



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 4, 2023 – 12:21 am GMT

PDB ID : 1H2U  
Title : Structure of the human nuclear cap-binding-complex (CBC) in complex with a cap analogue m7GpppG  
Authors : Mazza, C.; Segref, A.; Mattaj, I.W.; Cusack, S.  
Deposited on : 2002-08-16  
Resolution : 2.40 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](mailto: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>.

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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

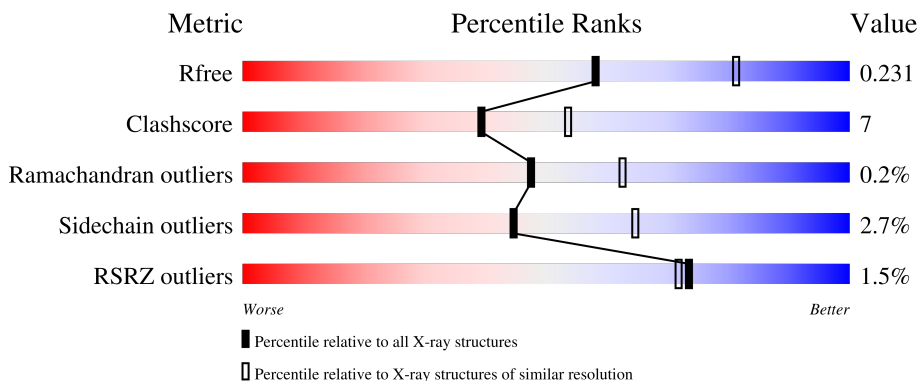
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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  $\geq 3$ , 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	723	
1	B	723	
2	X	156	
2	Y	156	

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 15364 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 80 KDA NUCLEAR CAP BINDING PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	706	Total	C	N	O	S	0	0	0
			5765	3722	971	1034	38			
1	B	706	Total	C	N	O	S	0	0	0
			5762	3720	971	1033	38			

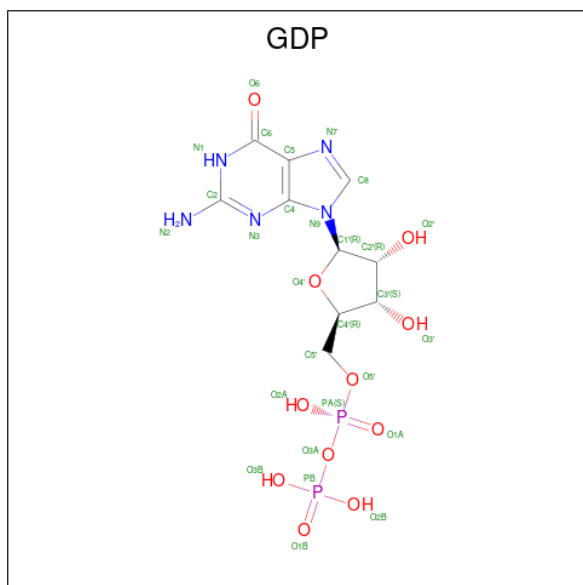
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	479	SER	ALA	engineered mutation	UNP Q09161
B	479	SER	ALA	engineered mutation	UNP Q09161

- Molecule 2 is a protein called 20 KDA NUCLEAR CAP BINDING PROTEIN.

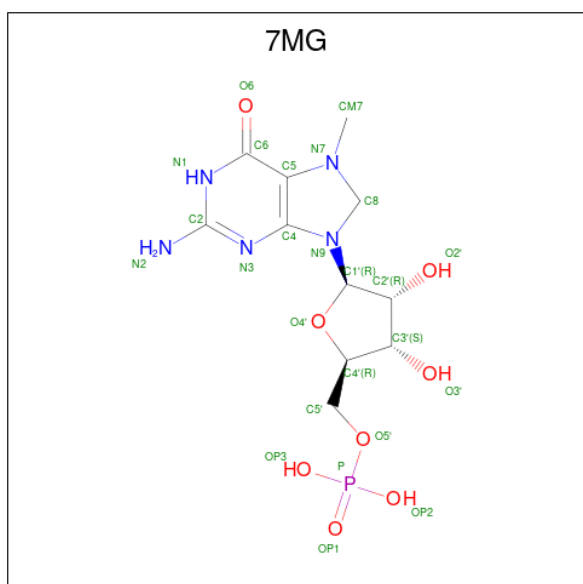
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	X	149	Total	C	N	O	S	0	0	0
			1214	757	217	234	6			
2	Y	147	Total	C	N	O	S	0	0	0
			1202	749	215	232	6			

- Molecule 3 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>11</sub>P<sub>2</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	X	1	28	10	5	11	2	0	0
3	Y	1	28	10	5	11	2	0	0

- Molecule 4 is 7N-METHYL-8-HYDROGUANOSINE-5'-MONOPHOSPHATE (three-letter code: 7MG) (formula: C<sub>11</sub>H<sub>18</sub>N<sub>5</sub>O<sub>8</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
4	X	1	24	11	5	7	1	0	0

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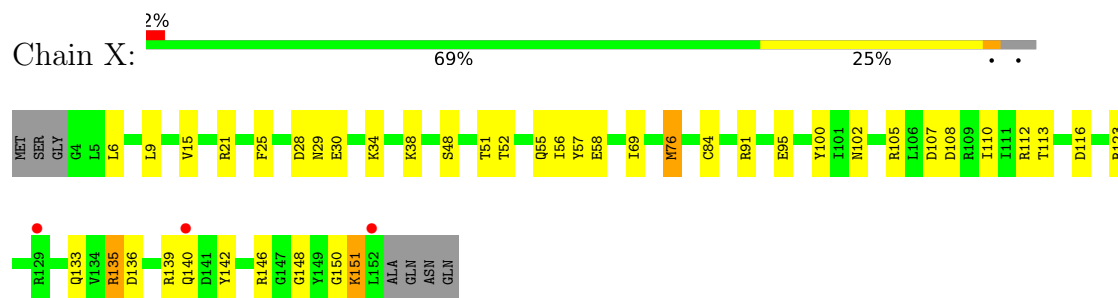
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	Y	1	Total	C	N	O	P	0	0
			24	11	5	7	1		

- Molecule 5 is water.

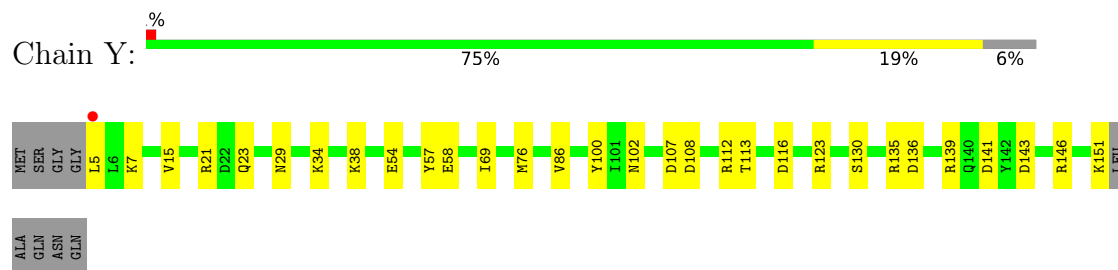
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	509	Total	O	0	0
			509	509		
5	B	538	Total	O	0	0
			538	538		
5	X	130	Total	O	0	0
			130	130		
5	Y	140	Total	O	0	0
			140	140		



- Molecule 2: 20 KDA NUCLEAR CAP BINDING PROTEIN



- Molecule 2: 20 KDA NUCLEAR CAP BINDING PROTEIN



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	111.84Å 125.72Å 188.76Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.98 – 2.40 19.98 – 2.30	Depositor EDS
% Data completeness (in resolution range)	92.3 (19.98-2.40) 89.2 (19.98-2.30)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.64 (at 2.30Å)	Xtrriage
Refinement program	CNS 1.0	Depositor
R, $R_{free}$	0.194 , 0.245 0.180 , 0.231	Depositor DCC
$R_{free}$ test set	5244 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	29.4	Xtrriage
Anisotropy	0.665	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 50.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	15364	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.88% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: GDP, 7MG

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	0.34	0/5919	0.52	0/8041
1	B	0.34	0/5916	0.53	0/8037
2	X	0.36	0/1234	0.61	0/1646
2	Y	0.36	0/1222	0.61	0/1630
All	All	0.34	0/14291	0.54	0/19354

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	5765	0	5737	93	0
1	B	5762	0	5736	62	0
2	X	1214	0	1174	32	0
2	Y	1202	0	1160	24	0
3	X	28	0	12	1	0
3	Y	28	0	12	1	0
4	X	24	0	16	1	0
4	Y	24	0	16	1	0
5	A	509	0	0	15	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	538	0	0	9	0
5	X	130	0	0	5	0
5	Y	140	0	0	4	0
All	All	15364	0	13863	205	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 7.

All (205) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:28:GLU:HB3	1:B:67:LYS:HE2	1.52	0.92
2:X:136:ASP:HA	2:X:139:ARG:HG3	1.58	0.85
1:A:503:CYS:HB3	5:A:2375:HOH:O	1.77	0.84
1:A:557:LYS:HD3	1:A:561:HIS:NE2	2.01	0.76
1:B:425:GLN:HG2	5:Y:2102:HOH:O	1.85	0.76
2:X:139:ARG:HB2	2:X:150:GLY:HA3	1.70	0.74
1:A:67:LYS:NZ	1:A:70:ARG:HH21	1.87	0.73
1:A:425:GLN:HE22	1:B:767:ASN:HD21	1.37	0.72
1:A:785:PHE:HE2	5:A:2478:HOH:O	1.72	0.72
1:B:774:LEU:HB2	1:B:779:LEU:HD23	1.72	0.71
1:B:609:ILE:HD11	1:B:619:VAL:HG21	1.72	0.71
1:B:714:PHE:O	1:B:718:ILE:HG12	1.91	0.71
2:X:135:ARG:HG3	5:X:2130:HOH:O	1.91	0.70
1:A:517:ILE:HG21	1:A:572:VAL:HG21	1.73	0.70
3:Y:1152:GDP:O1B	4:Y:1153:7MG:H81	1.92	0.69
1:A:28:GLU:HB3	1:A:67:LYS:HE2	1.75	0.69
2:Y:21:ARG:HE	2:Y:29:ASN:HD21	1.42	0.68
1:B:382:LEU:C	1:B:384:PRO:HD3	2.14	0.68
1:B:383:GLN:HB2	1:B:387:LEU:HB2	1.75	0.67
1:A:609:ILE:HD11	1:A:619:VAL:HG21	1.77	0.67
1:B:61:LEU:N	1:B:62:PRO:HD2	2.09	0.66
1:A:397:MET:HE3	1:A:401:ARG:NH2	2.11	0.66
2:X:28:ASP:OD2	2:X:30:GLU:HB3	1.96	0.66
1:A:61:LEU:N	1:A:62:PRO:HD2	2.11	0.65
1:A:150:GLU:HG2	1:A:195:ILE:HD11	1.79	0.65
1:A:635:LEU:O	1:A:639:GLU:HG3	1.96	0.65
2:X:112:ARG:HB2	5:X:2067:HOH:O	1.97	0.65
5:B:2004:HOH:O	2:Y:7:LYS:HB2	1.97	0.64
5:A:2352:HOH:O	2:X:108:ASP:HB2	1.99	0.63
2:Y:69:ILE:HD12	2:Y:86:VAL:HG22	1.79	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:A:2085:HOH:O	2:X:9:LEU:HD13	1.98	0.63
1:B:523:ASP:HB3	5:B:2405:HOH:O	1.98	0.63
1:A:146:VAL:O	1:A:150:GLU:HG3	1.99	0.62
1:A:374:THR:HG21	2:X:100:TYR:O	1.99	0.62
3:X:1153:GDP:O1B	4:X:1154:7MG:H81	1.98	0.62
1:A:59:ALA:HB3	5:A:2017:HOH:O	1.98	0.62
1:B:374:THR:HG21	2:Y:100:TYR:O	1.98	0.62
1:A:36:CYS:SG	2:X:6:LEU:HD22	2.41	0.61
1:A:770:PHE:HA	1:A:774:LEU:HD12	1.83	0.61
1:B:431:GLU:H	1:B:431:GLU:CD	2.03	0.60
2:Y:136:ASP:HA	2:Y:139:ARG:HG3	1.83	0.60
1:B:157:GLN:HE21	1:B:157:GLN:HA	1.66	0.60
1:A:500:VAL:HG23	5:A:2372:HOH:O	2.01	0.60
1:A:583:LYS:HD3	1:A:614:VAL:HA	1.84	0.59
1:A:780:ALA:O	1:A:784:GLN:HG3	2.03	0.59
2:Y:34:LYS:HD2	2:Y:38:LYS:NZ	2.18	0.58
1:A:180:VAL:HG22	1:A:184:LEU:HG	1.86	0.58
1:A:247:ARG:HH11	1:A:247:ARG:HG2	1.68	0.58
1:B:635:LEU:O	1:B:639:GLU:HG3	2.04	0.58
1:B:87:THR:HG21	1:B:133:ASP:HB3	1.86	0.58
2:X:34:LYS:O	2:X:38:LYS:HD3	2.04	0.57
2:Y:102:ASN:HB2	2:Y:113:THR:OG1	2.04	0.57
1:A:427:ARG:HD3	5:A:2327:HOH:O	2.05	0.56
2:Y:116:ASP:OD1	2:Y:123:ARG:NH2	2.38	0.56
1:A:117:LYS:HB2	5:A:2059:HOH:O	2.05	0.56
1:A:142:ALA:HB3	1:A:143:PRO:HD3	1.87	0.56
1:B:146:VAL:O	1:B:150:GLU:HG3	2.06	0.56
2:Y:34:LYS:HD2	2:Y:38:LYS:HZ3	1.71	0.56
1:A:144:SER:HB3	1:A:268:LEU:HB2	1.87	0.55
1:A:516:GLU:O	1:A:520:ILE:HG13	2.06	0.55
1:B:77:ARG:HB3	1:B:127:LEU:HD21	1.89	0.55
2:X:136:ASP:HA	2:X:139:ARG:CG	2.34	0.55
2:X:102:ASN:HB2	2:X:113:THR:OG1	2.07	0.55
1:A:109:ILE:HD11	1:A:268:LEU:HD22	1.88	0.54
1:B:142:ALA:HB3	1:B:143:PRO:HD3	1.88	0.54
1:B:431:GLU:HB3	5:B:2347:HOH:O	2.06	0.54
2:X:21:ARG:HH11	2:X:29:ASN:HD21	1.55	0.54
1:A:109:ILE:HD11	1:A:268:LEU:CD2	2.38	0.54
2:X:105:ARG:CZ	2:X:110:ILE:HD11	2.37	0.54
1:B:483:CYS:HB2	1:B:594:TRP:CH2	2.42	0.53
2:Y:151:LYS:HE3	5:Y:2129:HOH:O	2.07	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:67:LYS:HZ2	1:A:70:ARG:HH21	1.56	0.53
2:X:15:VAL:HG12	2:X:15:VAL:O	2.08	0.53
2:X:116:ASP:CG	2:X:123:ARG:HH22	2.13	0.53
1:A:329:ARG:HG3	1:A:378:GLU:HG3	1.91	0.52
1:B:498:HIS:O	1:B:502:LEU:HG	2.10	0.52
1:B:122:ASN:HB3	5:B:2073:HOH:O	2.09	0.52
1:B:383:GLN:N	1:B:384:PRO:HD3	2.24	0.52
1:B:35:ILE:O	1:B:38:VAL:HG12	2.09	0.52
1:A:483:CYS:HB2	1:A:594:TRP:CH2	2.44	0.52
1:A:785:PHE:CE2	5:A:2478:HOH:O	2.53	0.52
2:Y:69:ILE:CD1	2:Y:86:VAL:HG22	2.39	0.52
1:B:498:HIS:NE2	1:B:502:LEU:HD11	2.25	0.51
2:X:116:ASP:OD1	2:X:123:ARG:NH2	2.43	0.51
2:Y:112:ARG:HD3	5:Y:2108:HOH:O	2.11	0.51
2:Y:112:ARG:HB2	5:Y:2106:HOH:O	2.09	0.51
1:A:317:ASN:O	1:A:321:ILE:HG12	2.11	0.51
1:A:27:THR:HA	5:A:2001:HOH:O	2.11	0.51
1:A:39:GLY:HA2	1:A:46:LEU:HD13	1.93	0.51
1:B:373:THR:O	1:B:377:ILE:HG12	2.10	0.51
1:B:387:LEU:HB3	1:B:388:PRO:HD3	1.93	0.50
2:Y:15:VAL:O	2:Y:15:VAL:HG12	2.12	0.50
1:A:180:VAL:HG22	1:A:180:VAL:O	2.11	0.50
1:A:763:VAL:HG12	1:A:767:ASN:HD21	1.75	0.50
1:B:46:LEU:HD21	1:B:85:ILE:CD1	2.42	0.50
2:Y:34:LYS:O	2:Y:38:LYS:HD3	2.12	0.50
1:A:77:ARG:HB3	1:A:127:LEU:HD21	1.94	0.50
1:A:604:LEU:O	1:A:608:MET:HG3	2.11	0.50
1:A:711:LEU:O	1:A:715:GLN:HB2	2.12	0.49
1:A:742:ASN:HB2	5:A:2470:HOH:O	2.11	0.49
1:B:54:ALA:HA	1:B:93:LEU:HD11	1.95	0.49
1:A:425:GLN:HB2	1:A:427:ARG:NH1	2.28	0.49
2:Y:116:ASP:CG	2:Y:123:ARG:HH22	2.16	0.49
1:B:604:LEU:O	1:B:608:MET:HG3	2.12	0.48
2:Y:21:ARG:HE	2:Y:29:ASN:ND2	2.09	0.48
1:A:757:ILE:O	1:A:760:GLN:HG2	2.14	0.48
1:A:319:HIS:CE1	1:A:354:VAL:HG13	2.48	0.48
2:X:25:PHE:HB3	5:X:2022:HOH:O	2.13	0.48
1:A:557:LYS:HD3	1:A:561:HIS:CD2	2.48	0.48
1:B:46:LEU:HD11	1:B:85:ILE:HD12	1.95	0.48
1:B:458:ARG:HD3	2:Y:58:GLU:OE1	2.14	0.48
1:A:505:ALA:O	1:A:509:LYS:HG3	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:X:151:LYS:HE3	5:X:2126:HOH:O	2.14	0.48
1:A:542:LEU:O	1:A:546:VAL:HG22	2.15	0.47
1:B:89:LEU:O	1:B:93:LEU:HD13	2.15	0.47
1:A:480:ASN:ND2	1:A:482:THR:HG23	2.29	0.47
1:A:485:TYR:HB2	1:A:553:HIS:CD2	2.50	0.47
1:A:146:VAL:HG23	1:A:184:LEU:HD22	1.96	0.47
1:B:86:TYR:O	1:B:90:VAL:HG23	2.15	0.47
2:X:110:ILE:N	2:X:110:ILE:HD12	2.30	0.47
1:B:344:LYS:HA	1:B:344:LYS:HE2	1.97	0.47
2:Y:135:ARG:HG3	2:Y:135:ARG:HH11	1.78	0.47
1:B:109:ILE:HD11	1:B:268:LEU:HD22	1.97	0.46
1:A:150:GLU:CG	1:A:195:ILE:HD11	2.45	0.46
1:A:708:ASN:O	1:A:712:VAL:HG23	2.15	0.46
1:A:480:ASN:HD22	1:A:482:THR:CG2	2.29	0.46
1:B:150:GLU:CG	1:B:195:ILE:HD11	2.46	0.46
1:A:293:ASP:OD2	1:A:293:ASP:C	2.53	0.46
1:A:113:LYS:HD3	5:A:2057:HOH:O	2.14	0.46
1:A:92:LEU:O	1:A:96:ARG:HG3	2.16	0.45
2:X:21:ARG:NH1	2:X:29:ASN:HD21	2.13	0.45
1:B:328:GLU:HB3	5:B:2277:HOH:O	2.15	0.45
1:A:601:ILE:O	1:A:605:VAL:HG23	2.17	0.45
1:A:725:LEU:HD13	1:A:775:ASP:CG	2.37	0.45
1:B:218:THR:OG1	1:B:404:THR:HB	2.17	0.45
1:A:387:LEU:HB3	1:A:388:PRO:HD3	1.99	0.45
1:B:150:GLU:HG2	1:B:195:ILE:HD11	1.99	0.45
1:A:153:VAL:HG21	1:A:195:ILE:HG23	1.98	0.44
2:X:57:TYR:CD2	2:X:69:ILE:HD12	2.52	0.44
1:A:87:THR:HG21	1:A:133:ASP:HB3	1.98	0.44
1:A:256:PHE:HD2	1:A:259:ILE:HD12	1.81	0.44
1:B:83:LEU:HD11	1:B:130:PHE:HA	1.99	0.44
1:A:61:LEU:N	1:A:62:PRO:CD	2.79	0.44
1:B:293:ASP:OD2	1:B:293:ASP:C	2.56	0.44
1:B:703:GLN:HG2	5:B:2485:HOH:O	2.18	0.44
1:B:765:LEU:HD23	1:B:769:LEU:HD12	1.99	0.44
1:B:759:GLN:HE21	1:B:759:GLN:HB2	1.53	0.44
1:A:37:LYS:O	1:A:40:GLU:HG3	2.18	0.43
1:A:64:TYR:O	1:A:68:ILE:HG13	2.18	0.43
1:A:58:GLU:OE2	1:A:96:ARG:HD3	2.17	0.43
1:A:345:ILE:HB	1:A:346:PRO:HD2	2.01	0.43
1:B:737:THR:HB	1:B:738:PRO:HD2	2.01	0.43
1:A:557:LYS:HB3	1:A:561:HIS:CD2	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:232:LEU:O	1:A:236:ILE:HG12	2.18	0.43
1:B:557:LYS:HB2	5:B:2416:HOH:O	2.19	0.43
1:A:497:GLY:HA2	5:A:2372:HOH:O	2.18	0.43
1:B:55:GLY:HA2	1:B:96:ARG:NH1	2.34	0.42
1:B:134:LEU:HD23	1:B:134:LEU:HA	1.91	0.42
1:A:383:GLN:HB2	1:A:387:LEU:HB2	2.00	0.42
2:X:21:ARG:HA	2:X:21:ARG:HD3	1.79	0.42
2:X:48:SER:HB3	2:X:51:THR:OG1	2.19	0.42
1:A:188:LYS:HB3	1:A:191:GLU:HB2	2.02	0.42
1:B:93:LEU:HD23	1:B:100:PHE:CE2	2.55	0.42
2:X:123:ARG:HD3	5:X:2018:HOH:O	2.18	0.42
1:A:623:ILE:HG22	1:A:624:PHE:CD1	2.54	0.42
1:B:559:PHE:CZ	2:Y:54:GLU:HG3	2.55	0.42
1:B:742:ASN:HB2	5:B:2504:HOH:O	2.19	0.42
2:X:91:ARG:O	2:X:95:GLU:HG3	2.19	0.42
1:A:121:TYR:O	1:A:125:VAL:HG23	2.19	0.42
1:A:98:TYR:CE1	1:A:264:LEU:HD23	2.55	0.42
1:A:708:ASN:HB3	5:A:2458:HOH:O	2.19	0.42
1:B:764:THR:HG23	1:B:768:LEU:HD12	2.02	0.42
1:A:229:LEU:HD23	1:A:229:LEU:HA	1.87	0.42
1:A:382:LEU:C	1:A:384:PRO:HD3	2.40	0.42
1:A:718:ILE:CG2	1:A:774:LEU:HD21	2.50	0.42
1:A:743:CYS:HB2	5:A:2467:HOH:O	2.19	0.42
1:B:200:GLU:HB2	1:B:233:TRP:CZ2	2.55	0.42
2:X:52:THR:OG1	2:X:55:GLN:HG3	2.20	0.42
1:A:67:LYS:HZ1	1:A:70:ARG:HH21	1.67	0.41
1:A:83:LEU:HD11	1:A:130:PHE:HA	2.02	0.41
1:B:712:VAL:O	1:B:716:ARG:HG2	2.20	0.41
2:Y:139:ARG:HB3	2:Y:141:ASP:OD1	2.20	0.41
1:B:493:ASN:N	1:B:493:ASN:ND2	2.67	0.41
2:X:133:GLN:OE1	2:X:146:ARG:NH2	2.53	0.41
1:A:480:ASN:ND2	1:A:482:THR:CG2	2.84	0.41
1:B:718:ILE:HD11	1:B:770:PHE:CE2	2.54	0.41
1:A:458:ARG:HD3	2:X:58:GLU:OE1	2.20	0.41
1:B:211:VAL:HB	1:B:212:PRO:HD3	2.01	0.41
1:A:771:THR:OG1	1:A:773:GLU:HG2	2.20	0.41
1:A:260:LEU:C	1:A:262:GLU:H	2.24	0.41
1:B:371:MET:HG2	2:Y:100:TYR:CE1	2.55	0.41
1:B:753:GLN:NE2	5:B:2510:HOH:O	2.53	0.41
1:A:759:GLN:O	1:A:762:MET:HB2	2.21	0.41
2:Y:143:ASP:HB3	2:Y:146:ARG:HB3	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:Y:130:SER:OG	2:Y:151:LYS:HD3	2.20	0.41
1:A:251:ARG:HB3	1:A:253:TYR:CE1	2.55	0.40
1:A:480:ASN:HD22	1:A:482:THR:HG23	1.84	0.40
1:A:763:VAL:HG12	1:A:767:ASN:ND2	2.36	0.40
1:B:248:HIS:O	1:B:342:LYS:HB2	2.22	0.40
2:X:76:MET:CE	2:X:76:MET:HA	2.50	0.40
2:X:56:ILE:HD13	2:X:84:CYS:SG	2.60	0.40
1:A:213:MET:O	1:A:213:MET:CG	2.70	0.40
1:B:711:LEU:HD12	1:B:711:LEU:HA	1.88	0.40
1:A:387:LEU:O	1:A:387:LEU:HD13	2.21	0.40
2:X:142:TYR:CE1	2:X:148:GLY:HA2	2.57	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	702/723 (97%)	679 (97%)	21 (3%)	2 (0%)	41	55
1	B	702/723 (97%)	685 (98%)	17 (2%)	0	100	100
2	X	147/156 (94%)	142 (97%)	4 (3%)	1 (1%)	22	32
2	Y	145/156 (93%)	142 (98%)	3 (2%)	0	100	100
All	All	1696/1758 (96%)	1648 (97%)	45 (3%)	3 (0%)	47	62

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	X	151	LYS
1	A	491	SER
1	A	363	PRO

### 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	647/662 (98%)	633 (98%)	14 (2%)	52	71
1	B	647/662 (98%)	630 (97%)	17 (3%)	46	66
2	X	125/130 (96%)	121 (97%)	4 (3%)	39	59
2	Y	124/130 (95%)	118 (95%)	6 (5%)	25	41
All	All	1543/1584 (97%)	1502 (97%)	41 (3%)	44	65

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

Mol	Chain	Res	Type
1	A	26	GLU
1	A	79	LEU
1	A	93	LEU
1	A	247	ARG
1	A	299	GLU
1	A	345	ILE
1	A	387	LEU
1	A	464	ARG
1	A	517	ILE
1	A	561	HIS
1	A	597	HIS
1	A	635	LEU
1	A	744	ILE
1	A	779	LEU
1	B	79	LEU
1	B	114	GLU
1	B	157	GLN
1	B	160	ASP
1	B	279	ASP
1	B	299	GLU
1	B	342	LYS
1	B	382	LEU
1	B	387	LEU
1	B	464	ARG

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Mol	Chain	Res	Type
1	B	561	HIS
1	B	576	LEU
1	B	711	LEU
1	B	744	ILE
1	B	759	GLN
1	B	779	LEU
1	B	786	CYS
2	X	76	MET
2	X	107	ASP
2	X	135	ARG
2	X	140	GLN
2	Y	5	LEU
2	Y	23	GLN
2	Y	57	TYR
2	Y	76	MET
2	Y	107	ASP
2	Y	108	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (34) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	99	ASN
1	A	151	ASN
1	A	157	GLN
1	A	198	ASN
1	A	425	GLN
1	A	463	GLN
1	A	553	HIS
1	A	649	ASN
1	A	703	GLN
1	A	706	GLN
1	A	708	ASN
1	A	715	GLN
1	A	753	GLN
1	A	760	GLN
1	A	767	ASN
1	B	49	ASN
1	B	99	ASN
1	B	157	GLN
1	B	198	ASN
1	B	425	GLN
1	B	493	ASN

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Mol	Chain	Res	Type
1	B	596	ASN
1	B	649	ASN
1	B	703	GLN
1	B	706	GLN
1	B	708	ASN
1	B	715	GLN
1	B	753	GLN
1	B	756	GLN
1	B	759	GLN
1	B	760	GLN
2	X	29	ASN
2	X	140	GLN
2	Y	29	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 monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

4 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	$\# Z  > 2$
4	7MG	Y	1153	3	22,26,27	3.32	2 (9%)	29,39,42	1.55	2 (6%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	GDP	X	1153	4	24,30,30	0.93	2 (8%)	30,47,47	0.89	3 (10%)
4	7MG	X	1154	3	22,26,27	3.32	2 (9%)	29,39,42	1.56	2 (6%)
3	GDP	Y	1152	4	24,30,30	1.00	2 (8%)	30,47,47	0.77	2 (6%)

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
4	7MG	Y	1153	3	-	0/7/37/38	0/3/3/3
3	GDP	X	1153	4	-	3/12/32/32	0/3/3/3
4	7MG	X	1154	3	-	0/7/37/38	0/3/3/3
3	GDP	Y	1152	4	-	5/12/32/32	0/3/3/3

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	X	1154	7MG	C8-N9	-15.08	1.37	1.46
4	Y	1153	7MG	C8-N9	-15.05	1.37	1.46
4	Y	1153	7MG	C5-N7	3.58	1.39	1.35
4	X	1154	7MG	C5-N7	3.57	1.39	1.35
3	Y	1152	GDP	C5-C6	-2.64	1.42	1.47
3	Y	1152	GDP	C8-N7	-2.45	1.30	1.35
3	X	1153	GDP	C8-N7	-2.24	1.31	1.35
3	X	1153	GDP	C5-C6	-2.15	1.43	1.47

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	Y	1153	7MG	N9-C8-N7	6.51	112.69	103.38
4	X	1154	7MG	N9-C8-N7	6.49	112.66	103.38
4	X	1154	7MG	C4-C5-N7	4.35	111.58	105.53
4	Y	1153	7MG	C4-C5-N7	4.28	111.47	105.53
3	Y	1152	GDP	O2B-PB-O1B	2.26	119.51	110.68
3	X	1153	GDP	O2B-PB-O1B	2.23	119.39	110.68
3	X	1153	GDP	O6-C6-C5	2.16	128.60	124.37
3	Y	1152	GDP	O6-C6-C5	2.07	128.42	124.37
3	X	1153	GDP	O3B-PB-O3A	-2.02	97.85	104.64

There are no chirality outliers.

All (8) torsion outliers are listed below:

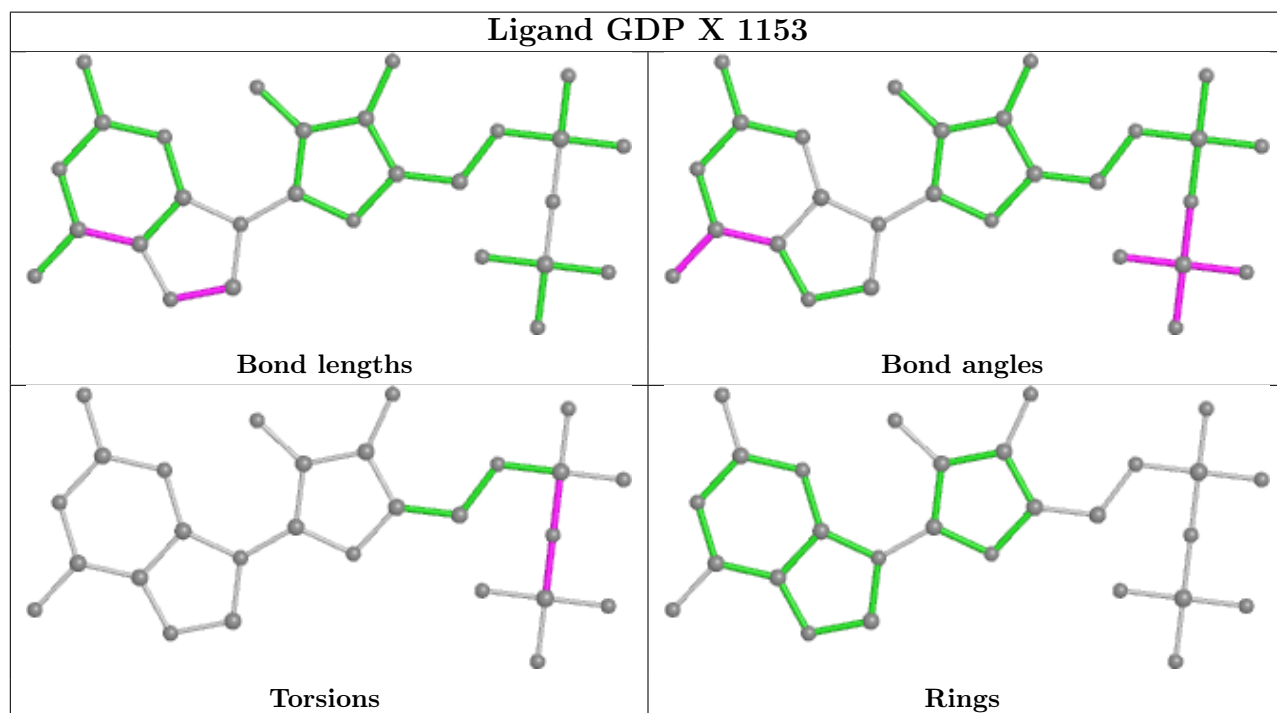
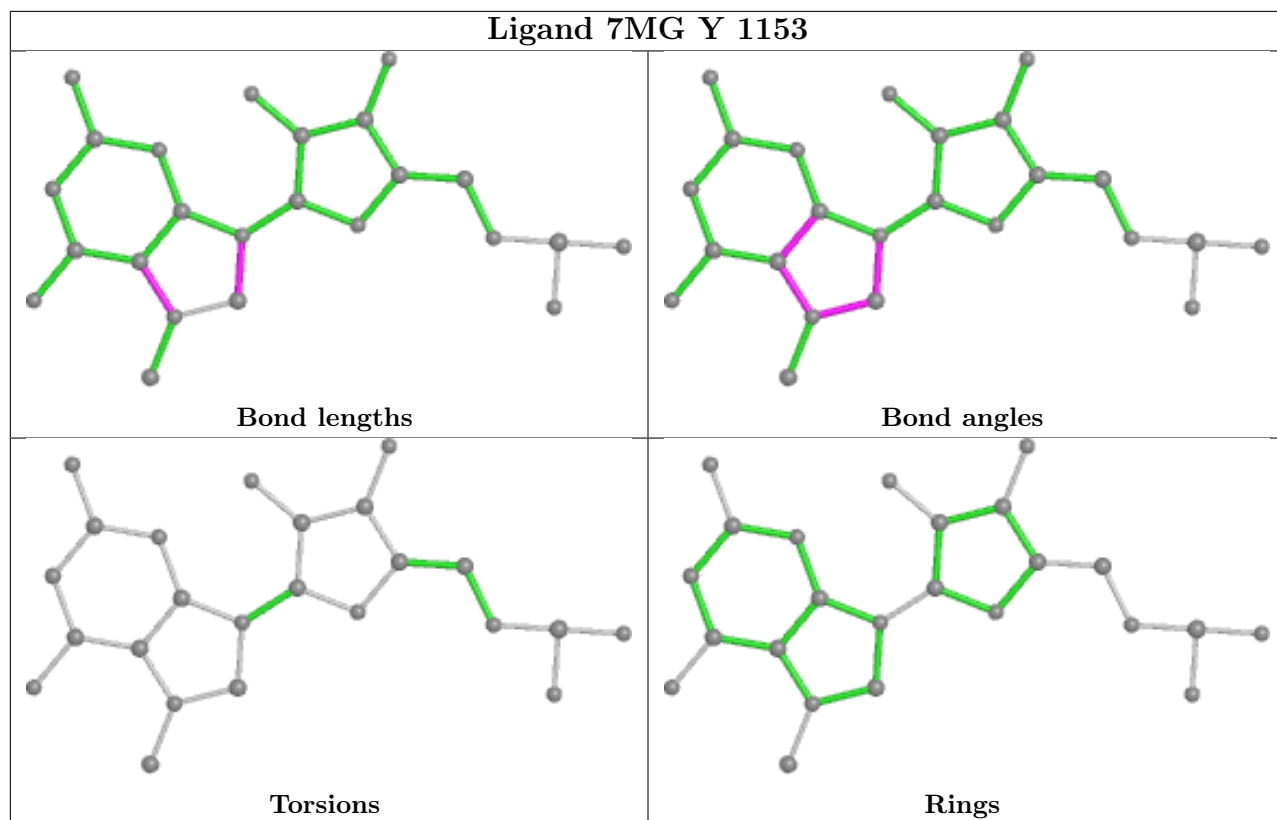
Mol	Chain	Res	Type	Atoms
3	X	1153	GDP	PA-O3A-PB-O3B
3	Y	1152	GDP	C5'-O5'-PA-O1A
3	Y	1152	GDP	C4'-C5'-O5'-PA
3	Y	1152	GDP	C5'-O5'-PA-O2A
3	X	1153	GDP	PB-O3A-PA-O1A
3	X	1153	GDP	PB-O3A-PA-O2A
3	Y	1152	GDP	C5'-O5'-PA-O3A
3	Y	1152	GDP	O4'-C4'-C5'-O5'

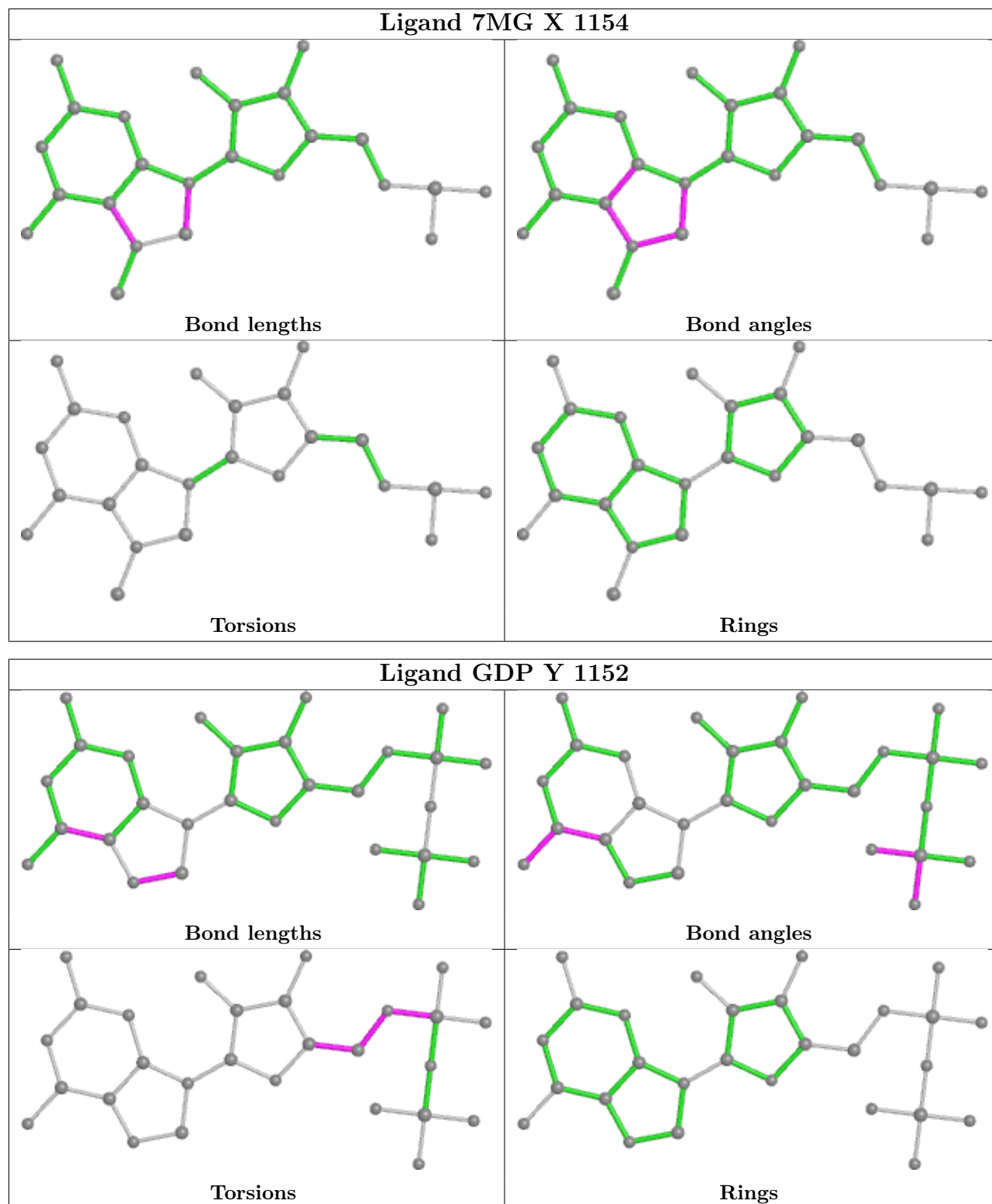
There are no ring outliers.

4 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	Y	1153	7MG	1	0
3	X	1153	GDP	1	0
4	X	1154	7MG	1	0
3	Y	1152	GDP	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

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	706/723 (97%)	-0.47	13 (1%) 68 66	18, 35, 62, 91	0
1	B	706/723 (97%)	-0.52	9 (1%) 77 75	18, 34, 60, 80	0
2	X	149/156 (95%)	-0.29	3 (2%) 65 63	20, 37, 70, 75	0
2	Y	147/156 (94%)	-0.61	1 (0%) 87 86	17, 29, 53, 68	0
All	All	1708/1758 (97%)	-0.49	26 (1%) 73 72	17, 34, 61, 91	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	526	ASN	3.8
1	A	41	LYS	3.7
2	X	140	GLN	3.6
1	A	527	PRO	3.6
1	B	262	GLU	3.5
1	A	490	GLU	3.5
2	X	152	LEU	3.4
1	B	652	VAL	3.2
1	A	732	GLY	3.1
1	B	538	SER	2.9
1	A	493	ASN	2.9
2	Y	5	LEU	2.8
1	A	26	GLU	2.7
1	B	160	ASP	2.6
1	A	652	VAL	2.5
1	B	41	LYS	2.5
1	B	278	GLU	2.5
1	A	299	GLU	2.5
1	A	653	GLY	2.3
1	A	651	HIS	2.3
1	A	525	PRO	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	28	GLU	2.2
2	X	129	ARG	2.1
1	B	27	THR	2.1
1	B	523	ASP	2.0
1	A	343	ASN	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 [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

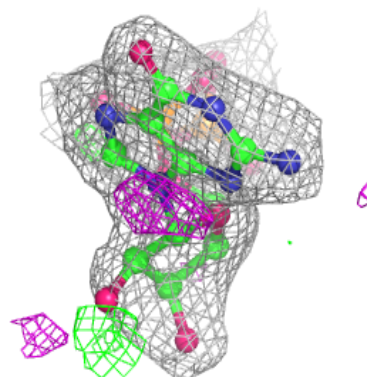
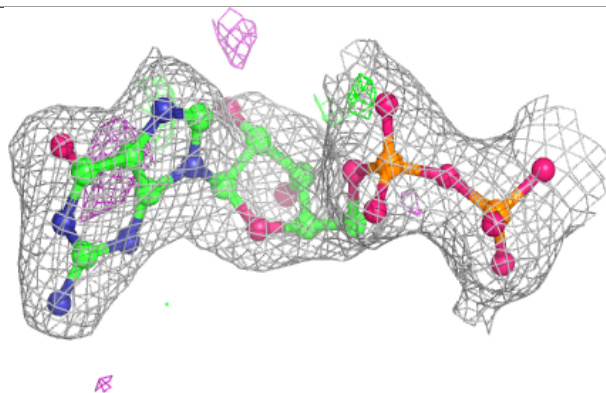
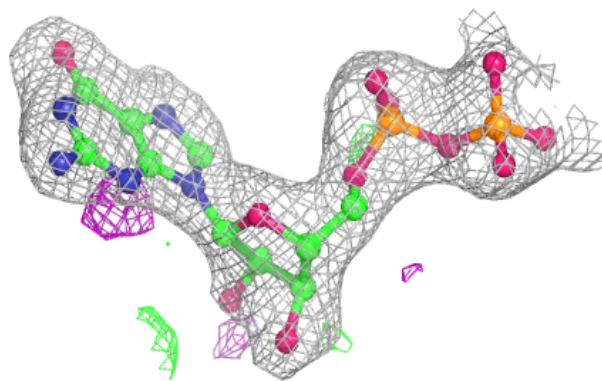
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
3	GDP	X	1153	28/28	0.95	0.13	39,50,59,65	0
3	GDP	Y	1152	28/28	0.95	0.17	30,73,79,82	0
4	7MG	X	1154	24/25	0.98	0.08	17,27,41,46	0
4	7MG	Y	1153	24/25	0.98	0.09	17,25,28,35	0

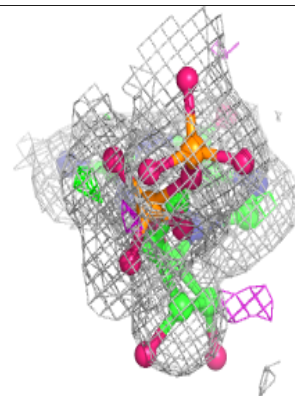
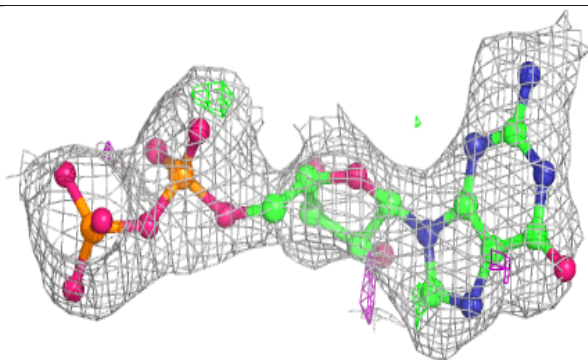
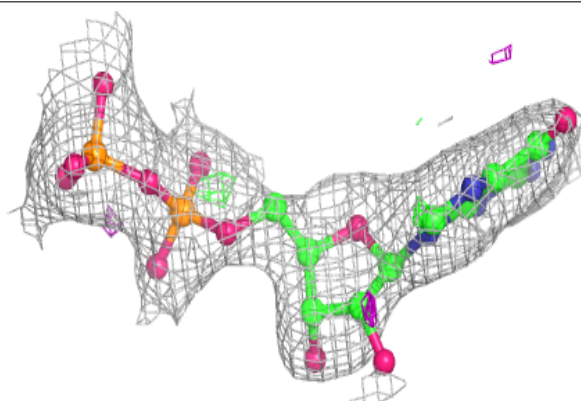
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around GDP X 1153:**

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

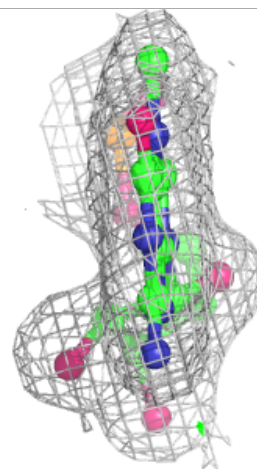
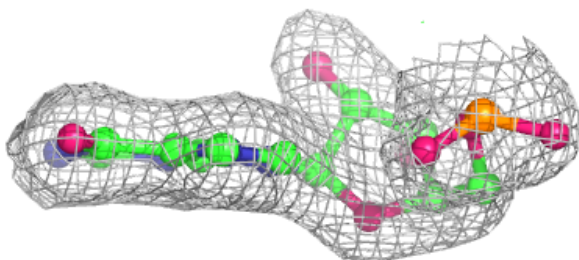
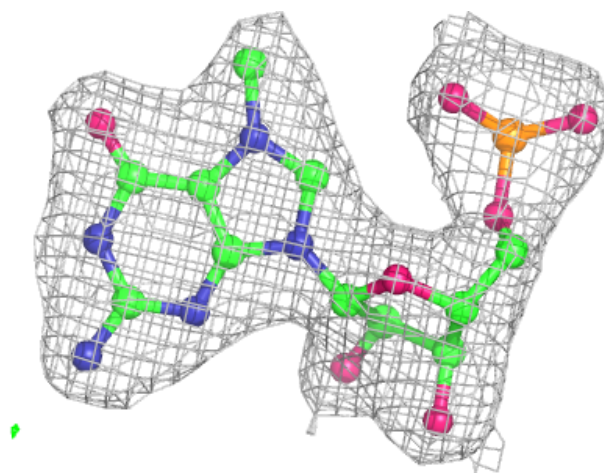
**Electron density around GDP Y 1152:**

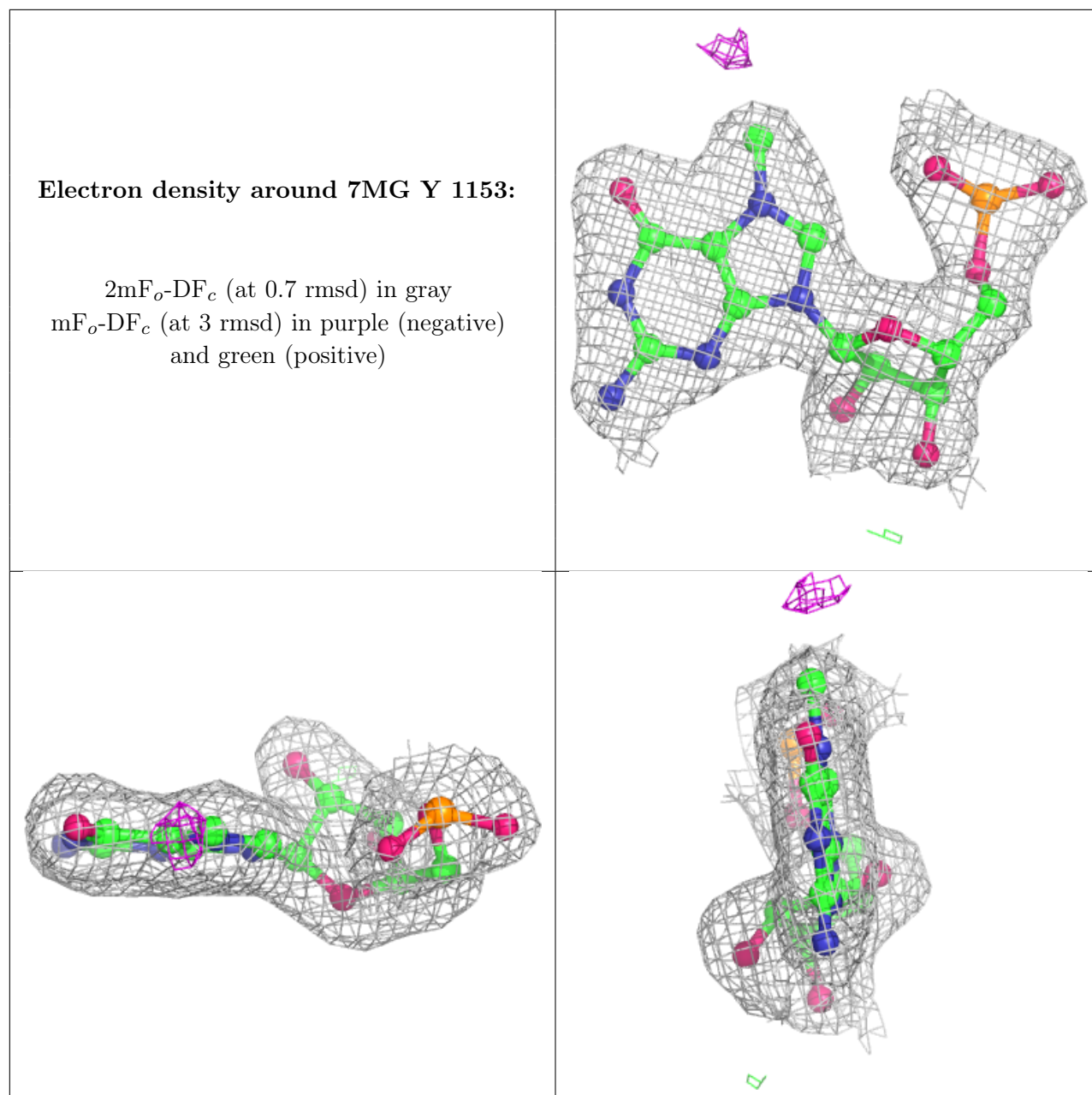
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around 7MG X 1154:**

$2mF_o-DF_c$  (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.