



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 10:33 AM UTC

PDB ID : 1QKZ / pdb_00001qkz
Title : Fab fragment (MN14C11.6) in complex with a peptide antigen derived from Neisseria meningitidis P1.7 serosubtype antigen and domain II from Streptococcal protein G
Authors : Derrick, J.P.; Feavers, I.; Maiden, M.C.J.
Deposited on : 1999-08-17
Resolution : 1.95 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
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

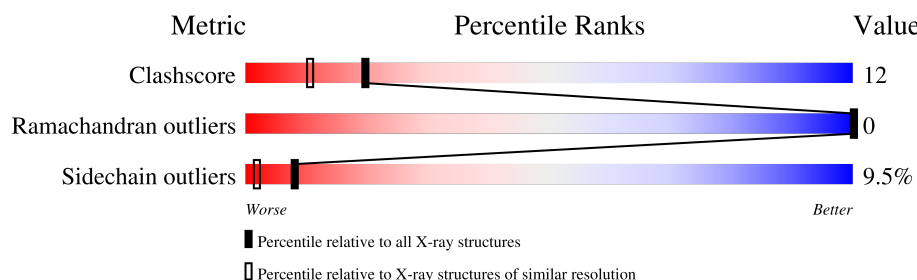
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.95 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	3612 (1.96-1.96)
Ramachandran outliers	187476	3587 (1.96-1.96)
Sidechain outliers	187428	3587 (1.96-1.96)

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	64	
2	H	219	
3	L	217	
4	P	10	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4369 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 PROTEIN G-PRIME.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	58	Total	C	N	O	0	0	0
			449	283	71	95			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	24	LYS	GLU	engineered mutation	UNP Q54181

- Molecule 2 is a protein called ANTIBODY.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	219	Total	C	N	O	S	0	0	0
			1670	1057	273	331	9			

- Molecule 3 is a protein called ANTIBODY.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	L	214	Total	C	N	O	S	0	0	0
			1662	1039	284	333	6			

- Molecule 4 is a protein called MAJOR OUTER MEMBRANE PROTEIN P1.16.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	P	10	Total	C	N	O	0	0	0
			62	35	13	14			

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	61	Total	O	0	0
			61	61		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	H	234	Total 234	O 234	0	0
5	L	221	Total 221	O 221	0	0
5	P	10	Total 10	O 10	0	0

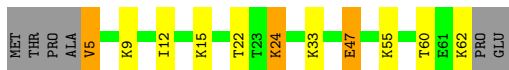
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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.

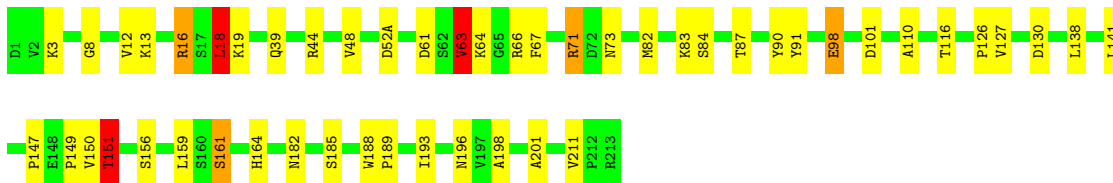
- Molecule 1: PROTEIN G-PRIME

Chain A:  73% 12% 5% 9%



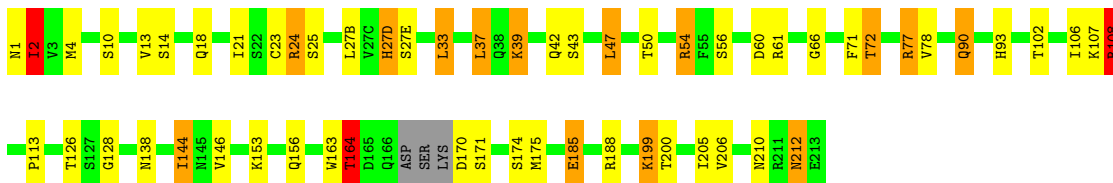
- Molecule 2: ANTIBODY

Chain H:  77% 20% ..



- Molecule 3: ANTIBODY

Chain L:  72% 19% 6% ..



- Molecule 4: MAJOR OUTER MEMBRANE PROTEIN P1.16

Chain P:  90% 10%



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	43.48 Å 63.10 Å 89.37 Å 90.00° 81.54° 90.00°	Depositor
Resolution (Å)	10.00 – 1.95	Depositor
% Data completeness (in resolution range)	99.0 (10.00-1.95)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.04	Depositor
Refinement program	REFMAC	Depositor
R, R_{free}	0.205 , 0.262	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4369	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

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	0.58	0/455	1.40	3/617 (0.5%)
2	H	0.66	1/1714 (0.1%)	1.69	11/2338 (0.5%)
3	L	0.65	0/1700	1.53	19/2305 (0.8%)
4	P	0.70	0/61	1.55	0/78
All	All	0.65	1/3930 (0.0%)	1.59	33/5338 (0.6%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	71	ARG	CD-NE	-5.38	1.38	1.46

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	71	ARG	CD-NE-CZ	37.76	177.26	124.40
2	H	63	VAL	N-CA-CB	-9.89	98.77	112.12
3	L	212	ASN	OD1-CG-ND2	-7.29	115.31	122.60
2	H	101	ASP	CA-CB-CG	6.97	119.57	112.60
2	H	52(A)	ASP	CA-CB-CG	6.97	119.57	112.60
3	L	164	THR	N-CA-CB	-6.94	99.74	110.29
2	H	71	ARG	NE-CZ-NH1	-6.82	114.69	121.50
3	L	1	ASN	CA-CB-CG	6.53	119.13	112.60
3	L	78	VAL	N-CA-C	6.52	117.45	109.30
2	H	150	VAL	N-CA-CB	6.01	122.54	112.44
3	L	156	GLN	OE1-CD-NE2	-5.76	116.84	122.60
3	L	2	ILE	CB-CA-C	5.68	117.83	110.96
2	H	130	ASP	CA-CB-CG	-5.67	106.93	112.60
1	A	24	LYS	CA-C-O	5.66	126.42	120.36
2	H	71	ARG	CG-CD-NE	5.57	124.25	112.00
3	L	54	ARG	CG-CD-NE	-5.55	99.80	112.00
3	L	54	ARG	NH1-CZ-NH2	5.53	126.49	119.30
1	A	47	GLU	CB-CG-CD	5.50	121.94	112.60
2	H	182	ASN	OD1-CG-ND2	-5.46	117.14	122.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	L	108	ARG	N-CA-CB	-5.38	102.88	111.43
3	L	2	ILE	N-CA-CB	5.34	117.09	111.00
3	L	128	GLY	CA-C-N	-5.29	117.77	122.47
3	L	128	GLY	C-N-CA	-5.29	117.77	122.47
3	L	50	THR	CA-C-N	5.17	131.28	121.97
3	L	50	THR	C-N-CA	5.17	131.28	121.97
1	A	24	LYS	O-C-N	-5.15	117.35	123.22
2	H	151	THR	N-CA-CB	-5.08	101.80	111.00
2	H	18	LEU	N-CA-CB	-5.08	103.69	111.56
3	L	27(D)	HIS	CA-CB-CG	5.08	118.88	113.80
3	L	144	ILE	CA-C-N	-5.03	115.90	122.99
3	L	144	ILE	C-N-CA	-5.03	115.90	122.99
3	L	1	ASN	CA-C-N	-5.03	116.09	122.37
3	L	1	ASN	C-N-CA	-5.03	116.09	122.37

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	449	0	441	6	0
2	H	1670	0	1616	32	0
3	L	1662	0	1606	47	0
4	P	62	0	62	4	0
5	A	61	0	0	5	0
5	H	234	0	0	8	0
5	L	221	0	0	12	0
5	P	10	0	0	4	0
All	All	4369	0	3725	86	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 12.

All (86) 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)
3:L:60:ASP:HB2	5:L:2081:HOH:O	1.31	1.25
2:H:161:SER:HB2	5:H:2191:HOH:O	1.33	1.25
4:P:2:ASN:HB2	5:P:2003:HOH:O	1.37	1.22
4:P:2:ASN:CB	5:P:2003:HOH:O	1.90	1.16
4:P:2:ASN:ND2	5:P:2003:HOH:O	1.88	1.01
4:P:2:ASN:CG	5:P:2003:HOH:O	1.99	0.98
3:L:37:LEU:HD13	3:L:39:LYS:HE2	1.47	0.96
3:L:2:ILE:HD11	3:L:25:SER:HB2	1.46	0.95
3:L:27(D):HIS:HA	5:L:2039:HOH:O	0.75	0.92
2:H:211:VAL:HG11	5:H:2102:HOH:O	1.67	0.92
2:H:156:SER:H	2:H:196:ASN:HD21	1.14	0.91
2:H:12:VAL:HG13	2:H:16:ARG:HB3	1.55	0.88
3:L:90:GLN:HE22	3:L:93:HIS:H	1.25	0.83
2:H:161:SER:C	5:H:2191:HOH:O	2.24	0.79
2:H:12:VAL:CG1	2:H:16:ARG:HB3	2.15	0.75
3:L:108:ARG:HG3	3:L:171:SER:HB3	1.67	0.75
2:H:156:SER:H	2:H:196:ASN:ND2	1.87	0.72
3:L:14:SER:HA	5:L:2021:HOH:O	1.93	0.68
3:L:72:THR:HG22	5:L:2101:HOH:O	1.94	0.67
3:L:24:ARG:HH11	3:L:24:ARG:HG2	1.63	0.65
3:L:164:THR:HG22	3:L:174:SER:H	1.63	0.64
3:L:108:ARG:HG3	3:L:171:SER:CB	2.28	0.64
2:H:151:THR:HG22	2:H:198:ALA:HB3	1.81	0.62
1:A:9:LYS:HG2	1:A:22:THR:HG22	1.83	0.61
1:A:60:THR:HG23	5:A:2047:HOH:O	2.01	0.61
3:L:27(B):LEU:HD23	3:L:33:LEU:HB2	1.86	0.57
2:H:12:VAL:HG13	2:H:16:ARG:HD3	1.85	0.57
1:A:47:GLU:HG3	5:A:2015:HOH:O	2.05	0.56
2:H:126:PRO:HD3	2:H:138:LEU:CD2	2.35	0.56
3:L:210:ASN:HD22	3:L:212:ASN:H	1.54	0.56
3:L:170:ASP:O	3:L:171:SER:HB2	2.04	0.56
2:H:98:GLU:HG2	5:H:2126:HOH:O	2.05	0.56
3:L:206:VAL:HG21	5:L:2095:HOH:O	2.06	0.55
3:L:27(D):HIS:CA	5:L:2039:HOH:O	1.64	0.54
3:L:199:LYS:O	3:L:199:LYS:HE2	2.08	0.54
3:L:21:ILE:HG12	3:L:102:THR:HG21	1.90	0.54
5:A:2038:HOH:O	3:L:126:THR:HG22	2.07	0.53
3:L:188:ARG:NH2	5:L:2193:HOH:O	2.42	0.53
2:H:82:MET:HE1	2:H:90:TYR:CZ	2.45	0.52
3:L:90:GLN:NE2	3:L:93:HIS:H	2.03	0.51
2:H:67:PHE:CZ	2:H:82:MET:HE2	2.47	0.51
3:L:144:ILE:HG22	3:L:163:TRP:CZ3	2.46	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:66:ARG:NH2	2:H:83:LYS:HE2	2.26	0.50
5:H:2134:HOH:O	3:L:42:GLN:HG2	2.12	0.50
2:H:164:HIS:HE1	3:L:138:ASN:HD21	1.60	0.49
1:A:60:THR:HG21	5:A:2011:HOH:O	2.13	0.49
2:H:211:VAL:HG22	5:H:2231:HOH:O	2.11	0.49
3:L:39:LYS:HE3	3:L:39:LYS:N	2.28	0.48
3:L:113:PRO:HG2	3:L:205:ILE:HD12	1.95	0.48
2:H:164:HIS:HE1	3:L:138:ASN:ND2	2.11	0.48
2:H:61:ASP:HA	2:H:64:LYS:HE3	1.96	0.48
3:L:2:ILE:HG12	3:L:90:GLN:HG2	1.97	0.47
3:L:146:VAL:HG11	3:L:175:MET:HE1	1.95	0.47
2:H:8:GLY:O	2:H:18:LEU:HD21	2.15	0.47
2:H:188:TRP:CG	2:H:189:PRO:HA	2.49	0.47
3:L:24:ARG:NH1	3:L:25:SER:O	2.48	0.47
2:H:156:SER:N	2:H:196:ASN:HD21	1.98	0.46
3:L:24:ARG:HG2	3:L:24:ARG:NH1	2.26	0.46
3:L:60:ASP:CA	5:L:2081:HOH:O	2.56	0.46
2:H:63:VAL:HG13	2:H:67:PHE:HB2	1.98	0.45
3:L:4:MET:HE3	3:L:23:CYS:SG	2.58	0.44
3:L:27(B):LEU:CD2	3:L:33:LEU:HD23	2.47	0.44
2:H:71:ARG:HD3	2:H:73:ASN:OD1	2.17	0.44
3:L:199:LYS:HG3	3:L:200:THR:N	2.32	0.44
3:L:66:GLY:HA3	3:L:71:PHE:HA	1.98	0.44
1:A:5:VAL:CG1	1:A:24:LYS:HB3	2.48	0.44
2:H:13:LYS:HE3	5:H:2014:HOH:O	2.18	0.43
3:L:18:GLN:NE2	5:L:2027:HOH:O	2.46	0.43
3:L:21:ILE:O	3:L:72:THR:HA	2.18	0.43
3:L:61:ARG:HD3	3:L:77:ARG:NH2	2.34	0.43
2:H:61:ASP:OD1	2:H:64:LYS:HE3	2.18	0.43
3:L:60:ASP:CB	5:L:2081:HOH:O	2.15	0.42
2:H:91:TYR:CE1	3:L:43:SER:HB3	2.55	0.42
2:H:126:PRO:HD3	2:H:138:LEU:HD22	2.01	0.42
3:L:27(E):SER:N	5:L:2039:HOH:O	2.50	0.42
2:H:82:MET:HE1	2:H:90:TYR:CE2	2.54	0.42
2:H:147:PRO:HD2	2:H:201:ALA:CB	2.50	0.42
3:L:37:LEU:CD1	3:L:39:LYS:HE2	2.35	0.41
1:A:33:LYS:HE2	5:A:2030:HOH:O	2.20	0.41
3:L:146:VAL:CG1	3:L:175:MET:HE1	2.50	0.41
2:H:87:THR:HG23	2:H:110:ALA:HA	2.01	0.41
3:L:61:ARG:HH11	3:L:61:ARG:HD2	1.73	0.41
2:H:39:GLN:HA	2:H:44:ARG:O	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:127:VAL:HA	5:H:2157:HOH:O	2.21	0.40
3:L:37:LEU:HB2	3:L:47:LEU:HD22	2.02	0.40
3:L:185:GLU:HG3	5:L:2187:HOH:O	2.20	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	56/64 (88%)	55 (98%)	1 (2%)	0	100	100
2	H	217/219 (99%)	214 (99%)	3 (1%)	0	100	100
3	L	210/217 (97%)	206 (98%)	4 (2%)	0	100	100
4	P	8/10 (80%)	7 (88%)	1 (12%)	0	100	100
All	All	491/510 (96%)	482 (98%)	9 (2%)	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	48/53 (91%)	43 (90%)	5 (10%)	7	1
2	H	188/188 (100%)	172 (92%)	16 (8%)	10	3

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	L	192/195 (98%)	172 (90%)	20 (10%)	7	1
4	P	5/5 (100%)	5 (100%)	0	100	100
All	All	433/441 (98%)	392 (90%)	41 (10%)	8	2

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

Mol	Chain	Res	Type
1	A	5	VAL
1	A	12	ILE
1	A	15	LYS
1	A	55	LYS
1	A	62	LYS
2	H	3	LYS
2	H	16	ARG
2	H	18	LEU
2	H	19	LYS
2	H	48	VAL
2	H	63	VAL
2	H	84	SER
2	H	98	GLU
2	H	116	THR
2	H	141	LEU
2	H	149	PRO
2	H	151	THR
2	H	159	LEU
2	H	161	SER
2	H	185	SER
2	H	193	ILE
3	L	2	ILE
3	L	10	SER
3	L	13	VAL
3	L	24	ARG
3	L	33	LEU
3	L	37	LEU
3	L	39	LYS
3	L	47	LEU
3	L	54	ARG
3	L	56	SER
3	L	72	THR
3	L	77	ARG
3	L	90	GLN

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Mol	Chain	Res	Type
3	L	106	ILE
3	L	107	LYS
3	L	108	ARG
3	L	153	LYS
3	L	164	THR
3	L	185	GLU
3	L	199	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	13	ASN
1	A	37	GLN
2	H	164	HIS
2	H	196	ASN
3	L	90	GLN
3	L	137	ASN
3	L	138	ASN
3	L	145	ASN
3	L	210	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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

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.