



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 28, 2023 – 03:42 AM EDT

PDB ID : 3K35
Title : Crystal Structure of Human SIRT6
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Bochkarev, A.; Bountra, C.; Weigelt, J.; Arrowsmith, C.H.; Min, J.; Edwards,
A.M.; Structural Genomics Consortium (SGC)
Deposited on : 2009-10-01
Resolution : 2.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35
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

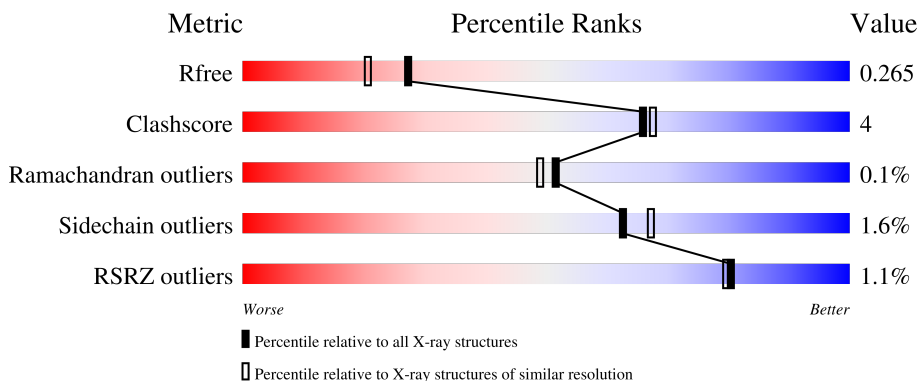
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION


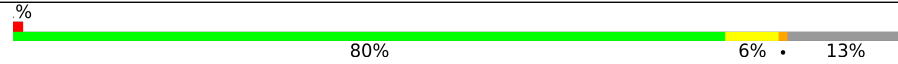
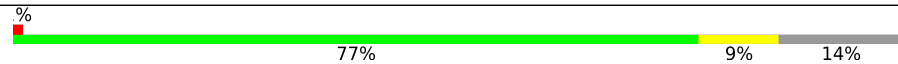

The reported resolution of this entry is 2.00 Å.

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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	318	
1	B	318	
1	C	318	
1	D	318	

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Mol	Chain	Length	Quality of chain
1	E	318	<p>%</p> <p>79% 8% 13%</p>
1	F	318	<p>%</p> <p>83% 5% 12%</p>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	SO4	B	319	-	-	X	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 14021 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 NAD-dependent deacetylase sirtuin-6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	274	2118	1338	383	386	11	0	2	0
1	B	276	2134	1347	385	391	11	11	2	0
1	C	275	2118	1336	382	389	11	0	1	0
1	D	273	2106	1326	384	385	11	0	1	0
1	E	276	2135	1347	387	390	11	0	0	0
1	F	280	2144	1352	386	395	11	0	1	0

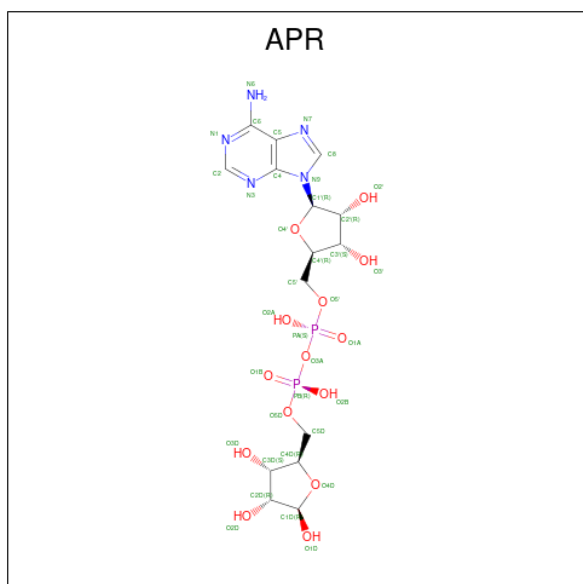
There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP Q8N6T7
A	0	SER	-	expression tag	UNP Q8N6T7
B	-1	GLY	-	expression tag	UNP Q8N6T7
B	0	SER	-	expression tag	UNP Q8N6T7
C	-1	GLY	-	expression tag	UNP Q8N6T7
C	0	SER	-	expression tag	UNP Q8N6T7
D	-1	GLY	-	expression tag	UNP Q8N6T7
D	0	SER	-	expression tag	UNP Q8N6T7
E	-1	GLY	-	expression tag	UNP Q8N6T7
E	0	SER	-	expression tag	UNP Q8N6T7
F	-1	GLY	-	expression tag	UNP Q8N6T7
F	0	SER	-	expression tag	UNP Q8N6T7

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Zn 1 1	0	0
2	B	1	Total Zn 1 1	0	0
2	C	1	Total Zn 1 1	0	0
2	D	1	Total Zn 1 1	0	0
2	E	1	Total Zn 1 1	0	0
2	F	1	Total Zn 1 1	0	0

- Molecule 3 is ADENOSINE-5-DIPHOSPHORIBOSE (three-letter code: APR) (formula: $C_{15}H_{23}N_5O_{14}P_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O P 36 15 5 14 2	0	0
3	B	1	Total C N O P 36 15 5 14 2	0	0
3	C	1	Total C N O P 36 15 5 14 2	0	0
3	D	1	Total C N O P 36 15 5 14 2	0	0
3	E	1	Total C N O P 36 15 5 14 2	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
3	F	1	36	15	5	14	2	0	0

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



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

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	E	1	Total O S 5 4 1	0	0
4	F	1	Total O S 5 4 1	0	0
4	F	1	Total O S 5 4 1	0	0

- Molecule 5 is UNKNOWN ATOM OR ION (three-letter code: UNX) (formula: X).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	3	Total X 3 3	0	0
5	B	3	Total X 3 3	0	0
5	C	3	Total X 3 3	0	0
5	D	3	Total X 3 3	0	0
5	E	3	Total X 3 3	0	0
5	F	3	Total X 3 3	0	0

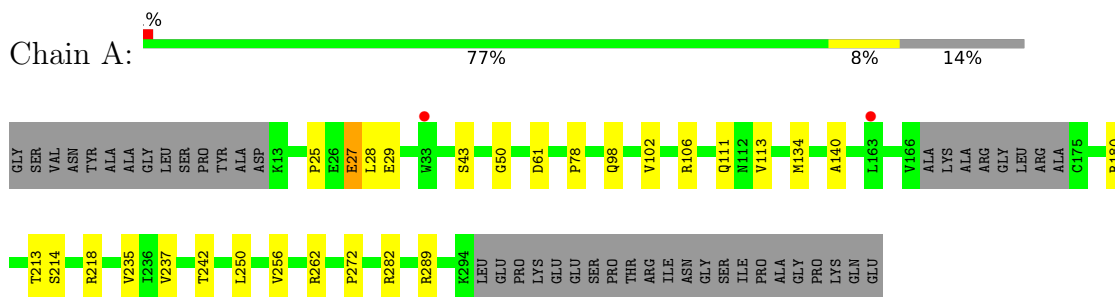
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	170	Total O 170 170	0	0
6	B	160	Total O 160 160	0	0
6	C	174	Total O 174 174	0	0
6	D	148	Total O 148 148	0	0
6	E	154	Total O 154 154	0	0
6	F	155	Total O 155 155	0	0

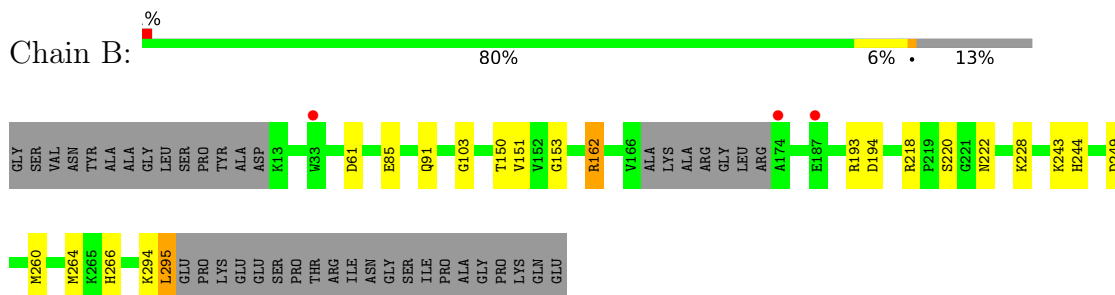
3 Residue-property plots [i](#)

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.

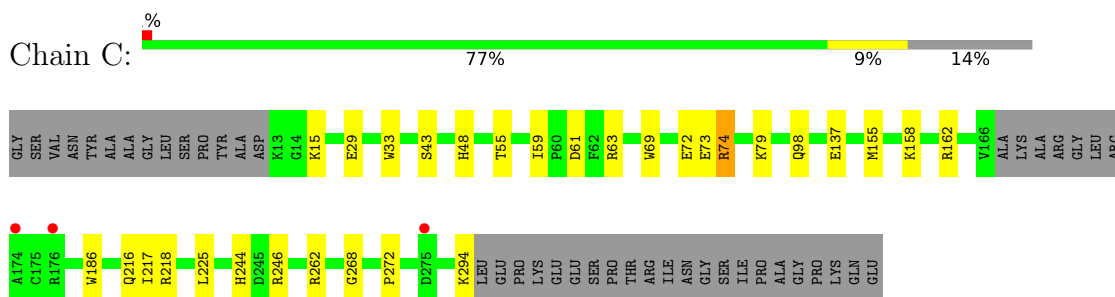
- Molecule 1: NAD-dependent deacetylase sirtuin-6



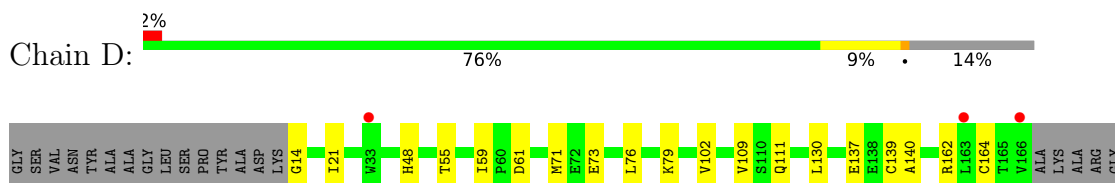
- Molecule 1: NAD-dependent deacetylase sirtuin-6



- Molecule 1: NAD-dependent deacetylase sirtuin-6

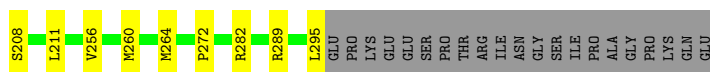
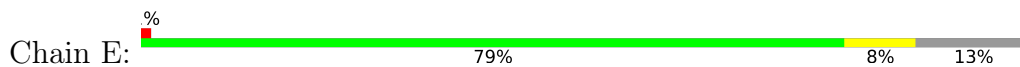


- Molecule 1: NAD-dependent deacetylase sirtuin-6

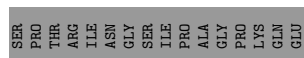
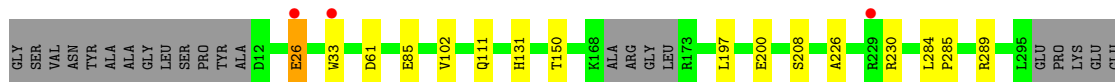
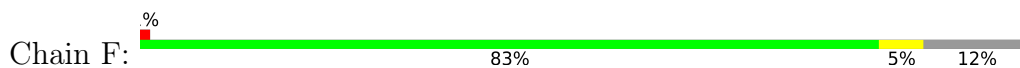




- Molecule 1: NAD-dependent deacetylase sirtuin-6



- Molecule 1: NAD-dependent deacetylase sirtuin-6



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	89.39Å 136.27Å 89.26Å 90.00° 119.87° 90.00°	Depositor
Resolution (Å)	19.95 – 2.00 19.95 – 2.00	Depositor EDS
% Data completeness (in resolution range)	100.0 (19.95-2.00) 96.5 (19.95-2.00)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.81 (at 2.01Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.202 , 0.267 0.204 , 0.265	Depositor DCC
R_{free} test set	1205 reflections (1.00%)	wwPDB-VP
Wilson B-factor (Å ²)	31.6	Xtriage
Anisotropy	0.125	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 30.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.037 for l,k,-h-l 0.037 for -h-l,k,h 0.045 for -h-l,-k,l 0.046 for h,-k,-h-l 0.139 for l,-k,h	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	14021	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.34% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: UNX, SO4, ZN, APR

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	0.63	0/2168	0.69	0/2946
1	B	0.66	0/2181	0.72	1/2963 (0.0%)
1	C	0.65	0/2165	0.67	0/2943
1	D	0.60	0/2153	0.69	0/2925
1	E	0.67	0/2182	0.69	1/2961 (0.0%)
1	F	0.58	0/2191	0.68	0/2979
All	All	0.63	0/13040	0.69	2/17717 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	162	ARG	NE-CZ-NH2	-5.89	117.36	120.30
1	E	166	VAL	CB-CA-C	-5.46	101.03	111.40

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	2118	0	2103	21	0
1	B	2134	0	2115	19	0
1	C	2118	0	2099	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2106	0	2088	20	0
1	E	2135	0	2133	14	0
1	F	2144	0	2106	10	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
3	A	36	0	21	3	0
3	B	36	0	21	1	0
3	C	36	0	21	1	0
3	D	36	0	21	2	0
3	E	36	0	21	1	0
3	F	36	0	21	1	0
4	A	20	0	0	0	0
4	B	10	0	0	3	0
4	C	5	0	0	1	0
4	D	10	0	0	0	0
4	E	10	0	0	0	0
4	F	10	0	0	0	0
5	A	3	0	0	0	0
5	B	3	0	0	0	0
5	C	3	0	0	0	0
5	D	3	0	0	0	0
5	E	3	0	0	0	0
5	F	3	0	0	0	0
6	A	170	0	0	5	0
6	B	160	0	0	5	0
6	C	174	0	0	5	0
6	D	148	0	0	4	0
6	E	154	0	0	2	0
6	F	155	0	0	1	0
All	All	14021	0	12770	104	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (104) 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:218:ARG:HH11	1:B:222:ASN:HD22	1.13	0.92
1:C:15:LYS:H	1:C:216:GLN:HE22	0.94	0.89
1:C:74:ARG:HH11	1:C:74:ARG:HG3	1.42	0.84
1:B:218:ARG:NH1	1:B:222:ASN:HD22	1.78	0.81
1:D:140:ALA:HB2	1:D:180:ARG:HD2	1.66	0.78
1:E:37:ARG:HG2	1:E:295:LEU:HD22	1.66	0.78
1:C:15:LYS:H	1:C:216:GLN:NE2	1.79	0.73
1:C:294:LYS:C	6:C:1045:HOH:O	2.25	0.73
1:A:256[B]:VAL:HG23	3:A:1001:APR:C2	2.20	0.71
1:C:74:ARG:HH11	1:C:74:ARG:CG	2.04	0.70
1:C:15:LYS:N	1:C:216:GLN:HE22	1.79	0.69
1:E:144:THR:HG23	6:E:1009:HOH:O	1.95	0.66
1:B:218:ARG:HH11	1:B:222:ASN:ND2	1.90	0.65
1:D:266:HIS:HE1	6:D:352:HOH:O	1.80	0.64
1:D:14:GLY:N	6:D:678:HOH:O	2.29	0.64
1:F:226:ALA:O	1:F:230:ARG:HG2	1.98	0.64
1:A:25:PRO:O	1:A:29:GLU:HG2	1.98	0.63
1:E:42:SER:HB3	1:E:206:ASP:OD1	1.99	0.62
1:C:29:GLU:OE2	1:C:262:ARG:NH1	2.33	0.62
1:B:194:ASP:OD2	6:B:331:HOH:O	2.16	0.61
1:A:78:PRO:HD3	6:A:373:HOH:O	2.00	0.61
1:C:162:ARG:NH2	6:C:349:HOH:O	2.33	0.61
1:E:141:LYS:HE3	1:F:197:LEU:CD2	2.30	0.61
1:B:266:HIS:HE1	6:B:372:HOH:O	1.85	0.59
1:A:27:GLU:HA	1:A:27:GLU:OE1	2.01	0.59
1:D:73:GLU:HG2	6:D:507:HOH:O	2.02	0.59
1:B:150:THR:OG1	1:D:294:LYS:HE2	2.02	0.58
1:D:162:ARG:HB3	1:D:179:LEU:HD12	1.85	0.57
1:C:63:ARG:NH2	1:C:217:ILE:HD11	2.20	0.55
1:D:111:GLN:NE2	3:D:4001:APR:H5R2	2.22	0.55
1:C:98:GLN:HB2	1:C:272:PRO:HD3	1.89	0.55
1:F:33:TRP:HB2	6:F:786:HOH:O	2.08	0.54
1:C:74:ARG:CG	1:C:74:ARG:NH1	2.69	0.53
1:A:256[B]:VAL:HG23	3:A:1001:APR:H2	1.89	0.53
1:C:61:ASP:OD2	3:C:3001:APR:H8	2.09	0.53
1:A:102:VAL:HB	1:A:289:ARG:HB3	1.90	0.52
1:A:98:GLN:HB2	1:A:272:PRO:HD3	1.91	0.52
1:A:27:GLU:OE1	1:A:27:GLU:CA	2.55	0.52
1:B:162:ARG:NH2	4:B:319:SO4:O2	2.43	0.51
1:C:268:GLY:HA2	6:C:782:HOH:O	2.11	0.51
1:B:260:MET:O	1:B:264:MET:HG2	2.11	0.51
1:E:24:PRO:HD2	1:E:27:GLU:HB2	1.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:243:LYS:HG2	1:B:244:HIS:CE1	2.46	0.50
1:C:155:MET:O	1:C:158:LYS:HD2	2.13	0.49
1:A:50:GLY:HA3	1:A:213:THR:HB	1.96	0.48
1:B:103:GLY:HA2	6:B:355:HOH:O	2.12	0.48
1:B:153:GLY:HA3	4:B:319:SO4:O3	2.13	0.48
1:A:106:ARG:NE	6:A:377:HOH:O	2.46	0.48
1:A:237:VAL:HG12	1:A:256[B]:VAL:HG22	1.96	0.48
1:E:152:VAL:HG13	1:E:160:THR:HG21	1.96	0.48
1:E:282:ARG:HD3	6:E:920:HOH:O	2.13	0.48
1:E:211:LEU:HD22	1:E:256:VAL:HG23	1.96	0.47
1:A:140:ALA:HB2	1:A:180:ARG:HD2	1.95	0.47
1:D:61:ASP:OD2	3:D:4001:APR:H8	2.15	0.47
1:D:260:MET:O	1:D:264:MET:HG2	2.15	0.47
1:C:48:HIS:HD2	6:C:338:HOH:O	1.98	0.46
1:E:61:ASP:OD1	3:E:5001:APR:H8	2.15	0.46
1:C:137:GLU:OE1	1:C:162:ARG:NH1	2.49	0.46
1:B:228:LYS:NZ	1:B:249:ASP:OD2	2.49	0.46
1:F:61:ASP:OD1	3:F:6001:APR:H8	2.15	0.46
1:D:55:THR:HA	1:D:59:ILE:O	2.16	0.45
1:D:71:MET:HE3	1:D:76:LEU:HB3	1.97	0.45
1:A:29:GLU:OE1	1:A:262:ARG:HD3	2.15	0.45
1:F:284:LEU:HB3	1:F:285:PRO:HD2	1.99	0.45
1:B:266:HIS:CE1	6:B:372:HOH:O	2.64	0.45
1:E:163:LEU:HG	1:E:176:ARG:O	2.17	0.44
1:F:85:GLU:OE2	1:F:150[A]:THR:HG23	2.18	0.44
1:A:106:ARG:NE	6:A:905:HOH:O	2.51	0.44
1:C:72:GLU:C	1:C:74:ARG:H	2.21	0.44
1:D:21:ILE:O	1:D:253:HIS:HB3	2.18	0.44
1:C:33:TRP:HB2	6:C:591:HOH:O	2.18	0.44
1:E:98:GLN:HB2	1:E:272:PRO:HD3	1.99	0.43
1:D:48:HIS:HA	1:D:109:VAL:O	2.19	0.43
1:D:137:GLU:OE1	1:D:162:ARG:NH1	2.51	0.43
1:D:130:LEU:O	1:D:191:PRO:HD2	2.19	0.43
1:D:71:MET:HE3	1:D:76:LEU:CB	2.48	0.43
1:D:266:HIS:CE1	6:D:352:HOH:O	2.62	0.43
1:F:26:GLU:H	1:F:26:GLU:CD	2.16	0.43
1:F:284:LEU:HB3	1:F:285:PRO:CD	2.48	0.43
1:B:162:ARG:NH2	4:B:319:SO4:S	2.88	0.43
1:C:69:TRP:CZ2	1:C:186:TRP:HZ2	2.37	0.42
1:E:260:MET:O	1:E:264:MET:HG2	2.19	0.42
1:E:108:LEU:HD21	1:E:117:HIS:CE1	2.54	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:111:GLN:HG2	1:F:131:HIS:CE1	2.53	0.42
1:A:113:VAL:O	1:A:134:MET:HG2	2.19	0.42
1:B:294:LYS:O	1:B:295:LEU:HD12	2.20	0.42
1:C:55:THR:HA	1:C:59:ILE:O	2.19	0.42
1:D:139:CYS:SG	1:D:164:CYS:HB2	2.59	0.42
1:C:225:LEU:HD11	1:C:244:HIS:CE1	2.55	0.42
1:D:111:GLN:CD	1:D:220[A]:SER:OG	2.58	0.42
1:E:102:VAL:HB	1:E:289:ARG:HB3	2.01	0.42
1:A:61:ASP:OD1	3:A:1001:APR:H8	2.20	0.42
1:A:235:VAL:HG22	1:A:250:LEU:HB3	2.02	0.42
1:A:180:ARG:CZ	6:A:985:HOH:O	2.66	0.41
1:B:228:LYS:HD2	1:B:228:LYS:HA	1.85	0.41
1:B:85:GLU:OE2	1:B:151:VAL:HG22	2.19	0.41
1:A:282:ARG:HG2	1:A:282:ARG:HH11	1.84	0.41
1:F:102:VAL:HB	1:F:289:ARG:HB3	2.03	0.41
1:D:102:VAL:HB	1:D:289:ARG:HB3	2.03	0.41
1:B:61:ASP:OD2	3:B:2001:APR:H8	2.19	0.41
1:B:91:GLN:HG3	6:B:364:HOH:O	2.21	0.41
1:C:218:ARG:HD2	4:C:318:SO4:O3	2.21	0.41
1:A:111:GLN:NE2	6:A:347:HOH:O	2.48	0.41
1:A:214:SER:HA	1:A:242:THR:HG22	2.03	0.41

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	272/318 (86%)	269 (99%)	3 (1%)	0	100	100
1	B	274/318 (86%)	269 (98%)	5 (2%)	0	100	100
1	C	272/318 (86%)	268 (98%)	3 (1%)	1 (0%)	34	30
1	D	270/318 (85%)	268 (99%)	2 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	272/318 (86%)	267 (98%)	5 (2%)	0	100	100
1	F	277/318 (87%)	275 (99%)	2 (1%)	0	100	100
All	All	1637/1908 (86%)	1616 (99%)	20 (1%)	1 (0%)	51	49

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	73	GLU

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	224/266 (84%)	220 (98%)	4 (2%)	59	63
1	B	225/266 (85%)	222 (99%)	3 (1%)	69	74
1	C	225/266 (85%)	221 (98%)	4 (2%)	59	63
1	D	224/266 (84%)	217 (97%)	7 (3%)	40	40
1	E	229/266 (86%)	228 (100%)	1 (0%)	91	93
1	F	224/266 (84%)	221 (99%)	3 (1%)	69	74
All	All	1351/1596 (85%)	1329 (98%)	22 (2%)	62	67

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	27	GLU
1	A	28	LEU
1	A	43	SER
1	A	218	ARG
1	B	193	ARG
1	B	220	SER
1	B	295	LEU
1	C	43	SER
1	C	74	ARG

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Mol	Chain	Res	Type
1	C	79	LYS
1	C	246	ARG
1	D	79	LYS
1	D	175	CYS
1	D	191	PRO
1	D	206	ASP
1	D	220[A]	SER
1	D	220[B]	SER
1	D	269	LEU
1	E	208	SER
1	F	26	GLU
1	F	200	GLU
1	F	208	SER

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

Mol	Chain	Res	Type
1	A	111	GLN
1	B	66	HIS
1	B	111	GLN
1	B	222	ASN
1	B	266	HIS
1	C	48	HIS
1	C	111	GLN
1	C	216	GLN
1	D	111	GLN
1	D	266	HIS
1	E	111	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](#)

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](#)

Of 43 ligands modelled in this entry, 6 are monoatomic and 18 are unknown - leaving 19 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	$\# Z > 2$
4	SO4	C	318	-	4,4,4	0.15	0	6,6,6	0.16	0
4	SO4	B	318	-	4,4,4	0.17	0	6,6,6	0.12	0
3	APR	A	1001	-	34,39,39	0.93	1 (2%)	40,60,60	1.45	6 (15%)
3	APR	E	5001	-	34,39,39	1.03	3 (8%)	40,60,60	1.56	9 (22%)
3	APR	F	6001	-	34,39,39	0.96	2 (5%)	40,60,60	1.58	10 (25%)
4	SO4	A	318	-	4,4,4	0.19	0	6,6,6	0.28	0
4	SO4	A	319	-	4,4,4	0.23	0	6,6,6	0.29	0
3	APR	C	3001	-	34,39,39	0.86	0	40,60,60	1.69	7 (17%)
4	SO4	D	319	-	4,4,4	0.19	0	6,6,6	0.34	0
4	SO4	E	318	-	4,4,4	0.32	0	6,6,6	0.52	0
4	SO4	F	319	-	4,4,4	0.28	0	6,6,6	0.36	0
4	SO4	A	320	-	4,4,4	0.30	0	6,6,6	0.80	0
3	APR	B	2001	-	34,39,39	0.95	2 (5%)	40,60,60	1.56	8 (20%)
4	SO4	D	318	-	4,4,4	0.14	0	6,6,6	0.27	0
4	SO4	F	318	-	4,4,4	0.15	0	6,6,6	0.12	0
4	SO4	E	319	-	4,4,4	0.20	0	6,6,6	0.24	0
4	SO4	B	319	-	4,4,4	0.14	0	6,6,6	0.20	0
4	SO4	A	321	-	4,4,4	0.15	0	6,6,6	0.18	0
3	APR	D	4001	-	34,39,39	0.89	1 (2%)	40,60,60	1.64	7 (17%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	APR	E	5001	-	-	1/18/54/54	0/4/4/4
3	APR	F	6001	-	-	3/18/54/54	0/4/4/4
3	APR	B	2001	-	-	1/18/54/54	0/4/4/4

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	APR	A	1001	-	-	1/18/54/54	0/4/4/4
3	APR	C	3001	-	-	2/18/54/54	0/4/4/4
3	APR	D	4001	-	-	2/18/54/54	0/4/4/4

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	5001	APR	O4'-C1'	3.15	1.45	1.41
3	D	4001	APR	C5-C4	2.96	1.48	1.40
3	E	5001	APR	C5-C4	2.77	1.48	1.40
3	B	2001	APR	O4'-C1'	2.72	1.44	1.41
3	A	1001	APR	C5-C4	2.68	1.48	1.40
3	F	6001	APR	C5-C4	2.44	1.47	1.40
3	F	6001	APR	C2-N3	2.24	1.35	1.32
3	E	5001	APR	C2'-C1'	-2.21	1.50	1.53
3	B	2001	APR	C5-C4	2.13	1.46	1.40

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	3001	APR	O1D-C1D-O4D	-5.36	104.27	111.13
3	D	4001	APR	N3-C2-N1	-4.85	121.09	128.68
3	C	3001	APR	N3-C2-N1	-4.31	121.94	128.68
3	A	1001	APR	N3-C2-N1	-4.19	122.13	128.68
3	F	6001	APR	N3-C2-N1	-4.14	122.21	128.68
3	B	2001	APR	N3-C2-N1	-3.99	122.44	128.68
3	E	5001	APR	N3-C2-N1	-3.56	123.11	128.68
3	D	4001	APR	C2-N1-C6	3.56	124.84	118.75
3	F	6001	APR	O2D-C2D-C1D	-3.48	102.22	111.82
3	E	5001	APR	O2D-C2D-C1D	-3.38	102.48	111.82
3	D	4001	APR	O2D-C2D-C1D	-3.25	102.86	111.82
3	D	4001	APR	O1D-C1D-O4D	3.23	115.27	111.13
3	A	1001	APR	C2-N1-C6	3.21	124.25	118.75
3	D	4001	APR	O4D-C4D-C3D	-3.15	98.88	105.11
3	C	3001	APR	C4-C5-N7	-3.13	106.14	109.40
3	B	2001	APR	O4D-C4D-C3D	-3.01	99.15	105.11
3	A	1001	APR	O2D-C2D-C1D	-2.88	103.88	111.82
3	F	6001	APR	PB-O3A-PA	-2.87	122.99	132.83
3	E	5001	APR	C3'-C2'-C1'	2.87	105.29	100.98
3	C	3001	APR	PB-O3A-PA	-2.82	123.15	132.83
3	B	2001	APR	C4-C5-N7	-2.81	106.47	109.40
3	E	5001	APR	O4'-C1'-C2'	-2.75	102.91	106.93

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	3001	APR	C1'-N9-C4	-2.70	121.89	126.64
3	B	2001	APR	PB-O3A-PA	-2.69	123.61	132.83
3	E	5001	APR	C1D-C2D-C3D	2.65	105.61	102.30
3	C	3001	APR	C2-N1-C6	2.49	123.01	118.75
3	F	6001	APR	C1'-N9-C4	-2.48	122.28	126.64
3	F	6001	APR	C4-C5-N7	-2.47	106.83	109.40
3	E	5001	APR	PB-O3A-PA	-2.43	124.48	132.83
3	F	6001	APR	O1D-C1D-O4D	2.40	114.21	111.13
3	C	3001	APR	O2D-C2D-C1D	-2.40	105.20	111.82
3	D	4001	APR	C4-C5-N7	-2.38	106.92	109.40
3	F	6001	APR	C1D-C2D-C3D	2.37	105.26	102.30
3	B	2001	APR	O3'-C3'-C4'	-2.37	104.20	111.05
3	A	1001	APR	C4-C5-N7	-2.35	106.95	109.40
3	E	5001	APR	C2-N1-C6	2.34	122.76	118.75
3	B	2001	APR	O2'-C2'-C1'	-2.33	102.26	110.85
3	B	2001	APR	C2-N1-C6	2.31	122.70	118.75
3	E	5001	APR	O2'-C2'-C1'	-2.29	102.41	110.85
3	F	6001	APR	O1D-C1D-C2D	2.28	121.29	110.39
3	B	2001	APR	O2D-C2D-C1D	-2.26	105.59	111.82
3	F	6001	APR	C2-N1-C6	2.26	122.62	118.75
3	D	4001	APR	C3'-C2'-C1'	2.25	104.37	100.98
3	E	5001	APR	N6-C6-N1	2.13	122.99	118.57
3	F	6001	APR	O2A-PA-O1A	2.12	122.72	112.24
3	A	1001	APR	C1'-N9-C4	-2.11	122.93	126.64
3	A	1001	APR	O2B-PB-O1B	2.10	122.63	112.24

There are no chirality outliers.

All (10) torsion outliers are listed below:

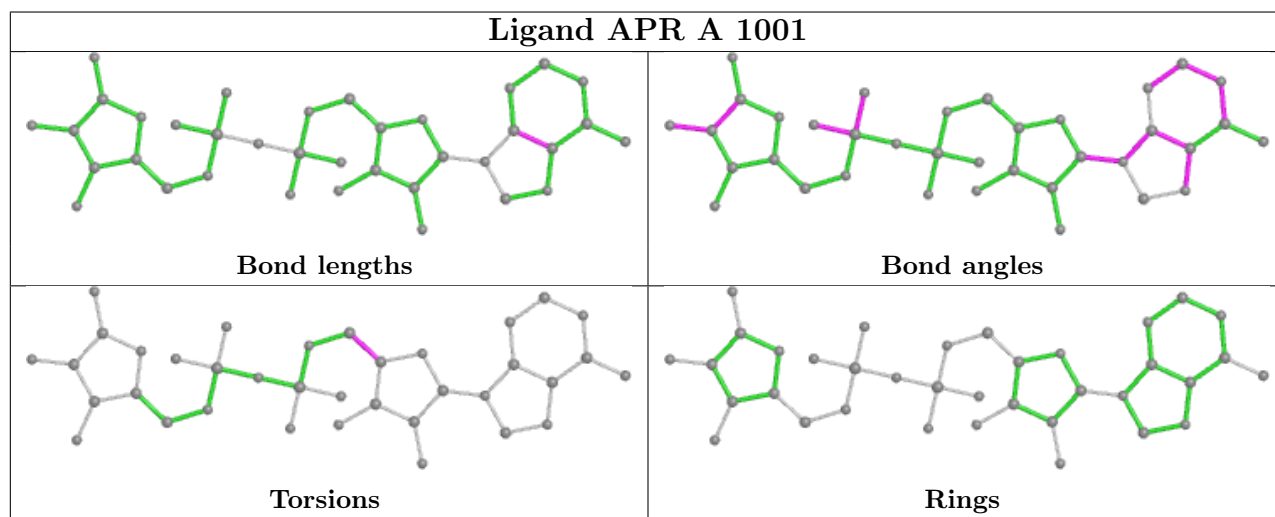
Mol	Chain	Res	Type	Atoms
3	D	4001	APR	C5D-O5D-PB-O1B
3	F	6001	APR	C5D-O5D-PB-O1B
3	F	6001	APR	O4'-C4'-C5'-O5'
3	E	5001	APR	O4'-C4'-C5'-O5'
3	B	2001	APR	O4'-C4'-C5'-O5'
3	F	6001	APR	C3'-C4'-C5'-O5'
3	C	3001	APR	C5D-O5D-PB-O1B
3	A	1001	APR	O4'-C4'-C5'-O5'
3	C	3001	APR	O4'-C4'-C5'-O5'
3	D	4001	APR	O4'-C4'-C5'-O5'

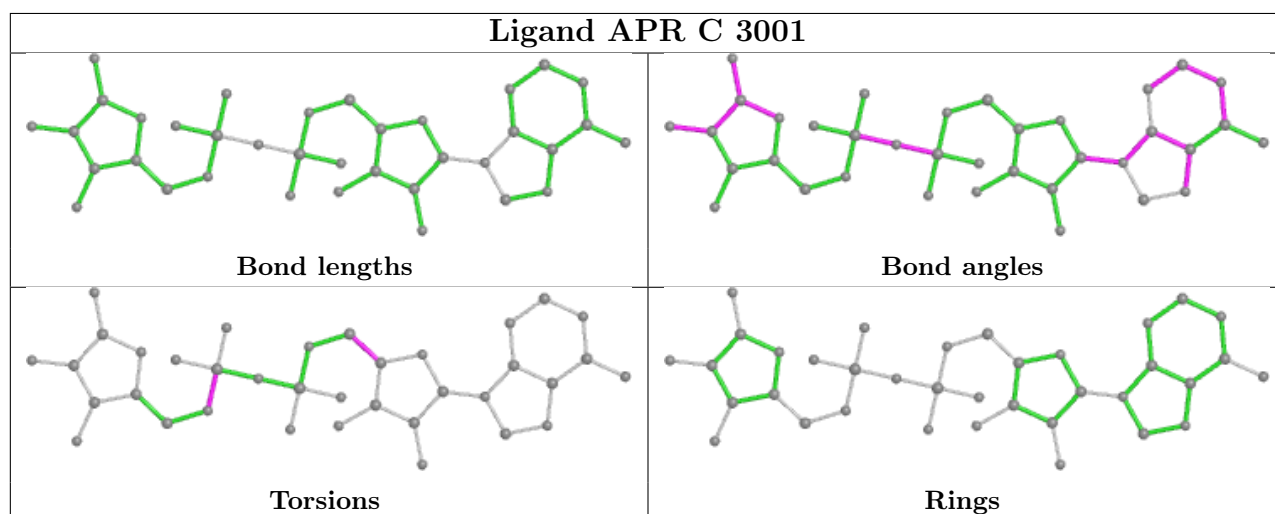
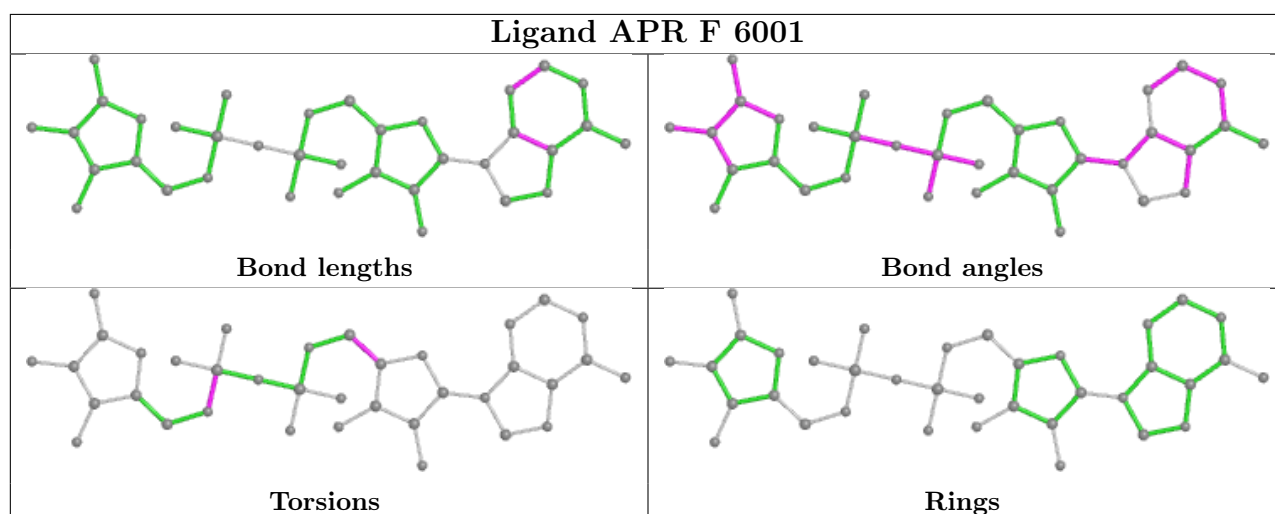
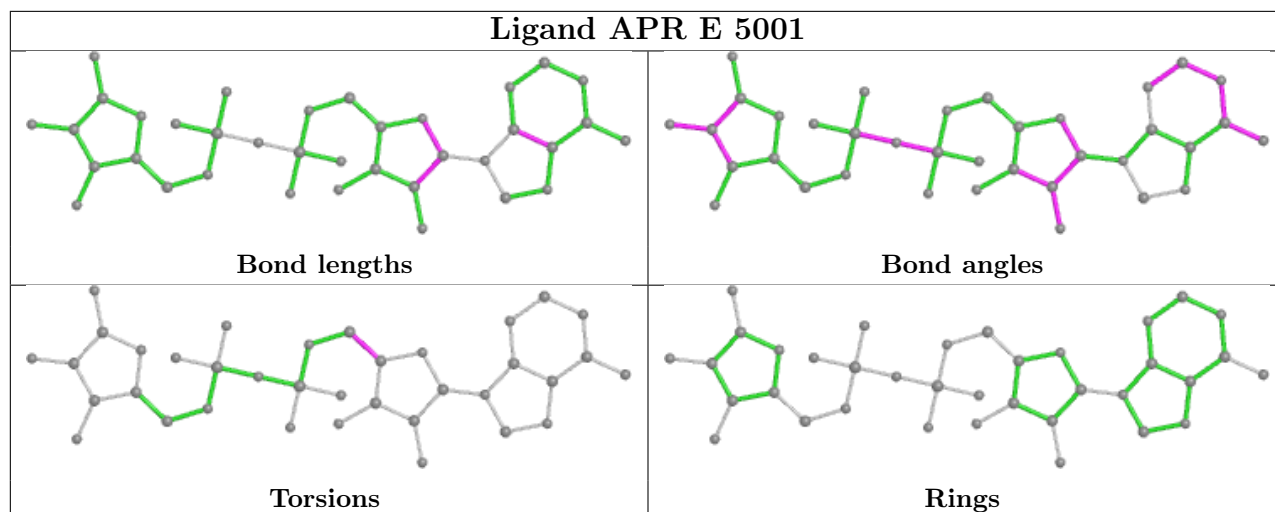
There are no ring outliers.

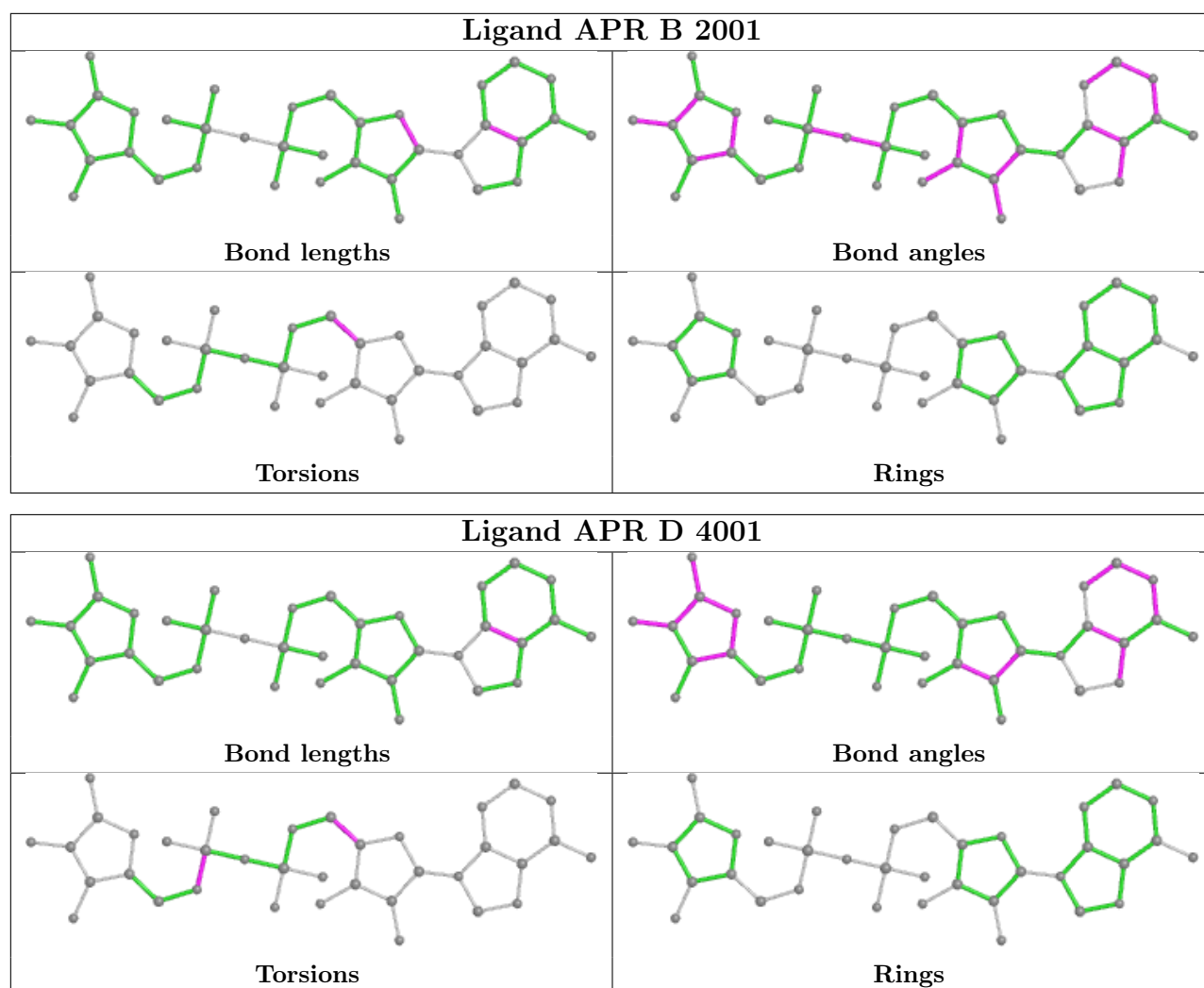
8 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	318	SO4	1	0
3	A	1001	APR	3	0
3	E	5001	APR	1	0
3	F	6001	APR	1	0
3	C	3001	APR	1	0
3	B	2001	APR	1	0
4	B	319	SO4	3	0
3	D	4001	APR	2	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, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	274/318 (86%)	-0.39	2 (0%) 87 87	20, 29, 43, 51	0
1	B	276/318 (86%)	-0.43	3 (1%) 80 79	18, 28, 42, 50	0
1	C	275/318 (86%)	-0.38	3 (1%) 80 79	18, 28, 43, 50	0
1	D	273/318 (85%)	-0.35	5 (1%) 68 66	20, 30, 46, 54	0
1	E	276/318 (86%)	-0.33	2 (0%) 87 87	19, 30, 45, 54	0
1	F	280/318 (88%)	-0.33	3 (1%) 80 79	22, 32, 47, 81	0
All	All	1654/1908 (86%)	-0.37	18 (1%) 80 79	18, 30, 44, 81	0

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	166	VAL	3.3
1	F	33	TRP	3.3
1	C	174	ALA	3.1
1	D	186	TRP	2.9
1	B	33	TRP	2.8
1	E	33	TRP	2.7
1	F	26	GLU	2.6
1	A	163	LEU	2.6
1	B	174	ALA	2.6
1	A	33	TRP	2.6
1	C	176	ARG	2.5
1	E	174	ALA	2.5
1	D	33	TRP	2.4
1	F	229	ARG	2.3
1	D	275	ASP	2.1
1	C	275	ASP	2.1
1	B	187	GLU	2.1
1	D	163	LEU	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, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

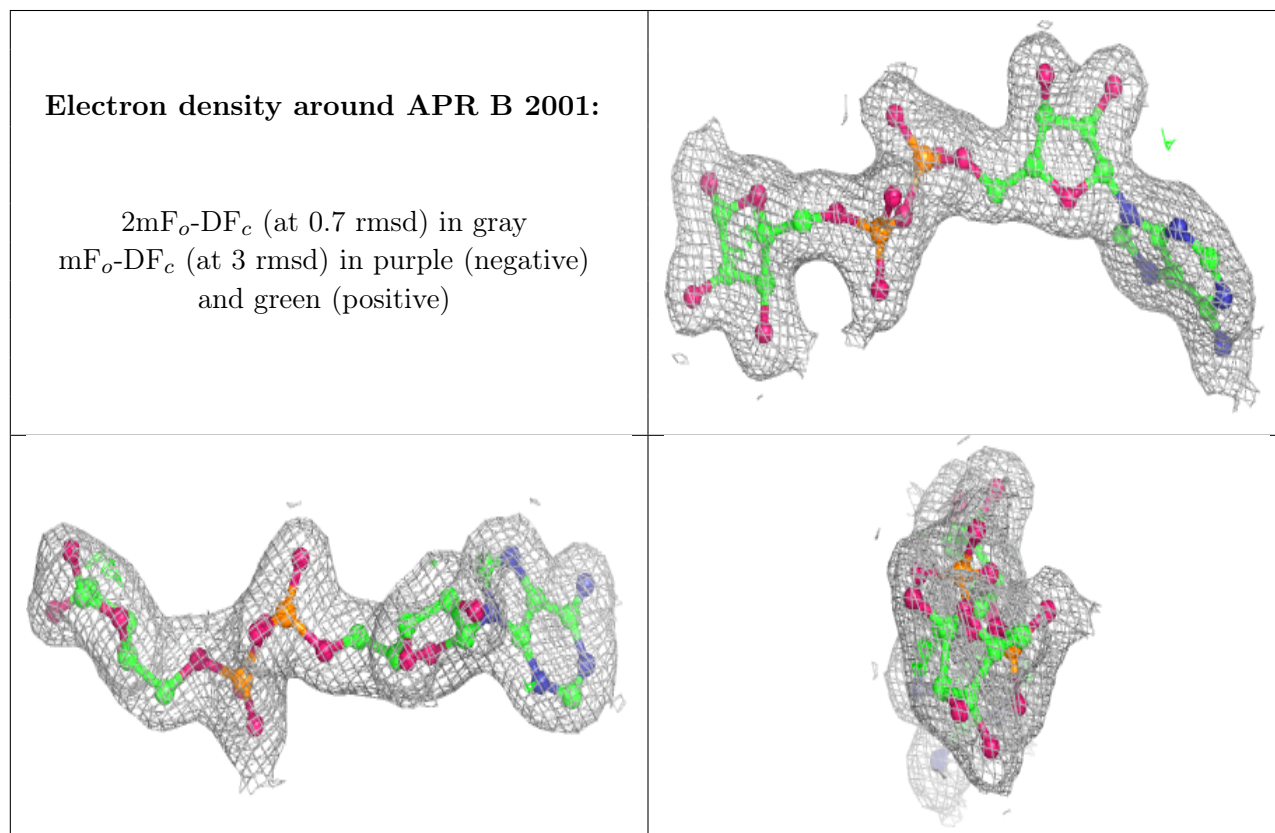
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
5	UNX	C	320	1/1	0.67	0.16	30,30,30,30	0
5	UNX	A	324	1/1	0.70	0.37	30,30,30,30	0
5	UNX	A	323	1/1	0.70	0.22	30,30,30,30	0
5	UNX	E	321	1/1	0.73	0.24	30,30,30,30	0
5	UNX	D	320	1/1	0.78	0.22	30,30,30,30	0
5	UNX	B	321	1/1	0.83	0.23	30,30,30,30	0
5	UNX	E	322	1/1	0.85	0.21	30,30,30,30	0
5	UNX	F	321	1/1	0.87	0.15	30,30,30,30	0
5	UNX	B	322	1/1	0.88	0.24	30,30,30,30	0
5	UNX	A	322	1/1	0.88	0.14	30,30,30,30	0
5	UNX	F	322	1/1	0.88	0.27	30,30,30,30	0
5	UNX	C	319	1/1	0.89	0.11	30,30,30,30	0
5	UNX	D	321	1/1	0.89	0.22	30,30,30,30	0
5	UNX	E	320	1/1	0.92	0.23	30,30,30,30	0
5	UNX	F	320	1/1	0.92	0.13	30,30,30,30	0
5	UNX	C	321	1/1	0.93	0.11	30,30,30,30	0
5	UNX	D	322	1/1	0.93	0.20	30,30,30,30	0
4	SO4	E	319	5/5	0.95	0.22	50,53,53,54	0
4	SO4	B	319	5/5	0.95	0.20	57,58,59,60	0
5	UNX	B	320	1/1	0.96	0.17	30,30,30,30	0
2	ZN	D	317	1/1	0.97	0.06	58,58,58,58	0
4	SO4	D	318	5/5	0.97	0.09	53,54,54,56	0
4	SO4	A	319	5/5	0.97	0.13	47,48,48,49	0
3	APR	B	2001	36/36	0.98	0.10	17,21,30,37	0
3	APR	C	3001	36/36	0.98	0.09	20,24,31,37	0
3	APR	D	4001	36/36	0.98	0.09	18,25,34,35	0
3	APR	E	5001	36/36	0.98	0.08	17,20,29,36	0

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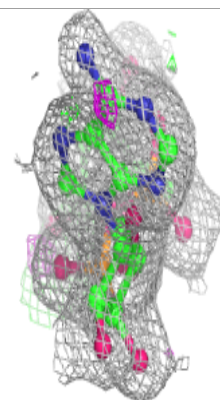
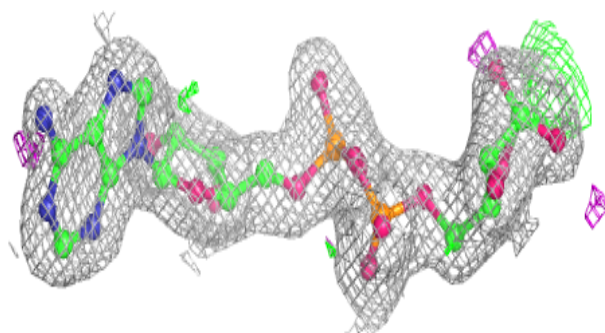
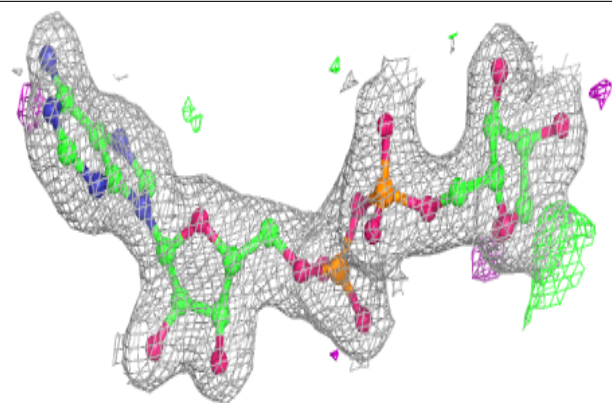
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	APR	F	6001	36/36	0.98	0.09	19,25,28,29	0
4	SO4	A	318	5/5	0.98	0.12	55,55,56,57	0
2	ZN	B	317	1/1	0.98	0.04	46,46,46,46	0
4	SO4	A	320	5/5	0.98	0.11	35,37,37,38	0
4	SO4	A	321	5/5	0.98	0.09	50,51,51,52	0
4	SO4	B	318	5/5	0.98	0.05	50,50,51,52	0
2	ZN	A	317	1/1	0.98	0.06	50,50,50,50	0
4	SO4	C	318	5/5	0.98	0.16	50,50,51,52	0
2	ZN	E	317	1/1	0.98	0.04	45,45,45,45	0
4	SO4	D	319	5/5	0.98	0.11	34,35,37,39	0
2	ZN	F	317	1/1	0.98	0.06	46,46,46,46	0
4	SO4	F	318	5/5	0.98	0.13	61,62,62,63	0
3	APR	A	1001	36/36	0.98	0.08	19,23,28,35	0
2	ZN	C	317	1/1	0.99	0.07	40,40,40,40	0
4	SO4	E	318	5/5	0.99	0.10	34,37,38,38	0
4	SO4	F	319	5/5	0.99	0.10	34,34,35,36	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.

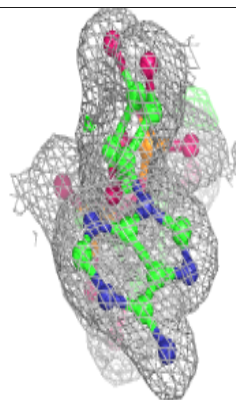
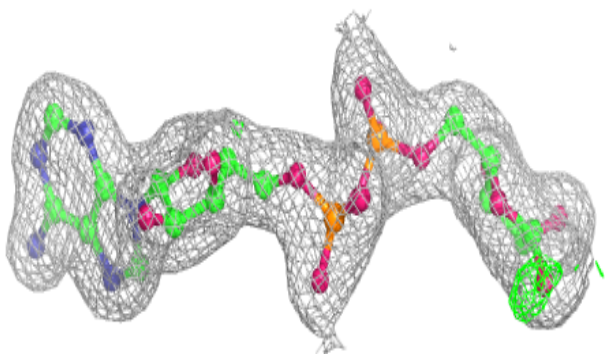
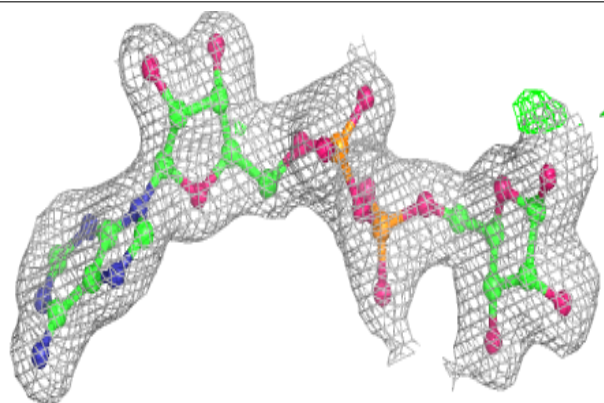


Electron density around APR C 3001:

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

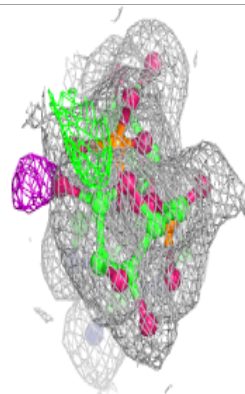
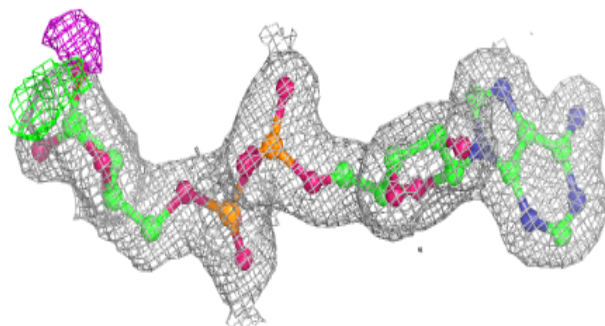
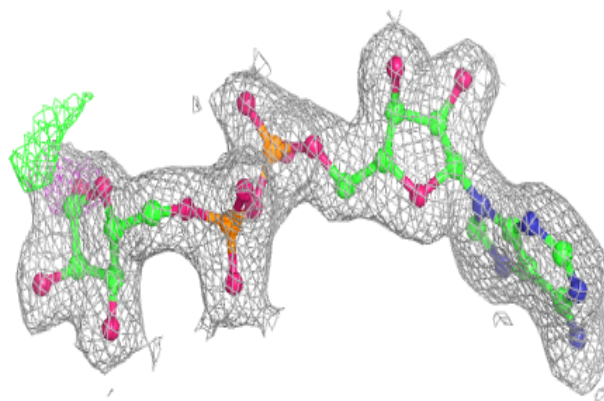
**Electron density around APR D 4001:**

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

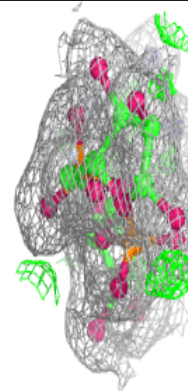
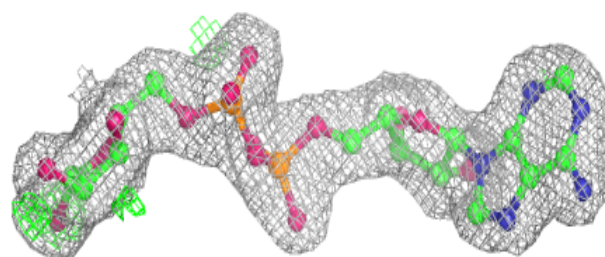
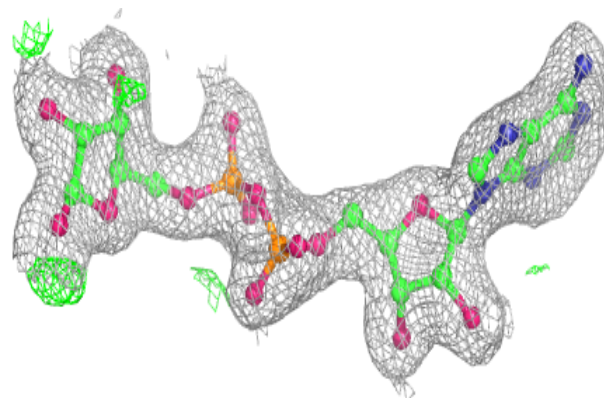


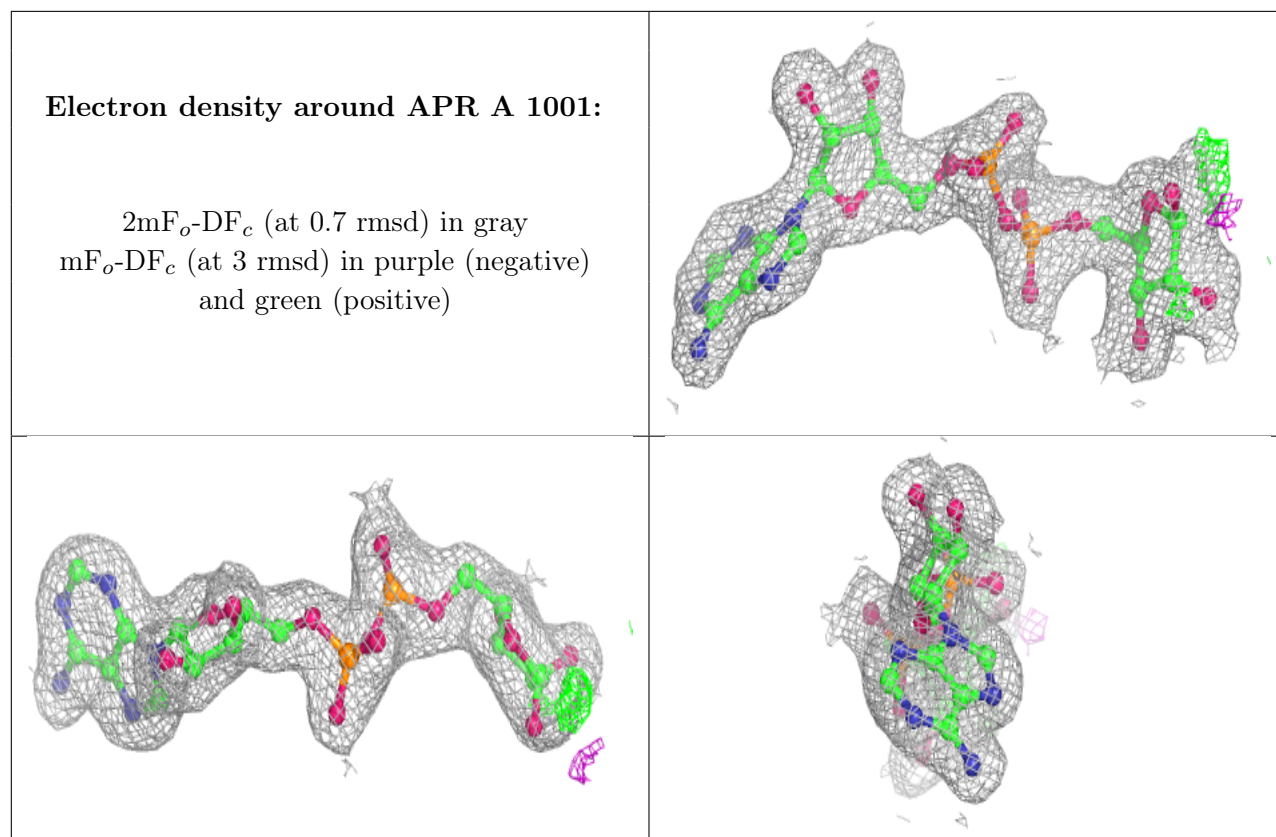
Electron density around APR E 5001:

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

**Electron density around APR F 6001:**

$2mF_o-DF_c$ (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.