Full wwPDB X-ray Structure Validation Report (i)

Mar 5, 2026 – 08:27 AM UTC

PDB ID	:	2CHX / pdb_00002chx
Title	:	A pharmacological map of the PI3-K family defines a role for p110alpha in signaling: The structure of complex of phosphoinositide 3-kinase gamma with inhibitor PIK-90
Authors	:	Knight, Z.A.; Gonzalez, B.; Feldman, M.E.; Zunder, E.R.; Goldenberg, D.D.; Williams, O.; Loewith, R.; Stokoe, D.; Balla, A.; Toth, B.; Balla, T.; Weiss, W.A.; Williams, R.L.; Shokat, K.M.
Deposited on	:	2006-03-16
Resolution	:	2.50 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:

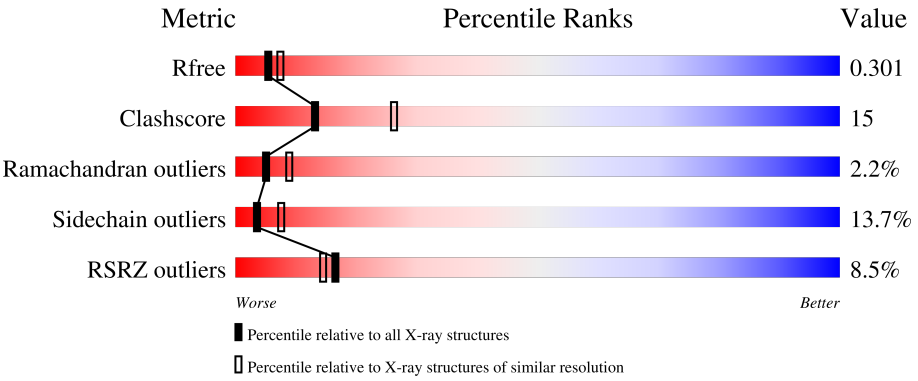
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal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

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 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	966	7% 56% 25% 6% • 13%

Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

2 Entry composition

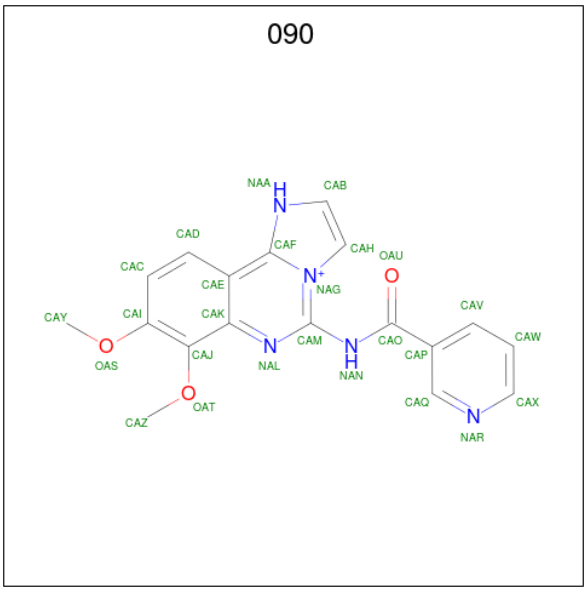
There are 2 unique types of molecules in this entry. The entry contains 6863 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PHOSPHATIDYLINOSITOL-4,5-BISPHOSPHATE 3-KINASE CATALYTIC SUBUNIT GAMMA ISOFORM.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	843	6837	4390	1170	1242	35	0	0	1

- Molecule 2 is N-(2,3-DIHYDRO-7,8-DIMETHOXYIMIDAZO[1,2-C] QUINAZOLIN-5-YL) NICOTINAMIDE (CCD ID: 090) (formula: $C_{18}H_{16}N_5O_3$).



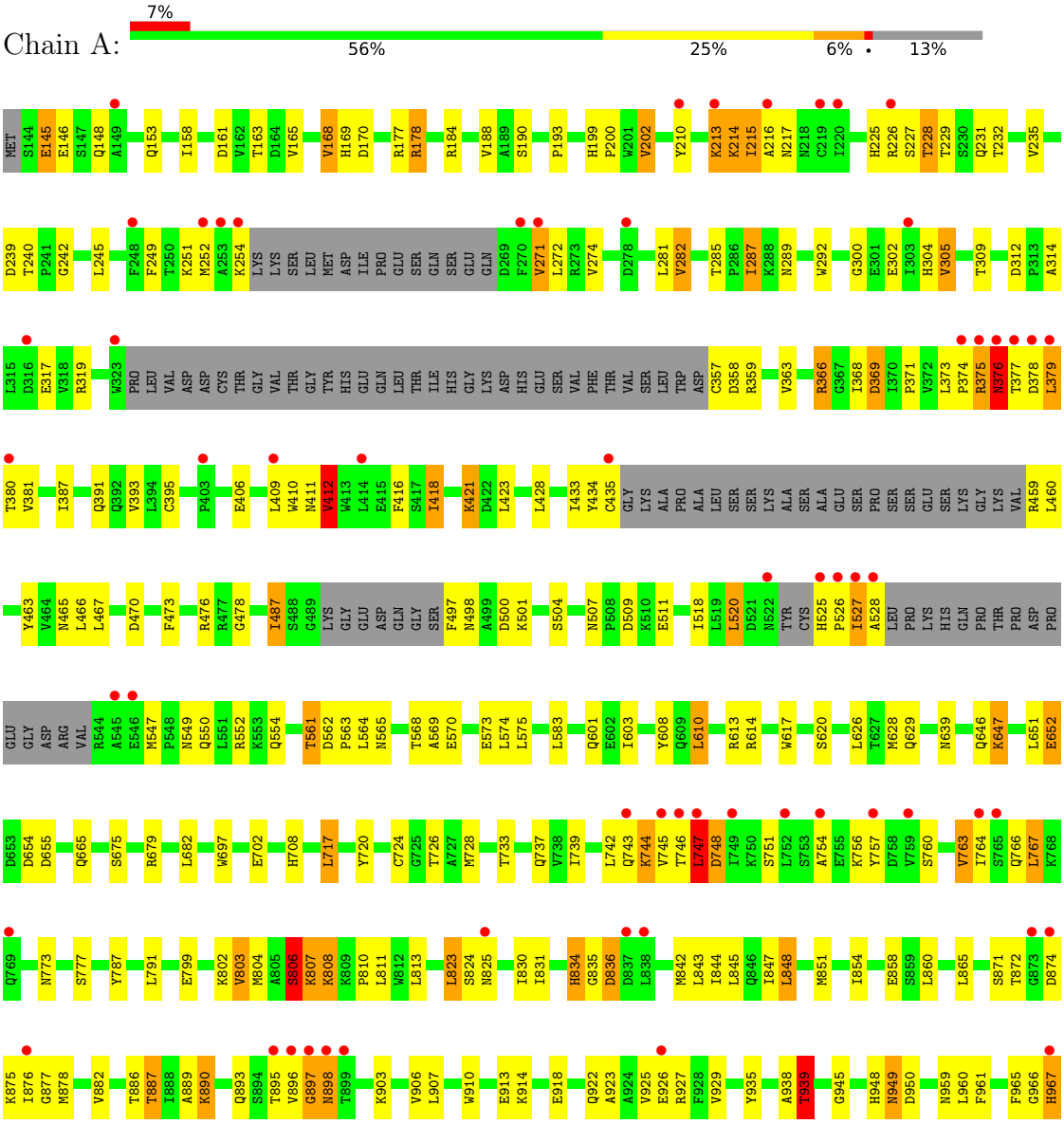
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	26	18	5	3	0	0

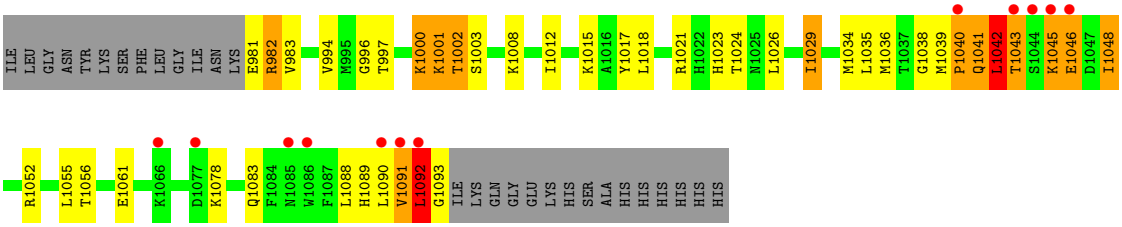
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: PHOSPHATIDYLINOSITOL-4,5-BISPHOSPHATE 3-KINASE CATALYTIC SUBUNIT GAMMA ISOFORM

Chain A:




ILE LEU GLY ASN TYR LYS SER PHE LEU GLY ILE ASN LYS E981 R982 V983 V994 M995 G996 T997 K1000 K1001 T1002 S1003 K1008 I1012 K1015 A1016 Y1017 L1018 R1021 H1022 H1023 T1024 N1025 L1026 I1029 M1034 L1035 M1036 T1037 G1038 M1039 P1040 Q1041 L1042 T1043 S1044 K1045 E1046 D1047 I1048
R1052 L1055 T1056 E1061 K1066 D1077 K1078 Q1083 F1084 N1085 W1086 F1087 L1088 H1089 L1090 V1091 L1092 G1093 ILE LYS GLN GLY GLU LYS HIS SER ALA HIS HIS HIS HIS HIS HIS

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	144.49Å 68.30Å 106.57Å 90.00° 95.34° 90.00°	Depositor
Resolution (Å)	57.17 – 2.50 57.17 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.8 (57.17-2.50) 99.8 (57.17-2.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.30 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.230 , 0.280 0.260 , 0.301	Depositor DCC
R_{free} test set	1483 reflections (4.11%)	wwPDB-VP
Wilson B-factor (Å^2)	51.3	Xtriage
Anisotropy	0.216	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 36.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	6863	wwPDB-VP
Average B, all atoms (Å^2)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.25% 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: 090

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	0.98	7/6985 (0.1%)	1.10	22/9449 (0.2%)

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

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	411	ASN	CG-OD1	13.37	1.49	1.23
1	A	366	ARG	C-N	12.61	1.47	1.33
1	A	411	ASN	CG-ND2	10.29	1.54	1.33
1	A	1000	LYS	CE-NZ	9.39	1.77	1.49
1	A	1001	LYS	CE-NZ	8.08	1.73	1.49
1	A	1092	LEU	C-N	-6.31	1.24	1.33
1	A	518	ILE	CA-CB	5.45	1.63	1.55

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	411	ASN	OD1-CG-ND2	9.26	131.86	122.60
1	A	525	HIS	CA-C-N	7.97	127.92	120.03
1	A	525	HIS	C-N-CA	7.97	127.92	120.03
1	A	877	GLY	N-CA-C	7.28	123.45	111.59
1	A	808	LYS	CA-C-N	-7.24	114.40	123.15
1	A	808	LYS	C-N-CA	-7.24	114.40	123.15

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	412	VAL	N-CA-C	6.98	117.94	108.17
1	A	549	ASN	N-CA-C	6.39	118.05	111.14
1	A	412	VAL	CB-CA-C	-6.33	101.40	110.83
1	A	808	LYS	N-CA-C	-6.13	102.87	110.41
1	A	1001	LYS	N-CA-C	6.13	118.24	110.33
1	A	423	LEU	CA-C-N	5.95	126.14	120.31
1	A	423	LEU	C-N-CA	5.95	126.14	120.31
1	A	939	THR	N-CA-C	5.64	117.43	111.28
1	A	1042	LEU	N-CA-C	5.52	118.18	108.75
1	A	803	VAL	N-CA-C	-5.41	100.60	108.17
1	A	177	ARG	N-CA-C	-5.38	105.50	111.36
1	A	1036	MET	N-CA-C	5.24	118.84	112.23
1	A	1000	LYS	CD-CE-NZ	-5.17	95.36	111.90
1	A	504	SER	N-CA-C	-5.16	106.98	113.28
1	A	507	ASN	CA-C-N	-5.09	114.49	119.64
1	A	507	ASN	C-N-CA	-5.09	114.49	119.64

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	434	TYR	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	6837	0	6879	204	0
2	A	26	0	16	2	0
All	All	6863	0	6895	205	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 15.

All (205) 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:A:1001:LYS:CE	1:A:1001:LYS:NZ	1.73	1.46
1:A:1000:LYS:CE	1:A:1000:LYS:NZ	1.77	1.43
1:A:629:GLN:HG2	1:A:1029:ILE:HG13	1.44	0.99
1:A:724:CYS:HB2	1:A:728:MET:HE3	1.48	0.95
1:A:1039:MET:HB3	1:A:1040:PRO:HD2	1.49	0.94
1:A:949:ASN:H	1:A:1083:GLN:HE22	1.08	0.94
1:A:652:GLU:OE1	1:A:654:ASP:HB3	1.67	0.94
1:A:240:THR:HG22	1:A:242:GLY:H	1.35	0.92
1:A:724:CYS:HB2	1:A:728:MET:CE	2.09	0.82
1:A:380:THR:O	1:A:435:CYS:SG	2.42	0.77
1:A:851:MET:HE1	1:A:938:ALA:HB1	1.67	0.77
1:A:874:ASP:O	1:A:875:LYS:HB2	1.83	0.76
1:A:550:GLN:O	1:A:554:GLN:HG3	1.87	0.75
1:A:561:THR:CG2	1:A:565:ASN:HB3	2.18	0.74
1:A:379:LEU:HD12	1:A:435:CYS:HB2	1.71	0.73
1:A:312:ASP:OD2	1:A:314:ALA:HB3	1.90	0.71
1:A:1000:LYS:NZ	1:A:1000:LYS:CD	2.53	0.70
1:A:949:ASN:H	1:A:1083:GLN:NE2	1.87	0.70
1:A:497:PHE:HD1	1:A:1041:GLN:HE21	1.37	0.70
1:A:165:VAL:HG12	1:A:165:VAL:O	1.91	0.70
1:A:225:HIS:CE1	1:A:304:HIS:HD2	2.09	0.70
1:A:1089:HIS:O	1:A:1092:LEU:N	2.24	0.70
1:A:848:LEU:HD12	1:A:851:MET:CE	2.21	0.70
1:A:1089:HIS:C	1:A:1091:VAL:H	2.00	0.69
1:A:848:LEU:HA	1:A:851:MET:HE2	1.75	0.68
1:A:184:ARG:O	1:A:188:VAL:HG23	1.94	0.68
1:A:830:ILE:HG21	1:A:878:MET:HE2	1.75	0.68
1:A:834:HIS:CD2	1:A:834:HIS:C	2.72	0.67
1:A:823:LEU:HD12	1:A:823:LEU:H	1.58	0.67
1:A:225:HIS:HE1	1:A:304:HIS:HD2	1.42	0.67
1:A:1021:ARG:HE	1:A:1056:THR:CG2	2.07	0.66
1:A:226:ARG:HH21	1:A:252:MET:HE2	1.61	0.66
1:A:935:TYR:O	1:A:939:THR:HB	1.96	0.65
1:A:652:GLU:OE1	1:A:654:ASP:CB	2.44	0.64
1:A:882:VAL:H	2:A:2093:090:HAA	1.44	0.64
1:A:981:GLU:HA	1:A:982:ARG:CZ	2.28	0.64
1:A:860:LEU:HD21	1:A:1015:LYS:HE2	1.79	0.64
1:A:1089:HIS:O	1:A:1091:VAL:N	2.32	0.63
1:A:387:ILE:HG13	1:A:418:ILE:CD1	2.28	0.63
1:A:807:LYS:HE3	1:A:807:LYS:H	1.64	0.63
1:A:834:HIS:CD2	1:A:835:GLY:N	2.67	0.63
1:A:743:GLN:O	1:A:747:LEU:HB2	1.99	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1089:HIS:C	1:A:1091:VAL:N	2.57	0.62
1:A:848:LEU:HD12	1:A:851:MET:HE2	1.82	0.61
1:A:1002:THR:HG23	1:A:1003:SER:N	2.16	0.60
1:A:1039:MET:HB3	1:A:1040:PRO:CD	2.29	0.60
1:A:608:TYR:CZ	1:A:639:ASN:ND2	2.70	0.60
1:A:371:PRO:HG2	1:A:511:GLU:O	2.02	0.59
1:A:410:TRP:HB3	1:A:412:VAL:CG2	2.32	0.59
1:A:767:LEU:HD12	1:A:803:VAL:HG23	1.84	0.59
1:A:178:ARG:HG3	1:A:178:ARG:NH1	2.17	0.59
1:A:675:SER:O	1:A:679:ARG:HG3	2.03	0.59
1:A:804:MET:HE1	1:A:831:ILE:HG12	1.85	0.59
1:A:226:ARG:HD2	1:A:229:THR:HB	1.85	0.58
1:A:202:VAL:HG22	1:A:285:THR:HG21	1.85	0.58
1:A:745:VAL:C	1:A:747:LEU:N	2.61	0.57
1:A:848:LEU:HD12	1:A:851:MET:HE1	1.86	0.57
1:A:1002:THR:CG2	1:A:1003:SER:N	2.67	0.57
1:A:1021:ARG:HE	1:A:1056:THR:HG23	1.66	0.57
1:A:395:CYS:HB3	1:A:418:ILE:HD11	1.87	0.57
1:A:939:THR:HG23	1:A:945:GLY:HA2	1.87	0.56
1:A:628:MET:HB2	1:A:1029:ILE:HG21	1.88	0.56
1:A:614:ARG:HG2	1:A:617:TRP:HB3	1.87	0.56
1:A:380:THR:O	1:A:435:CYS:CB	2.54	0.56
1:A:807:LYS:HZ2	1:A:808:LYS:H	1.54	0.56
1:A:854:ILE:HG23	1:A:1023:HIS:CD2	2.41	0.56
1:A:927:ARG:HE	1:A:959:ASN:HD22	1.53	0.56
1:A:526:PRO:O	1:A:527:ILE:HG13	2.05	0.56
1:A:824:SER:C	1:A:825:ASN:HD22	2.14	0.55
1:A:473:PHE:O	1:A:527:ILE:HD12	2.06	0.55
1:A:478:GLY:N	1:A:520:LEU:O	2.29	0.55
1:A:893:GLN:HA	1:A:897:GLY:CA	2.37	0.55
1:A:271:VAL:HG21	1:A:282:VAL:HG11	1.89	0.55
1:A:271:VAL:HG22	1:A:282:VAL:CG1	2.37	0.55
1:A:922:GLN:HA	1:A:922:GLN:OE1	2.06	0.54
1:A:378:ASP:O	1:A:379:LEU:C	2.51	0.54
1:A:178:ARG:HG3	1:A:178:ARG:HH11	1.71	0.54
1:A:428:LEU:HD22	1:A:465:ASN:HB3	1.90	0.54
1:A:145:GLU:HA	1:A:148:GLN:HE21	1.72	0.54
1:A:561:THR:HG23	1:A:565:ASN:HB3	1.87	0.53
1:A:1042:LEU:HD22	1:A:1042:LEU:O	2.08	0.53
1:A:806:SER:O	1:A:808:LYS:O	2.27	0.53
1:A:836:ASP:O	1:A:875:LYS:HA	2.08	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1035:LEU:HB3	1:A:1042:LEU:HG	1.89	0.53
1:A:651:LEU:HD22	1:A:655:ASP:HB3	1.91	0.53
1:A:733:THR:O	1:A:737:GLN:HG3	2.08	0.52
1:A:745:VAL:O	1:A:747:LEU:N	2.42	0.52
1:A:1055:LEU:O	1:A:1056:THR:HG22	2.09	0.52
1:A:887:THR:HG22	1:A:890:LYS:H	1.74	0.52
1:A:842:MET:HE2	1:A:871:SER:HB2	1.91	0.52
1:A:834:HIS:CG	1:A:835:GLY:N	2.77	0.51
1:A:214:LYS:NZ	1:A:300:GLY:HA2	2.25	0.51
1:A:225:HIS:HE1	1:A:304:HIS:CD2	2.24	0.51
1:A:527:ILE:HG22	1:A:528:ALA:N	2.25	0.51
1:A:368:ILE:HG21	1:A:433:ILE:HD11	1.92	0.51
1:A:357:CYS:N	1:A:421:LYS:HD3	2.26	0.51
1:A:939:THR:HG23	1:A:945:GLY:CA	2.40	0.51
1:A:272:LEU:HD22	1:A:305:VAL:CG1	2.41	0.50
1:A:620:SER:O	1:A:647:LYS:NZ	2.43	0.50
1:A:965:PHE:O	1:A:967:HIS:N	2.45	0.50
1:A:825:ASN:HD22	1:A:825:ASN:N	2.10	0.50
1:A:898:ASN:N	1:A:898:ASN:HD22	2.08	0.50
1:A:927:ARG:NE	1:A:959:ASN:HD22	2.09	0.50
1:A:387:ILE:HG13	1:A:418:ILE:HD13	1.94	0.49
1:A:498:ASN:OD1	1:A:498:ASN:C	2.55	0.49
1:A:747:LEU:HB3	1:A:748:ASP:OD1	2.11	0.49
1:A:165:VAL:O	1:A:165:VAL:CG1	2.58	0.49
1:A:844:ILE:HD13	1:A:1034:MET:SD	2.52	0.49
1:A:743:GLN:C	1:A:745:VAL:H	2.21	0.49
1:A:764:ILE:HG22	1:A:764:ILE:O	2.12	0.49
1:A:564:LEU:HD11	1:A:1048:ILE:HG22	1.95	0.49
1:A:804:MET:HE3	1:A:810:PRO:HB2	1.95	0.49
1:A:874:ASP:O	1:A:875:LYS:CB	2.58	0.49
1:A:1008:LYS:O	1:A:1012:ILE:HG13	2.12	0.49
1:A:285:THR:HG22	1:A:289:ASN:HB2	1.95	0.49
1:A:898:ASN:N	1:A:898:ASN:ND2	2.60	0.49
1:A:903:LYS:HB2	1:A:906:VAL:HG23	1.94	0.49
1:A:948:HIS:HD2	1:A:950:ASP:HB2	1.78	0.49
1:A:302:GLU:OE1	1:A:304:HIS:HE1	1.95	0.48
1:A:210:TYR:O	1:A:213:LYS:HD2	2.13	0.48
1:A:274:VAL:HG21	1:A:292:TRP:CD1	2.48	0.48
1:A:583:LEU:HD22	1:A:610:LEU:HD22	1.95	0.48
1:A:271:VAL:CG2	1:A:282:VAL:CG1	2.91	0.48
1:A:178:ARG:HH11	1:A:178:ARG:CG	2.26	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:387:ILE:HG13	1:A:418:ILE:HD11	1.96	0.48
1:A:421:LYS:HA	1:A:421:LYS:HD2	1.59	0.48
1:A:925:VAL:O	1:A:929:VAL:HG23	2.14	0.48
1:A:1045:LYS:O	1:A:1046:GLU:HG3	2.14	0.48
1:A:743:GLN:C	1:A:745:VAL:N	2.72	0.47
1:A:745:VAL:C	1:A:747:LEU:H	2.21	0.47
1:A:1035:LEU:HD12	1:A:1048:ILE:HD13	1.96	0.47
1:A:823:LEU:H	1:A:823:LEU:CD1	2.26	0.47
1:A:1001:LYS:NZ	1:A:1001:LYS:CD	2.70	0.47
1:A:743:GLN:HG2	1:A:876:ILE:HD11	1.96	0.47
1:A:804:MET:HE1	1:A:831:ILE:HG23	1.96	0.47
1:A:231:GLN:HE21	1:A:232:THR:H	1.62	0.47
1:A:1043:THR:HB	1:A:1046:GLU:HB2	1.97	0.47
1:A:199:HIS:O	1:A:200:PRO:C	2.59	0.46
1:A:760:SER:O	1:A:763:VAL:HG12	2.14	0.46
1:A:1055:LEU:C	1:A:1056:THR:HG22	2.41	0.46
1:A:359:ARG:HH11	1:A:359:ARG:HG2	1.81	0.46
1:A:239:ASP:O	1:A:287:ILE:HG13	2.16	0.45
1:A:271:VAL:CG2	1:A:282:VAL:HG11	2.46	0.45
1:A:896:VAL:HG23	1:A:897:GLY:H	1.81	0.45
1:A:228:THR:O	1:A:228:THR:CG2	2.64	0.45
1:A:742:LEU:HD22	1:A:813:LEU:HD11	1.98	0.45
1:A:896:VAL:CG2	1:A:903:LYS:HD2	2.46	0.45
1:A:939:THR:CG2	1:A:945:GLY:HA2	2.46	0.45
1:A:1088:LEU:O	1:A:1091:VAL:HG22	2.16	0.45
1:A:665:GLN:NE2	1:A:702:GLU:OE2	2.36	0.45
1:A:887:THR:HG22	1:A:889:ALA:N	2.33	0.44
1:A:214:LYS:HZ2	1:A:300:GLY:HA2	1.82	0.44
1:A:910:TRP:O	1:A:914:LYS:HG2	2.18	0.44
1:A:369:ASP:OD1	1:A:369:ASP:N	2.51	0.43
1:A:923:ALA:O	1:A:926:GLU:HB3	2.17	0.43
1:A:1040:PRO:HB2	1:A:1041:GLN:H	1.65	0.43
1:A:317:GLU:O	1:A:726:THR:HG23	2.18	0.43
1:A:994:VAL:C	1:A:996:GLY:H	2.25	0.43
1:A:466:LEU:HD11	1:A:476:ARG:HD3	2.00	0.43
1:A:287:ILE:HG13	1:A:287:ILE:H	1.68	0.43
1:A:1017:TYR:OH	1:A:1056:THR:HG22	2.19	0.43
1:A:161:ASP:OD1	1:A:163:THR:OG1	2.35	0.43
1:A:697:TRP:CZ3	1:A:872:THR:HG22	2.54	0.43
1:A:168:VAL:HG13	1:A:170:ASP:O	2.18	0.43
1:A:378:ASP:O	1:A:379:LEU:O	2.36	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:552:ARG:CZ	1:A:552:ARG:HB2	2.49	0.43
1:A:375:ARG:O	1:A:376:ASN:C	2.61	0.43
1:A:874:ASP:C	1:A:876:ILE:HG22	2.43	0.43
1:A:146:GLU:C	1:A:319:ARG:HH22	2.27	0.42
1:A:215:ILE:C	1:A:217:ASN:H	2.27	0.42
1:A:363:VAL:HG23	1:A:520:LEU:HD13	2.00	0.42
1:A:804:MET:HB2	1:A:810:PRO:HG2	2.01	0.42
1:A:834:HIS:CD2	1:A:835:GLY:CA	3.02	0.42
1:A:497:PHE:HD1	1:A:1041:GLN:NE2	2.10	0.42
1:A:910:TRP:HA	1:A:913:GLU:HG2	2.01	0.42
1:A:526:PRO:C	1:A:527:ILE:HG13	2.45	0.42
1:A:562:ASP:HB2	1:A:563:PRO:CD	2.50	0.42
1:A:470:ASP:HB3	1:A:476:ARG:NH2	2.34	0.41
1:A:410:TRP:HB3	1:A:412:VAL:HG22	2.00	0.41
1:A:467:LEU:HB2	1:A:476:ARG:HH12	1.85	0.41
1:A:561:THR:HG23	1:A:565:ASN:CB	2.50	0.41
1:A:460:LEU:HG	1:A:487:ILE:HD13	2.03	0.41
1:A:500:ASP:HB3	1:A:708:HIS:CD2	2.55	0.41
1:A:960:LEU:HD23	1:A:961:PHE:N	2.36	0.41
1:A:463:TYR:CE1	1:A:501:LYS:HA	2.55	0.41
1:A:497:PHE:HB3	1:A:1041:GLN:HE22	1.84	0.41
1:A:158:ILE:HG12	1:A:717:LEU:HD13	2.02	0.41
1:A:245:LEU:O	1:A:249:PHE:HD1	2.03	0.41
1:A:416:PHE:HB3	1:A:418:ILE:HD12	2.02	0.41
1:A:1045:LYS:O	1:A:1046:GLU:CG	2.69	0.41
1:A:1091:VAL:O	1:A:1091:VAL:HG23	2.21	0.41
2:A:2093:090:OAU	2:A:2093:090:NAL	2.51	0.41
1:A:168:VAL:HG13	1:A:169:HIS:N	2.35	0.41
1:A:178:ARG:NH1	1:A:178:ARG:CG	2.83	0.41
1:A:569:ALA:O	1:A:573:GLU:HG3	2.20	0.41
1:A:1092:LEU:HD23	1:A:1093:GLY:N	2.36	0.41
1:A:1042:LEU:HD22	1:A:1042:LEU:C	2.45	0.41
1:A:720:TYR:OH	1:A:728:MET:HE1	2.21	0.40
1:A:743:GLN:O	1:A:745:VAL:N	2.54	0.40
1:A:787:TYR:CD1	1:A:787:TYR:C	2.98	0.40
1:A:568:THR:HG22	1:A:570:GLU:H	1.85	0.40
1:A:897:GLY:C	1:A:898:ASN:HD22	2.29	0.40
1:A:1002:THR:HG23	1:A:1003:SER:H	1.85	0.40
1:A:1018:LEU:HD13	1:A:1061:GLU:OE1	2.21	0.40
1:A:1038:GLY:C	1:A:1039:MET:HE2	2.47	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	827/966 (86%)	760 (92%)	49 (6%)	18 (2%)	5 9

All (18) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	376	ASN
1	A	754	ALA
1	A	966	GLY
1	A	1040	PRO
1	A	1090	LEU
1	A	527	ILE
1	A	744	LYS
1	A	746	THR
1	A	806	SER
1	A	949	ASN
1	A	1046	GLU
1	A	374	PRO
1	A	747	LEU
1	A	1092	LEU
1	A	216	ALA
1	A	251	LYS
1	A	509	ASP
1	A	897	GLY

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	757/864 (88%)	653 (86%)	104 (14%)	3 7

All (104) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	145	GLU
1	A	153	GLN
1	A	168	VAL
1	A	178	ARG
1	A	190	SER
1	A	193	PRO
1	A	202	VAL
1	A	213	LYS
1	A	214	LYS
1	A	215	ILE
1	A	227	SER
1	A	228	THR
1	A	235	VAL
1	A	254	LYS
1	A	271	VAL
1	A	281	LEU
1	A	282	VAL
1	A	287	ILE
1	A	305	VAL
1	A	309	THR
1	A	358	ASP
1	A	366	ARG
1	A	369	ASP
1	A	373	LEU
1	A	375	ARG
1	A	376	ASN
1	A	377	THR
1	A	379	LEU
1	A	381	VAL
1	A	391	GLN
1	A	393	VAL
1	A	406	GLU
1	A	409	LEU
1	A	412	VAL
1	A	418	ILE
1	A	421	LYS
1	A	459	ARG
1	A	487	ILE

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Mol	Chain	Res	Type
1	A	520	LEU
1	A	547	MET
1	A	561	THR
1	A	574	LEU
1	A	575	LEU
1	A	601	GLN
1	A	603	ILE
1	A	610	LEU
1	A	613	ARG
1	A	626	LEU
1	A	646	GLN
1	A	647	LYS
1	A	652	GLU
1	A	682	LEU
1	A	717	LEU
1	A	739	ILE
1	A	744	LYS
1	A	747	LEU
1	A	748	ASP
1	A	751	SER
1	A	756	LYS
1	A	757	TYR
1	A	763	VAL
1	A	766	GLN
1	A	767	LEU
1	A	773	ASN
1	A	777	SER
1	A	791	LEU
1	A	799	GLU
1	A	802	LYS
1	A	806	SER
1	A	807	LYS
1	A	811	LEU
1	A	823	LEU
1	A	834	HIS
1	A	836	ASP
1	A	843	LEU
1	A	845	LEU
1	A	847	ILE
1	A	848	LEU
1	A	858	GLU
1	A	865	LEU

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Mol	Chain	Res	Type
1	A	886	THR
1	A	887	THR
1	A	890	LYS
1	A	895	THR
1	A	898	ASN
1	A	907	LEU
1	A	918	GLU
1	A	939	THR
1	A	967	HIS
1	A	982	ARG
1	A	983	VAL
1	A	997	THR
1	A	1002	THR
1	A	1024	THR
1	A	1026	LEU
1	A	1029	ILE
1	A	1041	GLN
1	A	1042	LEU
1	A	1043	THR
1	A	1045	LYS
1	A	1048	ILE
1	A	1052	ARG
1	A	1078	LYS
1	A	1091	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	148	GLN
1	A	225	HIS
1	A	231	GLN
1	A	304	HIS
1	A	389	HIS
1	A	522	ASN
1	A	600	GLN
1	A	634	ASN
1	A	639	ASN
1	A	766	GLN
1	A	773	ASN
1	A	775	GLN
1	A	825	ASN
1	A	834	HIS

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Mol	Chain	Res	Type
1	A	840	GLN
1	A	898	ASN
1	A	948	HIS
1	A	959	ASN
1	A	1010	GLN
1	A	1023	HIS
1	A	1041	GLN
1	A	1083	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)

1 ligand is modelled in this entry.

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	$\#\|Z\| > 2$
2	090	A	2093	-	27,29,29	2.32	5 (18%)	32,41,41	1.65	6 (18%)

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
2	090	A	2093	-	-	0/12/12/12	0/4/4/4

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	2093	090	CAB-CAH	9.82	1.53	1.35
2	A	2093	090	CAB-NAA	4.02	1.45	1.38
2	A	2093	090	CAF-CAE	-2.41	1.40	1.44
2	A	2093	090	CAM-NAL	2.31	1.37	1.33
2	A	2093	090	CAJ-CAK	-2.14	1.39	1.42

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	2093	090	CAB-CAH-NAG	-5.42	100.04	106.87
2	A	2093	090	CAE-CAF-NAA	3.56	128.96	120.88
2	A	2093	090	OAS-CAI-CAJ	2.97	120.00	116.44
2	A	2093	090	CAX-NAR-CAQ	2.70	121.58	116.85
2	A	2093	090	CAP-CAQ-NAR	-2.69	119.50	123.50
2	A	2093	090	OAS-CAI-CAC	-2.15	120.67	124.30

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

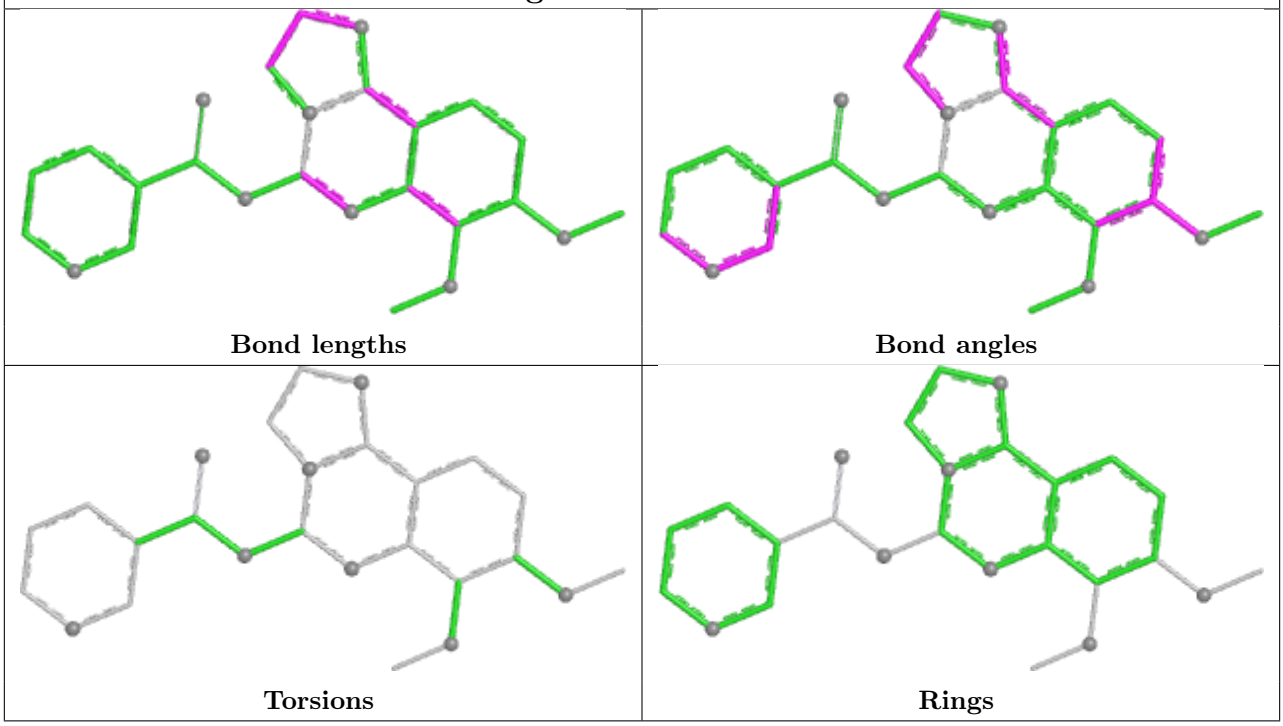
1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	2093	090	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 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 090 A 2093



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	843/966 (87%)	0.78	72 (8%)	16	14	20, 46, 74, 108	0

All (72) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1044	SER	5.9
1	A	528	ALA	4.7
1	A	1092	LEU	4.3
1	A	757	TYR	4.3
1	A	526	PRO	4.1
1	A	216	ALA	4.0
1	A	527	ILE	4.0
1	A	525	HIS	3.9
1	A	874	ASP	3.8
1	A	897	GLY	3.7
1	A	379	LEU	3.7
1	A	376	ASN	3.7
1	A	253	ALA	3.4
1	A	374	PRO	3.3
1	A	746	THR	3.3
1	A	896	VAL	3.3
1	A	926	GLU	3.3
1	A	898	ASN	3.2
1	A	1086	TRP	3.2
1	A	545	ALA	3.1
1	A	749	ILE	2.9
1	A	1091	VAL	2.9
1	A	967	HIS	2.9
1	A	378	ASP	2.9
1	A	1066	LYS	2.9
1	A	252	MET	2.9
1	A	747	LEU	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	403	PRO	2.7
1	A	270	PHE	2.7
1	A	745	VAL	2.7
1	A	323	TRP	2.7
1	A	764	ILE	2.6
1	A	316	ASP	2.6
1	A	754	ALA	2.6
1	A	254	LYS	2.5
1	A	759	VAL	2.5
1	A	765	SER	2.5
1	A	213	LYS	2.4
1	A	226	ARG	2.4
1	A	375	ARG	2.4
1	A	377	THR	2.4
1	A	414	LEU	2.4
1	A	303	ILE	2.4
1	A	752	LEU	2.3
1	A	876	ILE	2.3
1	A	838	LEU	2.3
1	A	1045	LYS	2.3
1	A	1085	ASN	2.3
1	A	248	PHE	2.3
1	A	271	VAL	2.3
1	A	1077	ASP	2.2
1	A	522	ASN	2.2
1	A	219	CYS	2.2
1	A	278	ASP	2.2
1	A	1040	PRO	2.2
1	A	380	THR	2.2
1	A	895	THR	2.2
1	A	546	GLU	2.2
1	A	409	LEU	2.2
1	A	220	ILE	2.2
1	A	149	ALA	2.1
1	A	1090	LEU	2.1
1	A	837	ASP	2.1
1	A	769	GLN	2.1
1	A	825	ASN	2.1
1	A	899	THR	2.1
1	A	1043	THR	2.1
1	A	435	CYS	2.1
1	A	743	GLN	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	873	GLY	2.0
1	A	1046	GLU	2.0
1	A	210	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)

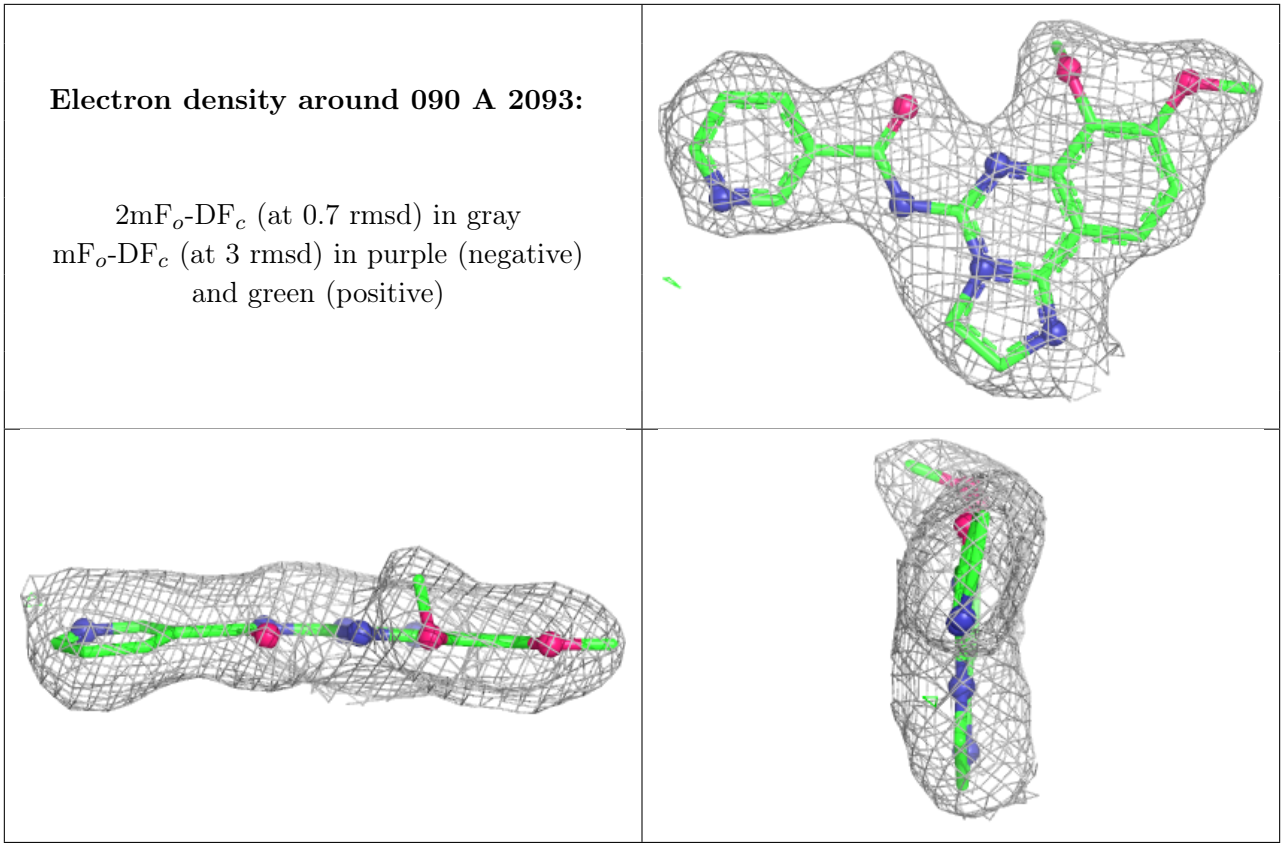
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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
2	090	A	2093	26/26	0.91	0.10	44,47,48,50	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 090 A 2093:

$2mF_o$-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.