WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Feb 5, 2025 – 12:03 PM EST

PDB ID	:	4NCA
Title	:	Structure of Thermus thermophilus Argonaute bound to guide DNA 19-mer and target DNA in the presence of Mg2+
Authors	:	Sheng, G.; Zhao, H.; Wang, J.; Rao, Y.; Wang, Y.
Deposited on	:	2013-10-24
Resolution	:	2.49 Å(reported)

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

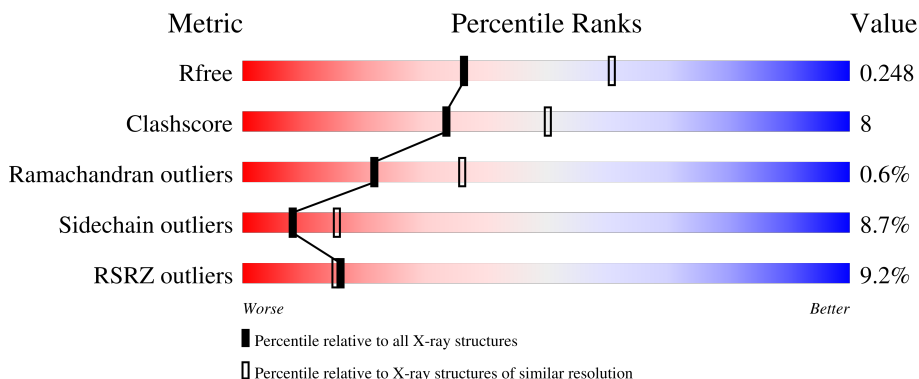|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.49 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	Percentile Ranks	Value
Rfree		0.248
Clashscore		8
Ramachandran outliers		0.6%
Sidechain outliers		8.7%
RSRZ outliers		9.2%

Worse ... *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	164625	7106 (2.50-2.46)
Clashscore	180529	7991 (2.50-2.46)
Ramachandran outliers	177936	7888 (2.50-2.46)
Sidechain outliers	177891	7890 (2.50-2.46)
RSRZ outliers	164620	7106 (2.50-2.46)

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	685	8% / 75% / 22% / •
1	B	685	11% / 79% / 19% / ••
2	C	21	48% / 24% / 5% / 24%
2	E	21	24% / 52% / 24%
3	D	10	80% / 10% / 10%

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Mol	Chain	Length	Quality of chain
3	F	10	90% 10%
4	G	6	67% 33%
4	H	6	33% 67%

2 Entity composition ⓘ

There are 7 unique types of molecules in this entry. The entry contains 12306 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 Argonaute.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	683	Total 5338	C 3409	N 1001	O 921	S 7	0	0	0
1	B	678	Total 5289	C 3383	N 995	O 904	S 7	0	0	0

- Molecule 2 is a DNA chain called 5'-D(P*TP*GP*AP*GP*GP*TP*AP*GP*TP*AP*GP*GP*TP*TP*GP*TP*AP*TP*AP*GP*T)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	16	Total 338	C 160	N 62	O 100	P 16	0	0	0
2	E	16	Total 338	C 160	N 62	O 100	P 16	0	0	0

- Molecule 3 is a DNA chain called 5'-D(P*TP*AP*CP*TP*AP*CP*CP*TP*CP*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	10	Total 200	C 95	N 33	O 62	P 10	0	0	0
3	F	10	Total 201	C 96	N 33	O 62	P 10	0	0	0

- Molecule 4 is a DNA chain called 5'-D(*AP*CP*AP*AP*CP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	G	6	Total 117	C 57	N 24	O 31	P 5	0	0	0
4	H	6	Total 117	C 57	N 24	O 31	P 5	0	0	0

- Molecule 5 is THYMIDINE-5'-PHOSPHATE (three-letter code: TMP) (formula: $C_{10}H_{15}N_2O_8P$).

TMP
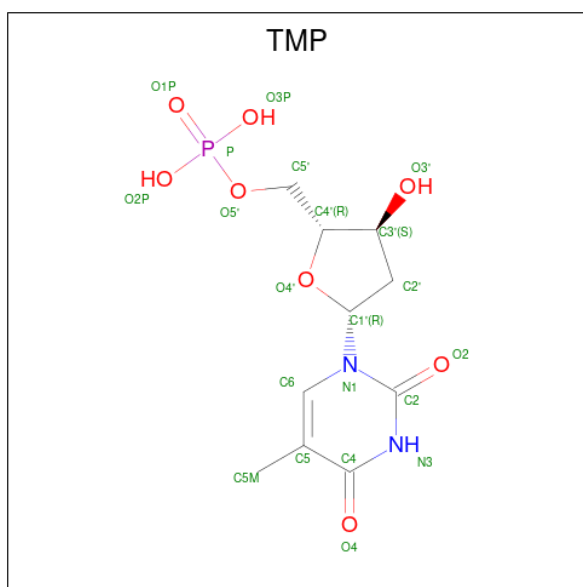
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			21	10	2	8	1		
5	B	1	Total	C	N	O	P	0	0
			21	10	2	8	1		

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	1	Total	Mg	0	0
			1	1		
6	B	2	Total	Mg	0	0
			2	2		
6	C	1	Total	Mg	0	0
			1	1		
6	D	1	Total	Mg	0	0
			1	1		
6	E	1	Total	Mg	0	0
			1	1		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	152	Total	O	0	0
			152	152		
7	B	118	Total	O	0	0
			118	118		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	C	11	Total 11	O 11	0	0
7	D	11	Total 11	O 11	0	0
7	E	18	Total 18	O 18	0	0
7	F	6	Total 6	O 6	0	0
7	G	1	Total 1	O 1	0	0
7	H	3	Total 3	O 3	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 seco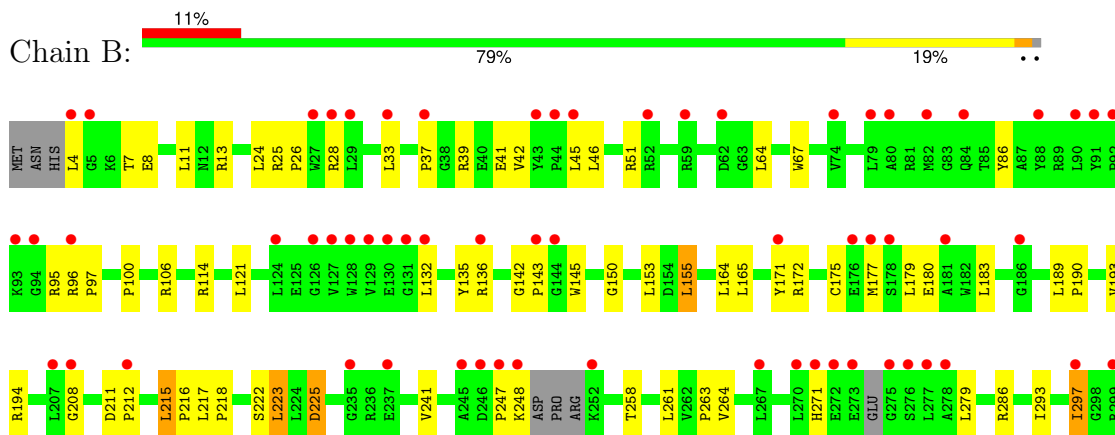nd graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates 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.
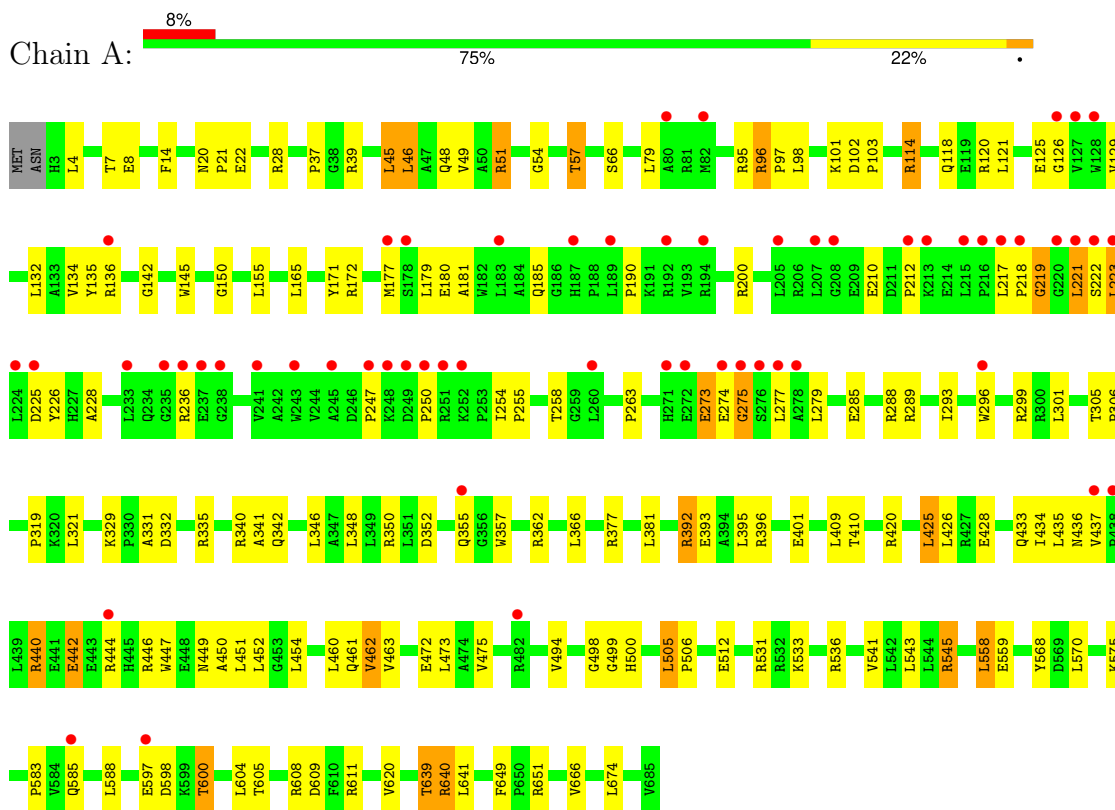
- Molecule 1: Argonaute

- Molecule 1: Argonaute

E307 R310 R315 P319 K320 L321 M322 R325 K329 D332 R335 R340 E343 L346 A347 L348 Q355 G356 W357 R363 L366 R367 S375 R392 V406 L425 L426 R427 E428 Q433 V437 P438 R444 E448 N449 A450 L451

L454 Q461 V462 L473 A474 V475 R482 E483 S484 V494 D497 G498 Q499 H500 L501 L505 P506 E512 E525 W528 R531 R532 K533 R540 V541 R545 R548 E553 L558 E564 L570 V571 S572 K575 P583 L588 L592 Y593 V594

D598 L602 L603 L604 T605 T613 R640 L641 F649 L652 K664 E665 V666 L674 V685

• Molecule 2: 5'-D(P*TP*GP*AP*GP*GP*TP*AP*GP*TP*AP*GP*GP*TP*TP*GP*TP*AP* TP*AP*GP*T)-3'

Chain C:

| | 48% | | 24% | 5% | 24% | |

T1 G2 A3 G4 T9 T14 G15 T16 DA DT DA DG DT

• Molecule 2: 5'-D(P*TP*GP*AP*GP*GP*TP*AP*GP*TP*AP*GP*GP*TP*TP*GP*TP*AP* TP*AP*GP*T)-3'

Chain E:

| | 24% | 52% | 24% | |

T1 G2 A3 G4 G5 T6 A7 G8 T9 A10 G11 G12 T13 T14 G15 T16 DA DT DA DG DT

• Molecule 3: 5'-D(P*TP*AP*CP*TP*AP*CP*CP*TP*CP*G)-3'

Chain D:

| | 80% | 10% | 10% | |

T10 A11 G19

• Molecule 3: 5'-D(P*TP*AP*CP*TP*AP*CP*CP*TP*CP*G)-3'

Chain F:

| | 90% | 10% | |

T10 G19

• Molecule 4: 5'-D(*AP*CP*AP*AP*CP*C)-3'

Chain G:

| | 67% | 33% | |

A1 C2 A3 A4 C5 C6

• Molecule 4: 5'-D(*AP*CP*AP*AP*CP*C)-3'

Chain H:

| | 33% | 67% | |

A4 C5 A6 A7 C8 C9

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	110.95Å 117.56Å 160.38Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.16 – 2.49 48.16 – 2.49	Depositor EDS
% Data completeness (in resolution range)	99.4 (48.16-2.49) 99.4 (48.16-2.49)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.33 (at 2.48Å)	Xtriage
Refinement program	PHENIX 1.8.2_1309	Depositor
R, R_{free}	0.200 , 0.245 0.205 , 0.248	Depositor DCC
R_{free} test set	3714 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	46.7	Xtriage
Anisotropy	0.322	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 57.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	12306	wwPDB-VP
Average B, all atoms (Å^2)	62.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.76% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 (i)

5.1 Standard geometry (i)

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

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	0/5466	0.47	2/7423 (0.0%)
1	B	0.26	0/5416	0.45	0/7353
2	C	0.73	1/379 (0.3%)	1.28	2/584 (0.3%)
2	E	0.75	1/379 (0.3%)	1.26	4/584 (0.7%)
3	D	0.83	1/222 (0.5%)	1.12	1/337 (0.3%)
3	F	0.82	1/223 (0.4%)	1.11	0/339
4	G	0.50	0/131	1.14	0/199
4	H	0.47	0/131	0.99	0/199
All	All	0.35	4/12347 (0.0%)	0.61	9/17018 (0.1%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1	DT	OP3-P	-10.57	1.48	1.61
2	E	1	DT	OP3-P	-10.56	1.48	1.61
3	F	10	DT	OP3-P	-10.31	1.48	1.61
3	D	10	DT	OP3-P	-10.17	1.49	1.61

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	E	1	DT	OP1-P-OP2	-8.62	106.67	119.60
2	C	1	DT	OP1-P-OP2	-7.58	108.22	119.60
1	A	247	PRO	N-CA-CB	6.04	110.55	103.30
2	E	11	DG	O4'-C1'-N9	5.66	111.96	108.00
1	A	250	PRO	N-CA-CB	5.60	110.02	103.30
2	E	9	DT	O4'-C1'-N1	5.49	111.84	108.00
2	C	9	DT	N3-C4-O4	5.26	123.05	119.90
3	D	11	DA	O4'-C1'-N9	5.17	111.62	108.00
2	E	13	DT	N3-C4-O4	5.05	122.93	119.90

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	5338	0	5395	97	0
1	B	5289	0	5362	73	0
2	C	338	0	183	5	0
2	E	338	0	183	5	0
3	D	200	0	111	1	0
3	F	201	0	114	1	0
4	G	117	0	67	2	0
4	H	117	0	67	4	0
5	A	21	0	13	6	0
5	B	21	0	13	3	0
6	A	1	0	0	0	0
6	B	2	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	1	0
6	E	1	0	0	0	0
7	A	152	0	0	2	0
7	B	118	0	0	2	0
7	C	11	0	0	0	0
7	D	11	0	0	0	0
7	E	18	0	0	0	0
7	F	6	0	0	0	0
7	G	1	0	0	0	0
7	H	3	0	0	0	0
All	All	12306	0	11508	176	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 8.

All (176) 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)
2:C:14:DT:H3	4:G:3:DA:H2	1.31	0.78
1:B:494:VAL:HG22	1:B:500:HIS:HB2	1.71	0.72
1:A:129:VAL:HG22	1:A:134:VAL:HG12	1.75	0.69
1:A:136:ARG:NH1	7:A:925:HOH:O	2.26	0.69
1:A:436:ASN:O	1:A:446:ARG:NH2	2.25	0.69
1:A:512:GLU:OE2	1:A:545:ARG:NH2	2.27	0.68
1:A:28:ARG:HE	1:A:96:ARG:HG2	1.59	0.67
1:A:51:ARG:NH2	1:A:118:GLN:OE1	2.28	0.67
1:A:392:ARG:NH1	1:B:525:GLU:OE1	2.28	0.66
1:A:597:GLU:HB3	1:A:600:THR:HG23	1.78	0.65
1:B:25:ARG:O	1:B:95:ARG:NH2	2.30	0.64
1:A:114:ARG:NH2	4:G:4:DA:OP2	2.31	0.64
1:A:583:PRO:HD3	1:A:588:LEU:HD13	1.79	0.64
1:B:8:GLU:OE1	1:B:310:ARG:NH1	2.31	0.63
1:B:190:PRO:HG2	1:B:263:PRO:HB3	1.82	0.62
3:D:10:DT:OP1	6:D:101:MG:MG	1.43	0.62
1:B:28:ARG:HD3	1:B:96:ARG:HB2	1.82	0.61
1:B:548:ARG:NH2	4:H:7:DA:N3	2.50	0.58
1:A:285:GLU:HG3	1:A:288:ARG:HH21	1.68	0.58
1:B:114:ARG:HD3	1:B:132:LEU:HD11	1.86	0.58
1:B:343:GLU:HG3	1:B:375:SER:HB2	1.84	0.58
2:E:6:DT:H2"	2:E:7:DA:H5"	1.85	0.58
1:A:121:LEU:HD22	1:A:134:VAL:HG11	1.84	0.58
1:A:273:GLU:O	1:A:275:GLY:N	2.37	0.58
1:A:319:PRO:HG3	1:A:640:ARG:HD2	1.86	0.57
2:C:3:DA:H2'	2:C:4:DG:C8	2.38	0.57
1:B:136:ARG:NH2	7:B:894:HOH:O	2.36	0.57
1:A:446:ARG:HG3	2:C:2:DG:C8	2.39	0.57
1:A:462:VAL:HG23	1:A:463:VAL:HG13	1.87	0.57
1:B:175:CYS:SG	1:B:263:PRO:HG2	2.45	0.56
1:B:286:ARG:HD2	1:B:613:THR:HG21	1.87	0.56
1:B:594:VAL:HB	1:B:602:LEU:HB2	1.87	0.56
1:A:136:ARG:NH2	1:A:293:ILE:HG23	2.21	0.56
1:B:208:GLY:N	1:B:241:VAL:O	2.39	0.55
1:B:473:LEU:HB3	1:B:541:VAL:HG12	1.89	0.55
1:B:605:THR:O	1:B:640:ARG:NH2	2.40	0.55
1:A:377:ARG:NH1	1:A:401:GLU:O	2.39	0.55
1:A:217:LEU:O	1:A:219:GLY:N	2.40	0.54
1:A:600:THR:HB	1:A:620:VAL:HG22	1.90	0.54
1:A:225:ASP:HA	1:A:228:ALA:HB3	1.89	0.54
1:B:545:ARG:NH1	1:B:553:GLU:OE2	2.40	0.54
1:B:218:PRO:HD2	5:B:701:TMP:HN3	1.74	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:319:PRO:HG2	1:B:640:ARG:HD2	1.89	0.53
1:A:54:GLY:O	1:A:57:THR:HG23	2.09	0.53
1:B:100:PRO:O	1:B:106:ARG:NH1	2.38	0.53
1:B:506:PRO:HG2	1:B:666:VAL:HG21	1.91	0.53
1:B:583:PRO:HD3	1:B:588:LEU:HD13	1.91	0.53
1:B:41:GLU:O	1:B:45:LEU:HB2	2.09	0.52
1:A:605:THR:O	1:A:640:ARG:NH2	2.42	0.52
1:A:212:PRO:O	1:A:222:SER:OG	2.28	0.52
1:A:180:GLU:HG2	1:A:258:THR:OG1	2.09	0.52
3:F:10:DT:OP2	4:H:9:DC:O3'	2.28	0.52
1:B:193:VAL:HG11	1:B:261:LEU:HD13	1.92	0.52
2:E:3:DA:H2'	2:E:4:DG:C8	2.46	0.51
1:A:221:LEU:HD13	1:A:226:TYR:HB2	1.92	0.51
1:A:410:THR:O	1:A:436:ASN:HA	2.10	0.51
1:B:363:ARG:O	1:B:367:ARG:HG3	2.10	0.51
1:A:48:GLN:HG2	1:A:79:LEU:HD22	1.93	0.51
1:B:33:LEU:HD13	1:B:45:LEU:HD23	1.91	0.51
1:A:217:LEU:HD21	1:A:223:LEU:HG	1.93	0.50
1:A:39:ARG:HD3	5:B:701:TMP:C2	2.46	0.50
1:A:340:ARG:NH1	1:A:499:GLY:O	2.35	0.50
1:A:461:GLN:NE2	1:A:498:GLY:O	2.44	0.50
1:A:461:GLN:HG3	1:A:499:GLY:O	2.12	0.50
1:A:362:ARG:NH1	7:A:872:HOH:O	2.36	0.50
1:A:393:GLU:OE2	1:A:396:ARG:NH2	2.36	0.50
1:B:293:ILE:O	1:B:297:ILE:HG12	2.11	0.50
1:B:437:VAL:HG22	1:B:438:PRO:HA	1.92	0.50
1:A:114:ARG:HD2	1:A:132:LEU:HD11	1.94	0.50
1:B:512:GLU:OE2	1:B:545:ARG:NH2	2.45	0.49
1:A:440:ARG:HB2	1:A:442:GLU:HG2	1.93	0.49
1:B:461:GLN:HG3	1:B:499:GLY:O	2.11	0.49
1:B:222:SER:HB2	1:B:225:ASP:HB2	1.93	0.49
1:A:319:PRO:CG	1:A:640:ARG:HD2	2.43	0.49
1:B:335:ARG:NH2	1:B:448:GLU:OE2	2.46	0.49
1:B:501:LEU:HD21	1:B:641:LEU:HD13	1.94	0.49
1:A:45:LEU:HD12	1:A:45:LEU:HA	1.69	0.49
1:A:200:ARG:NH1	5:A:701:TMP:O1P	2.42	0.49
1:B:4:LEU:HB3	1:B:315:ARG:O	2.12	0.49
1:A:395:LEU:HD11	1:A:425:LEU:HD22	1.94	0.49
1:A:472:GLU:OE2	1:A:536:ARG:NH2	2.28	0.48
5:A:701:TMP:C2	1:B:39:ARG:HB2	2.47	0.48
1:B:180:GLU:HG2	1:B:258:THR:OG1	2.13	0.48

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Full wwPDB X-ray Structure Validation Report

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:14:DT:H3	4:H:6:DA:H2	1.60	0.48
1:A:341:ALA:HA	1:A:460:LEU:HD22	1.95	0.48
1:A:37:PRO:HB3	1:A:45:LEU:HD23	1.95	0.48
1:B:37:PRO:HB2	1:B:41:GLU:HG3	1.95	0.48
1:A:444:ARG:HA	1:A:447:TRP:NE1	2.28	0.48
1:A:558:LEU:HG	1:A:568:TYR:CZ	2.49	0.48
1:A:125:GLU:HA	1:A:126:GLY:HA2	1.64	0.47
1:A:142:GLY:HA3	1:A:145:TRP:CE2	2.49	0.47
1:A:226:TYR:CZ	5:A:701:TMP:H51	2.48	0.47
1:A:350:ARG:HD2	1:A:352:ASP:OD1	2.14	0.47
1:B:217:LEU:HD11	1:B:223:LEU:HA	1.97	0.47
1:B:335:ARG:HH21	1:B:444:ARG:HE	1.63	0.47
1:B:392:ARG:NH2	1:B:428:GLU:OE2	2.47	0.47
1:B:135:TYR:HA	1:B:150:GLY:HA3	1.97	0.47
1:A:210:GLU:N	1:A:210:GLU:OE1	2.47	0.46
1:B:121:LEU:HD11	1:B:153:LEU:HD12	1.98	0.46
1:A:296:TRP:HE3	1:A:299:ARG:HH21	1.63	0.46
1:B:51:ARG:NE	4:H:5:DC:OP1	2.48	0.46
1:B:548:ARG:HA	1:B:572:SER:OG	2.15	0.46
1:A:666:VAL:HG22	1:A:674:LEU:HD11	1.97	0.46
1:B:142:GLY:HA3	1:B:145:TRP:CE2	2.50	0.46
1:A:506:PRO:HG2	1:A:666:VAL:HG21	1.97	0.45
1:A:225:ASP:OD1	1:A:225:ASP:N	2.46	0.45
1:A:640:ARG:HG3	1:A:649:PHE:CD2	2.52	0.45
1:A:179:LEU:HD12	1:A:258:THR:HG22	1.98	0.45
1:A:494:VAL:HG22	1:A:500:HIS:HB2	1.99	0.45
1:B:171:TYR:CG	1:B:279:LEU:HD22	2.52	0.45
1:B:329:LYS:NZ	1:B:332:ASP:OD1	2.50	0.45
1:B:575:LYS:HD3	1:B:652:LEU:HD11	1.99	0.45
1:B:666:VAL:HG22	1:B:674:LEU:HD11	1.99	0.45
1:A:409:LEU:HD23	1:A:435:LEU:HB3	1.98	0.45
1:A:136:ARG:HH22	1:A:293:ILE:HA	1.82	0.44
1:A:350:ARG:NH2	1:A:352:ASP:OD2	2.50	0.44
1:A:329:LYS:NZ	1:A:332:ASP:OD1	2.50	0.44
1:A:120:ARG:NH1	1:A:301:LEU:O	2.51	0.44
1:A:558:LEU:HG	1:A:568:TYR:CE2	2.53	0.44
1:B:26:PRO:HB3	1:B:67:TRP:CD1	2.53	0.44
1:B:640:ARG:HG3	1:B:649:PHE:CD2	2.53	0.44
1:A:135:TYR:HA	1:A:150:GLY:HA3	1.99	0.44
1:A:392:ARG:NH2	1:A:428:GLU:OE2	2.48	0.43
1:A:177:MET:HB2	1:A:181:ALA:HB3	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:592:LEU:HD12	1:B:592:LEU:HA	1.84	0.43
1:A:46:LEU:HA	1:A:46:LEU:HD12	1.80	0.43
1:B:41:GLU:OE1	1:B:86:TYR:OH	2.37	0.43
1:B:433:GLN:HG2	1:B:450:ALA:O	2.18	0.43
1:A:39:ARG:NH1	5:B:701:TMP:O2	2.52	0.43
1:A:102:ASP:HA	1:A:103:PRO:HD3	1.82	0.43
1:A:433:GLN:HG2	1:A:450:ALA:O	2.19	0.43
1:A:96:ARG:HA	1:A:97:PRO:HD3	1.88	0.42
1:B:545:ARG:HA	1:B:545:ARG:HD2	1.89	0.42
1:A:22:GLU:OE1	1:A:95:ARG:NH1	2.52	0.42
1:A:639:THR:HG21	1:A:640:ARG:HH21	1.83	0.42
1:A:348:LEU:HB2	1:A:357:TRP:CE2	2.54	0.42
1:B:348:LEU:HB2	1:B:357:TRP:CE2	2.54	0.42
1:A:255:PRO:O	5:A:701:TMP:H2'1	2.19	0.42
1:B:449:ASN:ND2	2:E:2:DG:H21	2.18	0.42
1:A:190:PRO:HG3	1:A:263:PRO:HB3	2.01	0.42
1:A:217:LEU:HB2	1:A:221:LEU:O	2.20	0.42
1:A:348:LEU:HB2	1:A:357:TRP:CZ2	2.55	0.42
1:A:305:THR:HA	1:A:306:PRO:HD3	1.85	0.42
5:A:701:TMP:N3	1:B:39:ARG:HB2	2.35	0.42
1:A:505:LEU:HD23	1:A:505:LEU:HA	1.89	0.41
1:A:575:LYS:HB3	1:A:651:ARG:HH22	1.85	0.41
1:A:434:ILE:O	2:C:1:DT:H4'	2.20	0.41
1:A:449:ASN:ND2	2:C:2:DG:H21	2.19	0.41
1:B:340:ARG:NH2	1:B:499:GLY:O	2.44	0.41
1:A:20:ASN:HB2	1:A:21:PRO:HD2	2.03	0.41
1:A:608:ARG:HB2	1:A:611:ARG:HG3	2.01	0.41
1:B:37:PRO:HB3	1:B:45:LEU:HD22	2.02	0.41
1:A:14:PHE:HB3	1:A:306:PRO:HB3	2.02	0.41
1:A:46:LEU:O	1:A:49:VAL:HG12	2.21	0.41
1:A:254:ILE:HA	1:A:255:PRO:HD3	1.95	0.41
1:A:7:THR:OG1	1:A:8:GLU:N	2.52	0.41
1:B:155:LEU:HD23	1:B:164:LEU:O	2.21	0.41
1:B:183:LEU:HD21	1:B:189:LEU:HD23	2.03	0.41
1:B:664:LYS:HE2	1:B:664:LYS:HB2	1.67	0.41
1:B:211:ASP:HA	1:B:212:PRO:HD2	1.93	0.41
1:B:426:LEU:HD13	7:B:872:HOH:O	2.20	0.41
1:A:533:LYS:HD3	1:A:533:LYS:HA	1.79	0.41
1:B:264:VAL:HG11	2:E:10:DA:H5'	2.03	0.41
1:A:171:TYR:CG	1:A:279:LEU:HD22	2.56	0.40
1:A:473:LEU:HB3	1:A:541:VAL:HG12	2.02	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:11:LEU:C	1:B:13:ARG:H	2.24	0.40
1:B:164:LEU:HD13	1:B:164:LEU:HA	1.97	0.40
1:A:101:LYS:HD3	1:A:101:LYS:HA	1.91	0.40
1:A:331:ALA:HA	1:A:452:LEU:HD11	2.03	0.40
1:B:193:VAL:HG21	1:B:261:LEU:HB3	2.03	0.40
1:B:640:ARG:HG3	1:B:649:PHE:CG	2.55	0.40
1:A:57:THR:HG22	1:A:66:SER:OG	2.21	0.40
1:A:226:TYR:CE1	5:A:701:TMP:H51	2.57	0.40
1:B:215:LEU:HA	1:B:216:PRO:HD3	1.84	0.40
1:B:335:ARG:NH2	1:B:444:ARG:HH21	2.19	0.40
1:B:25:ARG:CZ	1:B:97:PRO:HG3	2.52	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 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	681/685 (99%)	643 (94%)	32 (5%)	6 (1%)	14	26
1	B	672/685 (98%)	654 (97%)	16 (2%)	2 (0%)	37	54
All	All	1353/1370 (99%)	1297 (96%)	48 (4%)	8 (1%)	22	36

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	247	PRO
1	A	274	GLU
1	A	275	GLY
1	A	585	GLN
1	B	143	PRO
1	A	218	PRO
1	A	219	GLY

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Mol	Chain	Res	Type
1	A	355	GLN

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 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	529/549 (96%)	480 (91%)	49 (9%)	7	13
1	B	522/549 (95%)	480 (92%)	42 (8%)	10	18
All	All	1051/1098 (96%)	960 (91%)	91 (9%)	8	15

All (91) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	LEU
1	A	45	LEU
1	A	46	LEU
1	A	51	ARG
1	A	57	THR
1	A	96	ARG
1	A	98	LEU
1	A	114	ARG
1	A	155	LEU
1	A	165	LEU
1	A	172	ARG
1	A	185	GLN
1	A	221	LEU
1	A	223	LEU
1	A	236	ARG
1	A	273	GLU
1	A	277	LEU
1	A	289	ARG
1	A	321	LEU
1	A	335	ARG
1	A	342	GLN
1	A	346	LEU

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Mol	Chain	Res	Type
1	A	366	LEU
1	A	381	LEU
1	A	392	ARG
1	A	420	ARG
1	A	425	LEU
1	A	426	LEU
1	A	437	VAL
1	A	440	ARG
1	A	442	GLU
1	A	451	LEU
1	A	454	LEU
1	A	462	VAL
1	A	475	VAL
1	A	505	LEU
1	A	531	ARG
1	A	543	LEU
1	A	545	ARG
1	A	558	LEU
1	A	559	GLU
1	A	570	LEU
1	A	598	ASP
1	A	600	THR
1	A	604	LEU
1	A	609	ASP
1	A	639	THR
1	A	640	ARG
1	A	641	LEU
1	B	7	THR
1	B	24	LEU
1	B	42	VAL
1	B	46	LEU
1	B	64	LEU
1	B	155	LEU
1	B	165	LEU
1	B	172	ARG
1	B	177	MET
1	B	179	LEU
1	B	194	ARG
1	B	215	LEU
1	B	223	LEU
1	B	225	ASP
1	B	248	LYS

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Mol	Chain	Res	Type
1	B	271	HIS
1	B	297	ILE
1	B	315	ARG
1	B	346	LEU
1	B	355	GLN
1	B	366	LEU
1	B	392	ARG
1	B	406	VAL
1	B	425	LEU
1	B	426	LEU
1	B	437	VAL
1	B	451	LEU
1	B	454	LEU
1	B	462	VAL
1	B	475	VAL
1	B	494	VAL
1	B	505	LEU
1	B	531	ARG
1	B	533	LYS
1	B	540	ARG
1	B	558	LEU
1	B	564	GLU
1	B	570	LEU
1	B	592	LEU
1	B	604	LEU
1	B	640	ARG
1	B	641	LEU

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	461	GLN
1	B	312	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)

Of 8 ligands modelled in this entry, 6 are monoatomic - leaving 2 for Mogul analysis.

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	$\#|Z| > 2$
5	TMP	A	701	-	22,22,22	0.61	0	32,33,33	0.89	2 (6%)
5	TMP	B	701	-	22,22,22	0.66	0	32,33,33	1.02	3 (9%)

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
5	TMP	A	701	-	-	3/10/22/22	0/2/2/2
5	TMP	B	701	-	-	1/10/22/22	0/2/2/2

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	B	701	TMP	O4-C4-C5	-2.92	121.58	124.92
5	B	701	TMP	O3P-P-O2P	2.67	117.81	107.80
5	A	701	TMP	O4-C4-C5	-2.67	121.86	124.92
5	A	701	TMP	O2P-P-O1P	2.06	118.87	110.83
5	B	701	TMP	C6-C5-C4	2.01	119.67	118.02

There are no chirality outliers.
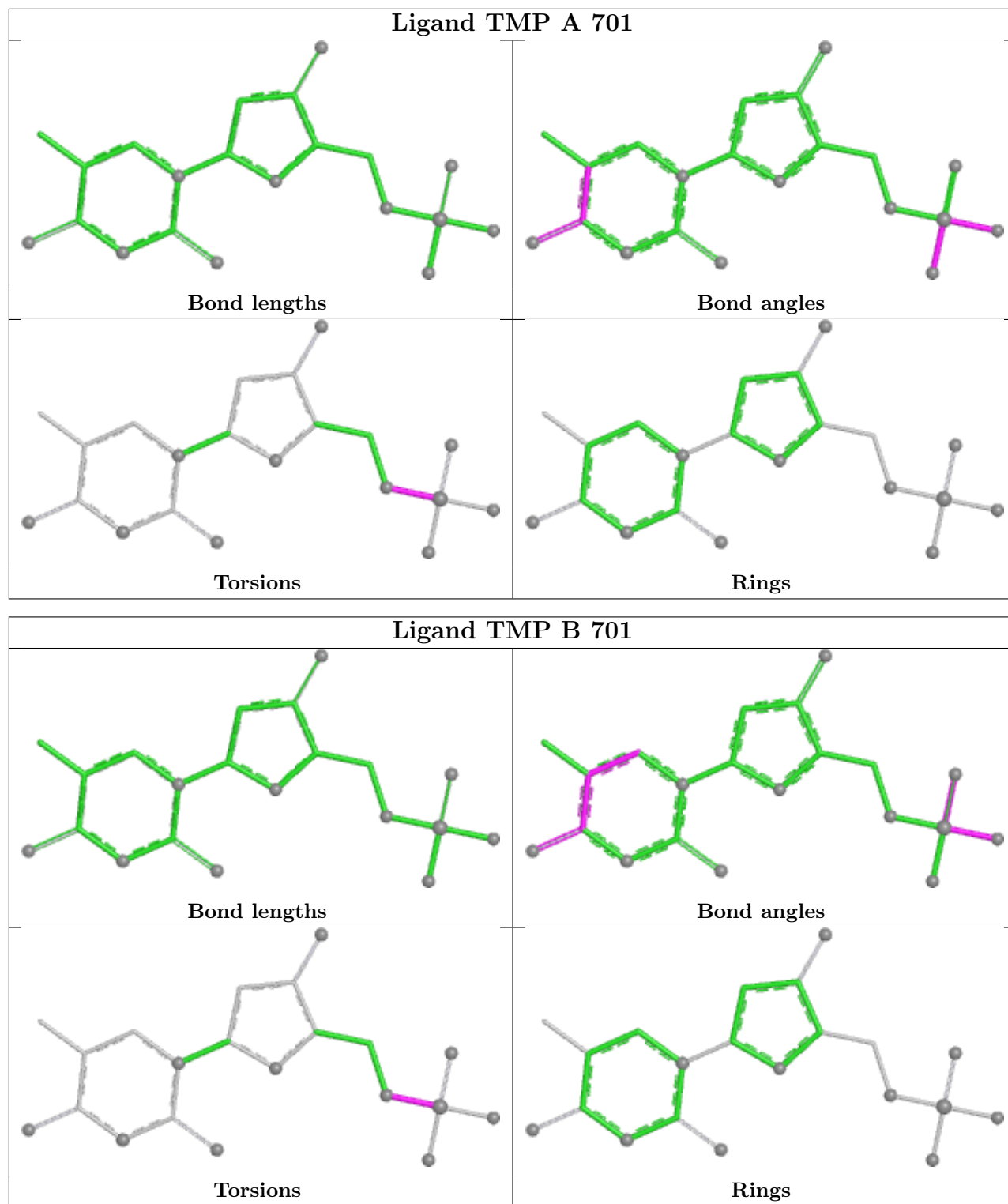
All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	701	TMP	C5'-O5'-P-O1P
5	A	701	TMP	C5'-O5'-P-O2P
5	A	701	TMP	C5'-O5'-P-O3P
5	B	701	TMP	C5'-O5'-P-O1P

There are no ring outliers.

2 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	701	TMP	6	0
5	B	701	TMP	3	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 then 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.

Ligand TMP A 701

Bond lengths

Bond angles

Torsions

Rings

Ligand TMP B 701

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

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, 95th 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(Å²)	Q<0.9
1	A	683/685 (99%)	0.48	58 (8%)	18	17	31, 56, 106, 142	0
1	B	678/685 (98%)	0.60	73 (10%)	12	12	36, 59, 99, 160	0
2	C	16/21 (76%)	-0.49	0	100	100	50, 56, 71, 90	0
2	E	16/21 (76%)	-0.53	0	100	100	46, 57, 73, 95	0
3	D	10/10 (100%)	-0.27	0	100	100	53, 65, 73, 76	0
3	F	10/10 (100%)	-0.33	0	100	100	52, 62, 69, 72	0
4	G	6/6 (100%)	0.44	0	100	100	53, 67, 85, 99	0
4	H	6/6 (100%)	0.16	0	100	100	50, 70, 93, 94	0
All	All	1425/1444 (98%)	0.50	131 (9%)	16	15	31, 57, 101, 160	0

All (131) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	136	ARG	7.4
1	B	277	LEU	6.0
1	B	276	SER	5.6
1	A	437	VAL	5.5
1	B	247	PRO	5.2
1	A	247	PRO	5.2
1	B	5	GLY	5.1
1	B	246	ASP	5.0
1	B	273	GLU	4.9
1	A	276	SER	4.7
1	A	207	LEU	4.6
1	B	178	SER	4.6
1	A	275	GLY	4.5
1	B	272	GLU	4.5
1	B	131	GLY	4.4
1	B	143	PRO	4.3

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Mol	Chain	Res	Type	RSRZ
1	B	248	LYS	4.2
1	A	251	ARG	4.2
1	B	29	LEU	4.1
1	B	132	LEU	4.1
1	B	128	TRP	4.0
1	A	272	GLU	4.0
1	A	274	GLU	4.0
1	A	248	LYS	3.9
1	B	4	LEU	3.9
1	A	278	ALA	3.9
1	B	252	LYS	3.9
1	B	267	LEU	3.7
1	A	127	VAL	3.7
1	A	250	PRO	3.6
1	A	355	GLN	3.6
1	A	249	ASP	3.4
1	A	208	GLY	3.4
1	A	205	LEU	3.4
1	A	277	LEU	3.3
1	B	91	TYR	3.3
1	B	482	ARG	3.2
1	B	43	TYR	3.2
1	A	215	LEU	3.2
1	A	224	LEU	3.2
1	B	278	ALA	3.2
1	B	96	ARG	3.2
1	B	177	MET	3.1
1	A	183	LEU	3.1
1	B	136	ARG	3.1
1	B	127	VAL	3.0
1	B	297	ILE	3.0
1	A	216	PRO	3.0
1	B	275	GLY	2.9
1	B	37	PRO	2.9
1	A	236	ARG	2.9
1	B	124	LEU	2.9
1	A	482	ARG	2.9
1	A	225	ASP	2.9
1	B	80	ALA	2.9
1	B	176	GLU	2.8
1	B	129	VAL	2.8
1	A	223	LEU	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	528	TRP	2.8
1	B	59	ARG	2.8
1	A	222	SER	2.8
1	A	217	LEU	2.8
1	A	212	PRO	2.8
1	B	235	GLY	2.8
1	B	44	PRO	2.7
1	B	237	GLU	2.7
1	A	233	LEU	2.7
1	A	271	HIS	2.7
1	B	208	GLY	2.7
1	B	270	LEU	2.7
1	B	92	PRO	2.7
1	A	585	GLN	2.7
1	B	271	HIS	2.6
1	B	90	LEU	2.6
1	B	94	GLY	2.6
1	B	126	GLY	2.6
1	A	82	MET	2.6
1	A	221	LEU	2.6
1	B	207	LEU	2.6
1	B	62	ASP	2.6
1	A	213	LYS	2.5
1	A	597	GLU	2.5
1	B	88	TYR	2.5
1	A	252	LYS	2.5
1	B	320	LYS	2.5
1	A	241	VAL	2.4
1	A	218	PRO	2.4
1	B	79	LEU	2.4
1	B	52	ARG	2.4
1	B	181	ALA	2.4
1	B	28	ARG	2.4
1	A	189	LEU	2.3
1	B	144	GLY	2.3
1	B	186	GLY	2.3
1	B	33	LEU	2.3
1	B	299	ARG	2.3
1	B	74	VAL	2.3
1	A	220	GLY	2.3
1	B	598	ASP	2.3
1	A	438	PRO	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	245	ALA	2.3
1	A	126	GLY	2.3
1	A	192	ARG	2.3
1	B	82	MET	2.2
1	A	243	TRP	2.2
1	A	296	TRP	2.2
1	A	80	ALA	2.2
1	B	130	GLU	2.2
1	A	444	ARG	2.2
1	A	128	TRP	2.2
1	B	171	TYR	2.2
1	A	235	GLY	2.2
1	B	497	ASP	2.2
1	B	27	TRP	2.2
1	A	237	GLU	2.1
1	B	325	ARG	2.1
1	A	178	SER	2.1
1	B	212	PRO	2.1
1	B	484	SER	2.1
1	A	260	LEU	2.1
1	B	45	LEU	2.1
1	A	245	ALA	2.1
1	A	177	MET	2.1
1	B	322	MET	2.1
1	A	238	GLY	2.0
1	B	93	LYS	2.0
1	B	84	GLN	2.0
1	A	187	HIS	2.0
1	B	533	LYS	2.0
1	B	307	GLU	2.0
1	A	194	ARG	2.0

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

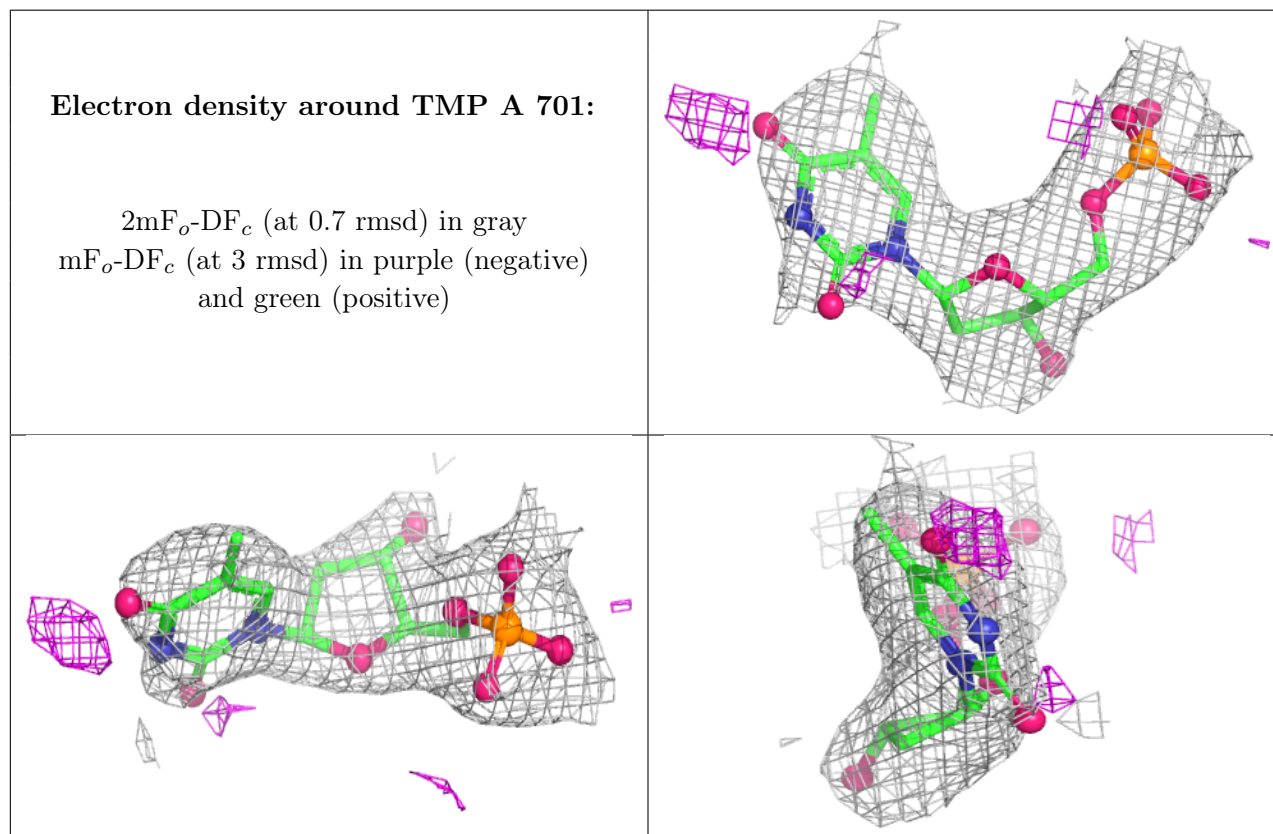There are no non-standard protein/DNA/RNA residues in this entry.

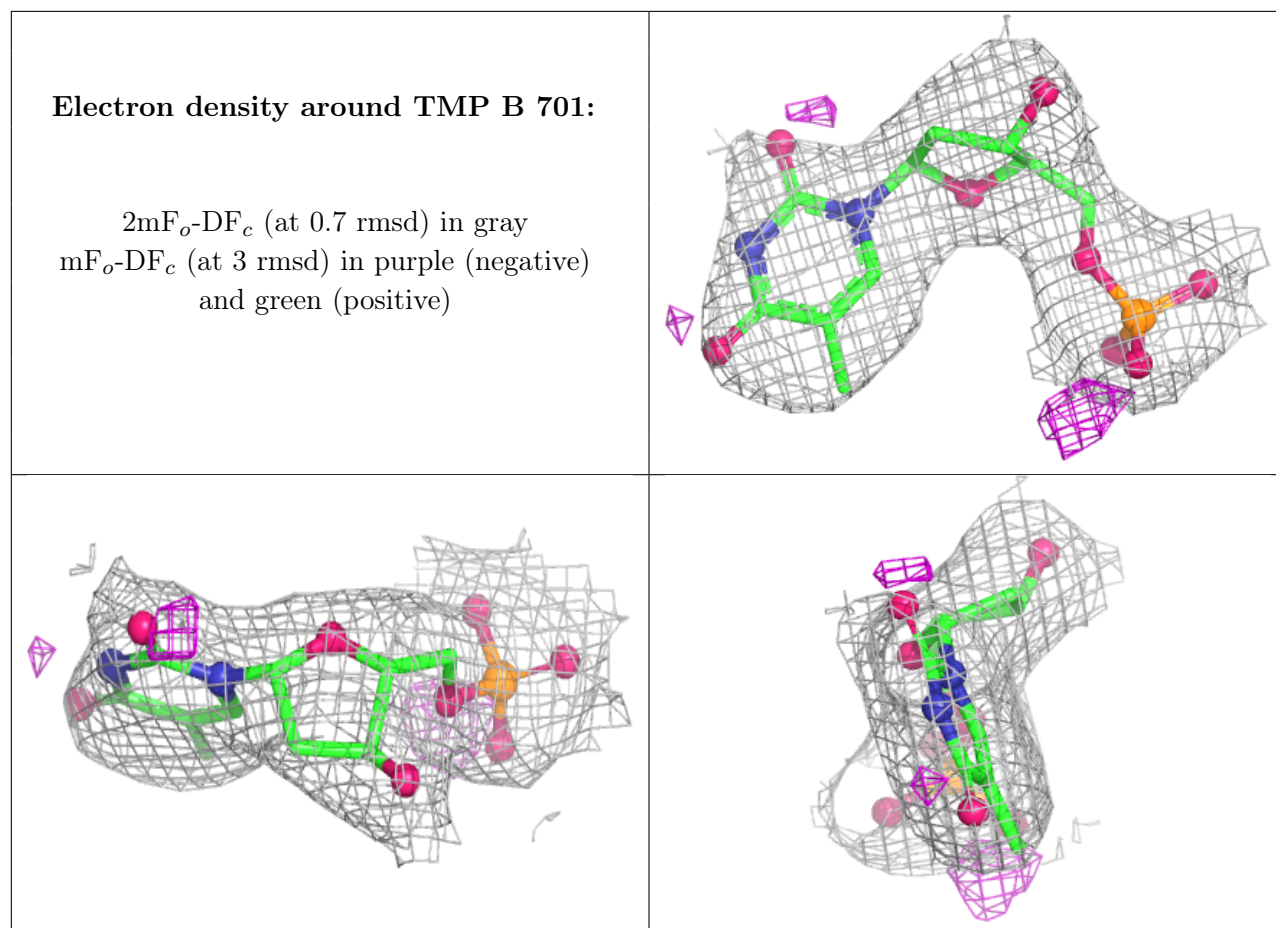## 6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4　Ligands　ⓘ

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, 95th 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
5	TMP	A	701	21/21	0.89	0.15	74,84,92,94	0
6	MG	D	101	1/1	0.90	0.07	67,67,67,67	0
5	TMP	B	701	21/21	0.94	0.12	56,67,73,79	0
6	MG	A	702	1/1	0.97	0.04	43,43,43,43	0
6	MG	C	101	1/1	0.99	0.06	50,50,50,50	0
6	MG	B	703	1/1	0.99	0.03	51,51,51,51	0
6	MG	E	101	1/1	0.99	0.04	48,48,48,48	0
6	MG	B	702	1/1	1.00	0.02	44,44,44,44	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around TMP A 701:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative) and green (positive)

Electron density around TMP B 701:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

6.5   Other polymers ⓘ

There are no such residues in this entry.