



wwPDB X-ray Structure Validation Summary Report ⓘ

May 24, 2020 – 11:57 am BST

PDB ID : 4O51
Title : Crystal structure of the QAA variant of anti-hinge rabbit antibody 2095-2 in complex with IDES hinge peptide
Authors : Malia, T.J.; Luo, J.; Teplyakov, A.; Gilliland, G.L.
Deposited on : 2013-12-19
Resolution : 2.20 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
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)	:	2.11

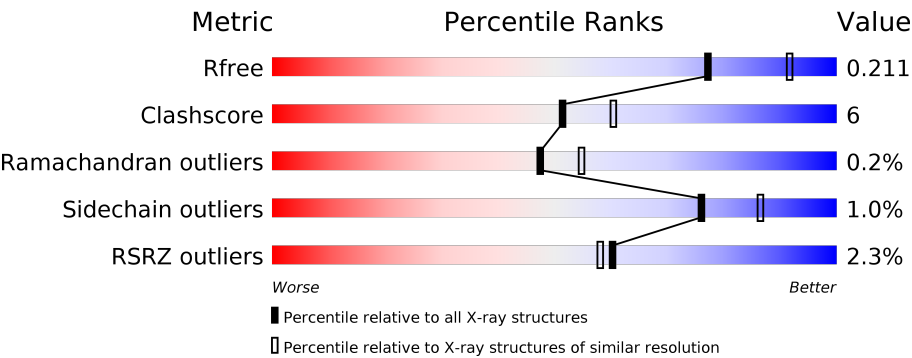
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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 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	216	<div><div>%</div><div><div></div><div>88%</div><div>12%</div></div></div>
1	C	216	<div><div>%</div><div><div></div><div>88%</div><div>11%</div></div></div>
1	E	216	<div><div></div><div><div></div><div>86%</div><div>13%</div></div></div>
1	L	216	<div><div></div><div><div></div><div>87%</div><div>13%</div></div></div>
2	B	223	<div><div>2%</div><div><div></div><div>81%</div><div>14%</div><div></div></div></div>
2	D	223	<div><div>4%</div><div><div></div><div>81%</div><div>15%</div><div></div></div></div>

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Mol	Chain	Length	Quality of chain
2	F	223	<div><div></div><div>4%</div><div>82%</div><div>14%</div><div></div></div>
2	H	223	<div><div></div><div>3%</div><div>82%</div><div>13%</div><div></div></div>
3	M	14	<div><div></div><div>7%</div><div>36%</div><div>7%</div><div>57%</div><div></div></div>
3	N	14	<div><div></div><div>7%</div><div>29%</div><div>14%</div><div>57%</div><div></div></div>
3	O	14	<div><div></div><div>7%</div><div>21%</div><div>21%</div><div>57%</div><div></div></div>
3	P	14	<div><div></div><div>7%</div><div>29%</div><div>14%</div><div>57%</div><div></div></div>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 13803 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 QAA-2095-2 light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	215	Total	C	N	O	S	0	0	0
			1624	1014	274	332	4			
1	A	215	Total	C	N	O	S	0	0	0
			1624	1014	274	332	4			
1	C	215	Total	C	N	O	S	0	0	0
			1624	1014	274	332	4			
1	E	215	Total	C	N	O	S	0	0	0
			1624	1014	274	332	4			

- Molecule 2 is a protein called QAA-2095-2 heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	214	Total	C	N	O	S	0	0	0
			1578	1001	259	313	5			
2	B	214	Total	C	N	O	S	0	0	0
			1578	1001	259	313	5			
2	D	214	Total	C	N	O	S	0	0	0
			1578	1001	259	313	5			
2	F	214	Total	C	N	O	S	0	0	0
			1578	1001	259	313	5			

- Molecule 3 is a protein called IDES hinge peptide.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	M	6	Total	C	N	O	0	0	0
			42	27	6	9			
3	N	6	Total	C	N	O	0	0	0
			42	27	6	9			
3	O	6	Total	C	N	O	0	0	0
			42	27	6	9			
3	P	6	Total	C	N	O	0	0	0
			42	27	6	9			

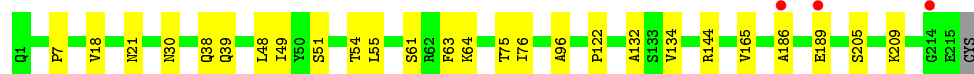
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	L	117	Total 117	O 117	0	0
4	H	116	Total 116	O 116	0	0
4	M	4	Total 4	O 4	0	0
4	A	82	Total 82	O 82	0	0
4	B	94	Total 94	O 94	0	0
4	N	1	Total 1	O 1	0	0
4	C	99	Total 99	O 99	0	0
4	D	97	Total 97	O 97	0	0
4	O	1	Total 1	O 1	0	0
4	E	108	Total 108	O 108	0	0
4	F	106	Total 106	O 106	0	0
4	P	2	Total 2	O 2	0	0

- Molecule 1: QAA-2095-2 light chain

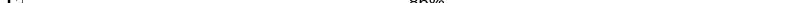


- Chain A:  88% 12%




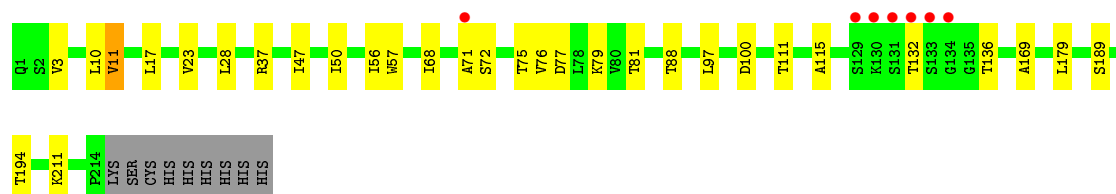
- Chain C:  88% 11%



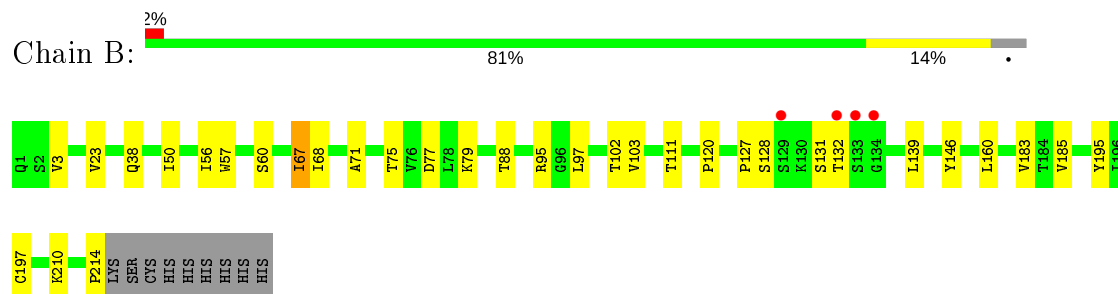
- Chain E:  86% 13%



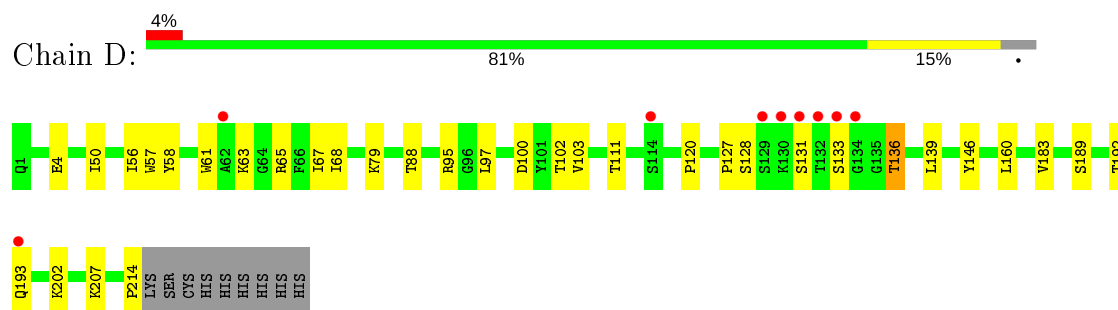
- Chain H:  3% 82% 13% .



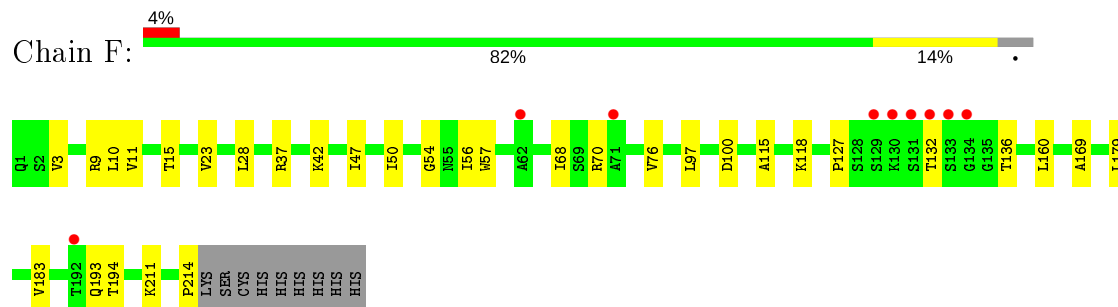
- Molecule 2: QAA-2095-2 heavy chain



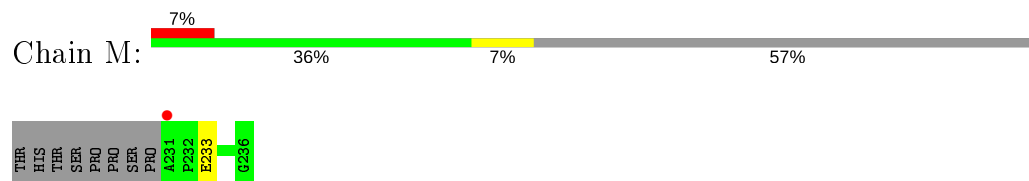
- Molecule 2: QAA-2095-2 heavy chain



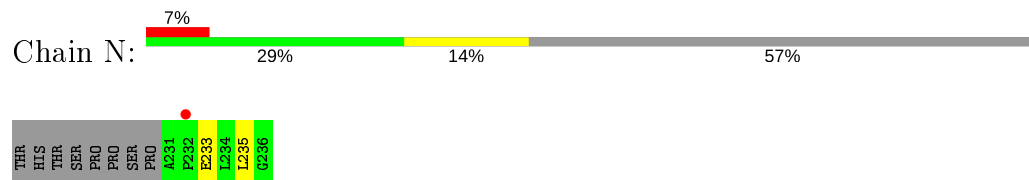
- Molecule 2: QAA-2095-2 heavy chain



- Molecule 3: IDES hinge peptide

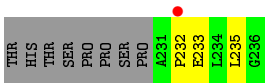


- Molecule 3: IDES hinge peptide

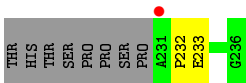


- Molecule 3: IDES hinge peptide





● Molecule 3: IDES hinge peptide



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	128.51Å 93.87Å 74.73Å 90.00° 90.04° 90.00°	Depositor
Resolution (Å)	48.74 – 2.20 48.74 – 2.20	Depositor EDS
% Data completeness (in resolution range)	89.0 (48.74-2.20) 88.9 (48.74-2.20)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.36 (at 2.20Å)	Xtriage
Refinement program	PHENIX (phenix.refine: dev_1232)	Depositor
R, R_{free}	0.182 , 0.213 0.185 , 0.211	Depositor DCC
R_{free} test set	2000 reflections (2.51%)	wwPDB-VP
Wilson B-factor (Å ²)	39.0	Xtriage
Anisotropy	0.351	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 36.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.23$	Xtriage
Estimated twinning fraction	0.436 for -h,-k,l	Xtriage
Reported twinning fraction	0.450 for -h,-k,l	Depositor
Outliers	0 of 79799 reflections	Xtriage
F_o, F_c correlation	0.98	EDS
Total number of atoms	13803	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 99.21 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.2972e-12. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical 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 [i](#)

5.1 Standard geometry [i](#)

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

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	0/1650	0.51	0/2246
1	C	0.38	0/1650	0.52	0/2246
1	E	0.40	0/1650	0.52	0/2246
1	L	0.38	0/1650	0.52	0/2246
2	B	0.36	0/1613	0.53	0/2212
2	D	0.34	0/1613	0.52	0/2212
2	F	0.36	0/1613	0.54	0/2212
2	H	0.35	0/1613	0.54	0/2212
3	M	0.31	0/42	0.48	0/55
3	N	0.42	0/42	0.53	0/55
3	O	0.54	0/42	0.65	0/55
3	P	0.31	0/42	0.41	0/55
All	All	0.37	0/13220	0.53	0/18052

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 [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	1624	0	1572	15	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	1624	0	1572	17	0
1	E	1624	0	1572	20	0
1	L	1624	0	1572	17	0
2	B	1578	0	1552	18	0
2	D	1578	0	1552	24	0
2	F	1578	0	1552	22	0
2	H	1578	0	1552	17	0
3	M	42	0	42	1	0
3	N	42	0	42	2	0
3	O	42	0	42	4	0
3	P	42	0	42	2	0
4	A	82	0	0	0	0
4	B	94	0	0	1	0
4	C	99	0	0	2	0
4	D	97	0	0	2	0
4	E	108	0	0	3	0
4	F	106	0	0	2	0
4	H	116	0	0	1	0
4	L	117	0	0	2	0
4	M	4	0	0	0	0
4	N	1	0	0	0	0
4	O	1	0	0	0	0
4	P	2	0	0	0	0
All	All	13803	0	12664	143	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.

The worst 5 of 143 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)
2:H:72:SER:OG	2:H:75:THR:N	2.21	0.74
2:B:50:ILE:HG12	2:B:56:ILE:HG12	1.74	0.69
1:L:151:LYS:NZ	1:L:197:GLU:OE1	2.25	0.69
1:E:151:LYS:NZ	1:E:197:GLU:OE1	2.25	0.69
2:F:118:LYS:NZ	4:F:353:HOH:O	2.25	0.69

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	213/216 (99%)	204 (96%)	9 (4%)	0	100	100
1	C	213/216 (99%)	205 (96%)	8 (4%)	0	100	100
1	E	213/216 (99%)	202 (95%)	11 (5%)	0	100	100
1	L	213/216 (99%)	202 (95%)	11 (5%)	0	100	100
2	B	212/223 (95%)	204 (96%)	7 (3%)	1 (0%)	29	31
2	D	212/223 (95%)	205 (97%)	6 (3%)	1 (0%)	29	31
2	F	212/223 (95%)	205 (97%)	6 (3%)	1 (0%)	29	31
2	H	212/223 (95%)	206 (97%)	5 (2%)	1 (0%)	29	31
3	M	4/14 (29%)	4 (100%)	0	0	100	100
3	N	4/14 (29%)	4 (100%)	0	0	100	100
3	O	4/14 (29%)	4 (100%)	0	0	100	100
3	P	4/14 (29%)	4 (100%)	0	0	100	100
All	All	1716/1812 (95%)	1649 (96%)	63 (4%)	4 (0%)	47	55

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	97	LEU
2	B	97	LEU
2	D	97	LEU
2	F	97	LEU

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	181/182 (100%)	178 (98%)	3 (2%)	60	74
1	C	181/182 (100%)	180 (99%)	1 (1%)	86	93
1	E	181/182 (100%)	180 (99%)	1 (1%)	86	93
1	L	181/182 (100%)	179 (99%)	2 (1%)	73	85
2	B	179/188 (95%)	176 (98%)	3 (2%)	60	74
2	D	179/188 (95%)	177 (99%)	2 (1%)	73	85
2	F	179/188 (95%)	178 (99%)	1 (1%)	86	93
2	H	179/188 (95%)	178 (99%)	1 (1%)	86	93
3	M	4/12 (33%)	4 (100%)	0	100	100
3	N	4/12 (33%)	4 (100%)	0	100	100
3	O	4/12 (33%)	4 (100%)	0	100	100
3	P	4/12 (33%)	4 (100%)	0	100	100
All	All	1456/1528 (95%)	1442 (99%)	14 (1%)	76	86

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	60	SER
2	B	67	ILE
2	D	192	THR
1	A	205	SER
2	D	136	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	L	71	GLN
1	A	21	ASN
1	A	23	GLN
1	A	71	GLN
1	E	201	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

8 non-standard protein/DNA/RNA residues 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	PCA	B	1	2	7,8,9	1.80	1 (14%)	9,10,12	2.25	5 (55%)
2	PCA	D	1	2	7,8,9	1.79	1 (14%)	9,10,12	2.22	5 (55%)
2	PCA	F	1	2	7,8,9	1.80	1 (14%)	9,10,12	2.38	6 (66%)
1	PCA	L	1	1	7,8,9	1.81	1 (14%)	9,10,12	2.07	4 (44%)
2	PCA	H	1	2	7,8,9	1.80	1 (14%)	9,10,12	2.33	5 (55%)
1	PCA	E	1	1	7,8,9	1.82	1 (14%)	9,10,12	2.09	5 (55%)
1	PCA	C	1	1	7,8,9	1.78	1 (14%)	9,10,12	2.10	5 (55%)
1	PCA	A	1	1	7,8,9	1.77	1 (14%)	9,10,12	2.11	5 (55%)

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	PCA	B	1	2	-	0/0/11/13	0/1/1/1
2	PCA	D	1	2	-	0/0/11/13	0/1/1/1
2	PCA	F	1	2	-	0/0/11/13	0/1/1/1
1	PCA	L	1	1	-	0/0/11/13	0/1/1/1
2	PCA	H	1	2	-	0/0/11/13	0/1/1/1
1	PCA	E	1	1	-	0/0/11/13	0/1/1/1
1	PCA	C	1	1	-	0/0/11/13	0/1/1/1
1	PCA	A	1	1	-	0/0/11/13	0/1/1/1

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	L	1	PCA	CD-N	4.66	1.46	1.34
2	B	1	PCA	CD-N	4.65	1.46	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	1	PCA	CD-N	4.65	1.46	1.34
2	D	1	PCA	CD-N	4.63	1.46	1.34
1	A	1	PCA	CD-N	4.62	1.46	1.34

The worst 5 of 40 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	1	PCA	CB-CA-C	-3.75	107.55	112.70
2	H	1	PCA	CB-CA-C	-3.72	107.59	112.70
2	B	1	PCA	OE-CD-CG	-3.17	121.22	126.76
2	B	1	PCA	CB-CA-C	-3.11	108.43	112.70
1	A	1	PCA	OE-CD-CG	-3.09	121.36	126.76

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no carbohydrates 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	214/216 (99%)	-0.28	3 (1%) 75 73	21, 43, 70, 126	0
1	C	214/216 (99%)	-0.24	3 (1%) 75 73	21, 43, 69, 120	0
1	E	214/216 (99%)	-0.38	0 100 100	20, 36, 56, 69	0
1	L	214/216 (99%)	-0.42	0 100 100	23, 36, 56, 72	0
2	B	213/223 (95%)	-0.32	4 (1%) 66 65	20, 36, 69, 138	0
2	D	213/223 (95%)	-0.24	9 (4%) 36 34	21, 36, 73, 160	0
2	F	213/223 (95%)	-0.26	9 (4%) 36 34	20, 36, 67, 182	0
2	H	213/223 (95%)	-0.23	7 (3%) 46 44	21, 36, 72, 161	0
3	M	6/14 (42%)	0.82	1 (16%) 1 1	42, 52, 69, 106	0
3	N	6/14 (42%)	1.01	1 (16%) 1 1	53, 62, 78, 89	0
3	O	6/14 (42%)	1.04	1 (16%) 1 1	49, 58, 68, 87	0
3	P	6/14 (42%)	1.09	1 (16%) 1 1	38, 50, 55, 97	0
All	All	1732/1812 (95%)	-0.28	39 (2%) 60 58	20, 38, 69, 182	0

The worst 5 of 39 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	131	SER	6.8
3	P	231	ALA	6.1
2	F	131	SER	5.7
2	H	132	THR	5.7
3	M	231	ALA	5.4

6.2 Non-standard residues in protein, DNA, RNA chains [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, 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
2	PCA	F	1	8/9	0.90	0.16	39,47,52,56	0
2	PCA	B	1	8/9	0.91	0.18	41,46,47,48	0
1	PCA	A	1	8/9	0.93	0.12	27,34,43,53	0
2	PCA	H	1	8/9	0.94	0.12	41,49,52,58	0
1	PCA	C	1	8/9	0.94	0.12	30,36,45,52	0
2	PCA	D	1	8/9	0.94	0.13	39,52,54,55	0
1	PCA	L	1	8/9	0.95	0.10	30,32,34,37	0
1	PCA	E	1	8/9	0.96	0.10	29,31,35,36	0

6.3 Carbohydrates [i](#)

There are no carbohydrates 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.