



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 4, 2026 – 06:25 AM EDT

PDB ID : 5SUP / pdb_00005sup
Title : Crystal structure of the Sub2-Yra1 complex in association with RNA
Authors : Ren, Y.; Schmiede, P.; Blobel, G.
Deposited on : 2016-08-03
Resolution : 2.60 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.015 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

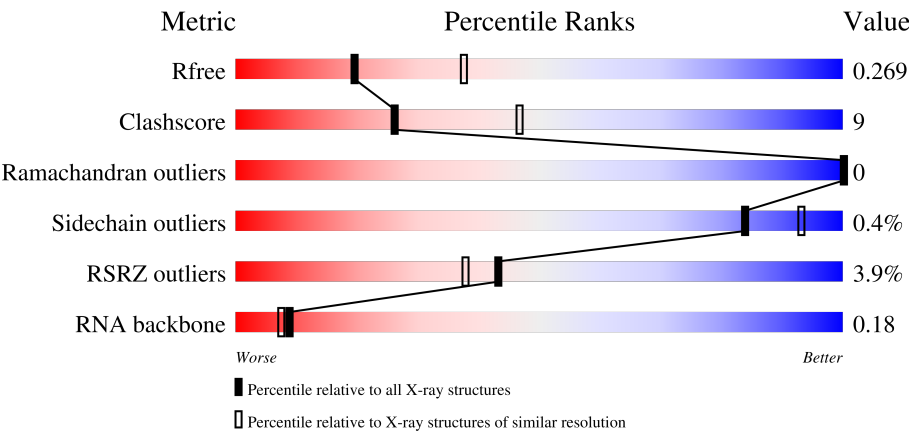
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R _{free}	180053	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)
RNA backbone	3983	1014 (2.84-2.36)

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	390	2% 81% 17%
1	B	390	3% 79% 18%
1	C	390	7% 72% 25%
2	G	32	44% 9% 47%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	H	32	41% 9% • 47%
2	I	32	9% 12% 25% 9% 53%
3	D	15	13% 13% 13% 60%
3	E	15	20% 13% 7% 60%
3	F	15	7% 13% 20% 60%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 10127 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 ATP-dependent RNA helicase SUB2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	383	Total	C	N	O	S	0	0	0
			3082	1960	535	576	11			
1	B	383	Total	C	N	O	S	0	0	0
			3082	1960	535	576	11			
1	C	381	Total	C	N	O	S	0	0	0
			3071	1954	533	573	11			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	57	GLY	-	expression tag	UNP Q07478
A	58	ALA	-	expression tag	UNP Q07478
A	59	MET	-	expression tag	UNP Q07478
A	60	GLY	-	expression tag	UNP Q07478
B	57	GLY	-	expression tag	UNP Q07478
B	58	ALA	-	expression tag	UNP Q07478
B	59	MET	-	expression tag	UNP Q07478
B	60	GLY	-	expression tag	UNP Q07478
C	57	GLY	-	expression tag	UNP Q07478
C	58	ALA	-	expression tag	UNP Q07478
C	59	MET	-	expression tag	UNP Q07478
C	60	GLY	-	expression tag	UNP Q07478

- Molecule 2 is a protein called RNA annealing protein YRA1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	G	17	Total	C	N	O	S	0	0	0
			141	89	20	31	1			
2	H	17	Total	C	N	O	S	0	0	0
			141	89	20	31	1			
2	I	15	Total	C	N	O	S	0	0	0
			127	80	17	29	1			

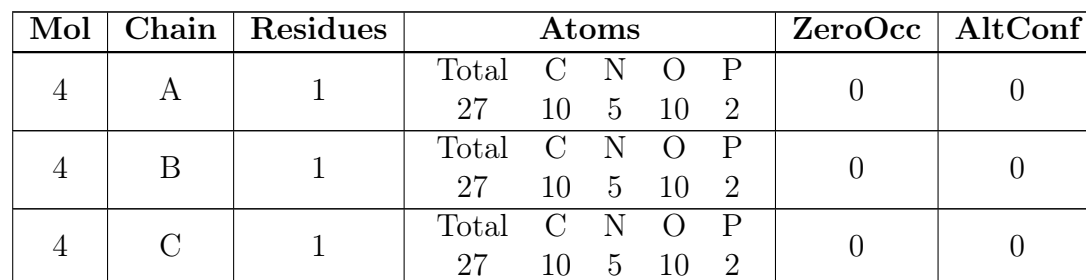
There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	195	GLY	-	expression tag	UNP Q12159
G	196	ALA	-	expression tag	UNP Q12159
G	197	MET	-	expression tag	UNP Q12159
G	198	GLY	-	expression tag	UNP Q12159
G	199	SER	-	expression tag	UNP Q12159
H	195	GLY	-	expression tag	UNP Q12159
H	196	ALA	-	expression tag	UNP Q12159
H	197	MET	-	expression tag	UNP Q12159
H	198	GLY	-	expression tag	UNP Q12159
H	199	SER	-	expression tag	UNP Q12159
I	195	GLY	-	expression tag	UNP Q12159
I	196	ALA	-	expression tag	UNP Q12159
I	197	MET	-	expression tag	UNP Q12159
I	198	GLY	-	expression tag	UNP Q12159
I	199	SER	-	expression tag	UNP Q12159

- Molecule 3 is a RNA chain called RNA (5'-R(P*UP*UP*UP*UP*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	6	Total	C	N	O	P	0	0	0
			120	54	12	48	6			
3	E	6	Total	C	N	O	P	0	0	0
			120	54	12	48	6			
3	F	6	Total	C	N	O	P	0	0	0
			120	54	12	48	6			

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C₁₀H₁₅N₅O₁₀P₂).



- BEF
- F3
- F⁻
- BE Be⁺² F⁻ F1
- F⁻
- F2

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	Be	F	0	0
			4	1	3		



Continued from previous page...

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total 4	Be 1	F 3	0	0
5	C	1	Total 4	Be 1	F 3	0	0

- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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

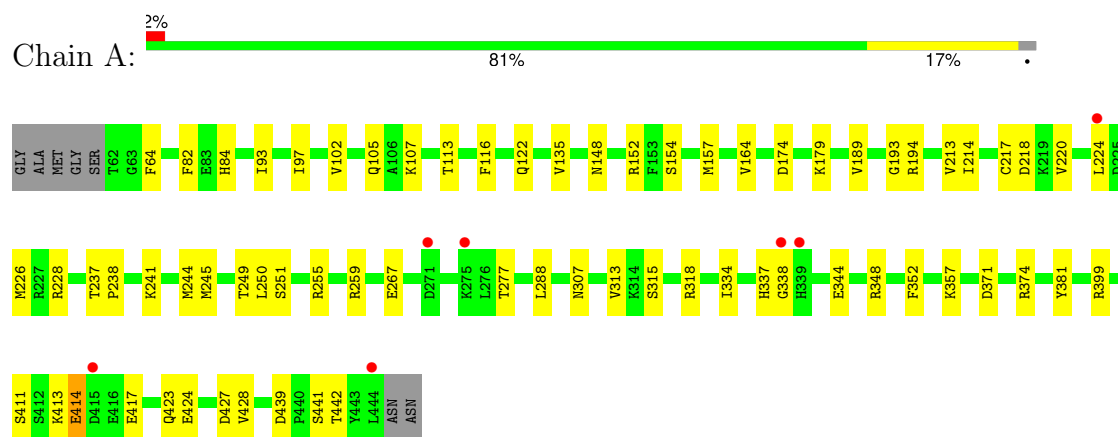
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	13	Total 13	O 13	0	0
7	B	9	Total 9	O 9	0	0
7	C	5	Total 5	O 5	0	0

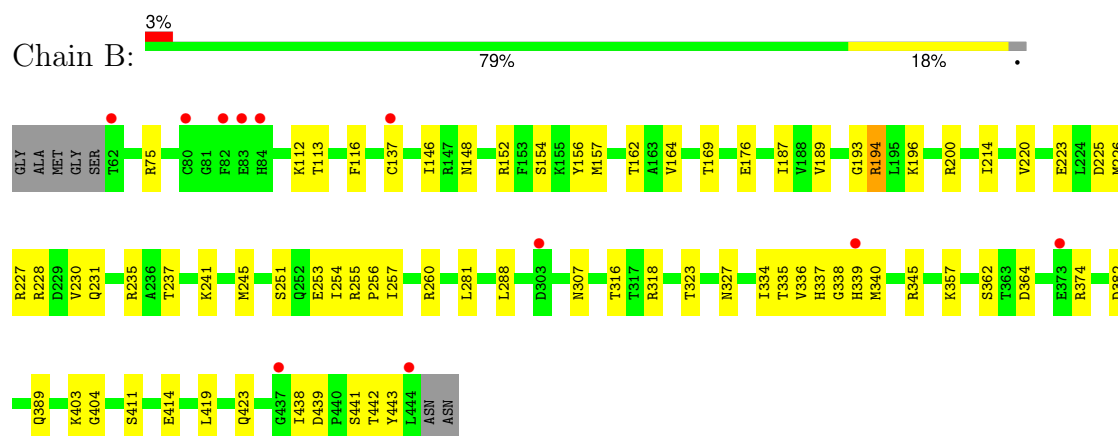
3 Residue-property plots [i](#)

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.

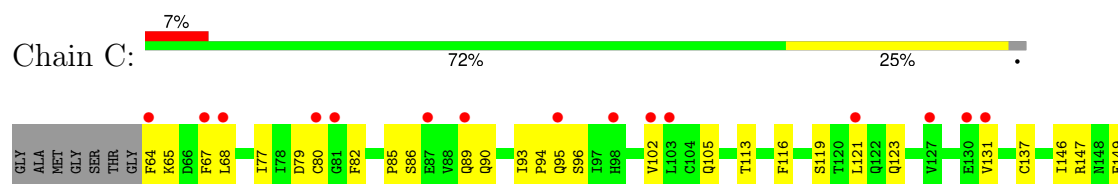
• Molecule 1: ATP-dependent RNA helicase SUB2

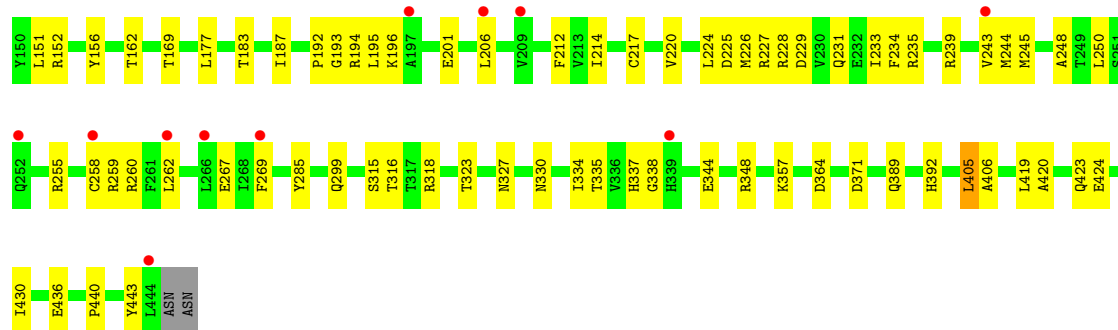


• Molecule 1: ATP-dependent RNA helicase SUB2



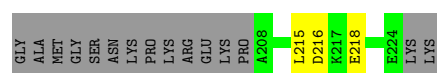
• Molecule 1: ATP-dependent RNA helicase SUB2





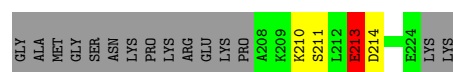
• Molecule 2: RNA annealing protein YRA1

Chain G: 44% 9% 47%



• Molecule 2: RNA annealing protein YRA1

Chain H: 41% 9% 47%



• Molecule 2: RNA annealing protein YRA1

Chain I: 9% 12% 25% 9% 53%



• Molecule 3: RNA (5'-R(P*UP*UP*UP*UP*UP*U)-3')

Chain D: 13% 13% 13% 60%



• Molecule 3: RNA (5'-R(P*UP*UP*UP*UP*UP*U)-3')

Chain E: 20% 13% 7% 60%



• Molecule 3: RNA (5'-R(P*UP*UP*UP*UP*UP*U)-3')

Chain F: 7% 13% 20% 60%

U1	U2	U3	U4	U5	U6	U	U	U	U	U	U	U	U	U
----	----	----	----	----	----	---	---	---	---	---	---	---	---	---

4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	99.35Å 99.35Å 247.47Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	49.67 – 2.60 49.67 – 2.60	Depositor EDS
% Data completeness (in resolution range)	100.0 (49.67-2.60) 95.1 (49.67-2.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.90 (at 2.61Å)	Xtriage
Refinement program	PHENIX (1.10_2155)	Depositor
R, R_{free}	0.219 , 0.268 0.220 , 0.269	Depositor DCC
R_{free} test set	2235 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	47.9	Xtriage
Anisotropy	0.313	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 38.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.029 for -h,-k,l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	10127	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.69% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ADP, BEF, 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	0.31	0/3137	0.63	10/4233 (0.2%)
1	B	0.25	0/3137	0.50	1/4233 (0.0%)
1	C	0.27	0/3126	0.55	2/4218 (0.0%)
2	G	0.10	0/142	0.30	0/187
2	H	0.85	0/142	1.08	2/187 (1.1%)
2	I	1.00	1/128 (0.8%)	1.56	5/169 (3.0%)
3	D	0.10	0/131	0.30	0/200
3	E	0.10	0/131	0.28	0/200
3	F	0.17	0/131	0.47	0/200
All	All	0.30	1/10205 (0.0%)	0.59	20/13827 (0.1%)

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	C	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	I	213	GLU	CD-OE1	-5.58	1.14	1.25

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	427	ASP	CB-CA-C	-8.76	92.98	110.42
2	I	213	GLU	CB-CG-CD	-8.39	98.34	112.60
1	A	424	GLU	CB-CG-CD	7.60	125.53	112.60

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	65	LYS	CB-CG-CD	-6.80	95.66	111.30
2	I	210	LYS	CG-CD-CE	-6.54	96.26	111.30
1	A	427	ASP	N-CA-CB	6.50	121.47	110.49
1	A	414	GLU	CB-CA-C	-6.35	97.05	110.31
2	H	213	GLU	CB-CA-C	-6.32	97.84	110.42
1	A	417	GLU	CA-CB-CG	6.13	126.36	114.10
1	C	201	GLU	CA-CB-CG	6.10	126.29	114.10
1	A	417	GLU	CG-CD-OE2	5.82	131.78	118.40
2	I	213	GLU	CG-CD-OE2	5.76	131.64	118.40
2	I	213	GLU	CG-CD-OE1	-5.65	105.40	118.40
1	A	424	GLU	CG-CD-OE1	5.58	131.23	118.40
2	H	213	GLU	CA-CB-CG	5.46	125.01	114.10
1	A	423	GLN	CA-C-N	-5.15	112.98	120.29
1	A	423	GLN	C-N-CA	-5.15	112.98	120.29
2	I	215	LEU	CD1-CG-CD2	-5.14	99.50	110.80
1	A	414	GLU	N-CA-CB	5.06	118.78	110.39
1	B	438	ILE	CG1-CB-CG2	-5.00	95.70	110.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	95	GLN	Sidechain

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	3082	0	3117	44	0
1	B	3082	0	3118	53	0
1	C	3071	0	3108	80	0
2	G	141	0	132	4	0
2	H	141	0	132	3	0
2	I	127	0	114	23	0
3	D	120	0	61	2	0
3	E	120	0	61	2	0
3	F	120	0	61	2	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	27	0	12	0	0
4	B	27	0	12	0	0
4	C	27	0	12	1	0
5	A	4	0	0	0	0
5	B	4	0	0	1	0
5	C	4	0	0	0	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
7	A	13	0	0	0	0
7	B	9	0	0	0	0
7	C	5	0	0	0	0
All	All	10127	0	9940	189	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 9.

All (189) 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)
2:I:210:LYS:NZ	2:I:218:GLU:OE1	1.73	1.18
1:C:86:SER:O	1:C:89:GLN:NE2	1.79	1.15
1:A:413:LYS:HD2	1:A:414:GLU:H	1.19	1.02
1:C:228:ARG:HE	2:I:210:LYS:HG2	1.36	0.90
1:C:89:GLN:HE22	1:C:90:GLN:HG3	1.39	0.87
1:C:85:PRO:HB2	1:C:89:GLN:NE2	1.93	0.84
1:A:413:LYS:HD2	1:A:414:GLU:N	1.91	0.84
1:A:277:THR:HG21	1:A:428:VAL:HG11	1.60	0.82
2:I:210:LYS:HG3	2:I:215:LEU:HD11	1.62	0.79
1:C:194:ARG:NH1	3:E:5:U:O2'	2.17	0.78
1:C:259:ARG:NH1	1:C:267:GLU:OE2	2.16	0.76
1:C:228:ARG:HE	2:I:210:LYS:CG	1.98	0.75
1:B:227:ARG:HE	1:B:231:GLN:NE2	1.86	0.73
1:A:228:ARG:NH1	2:H:210:LYS:O	2.21	0.73
2:H:211:SER:OG	2:H:213:GLU:HB2	1.89	0.73
1:B:227:ARG:HE	1:B:231:GLN:HE21	1.36	0.71
1:C:228:ARG:HH21	2:I:210:LYS:N	1.89	0.70
1:C:214:ILE:HD12	1:C:245:MET:HE2	1.74	0.69
1:C:89:GLN:NE2	1:C:90:GLN:HG3	2.07	0.69
1:C:334:ILE:HG23	1:C:357:LYS:HD2	1.75	0.69
1:C:131:VAL:HG11	1:C:206:LEU:HD23	1.74	0.68

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:231:GLN:HA	1:C:234:PHE:HB3	1.75	0.68
1:B:337:HIS:ND1	1:B:338:GLY:O	2.27	0.68
1:B:334:ILE:HG23	1:B:357:LYS:HD2	1.75	0.67
1:C:229:ASP:O	1:C:233:ILE:HD12	1.94	0.67
1:C:259:ARG:HH12	1:C:267:GLU:CD	2.03	0.66
1:A:154:SER:HA	1:A:157:MET:HE3	1.77	0.66
1:A:337:HIS:ND1	1:A:338:GLY:O	2.29	0.65
1:C:192:PRO:HG2	1:C:226:MET:HE3	1.76	0.65
1:A:174:ASP:OD1	1:A:194:ARG:NH1	2.30	0.64
1:C:227:ARG:HD3	2:I:215:LEU:HD23	1.78	0.64
1:A:224:LEU:O	1:A:228:ARG:HG3	1.99	0.63
1:B:223:GLU:HG2	1:B:226:MET:HG3	1.79	0.63
2:I:210:LYS:HD3	2:I:215:LEU:CD1	2.30	0.62
1:C:79:ASP:OD2	1:C:156:TYR:HE2	1.83	0.62
2:H:211:SER:OG	2:H:214:ASP:OD2	2.12	0.61
1:A:214:ILE:HD12	1:A:245:MET:HE2	1.81	0.61
1:A:318:ARG:NH2	1:A:381:TYR:HE2	1.99	0.61
1:B:169:THR:O	1:B:194:ARG:NH2	2.24	0.61
2:I:212:LEU:O	2:I:215:LEU:HB2	2.01	0.61
1:B:214:ILE:HD12	1:B:245:MET:HE2	1.82	0.61
1:B:237:THR:OG1	1:B:241:LYS:NZ	2.29	0.60
1:C:337:HIS:ND1	1:C:338:GLY:O	2.34	0.60
1:B:176:GLU:HG2	1:C:330:ASN:ND2	2.17	0.60
1:C:149:GLU:OE1	1:C:152:ARG:NH1	2.34	0.60
2:I:213:GLU:HA	2:I:216:ASP:OD1	2.00	0.60
1:C:231:GLN:O	1:C:235:ARG:N	2.35	0.60
1:A:237:THR:OG1	1:A:241:LYS:NZ	2.29	0.59
1:B:253:GLU:N	1:B:253:GLU:OE2	2.35	0.59
1:B:414:GLU:N	1:B:414:GLU:OE1	2.34	0.59
1:C:80:CYS:HB3	1:C:152:ARG:HH21	1.68	0.58
1:A:439:ASP:OD2	1:A:441:SER:OG	2.15	0.58
2:I:210:LYS:CG	2:I:215:LEU:HD11	2.34	0.57
1:A:313:VAL:HG12	1:A:315:SER:H	1.70	0.57
1:B:112:LYS:NZ	5:B:2001:BEF:F2	2.27	0.57
1:B:235:ARG:NE	2:G:218:GLU:OE2	2.38	0.56
1:A:334:ILE:HG23	1:A:357:LYS:HD2	1.87	0.56
1:B:364:ASP:OD1	1:B:389:GLN:NE2	2.36	0.56
1:C:420:ALA:O	1:C:424:GLU:HG3	2.04	0.56
2:I:210:LYS:HD3	2:I:215:LEU:HD12	1.88	0.56
1:B:225:ASP:OD1	1:B:228:ARG:NH1	2.39	0.56
1:C:255:ARG:O	1:C:259:ARG:HG3	2.06	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:440:PRO:HA	1:C:443:TYR:CE2	2.40	0.56
1:C:162:THR:HG22	1:C:187:ILE:HB	1.89	0.55
1:C:196:LYS:HB2	1:C:233:ILE:HD11	1.89	0.55
2:I:215:LEU:O	2:I:218:GLU:HB2	2.07	0.55
1:C:85:PRO:HB2	1:C:89:GLN:CD	2.32	0.54
1:A:413:LYS:CD	1:A:414:GLU:N	2.69	0.54
1:C:67:PHE:CE1	1:C:94:PRO:HD3	2.43	0.54
1:C:225:ASP:OD1	1:C:228:ARG:NH1	2.41	0.54
2:I:210:LYS:CD	2:I:215:LEU:CD1	2.85	0.54
1:B:154:SER:HA	1:B:157:MET:HE3	1.91	0.53
1:B:318:ARG:HH21	1:B:382:ASP:CG	2.16	0.53
1:A:193:GLY:HA3	3:D:5:U:H5''	1.91	0.53
1:B:162:THR:HG22	1:B:187:ILE:HB	1.91	0.53
1:B:439:ASP:O	1:B:442:THR:HG22	2.09	0.53
1:C:96:SER:O	1:C:123:GLN:NE2	2.41	0.52
1:B:137:CYS:SG	1:B:146:ILE:HD12	2.49	0.52
1:A:344:GLU:O	1:A:348:ARG:HG3	2.10	0.52
1:C:80:CYS:HB3	1:C:152:ARG:NH2	2.24	0.52
1:A:84:HIS:ND1	1:C:299:GLN:HB2	2.24	0.52
1:B:225:ASP:O	1:B:228:ARG:HG2	2.10	0.51
1:C:239:ARG:HH11	2:I:223:PHE:HA	1.74	0.51
1:A:255:ARG:O	1:A:259:ARG:HG3	2.10	0.51
1:B:254:ILE:O	1:B:257:ILE:HG22	2.11	0.51
1:C:177:LEU:HG	1:C:183:THR:HB	1.92	0.51
1:C:113:THR:HA	1:C:116:PHE:CE2	2.45	0.51
1:A:220:VAL:HA	1:A:226:MET:HE3	1.93	0.51
1:C:285:TYR:HD2	1:C:430:ILE:HG22	1.76	0.51
1:C:193:GLY:HA3	3:E:5:U:H5''	1.92	0.51
1:C:371:ASP:OD1	4:C:3000:ADP:O3'	2.19	0.50
1:B:193:GLY:HA3	3:F:5:U:H5''	1.93	0.50
1:C:260:ARG:HH21	2:I:216:ASP:HB3	1.75	0.50
1:A:107:LYS:NZ	1:C:436:GLU:OE1	2.45	0.50
1:C:364:ASP:OD1	1:C:389:GLN:NE2	2.41	0.50
1:A:288:LEU:O	1:A:411:SER:HA	2.12	0.50
1:C:86:SER:C	1:C:89:GLN:HE21	2.12	0.50
1:C:255:ARG:HD3	1:C:269:PHE:CZ	2.47	0.50
1:B:220:VAL:HA	1:B:226:MET:HE3	1.94	0.49
1:B:318:ARG:NH2	1:B:382:ASP:OD2	2.45	0.49
1:B:403:LYS:HB3	1:B:443:TYR:HA	1.94	0.49
1:B:339:HIS:O	1:B:339:HIS:CG	2.66	0.49
1:B:231:GLN:HE22	2:G:215:LEU:HB3	1.77	0.49

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:231:GLN:HA	1:C:234:PHE:CB	2.40	0.49
1:B:307:ASN:HB3	1:B:374:ARG:O	2.13	0.49
1:C:102:VAL:HB	1:C:244:MET:HG2	1.95	0.48
1:C:224:LEU:O	1:C:228:ARG:HG3	2.13	0.48
1:C:316:THR:HG23	1:C:337:HIS:CE1	2.49	0.48
1:A:93:ILE:O	1:A:97:ILE:HG12	2.12	0.48
1:B:323:THR:O	1:B:327:ASN:ND2	2.46	0.48
1:A:315:SER:HA	3:D:2:U:H5'	1.95	0.48
1:B:254:ILE:HD12	1:B:257:ILE:HG21	1.96	0.48
1:B:227:ARG:HD3	2:G:215:LEU:HD13	1.95	0.47
1:C:228:ARG:NE	2:I:210:LYS:HG2	2.17	0.47
1:B:75:ARG:HG2	1:B:156:TYR:CE2	2.49	0.47
1:C:86:SER:N	1:C:89:GLN:HE21	2.12	0.47
1:A:277:THR:HG21	1:A:428:VAL:CG1	2.39	0.47
1:C:220:VAL:HA	1:C:226:MET:HE2	1.97	0.47
1:A:238:PRO:O	1:A:241:LYS:HD3	2.15	0.46
1:A:164:VAL:HA	1:A:189:VAL:O	2.14	0.46
1:C:239:ARG:HG2	2:I:222:TYR:CZ	2.50	0.46
1:A:439:ASP:HB3	1:A:442:THR:HG23	1.97	0.46
2:I:210:LYS:CG	2:I:215:LEU:CD1	2.94	0.46
1:A:371:ASP:OD2	1:A:399:ARG:HD3	2.15	0.46
1:C:64:PHE:CE1	1:C:85:PRO:HB3	2.50	0.46
2:I:210:LYS:HB3	2:I:210:LYS:HE2	1.67	0.46
1:A:251:SER:O	1:A:255:ARG:HG3	2.16	0.46
1:C:137:CYS:SG	1:C:146:ILE:HD12	2.56	0.46
1:C:228:ARG:NH2	2:I:210:LYS:N	2.60	0.46
1:C:89:GLN:HB2	1:C:93:ILE:HD12	1.96	0.46
1:C:260:ARG:CZ	2:I:216:ASP:OD2	2.64	0.46
1:B:196:LYS:O	1:B:200:ARG:HG3	2.16	0.45
2:I:220:ALA:O	2:I:224:GLU:OE2	2.34	0.45
1:A:307:ASN:HB3	1:A:374:ARG:O	2.15	0.45
1:C:105:GLN:HB2	1:C:250:LEU:HD12	1.98	0.45
1:C:258:CYS:O	1:C:262:LEU:HD12	2.17	0.45
1:A:179:LYS:HE3	1:A:179:LYS:HB2	1.57	0.45
1:C:195:LEU:HG	1:C:233:ILE:HG12	1.99	0.45
1:B:260:ARG:NH1	2:G:216:ASP:HB3	2.32	0.45
1:A:64:PHE:CE2	1:A:82:PHE:HB3	2.51	0.45
1:B:227:ARG:NE	1:B:231:GLN:NE2	2.62	0.45
1:B:226:MET:O	1:B:230:VAL:HG13	2.18	0.44
1:B:288:LEU:O	1:B:411:SER:HA	2.17	0.44
1:B:176:GLU:HG2	1:C:330:ASN:HD21	1.81	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:419:LEU:O	1:B:423:GLN:HG3	2.18	0.44
1:A:334:ILE:HD11	1:A:352:PHE:HB2	2.00	0.43
1:B:316:THR:HG23	1:B:337:HIS:CE1	2.53	0.43
1:C:212:PHE:O	1:C:243:VAL:HA	2.18	0.43
1:C:344:GLU:O	1:C:348:ARG:HG3	2.17	0.43
1:C:267:GLU:HB3	1:C:269:PHE:CE2	2.53	0.43
1:B:164:VAL:HA	1:B:189:VAL:O	2.18	0.43
1:C:67:PHE:HZ	1:C:89:GLN:OE1	2.02	0.43
1:C:77:ILE:O	1:C:82:PHE:HB2	2.19	0.43
1:A:97:ILE:HD12	1:A:122:GLN:HG2	2.00	0.43
1:A:102:VAL:HB	1:A:244:MET:HG2	2.00	0.43
1:B:323:THR:OG1	1:B:335:THR:HB	2.19	0.43
1:C:119:SER:O	1:C:123:GLN:HG3	2.18	0.43
1:A:113:THR:HA	1:A:116:PHE:CE2	2.53	0.43
1:A:135:VAL:HG22	1:A:213:VAL:HB	2.01	0.43
1:C:147:ARG:CZ	1:C:151:LEU:HD11	2.49	0.43
1:C:121:LEU:HD21	1:C:187:ILE:HD11	2.01	0.43
3:F:1:U:H2'	3:F:2:U:C6	2.53	0.43
1:B:148:ASN:O	1:B:152:ARG:HG3	2.19	0.43
1:C:85:PRO:HG2	1:C:90:GLN:HE21	1.84	0.42
1:B:113:THR:HA	1:B:116:PHE:CE2	2.55	0.42
1:B:340:MET:HG3	1:B:345:ARG:HG3	2.02	0.42
1:C:405:LEU:HD12	1:C:406:ALA:N	2.34	0.42
1:C:323:THR:O	1:C:327:ASN:ND2	2.47	0.42
1:A:105:GLN:HB2	1:A:250:LEU:HD12	2.02	0.42
1:C:419:LEU:O	1:C:423:GLN:HG3	2.20	0.42
1:C:248:ALA:HB3	1:C:392:HIS:CE1	2.54	0.42
1:A:148:ASN:O	1:A:152:ARG:HG3	2.20	0.41
1:A:259:ARG:NH1	1:A:267:GLU:OE1	2.53	0.41
1:B:336:VAL:O	1:B:362:SER:HB2	2.20	0.41
1:C:315:SER:OG	1:C:318:ARG:HG3	2.20	0.41
1:B:251:SER:O	1:B:255:ARG:HG3	2.20	0.41
1:C:217:CYS:SG	1:C:245:MET:HB3	2.60	0.41
2:I:211:SER:O	2:I:212:LEU:C	2.62	0.41
1:A:217:CYS:SG	1:A:245:MET:HB3	2.61	0.40
1:A:218:ASP:OD2	1:A:249:THR:OG1	2.38	0.40
1:B:251:SER:O	1:B:254:ILE:HG22	2.21	0.40
1:C:323:THR:OG1	1:C:335:THR:HB	2.21	0.40
1:B:281:LEU:HD12	1:B:404:GLY:C	2.46	0.40
1:B:439:ASP:OD2	1:B:441:SER:HB3	2.22	0.40
1:A:313:VAL:CG1	1:A:318:ARG:HB2	2.51	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:152:ARG:HH11	1:B:152:ARG:HD2	1.78	0.40
1:B:255:ARG:N	1:B:256:PRO:HD2	2.36	0.40
1:C:67:PHE:CZ	1:C:89:GLN:OE1	2.74	0.40
1:C:169:THR:O	1:C:194:ARG:NH2	2.55	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	381/390 (98%)	370 (97%)	11 (3%)	0	100	100
1	B	381/390 (98%)	373 (98%)	8 (2%)	0	100	100
1	C	379/390 (97%)	371 (98%)	8 (2%)	0	100	100
2	G	15/32 (47%)	15 (100%)	0	0	100	100
2	H	15/32 (47%)	14 (93%)	1 (7%)	0	100	100
2	I	13/32 (41%)	13 (100%)	0	0	100	100
All	All	1184/1266 (94%)	1156 (98%)	28 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	339/343 (99%)	339 (100%)	0	100	100
1	B	339/343 (99%)	338 (100%)	1 (0%)	86	94
1	C	338/343 (98%)	336 (99%)	2 (1%)	78	91
2	G	15/27 (56%)	15 (100%)	0	100	100
2	H	15/27 (56%)	14 (93%)	1 (7%)	15	33
2	I	14/27 (52%)	14 (100%)	0	100	100
All	All	1060/1110 (96%)	1056 (100%)	4 (0%)	84	93

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	194	ARG
1	C	68	LEU
1	C	405	LEU
2	H	213	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	98	HIS
1	A	123	GLN
1	A	211	ASN
1	A	299	GLN
1	A	307	ASN
1	B	91	HIS
1	B	123	GLN
1	B	211	ASN
1	B	231	GLN
1	B	307	ASN
1	C	89	GLN
1	C	90	GLN
1	C	123	GLN
1	C	148	ASN
1	C	211	ASN
1	C	330	ASN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
3	D	5/15 (33%)	4 (80%)	0
3	E	5/15 (33%)	3 (60%)	0
3	F	6/15 (40%)	4 (66%)	1 (16%)
All	All	16/45 (35%)	11 (68%)	1 (6%)

All (11) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
3	D	2	U
3	D	4	U
3	D	5	U
3	D	6	U
3	E	4	U
3	E	5	U
3	E	6	U
3	F	2	U
3	F	4	U
3	F	5	U
3	F	6	U

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
3	F	1	U

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 9 ligands modelled in this entry, 3 are monoatomic - leaving 6 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	BEF	B	2001	4	0,3,3	-	-	-		
4	ADP	B	2000	6,5	28,29,29	1.40	5 (17%)	43,45,45	1.81	9 (20%)
5	BEF	A	1001	4	0,3,3	-	-	-		
4	ADP	C	3000	6,5	28,29,29	1.41	4 (14%)	43,45,45	1.82	9 (20%)
4	ADP	A	1000	6,5	28,29,29	1.41	4 (14%)	43,45,45	1.83	9 (20%)
5	BEF	C	3001	4	0,3,3	-	-	-		

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	ADP	B	2000	6,5	-	2/16/32/32	0/3/3/3
4	ADP	C	3000	6,5	-	1/16/32/32	0/3/3/3
4	ADP	A	1000	6,5	-	1/16/32/32	0/3/3/3

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	3000	ADP	C5-C4	4.70	1.47	1.39
4	A	1000	ADP	C5-C4	4.61	1.47	1.39
4	B	2000	ADP	C5-C4	4.56	1.47	1.39
4	A	1000	ADP	C5-C6	2.74	1.48	1.41
4	C	3000	ADP	C5-C6	2.72	1.48	1.41
4	B	2000	ADP	C5-C6	2.66	1.48	1.41
4	A	1000	ADP	C8-N7	2.42	1.36	1.31
4	C	3000	ADP	C8-N7	2.37	1.36	1.31
4	B	2000	ADP	C8-N7	2.34	1.36	1.31
4	A	1000	ADP	C5-N7	-2.24	1.35	1.39
4	C	3000	ADP	C5-N7	-2.19	1.35	1.39
4	B	2000	ADP	C5-N7	-2.19	1.35	1.39
4	B	2000	ADP	C4-N9	-2.13	1.33	1.37

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1000	ADP	C5-C4-N3	-5.74	118.82	126.72
4	C	3000	ADP	C5-C4-N3	-5.67	118.91	126.72
4	B	2000	ADP	C5-C4-N3	-5.35	119.35	126.72
4	C	3000	ADP	N3-C4-N9	4.53	134.87	127.17
4	A	1000	ADP	N3-C4-N9	4.49	134.81	127.17
4	B	2000	ADP	N3-C4-N9	4.35	134.57	127.17
4	A	1000	ADP	C2-N3-C4	3.73	120.93	111.83
4	C	3000	ADP	C2-N3-C4	3.67	120.80	111.83
4	B	2000	ADP	C2-N3-C4	3.60	120.62	111.83
4	A	1000	ADP	C4-C5-N7	-3.52	106.56	110.58
4	C	3000	ADP	C4-C5-N7	-3.40	106.69	110.58
4	B	2000	ADP	N3-C2-N1	-3.38	123.47	128.58
4	B	2000	ADP	C4-C5-N7	-3.36	106.74	110.58
4	A	1000	ADP	N3-C2-N1	-3.35	123.50	128.58
4	C	3000	ADP	N3-C2-N1	-3.29	123.61	128.58
4	B	2000	ADP	C4-N9-C8	3.18	109.08	105.74
4	C	3000	ADP	C4-N9-C8	2.77	108.65	105.74
4	A	1000	ADP	C4-N9-C8	2.75	108.63	105.74
4	A	1000	ADP	C5-N7-C8	2.59	107.52	103.45
4	C	3000	ADP	C5-N7-C8	2.50	107.39	103.45
4	B	2000	ADP	C5-N7-C8	2.50	107.38	103.45
4	B	2000	ADP	N9-C8-N7	-2.27	110.72	113.94
4	B	2000	ADP	C6-C5-N7	2.25	136.44	132.09
4	A	1000	ADP	C6-C5-N7	2.18	136.29	132.09
4	A	1000	ADP	N9-C8-N7	-2.13	110.91	113.94
4	C	3000	ADP	C6-C5-N7	2.12	136.17	132.09
4	C	3000	ADP	N9-C8-N7	-2.03	111.05	113.94

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	3000	ADP	PA-O3A-PB-O3B
4	B	2000	ADP	PA-O3A-PB-O1B
4	A	1000	ADP	PA-O3A-PB-O3B
4	B	2000	ADP	PA-O3A-PB-O2B

There are no ring outliers.

2 monomers are involved in 2 short contacts:

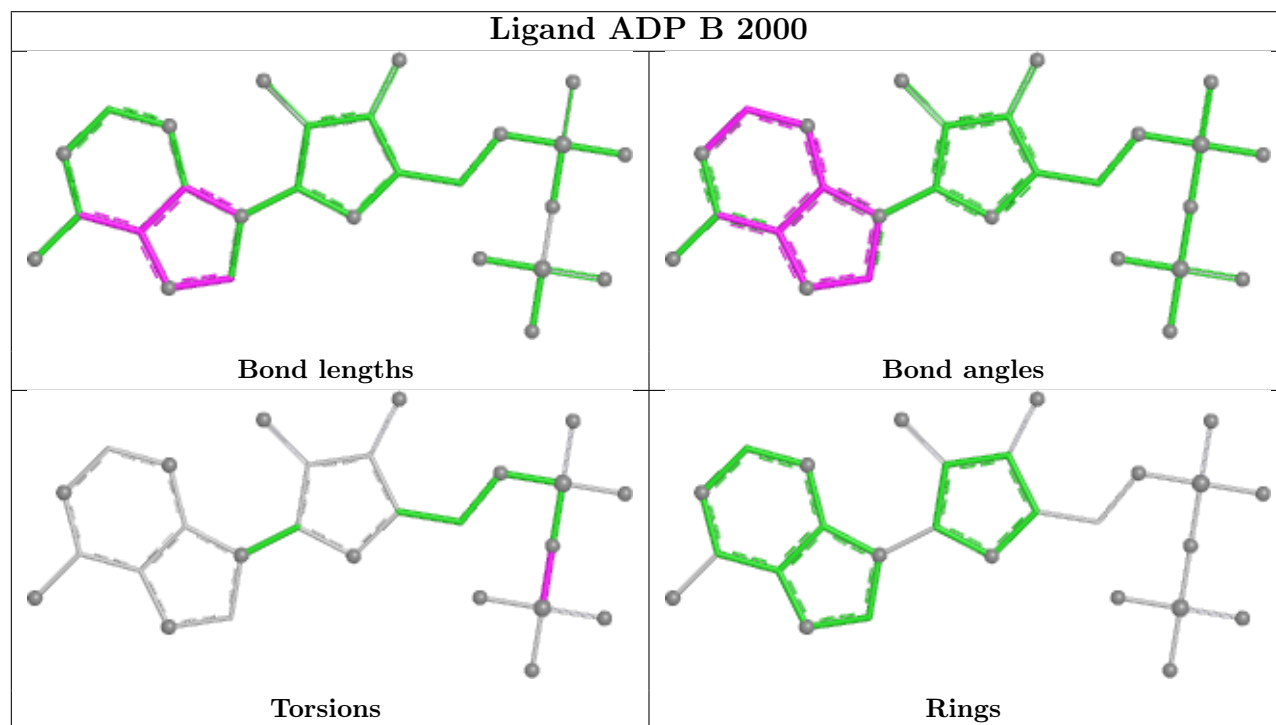
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	2001	BEF	1	0

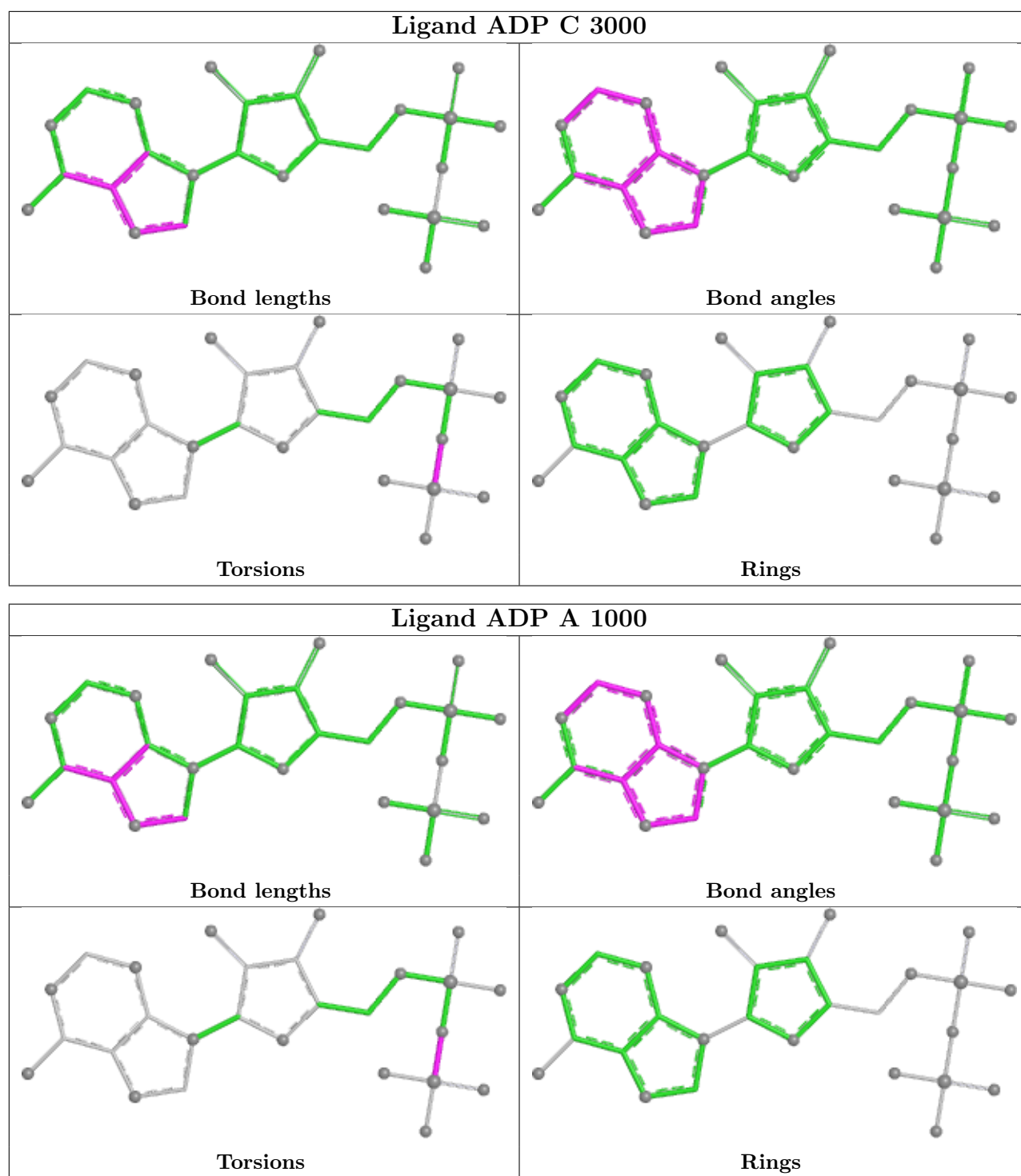
Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	3000	ADP	1	0

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





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	383/390 (98%)	0.18	7 (1%) 67 63	31, 50, 79, 99	0
1	B	383/390 (98%)	0.21	11 (2%) 53 48	32, 51, 77, 104	0
1	C	381/390 (97%)	0.54	26 (6%) 23 19	34, 56, 85, 99	0
2	G	17/32 (53%)	0.66	0 100 100	52, 66, 99, 100	0
2	H	17/32 (53%)	0.82	0 100 100	58, 75, 93, 93	0
2	I	15/32 (46%)	1.35	3 (20%) 3 2	81, 98, 110, 113	0
3	D	6/15 (40%)	0.23	0 100 100	56, 61, 80, 99	0
3	E	6/15 (40%)	0.30	0 100 100	48, 58, 90, 92	0
3	F	6/15 (40%)	0.35	0 100 100	52, 57, 67, 110	0
All	All	1214/1311 (92%)	0.33	47 (3%) 43 38	31, 53, 85, 113	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	444	LEU	4.1
1	C	80	CYS	3.7
1	C	197	ALA	3.6
1	C	95	GLN	3.5
1	C	64	PHE	3.3
1	C	67	PHE	3.1
1	A	339	HIS	3.1
1	C	131	VAL	2.9
1	C	130	GLU	2.8
1	B	82	PHE	2.6
1	C	102	VAL	2.6
1	C	269	PHE	2.6
1	C	127	VAL	2.6
1	B	444	LEU	2.5
1	C	103	LEU	2.5

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	121	LEU	2.4
1	A	338	GLY	2.4
1	C	89	GLN	2.4
1	C	209	VAL	2.4
1	C	68	LEU	2.4
1	B	83	GLU	2.4
1	C	206	LEU	2.4
2	I	213	GLU	2.4
1	C	81	GLY	2.4
1	C	258	CYS	2.3
1	A	444	LEU	2.3
1	C	266	LEU	2.3
1	C	339	HIS	2.3
1	B	62	THR	2.3
1	A	275	LYS	2.3
1	B	303	ASP	2.3
1	C	243	VAL	2.3
1	B	339	HIS	2.3
1	B	437	GLY	2.2
1	B	84	HIS	2.2
1	B	80	CYS	2.2
1	C	87	GLU	2.2
2	I	224	GLU	2.1
1	C	262	LEU	2.1
1	A	271	ASP	2.1
1	A	415	ASP	2.1
2	I	210	LYS	2.1
1	A	224	LEU	2.1
1	C	98	HIS	2.1
1	B	137	CYS	2.1
1	B	373	GLU	2.0
1	C	252	GLN	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 oligosaccharides in this entry.

6.4 Ligands

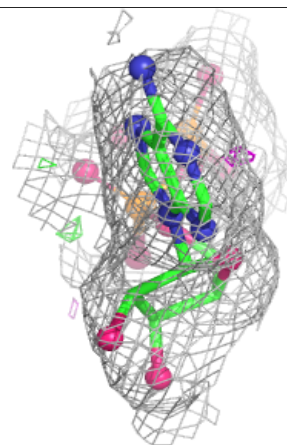
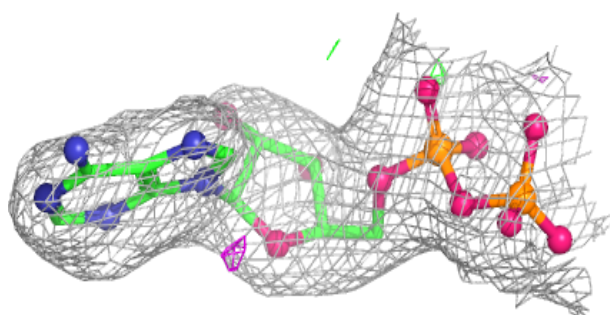
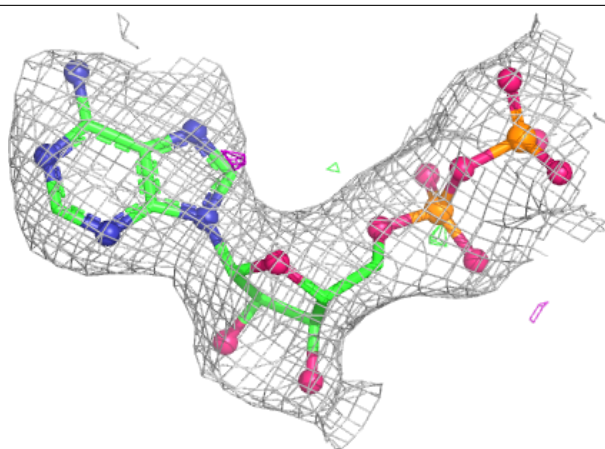
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	BEF	A	1001	4/4	0.92	0.08	34,34,38,41	0
5	BEF	C	3001	4/4	0.92	0.10	47,47,51,53	0
4	ADP	C	3000	27/27	0.95	0.09	38,57,70,73	0
4	ADP	B	2000	27/27	0.96	0.08	36,46,53,55	0
5	BEF	B	2001	4/4	0.96	0.06	31,40,41,42	0
4	ADP	A	1000	27/27	0.96	0.08	28,36,44,48	0
6	MG	C	3002	1/1	0.99	0.03	44,44,44,44	0
6	MG	B	2002	1/1	1.00	0.03	37,37,37,37	0
6	MG	A	1002	1/1	1.00	0.02	24,24,24,24	0

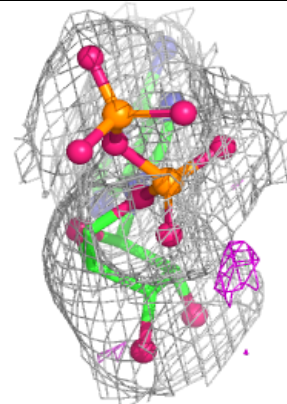
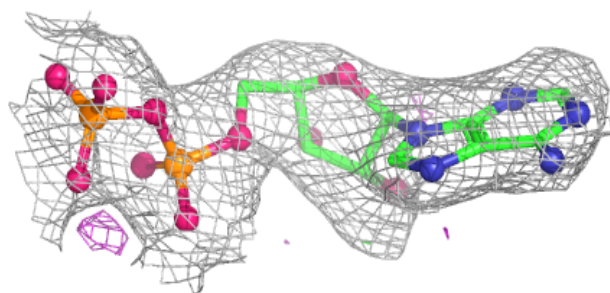
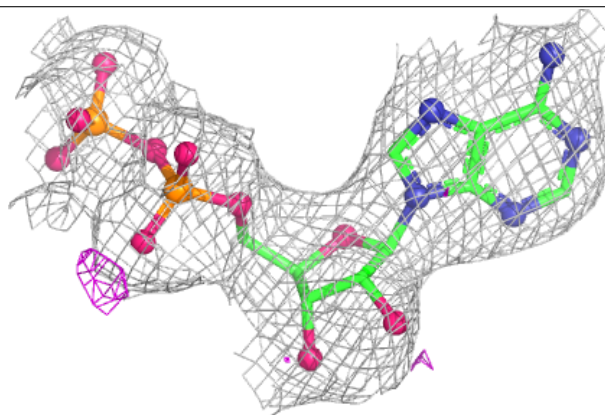
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

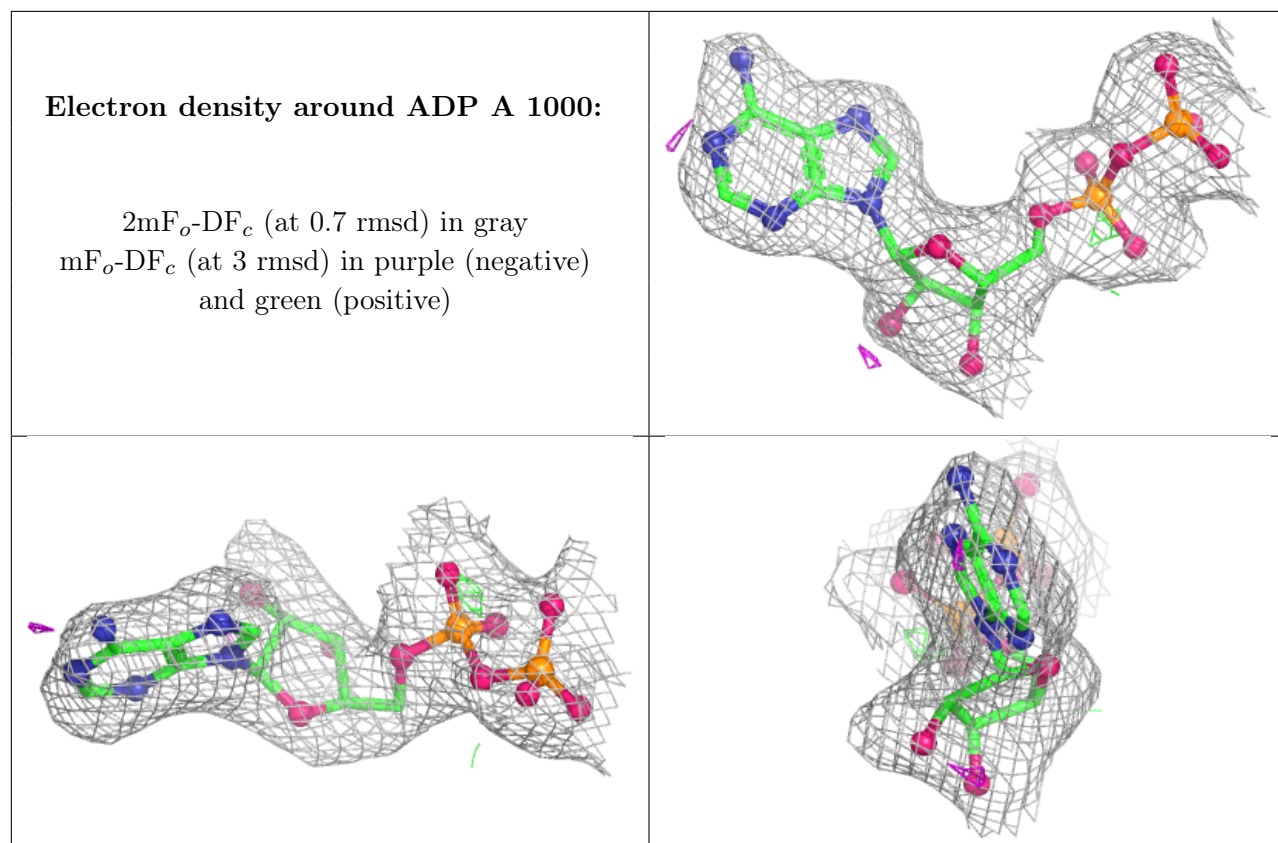
Electron density around ADP C 3000:

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

**Electron density around ADP B 2000:**

$2mF_o-DF_c$ (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.