



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 10, 2023 – 04:13 pm GMT

PDB ID : 2J0Q  
Title : The crystal structure of the Exon Junction Complex at 3.2 Å resolution  
Authors : Bono, F.; Ebert, J.; Lorentzen, E.; Conti, E.  
Deposited on : 2006-08-04  
Resolution : 3.20 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

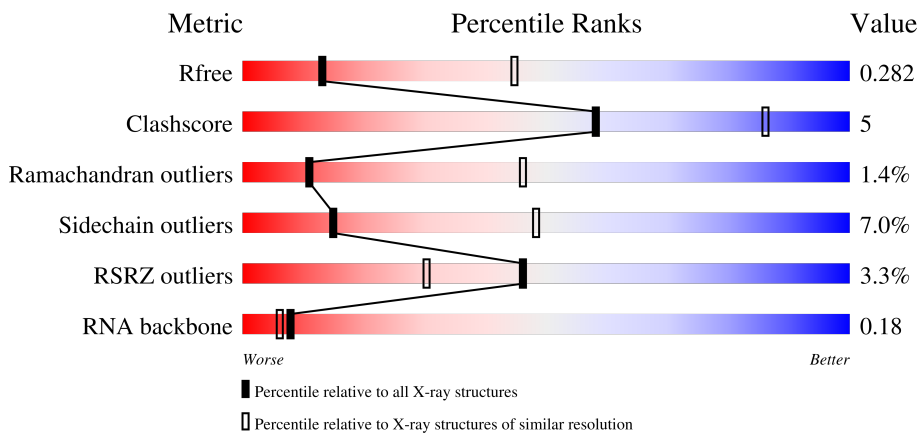
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.20 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	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)
RNA backbone	3102	1010 (3.50-2.90)

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	410	 81% 12% • 5%
1	B	410	 81% 12% • 5%
2	C	146	 86% 12% •
2	F	146	 82% 16% •

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Mol	Chain	Length	Quality of chain
3	D	109	<p>6% 63% 17% 18%</p>
3	G	109	<p>6% 68% 14% 18%</p>
4	E	15	<p>7% 33% 60%</p>
4	H	15	<p>20% 7% 13% 60%</p>
5	I	150	<p>7% 29% 13% 58%</p>
5	T	150	<p>8% 33% 8% 57%</p>

## 2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 11226 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 DDX48.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	390	Total	C	N	O	S	0	0	0
			3073	1944	533	577	19			
1	B	390	Total	C	N	O	S	0	0	0
			3081	1949	535	578	19			

- Molecule 2 is a protein called PROTEIN MAGO NASHI HOMOLOG.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	143	Total	C	N	O	S	0	0	0
			1178	764	197	214	3			
2	F	143	Total	C	N	O	S	0	0	0
			1178	764	197	214	3			

- Molecule 3 is a protein called RNA-BINDING PROTEIN 8A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	D	89	Total	C	N	O	S	0	0	0
			688	440	115	130	3			
3	G	89	Total	C	N	O	S	0	0	0
			688	440	115	130	3			

- Molecule 4 is a RNA chain called 5'-R(\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*UP\*U P\*UP\*UP\*U)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
4	E	6	Total	C	N	O	P	0	0	0
			121	54	12	49	6			
4	H	6	Total	C	N	O	P	0	0	0
			121	54	12	49	6			

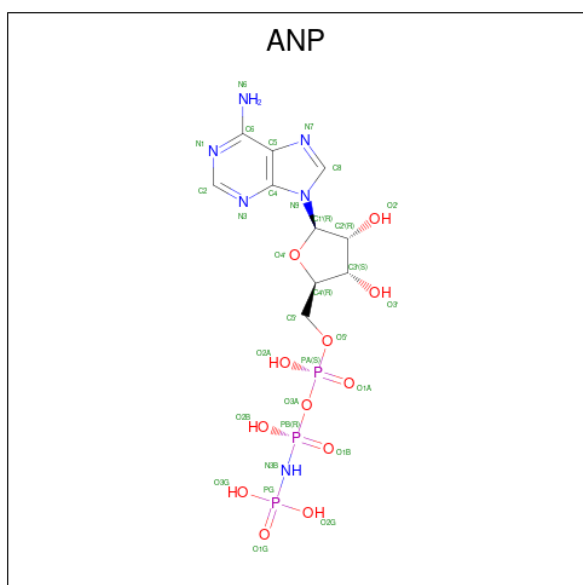
- Molecule 5 is a protein called PROTEIN CASC3.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	I	63	Total	C	N	O	0	0	0
			495	306	92	97			
5	T	65	Total	C	N	O	0	0	0
			538	332	102	104			

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 7 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula: C<sub>10</sub>H<sub>17</sub>N<sub>6</sub>O<sub>12</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
7	A	1	Total	C	N	O	P	0	0
			31	10	6	12	3		
7	B	1	Total	C	N	O	P	0	0
			31	10	6	12	3		

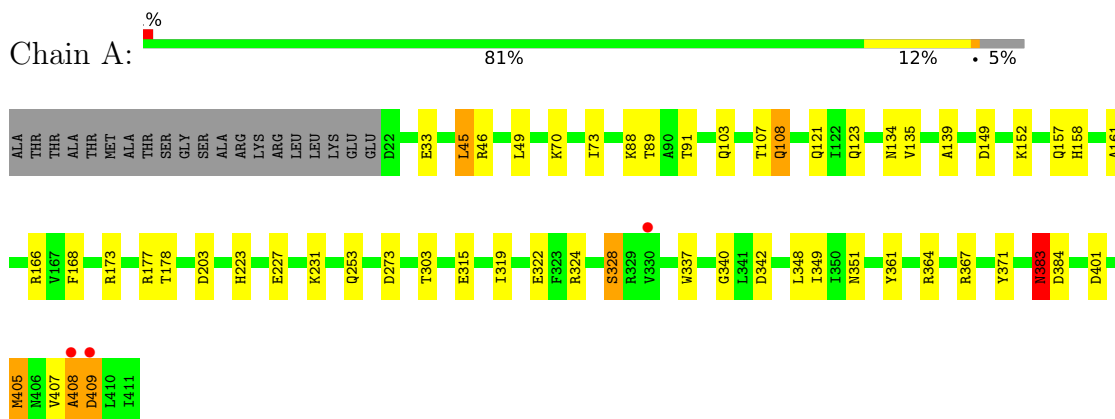
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	1	Total	O	0	0
			1	1		

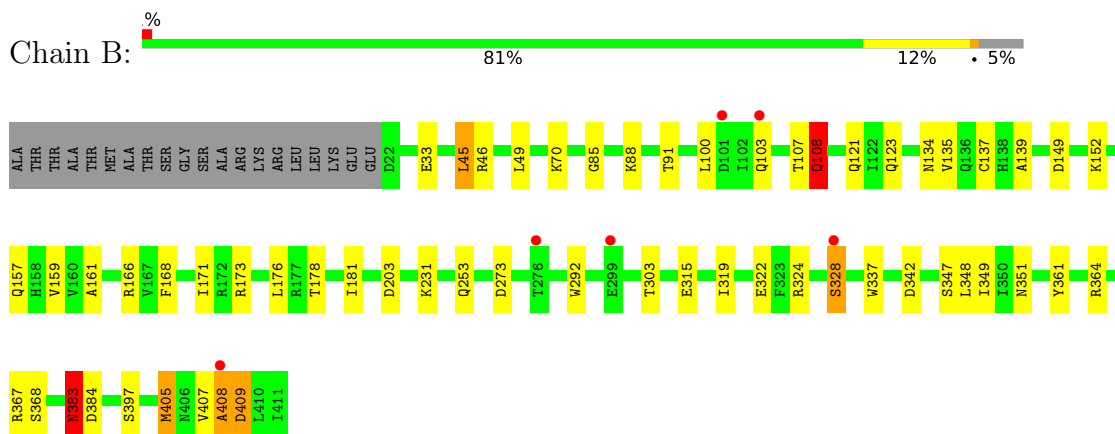
### 3 Residue-property plots [i](#)

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.

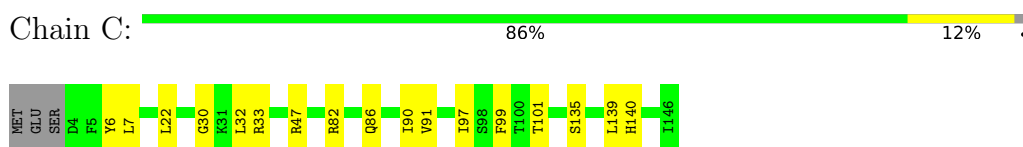
- Molecule 1: ATP-DEPENDENT RNA HELICASE DDX48



- Molecule 1: ATP-DEPENDENT RNA HELICASE DDX48



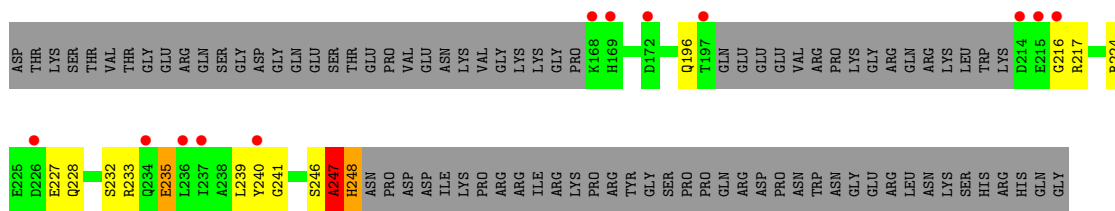
- Molecule 2: PROTEIN MAGO NASHI HOMOLOG



- Molecule 2: PROTEIN MAGO NASHI HOMOLOG









## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	69.15Å 161.24Å 193.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.98 – 3.20 46.97 – 3.20	Depositor EDS
% Data completeness (in resolution range)	100.0 (46.98-3.20) 95.5 (46.97-3.20)	Depositor EDS
$R_{merge}$	0.24	Depositor
$R_{sym}$	0.24	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.63 (at 3.19Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.232 , 0.277 0.237 , 0.282	Depositor DCC
$R_{free}$ test set	1746 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	56.8	Xtrriage
Anisotropy	0.099	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 89.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.40$ , $\langle L^2 \rangle = 0.22$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.88	EDS
Total number of atoms	11226	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	69.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 26.06 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.8224e-03.*

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

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

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: ANP, 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	0.46	0/3122	0.64	0/4224
1	B	0.45	0/3130	0.66	1/4233 (0.0%)
2	C	0.53	0/1207	0.62	0/1627
2	F	0.51	0/1207	0.62	0/1627
3	D	0.39	0/705	0.55	0/958
3	G	0.39	0/705	0.56	0/958
4	E	1.32	1/132 (0.8%)	1.57	3/200 (1.5%)
4	H	1.25	1/132 (0.8%)	1.44	0/200
5	I	0.48	0/507	0.66	0/684
5	T	0.51	0/551	0.70	0/740
All	All	0.50	2/11398 (0.0%)	0.67	4/15451 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	2
5	T	0	1
All	All	0	4

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	H	1	U	OP3-P	-9.83	1.49	1.61
4	E	1	U	OP3-P	-9.37	1.50	1.61

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	108	GLN	N-CA-C	9.66	137.08	111.00
4	E	3	U	O4'-C1'-N1	6.01	113.01	108.20
4	E	4	U	O4'-C1'-N1	5.74	112.79	108.20
4	E	5	U	O4'-C1'-N1	5.16	112.32	108.20

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	408	ALA	Peptide
1	B	107	THR	Peptide
1	B	408	ALA	Peptide
5	T	247	ALA	Peptide

## 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	3073	0	3066	34	0
1	B	3081	0	3083	30	0
2	C	1178	0	1157	7	0
2	F	1178	0	1157	10	0
3	D	688	0	633	8	0
3	G	688	0	633	4	0
4	E	121	0	61	0	0
4	H	121	0	61	2	0
5	I	495	0	406	8	0
5	T	538	0	472	10	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
7	A	31	0	13	3	0
7	B	31	0	13	1	0
8	A	1	0	0	0	0
All	All	11226	0	10755	105	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

All (105) 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:408:ALA:HB3	1:B:409:ASP:HB2	1.66	0.78
1:A:408:ALA:HB3	1:A:409:ASP:HB2	1.67	0.74
1:B:121:GLN:HE21	1:B:324:ARG:HH22	1.33	0.73
1:A:121:GLN:HE21	1:A:324:ARG:HH22	1.41	0.68
1:A:107:THR:HA	1:A:108:GLN:CB	2.26	0.66
1:A:351:ASN:HD21	1:A:364:ARG:HD3	1.60	0.66
5:I:240:TYR:H	5:I:241:GLY:HA2	1.65	0.62
1:B:253:GLN:NE2	1:B:361:TYR:OH	2.32	0.61
1:B:349:ILE:HD11	1:B:367:ARG:HB2	1.84	0.60
1:A:383:ASN:HD22	1:A:384:ASP:H	1.49	0.59
1:B:139:ALA:HA	1:B:161:ALA:O	2.03	0.59
1:A:108:GLN:CB	1:A:158:HIS:O	2.52	0.58
1:B:85:GLY:N	7:B:1413:ANP:O3G	2.37	0.58
1:A:349:ILE:HD11	1:A:367:ARG:HB2	1.86	0.58
1:B:351:ASN:HD21	1:B:364:ARG:HD3	1.68	0.58
3:D:66:PRO:HB3	3:D:148:TRP:CD2	2.40	0.56
1:A:253:GLN:NE2	1:A:361:TYR:OH	2.38	0.56
5:I:240:TYR:N	5:I:241:GLY:HA2	2.22	0.55
1:A:401:ASP:OD2	3:D:108:ARG:NH2	2.40	0.55
1:B:408:ALA:CB	1:B:409:ASP:HB2	2.35	0.55
1:A:139:ALA:HA	1:A:161:ALA:O	2.07	0.54
1:B:121:GLN:NE2	1:B:324:ARG:HH22	2.05	0.53
1:B:383:ASN:HD22	1:B:384:ASP:H	1.56	0.53
1:A:408:ALA:CB	1:A:409:ASP:HB2	2.36	0.52
5:T:240:TYR:H	5:T:241:GLY:HA2	1.75	0.52
3:G:66:PRO:HB3	3:G:148:TRP:CD2	2.45	0.52
5:T:246:SER:O	5:T:247:ALA:HB2	2.10	0.52
1:A:33:GLU:N	1:A:33:GLU:OE2	2.42	0.52
1:B:33:GLU:N	1:B:33:GLU:OE2	2.42	0.51
5:I:227:GLU:O	5:I:228:GLN:NE2	2.44	0.51
5:T:247:ALA:O	5:T:248:HIS:HB3	2.10	0.50
4:H:6:U:H5''	4:H:6:U:C6	2.46	0.50
2:F:86:GLN:N	2:F:101:THR:O	2.42	0.50
1:B:108:GLN:HA	1:B:181:ILE:HA	1.93	0.49
1:A:351:ASN:ND2	1:A:364:ARG:HD3	2.27	0.49
1:A:231:LYS:O	5:T:217:ARG:HG2	2.12	0.49
1:A:351:ASN:HD21	1:A:364:ARG:CD	2.25	0.49
1:B:408:ALA:CA	1:B:409:ASP:HB2	2.43	0.48
3:G:123:THR:OG1	3:G:126:GLU:HG2	2.13	0.48
1:A:408:ALA:CA	1:A:409:ASP:HB2	2.44	0.48
2:F:90:ILE:HB	2:F:97:ILE:HG13	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:322:GLU:HB3	1:A:328:SER:HB2	1.96	0.48
1:B:405:MET:CE	1:B:405:MET:H	2.26	0.48
1:A:315:GLU:O	1:A:319:ILE:HG12	2.14	0.48
1:A:340:GLY:HA2	7:A:1413:ANP:O2G	2.13	0.47
1:B:315:GLU:O	1:B:319:ILE:HG12	2.13	0.47
1:A:405:MET:H	1:A:405:MET:CE	2.27	0.47
1:B:100:LEU:HD22	1:B:108:GLN:HG3	1.96	0.47
2:C:90:ILE:HB	2:C:97:ILE:HG13	1.95	0.47
4:H:3:U:H6	4:H:3:U:H5''	1.80	0.47
1:B:351:ASN:HD22	1:B:364:ARG:HH11	1.63	0.46
1:A:88:LYS:O	1:A:91:THR:HB	2.15	0.46
1:A:351:ASN:ND2	1:A:364:ARG:HH11	2.14	0.46
1:B:88:LYS:O	1:B:91:THR:HB	2.16	0.46
1:A:45:LEU:HD13	1:A:49:LEU:HD23	1.98	0.45
2:C:86:GLN:N	2:C:101:THR:O	2.45	0.45
5:I:242:TYR:O	5:I:244:ILE:N	2.49	0.45
1:A:121:GLN:HE22	1:A:342:ASP:H	1.65	0.45
1:B:45:LEU:HD13	1:B:49:LEU:HD23	1.99	0.45
2:F:97:ILE:HD13	2:F:99:PHE:CE2	2.52	0.45
2:F:108:ILE:O	2:F:112:GLN:HG2	2.17	0.45
1:A:383:ASN:ND2	1:A:384:ASP:H	2.15	0.44
5:T:240:TYR:N	5:T:241:GLY:HA2	2.32	0.44
1:B:137:CYS:SG	1:B:159:VAL:HB	2.58	0.44
1:A:223:HIS:ND1	1:A:227:GLU:OE2	2.46	0.44
1:A:349:ILE:HD13	1:A:364:ARG:O	2.18	0.44
3:D:123:THR:OG1	3:D:126:GLU:HG2	2.18	0.44
2:F:6:TYR:HB3	2:F:91:VAL:HB	2.00	0.44
5:I:223:PHE:CE2	5:I:228:GLN:HG3	2.52	0.44
1:B:351:ASN:ND2	1:B:364:ARG:HD3	2.33	0.43
2:F:90:ILE:HD12	2:F:97:ILE:HD11	2.00	0.43
5:T:232:SER:O	5:T:235:GLU:N	2.51	0.43
2:F:16:LYS:HE2	2:F:17:PHE:CZ	2.53	0.43
1:A:121:GLN:NE2	1:A:324:ARG:HH22	2.14	0.43
3:D:96:TYR:O	3:D:126:GLU:HB2	2.18	0.43
3:D:90:HIS:O	3:D:94:ALA:HB2	2.19	0.43
1:B:349:ILE:HD13	1:B:364:ARG:O	2.19	0.43
1:B:121:GLN:HE22	1:B:342:ASP:H	1.67	0.43
1:B:347:SER:HA	1:B:368:SER:HB2	2.01	0.43
5:T:239:LEU:H	5:T:239:LEU:HD23	1.84	0.42
1:B:292:TRP:HB2	5:I:179:PRO:HB2	2.01	0.42
1:A:351:ASN:HD22	1:A:364:ARG:HH11	1.65	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:13:HIS:CE1	2:F:20:GLU:HB2	2.55	0.42
1:B:168:PHE:CE1	1:B:203:ASP:HB3	2.55	0.42
2:C:139:LEU:HB3	3:D:74:ILE:HD11	2.01	0.42
5:T:235:GLU:O	5:T:239:LEU:HD23	2.19	0.42
1:A:89:THR:OG1	7:A:1413:ANP:O1B	2.38	0.42
1:B:231:LYS:HD2	5:I:216:GLY:HA3	2.02	0.42
2:C:97:ILE:HD13	2:C:99:PHE:CE2	2.54	0.42
1:B:322:GLU:HB3	1:B:328:SER:HB2	2.01	0.42
5:T:216:GLY:HA2	5:T:217:ARG:HA	1.88	0.41
2:F:10:TYR:HB3	2:F:87:GLU:HB2	2.02	0.41
1:B:408:ALA:N	1:B:409:ASP:CB	2.83	0.41
2:C:6:TYR:HB3	2:C:91:VAL:HB	2.03	0.41
2:C:140:HIS:HA	3:D:69:SER:HB3	2.02	0.41
1:A:408:ALA:N	1:A:409:ASP:CB	2.83	0.41
3:G:106:LEU:N	3:G:106:LEU:HD12	2.36	0.41
1:A:177:ARG:HB2	5:T:228:GLN:NE2	2.35	0.41
2:C:90:ILE:HD12	2:C:97:ILE:HD11	2.02	0.41
2:F:140:HIS:HA	3:G:69:SER:HB3	2.02	0.41
3:D:138:ASP:O	3:D:139:LEU:HD12	2.21	0.40
1:A:168:PHE:CE1	1:A:203:ASP:HB3	2.57	0.40
1:A:371:TYR:CE2	7:A:1413:ANP:C2	3.04	0.40
1:B:171:ILE:HA	1:B:176:LEU:O	2.21	0.40
5:I:234:GLN:O	5:I:238:ALA:N	2.54	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	388/410 (95%)	360 (93%)	25 (6%)	3 (1%)	19 58
1	B	388/410 (95%)	361 (93%)	24 (6%)	3 (1%)	19 58

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	C	141/146 (97%)	129 (92%)	11 (8%)	1 (1%)	22	61
2	F	141/146 (97%)	131 (93%)	9 (6%)	1 (1%)	22	61
3	D	87/109 (80%)	80 (92%)	4 (5%)	3 (3%)	3	24
3	G	87/109 (80%)	80 (92%)	4 (5%)	3 (3%)	3	24
5	I	59/150 (39%)	46 (78%)	9 (15%)	4 (7%)	1	9
5	T	61/150 (41%)	52 (85%)	8 (13%)	1 (2%)	9	43
All	All	1352/1630 (83%)	1239 (92%)	94 (7%)	19 (1%)	11	46

All (19) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	108	GLN
1	A	383	ASN
1	B	108	GLN
1	B	383	ASN
3	D	86	GLU
3	G	86	GLU
5	T	247	ALA
2	C	30	GLY
3	D	84	ALA
2	F	30	GLY
3	G	84	ALA
3	G	135	ASN
5	I	185	LYS
5	I	243	ASP
1	A	409	ASP
1	B	409	ASP
3	D	135	ASN
5	I	172	ASP
5	I	218	TRP

### 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	330/360 (92%)	308 (93%)	22 (7%)	16	50
1	B	332/360 (92%)	309 (93%)	23 (7%)	15	49
2	C	127/134 (95%)	120 (94%)	7 (6%)	21	57
2	F	127/134 (95%)	121 (95%)	6 (5%)	26	62
3	D	67/92 (73%)	61 (91%)	6 (9%)	9	34
3	G	67/92 (73%)	61 (91%)	6 (9%)	9	34
5	I	43/133 (32%)	39 (91%)	4 (9%)	9	33
5	T	52/133 (39%)	46 (88%)	6 (12%)	5	24
All	All	1145/1438 (80%)	1065 (93%)	80 (7%)	15	48

All (80) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	45	LEU
1	A	46	ARG
1	A	70	LYS
1	A	73	ILE
1	A	103	GLN
1	A	123	GLN
1	A	134	ASN
1	A	135	VAL
1	A	149	ASP
1	A	152	LYS
1	A	157	GLN
1	A	166	ARG
1	A	173	ARG
1	A	178	THR
1	A	273	ASP
1	A	303	THR
1	A	328	SER
1	A	337	TRP
1	A	348	LEU
1	A	383	ASN
1	A	405	MET
1	A	407	VAL
1	B	45	LEU
1	B	46	ARG
1	B	70	LYS
1	B	103	GLN
1	B	108	GLN

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	B	123	GLN
1	B	134	ASN
1	B	135	VAL
1	B	149	ASP
1	B	152	LYS
1	B	157	GLN
1	B	166	ARG
1	B	173	ARG
1	B	178	THR
1	B	273	ASP
1	B	303	THR
1	B	328	SER
1	B	337	TRP
1	B	348	LEU
1	B	383	ASN
1	B	397	SER
1	B	405	MET
1	B	407	VAL
2	C	7	LEU
2	C	22	LEU
2	C	32	LEU
2	C	33	ARG
2	C	47	ARG
2	C	82	ARG
2	C	135	SER
3	D	67	GLN
3	D	132	GLU
3	D	139	LEU
3	D	140	MET
3	D	145	SER
3	D	151	VAL
2	F	22	LEU
2	F	32	LEU
2	F	33	ARG
2	F	47	ARG
2	F	82	ARG
2	F	135	SER
3	G	67	GLN
3	G	132	GLU
3	G	139	LEU
3	G	140	MET
3	G	145	SER

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Mol	Chain	Res	Type
3	G	151	VAL
5	I	193	LEU
5	I	196	GLN
5	I	224	ARG
5	I	239	LEU
5	T	196	GLN
5	T	224	ARG
5	T	227	GLU
5	T	233	ARG
5	T	235	GLU
5	T	248	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	121	GLN
1	A	157	GLN
1	A	253	GLN
1	A	308	HIS
1	A	313	GLN
1	A	351	ASN
1	A	356	ASN
1	A	383	ASN
1	B	121	GLN
1	B	157	GLN
1	B	253	GLN
1	B	308	HIS
1	B	313	GLN
1	B	351	ASN
1	B	356	ASN
1	B	383	ASN
2	C	86	GLN
3	D	137	GLN
3	D	142	GLN
2	F	13	HIS
2	F	86	GLN
3	G	137	GLN
3	G	142	GLN
5	I	196	GLN

### 5.3.3 RNA

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
4	E	5/15 (33%)	1 (20%)	0
4	H	5/15 (33%)	2 (40%)	0
All	All	10/30 (33%)	3 (30%)	0

All (3) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
4	E	6	U
4	H	3	U
4	H	6	U

There are no RNA pucker outliers to report.

## 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 4 ligands modelled in this entry, 2 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
7	ANP	B	1413	6	29,33,33	1.94	10 (34%)	31,52,52	2.07	7 (22%)
7	ANP	A	1413	6	29,33,33	1.85	7 (24%)	31,52,52	1.75	7 (22%)

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
7	ANP	B	1413	6	-	8/14/38/38	0/3/3/3
7	ANP	A	1413	6	-	4/14/38/38	0/3/3/3

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	1413	ANP	PG-N3B	4.37	1.74	1.63
7	B	1413	ANP	PG-O1G	4.28	1.52	1.46
7	A	1413	ANP	PB-N3B	4.07	1.74	1.63
7	B	1413	ANP	PG-N3B	4.05	1.73	1.63
7	A	1413	ANP	PG-O1G	3.85	1.52	1.46
7	B	1413	ANP	PB-N3B	3.71	1.73	1.63
7	A	1413	ANP	PB-O1B	3.11	1.51	1.46
7	B	1413	ANP	PB-O1B	3.03	1.51	1.46
7	B	1413	ANP	PB-O3A	2.97	1.62	1.59
7	B	1413	ANP	C5-C4	2.96	1.48	1.40
7	A	1413	ANP	PB-O2B	-2.53	1.49	1.56
7	A	1413	ANP	C5-C4	2.43	1.47	1.40
7	B	1413	ANP	PG-O2G	-2.29	1.50	1.56
7	A	1413	ANP	PG-O2G	-2.29	1.50	1.56
7	B	1413	ANP	PG-O3G	-2.25	1.50	1.56
7	B	1413	ANP	C2-N3	2.25	1.35	1.32
7	B	1413	ANP	O4'-C1'	2.21	1.44	1.41

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	1413	ANP	O1B-PB-N3B	-6.22	102.61	111.77
7	B	1413	ANP	O1G-PG-N3B	-4.44	105.23	111.77
7	A	1413	ANP	O2B-PB-O1B	4.26	118.85	109.92
7	B	1413	ANP	O2B-PB-O1B	4.13	118.59	109.92
7	A	1413	ANP	N3-C2-N1	-3.63	123.00	128.68
7	A	1413	ANP	O1B-PB-N3B	-3.50	106.61	111.77
7	A	1413	ANP	O1G-PG-N3B	-3.44	106.71	111.77
7	B	1413	ANP	N3-C2-N1	-3.43	123.32	128.68
7	B	1413	ANP	O3A-PB-N3B	3.16	115.35	106.59
7	A	1413	ANP	PB-O3A-PA	-2.81	122.71	132.62
7	B	1413	ANP	C4-C5-N7	-2.42	106.87	109.40
7	A	1413	ANP	C2-N1-C6	2.27	122.63	118.75
7	A	1413	ANP	C4-C5-N7	-2.20	107.11	109.40
7	B	1413	ANP	C3'-C2'-C1'	2.03	104.03	100.98

There are no chirality outliers.

All (12) torsion outliers are listed below:

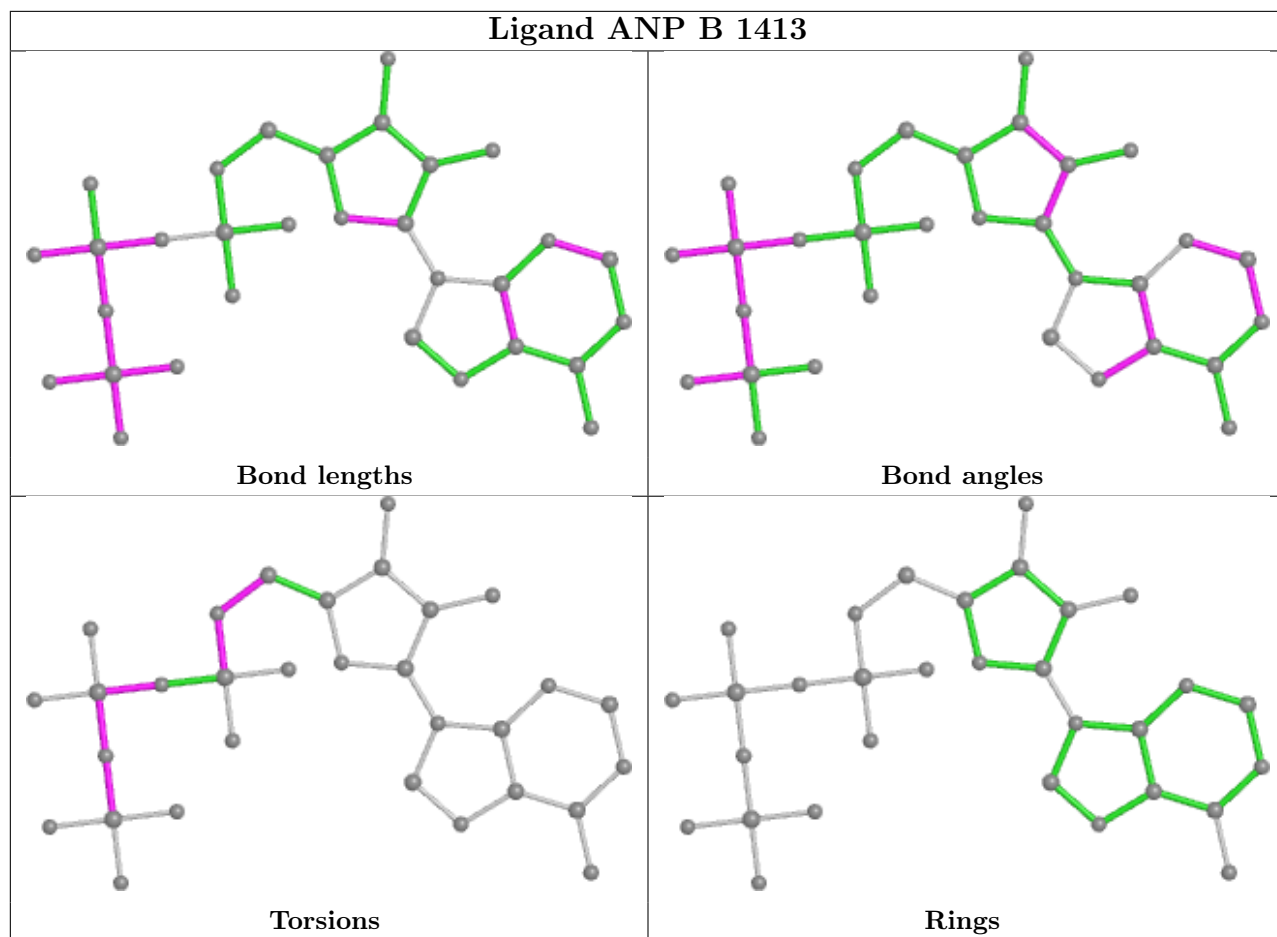
Mol	Chain	Res	Type	Atoms
7	A	1413	ANP	PG-N3B-PB-O1B
7	A	1413	ANP	PG-N3B-PB-O3A
7	A	1413	ANP	PA-O3A-PB-O1B
7	A	1413	ANP	PA-O3A-PB-O2B
7	B	1413	ANP	PB-N3B-PG-O1G
7	B	1413	ANP	PG-N3B-PB-O1B
7	B	1413	ANP	PA-O3A-PB-O1B
7	B	1413	ANP	C5'-O5'-PA-O1A
7	B	1413	ANP	C5'-O5'-PA-O2A
7	B	1413	ANP	C5'-O5'-PA-O3A
7	B	1413	ANP	C4'-C5'-O5'-PA
7	B	1413	ANP	PG-N3B-PB-O3A

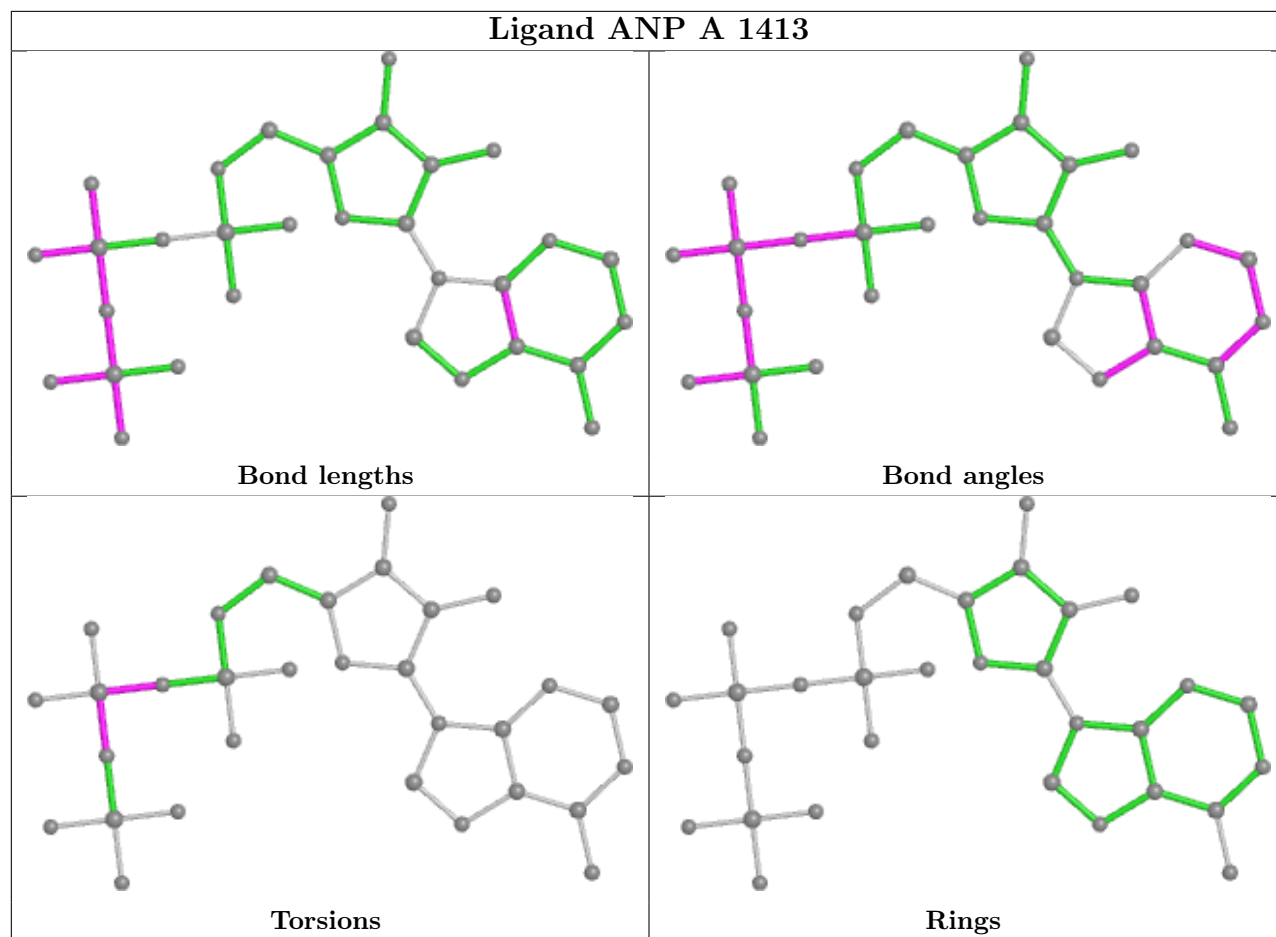
There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	B	1413	ANP	1	0
7	A	1413	ANP	3	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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	390/410 (95%)	0.07	3 (0%) 86 78	56, 69, 84, 90	0
1	B	390/410 (95%)	0.21	6 (1%) 73 61	56, 69, 83, 90	0
2	C	143/146 (97%)	-0.15	0 100 100	54, 62, 71, 74	0
2	F	143/146 (97%)	-0.02	0 100 100	54, 62, 71, 74	0
3	D	89/109 (81%)	0.63	7 (7%) 12 6	65, 75, 89, 93	0
3	G	89/109 (81%)	0.56	6 (6%) 17 10	65, 75, 89, 93	0
4	E	6/15 (40%)	-0.54	0 100 100	40, 44, 58, 68	0
4	H	6/15 (40%)	-0.22	0 100 100	55, 63, 73, 81	0
5	I	63/150 (42%)	0.85	11 (17%) 1 1	67, 80, 97, 100	0
5	T	65/150 (43%)	0.85	12 (18%) 1 1	53, 74, 82, 83	0
All	All	1384/1660 (83%)	0.21	45 (3%) 46 30	40, 69, 85, 100	0

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
5	T	197	THR	5.6
1	B	276	THR	4.2
5	I	169	HIS	3.9
5	I	172	ASP	3.7
5	I	215	GLU	3.7
5	T	214	ASP	3.5
5	T	169	HIS	3.3
3	D	140	MET	3.2
5	I	216	GLY	3.1
5	I	173	ASP	3.0
3	D	136	GLY	2.9
5	I	171	ASP	2.9
1	B	408	ALA	2.8

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Mol	Chain	Res	Type	RSRZ
3	G	139	LEU	2.8
3	D	80	VAL	2.7
5	I	224	ARG	2.5
1	B	328	SER	2.5
1	B	299	GLU	2.5
1	B	101	ASP	2.5
3	G	76	PHE	2.4
5	T	240	TYR	2.4
5	I	170	LEU	2.4
3	G	134	LEU	2.4
3	G	146	VAL	2.4
3	G	154	PRO	2.4
5	I	168	LYS	2.3
5	T	215	GLU	2.3
3	D	154	PRO	2.3
5	T	237	ILE	2.3
1	A	408	ALA	2.3
5	T	226	ASP	2.2
5	T	236	LEU	2.2
5	T	168	LYS	2.2
1	A	409	ASP	2.2
5	I	175	ASP	2.1
5	T	216	GLY	2.1
5	T	172	ASP	2.1
3	D	148	TRP	2.1
1	B	103	GLN	2.1
3	G	77	VAL	2.1
5	I	219	GLU	2.0
3	D	81	HIS	2.0
5	T	234	GLN	2.0
1	A	330	VAL	2.0
3	D	139	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](#)

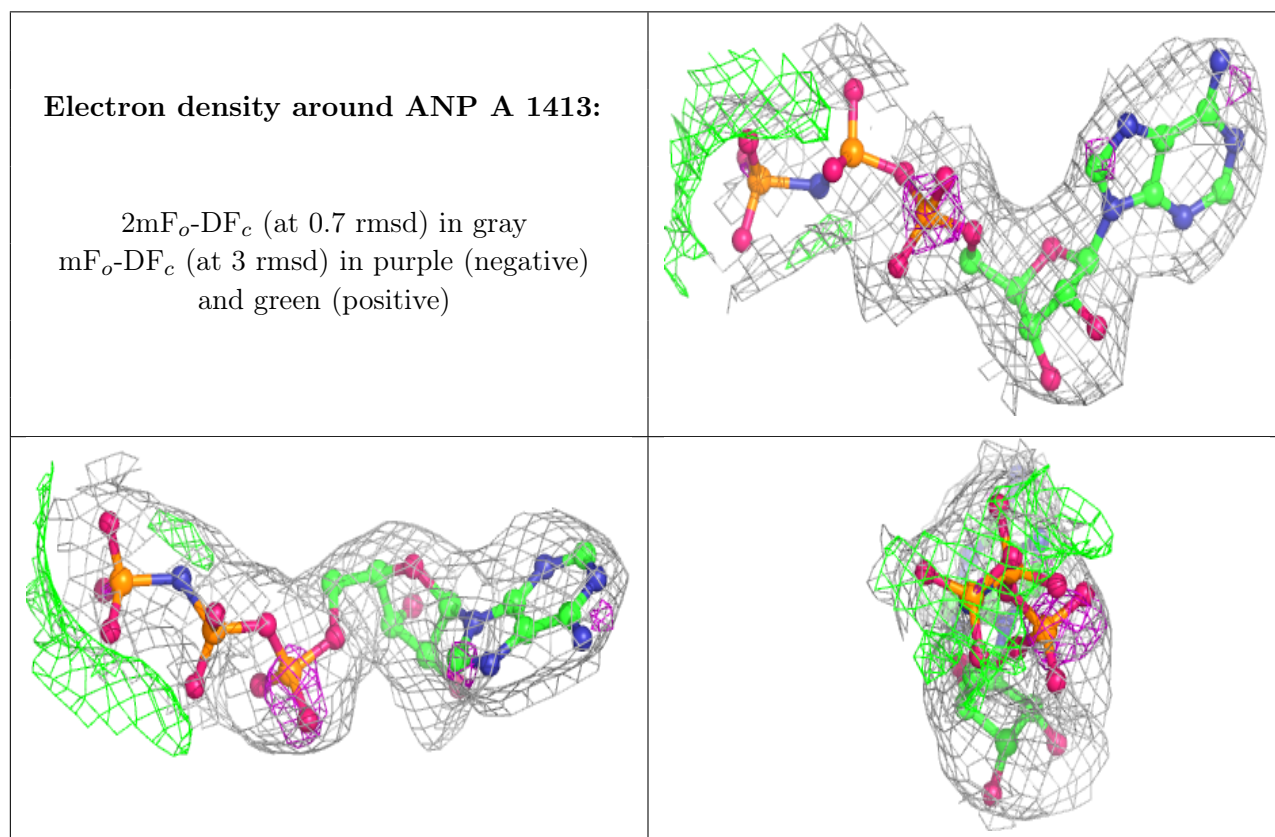
There are no monosaccharides in this entry.

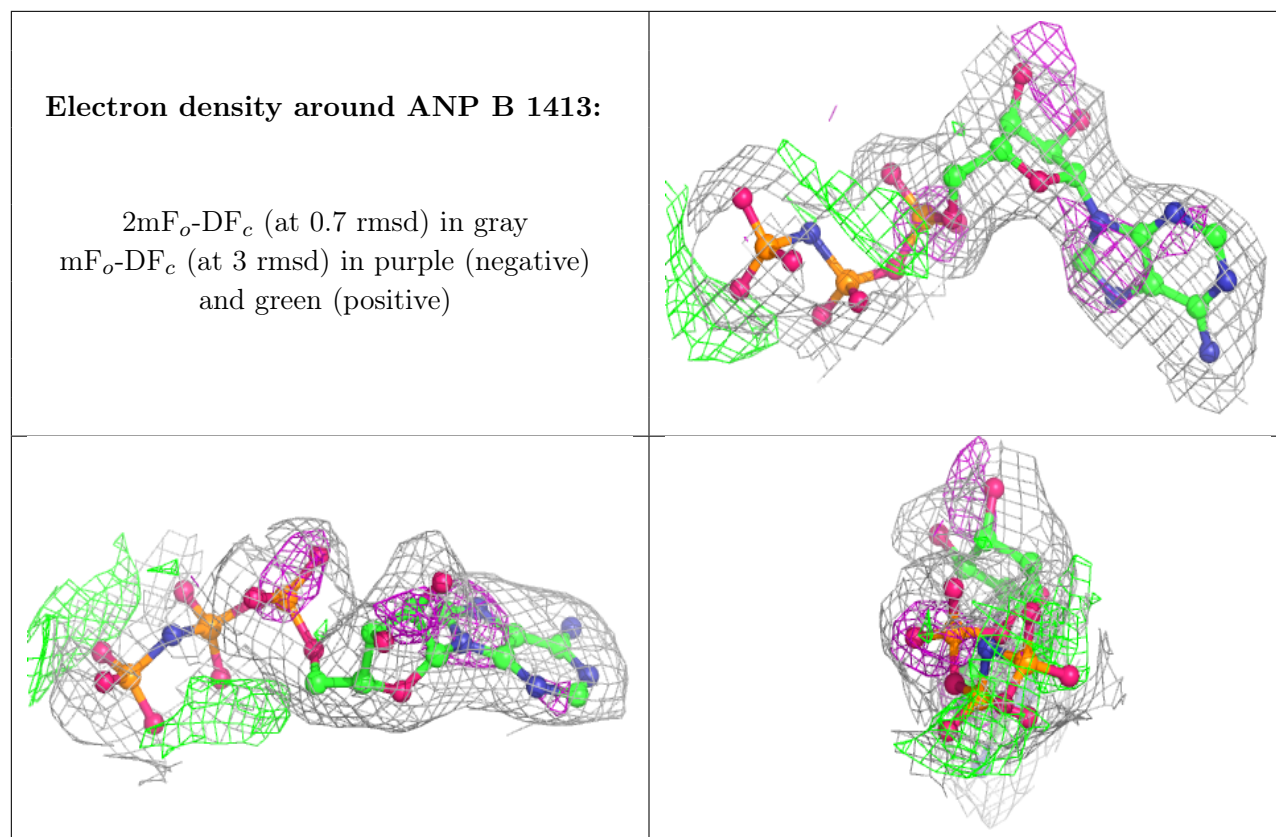
## 6.4 Ligands (i)

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, 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
6	MG	A	1412	1/1	0.92	0.29	25,25,25,25	0
7	ANP	A	1413	31/31	0.92	0.19	47,48,52,52	0
7	ANP	B	1413	31/31	0.93	0.20	37,41,50,51	0
6	MG	B	1412	1/1	0.95	0.34	19,19,19,19	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.