



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 11:44 AM GMT

PDB ID : 3PPK
Title : Human B-Raf Kinase in Complex with a Non-Oxime Furopyridine Inhibitor
Authors : Voegtli, W.C.; Vigers, G.P.A.; Morales, T.; Brandhuber, B.J.
Deposited on : 2010-11-24
Resolution : 3.00 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

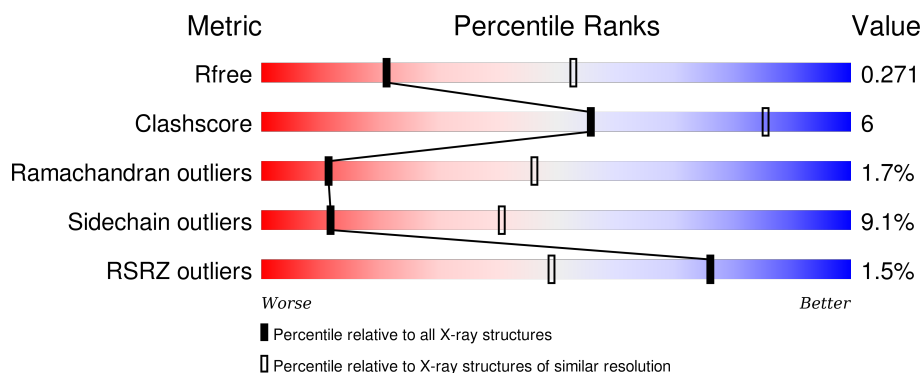
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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}	91344	1578 (3.00-3.00)
Clashscore	102246	1912 (3.00-3.00)
Ramachandran outliers	100387	1853 (3.00-3.00)
Sidechain outliers	100360	1856 (3.00-3.00)
RSRZ outliers	91569	1592 (3.00-3.00)

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 ≥ 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.

Mol	Chain	Length	Quality of chain
1	A	307	<div> <div></div> <div>68%14%•15%</div> </div>
1	B	307	<div> <div>2%</div> <div>69%13%•14%</div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4260 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.

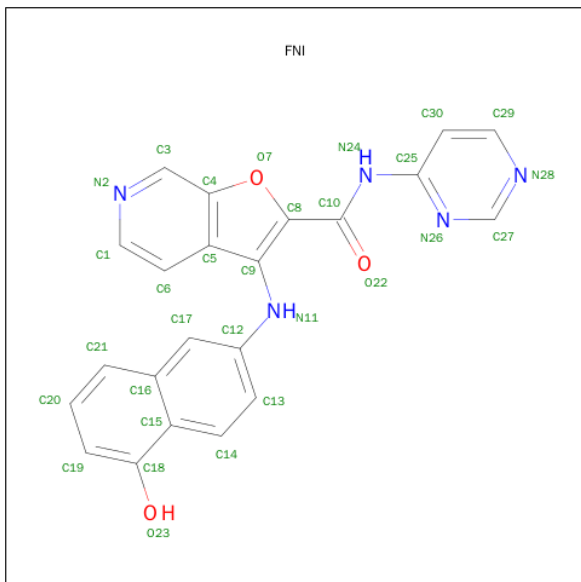
- Molecule 1 is a protein called Serine/threonine-protein kinase B-raf.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	262	Total	C	N	O	S	0	0	0
			2093	1343	364	373	13			
1	B	264	Total	C	N	O	S	0	0	0
			2107	1352	366	376	13			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	420	MET	-	EXPRESSION TAG	UNP P15056
A	421	ASP	-	EXPRESSION TAG	UNP P15056
A	422	ARG	-	EXPRESSION TAG	UNP P15056
A	423	GLY	-	EXPRESSION TAG	UNP P15056
A	424	SER	-	EXPRESSION TAG	UNP P15056
A	425	HIS	-	EXPRESSION TAG	UNP P15056
A	426	HIS	-	EXPRESSION TAG	UNP P15056
A	427	HIS	-	EXPRESSION TAG	UNP P15056
A	428	HIS	-	EXPRESSION TAG	UNP P15056
A	429	HIS	-	EXPRESSION TAG	UNP P15056
A	430	HIS	-	EXPRESSION TAG	UNP P15056
A	431	GLY	-	EXPRESSION TAG	UNP P15056
B	420	MET	-	EXPRESSION TAG	UNP P15056
B	421	ASP	-	EXPRESSION TAG	UNP P15056
B	422	ARG	-	EXPRESSION TAG	UNP P15056
B	423	GLY	-	EXPRESSION TAG	UNP P15056
B	424	SER	-	EXPRESSION TAG	UNP P15056
B	425	HIS	-	EXPRESSION TAG	UNP P15056
B	426	HIS	-	EXPRESSION TAG	UNP P15056
B	427	HIS	-	EXPRESSION TAG	UNP P15056
B	428	HIS	-	EXPRESSION TAG	UNP P15056
B	429	HIS	-	EXPRESSION TAG	UNP P15056
B	430	HIS	-	EXPRESSION TAG	UNP P15056
B	431	GLY	-	EXPRESSION TAG	UNP P15056

- Molecule 2 is 3-[(5-HYDROXYNAPHTHALEN-2-YL)AMINO]-N-(PYRIMIDIN-4-YL)FUR O[2,3-C]PYRIDINE-2-CARBOXAMIDE (three-letter code: FNI) (formula: C₂₂H₁₅N₅O₃).

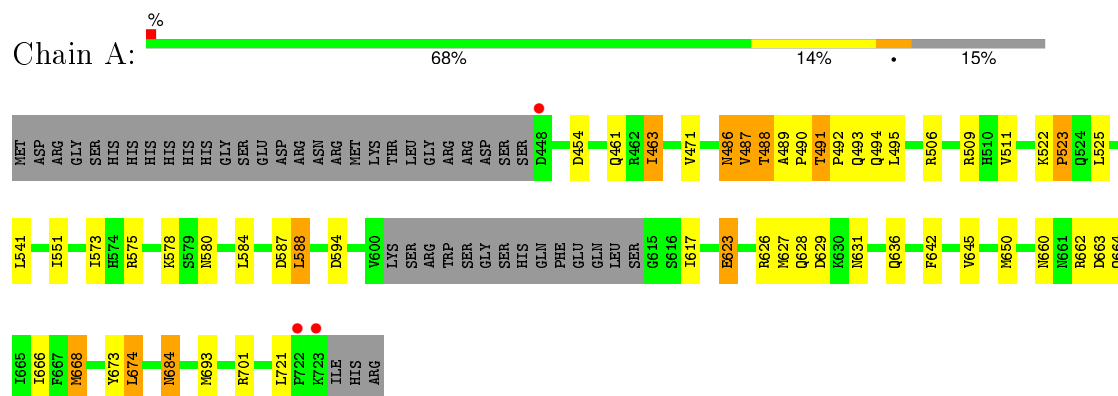


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			30	22	5	3		
2	B	1	Total	C	N	O	0	0
			30	22	5	3		

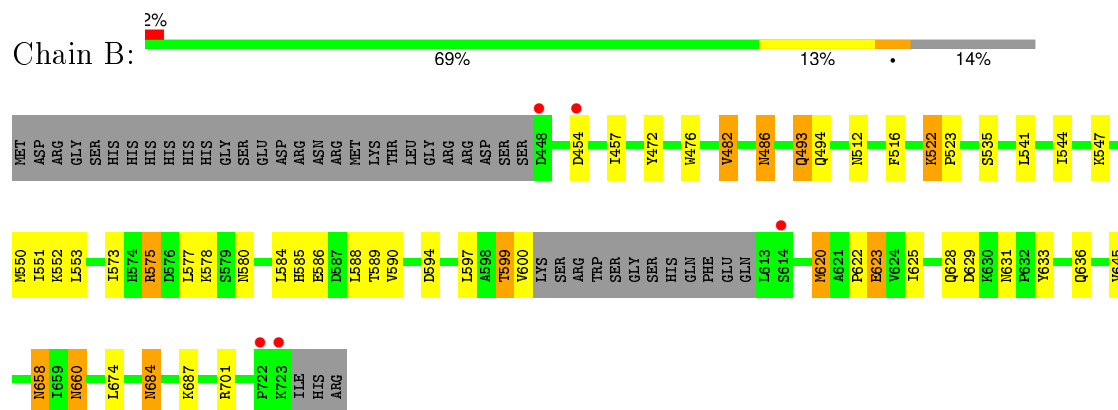
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Serine/threonine-protein kinase B-raf



- Molecule 1: Serine/threonine-protein kinase B-raf



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	100.31Å 100.31Å 163.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.00 – 3.00 47.95 – 3.00	Depositor EDS
% Data completeness (in resolution range)	100.0 (25.00-3.00) 99.1 (47.95-3.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.49 (at 3.01Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.238 , 0.280 0.232 , 0.271	Depositor DCC
R_{free} test set	864 reflections (5.32%)	DCC
Wilson B-factor (Å ²)	73.8	Xtriage
Anisotropy	0.093	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 22.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	1 of 17143 reflections (0.006%)	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	4260	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.50% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.35	0/2138	0.58	2/2886 (0.1%)
1	B	0.34	0/2152	0.53	0/2905
All	All	0.35	0/4290	0.56	2/5791 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	487	VAL	N-CA-C	6.14	127.58	111.00
1	A	588	LEU	CA-CB-CG	5.50	127.94	115.30

There are no chirality outliers.

There are no planarity outliers.

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	2093	0	2135	25	0
1	B	2107	0	2151	27	0
2	A	30	0	15	1	0
2	B	30	0	15	1	0
All	All	4260	0	4316	53	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 6.

All (53) 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:684:ASN:H	1:B:684:ASN:HD22	1.34	0.75
1:B:660:ASN:HD22	1:B:660:ASN:C	1.98	0.68
1:B:658:ASN:H	1:B:658:ASN:HD22	1.43	0.64
1:B:454:ASP:HB2	1:B:522:LYS:NZ	2.16	0.60
1:B:551:ILE:HD12	1:B:551:ILE:H	1.68	0.57
1:B:575:ARG:NH1	1:B:597:LEU:O	2.37	0.57
1:A:617:ILE:HD11	1:A:662:ARG:HG2	1.88	0.55
1:A:664:GLN:O	1:A:668:MET:HB2	2.06	0.55
1:A:463:ILE:HD11	1:A:471:VAL:HG12	1.89	0.54
1:A:488:THR:HG22	1:A:489:ALA:H	1.73	0.54
1:A:573:ILE:HG22	1:A:575:ARG:HG3	1.90	0.54
1:B:622:PRO:HA	1:B:625:ILE:HG22	1.89	0.53
1:B:684:ASN:H	1:B:684:ASN:ND2	2.05	0.53
1:B:620:MET:HE2	1:B:625:ILE:HA	1.91	0.52
1:B:472:TYR:HB2	1:B:482:VAL:HG23	1.91	0.52
1:B:573:ILE:HG22	1:B:575:ARG:HG3	1.92	0.52
1:B:486:ASN:C	1:B:486:ASN:HD22	2.14	0.52
1:A:636:GLN:HG2	1:A:701:ARG:O	2.10	0.51
1:A:454:ASP:H	1:A:522:LYS:HD3	1.75	0.51
1:A:663:ASP:HA	1:A:666:ILE:HG12	1.94	0.50
1:A:626:ARG:O	1:A:628:GLN:N	2.45	0.50
1:B:457:ILE:HG22	1:B:476:TRP:HB2	1.93	0.49
1:A:551:ILE:HD12	1:A:551:ILE:H	1.77	0.49
1:B:623:GLU:HG3	1:B:623:GLU:H	1.40	0.48
1:B:493:GLN:HG3	1:B:494:GLN:N	2.28	0.48
1:B:550:MET:HA	1:B:553:LEU:HD12	1.96	0.47
1:A:491:THR:HG22	1:A:492:PRO:HD2	1.97	0.46
1:A:684:ASN:HD22	1:A:684:ASN:H	1.62	0.46
1:A:486:ASN:N	1:A:486:ASN:ND2	2.63	0.46
1:B:620:MET:CE	1:B:625:ILE:HA	2.46	0.46
1:B:454:ASP:HB2	1:B:522:LYS:HZ3	1.78	0.45
1:A:522:LYS:HB2	1:A:523:PRO:HD3	1.98	0.45
1:B:578:LYS:HG3	1:B:580:ASN:HB2	1.98	0.45
1:A:509:ARG:HD3	1:B:516:PHE:O	2.17	0.45
1:A:668:MET:HG3	1:A:673:TYR:HB2	1.98	0.45
1:B:575:ARG:HG2	1:B:633:TYR:CD2	2.52	0.44
1:A:668:MET:HB3	1:A:674:LEU:HB2	1.98	0.44
1:A:491:THR:HB	1:A:493:GLN:HB3	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:642:PHE:O	1:A:645:VAL:HG22	2.17	0.44
1:A:486:ASN:HD21	1:A:525:LEU:N	2.15	0.44
1:A:650:MET:HG3	1:A:693:MET:HE1	2.00	0.43
1:A:578:LYS:HD2	1:A:580:ASN:HD22	1.84	0.43
2:B:727:FNI:C17	2:B:727:FNI:H6	2.49	0.42
1:B:512:ASN:HA	1:B:590:VAL:O	2.20	0.41
1:A:492:PRO:HA	1:A:495:LEU:HB2	2.00	0.41
1:B:599:THR:HG22	1:B:600:VAL:H	1.86	0.41
1:B:660:ASN:ND2	1:B:660:ASN:C	2.68	0.41
1:A:623:GLU:HG3	1:A:623:GLU:H	1.46	0.41
1:B:636:GLN:HG2	1:B:701:ARG:O	2.21	0.41
1:B:544:ILE:HG13	1:B:544:ILE:H	1.75	0.41
2:A:727:FNI:O22	2:A:727:FNI:H30	2.21	0.40
1:B:585:HIS:CE1	1:B:586:GLU:HG2	2.56	0.40
1:A:489:ALA:HA	1:A:490:PRO:HD3	1.94	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	258/307 (84%)	240 (93%)	12 (5%)	6 (2%)	8	36
1	B	260/307 (85%)	241 (93%)	16 (6%)	3 (1%)	16	56
All	All	518/614 (84%)	481 (93%)	28 (5%)	9 (2%)	11	46

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	487	VAL
1	A	627	MET
1	B	523	PRO

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Mol	Chain	Res	Type
1	A	629	ASP
1	A	594	ASP
1	A	721	LEU
1	B	594	ASP
1	B	629	ASP
1	A	523	PRO

5.3.2 Protein sidechains ⓘ

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	230/271 (85%)	212 (92%)	18 (8%)	16	49
1	B	232/271 (86%)	208 (90%)	24 (10%)	9	33
All	All	462/542 (85%)	420 (91%)	42 (9%)	12	41

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	461	GLN
1	A	463	ILE
1	A	486	ASN
1	A	488	THR
1	A	491	THR
1	A	494	GLN
1	A	506	ARG
1	A	511	VAL
1	A	541	LEU
1	A	584	LEU
1	A	587	ASP
1	A	588	LEU
1	A	623	GLU
1	A	631	ASN
1	A	660	ASN
1	A	668	MET
1	A	674	LEU

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Mol	Chain	Res	Type
1	A	684	ASN
1	B	482	VAL
1	B	486	ASN
1	B	493	GLN
1	B	522	LYS
1	B	535	SER
1	B	541	LEU
1	B	547	LYS
1	B	552	LYS
1	B	575	ARG
1	B	577	LEU
1	B	584	LEU
1	B	588	LEU
1	B	589	THR
1	B	599	THR
1	B	620	MET
1	B	623	GLU
1	B	628	GLN
1	B	631	ASN
1	B	645	VAL
1	B	658	ASN
1	B	660	ASN
1	B	674	LEU
1	B	684	ASN
1	B	687	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	461	GLN
1	A	486	ASN
1	A	494	GLN
1	A	580	ASN
1	A	660	ASN
1	A	684	ASN
1	B	486	ASN
1	B	524	GLN
1	B	585	HIS
1	B	631	ASN
1	B	658	ASN
1	B	660	ASN
1	B	684	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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

2 ligands are 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	FNI	A	727	-	30,34,34	1.68	5 (16%)	36,48,48	2.35	7 (19%)
2	FNI	B	727	-	30,34,34	1.57	5 (16%)	36,48,48	2.31	8 (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	FNI	A	727	-	-	0/8/12/12	0/4/5/5
2	FNI	B	727	-	-	0/8/12/12	0/4/5/5

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	727	FNI	C8-C10	-4.47	1.42	1.49

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	727	FNI	C8-C10	-3.58	1.44	1.49
2	A	727	FNI	C12-N11	-3.03	1.34	1.40
2	B	727	FNI	C12-N11	-2.69	1.35	1.40
2	A	727	FNI	C20-C21	2.11	1.41	1.36
2	B	727	FNI	C20-C21	2.12	1.41	1.36
2	A	727	FNI	C14-C13	2.26	1.41	1.36
2	B	727	FNI	C14-C13	2.30	1.41	1.36
2	B	727	FNI	C6-C1	4.34	1.41	1.36
2	A	727	FNI	C6-C1	4.37	1.41	1.36

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	727	FNI	C6-C5-C9	-10.08	129.54	135.48
2	B	727	FNI	C6-C5-C9	-9.93	129.64	135.48
2	A	727	FNI	C1-C6-C5	-3.04	116.92	119.80
2	B	727	FNI	C6-C5-C4	-2.72	118.80	120.33
2	B	727	FNI	C1-C6-C5	-2.69	117.25	119.80
2	B	727	FNI	N28-C27-N26	-2.26	125.53	127.88
2	A	727	FNI	C30-C29-N28	-2.26	119.70	123.64
2	A	727	FNI	O22-C10-C8	-2.05	118.24	121.01
2	B	727	FNI	N24-C25-N26	2.17	121.09	114.83
2	A	727	FNI	O23-C18-C15	2.84	120.31	116.20
2	B	727	FNI	O23-C18-C15	2.89	120.38	116.20
2	B	727	FNI	C9-N11-C12	3.21	136.31	124.89
2	A	727	FNI	C9-N11-C12	3.51	137.38	124.89
2	A	727	FNI	C9-C5-C4	4.42	111.22	105.94
2	B	727	FNI	C9-C5-C4	4.71	111.57	105.94

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	727	FNI	1	0
2	B	727	FNI	1	0

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

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

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	262/307 (85%)	-0.04	3 (1%) 82 58	52, 62, 82, 96	0
1	B	264/307 (85%)	-0.03	5 (1%) 70 41	51, 67, 83, 97	0
All	All	526/614 (85%)	-0.04	8 (1%) 76 49	51, 64, 83, 97	0

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	722	PRO	5.0
1	A	723	LYS	4.9
1	B	448	ASP	4.8
1	B	723	LYS	4.1
1	B	614	SER	3.9
1	A	448	ASP	3.9
1	B	722	PRO	3.7
1	B	454	ASP	2.1

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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains.

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	LLDF	B-factors(\AA^2)	Q<0.9
2	FNI	A	727	30/30	0.92	0.28	1.72	69,71,75,75	0
2	FNI	B	727	30/30	0.91	0.20	-0.28	62,65,69,70	0

6.5 Other polymers [i](#)

There are no such residues in this entry.