



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 12:00 PM UTC

PDB ID : 1A0L / pdb_00001a0l
Title : HUMAN BETA-TRYPTASE: A RING-LIKE TETRAMER WITH ACTIVE SITES FACING A CENTRAL PORE
Authors : Pereira, P.J.B.; Bergner, A.; Macedo-Ribeiro, S.; Huber, R.; Matschiner, G.; Fritz, H.; Sommerhoff, C.P.; Bode, W.
Deposited on : 1997-12-03
Resolution : 3.00 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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

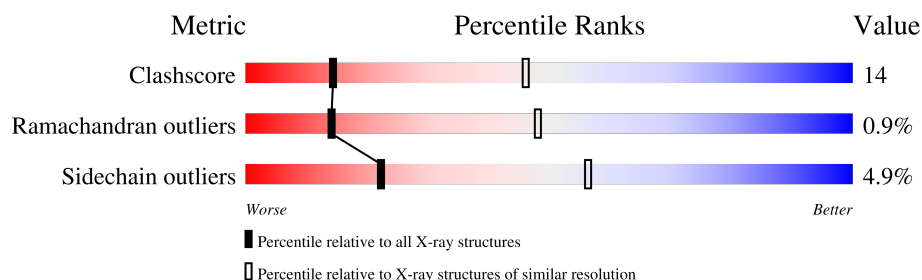
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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))
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	244	
1	B	244	
1	C	244	
1	D	244	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	APA	A	301	-	X	-	-
2	APA	B	301	-	X	-	-
2	APA	C	301	-	X	-	-
2	APA	D	301	-	X	-	-

2 Entry composition [i](#)

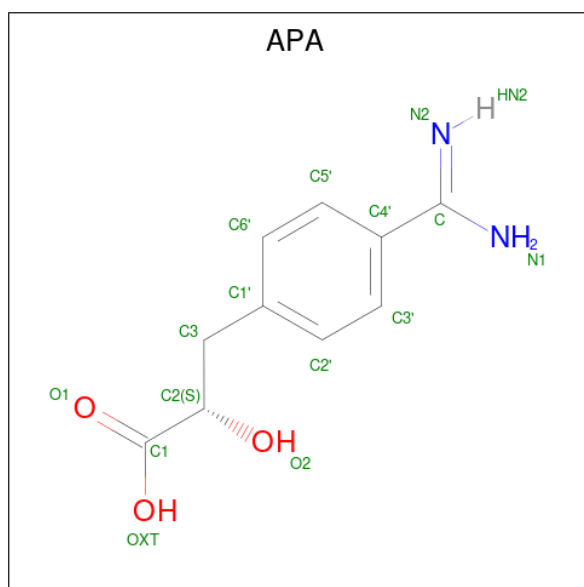
There are 3 unique types of molecules in this entry. The entry contains 7872 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 BETA-TRYPTASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	244	Total	C	N	O	S	0	0	0
			1929	1236	340	341	12			
1	B	244	Total	C	N	O	S	0	0	0
			1929	1236	340	341	12			
1	C	244	Total	C	N	O	S	0	0	0
			1929	1236	340	341	12			
1	D	244	Total	C	N	O	S	0	0	0
			1929	1236	340	341	12			

- Molecule 2 is (2S)-3-(4-carbamimidoylphenyl)-2-hydroxypropanoic acid (CCD ID: APA) (formula: C₁₀H₁₂N₂O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			15	10	2	3		
2	B	1	Total	C	N	O	0	0
			15	10	2	3		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	C	1	Total	C	N	O	0	0
			15	10	2	3		
2	D	1	Total	C	N	O	0	0
			15	10	2	3		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	26	Total	O	0	0
			26	26		
3	B	25	Total	O	0	0
			25	25		
3	C	17	Total	O	0	0
			17	17		
3	D	28	Total	O	0	0
			28	28		

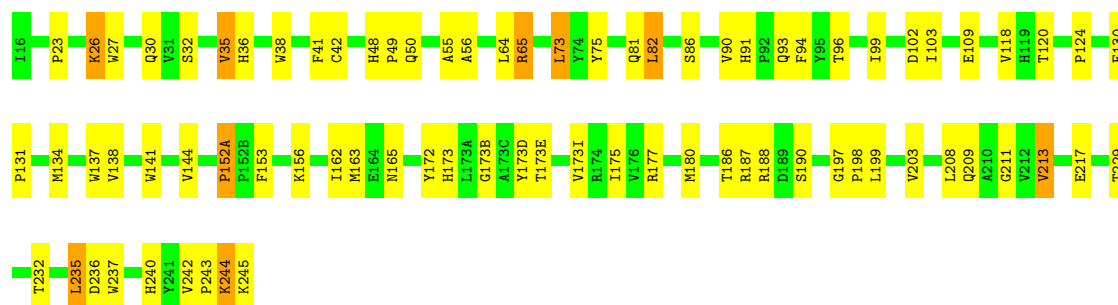
3 Residue-property plots

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.

Note EDS was not executed.

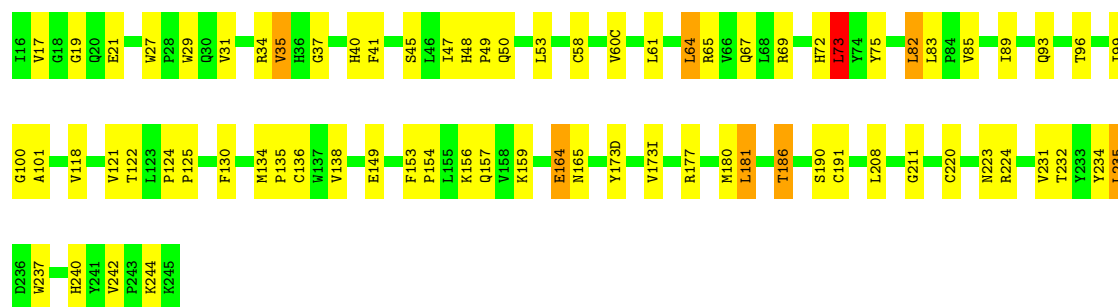
• Molecule 1: BETA-TRYPTASE

Chain A: 



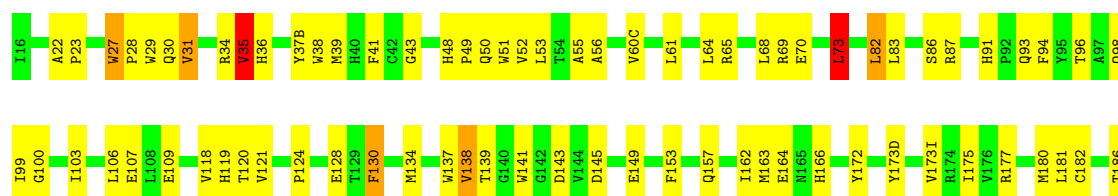
• Molecule 1: BETA-TRYPTASE

Chain B: 



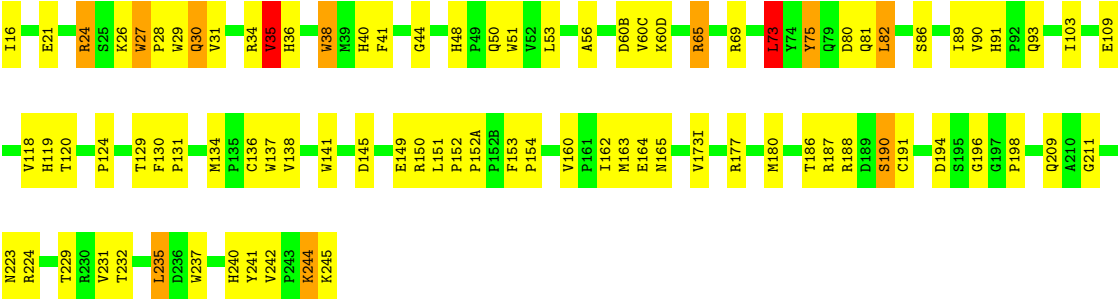
• Molecule 1: BETA-TRYPTASE

Chain C: 





● Molecule 1: BETA-TRYPTASE



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 41	Depositor
Cell constants a, b, c, α , β , γ	82.93Å 82.93Å 172.86Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 3.00	Depositor
% Data completeness (in resolution range)	99.3 (10.00-3.00)	Depositor
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.197 , 0.276	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	7872	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.62	0/1994	1.07	10/2731 (0.4%)
1	B	0.61	0/1994	1.08	9/2731 (0.3%)
1	C	0.59	0/1994	1.09	13/2731 (0.5%)
1	D	0.62	0/1994	1.04	11/2731 (0.4%)
All	All	0.61	0/7976	1.07	43/10924 (0.4%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1

There are no bond length outliers.

All (43) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	73	LEU	N-CA-C	9.89	127.59	111.37
1	B	73	LEU	N-CA-C	8.54	128.99	110.80
1	C	242	VAL	N-CA-C	8.51	115.30	107.56
1	D	120	THR	N-CA-C	8.14	121.27	110.53
1	A	27	TRP	CA-C-N	7.66	127.38	119.56
1	A	27	TRP	C-N-CA	7.66	127.38	119.56
1	D	75	TYR	N-CA-C	7.45	120.46	111.82
1	D	190	SER	N-CA-C	-7.17	101.28	110.53
1	C	120	THR	N-CA-C	7.07	119.43	110.24
1	D	73	LEU	N-CA-C	6.97	125.65	110.80
1	C	73	LEU	N-CA-C	6.93	125.57	110.80
1	B	35	VAL	CB-CA-C	-6.83	100.43	110.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	27	TRP	CA-C-N	6.79	127.35	119.47
1	C	27	TRP	C-N-CA	6.79	127.35	119.47
1	D	35	VAL	CB-CA-C	-6.77	101.16	110.90
1	B	75	TYR	N-CA-C	6.63	118.17	111.07
1	C	94	PHE	N-CA-C	6.60	120.00	109.24
1	A	242	VAL	N-CA-C	6.33	113.81	107.55
1	D	27	TRP	CA-C-N	6.28	127.69	119.84
1	D	27	TRP	C-N-CA	6.28	127.69	119.84
1	B	100	GLY	N-CA-C	5.97	119.34	111.52
1	C	35	VAL	CB-CA-C	-5.92	102.64	110.98
1	B	242	VAL	N-CA-C	5.88	112.92	107.56
1	C	175	ILE	N-CA-C	-5.75	106.10	111.45
1	C	138	VAL	N-CA-C	-5.71	100.06	108.85
1	C	43	GLY	N-CA-C	-5.70	103.87	112.60
1	B	186	THR	N-CA-C	5.65	119.65	112.87
1	A	165	ASN	N-CA-C	5.53	118.02	111.33
1	A	94	PHE	N-CA-C	5.45	117.58	109.25
1	A	26	LYS	N-CA-C	5.43	119.91	113.12
1	A	120	THR	N-CA-C	5.34	116.97	110.41
1	B	190	SER	N-CA-C	-5.33	103.65	110.53
1	A	152(A)	PRO	N-CA-C	-5.24	105.44	110.47
1	D	24	ARG	N-CA-C	5.20	119.10	112.34
1	C	128	GLU	N-CA-C	5.20	117.24	110.43
1	D	160	VAL	CA-C-N	5.19	126.33	119.84
1	D	160	VAL	C-N-CA	5.19	126.33	119.84
1	C	130	PHE	CA-C-N	5.14	125.67	120.38
1	C	130	PHE	C-N-CA	5.14	125.67	120.38
1	D	242	VAL	N-CA-C	5.13	112.23	107.56
1	B	130	PHE	CA-C-N	5.13	125.66	120.38
1	B	130	PHE	C-N-CA	5.13	125.66	120.38
1	A	175	ILE	N-CA-C	-5.12	106.16	111.58

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	37	GLY	Peptide

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	1929	0	1867	51	0
1	B	1929	0	1867	48	0
1	C	1929	0	1867	63	0
1	D	1929	0	1867	64	0
2	A	15	0	9	1	0
2	B	15	0	9	0	0
2	C	15	0	9	0	0
2	D	15	0	9	0	0
3	A	26	0	0	1	0
3	B	25	0	0	2	0
3	C	17	0	0	1	0
3	D	28	0	0	5	0
All	All	7872	0	7504	215	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 14.

All (215) 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:D:65:ARG:HG2	1:D:82:LEU:HB3	1.40	1.02
1:A:65:ARG:HG2	1:A:82:LEU:HB3	1.49	0.93
1:B:65:ARG:HG2	1:B:82:LEU:HB3	1.58	0.85
1:A:232:THR:HA	1:A:235:LEU:HD22	1.58	0.84
1:C:65:ARG:HG2	1:C:82:LEU:HB3	1.62	0.82
1:A:73:LEU:HB2	1:A:153:PHE:HB2	1.65	0.78
1:C:35:VAL:HG22	1:C:41:PHE:CD1	2.21	0.76
1:C:68:LEU:HD13	1:C:118:VAL:HG21	1.69	0.75
1:B:232:THR:HA	1:B:235:LEU:HD22	1.70	0.74
1:B:134:MET:SD	1:B:135:PRO:HD2	2.28	0.73
1:C:177:ARG:HB2	1:C:180:MET:HE3	1.69	0.73
1:D:131:PRO:HD2	1:D:134:MET:HE2	1.71	0.73
1:A:237:TRP:HA	1:A:240:HIS:HD2	1.55	0.72
1:C:48:HIS:CE1	1:C:243:PRO:HG2	2.26	0.70
1:A:73:LEU:HB2	1:A:153:PHE:CB	2.21	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:35:VAL:HG22	1:D:41:PHE:CD1	2.29	0.66
1:C:130:PHE:O	1:C:162:ILE:HG21	1.96	0.65
1:B:27:TRP:O	1:B:69:ARG:HG3	1.97	0.64
1:C:134:MET:HE1	1:C:203:VAL:HG22	1.80	0.63
1:A:172:TYR:HE2	1:A:217:GLU:HG3	1.63	0.62
1:A:86:SER:HB2	1:A:109:GLU:HA	1.82	0.62
1:D:151:LEU:HD12	1:D:152:PRO:HD2	1.80	0.62
1:A:144:VAL:HG12	1:A:156:LYS:HE2	1.82	0.61
1:A:173(B):GLY:O	1:D:60(C):VAL:HG23	2.00	0.60
1:A:93:GLN:HA	1:D:173(I):VAL:HG21	1.83	0.60
1:C:27:TRP:O	1:C:69:ARG:HG3	2.02	0.60
1:D:48:HIS:HD2	1:D:50:GLN:H	1.49	0.60
1:D:73:LEU:HB2	1:D:153:PHE:CB	2.32	0.59
1:D:244:LYS:HB2	1:D:244:LYS:NZ	2.17	0.59
1:A:237:TRP:HA	1:A:240:HIS:CD2	2.36	0.59
1:D:237:TRP:HA	1:D:240:HIS:HD2	1.68	0.58
1:B:223:ASN:O	1:B:224:ARG:HD3	2.03	0.58
1:C:139:THR:HG22	1:C:157:GLN:HB3	1.85	0.58
1:D:56:ALA:HB2	1:D:103:ILE:O	2.04	0.58
1:D:130:PHE:O	1:D:162:ILE:HG21	2.02	0.58
1:A:35:VAL:HG22	1:A:41:PHE:CD1	2.39	0.58
1:A:177:ARG:NH1	3:A:504:HOH:O	2.37	0.57
1:C:36:HIS:HB2	1:C:38:TRP:CH2	2.38	0.57
1:D:124:PRO:O	1:D:235:LEU:HD21	2.04	0.57
1:D:21:GLU:HG3	1:D:154:PRO:HB2	1.85	0.57
1:D:138:VAL:HG11	1:D:190:SER:HB3	1.87	0.57
1:C:139:THR:HG22	1:C:157:GLN:CB	2.35	0.57
1:B:73:LEU:HB2	1:B:153:PHE:CB	2.34	0.56
1:D:35:VAL:O	1:D:38:TRP:HA	2.05	0.56
1:B:177:ARG:HB2	1:B:180:MET:HE3	1.88	0.56
1:B:60(C):VAL:HA	1:C:173(D):TYR:CE2	2.40	0.56
1:D:130:PHE:HA	1:D:134:MET:HE3	1.87	0.56
1:D:223:ASN:O	1:D:224:ARG:HD3	2.06	0.55
1:B:124:PRO:O	1:B:235:LEU:HD21	2.06	0.55
1:C:30:GLN:NE2	1:C:198:PRO:HD2	2.22	0.55
1:C:138:VAL:HG11	1:C:190:SER:HB3	1.87	0.55
1:D:80:ASP:HB2	3:D:640:HOH:O	2.07	0.55
1:C:29:TRP:CG	1:C:121:VAL:HB	2.42	0.55
1:B:21:GLU:HG3	1:B:154:PRO:HB2	1.89	0.54
1:D:48:HIS:CD2	1:D:50:GLN:H	2.25	0.54
1:A:187:ARG:O	1:A:188:ARG:HG2	2.07	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:48:HIS:HB3	1:C:51:TRP:HB2	1.89	0.54
1:D:177:ARG:NH1	3:D:557:HOH:O	2.41	0.54
1:D:16:ILE:HD13	1:D:190:SER:HA	1.89	0.54
1:A:23:PRO:HD2	1:A:26:LYS:HG3	1.90	0.54
1:A:138:VAL:HG22	1:A:199:LEU:HD13	1.89	0.54
1:C:65:ARG:HG3	1:C:83:LEU:O	2.08	0.54
1:D:86:SER:HB2	1:D:109:GLU:HA	1.91	0.53
1:B:232:THR:HG23	3:B:537:HOH:O	2.07	0.53
1:A:118:VAL:HG13	1:A:118:VAL:O	2.09	0.53
1:A:124:PRO:O	1:A:235:LEU:HD21	2.09	0.53
1:C:73:LEU:HG	1:C:141:TRP:CD1	2.44	0.53
1:C:237:TRP:HA	1:C:240:HIS:CD2	2.44	0.53
1:C:52:VAL:HB	1:C:106:LEU:HB2	1.89	0.52
1:B:17:VAL:HG21	1:B:220:CYS:HB3	1.91	0.52
1:C:73:LEU:HB2	1:C:153:PHE:HB2	1.90	0.52
1:A:32:SER:HB2	1:A:141:TRP:CZ3	2.44	0.52
1:C:211:GLY:HA2	1:C:231:VAL:HG23	1.91	0.52
1:D:152(A):PRO:HA	1:D:153:PHE:H	1.74	0.52
1:C:96:THR:HB	1:C:99:ILE:HD12	1.90	0.52
1:A:56:ALA:HB2	1:A:103:ILE:O	2.09	0.52
1:A:172:TYR:CE2	1:A:217:GLU:HG3	2.44	0.52
1:C:124:PRO:HB3	1:C:130:PHE:HZ	1.74	0.52
1:C:31:VAL:HG21	1:C:52:VAL:HG11	1.92	0.52
1:C:34:ARG:HA	1:C:39:MET:O	2.10	0.52
1:D:53:LEU:HD11	1:D:103:ILE:HD11	1.92	0.52
1:D:187:ARG:O	1:D:188:ARG:HG2	2.10	0.51
1:D:36:HIS:HB2	1:D:38:TRP:CH2	2.46	0.51
1:A:41:PHE:O	1:A:42:CYS:SG	2.68	0.51
1:D:145:ASP:HB3	1:D:149:GLU:HB2	1.92	0.51
1:B:29:TRP:O	1:B:45:SER:HA	2.11	0.50
1:D:162:ILE:HG22	1:D:163:MET:N	2.26	0.50
1:A:96:THR:HB	1:A:99:ILE:HG13	1.93	0.50
1:B:27:TRP:HE3	1:B:29:TRP:CZ2	2.29	0.50
1:B:101:ALA:HA	1:B:234:TYR:OH	2.11	0.50
1:D:44:GLY:HA2	1:D:196:GLY:O	2.12	0.50
1:B:34:ARG:HD3	1:B:40:HIS:HA	1.92	0.50
1:C:73:LEU:HB2	1:C:153:PHE:CB	2.41	0.50
1:B:237:TRP:HA	1:B:240:HIS:CD2	2.46	0.50
1:D:31:VAL:HG22	1:D:44:GLY:C	2.36	0.50
1:B:73:LEU:HB2	1:B:153:PHE:HB3	1.94	0.49
1:C:28:PRO:HB2	1:C:119:HIS:H	1.77	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:124:PRO:HB3	1:D:130:PHE:HZ	1.77	0.49
1:C:56:ALA:HB2	1:C:103:ILE:O	2.12	0.49
1:C:70:GLU:O	1:C:141:TRP:HZ2	1.95	0.49
1:A:48:HIS:HD2	1:A:50:GLN:H	1.60	0.49
1:A:36:HIS:HB2	1:A:38:TRP:CH2	2.47	0.49
1:A:91:HIS:CD2	1:A:93:GLN:H	2.29	0.49
1:D:34:ARG:HD3	1:D:40:HIS:HA	1.95	0.49
1:A:48:HIS:O	1:A:50:GLN:N	2.46	0.49
1:A:177:ARG:HB2	1:A:180:MET:HE3	1.95	0.49
1:C:87:ARG:HB3	1:C:107:GLU:HB3	1.93	0.49
1:D:27:TRP:O	1:D:69:ARG:HG3	2.12	0.49
1:C:162:ILE:HD12	1:C:181:LEU:HD21	1.95	0.49
1:D:177:ARG:HB2	1:D:180:MET:SD	2.53	0.49
1:C:137:TRP:CZ3	1:C:157:GLN:NE2	2.81	0.49
1:D:211:GLY:HA2	1:D:231:VAL:HG23	1.93	0.49
1:B:173(D):TYR:CZ	1:C:60(C):VAL:HA	2.48	0.49
1:B:211:GLY:HA2	1:B:231:VAL:HG23	1.94	0.49
1:B:173(D):TYR:CE2	1:C:60(C):VAL:HA	2.48	0.48
1:D:73:LEU:HB2	1:D:153:PHE:HB3	1.94	0.48
1:D:73:LEU:HB2	1:D:153:PHE:HB2	1.95	0.48
1:B:41:PHE:HE2	1:B:58:CYS:O	1.96	0.48
1:B:121:VAL:HG22	1:B:122:THR:N	2.29	0.48
1:C:28:PRO:HG2	1:C:29:TRP:CE3	2.49	0.47
1:B:19:GLY:HA3	1:B:157:GLN:O	2.14	0.47
1:B:61:LEU:HG	1:B:85:VAL:HG23	1.96	0.47
1:A:173:HIS:HD2	1:A:173(E):THR:O	1.96	0.47
1:B:122:THR:HB	1:B:208:LEU:HD23	1.95	0.47
1:C:53:LEU:HD11	1:C:103:ILE:HD11	1.96	0.47
1:D:89:ILE:HD13	1:D:241:TYR:CD1	2.50	0.47
1:A:75:TYR:HE1	1:B:72:HIS:ND1	2.13	0.46
1:A:124:PRO:HB3	1:A:130:PHE:HZ	1.80	0.46
1:B:173(I):VAL:HG21	1:C:93:GLN:HA	1.96	0.46
1:C:124:PRO:HD3	1:C:209:GLN:O	2.15	0.46
1:D:75:TYR:N	1:D:75:TYR:CD1	2.84	0.46
1:A:211:GLY:HA2	1:A:229:THR:O	2.15	0.46
1:A:137:TRP:O	1:A:199:LEU:HD12	2.16	0.46
1:C:234:TYR:O	1:C:238:ILE:HG13	2.15	0.46
1:A:56:ALA:HB1	1:A:90:VAL:HG13	1.97	0.46
1:C:37(B):TYR:HE1	1:D:150:ARG:HH12	1.63	0.46
1:C:51:TRP:CH2	1:C:107:GLU:HB2	2.51	0.46
1:B:235:LEU:HD12	1:B:235:LEU:HA	1.83	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:136:CYS:SG	1:D:162:ILE:HD11	2.56	0.46
1:D:30:GLN:NE2	1:D:141:TRP:CZ3	2.84	0.46
1:C:232:THR:HA	1:C:235:LEU:HD22	1.97	0.45
1:D:56:ALA:HB1	1:D:90:VAL:HG13	1.98	0.45
1:C:51:TRP:CZ3	1:C:107:GLU:HB2	2.52	0.45
1:D:152(A):PRO:HA	1:D:153:PHE:N	2.31	0.45
1:B:47:ILE:HD13	1:B:53:LEU:HB2	1.99	0.45
1:C:130:PHE:HA	1:C:134:MET:HE3	1.98	0.45
1:B:164:GLU:HG3	1:B:165:ASN:N	2.30	0.45
1:B:134:MET:HB3	1:B:136:CYS:SG	2.56	0.45
1:B:135:PRO:HA	1:B:159:LYS:NZ	2.32	0.45
1:D:137:TRP:HZ3	3:D:566:HOH:O	1.98	0.45
1:A:50:GLN:O	1:A:50:GLN:HG2	2.17	0.45
1:C:172:TYR:CE1	1:C:227:ILE:HD11	2.52	0.45
1:C:163:MET:HE3	1:C:163:MET:HB2	1.70	0.45
1:A:131:PRO:HD2	1:A:134:MET:HE2	2.00	0.44
1:D:28:PRO:HG3	1:D:119:HIS:CE1	2.52	0.44
1:A:55:ALA:HB1	1:A:102:ASP:OD1	2.16	0.44
1:D:177:ARG:NH2	3:D:579:HOH:O	2.49	0.44
1:B:17:VAL:HG23	1:B:191:CYS:HB2	1.99	0.44
1:D:232:THR:HA	1:D:235:LEU:HD22	2.00	0.44
1:D:65:ARG:NH1	3:D:639:HOH:O	2.45	0.44
1:A:152(A):PRO:HB3	1:A:153:PHE:CZ	2.53	0.44
1:D:118:VAL:O	1:D:118:VAL:HG13	2.18	0.44
1:D:211:GLY:HA2	1:D:229:THR:O	2.18	0.44
1:D:187:ARG:C	1:D:188:ARG:HG2	2.43	0.44
1:A:163:MET:HE3	1:A:163:MET:HB2	1.70	0.44
1:B:64:LEU:HD23	1:B:65:ARG:H	1.83	0.44
1:B:101:ALA:HA	1:B:234:TYR:CZ	2.53	0.44
1:C:164:GLU:OE2	1:C:166:HIS:HB2	2.18	0.44
1:C:235:LEU:HD12	1:C:235:LEU:HA	1.85	0.43
1:A:244:LYS:O	1:A:245:LYS:HB3	2.18	0.43
1:B:73:LEU:HB2	1:B:153:PHE:HB2	1.99	0.43
1:A:187:ARG:C	1:A:188:ARG:HG2	2.44	0.43
1:B:48:HIS:O	1:B:50:GLN:N	2.51	0.43
1:A:124:PRO:HD3	1:A:209:GLN:O	2.18	0.43
1:A:173(I):VAL:HG21	1:D:93:GLN:HA	2.00	0.43
1:D:27:TRP:HE3	1:D:29:TRP:CZ2	2.37	0.43
1:B:65:ARG:HG3	1:B:83:LEU:O	2.18	0.43
1:C:55:ALA:H	1:C:196:GLY:HA2	1.82	0.43
1:A:190:SER:OG	2:A:301:APA:N2	2.52	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:96:THR:HG22	1:B:99:ILE:H	1.84	0.42
1:D:91:HIS:HD2	1:D:93:GLN:H	1.67	0.42
1:D:163:MET:HE3	1:D:163:MET:HB2	1.66	0.42
1:A:130:PHE:O	1:A:162:ILE:HG21	2.18	0.42
1:B:67:GLN:HB2	1:B:82:LEU:HD12	2.01	0.42
1:B:61:LEU:HG	1:B:85:VAL:CG2	2.49	0.42
1:C:27:TRP:CD1	1:C:139:THR:HG21	2.55	0.42
1:D:124:PRO:HD3	1:D:209:GLN:O	2.19	0.42
1:B:177:ARG:NH1	3:B:533:HOH:O	2.41	0.42
1:C:86:SER:HB2	1:C:109:GLU:HA	2.01	0.42
1:B:124:PRO:HA	1:B:125:PRO:HD3	1.93	0.42
1:A:48:HIS:CE1	1:A:243:PRO:HG2	2.55	0.42
1:C:61:LEU:N	1:C:61:LEU:HD12	2.35	0.42
1:B:156:LYS:HB3	1:B:156:LYS:HE3	1.87	0.41
1:C:242:VAL:HA	1:C:243:PRO:HD2	1.91	0.41
1:C:91:HIS:HE1	1:C:93:GLN:OE1	2.03	0.41
1:D:191:CYS:O	1:D:194:ASP:HB2	2.20	0.41
1:C:22:ALA:HB2	1:C:157:GLN:HG2	2.03	0.41
1:B:181:LEU:HD23	1:B:181:LEU:C	2.46	0.41
1:A:197:GLY:O	1:A:213:VAL:HG23	2.21	0.41
1:B:118:VAL:HG13	1:B:118:VAL:O	2.20	0.41
1:C:143:ASP:HB2	1:C:191:CYS:SG	2.59	0.41
1:C:143:ASP:HB3	1:C:145:ASP:O	2.20	0.41
1:D:244:LYS:O	1:D:245:LYS:HB3	2.20	0.41
1:B:93:GLN:HA	1:C:173(I):VAL:HG21	2.03	0.41
1:D:60(B):ASP:O	1:D:60(D):LYS:NZ	2.49	0.41
1:C:96:THR:HG22	1:C:98:GLN:H	1.86	0.41
1:C:100:GLY:HA2	3:C:621:HOH:O	2.21	0.40
1:C:181:LEU:HD23	1:C:182:CYS:N	2.35	0.40
1:D:51:TRP:CZ3	1:D:89:ILE:HD12	2.56	0.40
1:D:164:GLU:O	1:D:165:ASN:C	2.63	0.40
1:A:30:GLN:NE2	1:A:198:PRO:HD2	2.36	0.40
1:A:138:VAL:HG11	1:A:190:SER:HB3	2.03	0.40
1:A:173(D):TYR:CZ	1:D:60(C):VAL:HA	2.57	0.40
1:A:203:VAL:HB	1:A:208:LEU:CD1	2.52	0.40
1:C:48:HIS:O	1:C:50:GLN:N	2.55	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all 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	242/244 (99%)	221 (91%)	19 (8%)	2 (1%)	16	50
1	B	242/244 (99%)	221 (91%)	19 (8%)	2 (1%)	16	50
1	C	242/244 (99%)	222 (92%)	18 (7%)	2 (1%)	16	50
1	D	242/244 (99%)	218 (90%)	21 (9%)	3 (1%)	10	40
All	All	968/976 (99%)	882 (91%)	77 (8%)	9 (1%)	14	48

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	73	LEU
1	A	213	VAL
1	B	73	LEU
1	D	38	TRP
1	B	49	PRO
1	C	73	LEU
1	D	24	ARG
1	A	49	PRO
1	C	49	PRO

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all 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	209/209 (100%)	200 (96%)	9 (4%)	26	60
1	B	209/209 (100%)	197 (94%)	12 (6%)	18	52

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	209/209 (100%)	200 (96%)	9 (4%)	26	60
1	D	209/209 (100%)	198 (95%)	11 (5%)	20	54
All	All	836/836 (100%)	795 (95%)	41 (5%)	22	56

All (41) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	35	VAL
1	A	64	LEU
1	A	65	ARG
1	A	81	GLN
1	A	82	LEU
1	A	186	THR
1	A	235	LEU
1	A	236	ASP
1	A	244	LYS
1	B	31	VAL
1	B	35	VAL
1	B	64	LEU
1	B	82	LEU
1	B	89	ILE
1	B	138	VAL
1	B	149	GLU
1	B	164	GLU
1	B	181	LEU
1	B	186	THR
1	B	235	LEU
1	B	244	LYS
1	C	23	PRO
1	C	31	VAL
1	C	35	VAL
1	C	64	LEU
1	C	82	LEU
1	C	149	GLU
1	C	186	THR
1	C	235	LEU
1	C	244	LYS
1	D	26	LYS
1	D	30	GLN
1	D	35	VAL
1	D	65	ARG

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Mol	Chain	Res	Type
1	D	81	GLN
1	D	82	LEU
1	D	129	THR
1	D	186	THR
1	D	198	PRO
1	D	235	LEU
1	D	244	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	30	GLN
1	A	48	HIS
1	A	72	HIS
1	A	81	GLN
1	A	117	HIS
1	A	240	HIS
1	B	20	GLN
1	B	30	GLN
1	B	79	GLN
1	B	91	HIS
1	B	240	HIS
1	C	30	GLN
1	C	48	HIS
1	C	81	GLN
1	C	91	HIS
1	C	93	GLN
1	C	240	HIS
1	D	48	HIS
1	D	79	GLN
1	D	240	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
2	APA	B	301	1	15,15,15	2.18	6 (40%)	16,20,20	3.16	11 (68%)
2	APA	C	301	1	15,15,15	2.23	6 (40%)	16,20,20	3.22	11 (68%)
2	APA	A	301	1	15,15,15	2.56	5 (33%)	16,20,20	3.21	11 (68%)
2	APA	D	301	1	15,15,15	2.29	5 (33%)	16,20,20	3.12	11 (68%)

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	APA	B	301	1	-	4/12/12/12	0/1/1/1
2	APA	C	301	1	-	6/12/12/12	0/1/1/1
2	APA	A	301	1	-	6/12/12/12	0/1/1/1
2	APA	D	301	1	-	6/12/12/12	0/1/1/1

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	APA	C2-C1	6.12	1.60	1.52
2	A	301	APA	O1-C1	5.45	1.38	1.22
2	D	301	APA	O1-C1	5.24	1.37	1.22
2	C	301	APA	O1-C1	5.19	1.37	1.22
2	B	301	APA	O1-C1	5.14	1.37	1.22
2	D	301	APA	C2-C1	5.13	1.59	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	301	APA	C2-C1	3.96	1.57	1.52
2	C	301	APA	C2-C1	3.57	1.57	1.52
2	A	301	APA	C4'-C	-3.30	1.41	1.47
2	B	301	APA	C3'-C4'	2.82	1.43	1.39
2	C	301	APA	C5'-C4'	2.74	1.43	1.39
2	D	301	APA	C5'-C4'	2.61	1.43	1.39
2	C	301	APA	C4'-C	-2.51	1.42	1.47
2	C	301	APA	OXT-C1	-2.51	1.22	1.30
2	C	301	APA	C3'-C4'	2.49	1.43	1.39
2	D	301	APA	OXT-C1	-2.49	1.22	1.30
2	B	301	APA	C4'-C	-2.43	1.42	1.47
2	B	301	APA	OXT-C1	-2.31	1.23	1.30
2	A	301	APA	C3'-C4'	2.24	1.42	1.39
2	D	301	APA	C3'-C4'	2.20	1.42	1.39
2	B	301	APA	C5'-C4'	2.15	1.42	1.39
2	A	301	APA	OXT-C1	-2.09	1.24	1.30

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	301	APA	C3'-C2'-C1'	5.76	128.57	121.00
2	B	301	APA	O1-C1-C2	-5.69	111.23	122.60
2	D	301	APA	C3'-C2'-C1'	5.55	128.29	121.00
2	C	301	APA	O1-C1-C2	-5.48	111.65	122.60
2	A	301	APA	O1-C1-C2	-5.40	111.81	122.60
2	A	301	APA	C3'-C2'-C1'	5.24	127.89	121.00
2	B	301	APA	C3'-C2'-C1'	5.09	127.69	121.00
2	D	301	APA	O1-C1-C2	-4.98	112.66	122.60
2	A	301	APA	C2'-C3'-C4'	-4.80	115.67	120.80
2	C	301	APA	C2'-C3'-C4'	-4.69	115.79	120.80
2	A	301	APA	C1'-C3-C2	4.60	121.58	113.85
2	D	301	APA	C2'-C3'-C4'	-4.35	116.16	120.80
2	B	301	APA	C2'-C3'-C4'	-4.33	116.17	120.80
2	D	301	APA	C1'-C3-C2	4.24	120.98	113.85
2	C	301	APA	C6'-C5'-C4'	4.05	125.13	120.80
2	C	301	APA	C1'-C3-C2	4.00	120.58	113.85
2	B	301	APA	C1'-C3-C2	3.92	120.44	113.85
2	A	301	APA	C6'-C5'-C4'	3.89	124.96	120.80
2	C	301	APA	OXT-C1-O1	3.77	132.64	124.08
2	D	301	APA	C6'-C5'-C4'	3.76	124.81	120.80
2	B	301	APA	OXT-C1-O1	3.66	132.39	124.08
2	B	301	APA	C6'-C5'-C4'	3.63	124.68	120.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	301	APA	OXT-C1-O1	3.40	131.80	124.08
2	D	301	APA	OXT-C1-O1	3.35	131.67	124.08
2	D	301	APA	C4'-C-N1	3.24	122.93	118.01
2	B	301	APA	C4'-C-N1	2.95	122.50	118.01
2	A	301	APA	C3-C1'-C2'	2.79	126.09	120.90
2	C	301	APA	C3-C1'-C2'	2.59	125.72	120.90
2	B	301	APA	C3-C1'-C2'	2.56	125.66	120.90
2	B	301	APA	O2-C2-C3	-2.55	104.52	110.03
2	A	301	APA	O2-C2-C3	-2.48	104.68	110.03
2	B	301	APA	C3-C2-C1	-2.47	104.91	110.82
2	A	301	APA	C4'-C-N1	2.38	121.63	118.01
2	C	301	APA	C6'-C1'-C2'	-2.29	114.83	118.23
2	D	301	APA	C5'-C4'-C3'	-2.23	115.73	118.57
2	C	301	APA	C4'-C-N1	2.23	121.39	118.01
2	D	301	APA	C3-C1'-C2'	2.22	125.04	120.90
2	A	301	APA	C6'-C1'-C2'	-2.21	114.95	118.23
2	D	301	APA	O2-C2-C3	-2.21	105.27	110.03
2	C	301	APA	C5'-C4'-C3'	-2.16	115.82	118.57
2	A	301	APA	C3-C2-C1	-2.16	105.65	110.82
2	C	301	APA	C3-C2-C1	-2.15	105.68	110.82
2	D	301	APA	C3-C2-C1	-2.10	105.79	110.82
2	B	301	APA	C6'-C1'-C2'	-2.05	115.18	118.23

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	APA	C6'-C1'-C3-C2
2	A	301	APA	C2'-C1'-C3-C2
2	C	301	APA	C6'-C1'-C3-C2
2	C	301	APA	C2'-C1'-C3-C2
2	A	301	APA	N1-C-C4'-C3'
2	A	301	APA	N1-C-C4'-C5'
2	B	301	APA	N1-C-C4'-C3'
2	B	301	APA	N1-C-C4'-C5'
2	C	301	APA	N1-C-C4'-C3'
2	C	301	APA	N1-C-C4'-C5'
2	D	301	APA	N1-C-C4'-C3'
2	D	301	APA	N1-C-C4'-C5'
2	D	301	APA	C2'-C1'-C3-C2
2	D	301	APA	C6'-C1'-C3-C2
2	A	301	APA	N2-C-C4'-C3'

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Mol	Chain	Res	Type	Atoms
2	A	301	APA	N2-C-C4'-C5'
2	B	301	APA	N2-C-C4'-C3'
2	B	301	APA	N2-C-C4'-C5'
2	C	301	APA	N2-C-C4'-C3'
2	C	301	APA	N2-C-C4'-C5'
2	D	301	APA	N2-C-C4'-C3'
2	D	301	APA	N2-C-C4'-C5'

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	301	APA	1	0

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.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.