



# wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 3, 2023 – 03:10 PM EDT

PDB ID : 3T5I  
Title : Structure of Fully modified farnesylated Rheb Peptide in complex with PDE6D  
Authors : Ismail, S.A.; Chen, Y.-X.; Wittinghofer, A.  
Deposited on : 2011-07-27  
Resolution : 2.10 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](mailto: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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
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

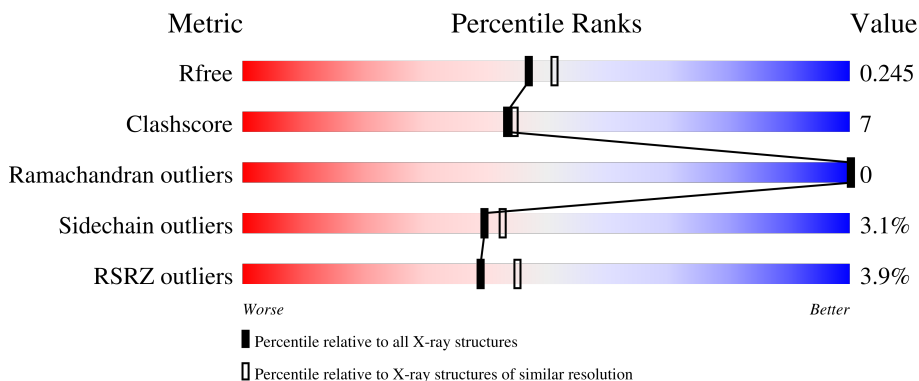
# 1 Overall quality at a glance

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))
$R_{free}$	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	152	 83% 15%
1	B	152	 82% 11% 7%
1	C	152	 86% 11%
1	D	152	 86% 12%
2	Q	9	 11% 22% 67%

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Mol	Chain	Length	Quality of chain
2	R	9	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	CMT	R	14	-	-	X	-

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5205 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 Retinal rod rhodopsin-sensitive cGMP 3',5'-cyclic phosphodiesterase subunit delta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	142	Total 1168	C 753	N 202	O 208	S 5	0	2	0
1	A	149	Total 1232	C 796	N 207	O 223	S 6	0	5	0
1	C	149	Total 1222	C 785	N 210	O 221	S 6	0	3	0
1	D	149	Total 1205	C 774	N 204	O 221	S 6	0	0	0

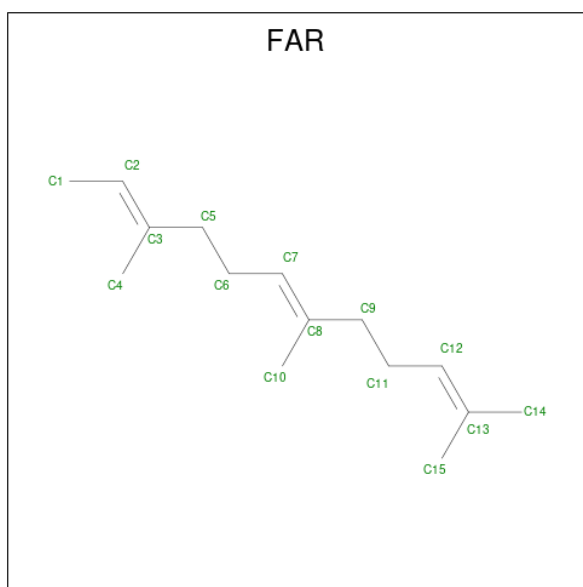
There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-1	GLY	-	expression tag	UNP O43924
B	0	SER	-	expression tag	UNP O43924
A	-1	GLY	-	expression tag	UNP O43924
A	0	SER	-	expression tag	UNP O43924
C	-1	GLY	-	expression tag	UNP O43924
C	0	SER	-	expression tag	UNP O43924
D	-1	GLY	-	expression tag	UNP O43924
D	0	SER	-	expression tag	UNP O43924

- Molecule 2 is a protein called C-terminal Farnesylated Rheb peptide CSQQGKSS(CMT).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	Q	3	Total 20	C 10	N 3	O 6	S 1	0	0	0
2	R	3	Total 20	C 10	N 3	O 6	S 1	0	0	0

- Molecule 3 is FARNESYL (three-letter code: FAR) (formula: C<sub>15</sub>H<sub>26</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total C 15 15	0	0
3	A	1	Total C 15 15	0	0
3	C	1	Total C 15 15	0	0
3	Q	1	Total C 15 15	0	0

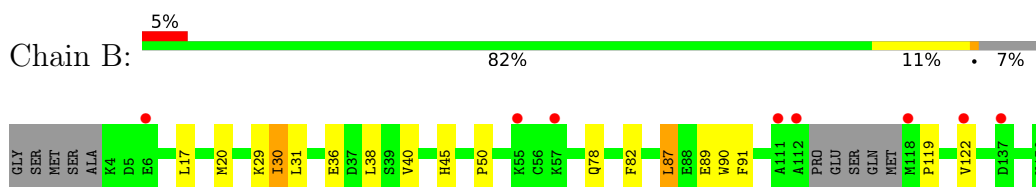
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	66	Total O 66 66	0	0
4	A	81	Total O 81 81	0	0
4	C	52	Total O 52 52	0	0
4	D	75	Total O 75 75	0	0
4	Q	1	Total O 1 1	0	0
4	R	3	Total O 3 3	0	0

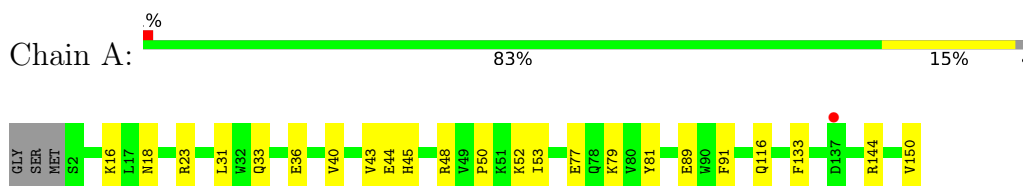
### 3 Residue-property plots [i](#)

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.

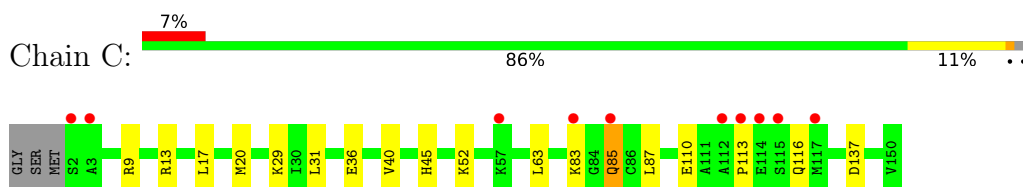
- Molecule 1: Retinal rod rhodopsin-sensitive cGMP 3',5'-cyclic phosphodiesterase subunit delta



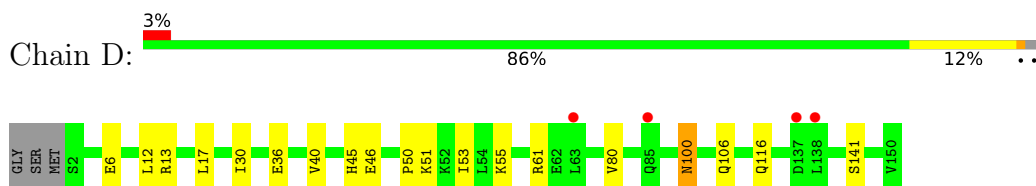
- Molecule 1: Retinal rod rhodopsin-sensitive cGMP 3',5'-cyclic phosphodiesterase subunit delta



- Molecule 1: Retinal rod rhodopsin-sensitive cGMP 3',5'-cyclic phosphodiesterase subunit delta



- Molecule 1: Retinal rod rhodopsin-sensitive cGMP 3',5'-cyclic phosphodiesterase subunit delta



- Molecule 2: C-terminal Farnesylated Rheb peptide CSQQGKSS(CMT)



- Molecule 2: C-terminal Farnesylated Rheb peptide CSQQGKSS(CMT)



CYS	S12
SER	S13
GLN	C14
GLY	
LYS	

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	65.75Å 70.05Å 71.23Å 90.00° 81.55° 90.00°	Depositor
Resolution (Å)	29.91 – 2.10 29.91 – 2.10	Depositor EDS
% Data completeness (in resolution range)	100.0 (29.91-2.10) 99.7 (29.91-2.10)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.96 (at 2.10Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.189 , 0.243 0.190 , 0.245	Depositor DCC
$R_{free}$ test set	1870 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	28.3	Xtrriage
Anisotropy	0.155	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 54.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	5205	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.20% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>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: FAR, CMT

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	0.57	0/1275	0.68	1/1717 (0.1%)
1	B	0.59	0/1198	0.66	0/1613
1	C	0.57	0/1257	0.67	0/1695
1	D	0.58	0/1231	0.67	0/1661
2	Q	1.22	0/11	0.76	0/13
2	R	0.17	0/11	0.19	0/13
All	All	0.58	0/4983	0.67	1/6712 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	23	ARG	NE-CZ-NH2	-5.84	117.38	120.30

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	1232	0	1240	17	0
1	B	1168	0	1169	14	0
1	C	1222	0	1216	14	0
1	D	1205	0	1190	16	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	Q	20	0	15	1	0
2	R	20	0	16	5	0
3	A	15	0	26	6	0
3	B	15	0	26	5	0
3	C	15	0	26	2	0
3	Q	15	0	24	0	0
4	A	81	0	0	0	0
4	B	66	0	0	0	0
4	C	52	0	0	4	0
4	D	75	0	0	4	0
4	Q	1	0	0	0	0
4	R	3	0	0	0	0
All	All	5205	0	4948	65	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 7.

The worst 5 of 65 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:A:2010:FAR:H13	2:R:14:CMT:SG	1.71	1.24
3:A:2010:FAR:H11	2:R:14:CMT:SG	1.81	1.10
1:A:33[A]:GLN:HE22	1:D:30:ILE:H	1.00	0.99
3:A:2010:FAR:H13	2:R:14:CMT:CB	2.05	0.87
1:A:33[A]:GLN:HE22	1:D:30:ILE:N	1.73	0.86

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	152/152 (100%)	149 (98%)	3 (2%)	0	100	100
1	B	140/152 (92%)	138 (99%)	2 (1%)	0	100	100
1	C	150/152 (99%)	144 (96%)	6 (4%)	0	100	100
1	D	147/152 (97%)	145 (99%)	2 (1%)	0	100	100
2	Q	1/9 (11%)	1 (100%)	0	0	100	100
2	R	1/9 (11%)	1 (100%)	0	0	100	100
All	All	591/626 (94%)	578 (98%)	13 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	135/136 (99%)	134 (99%)	1 (1%)	84	88
1	B	126/136 (93%)	122 (97%)	4 (3%)	39	41
1	C	132/136 (97%)	127 (96%)	5 (4%)	33	34
1	D	130/136 (96%)	125 (96%)	5 (4%)	33	34
2	Q	2/7 (29%)	2 (100%)	0	100	100
2	R	2/7 (29%)	1 (50%)	1 (50%)	0	0
All	All	527/558 (94%)	511 (97%)	16 (3%)	40	44

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	100	ASN
1	D	61	ARG
1	C	85	GLN
1	D	51	LYS
1	C	83	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	45	HIS
1	C	126	ASN
1	D	116	GLN
1	D	45	HIS
1	D	106	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

2 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	CMT	R	14	2,3	7,7,7	0.79	0	6,8,8	1.33	1 (16%)
2	CMT	Q	14	2,3	7,7,7	1.62	1 (14%)	6,8,8	2.99	1 (16%)

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	CMT	R	14	2,3	-	1/8/8/8	-
2	CMT	Q	14	2,3	-	5/8/8/8	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	Q	14	CMT	OXT-C1	-3.45	1.37	1.45

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	Q	14	CMT	C1-OXT-C	-7.07	99.94	115.94
2	R	14	CMT	C1-OXT-C	-2.86	109.47	115.94

There are no chirality outliers.

5 of 6 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	Q	14	CMT	CA-C-OXT-C1
2	Q	14	CMT	O-C-OXT-C1
2	Q	14	CMT	N-CA-CB-SG
2	R	14	CMT	N-CA-CB-SG
2	Q	14	CMT	O-C-CA-N

There are no ring outliers.

1 monomer is involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	R	14	CMT	5	0

## 5.5 Carbohydrates [i](#)

There are no monosaccharides 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	$\# Z  > 2$
3	FAR	Q	5010	2	14,14,14	0.46	0	16,16,16	1.74	6 (37%)
3	FAR	C	4010	-	14,14,14	0.60	0	16,16,16	1.32	2 (12%)
3	FAR	B	3010	-	14,14,14	0.66	0	16,16,16	1.15	0
3	FAR	A	2010	2	14,14,14	0.41	0	16,16,16	1.57	3 (18%)

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
3	FAR	Q	5010	2	-	2/14/14/14	-
3	FAR	C	4010	-	-	2/14/14/14	-
3	FAR	B	3010	-	-	4/14/14/14	-
3	FAR	A	2010	2	-	3/14/14/14	-

There are no bond length outliers.

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	Q	5010	FAR	C4-C3-C5	3.19	120.63	115.27
3	A	2010	FAR	C4-C3-C5	2.97	120.26	115.27
3	A	2010	FAR	C15-C13-C14	2.78	120.75	114.60
3	Q	5010	FAR	C6-C7-C8	-2.63	121.33	127.66
3	Q	5010	FAR	C6-C5-C3	-2.59	104.45	112.98

There are no chirality outliers.

5 of 11 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	3010	FAR	C5-C6-C7-C8
3	B	3010	FAR	C12-C11-C9-C8
3	Q	5010	FAR	C10-C8-C9-C11
3	Q	5010	FAR	C7-C8-C9-C11
3	B	3010	FAR	C4-C3-C5-C6

There are no ring outliers.

3 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	4010	FAR	2	0
3	B	3010	FAR	5	0
3	A	2010	FAR	6	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	149/152 (98%)	0.01	1 (0%) 87 89	16, 25, 35, 39	0
1	B	142/152 (93%)	0.24	8 (5%) 24 29	16, 26, 37, 53	0
1	C	149/152 (98%)	0.44	10 (6%) 17 22	15, 30, 49, 64	0
1	D	149/152 (98%)	0.31	4 (2%) 54 60	16, 29, 38, 43	0
2	Q	2/9 (22%)	0.79	0 100 100	38, 38, 38, 39	0
2	R	2/9 (22%)	0.44	0 100 100	33, 33, 33, 35	0
All	All	593/626 (94%)	0.25	23 (3%) 39 45	15, 27, 40, 64	0

The worst 5 of 23 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	112	ALA	4.8
1	C	115	SER	4.8
1	C	114	GLU	4.2
1	D	85	GLN	3.1
1	C	85	GLN	3.0

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	CMT	R	14	8/8	0.91	0.13	20,31,32,32	0
2	CMT	Q	14	8/8	0.95	0.10	20,34,34,34	0



### 6.3 Carbohydrates [i](#)

There are no monosaccharides 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. The B-factors column lists the minimum, median, 95<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
3	FAR	C	4010	15/15	0.82	0.30	42,44,46,47	0
3	FAR	B	3010	15/15	0.83	0.24	41,43,48,48	0
3	FAR	A	2010	15/15	0.88	0.19	27,29,32,33	0
3	FAR	Q	5010	15/15	0.90	0.22	26,32,34,35	0

### 6.5 Other polymers [i](#)

There are no such residues in this entry.