W O R L D W I D E

wwPDB

P R O T E I N   D A T A   B A N K

Full wwPDB X-ray Structure Validation Report (i)

Oct 16, 2021 – 07:27 PM EDT

PDB ID	:	1RFI
Title	:	Crystal structure of human Tyrosyl-DNA Phosphodiesterase complexed with vanadate, pentapeptide KLNYK, and tetranucleotide AGTC
Authors	:	Davies, D.R.; Interthal, H.; Champoux, J.J.; Hol, W.G.
Deposited on	:	2003-11-10
Resolution	:	2.20 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 (i) symbol.

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

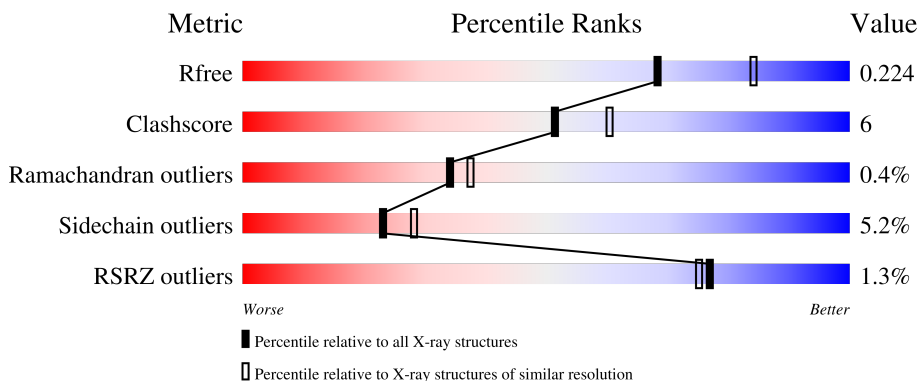|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.23.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

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 2.20 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		0.224
Clashscore		6
Ramachandran outliers		0.4%
Sidechain outliers		5.2%
RSRZ outliers		1.3%

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}	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	D	4	75% 25%
1	F	4	75% 25%
2	A	485	2% 73% 13% · 12%
2	B	485	77% 11% · 12%
3	C	5	20% 40% 60%

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Mol	Chain	Length	Quality of chain
3	E	5	60%　　　　　　　　　　　　　　　　40%

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
4	VO4	A	699	-	-	X	-
4	VO4	B	699	-	-	X	-

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 7258 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 DNA chain called 5'-D(*AP*GP*TP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	D	3	Total	C	N	O	P	0	0	0
			50	24	5	18	3			
1	F	3	Total	C	N	O	P	0	0	0
			50	24	5	18	3			

- Molecule 2 is a protein called Tyrosyl-DNA phosphodiesterase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	425	Total	C	N	O	S	0	0	0
			3394	2208	573	602	11			
2	B	429	Total	C	N	O	S	0	0	0
			3426	2230	578	607	11			

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	124	MET	-	cloning artifact	UNP Q9NUW8
A	125	GLY	-	cloning artifact	UNP Q9NUW8
A	126	SER	-	cloning artifact	UNP Q9NUW8
A	127	SER	-	cloning artifact	UNP Q9NUW8
A	128	HIS	-	cloning artifact	UNP Q9NUW8
A	129	HIS	-	cloning artifact	UNP Q9NUW8
A	130	HIS	-	cloning artifact	UNP Q9NUW8
A	131	HIS	-	cloning artifact	UNP Q9NUW8
A	132	HIS	-	cloning artifact	UNP Q9NUW8
A	133	HIS	-	cloning artifact	UNP Q9NUW8
A	134	SER	-	cloning artifact	UNP Q9NUW8
A	135	SER	-	cloning artifact	UNP Q9NUW8
A	136	GLY	-	cloning artifact	UNP Q9NUW8
A	137	LEU	-	cloning artifact	UNP Q9NUW8
A	138	VAL	-	cloning artifact	UNP Q9NUW8
A	139	PRO	-	cloning artifact	UNP Q9NUW8

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Chain	Residue	Modelled	Actual	Comment	Reference
A	140	ARG	-	cloning artifact	UNP Q9NUW8
A	141	GLY	-	cloning artifact	UNP Q9NUW8
A	142	SER	-	cloning artifact	UNP Q9NUW8
A	143	HIS	-	cloning artifact	UNP Q9NUW8
A	144	MET	-	cloning artifact	UNP Q9NUW8
A	145	LEU	-	cloning artifact	UNP Q9NUW8
A	146	GLU	-	cloning artifact	UNP Q9NUW8
A	147	ASP	-	cloning artifact	UNP Q9NUW8
A	148	PRO	-	cloning artifact	UNP Q9NUW8
A	322	ASN	ASP	engineered mutation	UNP Q9NUW8
A	328	THR	MET	engineered mutation	UNP Q9NUW8
A	548	LEU	PHE	engineered mutation	UNP Q9NUW8
B	124	MET	-	cloning artifact	UNP Q9NUW8
B	125	GLY	-	cloning artifact	UNP Q9NUW8
B	126	SER	-	cloning artifact	UNP Q9NUW8
B	127	SER	-	cloning artifact	UNP Q9NUW8
B	128	HIS	-	cloning artifact	UNP Q9NUW8
B	129	HIS	-	cloning artifact	UNP Q9NUW8
B	130	HIS	-	cloning artifact	UNP Q9NUW8
B	131	HIS	-	cloning artifact	UNP Q9NUW8
B	132	HIS	-	cloning artifact	UNP Q9NUW8
B	133	HIS	-	cloning artifact	UNP Q9NUW8
B	134	SER	-	cloning artifact	UNP Q9NUW8
B	135	SER	-	cloning artifact	UNP Q9NUW8
B	136	GLY	-	cloning artifact	UNP Q9NUW8
B	137	LEU	-	cloning artifact	UNP Q9NUW8
B	138	VAL	-	cloning artifact	UNP Q9NUW8
B	139	PRO	-	cloning artifact	UNP Q9NUW8
B	140	ARG	-	cloning artifact	UNP Q9NUW8
B	141	GLY	-	cloning artifact	UNP Q9NUW8
B	142	SER	-	cloning artifact	UNP Q9NUW8
B	143	HIS	-	cloning artifact	UNP Q9NUW8
B	144	MET	-	cloning artifact	UNP Q9NUW8
B	145	LEU	-	cloning artifact	UNP Q9NUW8
B	146	GLU	-	cloning artifact	UNP Q9NUW8
B	147	ASP	-	cloning artifact	UNP Q9NUW8
B	148	PRO	-	cloning artifact	UNP Q9NUW8
B	322	ASN	ASP	engineered mutation	UNP Q9NUW8
B	328	THR	MET	engineered mutation	UNP Q9NUW8
B	548	LEU	PHE	engineered mutation	UNP Q9NUW8

- Molecule 3 is a protein called Topoisomerase I-Derived Peptide.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	5	Total	C	N	O	0	0	0
			47	31	8	8			
3	E	3	Total	C	N	O	0	0	0
			28	19	4	5			

- Molecule 4 is VANADATE ION (three-letter code: VO4) (formula: O_4V).

VO4
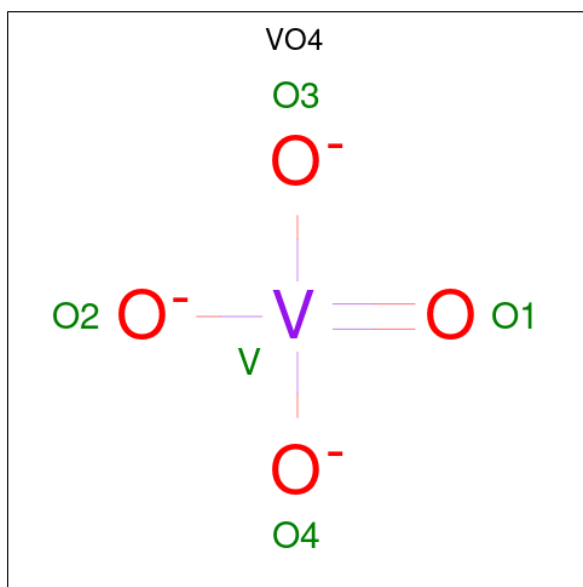
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	V	0	0
			3	2	1		
4	B	1	Total	O	V	0	0
			3	2	1		

- Molecule 5 is SPERMINE (three-letter code: SPM) (formula: $C_{10}H_{26}N_4$).

SPM
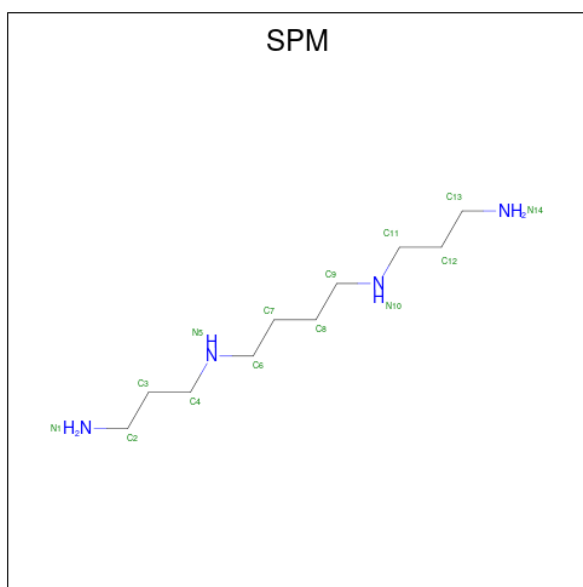
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total 14	C 10	N 4	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	D	5	Total 5	O 5	0	0
6	F	2	Total 2	O 2	0	0
6	A	112	Total 112	O 112	0	0
6	B	123	Total 123	O 123	0	0
6	C	1	Total 1	O 1	0	0

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry 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.
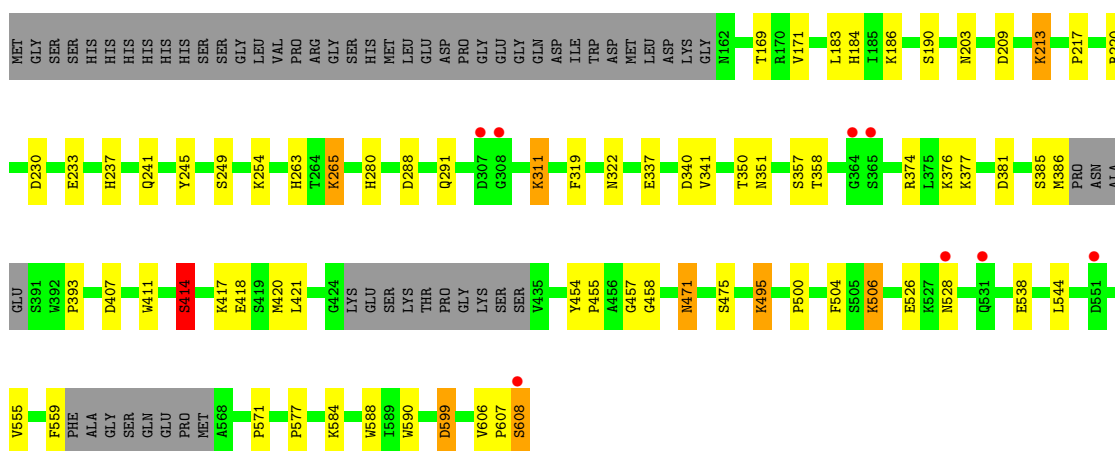
• Molecule 1: 5'-D(*AP*GP*TP*C)-3'

Chain D:

• Molecule 1: 5'-D(*AP*GP*TP*C)-3'

Chain F:

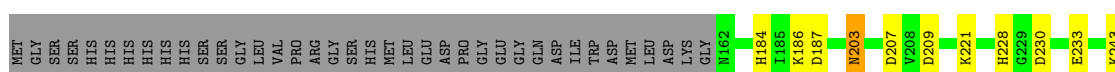• Molecule 2: Tyrosyl-DNA phosphodiesterase 1

Chain A:

• Molecule 2: Tyrosyl-DNA phosphodiesterase 1

Chain B:
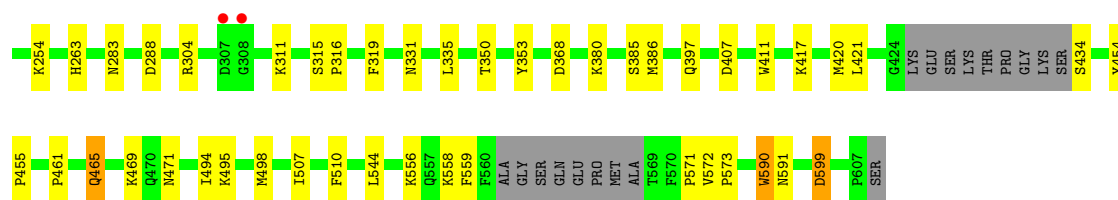
K254 H263 N283 D288 R304 D307 G308 K311 S315 P316 F319 N331 L335 T350 Y353 D368 K380 S385 M386 Q397 D407 W411 K417 M420 L421 G424 LYS GLU SER LYS THR PRO GLY LYS SER S434 Y454

P455 P461 Q465 K469 Q470 N471 I494 K495 M498 I507 F510 L544 K556 Q557 K558 F559 F560 ALA GLY SER GLN GLU PRO MET ALA T569 F570 P571 V572 P573 W590 N591 D599 P607 SER

• Molecule 3: Topoisomerase I-Derived Peptide

Chain C:

20%

40%   60%

K720 L721 K724

• Molecule 3: Topoisomerase I-Derived Peptide

Chain E:

60%   40%

LYS L721 N722 Y723 LYS
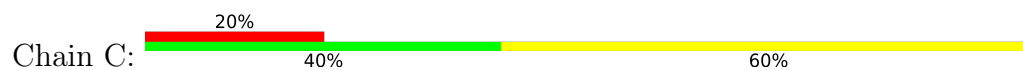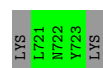
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	49.82Å 104.83Å 193.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.20 48.38 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.9 (50.00-2.20) 99.9 (48.38-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.12	Depositor
$< I/\sigma(I) >$ [1]	2.72 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.188 , 0.227 0.186 , 0.224	Depositor DCC
R_{free} test set	2674 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å^2)	24.5	Xtriage
Anisotropy	0.502	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 42.6	EDS
L-test for twinning[2]	$< \lvert L \rvert > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7258	wwPDB-VP
Average B, all atoms (Å^2)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.07% 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 $< \lvert L \rvert >$, $< L^2 >$ 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: SPM, VO4

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	D	0.79	0/54	1.20	0/80
1	F	0.90	0/54	1.46	0/80
2	A	0.44	0/3505	0.67	5/4765 (0.1%)
2	B	0.48	0/3540	0.67	6/4816 (0.1%)
3	C	0.64	0/47	0.65	0/59
3	E	0.60	0/28	0.51	0/37
All	All	0.47	0/7228	0.68	11/9837 (0.1%)

There are no bond length outliers.

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	209	ASP	CB-CG-OD2	7.03	124.62	118.30
2	A	340	ASP	CB-CG-OD2	6.98	124.58	118.30
2	B	209	ASP	CB-CG-OD2	6.25	123.92	118.30
2	B	407	ASP	CB-CG-OD2	6.18	123.86	118.30
2	B	599	ASP	CB-CG-OD2	5.73	123.46	118.30
2	A	599	ASP	CB-CG-OD2	5.62	123.36	118.30
2	B	207	ASP	CB-CG-OD2	5.58	123.32	118.30
2	A	407	ASP	CB-CG-OD2	5.57	123.31	118.30
2	A	230	ASP	CB-CG-OD2	5.47	123.22	118.30
2	B	187	ASP	CB-CG-OD2	5.38	123.14	118.30
2	B	368	ASP	CB-CG-OD2	5.04	122.84	118.30

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	D	50	0	29	0	0
1	F	50	0	29	2	0
2	A	3394	0	3330	41	0
2	B	3426	0	3354	31	0
3	C	47	0	50	5	0
3	E	28	0	24	0	0
4	A	3	0	0	3	0
4	B	3	0	0	3	0
5	A	14	0	26	2	0
6	A	112	0	0	5	0
6	B	123	0	0	0	0
6	C	1	0	0	1	0
6	D	5	0	0	0	0
6	F	2	0	0	0	0
All	All	7258	0	6842	78	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 6.

All (78) 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:B:498:MET:CE	2:B:507:ILE:HG21	1.77	1.14
2:B:498:MET:HE1	2:B:507:ILE:HG21	1.46	0.95
2:A:607:PRO:O	2:A:608:SER:HB2	1.74	0.86
2:B:498:MET:HE2	2:B:507:ILE:HG21	1.58	0.83
2:B:228:HIS:HD2	2:B:230:ASP:H	1.26	0.81
2:A:606:VAL:H	5:A:999:SPM:HN5	1.28	0.80
2:B:417:LYS:O	2:B:421:LEU:HG	1.86	0.75
2:A:607:PRO:O	2:A:608:SER:CB	2.37	0.73
2:B:498:MET:HE2	2:B:507:ILE:CG2	2.21	0.70
2:A:241:GLN:OE1	6:A:826:HOH:O	2.09	0.69
4:B:699:VO4:O1	4:B:699:VO4:V	1.49	0.68
4:B:699:VO4:V	4:B:699:VO4:O3	1.51	0.68
4:A:699:VO4:V	4:A:699:VO4:O3	1.50	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:699:VO4:V	4:A:699:VO4:O1	1.50	0.66
2:A:606:VAL:HG23	5:A:999:SPM:H22	1.78	0.66
2:B:498:MET:CE	2:B:507:ILE:CG2	2.64	0.66
2:B:228:HIS:HD2	2:B:230:ASP:N	1.93	0.64
2:A:414:SER:O	2:A:418:GLU:HG2	1.98	0.63
2:A:417:LYS:HG2	2:A:421:LEU:HD23	1.79	0.63
2:A:458:GLY:HA3	3:C:724:LYS:HE3	1.79	0.63
2:B:465:GLN:HE22	2:B:591:ASN:HD21	1.46	0.62
2:A:457:GLY:HA3	2:A:588:TRP:CZ2	2.37	0.60
2:A:526:GLU:OE1	6:A:837:HOH:O	2.16	0.59
2:A:233:GLU:HG2	6:A:937:HOH:O	2.01	0.59
2:A:213:LYS:N	2:A:213:LYS:HD3	2.18	0.58
2:B:228:HIS:CD2	2:B:230:ASP:H	2.16	0.57
2:A:377:LYS:NZ	2:A:381:ASP:OD2	2.28	0.57
2:A:471:ASN:HB2	6:A:845:HOH:O	2.05	0.56
2:A:263:HIS:NE2	4:A:699:VO4:O3	2.40	0.55
1:F:804:DG:OP2	2:B:469:LYS:NZ	2.40	0.54
2:A:213:LYS:NZ	2:A:245:TYR:OH	2.41	0.53
1:F:805:DT:H73	1:F:806:DC:N4	2.24	0.53
2:A:376:LYS:HE3	6:A:1114:HOH:O	2.10	0.51
2:B:184:HIS:HD2	2:B:186:LYS:HB2	1.75	0.51
2:B:263:HIS:NE2	4:B:699:VO4:O3	2.44	0.51
2:B:465:GLN:NE2	2:B:465:GLN:H	2.09	0.51
2:A:414:SER:O	2:A:418:GLU:CG	2.58	0.51
2:A:504:PHE:CE1	2:A:577:PRO:HB3	2.45	0.50
2:B:498:MET:HE1	2:B:507:ILE:CG2	2.31	0.50
2:B:556:LYS:HD3	2:B:558:LYS:O	2.12	0.50
2:B:319:PHE:CG	2:B:350:THR:HG21	2.46	0.49
2:A:457:GLY:HA3	2:A:588:TRP:CE2	2.47	0.49
2:A:458:GLY:HA3	3:C:724:LYS:CE	2.41	0.49
2:A:458:GLY:CA	3:C:724:LYS:HE3	2.42	0.49
2:A:559:PHE:CE1	2:A:571:PRO:HB2	2.47	0.49
2:B:397:GLN:HE22	2:B:494:ILE:HG23	1.78	0.49
2:B:203:ASN:OD1	2:B:283:ASN:HA	2.13	0.48
2:B:559:PHE:CE1	2:B:571:PRO:HB2	2.49	0.47
2:A:322:ASN:OD1	2:A:374:ARG:NH1	2.46	0.47
2:A:337:GLU:O	2:A:341:VAL:HG23	2.15	0.46
2:B:386:MET:N	2:B:386:MET:SD	2.88	0.46
2:B:228:HIS:CD2	2:B:230:ASP:HB2	2.51	0.46
2:A:237:HIS:HE1	3:C:721:LEU:HD11	1.80	0.45
2:A:454:TYR:N	2:A:455:PRO:CD	2.79	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:171:VAL:HG13	2:A:291:GLN:HA	1.99	0.45
2:B:454:TYR:N	2:B:455:PRO:CD	2.80	0.44
2:B:461:PRO:HA	2:B:590:TRP:CD2	2.52	0.44
2:B:454:TYR:CD2	2:B:599:ASP:HB3	2.53	0.44
2:B:315:SER:HB2	2:B:316:PRO:HD2	1.99	0.43
2:B:353:TYR:CE1	2:B:544:LEU:HD12	2.53	0.43
2:A:393:PRO:HD2	2:A:500:PRO:O	2.18	0.43
2:A:265:LYS:HB2	2:A:280:HIS:O	2.18	0.43
2:A:495:LYS:N	2:A:495:LYS:HD2	2.34	0.43
2:B:465:GLN:H	2:B:465:GLN:HE21	1.66	0.43
2:B:572:VAL:HA	2:B:573:PRO:HD3	1.88	0.42
2:A:169:THR:HA	2:A:183:LEU:O	2.19	0.42
2:A:454:TYR:CD2	2:A:599:ASP:HB3	2.55	0.42
2:A:217:PRO:HA	2:A:220:ARG:HG3	2.02	0.42
2:B:498:MET:HE3	2:B:510:PHE:HD1	1.84	0.41
3:C:720:LYS:N	6:C:828:HOH:O	2.52	0.41
2:A:504:PHE:CD1	2:A:577:PRO:HB3	2.56	0.41
2:A:319:PHE:CG	2:A:350:THR:HG21	2.55	0.41
2:A:311:LYS:NZ	2:A:311:LYS:HB3	2.36	0.41
2:A:506:LYS:HA	2:A:555:VAL:HG23	2.04	0.40
2:A:544:LEU:HA	2:A:544:LEU:HD23	1.83	0.40
2:A:184:HIS:CD2	2:A:186:LYS:H	2.39	0.40
2:B:335:LEU:HD23	2:B:335:LEU:HA	1.76	0.40
2:A:357:SER:HB2	2:A:538:GLU:HB2	2.03	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	
2	A	417/485 (86%)	407 (98%)	8 (2%)	2 (0%)	29	31

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	423/485 (87%)	415 (98%)	7 (2%)	1 (0%)	47	55
3	C	3/5 (60%)	2 (67%)	1 (33%)	0	100	100
3	E	1/5 (20%)	1 (100%)	0	0	100	100
All	All	844/980 (86%)	825 (98%)	16 (2%)	3 (0%)	34	37

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	A	414	SER
2	A	411	TRP
2	B	411	TRP

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	
2	A	366/421 (87%)	344 (94%)	22 (6%)	19	22
2	B	369/421 (88%)	352 (95%)	17 (5%)	27	34
3	C	5/5 (100%)	5 (100%)	0	100	100
3	E	3/5 (60%)	3 (100%)	0	100	100
All	All	743/852 (87%)	704 (95%)	39 (5%)	23	28

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	190	SER
2	A	203	ASN
2	A	213	LYS
2	A	249	SER
2	A	254	LYS
2	A	265	LYS
2	A	288	ASP
2	A	311	LYS

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Mol	Chain	Res	Type
2	A	351	ASN
2	A	358	THR
2	A	385	SER
2	A	386	MET
2	A	414	SER
2	A	420	MET
2	A	471	ASN
2	A	475	SER
2	A	495	LYS
2	A	506	LYS
2	A	528	ASN
2	A	584	LYS
2	A	590	TRP
2	A	608	SER
2	B	203	ASN
2	B	221	LYS
2	B	233	GLU
2	B	243	LYS
2	B	254	LYS
2	B	288	ASP
2	B	304	ARG
2	B	311	LYS
2	B	331	ASN
2	B	380	LYS
2	B	385	SER
2	B	420	MET
2	B	434	SER
2	B	465	GLN
2	B	471	ASN
2	B	495	LYS
2	B	590	TRP

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

Mol	Chain	Res	Type
2	A	237	HIS
2	A	351	ASN
2	A	363	GLN
2	A	369	ASN
2	A	397	GLN
2	A	531	GLN
2	B	165	GLN

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Mol	Chain	Res	Type
2	B	184	HIS
2	B	228	HIS
2	B	369	ASN
2	B	397	GLN
2	B	465	GLN
2	B	528	ASN
2	B	531	GLN

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 ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

3 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	$\#|Z| > 2$
5	SPM	A	999	-	13,13,13	0.36	0	12,12,12	0.78	0
4	VO4	B	699	1,2,3	0,2,4	-	-	-		
4	VO4	A	699	1,2,3	0,2,4	-	-	-		

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	SPM	A	999	-	-	11/11/11/11	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	999	SPM	C7-C8-C9-N10
5	A	999	SPM	N5-C6-C7-C8
5	A	999	SPM	C2-C3-C4-N5
5	A	999	SPM	C12-C11-N10-C9
5	A	999	SPM	N1-C2-C3-C4
5	A	999	SPM	C6-C7-C8-C9
5	A	999	SPM	N10-C11-C12-C13
5	A	999	SPM	C3-C4-N5-C6
5	A	999	SPM	C11-C12-C13-N14
5	A	999	SPM	C7-C6-N5-C4
5	A	999	SPM	C8-C9-N10-C11

There are no ring outliers.

3 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	999	SPM	2	0
4	B	699	VO4	3	0
4	A	699	VO4	3	0

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, 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	D	3/4 (75%)	-0.63	0	100	100	26, 26, 40, 48	0
1	F	3/4 (75%)	-0.34	0	100	100	24, 24, 37, 47	0
2	A	425/485 (87%)	-0.40	8 (1%)	66	65	12, 26, 45, 63	0
2	B	429/485 (88%)	-0.49	2 (0%)	91	90	8, 20, 39, 53	0
3	C	5/5 (100%)	1.55	1 (20%)	1	1	36, 41, 49, 54	0
3	E	3/5 (60%)	0.18	0	100	100	34, 34, 43, 43	0
All	All	868/988 (87%)	-0.43	11 (1%)	77	75	8, 23, 44, 63	0

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	724	LYS	3.9
2	A	528	ASN	3.6
2	A	308	GLY	3.2
2	A	365	SER	2.6
2	A	307	ASP	2.3
2	B	307	ASP	2.3
2	A	364	GLY	2.2
2	A	531	GLN	2.2
2	B	308	GLY	2.1
2	A	608	SER	2.1
2	A	551	ASP	2.0

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

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

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6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (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, 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	SPM	A	999	14/14	0.81	0.20	36,39,47,47	0
4	VO4	A	699	3/5	0.99	0.08	16,16,20,20	0
4	VO4	B	699	3/5	1.00	0.07	15,15,17,17	0

6.5 Other polymers (i)

There are no such residues in this entry.