



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 05:53 AM UTC

PDB ID : 3KZ1 / pdb_00003kz1
Title : Crystal Structure of the Complex of PDZ-RhoGEF DH/PH domains with GTP-gamma-S Activated RhoA
Authors : Chen, Z.; Sternweis, P.C.; Sprang, S.R.
Deposited on : 2009-12-07
Resolution : 2.70 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	:	9.0.010 (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

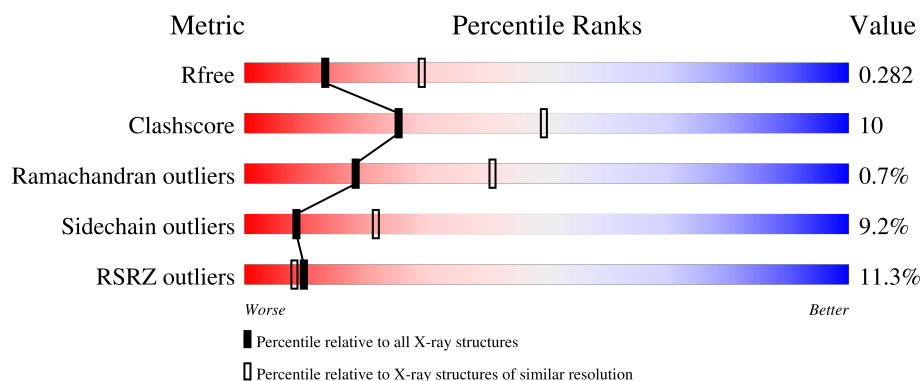
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	383	% 68% 23% • 6%
1	B	383	4% 71% 19% •• 7%
2	E	182	5% 77% 17% •••
2	F	182	49% 69% 25% ••

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8846 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 Rho guanine nucleotide exchange factor 11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	360	Total	C	N	O	S	0	0	0
			2946	1861	528	542	15			
1	B	357	Total	C	N	O	S	0	0	0
			2921	1847	523	536	15			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	709	GLY	-	expression tag	UNP O15085
A	1086	HIS	-	expression tag	UNP O15085
A	1087	HIS	-	expression tag	UNP O15085
A	1088	HIS	-	expression tag	UNP O15085
A	1089	HIS	-	expression tag	UNP O15085
A	1090	HIS	-	expression tag	UNP O15085
A	1091	HIS	-	expression tag	UNP O15085
B	709	GLY	-	expression tag	UNP O15085
B	1086	HIS	-	expression tag	UNP O15085
B	1087	HIS	-	expression tag	UNP O15085
B	1088	HIS	-	expression tag	UNP O15085
B	1089	HIS	-	expression tag	UNP O15085
B	1090	HIS	-	expression tag	UNP O15085
B	1091	HIS	-	expression tag	UNP O15085

- Molecule 2 is a protein called Transforming protein RhoA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	179	Total	C	N	O	S	0	0	0
			1419	897	240	272	10			
2	F	179	Total	C	N	O	S	0	0	0
			1419	897	240	272	10			

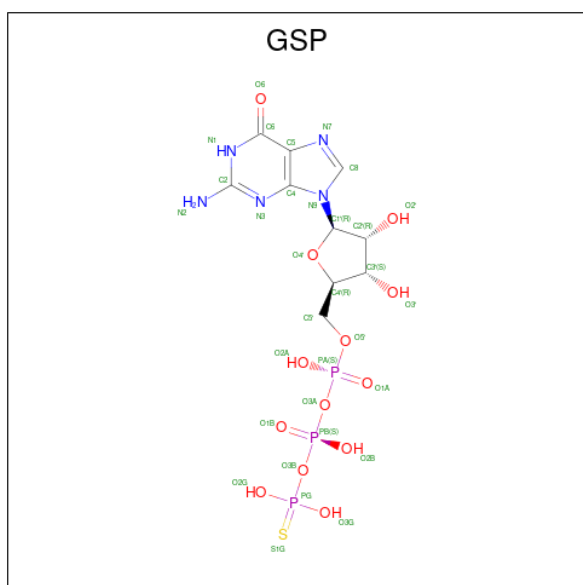
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	0	GLY	-	expression tag	UNP P61586
F	0	GLY	-	expression tag	UNP P61586

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	E	1	Total Mg 1 1	0	0
3	F	1	Total Mg 1 1	0	0

- Molecule 4 is 5'-GUANOSINE-DIPHOSPHATE-MONOTHIOPHOSPHATE (CCD ID: GSP) (formula: C₁₀H₁₆N₅O₁₃P₃S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	E	1	Total C N O P S 32 10 5 13 3 1	0	0
4	F	1	Total C N O P S 32 10 5 13 3 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	36	Total O 36 36	0	0
5	B	18	Total O 18 18	0	0

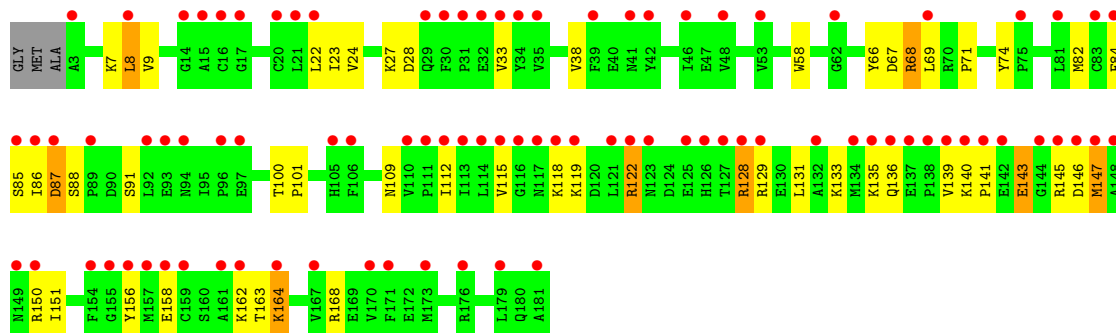
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	E	12	Total	O	0	0
			12	12		
5	F	9	Total	O	0	0
			9	9		



● Molecule 2: Transforming protein RhoA



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	98.17Å 111.84Å 138.39Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.45 – 2.70 33.45 – 2.70	Depositor EDS
% Data completeness (in resolution range)	90.8 (33.45-2.70) 90.7 (33.45-2.70)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.30 (at 2.68Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.234 , 0.283 0.242 , 0.282	Depositor DCC
R_{free} test set	2147 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	52.8	Xtriage
Anisotropy	0.941	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 62.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	8846	wwPDB-VP
Average B, all atoms (Å ²)	71.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.72% 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: MG, GSP

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	0.89	0/2991	1.03	7/4026 (0.2%)
1	B	0.79	1/2966 (0.0%)	0.98	5/3992 (0.1%)
2	E	0.77	0/1447	0.95	1/1956 (0.1%)
2	F	0.73	0/1447	0.92	2/1956 (0.1%)
All	All	0.81	1/8851 (0.0%)	0.98	15/11930 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	876	ILE	CA-CB	6.12	1.61	1.54

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	950	ASN	CA-C-N	6.91	126.54	119.56
1	B	950	ASN	C-N-CA	6.91	126.54	119.56
1	A	803	GLY	CA-C-N	5.95	125.57	119.56
1	A	803	GLY	C-N-CA	5.95	125.57	119.56
2	F	115	VAL	N-CA-C	5.66	116.01	107.80
1	B	959	LEU	N-CA-C	5.61	117.08	110.97
1	A	948	ALA	N-CA-C	5.57	116.78	108.31
1	A	948	ALA	CB-CA-C	-5.51	110.20	116.54
1	B	803	GLY	CA-C-N	5.36	125.18	119.28
1	B	803	GLY	C-N-CA	5.36	125.18	119.28
1	A	1001	GLU	N-CA-C	-5.18	105.84	113.61
1	A	1053	PRO	CA-C-N	5.15	125.13	120.03
1	A	1053	PRO	C-N-CA	5.15	125.13	120.03
2	F	38	VAL	N-CA-C	-5.13	106.80	111.67
2	E	33	VAL	CB-CA-C	-5.07	104.63	111.63

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	2946	0	3037	61	0
1	B	2921	0	3014	53	0
2	E	1419	0	1408	30	0
2	F	1419	0	1408	33	0
3	E	1	0	0	0	0
3	F	1	0	0	0	0
4	E	32	0	12	2	0
4	F	32	0	12	1	0
5	A	36	0	0	1	0
5	B	18	0	0	0	0
5	E	12	0	0	2	0
5	F	9	0	0	2	0
All	All	8846	0	8891	169	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 10.

All (169) 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:719:THR:O	1:B:720:VAL:HG22	1.42	1.16
1:A:731:ARG:NH2	1:A:897:GLU:HG2	1.67	1.08
2:F:8:LEU:C	2:F:8:LEU:HD12	1.78	1.07
1:A:972:LEU:HD22	1:A:986:VAL:HG11	1.45	0.95
1:B:719:THR:O	1:B:720:VAL:CG2	2.16	0.93
2:F:8:LEU:HD12	2:F:9:VAL:N	1.84	0.93
1:A:731:ARG:HH22	1:A:897:GLU:HG2	1.41	0.83
1:B:952:LEU:HD21	1:B:1052:GLY:HA3	1.62	0.81
1:A:863:HIS:HD2	1:A:865:GLN:H	1.30	0.79
2:F:8:LEU:C	2:F:8:LEU:CD1	2.54	0.76
1:B:722:LYS:HD3	2:F:33:VAL:HG22	1.70	0.73

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:719:THR:C	1:B:720:VAL:HG22	2.14	0.70
1:B:840:LEU:HD21	1:B:875:ILE:HG21	1.73	0.70
1:A:715:ASN:HB2	1:A:718:HIS:CD2	2.26	0.70
2:F:88:SER:O	2:F:91:SER:HB3	1.90	0.70
1:A:731:ARG:NH2	1:A:897:GLU:CG	2.50	0.69
2:E:80:ILE:HD13	2:E:103:VAL:HG13	1.74	0.69
1:A:734:ASP:HB3	1:A:895:HIS:CE1	2.28	0.69
1:B:759:ILE:HD11	1:B:865:GLN:HB3	1.75	0.68
1:B:1036:VAL:HA	2:E:41:ASN:ND2	2.08	0.68
2:F:24:VAL:O	2:F:28:ASP:HA	1.94	0.68
2:F:118:LYS:HG2	4:F:538:GSP:C6	2.29	0.68
1:A:721:GLY:HA2	2:E:33:VAL:HG22	1.76	0.67
1:B:950:ASN:ND2	1:B:952:LEU:HD12	2.09	0.67
1:A:880:GLN:O	1:A:883:THR:HG22	1.96	0.66
1:B:863:HIS:HD2	1:B:865:GLN:H	1.43	0.65
1:A:729:THR:HG23	1:A:732:GLU:H	1.62	0.65
1:B:755:VAL:HG13	1:B:759:ILE:HD12	1.78	0.65
1:A:977:SER:HB3	1:A:980:LYS:HB2	1.80	0.64
2:F:82:MET:HE2	2:F:112:ILE:HG21	1.78	0.64
1:A:778:LEU:HD13	1:A:779:PHE:CE2	2.35	0.61
1:A:722:LYS:H	1:A:722:LYS:HD3	1.63	0.61
1:A:816:ARG:O	1:A:816:ARG:HD3	1.99	0.61
1:B:879:MET:O	1:B:883:THR:HG22	2.00	0.61
1:B:751:ARG:HH12	1:B:867:ARG:NH1	1.98	0.61
1:B:822:ARG:NH2	1:B:915:GLU:HG2	2.15	0.61
1:A:972:LEU:HD22	1:A:986:VAL:CG1	2.25	0.61
1:A:1022:PHE:CE2	1:A:1055:GLN:HG2	2.34	0.61
2:F:100:THR:HB	2:F:101:PRO:HD3	1.82	0.60
1:A:1046:ILE:HG12	1:A:1056:ILE:HD13	1.81	0.60
1:B:822:ARG:NH2	1:B:915:GLU:CG	2.65	0.60
2:E:98:LYS:HE2	5:E:205:HOH:O	2.01	0.59
1:B:1050:LYS:O	1:B:1051:LEU:HB2	2.02	0.58
2:E:68:ARG:NH2	5:E:200:HOH:O	2.34	0.58
1:B:857:MET:O	1:B:861:GLU:HG3	2.03	0.58
1:B:996:LEU:HD22	1:B:1003:LEU:HB3	1.85	0.58
2:E:49:ASP:OD1	2:E:176:ARG:NH1	2.36	0.57
1:B:720:VAL:HG23	1:B:721:GLY:N	2.21	0.56
1:A:1050:LYS:O	1:A:1051:LEU:HB2	2.05	0.56
1:B:778:LEU:HD13	1:B:779:PHE:CE2	2.40	0.56
2:F:7:LYS:HE3	2:F:58:TRP:CE2	2.40	0.56
1:B:952:LEU:CD2	1:B:1052:GLY:HA3	2.34	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:999:GLN:HG3	1:A:1004:LEU:HD11	1.89	0.55
2:F:131:LEU:HB3	2:F:136:GLN:O	2.06	0.55
1:A:822:ARG:HG3	1:A:916:ILE:HD11	1.89	0.55
2:F:84:PHE:HB2	2:F:91:SER:OG	2.07	0.55
2:F:68:ARG:NH1	5:F:204:HOH:O	2.36	0.54
2:F:71:PRO:HA	2:F:74:TYR:CD2	2.43	0.54
1:B:810:SER:HB3	1:B:905:LYS:HE2	1.90	0.53
1:A:731:ARG:CZ	1:A:897:GLU:HG2	2.34	0.53
1:A:1045:ILE:HD12	1:A:1059:LEU:HD12	1.89	0.53
1:A:716:TRP:O	1:A:720:VAL:HG12	2.09	0.53
2:F:8:LEU:HD12	2:F:9:VAL:CA	2.39	0.53
2:F:143:GLU:H	2:F:143:GLU:CD	2.14	0.52
1:B:1037:ALA:H	2:E:41:ASN:ND2	2.06	0.52
2:F:147:MET:O	2:F:151:ILE:HG12	2.08	0.52
1:B:715:ASN:HB2	1:B:718:HIS:HD2	1.74	0.51
2:F:86:ILE:HD13	2:F:122:ARG:HH11	1.74	0.51
1:A:715:ASN:HB2	1:A:718:HIS:HD2	1.72	0.51
1:B:759:ILE:CD1	1:B:865:GLN:HB3	2.40	0.51
1:A:1046:ILE:HG12	1:A:1056:ILE:CD1	2.39	0.51
1:B:1050:LYS:O	1:B:1051:LEU:CB	2.59	0.51
1:B:863:HIS:CD2	1:B:865:GLN:H	2.26	0.51
1:A:863:HIS:CD2	1:A:865:GLN:H	2.20	0.50
1:A:742:LEU:HD13	1:A:888:LEU:HD23	1.91	0.50
2:E:71:PRO:HA	2:E:74:TYR:CD2	2.46	0.50
2:E:71:PRO:HA	2:E:74:TYR:HD2	1.77	0.50
1:A:1020:GLN:N	5:A:235:HOH:O	2.44	0.49
1:A:781:ASN:ND2	1:A:828:VAL:HG13	2.28	0.49
1:B:816:ARG:O	1:B:816:ARG:HD3	2.13	0.49
1:A:719:THR:O	1:A:720:VAL:HG12	2.12	0.48
1:A:729:THR:O	1:A:733:ILE:HG13	2.13	0.48
1:B:975:ARG:NH2	1:B:1039:ASP:OD2	2.46	0.48
2:F:128:ARG:HA	2:F:131:LEU:HD12	1.95	0.48
1:B:1036:VAL:HA	2:E:41:ASN:HD21	1.77	0.48
2:F:23:ILE:HG23	2:F:27:LYS:HD2	1.95	0.48
2:F:122:ARG:HH21	2:F:141:PRO:HD3	1.79	0.48
2:E:10:ILE:O	2:E:60:THR:OG1	2.31	0.47
1:A:863:HIS:CD2	1:A:865:GLN:HB2	2.49	0.47
1:A:732:GLU:OE2	1:A:735:ARG:NH1	2.47	0.47
1:A:792:TRP:O	1:A:796:MET:HG3	2.15	0.47
1:B:910:ARG:HD2	1:B:914:ARG:NH2	2.29	0.47
1:B:1026:LEU:HD22	1:B:1047:CYS:HB2	1.95	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:721:GLY:HA2	2:E:33:VAL:CG2	2.45	0.46
1:A:761:TYR:CZ	1:A:765:LYS:NZ	2.84	0.46
2:E:82:MET:HE2	2:E:103:VAL:HG21	1.97	0.46
1:B:987:LEU:HB2	1:B:994:VAL:HG13	1.96	0.46
1:A:959:LEU:HD12	1:A:1005:LEU:HD11	1.97	0.46
1:B:952:LEU:H	1:B:952:LEU:HG	1.65	0.46
1:B:764:MET:HG2	1:B:769:LEU:HD12	1.98	0.46
2:E:92:LEU:HD22	2:E:147:MET:HE3	1.98	0.46
1:A:1056:ILE:HG23	1:A:1056:ILE:HD12	1.67	0.45
1:A:770:MET:HB2	1:A:771:PRO:HD2	1.98	0.45
1:A:941:ASP:HB2	1:A:1002:LYS:HE2	1.99	0.45
1:A:1036:VAL:HG23	1:A:1043:PHE:HA	1.98	0.45
1:A:1050:LYS:HE3	1:A:1050:LYS:HB2	1.81	0.45
2:E:122:ARG:HH22	2:E:158:GLU:CD	2.24	0.45
2:F:69:LEU:HD21	5:F:204:HOH:O	2.17	0.45
2:F:156:TYR:OH	2:F:158:GLU:OE2	2.24	0.45
1:B:781:ASN:N	1:B:781:ASN:OD1	2.49	0.45
1:B:959:LEU:HD12	1:B:1005:LEU:HD11	1.99	0.45
1:A:734:ASP:HB3	1:A:895:HIS:ND1	2.31	0.44
1:A:1007:CYS:O	1:A:1008:HIS:HB2	2.16	0.44
1:A:803:GLY:HA2	1:A:804:PRO:HD3	1.79	0.44
1:A:894:LYS:HG3	1:A:895:HIS:HD2	1.82	0.44
2:F:85:SER:OG	2:F:87:ASP:OD1	2.26	0.44
2:F:82:MET:HE2	2:F:112:ILE:CG2	2.45	0.44
1:A:782:LEU:HB3	1:A:783:PRO:HD3	2.00	0.44
1:B:1070:TRP:O	1:B:1074:LEU:HB2	2.18	0.44
2:F:8:LEU:CD1	2:F:9:VAL:N	2.70	0.44
1:B:879:MET:HE1	1:B:921:ASN:OD1	2.18	0.44
2:E:8:LEU:HB2	2:E:79:VAL:HG13	2.00	0.44
1:A:880:GLN:C	1:A:883:THR:HG22	2.43	0.43
1:B:816:ARG:HD3	1:B:816:ARG:C	2.39	0.43
2:E:118:LYS:HG2	4:E:538:GSP:C5	2.53	0.43
1:A:772:ARG:NE	1:A:772:ARG:HA	2.33	0.43
1:B:984:LEU:HD13	1:B:995:LEU:HB3	1.99	0.43
1:B:738:VAL:HG11	1:B:891:SER:HB3	2.00	0.43
2:F:86:ILE:HG23	2:F:139:VAL:HB	1.99	0.43
2:F:143:GLU:HA	2:F:146:ASP:HB2	2.00	0.43
1:A:987:LEU:HB2	1:A:994:VAL:HG13	2.00	0.43
1:B:941:ASP:HB3	1:B:1004:LEU:HD23	2.01	0.43
2:F:66:TYR:O	2:F:67:ASP:C	2.61	0.43
2:E:65:ASP:OD1	2:E:65:ASP:N	2.49	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:95:ILE:HB	2:E:96:PRO:HD3	2.00	0.43
1:B:1054:PRO:O	2:E:72:LEU:HD21	2.19	0.43
1:A:721:GLY:CA	2:E:33:VAL:HG22	2.47	0.43
1:A:788:ILE:HG23	1:A:816:ARG:CZ	2.49	0.43
2:E:154:PHE:HE1	2:E:180:GLN:HE22	1.66	0.43
2:E:19:THR:HG23	2:E:59:ASP:OD2	2.19	0.43
1:A:761:TYR:OH	1:A:765:LYS:NZ	2.47	0.42
1:B:863:HIS:HA	1:B:864:PRO:HD3	1.84	0.42
2:F:146:ASP:O	2:F:147:MET:C	2.59	0.42
1:B:822:ARG:NH2	1:B:915:GLU:HG3	2.33	0.42
1:A:792:TRP:NE1	1:A:812:LEU:HD22	2.34	0.42
1:B:876:ILE:O	1:B:876:ILE:HG13	2.20	0.42
1:A:720:VAL:HG13	1:A:721:GLY:H	1.85	0.42
2:F:122:ARG:NH2	2:F:141:PRO:HD3	2.35	0.42
1:A:884:LYS:HG3	1:A:888:LEU:HD13	2.01	0.41
1:A:985:HIS:O	1:A:996:LEU:HB2	2.20	0.41
1:A:1039:ASP:OD1	1:A:1041:ARG:HB2	2.21	0.41
1:A:927:THR:HG23	1:A:930:ARG:HH12	1.85	0.41
1:B:985:HIS:O	1:B:996:LEU:HB2	2.20	0.41
1:B:964:ARG:HG2	1:B:991:ASP:OD1	2.21	0.41
2:E:122:ARG:NH2	2:E:158:GLU:OE1	2.54	0.41
2:F:135:LYS:O	2:F:135:LYS:HG2	2.20	0.41
1:B:755:VAL:HG22	1:B:865:GLN:HG2	2.03	0.41
1:A:997:GLN:NE2	1:A:1008:HIS:HE1	2.19	0.41
1:A:719:THR:O	1:A:720:VAL:CG1	2.69	0.41
1:B:719:THR:C	1:B:720:VAL:CG2	2.83	0.41
2:E:40:GLU:HB2	2:E:59:ASP:HB3	2.03	0.41
2:E:74:TYR:N	2:E:75:PRO:CD	2.84	0.41
2:E:100:THR:O	2:E:101:PRO:C	2.63	0.41
2:E:154:PHE:HE1	2:E:180:GLN:NE2	2.19	0.41
1:B:715:ASN:HB2	1:B:718:HIS:CD2	2.54	0.41
1:B:822:ARG:HG3	1:B:916:ILE:HD11	2.03	0.40
2:F:163:THR:O	2:F:164:LYS:CB	2.69	0.40
2:E:118:LYS:HG2	4:E:538:GSP:C6	2.56	0.40
2:E:164:LYS:HB2	2:E:164:LYS:HE3	1.80	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	356/383 (93%)	341 (96%)	14 (4%)	1 (0%)	36	60
1	B	353/383 (92%)	330 (94%)	19 (5%)	4 (1%)	11	29
2	E	177/182 (97%)	168 (95%)	8 (4%)	1 (1%)	21	44
2	F	177/182 (97%)	169 (96%)	7 (4%)	1 (1%)	21	44
All	All	1063/1130 (94%)	1008 (95%)	48 (4%)	7 (1%)	18	41

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	949	SER
2	F	109	ASN
1	B	960	ASP
1	B	726	ALA
1	B	1051	LEU
2	E	75	PRO
1	A	720	VAL

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	328/347 (94%)	300 (92%)	28 (8%)	10	25
1	B	325/347 (94%)	293 (90%)	32 (10%)	7	19
2	E	156/157 (99%)	144 (92%)	12 (8%)	12	30

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	F	156/157 (99%)	139 (89%)	17 (11%)	6	16
All	All	965/1008 (96%)	876 (91%)	89 (9%)	8	22

All (89) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	719	THR
1	A	722	LYS
1	A	725	VAL
1	A	750	LEU
1	A	778	LEU
1	A	800	ARG
1	A	802	GLU
1	A	812	LEU
1	A	827	GLN
1	A	842	LEU
1	A	843	ILE
1	A	855	LEU
1	A	876	ILE
1	A	917	LEU
1	A	945	LEU
1	A	947	ARG
1	A	950	ASN
1	A	952	LEU
1	A	959	LEU
1	A	975	ARG
1	A	981	THR
1	A	982	LEU
1	A	986	VAL
1	A	988	LEU
1	A	994	VAL
1	A	1055	GLN
1	A	1069	THR
1	A	1074	LEU
1	B	722	LYS
1	B	750	LEU
1	B	769	LEU
1	B	778	LEU
1	B	799	LEU
1	B	812	LEU
1	B	816	ARG
1	B	841	GLU

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Mol	Chain	Res	Type
1	B	842	LEU
1	B	846	LYS
1	B	855	LEU
1	B	859	GLU
1	B	872	ARG
1	B	876	ILE
1	B	879	MET
1	B	882	LEU
1	B	888	LEU
1	B	900	THR
1	B	950	ASN
1	B	952	LEU
1	B	959	LEU
1	B	972	LEU
1	B	975	ARG
1	B	982	LEU
1	B	986	VAL
1	B	988	LEU
1	B	994	VAL
1	B	999	GLN
1	B	1034	ARG
1	B	1049	SER
1	B	1051	LEU
1	B	1074	LEU
2	E	8	LEU
2	E	33	VAL
2	E	65	ASP
2	E	68	ARG
2	E	75	PRO
2	E	87	ASP
2	E	92	LEU
2	E	93	GLU
2	E	135	LYS
2	E	168	ARG
2	E	179	LEU
2	E	180	GLN
2	F	8	LEU
2	F	22	LEU
2	F	68	ARG
2	F	87	ASP
2	F	119	LYS
2	F	122	ARG

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Mol	Chain	Res	Type
2	F	128	ARG
2	F	129	ARG
2	F	133	LYS
2	F	140	LYS
2	F	143	GLU
2	F	145	ARG
2	F	147	MET
2	F	150	ARG
2	F	162	LYS
2	F	164	LYS
2	F	168	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (29) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	718	HIS
1	A	749	HIS
1	A	831	GLN
1	A	847	GLN
1	A	854	GLN
1	A	863	HIS
1	A	880	GLN
1	A	903	HIS
1	A	950	ASN
1	A	1008	HIS
1	A	1020	GLN
1	A	1055	GLN
1	A	1068	ASN
1	B	718	HIS
1	B	749	HIS
1	B	854	GLN
1	B	863	HIS
1	B	865	GLN
1	B	880	GLN
1	B	903	HIS
1	B	912	GLN
1	B	926	GLN
1	B	950	ASN
2	E	149	ASN
2	E	180	GLN
2	F	63	GLN
2	F	94	ASN

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Mol	Chain	Res	Type
2	F	123	ASN
2	F	149	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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	$\# Z > 2$
4	GSP	F	538	3	33,34,34	1.72	3 (9%)	47,54,54	1.67	10 (21%)
4	GSP	E	538	3	33,34,34	1.76	6 (18%)	47,54,54	1.72	11 (23%)

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	GSP	F	538	3	-	2/21/38/38	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GSP	E	538	3	-	2/21/38/38	0/3/3/3

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	F	538	GSP	PG-S1G	-8.07	1.73	1.90
4	E	538	GSP	PG-S1G	-6.74	1.76	1.90
4	E	538	GSP	PB-O3A	3.90	1.63	1.59
4	E	538	GSP	PA-O3A	3.02	1.62	1.59
4	F	538	GSP	PB-O3B	2.65	1.62	1.59
4	E	538	GSP	PB-O3B	2.37	1.62	1.59
4	E	538	GSP	C2-N3	2.26	1.38	1.33
4	E	538	GSP	C5-N7	-2.17	1.34	1.39
4	F	538	GSP	C2-N3	2.06	1.38	1.33

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	538	GSP	C5-C4-N3	-4.96	120.49	128.39
4	F	538	GSP	C2-N3-C4	4.61	120.23	112.30
4	E	538	GSP	C2-N3-C4	4.50	120.05	112.30
4	F	538	GSP	C5-C4-N3	-4.25	121.62	128.39
4	F	538	GSP	PB-O3B-PG	-3.47	120.46	133.17
4	E	538	GSP	C2-N1-C6	-3.01	119.64	125.11
4	F	538	GSP	N9-C4-N3	2.84	131.64	125.95
4	E	538	GSP	N9-C4-N3	2.79	131.54	125.95
4	E	538	GSP	C5-C6-N1	2.69	120.11	113.25
4	F	538	GSP	N1-C2-N3	-2.67	118.44	123.32
4	F	538	GSP	O2B-PB-O3A	2.55	114.16	107.27
4	F	538	GSP	N9-C8-N7	-2.44	108.87	113.40
4	E	538	GSP	C8-N7-C5	2.40	108.54	104.26
4	E	538	GSP	O5'-C5'-C4'	2.26	116.69	108.99
4	E	538	GSP	N9-C8-N7	-2.24	109.25	113.40
4	E	538	GSP	O6-C6-C5	-2.23	120.65	126.53
4	F	538	GSP	C8-N7-C5	2.22	108.21	104.26
4	F	538	GSP	C5-C6-N1	2.21	118.87	113.25
4	E	538	GSP	PB-O3B-PG	-2.19	125.16	133.17
4	E	538	GSP	O2A-PA-O5'	2.11	117.14	107.57
4	F	538	GSP	O6-C6-C5	-2.04	121.16	126.53

There are no chirality outliers.

All (4) torsion outliers are listed below:

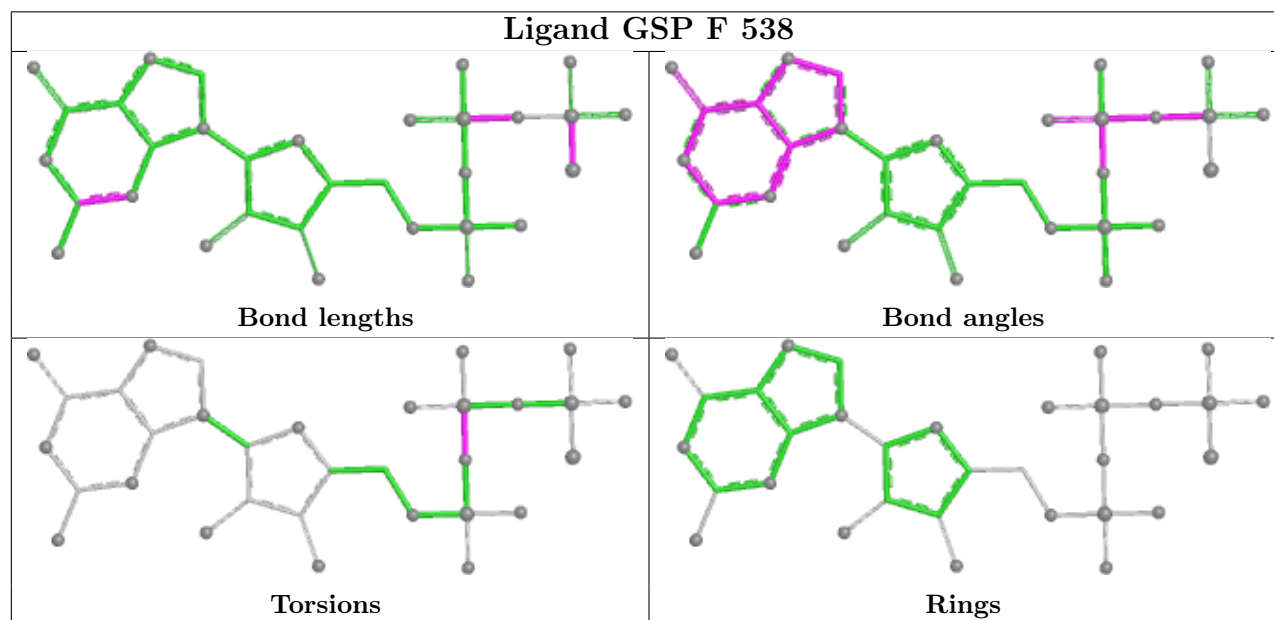
Mol	Chain	Res	Type	Atoms
4	E	538	GSP	PA-O3A-PB-O2B
4	F	538	GSP	PA-O3A-PB-O2B
4	E	538	GSP	PA-O3A-PB-O1B
4	F	538	GSP	PA-O3A-PB-O1B

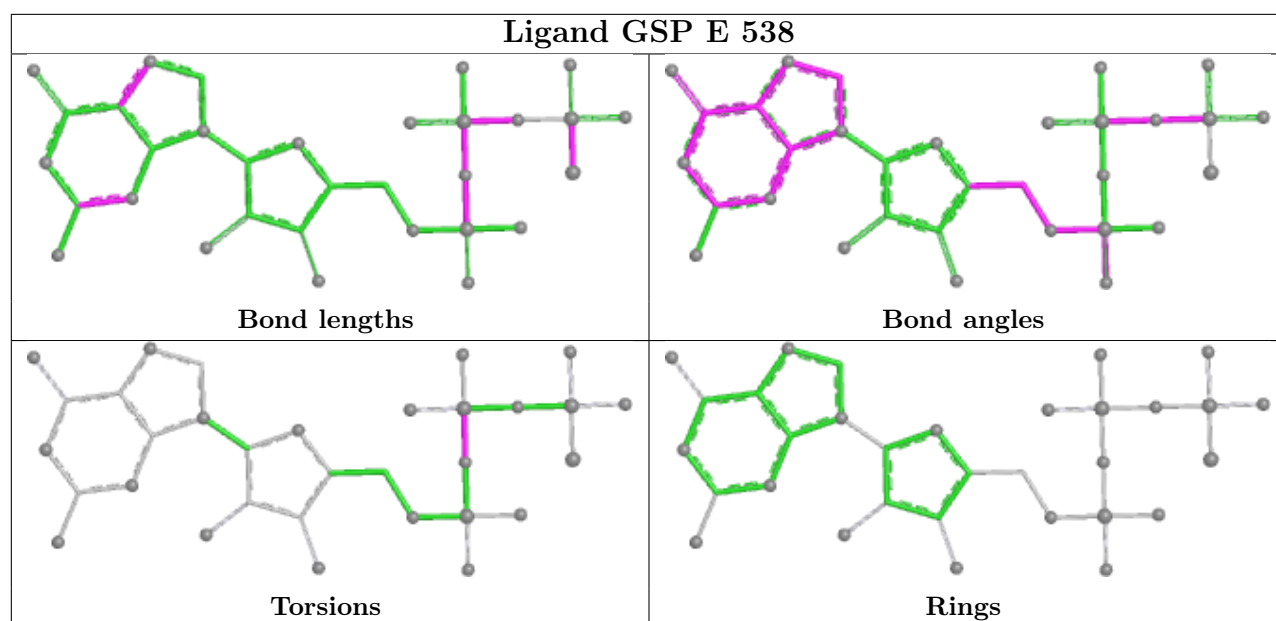
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	F	538	GSP	1	0
4	E	538	GSP	2	0

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





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	360/383 (93%)	0.21	5 (1%) 73 72	40, 58, 84, 95	0
1	B	357/383 (93%)	0.44	17 (4%) 35 32	46, 65, 95, 110	0
2	E	179/182 (98%)	0.72	10 (5%) 30 26	41, 70, 142, 171	0
2	F	179/182 (98%)	2.10	90 (50%) 0 0	45, 86, 171, 207	0
All	All	1075/1130 (95%)	0.69	122 (11%) 10 8	40, 66, 113, 207	0

All (122) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	F	156	TYR	5.9
2	F	86	ILE	5.8
2	F	89	PRO	5.5
2	F	158	GLU	5.2
2	F	155	GLY	4.8
2	F	30	PHE	4.8
2	F	114	LEU	4.8
2	E	3	ALA	4.7
2	F	15	ALA	4.6
2	F	121	LEU	4.5
2	F	139	VAL	4.4
1	A	952	LEU	4.1
2	F	138	PRO	4.0
2	F	87	ASP	4.0
2	F	123	ASN	3.9
2	F	167	VAL	3.9
2	F	116	GLY	3.8
2	F	157	MET	3.8
2	F	3	ALA	3.6
2	F	117	ASN	3.6
2	F	92	LEU	3.6

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Mol	Chain	Res	Type	RSRZ
2	F	62	GLY	3.5
2	F	20	CYS	3.5
2	F	84	PHE	3.4
1	B	720	VAL	3.4
2	F	141	PRO	3.3
2	F	181	ALA	3.3
2	F	159	CYS	3.3
2	F	14	GLY	3.3
2	F	93	GLU	3.2
2	F	161	ALA	3.2
1	B	728	LEU	3.2
2	F	173	MET	3.2
2	F	122	ARG	3.2
2	F	48	VAL	3.1
2	F	162	LYS	3.1
2	F	128	ARG	3.0
1	A	899	GLY	3.0
2	F	119	LYS	3.0
2	F	125	GLU	2.9
2	E	162	LYS	2.9
1	B	727	GLY	2.9
2	F	127	THR	2.9
2	F	148	ALA	2.9
2	F	136	GLN	2.9
1	B	715	ASN	2.9
2	E	83	CYS	2.9
2	F	179	LEU	2.8
2	F	118	LYS	2.8
2	F	105	HIS	2.8
2	F	34	TYR	2.8
2	F	97	GLU	2.8
2	F	115	VAL	2.8
2	F	145	ARG	2.8
1	B	805	ILE	2.7
2	F	17	GLY	2.7
2	E	181	ALA	2.7
1	B	716	TRP	2.7
1	B	724	VAL	2.7
2	F	33	VAL	2.7
2	F	69	LEU	2.6
2	F	96	PRO	2.6
2	F	113	ILE	2.6

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Mol	Chain	Res	Type	RSRZ
2	F	112	ILE	2.6
2	F	35	VAL	2.6
2	F	94	ASN	2.6
2	F	154	PHE	2.6
2	E	68	ARG	2.5
1	B	806	ILE	2.5
2	F	32	GLU	2.5
2	F	41	ASN	2.5
2	F	110	VAL	2.5
1	A	731	ARG	2.4
2	F	129	ARG	2.4
2	F	149	ASN	2.4
2	F	22	LEU	2.4
2	F	39	PHE	2.4
2	F	83	CYS	2.4
2	F	132	ALA	2.4
1	B	952	LEU	2.4
2	F	147	MET	2.4
2	F	75	PRO	2.4
2	F	46	ILE	2.3
2	F	142	GLU	2.3
2	F	134	MET	2.3
2	F	144	GLY	2.3
2	F	126	HIS	2.3
2	F	140	LYS	2.3
2	F	137	GLU	2.3
2	F	146	ASP	2.3
2	E	121	LEU	2.3
2	E	159	CYS	2.3
2	F	176	ARG	2.3
1	B	721	GLY	2.3
2	F	81	LEU	2.3
2	F	85	SER	2.2
2	F	29	GLN	2.2
2	F	21	LEU	2.2
1	B	733	ILE	2.2
2	F	106	PHE	2.2
1	B	1051	LEU	2.2
2	F	164	LYS	2.2
1	B	718	HIS	2.2
1	B	725	VAL	2.2
1	B	949	SER	2.2

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Mol	Chain	Res	Type	RSRZ
2	E	33	VAL	2.1
2	E	132	ALA	2.1
2	F	16	CYS	2.1
1	A	842	LEU	2.1
1	B	729	THR	2.1
2	F	31	PRO	2.1
2	F	111	PRO	2.1
2	F	53	VAL	2.1
2	F	171	PHE	2.1
2	F	150	ARG	2.1
2	F	135	LYS	2.1
2	F	42	TYR	2.1
1	A	772	ARG	2.0
2	E	151	ILE	2.0
2	F	170	VAL	2.0
2	F	8	LEU	2.0
1	B	876	ILE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

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.

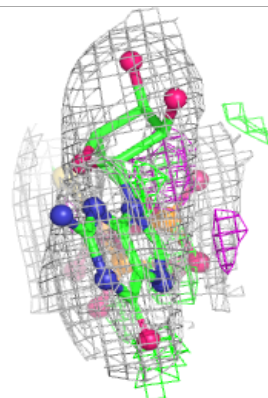
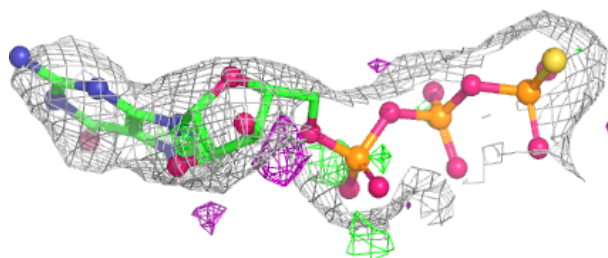
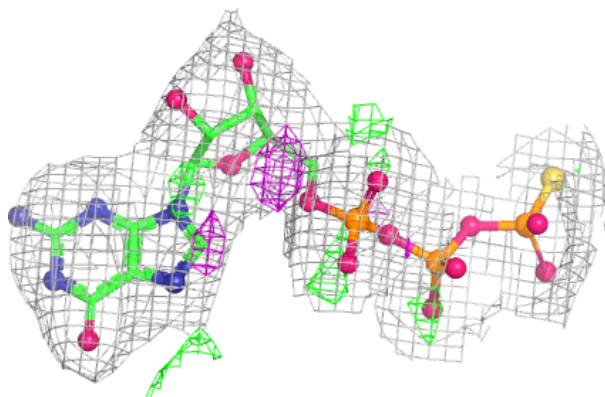
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	GSP	F	538	32/32	0.89	0.14	60,83,98,105	0
3	MG	E	550	1/1	0.95	0.13	59,59,59,59	0
4	GSP	E	538	32/32	0.96	0.08	55,73,88,90	0
3	MG	F	550	1/1	0.98	0.11	57,57,57,57	0

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.

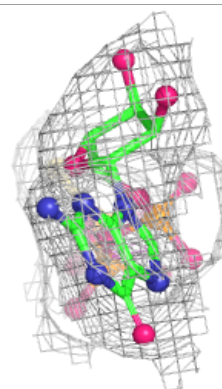
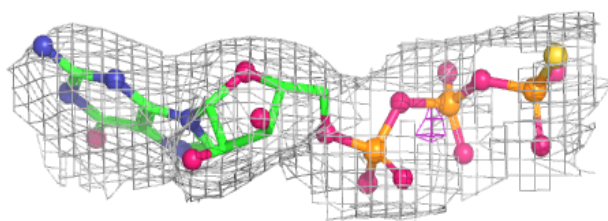
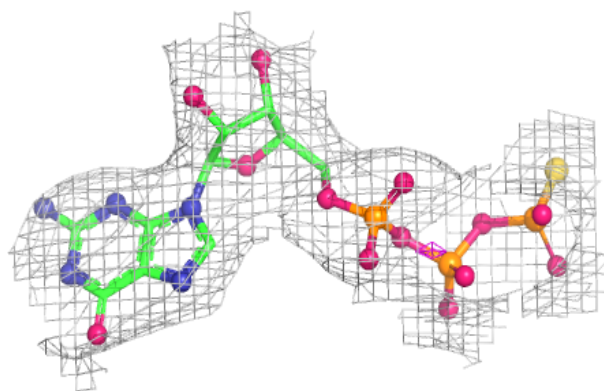
Electron density around GSP F 538:

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



Electron density around GSP E 538:

$2mF_o-DF_c$ (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.