

wwPDB X-ray Structure Validation Summary Report (i)

Aug 21, 2023 – 10:53 AM EDT

PDB ID	:	2Q59
Title	:	Crystal Structure of PPARgamma LBD bound to full agonist MRL20
Authors	:	Bruning, J.B.; Nettles, K.W.
Deposited on		
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 (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:

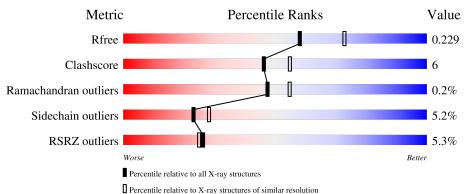
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7(2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure: $X\text{-}RAY \, DIFFRACTION$

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	$egin{array}{c} { m Whole \ archive} \ (\#{ m Entries}) \end{array}$	${f Similar\ resolution}\ (\#{ m Entries,\ resolution\ range}({ m \AA}))$
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 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	А	274	3% 77% 149	%	•	7%
2	В	274	81%	1%	•	8%



2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 4396 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 Peroxisome Proliferator-Activated Receptor gamma.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace		
1	А	255	Total 2057	C 1328	N 332	0 384	S 13	0	6	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	204	SER	-	expression tag	UNP P37231
А	285	CME	CYS	modified residue	UNP P37231

• Molecule 2 is a protein called Peroxisome Proliferator-Activated Receptor gamma.

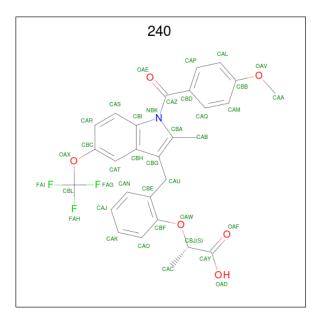
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace		
2	В	253	Total 2019	C 1311	N 327	0 372	S 9	0	4	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
В	204	SER	-	expression tag	UNP P37231

• Molecule 3 is (2S)-2-(2-{[1-(4-METHOXYBENZOYL)-2-METHYL-5-(TRIFLUOROMET HOXY)-1H-INDOL-3-YL]METHYL}PHENOXY)PROPANOIC ACID (three-letter code: 240) (formula: C₂₈H₂₄F₃NO₆).





Mol	Chain	Residues	Atoms				ZeroOcc	AltConf		
2	Λ	1	Total	С	F	Ν	Ο	0	0	
5	A	1	38	28	3	1	6	0	0	
9	D	1	Total	С	F	Ν	0	0	0	
0	D	1	38	28	3	1	6	0	0	

• Molecule 4 is water.

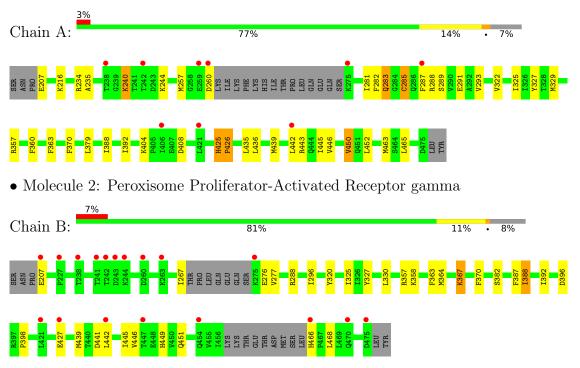
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	А	127	Total O 127 127	0	0
4	В	117	Total O 117 117	0	0



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: Peroxisome Proliferator-Activated Receptor gamma





4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants	89.16Å 63.94Å 119.19Å	Depositor
a, b, c, α , β , γ	90.00° 103.43° 90.00°	Depositor
Resolution (Å)	15.00 - 2.20	Depositor
	14.94 - 2.20	EDS
% Data completeness	99.2 (15.00-2.20)	Depositor
(in resolution range)	99.2(14.94-2.20)	EDS
R_{merge}	0.07	Depositor
R _{sym}	0.07	Depositor
$< I/\sigma(I) > 1$	$2.63 (at 2.20 \text{\AA})$	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.183 , 0.230	Depositor
It, It _{free}	0.181 , 0.229	DCC
R_{free} test set	1667 reflections (5.06%)	wwPDB-VP
Wilson B-factor ($Å^2$)	27.8	Xtriage
Anisotropy	0.138	Xtriage
Bulk solvent $k_{sol}(e/Å^3)$, $B_{sol}(Å^2)$	$0.36\;,55.4$	EDS
L-test for twinning ²	$ \langle L \rangle = 0.49, \langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4396	wwPDB-VP
Average B, all atoms $(Å^2)$	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 6.33% of the height of the origin peak. No significant pseudotranslation is detected.

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.



¹Intensities estimated from amplitudes.

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: 240, CME

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).

Mal	Mol Chain		nd lengths	Bond angles		
IVIOI	Chain	RMSZ	# Z > 5	RMSZ	# Z > 5	
1	А	0.43	1/2087~(0.0%)	0.56	1/2812~(0.0%)	
2	В	0.39	0/2065	0.50	0/2787	
All	All	0.41	1/4152~(0.0%)	0.53	1/5599~(0.0%)	

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	А	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Ζ	Observed(Å)	Ideal(Å)
1	А	260	ASP	C-O	6.00	1.34	1.23

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
1	А	425	HIS	C-N-CD	-5.38	108.76	120.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	А	425	HIS	Peptide



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	А	2057	0	2114	24	0
2	В	2019	0	2052	23	0
3	А	38	0	23	9	0
3	В	38	0	23	7	0
4	А	127	0	0	0	0
4	В	117	0	0	0	0
All	All	4396	0	4212	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.

The worst 5 of 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:A:327:TYR:HE1	3:A:5001:240:HAK	1.33	0.93
1:A:327:TYR:CE1	3:A:5001:240:HAK	2.20	0.74
1:A:235:ALA:HA	1:A:240:LYS:HG3	1.76	0.68
2:B:325[A]:ILE:HD11	2:B:392:ILE:CG1	2.26	0.66
2:B:357:ARG:HG2	2:B:358:LYS:H	1.60	0.64

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	А	255/274~(93%)	253~(99%)	1 (0%)	1 (0%)	34 37

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Perce	ntiles
2	В	251/274~(92%)	243~(97%)	8(3%)	0	100	100
All	All	506/548~(92%)	496 (98%)	9~(2%)	1 (0%)	47	55

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	А	426	PRO

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	А	227/246~(92%)	214~(94%)	13~(6%)	20 24
2	В	221/247~(90%)	210~(95%)	11 (5%)	24 30
All	All	448/493 (91%)	424 (95%)	24~(5%)	23 26

5 of 24 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	В	267	ILE
2	В	382	SER
2	В	367	LYS
2	В	388[A]	ILE
1	А	426	PRO

Sometimes side chains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such side chains are listed below:

Mol	Chain	Res	Type
1	А	283	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).

Mal	Mal Turna Chain Dag		Dec	Tinle	В	Bond lengths			Bond angles		
Mol	Type	Chain	Res	Link	Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2	
1	CME	А	285[B]	-	8,9,10	0.93	0	5,9,11	1.67	1 (20%)	
1	CME	А	285[A]	-	8,9,10	0.78	0	5,9,11	1.67	1 (20%)	

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
1	CME	А	285[B]	-	-	2/5/8/10	-
1	CME	А	285[A]	-	-	3/5/8/10	-

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
1	А	285[B]	CME	CE-SD-SG	3.30	118.66	103.45
1	А	285[A]	CME	CE-SD-SG	3.26	118.45	103.45

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	А	285[A]	CME	SD-CE-CZ-OH
1	А	285[B]	CME	SD-CE-CZ-OH
1	А	285[B]	CME	CE-SD-SG-CB
1	А	285[A]	CME	CZ-CE-SD-SG
1	А	285[A]	CME	CA-CB-SG-SD



There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	А	285[B]	CME	1	0
1	А	285[A]	CME	1	0

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

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	Turne	Chain	Res Link		Bo	ond leng	ths	Bond angles		
	Type	Unam	nes	LIIIK	Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z >2
3	240	В	7001	-	38,41,41	0.99	1 (2%)	50,60,60	2.38	10 (20%)
3	240	А	5001	-	38,41,41	1.05	2 (5%)	50,60,60	2.58	12 (24%)

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	240	В	7001	-	-	7/23/27/27	0/4/4/4
3	240	А	5001	-	-	8/23/27/27	0/4/4/4

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	А	5001	240	CBI-NBK	-3.83	1.34	1.39
3	В	7001	240	CBI-NBK	-3.63	1.34	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	А	5001	240	CAT-CBC	2.10	1.40	1.37

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
3	В	7001	240	CBD-CAZ-NBK	9.81	129.41	117.95
3	А	5001	240	CBD-CAZ-NBK	9.19	128.69	117.95
3	А	5001	240	CAP-CBD-CAZ	-7.09	104.97	120.26
3	А	5001	240	CAQ-CBD-CAZ	6.87	135.08	120.26
3	В	7001	240	CAP-CBD-CAZ	-5.89	107.55	120.26

There are no chirality outliers.

5 of 15 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	В	7001	240	FAG-CBL-OAX-CBC
3	В	7001	240	FAH-CBL-OAX-CBC
3	В	7001	240	CAM-CBB-OAV-CAA
3	В	7001	240	CAL-CBB-OAV-CAA
3	В	7001	240	FAI-CBL-OAX-CBC

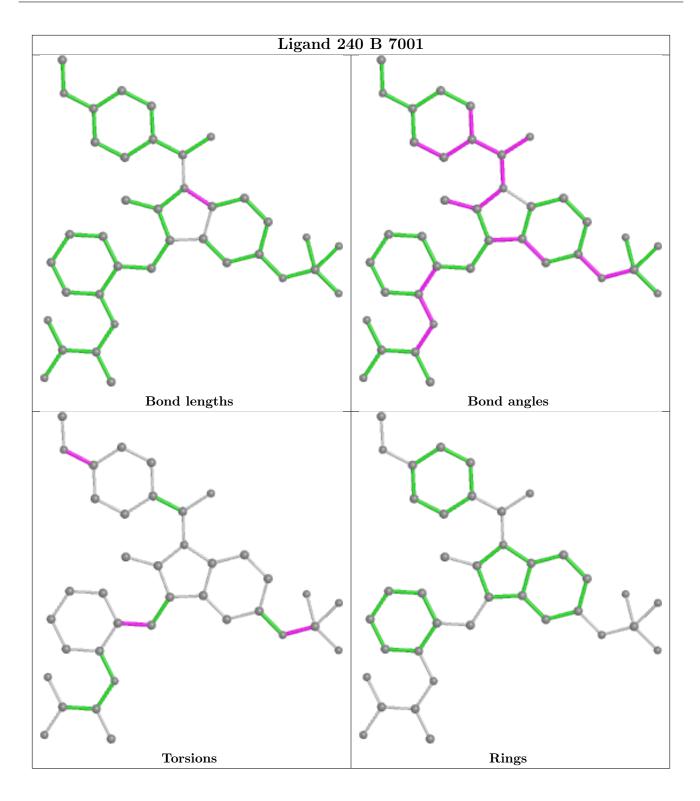
There are no ring outliers.

2 monomers are involved in 16 short contacts:

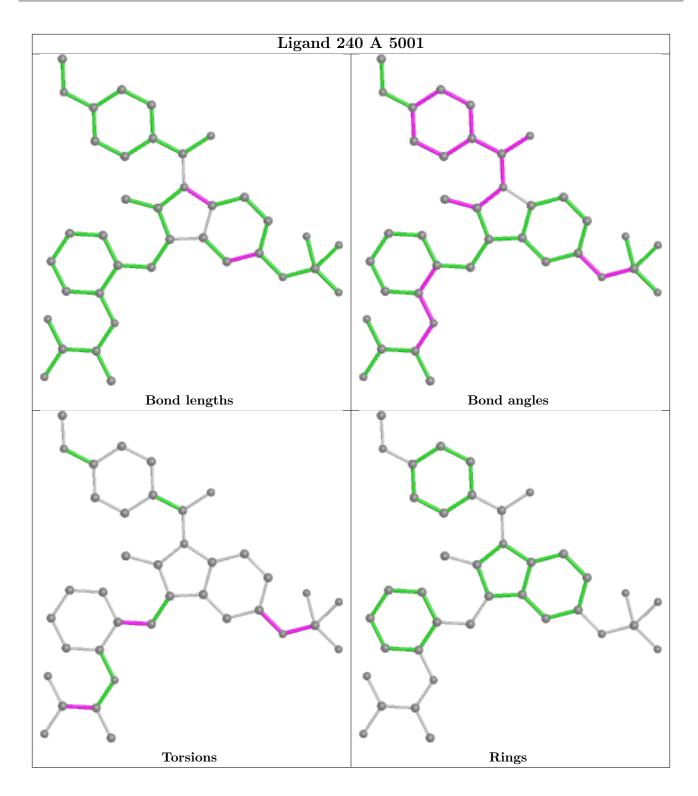
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	В	7001	240	7	0
3	А	5001	240	9	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and sufficient the outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









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, 95^{th} 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	$\langle RSRZ \rangle$	#RSRZ>2		$\mathbf{OWAB}(\mathrm{\AA}^2)$	Q<0.9
1	А	254/274~(92%)	0.18	9 (3%) 44	42	7, 17, 27, 35	6 (2%)
2	В	253/274 (92%)	0.33	18 (7%) 16	14	11, 22, 38, 40	0
All	All	507/548~(92%)	0.25	27 (5%) 26	25	7, 19, 37, 40	6 (1%)

The worst 5 of 27 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	В	242	THR	6.0
2	В	243	ASP	5.5
2	В	475	ASP	4.8
1	А	260	ASP	4.4
1	А	275	LYS	3.8

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^{th} 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	$\mathbf{B} ext{-factors}(\mathrm{\AA}^2)$	Q < 0.9
1	CME	А	285[A]	10/11	0.73	0.32	$21,\!23,\!23,\!23$	7
1	CME	А	285[B]	10/11	0.73	0.32	22,23,26,27	7

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

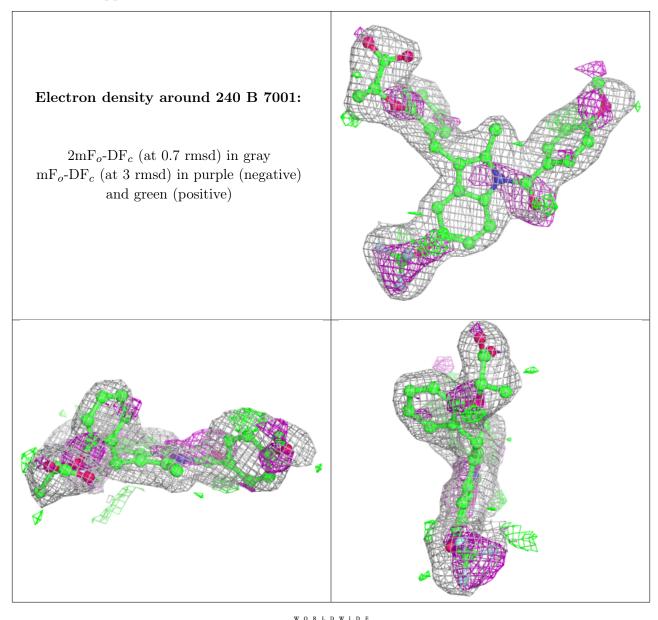


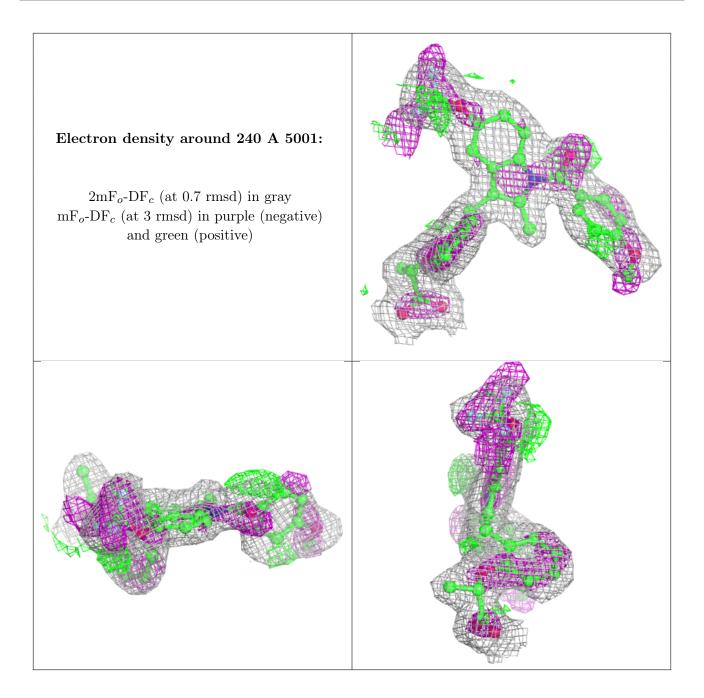
6.4 Ligands (i)

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^{th} 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	$\mathbf{B} ext{-factors}(\mathrm{\AA}^2)$	Q<0.9
3	240	В	7001	38/38	0.85	0.24	$38,\!41,\!46,\!47$	0
3	240	А	5001	38/38	0.93	0.20	24,25,29,31	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.





6.5 Other polymers (i)

There are no such residues in this entry.

