



# Full wwPDB/EMDatabank EM Map/Model Validation Report ⓘ

Mar 15, 2018 – 05:07 PM EDT

PDB ID : 6FUW  
EMDB ID: : EMD-4225  
Title : Cryo-EM structure of the human CPSF160-WDR33-CPSF30 complex bound to the PAS AAUAAA motif at 3.1 Angstrom resolution  
Authors : Clerici, M.; Faini, M.; Jinek, M.  
Deposited on : 2018-02-28  
Resolution : 3.07 Å(reported)  
Based on PDB ID : 6F9N

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

We welcome your comments at [validation@mail.wwpdb.org](mailto: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) : rb-20030736

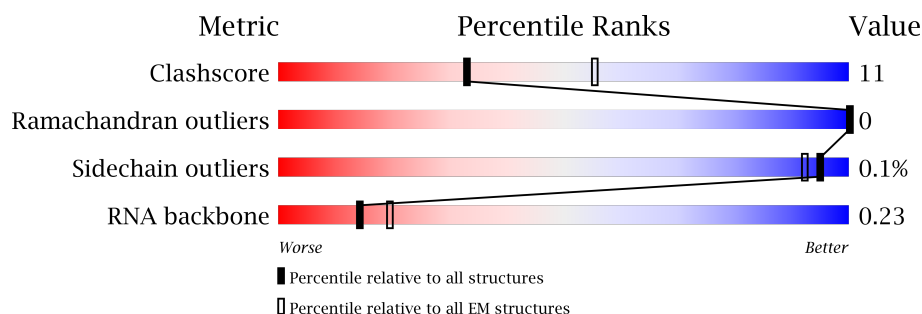
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.07 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
RNA backbone	3398	335

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  $\geq 3$ , 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	1446	61% (green), 21% (yellow), 18% (grey)
2	B	413	65% (green), 25% (yellow), 10% (grey)
3	C	178	47% (green), 16% (yellow), 36% (grey)
4	D	10	50% (green), 20% (yellow), 10% (orange), 20% (grey)

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 13421 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 Cleavage and polyadenylation specificity factor subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1181	Total	C	N	O	S	0	0
			9367	6019	1608	1685	55		

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP Q10570
A	-1	ASN	-	expression tag	UNP Q10570
A	0	ALA	-	expression tag	UNP Q10570

- Molecule 2 is a protein called pre-mRNA 3' end processing protein WDR33.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	370	Total	C	N	O	S	0	0
			2978	1882	544	533	19		

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-2	SER	-	expression tag	UNP Q9C0J8
B	-1	ASN	-	expression tag	UNP Q9C0J8
B	0	ALA	-	expression tag	UNP Q9C0J8

- Molecule 3 is a protein called Cleavage and polyadenylation specificity factor subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	114	Total	C	N	O	S	0	0
			897	577	148	158	14		

- Molecule 4 is a RNA chain called RNA (5'-R(P\*AP\*AP\*UP\*AP\*AP\*AP\*GP\*G)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	8	Total	C	N	O	P	0	0
			176	79	37	52	8		

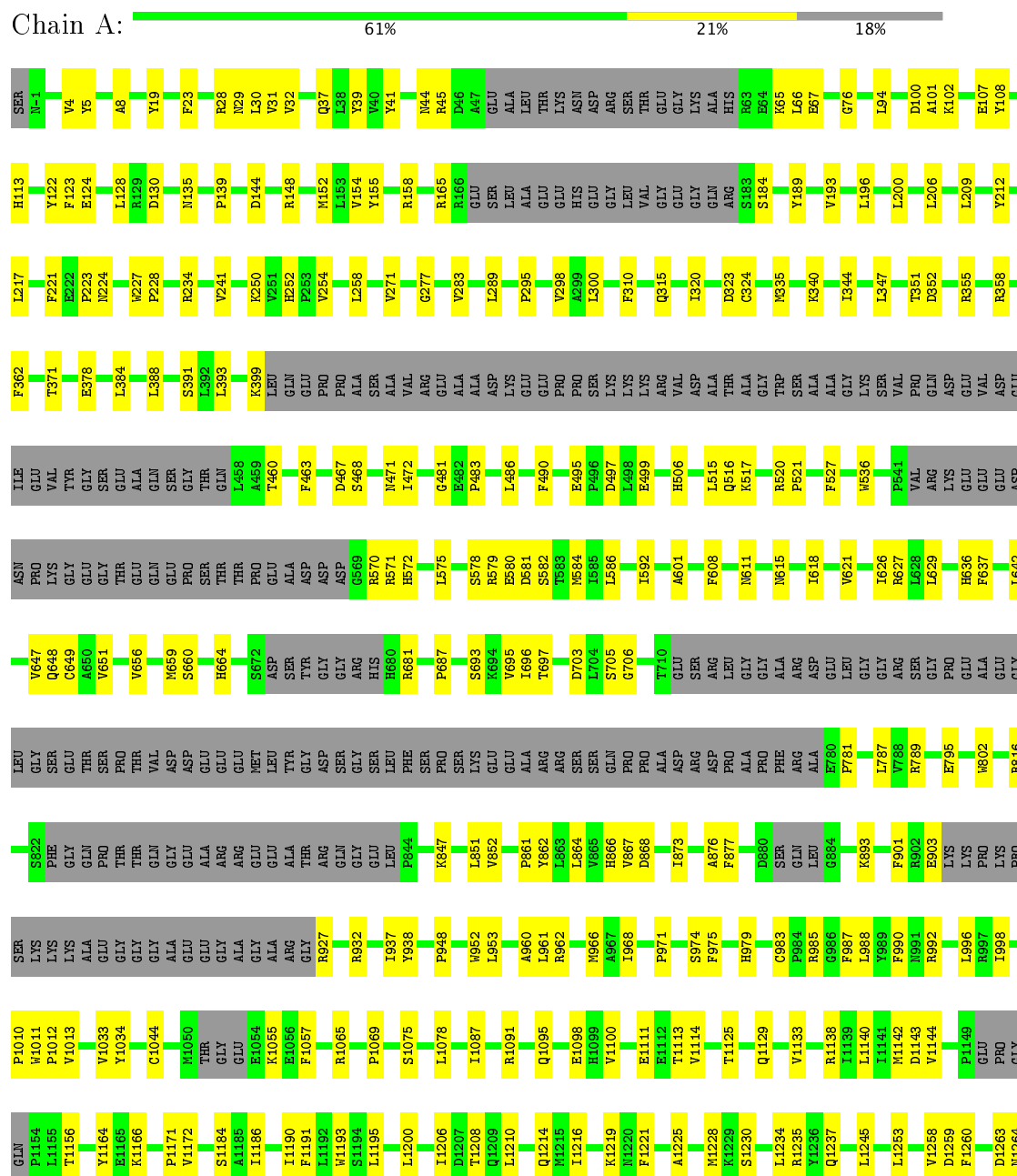
- Molecule 5 is ZINC ION (three-letter code: ZN) (formula: Zn).

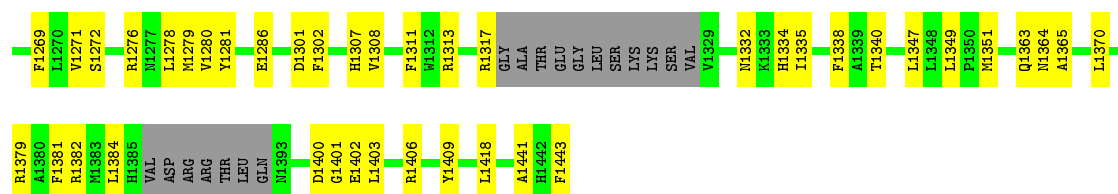
Mol	Chain	Residues	Atoms		AltConf
5	C	3	Total	Zn	0
			3	3	

### 3 Residue-property plots

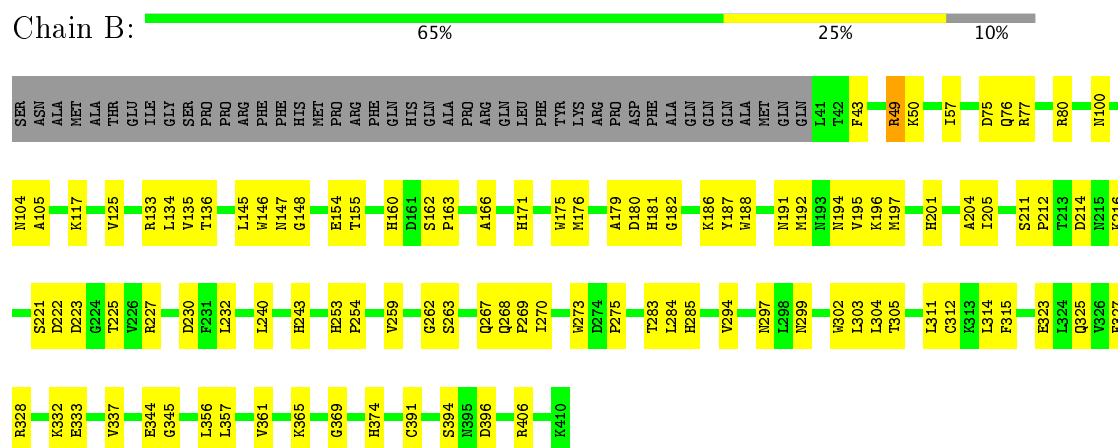
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according 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: Cleavage and polyadenylation specificity factor subunit 1

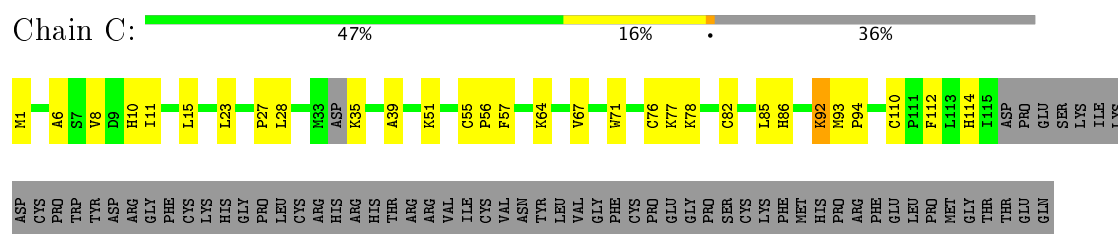




- Molecule 2: pre-mRNA 3' end processing protein WDR33



- Molecule 3: Cleavage and polyadenylation specificity factor subunit 4



- Molecule 4: RNA (5'-R(P\*AP\*AP\*UP\*AP\*AP\*AP\*GP\*G)-3')



## 4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	137000	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 ( $e^-/\text{\AA}^2$ )	80	Depositor
Minimum defocus (nm)	1100	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	47259	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

## 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: ZN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >2	RMSZ	# Z  >2
1	A	0.51	0/9581	0.59	0/13000
2	B	0.51	0/3062	0.61	1/4146 (0.0%)
3	C	0.39	0/920	0.53	1/1231 (0.1%)
4	D	0.73	0/198	0.87	0/307
All	All	0.51	0/13761	0.60	2/18684 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	92	LYS	C-N-CA	5.73	136.01	121.70
2	B	356	LEU	CA-CB-CG	5.38	127.67	115.30

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	9367	0	9420	188	0
2	B	2978	0	2895	78	0
3	C	897	0	872	25	0
4	D	176	0	88	1	0
5	C	3	0	0	0	0

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	13421	0	13275	281	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 11.

All (281) 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:A:1365:ALA:HB1	1:A:1418:LEU:HD11	1.65	0.79
1:A:575:LEU:HD23	1:A:586:LEU:HD12	1.66	0.78
1:A:481:GLY:O	1:A:499:GLU:HB3	1.85	0.77
1:A:648:GLN:HB3	1:A:659:MET:HB3	1.68	0.76
1:A:1184:SER:HG	1:A:1193:TRP:HE1	1.27	0.76
1:A:130:ASP:OD1	1:A:158:ARG:NH2	2.19	0.75
1:A:1370:LEU:HD23	1:A:1406:ARG:HH21	1.51	0.75
1:A:19:TYR:O	1:A:28:ARG:NH2	2.20	0.74
2:B:147:ASN:OD1	2:B:148:GLY:N	2.23	0.71
2:B:325:GLN:NE2	2:B:361:VAL:O	2.22	0.71
2:B:304:LEU:HD22	2:B:337:VAL:HG11	1.72	0.71
1:A:66:LEU:HD11	1:A:393:LEU:HD22	1.72	0.70
1:A:1263:ASP:OD1	1:A:1264:ASN:N	2.21	0.70
1:A:693:SER:HB2	1:A:789:ARG:HD3	1.74	0.70
2:B:294:VAL:HG23	2:B:305:THR:HG22	1.74	0.69
1:A:108:TYR:HH	1:A:113:HIS:HD1	1.39	0.69
1:A:937:ILE:HD11	1:A:987:PHE:HB3	1.72	0.69
1:A:516:GLN:OE1	1:A:520:ARG:NH1	2.26	0.68
2:B:182:GLY:H	2:B:204:ALA:HA	1.58	0.67
1:A:579:ARG:HG2	1:A:580:GLU:H	1.58	0.67
1:A:1276:ARG:HE	1:A:1307:HIS:CE1	2.12	0.67
1:A:224:ASN:HB3	1:A:234:ARG:HH11	1.59	0.66
2:B:315:PHE:HE1	2:B:323:GLU:HG2	1.61	0.66
1:A:221:PHE:HE2	1:A:223:PRO:HG3	1.60	0.65
1:A:1317:ARG:NH1	1:A:1441:ALA:O	2.30	0.65
1:A:320:ILE:HD11	1:A:362:PHE:HE2	1.61	0.65
1:A:847:LYS:HB2	1:A:866:HIS:HD2	1.62	0.64
1:A:1230:SER:HB3	1:A:1253:LEU:HB3	1.79	0.64
1:A:1301:ASP:HB2	1:A:1384:LEU:HD21	1.79	0.64
3:C:28:LEU:HD11	3:C:35:LYS:HD3	1.80	0.64
2:B:125:VAL:HG12	2:B:136:THR:HG22	1.79	0.64
1:A:1364:ASN:OD1	1:A:1379:ARG:NH1	2.31	0.63
1:A:4:VAL:HG13	1:A:1351:MET:SD	2.38	0.62

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:320:ILE:HD11	1:A:362:PHE:CE2	2.35	0.62
1:A:627:ARG:HB3	1:A:637:PHE:HD1	1.65	0.61
1:A:517:LYS:N	1:A:1443:PHE:OXT	2.24	0.61
1:A:1313:ARG:O	3:C:1:MET:N	2.33	0.61
1:A:1138:ARG:HG3	1:A:1166:LYS:C	2.21	0.61
1:A:953:LEU:HG	1:A:961:LEU:HD11	1.83	0.60
1:A:1195:LEU:HD13	1:A:1200:LEU:HD12	1.83	0.60
1:A:344:ILE:HG21	1:A:463:PHE:HE2	1.66	0.60
1:A:971:PRO:HG2	1:A:992:ARG:HD2	1.83	0.59
1:A:1190:ILE:HD12	1:A:1208:THR:HG21	1.84	0.58
1:A:45:ARG:NH2	1:A:378:GLU:OE1	2.35	0.58
2:B:75:ASP:OD2	2:B:77:ARG:NH1	2.35	0.58
1:A:196:LEU:HD21	1:A:252:HIS:CD2	2.38	0.58
2:B:186:LYS:NZ	2:B:197:MET:SD	2.77	0.58
1:A:227:TRP:CD1	1:A:228:PRO:HD2	2.38	0.58
1:A:695:VAL:HG22	1:A:787:LEU:HD21	1.86	0.58
3:C:93:MET:SD	3:C:94:PRO:HD2	2.43	0.58
2:B:145:LEU:HD12	2:B:155:THR:OG1	2.04	0.58
2:B:43:PHE:CD2	2:B:117:LYS:HG3	2.39	0.57
2:B:175:TRP:HZ3	2:B:195:VAL:HG21	1.68	0.57
2:B:297:ASN:HD22	2:B:302:TRP:HE3	1.52	0.57
1:A:864:LEU:HD23	1:A:873:ILE:HG12	1.86	0.57
2:B:394:SER:OG	2:B:396:ASP:OD1	2.22	0.57
2:B:201:HIS:CG	2:B:221:SER:HB2	2.39	0.57
1:A:154:VAL:HG12	1:A:155:TYR:CD2	2.40	0.57
1:A:1075:SER:HB3	1:A:1091:ARG:HE	1.71	0.56
1:A:1286:GLU:OE2	3:C:23:LEU:HB3	2.05	0.56
1:A:324:CYS:SG	2:B:80:ARG:NH1	2.79	0.56
1:A:515:LEU:HG	1:A:1013:VAL:HG12	1.87	0.56
1:A:647:VAL:HG22	1:A:927:ARG:HD3	1.86	0.55
1:A:101:ALA:HB3	1:A:124:GLU:HG3	1.87	0.55
1:A:44:ASN:HB2	1:A:67:GLU:OE1	2.07	0.55
1:A:983:CYS:SG	1:A:998:ILE:HG22	2.46	0.55
1:A:1140:LEU:HG	1:A:1142:MET:SD	2.47	0.55
1:A:497:ASP:OD1	1:A:520:ARG:NH2	2.33	0.55
1:A:636:HIS:ND1	1:A:681:ARG:HD2	2.21	0.54
2:B:187:TYR:CD2	2:B:196:LYS:HB3	2.42	0.54
1:A:867:VAL:HG12	1:A:868:ASP:H	1.72	0.54
3:C:64:LYS:HE2	3:C:85:LEU:HA	1.90	0.54
1:A:224:ASN:HB3	1:A:234:ARG:NH1	2.22	0.54
1:A:932:ARG:HG3	1:A:975:PHE:HB3	1.90	0.54

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:221:SER:OG	2:B:222:ASP:N	2.41	0.54
1:A:300:LEU:O	1:A:1065:ARG:NH1	2.41	0.53
1:A:601:ALA:HB2	1:A:627:ARG:CZ	2.39	0.53
1:A:1234:LEU:HD23	1:A:1245:LEU:HA	1.91	0.53
1:A:31:VAL:HG11	1:A:94:LEU:HD21	1.90	0.53
1:A:703:ASP:O	1:A:781:PRO:HA	2.09	0.53
2:B:104:ASN:OD1	2:B:105:ALA:N	2.42	0.53
3:C:82:CYS:HB3	3:C:86:HIS:HE1	1.74	0.53
1:A:165:ARG:HB3	1:A:184:SER:HA	1.91	0.53
1:A:1363:GLN:HG3	1:A:1403:LEU:HD23	1.92	0.52
2:B:192:MET:O	3:C:77:LYS:HE3	2.10	0.52
3:C:71:TRP:CD1	3:C:86:HIS:HD2	2.26	0.52
2:B:299:ASN:ND2	2:B:344:GLU:OE2	2.42	0.52
1:A:340:LYS:HE3	2:B:80:ARG:HG2	1.91	0.52
1:A:988:LEU:HD13	1:A:996:LEU:HD11	1.92	0.52
2:B:267:GLN:O	2:B:285:HIS:NE2	2.43	0.52
1:A:1138:ARG:HG3	1:A:1166:LYS:O	2.09	0.52
1:A:642:LEU:HD11	1:A:660:SER:OG	2.09	0.52
2:B:176:MET:HB3	2:B:188:TRP:HB2	1.92	0.51
2:B:262:GLY:HA2	2:B:269:PRO:O	2.11	0.51
2:B:57:ILE:HD12	2:B:406:ARG:HH22	1.75	0.51
2:B:75:ASP:N	2:B:75:ASP:OD1	2.40	0.51
1:A:516:GLN:O	1:A:1012:PRO:HD2	2.11	0.51
2:B:357:LEU:HD23	2:B:369:GLY:HA3	1.93	0.51
1:A:298:VAL:CG1	1:A:315:GLN:HB2	2.41	0.51
3:C:39:ALA:O	3:C:57:PHE:HB3	2.10	0.51
1:A:193:VAL:HG22	1:A:200:LEU:HD22	1.91	0.50
1:A:139:PRO:HB3	1:A:152:MET:HE2	1.93	0.50
1:A:1216:ILE:HG22	1:A:1260:PHE:HE2	1.76	0.50
1:A:1100:VAL:HG22	1:A:1125:THR:HG22	1.93	0.50
1:A:209:LEU:HD12	1:A:212:TYR:HE2	1.76	0.50
2:B:160:HIS:CG	2:B:180:ASP:HB3	2.47	0.50
1:A:221:PHE:CE2	1:A:223:PRO:HG3	2.44	0.50
2:B:270:ILE:HB	2:B:284:LEU:HB3	1.94	0.50
2:B:315:PHE:CE1	2:B:323:GLU:HG2	2.45	0.50
1:A:283:VAL:HG22	1:A:323:ASP:HB3	1.94	0.50
2:B:133:ARG:NE	2:B:154:GLU:OE1	2.42	0.50
2:B:160:HIS:CE1	2:B:186:LYS:HD3	2.47	0.50
2:B:259:VAL:HG23	2:B:275:PRO:HG3	1.93	0.49
2:B:201:HIS:HD2	2:B:205:ILE:HG12	1.78	0.49
1:A:1308:VAL:HG22	1:A:1340:THR:HG22	1.94	0.49

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:579:ARG:NH1	1:A:584:MET:SD	2.82	0.49
1:A:816:ARG:HD3	1:A:1409:TYR:O	2.12	0.49
1:A:527:PHE:HE2	1:A:592:ILE:HG21	1.78	0.49
2:B:374:HIS:CG	2:B:394:SER:HG	2.30	0.49
1:A:852:VAL:O	1:A:861:PRO:HA	2.12	0.49
1:A:861:PRO:HG2	1:A:876:ALA:HB3	1.95	0.49
2:B:240:LEU:HD22	2:B:273:TRP:CE3	2.48	0.48
2:B:75:ASP:OD1	2:B:77:ARG:HG2	2.12	0.48
2:B:186:LYS:HG2	2:B:197:MET:HG3	1.95	0.48
1:A:258:LEU:HD12	1:A:289:LEU:HD23	1.96	0.48
2:B:243:HIS:CG	2:B:263:SER:HG	2.30	0.48
1:A:352:ASP:OD1	1:A:358:ARG:NE	2.46	0.48
1:A:37:GLN:HG2	1:A:39:TYR:OH	2.14	0.48
2:B:133:ARG:HB2	2:B:146:TRP:O	2.13	0.48
2:B:212:PRO:HB3	2:B:254:PRO:O	2.14	0.48
3:C:78:LYS:O	3:C:82:CYS:N	2.47	0.48
1:A:371:THR:HG22	1:A:384:LEU:HB3	1.95	0.48
1:A:642:LEU:HD13	1:A:664:HIS:HB2	1.96	0.48
1:A:1044:CYS:HB3	1:A:1069:PRO:HB2	1.96	0.47
1:A:1219:LYS:NZ	3:C:11:ILE:O	2.47	0.47
1:A:128:LEU:HD23	1:A:158:ARG:NH1	2.29	0.47
2:B:191:ASN:ND2	3:C:76:CYS:O	2.46	0.47
1:A:471:ASN:OD1	1:A:472:ILE:N	2.48	0.47
1:A:1143:ASP:OD1	1:A:1144:VAL:N	2.48	0.47
1:A:651:VAL:HG22	1:A:656:VAL:HG22	1.94	0.47
1:A:29:ASN:HB2	1:A:41:TYR:O	2.14	0.47
1:A:536:TRP:HZ3	1:A:578:SER:HB2	1.79	0.47
1:A:1210:LEU:HD22	1:A:1228:MET:HE2	1.97	0.47
1:A:144:ASP:OD2	1:A:148:ARG:HG2	2.15	0.47
2:B:201:HIS:CE1	2:B:227:ARG:HD2	2.50	0.47
1:A:467:ASP:OD1	1:A:468:SER:N	2.44	0.47
3:C:51:LYS:HG3	3:C:56:PRO:HD2	1.96	0.47
1:A:1095:GLN:HB3	1:A:1098:GLU:OE1	2.15	0.46
1:A:847:LYS:HB2	1:A:866:HIS:CD2	2.47	0.46
2:B:204:ALA:HB3	2:B:222:ASP:OD2	2.14	0.46
1:A:1098:GLU:OE1	1:A:1138:ARG:NH2	2.49	0.46
1:A:490:PHE:CZ	1:A:521:PRO:HG2	2.50	0.46
1:A:23:PHE:HD2	1:A:29:ASN:HD21	1.63	0.46
1:A:948:PRO:HA	1:A:971:PRO:HB3	1.96	0.46
1:A:570:ARG:HD2	1:A:985:ARG:HH22	1.79	0.46
1:A:705:SER:OG	1:A:706:GLY:N	2.48	0.46

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:8:VAL:HG12	3:C:11:ILE:HD12	1.98	0.46
1:A:344:ILE:CG2	1:A:463:PHE:HE2	2.27	0.46
1:A:388:LEU:HD22	1:A:506:HIS:HB3	1.98	0.46
1:A:618:ILE:HB	1:A:629:LEU:HB2	1.97	0.46
1:A:1311:PHE:CD1	1:A:1338:PHE:HB3	2.51	0.46
1:A:209:LEU:HD12	1:A:212:TYR:CE2	2.51	0.46
2:B:225:THR:OG1	2:B:227:ARG:NH1	2.49	0.46
1:A:101:ALA:HB1	1:A:123:PHE:HB2	1.98	0.46
1:A:1370:LEU:HD23	1:A:1406:ARG:NH2	2.26	0.46
2:B:253:HIS:CG	2:B:254:PRO:HD2	2.51	0.46
1:A:1335:ILE:HG12	1:A:1349:LEU:HD13	1.99	0.45
1:A:271:VAL:HB	1:A:277:GLY:H	1.80	0.45
1:A:867:VAL:HG12	1:A:868:ASP:N	2.31	0.45
1:A:344:ILE:HG21	1:A:463:PHE:CE2	2.49	0.45
2:B:163:PRO:HD2	2:B:181:HIS:HB3	1.98	0.45
2:B:186:LYS:HE3	2:B:194:ASN:ND2	2.30	0.45
2:B:43:PHE:HD2	2:B:117:LYS:HG3	1.81	0.45
1:A:789:ARG:NH1	1:A:795:GLU:OE1	2.47	0.45
1:A:571:ARG:HA	1:A:979:HIS:HD2	1.82	0.45
3:C:110:CYS:HB3	3:C:114:HIS:HE1	1.81	0.45
3:C:82:CYS:HB3	3:C:86:HIS:CE1	2.51	0.45
3:C:71:TRP:CG	3:C:86:HIS:HD2	2.34	0.45
1:A:877:PHE:CE1	1:A:893:LYS:HB2	2.51	0.45
1:A:1033:VAL:HG12	1:A:1034:TYR:N	2.31	0.45
1:A:1235:ARG:HH22	1:A:1237:GLN:HE21	1.63	0.45
1:A:1258:VAL:HG23	1:A:1271:VAL:HG22	1.99	0.45
1:A:1221:PHE:HE2	3:C:15:LEU:HB3	1.82	0.45
1:A:851:LEU:HD12	1:A:862:TYR:O	2.17	0.45
1:A:76:GLY:HA2	1:A:1381:PHE:CE1	2.52	0.45
1:A:952:TRP:HE1	1:A:966:MET:CE	2.29	0.45
2:B:201:HIS:CD2	2:B:205:ILE:HG12	2.52	0.44
2:B:201:HIS:CE1	2:B:227:ARG:HH11	2.36	0.44
2:B:211:SER:O	2:B:214:ASP:N	2.40	0.44
2:B:171:HIS:ND1	2:B:214:ASP:OD1	2.45	0.44
1:A:1186:ILE:HD12	1:A:1191:PHE:CD2	2.51	0.44
2:B:240:LEU:HD13	2:B:273:TRP:CD2	2.52	0.44
4:D:2:A:O2'	4:D:3:U:H5'	2.17	0.44
1:A:1078:LEU:HB3	1:A:1087:ILE:HD12	1.98	0.44
1:A:636:HIS:CE1	1:A:681:ARG:HD2	2.52	0.44
2:B:294:VAL:HG22	2:B:303:LEU:HD11	2.00	0.44
3:C:51:LYS:HB2	3:C:55:CYS:HA	1.99	0.44

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:206:LEU:HD12	1:A:217:LEU:HD21	1.99	0.44
1:A:241:VAL:HG13	1:A:254:VAL:HG13	1.99	0.44
1:A:1334:HIS:CD2	3:C:6:ALA:HB1	2.52	0.44
1:A:107:GLU:HG2	1:A:108:TYR:H	1.82	0.44
1:A:1214:GLN:HB3	1:A:1225:ALA:HB3	2.00	0.44
1:A:1302:PHE:CZ	1:A:1382:ARG:HD2	2.53	0.44
1:A:608:PHE:HB3	1:A:621:VAL:HB	2.00	0.44
1:A:1279:MET:HB3	1:A:1281:TYR:HE1	1.83	0.44
1:A:1171:PRO:O	1:A:1186:ILE:HA	2.18	0.43
1:A:1206:ILE:HG23	1:A:1208:THR:HG23	2.00	0.43
1:A:579:ARG:HH22	1:A:584:MET:HB2	1.82	0.43
2:B:221:SER:HB3	2:B:223:ASP:OD1	2.18	0.43
2:B:268:GLN:HG2	2:B:283:THR:HG21	2.00	0.43
1:A:335:MET:HE2	1:A:347:LEU:HD23	1.99	0.43
1:A:611:ASN:HB3	1:A:615:ASN:HA	2.00	0.43
1:A:5:TYR:O	1:A:1401:GLY:HA3	2.19	0.43
2:B:311:LEU:CD2	2:B:328:ARG:HG2	2.48	0.43
2:B:43:PHE:CE2	2:B:117:LYS:HG3	2.53	0.43
1:A:621:VAL:HG13	1:A:626:ILE:HG22	2.00	0.43
3:C:27:PRO:HG3	3:C:51:LYS:HD2	2.00	0.43
1:A:1235:ARG:HH22	1:A:1237:GLN:NE2	2.16	0.43
1:A:687:PRO:HB3	1:A:802:TRP:CE2	2.53	0.43
1:A:1129:GLN:HG3	1:A:1133:VAL:HG11	1.99	0.43
1:A:696:ILE:HG22	1:A:697:THR:HG23	2.01	0.43
2:B:135:VAL:HG22	2:B:145:LEU:CD2	2.49	0.43
2:B:134:LEU:HD21	2:B:391:CYS:SG	2.59	0.43
1:A:391:SER:O	1:A:468:SER:HA	2.19	0.43
1:A:65:LYS:HG3	1:A:467:ASP:OD2	2.18	0.43
1:A:490:PHE:HZ	1:A:521:PRO:HG2	1.84	0.43
1:A:1164:TYR:CZ	1:A:1166:LYS:HB3	2.53	0.43
1:A:960:ALA:HB1	1:A:962:ARG:NH1	2.33	0.43
2:B:43:PHE:CE2	2:B:117:LYS:HE3	2.54	0.43
1:A:903:GLU:HG2	1:A:948:PRO:HB3	2.00	0.43
1:A:974:SER:HB2	1:A:990:PHE:HB2	2.00	0.42
1:A:1156:THR:HG22	1:A:1156:THR:O	2.20	0.42
1:A:1400:ASP:O	1:A:1402:GLU:N	2.47	0.42
2:B:216:LYS:HG2	2:B:230:ASP:HA	2.02	0.42
1:A:100:ASP:OD1	1:A:135:ASN:ND2	2.39	0.42
1:A:621:VAL:HG21	1:A:649:CYS:SG	2.59	0.42
1:A:572:HIS:HD2	1:A:979:HIS:N	2.17	0.42
1:A:1111:GLU:N	1:A:1111:GLU:OE1	2.49	0.42

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:323:ASP:OD1	1:A:340:LYS:HD2	2.19	0.42
2:B:312:CYS:HB2	2:B:327:PHE:HB2	2.02	0.42
2:B:57:ILE:HD12	2:B:406:ARG:NH2	2.35	0.42
2:B:76:GLN:OE1	2:B:100:ASN:HB2	2.20	0.42
3:C:67:VAL:HG23	3:C:92:LYS:O	2.20	0.42
1:A:206:LEU:HD12	1:A:217:LEU:HD11	2.01	0.42
2:B:49:ARG:HD2	2:B:50:LYS:O	2.19	0.42
1:A:1113:THR:HG22	1:A:1114:VAL:N	2.35	0.42
2:B:187:TYR:HD2	2:B:196:LYS:HB3	1.82	0.42
1:A:1184:SER:OG	1:A:1193:TRP:NE1	2.23	0.41
1:A:1332:ASN:OD1	3:C:10:HIS:NE2	2.38	0.41
1:A:399:LYS:N	1:A:460:THR:O	2.53	0.41
1:A:581:ASP:OD1	1:A:582:SER:N	2.53	0.41
2:B:303:LEU:O	2:B:314:LEU:HD12	2.20	0.41
1:A:1055:LYS:HE3	1:A:1057:PHE:HZ	1.85	0.41
1:A:527:PHE:HB2	1:A:996:LEU:HB3	2.02	0.41
2:B:332:LYS:HB3	2:B:333:GLU:H	1.77	0.41
1:A:1259:ASP:OD1	1:A:1260:PHE:N	2.53	0.41
1:A:351:THR:HB	1:A:355:ARG:HA	2.02	0.41
2:B:240:LEU:HD13	2:B:273:TRP:CG	2.55	0.41
1:A:298:VAL:HG11	1:A:315:GLN:NE2	2.36	0.41
2:B:345:GLY:O	2:B:361:VAL:HG23	2.21	0.41
1:A:30:LEU:HG	1:A:32:VAL:HG13	2.01	0.41
1:A:938:TYR:O	1:A:938:TYR:CG	2.72	0.41
1:A:1269:PHE:O	1:A:1280:VAL:HA	2.20	0.41
1:A:139:PRO:HB3	1:A:152:MET:CE	2.50	0.41
1:A:1272:SER:HB3	1:A:1278:LEU:HD23	2.03	0.41
1:A:8:ALA:HB2	1:A:1347:LEU:HD23	2.03	0.41
3:C:94:PRO:HG2	3:C:112:PHE:CE1	2.56	0.41
1:A:189:TYR:CD1	1:A:250:LYS:HE2	2.56	0.41
1:A:486:LEU:HD11	1:A:968:ILE:HD11	2.03	0.41
2:B:232:LEU:HD23	2:B:232:LEU:HA	1.95	0.40
1:A:1010:PRO:O	1:A:1011:TRP:HD1	2.04	0.40
2:B:135:VAL:HG22	2:B:145:LEU:HD23	2.03	0.40
2:B:162:SER:OG	2:B:181:HIS:O	2.22	0.40
1:A:234:ARG:HH22	2:B:365:LYS:NZ	2.20	0.40
3:C:71:TRP:CD1	3:C:86:HIS:CD2	3.09	0.40
1:A:102:LYS:HE3	1:A:122:TYR:HE1	1.87	0.40
1:A:1172:VAL:HG22	1:A:1186:ILE:HG12	2.04	0.40
2:B:166:ALA:HB3	2:B:179:ALA:HB3	2.03	0.40
1:A:295:PRO:HB2	1:A:310:PHE:HZ	1.87	0.40

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:495:GLU:O	1:A:495:GLU:HG2	2.20	0.40
1:A:483:PRO:HG3	1:A:516:GLN:NE2	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	1153/1446 (80%)	1010 (88%)	143 (12%)	0	100	100
2	B	368/413 (89%)	336 (91%)	32 (9%)	0	100	100
3	C	110/178 (62%)	92 (84%)	18 (16%)	0	100	100
All	All	1631/2037 (80%)	1438 (88%)	193 (12%)	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	1032/1237 (83%)	1031 (100%)	1 (0%)	94	98
2	B	320/357 (90%)	319 (100%)	1 (0%)	94	97
3	C	97/156 (62%)	97 (100%)	0	100	100
All	All	1449/1750 (83%)	1447 (100%)	2 (0%)	95	98



All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	901	PHE
2	B	49	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	7	GLN
1	A	85	GLN
1	A	202	ASN
1	A	225	GLN
1	A	291	GLN
1	A	315	GLN
1	A	572	HIS
1	A	1237	GLN
1	A	1307	HIS
2	B	69	ASN
2	B	194	ASN
2	B	343	HIS
2	B	405	ASN
3	C	86	HIS

### 5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
4	D	7/10 (70%)	2 (28%)	0

All (2) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
4	D	2	A
4	D	7	G

There are no RNA pucker outliers to report.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates

There are no carbohydrates in this entry.

## 5.6 Ligand geometry

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.