



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:23 AM UTC

PDB ID : 5U21 / pdb_00005u21
Title : X-ray structure of the WlaRF aminotransferase from *Campylobacter jejuni*, K184A mutant in complex with TDP-Qui3N
Authors : Thoden, J.B.; Holden, H.M.; Dow, G.T.; Gilbert, M.
Deposited on : 2016-11-29
Resolution : 1.60 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)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

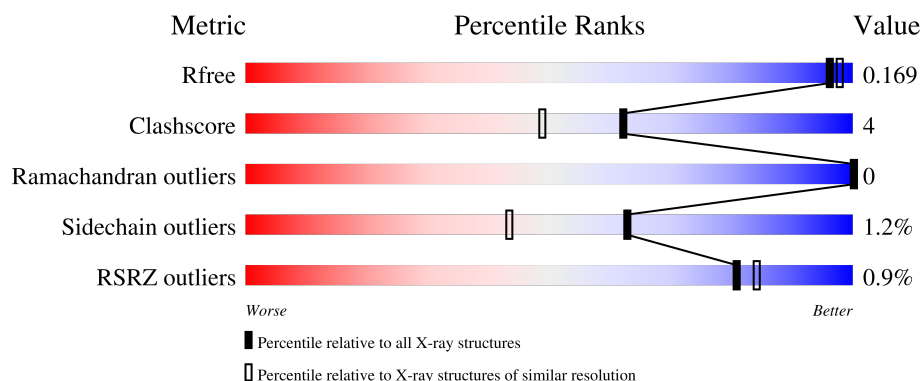
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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}	180053	4673 (1.60-1.60)
Clashscore	190562	4931 (1.60-1.60)
Ramachandran outliers	187476	4831 (1.60-1.60)
Sidechain outliers	187428	4830 (1.60-1.60)
RSRZ outliers	180081	4672 (1.60-1.60)

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	382	85% 8% 5%
1	B	382	84% 10% 5%
1	C	382	84% 10% 5%
1	D	382	86% 8% 5%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 13583 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 Putative aminotransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	361	Total	C	N	O	S	0	3	0
			2938	1891	495	537	15			
1	B	362	Total	C	N	O	S	0	2	0
			2938	1890	498	536	14			
1	C	361	Total	C	N	O	S	0	2	0
			2945	1893	500	538	14			
1	D	361	Total	C	N	O	S	0	3	0
			2941	1892	497	537	15			

There are 92 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-21	MET	-	initiating methionine	UNP Q9ALS9
A	-20	GLY	-	expression tag	UNP Q9ALS9
A	-19	SER	-	expression tag	UNP Q9ALS9
A	-18	SER	-	expression tag	UNP Q9ALS9
A	-17	HIS	-	expression tag	UNP Q9ALS9
A	-16	HIS	-	expression tag	UNP Q9ALS9
A	-15	HIS	-	expression tag	UNP Q9ALS9
A	-14	HIS	-	expression tag	UNP Q9ALS9
A	-13	HIS	-	expression tag	UNP Q9ALS9
A	-12	HIS	-	expression tag	UNP Q9ALS9
A	-11	SER	-	expression tag	UNP Q9ALS9
A	-10	SER	-	expression tag	UNP Q9ALS9
A	-9	ARG	-	expression tag	UNP Q9ALS9
A	-8	ASN	-	expression tag	UNP Q9ALS9
A	-7	LEU	-	expression tag	UNP Q9ALS9
A	-6	TYR	-	expression tag	UNP Q9ALS9
A	-5	PHE	-	expression tag	UNP Q9ALS9
A	-4	GLN	-	expression tag	UNP Q9ALS9
A	-3	GLY	-	expression tag	UNP Q9ALS9
A	-2	GLY	-	expression tag	UNP Q9ALS9
A	-1	GLY	-	expression tag	UNP Q9ALS9

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Chain	Residue	Modelled	Actual	Comment	Reference
A	0	HIS	-	expression tag	UNP Q9ALS9
A	184	ALA	LYS	engineered mutation	UNP Q9ALS9
B	-21	MET	-	initiating methionine	UNP Q9ALS9
B	-20	GLY	-	expression tag	UNP Q9ALS9
B	-19	SER	-	expression tag	UNP Q9ALS9
B	-18	SER	-	expression tag	UNP Q9ALS9
B	-17	HIS	-	expression tag	UNP Q9ALS9
B	-16	HIS	-	expression tag	UNP Q9ALS9
B	-15	HIS	-	expression tag	UNP Q9ALS9
B	-14	HIS	-	expression tag	UNP Q9ALS9
B	-13	HIS	-	expression tag	UNP Q9ALS9
B	-12	HIS	-	expression tag	UNP Q9ALS9
B	-11	SER	-	expression tag	UNP Q9ALS9
B	-10	SER	-	expression tag	UNP Q9ALS9
B	-9	ARG	-	expression tag	UNP Q9ALS9
B	-8	ASN	-	expression tag	UNP Q9ALS9
B	-7	LEU	-	expression tag	UNP Q9ALS9
B	-6	TYR	-	expression tag	UNP Q9ALS9
B	-5	PHE	-	expression tag	UNP Q9ALS9
B	-4	GLN	-	expression tag	UNP Q9ALS9
B	-3	GLY	-	expression tag	UNP Q9ALS9
B	-2	GLY	-	expression tag	UNP Q9ALS9
B	-1	GLY	-	expression tag	UNP Q9ALS9
B	0	HIS	-	expression tag	UNP Q9ALS9
B	184	ALA	LYS	engineered mutation	UNP Q9ALS9
C	-21	MET	-	initiating methionine	UNP Q9ALS9
C	-20	GLY	-	expression tag	UNP Q9ALS9
C	-19	SER	-	expression tag	UNP Q9ALS9
C	-18	SER	-	expression tag	UNP Q9ALS9
C	-17	HIS	-	expression tag	UNP Q9ALS9
C	-16	HIS	-	expression tag	UNP Q9ALS9
C	-15	HIS	-	expression tag	UNP Q9ALS9
C	-14	HIS	-	expression tag	UNP Q9ALS9
C	-13	HIS	-	expression tag	UNP Q9ALS9
C	-12	HIS	-	expression tag	UNP Q9ALS9
C	-11	SER	-	expression tag	UNP Q9ALS9
C	-10	SER	-	expression tag	UNP Q9ALS9
C	-9	ARG	-	expression tag	UNP Q9ALS9
C	-8	ASN	-	expression tag	UNP Q9ALS9
C	-7	LEU	-	expression tag	UNP Q9ALS9
C	-6	TYR	-	expression tag	UNP Q9ALS9
C	-5	PHE	-	expression tag	UNP Q9ALS9

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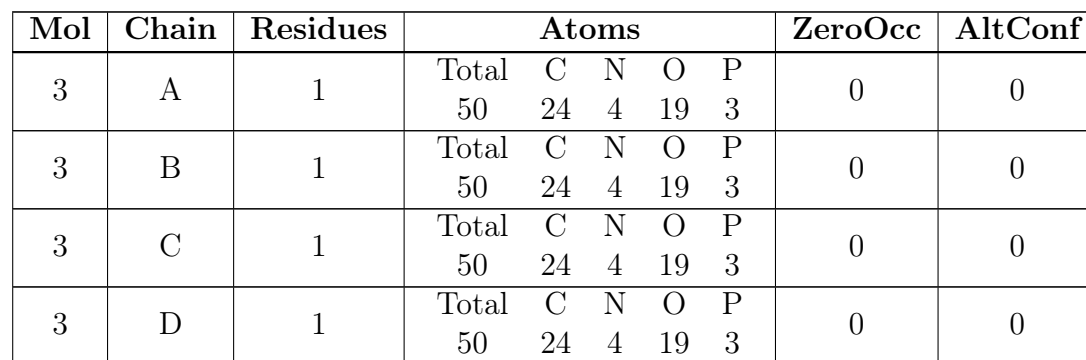
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Chain	Residue	Modelled	Actual	Comment	Reference
C	-4	GLN	-	expression tag	UNP Q9ALS9
C	-3	GLY	-	expression tag	UNP Q9ALS9
C	-2	GLY	-	expression tag	UNP Q9ALS9
C	-1	GLY	-	expression tag	UNP Q9ALS9
C	0	HIS	-	expression tag	UNP Q9ALS9
C	184	ALA	LYS	engineered mutation	UNP Q9ALS9
D	-21	MET	-	initiating methionine	UNP Q9ALS9
D	-20	GLY	-	expression tag	UNP Q9ALS9
D	-19	SER	-	expression tag	UNP Q9ALS9
D	-18	SER	-	expression tag	UNP Q9ALS9
D	-17	HIS	-	expression tag	UNP Q9ALS9
D	-16	HIS	-	expression tag	UNP Q9ALS9
D	-15	HIS	-	expression tag	UNP Q9ALS9
D	-14	HIS	-	expression tag	UNP Q9ALS9
D	-13	HIS	-	expression tag	UNP Q9ALS9
D	-12	HIS	-	expression tag	UNP Q9ALS9
D	-11	SER	-	expression tag	UNP Q9ALS9
D	-10	SER	-	expression tag	UNP Q9ALS9
D	-9	ARG	-	expression tag	UNP Q9ALS9
D	-8	ASN	-	expression tag	UNP Q9ALS9
D	-7	LEU	-	expression tag	UNP Q9ALS9
D	-6	TYR	-	expression tag	UNP Q9ALS9
D	-5	PHE	-	expression tag	UNP Q9ALS9
D	-4	GLN	-	expression tag	UNP Q9ALS9
D	-3	GLY	-	expression tag	UNP Q9ALS9
D	-2	GLY	-	expression tag	UNP Q9ALS9
D	-1	GLY	-	expression tag	UNP Q9ALS9
D	0	HIS	-	expression tag	UNP Q9ALS9
D	184	ALA	LYS	engineered mutation	UNP Q9ALS9

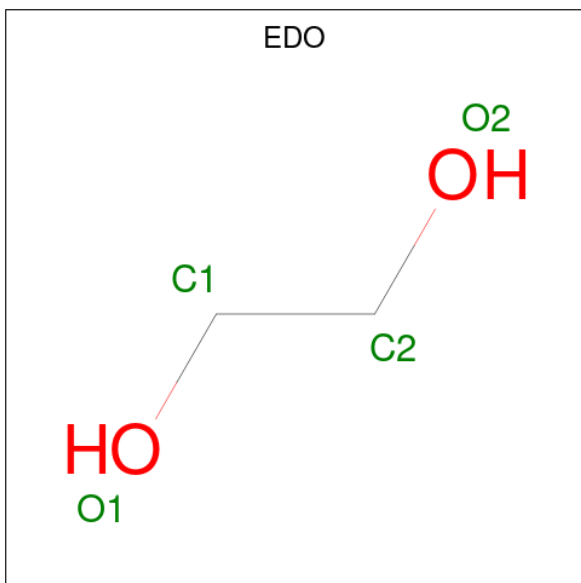
- Molecule 2 is SODIUM ION (CCD ID: NA) (formula: Na).

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

- Molecule 3 is (2R,3R,4S,5S,6R)-3,5-dihydroxy-4-[(1E)-{3-hydroxy-2-methyl-5-[(phosphono oxy)methyl]pyridin-4-yl)methylidene]amino}-6-methyltetrahydro-2H-pyran-2-yl [(2R,3S,5R)-3-hydroxy-5-(5-methyl-2,4-dioxo-3,4-dihydropyrimidin-1(2H)-yl)tetrahydrofuran-2-yl]methyl dihydrogen diphosphate (CCD ID: TQP) (formula: C₂₄H₃₅N₄O₁₉P₃).



- Molecule 4 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $\text{C}_2\text{H}_6\text{O}_2$).



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

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

- Molecule 6 is water.

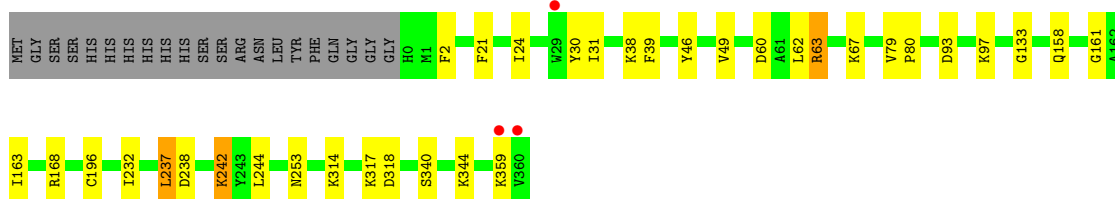
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	434	Total O 434 434	0	0
6	B	398	Total O 398 398	0	0
6	C	398	Total O 398 398	0	0
6	D	364	Total O 364 364	0	0

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.

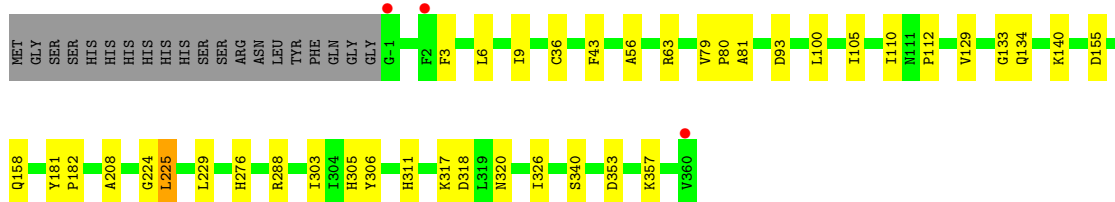
- Molecule 1: Putative aminotransferase

Chain A: 



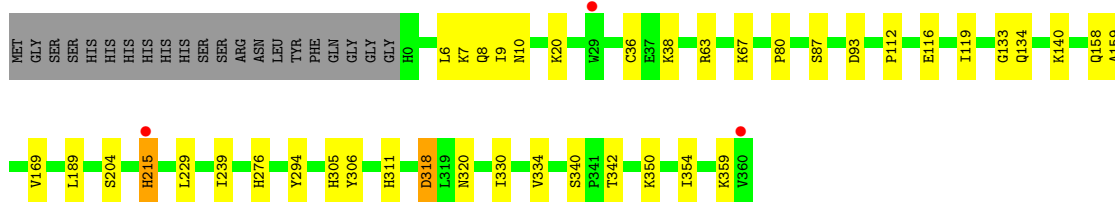
- Molecule 1: Putative aminotransferase

Chain B: 



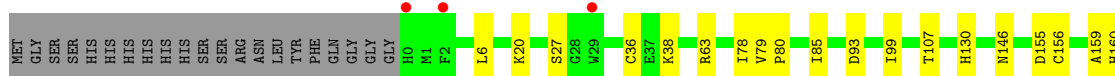
- Molecule 1: Putative aminotransferase

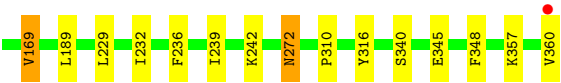
Chain C: 



- Molecule 1: Putative aminotransferase

Chain D: 





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	108.16Å 56.65Å 124.80Å 90.00° 90.04° 90.00°	Depositor
Resolution (Å)	29.98 – 1.60 29.98 – 1.60	Depositor EDS
% Data completeness (in resolution range)	97.4 (29.98-1.60) 99.5 (29.98-1.60)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.26 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.8.0124	Depositor
R, R_{free}	0.132 , 0.161 0.145 , 0.169	Depositor DCC
R_{free} test set	9932 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	12.7	Xtriage
Anisotropy	0.128	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 40.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.018 for h,-k,-l	Xtriage
Reported twinning fraction	0.396 for H, K, L 0.604 for -h,-k,l	Depositor
Outliers	5 of 198884 reflections (0.003%)	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	13583	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.06% 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: TQP, CL, NA, EDO

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	0.80	0/3009	1.15	4/4063 (0.1%)
1	B	0.74	0/3007	1.11	4/4061 (0.1%)
1	C	0.69	0/3008	1.09	3/4062 (0.1%)
1	D	0.71	0/3006	1.08	3/4061 (0.1%)
All	All	0.74	0/12030	1.11	14/16247 (0.1%)

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	62	LEU	N-CA-C	6.51	118.37	111.28
1	C	38	LYS	N-CA-C	6.00	117.49	111.07
1	B	326	ILE	N-CA-C	-5.89	105.00	110.53
1	A	253	ASN	N-CA-C	5.86	117.67	111.28
1	D	27	SER	N-CA-C	5.79	118.54	111.82
1	A	161	GLY	N-CA-C	5.59	122.78	115.40
1	C	10	ASN	N-CA-C	5.59	119.27	112.23
1	D	189	LEU	CA-C-N	5.49	128.58	121.23
1	D	189	LEU	C-N-CA	5.49	128.58	121.23
1	A	237	LEU	N-CA-C	5.47	117.95	111.33
1	B	43	PHE	N-CA-C	5.43	117.20	111.28
1	C	87	SER	N-CA-C	-5.31	105.49	111.28
1	B	208	ALA	N-CA-C	5.26	116.69	111.07
1	B	56	ALA	N-CA-C	5.02	119.11	112.89

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	2938	0	2967	25	0
1	B	2938	0	2962	21	0
1	C	2945	0	2965	27	0
1	D	2941	0	2966	24	0
2	A	1	0	0	0	0
2	C	1	0	0	0	0
3	A	50	0	30	0	0
3	B	50	0	30	0	0
3	C	50	0	31	0	0
3	D	50	0	30	3	0
4	A	12	0	18	0	0
4	B	4	0	6	0	0
4	D	8	0	12	1	0
5	A	1	0	0	0	0
6	A	434	0	0	5	0
6	B	398	0	0	4	1
6	C	398	0	0	7	1
6	D	364	0	0	3	0
All	All	13583	0	12017	98	1

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 (98) 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:63:ARG:HD2	1:D:93:ASP:OD2	1.32	1.24
1:C:63:ARG:HD2	1:C:93:ASP:OD2	1.41	1.17
1:B:63:ARG:HD3	1:B:93:ASP:OD1	1.67	0.94
1:C:63:ARG:CD	1:C:93:ASP:OD2	2.22	0.87
1:D:63:ARG:CD	1:D:93:ASP:OD2	2.23	0.84
1:D:85:ILE:HD11	1:D:316:TYR:HE2	1.41	0.83
1:B:63:ARG:CD	1:B:93:ASP:OD1	2.34	0.76
1:C:112:PRO:HB2	1:C:140:LYS:HD2	1.75	0.67
1:D:85:ILE:HD11	1:D:316:TYR:CE2	2.27	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:146:ASN:HB3	6:D:807:HOH:O	1.99	0.60
1:C:140:LYS:CG	6:C:664:HOH:O	2.51	0.58
1:C:294:TYR:CE2	1:C:354:ILE:HG23	2.39	0.58
1:B:105:ILE:HD13	6:B:579:HOH:O	2.03	0.58
1:A:49:VAL:HG21	1:A:196:CYS:HB3	1.87	0.57
1:A:318:ASP:HB2	6:A:773:HOH:O	2.05	0.57
1:D:156:CYS:SG	1:D:169:VAL:HG13	2.46	0.56
1:A:38:LYS:HE3	1:A:238:ASP:OD2	2.06	0.56
1:A:60:ASP:OD1	1:A:63:ARG:NH2	2.39	0.55
1:D:6:LEU:HD12	3:D:401:TQP:C2	2.36	0.55
1:B:353:ASP:OD2	1:B:357:LYS:HE3	2.07	0.55
1:C:67:LYS:HE2	6:C:844:HOH:O	2.06	0.55
1:D:38:LYS:NZ	6:D:501:HOH:O	2.16	0.54
1:C:20:LYS:HG3	1:C:239:ILE:HD11	1.88	0.54
1:C:6:LEU:HD23	1:C:9:ILE:HD12	1.91	0.53
1:C:140:LYS:CD	6:C:664:HOH:O	2.56	0.53
1:C:140:LYS:HG3	6:C:664:HOH:O	2.07	0.53
1:C:305:HIS:HA	1:C:306:TYR:CD1	2.44	0.53
1:C:318:ASP:OD1	1:C:318:ASP:N	2.40	0.53
1:C:8:GLN:NE2	1:C:342:THR:OG1	2.39	0.52
1:D:232:ILE:HG22	1:D:236:PHE:CE2	2.45	0.52
1:A:79:VAL:HG23	1:A:80:PRO:HD2	1.90	0.52
1:A:79:VAL:CG2	1:A:80:PRO:HD2	2.40	0.52
1:A:67:LYS:HE2	6:A:878:HOH:O	2.09	0.52
1:A:163:ILE:CD1	1:A:168:ARG:HD3	2.41	0.51
1:B:6:LEU:HD23	1:B:9:ILE:HD12	1.92	0.51
1:D:107:THR:HA	4:D:403:EDO:H22	1.92	0.51
1:C:140:LYS:HB3	6:C:796:HOH:O	2.10	0.51
1:D:20:LYS:HG3	1:D:239:ILE:HD11	1.92	0.50
1:B:36[B]:CYS:SG	1:B:229:LEU:O	2.70	0.50
1:A:163:ILE:HD11	1:A:168:ARG:HD3	1.93	0.49
1:D:345:GLU:HA	1:D:348:PHE:CE2	2.47	0.49
1:D:357:LYS:O	1:D:360:VAL:HG12	2.13	0.48
1:B:3:PHE:CD2	1:B:303:ILE:HD12	2.48	0.48
1:D:232:ILE:CG2	1:D:236:PHE:CE2	2.97	0.48
1:A:21:PHE:HD1	1:A:232:ILE:HD12	1.76	0.48
1:A:38:LYS:HE3	6:A:536:HOH:O	2.13	0.48
1:D:155:ASP:OD2	3:D:401:TQP:N1P	2.47	0.47
1:A:21:PHE:HD1	1:A:232:ILE:CD1	2.28	0.47
1:B:288:ARG:NH2	6:B:510:HOH:O	2.47	0.47
1:B:305:HIS:HA	1:B:306:TYR:CD1	2.50	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:LYS:HE2	1:A:242:LYS:HB3	1.48	0.46
1:B:134:GLN:HB2	1:B:276:HIS:CD2	2.51	0.46
1:B:317:LYS:HA	1:B:320:ASN:OD1	2.15	0.46
1:A:31:ILE:HD13	6:A:668:HOH:O	2.16	0.46
1:A:63:ARG:CD	1:A:93:ASP:OD2	2.64	0.46
1:C:350:LYS:HG2	1:C:354:ILE:HD12	1.97	0.46
1:C:350:LYS:CG	1:C:354:ILE:HD12	2.46	0.45
1:D:272:ASN:HD22	1:D:272:ASN:N	2.14	0.45
1:D:36[B]:CYS:SG	1:D:229:LEU:O	2.75	0.45
1:C:159:ALA:O	1:C:169:VAL:HG21	2.18	0.44
1:A:46:TYR:CZ	1:A:244:LEU:HD23	2.53	0.44
1:A:314:LYS:O	1:A:317:LYS:HG3	2.18	0.44
1:A:30:TYR:C	1:A:31:ILE:HG12	2.42	0.43
1:B:311:HIS:O	1:B:320:ASN:HA	2.18	0.43
1:C:204:SER:OG	1:C:215:HIS:HE1	2.00	0.43
1:B:140:LYS:HB2	6:B:768:HOH:O	2.19	0.43
1:C:116:GLU:HA	1:C:119:ILE:HD12	2.01	0.43
1:C:311:HIS:O	1:C:320:ASN:HA	2.18	0.43
1:A:24:ILE:HD12	1:A:232:ILE:HD13	2.00	0.43
1:A:24:ILE:CD1	1:A:232:ILE:HD13	2.49	0.43
1:A:163:ILE:HD11	1:A:168:ARG:CD	2.49	0.42
1:A:2:PHE:O	6:A:501:HOH:O	2.21	0.42
3:D:401:TQP:N3Q	3:D:401:TQP:O3'	2.51	0.42
1:B:129:VAL:HG22	1:B:155:ASP:HB3	2.01	0.42
1:C:330:ILE:O	1:C:334:VAL:HG13	2.20	0.42
1:A:39:PHE:CE1	1:A:237:LEU:HB3	2.55	0.42
1:B:110:ILE:O	1:B:112:PRO:HD3	2.20	0.42
1:B:224:GLY:O	1:B:225:LEU:HD13	2.20	0.42
1:A:344:LYS:HB2	1:A:344:LYS:HE3	1.87	0.41
1:C:7:LYS:HE2	6:C:513:HOH:O	2.20	0.41
1:B:318:ASP:HB2	6:B:600:HOH:O	2.20	0.41
1:D:232:ILE:HG23	1:D:236:PHE:CZ	2.54	0.41
1:B:133:GLY:HA2	1:B:158:GLN:O	2.20	0.41
1:C:36[A]:CYS:SG	1:C:229:LEU:O	2.78	0.41
1:D:130:HIS:CD2	1:D:169:VAL:HG22	2.55	0.41
1:A:133:GLY:HA2	1:A:158:GLN:O	2.19	0.41
1:B:79:VAL:CG2	1:B:80:PRO:HD2	2.50	0.41
1:B:81:ALA:HB2	1:B:100:LEU:HB3	2.03	0.41
1:C:134:GLN:HB2	1:C:276:HIS:CD2	2.56	0.41
1:D:159:ALA:O	1:D:160:HIS:C	2.62	0.41
1:D:242:LYS:NZ	6:D:501:HOH:O	2.13	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:79:VAL:CG2	1:D:80:PRO:HD2	2.51	0.40
1:D:345:GLU:HA	1:D:348:PHE:CZ	2.56	0.40
1:C:80:PRO:HG3	6:C:694:HOH:O	2.22	0.40
1:C:133:GLY:HA2	1:C:158:GLN:O	2.22	0.40
1:C:294:TYR:HE2	1:C:354:ILE:HG23	1.85	0.40
1:D:78:ILE:HD13	1:D:99:ILE:HB	2.03	0.40
1:B:181:TYR:HA	1:B:182:PRO:HD3	1.96	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:B:865:HOH:O	6:C:886:HOH:O[1_545]	2.15	0.05

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	362/382 (95%)	346 (96%)	16 (4%)	0	100	100
1	B	362/382 (95%)	349 (96%)	13 (4%)	0	100	100
1	C	361/382 (94%)	350 (97%)	11 (3%)	0	100	100
1	D	362/382 (95%)	347 (96%)	15 (4%)	0	100	100
All	All	1447/1528 (95%)	1392 (96%)	55 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	323/338 (96%)	318 (98%)	5 (2%)	57	35
1	B	322/338 (95%)	320 (99%)	2 (1%)	78	66
1	C	323/338 (96%)	318 (98%)	5 (2%)	57	35
1	D	323/338 (96%)	319 (99%)	4 (1%)	63	43
All	All	1291/1352 (96%)	1275 (99%)	16 (1%)	63	43

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	63	ARG
1	A	97	LYS
1	A	242	LYS
1	A	340	SER
1	A	359	LYS
1	B	225	LEU
1	B	340	SER
1	C	189	LEU
1	C	215	HIS
1	C	318	ASP
1	C	340	SER
1	C	359	LYS
1	D	169	VAL
1	D	272	ASN
1	D	310	PRO
1	D	340	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	266	ASN
1	A	293	HIS
1	A	321	HIS
1	B	74	ASN
1	B	249	ASN
1	B	266	ASN
1	C	8	GLN

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Mol	Chain	Res	Type
1	C	215	HIS
1	C	249	ASN
1	C	260	GLN
1	C	266	ASN
1	C	292	GLN
1	C	297	ASN
1	D	142	GLN
1	D	266	ASN
1	D	272	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 13 ligands modelled in this entry, 3 are monoatomic - leaving 10 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	$\# Z > 2$
3	TQP	A	402	-	52,53,53	1.85	10 (19%)	75,81,81	2.24	20 (26%)
4	EDO	B	402	-	3,3,3	0.59	0	2,2,2	0.12	0
4	EDO	A	404	-	3,3,3	0.51	0	2,2,2	0.14	0
4	EDO	D	403	-	3,3,3	0.44	0	2,2,2	0.59	0
4	EDO	D	402	-	3,3,3	0.51	0	2,2,2	0.33	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	TQP	B	401	-	52,53,53	1.42	5 (9%)	75,81,81	2.05	19 (25%)
4	EDO	A	405	-	3,3,3	0.37	0	2,2,2	0.13	0
3	TQP	C	402	-	52,53,53	1.52	7 (13%)	75,81,81	1.90	15 (20%)
4	EDO	A	403	-	3,3,3	0.48	0	2,2,2	0.13	0
3	TQP	D	401	-	52,53,53	1.56	5 (9%)	75,81,81	1.73	14 (18%)

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
3	TQP	A	402	-	-	5/32/64/64	0/4/4/4
4	EDO	B	402	-	-	0/1/1/1	-
4	EDO	A	404	-	-	0/1/1/1	-
4	EDO	D	403	-	-	0/1/1/1	-
4	EDO	D	402	-	-	0/1/1/1	-
3	TQP	B	401	-	-	4/32/64/64	0/4/4/4
4	EDO	A	405	-	-	1/1/1/1	-
3	TQP	C	402	-	-	5/32/64/64	0/4/4/4
4	EDO	A	403	-	-	0/1/1/1	-
3	TQP	D	401	-	-	3/32/64/64	0/4/4/4

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	402	TQP	C3P-C2P	6.54	1.47	1.41
3	D	401	TQP	C3P-C2P	6.35	1.47	1.41
3	A	402	TQP	C4P-C5P	5.54	1.49	1.42
3	C	402	TQP	C3P-C2P	5.53	1.46	1.41
3	C	402	TQP	C4P-C3P	5.04	1.49	1.41
3	B	401	TQP	C3P-C2P	4.97	1.46	1.41
3	D	401	TQP	C4P-C5P	4.58	1.48	1.42
3	B	401	TQP	C4P-C5P	4.24	1.47	1.42
3	A	402	TQP	PB-O3A	4.20	1.64	1.59
3	C	402	TQP	C4P-C5P	3.95	1.47	1.42
3	A	402	TQP	C4P-C3P	3.64	1.47	1.41
3	D	401	TQP	C4P-C3P	3.60	1.47	1.41
3	A	402	TQP	C6-C5	3.22	1.39	1.34
3	A	402	TQP	O2-C2	3.12	1.28	1.23
3	B	401	TQP	C6-C5	3.09	1.39	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	401	TQP	C4P-C3P	2.90	1.45	1.41
3	A	402	TQP	PA-O3A	2.84	1.62	1.59
3	D	401	TQP	C6-C5	2.84	1.39	1.34
3	D	401	TQP	C4-N3	-2.39	1.34	1.38
3	C	402	TQP	O2-C2	2.34	1.27	1.23
3	C	402	TQP	C2P-N1P	2.30	1.38	1.33
3	B	401	TQP	C4-C5	2.27	1.48	1.44
3	A	402	TQP	C2P-N1P	2.21	1.37	1.33
3	A	402	TQP	C2-N3	-2.18	1.34	1.38
3	C	402	TQP	C4-N3	-2.15	1.34	1.38
3	C	402	TQP	C6-N1	-2.15	1.34	1.38
3	A	402	TQP	PB-O3B	2.01	1.65	1.59

All (68) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	402	TQP	C3P-C4P-C5P	-8.70	111.29	118.28
3	B	401	TQP	C2Q-C3Q-N3Q	-7.82	101.14	109.73
3	A	402	TQP	C2Q-C3Q-N3Q	-7.74	101.23	109.73
3	A	402	TQP	O4-C4-C5	-6.63	117.33	124.92
3	C	402	TQP	C2Q-C3Q-N3Q	-6.30	102.81	109.73
3	C	402	TQP	C5-C4-N3	6.01	120.55	115.32
3	D	401	TQP	C3P-C4P-C5P	-5.57	113.81	118.28
3	D	401	TQP	C2Q-C3Q-N3Q	-5.56	103.63	109.73
3	C	402	TQP	O4-C4-C5	-4.96	119.25	124.92
3	B	401	TQP	O4-C4-C5	-4.95	119.25	124.92
3	B	401	TQP	C5-C4-N3	4.71	119.42	115.32
3	C	402	TQP	C4-N3-C2	-4.69	121.19	127.34
3	D	401	TQP	C3Q-N3Q-C4'	4.66	126.30	118.19
3	C	402	TQP	C3Q-N3Q-C4'	4.65	126.29	118.19
3	A	402	TQP	C4P-C4'-N3Q	-4.56	113.78	122.73
3	B	401	TQP	C4P-C4'-N3Q	-4.43	114.03	122.73
3	D	401	TQP	N3-C2-N1	4.15	120.29	114.89
3	B	401	TQP	C4-N3-C2	-4.04	122.04	127.34
3	A	402	TQP	C5-C4-N3	3.89	118.71	115.32
3	A	402	TQP	C6P-C5P-C4P	3.72	124.62	118.21
3	B	401	TQP	O2P-P-O4P	-3.66	97.13	106.67
3	A	402	TQP	C2'-C2P-C3P	-3.59	116.60	120.80
3	D	401	TQP	C4P-C4'-N3Q	-3.54	115.77	122.73
3	A	402	TQP	O4P-C5'-C5P	3.51	115.94	109.36
3	B	401	TQP	N3-C2-N1	3.44	119.36	114.89
3	B	401	TQP	O1B-PB-O3A	3.32	116.25	107.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	401	TQP	O4-C4-C5	-3.23	121.22	124.92
3	B	401	TQP	C5-C6-N1	-3.22	119.82	123.31
3	A	402	TQP	C3P-C2P-N1P	3.19	124.98	120.96
3	C	402	TQP	C4P-C4'-N3Q	-3.13	116.58	122.73
3	C	402	TQP	C3P-C4P-C5P	-3.11	115.78	118.28
3	C	402	TQP	N3-C2-N1	3.11	118.94	114.89
3	B	401	TQP	O3B-PB-O2B	-3.04	100.07	109.81
3	B	401	TQP	O5Q-C1Q-O3B	3.02	115.31	111.36
3	B	401	TQP	C3P-C4P-C5P	-3.01	115.86	118.28
3	D	401	TQP	O3'-C3P-C2P	2.95	123.70	117.58
3	B	401	TQP	O1B-PB-O2B	2.94	126.14	112.44
3	B	401	TQP	O4P-C5'-C5P	2.89	114.78	109.36
3	B	401	TQP	C5M-C5-C4	2.89	121.87	118.78
3	A	402	TQP	C6-C5-C4	-2.84	115.68	118.02
3	C	402	TQP	O3'-C3P-C2P	2.80	123.39	117.58
3	D	401	TQP	C4-N3-C2	-2.77	123.70	127.34
3	A	402	TQP	C5M-C5-C6	2.70	126.51	122.85
3	C	402	TQP	C4Q-C3Q-N3Q	2.68	112.68	109.73
3	C	402	TQP	O5Q-C5Q-C4Q	-2.65	104.78	109.55
3	A	402	TQP	O1B-PB-O2B	2.63	124.68	112.44
3	D	401	TQP	O1B-PB-O2B	2.51	124.11	112.44
3	A	402	TQP	C5P-C4P-C4'	2.47	125.28	121.47
3	A	402	TQP	C3Q-N3Q-C4'	2.39	122.35	118.19
3	A	402	TQP	C4P-C3P-C2P	-2.33	118.83	120.14
3	A	402	TQP	O3B-PB-O2B	-2.31	102.41	109.81
3	C	402	TQP	C1'-N1-C6	-2.31	116.87	120.74
3	C	402	TQP	C5Q-C4Q-C3Q	2.27	115.09	109.57
3	A	402	TQP	O1A-PA-O2A	2.26	122.95	112.44
3	B	401	TQP	C1'-N1-C6	-2.25	116.95	120.74
3	B	401	TQP	C3Q-N3Q-C4'	2.25	122.10	118.19
3	B	401	TQP	O3P-P-O2P	2.19	116.00	107.80
3	D	401	TQP	C1'-N1-C2	2.18	121.92	117.66
3	C	402	TQP	C6-C5-C4	-2.18	116.23	118.02
3	D	401	TQP	O2-C2-N3	-2.17	117.48	121.49
3	A	402	TQP	C4Q-C3Q-N3Q	2.14	112.09	109.73
3	D	401	TQP	C6-N1-C2	-2.09	119.22	121.30
3	B	401	TQP	C4Q-C3Q-N3Q	2.06	112.00	109.73
3	A	402	TQP	O2P-P-O4P	2.05	112.01	106.67
3	D	401	TQP	O4'-C1'-N1	2.05	111.50	107.86
3	A	402	TQP	O4-C4-N3	2.03	123.94	120.11
3	D	401	TQP	O3P-P-O2P	2.02	115.37	107.80
3	C	402	TQP	C4P-C3P-C2P	-2.01	119.01	120.14

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	TQP	C4Q-C3Q-N3Q-C4'
3	B	401	TQP	C4Q-C3Q-N3Q-C4'
3	C	402	TQP	C4Q-C3Q-N3Q-C4'
3	D	401	TQP	C4Q-C3Q-N3Q-C4'
4	A	405	EDO	O1-C1-C2-O2
3	A	402	TQP	C1Q-O3B-PB-O1B
3	C	402	TQP	C1Q-O3B-PB-O1B
3	D	401	TQP	C1Q-O3B-PB-O1B
3	B	401	TQP	C2Q-C1Q-O3B-PB
3	C	402	TQP	PB-O3A-PA-O1A
3	A	402	TQP	C2Q-C1Q-O3B-PB
3	C	402	TQP	C2Q-C1Q-O3B-PB
3	B	401	TQP	C1Q-O3B-PB-O1B
3	C	402	TQP	C1Q-O3B-PB-O2B
3	A	402	TQP	PB-O3A-PA-O2A
3	D	401	TQP	C2Q-C1Q-O3B-PB
3	A	402	TQP	PB-O3A-PA-O1A
3	B	401	TQP	PB-O3A-PA-O1A

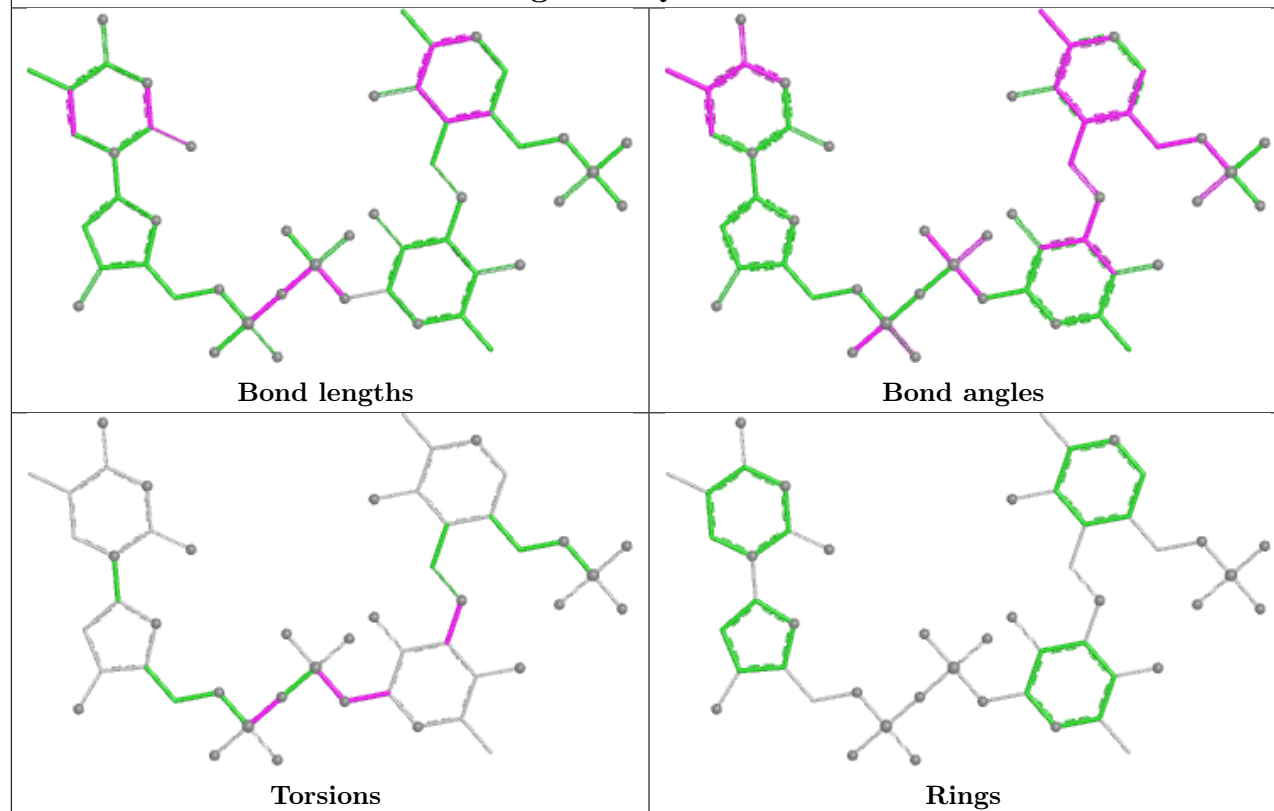
There are no ring outliers.

2 monomers are involved in 4 short contacts:

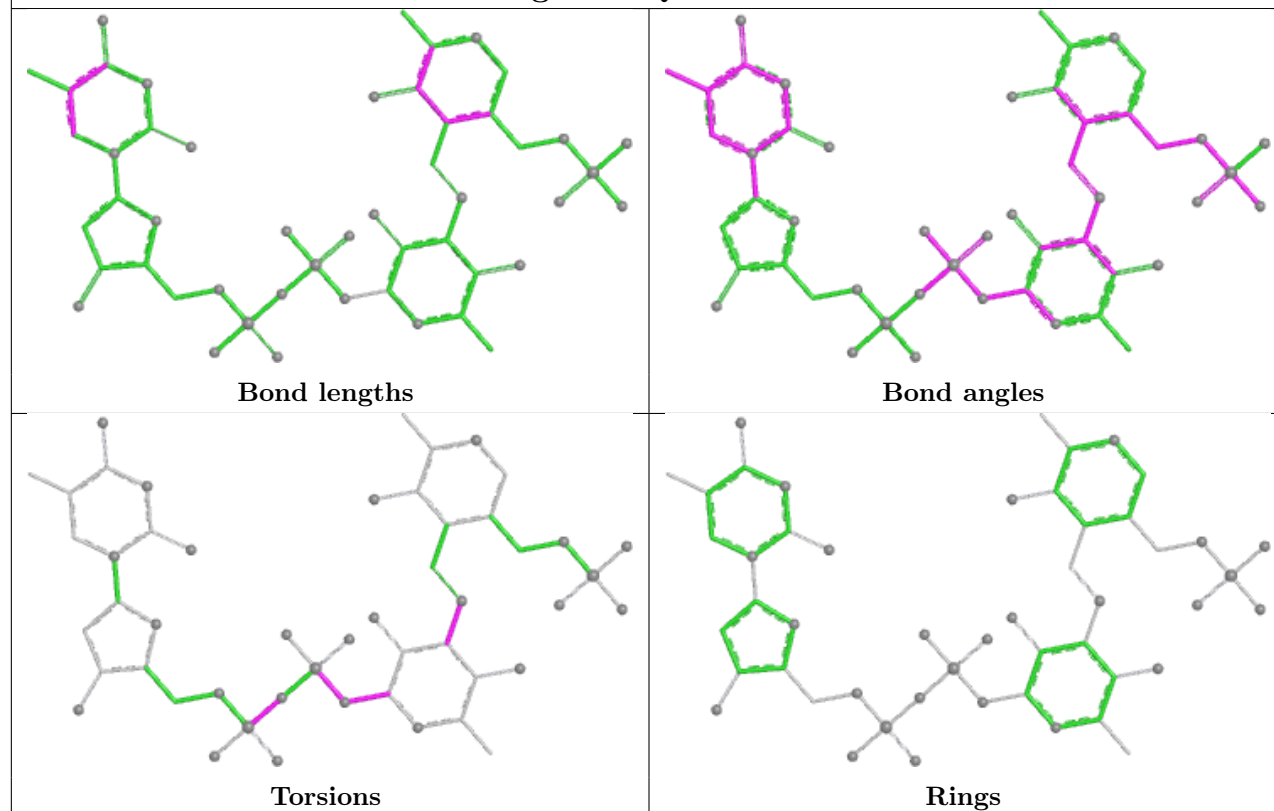
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	403	EDO	1	0
3	D	401	TQP	3	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

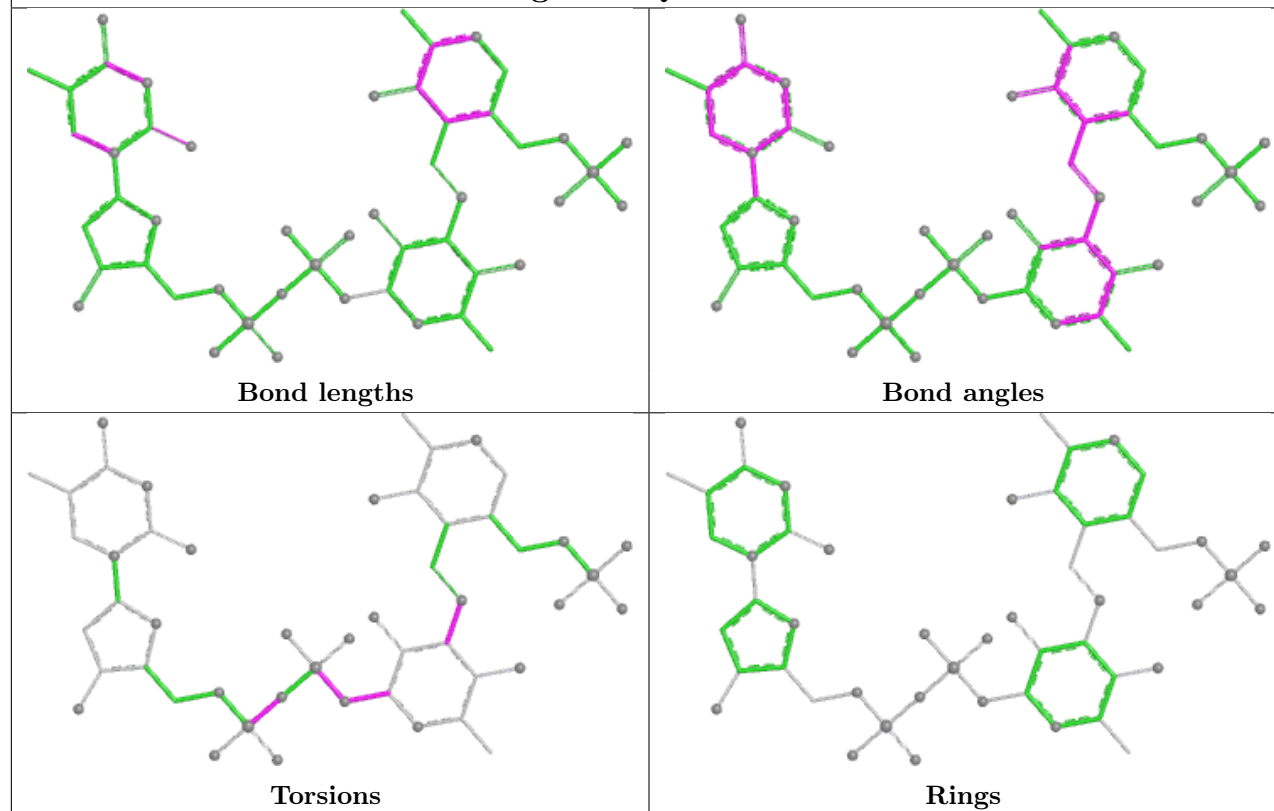
Ligand TQP A 402



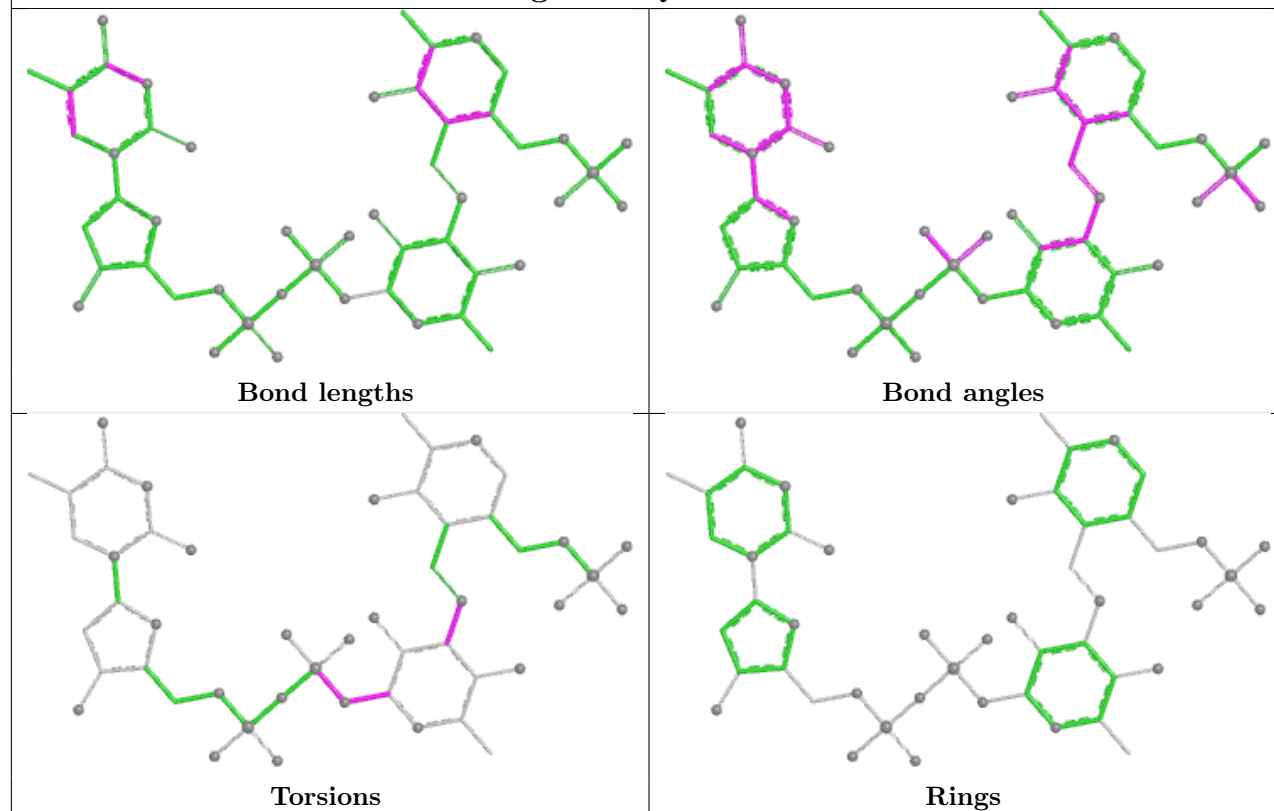
Ligand TQP B 401



Ligand TQP C 402



Ligand TQP D 401



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	361/382 (94%)	-0.47	3 (0%) 82 86	7, 12, 24, 50	3 (0%)
1	B	362/382 (94%)	-0.38	3 (0%) 82 86	7, 14, 28, 51	2 (0%)
1	C	361/382 (94%)	-0.29	3 (0%) 82 86	7, 15, 30, 44	2 (0%)
1	D	361/382 (94%)	-0.33	4 (1%) 78 82	5, 14, 31, 45	3 (0%)
All	All	1445/1528 (94%)	-0.37	13 (0%) 81 84	5, 14, 28, 51	10 (0%)

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	0	HIS	3.6
1	B	360	VAL	3.4
1	A	29	TRP	3.3
1	A	360	VAL	3.1
1	C	215	HIS	2.8
1	D	29	TRP	2.5
1	B	-1	GLY	2.5
1	D	360	VAL	2.5
1	C	29	TRP	2.4
1	D	2	PHE	2.4
1	B	2	PHE	2.1
1	C	360	VAL	2.0
1	A	359	LYS	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

There are no oligosaccharides in this entry.

6.4 Ligands

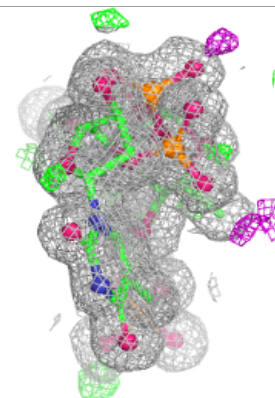
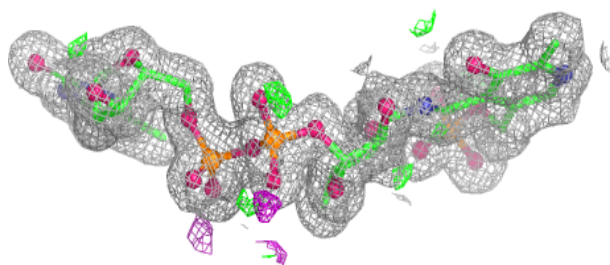
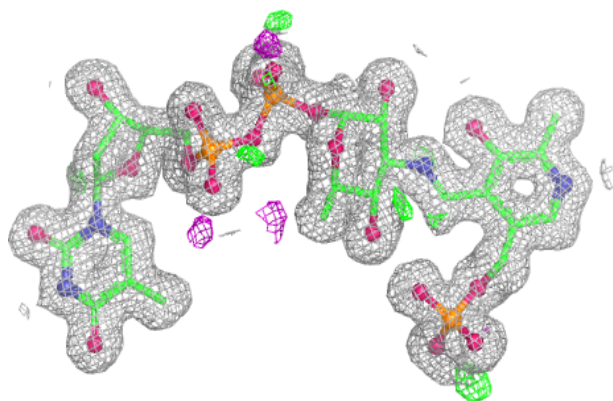
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	EDO	B	402	4/4	0.79	0.14	33,34,34,35	0
4	EDO	A	405	4/4	0.93	0.12	20,24,30,31	0
4	EDO	A	403	4/4	0.94	0.09	17,21,22,24	0
4	EDO	D	402	4/4	0.96	0.08	17,19,24,24	0
4	EDO	A	404	4/4	0.97	0.06	13,14,14,16	0
3	TQP	D	401	50/50	0.98	0.04	6,12,18,22	0
3	TQP	A	402	50/50	0.98	0.04	7,10,13,18	0
3	TQP	B	401	50/50	0.98	0.05	7,12,18,24	0
4	EDO	D	403	4/4	0.98	0.06	14,15,16,20	0
2	NA	C	401	1/1	0.99	0.05	7,7,7,7	0
3	TQP	C	402	50/50	0.99	0.04	8,11,17,20	0
2	NA	A	401	1/1	0.99	0.04	8,8,8,8	0
5	CL	A	406	1/1	0.99	0.03	12,12,12,12	0

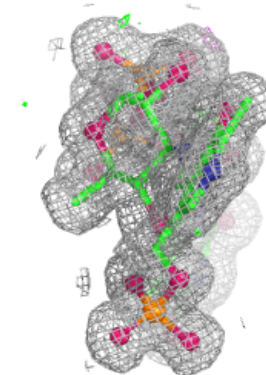
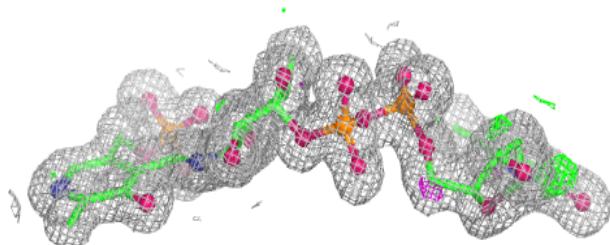
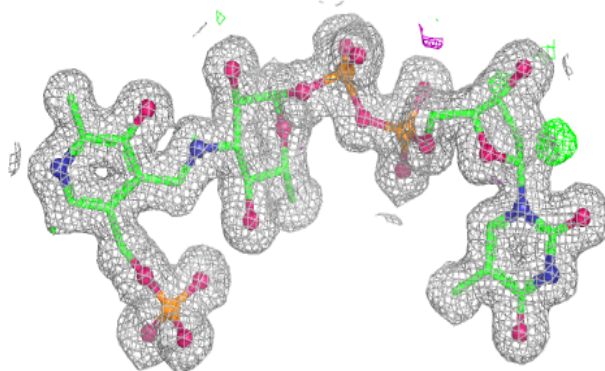
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around TQP D 401:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

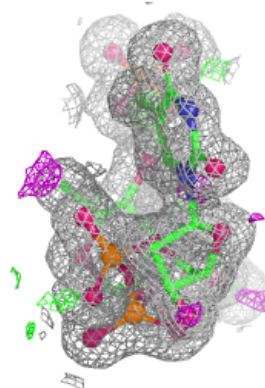
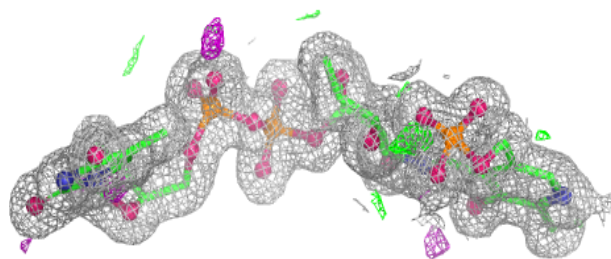
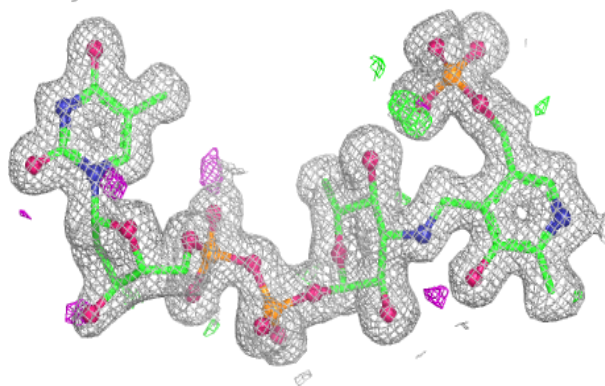
**Electron density around TQP A 402:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

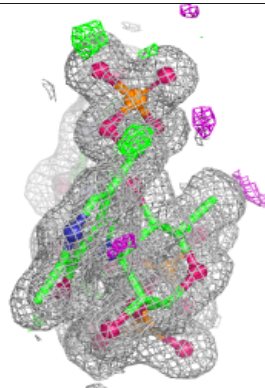
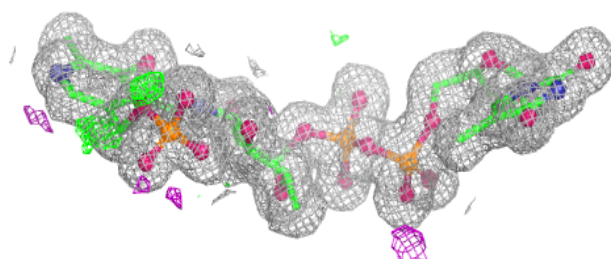
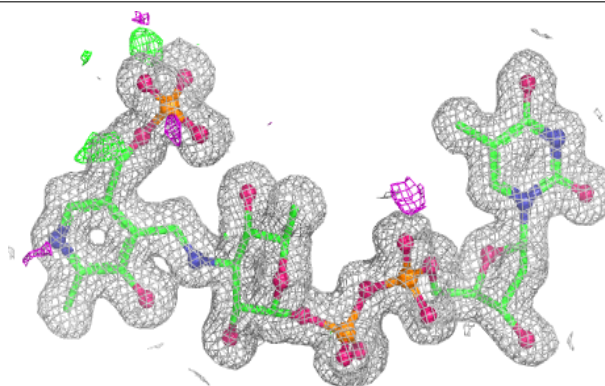


Electron density around TQP B 401:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around TQP C 402:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.