



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 21, 2020 – 06:42 AM BST

PDB ID : 5NXF
Title : Crystal structure of the carboxy-terminal region of the bacteriophage T4 proximal long tail fibre protein gp34, residues 795 to 1289, at 1.9 Angstrom.
Authors : Namura, M.; van Raaij, M.J.; Kanamaru, S.
Deposited on : 2017-05-10
Resolution : 1.90 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references ⓘ](#)) 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 : 2.13.1
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) : 2.13.1

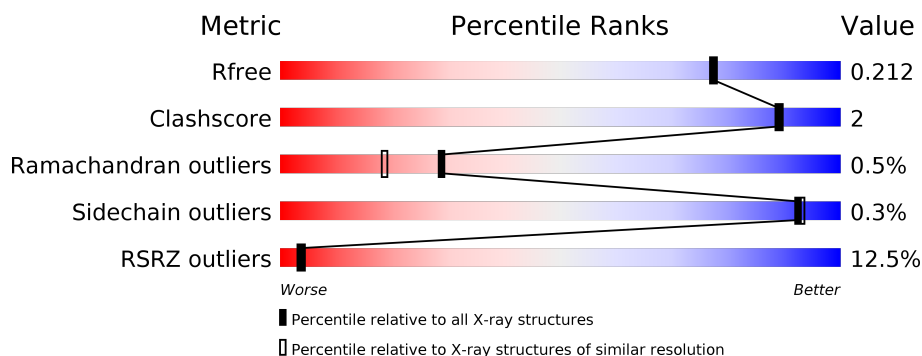
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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 on 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	509	<div> <div>10%</div> <div>91%</div> <div>6%</div> <div>.</div> </div>
1	B	509	<div> <div>13%</div> <div>91%</div> <div>6%</div> <div>.</div> </div>
1	C	509	<div> <div>13%</div> <div>92%</div> <div>5%</div> <div>.</div> </div>

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 13250 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 Long-tail fiber proximal subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	495	Total	C	N	O	Se	0	0	0
			3773	2357	655	756	5			
1	B	494	Total	C	N	O	Se	0	0	0
			3763	2352	654	752	5			
1	C	494	Total	C	N	O	Se	0	0	0
			3763	2352	654	752	5			

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			6	3	3		
2	A	1	Total	C	O	0	0
			6	3	3		
2	A	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	C	O	0	0
			6	3	3		
2	B	1	Total	C	O	0	0
			6	3	3		
2	B	1	Total	C	O	0	0
			6	3	3		
2	B	1	Total	C	O	0	0
			6	3	3		
2	B	1	Total	C	O	0	0
			6	3	3		
2	C	1	Total	C	O	0	0
			6	3	3		
2	C	1	Total	C	O	0	0
			6	3	3		
2	C	1	Total	C	O	0	0
			6	3	3		
2	C	1	Total	C	O	0	0
			6	3	3		
2	C	1	Total	C	O	0	0
			6	3	3		
2	C	1	Total	C	O	0	0
			6	3	3		
2	C	1	Total	C	O	0	0
			6	3	3		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	C	1	Total	O	P	0	0
			5	4	1		

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		

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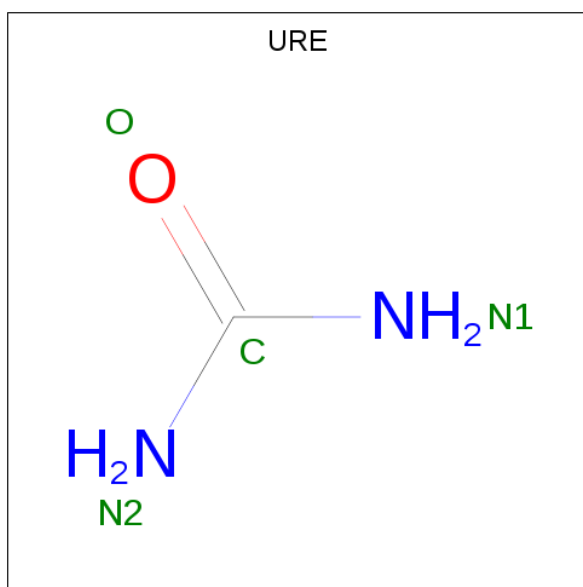
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 5 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Na	0	0
			1	1		

- Molecule 6 is UREA (three-letter code: URE) (formula: CH₄N₂O).

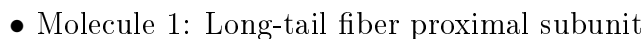
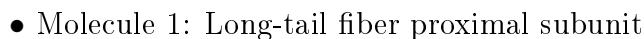


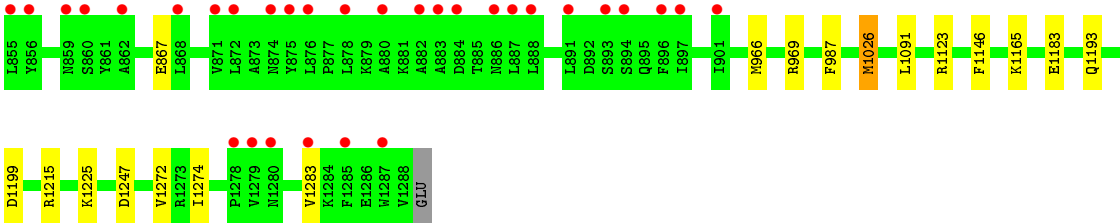
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	C	1	Total	C	N	O	0	0
			4	1	2	1		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	626	Total	O	0	0
			626	626		
7	B	576	Total	O	0	0
			576	576		
7	C	619	Total	O	0	0
			619	619		

- Molecule 1: Long-tail fiber proximal subunit





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	92.11Å 75.94Å 149.13Å 90.00° 90.21° 90.00°	Depositor
Resolution (Å)	46.12 – 1.90 46.12 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.9 (46.12-1.90) 99.0 (46.12-1.90)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.02 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.171 , 0.208 0.182 , 0.212	Depositor DCC
R_{free} test set	1957 reflections (1.21%)	wwPDB-VP
Wilson B-factor (Å ²)	15.6	Xtriage
Anisotropy	0.363	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 58.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.026 for h,-k,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	13250	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.49% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: URE, PO4, ACT, NA, GOL

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	0/3847	0.75	3/5230 (0.1%)
1	B	0.59	0/3837	0.74	5/5218 (0.1%)
1	C	0.58	0/3837	0.72	4/5218 (0.1%)
All	All	0.58	0/11521	0.74	12/15666 (0.1%)

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	A	0	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1166	MSE	CG-SE-CE	-7.38	82.67	98.90
1	B	1026	MSE	CG-SE-CE	-5.96	85.79	98.90
1	A	1181	ARG	NE-CZ-NH1	5.76	123.18	120.30
1	B	1166	MSE	CG-SE-CE	-5.57	86.64	98.90
1	B	1150	ASP	CB-CG-OD1	5.51	123.26	118.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	796	GLU	Peptide
1	B	796	GLU	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	3773	0	3659	17	0
1	B	3763	0	3653	19	0
1	C	3763	0	3653	16	0
2	A	18	0	24	0	0
2	B	30	0	40	0	0
2	C	54	0	72	1	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
3	C	5	0	0	0	0
4	A	8	0	6	1	0
5	A	1	0	0	0	0
6	C	4	0	4	1	0
7	A	626	0	0	1	0
7	B	576	0	0	0	0
7	C	619	0	0	1	0
All	All	13250	0	11111	43	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 2.

The worst 5 of 43 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:B:798:VAL:HG21	1:B:811:ASN:HB3	1.72	0.71
1:A:1267:LEU:HD23	1:A:1274:ILE:HD12	1.76	0.66
1:A:1034:PHE:CZ	1:C:1026:MSE:HE1	2.30	0.65
1:A:1026:MSE:HE1	1:B:1034:PHE:CZ	2.35	0.60
1:C:798:VAL:HG21	1:C:807:VAL:HG13	1.87	0.57

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	493/509 (97%)	480 (97%)	10 (2%)	3 (1%)	25	15
1	B	492/509 (97%)	472 (96%)	17 (4%)	3 (1%)	25	15
1	C	492/509 (97%)	476 (97%)	15 (3%)	1 (0%)	47	38
All	All	1477/1527 (97%)	1428 (97%)	42 (3%)	7 (0%)	29	18

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	803	ALA
1	B	802	SER
1	B	1067	ALA
1	A	1067	ALA
1	C	801	THR

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	412/418 (99%)	411 (100%)	1 (0%)	93	94
1	B	411/418 (98%)	409 (100%)	2 (0%)	88	89
1	C	411/418 (98%)	410 (100%)	1 (0%)	93	94
All	All	1234/1254 (98%)	1230 (100%)	4 (0%)	92	93

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1123	ARG
1	B	1123	ARG
1	B	1157	TYR
1	C	1123	ARG

Some 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](#)

Of 24 ligands modelled in this entry, 1 is monoatomic - leaving 23 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	$\# Z > 2$
2	GOL	C	1301	-	5,5,5	0.35	0	5,5,5	0.20	0
2	GOL	A	1301	-	5,5,5	0.42	0	5,5,5	0.44	0
6	URE	C	1311	-	3,3,3	0.49	0	3,3,3	0.48	0
3	PO4	B	1306	-	4,4,4	0.98	0	6,6,6	0.95	0
2	GOL	C	1303	-	5,5,5	0.22	0	5,5,5	0.40	0
2	GOL	C	1307	-	5,5,5	0.20	0	5,5,5	0.51	0
2	GOL	C	1305	-	5,5,5	0.28	0	5,5,5	0.48	0
2	GOL	A	1302	-	5,5,5	0.27	0	5,5,5	0.39	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	GOL	C	1302	-	5,5,5	0.19	0	5,5,5	0.38	0
2	GOL	C	1309	-	5,5,5	0.24	0	5,5,5	0.30	0
2	GOL	C	1304	-	5,5,5	0.26	0	5,5,5	0.26	0
2	GOL	B	1304	-	5,5,5	0.53	0	5,5,5	0.61	0
3	PO4	A	1304	-	4,4,4	1.63	1 (25%)	6,6,6	1.14	0
4	ACT	A	1306	-	1,3,3	1.21	0	0,3,3	0.00	-
2	GOL	B	1302	-	5,5,5	0.39	0	5,5,5	0.61	0
2	GOL	C	1306	-	5,5,5	0.33	0	5,5,5	0.70	0
2	GOL	B	1301	-	5,5,5	0.20	0	5,5,5	0.36	0
3	PO4	C	1310	-	4,4,4	1.50	1 (25%)	6,6,6	0.68	0
2	GOL	C	1308	-	5,5,5	0.23	0	5,5,5	0.45	0
2	GOL	B	1303	-	5,5,5	0.23	0	5,5,5	0.68	0
4	ACT	A	1305	-	1,3,3	0.24	0	0,3,3	0.00	-
2	GOL	A	1303	-	5,5,5	0.36	0	5,5,5	0.37	0
2	GOL	B	1305	-	5,5,5	0.68	0	5,5,5	0.43	0

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	GOL	B	1303	-	-	0/4/4/4	-
2	GOL	C	1301	-	-	0/4/4/4	-
2	GOL	A	1301	-	-	0/4/4/4	-
2	GOL	C	1305	-	-	2/4/4/4	-
2	GOL	A	1302	-	-	0/4/4/4	-
2	GOL	C	1302	-	-	2/4/4/4	-
2	GOL	B	1302	-	-	0/4/4/4	-
2	GOL	C	1306	-	-	2/4/4/4	-
2	GOL	B	1301	-	-	0/4/4/4	-
2	GOL	A	1303	-	-	0/4/4/4	-
2	GOL	B	1305	-	-	0/4/4/4	-
2	GOL	C	1303	-	-	2/4/4/4	-
2	GOL	C	1308	-	-	3/4/4/4	-
2	GOL	C	1307	-	-	4/4/4/4	-
2	GOL	C	1309	-	-	0/4/4/4	-
2	GOL	C	1304	-	-	0/4/4/4	-
2	GOL	B	1304	-	-	2/4/4/4	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1310	PO4	P-O1	2.23	1.56	1.50
3	A	1304	PO4	P-O4	-2.21	1.47	1.54

There are no bond angle outliers.

There are no chirality outliers.

5 of 17 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1303	GOL	C1-C2-C3-O3
2	C	1307	GOL	O1-C1-C2-O2
2	C	1307	GOL	O1-C1-C2-C3
2	B	1304	GOL	O1-C1-C2-C3
2	C	1306	GOL	O1-C1-C2-C3

There are no ring outliers.

3 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	C	1311	URE	1	0
2	C	1304	GOL	1	0
4	A	1305	ACT	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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	490/509 (96%)	0.43	52 (10%) 6 7	7, 17, 59, 91	0
1	B	489/509 (96%)	0.52	64 (13%) 3 3	8, 18, 65, 105	0
1	C	489/509 (96%)	0.50	68 (13%) 2 3	8, 17, 61, 111	0
All	All	1468/1527 (96%)	0.48	184 (12%) 3 4	7, 17, 63, 111	0

The worst 5 of 184 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	803	ALA	10.9
1	B	803	ALA	8.7
1	B	822	TRP	8.3
1	C	804	ASN	8.1
1	B	801	THR	7.8

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](#)

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(\AA^2)	Q<0.9
2	GOL	C	1304	6/6	0.75	0.31	47,56,59,61	0
2	GOL	C	1305	6/6	0.77	0.22	51,53,53,55	0
2	GOL	B	1305	6/6	0.77	0.20	27,40,41,42	0
4	ACT	A	1305	4/4	0.79	0.18	44,45,47,48	0
2	GOL	A	1302	6/6	0.79	0.26	43,45,48,52	0
6	URE	C	1311	4/4	0.80	0.12	36,39,41,44	0
2	GOL	C	1302	6/6	0.81	0.20	48,54,56,60	0
2	GOL	C	1303	6/6	0.84	0.23	33,45,46,46	0
2	GOL	C	1308	6/6	0.84	0.16	43,46,47,48	0
2	GOL	B	1304	6/6	0.86	0.15	36,39,39,41	0
2	GOL	C	1306	6/6	0.88	0.18	30,36,37,45	0
5	NA	A	1307	1/1	0.89	0.22	41,41,41,41	0
2	GOL	C	1307	6/6	0.89	0.24	30,37,39,45	0
4	ACT	A	1306	4/4	0.94	0.11	28,33,33,33	0
2	GOL	A	1301	6/6	0.94	0.10	20,23,23,25	0
2	GOL	A	1303	6/6	0.95	0.13	21,27,31,34	0
2	GOL	C	1309	6/6	0.95	0.09	23,27,30,31	0
2	GOL	B	1302	6/6	0.96	0.08	19,22,24,24	0
2	GOL	C	1301	6/6	0.96	0.08	21,24,24,24	0
2	GOL	B	1303	6/6	0.96	0.10	20,24,27,29	0
2	GOL	B	1301	6/6	0.97	0.12	18,18,20,21	0
3	PO4	B	1306	5/5	0.97	0.10	18,21,22,26	0
3	PO4	C	1310	5/5	0.98	0.10	20,20,23,25	0
3	PO4	A	1304	5/5	0.99	0.09	15,17,17,21	0

6.5 Other polymers [i](#)

There are no such residues in this entry.