



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 13, 2017 – 03:05 am GMT

PDB ID : 3ERK  
Title : THE COMPLEX STRUCTURE OF THE MAP KINASE ERK2/SB220025  
Authors : Wang, Z.; Canagarajah, B.; Boehm, J.C.; Cobb, M.H.; Young, P.R.; Abdel-Meguid, S.; Adams, J.L.; Goldsmith, E.J.  
Deposited on : 1998-07-09  
Resolution : 2.10 Å(reported)

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

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

A user guide is available at

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467  
Mogul : 1.7.2 (RC1), CSD as538be (2017)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : recalc28949

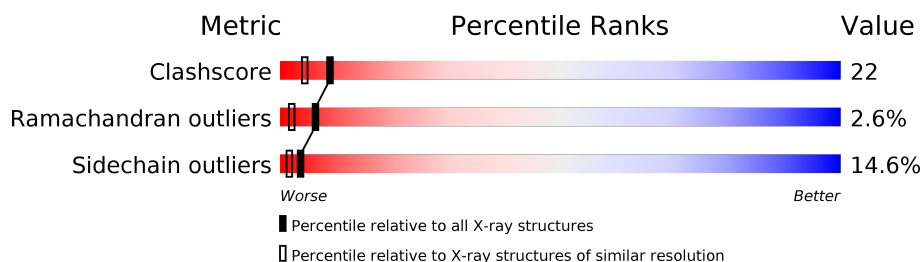
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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))
Clashscore	112137	4788 (2.10-2.10)
Ramachandran outliers	110173	4740 (2.10-2.10)
Sidechain outliers	110143	4741 (2.10-2.10)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	364	

## 2 Entry composition [i](#)

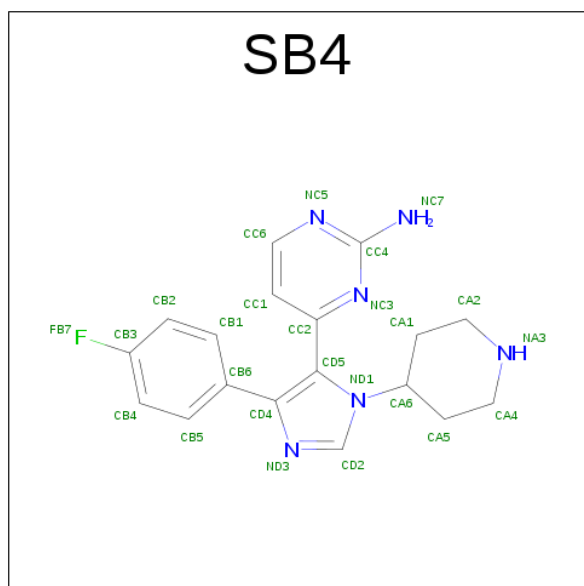
There are 3 unique types of molecules in this entry. The entry contains 3016 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 EXTRACELLULAR REGULATED KINASE 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	350	Total	C	N	O	S	0	0	0
			2849	1829	487	518	15			

- Molecule 2 is 4-(4-FLUOROPHENYL)-1-(4-PIPERIDINYL)-5-(2-AMINO-4-PYRIMIDINYL)-IMIDAZOLE (three-letter code: SB4) (formula: C<sub>18</sub>H<sub>19</sub>FN<sub>6</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	F	N	0	0
			25	18	1	6		

- Molecule 3 is water.

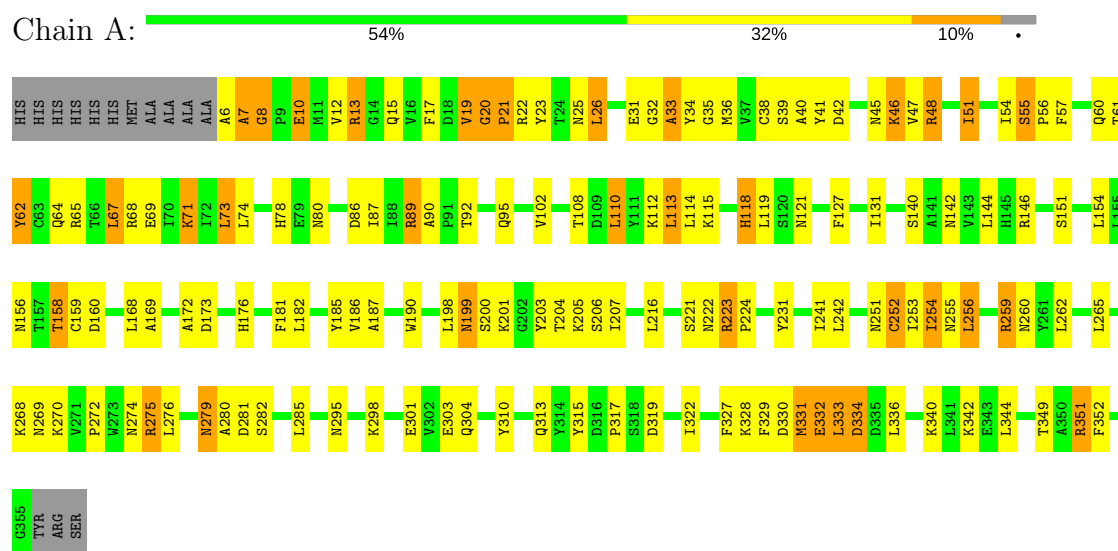
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	142	Total	O	0	0
			142	142		

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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.

Note EDS was not executed.

#### • Molecule 1: EXTRACELLULAR REGULATED KINASE 2



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	48.85 Å   70.00 Å   60.70 Å 90.00°   109.20°   90.00°	Depositor
Resolution (Å)	20.00 – 2.10	Depositor
% Data completeness (in resolution range)	88.0 (20.00-2.10)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.03	Depositor
Refinement program	X-PLOR 3.8	Depositor
R, $R_{free}$	0.206 , 0.262	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3016	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	32.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SB4

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	0.39	0/2918	0.60	0/3955

There are no bond length outliers.

There are no bond angle outliers.

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	2849	0	2850	129	0
2	A	25	0	19	2	0
3	A	142	0	0	10	0
All	All	3016	0	2869	129	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 22.

All (129) 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:67:LEU:HD22	1:A:71:LYS:HD2	1.45	0.98

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:251:ASN:HA	1:A:259:ARG:HH21	1.30	0.96
1:A:34:TYR:HB2	1:A:55:SER:H	1.26	0.96
1:A:51:ILE:HD13	1:A:102:VAL:HG22	1.61	0.83
1:A:68:ARG:HD2	3:A:485:HOH:O	1.80	0.80
1:A:301:GLU:H	1:A:304:GLN:HE21	1.30	0.79
1:A:64:GLN:NE2	1:A:334:ASP:HB3	1.99	0.78
1:A:328:LYS:HB2	3:A:505:HOH:O	1.83	0.77
1:A:64:GLN:CD	1:A:334:ASP:HB3	2.07	0.75
1:A:62:TYR:N	1:A:62:TYR:CD1	2.51	0.74
1:A:78:HIS:HD2	1:A:80:ASN:H	1.36	0.73
1:A:223:ARG:HG2	1:A:224:PRO:HD2	1.70	0.72
1:A:78:HIS:CD2	1:A:80:ASN:H	2.09	0.71
1:A:242:LEU:O	1:A:270:LYS:HE2	1.92	0.69
1:A:41:TYR:OH	1:A:46:LYS:HG3	1.93	0.69
1:A:319:ASP:OD2	3:A:546:HOH:O	2.11	0.68
1:A:60:GLN:HE22	1:A:64:GLN:NE2	1.90	0.68
1:A:280:ALA:HB3	1:A:285:LEU:HD11	1.76	0.67
1:A:89:ARG:HD2	1:A:90:ALA:O	1.96	0.65
1:A:279:ASN:ND2	1:A:279:ASN:H	1.93	0.65
1:A:6:ALA:HB3	1:A:10:GLU:HG2	1.77	0.65
1:A:13:ARG:HG2	3:A:495:HOH:O	1.97	0.64
1:A:34:TYR:HD2	1:A:54:ILE:HB	1.63	0.63
1:A:64:GLN:NE2	1:A:334:ASP:CB	2.62	0.63
1:A:62:TYR:HD1	1:A:62:TYR:N	1.93	0.62
1:A:26:LEU:HD23	1:A:40:ALA:HB2	1.81	0.62
1:A:272:PRO:HG2	1:A:275:ARG:HB2	1.81	0.61
1:A:34:TYR:O	1:A:54:ILE:HG22	2.01	0.61
1:A:127:PHE:O	1:A:131:ILE:HG13	2.01	0.61
1:A:6:ALA:HB3	1:A:10:GLU:CG	2.31	0.60
1:A:48:ARG:HG2	1:A:48:ARG:HH11	1.67	0.60
1:A:251:ASN:CA	1:A:259:ARG:HH21	2.11	0.59
1:A:48:ARG:HG2	1:A:48:ARG:NH1	2.18	0.59
1:A:173:ASP:OD1	1:A:176:HIS:HD2	1.87	0.58
1:A:199:ASN:HD22	1:A:200:SER:N	2.00	0.58
1:A:71:LYS:HD3	1:A:329:PHE:HE1	1.69	0.58
1:A:60:GLN:NE2	1:A:64:GLN:NE2	2.51	0.57
1:A:330:ASP:OD1	1:A:331:MET:N	2.38	0.57
1:A:156:ASN:ND2	1:A:160:ASP:HB2	2.20	0.56
1:A:199:ASN:C	1:A:199:ASN:HD22	2.08	0.56
1:A:301:GLU:H	1:A:304:GLN:NE2	2.01	0.55
1:A:204:THR:HG22	1:A:206:SER:H	1.71	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:40:ALA:O	1:A:48:ARG:HA	2.07	0.54
1:A:71:LYS:HD3	1:A:329:PHE:CE1	2.42	0.54
1:A:113:LEU:HD13	1:A:119:LEU:HD21	1.89	0.53
1:A:32:GLY:O	1:A:33:ALA:HB3	2.08	0.53
1:A:31:GLU:HA	1:A:35:GLY:O	2.09	0.53
1:A:71:LYS:HE2	3:A:506:HOH:O	2.08	0.53
1:A:252:CYS:HB2	3:A:519:HOH:O	2.10	0.52
1:A:110:LEU:HD22	1:A:114:LEU:HG	1.91	0.52
1:A:185:TYR:CE2	1:A:187:ALA:HB3	2.44	0.52
1:A:10:GLU:OE1	1:A:17:PHE:O	2.27	0.52
1:A:253:ILE:O	1:A:259:ARG:NH1	2.43	0.52
1:A:181:PHE:O	1:A:182:LEU:HB2	2.10	0.51
1:A:34:TYR:CZ	1:A:62:TYR:HB3	2.45	0.51
1:A:64:GLN:OE1	1:A:334:ASP:HB3	2.10	0.51
1:A:146:ARG:HD3	1:A:168:LEU:O	2.10	0.51
1:A:87:ILE:HD13	1:A:349:THR:HG22	1.93	0.50
1:A:142:ASN:ND2	1:A:172:ALA:HB3	2.27	0.50
1:A:48:ARG:CG	1:A:48:ARG:HH11	2.25	0.50
1:A:118:HIS:HE1	3:A:572:HOH:O	1.94	0.50
1:A:329:PHE:O	1:A:332:GLU:OE1	2.30	0.49
1:A:340:LYS:O	1:A:344:LEU:HG	2.12	0.49
1:A:295:ASN:CB	1:A:298:LYS:HD2	2.43	0.49
1:A:221:SER:O	1:A:222:ASN:HB2	2.13	0.48
1:A:158:THR:O	1:A:159:CYS:HB2	2.13	0.48
1:A:54:ILE:HD12	1:A:56:PRO:HG3	1.96	0.48
1:A:121:ASN:HB2	3:A:516:HOH:O	2.14	0.48
1:A:68:ARG:HD3	1:A:169:ALA:O	2.13	0.48
1:A:315:TYR:CZ	1:A:317:PRO:HG3	2.49	0.47
1:A:7:ALA:O	1:A:8:GLY:O	2.32	0.47
1:A:328:LYS:HD3	1:A:328:LYS:HA	1.65	0.47
1:A:92:THR:OG1	1:A:95:GLN:HB2	2.14	0.47
1:A:295:ASN:ND2	1:A:298:LYS:HD2	2.30	0.47
1:A:34:TYR:HB2	1:A:55:SER:N	2.10	0.47
1:A:329:PHE:O	1:A:332:GLU:HB3	2.14	0.47
1:A:295:ASN:HB3	1:A:298:LYS:HD2	1.97	0.46
1:A:57:PHE:CD1	1:A:342:LYS:HG3	2.51	0.46
1:A:32:GLY:O	1:A:33:ALA:CB	2.63	0.46
1:A:60:GLN:NE2	1:A:64:GLN:HE21	2.11	0.46
1:A:223:ARG:HG3	1:A:223:ARG:HH11	1.79	0.46
1:A:33:ALA:C	1:A:35:GLY:H	2.18	0.46
1:A:13:ARG:NE	3:A:495:HOH:O	2.44	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:86:ASP:HA	1:A:352:PHE:CD1	2.51	0.45
1:A:144:LEU:HD22	1:A:205:LYS:HA	1.98	0.45
1:A:254:ILE:O	1:A:256:LEU:N	2.50	0.45
1:A:69:GLU:HG3	1:A:73:LEU:HD22	1.98	0.45
1:A:33:ALA:O	1:A:35:GLY:N	2.44	0.45
1:A:199:ASN:C	1:A:199:ASN:ND2	2.70	0.45
1:A:254:ILE:HA	1:A:254:ILE:HD12	1.84	0.45
1:A:64:GLN:HE22	1:A:334:ASP:CB	2.28	0.44
1:A:331:MET:O	1:A:331:MET:HE2	2.18	0.44
1:A:279:ASN:N	1:A:279:ASN:ND2	2.62	0.44
1:A:33:ALA:C	1:A:35:GLY:N	2.71	0.43
1:A:151:SER:O	2:A:800:SB4:H21	2.18	0.43
1:A:60:GLN:HE22	1:A:64:GLN:HE21	1.62	0.43
1:A:54:ILE:HD12	1:A:56:PRO:HD3	2.01	0.43
1:A:108:THR:OG1	1:A:112:LYS:HE2	2.19	0.43
1:A:121:ASN:ND2	1:A:310:TYR:OH	2.51	0.43
1:A:223:ARG:CG	1:A:223:ARG:HH11	2.31	0.43
1:A:144:LEU:CD2	1:A:205:LYS:HA	2.48	0.43
1:A:39:SER:O	1:A:48:ARG:NH2	2.52	0.43
1:A:253:ILE:O	1:A:259:ARG:CZ	2.67	0.43
1:A:201:LYS:HD3	1:A:203:TYR:CE2	2.54	0.42
1:A:331:MET:O	1:A:331:MET:CE	2.67	0.42
1:A:15:GLN:HB3	1:A:36:MET:HE1	2.01	0.42
1:A:181:PHE:HB2	1:A:255:ASN:OD1	2.18	0.42
1:A:23:TYR:HA	1:A:41:TYR:O	2.19	0.42
1:A:115:LYS:O	1:A:115:LYS:HG3	2.19	0.42
1:A:74:LEU:HD13	1:A:351:ARG:NH2	2.34	0.42
1:A:39:SER:OG	1:A:48:ARG:NH2	2.53	0.42
1:A:331:MET:HE3	1:A:331:MET:HB2	1.85	0.42
1:A:332:GLU:O	1:A:333:LEU:CB	2.67	0.42
1:A:112:LYS:HB2	1:A:112:LYS:HE2	1.88	0.42
1:A:21:PRO:HG2	1:A:22:ARG:H	1.85	0.42
1:A:332:GLU:HG2	1:A:332:GLU:O	2.19	0.42
1:A:45:ASN:O	1:A:47:VAL:HG13	2.20	0.42
1:A:254:ILE:O	1:A:255:ASN:C	2.59	0.41
1:A:19:VAL:HG21	1:A:26:LEU:HD21	2.02	0.41
1:A:12:VAL:HG11	1:A:38:CYS:SG	2.61	0.41
1:A:190:TRP:CZ3	1:A:224:PRO:HG3	2.55	0.41
1:A:42:ASP:C	1:A:42:ASP:OD1	2.59	0.41
1:A:73:LEU:HD12	1:A:73:LEU:HA	1.82	0.41
1:A:20:GLY:HA3	1:A:21:PRO:HD2	1.93	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:241:ILE:HG12	1:A:276:LEU:HD11	2.02	0.40
1:A:154:LEU:HD21	2:A:800:SB4:H11	2.03	0.40
1:A:140:SER:HB2	1:A:322:ILE:HB	2.03	0.40
1:A:332:GLU:O	1:A:333:LEU:HB2	2.21	0.40
1:A:78:HIS:HE1	3:A:404:HOH:O	2.04	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	348/364 (96%)	310 (89%)	29 (8%)	9 (3%)	<b>6</b> <b>2</b>

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	7	ALA
1	A	33	ALA
1	A	8	GLY
1	A	333	LEU
1	A	20	GLY
1	A	231	TYR
1	A	26	LEU
1	A	21	PRO
1	A	19	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	314/324 (97%)	268 (85%)	46 (15%)	<b>3</b> <b>1</b>

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	GLU
1	A	13	ARG
1	A	25	ASN
1	A	46	LYS
1	A	48	ARG
1	A	51	ILE
1	A	55	SER
1	A	61	THR
1	A	62	TYR
1	A	65	ARG
1	A	67	LEU
1	A	71	LYS
1	A	73	LEU
1	A	89	ARG
1	A	110	LEU
1	A	113	LEU
1	A	118	HIS
1	A	158	THR
1	A	186	VAL
1	A	198	LEU
1	A	199	ASN
1	A	207	ILE
1	A	216	LEU
1	A	223	ARG
1	A	252	CYS
1	A	254	ILE
1	A	256	LEU
1	A	259	ARG
1	A	260	ASN
1	A	262	LEU
1	A	265	LEU
1	A	268	LYS
1	A	269	ASN
1	A	274	ASN
1	A	275	ARG

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Mol	Chain	Res	Type
1	A	279	ASN
1	A	281	ASP
1	A	282	SER
1	A	303	GLU
1	A	313	GLN
1	A	327	PHE
1	A	331	MET
1	A	332	GLU
1	A	334	ASP
1	A	336	LEU
1	A	351	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	25	ASN
1	A	59	HIS
1	A	64	GLN
1	A	78	HIS
1	A	121	ASN
1	A	142	ASN
1	A	152	ASN
1	A	176	HIS
1	A	178	HIS
1	A	199	ASN
1	A	260	ASN
1	A	269	ASN
1	A	279	ASN
1	A	304	GLN
1	A	313	GLN

### 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 [i](#)

There are no carbohydrates 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	SB4	A	800	-	23,28,28	1.90	7 (30%)	27,39,39	1.89	6 (22%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	SB4	A	800	-	-	0/5/20/20	0/4/4/4

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	800	SB4	CB6-CD4	-4.18	1.44	1.49
2	A	800	SB4	CB1-CB6	2.23	1.44	1.39
2	A	800	SB4	CB5-CB6	2.30	1.44	1.39
2	A	800	SB4	CB2-CB3	2.34	1.41	1.37
2	A	800	SB4	CC1-CC6	2.57	1.43	1.38
2	A	800	SB4	CD5-CD4	2.75	1.50	1.43
2	A	800	SB4	CC1-CC2	3.15	1.46	1.38

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	800	SB4	CC1-CC2-NC3	-2.09	119.14	121.97
2	A	800	SB4	CC1-CC6-NC5	-2.02	121.59	123.92

*Continued on next page...*

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	800	SB4	CA4-NA3-CA2	2.17	117.10	110.33
2	A	800	SB4	CD5-ND1-CA6	3.27	133.20	126.72
2	A	800	SB4	CA4-CA5-CA6	4.95	114.20	110.37
2	A	800	SB4	CC2-NC3-CC4	5.16	119.16	116.36

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	800	SB4	2	0

## 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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.