



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 9, 2022 – 02:05 PM EDT

PDB ID : 7STS
Title : Crystal Structure of Human Fab S24-1379 in the Complex with the N-terminal Domain of Nucleocapsid Protein from SARS CoV-2
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Deposited on : 2021-11-15
Resolution : 2.16 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.29
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) : 2.29

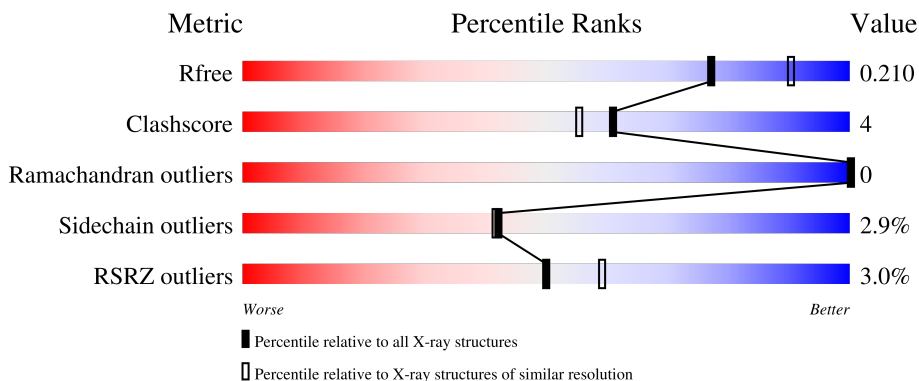
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.16 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.



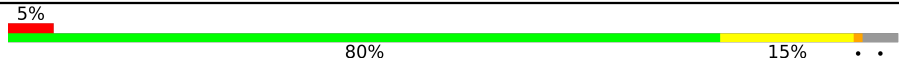
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1479 (2.16-2.16)
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)
RSRZ outliers	127900	1456 (2.16-2.16)

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 $\leq 5\%$. 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	218	 4% 76% 16% • 6%
1	H	218	 2% 82% 14% • •
2	B	212	 4% 86% 14%
2	L	212	 91% 9%
3	C	130	 2% 78% 8% 15%

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Mol	Chain	Length	Quality of chain
3	D	130	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into three segments: a small red segment on the left labeled '5%', a large green segment in the middle labeled '80%', and a small yellow segment on the right labeled '15%'. The bar ends with two small black dots.</p>

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 8245 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 Fab S24-1379, heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	204	Total 1548	C 989	N 251	O 303	S 5	0	0	0
1	H	210	Total 1601	C 1019	N 262	O 315	S 5	0	1	0

- Molecule 2 is a protein called Fab S24-1379, light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	212	Total 1581	C 986	N 270	O 321	S 4	0	0	0
2	L	212	Total 1592	C 992	N 274	O 322	S 4	0	1	0

- Molecule 3 is a protein called Nucleoprotein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	111	Total 863	C 554	N 150	O 159		0	0	0
3	D	125	Total 970	C 616	N 175	O 178	S 1	0	0	0

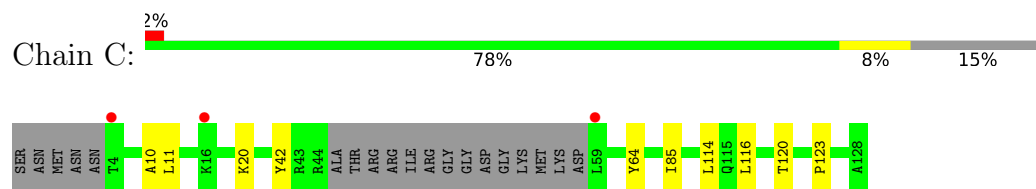
There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-1	SER	-	expression tag	UNP P0DTC9
C	0	ASN	-	expression tag	UNP P0DTC9
C	1	MET	-	expression tag	UNP P0DTC9
D	-1	SER	-	expression tag	UNP P0DTC9
D	0	ASN	-	expression tag	UNP P0DTC9
D	1	MET	-	expression tag	UNP P0DTC9

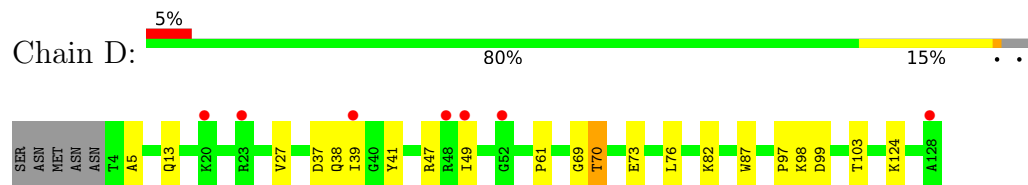
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	12	Total O 12 12	0	0
4	B	15	Total O 15 15	0	0
4	C	10	Total O 10 10	0	0
4	D	10	Total O 10 10	0	0
4	H	17	Total O 17 17	0	0
4	L	26	Total O 26 26	0	0

- Molecule 3: Nucleoprotein



- Molecule 3: Nucleoprotein



4 Data and refinement statistics i

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	99.08Å 99.08Å 221.89Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	49.54 – 2.16 49.54 – 2.16	Depositor EDS
% Data completeness (in resolution range)	99.8 (49.54-2.16) 99.8 (49.54-2.16)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.59 (at 2.16Å)	Xtrriage
Refinement program	PHENIX 1.19_4092	Depositor
R, R_{free}	0.190 , 0.209 0.190 , 0.210	Depositor DCC
R_{free} test set	3537 reflections (5.17%)	wwPDB-VP
Wilson B-factor (Å ²)	53.7	Xtrriage
Anisotropy	0.208	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 31.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.39$, $\langle L^2 \rangle = 0.22$	Xtrriage
Estimated twinning fraction	0.460 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8245	wwPDB-VP
Average B, all atoms (Å ²)	58.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.38% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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](#)

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	0.25	0/1589	0.50	0/2174
1	H	0.26	0/1643	0.51	0/2248
2	B	0.25	0/1620	0.48	0/2211
2	L	0.25	0/1631	0.48	0/2225
3	C	0.25	0/890	0.47	0/1215
3	D	0.25	0/998	0.49	0/1357
All	All	0.25	0/8371	0.49	0/11430

There are no bond length outliers.

There are no bond angle outliers.

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	1548	0	1523	20	0
1	H	1601	0	1577	15	0
2	B	1581	0	1535	14	0
2	L	1592	0	1547	12	0
3	C	863	0	827	5	0
3	D	970	0	942	11	0
4	A	12	0	0	0	0
4	B	15	0	0	0	0
4	C	10	0	0	0	0
4	D	10	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	H	17	0	0	0	0
4	L	26	0	0	1	0
All	All	8245	0	7951	72	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 4.

All (72) 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:H:33:TYR:HB2	1:H:98:ASP:HB2	1.72	0.69
1:H:173:VAL:HG21	2:L:164:GLU:HB3	1.80	0.64
1:A:33:TYR:HB2	1:A:98:ASP:HB2	1.79	0.64
1:A:173:VAL:HG21	2:B:164:GLU:HB3	1.86	0.58
2:B:1:GLN:HB2	2:B:25:SER:HB3	1.86	0.58
1:A:167:VAL:HG22	1:A:186:VAL:HG22	1.85	0.58
3:D:13:GLN:HB3	3:D:61:PRO:HG2	1.85	0.58
2:B:142:ASP:OD1	2:B:171:GLN:NE2	2.31	0.57
1:A:11:LEU:HB2	1:A:151:PRO:HG3	1.86	0.56
3:C:20:LYS:H	3:C:123:PRO:HG2	1.71	0.56
3:D:69:GLY:HA3	3:D:97:PRO:HB3	1.88	0.56
2:L:40:LEU:HD23	2:L:85:ALA:HB2	1.86	0.56
1:H:127:PRO:HD3	1:H:213:LYS:HE3	1.89	0.55
1:A:101:GLN:HG2	1:A:102:LEU:HD12	1.89	0.55
2:L:1:GLN:HB2	2:L:25:SER:HB3	1.88	0.55
1:H:193:LEU:HD22	1:H:217:PRO:HB3	1.89	0.54
1:H:139:THR:HA	1:H:189:PRO:HA	1.89	0.54
2:B:38:GLN:HB2	2:B:48:LEU:HD11	1.91	0.53
1:A:13:LYS:HD3	1:A:117:SER:HA	1.89	0.52
1:A:39:GLN:HB2	1:A:45:LEU:HD23	1.92	0.52
1:A:130:PRO:HG3	1:A:142:LEU:HB3	1.93	0.51
2:L:3:VAL:HA	2:L:100:VAL:HG11	1.94	0.49
2:L:151:ALA:HB3	2:L:198:GLN:HB3	1.93	0.49
1:H:101:GLN:HG2	1:H:102:LEU:HD12	1.96	0.48
1:H:185:VAL:HB	2:L:139:LEU:HD13	1.96	0.48
2:L:130:GLN:NE2	4:L:303:HOH:O	2.46	0.47
1:H:40:PRO:HB2	1:H:43:LYS:HB2	1.95	0.47
1:H:158:TRP:CH2	1:H:200:CYS:HB3	2.50	0.47
3:D:5:ALA:HB1	3:D:103:THR:HB	1.97	0.46
3:C:10:ALA:HB2	3:C:64:TYR:CE2	2.50	0.46
2:L:1:GLN:O	2:L:25:SER:OG	2.29	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:50:TYR:CE1	1:A:58:ASN:HB2	2.51	0.46
2:L:26:SER:HA	2:L:30:GLY:HA3	1.99	0.45
3:D:73:GLU:HB3	3:D:76:LEU:HD12	1.99	0.45
1:A:123:PRO:HB3	1:A:149:TYR:HB3	1.98	0.45
2:B:82:GLU:OE1	2:B:82:GLU:N	2.39	0.45
2:B:40:LEU:HD23	2:B:85:ALA:HB2	1.99	0.45
1:A:8:GLY:HA3	1:A:20:LEU:HD23	1.99	0.44
2:B:14:PRO:HA	2:B:79:LEU:HB3	2.00	0.44
3:D:41:TYR:HB3	3:D:87:TRP:CE3	2.53	0.44
2:B:84:GLU:HG3	2:B:109:VAL:H	1.83	0.44
1:H:8:GLY:HA3	1:H:20:LEU:HD23	1.99	0.44
3:D:124:LYS:HE3	3:D:124:LYS:HB2	1.74	0.43
2:L:170:LYS:HB2	2:L:170:LYS:HE2	1.74	0.43
1:H:123:PRO:HB3	1:H:149:TYR:HB3	1.99	0.43
1:A:139:THR:HA	1:A:189:PRO:HA	1.99	0.43
1:A:125:VAL:HG13	1:A:213:LYS:HE2	1.99	0.43
3:C:116:LEU:HD13	3:C:120:THR:HG21	2.01	0.43
2:B:119:VAL:HG22	2:B:140:ILE:HG12	1.99	0.43
2:B:170:LYS:HE2	2:B:170:LYS:HB2	1.81	0.43
3:D:70:THR:HG22	3:D:103:THR:HG23	2.01	0.43
2:B:150:VAL:HG22	2:B:199:VAL:HG22	2.01	0.42
1:H:90:THR:HG23	1:H:114:THR:HA	2.01	0.42
3:D:37:ASP:HA	3:D:98:LYS:HE3	2.00	0.42
1:A:13:LYS:HB3	1:A:16:GLU:HG3	2.01	0.42
1:A:75:LYS:HB2	1:A:77:GLN:HG2	2.01	0.42
3:D:49:ILE:HD12	3:D:49:ILE:HA	1.97	0.42
1:A:128:LEU:HB3	2:B:122:PHE:CD2	2.55	0.42
3:D:27:VAL:HG11	3:D:38:GLN:HB3	2.01	0.42
1:A:6:GLU:HG3	1:A:95:CYS:SG	2.61	0.41
1:A:146:VAL:HG11	1:A:154:VAL:HG11	2.03	0.41
1:A:150:PHE:HA	1:A:151:PRO:HA	1.84	0.41
3:D:37:ASP:O	3:D:39:ILE:N	2.54	0.41
1:H:4:LEU:HD11	1:H:34:TRP:HZ3	1.86	0.41
2:B:95:SER:HB2	2:L:95:SER:HB2	2.02	0.41
3:C:42:TYR:O	3:C:85:ILE:HA	2.21	0.41
1:H:130:PRO:HG3	1:H:142:LEU:HB3	2.03	0.41
2:B:185:THR:OG1	2:B:188:GLN:HG3	2.21	0.41
1:H:172:ALA:HA	1:H:182:LEU:HB3	2.02	0.40
2:L:153:LYS:HB2	2:L:196:SER:HB2	2.02	0.40
1:A:6:GLU:HB2	1:A:111:THR:HG23	2.03	0.40
3:C:11:LEU:HG	3:C:114:LEU:HD13	2.04	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	198/218 (91%)	188 (95%)	10 (5%)	0	100	100
1	H	207/218 (95%)	199 (96%)	8 (4%)	0	100	100
2	B	210/212 (99%)	199 (95%)	11 (5%)	0	100	100
2	L	211/212 (100%)	206 (98%)	5 (2%)	0	100	100
3	C	107/130 (82%)	104 (97%)	3 (3%)	0	100	100
3	D	123/130 (95%)	119 (97%)	4 (3%)	0	100	100
All	All	1056/1120 (94%)	1015 (96%)	41 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all 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	178/190 (94%)	172 (97%)	6 (3%)	37	35
1	H	185/190 (97%)	179 (97%)	6 (3%)	39	38
2	B	177/177 (100%)	170 (96%)	7 (4%)	31	29
2	L	178/177 (101%)	174 (98%)	4 (2%)	52	55
3	C	87/103 (84%)	87 (100%)	0	100	100
3	D	97/103 (94%)	93 (96%)	4 (4%)	30	29

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	902/940 (96%)	875 (97%)	27 (3%)	42 40

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	50	TYR
1	A	101	GLN
1	A	109	GLN
1	A	139	THR
1	A	187	THR
1	A	200	CYS
2	B	35	TYR
2	B	81	SER
2	B	97	SER
2	B	127	GLU
2	B	130	GLN
2	B	187	GLU
2	B	196	SER
3	D	47	ARG
3	D	70	THR
3	D	82	LYS
3	D	99	ASP
1	H	43	LYS
1	H	50	TYR
1	H	119	SER
1	H	163	LEU
1	H	193	LEU
1	H	205	LYS
2	L	35	TYR
2	L	51[A]	ARG
2	L	51[B]	ARG
2	L	171	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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

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(Å ²)	Q<0.9
1	A	204/218 (93%)	0.22	9 (4%) 34 43	38, 61, 91, 140	0
1	H	210/218 (96%)	0.02	4 (1%) 66 74	37, 51, 77, 102	1 (0%)
2	B	212/212 (100%)	0.34	8 (3%) 40 49	37, 60, 97, 118	2 (0%)
2	L	212/212 (100%)	-0.08	1 (0%) 91 93	36, 50, 67, 101	0
3	C	111/130 (85%)	0.03	3 (2%) 54 63	40, 53, 80, 99	0
3	D	125/130 (96%)	0.27	7 (5%) 24 33	39, 65, 101, 139	0
All	All	1074/1120 (95%)	0.13	32 (2%) 50 59	36, 55, 90, 140	3 (0%)

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	192	SER	6.8
3	C	4	THR	5.2
2	B	172	SER	4.7
1	A	217	PRO	3.5
2	L	1	GLN	3.4
1	A	198	TYR	3.4
2	B	111	GLY	3.0
1	A	218	LYS	3.0
1	A	214	ARG	2.9
3	C	59	LEU	2.9
1	A	216	GLU	2.8
2	B	169	SER	2.8
3	D	23	ARG	2.7
2	B	116	ALA	2.7
3	D	128	ALA	2.6
3	D	52	GLY	2.6
3	D	48	ARG	2.6
2	B	15	GLY	2.5
1	A	197	THR	2.5

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Mol	Chain	Res	Type	RSRZ
1	H	195	THR	2.4
2	B	133	LYS	2.4
2	B	173	ASN	2.4
3	D	20	LYS	2.3
1	A	188	VAL	2.3
1	H	188	VAL	2.3
1	A	186	VAL	2.2
3	C	16	LYS	2.2
2	B	131	ALA	2.1
1	H	214	ARG	2.1
3	D	49	ILE	2.0
1	A	163	LEU	2.0
3	D	39	ILE	2.0

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

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

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.