



Full wwPDB EM Validation Report ⓘ

Jun 26, 2025 – 12:15 AM JST

PDB ID : 8WH9 / pdb_00008wh9
EMDB ID : EMD-37535
Title : Structure of DDM1-nucleosome complex in ADP-BeFx state
Authors : Liu, Y.; Zhang, Z.; Du, J.
Deposited on : 2023-09-22
Resolution : 3.31 Å(reported)

This is a Full wwPDB EM Validation 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0rc1
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

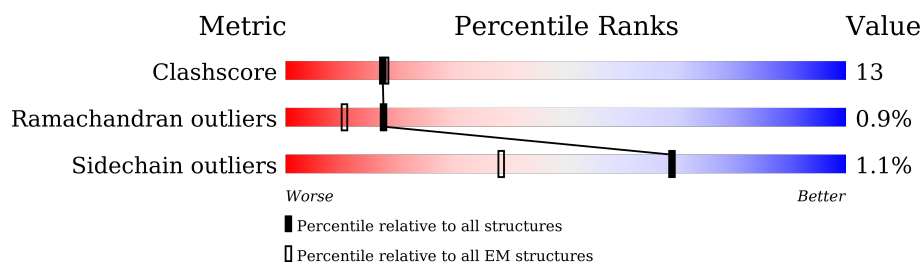
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.31 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	136	
1	E	136	
2	B	103	
2	F	103	
3	C	130	
3	G	130	
4	D	150	
4	H	150	
5	I	147	

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Mol	Chain	Length	Quality of chain
6	J	147	46% 48%
7	K	765	35% 22% 41%

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 15328 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 Histone H3.1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	93	Total	C	N	O	S	0	0
			755	480	141	132	2		
1	E	98	Total	C	N	O	S	0	0
			799	506	154	137	2		

- Molecule 2 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	79	Total	C	N	O	S	0	0
			636	400	126	109	1		
2	F	84	Total	C	N	O	S	0	0
			688	433	140	114	1		

- Molecule 3 is a protein called Histone H2A.6.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	102	Total	C	N	O	S	0	0
			768	485	144	138	1		
3	G	99	Total	C	N	O	S	0	0
			750	475	141	133	1		

- Molecule 4 is a protein called Histone H2B.6.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	89	Total	C	N	O	S	0	0
			694	446	118	128	2		
4	H	92	Total	C	N	O	S	0	0
			716	459	121	134	2		

- Molecule 5 is a DNA chain called DNA (sense strand).

Mol	Chain	Residues	Atoms					AltConf	Trace
5	I	142	Total	C	N	O	P	0	0
			2893	1373	529	849	142		

- Molecule 6 is a DNA chain called DNA (antisense strand).

Mol	Chain	Residues	Atoms					AltConf	Trace
6	J	142	Total	C	N	O	P	0	0
			2929	1386	546	855	142		

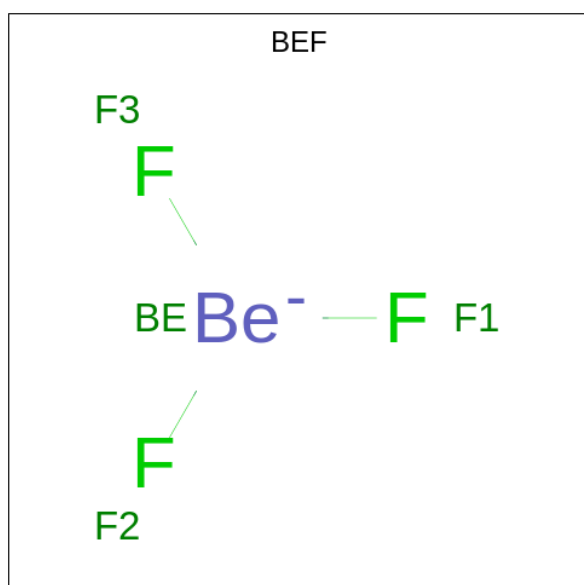
- Molecule 7 is a protein called ATP-dependent DNA helicase DDM1.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	K	452	Total	C	N	O	S	0	0
			3669	2346	657	648	18		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
K	0	SER	-	expression tag	UNP Q9XFH4

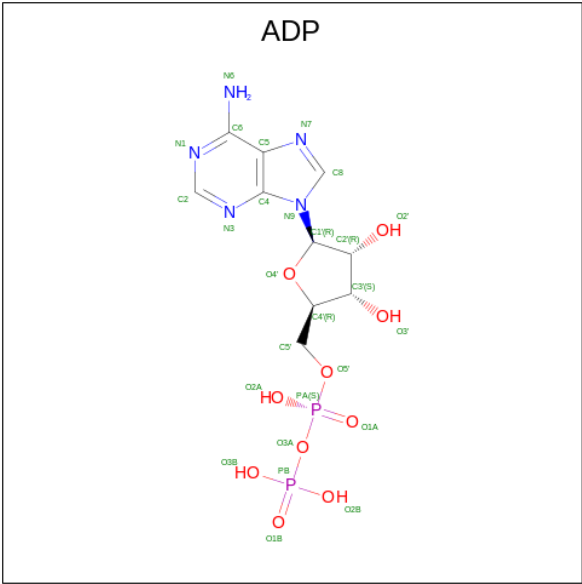
- Molecule 8 is BERYLLIUM TRIFLUORIDE ION (CCD ID: BEF) (formula: BeF₃).



Mol	Chain	Residues	Atoms			AltConf
8	K	1	Total	Be	F	0
			4	1	3	

- Molecule 9 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C₁₀H₁₅N₅O₁₀P₂)

(labeled as "Ligand of Interest" by depositor).

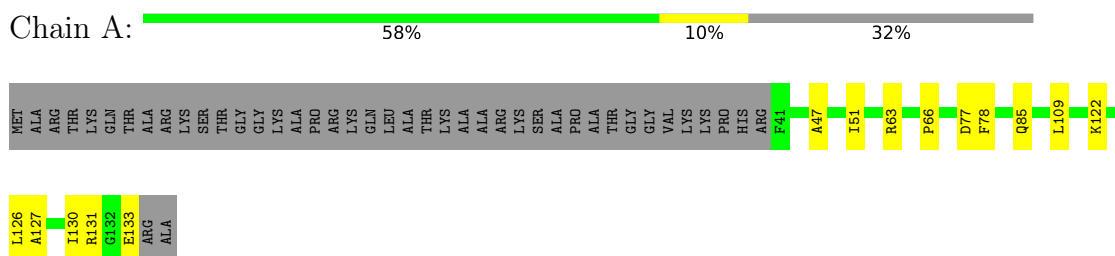


Mol	Chain	Residues	Atoms					AltConf
9	K	1	Total	C	N	O	P	0
			27	10	5	10	2	

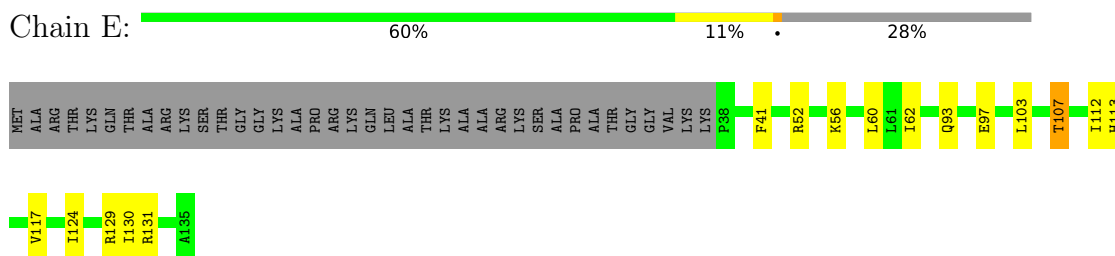
3 Residue-property plots

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. 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.

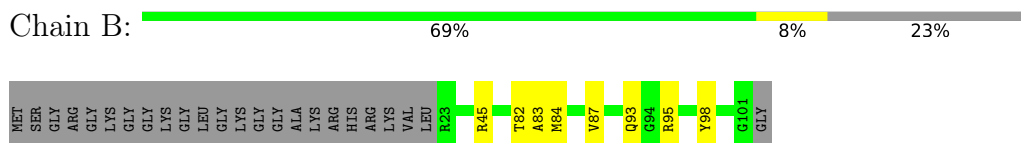
- Molecule 1: Histone H3.1



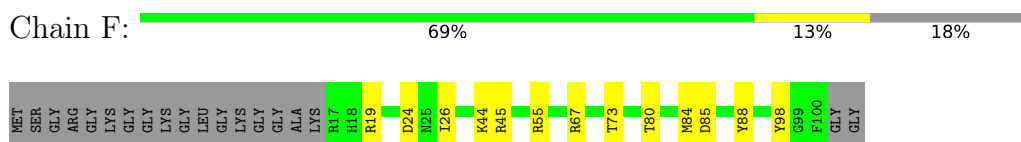
- Molecule 1: Histone H3.1



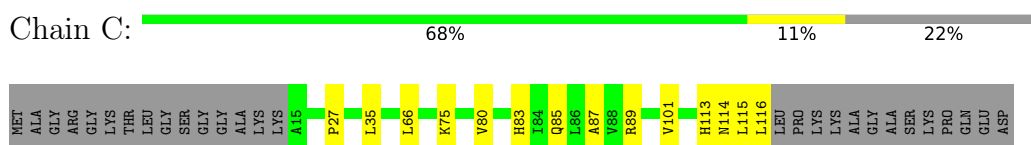
- Molecule 2: Histone H4



- Molecule 2: Histone H4



- Molecule 3: Histone H2A.6



Chain K: 35% 22% 41%

SER	LEU	K667	K551	H462	L372	K267	LEU	LYS	SER
THR	L552	L463	L570	L466	L376	E268	THR	MET	THR
ILE	L553	L467	D571	L468	N377	I269	GLU	VAL	GLU
ALA	D554	L469	L576	L470	F378	F272	GLU	ILE	SER
PRO	V671	L471	L577	L472	I379	I276	THR	THR	ARG
GLY	V672	L473	L578	L474	D382	M277	VAL	ILE	SER
GLU	V673	L475	L579	L476	I383	I280	ILE	ASN	ARG
THR	V674	L477	L580	L478	F384	D289	LYS	GLY	LYS
GLN	V675	L479	L581	L479	T385	E290	GLU	ALA	VAL
ALA	V676	L480	L582	L480	S386	L291	GLN	GLU	ILE
ALA	PHE	L481	L583	L481	H387	R292	ASN	SER	PRO
ALA	HIS	L482	L584	L482	D388	K293	GLU	GLU	ALA
GLU	GLN	L483	L585	L483	E389	F294	GLU	SER	SER
GLU	GLU	L484	L586	L484	F390	K295	GLU	LEU	GLU
GLU	GLU	L485	L587	L485	E391	H296	LEU	LEU	VAL
GLU	GLU	L486	L588	L486	S392	M297	THR	PRO	ASP
GLU	GLU	L487	L589	L487	TRP	P297	GLY	GLU	GLY
GLU	GLU	L488	L590	L488	PHE	F304	GLY	LYS	LYS
GLU	GLU	L489	L591	L489	PHE	P305	LEU	THR	THR
GLU	GLU	L490	L592	L490	GLU	N316	LEU	GLY	GLU
GLU	GLU	L491	L593	L491	LYS	D317	LEU	ARG	LYS
GLU	GLU	L492	L594	L492	ASN	A318	LEU	GLY	ALA
GLU	GLU	L493	L595	L493	LYS	K319	LEU	ASN	ALA
GLU	GLU	L494	L596	L494	ASN	L322	LEU	LYS	SER
GLU	GLU	L495	L597	L495	ALA	Y325	LEU	ALA	PRO
GLU	GLU	L496	L598	L496	THR	P326	LEU	VAL	THR
GLU	GLU	L497	L599	L497	LYS	W327	LEU	ALA	SER
GLU	GLU	L498	L600	L498	THR	K328	LEU	PRO	VAL
GLU	GLU	L499	L601	L499	LYS	Y329	LEU	ASN	VAL
GLU	GLU	L500	L602	L500	LYS	D333	LEU	ASN	GLU
GLU	GLU	L501	L603	L501	ARG	E334	LEU	GLU	GLU
GLU	GLU	L502	L604	L502	ARG	L346	LEU	THR	GLU
GLU	GLU	L503	L605	L503	ALA	L349	LEU	GLN	GLU
GLU	GLU	L504	L606	L504	V416	K350	LEU	LYS	LYS
GLU	GLU	L505	L607	L505	H421	H351	LEU	VAL	LYS
GLU	GLU	L506	L608	L506	R430	L352	LEU	ALA	SER
GLU	GLU	L507	L609	L507	R431	K353	LEU	ALA	VAL
GLU	GLU	L508	L610	L508	M432	M354	LEU	ILE	THR
GLU	GLU	L509	L611	L509	K433	D355	LEU	SER	VAL
GLU	GLU	L510	L612	L510	S439	L359	LEU	ARG	VAL
GLU	GLU	L511	L613	L511	L440	L360	LEU	LYS	GLU
GLU	GLU	L512	L614	L512	P441	T363	LEU	ASP	ILE
GLU	GLU	L513	L615	L513	M452	P364	LEU	GLY	THR
GLU	GLU	L514	L616	L514	Q456	L365	LEU	THR	GLU
GLU	GLU	L515	L617	L515	K457	Q366	LEU	ILE	ALA
GLU	GLU	L516	L618	L516	K458	L369	LEU	ASN	LYS
GLU	GLU	L517	L619	L517	F459	L370	LEU	GLY	ASN
GLU	GLU	L518	L620	L518			LEU	GLU	GLY
GLU	GLU	L519	L621	L519			LEU	GLU	ASP
GLU	GLU	L520	L622	L520			LEU	GLU	ASP
GLU	GLU	L521	L623	L521			LEU	GLU	ASP
GLU	GLU	L522	L624	L522			LEU	GLU	ASP
GLU	GLU	L523	L625	L523			LEU	GLU	ASP
GLU	GLU	L524	L626	L524			LEU	GLU	ASP
GLU	GLU	L525	L627	L525			LEU	GLU	ASP
GLU	GLU	L526	L628	L526			LEU	GLU	ASP
GLU	GLU	L527	L629	L527			LEU	GLU	ASP
GLU	GLU	L528	L630	L528			LEU	GLU	ASP
GLU	GLU	L529	L631	L529			LEU	GLU	ASP
GLU	GLU	L530	L632	L530			LEU	GLU	ASP
GLU	GLU	L531	L633	L531			LEU	GLU	ASP
GLU	GLU	L532	L634	L532			LEU	GLU	ASP
GLU	GLU	L533	L635	L533			LEU	GLU	ASP
GLU	GLU	L534	L636	L534			LEU	GLU	ASP
GLU	GLU	L535	L637	L535			LEU	GLU	ASP
GLU	GLU	L536	L638	L536			LEU	GLU	ASP
GLU	GLU	L537	L639	L537			LEU	GLU	ASP
GLU	GLU	L538	L640	L538			LEU	GLU	ASP
GLU	GLU	L539	L641	L539			LEU	GLU	ASP
GLU	GLU	L540	L642	L540			LEU	GLU	ASP
GLU	GLU	L541	L643	L541			LEU	GLU	ASP
GLU	GLU	L542	L644	L542			LEU	GLU	ASP
GLU	GLU	L543	L645	L543			LEU	GLU	ASP
GLU	GLU	L544	L646	L544			LEU	GLU	ASP
GLU	GLU	L545	L647	L545			LEU	GLU	ASP
GLU	GLU	L546	L648	L546			LEU	GLU	ASP
GLU	GLU	L547	L649	L547			LEU	GLU	ASP
GLU	GLU	L548	L650	L548			LEU	GLU	ASP
GLU	GLU	L549	L651	L549			LEU	GLU	ASP
GLU	GLU	L550	L652	L550			LEU	GLU	ASP
GLU	GLU	L551	L653	L551			LEU	GLU	ASP
GLU	GLU	L552	L654	L552			LEU	GLU	ASP
GLU	GLU	L553	L655	L553			LEU	GLU	ASP
GLU	GLU	L554	L656	L554			LEU	GLU	ASP
GLU	GLU	L555	L657	L555			LEU	GLU	ASP
GLU	GLU	L556	L658	L556			LEU	GLU	ASP
GLU	GLU	L557	L659	L557			LEU	GLU	ASP
GLU	GLU	L558	L660	L558			LEU	GLU	ASP
GLU	GLU	L559	L661	L559			LEU	GLU	ASP
GLU	GLU	L560	L662	L560			LEU	GLU	ASP
GLU	GLU	L561	L663	L561			LEU	GLU	ASP
GLU	GLU	L562	L664	L562			LEU	GLU	ASP
GLU	GLU	L563	L665	L563			LEU	GLU	ASP
GLU	GLU	L564	L666	L564			LEU	GLU	ASP
GLU	GLU	L565	L667	L565			LEU	GLU	ASP
GLU	GLU	L566	L668	L566			LEU	GLU	ASP
GLU	GLU	L567	L669	L567			LEU	GLU	ASP
GLU	GLU	L568	L670	L568			LEU	GLU	ASP
GLU	GLU	L569	L671	L569			LEU	GLU	ASP
GLU	GLU	L570	L672	L570			LEU	GLU	ASP
GLU	GLU	L571	L673	L571			LEU	GLU	ASP
GLU	GLU	L572	L674	L572			LEU	GLU	ASP
GLU	GLU	L573	L675	L573			LEU	GLU	ASP
GLU	GLU	L574	L676	L574			LEU	GLU	ASP
GLU	GLU	L575	L677	L575			LEU	GLU	ASP
GLU	GLU	L576	L678	L576			LEU	GLU	ASP
GLU	GLU	L577	L679	L577			LEU	GLU	ASP
GLU	GLU	L578	L680	L578			LEU	GLU	ASP
GLU	GLU	L579	L681	L579			LEU	GLU	ASP
GLU	GLU	L580	L682	L580			LEU	GLU	ASP
GLU	GLU	L581	L683	L581			LEU	GLU	ASP
GLU	GLU	L582	L684	L582			LEU	GLU	ASP
GLU	GLU	L583	L685	L583			LEU	GLU	ASP
GLU	GLU	L584	L686	L584			LEU	GLU	ASP
GLU	GLU	L585	L687	L585			LEU	GLU	ASP
GLU	GLU	L586	L688	L586			LEU	GLU	ASP
GLU	GLU	L587	L689	L587			LEU	GLU	ASP
GLU	GLU	L588	L690	L588			LEU	GLU	ASP
GLU	GLU	L589	L691	L589			LEU	GLU	ASP
GLU	GLU	L590	L692	L590			LEU	GLU	ASP
GLU	GLU	L591	L693	L591			LEU	GLU	ASP
GLU	GLU	L592	L694	L592			LEU	GLU	ASP
GLU	GLU	L593	L695	L593			LEU	GLU	ASP
GLU	GLU	L594	L696	L594			LEU	GLU	ASP
GLU	GLU	L595	L697	L595			LEU	GLU	ASP
GLU	GLU	L596	L698	L596			LEU	GLU	ASP
GLU	GLU	L597	L699	L597			LEU	GLU	ASP
GLU	GLU	L598	L700	L598			LEU	GLU	ASP
GLU	GLU	L599	L701	L599			LEU	GLU	ASP
GLU	GLU	L600	L702	L600			LEU	GLU	ASP
GLU	GLU	L601	L703	L601			LEU	GLU	ASP
GLU	GLU	L602	L704	L602			LEU	GLU	ASP
GLU	GLU	L603	L705	L603			LEU	GLU	ASP
GLU	GLU	L604	L706	L604			LEU	GLU	ASP
GLU	GLU	L605	L707	L605			LEU	GLU	ASP
GLU	GLU	L606	L708	L606			LEU	GLU	ASP
GLU	GLU	L607	L709	L607			LEU	GLU	ASP
GLU	GLU	L608	L710	L608			LEU	GLU	ASP
GLU	GLU	L609	L711	L609			LEU	GLU	ASP
GLU	GLU	L610	L712	L610			LEU	GLU	ASP
GLU	GLU	L611	L713	L611			LEU	GLU	ASP
GLU	GLU	L612	L714	L612			LEU	GLU	ASP
GLU	GLU	L613	L715	L613			LEU	GLU	ASP
GLU	GLU	L614	L716	L614			LEU	GLU	ASP
GLU	GLU	L615	L717	L615			LEU	GLU	ASP
GLU	GLU	L616	L718	L616			LEU	GLU	ASP
GLU	GLU	L617	L719	L617			LEU	GLU	ASP
GLU	GLU	L618	L720	L618			LEU	GLU	ASP
GLU	GLU	L619	L721	L619			LEU	GLU	ASP
GLU	GLU	L620	L722	L620			LEU	GLU	ASP
GLU	GLU	L621	L723	L621			LEU	GLU	ASP
GLU	GLU	L622	L724	L622			LEU	GLU	ASP
GLU	GLU	L623	L725	L623			LEU	GLU	ASP
GLU	GLU	L624	L726	L624			LEU	GLU	ASP
GLU	GLU	L625	L727	L625			LEU	GLU	ASP
GLU	GLU	L626	L728	L626			LEU	GLU	ASP
GLU	GLU	L627	L729	L627			LEU	GLU	ASP
GLU	GLU	L628	L730	L628			LEU	GLU	ASP
GLU	GLU	L629	L731	L629			LEU	GLU	ASP
GLU	GLU	L630	L732	L630			LEU	GLU	ASP
GLU	GLU	L631	L733	L631			LEU	GLU	ASP
GLU	GLU	L632	L734	L632			LEU	GLU	ASP
GLU	GLU	L633	L735	L633			LEU	GLU	ASP
GLU	GLU	L634	L736	L634			LEU	GLU	ASP
GLU	GLU	L635	L737	L635			LEU	GLU	ASP
GLU	GLU	L636	L738	L636			LEU	GLU	ASP
GLU	GLU	L637	L739	L637			LEU	GLU	ASP
GLU	GLU	L638	L740	L638			LEU	GLU	ASP
GLU	GLU	L639	L741	L639			LEU	GLU	ASP
GLU	GLU	L640	L742	L640			LEU	GLU	ASP

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	156597	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality

5.1 Standard geometry

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

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	0.32	0/765	0.65	0/1027
1	E	0.34	0/811	0.69	1/1088 (0.1%)
2	B	0.50	0/643	0.67	1/861 (0.1%)
2	F	0.45	0/696	0.58	0/931
3	C	0.42	0/778	0.66	0/1051
3	G	0.50	0/760	0.64	0/1026
4	D	0.36	0/705	0.59	0/947
4	H	0.30	0/727	0.59	0/977
5	I	0.32	0/3242	0.63	2/4996 (0.0%)
6	J	0.33	0/3288	0.66	6/5078 (0.1%)
7	K	0.87	0/3746	1.18	19/5050 (0.4%)
All	All	0.53	0/16161	0.79	29/23032 (0.1%)

There are no bond length outliers.

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	J	9	DT	C2'-C3'-O3'	9.32	125.48	111.50
1	E	107	THR	N-CA-C	-9.06	102.22	113.18
5	I	126	DG	C2'-C3'-O3'	8.68	124.52	111.50
7	K	293	ARG	N-CA-C	-8.58	102.98	113.19
6	J	97	DG	C2'-C3'-O3'	8.53	124.29	111.50
6	J	24	DT	C2'-C3'-O3'	8.24	123.86	111.50
7	K	667	LYS	N-CA-C	-7.24	102.42	111.11
6	J	138	DG	C2'-C3'-O3'	6.62	121.44	111.50
7	K	674	GLY	N-CA-C	-6.52	104.91	112.73
7	K	671	VAL	N-CA-C	-6.18	103.37	111.09
7	K	621	ASP	N-CA-C	6.12	116.64	108.38
7	K	243	HIS	CA-C-N	-6.09	110.84	122.53
7	K	243	HIS	C-N-CA	-6.09	110.84	122.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	K	519	ILE	N-CA-C	-6.07	104.06	112.50
7	K	277	ASN	CA-C-O	-6.05	115.19	120.88
7	K	537	PHE	N-CA-C	-5.93	105.14	112.90
7	K	667	LYS	N-CA-CB	5.91	118.75	109.94
7	K	251	GLY	CA-C-N	-5.85	113.19	120.79
7	K	251	GLY	C-N-CA	-5.85	113.19	120.79
7	K	382	ASP	N-CA-C	-5.85	106.00	113.01
6	J	138	DG	C4'-C3'-O3'	5.81	118.71	110.00
7	K	511	TYR	N-CA-C	-5.42	104.77	111.33
6	J	15	DT	C2'-C3'-O3'	5.38	119.57	111.50
7	K	516	VAL	CA-C-O	-5.36	114.69	120.47
7	K	553	LEU	N-CA-C	-5.27	105.54	111.28
2	B	84	MET	N-CA-C	-5.18	107.10	113.41
7	K	471	HIS	N-CA-C	-5.14	105.68	111.28
5	I	132	DG	C4'-C3'-O3'	5.03	117.54	110.00
7	K	240	PHE	CA-CB-CG	5.01	118.81	113.80

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	755	0	794	18	0
1	E	799	0	840	19	0
2	B	636	0	675	6	0
2	F	688	0	738	12	0
3	C	768	0	804	16	0
3	G	750	0	787	16	0
4	D	694	0	734	7	0
4	H	716	0	754	16	0
5	I	2893	0	1592	88	0
6	J	2929	0	1595	84	0
7	K	3669	0	3755	136	0
8	K	4	0	0	0	0
9	K	27	0	12	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	15328	0	13080	369	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 13.

All (369) 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)
6:J:133:DA:H2''	6:J:134:DC:H5'	1.20	1.18
7:K:252:PRO:HB2	7:K:327:TRP:HA	1.51	0.92
7:K:227:ASP:CG	7:K:431:ARG:HH11	1.77	0.91
7:K:383:ILE:HG22	7:K:383:ILE:O	1.71	0.88
7:K:384:PHE:CD1	7:K:385:THR:N	2.42	0.86
6:J:133:DA:C2'	6:J:134:DC:H5'	2.06	0.84
5:I:112:DT:H2'	5:I:113:DA:C8	2.15	0.81
5:I:5:DA:H2''	5:I:6:DG:C8	2.21	0.75
6:J:52:DG:H2''	6:J:53:DG:H5''	1.68	0.74
7:K:227:ASP:CG	7:K:431:ARG:NH1	2.48	0.71
5:I:99:DG:H2'	5:I:100:DG:C8	2.28	0.68
7:K:233:LYS:O	7:K:237:THR:HG23	1.95	0.67
5:I:95:DC:H2'	5:I:96:DC:C6	2.31	0.65
6:J:44:DA:H2''	6:J:45:DT:H5'	1.78	0.65
7:K:383:ILE:O	7:K:384:PHE:C	2.40	0.65
2:F:26:ILE:HG13	2:F:55:ARG:HG2	1.79	0.65
7:K:383:ILE:O	7:K:383:ILE:CG2	2.42	0.65
5:I:115:DT:H2''	5:I:116:DC:O5'	1.97	0.64
7:K:599:SER:HB3	7:K:602:ALA:HB2	1.80	0.64
7:K:237:THR:HA	7:K:240:PHE:CD2	2.32	0.64
7:K:372:LEU:O	7:K:376:LEU:HG	1.98	0.64
6:J:40:DA:H2''	6:J:41:DG:C8	2.34	0.63
3:G:30:ARG:NH1	4:H:61:THR:O	2.32	0.63
6:J:53:DG:H2'	6:J:54:DG:O4'	1.98	0.63
6:J:57:DG:H2''	6:J:58:DT:C5	2.32	0.63
7:K:552:LEU:HD21	7:K:618:TYR:CD2	2.33	0.63
1:A:131:ARG:HG2	1:E:130:ILE:O	1.99	0.62
7:K:525:LYS:HE3	7:K:618:TYR:CZ	2.34	0.62
2:B:98:TYR:CE2	3:C:101:VAL:HG11	2.34	0.62
5:I:114:DG:H2''	5:I:115:DT:H5'	1.81	0.62
6:J:18:DG:H1'	6:J:19:DA:N9	2.14	0.62
5:I:95:DC:H2'	5:I:96:DC:H6	1.64	0.62
7:K:542:LYS:HB2	7:K:612:ALA:HA	1.80	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:66:PRO:HD3	5:I:91:DC:H5''	1.83	0.61
5:I:90:DA:C6	6:J:57:DG:C6	2.89	0.61
6:J:121:DA:H2'	6:J:122:DG:C8	2.36	0.60
7:K:462:HIS:HB2	7:K:468:LEU:HD13	1.83	0.60
5:I:39:DA:H2'	5:I:40:DG:C8	2.36	0.60
5:I:98:DA:H3'	5:I:99:DG:H21	1.66	0.60
6:J:19:DA:H2'	6:J:20:DC:C5	2.37	0.60
7:K:488:ASN:O	7:K:489:LEU:C	2.45	0.60
7:K:433:LYS:HZ1	7:K:440:LEU:HD12	1.66	0.60
5:I:29:DA:H2'	5:I:30:DA:C8	2.38	0.59
1:A:122:LYS:HG2	1:E:113:HIS:NE2	2.17	0.59
7:K:458:LYS:O	7:K:462:HIS:ND1	2.34	0.59
5:I:26:DC:H2''	5:I:27:DT:O5'	2.02	0.59
5:I:48:DT:H2''	5:I:49:DA:O4'	2.03	0.59
1:E:60:LEU:HD11	1:E:93:GLN:HG2	1.83	0.59
7:K:516:VAL:HB	7:K:519:ILE:HG12	1.85	0.58
5:I:102:DG:H2''	5:I:103:DA:C8	2.38	0.58
3:G:64:LEU:HD13	4:H:70:LEU:HB2	1.85	0.58
3:C:116:LEU:HD13	1:E:112:ILE:HD11	1.85	0.58
5:I:98:DA:H3'	5:I:99:DG:N2	2.19	0.58
7:K:675:GLN:O	7:K:676:GLY:C	2.46	0.58
5:I:6:DG:H2'	5:I:7:DA:O4'	2.03	0.58
5:I:41:DA:H2'	5:I:42:DC:C6	2.39	0.57
5:I:119:DC:H42	6:J:29:DG:H1	1.52	0.57
6:J:55:DC:H4'	6:J:56:DG:OP1	2.04	0.57
2:F:73:THR:OG1	2:F:85:ASP:OD2	2.22	0.57
3:C:113:HIS:ND1	1:E:112:ILE:HD13	2.20	0.57
5:I:40:DG:H2'	5:I:41:DA:C8	2.40	0.57
7:K:617:LEU:HD13	7:K:627:ASP:CG	2.30	0.57
6:J:6:DA:H2'	6:J:7:DT:O4'	2.04	0.57
6:J:50:DT:H1'	6:J:51:DT:H5'	1.87	0.57
6:J:142:DC:H2''	6:J:143:DT:C6	2.39	0.56
6:J:52:DG:H2'	6:J:53:DG:H21	1.69	0.56
6:J:18:DG:H1'	6:J:19:DA:C8	2.41	0.56
6:J:52:DG:H5''	6:J:52:DG:N3	2.20	0.56
5:I:26:DC:H4'	5:I:27:DT:OP1	2.04	0.56
7:K:477:ILE:HG13	7:K:508:ASP:HB2	1.88	0.56
7:K:670:HIS:HA	7:K:673:ILE:HD12	1.86	0.56
6:J:40:DA:H2''	6:J:41:DG:H5'	1.88	0.56
1:A:47:ALA:O	1:A:51:ILE:HD12	2.05	0.56
7:K:441:PRO:HB2	7:K:642:PRO:HB3	1.86	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:K:266:PHE:HD2	7:K:280:ILE:HG23	1.70	0.55
7:K:546:PHE:CE2	7:K:630:ALA:HB1	2.41	0.55
2:B:93:GLN:OE1	2:B:95:ARG:HD2	2.07	0.55
5:I:130:DC:H3'	5:I:131:DA:C8	2.41	0.55
7:K:473:GLY:HA2	7:K:476:ALA:HB2	1.89	0.55
6:J:24:DT:H2'	6:J:25:DG:C8	2.42	0.54
7:K:519:ILE:HG23	7:K:522:GLN:OE1	2.05	0.54
7:K:571:ASP:HA	7:K:602:ALA:HB1	1.90	0.54
3:C:116:LEU:HD12	3:C:116:LEU:H	1.71	0.54
6:J:52:DG:H2''	6:J:53:DG:C5'	2.38	0.54
7:K:463:LEU:HD23	7:K:493:LEU:HD23	1.89	0.54
7:K:205:TYR:HB2	7:K:431:ARG:HE	1.72	0.54
3:G:27:PRO:HD3	4:H:65:TYR:CG	2.43	0.54
6:J:38:DG:H2''	6:J:39:DG:N7	2.22	0.54
1:A:127:ALA:O	1:A:131:ARG:HG3	2.08	0.53
3:C:27:PRO:HG3	4:D:65:TYR:CE2	2.43	0.53
5:I:39:DA:H2'	5:I:40:DG:H8	1.72	0.53
4:H:58:SER:N	6:J:123:DC:H4'	2.23	0.53
6:J:16:DC:H2'	6:J:17:DT:C6	2.44	0.53
7:K:421:HIS:CE1	7:K:675:GLN:O	2.62	0.53
7:K:623:ASN:HB3	7:K:626:MET:HG2	1.90	0.53
7:K:631:MET:HE3	7:K:645:VAL:HG21	1.91	0.53
1:E:60:LEU:HD12	1:E:97:GLU:OE1	2.08	0.53
6:J:11:DT:H2''	6:J:12:DA:O5'	2.09	0.53
7:K:235:ILE:HG22	7:K:235:ILE:O	2.09	0.53
7:K:292:ARG:C	7:K:294:LYS:H	2.17	0.53
5:I:118:DC:H2''	5:I:119:DC:C6	2.44	0.52
1:E:41:PHE:HD2	6:J:84:DG:OP1	1.92	0.52
7:K:226:ALA:HB3	7:K:430:ARG:HG2	1.91	0.52
7:K:227:ASP:OD1	7:K:431:ARG:NH1	2.31	0.52
7:K:237:THR:HA	7:K:240:PHE:CE2	2.45	0.52
7:K:322:LEU:CD1	7:K:351:HIS:O	2.57	0.52
5:I:121:DG:H5''	5:I:121:DG:H8	1.75	0.52
5:I:130:DC:H2'	5:I:131:DA:C5	2.44	0.52
7:K:489:LEU:O	7:K:490:VAL:C	2.53	0.52
6:J:25:DG:H2''	6:J:26:DC:OP1	2.08	0.52
4:H:66:ILE:HB	4:H:84:MET:HE1	1.91	0.52
7:K:333:ASP:HA	7:K:360:LEU:HD12	1.92	0.52
3:C:89:ARG:NH2	3:C:101:VAL:O	2.39	0.52
7:K:292:ARG:C	7:K:294:LYS:N	2.65	0.52
5:I:145:DG:H2''	5:I:146:DA:C8	2.45	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:I:37:DG:O6	6:J:110:DA:N6	2.43	0.51
6:J:40:DA:H2''	6:J:41:DG:H8	1.75	0.51
7:K:334:GLU:OE1	7:K:605:LEU:HD21	2.10	0.51
7:K:363:THR:HG21	7:K:625:GLN:HE21	1.75	0.51
7:K:252:PRO:C	7:K:327:TRP:HE3	2.19	0.51
3:G:27:PRO:HD3	4:H:65:TYR:CD1	2.45	0.51
5:I:112:DT:H2'	5:I:113:DA:H8	1.69	0.51
6:J:111:DC:H2''	6:J:112:DG:C8	2.46	0.51
5:I:144:DC:H2''	5:I:145:DG:C8	2.46	0.51
7:K:235:ILE:HD12	7:K:272:PHE:CE1	2.46	0.51
7:K:459:PHE:CZ	7:K:472:LEU:HD21	2.45	0.51
3:C:113:HIS:CE1	1:E:112:ILE:HG21	2.45	0.51
6:J:48:DC:H1'	6:J:49:DC:H5'	1.92	0.51
7:K:365:LEU:HD11	7:K:372:LEU:HD13	1.92	0.51
7:K:544:LEU:HD21	7:K:609:LEU:HD12	1.93	0.51
7:K:599:SER:HB3	7:K:602:ALA:CB	2.40	0.51
7:K:391:GLU:O	7:K:416:VAL:HG11	2.11	0.51
5:I:15:DT:H2'	5:I:16:DG:C8	2.45	0.50
5:I:82:DC:H2''	5:I:83:DG:C8	2.45	0.50
7:K:359:LEU:HD12	7:K:379:ILE:HB	1.92	0.50
5:I:119:DC:N4	6:J:29:DG:H1	2.10	0.50
6:J:54:DG:H2'	6:J:55:DC:C6	2.46	0.50
3:G:66:LEU:HB3	3:G:87:ALA:HB1	1.93	0.50
7:K:482:TRP:CZ2	7:K:506:GLN:HB2	2.47	0.50
2:F:45:ARG:CD	6:J:70:DG:H5''	2.41	0.50
5:I:26:DC:H2'	5:I:27:DT:C5	2.47	0.50
7:K:252:PRO:C	7:K:327:TRP:CE3	2.90	0.50
7:K:363:THR:CG2	7:K:625:GLN:HE21	2.25	0.50
6:J:20:DC:H1'	6:J:21:DA:H5'	1.94	0.49
2:F:24:ASP:OD1	2:F:24:ASP:N	2.44	0.49
6:J:56:DG:C6	6:J:57:DG:C6	3.00	0.49
7:K:213:LEU:HD22	7:K:240:PHE:CD2	2.47	0.49
3:C:27:PRO:HD3	4:D:65:TYR:CG	2.47	0.49
7:K:570:ILE:HD13	7:K:579:ARG:HB2	1.94	0.49
7:K:622:TRP:CE3	7:K:622:TRP:HA	2.46	0.49
6:J:141:DT:H2''	6:J:142:DC:H5'	1.94	0.49
3:G:36:LYS:HE3	3:G:44:VAL:HB	1.94	0.49
6:J:55:DC:H2''	6:J:56:DG:C5'	2.43	0.49
5:I:109:DC:H2''	5:I:110:DC:C5	2.47	0.49
3:C:116:LEU:HD11	1:E:117:VAL:HG12	1.95	0.48
3:G:18:ARG:O	3:G:21:LYS:HG2	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:K:459:PHE:CE1	7:K:472:LEU:HD11	2.48	0.48
7:K:468:LEU:HD12	7:K:472:LEU:HD13	1.95	0.48
7:K:513:TYR:O	7:K:514:PRO:C	2.55	0.48
2:B:83:ALA:O	2:B:87:VAL:HG23	2.13	0.48
7:K:624:PRO:HD3	7:K:665:LYS:HD3	1.94	0.48
5:I:68:DT:H2''	5:I:69:DA:C8	2.48	0.48
6:J:129:DC:H2''	6:J:130:DG:C8	2.47	0.48
6:J:59:DT:H2'	6:J:60:DA:C8	2.49	0.48
7:K:252:PRO:HG3	7:K:325:TYR:HB2	1.96	0.48
7:K:252:PRO:HD2	7:K:328:LYS:HG2	1.95	0.48
5:I:116:DC:H2''	5:I:117:DT:H5'	1.95	0.48
6:J:57:DG:H2''	6:J:58:DT:C6	2.48	0.48
7:K:235:ILE:HG12	9:K:802:ADP:O1A	2.14	0.48
7:K:544:LEU:N	7:K:614:THR:O	2.47	0.48
5:I:37:DG:C6	6:J:110:DA:N6	2.81	0.48
7:K:494:ARG:HH22	7:K:548:GLN:HG3	1.79	0.48
6:J:30:DG:H2'	6:J:31:DA:C8	2.48	0.48
1:A:126:LEU:HD22	1:E:113:HIS:CG	2.49	0.48
5:I:100:DG:H2'	5:I:101:DG:N2	2.29	0.48
7:K:209:GLY:CA	7:K:431:ARG:HH22	2.27	0.48
2:F:19:ARG:HH22	7:K:514:PRO:HD3	1.79	0.48
5:I:55:DG:H1	6:J:93:DC:H42	1.61	0.48
7:K:666:LEU:O	7:K:669:GLU:HB2	2.14	0.48
1:A:127:ALA:HA	1:E:130:ILE:HD12	1.95	0.47
6:J:50:DT:H72	6:J:51:DT:C2	2.48	0.47
6:J:57:DG:H2''	6:J:58:DT:C7	2.44	0.47
6:J:142:DC:H2''	6:J:143:DT:C5	2.49	0.47
7:K:672:VAL:O	7:K:675:GLN:HB2	2.15	0.47
5:I:95:DC:H2''	5:I:96:DC:O5'	2.15	0.47
1:A:85:GLN:HG3	2:F:80:THR:CG2	2.44	0.47
1:A:109:LEU:HD13	1:E:129:ARG:HE	1.79	0.47
1:A:130:ILE:HD12	1:E:130:ILE:HD11	1.96	0.47
7:K:229:MET:HA	7:K:233:LYS:NZ	2.30	0.47
1:A:85:GLN:HG3	2:F:80:THR:HG22	1.97	0.47
3:C:113:HIS:HD1	1:E:112:ILE:HD13	1.79	0.47
2:F:84:MET:HG3	2:F:88:TYR:CE2	2.49	0.47
4:H:61:THR:OG1	4:H:63:LYS:HG2	2.15	0.47
7:K:622:TRP:HA	7:K:622:TRP:HE3	1.78	0.47
5:I:114:DG:H2'	5:I:115:DT:C6	2.50	0.46
1:A:131:ARG:HB2	1:A:133:GLU:OE1	2.15	0.46
7:K:666:LEU:O	7:K:669:GLU:N	2.48	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:K:669:GLU:O	7:K:673:ILE:HG13	2.15	0.46
1:E:52:ARG:O	1:E:56:LYS:HG2	2.16	0.46
5:I:48:DT:H2'	5:I:49:DA:C8	2.50	0.46
7:K:388:ASP:OD1	7:K:388:ASP:O	2.33	0.46
1:A:66:PRO:CD	5:I:91:DC:H5''	2.46	0.46
1:E:62:ILE:HG13	1:E:97:GLU:OE2	2.15	0.46
3:G:27:PRO:HG3	4:H:65:TYR:CE2	2.51	0.46
7:K:210:VAL:HG12	7:K:214:ILE:HD11	1.97	0.46
7:K:666:LEU:HA	7:K:669:GLU:HB2	1.96	0.46
5:I:116:DC:H2'	5:I:117:DT:C7	2.46	0.46
7:K:366:GLN:CB	7:K:625:GLN:HG3	2.46	0.46
7:K:318:ALA:O	7:K:319:LYS:C	2.59	0.46
1:A:77:ASP:OD1	1:A:77:ASP:N	2.49	0.46
4:D:110:LYS:HA	4:D:110:LYS:HE3	1.98	0.46
7:K:433:LYS:HD2	7:K:433:LYS:HA	1.83	0.46
5:I:93:DG:N2	6:J:56:DG:C6	2.84	0.45
7:K:636:ARG:O	7:K:637:ILE:C	2.58	0.45
7:K:369:LEU:HD13	7:K:391:GLU:OE2	2.16	0.45
7:K:621:ASP:HB2	7:K:658:VAL:CG1	2.47	0.45
5:I:13:DG:H2'	5:I:14:DG:C8	2.50	0.45
6:J:135:DC:H2''	6:J:136:DG:O5'	2.17	0.45
7:K:440:LEU:HB3	7:K:635:HIS:CE1	2.52	0.45
3:G:48:ALA:HB3	3:G:49:PRO:HD3	1.99	0.45
4:H:60:GLU:HA	6:J:123:DC:OP1	2.16	0.45
4:H:114:ILE:HA	4:H:118:GLU:OE2	2.17	0.45
5:I:27:DT:H1'	5:I:28:DC:C2	2.51	0.45
7:K:228:GLN:HE21	7:K:433:LYS:HG2	1.82	0.45
7:K:599:SER:O	7:K:602:ALA:HB3	2.17	0.45
4:H:138:GLU:O	4:H:141:LYS:HB3	2.17	0.45
5:I:8:DA:H5''	5:I:9:DT:H71	1.98	0.45
6:J:43:DA:H2'	6:J:44:DA:C8	2.52	0.45
7:K:244:LEU:O	7:K:245:LYS:C	2.59	0.45
7:K:431:ARG:O	7:K:432:MET:SD	2.75	0.45
5:I:17:DC:H2''	5:I:18:DC:C5	2.52	0.45
6:J:7:DT:H2''	6:J:8:DG:H5'	1.99	0.45
6:J:2:DT:H2''	6:J:3:DC:OP2	2.16	0.44
7:K:366:GLN:HB3	7:K:625:GLN:HG3	1.99	0.44
5:I:36:DC:H2''	5:I:37:DG:C8	2.52	0.44
5:I:93:DG:N2	6:J:56:DG:C5	2.85	0.44
6:J:59:DT:C4	6:J:60:DA:C6	3.05	0.44
6:J:97:DG:H2''	6:J:98:DC:H5'	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:J:135:DC:H2'	6:J:136:DG:C8	2.53	0.44
7:K:547:SER:OG	7:K:548:GLN:N	2.49	0.44
1:A:78:PHE:CE1	2:F:67:ARG:HG3	2.53	0.44
2:B:93:GLN:OE1	2:B:95:ARG:NH1	2.50	0.44
4:D:76:ASP:OD1	4:D:76:ASP:N	2.47	0.44
7:K:456:GLN:OE1	7:K:523:CYS:HA	2.18	0.44
7:K:490:VAL:HG22	7:K:657:ARG:HH22	1.83	0.44
5:I:8:DA:H3'	5:I:9:DT:H71	1.99	0.44
5:I:16:DG:H2''	5:I:17:DC:H5'	2.00	0.44
5:I:27:DT:H2''	5:I:28:DC:C5	2.53	0.44
1:E:103:LEU:O	1:E:107:THR:HG23	2.17	0.44
5:I:140:DC:H2''	5:I:141:DA:OP2	2.16	0.44
6:J:101:DG:H2'	6:J:102:DA:C8	2.52	0.44
7:K:295:HIS:HB2	7:K:305:PRO:HD3	1.99	0.44
3:C:80:VAL:HG22	3:C:83:HIS:CE1	2.53	0.44
5:I:99:DG:H4'	5:I:100:DG:OP1	2.18	0.44
5:I:109:DC:H2''	5:I:110:DC:C6	2.53	0.44
7:K:205:TYR:HB2	7:K:431:ARG:NE	2.32	0.44
3:C:114:ASN:CG	3:C:115:LEU:H	2.26	0.44
2:F:98:TYR:CD2	3:G:101:VAL:HG11	2.53	0.44
4:H:105:LEU:HD21	4:H:121:THR:OG1	2.18	0.44
3:G:26:PHE:CD1	3:G:57:GLU:HB3	2.53	0.44
6:J:16:DC:H2''	6:J:17:DT:O4'	2.18	0.43
6:J:119:DT:H1'	6:J:120:DG:C8	2.53	0.43
7:K:632:ASP:O	7:K:633:ARG:C	2.61	0.43
1:E:107:THR:CG2	1:E:124:ILE:HA	2.48	0.43
2:F:44:LYS:HE2	3:G:115:LEU:HB3	1.99	0.43
5:I:77:DT:H2''	5:I:78:DC:C6	2.54	0.43
5:I:101:DG:H1'	5:I:102:DG:H5'	2.00	0.43
7:K:326:PRO:HB3	7:K:355:ASP:OD2	2.18	0.43
7:K:366:GLN:HB3	7:K:625:GLN:CG	2.48	0.43
7:K:617:LEU:HD13	7:K:627:ASP:OD2	2.19	0.43
4:D:112:PRO:HD2	6:J:40:DA:OP1	2.18	0.43
7:K:227:ASP:OD1	7:K:431:ARG:HG3	2.18	0.43
7:K:544:LEU:HD12	7:K:544:LEU:HA	1.85	0.43
7:K:633:ARG:HA	7:K:633:ARG:NE	2.33	0.43
1:A:122:LYS:HB3	1:A:122:LYS:HE2	1.79	0.43
3:G:84:ILE:HD11	4:H:83:ALA:HB1	2.00	0.43
5:I:131:DA:OP2	5:I:131:DA:H2'	2.18	0.43
6:J:56:DG:C5	6:J:57:DG:C5	3.06	0.43
7:K:295:HIS:ND1	7:K:304:PHE:HD1	2.15	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:I:90:DA:H2	6:J:58:DT:O2	2.01	0.43
7:K:289:ASP:OD1	7:K:290:GLU:N	2.52	0.43
5:I:10:DC:H1'	5:I:11:DC:H5'	2.00	0.43
3:C:85:GLN:NE2	3:C:89:ARG:HG3	2.34	0.43
6:J:9:DT:H2''	6:J:10:DA:C8	2.53	0.43
3:C:75:LYS:HG3	3:C:75:LYS:O	2.19	0.43
5:I:80:DC:H2''	5:I:81:DC:C5	2.54	0.43
5:I:129:DT:H2''	5:I:130:DC:C6	2.54	0.42
6:J:18:DG:O3'	6:J:19:DA:O4'	2.37	0.42
3:G:80:VAL:HG22	3:G:83:HIS:CE1	2.54	0.42
5:I:74:DC:H2'	5:I:75:DT:H71	1.99	0.42
5:I:95:DC:C2	6:J:54:DG:N2	2.87	0.42
6:J:136:DG:H2''	6:J:137:DG:H5'	2.01	0.42
7:K:268:GLU:OE2	7:K:272:PHE:HB2	2.19	0.42
7:K:385:THR:C	7:K:387:HIS:H	2.27	0.42
7:K:483:LYS:HD2	7:K:485:LYS:NZ	2.34	0.42
1:A:130:ILE:HG22	1:E:131:ARG:HG3	2.00	0.42
3:G:103:ILE:O	3:G:104:ALA:C	2.61	0.42
7:K:217:TRP:CD1	7:K:329:TYR:HH	2.37	0.42
6:J:22:DC:H2''	6:J:23:DG:H5'	2.01	0.42
7:K:546:PHE:HA	7:K:598:LEU:O	2.19	0.42
3:C:66:LEU:HB3	3:C:87:ALA:HB1	2.02	0.42
4:D:123:VAL:HG13	4:D:127:LEU:HD12	2.02	0.42
4:H:82:LYS:O	4:H:86:ILE:HG12	2.20	0.42
5:I:10:DC:H2''	5:I:11:DC:OP2	2.16	0.42
3:G:54:ALA:O	3:G:57:GLU:HG3	2.20	0.42
4:H:64:ILE:HG22	4:H:68:LYS:HE2	2.00	0.42
7:K:227:ASP:OD2	7:K:431:ARG:NH1	2.52	0.42
5:I:42:DC:H2'	5:I:43:DA:C8	2.55	0.42
3:C:35:LEU:HD23	3:C:35:LEU:HA	1.89	0.42
2:F:45:ARG:HD2	6:J:70:DG:H5''	2.01	0.42
5:I:121:DG:H2''	5:I:122:DG:C8	2.54	0.42
5:I:137:DA:H2''	5:I:138:DT:O5'	2.20	0.42
5:I:129:DT:H1'	5:I:130:DC:N1	2.36	0.41
5:I:142:DT:H2''	5:I:143:DC:OP2	2.19	0.41
7:K:525:LYS:HE3	7:K:618:TYR:CE2	2.54	0.41
6:J:40:DA:C2'	6:J:41:DG:C8	3.02	0.41
6:J:55:DC:H2''	6:J:56:DG:H5''	2.03	0.41
7:K:346:LEU:HD12	7:K:346:LEU:HA	1.72	0.41
5:I:15:DT:H3'	5:I:16:DG:C8	2.55	0.41
5:I:100:DG:H1'	5:I:101:DG:H5'	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:J:142:DC:H2''	6:J:143:DT:H71	2.01	0.41
7:K:585:ASP:O	7:K:586:PHE:C	2.63	0.41
1:A:63:ARG:HA	1:A:63:ARG:HD3	1.77	0.41
4:H:117:ARG:O	4:H:120:GLN:HB2	2.20	0.41
5:I:50:DG:C2	5:I:51:DC:C2	3.08	0.41
5:I:121:DG:C2'	5:I:122:DG:C8	3.03	0.41
7:K:226:ALA:O	7:K:227:ASP:C	2.62	0.41
7:K:387:HIS:C	7:K:389:GLU:H	2.28	0.41
7:K:551:LYS:O	7:K:554:ASP:HB2	2.21	0.41
5:I:79:DC:H2''	5:I:80:DC:C5	2.56	0.41
5:I:101:DG:H1'	5:I:102:DG:C5'	2.51	0.41
7:K:276:ILE:O	7:K:277:ASN:C	2.63	0.41
7:K:478:ARG:HD3	7:K:478:ARG:HA	1.96	0.41
7:K:576:LEU:O	7:K:579:ARG:HG2	2.20	0.41
6:J:96:DT:H2'	6:J:97:DG:O4'	2.20	0.41
7:K:621:ASP:C	7:K:623:ASN:H	2.28	0.41
5:I:13:DG:H2'	5:I:14:DG:H8	1.86	0.41
5:I:48:DT:H2'	5:I:49:DA:H8	1.85	0.41
5:I:97:DA:H2''	5:I:98:DA:O4'	2.21	0.41
7:K:349:LEU:HG	7:K:354:MET:HE1	2.02	0.41
7:K:666:LEU:O	7:K:670:HIS:N	2.53	0.41
5:I:66:DC:H2''	5:I:67:DG:C8	2.55	0.41
5:I:97:DA:N6	6:J:52:DG:O6	2.53	0.41
6:J:68:DG:H2''	6:J:69:DG:C8	2.56	0.41
6:J:98:DC:H2''	6:J:99:DT:OP2	2.20	0.41
6:J:133:DA:H2'	6:J:134:DC:C6	2.56	0.41
6:J:137:DG:H2''	6:J:138:DG:H8	1.86	0.41
7:K:210:VAL:HA	7:K:240:PHE:CE1	2.56	0.41
7:K:234:THR:HG22	7:K:265:TRP:CZ2	2.56	0.41
7:K:666:LEU:HD12	7:K:669:GLU:HB2	2.03	0.41
5:I:121:DG:O6	6:J:26:DC:N4	2.54	0.41
7:K:352:LEU:HB2	7:K:354:MET:HE3	2.02	0.41
2:B:82:THR:OG1	2:B:83:ALA:N	2.53	0.40
7:K:452:MET:HG3	7:K:456:GLN:HB2	2.02	0.40
7:K:482:TRP:CD1	7:K:507:ILE:HD13	2.56	0.40
7:K:509:GLY:O	7:K:510:SER:C	2.64	0.40
2:B:45:ARG:HA	6:J:82:DG:OP1	2.21	0.40
4:D:71:LYS:HD3	4:D:71:LYS:HA	1.82	0.40
6:J:52:DG:H2'	6:J:53:DG:N2	2.35	0.40
7:K:210:VAL:HG22	7:K:240:PHE:CD1	2.56	0.40
7:K:316:ASN:OD1	7:K:317:ASP:N	2.55	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:K:376:LEU:O	7:K:377:ASN:C	2.64	0.40
7:K:475:ASN:O	7:K:476:ALA:C	2.62	0.40
5:I:95:DC:H4'	5:I:96:DC:OP1	2.21	0.40
5:I:128:DG:H2''	5:I:129:DT:C5	2.55	0.40
6:J:141:DT:H2''	6:J:142:DC:OP2	2.21	0.40
5:I:8:DA:C2	6:J:141:DT:C2	3.10	0.40
7:K:261:THR:HG22	7:K:606:GLY:HA3	2.03	0.40
7:K:488:ASN:O	7:K:491:ILE:N	2.53	0.40

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 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	91/136 (67%)	88 (97%)	3 (3%)	0	100	100
1	E	96/136 (71%)	93 (97%)	3 (3%)	0	100	100
2	B	77/103 (75%)	76 (99%)	1 (1%)	0	100	100
2	F	82/103 (80%)	78 (95%)	4 (5%)	0	100	100
3	C	100/130 (77%)	94 (94%)	6 (6%)	0	100	100
3	G	97/130 (75%)	90 (93%)	7 (7%)	0	100	100
4	D	87/150 (58%)	84 (97%)	3 (3%)	0	100	100
4	H	90/150 (60%)	85 (94%)	5 (6%)	0	100	100
7	K	448/765 (59%)	383 (86%)	55 (12%)	10 (2%)	5	28
All	All	1168/1803 (65%)	1071 (92%)	87 (7%)	10 (1%)	17	44

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
7	K	600	THR
7	K	236	GLN
7	K	235	ILE
7	K	384	PHE
7	K	466	ASN
7	K	514	PRO
7	K	233	LYS
7	K	439	SER
7	K	637	ILE
7	K	297	PRO

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 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	79/109 (72%)	79 (100%)	0	100	100
1	E	83/109 (76%)	83 (100%)	0	100	100
2	B	65/79 (82%)	65 (100%)	0	100	100
2	F	71/79 (90%)	71 (100%)	0	100	100
3	C	77/95 (81%)	77 (100%)	0	100	100
3	G	75/95 (79%)	75 (100%)	0	100	100
4	D	78/124 (63%)	78 (100%)	0	100	100
4	H	81/124 (65%)	80 (99%)	1 (1%)	67	81
7	K	406/678 (60%)	396 (98%)	10 (2%)	42	67
All	All	1015/1492 (68%)	1004 (99%)	11 (1%)	69	82

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	H	60	GLU
7	K	211	LYS
7	K	269	ILE
7	K	294	LYS
7	K	433	LYS

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Mol	Chain	Res	Type
7	K	457	LYS
7	K	516	VAL
7	K	517	GLU
7	K	544	LEU
7	K	584	LYS
7	K	627	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	68	GLN
2	B	25	ASN
4	D	109	ASN
3	G	105	ASN
4	H	74	HIS
7	K	264	ASN
7	K	277	ASN
7	K	286	ASN
7	K	608	ASN
7	K	629	GLN

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](#)

2 ligands are modelled in this entry.

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
9	ADP	K	802	-	24,29,29	0.72	0	29,45,45	0.79	1 (3%)
8	BEF	K	801	-	0,3,3	-	-	-		

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	ADP	K	802	-	-	4/12/32/32	0/3/3/3

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	K	802	ADP	C5-C6-N6	2.33	123.89	120.35

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
9	K	802	ADP	PA-O3A-PB-O2B
9	K	802	ADP	PA-O3A-PB-O3B
9	K	802	ADP	C4'-C5'-O5'-PA
9	K	802	ADP	PA-O3A-PB-O1B

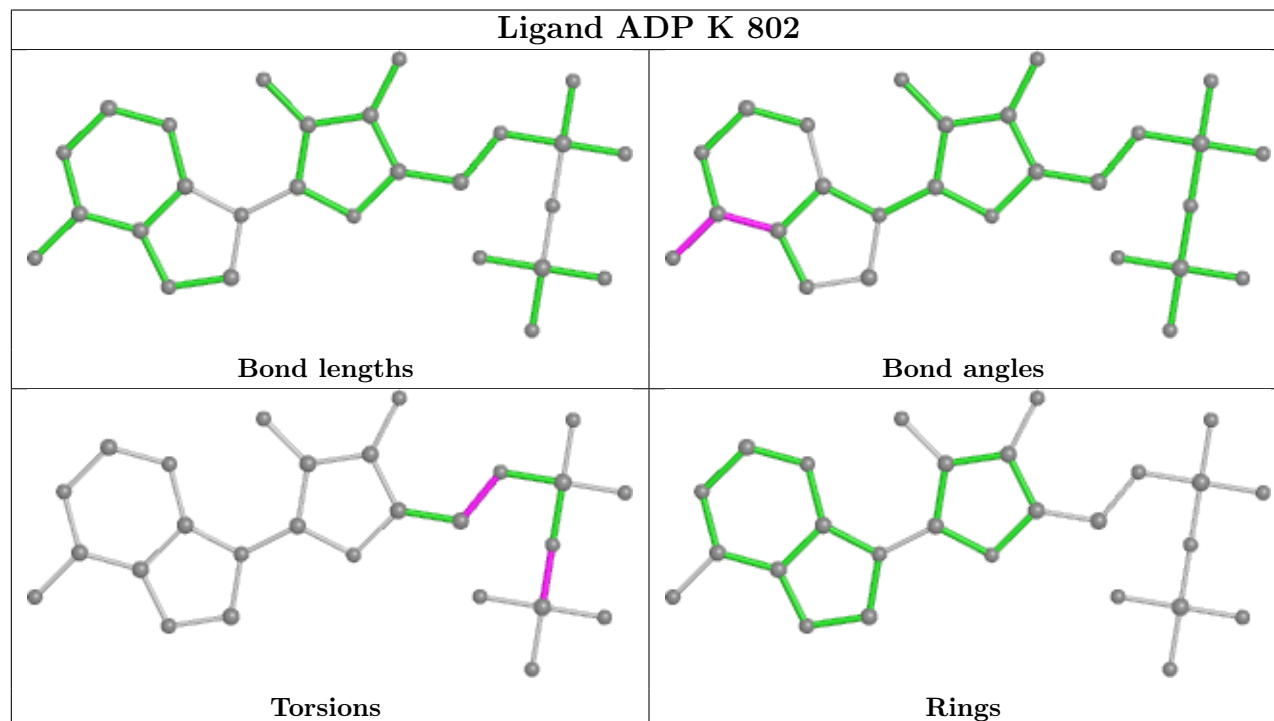
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	K	802	ADP	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



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.