Full wwPDB X-ray Structure Validation Report (i)

Mar 5, 2026 – 03:37 PM UTC

PDB ID	:	6GQY / pdb_00006gqy
Title	:	KRAS-169 Q61H GPPNHP + CH-3
Authors	:	Cruz-Migoni, A.; Quevedo, C.E.; Carr, S.B.; Phillips, S.V.E.; Rabbitts, T.H.
Deposited on	:	2018-06-08
Resolution	:	2.75 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 (i) 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 (i)) were used in the production of this report:

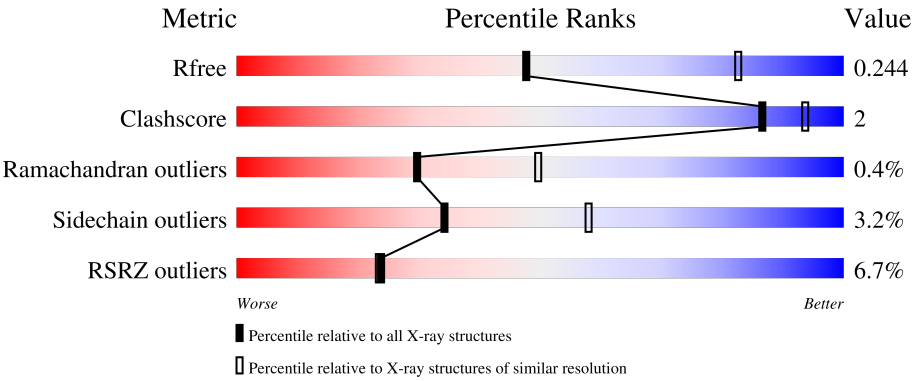
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

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 2.75 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	1009 (2.76-2.76)
Clashscore	190562	1044 (2.76-2.76)
Ramachandran outliers	187476	1024 (2.76-2.76)
Sidechain outliers	187428	1024 (2.76-2.76)
RSRZ outliers	180081	1009 (2.76-2.76)

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 <=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	171	4% 92% 7%
1	B	171	5% 94% 5%
1	C	171	5% 89% 8%
1	D	171	9% 87% 9%
1	E	171	7% 88% 8%

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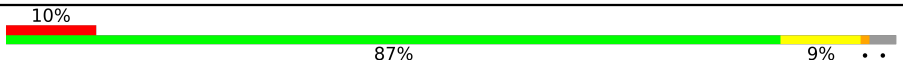
Mol	Chain	Length	Quality of chain
1	F	171	

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 8337 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 GTPase KRas.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	171	Total	C	N	O	S	0	1	0
			1366	861	233	265	7			
1	B	171	Total	C	N	O	S	0	0	0
			1348	846	232	264	6			
1	C	165	Total	C	N	O	S	0	0	0
			1300	820	222	252	6			
1	D	164	Total	C	N	O	S	0	1	0
			1316	828	226	256	6			
1	E	164	Total	C	N	O	S	0	1	0
			1304	822	223	253	6			
1	F	166	Total	C	N	O	S	0	3	0
			1345	846	231	261	7			

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	TYR	-	expression tag	UNP P01116
A	-2	PHE	-	expression tag	UNP P01116
A	-1	GLN	-	expression tag	UNP P01116
A	0	GLY	-	expression tag	UNP P01116
A	61	HIS	GLN	engineered mutation	UNP P01116
B	-3	TYR	-	expression tag	UNP P01116
B	-2	PHE	-	expression tag	UNP P01116
B	-1	GLN	-	expression tag	UNP P01116
B	0	GLY	-	expression tag	UNP P01116
B	61	HIS	GLN	engineered mutation	UNP P01116
C	-3	TYR	-	expression tag	UNP P01116
C	-2	PHE	-	expression tag	UNP P01116
C	-1	GLN	-	expression tag	UNP P01116
C	0	GLY	-	expression tag	UNP P01116
C	61	HIS	GLN	engineered mutation	UNP P01116
D	-3	TYR	-	expression tag	UNP P01116
D	-2	PHE	-	expression tag	UNP P01116

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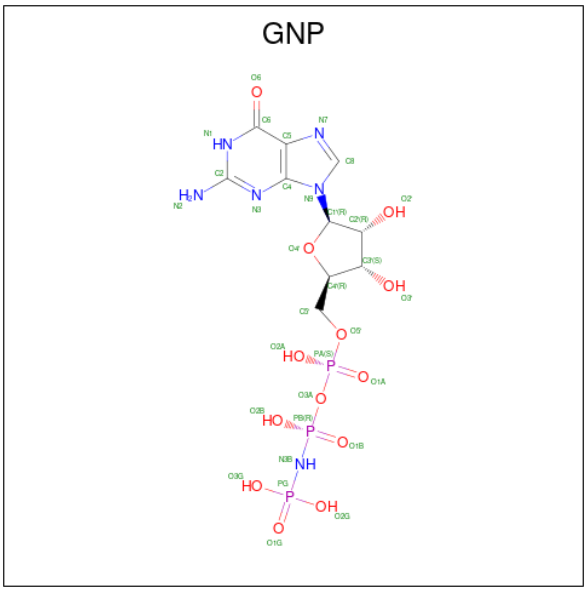
Chain	Residue	Modelled	Actual	Comment	Reference
D	-1	GLN	-	expression tag	UNP P01116
D	0	GLY	-	expression tag	UNP P01116
D	61	HIS	GLN	engineered mutation	UNP P01116
E	-3	TYR	-	expression tag	UNP P01116
E	-2	PHE	-	expression tag	UNP P01116
E	-1	GLN	-	expression tag	UNP P01116
E	0	GLY	-	expression tag	UNP P01116
E	61	HIS	GLN	engineered mutation	UNP P01116
F	-3	TYR	-	expression tag	UNP P01116
F	-2	PHE	-	expression tag	UNP P01116
F	-1	GLN	-	expression tag	UNP P01116
F	0	GLY	-	expression tag	UNP P01116
F	61	HIS	GLN	engineered mutation	UNP P01116

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

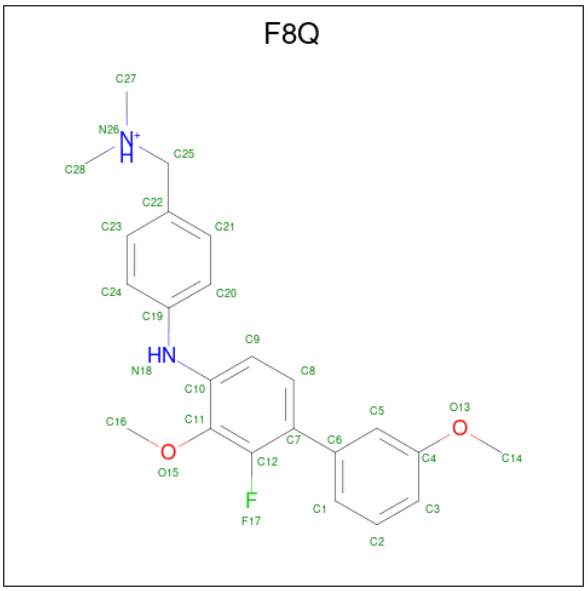
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Mg 1 1	0	0
2	B	1	Total Mg 1 1	0	0
2	C	1	Total Mg 1 1	0	0
2	D	1	Total Mg 1 1	0	0
2	E	1	Total Mg 1 1	0	0
2	F	1	Total Mg 1 1	0	0

- Molecule 3 is PHOSPHOAMINOPHOSPHONIC ACID-GUANYLATE ESTER (CCD ID: GNP) (formula: $C_{10}H_{17}N_6O_{13}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
3	B	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
3	C	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
3	D	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
3	E	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
3	F	1	Total	C	N	O	P	0	0
			32	10	6	13	3		

- Molecule 4 is [4-[[3-fluoranyl-2-methoxy-4-(3-methoxyphenyl)phenyl]amino]phenyl]methyl-dimethyl-azanium (CCD ID: F8Q) (formula: $C_{23}H_{26}FN_2O_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	F	N	O	0	0
			28	23	1	2	2		
4	B	1	Total	C	F	N	O	0	0
			28	23	1	2	2		
4	C	1	Total	C	F	N	O	0	0
			28	23	1	2	2		
4	D	1	Total	C	F	N	O	0	0
			28	23	1	2	2		

- Molecule 5 is water.

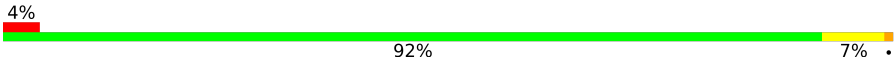
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	12	Total	O	0	0
			12	12		
5	B	10	Total	O	0	0
			10	10		
5	C	9	Total	O	0	0
			9	9		
5	D	8	Total	O	0	0
			8	8		
5	E	6	Total	O	0	0
			6	6		
5	F	3	Total	O	0	0
			3	3		

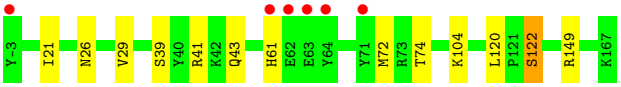
3 Residue-property plots (i)

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: GTPase KRas

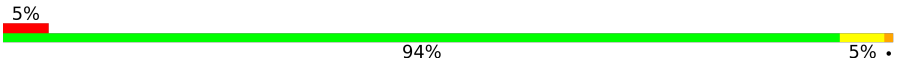
Chain A:

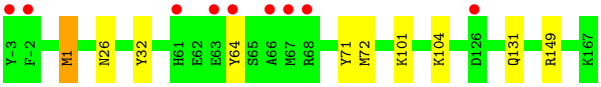




• Molecule 1: GTPase KRas

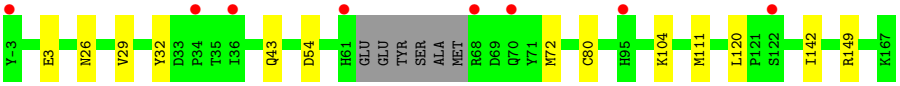
Chain B:





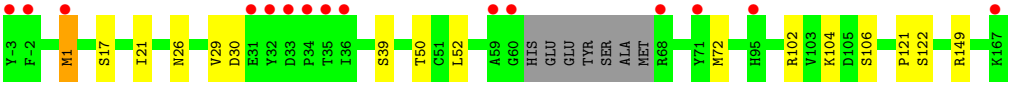
• Molecule 1: GTPase KRas

Chain C:



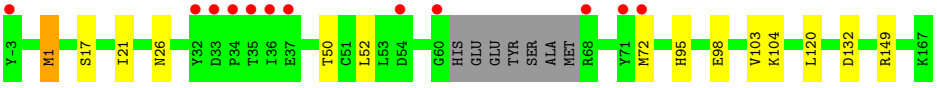
• Molecule 1: GTPase KRas

Chain D:



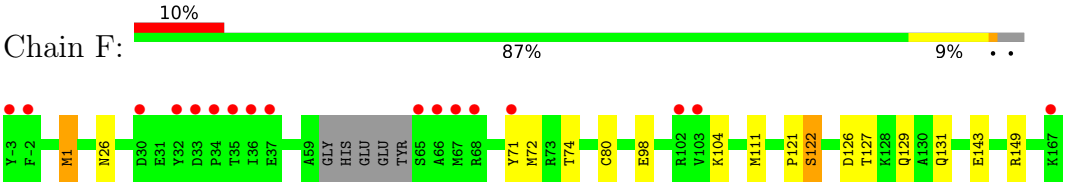
• Molecule 1: GTPase KRas

Chain E:



• Molecule 1: GTPase KRas

Chain F:


10%
87%
9%
Y-3
F-2
M1
N26
D30
E31
Y32
D33
P34
T35
I36
E37
A59
GLY
HIS
GLU
GLU
TYR
S65
A66
M67
R68
Y71
M72
R73
T74
C80
E98
R102
V103
K104
M111
P121
S122
D126
T127
K128
Q129
A130
Q131
E143
R149
K167

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	63.53Å 118.68Å 157.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	94.67 – 2.75 94.67 – 2.75	Depositor EDS
% Data completeness (in resolution range)	99.6 (94.67-2.75) 99.6 (94.67-2.75)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.88 (at 2.73Å)	Xtriage
Refinement program	REFMAC 5.8.0218	Depositor
R, R_{free}	0.205 , 0.247 0.206 , 0.244	Depositor DCC
R_{free} test set	1561 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å^2)	39.7	Xtriage
Anisotropy	0.034	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 37.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	8337	wwPDB-VP
Average B, all atoms (Å^2)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.86% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: GNP, MG, F8Q

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	0.95	0/1392	0.93	2/1878 (0.1%)
1	B	0.90	0/1370	0.88	0/1850
1	C	0.84	0/1321	0.88	2/1783 (0.1%)
1	D	0.84	0/1340	0.86	0/1806
1	E	0.79	0/1328	0.87	2/1792 (0.1%)
1	F	0.84	0/1367	0.85	0/1842
All	All	0.86	0/8118	0.88	6/10951 (0.1%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	120	LEU	CA-C-N	5.60	125.12	119.19
1	A	120	LEU	C-N-CA	5.60	125.12	119.19
1	C	120	LEU	CA-C-N	5.48	125.00	119.19
1	C	120	LEU	C-N-CA	5.48	125.00	119.19
1	E	120	LEU	CA-C-N	5.31	124.82	119.19
1	E	120	LEU	C-N-CA	5.31	124.82	119.19

There are no chirality outliers.

There are no planarity outliers.

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	1366	0	1345	4	0
1	B	1348	0	1313	4	0
1	C	1300	0	1270	6	0
1	D	1316	0	1300	9	1
1	E	1304	0	1287	7	1
1	F	1345	0	1327	8	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	32	0	13	0	0
3	B	32	0	13	1	0
3	C	32	0	13	0	0
3	D	32	0	13	0	0
3	E	32	0	13	0	0
3	F	32	0	13	0	0
4	A	28	0	0	0	0
4	B	28	0	0	0	0
4	C	28	0	0	0	0
4	D	28	0	0	1	0
5	A	12	0	0	0	0
5	B	10	0	0	1	0
5	C	9	0	0	0	0
5	D	8	0	0	0	0
5	E	6	0	0	1	0
5	F	3	0	0	0	0
All	All	8337	0	7920	34	1

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 2.

All (34) 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:F:80:CYS:SG	1:F:111:MET:HE3	2.22	0.80
1:C:80:CYS:SG	1:C:111:MET:HE3	2.27	0.74
1:E:72:MET:HB3	1:E:103:VAL:HG21	1.73	0.70
1:C:3:GLU:OE1	1:C:54:ASP:OD2	2.15	0.63
1:E:72:MET:CB	1:E:103:VAL:HG21	2.31	0.60
1:B:131:GLN:NE2	1:D:30:ASP:OD2	2.37	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:95:HIS:HB3	5:E:306:HOH:O	2.05	0.55
1:B:72:MET:O	1:B:104:LYS:HD3	2.08	0.53
1:C:72:MET:O	1:C:104:LYS:HD3	2.08	0.52
1:F:1:MET:N	1:F:1:MET:SD	2.82	0.52
3:B:202:GNP:O2G	5:B:301:HOH:O	2.19	0.51
1:F:72:MET:O	1:F:104:LYS:HD3	2.09	0.51
1:B:1:MET:HE1	1:E:52:LEU:HD11	1.93	0.50
1:D:72:MET:O	1:D:104:LYS:HD3	2.13	0.49
1:E:72:MET:O	1:E:104:LYS:HD3	2.12	0.48
1:D:1:MET:HG2	1:D:50:THR:HG22	1.96	0.48
1:A:41:ARG:NH2	1:C:3:GLU:HB2	2.30	0.47
1:D:39:SER:HB2	4:D:203:F8Q:C9	2.44	0.47
1:F:126:ASP:HB3	1:F:129:GLN:HG2	1.98	0.46
1:A:72:MET:O	1:A:104:LYS:HD3	2.16	0.45
1:E:1:MET:HG2	1:E:50:THR:HG22	1.99	0.44
1:A:21[B]:ILE:HD12	1:A:29:VAL:HG11	2.00	0.44
1:F:127:THR:HG22	1:F:131:GLN:HE21	1.83	0.44
1:D:52:LEU:HD11	1:F:1:MET:HE1	2.00	0.43
1:A:43:GLN:OE1	1:C:43:GLN:OE1	2.37	0.42
1:D:121:PRO:O	1:D:122:SER:HB2	2.20	0.41
1:D:1:MET:HG2	1:D:50:THR:CG2	2.50	0.41
1:D:17:SER:O	1:D:21:ILE:HG12	2.20	0.41
1:E:17:SER:O	1:E:21:ILE:HG12	2.21	0.41
1:B:71:TYR:CD1	1:B:71:TYR:C	2.99	0.41
1:F:71:TYR:CD1	1:F:71:TYR:C	2.99	0.41
1:F:121[A]:PRO:O	1:F:122[A]:SER:HB2	2.20	0.41
1:D:29:VAL:HG23	1:D:29:VAL:O	2.21	0.40
1:C:29:VAL:HG23	1:C:29:VAL:O	2.22	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:106:SER:OG	1:E:132:ASP:OD1[3_755]	1.97	0.23

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	170/171 (99%)	166 (98%)	2 (1%)	2 (1%)	10 20
1	B	169/171 (99%)	165 (98%)	3 (2%)	1 (1%)	21 38
1	C	161/171 (94%)	158 (98%)	3 (2%)	0	100 100
1	D	161/171 (94%)	159 (99%)	2 (1%)	0	100 100
1	E	161/171 (94%)	158 (98%)	3 (2%)	0	100 100
1	F	165/171 (96%)	161 (98%)	2 (1%)	2 (1%)	10 20
All	All	987/1026 (96%)	967 (98%)	15 (2%)	5 (0%)	30 43

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	64	TYR
1	A	122	SER
1	F	122[A]	SER
1	F	122[B]	SER
1	A	61	HIS

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	149/150 (99%)	144 (97%)	5 (3%)	32 57
1	B	145/150 (97%)	140 (97%)	5 (3%)	32 57
1	C	140/150 (93%)	136 (97%)	4 (3%)	37 61

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	D	145/150 (97%)	141 (97%)	4 (3%)	38 61
1	E	143/150 (95%)	139 (97%)	4 (3%)	38 61
1	F	148/150 (99%)	142 (96%)	6 (4%)	27 49
All	All	870/900 (97%)	842 (97%)	28 (3%)	34 58

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	26	ASN
1	A	39	SER
1	A	74	THR
1	A	122	SER
1	A	149	ARG
1	B	1	MET
1	B	26	ASN
1	B	32	TYR
1	B	101	LYS
1	B	149	ARG
1	C	26	ASN
1	C	32	TYR
1	C	142	ILE
1	C	149	ARG
1	D	1	MET
1	D	26	ASN
1	D	102	ARG
1	D	149	ARG
1	E	1	MET
1	E	26	ASN
1	E	98	GLU
1	E	149	ARG
1	F	1	MET
1	F	26	ASN
1	F	74	THR
1	F	98	GLU
1	F	143	GLU
1	F	149	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	129	GLN
1	B	25	GLN
1	B	150	GLN
1	C	131	GLN
1	D	-1	GLN
1	F	131	GLN
1	F	150	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 16 ligands modelled in this entry, 6 are monoatomic - leaving 10 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	$\#\|Z\| > 2$
3	GNP	B	202	2	34,34,34	1.45	4 (11%)	47,54,54	1.05	4 (8%)
3	GNP	E	202	2	34,34,34	1.15	4 (11%)	47,54,54	1.14	6 (12%)
3	GNP	F	202	2	34,34,34	1.03	3 (8%)	47,54,54	1.09	4 (8%)
4	F8Q	A	203	-	30,30,30	1.04	0	40,41,41	1.71	8 (20%)
3	GNP	D	202	2	34,34,34	1.19	3 (8%)	47,54,54	1.10	2 (4%)
4	F8Q	D	203	-	30,30,30	0.85	0	40,41,41	1.35	5 (12%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
4	F8Q	B	203	-	30,30,30	0.70	0	40,41,41	1.48	8 (20%)
3	GNP	C	202	2	34,34,34	1.08	3 (8%)	47,54,54	1.24	4 (8%)
4	F8Q	C	203	-	30,30,30	0.78	0	40,41,41	1.42	5 (12%)
3	GNP	A	202	2	34,34,34	1.35	4 (11%)	47,54,54	1.04	4 (8%)

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	GNP	B	202	2	-	1/18/38/38	0/3/3/3
3	GNP	E	202	2	-	4/18/38/38	0/3/3/3
3	GNP	F	202	2	-	4/18/38/38	0/3/3/3
4	F8Q	A	203	-	-	1/16/16/16	0/3/3/3
3	GNP	D	202	2	-	4/18/38/38	0/3/3/3
4	F8Q	D	203	-	-	2/16/16/16	0/3/3/3
4	F8Q	B	203	-	-	0/16/16/16	0/3/3/3
3	GNP	C	202	2	-	4/18/38/38	0/3/3/3
4	F8Q	C	203	-	-	2/16/16/16	0/3/3/3
3	GNP	A	202	2	-	4/18/38/38	0/3/3/3

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	202	GNP	PG-O1G	6.48	1.56	1.46
3	A	202	GNP	PG-O1G	5.15	1.54	1.46
3	D	202	GNP	PG-O1G	4.38	1.52	1.46
3	F	202	GNP	PG-O1G	3.88	1.52	1.46
3	C	202	GNP	PG-O1G	3.80	1.51	1.46
3	E	202	GNP	PG-O1G	3.72	1.51	1.46
3	C	202	GNP	PB-O1B	3.13	1.50	1.46
3	A	202	GNP	PB-O1B	3.09	1.50	1.46
3	D	202	GNP	PB-O1B	2.94	1.50	1.46
3	E	202	GNP	PB-O1B	2.90	1.50	1.46
3	B	202	GNP	PB-O1B	2.85	1.50	1.46
3	A	202	GNP	PB-O2B	-2.65	1.49	1.56
3	D	202	GNP	PB-O2B	-2.43	1.50	1.56
3	B	202	GNP	PB-O2B	-2.42	1.50	1.56
3	A	202	GNP	PG-O3G	-2.42	1.50	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	F	202	GNP	PB-O1B	2.38	1.49	1.46
3	E	202	GNP	PB-O2B	-2.33	1.50	1.56
3	B	202	GNP	PB-O3A	2.31	1.61	1.59
3	F	202	GNP	PB-O2B	-2.21	1.50	1.56
3	C	202	GNP	PB-O2B	-2.17	1.51	1.56
3	E	202	GNP	PA-O3A	2.12	1.61	1.59

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	202	GNP	O2B-PB-O1B	4.97	120.52	109.87
4	A	203	F8Q	C16-O15-C11	4.87	127.96	114.74
3	D	202	GNP	O2G-PG-O1G	-4.39	102.45	113.45
3	F	202	GNP	O2B-PB-O1B	4.07	118.60	109.87
3	D	202	GNP	O2B-PB-O1B	4.05	118.55	109.87
4	C	203	F8Q	C22-C25-N26	-3.99	105.71	113.17
4	B	203	F8Q	C14-O13-C4	3.96	125.99	117.50
3	B	202	GNP	O2B-PB-O1B	3.95	118.35	109.87
4	A	203	F8Q	C14-O13-C4	3.84	125.73	117.50
3	E	202	GNP	O2B-PB-O1B	3.81	118.04	109.87
3	C	202	GNP	O1B-PB-N3B	-3.81	106.16	111.77
3	E	202	GNP	O3G-PG-O1G	-3.77	103.99	113.45
4	B	203	F8Q	C6-C7-C12	-3.46	118.23	122.38
4	D	203	F8Q	C16-O15-C11	3.35	123.83	114.74
3	B	202	GNP	O2G-PG-O1G	-3.21	105.40	113.45
3	A	202	GNP	O2B-PB-O1B	3.14	116.61	109.87
4	C	203	F8Q	C6-C7-C12	-3.13	118.63	122.38
4	A	203	F8Q	C9-C10-N18	3.12	127.55	121.32
4	C	203	F8Q	C16-O15-C11	3.06	123.04	114.74
3	A	202	GNP	O3A-PB-N3B	-3.05	98.12	106.59
4	A	203	F8Q	C22-C25-N26	3.01	118.81	113.17
4	A	203	F8Q	C25-C22-C21	2.98	126.23	120.75
3	F	202	GNP	O1G-PG-N3B	-2.90	107.49	111.77
4	A	203	F8Q	C20-C19-C24	-2.86	115.24	119.04
3	C	202	GNP	O1G-PG-N3B	-2.82	107.62	111.77
3	A	202	GNP	O3'-C3'-C2'	-2.77	102.93	111.82
3	F	202	GNP	O2G-PG-O1G	-2.73	106.60	113.45
4	D	203	F8Q	C14-O13-C4	2.71	123.31	117.50
3	A	202	GNP	O3G-PG-O1G	-2.59	106.95	113.45
4	D	203	F8Q	C20-C19-N18	2.53	129.19	120.61
3	E	202	GNP	O1B-PB-N3B	-2.53	108.05	111.77
4	B	203	F8Q	C9-C10-N18	2.49	126.31	121.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	B	203	F8Q	C2-C3-C4	2.47	122.72	118.98
3	E	202	GNP	O1G-PG-N3B	2.41	115.31	111.77
3	E	202	GNP	O2G-PG-O1G	-2.38	107.48	113.45
4	D	203	F8Q	C19-N18-C10	2.37	132.78	126.73
4	B	203	F8Q	C8-C7-C6	2.36	123.38	118.70
4	A	203	F8Q	C23-C24-C19	2.36	123.01	120.30
4	C	203	F8Q	C8-C7-C6	2.34	123.34	118.70
4	D	203	F8Q	C8-C7-C12	2.29	118.71	115.98
4	B	203	F8Q	C16-O15-C11	2.29	120.95	114.74
4	A	203	F8Q	C9-C10-C11	-2.24	116.12	119.36
3	E	202	GNP	O2G-PG-O3G	2.23	113.57	107.59
3	B	202	GNP	O1G-PG-N3B	2.16	114.96	111.77
4	C	203	F8Q	C9-C10-N18	2.16	125.63	121.32
3	C	202	GNP	O2G-PG-O1G	-2.13	108.12	113.45
4	B	203	F8Q	C24-C19-N18	2.09	127.70	120.61
3	B	202	GNP	O2G-PG-O3G	2.06	113.13	107.59
3	F	202	GNP	O3G-PG-O1G	-2.03	108.37	113.45
4	B	203	F8Q	C8-C7-C12	2.01	118.38	115.98

There are no chirality outliers.

All (26) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	202	GNP	PG-N3B-PB-O1B
3	A	202	GNP	PG-N3B-PB-O3A
3	A	202	GNP	PA-O3A-PB-O2B
3	B	202	GNP	PG-N3B-PB-O1B
3	C	202	GNP	PB-N3B-PG-O1G
3	C	202	GNP	PG-N3B-PB-O1B
3	C	202	GNP	PA-O3A-PB-O2B
3	D	202	GNP	PB-N3B-PG-O1G
3	D	202	GNP	PG-N3B-PB-O1B
3	D	202	GNP	PA-O3A-PB-O2B
3	E	202	GNP	PB-N3B-PG-O1G
3	E	202	GNP	PG-N3B-PB-O1B
3	E	202	GNP	PA-O3A-PB-O1B
3	E	202	GNP	PA-O3A-PB-O2B
3	F	202	GNP	PB-N3B-PG-O1G
3	F	202	GNP	PG-N3B-PB-O1B
3	F	202	GNP	PA-O3A-PB-O2B
4	C	203	F8Q	C5-C4-O13-C14
4	C	203	F8Q	C3-C4-O13-C14

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Mol	Chain	Res	Type	Atoms
4	D	203	F8Q	C3-C4-O13-C14
4	D	203	F8Q	C5-C4-O13-C14
3	A	202	GNP	PA-O3A-PB-O1B
3	C	202	GNP	PA-O3A-PB-O1B
3	D	202	GNP	PA-O3A-PB-O1B
3	F	202	GNP	PA-O3A-PB-O1B
4	A	203	F8Q	C10-C11-O15-C16

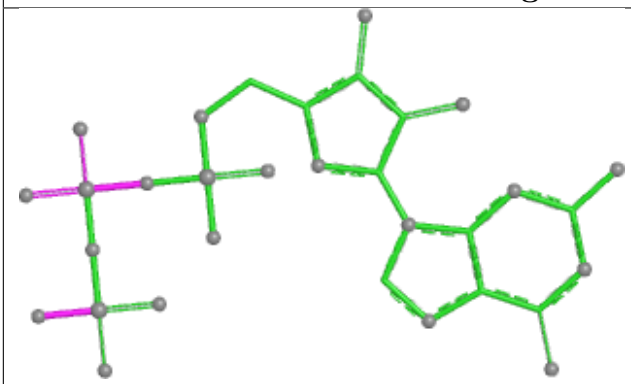
There are no ring outliers.

2 monomers are involved in 2 short contacts:

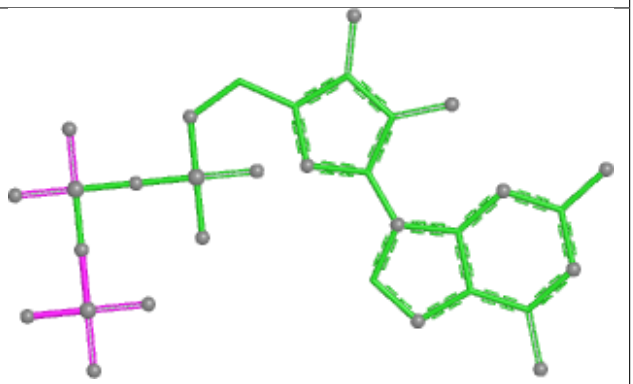
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	202	GNP	1	0
4	D	203	F8Q	1	0

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 then 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.

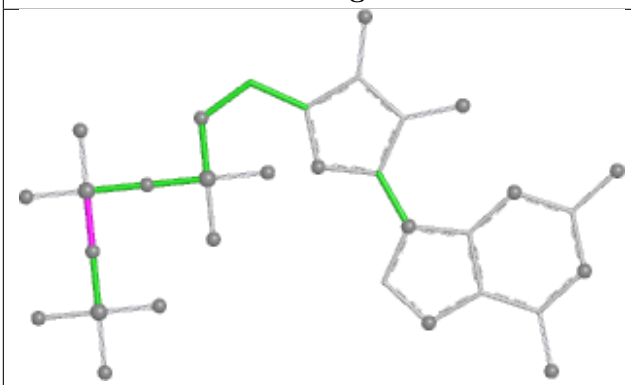
Ligand GNP B 202



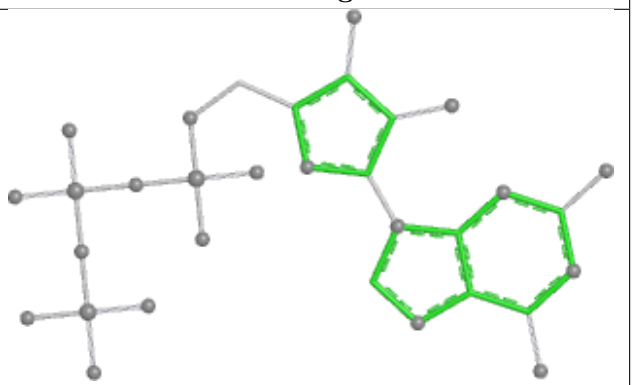
Bond lengths



Bond angles

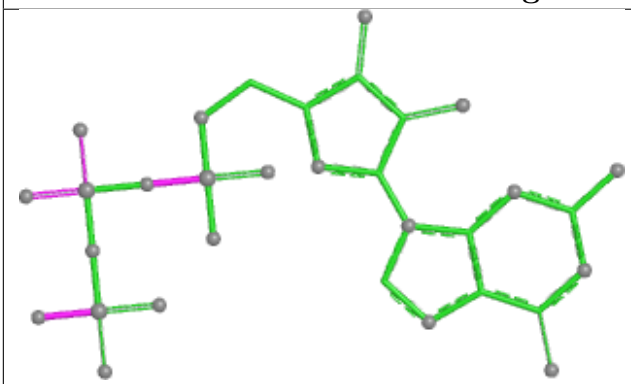


Torsions



Rings

Ligand GNP E 202



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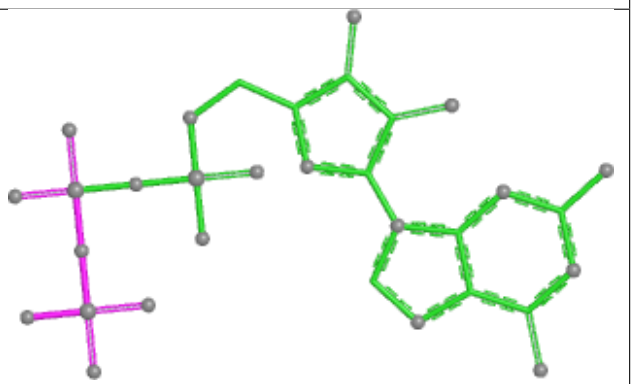

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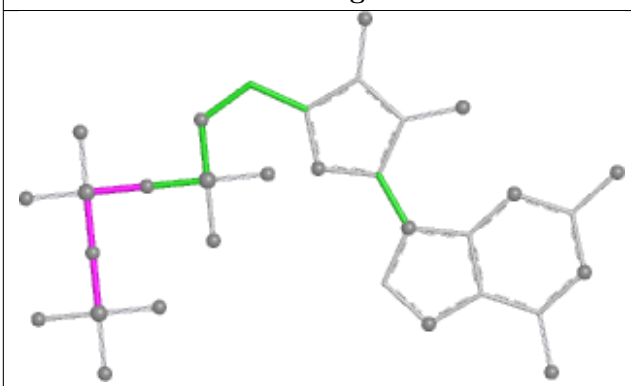

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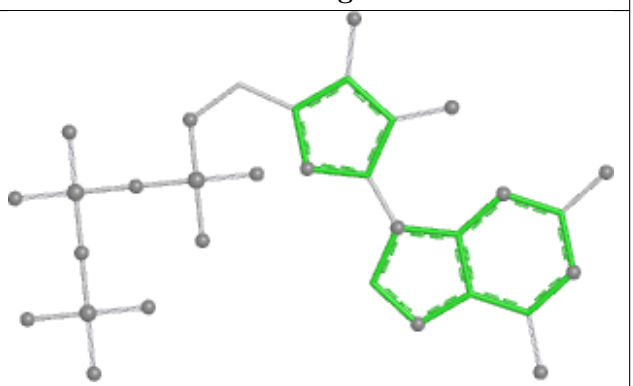
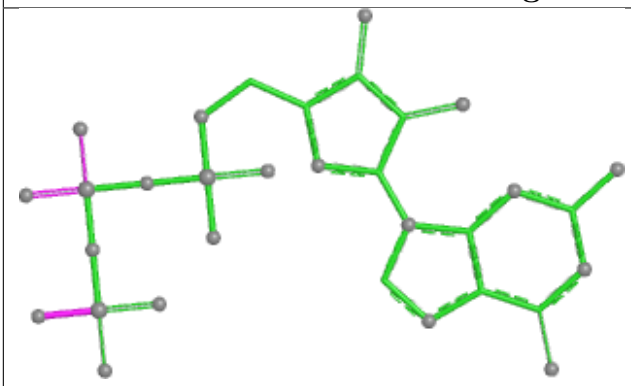
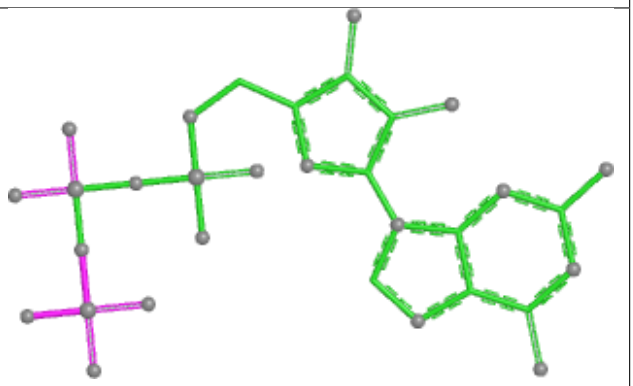


Rings

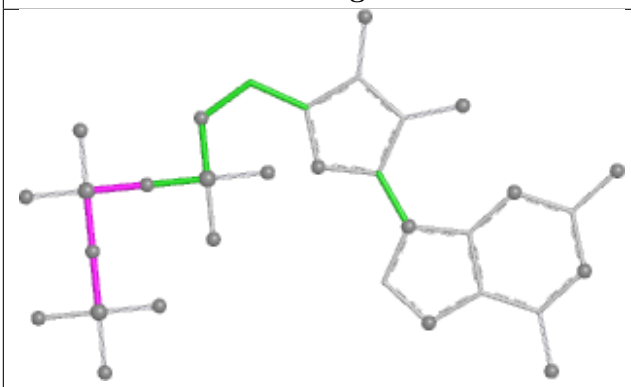
Ligand GNP F 202



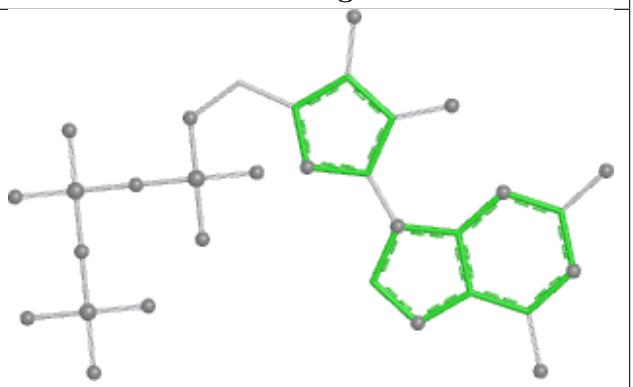
Bond lengths



Bond angles

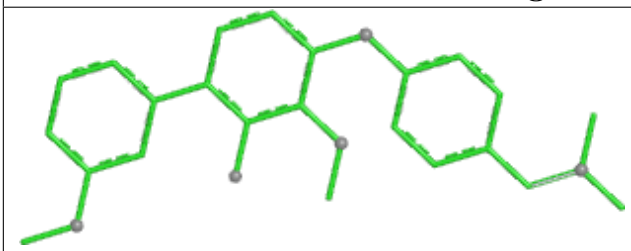


Torsions

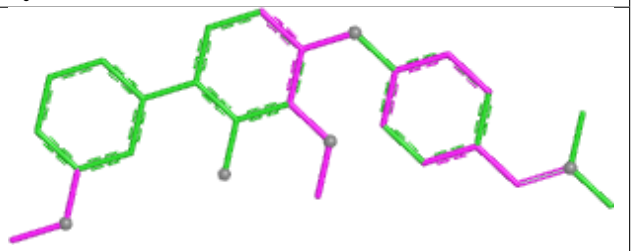


Rings

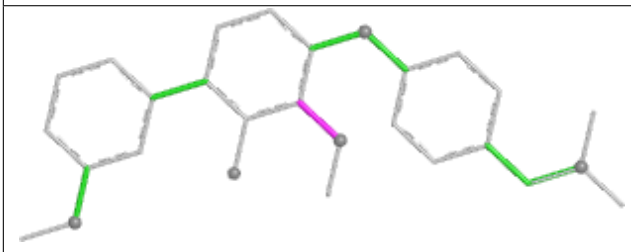
Ligand F8Q A 203



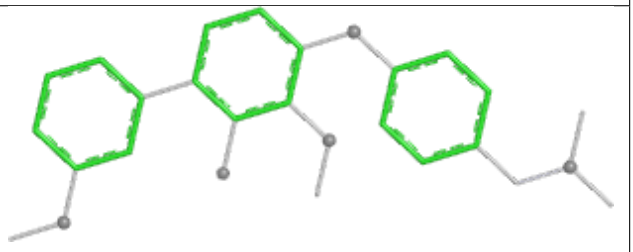
Bond lengths



Bond angles

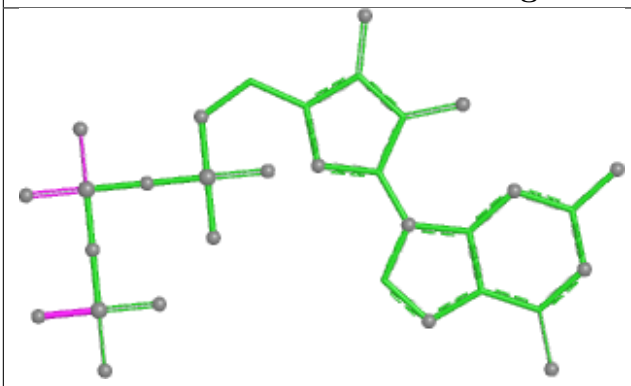


Torsions

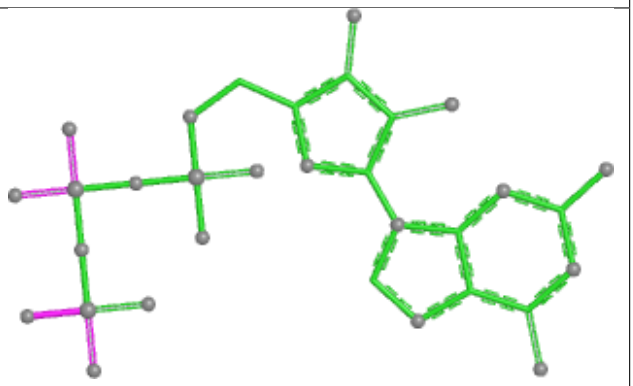


Rings

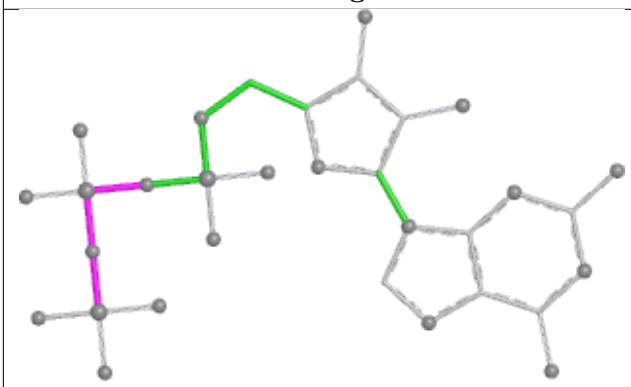
Ligand GNP D 202



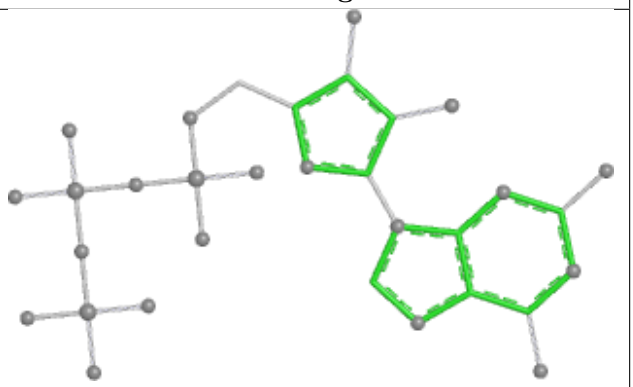
Bond lengths



Bond angles

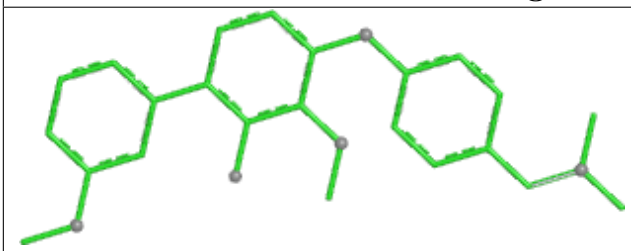


Torsions

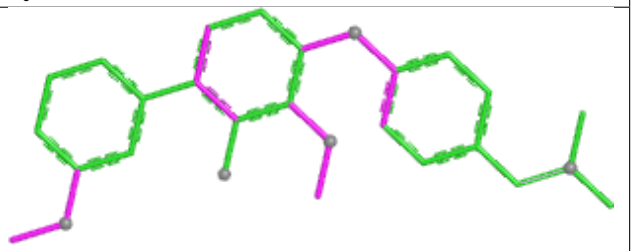


Rings

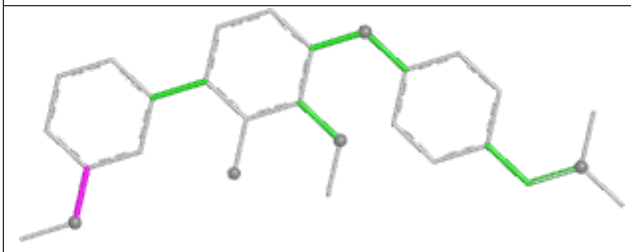
Ligand F8Q D 203



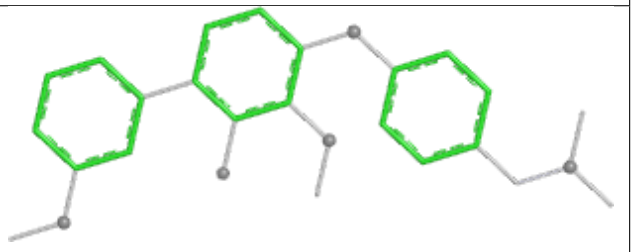
Bond lengths



Bond angles

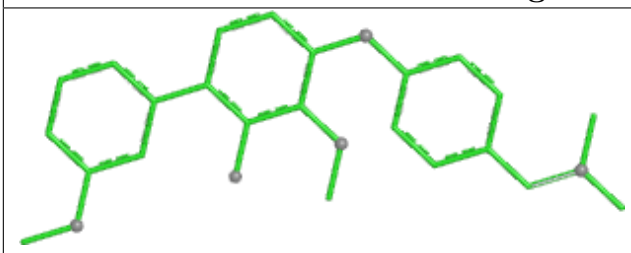


Torsions

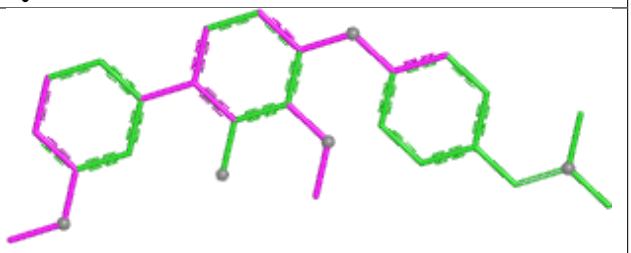


Rings

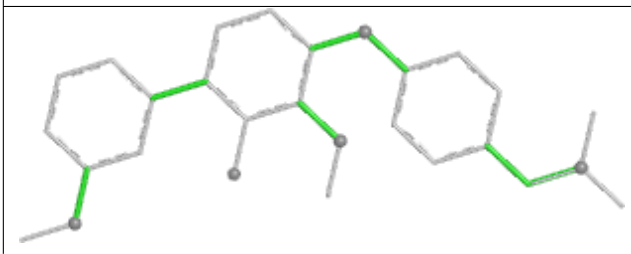
Ligand F8Q B 203



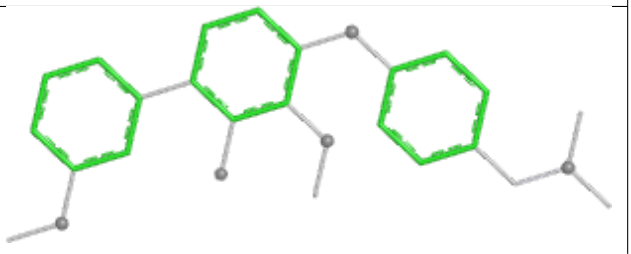
Bond lengths



Bond angles

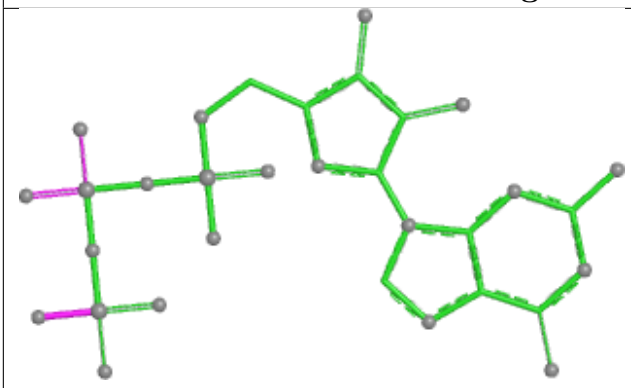


Torsions

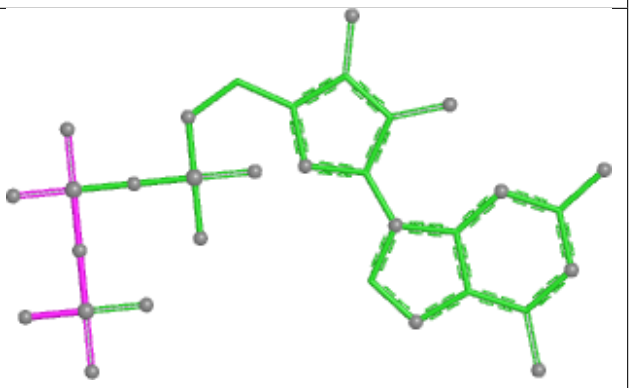


Rings

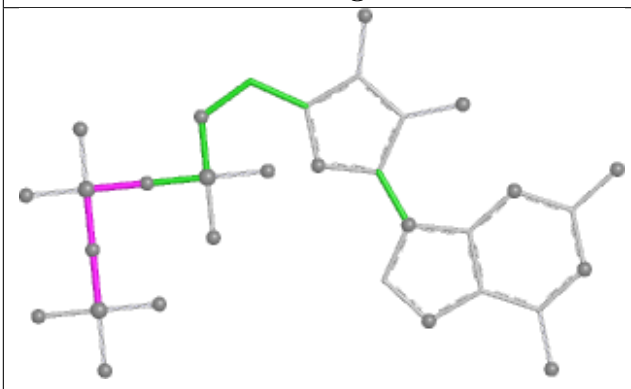
Ligand GNP C 202



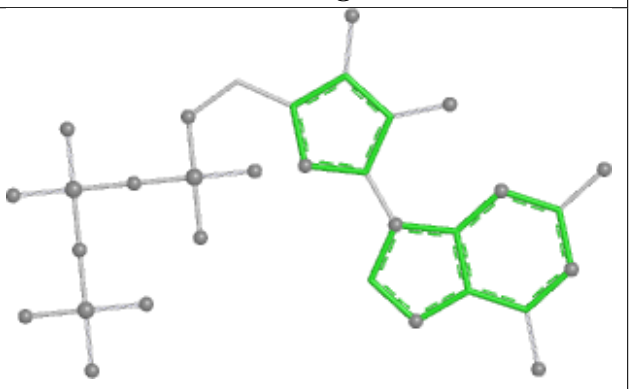
Bond lengths



Bond angles

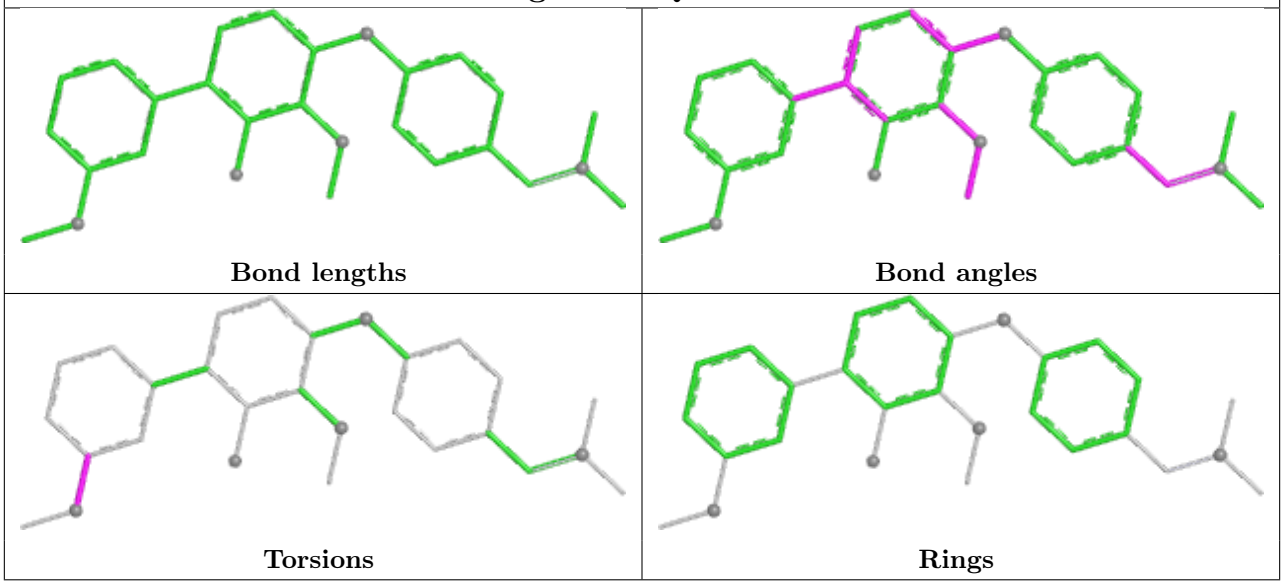


Torsions

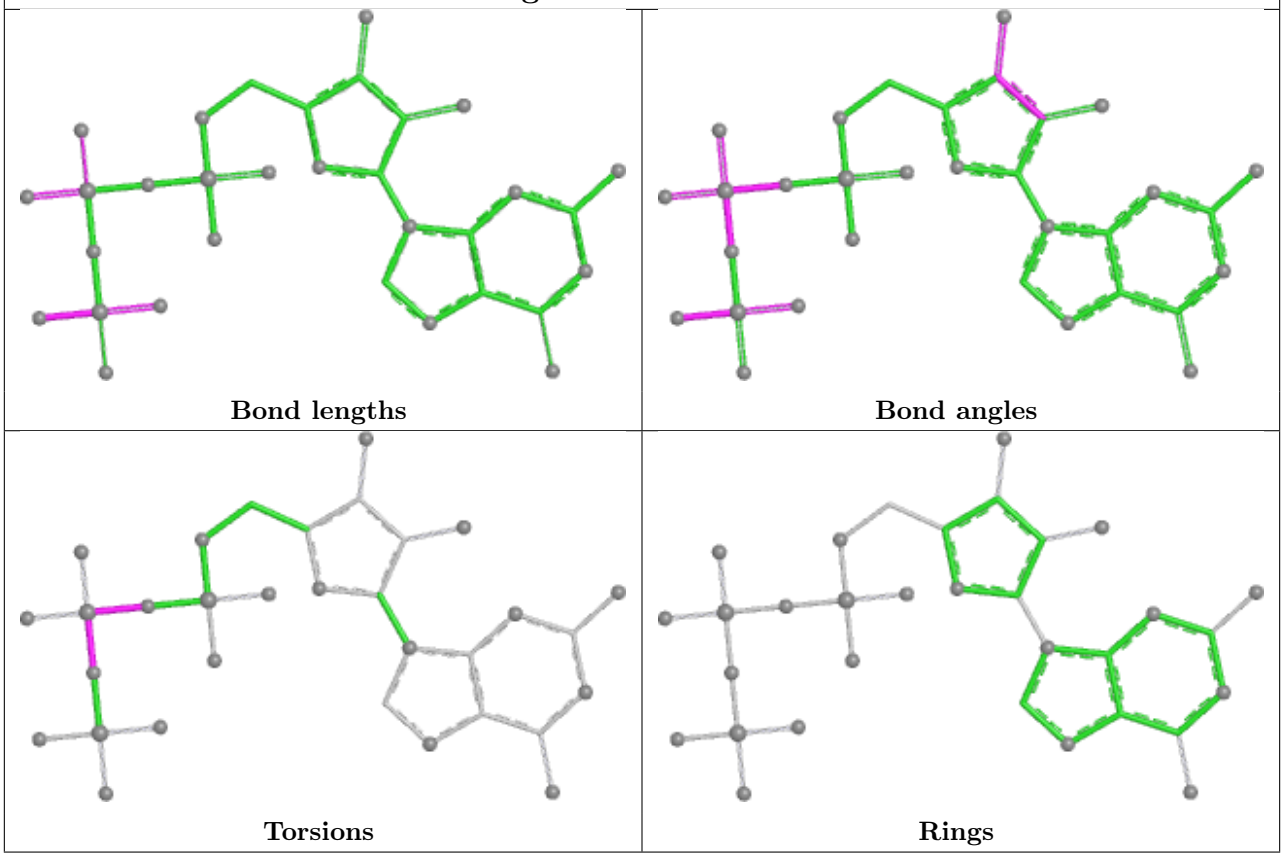


Rings

Ligand F8Q C 203



Ligand GNP A 202



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} 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	171/171 (100%)	-0.13	6 (3%)	47	44	11, 30, 73, 109	1 (0%)
1	B	171/171 (100%)	0.02	9 (5%)	32	31	19, 33, 79, 129	0
1	C	165/171 (96%)	0.17	8 (4%)	35	35	26, 42, 89, 108	0
1	D	164/171 (95%)	0.26	15 (9%)	15	14	20, 41, 95, 142	1 (0%)
1	E	164/171 (95%)	0.36	12 (7%)	21	21	27, 44, 108, 150	1 (0%)
1	F	166/171 (97%)	0.26	17 (10%)	12	11	21, 39, 112, 129	3 (1%)
All	All	1001/1026 (97%)	0.15	67 (6%)	24	23	11, 38, 93, 150	6 (0%)

All (67) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	61	HIS	5.9
1	B	-3	TYR	5.3
1	E	71	TYR	4.9
1	E	-3	TYR	4.5
1	E	36	ILE	4.4
1	F	36	ILE	4.2
1	D	36	ILE	4.0
1	D	71	TYR	4.0
1	A	-3	TYR	3.9
1	D	35	THR	3.8
1	A	63	GLU	3.7
1	F	-3	TYR	3.6
1	B	64	TYR	3.5
1	F	34	PRO	3.4
1	B	68	ARG	3.3
1	B	-2	PHE	3.3
1	E	54	ASP	3.3
1	E	35	THR	3.3
1	D	60	GLY	3.3

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Mol	Chain	Res	Type	RSRZ
1	C	36	ILE	3.2
1	B	61	HIS	3.0
1	C	95	HIS	3.0
1	D	34	PRO	3.0
1	B	63	GLU	3.0
1	D	1	MET	2.9
1	F	35	THR	2.9
1	F	65	SER	2.9
1	D	167	LYS	2.8
1	D	59	ALA	2.8
1	E	72	MET	2.8
1	A	61	HIS	2.8
1	B	67	MET	2.8
1	E	34	PRO	2.7
1	F	32	TYR	2.7
1	D	33	ASP	2.7
1	A	71	TYR	2.6
1	C	68	ARG	2.6
1	A	64	TYR	2.6
1	D	32	TYR	2.5
1	C	70	GLN	2.5
1	E	68	ARG	2.5
1	D	31	GLU	2.5
1	F	67	MET	2.5
1	D	95	HIS	2.5
1	C	34	PRO	2.5
1	D	-3	TYR	2.4
1	F	102	ARG	2.4
1	E	37	GLU	2.4
1	F	103	VAL	2.4
1	E	32	TYR	2.4
1	F	-2	PHE	2.4
1	F	66	ALA	2.4
1	F	68	ARG	2.4
1	F	30	ASP	2.4
1	D	68	ARG	2.3
1	F	71	TYR	2.3
1	F	167	LYS	2.3
1	D	-2	PHE	2.3
1	B	66	ALA	2.2
1	E	60	GLY	2.2
1	B	126	ASP	2.2

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Mol	Chain	Res	Type	RSRZ
1	F	33	ASP	2.2
1	F	37	GLU	2.1
1	E	33	ASP	2.1
1	A	62	GLU	2.1
1	C	122	SER	2.0
1	C	-3	TYR	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 (i)

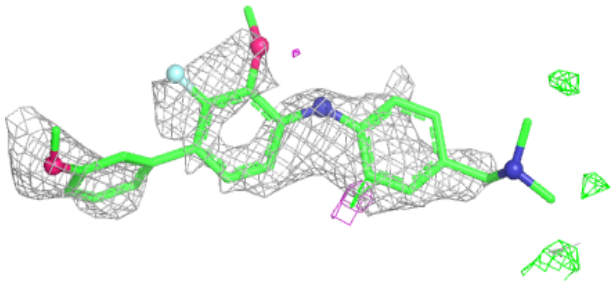
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

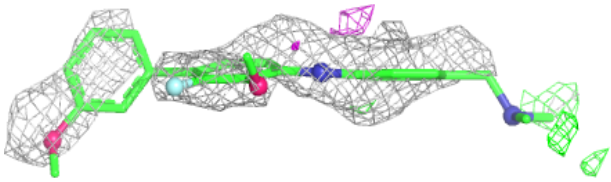
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	F8Q	D	203	28/28	0.67	0.26	90,99,131,136	0
2	MG	D	201	1/1	0.84	0.21	123,123,123,123	0
2	MG	E	201	1/1	0.87	0.21	80,80,80,80	0
4	F8Q	B	203	28/28	0.88	0.14	33,55,78,81	0
2	MG	F	201	1/1	0.90	0.16	72,72,72,72	0
4	F8Q	C	203	28/28	0.91	0.10	32,39,55,60	0
4	F8Q	A	203	28/28	0.93	0.11	28,32,71,75	0
2	MG	C	201	1/1	0.93	0.07	57,57,57,57	0
3	GNP	D	202	32/32	0.95	0.08	26,32,82,99	0
3	GNP	E	202	32/32	0.96	0.07	31,37,70,75	0
3	GNP	F	202	32/32	0.96	0.07	26,29,67,80	0
3	GNP	C	202	32/32	0.96	0.07	31,35,81,93	0
3	GNP	B	202	32/32	0.98	0.04	15,17,24,26	0
2	MG	A	201	1/1	0.98	0.04	19,19,19,19	0
3	GNP	A	202	32/32	0.98	0.05	17,21,23,24	0
2	MG	B	201	1/1	0.99	0.03	20,20,20,20	0

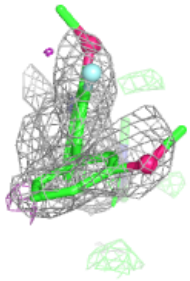
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around F8Q D 203:

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

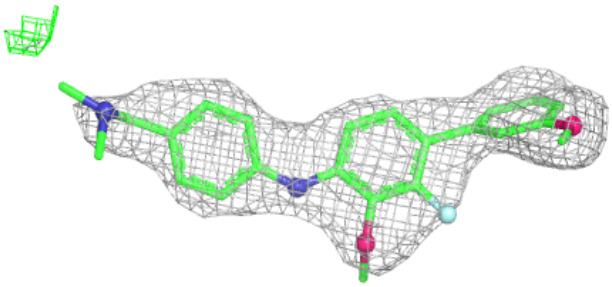


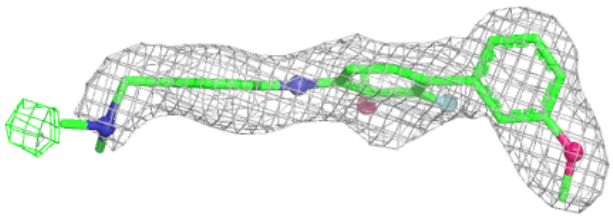


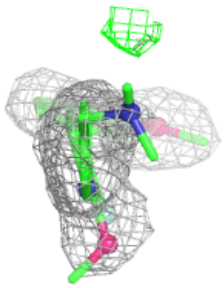


Electron density around F8Q B 203:

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

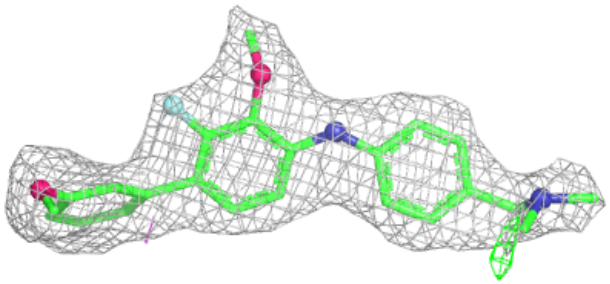


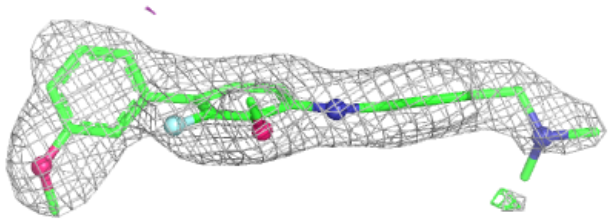


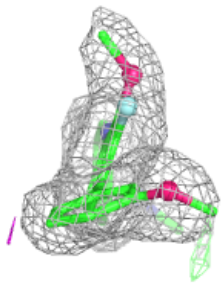


Electron density around F8Q C 203:

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

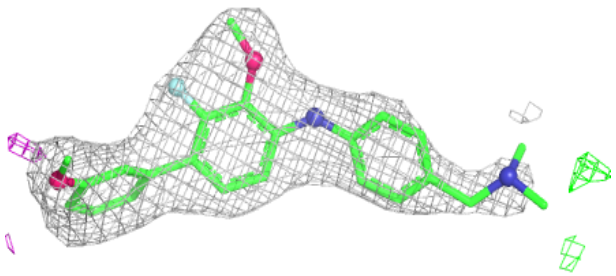


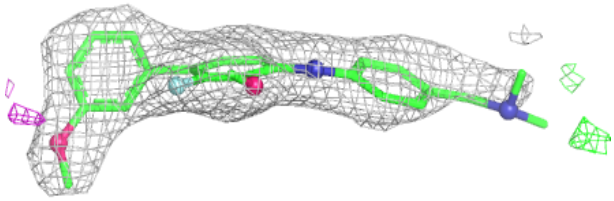


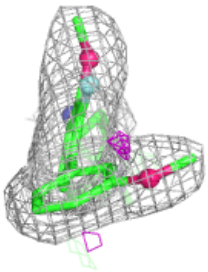


Electron density around F8Q A 203:

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

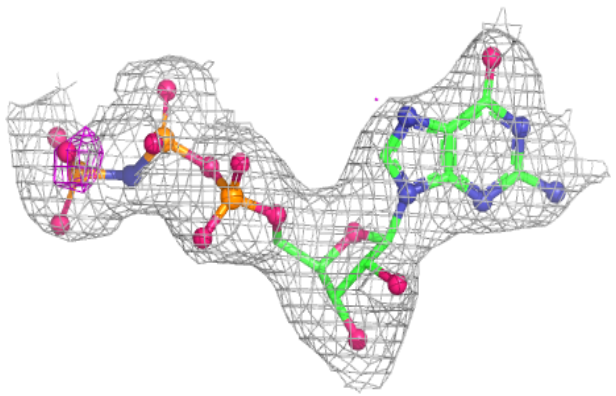


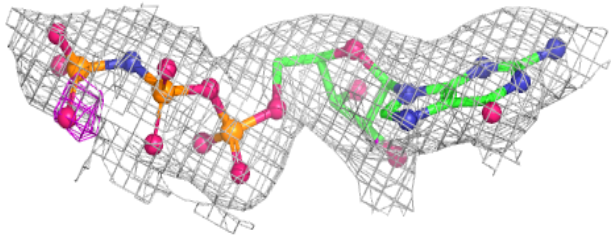


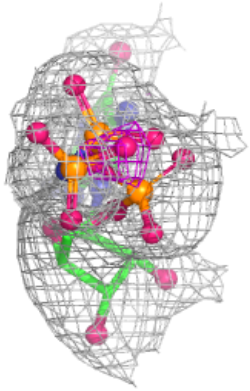


Electron density around GNP D 202:

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

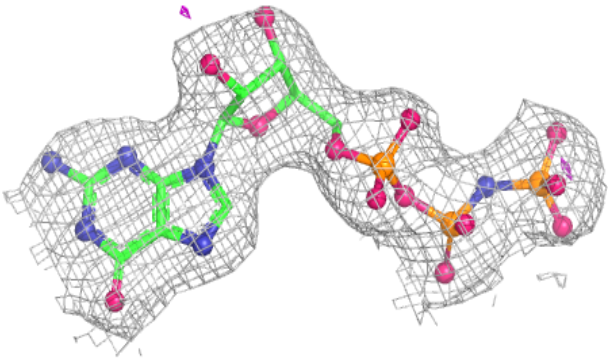


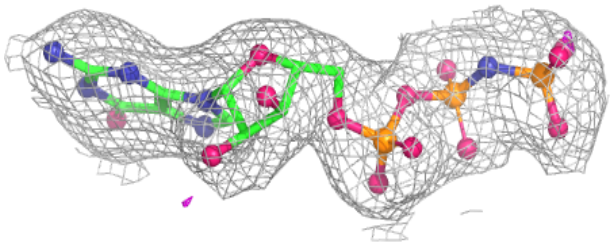


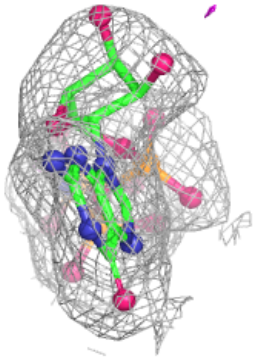


Electron density around GNP E 202:

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

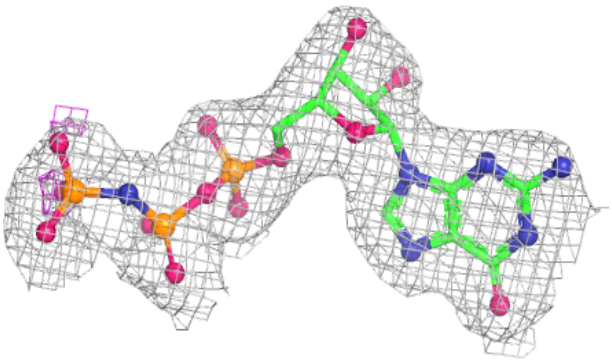


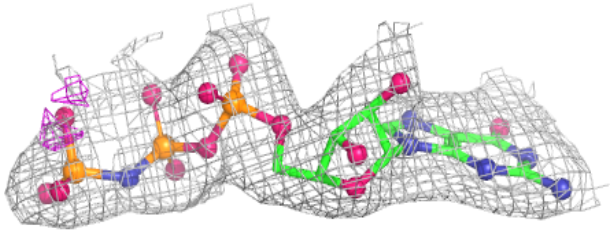


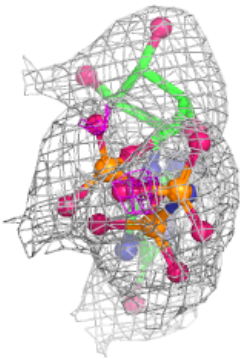


Electron density around GNP F 202:

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

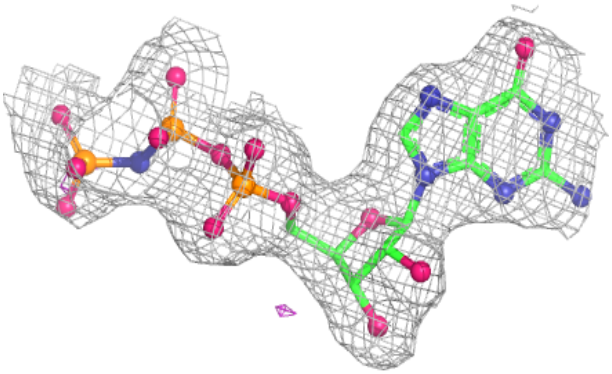


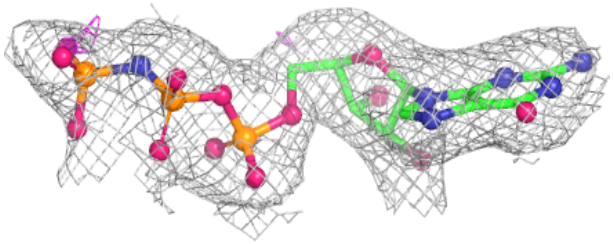


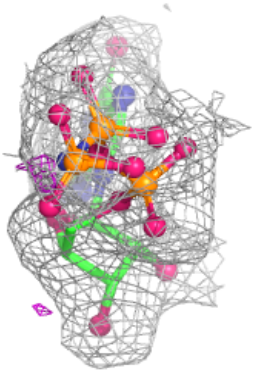


Electron density around GNP C 202:

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

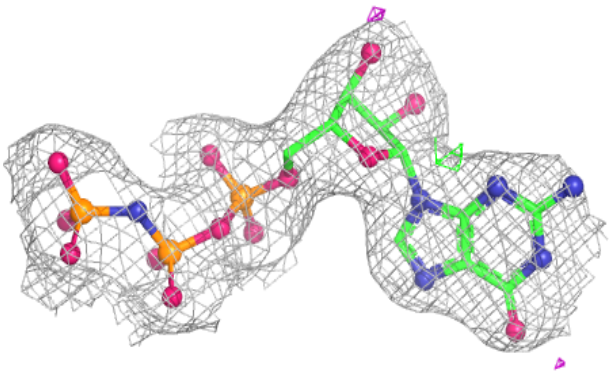


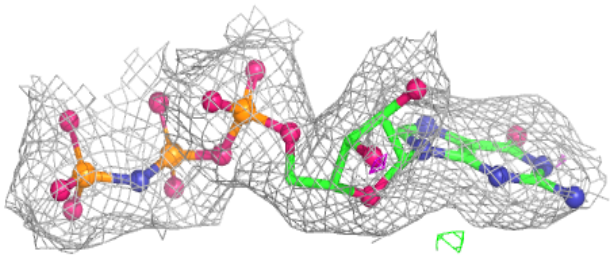


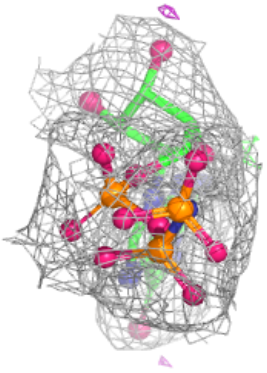


Electron density around GNP B 202:

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

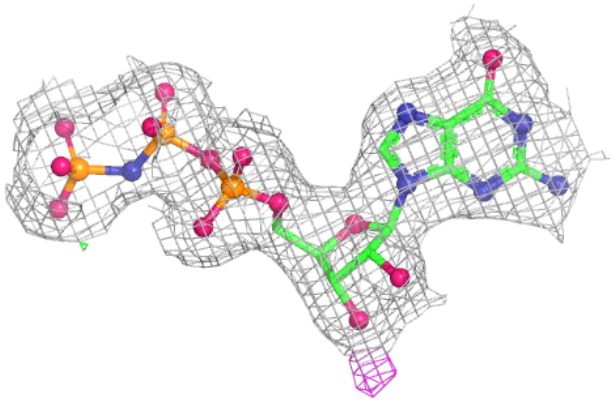


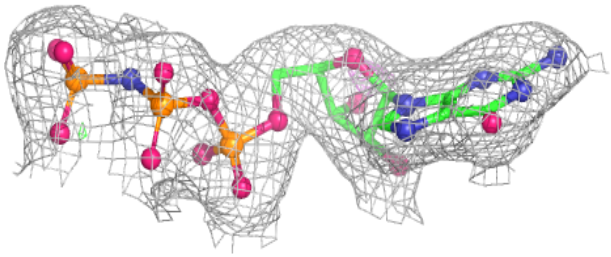


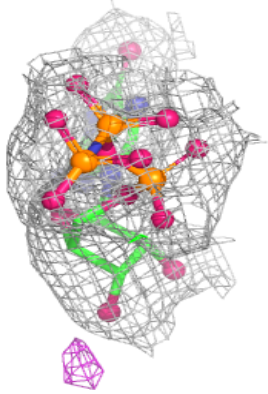


Electron density around GNP A 202:

$2mF_o$-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.