



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 10:07 AM UTC

PDB ID : 2ATL / pdb_00002atl
Title : Unmodified Insertion Ternary Complex
Authors : Rechko, O.; Malinina, L.; Cheng, Y.; Kuryav, V.; Broyde, S.; Geacintov, N.E.; Patel, D.J.
Deposited on : 2005-08-25
Resolution : 2.80 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

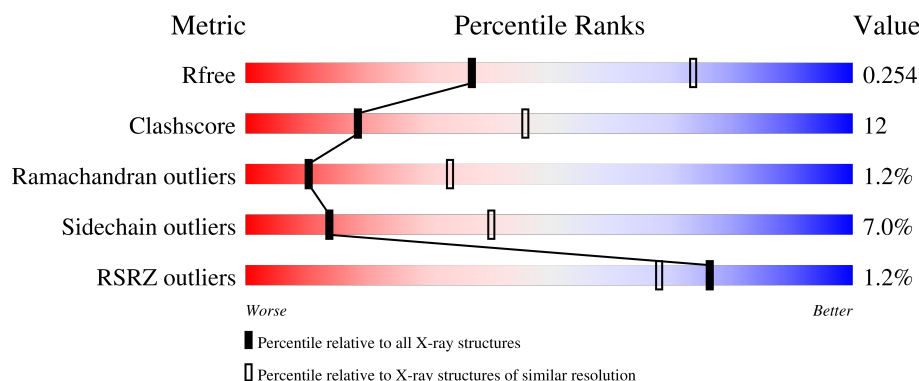
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	D	13	
1	H	13	
2	E	19	
2	J	19	
3	A	360	

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Mol	Chain	Length	Quality of chain
3	B	360	% 63% 29% • 5%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 6946 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 DNA chain called 5'-D(*GP*GP*TP*TP*GP*GP*AP*TP*GP*GP*TP*A P*(DDG))-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	D	13	Total	C	N	O	P	0	0	0
			272	130	53	77	12			
1	H	13	Total	C	N	O	P	0	0	0
			272	130	53	77	12			

- Molecule 2 is a DNA chain called 5'-D(*CP*T*AP*AP*CP*GP*CP*TP*AP*CP*CP*AP*TP*CP*CP*AP*AP*CP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	17	Total	C	N	O	P	0	0	0
			337	162	63	96	16			
2	J	19	Total	C	N	O	P	0	0	0
			376	181	68	109	18			

- Molecule 3 is a protein called Dpo4 polymerase IV.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	341	Total	C	N	O	S	0	0	0
			2739	1757	472	504	6			
3	B	341	Total	C	N	O	S	0	0	0
			2739	1757	472	504	6			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	GLY	-	cloning artifact	UNP Q97W02
A	-6	SER	-	cloning artifact	UNP Q97W02
A	-5	HIS	-	cloning artifact	UNP Q97W02
A	-4	MET	-	cloning artifact	UNP Q97W02
A	-3	GLY	-	cloning artifact	UNP Q97W02
A	-2	GLY	-	cloning artifact	UNP Q97W02

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	cloning artifact	UNP Q97W02
A	0	GLY	-	cloning artifact	UNP Q97W02
A	1	GLY	-	cloning artifact	UNP Q97W02
B	-7	GLY	-	cloning artifact	UNP Q97W02
B	-6	SER	-	cloning artifact	UNP Q97W02
B	-5	HIS	-	cloning artifact	UNP Q97W02
B	-4	MET	-	cloning artifact	UNP Q97W02
B	-3	GLY	-	cloning artifact	UNP Q97W02
B	-2	GLY	-	cloning artifact	UNP Q97W02
B	-1	GLY	-	cloning artifact	UNP Q97W02
B	0	GLY	-	cloning artifact	UNP Q97W02
B	1001	GLY	-	cloning artifact	UNP Q97W02

- | Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|-----|-------|----------|-----------------|---------|---------|
| 4 | D | 1 | Total Ca
1 1 | 0 | 0 |
| 4 | H | 1 | Total Ca
1 1 | 0 | 0 |
| 4 | A | 3 | Total Ca
3 3 | 0 | 0 |
| 4 | B | 3 | Total Ca
3 3 | 0 | 0 |

- # DCP

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			28	9	3	13	3		
5	B	1	Total	C	N	O	P	0	0
			28	9	3	13	3		

- Molecule 6 is water.

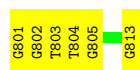
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	D	13	Total	O	0	0
			13	13		
6	E	12	Total	O	0	0
			12	12		
6	H	10	Total	O	0	0
			10	10		
6	J	3	Total	O	0	0
			3	3		
6	A	52	Total	O	0	0
			52	52		
6	B	57	Total	O	0	0
			57	57		

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.

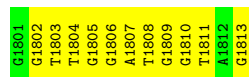
- Molecule 1: 5'-D(*GP*GP*TP*TP*GP*GP*AP*TP*GP*GP*TP*AP*(DDG))-3'

Chain D: 



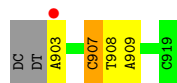
- Molecule 1: 5'-D(*GP*GP*TP*TP*GP*GP*AP*TP*GP*GP*TP*AP*(DDG))-3'

Chain H: 



- Molecule 2: 5'-D(*CP*T*AP*AP*CP*GP*CP*TP*AP*CP*CP*AP*TP*CP*CP*AP*AP*CP*C)-3'

Chain E: 



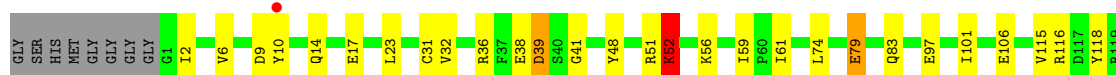
- Molecule 2: 5'-D(*CP*T*AP*AP*CP*GP*CP*TP*AP*CP*CP*AP*TP*CP*CP*AP*AP*CP*C)-3'

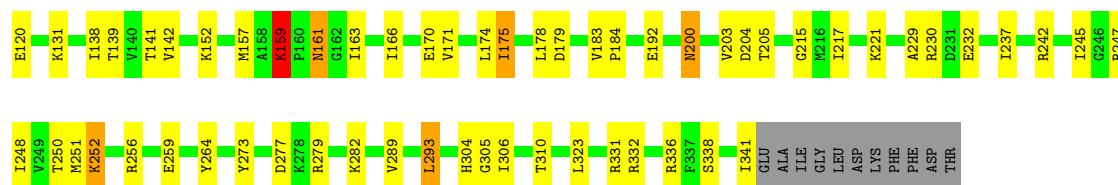
Chain J: 



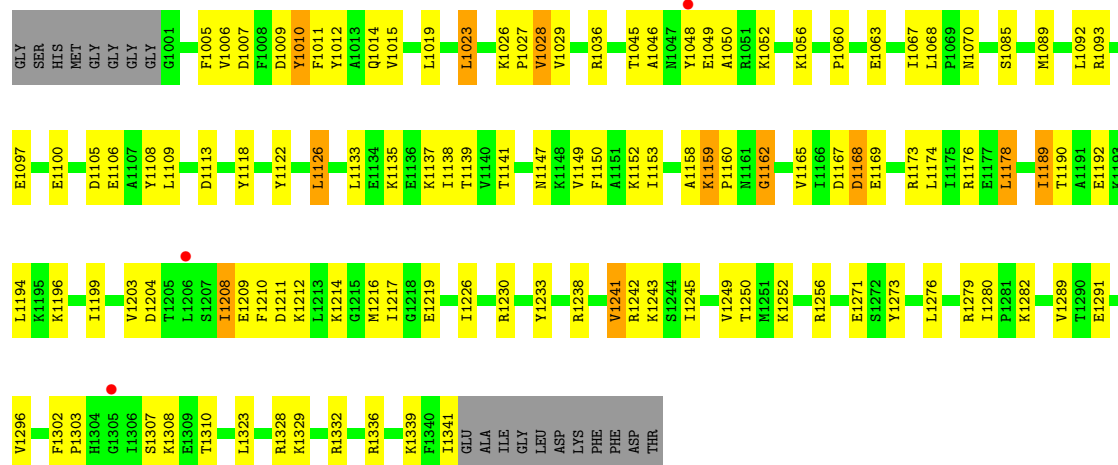
- Molecule 3: Dpo4 polymerase IV

Chain A: 





• Molecule 3: Dpo4 polymerase IV



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	52.58Å 101.76Å 112.29Å 90.00° 94.72° 90.00°	Depositor
Resolution (Å)	20.00 – 2.80 20.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	95.7 (20.00-2.80) 95.4 (20.00-2.80)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.19 (at 2.79Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.224 , 0.279 0.261 , 0.254	Depositor DCC
R_{free} test set	1396 reflections (4.79%)	wwPDB-VP
Wilson B-factor (Å ²)	39.5	Xtriage
Anisotropy	0.422	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 31.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	6946	wwPDB-VP
Average B, all atoms (Å ²)	9.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.05% 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: DDG, DCP, CA

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	D	0.36	0/282	1.05	0/436
1	H	0.34	0/282	1.02	0/436
2	E	0.40	0/377	1.16	3/577 (0.5%)
2	J	0.40	0/420	1.18	3/643 (0.5%)
3	A	0.58	0/2778	0.85	4/3731 (0.1%)
3	B	0.55	0/2778	0.91	2/3731 (0.1%)
All	All	0.54	0/6917	0.94	12/9554 (0.1%)

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	J	1905	DC	P-O3'-C3'	7.88	132.03	120.20
3	B	1280	ILE	N-CA-C	6.13	113.14	107.56
2	J	1901	DC	P-O3'-C3'	5.77	128.86	120.20
2	E	907	DC	C1'-O4'-C4'	-5.67	101.19	109.70
3	B	1162	GLY	N-CA-C	5.67	120.91	112.41
3	A	159	LYS	CA-C-N	-5.55	112.90	119.84
3	A	159	LYS	C-N-CA	-5.55	112.90	119.84
2	J	1908	DT	C4'-C3'-O3'	-5.18	102.22	110.00
3	A	205	THR	N-CA-C	-5.18	107.00	113.38
2	E	903	DA	P-O3'-C3'	5.11	127.87	120.20
2	E	907	DC	C4'-C3'-O3'	-5.09	102.37	110.00
3	A	256	ARG	N-CA-C	-5.02	106.30	114.09

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	D	272	0	149	4	0
1	H	272	0	149	10	0
2	E	337	0	191	3	0
2	J	376	0	214	8	0
3	A	2739	0	2883	59	0
3	B	2739	0	2880	81	0
4	A	3	0	0	0	0
4	B	3	0	0	0	0
4	D	1	0	0	0	0
4	H	1	0	0	0	0
5	A	28	0	12	3	0
5	B	28	0	12	4	0
6	A	52	0	0	6	0
6	B	57	0	0	6	0
6	D	13	0	0	0	0
6	E	12	0	0	0	0
6	H	10	0	0	1	0
6	J	3	0	0	1	0
All	All	6946	0	6490	160	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 (160) 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:A:14:GLN:HE22	3:A:139:THR:N	1.66	0.92
3:A:14:GLN:NE2	3:A:139:THR:H	1.70	0.89
3:B:1250:THR:HA	3:B:1332:ARG:HG2	1.60	0.83
3:B:1027:PRO:HG3	3:B:1068:LEU:HD22	1.59	0.82
3:B:1241:VAL:HB	6:B:32:HOH:O	1.80	0.80
3:A:14:GLN:HE22	3:A:139:THR:H	0.84	0.79
3:B:1273:TYR:HA	3:B:1276:LEU:HD12	1.64	0.77
3:B:1014:GLN:NE2	3:B:1138:ILE:HA	2.02	0.74
3:B:1149:VAL:HG23	3:B:1233:TYR:CE2	2.22	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:1804:DT:H3	2:J:1916:DA:H61	1.36	0.74
3:B:1014:GLN:HE22	3:B:1139:THR:H	1.35	0.73
6:H:1504:HOH:O	3:B:1152:LYS:HE3	1.89	0.72
3:A:79:GLU:H	3:A:79:GLU:CD	1.98	0.71
3:B:1208:ILE:HG12	3:B:1209:GLU:H	1.56	0.70
3:B:1141:THR:OG1	3:B:1159:LYS:O	2.09	0.69
3:A:10:TYR:CD2	3:A:48:TYR:CE1	2.81	0.68
3:A:230:ARG:O	3:A:232:GLU:HG3	1.94	0.68
2:J:1902:DT:H2''	2:J:1903:DA:OP2	1.94	0.67
3:A:250:THR:HA	3:A:332:ARG:HG2	1.77	0.67
3:B:1005:PHE:CD1	3:B:1108:TYR:CE1	2.84	0.66
3:A:10:TYR:HD2	3:A:48:TYR:CE1	2.14	0.66
3:A:289:VAL:HB	3:A:332:ARG:HB2	1.80	0.64
3:A:10:TYR:HD2	3:A:48:TYR:HE1	1.45	0.63
3:B:1014:GLN:HE22	3:B:1138:ILE:HA	1.62	0.63
3:B:1026:LYS:HB2	3:B:1027:PRO:HD2	1.78	0.63
3:B:1147:ASN:HD21	3:B:1150:PHE:HD2	1.47	0.63
3:B:1135:LYS:HB3	6:B:121:HOH:O	1.99	0.62
3:A:10:TYR:HA	5:A:414:DCP:O2B	1.98	0.62
3:B:1097:GLU:HB2	6:B:5:HOH:O	1.99	0.62
3:B:1194:LEU:HD21	3:B:1217:ILE:HD13	1.81	0.62
1:H:1803:DT:H5''	1:H:1804:DT:H72	1.80	0.62
3:B:1133:LEU:HD12	3:B:1137:LYS:HA	1.81	0.61
3:B:1250:THR:OG1	3:B:1332:ARG:HD3	2.00	0.61
1:H:1802:DG:H2'	1:H:1803:DT:C6	2.37	0.60
3:B:1199:ILE:HG23	3:B:1204:ASP:HB2	1.84	0.60
3:A:10:TYR:CD2	3:A:48:TYR:HE1	2.19	0.59
3:B:1015:VAL:O	3:B:1019:LEU:HD13	2.02	0.59
3:B:1214:LYS:HE2	3:B:1219:GLU:HG3	1.85	0.59
3:A:217:ILE:HD12	3:A:221:LYS:HB3	1.86	0.58
3:B:1014:GLN:HE22	3:B:1139:THR:N	2.00	0.58
3:B:1149:VAL:O	3:B:1153:ILE:HG13	2.03	0.58
3:A:38:GLU:O	3:A:39:ASP:HB2	2.03	0.57
3:B:1289:VAL:HB	3:B:1332:ARG:HB2	1.87	0.56
3:B:1122:TYR:HE2	3:B:1126:LEU:HD12	1.71	0.56
2:E:907:DC:OP2	3:A:250:THR:OG1	2.23	0.55
3:B:1168:ASP:OD2	3:B:1168:ASP:N	2.38	0.55
3:A:10:TYR:HA	5:A:414:DCP:PB	2.47	0.55
3:A:273:TYR:HE1	6:A:509:HOH:O	1.89	0.54
3:B:1176:ARG:HA	3:B:1203:VAL:HB	1.89	0.54
3:B:1122:TYR:CE2	3:B:1126:LEU:HD12	2.42	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:909:DA:P	3:A:336:ARG:HH22	2.30	0.54
3:A:273:TYR:OH	3:A:306:ILE:O	2.24	0.54
3:B:1010:TYR:HA	5:B:1414:DCP:PB	2.48	0.53
3:A:14:GLN:NE2	3:A:138:ILE:HA	2.24	0.53
3:B:1067:ILE:HG22	3:B:1068:LEU:HG	1.89	0.53
3:B:1049:GLU:H	3:B:1049:GLU:CD	2.17	0.53
3:B:1006:VAL:HG21	3:B:1092:LEU:HD22	1.91	0.52
3:B:1147:ASN:ND2	3:B:1150:PHE:HD2	2.07	0.51
3:B:1208:ILE:HG12	3:B:1209:GLU:N	2.24	0.51
3:B:1048:TYR:O	3:B:1052:LYS:N	2.44	0.51
3:B:1256:ARG:NH2	3:B:1323:LEU:O	2.43	0.51
3:A:9:ASP:O	3:A:10:TYR:C	2.54	0.51
3:A:174:LEU:HD22	3:A:178:LEU:HB2	1.92	0.51
3:B:1085:SER:O	3:B:1089:MET:HG2	2.10	0.51
3:B:1009:ASP:O	3:B:1010:TYR:C	2.54	0.50
3:B:1210:PHE:CE2	3:B:1214:LYS:HD2	2.46	0.50
3:A:166:ILE:HG23	3:A:170:GLU:HB3	1.94	0.50
3:B:1048:TYR:O	3:B:1052:LYS:HG3	2.12	0.50
1:D:804:DT:H2''	1:D:805:DG:C8	2.47	0.50
1:H:1808:DT:H1'	1:H:1809:DG:H5'	1.92	0.49
1:H:1808:DT:H2''	1:H:1809:DG:OP2	2.12	0.49
3:A:159:LYS:O	3:A:161:ASN:N	2.46	0.49
3:B:1137:LYS:HG2	6:B:57:HOH:O	2.11	0.49
3:B:1242:ARG:HD2	3:B:1245:ILE:HD13	1.94	0.49
3:A:251:MET:HG2	3:A:264:TYR:CG	2.48	0.48
3:B:1011:PHE:HB2	6:B:1501:HOH:O	2.13	0.48
3:B:1158:ALA:HB1	3:B:1162:GLY:HA3	1.95	0.48
3:A:142:VAL:O	3:A:163:ILE:HA	2.14	0.48
3:A:304:HIS:HD2	3:A:305:GLY:O	1.97	0.48
3:B:1118:TYR:HB3	3:B:1165:VAL:HG11	1.95	0.48
1:D:802:DG:H1'	1:D:803:DT:H5'	1.95	0.47
3:A:251:MET:HA	3:A:264:TYR:CE1	2.49	0.47
3:B:1005:PHE:CE2	3:B:1007:ASP:HB2	2.50	0.47
3:A:10:TYR:CD2	3:A:48:TYR:CD1	3.03	0.47
3:B:1012:TYR:HB2	3:B:1045:THR:HG22	1.96	0.47
1:H:1806:DG:H2''	1:H:1807:DA:C8	2.50	0.47
3:B:1192:GLU:C	3:B:1194:LEU:H	2.23	0.47
3:A:141:THR:OG1	3:A:159:LYS:O	2.16	0.46
3:A:166:ILE:HG22	3:A:171:VAL:HG23	1.97	0.46
3:A:10:TYR:H	5:A:414:DCP:PG	2.38	0.46
3:A:152:LYS:HE2	6:A:502:HOH:O	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:801:DG:H2''	1:D:802:DG:C8	2.51	0.46
3:A:32:VAL:O	3:A:41:GLY:HA3	2.16	0.46
3:B:1011:PHE:O	3:B:1015:VAL:HG23	2.16	0.46
1:D:803:DT:H1'	1:D:804:DT:H5'	1.98	0.46
3:A:259:GLU:HA	3:A:259:GLU:OE1	2.15	0.45
3:B:1005:PHE:HD1	3:B:1108:TYR:CE1	2.30	0.45
3:B:1243:LYS:HG3	6:B:32:HOH:O	2.16	0.45
2:J:1903:DA:OP2	2:J:1903:DA:H2'	2.17	0.45
3:A:101:ILE:N	3:A:101:ILE:HD12	2.31	0.45
3:A:183:VAL:O	3:A:184:PRO:C	2.60	0.45
3:B:1212:LYS:O	3:B:1216:MET:HG2	2.17	0.45
2:J:1918:DC:H2''	2:J:1919:DC:OP2	2.17	0.45
3:A:51:ARG:O	3:A:52:LYS:C	2.59	0.45
3:B:1291:GLU:OE1	3:B:1329:LYS:HG3	2.17	0.45
2:J:1913:DT:H2''	6:J:111:HOH:O	2.17	0.45
3:B:1226:ILE:O	3:B:1230:ARG:HB2	2.16	0.45
5:B:1414:DCP:H6	5:B:1414:DCP:O5'	2.17	0.45
3:B:1010:TYR:HA	5:B:1414:DCP:O3B	2.17	0.44
2:J:1903:DA:N1	3:B:1036:ARG:NH1	2.64	0.44
3:A:293:LEU:HD23	3:A:332:ARG:NH1	2.32	0.44
3:B:1159:LYS:CB	3:B:1160:PRO:HD3	2.47	0.44
3:B:1005:PHE:HD1	3:B:1108:TYR:CD1	2.36	0.44
3:A:48:TYR:HB3	3:A:52:LYS:NZ	2.32	0.44
3:A:157:MET:HE2	3:A:157:MET:HB3	1.90	0.44
3:A:251:MET:HG2	3:A:264:TYR:CD2	2.53	0.44
3:B:1149:VAL:HG23	3:B:1233:TYR:CZ	2.52	0.44
3:B:1189:ILE:HD13	3:B:1189:ILE:HA	1.87	0.44
1:H:1804:DT:C4	1:H:1805:DG:O6	2.71	0.43
3:A:175:ILE:HG12	3:A:229:ALA:HA	2.00	0.43
3:B:1174:LEU:HD22	3:B:1178:LEU:HB2	1.99	0.43
3:B:1291:GLU:HB2	3:B:1329:LYS:HB2	2.00	0.43
3:B:1174:LEU:HD23	3:B:1174:LEU:HA	1.82	0.43
1:H:1805:DG:H2''	1:H:1806:DG:N7	2.33	0.43
1:H:1810:DG:H1'	1:H:1811:DT:H5'	2.01	0.43
3:B:1282:LYS:HB2	3:B:1339:LYS:O	2.18	0.43
3:A:36:ARG:HD3	3:A:252:LYS:O	2.19	0.43
3:A:282:LYS:HE3	3:A:341:ILE:HG12	2.01	0.43
3:B:1023:LEU:HB3	3:B:1028:VAL:HG21	2.00	0.43
2:E:908:DT:OP1	3:A:247:ARG:HD2	2.18	0.43
3:A:56:LYS:O	3:A:59:ILE:HG12	2.19	0.43
3:B:1049:GLU:HA	3:B:1052:LYS:HG3	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:B:1027:PRO:HB3	3:B:1050:ALA:HA	2.00	0.42
3:A:215:GLY:HA2	6:A:511:HOH:O	2.19	0.42
3:A:331:ARG:HD2	6:A:550:HOH:O	2.20	0.42
1:H:1802:DG:C5	1:H:1803:DT:C4	3.07	0.42
3:A:115:VAL:HB	3:A:120:GLU:HB2	2.01	0.42
3:B:1029:VAL:HG13	3:B:1046:ALA:HB2	2.02	0.42
3:B:1060:PRO:HB2	3:B:1063:GLU:HG2	2.02	0.42
3:B:1307:SER:O	3:B:1308:LYS:C	2.62	0.42
3:A:31:CYS:HB3	3:A:61:ILE:HD11	2.01	0.42
3:A:161:ASN:OD1	3:A:161:ASN:C	2.63	0.42
3:A:310:THR:HG21	6:A:508:HOH:O	2.19	0.42
3:B:1190:THR:O	3:B:1194:LEU:HG	2.19	0.42
2:J:1902:DT:C2'	2:J:1903:DA:OP2	2.66	0.41
2:J:1911:DC:OP2	3:B:1243:LYS:HE3	2.20	0.41
3:B:1089:MET:O	3:B:1093:ARG:HG3	2.20	0.41
3:A:2:ILE:HG23	3:A:118:TYR:HE1	1.84	0.41
3:A:245:ILE:HG13	3:A:279:ARG:HH21	1.86	0.41
3:A:6:VAL:O	3:A:106:GLU:HA	2.20	0.41
3:A:74:LEU:HB3	6:A:534:HOH:O	2.20	0.41
3:B:1100:GLU:HB3	3:B:1108:TYR:HB2	2.01	0.41
3:B:1167:ASP:C	3:B:1169:GLU:N	2.75	0.41
3:B:1256:ARG:NH1	3:B:1328:ARG:O	2.49	0.41
3:B:1010:TYR:HA	5:B:1414:DCP:O2B	2.20	0.41
3:B:1092:LEU:HB3	3:B:1109:LEU:HD11	2.03	0.40
3:B:1105:ASP:C	3:B:1106:GLU:HG3	2.46	0.40
3:A:179:ASP:HA	3:A:200:ASN:O	2.21	0.40
3:B:1302:PHE:CD2	3:B:1303:PRO:HD2	2.57	0.40
3:A:6:VAL:HG22	3:A:142:VAL:HG22	2.03	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	
3	A	339/360 (94%)	316 (93%)	18 (5%)	5 (2%)	8	28
3	B	339/360 (94%)	305 (90%)	31 (9%)	3 (1%)	14	41
All	All	678/720 (94%)	621 (92%)	49 (7%)	8 (1%)	10	34

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	B	1159	LYS
3	A	52	LYS
3	A	161	ASN
3	B	1279	ARG
3	A	277	ASP
3	A	39	ASP
3	A	159	LYS
3	B	1010	TYR

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	
3	A	299/311 (96%)	279 (93%)	20 (7%)	15	42
3	B	299/311 (96%)	277 (93%)	22 (7%)	13	37
All	All	598/622 (96%)	556 (93%)	42 (7%)	14	40

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	17	GLU
3	A	23	LEU
3	A	52	LYS
3	A	79	GLU
3	A	83	GLN
3	A	97	GLU
3	A	116	ARG
3	A	131	LYS

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Mol	Chain	Res	Type
3	A	175	ILE
3	A	192	GLU
3	A	200	ASN
3	A	203	VAL
3	A	204	ASP
3	A	237	ILE
3	A	242	ARG
3	A	248	ILE
3	A	252	LYS
3	A	293	LEU
3	A	323	LEU
3	A	338	SER
3	B	1023	LEU
3	B	1028	VAL
3	B	1056	LYS
3	B	1070	ASN
3	B	1113	ASP
3	B	1126	LEU
3	B	1168	ASP
3	B	1173	ARG
3	B	1178	LEU
3	B	1189	ILE
3	B	1196	LYS
3	B	1208	ILE
3	B	1211	ASP
3	B	1238	ARG
3	B	1241	VAL
3	B	1249	VAL
3	B	1252	LYS
3	B	1271	GLU
3	B	1296	VAL
3	B	1310	THR
3	B	1336	ARG
3	B	1341	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
3	A	14	GLN
3	A	188	ASN
3	A	304	HIS
3	B	1014	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

2 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	DDG	D	813	2,1,4	20,23,24	0.40	0	27,33,36	0.86	1 (3%)
1	DDG	H	1813	2,1,4	20,23,24	0.54	0	27,33,36	0.80	2 (7%)

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	DDG	D	813	2,1,4	-	0/7/18/19	0/3/3/3
1	DDG	H	1813	2,1,4	-	2/7/18/19	0/3/3/3

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	813	DDG	C3'-C2'-C1'	2.31	105.53	102.87
1	H	1813	DDG	O4'-C1'-C2'	2.20	109.02	106.41
1	H	1813	DDG	O4'-C4'-C3'	2.16	108.36	104.81

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	H	1813	DDG	O4'-C4'-C5'-O5'

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Mol	Chain	Res	Type	Atoms
1	H	1813	DDG	C3'-C4'-C5'-O5'

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 8 are monoatomic - leaving 2 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
5	DCP	A	414	4	28,29,29	2.60	4 (14%)	41,45,45	1.10	3 (7%)
5	DCP	B	1414	4	28,29,29	2.40	4 (14%)	41,45,45	1.17	3 (7%)

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
5	DCP	A	414	4	-	4/22/34/34	0/2/2/2
5	DCP	B	1414	4	-	1/22/34/34	0/2/2/2

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	1414	DCP	PB-O3B	-7.69	1.51	1.59
5	A	414	DCP	PB-O3B	-7.55	1.51	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	414	DCP	PB-O3A	-7.38	1.51	1.59
5	A	414	DCP	PA-O3A	-7.28	1.51	1.59
5	B	1414	DCP	PB-O3A	-6.07	1.52	1.59
5	B	1414	DCP	PA-O3A	-6.02	1.53	1.59
5	B	1414	DCP	C4-N4	2.50	1.40	1.33
5	A	414	DCP	PA-O5'	-2.44	1.49	1.59

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	414	DCP	O2-C2-N3	-3.30	117.12	122.33
5	B	1414	DCP	O2-C2-N3	-3.00	117.61	122.33
5	B	1414	DCP	O4'-C1'-N1	2.54	112.37	107.86
5	A	414	DCP	O2A-PA-O3A	2.46	113.91	107.27
5	A	414	DCP	O4'-C1'-N1	2.35	112.04	107.86
5	B	1414	DCP	C4'-O4'-C1'	2.22	114.79	109.51

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	414	DCP	PB-O3B-PG-O2G
5	A	414	DCP	PB-O3A-PA-O1A
5	A	414	DCP	PB-O3A-PA-O2A
5	B	1414	DCP	PA-O3A-PB-O1B
5	A	414	DCP	PA-O3A-PB-O2B

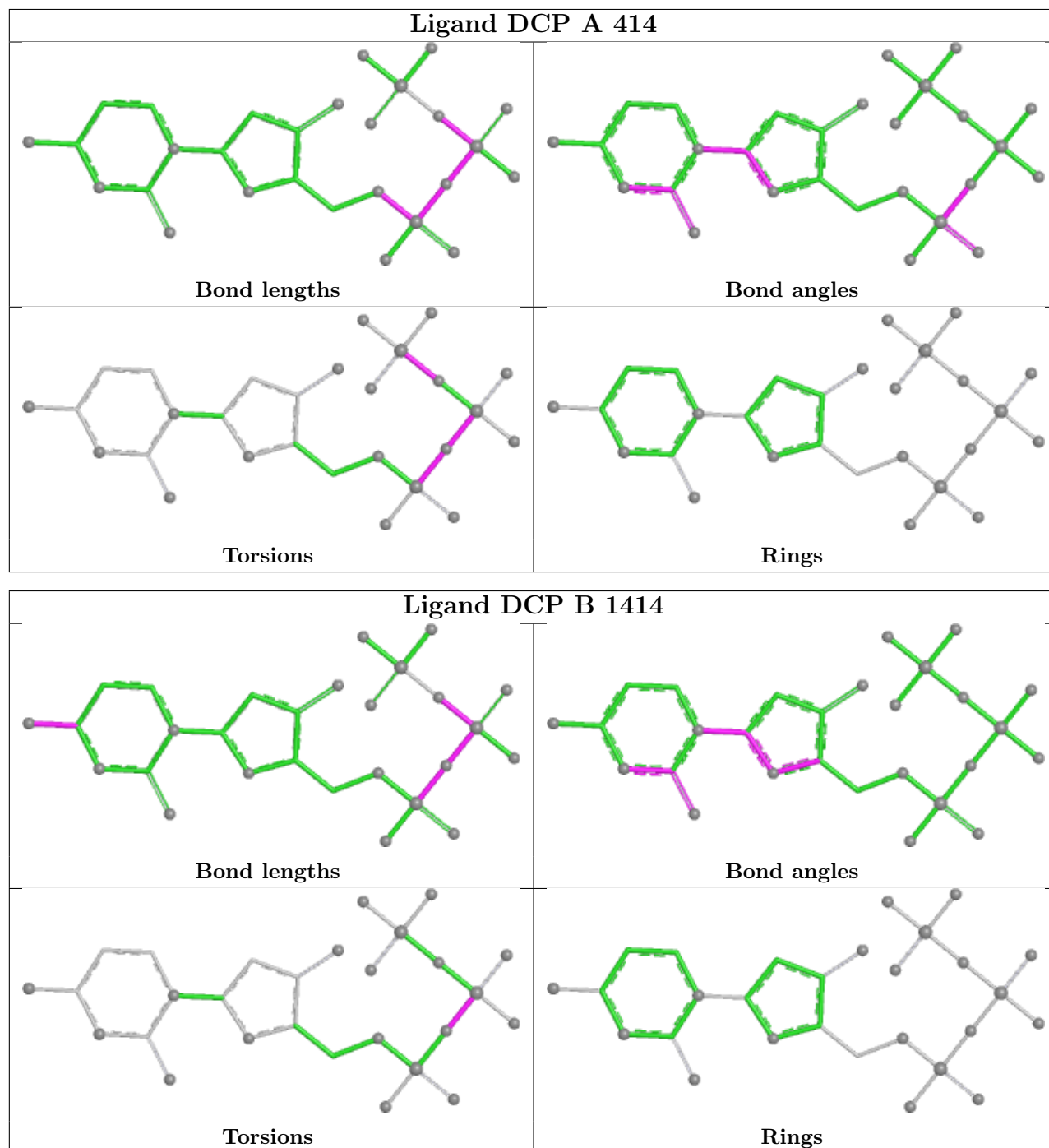
There are no ring outliers.

2 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	414	DCP	3	0
5	B	1414	DCP	4	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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	D	12/13 (92%)	-0.80	0 100 100	2, 5, 14, 19	0
1	H	12/13 (92%)	1.09	0 100 100	5, 31, 43, 44	0
2	E	17/19 (89%)	-0.30	1 (5%) 28 21	2, 2, 42, 50	0
2	J	19/19 (100%)	0.95	4 (21%) 2 2	2, 21, 50, 54	0
3	A	341/360 (94%)	-0.48	1 (0%) 90 86	2, 4, 16, 20	0
3	B	341/360 (94%)	0.20	3 (0%) 81 74	2, 10, 18, 20	0
All	All	742/784 (94%)	-0.10	9 (1%) 76 68	2, 7, 19, 54	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	J	1902	DT	3.9
2	J	1903	DA	3.0
2	J	1904	DA	3.0
3	B	1305	GLY	2.8
2	J	1901	DC	2.5
3	B	1206	LEU	2.2
3	A	10	TYR	2.1
3	B	1048	TYR	2.1
2	E	903	DA	2.1

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($\text{\AA}^2$)	Q<0.9
1	DDG	H	1813	21/22	0.93	0.10	2,2,2,2	0
1	DDG	D	813	21/22	0.95	0.09	2,2,2,2	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

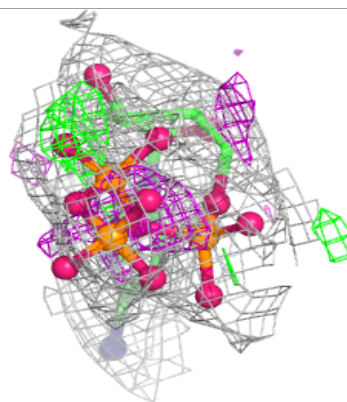
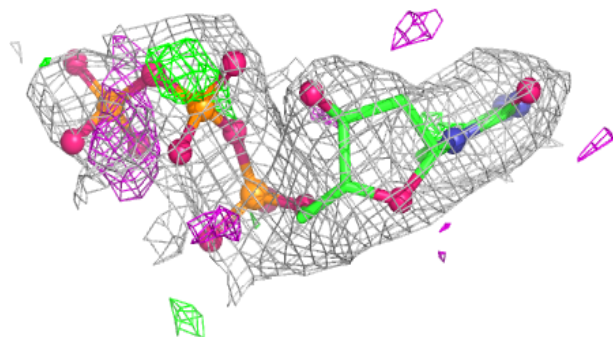
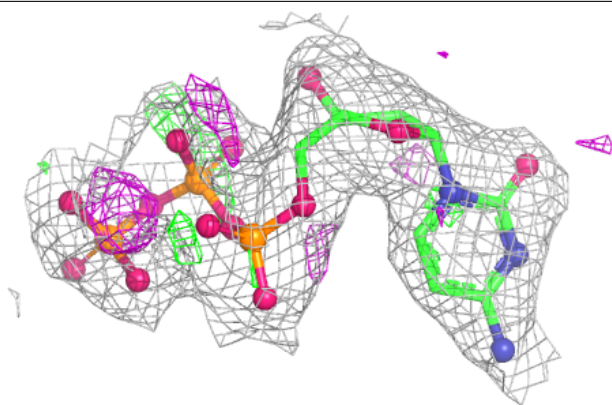
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	CA	B	1416	1/1	0.72	0.16	3,3,3,3	0
4	CA	H	1418	1/1	0.73	0.17	99,99,99,99	0
4	CA	B	1417	1/1	0.88	0.07	17,17,17,17	0
5	DCP	B	1414	28/28	0.88	0.14	2,2,16,16	0
4	CA	B	1415	1/1	0.90	0.09	2,2,2,2	0
4	CA	D	418	1/1	0.90	0.15	45,45,45,45	0
4	CA	A	416	1/1	0.91	0.12	2,2,2,2	0
5	DCP	A	414	28/28	0.93	0.11	2,2,17,18	0
4	CA	A	417	1/1	0.93	0.09	7,7,7,7	0
4	CA	A	415	1/1	0.97	0.10	2,2,2,2	0

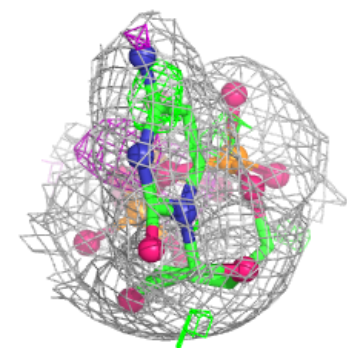
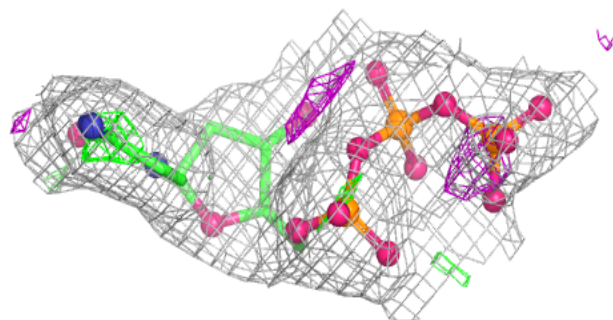
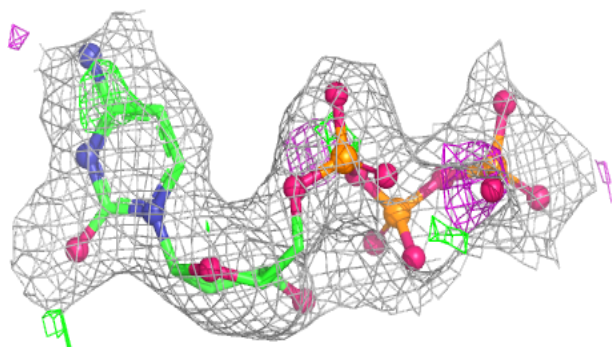
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around DCP B 1414:

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

**Electron density around DCP A 414:**

$2mF_o-DF_c$ (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.