



## Full wwPDB EM Validation Report ⓘ

Jan 23, 2024 – 08:07 PM JST

PDB ID : 8HWC  
EMDB ID : EMD-35053  
Title : Cryo-EM Structure of D5 Apo  
Authors : Li, Y.N.; Zhu, J.; Guo, Y.Y.; Yan, R.H.  
Deposited on : 2022-12-29  
Resolution : 3.30 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](mailto: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>.

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

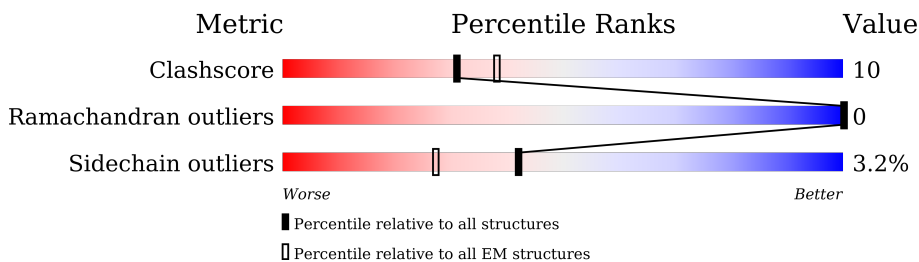
EMDB validation analysis : **FAILED**  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

# 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 3.30 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	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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  $\geq 3$ , 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	785	34% 14% 52%
1	B	785	30% 10% 59%
1	C	785	26% 9% 64%
1	D	785	25% 8% 66%
1	E	785	27% 9% 64%
1	F	785	30% 9% 61%

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 14943 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 Primase D5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	E	284	2313	1480	394	425	14	0	0
1	F	308	2514	1608	429	463	14	0	0
1	D	266	2178	1399	372	394	13	0	0
1	C	280	2283	1466	388	416	13	0	0
1	B	320	2610	1672	440	484	14	0	0
1	A	378	3045	1939	518	572	16	0	0

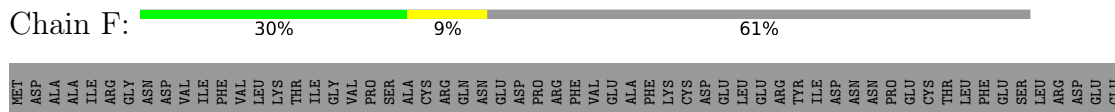
### 3 Residue-property plots

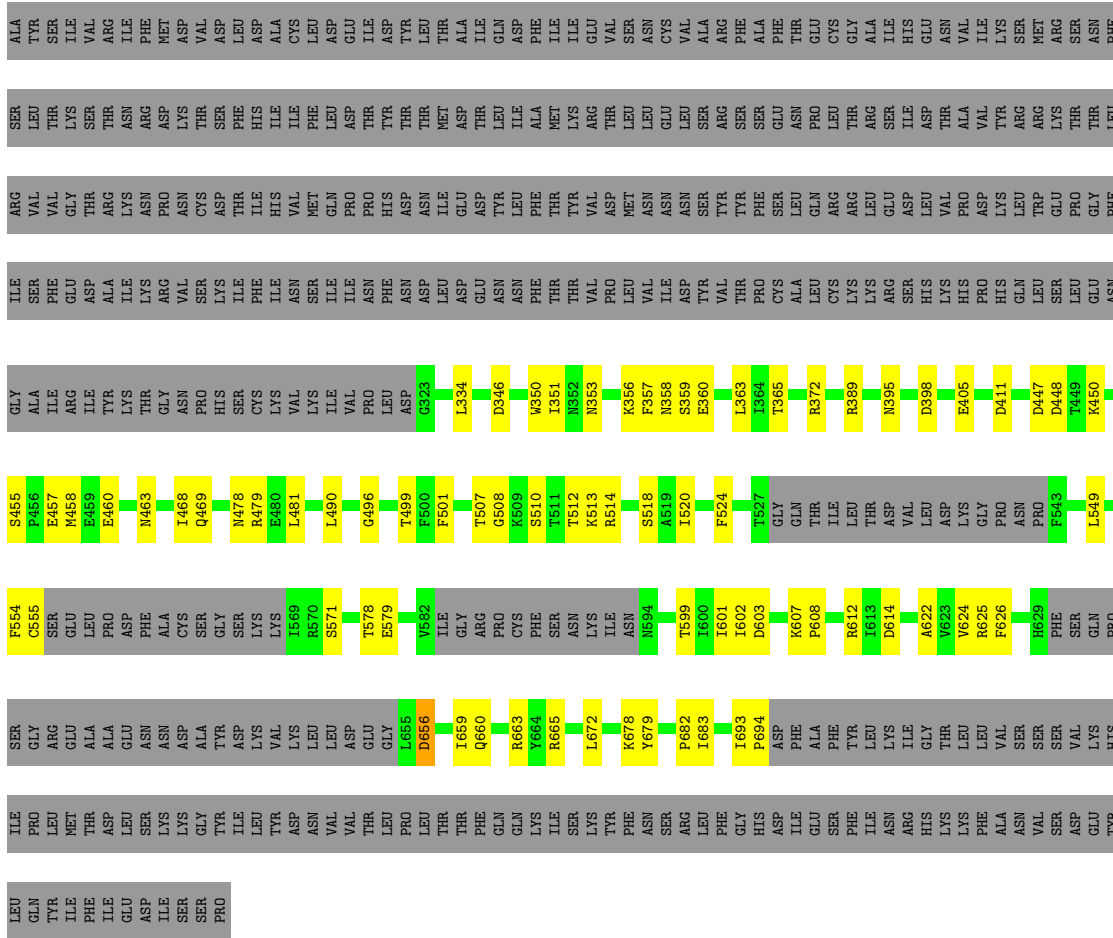
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: Primase D5

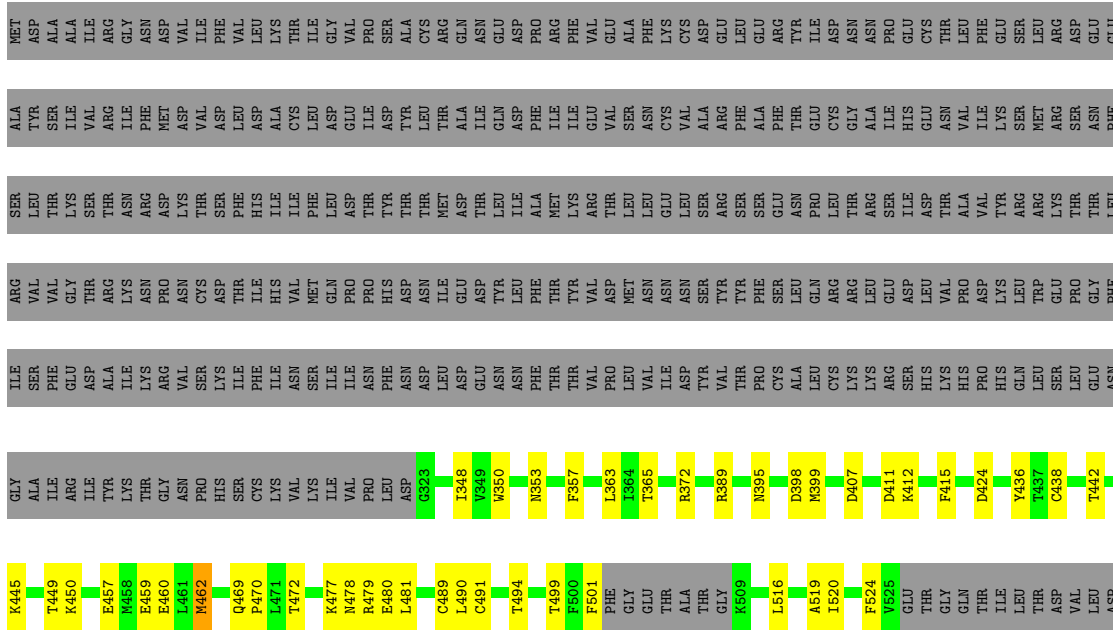


- Molecule 1: Primase D5





• Molecule 1: Primase D5







L461	L462	N466	D467	L468	Q469	E474	N478	L481	K484	C491	K495	G496	C497	L498	T499	F500	F501	E504	T507	G508	K509	S510	R514	S518	A519	I520	F524	T527	D534	K538	G539	P540	N541	F542	F543	I544	H548	V553	F554	C555	S556												
E557	S566	K567	K568	D572	N573	I574	K575	K576	L577	T578	E579	P586	S589	W590	K591	I592	N593	N594	R595	I600	I601	I602	D603	K607	P608	D614	M618	R619	R620	V623	V624	R625	F626	R627	T628	H629	F630	S631	Q632	P633	S634	Y645	D646	K647	V648	K649	L650	L651	D652				
E653	G654	D656	G657	K658	I659	Q660	R663	Y664	R665	L669	Y670	L671	K674	W675	Y679	I683	D695	L700	LYS	ILE	ARG	HIS	LYS	LYS	PHE	ALA	ASN	VAL	SER	SER	VAL	LYS	HIS	ILE	PRO	LEU	MET	THR	ASP	LEU	SER	LYS	LYS	GLY	TYR	ILE	LEU	TYR	ASP	ASN	VAL	VAL	THR



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	779993	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)	1200	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	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  >5	RMSZ	# Z  >5
1	A	0.26	0/3108	0.52	0/4198
1	B	0.26	0/2660	0.50	0/3587
1	C	0.26	0/2324	0.51	0/3126
1	D	0.25	0/2216	0.50	0/2977
1	E	0.25	0/2354	0.48	0/3165
1	F	0.24	0/2562	0.49	0/3453
All	All	0.25	0/15224	0.50	0/20506

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 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	3045	0	3055	75	0
1	B	2610	0	2630	50	0
1	C	2283	0	2324	49	0
1	D	2178	0	2227	36	0
1	E	2313	0	2345	40	0
1	F	2514	0	2544	52	0
All	All	14943	0	15125	291	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.

All (291) 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:B:612:ARG:HH12	1:B:614:ASP:HB3	1.41	0.86
1:A:652:ASP:HB3	1:A:655:LEU:HB2	1.69	0.74
1:C:483:GLU:HA	1:C:675:TRP:HZ3	1.55	0.71
1:F:501:PHE:HB2	1:F:603:ASP:HA	1.73	0.69
1:A:406:THR:O	1:A:595:ARG:NH1	2.26	0.69
1:E:398:ASP:OD2	1:D:389:ARG:NH1	2.25	0.69
1:A:468:ILE:HD11	1:A:508:GLY:HA3	1.74	0.69
1:B:459:GLU:HA	1:B:462:MET:SD	2.33	0.68
1:D:489:CYS:SG	1:D:552:SER:OG	2.51	0.68
1:F:389:ARG:NH1	1:A:398:ASP:OD2	2.28	0.67
1:B:531:ILE:O	1:B:573:ASN:ND2	2.27	0.67
1:C:398:ASP:OD2	1:B:389:ARG:NH1	2.28	0.67
1:E:660:GLN:OE1	1:E:660:GLN:N	2.25	0.67
1:A:510:SER:OG	1:A:514:ARG:NH1	2.28	0.67
1:E:389:ARG:NH1	1:F:398:ASP:OD2	2.28	0.66
1:C:499:THR:HG22	1:C:622:ALA:HB3	1.77	0.66
1:B:510:SER:OG	1:B:514:ARG:NH1	2.30	0.65
1:A:469:GLN:HE22	1:A:478:ASN:HD22	1.45	0.65
1:A:478:ASN:ND2	1:A:625:ARG:O	2.30	0.65
1:E:462:MET:O	1:E:466:ASN:ND2	2.30	0.65
1:F:501:PHE:HE2	1:F:601:ILE:HD12	1.62	0.65
1:D:499:THR:HG22	1:D:622:ALA:HB3	1.79	0.65
1:F:607:LYS:HE2	1:F:694:PRO:HG2	1.80	0.64
1:C:483:GLU:HA	1:C:675:TRP:CZ3	2.31	0.64
1:D:398:ASP:OD2	1:C:389:ARG:NH1	2.30	0.64
1:E:548:HIS:CE1	1:E:549:LEU:HG	2.33	0.64
1:B:607:LYS:HZ1	1:B:695:ASP:HB2	1.63	0.64
1:C:483:GLU:HG2	1:C:675:TRP:CH2	2.32	0.64
1:B:398:ASP:OD2	1:A:389:ARG:NH1	2.30	0.64
1:E:500:PHE:HB2	1:E:623:VAL:HG12	1.79	0.63
1:E:499:THR:HG22	1:E:622:ALA:HB3	1.81	0.63
1:F:501:PHE:CE2	1:F:601:ILE:HD12	2.33	0.63
1:C:419:VAL:HG23	1:C:433:ALA:HB1	1.80	0.63
1:A:556:SER:HA	1:A:603:ASP:HB3	1.81	0.63
1:E:395:ASN:OD1	1:D:389:ARG:NH2	2.31	0.62
1:F:499:THR:HG22	1:F:622:ALA:HB3	1.81	0.61
1:E:510:SER:OG	1:E:514:ARG:NH1	2.33	0.61
1:A:566:SER:O	1:A:568:LYS:NZ	2.35	0.60
1:B:572:ASP:HB2	1:B:576:LYS:HE3	1.83	0.60
1:F:469:GLN:O	1:F:479:ARG:NH1	2.35	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:449:THR:OG1	1:A:450:LYS:NZ	2.34	0.59
1:B:360:GLU:HG3	1:B:361:GLU:HG3	1.84	0.59
1:E:657:GLY:HA2	1:E:660:GLN:HE22	1.67	0.59
1:A:632:GLN:NE2	1:A:653:GLU:OE2	2.35	0.59
1:A:478:ASN:HD21	1:A:625:ARG:H	1.49	0.58
1:A:579:GLU:N	1:A:579:GLU:OE1	2.37	0.57
1:A:462:MET:O	1:A:466:ASN:ND2	2.33	0.57
1:E:432:ASP:N	1:E:432:ASP:OD1	2.38	0.57
1:E:490:LEU:HD11	1:E:672:LEU:HB3	1.86	0.57
1:F:363:LEU:HD23	1:F:363:LEU:H	1.69	0.57
1:D:395:ASN:OD1	1:C:389:ARG:NH2	2.37	0.57
1:B:432:ASP:N	1:B:432:ASP:OD1	2.37	0.57
1:F:507:THR:HG21	1:F:626:PHE:HB3	1.88	0.56
1:A:629:HIS:CE1	1:A:631:SER:HB3	2.39	0.56
1:A:555:CYS:HB3	1:A:602:ILE:HA	1.88	0.56
1:C:340:LEU:HD13	1:C:404:VAL:HG11	1.88	0.56
1:B:501:PHE:HE1	1:B:601:ILE:HD12	1.71	0.56
1:D:490:LEU:O	1:D:551:ARG:NH1	2.39	0.56
1:C:395:ASN:OD1	1:B:389:ARG:NH2	2.39	0.55
1:C:510:SER:OG	1:C:514:ARG:NH1	2.39	0.55
1:C:406:THR:O	1:C:595:ARG:NH1	2.38	0.55
1:E:406:THR:O	1:E:595:ARG:NH1	2.40	0.54
1:A:656:ASP:O	1:A:660:GLN:HG2	2.07	0.54
1:E:363:LEU:HD23	1:E:363:LEU:H	1.73	0.54
1:B:532:LEU:HD11	1:B:602:ILE:HD12	1.90	0.54
1:D:469:GLN:O	1:D:479:ARG:NH1	2.40	0.54
1:F:411:ASP:OD1	1:F:411:ASP:N	2.34	0.53
1:B:363:LEU:H	1:B:363:LEU:HD23	1.74	0.53
1:C:360:GLU:OE1	1:C:360:GLU:N	2.30	0.53
1:F:693:ILE:HD12	1:F:694:PRO:HD2	1.90	0.53
1:C:365:THR:HG23	1:C:389:ARG:HB3	1.91	0.53
1:E:678:LYS:HE2	1:E:679:TYR:HE1	1.74	0.52
1:C:495:LYS:NZ	1:C:597:HIS:O	2.39	0.52
1:E:346:ASP:OD2	1:E:359:SER:OG	2.27	0.52
1:D:363:LEU:H	1:D:363:LEU:HD23	1.74	0.52
1:A:363:LEU:HD23	1:A:363:LEU:H	1.72	0.52
1:C:674:LYS:HA	1:C:677:LYS:HG2	1.92	0.52
1:B:478:ASN:ND2	1:B:625:ARG:O	2.42	0.52
1:A:670:TYR:O	1:A:674:LYS:HG2	2.10	0.52
1:B:681:ILE:HB	1:B:682:PRO:HD3	1.92	0.52
1:B:573:ASN:HA	1:B:576:LYS:HD2	1.90	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:518:SER:O	1:C:665:ARG:NH1	2.44	0.51
1:F:510:SER:O	1:F:514:ARG:HG2	2.11	0.51
1:C:363:LEU:HD23	1:C:363:LEU:H	1.74	0.51
1:A:501:PHE:O	1:A:509:LYS:NZ	2.44	0.51
1:F:682:PRO:HB2	1:F:683:ILE:HD12	1.93	0.51
1:A:658:LYS:HD3	1:A:663:ARG:HD3	1.93	0.51
1:C:456:PRO:HA	1:C:459:GLU:OE1	2.11	0.51
1:E:324:ASN:OD1	1:E:324:ASN:N	2.39	0.50
1:A:655:LEU:O	1:A:659:ILE:HG12	2.12	0.50
1:E:570:ARG:NH2	1:E:572:ASP:OD2	2.37	0.50
1:F:607:LYS:HD2	1:F:608:PRO:HD2	1.93	0.50
1:D:477:LYS:O	1:D:481:LEU:HG	2.11	0.50
1:A:633:PRO:HD3	1:A:650:LEU:HD23	1.93	0.50
1:F:478:ASN:HD21	1:F:625:ARG:H	1.58	0.50
1:E:389:ARG:NH2	1:F:395:ASN:OD1	2.45	0.50
1:D:477:LYS:O	1:D:480:GLU:HG3	2.12	0.50
1:E:556:SER:HA	1:E:603:ASP:HB3	1.93	0.50
1:B:342:THR:OG1	1:B:346:ASP:OD1	2.29	0.50
1:A:461:LEU:HD21	1:A:664:TYR:CG	2.46	0.50
1:A:324:ASN:OD1	1:A:324:ASN:N	2.41	0.50
1:C:470:PRO:HB2	1:C:472:THR:HG23	1.94	0.50
1:E:520:ILE:HD11	1:E:524:PHE:HB2	1.94	0.50
1:F:478:ASN:ND2	1:F:625:ARG:O	2.45	0.50
1:A:461:LEU:HD11	1:A:664:TYR:HB3	1.94	0.49
1:F:513:LYS:HG3	1:F:554:PHE:CD2	2.48	0.49
1:A:510:SER:O	1:A:514:ARG:HG2	2.12	0.49
1:C:324:ASN:OD1	1:C:324:ASN:N	2.45	0.49
1:C:511:THR:O	1:C:515:LEU:HG	2.13	0.49
1:D:365:THR:HG23	1:D:389:ARG:HB3	1.94	0.49
1:B:575:LYS:H	1:B:575:LYS:HD2	1.77	0.49
1:A:534:ASP:O	1:A:573:ASN:ND2	2.38	0.49
1:C:678:LYS:HE2	1:C:679:TYR:HE1	1.78	0.48
1:B:553:VAL:HB	1:B:600:ILE:HD12	1.94	0.48
1:A:457:GLU:HB3	1:A:664:TYR:CD1	2.47	0.48
1:F:571:SER:OG	1:F:612:ARG:NH1	2.46	0.48
1:C:462:MET:O	1:C:466:ASN:ND2	2.39	0.48
1:A:507:THR:HG23	1:A:645:TYR:HE1	1.77	0.48
1:A:591:LYS:HD3	1:A:593:ASN:HD21	1.78	0.48
1:F:346:ASP:OD2	1:F:359:SER:OG	2.25	0.48
1:F:455:SER:OG	1:F:457:GLU:OE1	2.31	0.48
1:B:326:LEU:HD13	1:B:391:THR:HG21	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:340:LEU:HD13	1:A:404:VAL:HG21	1.94	0.48
1:A:365:THR:HG23	1:A:389:ARG:HB3	1.95	0.48
1:A:415:PHE:HZ	1:A:669:LEU:HD21	1.78	0.48
1:A:629:HIS:HB3	1:A:648:VAL:HG22	1.94	0.48
1:F:351:ILE:O	1:F:356:LYS:NZ	2.46	0.48
1:D:459:GLU:HA	1:D:462:MET:HB2	1.95	0.48
1:D:411:ASP:OD1	1:D:412:LYS:NZ	2.43	0.48
1:D:470:PRO:HB2	1:D:472:THR:HG23	1.96	0.48
1:E:555:CYS:HB3	1:E:602:ILE:HG23	1.96	0.48
1:F:520:ILE:HD11	1:F:524:PHE:HD2	1.79	0.48
1:B:656:ASP:O	1:B:660:GLN:HG2	2.13	0.48
1:A:586:PRO:HD2	1:A:589:SER:HB3	1.95	0.48
1:F:501:PHE:HA	1:F:624:VAL:HG22	1.96	0.47
1:C:516:LEU:HB3	1:C:524:PHE:HE2	1.79	0.47
1:A:415:PHE:CZ	1:A:669:LEU:HD21	2.48	0.47
1:A:497:CYS:O	1:A:498:LEU:HD23	2.14	0.47
1:A:538:LYS:HD3	1:A:539:GLY:H	1.77	0.47
1:F:365:THR:HG23	1:F:389:ARG:HB3	1.97	0.47
1:C:342:THR:OG1	1:C:346:ASP:O	2.26	0.47
1:B:453:GLU:HA	1:B:670:TYR:HE2	1.79	0.47
1:A:457:GLU:HB3	1:A:664:TYR:HD1	1.79	0.47
1:C:508:GLY:O	1:C:512:THR:OG1	2.29	0.47
1:C:671:LEU:O	1:C:675:TRP:HD1	1.97	0.47
1:A:520:ILE:HD11	1:A:524:PHE:HD2	1.79	0.47
1:C:656:ASP:O	1:C:660:GLN:HG2	2.15	0.46
1:A:541:ASN:HB3	1:A:544:ILE:HB	1.97	0.46
1:E:470:PRO:HB2	1:E:472:THR:HG23	1.98	0.46
1:C:449:THR:OG1	1:C:450:LYS:NZ	2.47	0.46
1:B:329:ILE:HG21	1:B:383:LEU:HD21	1.97	0.46
1:B:572:ASP:OD1	1:B:572:ASP:N	2.44	0.46
1:B:464:ILE:HA	1:B:467:ASP:OD2	2.16	0.46
1:A:481:LEU:HD23	1:A:624:VAL:HG12	1.98	0.46
1:F:405:GLU:OE2	1:F:405:GLU:N	2.41	0.46
1:F:599:THR:O	1:F:601:ILE:HG23	2.16	0.46
1:B:527:THR:HG1	1:B:555:CYS:HG	1.54	0.46
1:F:518:SER:O	1:F:665:ARG:NH1	2.49	0.46
1:C:671:LEU:O	1:C:675:TRP:CD1	2.69	0.46
1:A:334:LEU:HD23	1:A:334:LEU:HA	1.83	0.46
1:F:514:ARG:HB3	1:F:659:ILE:HG21	1.98	0.46
1:D:494:THR:HG21	1:D:580:PRO:HA	1.97	0.46
1:D:681:ILE:HD13	1:D:681:ILE:HA	1.84	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:385:CYS:SG	1:C:387:ARG:NH2	2.89	0.45
1:A:607:LYS:HZ3	1:A:608:PRO:HD2	1.81	0.45
1:F:555:CYS:HB3	1:F:602:ILE:HG23	1.98	0.45
1:D:678:LYS:HG2	1:D:679:TYR:CD1	2.52	0.45
1:D:678:LYS:HG2	1:D:679:TYR:CE1	2.51	0.45
1:B:470:PRO:HB2	1:B:472:THR:HG23	1.97	0.45
1:D:350:TRP:CZ2	1:D:353:ASN:HA	2.52	0.45
1:A:553:VAL:HB	1:A:600:ILE:HD13	1.97	0.45
1:F:447:ASP:OD2	1:F:450:LYS:NZ	2.49	0.45
1:F:490:LEU:HD11	1:F:672:LEU:HB3	1.99	0.45
1:D:407:ASP:OD1	1:D:438:CYS:HA	2.16	0.45
1:A:573:ASN:O	1:A:577:LEU:HG	2.16	0.45
1:E:509:LYS:HB2	1:E:509:LYS:HE2	1.78	0.45
1:F:614:ASP:OD1	1:F:614:ASP:N	2.51	0.44
1:A:572:ASP:O	1:A:576:LYS:HG3	2.17	0.44
1:F:350:TRP:CZ2	1:F:353:ASN:HA	2.52	0.44
1:C:685:LYS:HB3	1:C:685:LYS:HE3	1.72	0.44
1:E:461:LEU:HA	1:E:464:ILE:HD12	1.99	0.44
1:D:415:PHE:HD1	1:D:442:THR:HG1	1.65	0.44
1:B:477:LYS:HB3	1:B:477:LYS:HE2	1.76	0.44
1:D:516:LEU:O	1:D:520:ILE:HG12	2.18	0.44
1:B:461:LEU:HD13	1:B:664:TYR:HB3	1.98	0.44
1:B:516:LEU:O	1:B:520:ILE:HG12	2.18	0.44
1:E:514:ARG:HB3	1:E:659:ILE:HG21	1.99	0.44
1:E:658:LYS:HB2	1:E:658:LYS:HE3	1.78	0.44
1:D:348:ILE:HG22	1:D:357:PHE:HB3	1.98	0.44
1:D:445:LYS:HB2	1:D:445:LYS:HE3	1.74	0.44
1:C:479:ARG:O	1:C:483:GLU:HG3	2.17	0.44
1:C:669:LEU:O	1:C:673:VAL:HG12	2.18	0.44
1:F:656:ASP:O	1:F:660:GLN:HG2	2.18	0.44
1:B:448:ASP:OD1	1:B:448:ASP:N	2.50	0.44
1:F:508:GLY:O	1:F:512:THR:HG23	2.18	0.44
1:C:350:TRP:CZ2	1:C:353:ASN:HA	2.53	0.44
1:B:478:ASN:HD21	1:B:625:ARG:H	1.65	0.44
1:B:575:LYS:HA	1:B:620:ARG:HH12	1.82	0.44
1:B:548:HIS:CE1	1:B:595:ARG:H	2.36	0.44
1:F:448:ASP:OD1	1:F:448:ASP:N	2.51	0.44
1:F:656:ASP:OD1	1:F:656:ASP:N	2.51	0.44
1:B:415:PHE:HD1	1:B:442:THR:HG1	1.65	0.44
1:B:669:LEU:O	1:B:673:VAL:HG23	2.18	0.44
1:D:457:GLU:HA	1:D:460:GLU:HB2	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:494:THR:HG21	1:B:580:PRO:HA	2.00	0.43
1:F:455:SER:O	1:F:458:MET:HG2	2.18	0.43
1:D:671:LEU:HD21	1:D:675:TRP:CH2	2.53	0.43
1:C:622:ALA:HB2	1:C:688:PRO:HA	2.00	0.43
1:A:491:CYS:SG	1:A:495:LYS:HD2	2.58	0.43
1:F:457:GLU:HA	1:F:460:GLU:HB2	2.00	0.43
1:C:481:LEU:O	1:C:485:THR:OG1	2.34	0.43
1:A:518:SER:O	1:A:665:ARG:NE	2.48	0.43
1:E:677:LYS:HB2	1:E:677:LYS:HE3	1.79	0.43
1:B:490:LEU:HD11	1:B:672:LEU:HB3	2.00	0.43
1:B:573:ASN:O	1:B:577:LEU:HG	2.18	0.43
1:E:572:ASP:HB2	1:E:576:LYS:HE3	2.01	0.43
1:F:496:GLY:HA2	1:F:578:THR:HG22	2.01	0.43
1:A:348:ILE:HG22	1:A:357:PHE:HB3	2.00	0.43
1:E:463:ASN:OD1	1:E:464:ILE:N	2.51	0.43
1:F:468:ILE:HD12	1:F:468:ILE:HA	1.86	0.43
1:B:415:PHE:CZ	1:B:669:LEU:HD21	2.54	0.43
1:F:481:LEU:HD22	1:F:624:VAL:HG12	2.01	0.43
1:A:474:GLU:OE2	1:A:627:ARG:NH1	2.43	0.43
1:A:658:LYS:HE3	1:A:658:LYS:HB2	1.76	0.43
1:A:683:ILE:HD12	1:A:683:ILE:HA	1.90	0.43
1:D:658:LYS:HE3	1:D:658:LYS:HB2	1.77	0.43
1:A:484:LYS:NZ	1:A:679:TYR:HB3	2.34	0.43
1:E:575:LYS:HA	1:E:575:LYS:HD3	1.78	0.43
1:B:444:PHE:CE2	1:B:665:ARG:HD3	2.54	0.43
1:A:343:GLU:CD	1:A:343:GLU:H	2.22	0.43
1:F:678:LYS:HE3	1:F:679:TYR:CZ	2.54	0.42
1:D:520:ILE:HD11	1:D:524:PHE:HB2	2.01	0.42
1:B:350:TRP:CZ2	1:B:353:ASN:HA	2.53	0.42
1:B:431:ASP:O	1:B:434:LYS:HB3	2.20	0.42
1:A:467:ASP:OD1	1:A:468:ILE:N	2.52	0.42
1:A:647:LYS:NZ	1:A:648:VAL:H	2.18	0.42
1:A:575:LYS:HZ2	1:A:620:ARG:HD2	1.85	0.42
1:E:518:SER:O	1:E:665:ARG:NH1	2.52	0.42
1:C:671:LEU:HG	1:C:675:TRP:CD1	2.54	0.42
1:A:500:PHE:HB2	1:A:623:VAL:HG23	2.01	0.42
1:A:627:ARG:NH2	1:A:646:ASP:OD1	2.53	0.42
1:F:389:ARG:NH2	1:A:395:ASN:OD1	2.52	0.42
1:F:579:GLU:OE1	1:F:579:GLU:N	2.52	0.42
1:A:498:LEU:HD22	1:A:600:ILE:HB	2.02	0.42
1:A:607:LYS:HZ1	1:A:695:ASP:HB2	1.85	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:671:LEU:HD11	1:A:675:TRP:CE2	2.54	0.42
1:F:358:ASN:OD1	1:F:360:GLU:HG2	2.19	0.42
1:D:519:ALA:HB1	1:D:669:LEU:HD13	2.02	0.42
1:B:495:LYS:HE3	1:B:599:THR:HB	2.00	0.42
1:F:463:ASN:OD1	1:F:463:ASN:N	2.52	0.42
1:D:395:ASN:O	1:D:399:MET:HG3	2.20	0.42
1:B:486:LEU:HD23	1:B:486:LEU:HA	1.84	0.41
1:A:469:GLN:HE22	1:A:478:ASN:ND2	2.16	0.41
1:A:548:HIS:CE1	1:A:594:ASN:HA	2.55	0.41
1:E:395:ASN:O	1:E:399:MET:HG3	2.20	0.41
1:E:477:LYS:HE3	1:E:477:LYS:HB3	1.84	0.41
1:D:671:LEU:HA	1:D:674:LYS:HE2	2.02	0.41
1:C:420:LEU:HB2	1:C:427:PHE:HD1	1.84	0.41
1:E:413:LEU:HD12	1:E:414:PRO:HD2	2.02	0.41
1:E:497:CYS:SG	1:E:686:LEU:HD13	2.60	0.41
1:C:671:LEU:HG	1:C:675:TRP:NE1	2.36	0.41
1:F:601:ILE:O	1:F:601:ILE:HG13	2.20	0.41
1:C:464:ILE:HA	1:C:467:ASP:OD2	2.20	0.41
1:E:350:TRP:CZ2	1:E:353:ASN:HA	2.55	0.41
1:F:334:LEU:HD23	1:F:334:LEU:HA	1.91	0.41
1:F:520:ILE:HD11	1:F:524:PHE:CD2	2.56	0.41
1:C:486:LEU:HD23	1:C:486:LEU:HA	1.86	0.41
1:C:497:CYS:O	1:C:498:LEU:HD23	2.20	0.41
1:C:519:ALA:HB2	1:C:668:PHE:HD2	1.85	0.41
1:A:527:THR:HG22	1:A:554:PHE:O	2.21	0.41
1:D:656:ASP:O	1:D:660:GLN:NE2	2.54	0.41
1:B:489:CYS:SG	1:B:516:LEU:HD21	2.61	0.41
1:A:495:LYS:HE2	1:A:495:LYS:HB2	1.91	0.41
1:D:657:GLY:O	1:D:661:ASN:ND2	2.44	0.41
1:C:483:GLU:CA	1:C:675:TRP:HZ3	2.30	0.41
1:C:544:ILE:HD12	1:C:544:ILE:HA	1.89	0.41
1:B:658:LYS:HE3	1:B:658:LYS:HB2	1.77	0.41
1:A:556:SER:O	1:A:557:GLU:HG2	2.21	0.41
1:E:361:GLU:HA	1:E:362:PRO:HD3	1.97	0.41
1:D:669:LEU:HD12	1:D:669:LEU:HA	1.85	0.41
1:B:484:LYS:HZ3	1:B:679:TYR:HB3	1.86	0.41
1:D:449:THR:OG1	1:D:450:LYS:NZ	2.47	0.40
1:A:509:LYS:HD3	1:A:603:ASP:OD1	2.22	0.40
1:E:448:ASP:OD1	1:E:448:ASP:N	2.40	0.40
1:C:544:ILE:HD11	1:C:582:VAL:HG11	2.03	0.40
1:E:358:ASN:OD1	1:E:360:GLU:HG2	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:334:LEU:HA	1:C:334:LEU:HD23	1.79	0.40
1:A:504:GLU:O	1:A:507:THR:OG1	2.31	0.40
1:B:607:LYS:HD2	1:B:608:PRO:HD2	2.03	0.40
1:A:458:MET:O	1:A:462:MET:HG2	2.21	0.40
1:A:625:ARG:HB3	1:A:625:ARG:NH1	2.36	0.40

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	376/785 (48%)	347 (92%)	29 (8%)	0	100	100
1	B	310/785 (40%)	294 (95%)	16 (5%)	0	100	100
1	C	268/785 (34%)	250 (93%)	18 (7%)	0	100	100
1	D	252/785 (32%)	236 (94%)	16 (6%)	0	100	100
1	E	272/785 (35%)	252 (93%)	20 (7%)	0	100	100
1	F	298/785 (38%)	282 (95%)	16 (5%)	0	100	100
All	All	1776/4710 (38%)	1661 (94%)	115 (6%)	0	100	100

There are no Ramachandran outliers to report.

#### 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	343/725 (47%)	334 (97%)	9 (3%)	46	71
1	B	295/725 (41%)	287 (97%)	8 (3%)	44	71
1	C	258/725 (36%)	251 (97%)	7 (3%)	44	71
1	D	247/725 (34%)	234 (95%)	13 (5%)	22	53
1	E	262/725 (36%)	250 (95%)	12 (5%)	27	58
1	F	285/725 (39%)	280 (98%)	5 (2%)	59	78
All	All	1690/4350 (39%)	1636 (97%)	54 (3%)	42	67

All (54) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	372	ARG
1	E	436	TYR
1	E	458	MET
1	E	477	LYS
1	E	480	GLU
1	E	481	LEU
1	E	484	LYS
1	E	491	CYS
1	E	502	PHE
1	E	522	ASP
1	E	548	HIS
1	E	670	TYR
1	F	357	PHE
1	F	372	ARG
1	F	549	LEU
1	F	656	ASP
1	F	663	ARG
1	D	372	ARG
1	D	424	ASP
1	D	436	TYR
1	D	462	MET
1	D	478	ASN
1	D	491	CYS
1	D	501	PHE
1	D	548	HIS
1	D	549	LEU
1	D	554	PHE
1	D	573	ASN
1	D	581	CYS
1	D	596	ASN

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Mol	Chain	Res	Type
1	C	357	PHE
1	C	458	MET
1	C	502	PHE
1	C	524	PHE
1	C	661	ASN
1	C	663	ARG
1	C	670	TYR
1	B	361	GLU
1	B	462	MET
1	B	491	CYS
1	B	502	PHE
1	B	543	PHE
1	B	554	PHE
1	B	575	LYS
1	B	696	PHE
1	A	359	SER
1	A	372	ARG
1	A	543	PHE
1	A	554	PHE
1	A	614	ASP
1	A	618	MET
1	A	625	ARG
1	A	634	SER
1	A	656	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	475	ASN
1	A	478	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 monosaccharides 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.