



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 6, 2020 – 07:20 PM BST

PDB ID : 6VJF  
Title : The P-Loop K to A mutation of C. therm Vps1 GTPase-BSE  
Authors : Tornabene, B.A.; Varlakhanova, N.V.; Chappie, J.S.; Ford, M.G.J.  
Deposited on : 2020-01-15  
Resolution : 2.47 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.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.13.1  
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) : 2.13.1

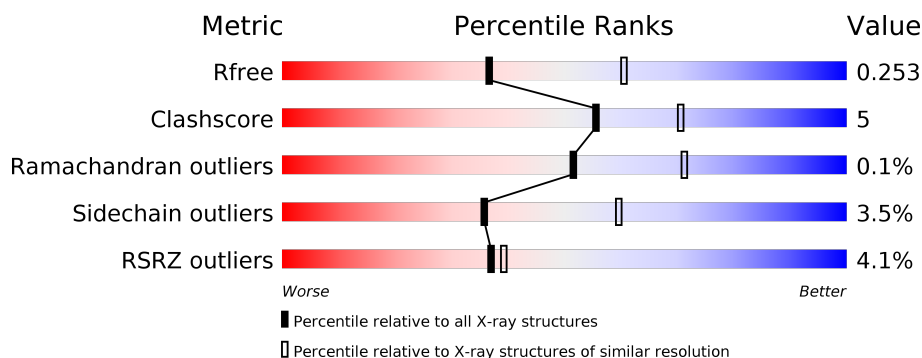
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.47 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	5857 (2.50-2.46)
Clashscore	141614	6594 (2.50-2.46)
Ramachandran outliers	138981	6469 (2.50-2.46)
Sidechain outliers	138945	6471 (2.50-2.46)
RSRZ outliers	127900	5738 (2.50-2.46)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	391	<div> <div>6%</div> <div> <div></div> <div>77%</div> <div>15%</div> <div>• 8%</div> </div> </div>
1	B	391	<div> <div>%</div> <div> <div></div> <div>81%</div> <div>10%</div> <div>• 8%</div> </div> </div>
1	C	391	<div> <div>3%</div> <div> <div></div> <div>80%</div> <div>13%</div> <div>• 7%</div> </div> </div>
1	D	391	<div> <div>5%</div> <div> <div></div> <div>76%</div> <div>12%</div> <div>• 11%</div> </div> </div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 11383 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Putative sorting protein Vps1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	361	Total	C	N	O	S	0	0	0
			2833	1777	513	536	7			
1	B	358	Total	C	N	O	S	0	0	0
			2801	1759	507	528	7			
1	C	365	Total	C	N	O	S	0	0	0
			2850	1792	514	537	7			
1	D	348	Total	C	N	O	S	0	0	0
			2714	1707	490	510	7			

There are 44 discrepancies between the modelled and reference sequences:

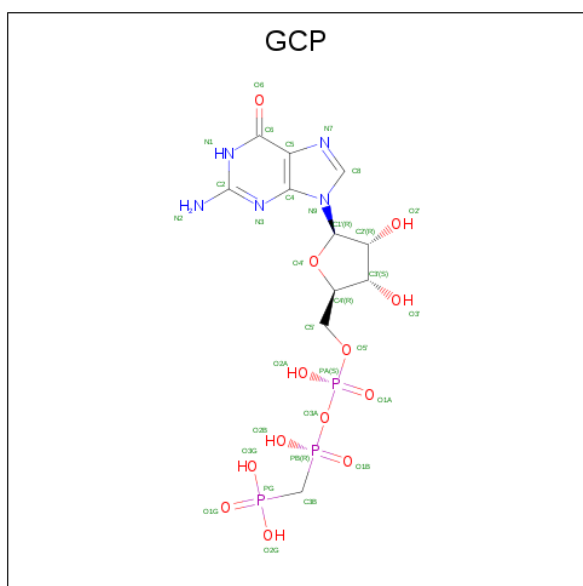
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP G0SFF0
A	0	PRO	-	expression tag	UNP G0SFF0
A	56	ALA	LYS	engineered mutation	UNP G0SFF0
A	661	LEU	-	linker	UNP G0SFF0
A	662	LEU	-	linker	UNP G0SFF0
A	663	GLY	-	linker	UNP G0SFF0
A	664	ALA	-	linker	UNP G0SFF0
A	665	GLY	-	linker	UNP G0SFF0
A	666	ALA	-	linker	UNP G0SFF0
A	667	GLY	-	linker	UNP G0SFF0
A	668	ALA	-	linker	UNP G0SFF0
B	-1	GLY	-	expression tag	UNP G0SFF0
B	0	PRO	-	expression tag	UNP G0SFF0
B	56	ALA	LYS	engineered mutation	UNP G0SFF0
B	661	LEU	-	linker	UNP G0SFF0
B	662	LEU	-	linker	UNP G0SFF0
B	663	GLY	-	linker	UNP G0SFF0
B	664	ALA	-	linker	UNP G0SFF0
B	665	GLY	-	linker	UNP G0SFF0
B	666	ALA	-	linker	UNP G0SFF0
B	667	GLY	-	linker	UNP G0SFF0

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Chain	Residue	Modelled	Actual	Comment	Reference
B	668	ALA	-	linker	UNP G0SFF0
C	-1	GLY	-	expression tag	UNP G0SFF0
C	0	PRO	-	expression tag	UNP G0SFF0
C	56	ALA	LYS	engineered mutation	UNP G0SFF0
C	352	LEU	-	linker	UNP G0SFF0
C	353	LEU	-	linker	UNP G0SFF0
C	663	GLY	-	linker	UNP G0SFF0
C	664	ALA	-	linker	UNP G0SFF0
C	665	GLY	-	linker	UNP G0SFF0
C	666	ALA	-	linker	UNP G0SFF0
C	667	GLY	-	linker	UNP G0SFF0
C	668	ALA	-	linker	UNP G0SFF0
D	-1	GLY	-	expression tag	UNP G0SFF0
D	0	PRO	-	expression tag	UNP G0SFF0
D	56	ALA	LYS	engineered mutation	UNP G0SFF0
D	661	LEU	-	linker	UNP G0SFF0
D	662	LEU	-	linker	UNP G0SFF0
D	663	GLY	-	linker	UNP G0SFF0
D	664	ALA	-	linker	UNP G0SFF0
D	665	GLY	-	linker	UNP G0SFF0
D	666	ALA	-	linker	UNP G0SFF0
D	667	GLY	-	linker	UNP G0SFF0
D	668	ALA	-	linker	UNP G0SFF0

- Molecule 2 is PHOSPHOMETHYLPHOSPHONIC ACID GUANYLATE ESTER (three-letter code: GCP) (formula:  $C_{11}H_{18}N_5O_{13}P_3$ ) (labeled as "Ligand of Interest" by author).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			32	11	5	13	3		
2	B	1	Total	C	N	O	P	0	0
			32	11	5	13	3		
2	C	1	Total	C	N	O	P	0	0
			32	11	5	13	3		
2	D	1	Total	C	N	O	P	0	0
			32	11	5	13	3		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Mg	0	0
			1	1		
3	A	1	Total	Mg	0	0
			1	1		
3	D	1	Total	Mg	0	0
			1	1		
3	C	1	Total	Mg	0	0
			1	1		

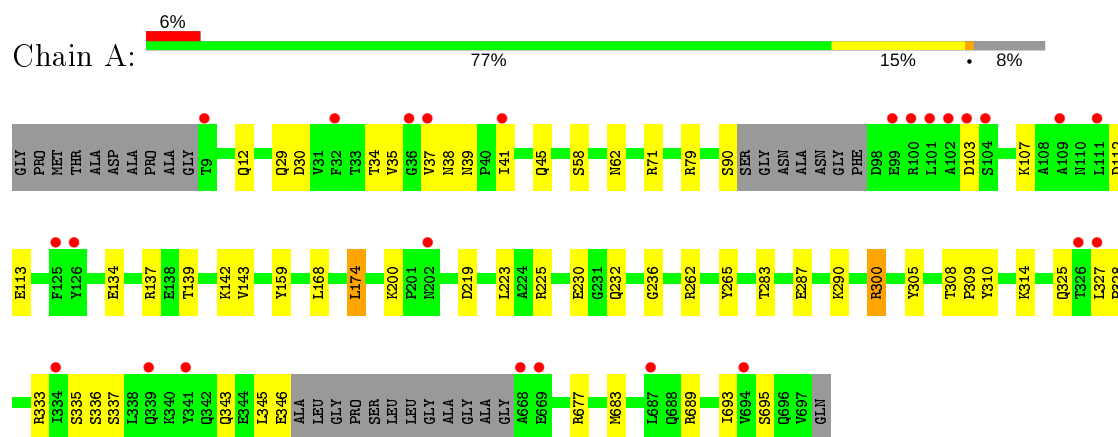
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	11	Total	O	0	0
			11	11		
4	B	15	Total	O	0	0
			15	15		
4	C	8	Total	O	0	0
			8	8		
4	D	19	Total	O	0	0
			19	19		

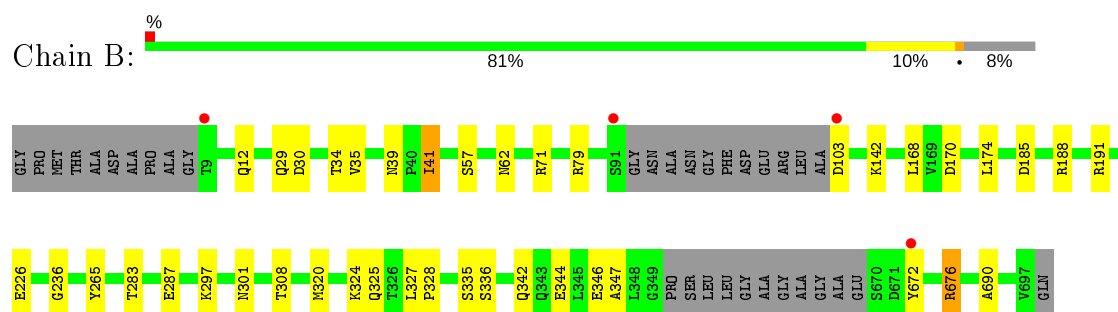
### 3 Residue-property plots [i](#)

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.

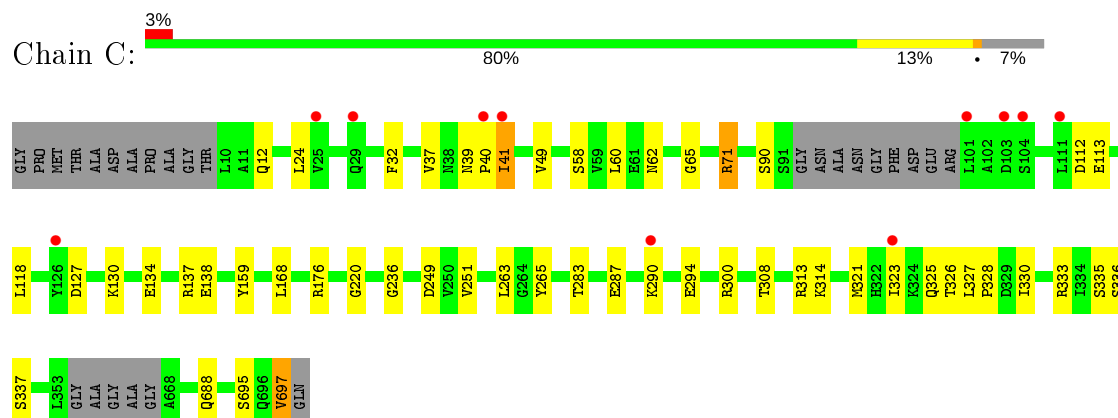
#### • Molecule 1: Putative sorting protein Vps1



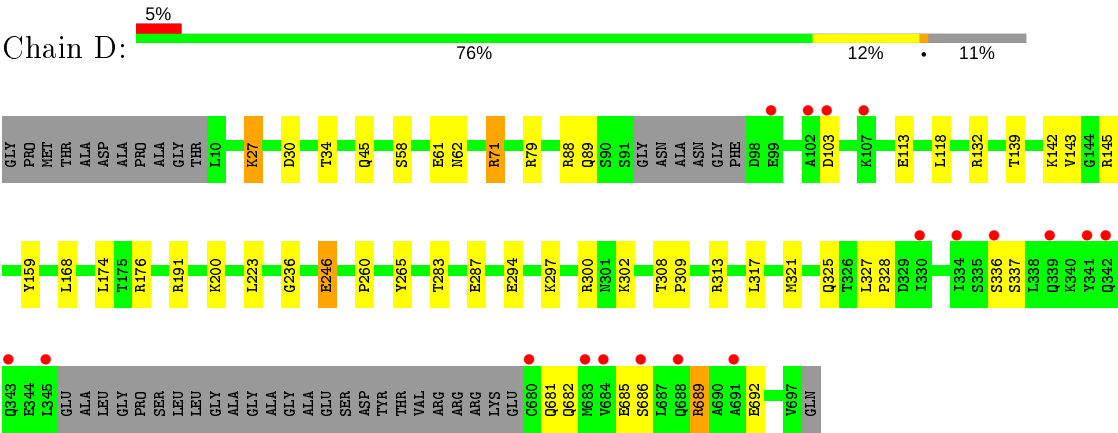
#### • Molecule 1: Putative sorting protein Vps1



#### • Molecule 1: Putative sorting protein Vps1



● Molecule 1: Putative sorting protein Vps1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	81.87Å 119.03Å 84.58Å 90.00° 100.95° 90.00°	Depositor
Resolution (Å)	80.38 – 2.47 80.38 – 2.47	Depositor EDS
% Data completeness (in resolution range)	99.2 (80.38-2.47) 99.2 (80.38-2.47)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.86 (at 2.48Å)	Xtriage
Refinement program	REFMAC 5.8.0253	Depositor
R, $R_{free}$	0.189 , 0.238 0.211 , 0.253	Depositor DCC
$R_{free}$ test set	2807 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	55.9	Xtriage
Anisotropy	0.070	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 35.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.016 for l,-k,h	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	11383	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.80% 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: GCP, MG

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	0.74	0/2872	0.91	0/3888
1	B	0.80	0/2840	0.94	3/3845 (0.1%)
1	C	0.73	0/2890	0.89	1/3914 (0.0%)
1	D	0.79	1/2752 (0.0%)	0.95	3/3728 (0.1%)
All	All	0.76	1/11354 (0.0%)	0.92	7/15375 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	246	GLU	CD-OE1	5.48	1.31	1.25

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	132	ARG	NE-CZ-NH2	-6.80	116.90	120.30
1	B	71	ARG	NE-CZ-NH2	-6.59	117.01	120.30
1	B	672	TYR	CB-CG-CD1	-6.43	117.14	121.00
1	C	71	ARG	NE-CZ-NH2	-6.07	117.26	120.30
1	D	71	ARG	NE-CZ-NH2	-6.06	117.27	120.30
1	D	71	ARG	NE-CZ-NH1	5.59	123.10	120.30
1	B	672	TYR	CB-CG-CD2	5.20	124.12	121.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	103	ASP	Peptide

## 5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2833	0	2910	37	0
1	B	2801	0	2884	23	0
1	C	2850	0	2938	31	0
1	D	2714	0	2795	29	0
2	A	32	0	14	0	0
2	B	32	0	14	0	0
2	C	32	0	14	0	0
2	D	32	0	14	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	11	0	0	0	0
4	B	15	0	0	0	0
4	C	8	0	0	0	0
4	D	19	0	0	1	0
All	All	11383	0	11583	116	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 5.

All (116) 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:37:VAL:HG12	1:A:38:ASN:O	1.71	0.91
1:A:174:LEU:HD11	1:A:223:LEU:HD12	1.54	0.89
1:B:30:ASP:O	1:B:34:THR:HG23	1.75	0.85
1:D:30:ASP:O	1:D:34:THR:HG23	1.77	0.84

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:174:LEU:HD13	1:A:219:ASP:HB3	1.58	0.84
1:A:29:GLN:HG2	1:A:39:ASN:HD22	1.47	0.79
1:C:12:GLN:HE22	1:C:65:GLY:HA3	1.49	0.78
1:C:176:ARG:CZ	1:D:176:ARG:HD2	2.16	0.76
1:B:191:ARG:NH1	1:B:226:GLU:OE1	2.17	0.74
1:A:174:LEU:HD11	1:A:223:LEU:CD1	2.20	0.70
1:B:342:GLN:O	1:B:346:GLU:CG	2.41	0.68
1:C:12:GLN:NE2	1:C:65:GLY:HA3	2.09	0.68
1:C:127:ASP:HB3	1:C:130:LYS:HE2	1.75	0.67
1:C:294:GLU:O	1:C:300:ARG:HG2	1.94	0.67
1:A:45:GLN:OE1	1:A:200:LYS:HD3	1.93	0.67
1:A:230:GLU:OE1	1:A:232:GLN:HB2	1.97	0.65
1:C:176:ARG:NH2	1:D:176:ARG:HD2	2.13	0.64
1:B:191:ARG:HH12	1:B:226:GLU:CD	2.01	0.63
1:D:62:ASN:HB3	1:D:308:THR:HG21	1.82	0.61
1:B:342:GLN:O	1:B:346:GLU:HG2	2.01	0.61
1:A:39:ASN:HD21	1:A:41:ILE:HD12	1.66	0.60
1:C:41:ILE:HD12	1:C:41:ILE:H	1.66	0.60
1:B:342:GLN:O	1:B:346:GLU:HG3	2.01	0.60
1:A:62:ASN:HB3	1:A:308:THR:HG21	1.84	0.59
1:D:313:ARG:O	1:D:317:LEU:HD23	2.02	0.59
1:D:689:ARG:NH2	1:D:692:GLU:OE2	2.35	0.59
1:C:249:ASP:OD1	1:C:251:VAL:HG22	2.03	0.58
1:A:90:SER:HB3	1:A:112:ASP:OD1	2.04	0.58
1:C:62:ASN:HB3	1:C:308:THR:HG21	1.84	0.58
1:B:320:MET:HE1	1:B:324:LYS:HE3	1.87	0.56
1:A:29:GLN:CG	1:A:39:ASN:HD22	2.16	0.56
1:A:343:GLN:O	1:A:346:GLU:OE2	2.24	0.56
1:D:88:ARG:NH1	1:D:89:GLN:O	2.40	0.55
1:C:323:ILE:O	1:C:326:THR:HG22	2.06	0.55
1:D:61:GLU:OE2	4:D:801:HOH:O	2.18	0.52
1:C:127:ASP:CB	1:C:130:LYS:HE2	2.39	0.52
1:D:45:GLN:OE1	1:D:200:LYS:HE3	2.10	0.52
1:C:37:VAL:HG22	1:C:333:ARG:NH1	2.26	0.51
1:C:263:LEU:O	1:C:314:LYS:HE2	2.10	0.51
1:A:343:GLN:O	1:A:346:GLU:CD	2.50	0.50
1:D:79:ARG:NH1	1:D:142:LYS:HG3	2.27	0.49
1:C:32:PHE:CE1	1:C:330:ILE:HG13	2.47	0.48
1:A:236:GLY:O	1:A:265:TYR:HA	2.14	0.48
1:A:29:GLN:HG2	1:A:39:ASN:ND2	2.23	0.48
1:D:294:GLU:O	1:D:300:ARG:HG3	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:79:ARG:NH1	1:B:142:LYS:HG3	2.29	0.47
1:C:236:GLY:O	1:C:265:TYR:HA	2.14	0.47
1:A:79:ARG:NH1	1:A:142:LYS:HG3	2.30	0.47
1:B:344:GLU:O	1:B:347:ALA:HB3	2.15	0.47
1:B:236:GLY:O	1:B:265:TYR:HA	2.15	0.47
1:C:24:LEU:HD21	1:C:323:ILE:HG21	1.97	0.46
1:D:682:GLN:CD	1:D:682:GLN:H	2.19	0.46
1:A:305:TYR:HD1	1:A:310:TYR:CE1	2.33	0.46
1:C:138:GLU:OE1	1:C:138:GLU:HA	2.15	0.46
1:A:12:GLN:HG3	1:A:12:GLN:O	2.15	0.46
1:A:300:ARG:HG2	1:D:260:PRO:HB2	1.98	0.46
1:B:35:VAL:HG11	1:B:690:ALA:HB2	1.98	0.46
1:D:174:LEU:HA	1:D:174:LEU:HD12	1.80	0.45
1:B:185:ASP:OD2	1:B:188:ARG:NH1	2.47	0.45
1:C:283:THR:O	1:C:287:GLU:HG3	2.17	0.45
1:C:24:LEU:CD2	1:C:323:ILE:HG21	2.46	0.45
1:B:62:ASN:HB3	1:B:308:THR:HG21	1.99	0.45
1:A:35:VAL:HG22	1:A:35:VAL:O	2.17	0.45
1:A:308:THR:N	1:A:309:PRO:CD	2.79	0.45
1:C:118:LEU:HD23	1:C:118:LEU:HA	1.84	0.45
1:C:176:ARG:NH2	1:D:176:ARG:CD	2.79	0.44
1:A:30:ASP:O	1:A:34:THR:HG23	2.17	0.44
1:A:683:MET:CE	1:A:683:MET:HA	2.48	0.44
1:C:62:ASN:HB3	1:C:308:THR:CG2	2.47	0.44
1:C:327:LEU:HD11	1:C:697:VAL:HG21	2.00	0.44
1:A:58:SER:HA	1:A:71:ARG:HD3	1.99	0.44
1:B:57:SER:OG	1:B:170:ASP:OD2	2.35	0.44
1:A:283:THR:O	1:A:287:GLU:HG3	2.19	0.43
1:B:41:ILE:N	1:B:41:ILE:HD13	2.34	0.43
1:A:168:LEU:HD12	1:A:168:LEU:N	2.34	0.43
1:B:35:VAL:HG11	1:B:690:ALA:CB	2.49	0.43
1:D:191:ARG:HG3	1:D:223:LEU:HD21	2.01	0.43
1:D:236:GLY:O	1:D:265:TYR:HA	2.18	0.43
1:A:62:ASN:HB3	1:A:308:THR:CG2	2.49	0.43
1:B:29:GLN:HG2	1:B:39:ASN:ND2	2.34	0.43
1:B:327:LEU:N	1:B:328:PRO:CD	2.82	0.42
1:D:118:LEU:HD12	1:D:118:LEU:HA	1.92	0.42
1:D:168:LEU:N	1:D:168:LEU:HD12	2.34	0.42
1:D:681:GLN:O	1:D:685:GLU:HG3	2.18	0.42
1:C:58:SER:HA	1:C:71:ARG:HD3	2.01	0.42
1:D:308:THR:N	1:D:309:PRO:CD	2.82	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:676:ARG:HA	1:B:676:ARG:HD2	1.60	0.42
1:C:134:GLU:OE1	1:C:137:ARG:NH1	2.49	0.42
1:A:37:VAL:HG22	1:A:333:ARG:NH1	2.35	0.42
1:A:232:GLN:HE22	1:A:262:ARG:NH2	2.18	0.42
1:D:88:ARG:HH11	1:D:88:ARG:HG3	1.84	0.42
1:D:58:SER:HA	1:D:71:ARG:HD3	2.01	0.42
1:C:327:LEU:N	1:C:328:PRO:CD	2.83	0.41
1:A:139:THR:O	1:A:143:VAL:HG22	2.19	0.41
1:C:168:LEU:N	1:C:168:LEU:HD12	2.35	0.41
1:D:27:LYS:HA	1:D:27:LYS:HD3	1.79	0.41
1:B:174:LEU:HA	1:B:174:LEU:HD12	1.90	0.41
1:D:139:THR:O	1:D:143:VAL:HG22	2.21	0.41
1:D:327:LEU:N	1:D:328:PRO:CD	2.83	0.41
1:A:113:GLU:HA	1:A:159:TYR:O	2.21	0.41
1:A:37:VAL:CG1	1:A:38:ASN:O	2.56	0.41
1:B:168:LEU:N	1:B:168:LEU:HD12	2.36	0.41
1:A:327:LEU:N	1:A:328:PRO:CD	2.84	0.41
1:B:191:ARG:NH1	1:B:226:GLU:CD	2.71	0.41
1:C:90:SER:CB	1:C:112:ASP:OD1	2.69	0.41
1:D:283:THR:O	1:D:287:GLU:HG3	2.20	0.41
1:D:62:ASN:HB3	1:D:308:THR:CG2	2.47	0.41
1:A:107:LYS:HA	1:A:107:LYS:HD3	1.89	0.41
1:C:113:GLU:HA	1:C:159:TYR:O	2.20	0.41
1:A:134:GLU:OE1	1:A:137:ARG:NH1	2.49	0.41
1:C:49:VAL:HG12	1:C:220:GLY:HA2	2.04	0.41
1:A:45:GLN:OE1	1:A:200:LYS:CD	2.66	0.40
1:A:689:ARG:NH1	1:A:693:ILE:HD11	2.36	0.40
1:B:283:THR:O	1:B:287:GLU:HG3	2.21	0.40
1:D:113:GLU:HA	1:D:159:TYR:O	2.21	0.40
1:C:60:LEU:HD12	1:C:60:LEU:HA	1.94	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	355/391 (91%)	344 (97%)	10 (3%)	1 (0%)	41	59
1	B	352/391 (90%)	345 (98%)	7 (2%)	0	100	100
1	C	359/391 (92%)	350 (98%)	8 (2%)	1 (0%)	41	59
1	D	342/391 (88%)	336 (98%)	6 (2%)	0	100	100
All	All	1408/1564 (90%)	1375 (98%)	31 (2%)	2 (0%)	51	71

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	40	PRO
1	A	345	LEU

### 5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	314/329 (95%)	303 (96%)	11 (4%)	36	59
1	B	311/329 (94%)	302 (97%)	9 (3%)	42	66
1	C	316/329 (96%)	304 (96%)	12 (4%)	33	56
1	D	301/329 (92%)	289 (96%)	12 (4%)	31	53
All	All	1242/1316 (94%)	1198 (96%)	44 (4%)	36	59

All (44) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	174	LEU
1	A	225	ARG
1	A	290	LYS
1	A	300	ARG
1	A	314	LYS
1	A	325	GLN

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Mol	Chain	Res	Type
1	A	335	SER
1	A	336	SER
1	A	337	SER
1	A	677	ARG
1	A	695	SER
1	B	12	GLN
1	B	41	ILE
1	B	103	ASP
1	B	297	LYS
1	B	301	ASN
1	B	325	GLN
1	B	335	SER
1	B	336	SER
1	B	676	ARG
1	C	39	ASN
1	C	41	ILE
1	C	290	LYS
1	C	313	ARG
1	C	321	MET
1	C	325	GLN
1	C	335	SER
1	C	336	SER
1	C	337	SER
1	C	688	GLN
1	C	695	SER
1	C	697	VAL
1	D	27	LYS
1	D	103	ASP
1	D	145	ARG
1	D	246	GLU
1	D	297	LYS
1	D	302	LYS
1	D	321	MET
1	D	325	GLN
1	D	336	SER
1	D	337	SER
1	D	686	SER
1	D	689	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	73	GLN
1	A	232	GLN
1	A	270	ASN
1	B	12	GLN
1	B	232	GLN
1	C	12	GLN
1	C	29	GLN
1	C	189	GLN
1	D	29	GLN
1	D	136	ASN
1	D	232	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z  > 2$	Counts	RMSZ	# $ Z  > 2$
2	GCP	D	701	3	26,34,34	2.50	7 (26%)	31,54,54	2.24	6 (19%)
2	GCP	A	701	3	26,34,34	2.45	8 (30%)	31,54,54	2.04	5 (16%)
2	GCP	C	701	3	26,34,34	2.71	9 (34%)	31,54,54	2.09	8 (25%)



Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	GCP	B	701	3	26,34,34	2.31	7 (26%)	31,54,54	2.19	9 (29%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GCP	D	701	3	-	1/18/38/38	0/3/3/3
2	GCP	A	701	3	-	3/18/38/38	0/3/3/3
2	GCP	C	701	3	-	1/18/38/38	0/3/3/3
2	GCP	B	701	3	-	1/18/38/38	0/3/3/3

All (31) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	701	GCP	C4-N9	-8.92	1.35	1.47
2	D	701	GCP	C4-N9	-8.57	1.36	1.47
2	A	701	GCP	C4-N9	-8.49	1.36	1.47
2	C	701	GCP	C4-N9	-7.96	1.37	1.47
2	C	701	GCP	C5-C6	-7.60	1.39	1.52
2	D	701	GCP	C5-C6	-6.37	1.41	1.52
2	A	701	GCP	C5-C6	-4.52	1.45	1.52
2	C	701	GCP	PB-O3A	4.27	1.63	1.58
2	A	701	GCP	PB-O2B	-4.10	1.46	1.56
2	B	701	GCP	C8-N9	-3.21	1.34	1.45
2	C	701	GCP	PB-O2B	-3.20	1.48	1.56
2	B	701	GCP	C5-C4	-3.13	1.33	1.53
2	C	701	GCP	C5-C4	-3.12	1.33	1.53
2	A	701	GCP	PB-O3A	-3.07	1.54	1.58
2	A	701	GCP	C5-C4	-3.04	1.34	1.53
2	D	701	GCP	C8-N9	-2.99	1.35	1.45
2	C	701	GCP	C8-N9	-2.80	1.36	1.45
2	A	701	GCP	C8-N9	-2.78	1.36	1.45
2	A	701	GCP	C6-N1	2.65	1.37	1.33
2	D	701	GCP	PB-O1B	-2.63	1.45	1.51
2	D	701	GCP	C5-C4	-2.60	1.37	1.53
2	B	701	GCP	PA-O1A	-2.60	1.41	1.50
2	B	701	GCP	C5-C6	-2.58	1.48	1.52
2	D	701	GCP	C6-N1	2.55	1.37	1.33
2	C	701	GCP	PA-O5'	2.51	1.69	1.59
2	B	701	GCP	C6-N1	2.47	1.37	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	701	GCP	C6-N1	2.39	1.37	1.33
2	A	701	GCP	PA-O1A	-2.23	1.43	1.50
2	B	701	GCP	PB-O1B	-2.20	1.46	1.51
2	C	701	GCP	C2-N1	-2.10	1.35	1.44
2	D	701	GCP	PA-O1A	-2.09	1.43	1.50

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	701	GCP	C4-C5-N7	6.33	110.85	102.46
2	B	701	GCP	C4-C5-N7	6.26	110.76	102.46
2	A	701	GCP	C4-C5-N7	6.11	110.56	102.46
2	D	701	GCP	C4-C5-N7	6.06	110.50	102.46
2	A	701	GCP	C5-C6-N1	-5.89	110.93	118.19
2	B	701	GCP	C5-C6-N1	-5.83	111.00	118.19
2	D	701	GCP	C5-C6-N1	-5.79	111.05	118.19
2	D	701	GCP	O1B-PB-C3B	5.06	122.44	109.07
2	C	701	GCP	C5-C6-N1	-4.90	112.15	118.19
2	C	701	GCP	O6-C6-C5	4.20	128.43	119.86
2	A	701	GCP	O6-C6-C5	4.14	128.31	119.86
2	B	701	GCP	O6-C6-C5	3.85	127.72	119.86
2	D	701	GCP	O6-C6-C5	3.76	127.53	119.86
2	D	701	GCP	O3G-PG-O1G	-3.37	103.48	112.39
2	D	701	GCP	O2G-PG-O1G	3.11	120.61	112.39
2	C	701	GCP	O1B-PB-C3B	3.07	117.18	109.07
2	B	701	GCP	O2G-PG-C3B	-3.05	99.00	106.40
2	B	701	GCP	O3G-PG-O2G	2.93	116.63	108.08
2	B	701	GCP	O3G-PG-O1G	2.91	120.08	112.39
2	C	701	GCP	O2G-PG-O1G	2.91	120.07	112.39
2	C	701	GCP	O1G-PG-C3B	-2.77	105.27	111.24
2	C	701	GCP	O2B-PB-O1B	2.70	119.09	110.07
2	A	701	GCP	O3'-C3'-C4'	-2.67	103.33	111.05
2	C	701	GCP	O6-C6-N1	-2.54	119.28	122.69
2	A	701	GCP	O5'-PA-O1A	2.39	118.39	109.07
2	B	701	GCP	O3G-PG-C3B	-2.28	100.86	106.40
2	B	701	GCP	O1G-PG-C3B	-2.17	106.56	111.24
2	B	701	GCP	O3'-C3'-C2'	-2.04	105.23	111.82

There are no chirality outliers.

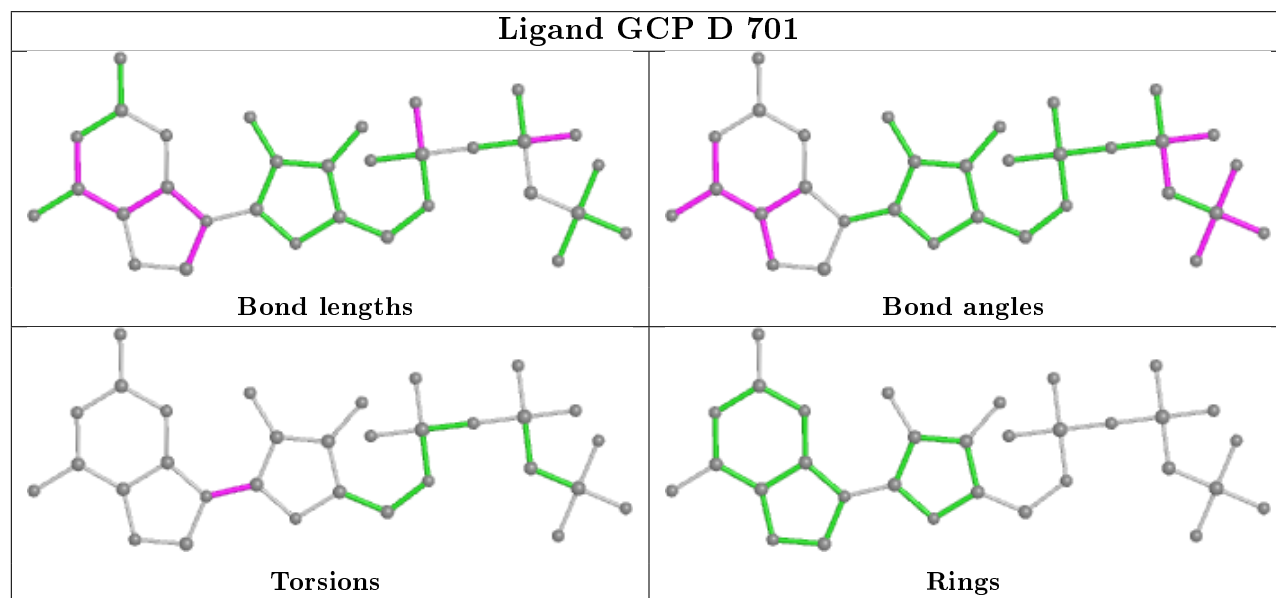
All (6) torsion outliers are listed below:

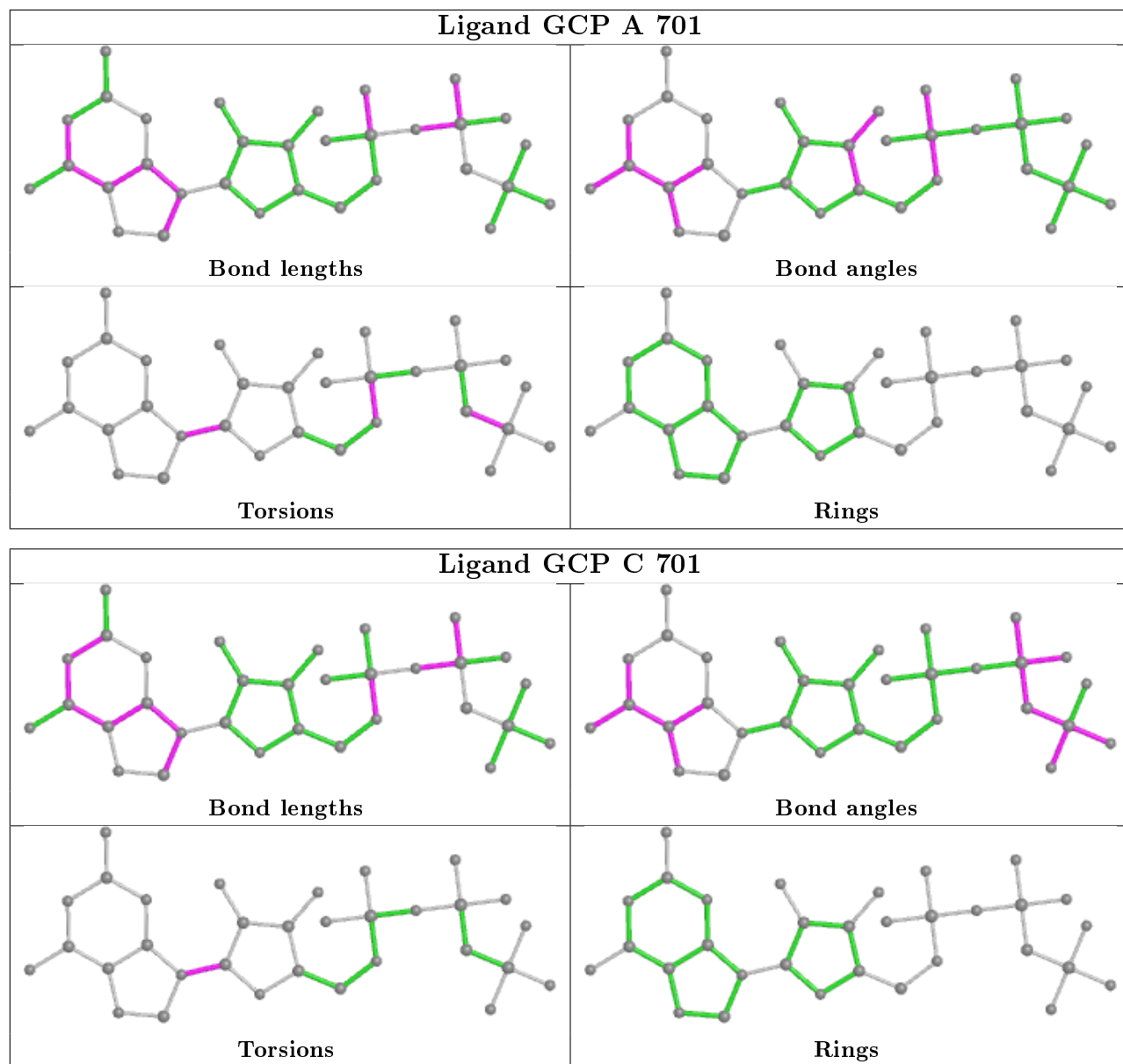
Mol	Chain	Res	Type	Atoms
2	D	701	GCP	C2'-C1'-N9-C4
2	A	701	GCP	C2'-C1'-N9-C4
2	C	701	GCP	C2'-C1'-N9-C4
2	B	701	GCP	C2'-C1'-N9-C4
2	A	701	GCP	C5'-O5'-PA-O3A
2	A	701	GCP	PB-C3B-PG-O1G

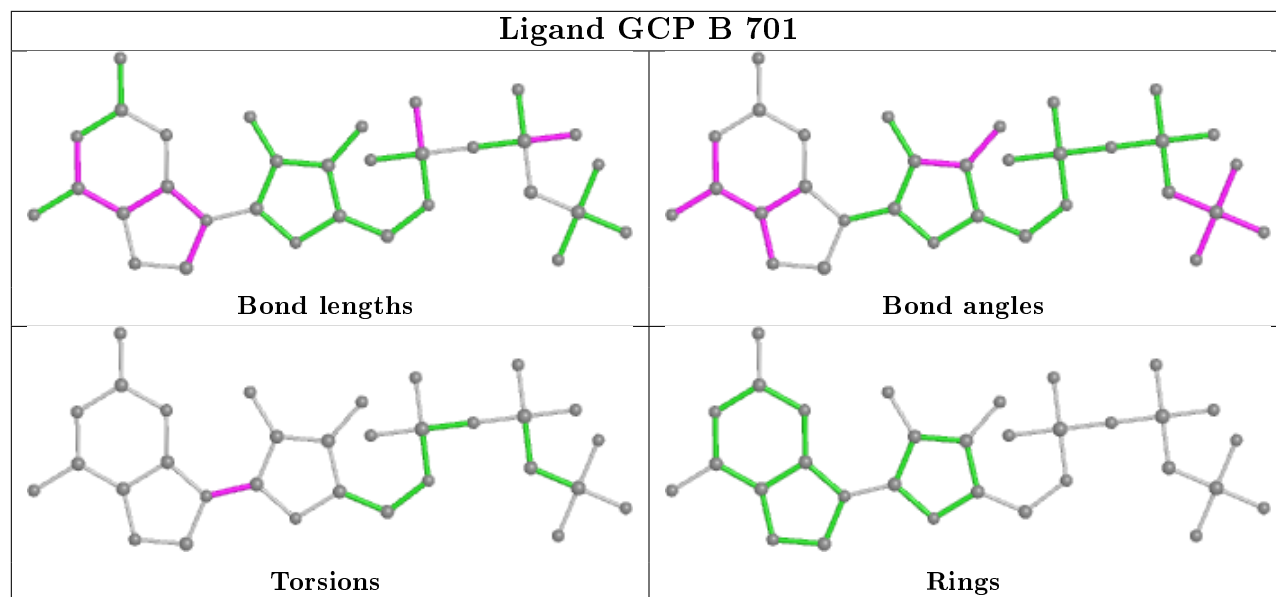
There are no ring outliers.

No monomer is involved in short contacts.

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 ⓘ

### 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	361/391 (92%)	0.45	25 (6%) 16 16	28, 48, 81, 93	0
1	B	358/391 (91%)	0.13	4 (1%) 80 82	25, 40, 68, 84	0
1	C	365/391 (93%)	0.24	11 (3%) 50 52	30, 51, 83, 119	0
1	D	348/391 (89%)	0.35	18 (5%) 27 28	26, 41, 73, 89	0
All	All	1432/1564 (91%)	0.30	58 (4%) 37 39	25, 45, 79, 119	0

All (58) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	341	TYR	6.2
1	C	40	PRO	5.9
1	A	334	ILE	4.6
1	D	343	GLN	4.3
1	C	101	LEU	4.2
1	A	36	GLY	3.7
1	A	37	VAL	3.7
1	A	668	ALA	3.7
1	A	100	ARG	3.6
1	D	691	ALA	3.4
1	A	103	ASP	3.3
1	C	41	ILE	3.2
1	A	102	ALA	3.1
1	A	32	PHE	3.1
1	D	102	ALA	3.0
1	A	327	LEU	3.0
1	A	111	LEU	3.0
1	C	103	ASP	2.9
1	D	336	SER	2.9
1	A	41	ILE	2.8
1	B	672	TYR	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	9	THR	2.7
1	C	126	TYR	2.7
1	D	680	CYS	2.7
1	B	103	ASP	2.7
1	A	326	THR	2.7
1	C	111	LEU	2.6
1	A	339	GLN	2.6
1	D	103	ASP	2.6
1	B	9	THR	2.5
1	A	101	LEU	2.5
1	C	323	ILE	2.5
1	A	202	ASN	2.5
1	C	290	LYS	2.5
1	D	339	GLN	2.4
1	A	669	GLU	2.4
1	A	687	LEU	2.4
1	A	104	SER	2.4
1	A	125	PHE	2.4
1	D	684	VAL	2.3
1	D	342	GLN	2.3
1	D	99	GLU	2.3
1	B	91	SER	2.3
1	A	99	GLU	2.3
1	A	109	ALA	2.3
1	D	683	MET	2.2
1	C	25	VAL	2.2
1	D	334	ILE	2.2
1	C	29	GLN	2.1
1	D	686	SER	2.2
1	A	694	VAL	2.1
1	A	126	TYR	2.1
1	A	341	TYR	2.1
1	D	107	LYS	2.1
1	D	330	ILE	2.1
1	D	345	LEU	2.1
1	C	104	SER	2.1
1	D	688	GLN	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

### 6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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.

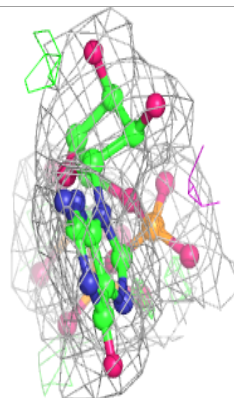
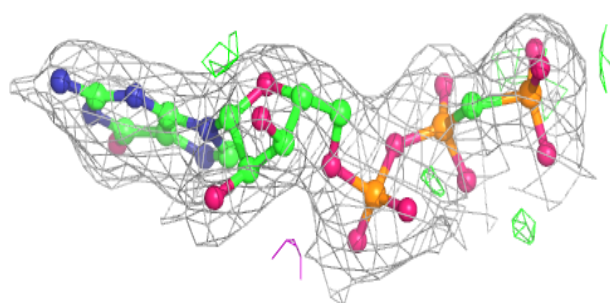
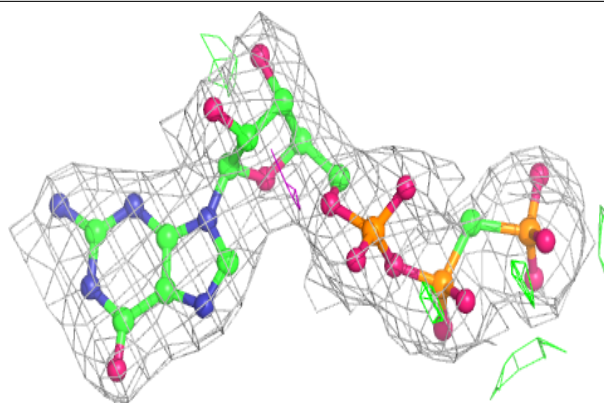
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	MG	C	702	1/1	0.94	0.21	41,41,41,41	0
3	MG	A	702	1/1	0.95	0.15	42,42,42,42	0
3	MG	B	702	1/1	0.96	0.24	38,38,38,38	0
3	MG	D	702	1/1	0.97	0.22	45,45,45,45	0
2	GCP	B	701	32/32	0.98	0.17	25,31,35,37	0
2	GCP	C	701	32/32	0.99	0.15	26,32,37,39	0
2	GCP	D	701	32/32	0.99	0.17	25,29,33,34	0
2	GCP	A	701	32/32	0.99	0.15	23,31,34,35	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.

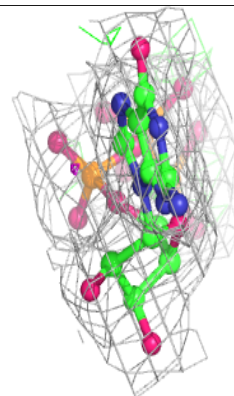
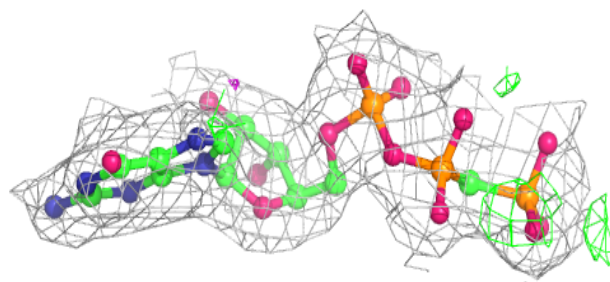
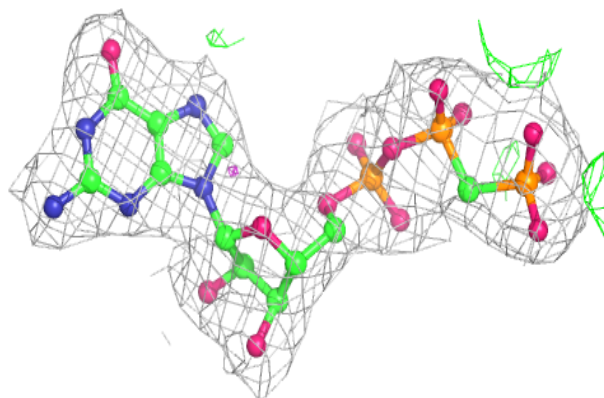


**Electron density around GCP B 701:**

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

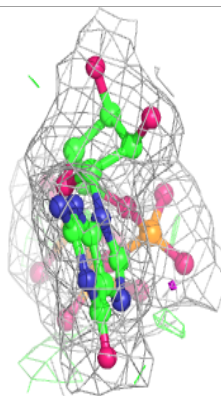
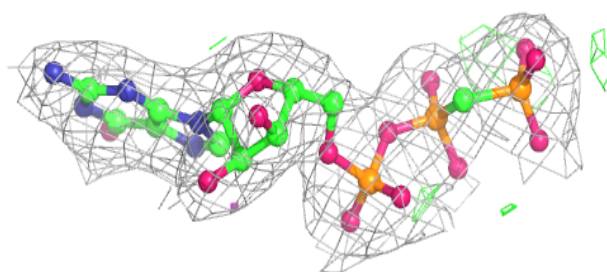
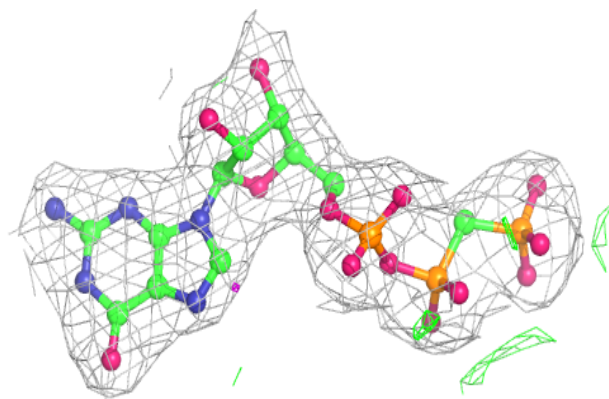
**Electron density around GCP C 701:**

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

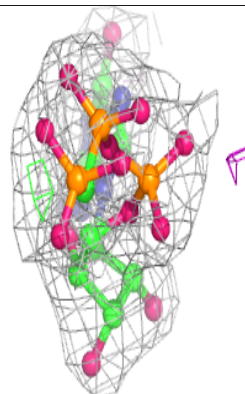
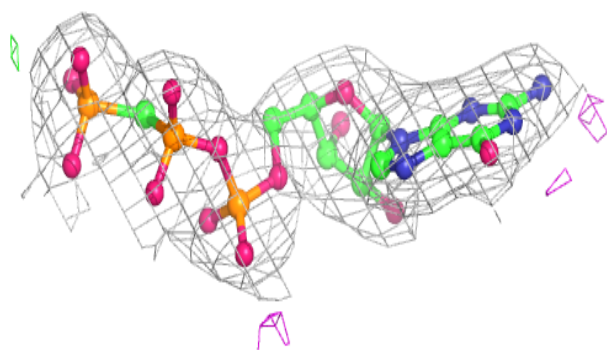
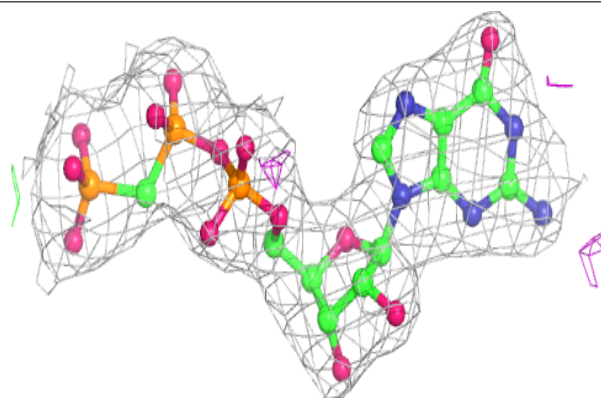


**Electron density around GCP D 701:**

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

**Electron density around GCP A 701:**

$2mF_o-DF_c$  (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.