



wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 2, 2017 – 08:42 PM EDT

PDB ID : 1XDK
Title : Crystal Structure of the RARbeta/RXRalpha Ligand Binding Domain Heterodimer in Complex with 9-cis Retinoic Acid and a Fragment of the TRAP220 Coactivator
Authors : Pogenberg, V.; Guichou, J.F.; Vivat-Hannah, V.; Kammerer, S.; Perez, E.; Germain, P.; De Lera, A.R.; Gronemeyer, H.; Royer, C.A.; Bourguet, W.
Deposited on : unknown
Resolution : 2.90 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

<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	:	1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20030345
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
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)	:	rb-20030345

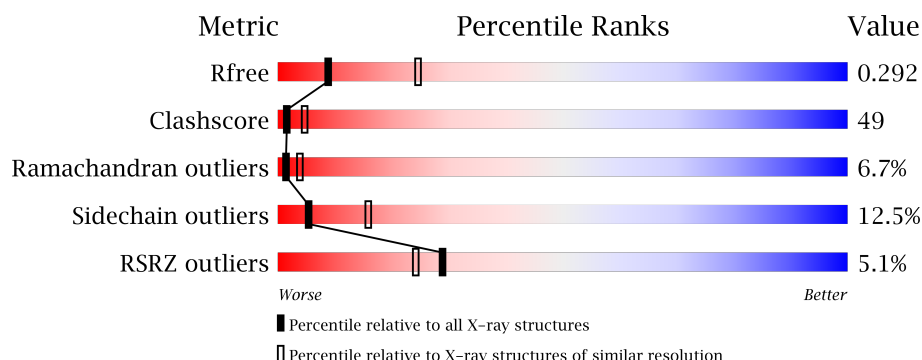
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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.




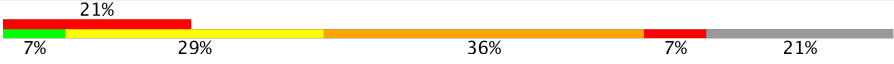

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	100719	1586 (2.90-2.90)
Clashscore	112137	1807 (2.90-2.90)
Ramachandran outliers	110173	1768 (2.90-2.90)
Sidechain outliers	110143	1770 (2.90-2.90)
RSRZ outliers	101464	1596 (2.90-2.90)

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	238	<div> <div>4%</div> <div> <div></div> <div>33%</div> <div>46%</div> <div>12%</div> <div>9%</div> </div> </div>
1	E	238	<div> <div>4%</div> <div> <div></div> <div>32%</div> <div>46%</div> <div>13%</div> <div>9%</div> </div> </div>
2	B	303	<div> <div>3%</div> <div> <div></div> <div>33%</div> <div>39%</div> <div>9%</div> <div>19%</div> </div> </div>
2	F	303	<div> <div>4%</div> <div> <div></div> <div>32%</div> <div>40%</div> <div>8%</div> <div>19%</div> </div> </div>
3	C	14	<div> <div>21%</div> <div> <div>7%</div> <div>36%</div> <div>29%</div> <div>7%</div> <div>21%</div> </div> </div>

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Mol	Chain	Length	Quality of chain
3	D	14	
3	G	14	
3	H	14	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7682 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 Retinoic acid receptor RXR-alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	217	Total	C	N	O	S	0	0	0
			1700	1091	290	309	10			
1	E	217	Total	C	N	O	S	0	0	0
			1700	1091	290	309	10			

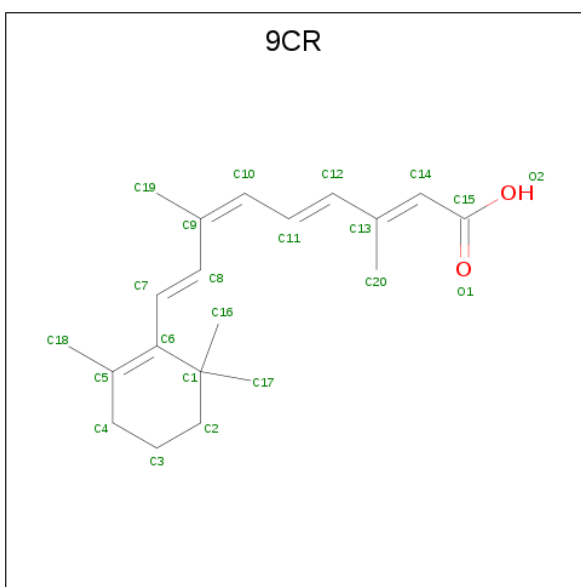
- Molecule 2 is a protein called Retinoic acid receptor, beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	245	Total	C	N	O	S	0	0	0
			1919	1220	325	360	14			
2	F	245	Total	C	N	O	S	0	0	0
			1919	1220	325	360	14			

- Molecule 3 is a protein called Thyroid Receptor Associated Protein 220.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	11	Total	C	N	O	S	0	0	0
			90	57	16	15	2			
3	D	10	Total	C	N	O	S	0	0	0
			82	53	14	13	2			
3	G	11	Total	C	N	O	S	0	0	0
			90	57	16	15	2			
3	H	10	Total	C	N	O	S	0	0	0
			82	53	14	13	2			

- Molecule 4 is (9cis)-retinoic acid (three-letter code: 9CR) (formula: C₂₀H₂₈O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			22	20	2		
4	B	1	Total	C	O	0	0
			22	20	2		
4	E	1	Total	C	O	0	0
			22	20	2		
4	F	1	Total	C	O	0	0
			22	20	2		

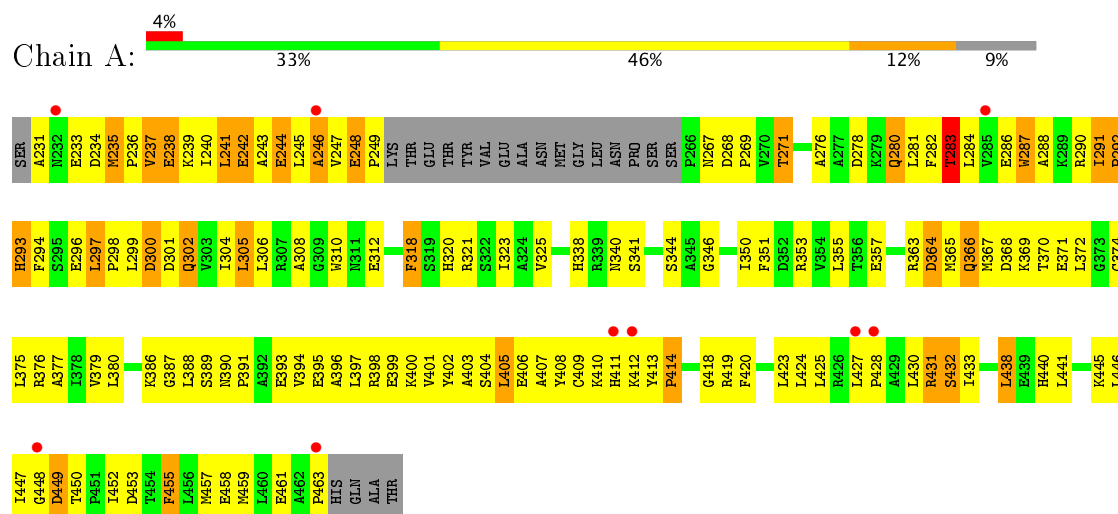
- Molecule 5 is water.

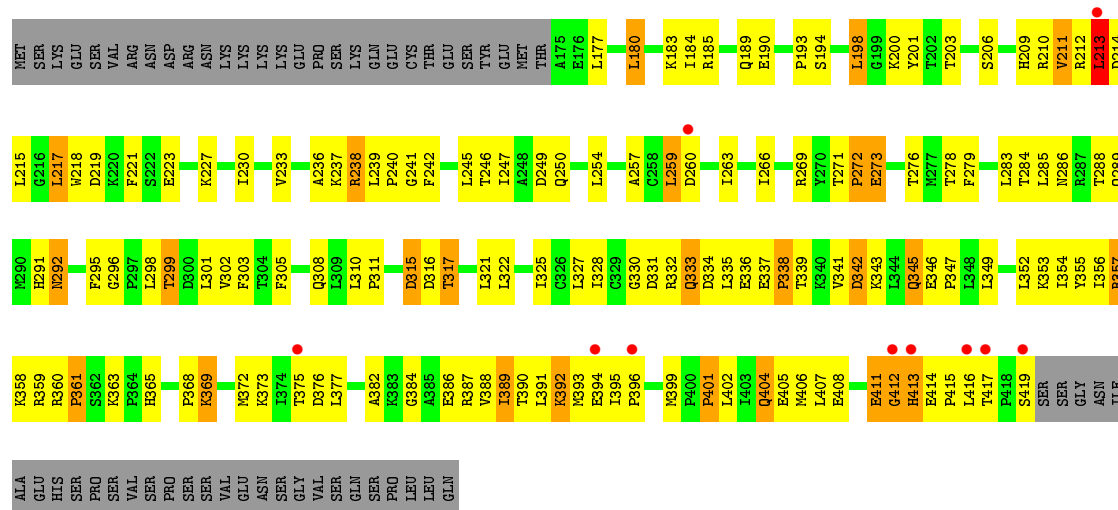
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	4	Total	O	0	0
			4	4		
5	B	2	Total	O	0	0
			2	2		
5	E	4	Total	O	0	0
			4	4		
5	F	2	Total	O	0	0
			2	2		

3 Residue-property plots

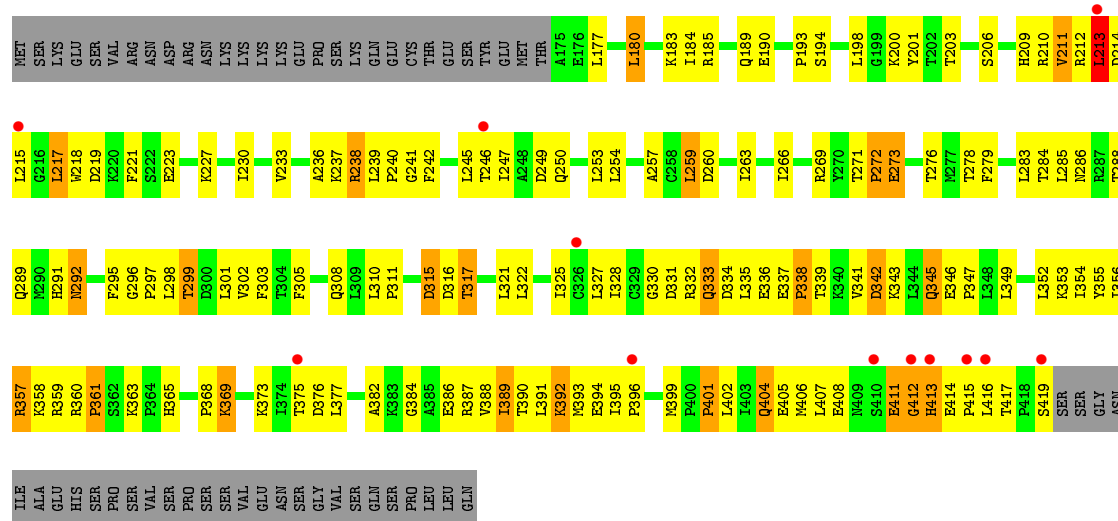
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are 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.

• Molecule 1: Retinoic acid receptor RXR-alpha

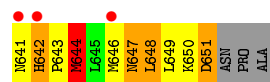




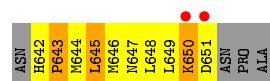
• Molecule 2: Retinoic acid receptor, beta



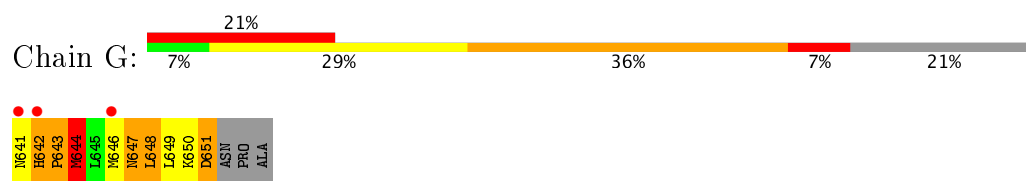
• Molecule 3: Thyroid Receptor Associated Protein 220



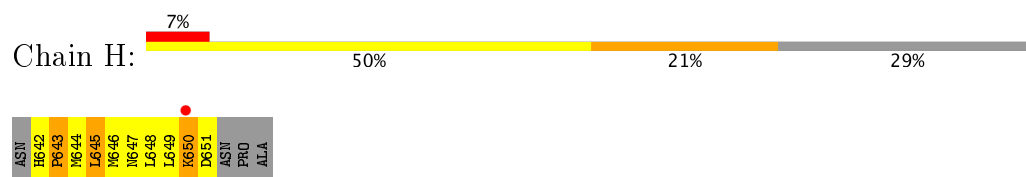
• Molecule 3: Thyroid Receptor Associated Protein 220



● Molecule 3: Thyroid Receptor Associated Protein 220



● Molecule 3: Thyroid Receptor Associated Protein 220



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	115.70Å 115.70Å 247.20Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 2.90 37.43 – 2.90	Depositor EDS
% Data completeness (in resolution range)	99.6 (30.00-2.90) 99.5 (37.43-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.30 (at 2.90Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.253 , 0.296 0.253 , 0.292	Depositor DCC
R_{free} test set	1372 reflections (3.19%)	DCC
Wilson B-factor (Å ²)	74.0	Xtriage
Anisotropy	0.605	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 79.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	0.480 for -h,-k,l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7682	wwPDB-VP
Average B, all atoms (Å ²)	73.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.34% 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, 0.333 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: 9CR

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	0.74	0/1734	0.92	0/2345
1	E	0.73	0/1734	0.92	0/2345
2	B	0.64	0/1952	0.84	1/2638 (0.0%)
2	F	0.64	0/1952	0.84	1/2638 (0.0%)
3	C	0.58	0/91	1.06	0/121
3	D	0.57	0/83	0.70	0/110
3	G	0.59	0/91	1.06	0/121
3	H	0.59	0/83	0.69	0/110
All	All	0.68	0/7720	0.88	2/10428 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	213	LEU	CA-CB-CG	5.64	128.27	115.30
2	F	213	LEU	CA-CB-CG	5.59	128.16	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	1700	0	1728	189	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	1700	0	1728	191	0
2	B	1919	0	1979	191	0
2	F	1919	0	1979	190	0
3	C	90	0	93	17	0
3	D	82	0	87	12	0
3	G	90	0	93	19	0
3	H	82	0	87	12	0
4	A	22	0	27	3	0
4	B	22	0	27	3	0
4	E	22	0	27	2	0
4	F	22	0	27	3	0
5	A	4	0	0	0	0
5	B	2	0	0	0	0
5	E	4	0	0	1	0
5	F	2	0	0	0	0
All	All	7682	0	7882	768	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 49.

The worst 5 of 768 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:B:343:LYS:HA	2:B:346:GLU:HG3	1.26	1.16
2:F:343:LYS:HA	2:F:346:GLU:HG3	1.26	1.14
2:F:315:ASP:HB3	2:F:359:ARG:HH12	1.09	1.13
2:F:357:ARG:HH11	2:F:357:ARG:HG3	1.13	1.09
1:A:237:VAL:HG23	1:A:238:GLU:H	1.14	1.07

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	213/238 (90%)	165 (78%)	33 (16%)	15 (7%)	1	3
1	E	213/238 (90%)	163 (76%)	34 (16%)	16 (8%)	1	3
2	B	243/303 (80%)	200 (82%)	34 (14%)	9 (4%)	4	16
2	F	243/303 (80%)	202 (83%)	32 (13%)	9 (4%)	4	16
3	C	9/14 (64%)	2 (22%)	2 (22%)	5 (56%)	0	0
3	D	8/14 (57%)	5 (62%)	1 (12%)	2 (25%)	0	0
3	G	9/14 (64%)	2 (22%)	2 (22%)	5 (56%)	0	0
3	H	8/14 (57%)	5 (62%)	1 (12%)	2 (25%)	0	0
All	All	946/1138 (83%)	744 (79%)	139 (15%)	63 (7%)	1	4

5 of 63 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	238	GLU
1	A	287	TRP
1	A	448	GLY
2	B	412	GLY
3	C	643	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	184/204 (90%)	161 (88%)	23 (12%)	5	16
1	E	184/204 (90%)	160 (87%)	24 (13%)	5	15
2	B	216/274 (79%)	192 (89%)	24 (11%)	7	21
2	F	216/274 (79%)	192 (89%)	24 (11%)	7	21
3	C	11/13 (85%)	8 (73%)	3 (27%)	0	1
3	D	10/13 (77%)	8 (80%)	2 (20%)	1	4
3	G	11/13 (85%)	8 (73%)	3 (27%)	0	1
3	H	10/13 (77%)	8 (80%)	2 (20%)	1	4

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	842/1008 (84%)	737 (88%)	105 (12%)	5 16

5 of 105 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	642	HIS
1	E	271	THR
2	F	404	GLN
3	C	644	MET
1	E	239	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
3	D	642	HIS
1	E	302	GLN
2	F	250	GLN
3	C	641	ASN
2	F	365	HIS

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

4 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
4	9CR	A	500	-	19,22,22	2.27	6 (31%)	26,30,30	2.26	7 (26%)
4	9CR	B	600	-	19,22,22	2.53	3 (15%)	26,30,30	2.32	6 (23%)
4	9CR	E	1500	-	19,22,22	2.20	5 (26%)	26,30,30	2.24	7 (26%)
4	9CR	F	1600	-	19,22,22	2.62	4 (21%)	26,30,30	2.32	6 (23%)

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
4	9CR	A	500	-	-	0/13/32/32	0/1/1/1
4	9CR	B	600	-	-	0/13/32/32	0/1/1/1
4	9CR	E	1500	-	-	0/13/32/32	0/1/1/1
4	9CR	F	1600	-	-	0/13/32/32	0/1/1/1

The worst 5 of 18 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	600	9CR	C14-C13	-3.89	1.30	1.35
4	E	1500	9CR	C14-C13	-3.45	1.31	1.35
4	F	1600	9CR	C14-C13	-3.37	1.31	1.35
4	A	500	9CR	C14-C13	-3.01	1.31	1.35
4	E	1500	9CR	C8-C9	-2.99	1.39	1.45

The worst 5 of 26 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	1600	9CR	C18-C5-C4	-3.90	106.04	113.45
4	B	600	9CR	C18-C5-C4	-3.90	106.06	113.45
4	A	500	9CR	C18-C5-C4	-3.78	106.27	113.45
4	E	1500	9CR	C18-C5-C4	-3.66	106.51	113.45
4	A	500	9CR	C3-C4-C5	2.01	117.23	113.78

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	500	9CR	3	0
4	B	600	9CR	3	0
4	E	1500	9CR	2	0
4	F	1600	9CR	3	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 ⓘ

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	217/238 (91%)	0.23	9 (4%) 38 32	39, 71, 93, 104	0
1	E	217/238 (91%)	0.23	9 (4%) 38 32	40, 71, 92, 105	0
2	B	245/303 (80%)	0.27	10 (4%) 38 32	45, 75, 96, 104	0
2	F	245/303 (80%)	0.29	12 (4%) 30 26	44, 75, 96, 105	0
3	C	11/14 (78%)	1.75	3 (27%) 1 0	91, 96, 102, 103	0
3	D	10/14 (71%)	1.13	2 (20%) 1 1	91, 96, 101, 106	0
3	G	11/14 (78%)	1.65	3 (27%) 1 0	90, 97, 104, 104	0
3	H	10/14 (71%)	1.15	1 (10%) 8 6	92, 97, 102, 106	0
All	All	966/1138 (84%)	0.31	49 (5%) 29 24	39, 74, 97, 106	0

The worst 5 of 49 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	641	ASN	6.1
3	G	641	ASN	6.0
1	A	463	PRO	5.1
1	E	463	PRO	5.1
2	B	416	LEU	5.0

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

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
4	9CR	A	500	22/22	0.95	0.27	1.74	48,57,66,68	0
4	9CR	E	1500	22/22	0.96	0.27	1.71	48,57,69,71	0
4	9CR	B	600	22/22	0.96	0.27	1.14	69,72,76,77	0
4	9CR	F	1600	22/22	0.96	0.27	1.10	69,72,75,77	0

6.5 Other polymers [i](#)

There are no such residues in this entry.