Full wwPDB X-ray Structure Validation Report ⓘ

May 26, 2021 – 03:04 pm BST

PDB ID	:	7B1H
Title	:	Monoclinic P21 Structure of Human Mad1 C-terminal Domain in Complex with Phosphorylated Bub1 CD1 Domain
Authors	:	Fischer, E.; Bellini, D.; Barford, D.
Deposited on	:	2020-11-24
Resolution	:	2.40 Å(reported)

This is a Full wwPDB X-ray Structure 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/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

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

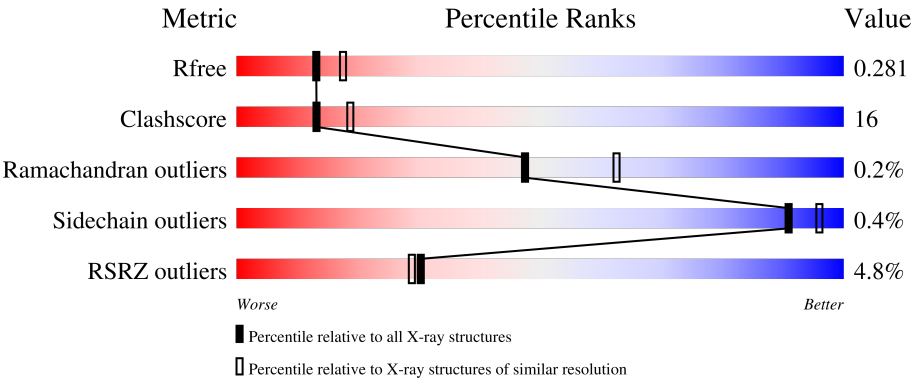
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.18
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.18

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	122	4% 75% 23%
1	B	122	5% 81% 18%
1	E	122	2% 81% 18%
1	F	122	75% 25%
2	C	26	19% 50% 15% 31%

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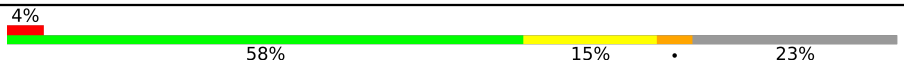
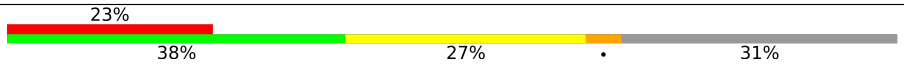
Mol	Chain	Length	Quality of chain
2	D	26	
2	G	26	
2	H	26	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4542 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Mitotic spindle assembly checkpoint protein MAD1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	122	Total	C	N	O	S	0	0	0
			980	619	166	192	3			
1	A	122	Total	C	N	O	S	0	0	0
			978	618	166	191	3			
1	E	122	Total	C	N	O	S	0	0	0
			980	619	166	192	3			
1	F	122	Total	C	N	O	S	0	0	0
			978	618	166	191	3			

- Molecule 2 is a protein called Mitotic checkpoint serine/threonine-protein kinase BUB1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	C	18	Total	C	N	O	P	S	0	0	0
			145	92	23	27	1	2			
2	D	20	Total	C	N	O	P	S	0	0	0
			159	101	25	30	1	2			
2	G	18	Total	C	N	O	P	S	0	0	0
			145	92	23	27	1	2			
2	H	21	Total	C	N	O	P	S	0	0	0
			165	104	26	32	1	2			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	480	SER	-	expression tag	UNP O43683
D	480	SER	-	expression tag	UNP O43683
G	480	SER	-	expression tag	UNP O43683
H	480	SER	-	expression tag	UNP O43683

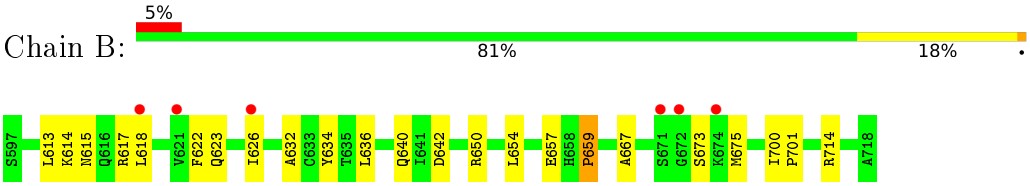
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	3	Total O 3 3	0	0
3	A	3	Total O 3 3	0	0
3	E	2	Total O 2 2	0	0
3	F	4	Total O 4 4	0	0

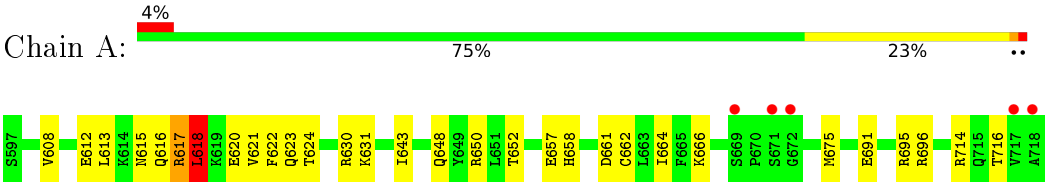
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

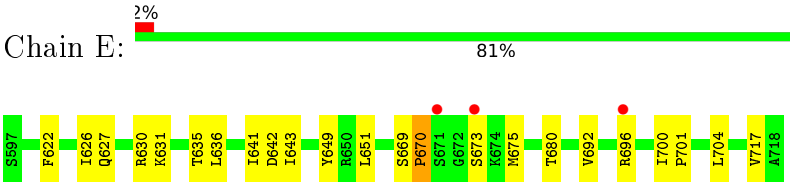
- Molecule 1: Mitotic spindle assembly checkpoint protein MAD1



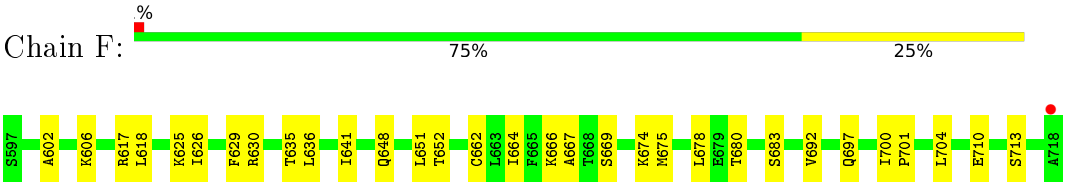
- Molecule 1: Mitotic spindle assembly checkpoint protein MAD1



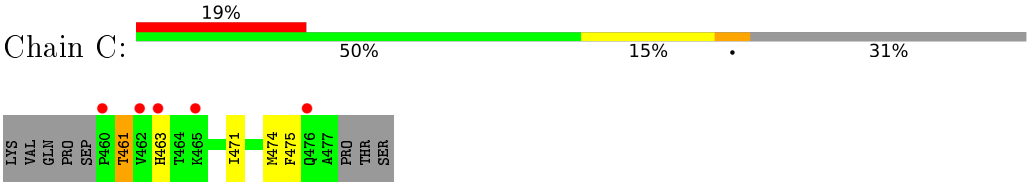
- Molecule 1: Mitotic spindle assembly checkpoint protein MAD1



- Molecule 1: Mitotic spindle assembly checkpoint protein MAD1

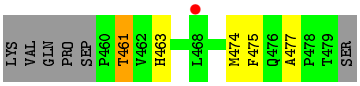


- Molecule 2: Mitotic checkpoint serine/threonine-protein kinase BUB1



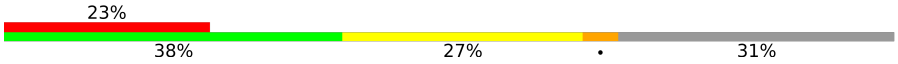
- Molecule 2: Mitotic checkpoint serine/threonine-protein kinase BUB1

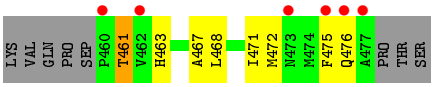
Chain D:



- Molecule 2: Mitotic checkpoint serine/threonine-protein kinase BUB1

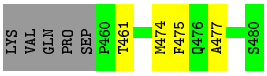
Chain G:





- Molecule 2: Mitotic checkpoint serine/threonine-protein kinase BUB1

Chain H:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	34.63Å 132.34Å 82.75Å 90.00° 93.34° 90.00°	Depositor
Resolution (Å)	39.43 – 2.40 51.64 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.6 (39.43-2.40) 99.7 (51.64-2.40)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.57 (at 2.39Å)	Xtriage
Refinement program	PHENIX (1.18.2_3874: ???)	Depositor
R, R_{free}	0.231 , 0.281 0.231 , 0.281	Depositor DCC
R_{free} test set	1376 reflections (4.75%)	wwPDB-VP
Wilson B-factor (Å^2)	48.8	Xtriage
Anisotropy	0.457	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 40.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	4542	wwPDB-VP
Average B, all atoms (Å^2)	61.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.88% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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

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	0.67	0/993	0.87	2/1337 (0.1%)
1	B	0.83	1/995 (0.1%)	0.73	0/1340
1	E	0.69	1/995 (0.1%)	0.72	0/1340
1	F	0.69	0/993	0.74	0/1337
2	C	0.65	0/136	0.78	0/179
2	D	0.64	0/151	0.71	0/201
2	G	0.67	0/136	0.75	0/179
2	H	0.63	0/157	0.75	0/209
All	All	0.71	2/4556 (0.0%)	0.76	2/6122 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	659	PRO	N-CD	16.58	1.71	1.47
1	E	670	PRO	N-CD	-7.83	1.36	1.47

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	618	LEU	N-CA-CB	13.16	136.72	110.40
1	A	618	LEU	N-CA-C	-7.20	91.56	111.00

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	978	0	984	39	1
1	B	980	0	988	52	0
1	E	980	0	988	35	0
1	F	978	0	984	34	0
2	C	145	0	139	21	0
2	D	159	0	154	10	0
2	G	145	0	140	17	0
2	H	165	0	158	3	0
3	A	3	0	0	0	0
3	B	3	0	0	0	0
3	E	2	0	0	2	0
3	F	4	0	0	0	0
All	All	4542	0	4535	148	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 16.

All (148) 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:622:PHE:CZ	1:B:626:ILE:HD11	1.31	1.64
1:B:623:GLN:CG	2:C:474:MET:CE	1.78	1.61
1:E:622:PHE:CZ	1:E:626:ILE:HD11	1.38	1.53
1:B:622:PHE:CZ	1:B:626:ILE:CD1	1.99	1.43
1:B:623:GLN:CG	2:C:474:MET:HE2	1.38	1.40
1:E:622:PHE:CZ	1:E:626:ILE:CD1	2.05	1.38
1:B:659:PRO:N	1:B:659:PRO:CD	1.71	1.35
1:B:623:GLN:HG3	2:C:474:MET:CE	0.85	1.32
1:B:622:PHE:CE2	1:B:626:ILE:CD1	2.16	1.26
1:B:622:PHE:CE2	1:B:626:ILE:HD12	1.70	1.26
1:E:622:PHE:CE2	1:E:626:ILE:HD12	1.75	1.21
1:B:622:PHE:CE1	1:B:626:ILE:HD11	1.76	1.20
1:B:623:GLN:HG3	2:C:474:MET:SD	1.89	1.12
1:A:613:LEU:O	1:A:617:ARG:HG3	1.52	1.09
1:B:613:LEU:HD23	2:D:463:HIS:ND1	1.70	1.07
1:B:623:GLN:CD	2:C:474:MET:HE2	1.76	1.05
1:B:613:LEU:HD23	2:D:463:HIS:CE1	1.92	1.04
1:E:669:SER:HB2	1:E:670:PRO:HD2	1.36	1.04
1:F:625:LYS:HZ1	2:G:472:MET:HE3	1.19	1.04

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:615:ASN:HB2	1:A:615:ASN:OD1	1.58	1.01
1:B:623:GLN:HG3	2:C:474:MET:HE1	1.05	1.01
1:E:622:PHE:CE2	1:E:626:ILE:CD1	2.38	1.00
1:B:614:LYS:O	1:B:618:LEU:HG	1.62	0.98
1:A:691:GLU:OE2	1:A:695:ARG:NE	1.97	0.97
1:F:625:LYS:HZ1	2:G:472:MET:CE	1.79	0.95
1:E:622:PHE:HZ	1:E:626:ILE:HD11	1.26	0.94
1:F:625:LYS:NZ	2:G:472:MET:CE	2.30	0.94
1:A:623:GLN:HG3	2:D:474:MET:HE1	1.48	0.94
1:B:623:GLN:CG	2:C:474:MET:HE1	1.71	0.91
1:F:630:ARG:NH2	2:H:477:ALA:O	2.03	0.91
1:B:615:ASN:CB	1:A:615:ASN:OD1	2.19	0.90
1:B:617:ARG:NH1	2:D:461:TPO:O1P	2.05	0.89
1:B:615:ASN:OD1	1:A:618:LEU:HD12	1.72	0.89
1:E:622:PHE:CE1	1:E:626:ILE:HD11	2.07	0.88
1:E:680:THR:HG23	3:E:801:HOH:O	1.74	0.88
1:E:643:ILE:HD11	1:F:629:PHE:HD1	1.39	0.86
1:F:625:LYS:NZ	2:G:472:MET:HE3	1.91	0.84
1:F:710:GLU:O	1:F:713:SER:OG	1.94	0.82
1:B:613:LEU:CD2	2:D:463:HIS:ND1	2.42	0.81
1:A:613:LEU:O	1:A:617:ARG:CG	2.28	0.81
1:E:641:ILE:HD13	1:E:651:LEU:HG	1.63	0.81
1:A:630:ARG:NH2	2:D:477:ALA:O	2.15	0.80
1:B:613:LEU:O	1:B:617:ARG:HG2	1.82	0.80
1:B:623:GLN:HG3	2:C:474:MET:HE2	0.92	0.78
1:E:643:ILE:HG22	1:E:643:ILE:O	1.82	0.77
1:E:641:ILE:CD1	1:E:651:LEU:HG	2.14	0.77
1:A:623:GLN:HG3	2:D:474:MET:CE	2.14	0.77
1:E:627:GLN:HG3	1:E:631:LYS:HE3	1.71	0.73
1:B:622:PHE:CD2	1:B:626:ILE:HD12	2.24	0.71
1:E:626:ILE:HD13	2:G:475:PHE:CZ	2.25	0.70
1:A:657:GLU:OE2	1:A:714:ARG:HD2	1.91	0.70
1:B:623:GLN:CB	2:C:474:MET:HE1	2.21	0.70
1:A:621:VAL:HG12	2:C:471:ILE:HD12	1.74	0.69
1:E:717:VAL:HG13	1:E:717:VAL:O	1.92	0.69
1:B:623:GLN:CG	2:C:474:MET:SD	2.64	0.68
1:B:615:ASN:OD1	1:A:618:LEU:CD1	2.43	0.65
1:F:652:THR:HG22	1:F:662:CYS:HB3	1.78	0.65
1:B:623:GLN:CD	2:C:474:MET:CE	2.47	0.64
1:E:626:ILE:HD13	2:G:475:PHE:CE1	2.33	0.64
1:F:667:ALA:HA	1:F:675:MET:SD	2.38	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:667:ALA:HA	1:B:675:MET:HG2	1.80	0.62
1:B:634:TYR:CE1	1:B:640:GLN:HB2	2.34	0.62
1:E:627:GLN:O	1:E:631:LYS:HG3	2.01	0.61
1:F:652:THR:HG22	1:F:662:CYS:CB	2.31	0.61
1:B:623:GLN:HA	2:C:474:MET:SD	2.40	0.61
1:A:613:LEU:HA	1:A:616:GLN:HB3	1.83	0.60
1:A:643:ILE:HD12	2:D:475:PHE:CG	2.35	0.60
1:A:621:VAL:HG12	2:C:471:ILE:CD1	2.32	0.60
1:B:614:LYS:HG2	1:A:615:ASN:ND2	2.17	0.59
1:F:669:SER:HB2	1:F:674:LYS:HB2	1.85	0.59
1:F:602:ALA:O	1:F:606:LYS:HG2	2.02	0.59
1:A:618:LEU:HD22	1:A:622:PHE:CZ	2.38	0.58
1:E:669:SER:CB	1:E:670:PRO:HD2	2.16	0.58
1:B:634:TYR:CD1	1:B:640:GLN:HB2	2.38	0.58
1:E:717:VAL:O	1:E:717:VAL:CG1	2.52	0.58
1:A:648:GLN:HE21	1:A:666:LYS:HD3	1.68	0.57
1:F:625:LYS:NZ	2:G:472:MET:HE2	2.16	0.57
2:G:467:ALA:O	2:G:471:ILE:HG22	2.05	0.57
1:E:635:THR:HG21	1:F:675:MET:HG2	1.87	0.56
1:E:622:PHE:CZ	2:G:471:ILE:CD1	2.89	0.56
1:E:673:SER:HA	1:F:635:THR:HG21	1.88	0.56
1:A:695:ARG:HH21	1:A:695:ARG:HG3	1.71	0.55
1:A:621:VAL:CG1	2:C:471:ILE:HD12	2.35	0.55
1:E:643:ILE:HD11	1:F:629:PHE:CD1	2.30	0.55
1:A:658:HIS:CD2	1:A:661:ASP:OD2	2.60	0.55
1:B:636:LEU:HD21	1:A:675:MET:SD	2.47	0.55
1:E:680:THR:CG2	3:E:801:HOH:O	2.42	0.54
1:E:622:PHE:HZ	1:E:626:ILE:CD1	1.95	0.53
1:B:615:ASN:CG	1:A:615:ASN:OD1	2.47	0.53
1:F:664:ILE:HG22	1:F:678:LEU:HD12	1.90	0.53
1:A:608:VAL:O	1:A:612:GLU:HG2	2.09	0.52
1:B:632:ALA:HA	1:A:675:MET:HE3	1.92	0.52
2:G:461:TPO:O2P	2:G:463:HIS:ND1	2.43	0.52
1:F:692:VAL:O	1:F:697:GLN:HB2	2.09	0.51
1:E:649:TYR:CD1	1:E:675:MET:HE1	2.45	0.51
1:A:658:HIS:HD2	1:A:661:ASP:OD2	1.94	0.50
1:B:614:LYS:HE3	1:A:615:ASN:HB3	1.94	0.49
1:B:622:PHE:CZ	1:B:626:ILE:HD13	2.29	0.49
1:B:642:ASP:OD1	1:B:650:ARG:HB3	2.13	0.48
1:B:700:ILE:N	1:B:701:PRO:CD	2.76	0.48
1:A:622:PHE:CD1	2:C:471:ILE:HD11	2.49	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:632:ALA:HA	1:A:675:MET:CE	2.42	0.48
1:B:634:TYR:HD1	1:B:640:GLN:N	2.11	0.48
1:F:617:ARG:HH22	2:G:461:TPO:P	2.37	0.48
1:B:634:TYR:CD1	1:B:640:GLN:N	2.82	0.48
1:F:625:LYS:HZ2	2:G:472:MET:CE	2.20	0.48
1:B:642:ASP:HB2	2:C:475:PHE:O	2.13	0.48
1:E:700:ILE:N	1:E:701:PRO:CD	2.77	0.48
1:F:625:LYS:CE	2:G:472:MET:CE	2.93	0.47
1:F:652:THR:CG2	1:F:662:CYS:HB3	2.43	0.46
1:B:614:LYS:O	1:B:618:LEU:CG	2.48	0.46
1:B:657:GLU:OE2	1:B:714:ARG:HD3	2.16	0.46
2:C:461:TPO:O1P	2:C:463:HIS:HB2	2.16	0.46
2:G:471:ILE:HG23	2:G:472:MET:N	2.31	0.46
1:A:623:GLN:HG3	2:D:474:MET:SD	2.56	0.46
1:F:648:GLN:HE21	1:F:666:LYS:HD2	1.81	0.46
1:A:613:LEU:O	1:A:613:LEU:HD12	2.17	0.45
1:A:650:ARG:HA	1:A:664:ILE:HD13	1.98	0.45
1:A:620:GLU:O	1:A:624:THR:HG23	2.16	0.45
1:F:641:ILE:HG13	1:F:651:LEU:HG	1.99	0.45
1:A:617:ARG:NH1	1:A:620:GLU:OE2	2.50	0.45
1:A:652:THR:HG22	1:A:662:CYS:HB3	1.98	0.45
1:A:613:LEU:HB2	1:A:617:ARG:HD2	1.99	0.45
2:G:468:LEU:HA	2:G:471:ILE:CG2	2.47	0.45
1:E:704:LEU:HD12	1:F:636:LEU:O	2.17	0.44
1:B:623:GLN:HB2	2:C:474:MET:HE1	1.96	0.44
1:B:634:TYR:HD1	1:B:640:GLN:CA	2.31	0.44
1:B:617:ARG:CZ	2:D:461:TPO:O1P	2.64	0.44
1:B:615:ASN:HA	1:B:618:LEU:HD12	2.00	0.44
1:F:700:ILE:N	1:F:701:PRO:CD	2.81	0.43
1:B:673:SER:HB3	1:A:631:LYS:HE3	2.00	0.43
1:E:641:ILE:CD1	1:E:651:LEU:CG	2.91	0.43
1:F:680:THR:H	1:F:683:SER:HB3	1.83	0.43
1:F:625:LYS:CE	2:G:472:MET:HE3	2.48	0.43
1:E:636:LEU:O	1:F:704:LEU:HD12	2.19	0.43
1:F:664:ILE:CG2	1:F:678:LEU:HD12	2.48	0.42
1:E:669:SER:HB2	1:E:670:PRO:CD	2.25	0.42
1:F:626:ILE:HG21	2:H:474:MET:HB3	2.00	0.42
1:E:643:ILE:O	1:E:643:ILE:CG2	2.55	0.42
1:A:622:PHE:HD1	2:C:471:ILE:CD1	2.32	0.42
1:B:634:TYR:CE2	1:B:654:LEU:HD13	2.55	0.42
1:F:626:ILE:HD12	2:H:475:PHE:CZ	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:630:ARG:NH2	1:E:642:ASP:OD1	2.53	0.41
1:E:630:ARG:NH1	2:G:476:GLN:O	2.54	0.41
1:E:692:VAL:O	1:E:696:ARG:HB3	2.20	0.41
1:F:618:LEU:HD23	1:F:618:LEU:HA	1.88	0.41
1:A:622:PHE:CE1	2:C:471:ILE:HG12	2.56	0.41
1:F:652:THR:CG2	1:F:662:CYS:CB	2.98	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:696:ARG:NH2	1:A:716:THR:O[1_655]	1.97	0.23

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	120/122 (98%)	114 (95%)	5 (4%)	1 (1%)	19 29
1	B	120/122 (98%)	117 (98%)	3 (2%)	0	100 100
1	E	120/122 (98%)	115 (96%)	5 (4%)	0	100 100
1	F	120/122 (98%)	118 (98%)	2 (2%)	0	100 100
2	C	15/26 (58%)	15 (100%)	0	0	100 100
2	D	17/26 (65%)	16 (94%)	1 (6%)	0	100 100
2	G	15/26 (58%)	13 (87%)	2 (13%)	0	100 100
2	H	18/26 (69%)	18 (100%)	0	0	100 100
All	All	545/592 (92%)	526 (96%)	18 (3%)	1 (0%)	47 62

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	618	LEU

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	110/111 (99%)	108 (98%)	2 (2%)	59 76
1	B	111/111 (100%)	111 (100%)	0	100 100
1	E	111/111 (100%)	111 (100%)	0	100 100
1	F	110/111 (99%)	110 (100%)	0	100 100
2	C	14/21 (67%)	14 (100%)	0	100 100
2	D	16/21 (76%)	16 (100%)	0	100 100
2	G	14/21 (67%)	14 (100%)	0	100 100
2	H	17/21 (81%)	17 (100%)	0	100 100
All	All	503/528 (95%)	501 (100%)	2 (0%)	91 96

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

Mol	Chain	Res	Type
1	A	617	ARG
1	A	618	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	607	GLN
1	A	640	GLN
1	A	648	GLN
1	A	658	HIS
2	C	476	GLN
1	E	616	GLN
1	E	627	GLN
1	F	648	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues 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	$\#\|Z\| > 2$
2	TPO	H	461	2	8,10,11	0.77	0	10,14,16	1.16	1 (10%)
2	TPO	D	461	2	8,10,11	0.76	0	10,14,16	1.03	1 (10%)
2	TPO	C	461	2	8,10,11	0.82	0	10,14,16	1.20	1 (10%)
2	TPO	G	461	2	8,10,11	0.78	0	10,14,16	1.14	1 (10%)

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
2	TPO	H	461	2	-	5/9/11/13	-
2	TPO	D	461	2	-	6/9/11/13	-
2	TPO	C	461	2	-	5/9/11/13	-
2	TPO	G	461	2	-	4/9/11/13	-

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	461	TPO	O-C-CA	-2.74	117.61	124.78
2	H	461	TPO	O-C-CA	-2.56	118.07	124.78
2	G	461	TPO	O-C-CA	-2.52	118.17	124.78
2	D	461	TPO	O-C-CA	-2.40	118.49	124.78

There are no chirality outliers.

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	461	TPO	N-CA-CB-CG2
2	C	461	TPO	N-CA-CB-OG1
2	C	461	TPO	C-CA-CB-CG2
2	C	461	TPO	CG2-CB-OG1-P
2	D	461	TPO	N-CA-CB-CG2
2	D	461	TPO	N-CA-CB-OG1
2	D	461	TPO	C-CA-CB-CG2
2	D	461	TPO	CG2-CB-OG1-P
2	D	461	TPO	CB-OG1-P-O2P
2	G	461	TPO	N-CA-CB-CG2
2	G	461	TPO	N-CA-CB-OG1
2	G	461	TPO	C-CA-CB-CG2
2	H	461	TPO	N-CA-CB-CG2
2	H	461	TPO	N-CA-CB-OG1
2	H	461	TPO	C-CA-CB-CG2
2	H	461	TPO	CG2-CB-OG1-P
2	C	461	TPO	CA-CB-OG1-P
2	D	461	TPO	O-C-CA-CB
2	G	461	TPO	O-C-CA-CB
2	H	461	TPO	O-C-CA-CB

There are no ring outliers.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	461	TPO	2	0
2	C	461	TPO	1	0
2	G	461	TPO	2	0

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

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å^2)	Q<0.9
1	A	122/122 (100%)	0.37	5 (4%) 37 36	36, 54, 86, 116	0
1	B	122/122 (100%)	0.47	6 (4%) 29 28	36, 55, 85, 104	0
1	E	122/122 (100%)	0.31	3 (2%) 57 55	37, 58, 85, 110	0
1	F	122/122 (100%)	0.17	1 (0%) 86 84	39, 54, 77, 109	0
2	C	17/26 (65%)	1.57	5 (29%) 0 0	81, 91, 101, 108	0
2	D	19/26 (73%)	0.82	1 (5%) 26 25	64, 70, 86, 92	0
2	G	17/26 (65%)	1.44	6 (35%) 0 0	73, 86, 106, 110	0
2	H	20/26 (76%)	0.39	0 100 100	49, 62, 78, 90	0
All	All	561/592 (94%)	0.42	27 (4%) 30 29	36, 58, 95, 116	0

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	672	GLY	7.1
1	A	671	SER	6.4
1	B	671	SER	6.3
1	A	672	GLY	5.3
1	E	671	SER	5.3
1	F	718	ALA	5.1
1	E	673	SER	4.2
2	C	465	LYS	4.2
1	A	718	ALA	3.4
1	A	669	SER	3.1
2	C	460	PRO	3.1
2	C	476	GLN	3.0
2	C	462	VAL	3.0
2	C	463	HIS	2.9
2	G	475	PHE	2.8
1	A	717	VAL	2.8

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Mol	Chain	Res	Type	RSRZ
2	G	473	ASN	2.4
1	B	674	LYS	2.4
2	G	476	GLN	2.4
1	B	621	VAL	2.4
2	D	468	LEU	2.3
2	G	462	VAL	2.3
1	B	626	ILE	2.3
1	E	696	ARG	2.2
2	G	477	ALA	2.1
1	B	618	LEU	2.1
2	G	460	PRO	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	TPO	G	461	11/12	0.77	0.23	84,95,116,120	0
2	TPO	D	461	11/12	0.90	0.14	84,88,90,96	0
2	TPO	C	461	11/12	0.92	0.12	77,91,101,101	0
2	TPO	H	461	11/12	0.93	0.15	71,78,86,93	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.