



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 4, 2024 – 04:29 pm GMT

PDB ID : 8C3G
Title : Crystal structure of DYRK1A in complex with AZ191
Authors : Grygier, P.; Pustelny, K.; Dubin, G.; Czarna, A.
Deposited on : 2022-12-23
Resolution : 2.08 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
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
buster-report : 1.1.7 (2018)
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) : 2.36

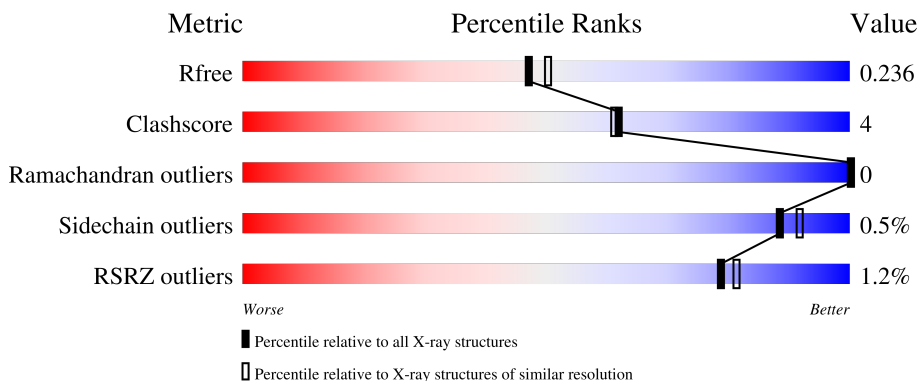
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.08 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	6189 (2.10-2.06)
Clashscore	141614	6738 (2.10-2.06)
Ramachandran outliers	138981	6663 (2.10-2.06)
Sidechain outliers	138945	6664 (2.10-2.06)
RSRZ outliers	127900	6057 (2.10-2.06)

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	371	 84% 8% • 7%
1	B	371	 2% 81% 8% • 10%
1	C	371	 80% 11% 8%
1	D	371	 2% 82% 9% 9%

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 11918 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 Dual specificity tyrosine-phosphorylation-regulated kinase 1A.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	344	2796	1803	477	497	1	18	0	3	0
1	B	333	2653	1718	443	474	1	17	0	0	0
1	C	341	2743	1767	467	490	1	18	0	3	0
1	D	337	2656	1710	448	480	1	17	1	0	0

There are 28 discrepancies between the modelled and reference sequences:

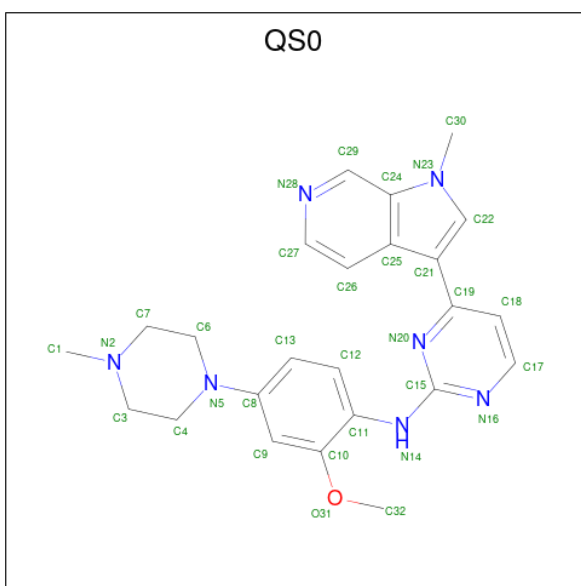
Chain	Residue	Modelled	Actual	Comment	Reference
A	125	MET	-	initiating methionine	UNP Q13627
A	490	HIS	-	expression tag	UNP Q13627
A	491	HIS	-	expression tag	UNP Q13627
A	492	HIS	-	expression tag	UNP Q13627
A	493	HIS	-	expression tag	UNP Q13627
A	494	HIS	-	expression tag	UNP Q13627
A	495	HIS	-	expression tag	UNP Q13627
B	125	MET	-	initiating methionine	UNP Q13627
B	490	HIS	-	expression tag	UNP Q13627
B	491	HIS	-	expression tag	UNP Q13627
B	492	HIS	-	expression tag	UNP Q13627
B	493	HIS	-	expression tag	UNP Q13627
B	494	HIS	-	expression tag	UNP Q13627
B	495	HIS	-	expression tag	UNP Q13627
C	125	MET	-	initiating methionine	UNP Q13627
C	490	HIS	-	expression tag	UNP Q13627
C	491	HIS	-	expression tag	UNP Q13627
C	492	HIS	-	expression tag	UNP Q13627
C	493	HIS	-	expression tag	UNP Q13627
C	494	HIS	-	expression tag	UNP Q13627
C	495	HIS	-	expression tag	UNP Q13627

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Chain	Residue	Modelled	Actual	Comment	Reference
D	125	MET	-	initiating methionine	UNP Q13627
D	490	HIS	-	expression tag	UNP Q13627
D	491	HIS	-	expression tag	UNP Q13627
D	492	HIS	-	expression tag	UNP Q13627
D	493	HIS	-	expression tag	UNP Q13627
D	494	HIS	-	expression tag	UNP Q13627
D	495	HIS	-	expression tag	UNP Q13627

- Molecule 2 is N-[2-methoxy-4-(4-methylpiperazin-1-yl)phenyl]-4-(1-methylpyrrolo[2,3-c]pyridin-3-yl)pyrimidin-2-amine (three-letter code: QS0) (formula: C₂₄H₂₇N₇O) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	Total	C	N	O	0	0
			32	24	7	1		
2	B	1	Total	C	N	O	0	0
			32	24	7	1		
2	C	1	Total	C	N	O	0	0
			32	24	7	1		
2	D	1	Total	C	N	O	0	0
			32	24	7	1		

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



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

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

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		

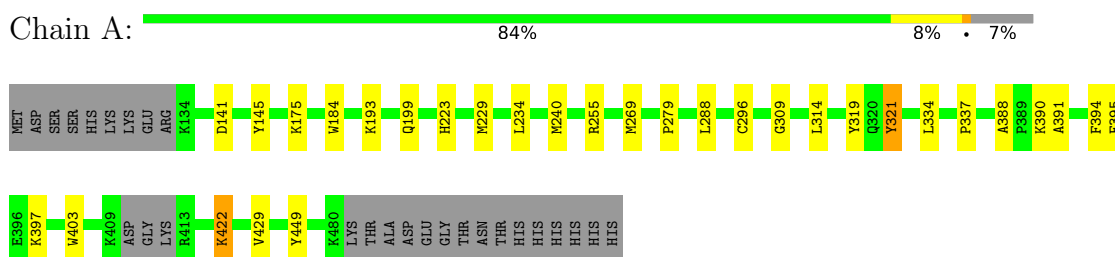
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	281	Total	O	0	0
			281	281		
5	B	158	Total	O	0	0
			158	158		
5	C	180	Total	O	0	0
			180	180		
5	D	185	Total	O	0	0
			185	185		

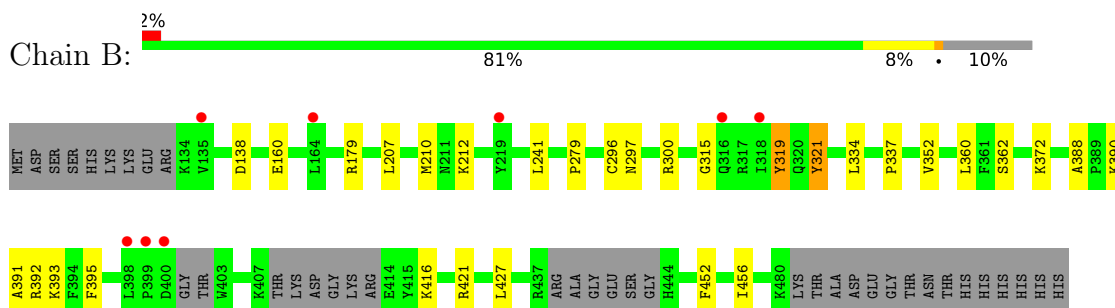
3 Residue-property plots [i](#)

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 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.

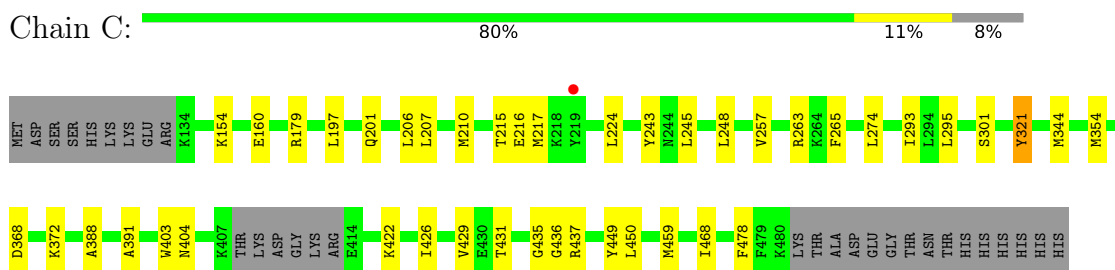
- Molecule 1: Dual specificity tyrosine-phosphorylation-regulated kinase 1A



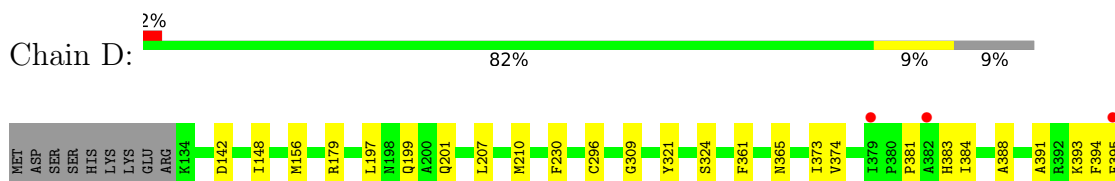
- Molecule 1: Dual specificity tyrosine-phosphorylation-regulated kinase 1A



- Molecule 1: Dual specificity tyrosine-phosphorylation-regulated kinase 1A



- Molecule 1: Dual specificity tyrosine-phosphorylation-regulated kinase 1A





4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	87.06Å 87.44Å 228.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	43.53 – 2.08 47.97 – 2.08	Depositor EDS
% Data completeness (in resolution range)	99.1 (43.53-2.08) 99.1 (47.97-2.08)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.70 (at 2.08Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.194 , 0.237 0.193 , 0.236	Depositor DCC
R_{free} test set	5259 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	34.9	Xtrriage
Anisotropy	0.611	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 57.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.006 for k,h,-l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11918	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.19% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: QS0, PTR, EDO, SO4

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	0.46	0/2853	0.63	0/3851
1	B	0.39	0/2698	0.57	0/3651
1	C	0.39	0/2796	0.61	0/3780
1	D	0.39	0/2700	0.58	0/3653
All	All	0.41	0/11047	0.60	0/14935

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	2796	0	2770	26	0
1	B	2653	0	2566	25	0
1	C	2743	0	2676	26	0
1	D	2656	0	2534	23	0
2	A	32	0	0	0	0
2	B	32	0	0	1	0
2	C	32	0	0	0	0
2	D	32	0	0	0	0
3	A	56	0	84	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	16	0	24	1	0
3	C	36	0	54	2	0
3	D	20	0	30	3	0
4	B	5	0	0	0	0
4	D	5	0	0	0	0
5	A	281	0	0	2	0
5	B	158	0	0	4	0
5	C	180	0	0	3	0
5	D	185	0	0	2	0
All	All	11918	0	10738	97	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 (97) 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:A:319:TYR:HB3	3:A:515:EDO:H21	1.51	0.93
1:B:241:LEU:HD12	1:B:296:CYS:HA	1.56	0.87
1:B:352:VAL:HG11	1:B:360:LEU:HD22	1.59	0.84
1:A:321:PTR:HD1	3:A:504:EDO:H11	1.63	0.81
1:B:321:PTR:HD1	3:B:504:EDO:H21	1.65	0.77
1:D:381:PRO:HG2	1:D:384:ILE:HD12	1.68	0.76
1:B:296:CYS:SG	5:B:755:HOH:O	2.44	0.75
1:A:296[A]:CYS:SG	5:A:846:HOH:O	2.46	0.72
1:D:296:CYS:SG	5:D:782:HOH:O	2.48	0.71
1:B:297:ASN:HB3	1:B:300:ARG:HB2	1.73	0.70
1:D:424:HIS:HB2	3:D:503:EDO:H21	1.73	0.69
1:C:245:LEU:HD12	1:C:354[B]:MET:SD	2.33	0.69
1:D:384:ILE:HD11	1:D:463:ASP:HB2	1.76	0.68
1:A:279:PRO:HG3	1:B:337:PRO:HG3	1.79	0.65
1:C:388:ALA:HB3	1:C:391:ALA:HB2	1.81	0.62
1:A:314:LEU:O	1:B:315:GLY:HA2	2.00	0.62
1:D:461:ASP:OD2	1:D:466:THR:HG23	2.03	0.58
1:B:452:PHE:CE1	1:B:456:ILE:HD11	2.39	0.57
1:A:193:LYS:HD2	5:C:709:HOH:O	2.04	0.57
1:B:160:GLU:OE2	1:B:179:ARG:NH1	2.35	0.56
1:D:179:ARG:HH12	3:D:505:EDO:H12	1.70	0.56
1:C:179:ARG:NH2	5:C:609:HOH:O	2.36	0.56
1:D:393:LYS:HD3	1:D:394:PHE:CZ	2.41	0.54
1:B:352:VAL:HG23	1:B:427:LEU:HD21	1.90	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:424:HIS:H	3:D:503:EDO:H21	1.73	0.53
1:C:217:MET:HE1	1:C:274:LEU:HD23	1.90	0.53
1:A:175:LYS:HE3	1:A:240:MET:HE3	1.91	0.53
1:B:393:LYS:NZ	5:B:606:HOH:O	2.42	0.53
1:C:422:LYS:O	1:C:426:ILE:HG12	2.09	0.52
1:C:197:LEU:O	1:C:201:GLN:HG2	2.09	0.52
1:D:388:ALA:HB3	1:D:391:ALA:HB2	1.91	0.52
1:A:422:LYS:HE2	3:A:503:EDO:H21	1.91	0.52
1:D:374:VAL:HG11	1:D:405:LEU:HD22	1.92	0.52
1:B:319:TYR:HD1	1:D:197:LEU:HD23	1.74	0.52
1:D:197:LEU:O	1:D:201:GLN:HG3	2.09	0.51
1:D:207:LEU:HD23	1:D:210:MET:HE3	1.93	0.51
1:B:452:PHE:CZ	1:B:456:ILE:HD11	2.44	0.51
1:B:207:LEU:HA	1:B:210:MET:HE3	1.92	0.51
1:A:337:PRO:HB2	3:A:508:EDO:H21	1.93	0.50
1:C:243:TYR:CE2	1:C:295:LEU:HG	2.46	0.50
1:A:337:PRO:HG3	1:B:279:PRO:HG3	1.93	0.49
1:C:265:PHE:HB2	1:C:354[A]:MET:HE1	1.94	0.49
1:C:321:PTR:HD2	3:C:504:EDO:H11	1.95	0.49
1:B:212:LYS:HE2	5:B:719:HOH:O	2.12	0.49
1:B:388:ALA:HB3	1:B:391:ALA:HB2	1.93	0.49
1:C:429:VAL:HG13	1:C:449:TYR:HB3	1.94	0.49
1:D:296:CYS:SG	5:D:784:HOH:O	2.51	0.49
1:A:199[A]:GLN:NE2	1:A:309:GLY:O	2.46	0.48
1:A:334:LEU:HB3	1:A:388:ALA:HB1	1.95	0.48
1:C:206:LEU:O	1:C:210:MET:HG3	2.13	0.47
1:C:248:LEU:HD21	1:C:257:VAL:HG11	1.96	0.47
3:C:509:EDO:H11	5:C:618:HOH:O	2.14	0.47
1:C:344:MET:SD	1:C:459:MET:HG2	2.55	0.46
1:B:392:ARG:HA	1:B:395:PHE:O	2.16	0.46
1:B:416:LYS:HD2	1:B:421:ARG:HB2	1.96	0.46
1:D:463:ASP:OD2	1:D:466:THR:HG22	2.16	0.46
1:B:334:LEU:HB3	1:B:388:ALA:HB1	1.97	0.45
1:D:142:ASP:HB3	1:D:148:ILE:CD1	2.47	0.45
1:C:403:TRP:C	1:C:404:ASN:HD22	2.20	0.45
1:A:223:HIS:NE2	3:A:512:EDO:H22	2.32	0.45
1:C:217:MET:CE	1:C:274:LEU:HD23	2.46	0.45
1:D:142:ASP:HB3	1:D:148:ILE:HD11	1.97	0.45
1:A:229:MET:HE1	1:A:234:LEU:HB2	1.98	0.45
1:A:394:PHE:HB2	1:A:395:PHE:CD2	2.52	0.44
1:B:390:LYS:NZ	5:B:610:HOH:O	2.48	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:321:PTR:HB2	3:A:515:EDO:H12	1.99	0.44
1:D:199:GLN:HE21	1:D:309:GLY:C	2.19	0.44
1:B:452:PHE:O	1:B:456:ILE:HD12	2.18	0.44
1:C:215:THR:OG1	1:C:216:GLU:N	2.50	0.44
1:A:175:LYS:HG3	1:A:240:MET:CE	2.47	0.44
1:B:362:SER:O	1:B:372:LYS:NZ	2.39	0.43
1:C:245:LEU:HD12	1:C:354[B]:MET:CE	2.47	0.43
1:D:394:PHE:HB2	1:D:395:PHE:CD2	2.53	0.43
1:A:390:LYS:HZ2	3:A:504:EDO:H21	1.83	0.43
1:A:429:VAL:HG22	1:A:449:TYR:HB3	2.01	0.43
1:C:154:LYS:HG3	1:C:160:GLU:HG2	2.00	0.43
1:B:352:VAL:CG1	1:B:360:LEU:HB2	2.48	0.42
1:C:368:ASP:OD2	1:C:372:LYS:HE3	2.19	0.42
1:A:269:MET:HA	1:A:269:MET:CE	2.50	0.42
1:A:288:LEU:HD12	1:A:288:LEU:HA	1.92	0.42
2:B:501:QS0:N20	2:B:501:QS0:C12	2.82	0.42
1:D:142:ASP:N	1:D:148:ILE:HD11	2.35	0.42
1:C:263:ARG:HG3	1:C:478:PHE:CE2	2.54	0.42
1:C:435:GLY:HA3	1:C:437:ARG:NH1	2.34	0.41
1:D:361:PHE:CE1	1:D:373:ILE:HA	2.55	0.41
1:D:156:MET:CE	1:D:230:PHE:HD1	2.34	0.41
1:C:245:LEU:HD23	1:C:293:ILE:HB	2.01	0.41
1:A:397:LYS:HD3	1:A:403:TRP:CE2	2.55	0.41
1:A:388:ALA:HB3	1:A:391:ALA:HB2	2.02	0.41
1:B:138:ASP:OD1	1:D:365:ASN:HB2	2.20	0.41
1:C:344:MET:HG2	1:C:468:ILE:O	2.20	0.41
1:A:141:ASP:HB3	1:A:145:TYR:HA	2.02	0.41
1:A:184:TRP:HB3	1:A:240:MET:CE	2.50	0.41
1:A:255:ARG:NH1	5:A:622:HOH:O	2.54	0.41
1:C:450:LEU:HD23	1:C:450:LEU:HA	1.87	0.41
1:C:207:LEU:HD13	1:C:224:LEU:HB2	2.03	0.40
1:C:431:THR:O	1:C:436:GLY:HA2	2.22	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	342/371 (92%)	333 (97%)	9 (3%)	0	100	100
1	B	324/371 (87%)	312 (96%)	12 (4%)	0	100	100
1	C	339/371 (91%)	326 (96%)	13 (4%)	0	100	100
1	D	330/371 (89%)	320 (97%)	10 (3%)	0	100	100
All	All	1335/1484 (90%)	1291 (97%)	44 (3%)	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	296/329 (90%)	295 (100%)	1 (0%)	92	95
1	B	273/329 (83%)	272 (100%)	1 (0%)	91	93
1	C	285/329 (87%)	284 (100%)	1 (0%)	91	93
1	D	268/329 (82%)	265 (99%)	3 (1%)	73	78
All	All	1122/1316 (85%)	1116 (100%)	6 (0%)	88	92

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	422	LYS
1	B	319	TYR
1	C	301	SER
1	D	324	SER
1	D	383	HIS
1	D	442	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	213	HIS
1	C	404	ASN
1	D	144	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](#)

4 non-standard protein/DNA/RNA residues 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
1	PTR	B	321	1	15,16,17	1.17	2 (13%)	19,22,24	0.85	1 (5%)
1	PTR	C	321	1	15,16,17	1.30	2 (13%)	19,22,24	0.55	0
1	PTR	A	321	1	15,16,17	1.34	2 (13%)	19,22,24	0.64	0
1	PTR	D	321	1	15,16,17	1.23	2 (13%)	19,22,24	0.90	1 (5%)

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
1	PTR	B	321	1	-	2/10/11/13	0/1/1/1
1	PTR	C	321	1	-	0/10/11/13	0/1/1/1
1	PTR	A	321	1	-	0/10/11/13	0/1/1/1
1	PTR	D	321	1	-	0/10/11/13	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	321	PTR	OH-CZ	-4.10	1.31	1.40
1	C	321	PTR	OH-CZ	-3.80	1.32	1.40
1	B	321	PTR	OH-CZ	-3.69	1.32	1.40
1	D	321	PTR	OH-CZ	-3.62	1.32	1.40
1	C	321	PTR	P-OH	2.92	1.63	1.59
1	A	321	PTR	P-OH	2.59	1.63	1.59
1	D	321	PTR	P-OH	2.36	1.62	1.59
1	B	321	PTR	P-OH	2.20	1.62	1.59

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	321	PTR	O3P-P-OH	2.30	112.44	105.24
1	D	321	PTR	P-OH-CZ	2.21	130.82	123.75

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	B	321	PTR	CZ-OH-P-O2P
1	B	321	PTR	CZ-OH-P-O1P

There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	321	PTR	1	0
1	C	321	PTR	1	0
1	A	321	PTR	2	0

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

38 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
3	EDO	C	501	-	3,3,3	0.50	0	2,2,2	0.47	0
3	EDO	D	505	-	3,3,3	0.10	0	2,2,2	0.17	0
3	EDO	D	502	-	3,3,3	0.16	0	2,2,2	0.20	0
3	EDO	C	506	-	3,3,3	0.49	0	2,2,2	0.48	0
2	QS0	D	501	-	33,36,36	0.78	1 (3%)	45,51,51	0.84	2 (4%)
3	EDO	A	505	-	3,3,3	0.61	0	2,2,2	0.25	0
3	EDO	A	504	-	3,3,3	0.56	0	2,2,2	0.41	0
4	SO4	D	507	-	4,4,4	0.12	0	6,6,6	0.12	0
3	EDO	A	509	-	3,3,3	0.10	0	2,2,2	0.19	0
2	QS0	A	501	-	33,36,36	0.83	0	45,51,51	0.90	3 (6%)
3	EDO	B	504	-	3,3,3	0.46	0	2,2,2	0.28	0
2	QS0	B	501	-	33,36,36	0.77	0	45,51,51	0.76	2 (4%)
4	SO4	B	506	-	4,4,4	0.13	0	6,6,6	0.26	0
3	EDO	A	513	-	3,3,3	0.10	0	2,2,2	0.21	0
3	EDO	A	506	-	3,3,3	0.34	0	2,2,2	0.64	0
3	EDO	C	510	-	3,3,3	0.11	0	2,2,2	0.22	0
3	EDO	A	510	-	3,3,3	0.48	0	2,2,2	0.45	0
3	EDO	A	507	-	3,3,3	0.61	0	2,2,2	0.16	0
3	EDO	C	507	-	3,3,3	0.60	0	2,2,2	0.03	0
3	EDO	A	514	-	3,3,3	0.46	0	2,2,2	0.89	0
3	EDO	D	503	-	3,3,3	0.45	0	2,2,2	0.28	0
3	EDO	B	502	-	3,3,3	0.50	0	2,2,2	0.40	0
3	EDO	D	504	-	3,3,3	0.52	0	2,2,2	0.35	0
3	EDO	A	502	-	3,3,3	0.14	0	2,2,2	0.35	0
2	QS0	C	502	-	33,36,36	0.75	0	45,51,51	0.98	3 (6%)
3	EDO	C	503	-	3,3,3	0.52	0	2,2,2	0.32	0
3	EDO	C	505	-	3,3,3	0.12	0	2,2,2	0.14	0
3	EDO	C	504	-	3,3,3	0.50	0	2,2,2	0.33	0
3	EDO	A	511	-	3,3,3	0.45	0	2,2,2	0.54	0
3	EDO	C	509	-	3,3,3	0.49	0	2,2,2	0.24	0
3	EDO	B	503	-	3,3,3	0.15	0	2,2,2	0.17	0
3	EDO	A	508	-	3,3,3	0.35	0	2,2,2	0.70	0
3	EDO	C	508	-	3,3,3	0.46	0	2,2,2	0.41	0
3	EDO	D	506	-	3,3,3	0.09	0	2,2,2	0.08	0
3	EDO	A	515	-	3,3,3	0.08	0	2,2,2	0.23	0
3	EDO	A	512	-	3,3,3	0.67	0	2,2,2	0.23	0
3	EDO	B	505	-	3,3,3	0.44	0	2,2,2	0.38	0
3	EDO	A	503	-	3,3,3	0.18	0	2,2,2	0.16	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
3	EDO	C	501	-	-	1/1/1/1	-
3	EDO	D	505	-	-	1/1/1/1	-
3	EDO	D	502	-	-	1/1/1/1	-
3	EDO	C	506	-	-	0/1/1/1	-
2	QS0	D	501	-	-	1/10/24/24	0/5/5/5
3	EDO	A	505	-	-	1/1/1/1	-
3	EDO	A	504	-	-	1/1/1/1	-
3	EDO	A	509	-	-	1/1/1/1	-
2	QS0	A	501	-	-	1/10/24/24	0/5/5/5
3	EDO	B	504	-	-	0/1/1/1	-
2	QS0	B	501	-	-	1/10/24/24	0/5/5/5
3	EDO	A	513	-	-	1/1/1/1	-
3	EDO	A	506	-	-	0/1/1/1	-
3	EDO	C	510	-	-	1/1/1/1	-
3	EDO	A	510	-	-	0/1/1/1	-
3	EDO	A	507	-	-	0/1/1/1	-
3	EDO	C	507	-	-	0/1/1/1	-
3	EDO	A	514	-	-	0/1/1/1	-
3	EDO	D	503	-	-	1/1/1/1	-
3	EDO	B	502	-	-	0/1/1/1	-
3	EDO	D	504	-	-	0/1/1/1	-
3	EDO	A	502	-	-	1/1/1/1	-
2	QS0	C	502	-	-	1/10/24/24	0/5/5/5
3	EDO	C	503	-	-	0/1/1/1	-
3	EDO	C	505	-	-	0/1/1/1	-
3	EDO	C	504	-	-	0/1/1/1	-
3	EDO	A	511	-	-	0/1/1/1	-
3	EDO	C	509	-	-	0/1/1/1	-
3	EDO	B	503	-	-	1/1/1/1	-
3	EDO	A	508	-	-	0/1/1/1	-
3	EDO	C	508	-	-	0/1/1/1	-
3	EDO	D	506	-	-	1/1/1/1	-
3	EDO	A	515	-	-	1/1/1/1	-
3	EDO	A	512	-	-	0/1/1/1	-
3	EDO	B	505	-	-	0/1/1/1	-
3	EDO	A	503	-	-	1/1/1/1	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	501	QS0	C26-C27	2.09	1.39	1.36

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
2	C	502	QS0	C11-N14-C15	2.59	137.40	129.60
2	C	502	QS0	C27-C26-C25	-2.48	117.71	119.81
2	A	501	QS0	C19-C21-C25	2.35	128.49	123.90
2	C	502	QS0	C19-C21-C25	2.31	128.41	123.90
2	D	501	QS0	C27-C26-C25	-2.29	117.87	119.81
2	A	501	QS0	C27-C26-C25	-2.27	117.89	119.81
2	D	501	QS0	C19-C21-C25	2.26	128.33	123.90
2	B	501	QS0	C27-C26-C25	-2.21	117.94	119.81
2	B	501	QS0	C19-C21-C25	2.14	128.09	123.90
2	A	501	QS0	C18-C19-C21	2.08	123.73	121.04

There are no chirality outliers.

All (18) torsion outliers are listed below:

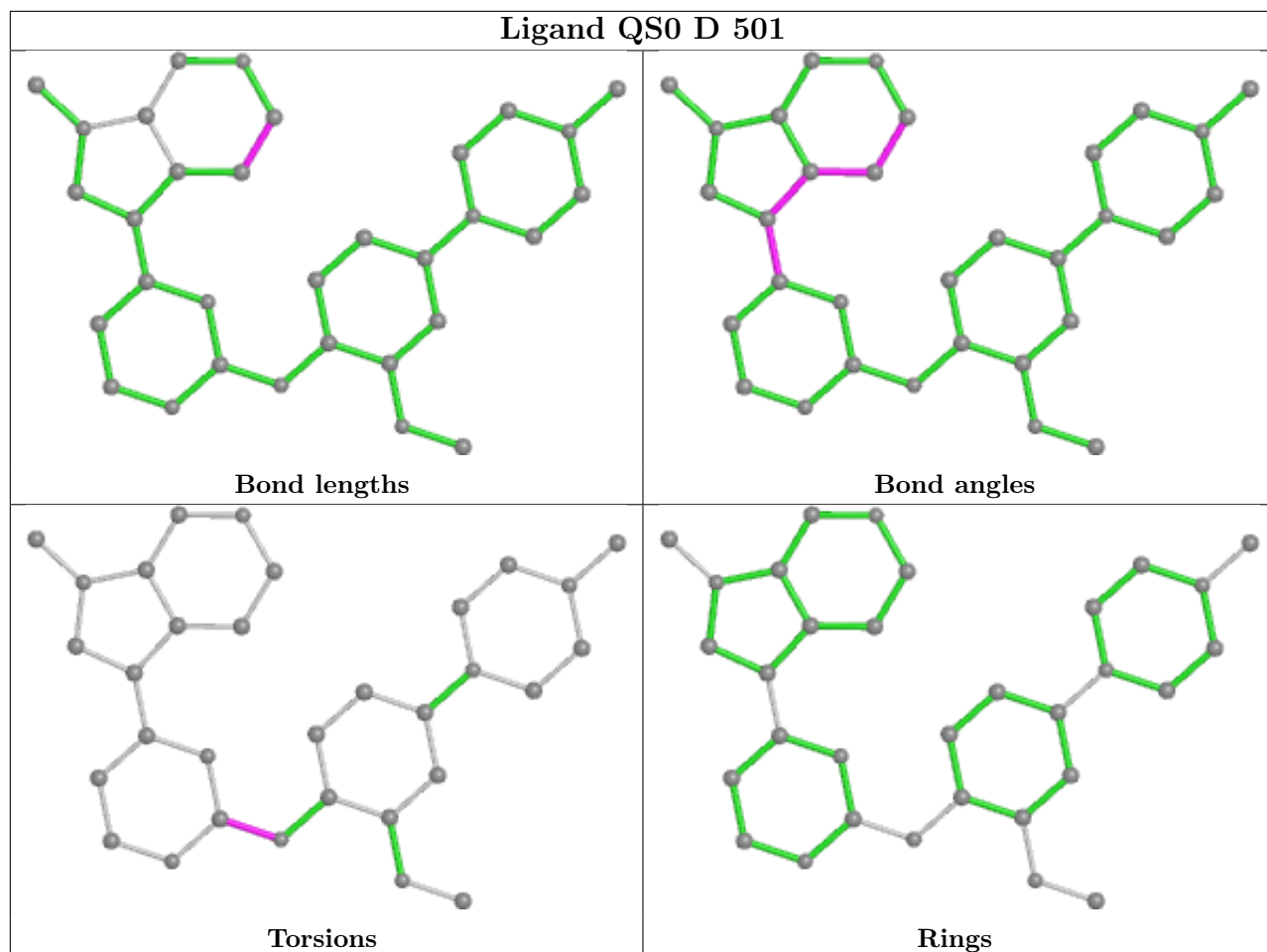
Mol	Chain	Res	Type	Atoms
3	D	506	EDO	O1-C1-C2-O2
3	A	505	EDO	O1-C1-C2-O2
3	D	503	EDO	O1-C1-C2-O2
3	D	505	EDO	O1-C1-C2-O2
2	D	501	QS0	N20-C15-N14-C11
3	A	503	EDO	O1-C1-C2-O2
3	A	504	EDO	O1-C1-C2-O2
3	A	509	EDO	O1-C1-C2-O2
3	A	513	EDO	O1-C1-C2-O2
3	A	515	EDO	O1-C1-C2-O2
2	A	501	QS0	N20-C15-N14-C11
3	A	502	EDO	O1-C1-C2-O2
3	D	502	EDO	O1-C1-C2-O2
2	B	501	QS0	N20-C15-N14-C11
3	C	510	EDO	O1-C1-C2-O2
2	C	502	QS0	N20-C15-N14-C11
3	B	503	EDO	O1-C1-C2-O2
3	C	501	EDO	O1-C1-C2-O2

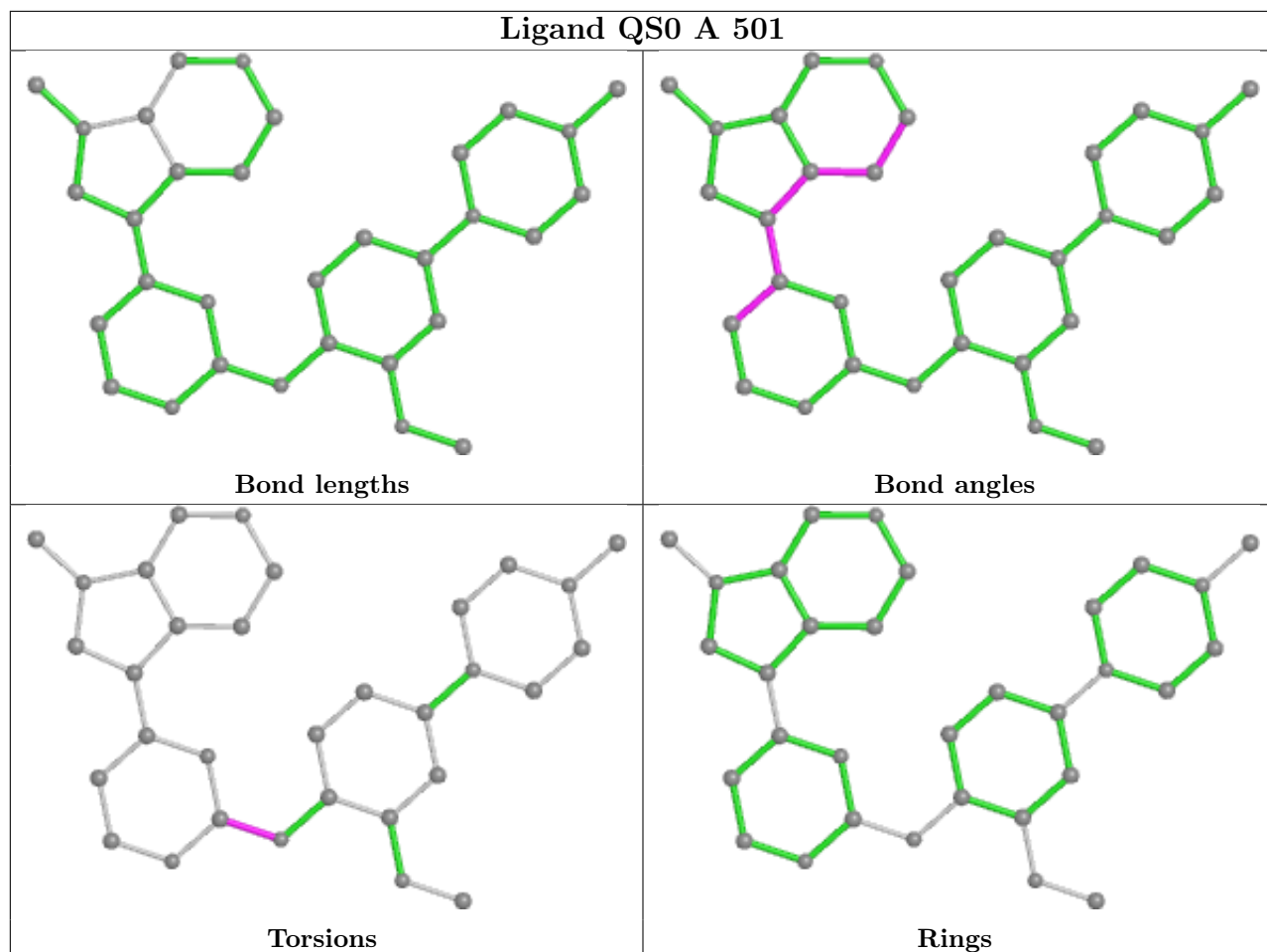
There are no ring outliers.

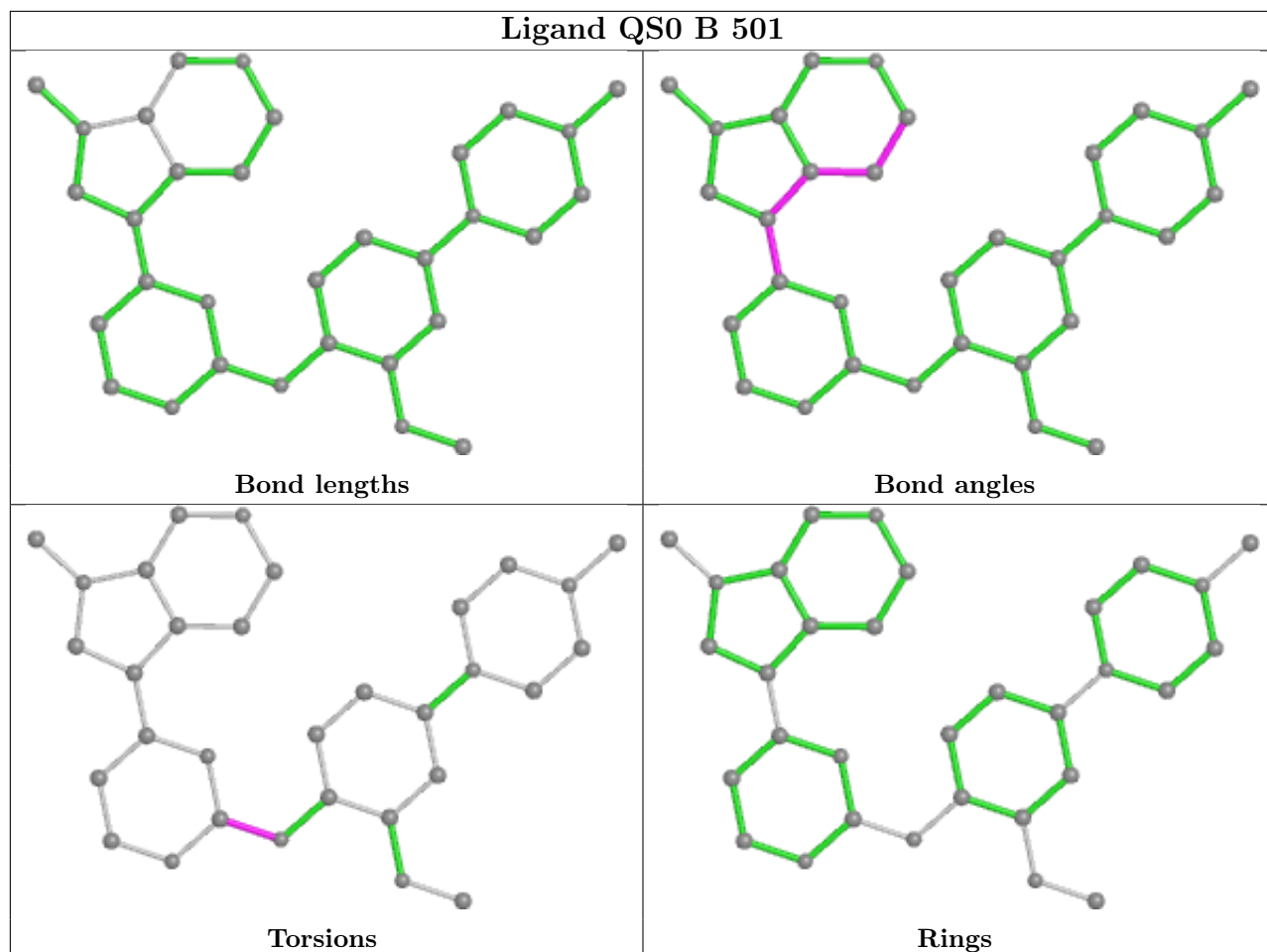
11 monomers are involved in 14 short contacts:

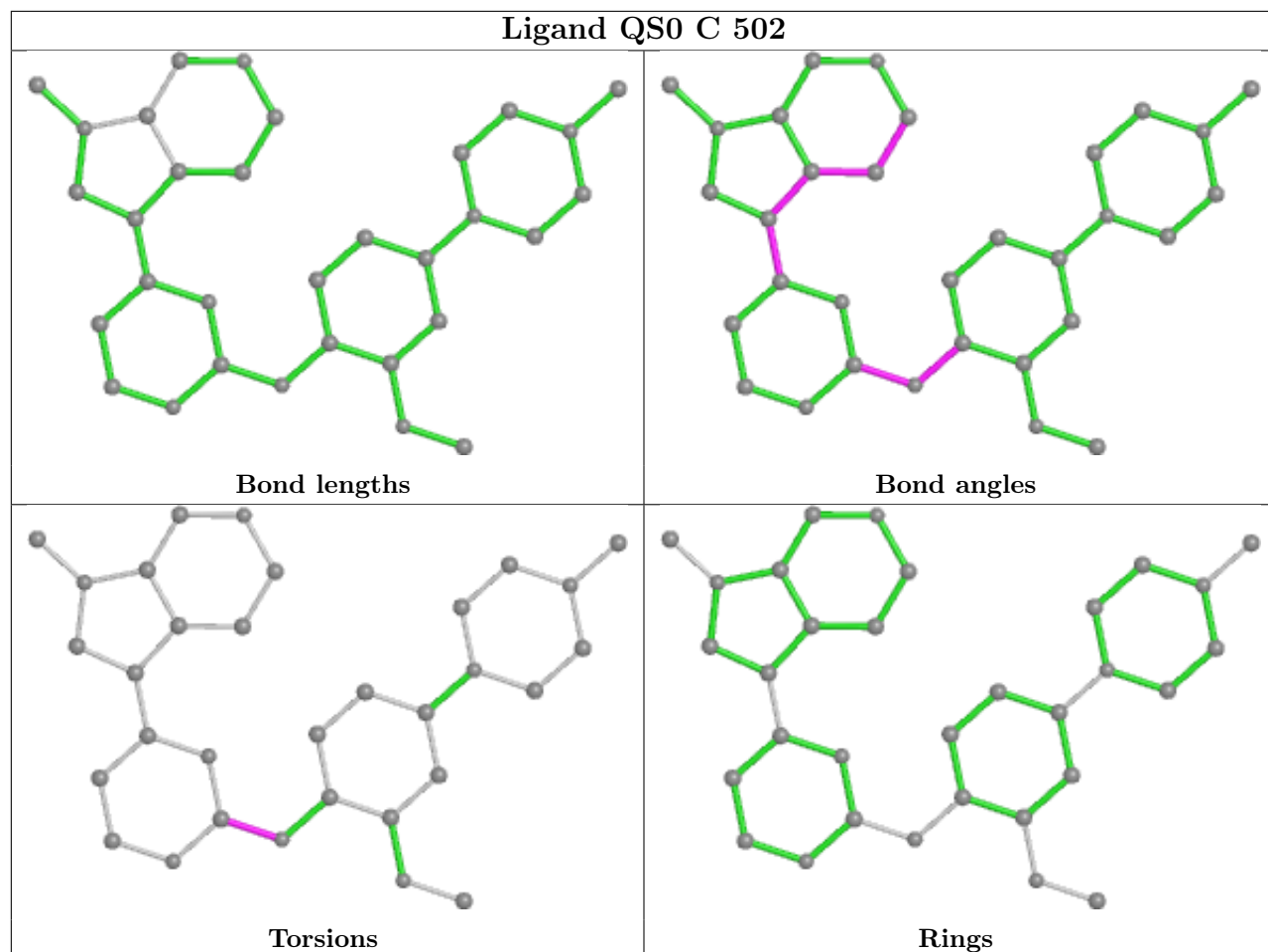
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	505	EDO	1	0
3	A	504	EDO	2	0
3	B	504	EDO	1	0
2	B	501	QS0	1	0
3	D	503	EDO	2	0
3	C	504	EDO	1	0
3	C	509	EDO	1	0
3	A	508	EDO	1	0
3	A	515	EDO	2	0
3	A	512	EDO	1	0
3	A	503	EDO	1	0

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.









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	343/371 (92%)	-0.45	0 100 100	23, 35, 54, 81	1 (0%)
1	B	332/371 (89%)	-0.16	8 (2%) 59 63	31, 52, 79, 106	1 (0%)
1	C	340/371 (91%)	-0.19	1 (0%) 94 94	32, 54, 77, 95	0
1	D	336/371 (90%)	-0.20	7 (2%) 63 67	29, 50, 89, 108	2 (0%)
All	All	1351/1484 (91%)	-0.25	16 (1%) 79 81	23, 47, 79, 108	4 (0%)

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	399	PRO	5.5
1	B	398	LEU	5.2
1	D	379	ILE	3.8
1	D	395	PHE	3.2
1	B	219	TYR	2.8
1	D	382	ALA	2.7
1	D	405	LEU	2.7
1	B	164	LEU	2.4
1	B	400	ASP	2.2
1	D	403	TRP	2.2
1	D	420	THR	2.2
1	B	318	ILE	2.1
1	B	316	GLN	2.1
1	C	219	TYR	2.1
1	B	135	VAL	2.1
1	D	450	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	PTR	D	321	16/17	0.94	0.13	52,59,61,66	0
1	PTR	C	321	16/17	0.95	0.11	37,41,45,46	0
1	PTR	A	321	16/17	0.96	0.09	31,39,44,50	0
1	PTR	B	321	16/17	0.96	0.09	44,52,58,58	0

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
3	EDO	A	512	4/4	0.81	0.20	40,46,47,53	0
3	EDO	C	508	4/4	0.81	0.20	63,65,66,70	0
3	EDO	A	515	4/4	0.82	0.20	52,53,54,55	0
3	EDO	A	510	4/4	0.82	0.14	50,53,53,63	0
3	EDO	B	502	4/4	0.83	0.21	53,59,64,69	0
3	EDO	C	509	4/4	0.83	0.20	61,61,62,66	0
3	EDO	C	510	4/4	0.84	0.13	55,55,59,65	0
3	EDO	D	504	4/4	0.84	0.20	58,64,64,71	0
3	EDO	A	514	4/4	0.85	0.17	41,41,41,44	0
3	EDO	C	507	4/4	0.87	0.17	52,53,58,58	0
3	EDO	D	503	4/4	0.88	0.17	68,68,71,80	0
3	EDO	A	504	4/4	0.88	0.13	40,43,44,46	0
3	EDO	D	506	4/4	0.88	0.10	63,64,66,66	0
4	SO4	B	506	5/5	0.88	0.20	76,77,93,93	0
3	EDO	A	513	4/4	0.90	0.15	46,52,55,55	0
3	EDO	A	509	4/4	0.90	0.12	40,40,43,44	0
3	EDO	B	505	4/4	0.90	0.11	61,61,61,64	0
3	EDO	C	504	4/4	0.90	0.10	47,51,53,54	0
3	EDO	C	501	4/4	0.91	0.13	58,62,67,68	0
3	EDO	C	505	4/4	0.92	0.14	50,51,52,53	0
3	EDO	C	506	4/4	0.92	0.10	45,49,53,53	0
3	EDO	A	505	4/4	0.92	0.10	38,43,45,48	0

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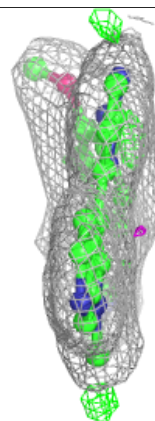
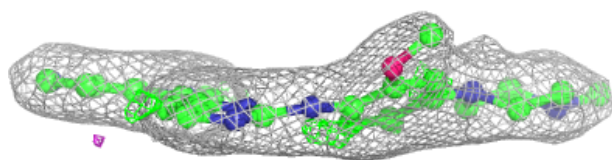
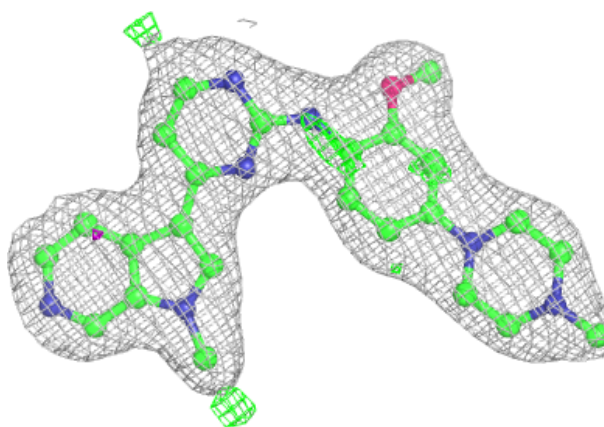
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	EDO	A	503	4/4	0.92	0.19	39,45,51,53	0
3	EDO	B	503	4/4	0.92	0.14	40,41,44,48	0
3	EDO	D	505	4/4	0.93	0.08	55,56,56,57	0
3	EDO	A	511	4/4	0.93	0.12	39,42,44,46	0
3	EDO	A	507	4/4	0.93	0.13	36,41,44,45	0
3	EDO	B	504	4/4	0.95	0.22	55,55,58,60	0
2	QS0	C	502	32/32	0.95	0.11	31,34,40,43	0
2	QS0	B	501	32/32	0.95	0.12	37,47,52,58	0
3	EDO	C	503	4/4	0.95	0.17	46,50,51,53	0
3	EDO	D	502	4/4	0.96	0.14	32,38,39,46	0
2	QS0	D	501	32/32	0.96	0.09	31,36,39,41	0
3	EDO	A	508	4/4	0.96	0.09	42,43,49,49	0
2	QS0	A	501	32/32	0.97	0.10	23,30,37,38	0
3	EDO	A	506	4/4	0.97	0.14	41,42,43,50	0
3	EDO	A	502	4/4	0.98	0.12	31,32,32,37	0
4	SO4	D	507	5/5	0.98	0.15	73,74,79,81	0

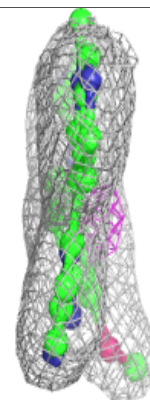
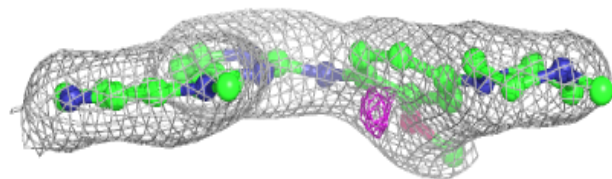
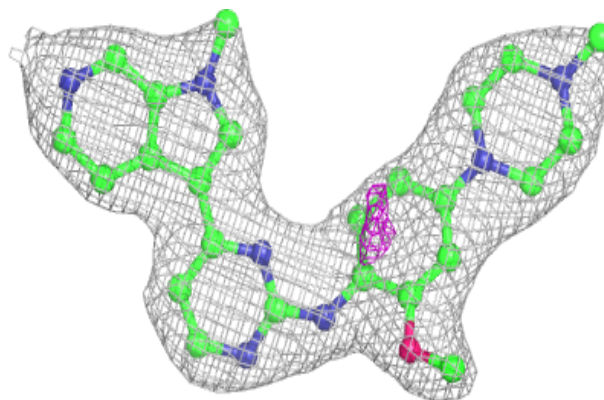
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around QS0 C 502:

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

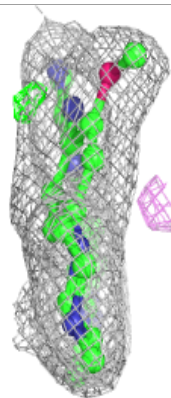
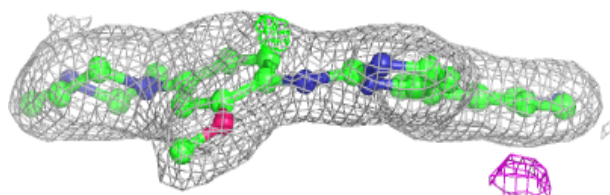
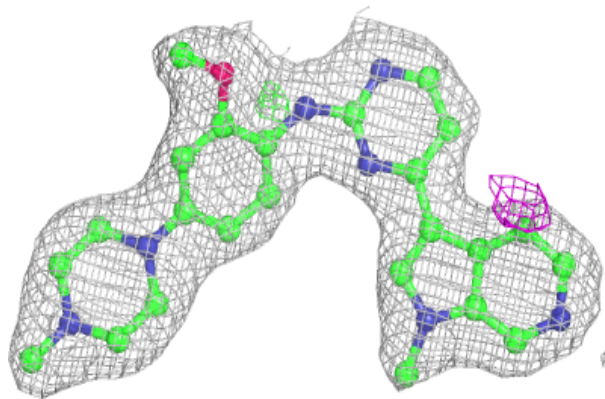
**Electron density around QS0 B 501:**

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

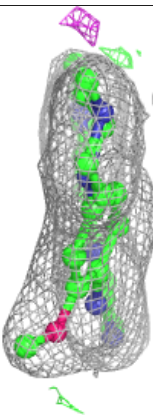
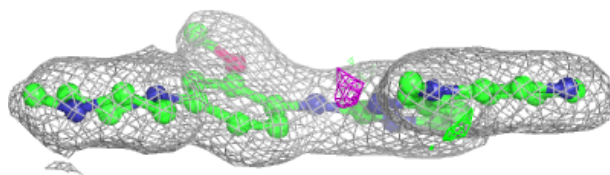
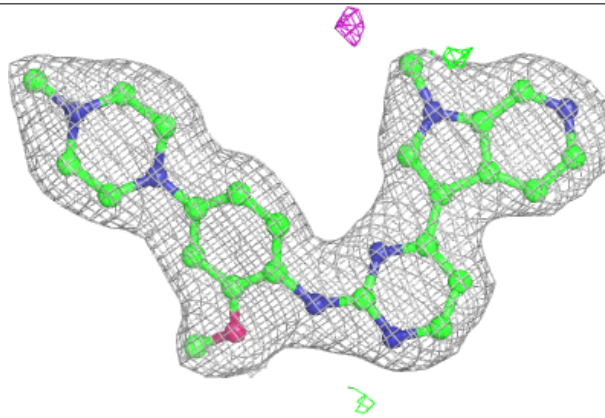


Electron density around QS0 D 501:

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

**Electron density around QS0 A 501:**

$2mF_o-DF_c$ (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.