	0
1	L	82/81 (101%)	80 (98%)	2 (2%)	43	15
1	M	84/81 (104%)	78 (93%)	6 (7%)	13	1
1	N	82/81 (101%)	80 (98%)	2 (2%)	43	15
1	O	80/81 (99%)	75 (94%)	5 (6%)	16	1
1	P	82/81 (101%)	75 (92%)	7 (8%)	10	0
1	Q	82/81 (101%)	79 (96%)	3 (4%)	30	6
1	R	83/81 (102%)	79 (95%)	4 (5%)	23	3
1	S	82/81 (101%)	77 (94%)	5 (6%)	17	1
1	T	82/81 (101%)	79 (96%)	3 (4%)	30	6
All	All	1640/1620 (101%)	1550 (94%)	90 (6%)	20	2

5 of 90 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	M	37[A]	MET
1	P	22	GLU
1	M	54	ASP
1	O	18	VAL
1	Q	11	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 45 such sidechains are listed below:

Mol	Chain	Res	Type
1	M	89	ASN
1	Q	9	ASN
1	N	9	ASN
1	P	58	ASN
1	Q	32	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 10 ligands modelled in this entry, 8 are monoatomic - leaving 2 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	ACT	N	101	-	3,3,3	2.87	3 (100%)	3,3,3	3.16	2 (66%)
3	ACT	Q	102	-	3,3,3	0.91	0	3,3,3	2.44	2 (66%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	N	101	ACT	O-C	3.47	1.37	1.22
3	N	101	ACT	CH3-C	2.69	1.59	1.49
3	N	101	ACT	OXT-C	2.33	1.41	1.30

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	N	101	ACT	OXT-C-CH3	3.99	131.78	115.05
3	N	101	ACT	O-C-CH3	-3.74	107.17	122.53
3	Q	102	ACT	OXT-C-CH3	3.34	129.04	115.05

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	Q	102	ACT	O-C-CH3	-2.28	113.20	122.53

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	N	101	ACT	4	0
3	Q	102	ACT	3	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, 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	98/98 (100%)	1.24	21 (21%) 2 2	14, 30, 48, 57	1 (1%)
1	B	98/98 (100%)	0.30	4 (4%) 41 45	10, 22, 36, 44	2 (2%)
1	C	98/98 (100%)	0.10	2 (2%) 65 68	10, 19, 32, 42	1 (1%)
1	D	98/98 (100%)	1.17	19 (19%) 3 2	12, 29, 48, 53	3 (3%)
1	E	98/98 (100%)	0.34	5 (5%) 33 36	14, 22, 35, 45	0
1	F	98/98 (100%)	0.15	2 (2%) 65 68	10, 19, 30, 40	1 (1%)
1	G	98/98 (100%)	0.45	8 (8%) 17 19	10, 21, 35, 42	1 (1%)
1	H	98/98 (100%)	0.43	5 (5%) 33 36	10, 22, 33, 38	1 (1%)
1	I	98/98 (100%)	0.44	8 (8%) 17 19	9, 20, 36, 42	1 (1%)
1	J	98/98 (100%)	0.45	4 (4%) 41 45	10, 22, 33, 37	1 (1%)
1	K	98/98 (100%)	1.79	32 (32%) 1 1	16, 35, 50, 56	1 (1%)
1	L	98/98 (100%)	0.52	5 (5%) 33 36	11, 24, 37, 45	1 (1%)
1	M	98/98 (100%)	0.24	5 (5%) 33 36	7, 19, 31, 46	3 (3%)
1	N	98/98 (100%)	0.09	2 (2%) 65 68	9, 18, 30, 34	1 (1%)
1	O	98/98 (100%)	0.99	17 (17%) 4 3	15, 26, 39, 46	0
1	P	98/98 (100%)	1.73	36 (36%) 1 0	13, 34, 49, 53	2 (2%)
1	Q	98/98 (100%)	0.57	8 (8%) 17 19	10, 24, 36, 43	1 (1%)
1	R	98/98 (100%)	0.13	6 (6%) 27 29	7, 19, 31, 44	2 (2%)
1	S	98/98 (100%)	0.11	5 (5%) 33 36	9, 18, 30, 33	1 (1%)
1	T	98/98 (100%)	1.00	18 (18%) 3 3	11, 27, 41, 46	1 (1%)
All	All	1960/1960 (100%)	0.61	212 (10%) 11 11	7, 23, 41, 57	25 (1%)

The worst 5 of 212 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	K	84	PRO	7.0
1	K	76	MET	6.7
1	P	76	MET	6.4
1	I	92	TRP	6.3
1	A	76	MET	6.2

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 [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, 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	ACT	N	101	4/4	0.77	0.20	24,25,25,28	0
3	ACT	Q	102	4/4	0.84	0.14	28,28,30,31	0
2	NA	B	101	1/1	0.96	0.06	30,30,30,30	0
2	NA	C	101	1/1	0.97	0.07	23,23,23,23	0
2	NA	F	101	1/1	0.97	0.09	23,23,23,23	0
2	NA	E	101	1/1	0.97	0.08	25,25,25,25	0
2	NA	Q	101	1/1	0.98	0.10	23,23,23,23	0
2	NA	R	101	1/1	0.98	0.10	18,18,18,18	0
2	NA	L	101	1/1	0.98	0.11	23,23,23,23	0
2	NA	M	101	1/1	0.98	0.11	18,18,18,18	0

6.5 Other polymers [i](#)

There are no such residues in this entry.