



wwPDB/EMDataBank EM Map/Model Validation Summary Report ⓘ

Mar 2, 2017 – 11:18 am GMT

PDB ID : 3FOH
EMDB ID: : EMD-1126
Title : Fitting of gp18M crystal structure into 3D cryo-EM reconstruction of bacteriophage T4 extended tail
Authors : Aksyuk, A.A.; Leiman, P.G.; Kurochkina, L.P.; Shneider, M.M.; Kostyuchenko, V.A.; Mesyanzhinov, V.V.; Rossmann, M.G.
Deposited on : 2008-12-30
Resolution : 15.00 Å(reported)
Based on PDB ID : 3FOA

This is a wwPDB/EMDataBank EM Map/Model Validation Summary Report
for a publicly released PDB/EMDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<http://wwpdb.org/validation/2016/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

MolProbity : 4.02b-467
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : recalc29047

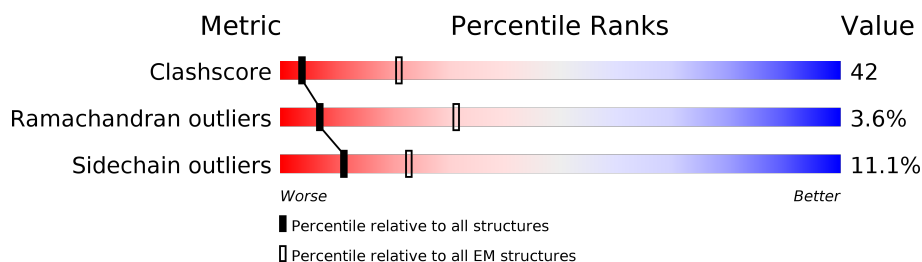
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 15.00 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)	EM structures (#Entries)
Clashscore	125131	1336
Ramachandran outliers	121729	1120
Sidechain outliers	121581	1026

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the bar indicate the fraction of residues that contain outliers for ≥ 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	510	
1	B	510	
1	C	510	
1	D	510	
1	E	510	
1	F	510	

2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 21678 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Tail sheath protein Gp18.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	479	Total	C	N	O	S	0	0
			3613	2279	600	726	8		
1	B	479	Total	C	N	O	S	0	0
			3613	2279	600	726	8		
1	C	479	Total	C	N	O	S	0	0
			3613	2279	600	726	8		
1	D	479	Total	C	N	O	S	0	0
			3613	2279	600	726	8		
1	E	479	Total	C	N	O	S	0	0
			3613	2279	600	726	8		
1	F	479	Total	C	N	O	S	0	0
			3613	2279	600	726	8		

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	100	GLU	ASP	SEE REMARK 999	UNP P13332
A	148	ALA	GLY	SEE REMARK 999	UNP P13332
A	150	ILE	ASN	SEE REMARK 999	UNP P13332
A	151	ILE	TYR	SEE REMARK 999	UNP P13332
A	301	GLY	GLU	SEE REMARK 999	UNP P13332
A	399	VAL	ALA	SEE REMARK 999	UNP P13332
A	454	TYR	HIS	SEE REMARK 999	UNP P13332
A	510	PRO	ARG	ENGINEERED	UNP P13332
B	100	GLU	ASP	SEE REMARK 999	UNP P13332
B	148	ALA	GLY	SEE REMARK 999	UNP P13332
B	150	ILE	ASN	SEE REMARK 999	UNP P13332
B	151	ILE	TYR	SEE REMARK 999	UNP P13332
B	301	GLY	GLU	SEE REMARK 999	UNP P13332
B	399	VAL	ALA	SEE REMARK 999	UNP P13332
B	454	TYR	HIS	SEE REMARK 999	UNP P13332
B	510	PRO	ARG	ENGINEERED	UNP P13332
C	100	GLU	ASP	SEE REMARK 999	UNP P13332
C	148	ALA	GLY	SEE REMARK 999	UNP P13332

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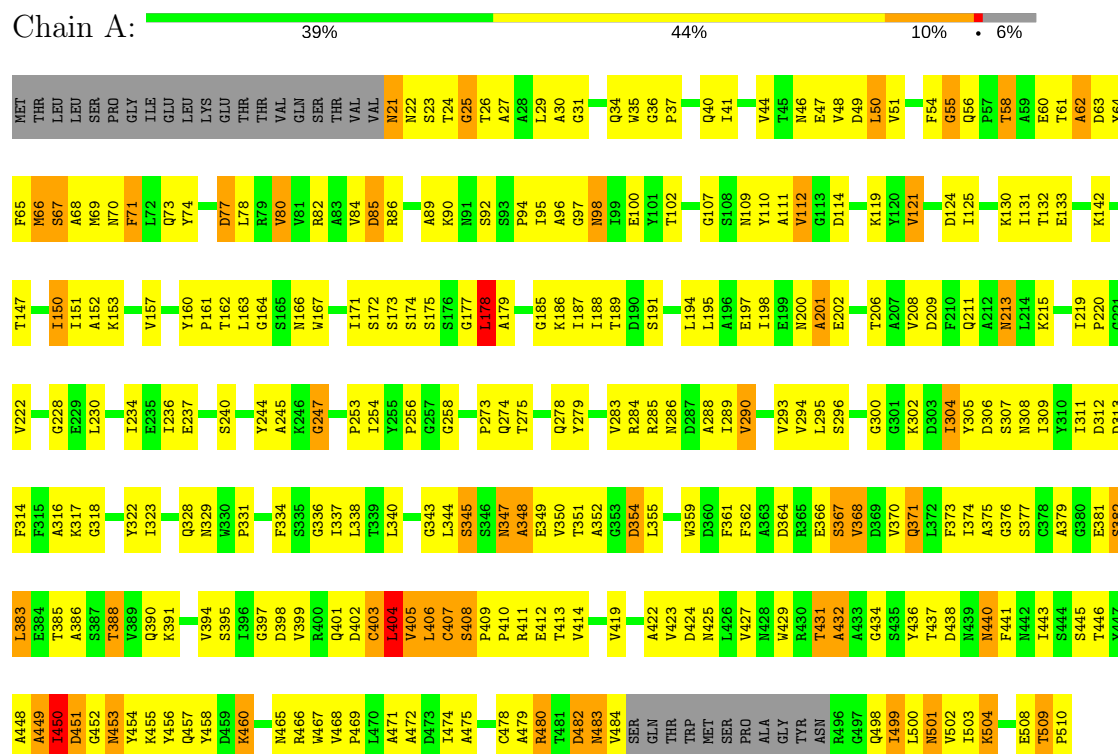
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Chain	Residue	Modelled	Actual	Comment	Reference
C	150	ILE	ASN	SEE REMARK 999	UNP P13332
C	151	ILE	TYR	SEE REMARK 999	UNP P13332
C	301	GLY	GLU	SEE REMARK 999	UNP P13332
C	399	VAL	ALA	SEE REMARK 999	UNP P13332
C	454	TYR	HIS	SEE REMARK 999	UNP P13332
C	510	PRO	ARG	ENGINEERED	UNP P13332
D	100	GLU	ASP	SEE REMARK 999	UNP P13332
D	148	ALA	GLY	SEE REMARK 999	UNP P13332
D	150	ILE	ASN	SEE REMARK 999	UNP P13332
D	151	ILE	TYR	SEE REMARK 999	UNP P13332
D	301	GLY	GLU	SEE REMARK 999	UNP P13332
D	399	VAL	ALA	SEE REMARK 999	UNP P13332
D	454	TYR	HIS	SEE REMARK 999	UNP P13332
D	510	PRO	ARG	ENGINEERED	UNP P13332
E	100	GLU	ASP	SEE REMARK 999	UNP P13332
E	148	ALA	GLY	SEE REMARK 999	UNP P13332
E	150	ILE	ASN	SEE REMARK 999	UNP P13332
E	151	ILE	TYR	SEE REMARK 999	UNP P13332
E	301	GLY	GLU	SEE REMARK 999	UNP P13332
E	399	VAL	ALA	SEE REMARK 999	UNP P13332
E	454	TYR	HIS	SEE REMARK 999	UNP P13332
E	510	PRO	ARG	ENGINEERED	UNP P13332
F	100	GLU	ASP	SEE REMARK 999	UNP P13332
F	148	ALA	GLY	SEE REMARK 999	UNP P13332
F	150	ILE	ASN	SEE REMARK 999	UNP P13332
F	151	ILE	TYR	SEE REMARK 999	UNP P13332
F	301	GLY	GLU	SEE REMARK 999	UNP P13332
F	399	VAL	ALA	SEE REMARK 999	UNP P13332
F	454	TYR	HIS	SEE REMARK 999	UNP P13332
F	510	PRO	ARG	ENGINEERED	UNP P13332

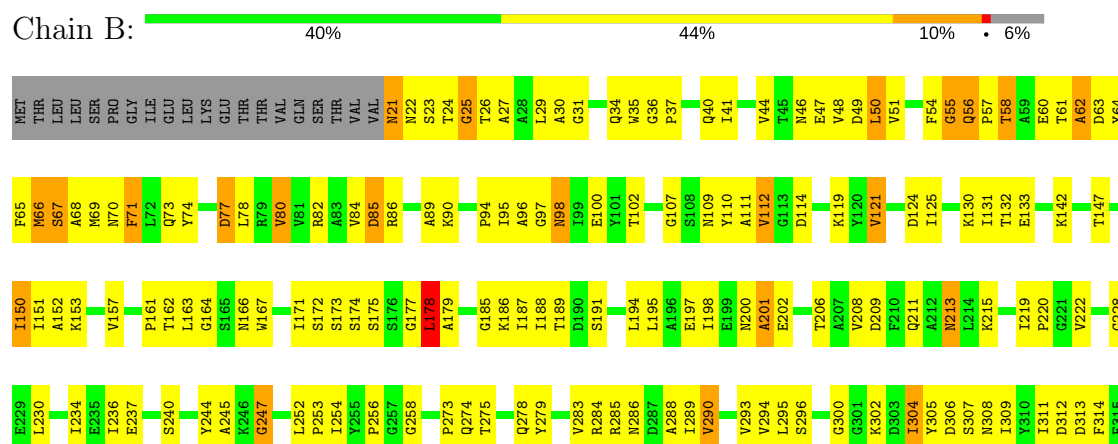
3 Residue-property plots

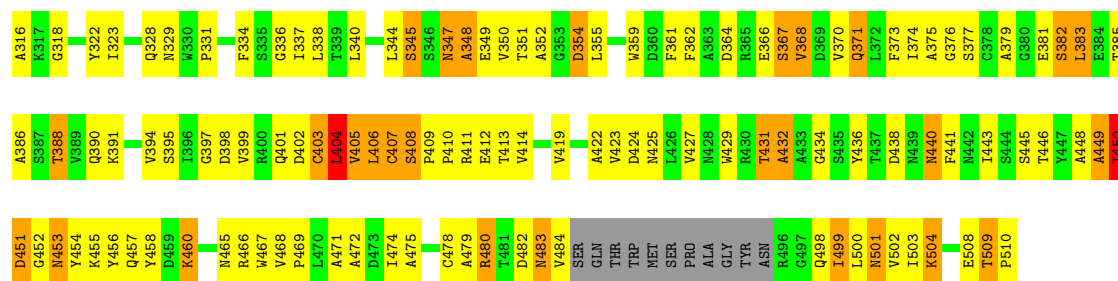
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according 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. 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: Tail sheath protein Gp18



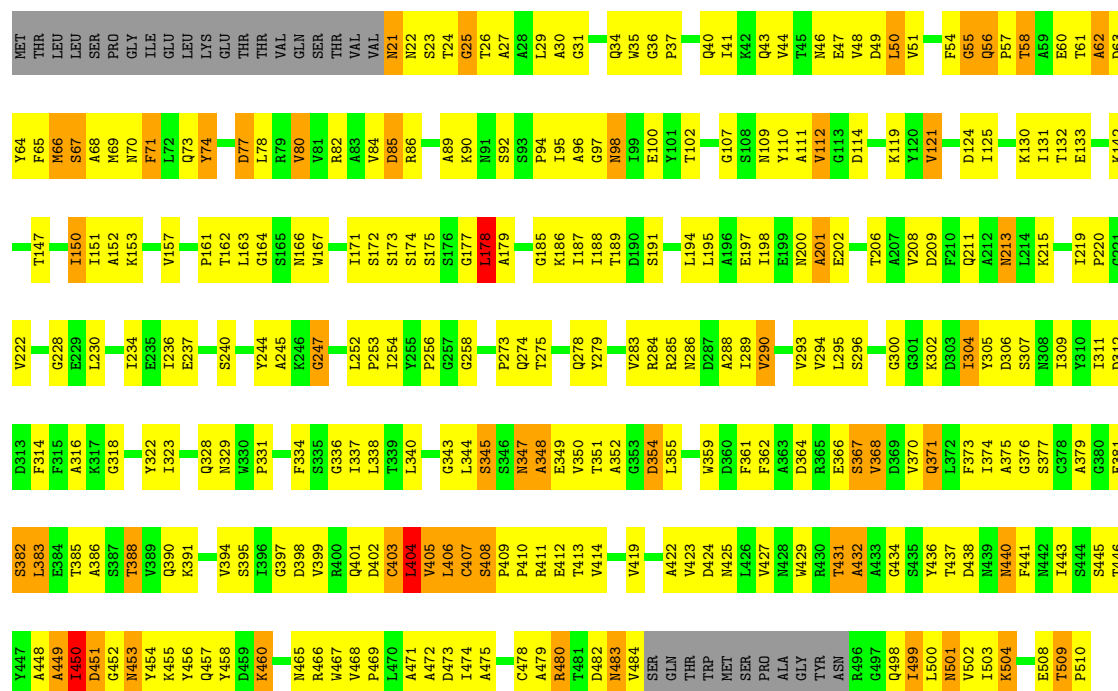
• Molecule 1: Tail sheath protein Gp18





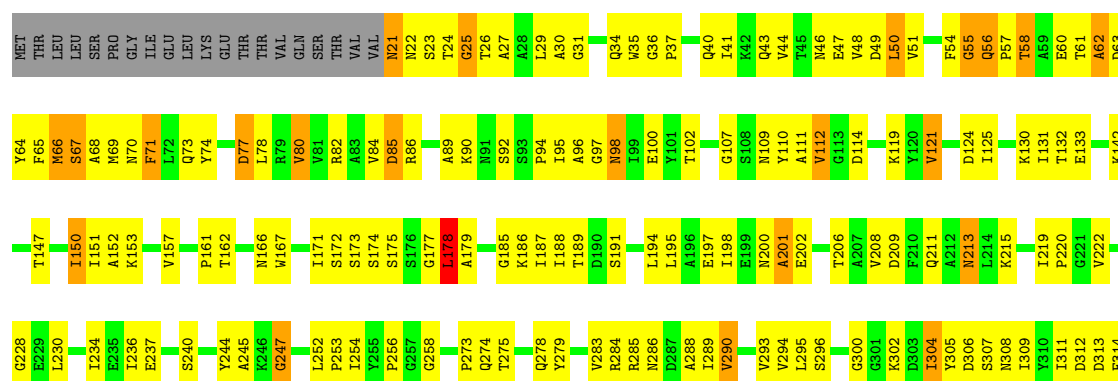
• Molecule 1: Tail sheath protein Gp18

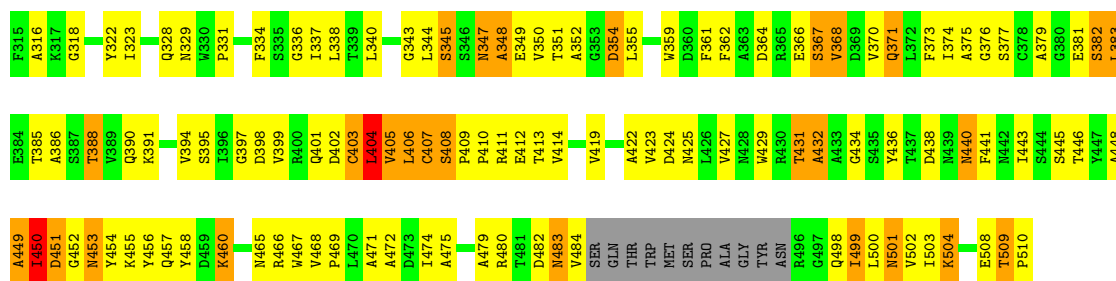
Chain C: 39% 44% 10% 6%



• Molecule 1: Tail sheath protein Gp18

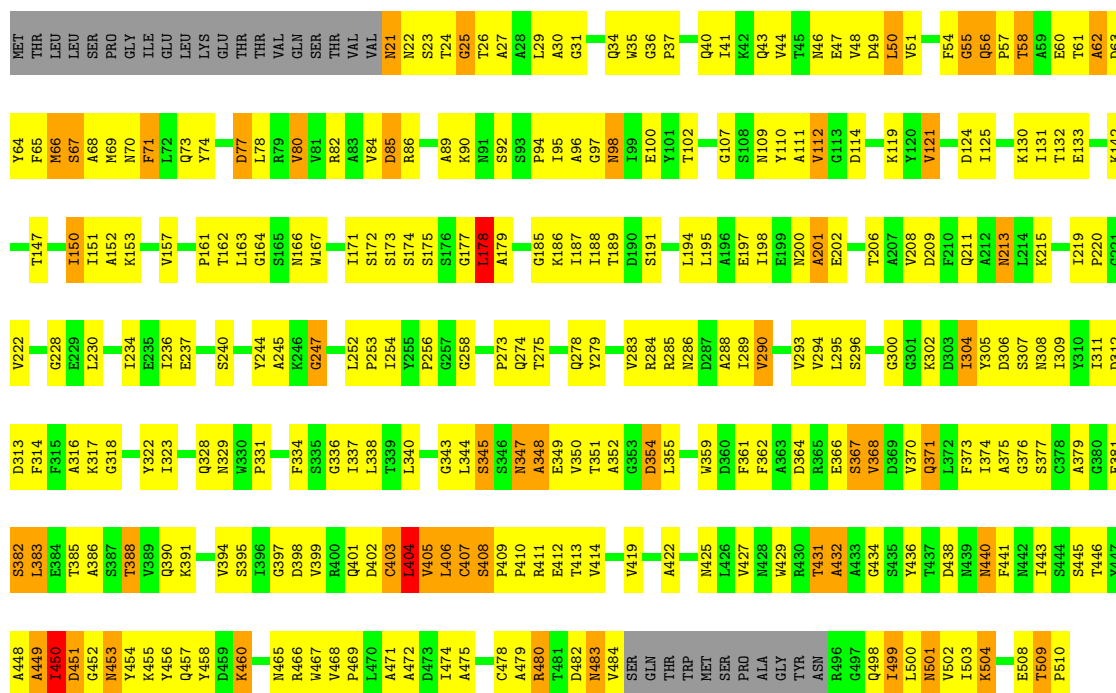
Chain D: 40% 44% 10% 6%





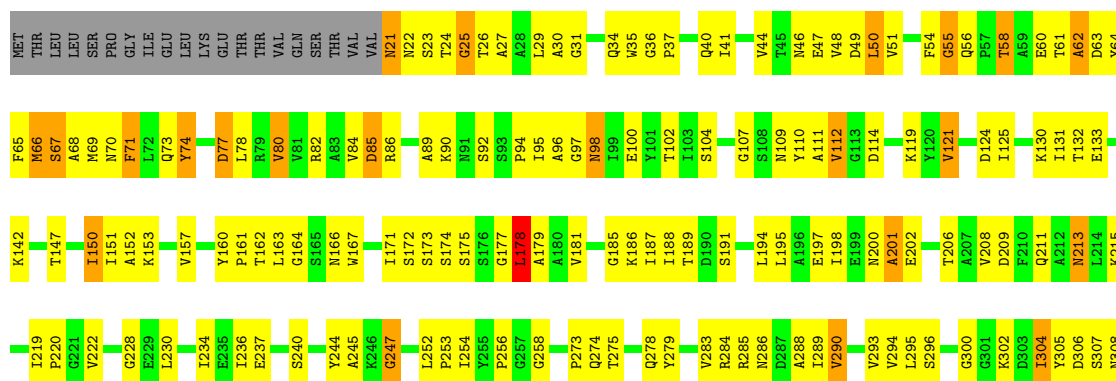
• Molecule 1: Tail sheath protein Gp18

Chain E: 40% 44% 10% 6%



• Molecule 1: Tail sheath protein Gp18

Chain F: 39% 45% 10% 6%



T509	P510	I443	S444	S445	T446	Y447	A448	A449	T450	D451	G452	N453	Y454	K455	Y456	Q457	Y458	D459	K460	N465	R466	Y467	Y468	P469	L470	A471	A472	D473	I474	A475	C478	A479	R480	T481	D482	N483	V484	SER	GLN	THR	TRP	MET	SER	PRO	ALA	GLY	TYR	ASN	R496	G497	Q498	I499	L500	N501	V502	I503	K504	E508	C378	A379	G380	E381	S382	L383	F384	T385	A386	S387	T388	V389	Q390	K391	V394	S395	I396	G397	D398	V399	R400	Q401	D402	C403	L404	V405	L406	C407	S408	P409	P410	R411	E412	T413	V414	V419	A422	V423	D424	N425	L426	V427	N428	W429	R430	T431	A432	A433	G434	S435	Y436	T437	D438	N439	N440	F441	N442	I309	F310	I311	D312	D313	F314	F315	A316	G317	G318	Y322	I323	Q328	N329	W330	P331	F334	S335	G336	I337	L338	T339	L340	G343	I344	S345	S346	N347	A348	E349	V350	T351	A352	G353	D354	L355	V359	D360	F361	F362	D364	E366	S367	V368	D369	V370	Q371	L372	F373	I374	A375	G376	S377
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4 Experimental information

Property	Value	Source
Reconstruction method	Not provided	Depositor
Imposed symmetry	POINT, Not provided	Depositor
Number of images used	Not provided	Depositor
Resolution determination method	Not provided	Depositor
CTF correction method	Not provided	Depositor
Microscope	Not provided	Depositor
Voltage (kV)	Not provided	Depositor
Electron dose ($e^-/\text{\AA}^2$)	Not provided	Depositor
Minimum defocus (nm)	Not provided	Depositor
Maximum defocus (nm)	Not provided	Depositor
Magnification	Not provided	Depositor
Image detector	Not provided	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	$\# Z > 2$	RMSZ	$\# Z > 2$
1	A	0.35	0/3677	0.78	21/5001 (0.4%)
1	B	0.35	0/3677	0.78	21/5001 (0.4%)
1	C	0.35	0/3677	0.78	21/5001 (0.4%)
1	D	0.35	0/3677	0.78	21/5001 (0.4%)
1	E	0.35	0/3677	0.78	21/5001 (0.4%)
1	F	0.35	0/3677	0.78	21/5001 (0.4%)
All	All	0.35	0/22062	0.78	126/30006 (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	4
1	B	0	4
1	C	0	4
1	D	0	4
1	E	0	4
1	F	0	4
All	All	0	24

There are no bond length outliers.

The worst 5 of 126 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	55	GLY	N-CA-C	18.02	158.14	113.10
1	F	55	GLY	N-CA-C	18.01	158.12	113.10
1	C	55	GLY	N-CA-C	18.01	158.12	113.10
1	D	55	GLY	N-CA-C	18.00	158.10	113.10
1	E	55	GLY	N-CA-C	18.00	158.10	113.10

There are no chirality outliers.

5 of 24 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	21	ASN	Peptide
1	A	450	ILE	Peptide
1	A	451	ASP	Peptide
1	A	452	GLY	Peptide
1	B	21	ASN	Peptide

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	3613	0	3554	299	0
1	B	3613	0	3554	296	0
1	C	3613	0	3554	298	0
1	D	3613	0	3554	298	0
1	E	3613	0	3554	297	0
1	F	3613	0	3554	301	0
All	All	21678	0	21324	1789	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 42.

The worst 5 of 1789 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:E:409:PRO:O	1:E:454:TYR:CE1	1.65	1.50
1:F:409:PRO:O	1:F:454:TYR:CE1	1.65	1.49
1:D:409:PRO:O	1:D:454:TYR:CE1	1.65	1.48
1:A:409:PRO:O	1:A:454:TYR:CE1	1.65	1.48
1:C:409:PRO:O	1:C:454:TYR:CE1	1.65	1.47

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 PDB entries followed by that with respect to all EM entries.

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	475/510 (93%)	371 (78%)	87 (18%)	17 (4%)	4	33
1	B	475/510 (93%)	371 (78%)	87 (18%)	17 (4%)	4	33
1	C	475/510 (93%)	371 (78%)	87 (18%)	17 (4%)	4	33
1	D	475/510 (93%)	371 (78%)	87 (18%)	17 (4%)	4	33
1	E	475/510 (93%)	371 (78%)	87 (18%)	17 (4%)	4	33
1	F	475/510 (93%)	371 (78%)	87 (18%)	17 (4%)	4	33
All	All	2850/3060 (93%)	2226 (78%)	522 (18%)	102 (4%)	7	33

5 of 102 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	98	ASN
1	A	201	ALA
1	A	432	ALA
1	B	98	ASN
1	B	201	ALA

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 PDB entries followed by that with respect to all EM entries.

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	383/411 (93%)	340 (89%)	43 (11%)	7	29
1	B	383/411 (93%)	341 (89%)	42 (11%)	7	30
1	C	383/411 (93%)	340 (89%)	43 (11%)	7	29

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	383/411 (93%)	341 (89%)	42 (11%)	7	30
1	E	383/411 (93%)	341 (89%)	42 (11%)	7	30
1	F	383/411 (93%)	340 (89%)	43 (11%)	7	29
All	All	2298/2466 (93%)	2043 (89%)	255 (11%)	11	29

5 of 255 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	404	LEU
1	D	188	ILE
1	F	367	SER
1	C	437	THR
1	D	58	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 51 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	453	ASN
1	D	278	GLN
1	F	390	GLN
1	D	43	GLN
1	D	329	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 carbohydrates 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.