Full wwPDB X-ray Structure Validation Report (i)

Sep 13, 2023 – 10:10 AM EDT

PDB ID	:	4ORZ
Title	:	HIV-1 Nef protein in complex with single domain antibody sdAb19 and an engineered Hck SH3 domain
Authors	:	Geyer, M.; Lulf, S.
Deposited on	:	2014-02-12
Resolution	:	2.00 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
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 (1)) were used in the production of this report:

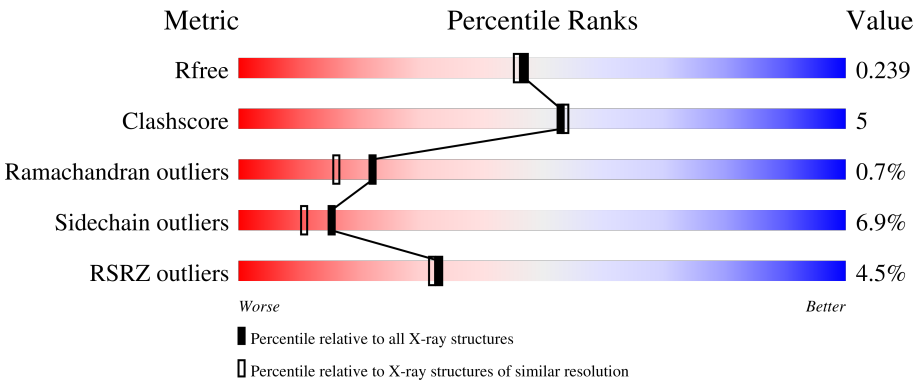
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 2.00 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}	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 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	67	3% 70% 10% • 16%
2	B	145	2% 77% • 19%
3	C	120	7% 71% 18% 5% • 5%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 2455 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 Tyrosine-protein kinase HCK.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	56	465	305	74	85	1	0	0	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	72	GLY	-	expression tag	UNP P08631
A	73	ALA	-	expression tag	UNP P08631
A	74	HIS	-	expression tag	UNP P08631
A	75	MET	-	expression tag	UNP P08631
A	76	GLY	-	expression tag	UNP P08631
A	90	TYR	GLU	engineered mutation	UNP P08631
A	91	SER	ALA	engineered mutation	UNP P08631
A	92	PRO	ILE	engineered mutation	UNP P08631
A	93	PHE	HIS	engineered mutation	UNP P08631
A	94	SER	HIS	engineered mutation	UNP P08631
A	95	TRP	GLU	engineered mutation	UNP P08631

- Molecule 2 is a protein called Protein Nef.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	117	991	656	167	165	3	0	0	0

There are 25 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	47	MET	ILE	engineered mutation	UNP P03407
B	48	ALA	THR	engineered mutation	UNP P03407
B	59	SER	CYS	engineered mutation	UNP P03407
B	?	-	GLU	deletion	UNP P03407
B	?	-	GLU	deletion	UNP P03407

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	ALA	deletion	UNP P03407
B	?	-	ASN	deletion	UNP P03407
B	?	-	GLU	deletion	UNP P03407
B	?	-	GLY	deletion	UNP P03407
B	?	-	GLU	deletion	UNP P03407
B	?	-	ASN	deletion	UNP P03407
B	?	-	ASN	deletion	UNP P03407
B	?	-	SER	deletion	UNP P03407
B	?	-	LEU	deletion	UNP P03407
B	?	-	LEU	deletion	UNP P03407
B	?	-	HIS	deletion	UNP P03407
B	?	-	PRO	deletion	UNP P03407
B	?	-	MET	deletion	UNP P03407
B	?	-	SER	deletion	UNP P03407
B	?	-	LEU	deletion	UNP P03407
B	?	-	HIS	deletion	UNP P03407
B	?	-	GLY	deletion	UNP P03407
B	?	-	MET	deletion	UNP P03407
B	?	-	GLU	deletion	UNP P03407
B	210	ALA	CYS	engineered mutation	UNP P03407

- Molecule 3 is a protein called single domain antibody sdAb19.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	114	874	546	155	169	4	0	0	0

- Molecule 4 is water.

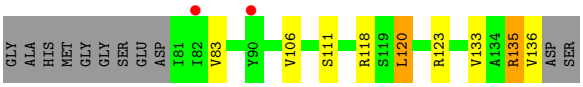
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	10	10	10	0	0
			Total	O		
4	B	91	91	91	0	0
			Total	O		
4	C	24	24	24	0	0

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.

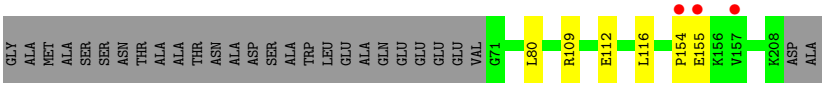
- Molecule 1: Tyrosine-protein kinase HCK

Chain A:



- Molecule 2: Protein Nef

Chain B:



- Molecule 3: single domain antibody sdAb19

Chain C:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 41	Depositor
Cell constants a, b, c, α, β, γ	73.00Å 73.00Å 71.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.75 – 2.00 41.75 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.9 (41.75-2.00) 98.9 (41.75-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.93 (at 2.00Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.1_1168)	Depositor
R, R_{free}	0.202 , 0.236 0.203 , 0.239	Depositor DCC
R_{free} test set	1252 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	29.9	Xtriage
Anisotropy	0.306	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 42.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.020 for -h,-l,-k 0.006 for -h,l,k 0.005 for l,-k,h 0.024 for -l,-k,-h 0.048 for h,-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	2455	wwPDB-VP
Average B, all atoms (Å^2)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.12% 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 (i)

5.1 Standard geometry (i)

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	0.40	0/479	0.53	0/651
2	B	0.45	0/1030	0.55	0/1401
3	C	0.41	0/890	0.70	3/1203 (0.2%)
All	All	0.43	0/2399	0.61	3/3255 (0.1%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	29	PHE	N-CA-C	-7.11	91.79	111.00
3	C	28	GLY	N-CA-C	-6.23	97.53	113.10
3	C	39	LEU	CA-CB-CG	6.21	129.58	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	465	0	448	5	0
2	B	991	0	967	2	0
3	C	874	0	852	18	0
4	A	10	0	0	0	0
4	B	91	0	0	1	0
4	C	24	0	0	3	0
All	All	2455	0	2267	25	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 5.

All (25) 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)
3:C:99:ARG:NH1	3:C:106:ASP:OD2	2.12	0.82
2:B:109:ARG:NH1	2:B:112:GLU:OE2	2.18	0.77
3:C:28:GLY:HA3	3:C:29:PHE:HB3	1.68	0.75
3:C:39:LEU:HD13	3:C:49:TRP:HA	1.79	0.63
3:C:66:LYS:HG3	3:C:68:ARG:HG3	1.80	0.62
4:B:390:HOH:O	3:C:63:ASP:OD1	2.17	0.60
3:C:15:GLN:HG3	4:C:220:HOH:O	2.05	0.56
3:C:5:GLN:N	3:C:27:SER:HG	2.03	0.56
3:C:65:VAL:C	3:C:66:LYS:HG2	2.29	0.53
3:C:65:VAL:HG13	3:C:69:PHE:HB2	1.91	0.53
1:A:83:VAL:HG12	1:A:133:VAL:HB	1.92	0.52
3:C:26:ALA:HB1	3:C:29:PHE:HE2	1.77	0.49
1:A:83:VAL:CG1	1:A:133:VAL:HB	2.42	0.49
3:C:17:GLY:O	4:C:202:HOH:O	2.20	0.48
1:A:106:VAL:HG23	1:A:120:LEU:HD11	1.98	0.45
3:C:42:ALA:HB1	3:C:43:PRO:HD2	1.98	0.45
1:A:118:ARG:HD3	1:A:123:ARG:HG3	1.98	0.44
2:B:154:PRO:HA	2:B:155:GLU:HA	1.78	0.44
3:C:54:THR:HB	3:C:58:TYR:O	2.17	0.44
3:C:79:THR:HG23	4:C:209:HOH:O	2.17	0.44
1:A:135:ARG:HG3	1:A:136:VAL:N	2.32	0.43
3:C:74:ASP:HB3	3:C:79:THR:HG22	1.99	0.43
3:C:63:ASP:C	3:C:65:VAL:H	2.22	0.43
3:C:66:LYS:NZ	3:C:66:LYS:HB3	2.33	0.42
3:C:54:THR:O	3:C:57:GLY:N	2.52	0.42

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	54/67 (81%)	52 (96%)	2 (4%)	0	100	100
2	B	115/145 (79%)	114 (99%)	1 (1%)	0	100	100
3	C	112/120 (93%)	102 (91%)	8 (7%)	2 (2%)	8	3
All	All	281/332 (85%)	268 (95%)	11 (4%)	2 (1%)	22	16

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	29	PHE
3	C	64	SER

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	49/56 (88%)	46 (94%)	3 (6%)	18	14
2	B	104/123 (85%)	102 (98%)	2 (2%)	57	61
3	C	92/95 (97%)	80 (87%)	12 (13%)	4	2
All	All	245/274 (89%)	228 (93%)	17 (7%)	15	11

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	111	SER
1	A	120	LEU
1	A	135	ARG
2	B	80	LEU
2	B	116	LEU
3	C	22	LEU
3	C	29	PHE
3	C	39	LEU
3	C	46	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
3	C	47	ARG
3	C	54	THR
3	C	65	VAL
3	C	66	LYS
3	C	75	ASN
3	C	79	THR
3	C	80	VAL
3	C	99	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

There are no ligands in this entry.

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 (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	56/67 (83%)	0.10	2 (3%)	42	42	25, 42, 51, 56	0
2	B	117/145 (80%)	-0.14	3 (2%)	56	54	19, 26, 54, 60	0
3	C	114/120 (95%)	0.30	8 (7%)	16	15	24, 37, 63, 68	0
All	All	287/332 (86%)	0.08	13 (4%)	33	32	19, 33, 58, 68	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	157	VAL	5.6
2	B	155	GLU	4.4
3	C	76	ALA	4.2
1	A	90	TYR	3.8
3	C	29	PHE	3.3
3	C	28	GLY	3.2
3	C	27	SER	3.1
2	B	154	PRO	3.1
3	C	26	ALA	2.9
1	A	82	ILE	2.5
3	C	108	TRP	2.3
3	C	30	THR	2.2
3	C	75	ASN	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 monosaccharides in this entry.

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.