



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 13, 2023 – 02:24 AM EDT

PDB ID : 4OIP  
Title : Crystal structure of *Thermus thermophilus* transcription initiation complex soaked with GE23077, ATP, and CMPcPP  
Authors : Zhang, Y.; Ebright, R.H.; Arnold, E.  
Deposited on : 2014-01-20  
Resolution : 3.40 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 : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.35.1  
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) : 2.35.1

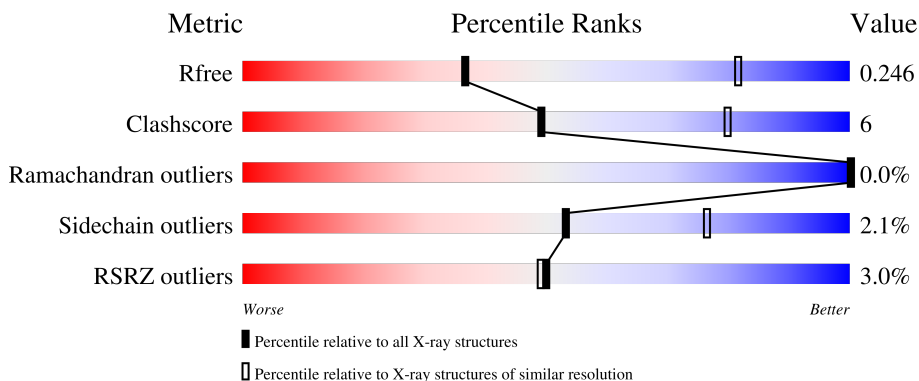
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.40 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.



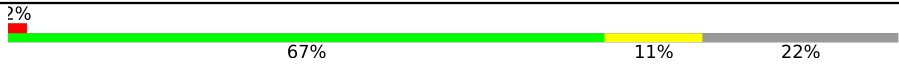



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1026 (3.48-3.32)
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)
RSRZ outliers	127900	2173 (3.50-3.30)

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	315	 2% 60% 13% 25%
1	B	315	 2% 57% 14% 27%
2	C	1119	 2% 83% 16% 1%
3	D	1524	 4% 80% 17% 1%
4	E	99	 2% 84% 10% 5%

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Mol	Chain	Length	Quality of chain
5	F	443	 2% 67% 11% 22%
6	G	21	 71% 5% 24%
7	H	27	 44% 44% 11%
8	I	7	 43% 57%

## 2 Entry composition

There are 13 unique types of molecules in this entry. The entry contains 28603 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 DNA-directed RNA polymerase subunit alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	231	Total	C	N	O	S	0	0	0
			1809	1155	315	337	2			
1	B	227	Total	C	N	O	S	0	0	0
			1789	1143	310	334	2			

- Molecule 2 is a protein called DNA-directed RNA polymerase subunit beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	1112	Total	C	N	O	S	0	0	0
			8774	5550	1565	1635	24			

- Molecule 3 is a protein called DNA-directed RNA polymerase subunit beta'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	D	1486	Total	C	N	O	S	0	1	0
			11746	7446	2070	2195	35			

- Molecule 4 is a protein called DNA-directed RNA polymerase subunit omega.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	E	94	Total	C	N	O	S	0	0	0
			758	483	132	139	4			

- Molecule 5 is a protein called DNA directed RNA polymerase sigma factor A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	F	346	Total	C	N	O	S	0	0	0
			2807	1770	509	524	4			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	-19	MET	-	expression tag	UNP Q5SKW1
F	-18	GLY	-	expression tag	UNP Q5SKW1
F	-17	SER	-	expression tag	UNP Q5SKW1
F	-16	SER	-	expression tag	UNP Q5SKW1
F	-15	HIS	-	expression tag	UNP Q5SKW1
F	-14	HIS	-	expression tag	UNP Q5SKW1
F	-13	HIS	-	expression tag	UNP Q5SKW1
F	-12	HIS	-	expression tag	UNP Q5SKW1
F	-11	HIS	-	expression tag	UNP Q5SKW1
F	-10	HIS	-	expression tag	UNP Q5SKW1
F	-9	SER	-	expression tag	UNP Q5SKW1
F	-8	SER	-	expression tag	UNP Q5SKW1
F	-7	GLY	-	expression tag	UNP Q5SKW1
F	-6	LEU	-	expression tag	UNP Q5SKW1
F	-5	VAL	-	expression tag	UNP Q5SKW1
F	-4	PRO	-	expression tag	UNP Q5SKW1
F	-3	ARG	-	expression tag	UNP Q5SKW1
F	-2	GLY	-	expression tag	UNP Q5SKW1
F	-1	SER	-	expression tag	UNP Q5SKW1
F	0	HIS	-	expression tag	UNP Q5SKW1

- Molecule 6 is a DNA chain called 5'-D(\*CP\*CP\*TP\*GP\*CP\*AP\*TP\*CP\*CP\*GP\*TP\*GP\*AP\*GP\*TP\*CP\*GP\*AP\*GP\*GP\*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
6	G	16	331	156	63	96	16	0	0	0

- Molecule 7 is a DNA chain called 5'-D(\*TP\*AP\*TP\*AP\*AP\*TP\*GP\*GP\*GP\*AP\*GP\*CP\*TP\*GP\*TP\*CP\*AP\*CP\*GP\*GP\*AP\*TP\*GP\*CP\*AP\*GP\*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
7	H	24	495	236	94	142	23	0	0	0

- Molecule 8 is a protein called GE23077.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
8	I	7	50	26	9	15	0	0	0

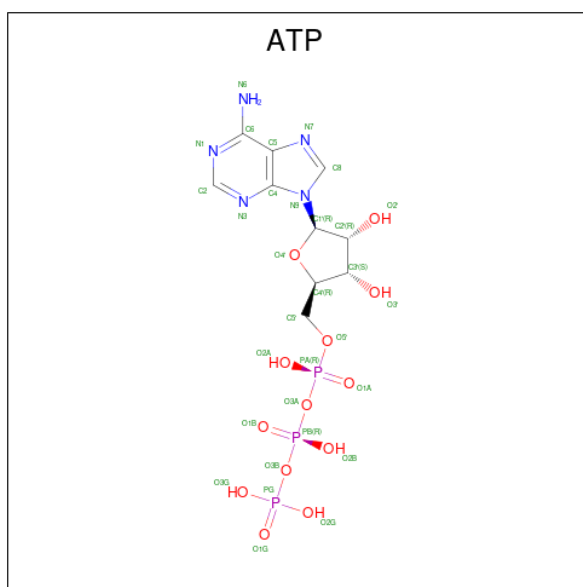
- Molecule 9 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	B	1	Total Mg 1 1	0	0
9	D	4	Total Mg 4 4	0	0
9	F	1	Total Mg 1 1	0	0

- Molecule 10 is ZINC ION (three-letter code: ZN) (formula: Zn).

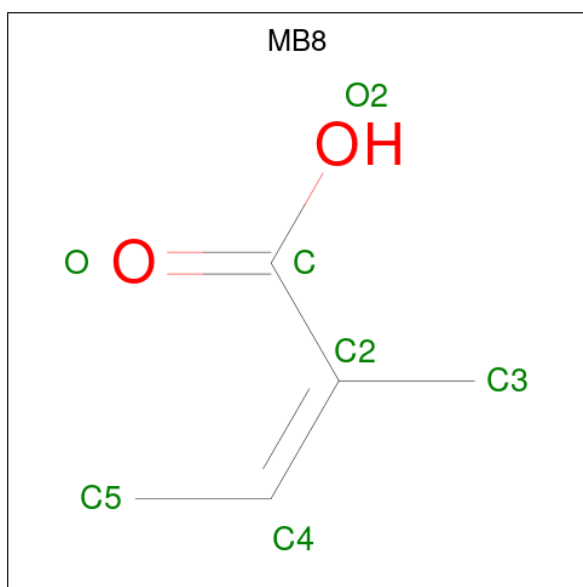
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	D	2	Total Zn 2 2	0	0

- Molecule 11 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>13</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	D	1	Total C N O P 31 10 5 13 3	10	0

- Molecule 12 is (2Z)-2-methylbut-2-enoic acid (three-letter code: MB8) (formula: C<sub>5</sub>H<sub>8</sub>O<sub>2</sub>).



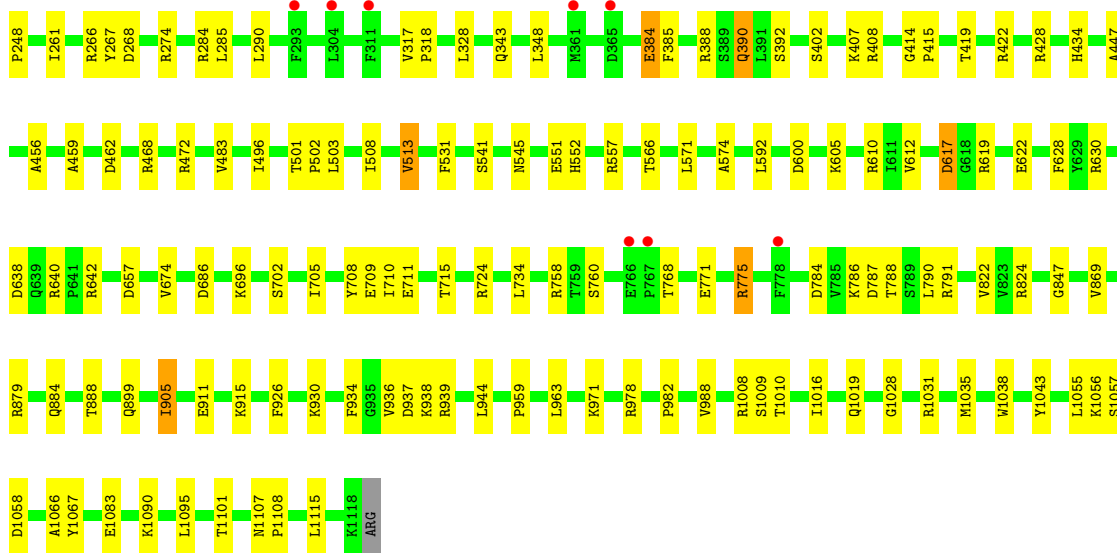
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
12	I	1	Total C O 2 1 1	0	0

- Molecule 13 is water.

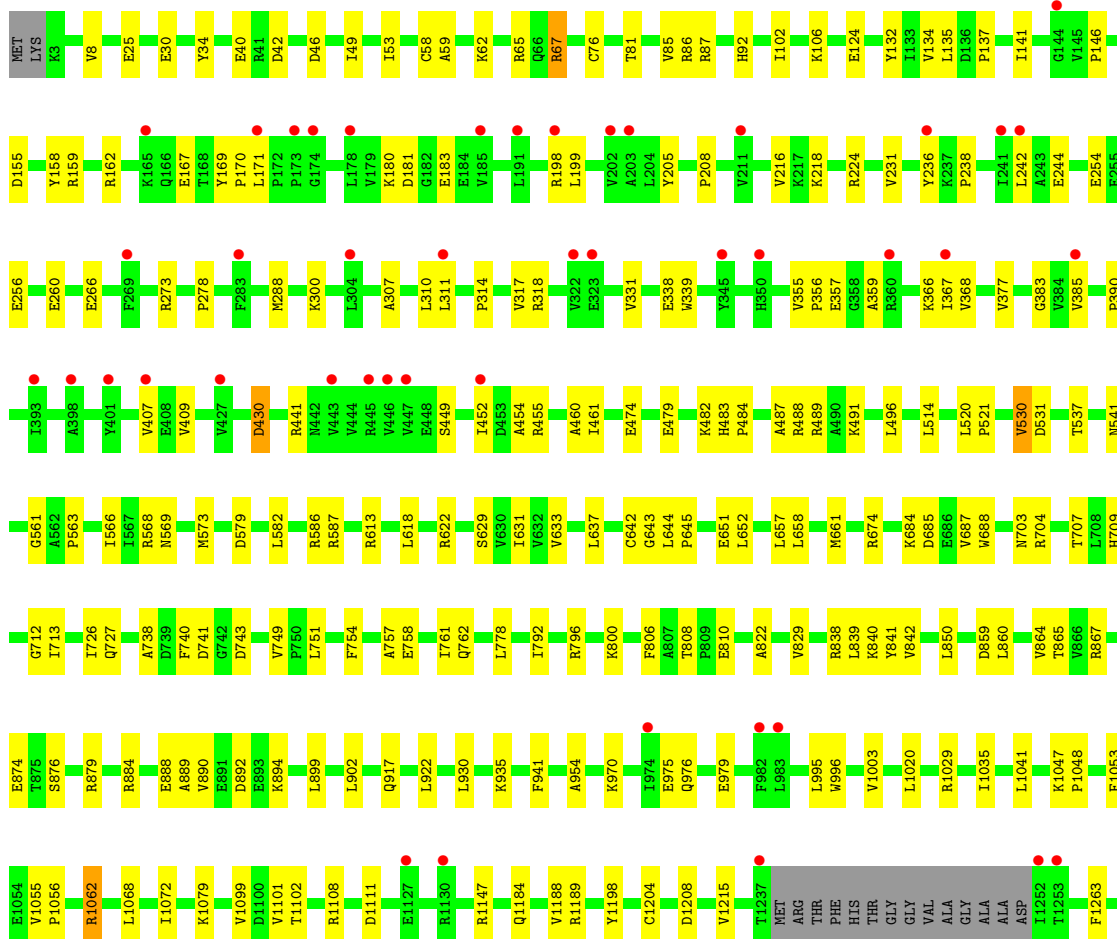
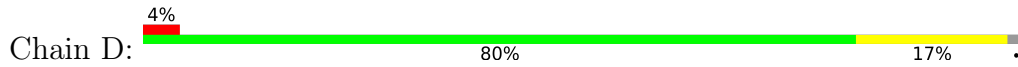
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
13	D	3	Total O 3 3	0	0

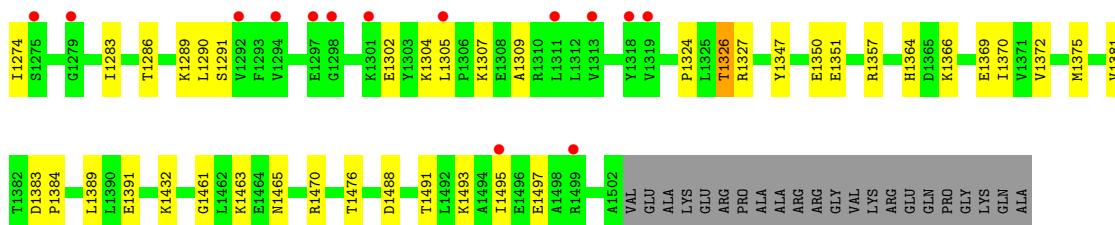




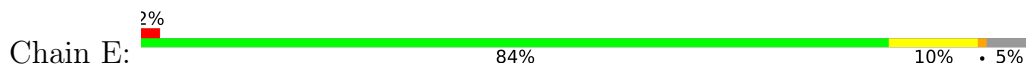


• Molecule 3: DNA-directed RNA polymerase subunit beta'

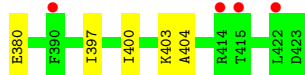
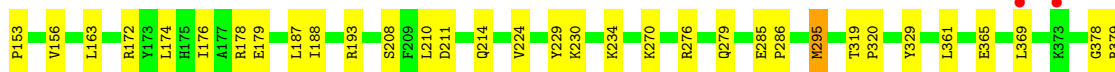
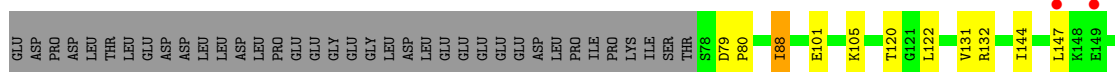
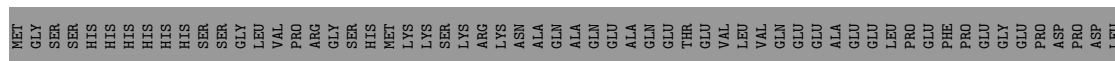




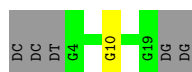
- Molecule 4: DNA-directed RNA polymerase subunit omega



- Molecule 5: DNA directed RNA polymerase sigma factor A



- Molecule 6: 5'-D(\*CP\*CP\*TP\*GP\*CP\*AP\*TP\*CP\*CP\*GP\*TP\*GP\*AP\*GP\*TP\*CP\*GP\*AP\*GP\*GP\*G)-3'



- Molecule 7: 5'-D(\*TP\*AP\*TP\*AP\*AP\*TP\*GP\*GP\*GP\*AP\*GP\*CP\*TP\*GP\*TP\*CP\*AP\*CP P\*GP\*GP\*AP\*TP\*GP\*CP\*AP\*GP\*G)-3'



- Molecule 8: GE23077



## 4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	182.92Å 104.39Å 294.21Å 90.00° 98.97° 90.00°	Depositor
Resolution (Å)	49.12 – 3.40 49.12 – 3.40	Depositor EDS
% Data completeness (in resolution range)	81.5 (49.12-3.40) 81.5 (49.12-3.40)	Depositor EDS
$R_{merge}$	0.15	Depositor
$R_{sym}$	0.15	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.28 (at 3.40Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.8_1069)	Depositor
R, $R_{free}$	0.208 , 0.246 0.211 , 0.246	Depositor DCC
$R_{free}$ test set	1643 reflections (2.66%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	95.8	Xtrriage
Anisotropy	0.247	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 26.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.018 for $1/2^*h-3/2^*k,-1/2^*h-1/2^*k,-1/2^*h+1/2^*k-1$ 0.014 for $1/2^*h+3/2^*k,1/2^*h-1/2^*k,-1/2^*h-1/2^*k-1$	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	28603	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	66.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.16% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MB8, MG, ZN, DVA, FGL, R2T, 2TL, 0QZ, DSN, ATP, 2RA

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	0.22	0/1841	0.44	0/2504
1	B	0.22	0/1821	0.45	0/2476
2	C	0.22	0/8941	0.42	0/12092
3	D	0.22	0/11955	0.42	0/16163
4	E	0.23	0/772	0.39	0/1040
5	F	0.21	0/2852	0.38	0/3837
6	G	0.44	0/371	0.93	0/571
7	H	0.46	0/556	1.02	0/858
All	All	0.23	0/29109	0.45	0/39541

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
8	I	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
8	I	5	2TL	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	1809	0	1863	29	0
1	B	1789	0	1841	32	0
2	C	8774	0	8877	110	0
3	D	11746	0	11984	154	0
4	E	758	0	770	6	0
5	F	2807	0	2882	31	0
6	G	331	0	180	2	0
7	H	495	0	272	12	0
8	I	50	0	37	0	0
9	B	1	0	0	0	0
9	D	4	0	0	0	0
9	F	1	0	0	0	0
10	D	2	0	0	0	0
11	D	31	0	12	1	0
12	I	2	0	0	0	0
13	D	3	0	0	0	0
All	All	28603	0	28718	337	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 6.

All (337) 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:42:ARG:NH2	1:B:31:GLY:O	2.18	0.77
2:C:165:LEU:HB2	2:C:168:ARG:HG3	1.68	0.74
1:A:44:LEU:HA	1:A:48:ILE:HG12	1.70	0.73
3:D:273:ARG:HB3	3:D:278:PRO:HA	1.71	0.72
3:D:65:ARG:NH1	5:F:378:GLY:O	2.23	0.72
1:A:44:LEU:HD13	1:A:177:VAL:HG21	1.72	0.70
3:D:1495:ILE:HG12	4:E:88:GLU:HG3	1.73	0.70
2:C:674:VAL:HG12	2:C:869:VAL:HB	1.73	0.69
2:C:97:ARG:NH1	2:C:110:GLU:OE1	2.23	0.69
2:C:390:GLN:HG2	2:C:414:GLY:HA2	1.75	0.68
2:C:266:ARG:NH1	7:H:11:DG:O6	2.27	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:106:LYS:O	3:D:586:ARG:NH1	2.27	0.68
3:D:260:GLU:OE1	3:D:273:ARG:NH1	2.27	0.68
5:F:131:VAL:HG13	5:F:178:ARG:HD3	1.77	0.67
2:C:168:ARG:HD3	2:C:268:ASP:HB3	1.76	0.66
5:F:397:ILE:HD12	5:F:400:ILE:HD11	1.78	0.66
3:D:171:LEU:HD12	3:D:390:PRO:HG2	1.78	0.65
1:B:56:VAL:HG22	1:B:142:VAL:HG12	1.78	0.64
3:D:208:PRO:HA	3:D:390:PRO:HA	1.77	0.64
2:C:628:PHE:H	2:C:638:ASP:HB3	1.62	0.64
2:C:243:ARG:NH1	7:H:9:DG:O6	2.31	0.64
2:C:711:GLU:HG2	2:C:822:VAL:HG22	1.80	0.64
3:D:1108:ARG:NH2	3:D:1198:TYR:O	2.31	0.64
3:D:1286:THR:HB	3:D:1289:LYS:H	1.62	0.63
1:A:185:ARG:NH2	1:A:187:GLY:O	2.31	0.63
2:C:428:ARG:NH2	2:C:447:ALA:O	2.32	0.63
2:C:194:VAL:HG22	2:C:221:LEU:HD12	1.80	0.62
3:D:167:GLU:OE2	3:D:198:ARG:NH1	2.32	0.62
3:D:970:LYS:HD3	3:D:995:LEU:HD13	1.80	0.62
3:D:489:ARG:NH1	3:D:1391:GLU:OE2	2.32	0.61
3:D:652:LEU:HB3	3:D:749:VAL:HG21	1.82	0.61
2:C:197:LEU:HD12	2:C:221:LEU:HD11	1.82	0.61
2:C:17:PRO:HB2	2:C:20:GLU:HB3	1.82	0.61
2:C:709:GLU:OE2	2:C:824:ARG:NH1	2.34	0.61
2:C:24:GLU:OE2	2:C:27:ARG:NH2	2.33	0.61
3:D:1147:ARG:NH2	3:D:1369:GLU:OE1	2.34	0.61
1:B:34:VAL:HG21	2:C:978:ARG:HB3	1.82	0.60
3:D:569:ASN:ND2	5:F:214:GLN:OE1	2.32	0.60
5:F:193:ARG:HB2	7:H:6:DT:H1'	1.84	0.59
3:D:242:LEU:HB3	3:D:311:LEU:HD12	1.83	0.59
2:C:12:VAL:HG21	2:C:472:ARG:HD3	1.83	0.59
5:F:365:GLU:HB2	5:F:404:ALA:HB2	1.84	0.59
1:A:58:ILE:HG12	1:A:140:MET:HG2	1.85	0.58
2:C:768:THR:OG1	2:C:771:GLU:OE1	2.19	0.58
3:D:1003:VAL:HG21	3:D:1041:LEU:HG	1.84	0.58
3:D:1465:ASN:OD1	3:D:1470:ARG:NH1	2.34	0.58
2:C:419:THR:HB	2:C:422:ARG:HG3	1.86	0.58
3:D:356:PRO:HG2	3:D:359:ALA:HB2	1.85	0.58
1:B:176:ARG:NH2	3:D:888:GLU:OE1	2.36	0.57
2:C:215:GLY:O	2:C:216:GLU:HB3	2.05	0.57
1:B:8:ALA:HB1	1:B:9:PRO:HA	1.85	0.57
2:C:134:ARG:NH1	2:C:392:SER:OG	2.38	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:630:ARG:NH1	2:C:705:ILE:O	2.37	0.57
3:D:657:LEU:HG	3:D:661:MET:HE2	1.86	0.57
3:D:1029:ARG:NH1	11:D:2007:ATP:O1G	2.35	0.57
3:D:180:LYS:NZ	3:D:357:GLU:OE1	2.34	0.57
2:C:129:ILE:HB	2:C:134:ARG:HD2	1.88	0.56
2:C:172:ILE:HG12	2:C:186:VAL:HG22	1.86	0.56
1:B:80:LEU:HD21	3:D:842:VAL:HG12	1.87	0.56
1:A:55:SER:HB3	1:A:143:ARG:HB3	1.86	0.56
5:F:144:ILE:HB	5:F:147:LEU:HD13	1.88	0.56
3:D:704:ARG:HD2	3:D:738:ALA:HB2	1.88	0.56
5:F:361:LEU:HB3	5:F:365:GLU:HG3	1.88	0.56
2:C:167:LYS:HD3	7:H:12:DC:H6	1.71	0.56
5:F:270:LYS:HG2	5:F:295:MET:HE1	1.88	0.56
3:D:633:VAL:HB	3:D:740:PHE:CZ	2.41	0.55
2:C:87:ASP:HA	2:C:131:GLY:HA3	1.88	0.55
2:C:1056:LYS:HD3	3:D:751:LEU:HD11	1.89	0.55
3:D:356:PRO:HB3	3:D:441:ARG:HA	1.87	0.55
3:D:707:THR:HG23	3:D:712:GLY:HA3	1.89	0.55
3:D:1111:ASP:OD1	3:D:1189:ARG:NH2	2.40	0.55
3:D:266:GLU:HG3	3:D:314:PRO:HB3	1.88	0.55
3:D:637:LEU:HD13	3:D:642:CYS:HA	1.88	0.55
1:B:94:LEU:O	1:B:146:ARG:NH2	2.39	0.54
2:C:905:ILE:HD13	2:C:905:ILE:H	1.72	0.54
3:D:644:LEU:HD12	3:D:645:PRO:HD2	1.89	0.54
1:A:183:ASP:HA	2:C:938:LYS:HE3	1.89	0.54
3:D:367:ILE:HG22	3:D:368:VAL:HG23	1.88	0.54
3:D:1189:ARG:HB3	3:D:1204:CYS:HA	1.89	0.54
1:B:80:LEU:HB3	3:D:867:ARG:HH21	1.72	0.54
1:A:48:ILE:HD12	1:A:213:GLN:HG3	1.89	0.54
3:D:643:GLY:HA3	3:D:727:GLN:HB2	1.89	0.54
1:A:196:THR:HG21	2:C:934:PHE:HE2	1.73	0.53
2:C:617:ASP:OD1	2:C:617:ASP:N	2.42	0.53
2:C:971:LYS:HG2	2:C:988:VAL:HG22	1.90	0.53
3:D:137:PRO:HA	3:D:452:ILE:HG13	1.91	0.53
1:B:51:THR:OG1	1:B:87:VAL:O	2.21	0.53
5:F:101:GLU:HG2	5:F:105:LYS:HE2	1.90	0.53
2:C:1008:ARG:HH11	2:C:1028:GLY:HA2	1.73	0.53
3:D:838:ARG:NH1	3:D:874:GLU:OE1	2.38	0.53
2:C:1083:GLU:OE2	3:D:87:ARG:NH2	2.42	0.53
2:C:911:GLU:O	2:C:915:LYS:HG2	2.09	0.52
2:C:939:ARG:HG2	2:C:982:PRO:HD3	1.90	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:1016:ILE:O	3:D:87:ARG:NH1	2.41	0.52
2:C:884:GLN:O	2:C:888:THR:OG1	2.22	0.52
3:D:758:GLU:OE1	3:D:1476:THR:OG1	2.20	0.52
3:D:954:ALA:O	3:D:1062:ARG:NH2	2.42	0.52
3:D:124:GLU:OE2	3:D:587:ARG:NH2	2.43	0.52
1:A:222:LEU:HD21	1:B:218:LEU:HD23	1.92	0.52
2:C:936:VAL:HG11	2:C:959:PRO:HB2	1.92	0.52
5:F:400:ILE:HA	5:F:403:LYS:HG2	1.91	0.51
1:B:25:LEU:HD23	1:B:28:LEU:HD11	1.92	0.51
3:D:658:LEU:HA	3:D:661:MET:HE3	1.93	0.51
3:D:1198:TYR:OH	3:D:1432:LYS:NZ	2.44	0.51
3:D:141:ILE:HA	3:D:146:PRO:HA	1.93	0.51
6:G:10:DG:O6	7:H:17:DA:N6	2.44	0.51
2:C:758:ARG:HH21	2:C:788:THR:HB	1.75	0.51
2:C:1038:TRP:CE2	3:D:1099:VAL:HG11	2.46	0.51
2:C:847:GLY:HA2	3:D:741:ASP:HA	1.94	0.50
2:C:571:LEU:HD23	2:C:702:SER:HB3	1.94	0.50
3:D:1350:GLU:OE2	3:D:1357:ARG:NH1	2.44	0.50
3:D:134:VAL:HG12	3:D:454:ALA:HB2	1.94	0.50
3:D:629:SER:HB3	3:D:726:ILE:HG13	1.92	0.50
5:F:88:ILE:HG23	5:F:193:ARG:HG2	1.94	0.50
1:A:64:GLU:HG3	1:A:79:ILE:HD12	1.93	0.50
3:D:155:ASP:OD1	3:D:159:ARG:NH1	2.44	0.50
3:D:894:LYS:H	3:D:894:LYS:HD2	1.77	0.50
3:D:899:LEU:HD22	3:D:917:GLN:HB3	1.93	0.50
5:F:188:ILE:HG12	5:F:224:VAL:HG21	1.94	0.50
5:F:79:ASP:OD2	7:H:8:DG:N1	2.39	0.49
2:C:1009:SER:OG	2:C:1010:THR:N	2.45	0.49
3:D:996:TRP:CD2	3:D:1056:PRO:HG3	2.47	0.49
1:A:53:VAL:HG22	1:A:144:VAL:HG22	1.95	0.49
2:C:402:SER:HA	2:C:566:THR:HG23	1.94	0.49
3:D:1364:HIS:CE1	3:D:1366:LYS:HG3	2.48	0.49
1:B:175:ARG:N	1:B:200:TRP:O	2.44	0.49
2:C:1019:GLN:HG2	2:C:1058:ASP:HB2	1.94	0.49
3:D:218:LYS:HG2	3:D:338:GLU:HG2	1.95	0.49
2:C:605:LYS:HB2	2:C:612:VAL:HB	1.93	0.49
2:C:1067:TYR:OH	3:D:674[B]:ARG:NH1	2.46	0.49
2:C:274:ARG:HH22	2:C:284:ARG:HH22	1.60	0.49
2:C:937:ASP:OD1	2:C:938:LYS:N	2.46	0.49
3:D:1068:LEU:O	3:D:1072:ILE:HG12	2.13	0.48
1:A:209:GLU:O	1:A:213:GLN:HG2	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:1101:VAL:HG13	3:D:1102:THR:HG23	1.95	0.48
1:A:199:ILE:HB	1:A:207:PRO:HB3	1.94	0.48
2:C:617:ASP:HB2	2:C:619:ARG:HG2	1.95	0.48
3:D:1020:LEU:HB3	3:D:1035:ILE:HD12	1.95	0.48
2:C:274:ARG:NH2	2:C:285:LEU:O	2.47	0.48
3:D:1208:ASP:HB2	3:D:1215:VAL:HA	1.96	0.48
1:A:24:VAL:HG22	1:A:196:THR:HG23	1.95	0.48
1:A:218:LEU:HD23	1:B:222:LEU:HD21	1.95	0.48
5:F:187:LEU:HD23	5:F:224:VAL:HG13	1.95	0.48
2:C:390:GLN:HB3	2:C:415:PRO:HD3	1.96	0.48
5:F:120:THR:HG22	5:F:122:LEU:HD13	1.95	0.48
2:C:1:MET:HG3	2:C:899:GLN:HA	1.95	0.47
3:D:30:GLU:OE1	3:D:40:GLU:HG2	2.14	0.47
2:C:784:ASP:OD1	2:C:784:ASP:N	2.39	0.47
1:B:71:VAL:HG22	1:B:132:LEU:HG	1.95	0.47
2:C:541:SER:O	2:C:545:ASN:ND2	2.46	0.47
3:D:158:TYR:CE1	3:D:454:ALA:HB3	2.49	0.47
2:C:173:ASP:HB2	2:C:185:LYS:HB3	1.97	0.47
1:A:193:ASP:OD2	2:C:938:LYS:NZ	2.43	0.47
2:C:343:GLN:HG3	2:C:385:PHE:HB2	1.96	0.47
2:C:462:ASP:HB3	2:C:468:ARG:HD2	1.96	0.47
3:D:102:ILE:HD12	3:D:579:ASP:HB3	1.96	0.47
3:D:368:VAL:HB	3:D:377:VAL:HB	1.95	0.47
1:B:199:ILE:HB	1:B:207:PRO:HB3	1.97	0.47
3:D:537:THR:OG1	3:D:541:ASN:ND2	2.47	0.47
3:D:1274:ILE:HG22	3:D:1324:PRO:HA	1.97	0.47
2:C:724:ARG:NH2	2:C:734:LEU:O	2.48	0.46
2:C:503:LEU:HD23	2:C:508:ILE:HA	1.97	0.46
3:D:238:PRO:HD3	3:D:318:ARG:HG3	1.97	0.46
3:D:474:GLU:HG3	3:D:496:LEU:HD11	1.97	0.46
2:C:124:ASP:OD2	2:C:407:LYS:NZ	2.35	0.46
2:C:640:ARG:HE	2:C:642:ARG:HH22	1.63	0.46
2:C:1055:LEU:HD22	2:C:1066:ALA:HB2	1.98	0.46
3:D:840:LYS:HE3	3:D:841:TYR:OH	2.15	0.46
1:B:34:VAL:HG12	1:B:181:VAL:HG21	1.96	0.46
2:C:261:ILE:HG23	2:C:290:LEU:HB2	1.97	0.46
2:C:1095:LEU:HD23	3:D:582:LEU:HD22	1.98	0.46
5:F:163:LEU:HD13	5:F:174:LEU:HD13	1.97	0.46
2:C:760:SER:O	2:C:786:LYS:HG2	2.16	0.46
3:D:1493:LYS:O	3:D:1497:GLU:HG2	2.15	0.46
1:A:8:ALA:HA	1:A:9:PRO:HD3	1.67	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:160:ALA:HB3	2:C:174:LEU:HB2	1.97	0.46
2:C:628:PHE:H	2:C:638:ASP:CB	2.29	0.46
3:D:355:VAL:HG11	3:D:385:VAL:HG21	1.98	0.46
3:D:487:ALA:O	3:D:491:LYS:HG2	2.16	0.46
5:F:153:PRO:HA	5:F:156:VAL:HG22	1.97	0.46
3:D:317:VAL:HG23	3:D:339:TRP:HB3	1.97	0.46
1:B:72:LYS:HG2	1:B:131:THR:OG1	2.16	0.45
2:C:501:THR:HG21	2:C:513:VAL:HG23	1.98	0.45
3:D:520:LEU:HD12	3:D:521:PRO:HD2	1.99	0.45
3:D:573:MET:SD	5:F:210:LEU:HB3	2.56	0.45
3:D:864:VAL:HG22	3:D:865:THR:H	1.81	0.45
3:D:890:VAL:HB	3:D:922:LEU:HD13	1.98	0.45
2:C:13:ILE:HD13	2:C:483:VAL:HG11	1.97	0.45
3:D:162:ARG:O	3:D:449:SER:HB2	2.17	0.45
5:F:285:GLU:HA	5:F:286:PRO:HD3	1.81	0.45
1:A:36:LEU:HD11	1:B:221:HIS:HB3	1.99	0.45
3:D:685:ASP:HA	3:D:688:TRP:HD1	1.82	0.45
3:D:829:VAL:HG21	3:D:839:LEU:HD11	1.99	0.45
3:D:850:LEU:HD12	3:D:884:ARG:NH2	2.32	0.45
3:D:1263:PHE:HD2	3:D:1375:MET:HE2	1.81	0.45
3:D:530:VAL:HG12	3:D:531:ASP:H	1.82	0.45
3:D:314:PRO:HB2	3:D:317:VAL:HG12	1.97	0.45
3:D:430:ASP:N	3:D:430:ASP:OD1	2.50	0.45
3:D:890:VAL:HG23	3:D:892:ASP:H	1.82	0.45
2:C:229:MET:HB2	2:C:233:GLU:HB2	1.99	0.45
2:C:571:LEU:HB2	2:C:574:ALA:HB2	1.98	0.45
3:D:561:GLY:HA3	5:F:132:ARG:HD3	1.99	0.45
1:A:179:PHE:HB3	1:A:197:LEU:HD23	1.98	0.44
3:D:514:LEU:HD23	3:D:514:LEU:HA	1.85	0.44
3:D:889:ALA:HB1	3:D:930:LEU:HA	1.98	0.44
1:A:91:ASN:HA	1:A:92:PRO:HD3	1.88	0.44
2:C:177:GLU:HG3	2:C:178:PRO:HD2	1.99	0.44
3:D:703:ASN:HB2	3:D:713:ILE:HG12	1.99	0.44
7:H:15:DT:H5'	7:H:15:DT:H6	1.82	0.44
1:A:39:PRO:HG3	1:B:39:PRO:HG3	2.00	0.44
2:C:168:ARG:O	2:C:267:TYR:HA	2.17	0.44
3:D:684:LYS:O	3:D:687:VAL:HG12	2.17	0.44
1:B:72:LYS:HG3	1:B:73:GLU:N	2.32	0.44
2:C:1031:ARG:HA	3:D:622:ARG:HA	2.00	0.44
5:F:193:ARG:HB3	7:H:7:DG:H5''	1.99	0.44
2:C:154:ARG:HA	2:C:155:PRO:HD3	1.87	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:975:GLU:O	3:D:979:GLU:HG2	2.17	0.44
1:B:153:ALA:HA	1:B:156:HIS:CE1	2.52	0.44
2:C:496:ILE:HG12	2:C:531:PHE:HB2	2.00	0.44
2:C:708:TYR:HB3	2:C:790:LEU:HD21	2.00	0.44
2:C:408:ARG:NH1	2:C:456:ALA:O	2.51	0.44
2:C:501:THR:HA	2:C:502:PRO:HD3	1.87	0.43
2:C:1115:LEU:HD23	3:D:85:VAL:HG12	1.99	0.43
3:D:563:PRO:HD2	3:D:566:ILE:HD12	2.00	0.43
2:C:551:GLU:HG2	2:C:552:HIS:CD2	2.53	0.43
2:C:686:ASP:OD2	2:C:879:ARG:NH1	2.34	0.43
3:D:455:ARG:HB2	3:D:460:ALA:HB2	2.00	0.43
1:B:48:ILE:HA	1:B:49:PRO:HD3	1.90	0.43
3:D:53:ILE:HA	3:D:86:ARG:HD2	2.00	0.43
3:D:256:GLU:HG3	3:D:300:LYS:HG3	1.99	0.43
3:D:613:ARG:HG3	3:D:618:LEU:HD23	1.99	0.43
3:D:1488:ASP:OD1	3:D:1488:ASP:N	2.46	0.43
2:C:328:LEU:HD23	2:C:328:LEU:HA	1.89	0.43
2:C:456:ALA:HB3	2:C:459:ALA:HB2	2.01	0.43
3:D:1305:LEU:HD13	3:D:1309:ALA:HB3	2.00	0.43
1:A:216:GLU:OE2	1:A:219:ARG:NH2	2.51	0.43
2:C:710:ILE:HD12	2:C:790:LEU:HB2	2.00	0.43
3:D:58:CYS:HB2	3:D:76:CYS:SG	2.58	0.43
3:D:840:LYS:HE3	3:D:841:TYR:CZ	2.54	0.43
3:D:1463:LYS:HE2	3:D:1463:LYS:HB3	1.82	0.43
1:B:124:ASN:OD1	1:B:124:ASN:N	2.52	0.43
2:C:247:PRO:HA	2:C:248:PRO:HD3	1.69	0.43
3:D:42:ASP:N	3:D:46:ASP:OD2	2.42	0.43
3:D:800:LYS:HB3	3:D:822:ALA:HB2	2.00	0.43
1:B:32:PHE:HA	1:B:35:THR:HB	2.00	0.43
1:A:106:PRO:HG3	1:A:134:GLU:HG2	2.01	0.43
1:A:133:GLU:HG2	1:A:134:GLU:H	1.84	0.43
2:C:1009:SER:HB3	3:D:651:GLU:O	2.19	0.43
3:D:244:GLU:HG3	3:D:310:LEU:HG	1.99	0.43
3:D:231:VAL:O	3:D:236:TYR:OH	2.35	0.43
4:E:40:LEU:HG	4:E:67:GLU:HG2	2.00	0.43
2:C:92:ALA:HB2	2:C:120:LEU:HD11	2.01	0.42
2:C:1101:THR:HG22	3:D:8:VAL:HG22	2.00	0.42
3:D:633:VAL:HB	3:D:740:PHE:CE2	2.53	0.42
3:D:1372:VAL:HA	3:D:1375:MET:HE3	2.00	0.42
2:C:35:PRO:HA	2:C:36:PRO:HD3	1.90	0.42
2:C:274:ARG:NH2	2:C:284:ARG:HH22	2.17	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:181:ASP:HB2	3:D:205:TYR:CD1	2.55	0.42
3:D:216:VAL:HG23	3:D:383:GLY:HA2	2.00	0.42
3:D:288:MET:SD	3:D:307:ALA:HB2	2.59	0.42
3:D:796:ARG:NH2	3:D:859:ASP:OD2	2.39	0.42
3:D:1383:ASP:HA	3:D:1384:PRO:HD3	1.87	0.42
3:D:479:GLU:HA	3:D:482:LYS:HE2	2.01	0.42
1:A:39:PRO:CG	1:B:39:PRO:HG3	2.50	0.42
1:B:150:TYR:CE1	1:B:170:VAL:HG22	2.55	0.42
2:C:317:VAL:HA	2:C:318:PRO:HD3	1.91	0.42
2:C:343:GLN:NE2	2:C:384:GLU:OE2	2.53	0.42
2:C:787:ASP:OD2	2:C:791:ARG:NH2	2.48	0.42
3:D:1048:PRO:O	3:D:1079:LYS:NZ	2.36	0.42
1:B:26:GLU:HB3	1:B:194:LYS:HG3	2.02	0.42
1:B:57:TYR:CD1	1:B:161:ARG:HD2	2.55	0.42
2:C:348:LEU:HD12	2:C:348:LEU:HA	1.93	0.42
3:D:792:ILE:HD13	3:D:941:PHE:CD1	2.55	0.42
3:D:806:PHE:O	3:D:829:VAL:HA	2.20	0.42
5:F:234:LYS:HE2	5:F:234:LYS:HB3	1.94	0.42
7:H:20:DG:H2''	7:H:21:DA:O5'	2.20	0.42
1:B:94:LEU:HD11	1:B:97:VAL:HG22	2.01	0.42
3:D:171:LEU:HD23	3:D:171:LEU:HA	1.82	0.42
3:D:407:VAL:HG22	3:D:409:VAL:H	1.85	0.42
3:D:1326:THR:HG22	3:D:1327:ARG:H	1.85	0.42
2:C:926:PHE:CE2	2:C:930:LYS:HD3	2.55	0.41
3:D:25:GLU:HB2	3:D:92:HIS:CE1	2.55	0.41
5:F:172:ARG:O	5:F:176:ILE:HG12	2.20	0.41
3:D:637:LEU:O	3:D:935:LYS:NZ	2.54	0.41
3:D:1047:LYS:HG2	3:D:1053:PHE:CZ	2.55	0.41
5:F:80:PRO:HB2	5:F:210:LEU:HD11	2.03	0.41
5:F:105:LYS:HD3	5:F:179:GLU:HG2	2.03	0.41
1:A:48:ILE:HA	1:A:49:PRO:HD3	1.86	0.41
1:B:111:ALA:HB3	1:B:125:PRO:HA	2.02	0.41
2:C:937:ASP:OD2	2:C:939:ARG:NH1	2.53	0.41
3:D:67:ARG:HD2	5:F:379:ARG:HB3	2.02	0.41
4:E:13:VAL:HG21	4:E:19:LEU:HB2	2.03	0.41
4:E:52:GLU:OE1	4:E:52:GLU:N	2.45	0.41
1:B:140:MET:HB3	1:B:140:MET:HE2	1.90	0.41
2:C:1035:MET:HA	2:C:1038:TRP:CE3	2.56	0.41
3:D:59:ALA:HB3	3:D:76:CYS:HB2	2.02	0.41
3:D:483:HIS:CG	3:D:484:PRO:HD2	2.55	0.41
5:F:208:SER:HB3	5:F:211:ASP:OD2	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:944:LEU:HD21	2:C:963:LEU:HD23	2.03	0.41
3:D:224:ARG:NE	3:D:254:GLU:OE2	2.32	0.41
3:D:483:HIS:CE1	3:D:488:ARG:HD3	2.56	0.41
3:D:762:GLN:HE22	3:D:1476:THR:HG23	1.86	0.41
3:D:860:LEU:O	3:D:876:SER:HB2	2.21	0.41
3:D:1291:SER:OG	3:D:1304:LYS:HG2	2.20	0.41
5:F:229:TYR:CZ	5:F:230:LYS:HD3	2.55	0.41
7:H:10:DA:H2''	7:H:11:DG:C8	2.55	0.41
3:D:58:CYS:SG	3:D:62:LYS:N	2.93	0.41
3:D:169:TYR:HA	3:D:170:PRO:HD3	1.84	0.41
3:D:1366:LYS:O	3:D:1370:ILE:HG12	2.21	0.41
2:C:124:ASP:HB3	2:C:592:LEU:HD12	2.03	0.41
4:E:80:VAL:HG23	4:E:81:PRO:O	2.21	0.41
5:F:276:ARG:O	5:F:279:GLN:HG3	2.20	0.41
1:A:150:TYR:CD1	2:C:696:LYS:HG2	2.56	0.41
1:B:7:LYS:O	1:B:8:ALA:HB3	2.20	0.41
2:C:1090:LYS:HA	2:C:1090:LYS:HD3	1.79	0.41
3:D:461:ILE:HD13	3:D:461:ILE:HA	1.94	0.41
2:C:612:VAL:HG22	2:C:622:GLU:HG3	2.01	0.40
2:C:1107:ASN:HA	2:C:1108:PRO:HD3	1.95	0.40
3:D:879:ARG:HD3	3:D:902:LEU:O	2.21	0.40
3:D:1283:ILE:H	3:D:1283:ILE:HG13	1.63	0.40
7:H:11:DG:H2''	7:H:12:DC:OP1	2.21	0.40
3:D:1381:VAL:HG21	3:D:1389:LEU:HD23	2.03	0.40
6:G:10:DG:H1	7:H:18:DC:H42	1.68	0.40
1:A:150:TYR:HD1	1:A:170:VAL:HG22	1.86	0.40
2:C:203:ASP:OD2	2:C:204:GLN:N	2.54	0.40
3:D:132:TYR:OH	3:D:568:ARG:NH1	2.54	0.40
3:D:631:ILE:HG12	3:D:743:ASP:O	2.21	0.40
3:D:757:ALA:O	3:D:761:ILE:HG12	2.21	0.40
3:D:1290:LEU:HD12	3:D:1291:SER:H	1.87	0.40
3:D:1302:GLU:OE1	3:D:1304:LYS:HE3	2.20	0.40
3:D:1461:GLY:O	3:D:1465:ASN:ND2	2.54	0.40
2:C:81:ASP:OD2	2:C:81:ASP:N	2.50	0.40
2:C:771:GLU:O	2:C:775:ARG:HB2	2.21	0.40
3:D:1347:TYR:CZ	3:D:1351:GLU:HG3	2.56	0.40
3:D:1491:THR:O	3:D:1495:ILE:HG13	2.20	0.40
4:E:3:GLU:HA	4:E:4:PRO:HD3	1.95	0.40
5:F:319:THR:HA	5:F:320:PRO:HD3	1.93	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	229/315 (73%)	227 (99%)	2 (1%)	0	100	100
1	B	225/315 (71%)	221 (98%)	3 (1%)	1 (0%)	34	67
2	C	1108/1119 (99%)	1088 (98%)	20 (2%)	0	100	100
3	D	1483/1524 (97%)	1463 (99%)	20 (1%)	0	100	100
4	E	92/99 (93%)	91 (99%)	1 (1%)	0	100	100
5	F	344/443 (78%)	339 (98%)	5 (2%)	0	100	100
All	All	3481/3815 (91%)	3429 (98%)	51 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	8	ALA

### 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	200/273 (73%)	198 (99%)	2 (1%)	76	88
1	B	200/273 (73%)	194 (97%)	6 (3%)	41	68
2	C	936/941 (100%)	913 (98%)	23 (2%)	47	72
3	D	1254/1279 (98%)	1231 (98%)	23 (2%)	59	79
4	E	82/88 (93%)	80 (98%)	2 (2%)	49	74
5	F	301/388 (78%)	296 (98%)	5 (2%)	60	80

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	2973/3242 (92%)	2912 (98%)	61 (2%)	53 76

All (61) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	LEU
1	A	44	LEU
1	B	7	LYS
1	B	34	VAL
1	B	72	LYS
1	B	139	ASN
1	B	154	GLU
1	B	156	HIS
2	C	1	MET
2	C	21	ILE
2	C	42	VAL
2	C	141	HIS
2	C	177	GLU
2	C	216	GLU
2	C	224	GLU
2	C	230	ARG
2	C	384	GLU
2	C	388	ARG
2	C	390	GLN
2	C	434	HIS
2	C	513	VAL
2	C	557	ARG
2	C	600	ASP
2	C	610	ARG
2	C	617	ASP
2	C	657	ASP
2	C	715	THR
2	C	775	ARG
2	C	905	ILE
2	C	1043	TYR
2	C	1057	SER
3	D	34	TYR
3	D	49	ILE
3	D	67	ARG
3	D	81	THR
3	D	135	LEU
3	D	183	GLU

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Mol	Chain	Res	Type
3	D	199	LEU
3	D	331	VAL
3	D	366	LYS
3	D	430	ASP
3	D	530	VAL
3	D	709	HIS
3	D	754	PHE
3	D	778	LEU
3	D	808	THR
3	D	810	GLU
3	D	976	GLN
3	D	1055	VAL
3	D	1062	ARG
3	D	1184	GLN
3	D	1188	VAL
3	D	1307	LYS
3	D	1326	THR
4	E	50	THR
4	E	80	VAL
5	F	88	ILE
5	F	295	MET
5	F	329	TYR
5	F	369	LEU
5	F	380	GLU

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

Mol	Chain	Res	Type
2	C	834	GLN
3	D	696	HIS
3	D	724	GLN
3	D	762	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

7 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
8	0QZ	I	6	8	4,5,6	1.56	1 (25%)	2,5,7	0.63	0
8	FGL	I	7	8	5,6,7	1.43	1 (20%)	1,7,9	1.72	0
8	2RA	I	1	12,8	3,5,6	0.62	0	1,5,7	0.29	0
8	R2T	I	4	8	8,10,11	1.87	2 (25%)	6,13,15	1.04	0
8	2TL	I	5	8	5,6,7	1.02	0	6,7,9	0.86	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	0QZ	I	6	8	-	1/3/4/6	-
8	FGL	I	7	8	-	0/4/6/8	-
8	2RA	I	1	12,8	-	0/2/4/6	-
8	R2T	I	4	8	-	2/13/14/16	-
8	2TL	I	5	8	-	1/5/6/8	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	I	4	R2T	CD-NE2	4.19	1.43	1.32
8	I	6	0QZ	OB-CA	-2.95	1.38	1.43
8	I	4	R2T	OB1-CB	-2.24	1.37	1.43
8	I	7	FGL	OG2-CB	2.02	1.28	1.22

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	I	4	R2T	OE1-CD-CG-OG1

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Mol	Chain	Res	Type	Atoms
8	I	4	R2T	NE2-CD-CG-OG1
8	I	5	2TL	O-C-CA-CB
8	I	6	0QZ	N-C1-CA-C

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides 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
12	MB8	I	101	8	0,1,6	-	-	-	-	-
11	ATP	D	2007	9	26,33,33	0.93	1 (3%)	31,52,52	1.59	5 (16%)

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
11	ATP	D	2007	9	-	6/18/38/38	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
11	D	2007	ATP	C5-C4	2.50	1.47	1.40

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
11	D	2007	ATP	PA-O3A-PB	-3.58	120.53	132.83
11	D	2007	ATP	PB-O3B-PG	-3.39	121.19	132.83
11	D	2007	ATP	C3'-C2'-C1'	3.32	105.97	100.98
11	D	2007	ATP	N3-C2-N1	-3.23	123.63	128.68
11	D	2007	ATP	C4-C5-N7	-2.69	106.59	109.40

There are no chirality outliers.

All (6) torsion outliers are listed below:

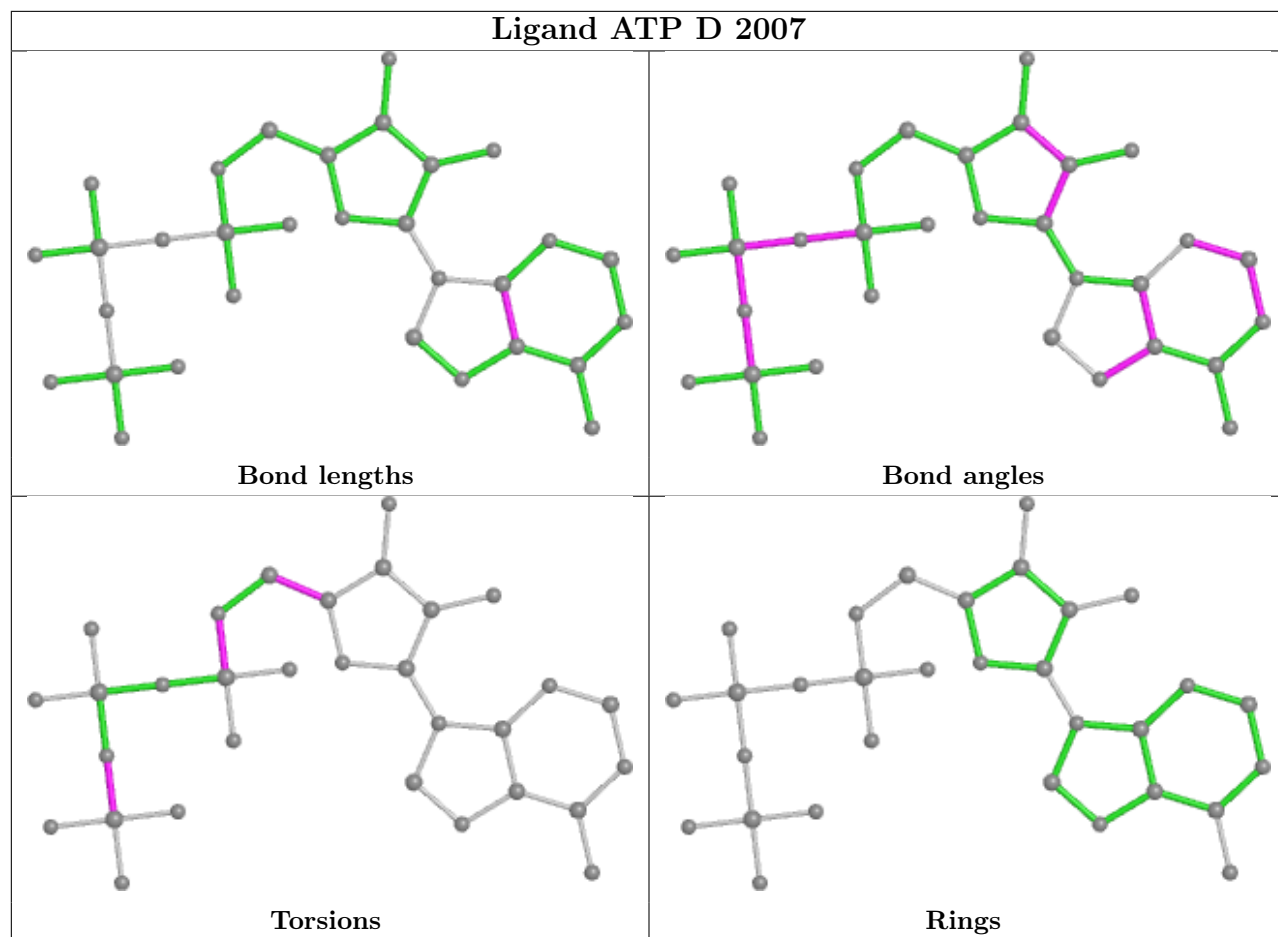
Mol	Chain	Res	Type	Atoms
11	D	2007	ATP	C5'-O5'-PA-O1A
11	D	2007	ATP	C5'-O5'-PA-O2A
11	D	2007	ATP	C3'-C4'-C5'-O5'
11	D	2007	ATP	O4'-C4'-C5'-O5'
11	D	2007	ATP	PB-O3B-PG-O1G
11	D	2007	ATP	C5'-O5'-PA-O3A

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
11	D	2007	ATP	1	0

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



## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 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	231/315 (73%)	-0.08	4 (1%) 70 68	38, 57, 83, 133	0
1	B	227/315 (72%)	-0.03	6 (2%) 56 54	39, 69, 97, 117	0
2	C	1112/1119 (99%)	0.08	27 (2%) 59 57	19, 52, 116, 143	0
3	D	1486/1524 (97%)	0.16	58 (3%) 39 38	21, 56, 116, 157	0
4	E	94/99 (94%)	-0.20	2 (2%) 63 62	32, 60, 98, 101	0
5	F	346/443 (78%)	0.04	8 (2%) 60 59	31, 73, 124, 144	0
6	G	16/21 (76%)	-0.26	0 100 100	65, 94, 203, 205	0
7	H	24/27 (88%)	-0.29	0 100 100	65, 123, 198, 228	0
8	I	0/7	-	-	-	-
All	All	3536/3870 (91%)	0.08	105 (2%) 50 49	19, 59, 117, 228	0

All (105) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	D	1237	THR	8.8
5	F	422	LEU	5.5
2	C	64	LEU	5.5
5	F	414	ARG	5.1
2	C	221	LEU	5.0
2	C	207	LEU	4.9
5	F	390	PHE	4.8
2	C	66	LEU	4.3
2	C	767	PRO	3.8
3	D	1499	ARG	3.7
3	D	283	PHE	3.7
4	E	95	VAL	3.7
5	F	149	GLU	3.7
3	D	345	TYR	3.6
3	D	360	ARG	3.6

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Mol	Chain	Res	Type	RSRZ
1	A	232	ALA	3.5
3	D	269	PHE	3.4
1	B	2	LEU	3.3
3	D	242	LEU	3.3
3	D	1253	THR	3.3
2	C	196	LEU	3.2
3	D	191	LEU	3.2
3	D	1495	ILE	3.2
3	D	173	PRO	3.2
2	C	191	PHE	3.2
2	C	311	PHE	3.2
3	D	144	GLY	3.1
3	D	211	VAL	3.1
2	C	219	GLN	3.0
3	D	1292	VAL	3.0
3	D	174	GLY	3.0
3	D	445	ARG	3.0
3	D	1297	GLU	3.0
3	D	203	ALA	2.9
2	C	159	ILE	2.9
3	D	1311	LEU	2.8
3	D	185	VAL	2.8
2	C	242	LEU	2.8
2	C	182	VAL	2.8
3	D	367	ILE	2.8
3	D	1301	LYS	2.8
2	C	105	THR	2.8
3	D	1275	SER	2.8
3	D	322	VAL	2.8
2	C	54	ILE	2.7
3	D	165	LYS	2.7
2	C	100	LEU	2.7
3	D	323	GLU	2.7
5	F	415	THR	2.7
2	C	226	VAL	2.6
3	D	202	VAL	2.6
1	A	234	ALA	2.6
3	D	1294	VAL	2.6
4	E	94	PRO	2.6
3	D	178	LEU	2.5
3	D	393	ILE	2.5
3	D	427	VAL	2.5

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
3	D	982	PHE	2.5
5	F	373	LYS	2.5
3	D	401	TYR	2.5
2	C	361	MET	2.5
3	D	1305	LEU	2.4
3	D	1127	GLU	2.4
2	C	766	GLU	2.4
5	F	147	LEU	2.4
2	C	176	VAL	2.4
2	C	293	PHE	2.4
2	C	778	PHE	2.3
3	D	1279	GLY	2.3
3	D	198	ARG	2.3
3	D	974	ILE	2.3
3	D	304	LEU	2.3
3	D	1252	ILE	2.3
3	D	236	TYR	2.2
2	C	189	ARG	2.2
5	F	369	LEU	2.2
3	D	446	VAL	2.2
3	D	1313	VAL	2.2
1	A	231	ALA	2.2
3	D	385	VAL	2.2
3	D	443	VAL	2.2
1	B	5	LYS	2.2
3	D	241	ILE	2.2
3	D	447	VAL	2.2
2	C	195	LEU	2.1
3	D	350	HIS	2.1
3	D	452	ILE	2.1
3	D	407	VAL	2.1
3	D	1318	TYR	2.1
1	B	189	ARG	2.1
2	C	107	LEU	2.1
3	D	1130	ARG	2.1
2	C	304	LEU	2.1
3	D	1298	GLY	2.1
1	B	118	ALA	2.1
3	D	1319	VAL	2.1
3	D	983	LEU	2.1
1	B	140	MET	2.1
2	C	365	ASP	2.1

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Mol	Chain	Res	Type	RSRZ
3	D	311	LEU	2.0
3	D	398	ALA	2.0
2	C	183	SER	2.0
3	D	171	LEU	2.0
1	B	23	PHE	2.0
1	A	233	VAL	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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
8	FGL	I	7	7/8	0.90	0.23	33,36,38,39	0
8	R2T	I	4	11/12	0.92	0.21	34,36,45,46	0
8	2RA	I	1	6/7	0.94	0.15	33,35,41,50	0
8	DSN	I	2	6/7	0.95	0.20	34,37,50,56	0
8	2TL	I	5	7/8	0.97	0.22	37,41,43,44	0
8	0QZ	I	6	6/7	0.97	0.22	33,33,37,38	0
8	DVA	I	3	7/8	0.98	0.18	33,36,41,47	0

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

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

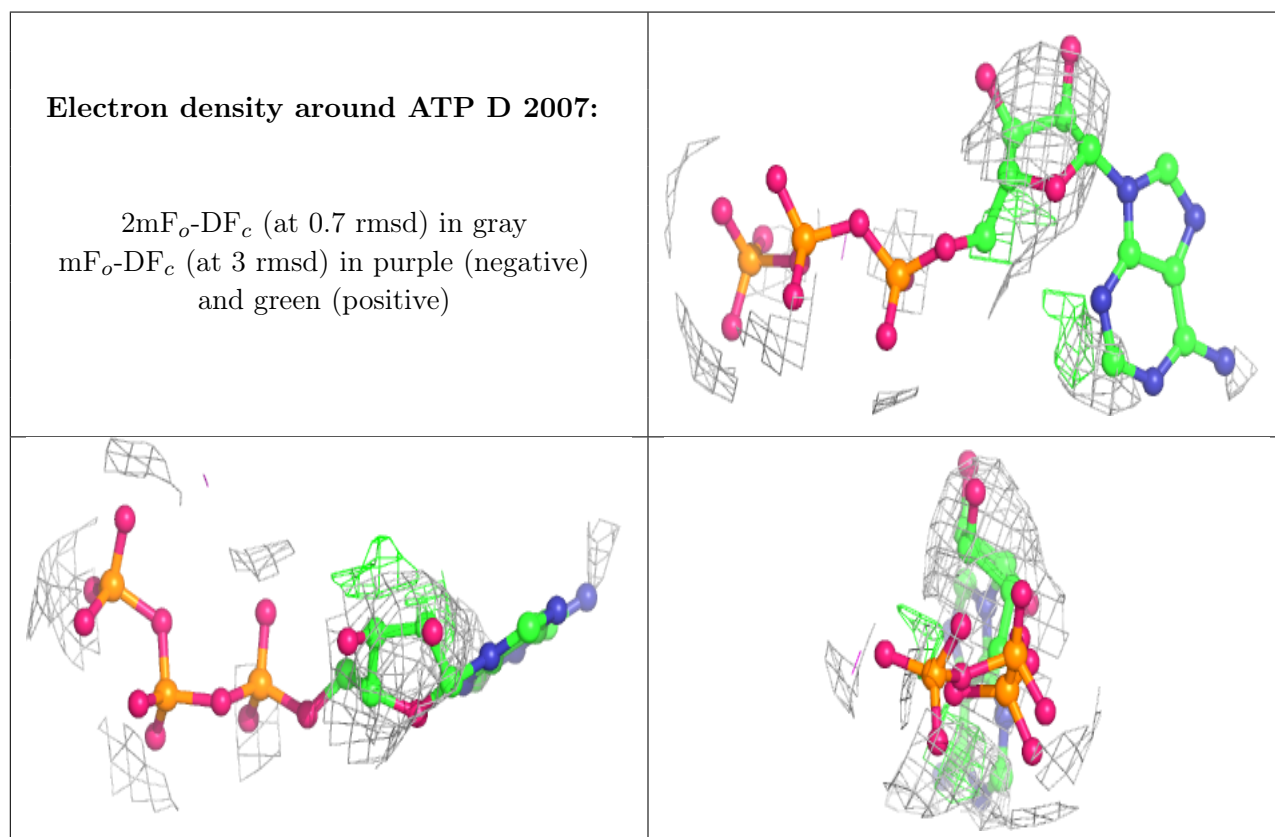
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
9	MG	F	2001	1/1	0.56	0.18	68,68,68,68	0
9	MG	D	2006	1/1	0.73	0.17	50,50,50,50	0
9	MG	B	2001	1/1	0.78	0.35	93,93,93,93	0
11	ATP	D	2007	31/31	0.91	0.35	53,108,121,122	10
9	MG	D	2004	1/1	0.92	0.41	69,69,69,69	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
12	MB8	I	101	2/7	0.92	0.16	34,34,34,34	0
9	MG	D	2005	1/1	0.96	0.42	33,33,33,33	0
9	MG	D	2003	1/1	0.98	0.20	26,26,26,26	0
10	ZN	D	2002	1/1	0.98	0.10	79,79,79,79	0
10	ZN	D	2001	1/1	1.00	0.19	38,38,38,38	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.



## 6.5 Other polymers [i](#)

There are no such residues in this entry.