



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 11:24 AM UTC

PDB ID : 8BF2 / pdb_00008bf2
Title : Human PPARgamma in complex with MEHP bound to the AF-2 and omega sub-pockets
Authors : Useini, A.; Straeter, N.
Deposited on : 2022-10-23
Resolution : 2.18 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

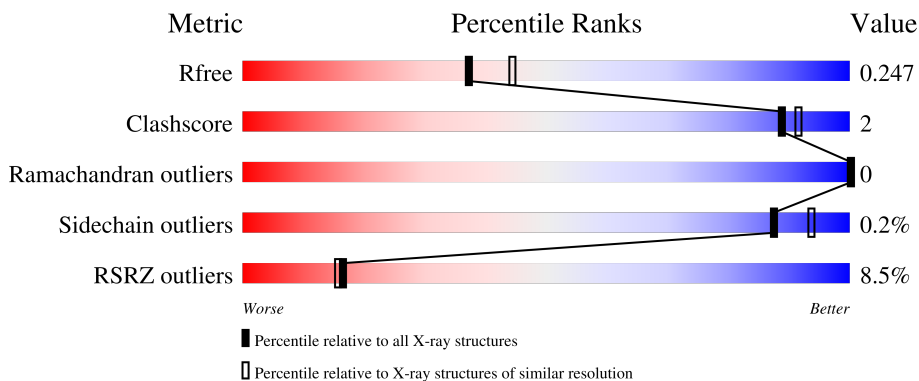
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.18 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}	180053	8975 (2.20-2.16)
Clashscore	190562	9786 (2.20-2.16)
Ramachandran outliers	187476	9664 (2.20-2.16)
Sidechain outliers	187428	9664 (2.20-2.16)
RSRZ outliers	180081	8979 (2.20-2.16)

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 $\leq 5\%$. 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	283	 6% 86% 6% 8%
1	B	283	 9% 89% 2% 8%

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 8793 atoms, of which 4368 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.

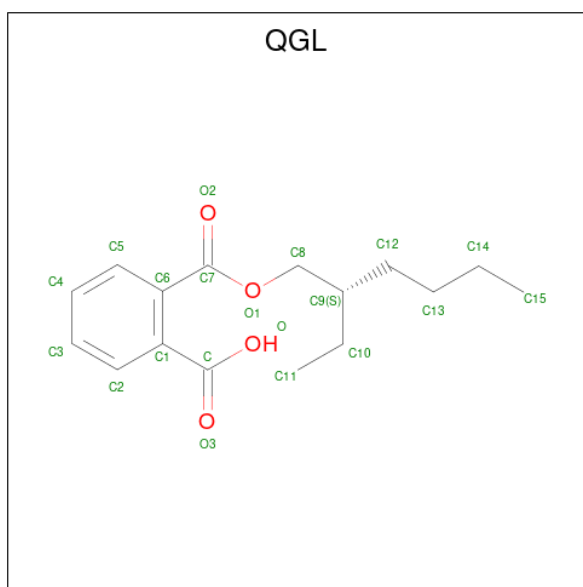
- Molecule 1 is a protein called Peroxisome proliferator-activated receptor gamma.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	259	4220	1343	2140	337	390	10	0	2	0
1	B	261	4263	1359	2162	342	391	9	0	2	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	195	MET	-	initiating methionine	UNP P37231
A	196	ARG	-	expression tag	UNP P37231
A	197	GLY	-	expression tag	UNP P37231
A	198	SER	-	expression tag	UNP P37231
A	199	HIS	-	expression tag	UNP P37231
A	200	HIS	-	expression tag	UNP P37231
A	201	HIS	-	expression tag	UNP P37231
A	202	HIS	-	expression tag	UNP P37231
A	203	HIS	-	expression tag	UNP P37231
A	204	HIS	-	expression tag	UNP P37231
A	205	GLY	-	expression tag	UNP P37231
B	195	MET	-	initiating methionine	UNP P37231
B	196	ARG	-	expression tag	UNP P37231
B	197	GLY	-	expression tag	UNP P37231
B	198	SER	-	expression tag	UNP P37231
B	199	HIS	-	expression tag	UNP P37231
B	200	HIS	-	expression tag	UNP P37231
B	201	HIS	-	expression tag	UNP P37231
B	202	HIS	-	expression tag	UNP P37231
B	203	HIS	-	expression tag	UNP P37231
B	204	HIS	-	expression tag	UNP P37231
B	205	GLY	-	expression tag	UNP P37231

- Molecule 2 is 2-[(2 {S})-2-ethylhexoxy]carbonylbenzoic acid (CCD ID: QGL) (formula: C₁₆H₂₂O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
2	A	1	42	16	22	4	0	0
2	A	1	42	16	22	4	0	0
2	B	1	42	16	22	4	0	0

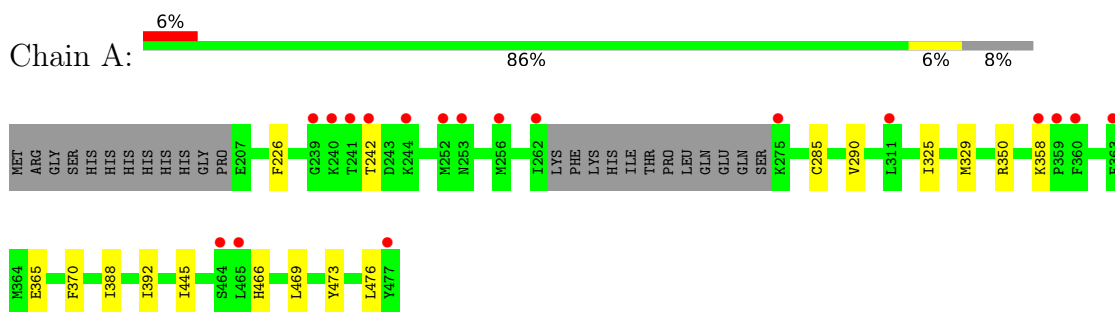
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	107	107	107	0	0
3	B	77	77	77	0	0

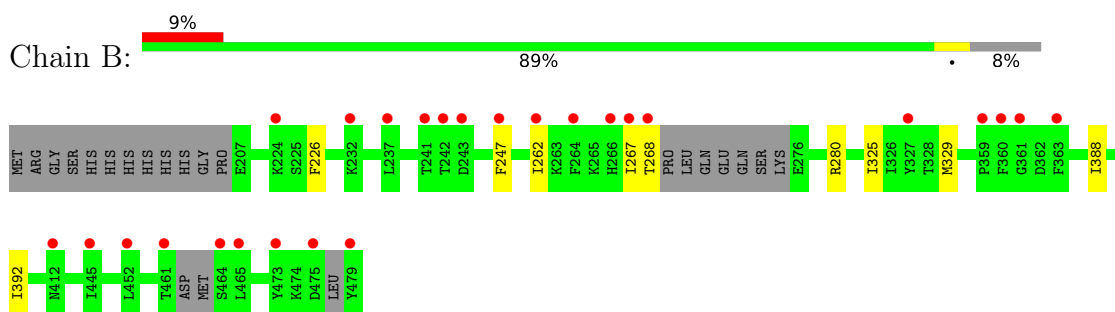
3 Residue-property plots [i](#)

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



- Molecule 1: Peroxisome proliferator-activated receptor gamma



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	93.46Å 61.52Å 118.25Å 90.00° 102.64° 90.00°	Depositor
Resolution (Å)	36.08 – 2.18 36.08 – 2.18	Depositor EDS
% Data completeness (in resolution range)	98.0 (36.08-2.18) 97.9 (36.08-2.18)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.54 (at 2.18Å)	Xtrriage
Refinement program	PHENIX 1.19.2_4158, PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.208 , 0.247 0.211 , 0.247	Depositor DCC
R_{free} test set	1719 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	48.8	Xtrriage
Anisotropy	0.631	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 54.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8793	wwPDB-VP
Average B, all atoms (Å ²)	73.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.85% 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: QGL

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	0.09	0/2124	0.23	0/2862
1	B	0.08	0/2143	0.22	0/2884
All	All	0.08	0/4267	0.23	0/5746

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	2080	2140	2132	10	0
1	B	2101	2162	2155	6	0
2	A	40	44	0	0	0
2	B	20	22	0	0	0
3	A	107	0	0	2	0
3	B	77	0	0	0	0
All	All	4425	4368	4287	16	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 2.

All (16) 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:325:ILE:HG23	1:A:388:ILE:HD12	1.73	0.70
1:A:358:LYS:NZ	3:A:603:HOH:O	2.27	0.66
1:B:325:ILE:HG23	1:B:388:ILE:HD12	1.85	0.58
1:B:267:ILE:HD11	1:B:280:ARG:HG3	1.91	0.51
1:A:370:PHE:HB2	1:A:445:ILE:HD11	1.91	0.51
1:A:473:TYR:HD1	1:A:476:LEU:HD12	1.75	0.51
1:A:226:PHE:CG	1:A:329:MET:HE1	2.50	0.46
1:B:226:PHE:CG	1:B:329:MET:HE1	2.52	0.45
1:B:267:ILE:HG22	1:B:268:THR:N	2.32	0.45
1:A:242:THR:HG23	3:A:684:HOH:O	2.18	0.43
1:B:325:ILE:HD11	1:B:392:ILE:HG13	2.01	0.41
1:A:325:ILE:HD11	1:A:392:ILE:HG13	2.02	0.41
1:A:350:ARG:NH2	1:A:365:GLU:OE2	2.42	0.40
1:A:290:VAL:HG21	1:A:466:HIS:CG	2.56	0.40
1:B:247:PHE:HB3	1:B:262:ILE:HD11	2.02	0.40
1:A:290:VAL:HG22	1:A:469:LEU:HD13	2.03	0.40

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	257/283 (91%)	254 (99%)	3 (1%)	0	100	100
1	B	256/283 (90%)	250 (98%)	6 (2%)	0	100	100
All	All	513/566 (91%)	504 (98%)	9 (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	234/254 (92%)	233 (100%)	1 (0%)	84	91
1	B	235/254 (92%)	235 (100%)	0	100	100
All	All	469/508 (92%)	468 (100%)	1 (0%)	87	94

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	285	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	283	GLN
1	B	308	ASN
1	B	323	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 oligosaccharides in this entry.

5.6 Ligand geometry

3 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
2	QGL	A	502	-	20,20,20	0.23	0	25,25,25	0.23	0
2	QGL	B	501	-	20,20,20	0.24	0	25,25,25	0.26	0
2	QGL	A	501	-	20,20,20	0.22	0	25,25,25	0.29	0

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	QGL	A	502	-	-	8/19/19/19	0/1/1/1
2	QGL	B	501	-	-	10/19/19/19	0/1/1/1
2	QGL	A	501	-	-	1/19/19/19	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	502	QGL	O1-C8-C9-C10
2	B	501	QGL	O1-C8-C9-C10
2	B	501	QGL	C9-C12-C13-C14
2	B	501	QGL	O1-C8-C9-C12
2	A	502	QGL	O1-C8-C9-C12
2	A	502	QGL	O3-C-C1-C2
2	A	502	QGL	C13-C12-C9-C8
2	A	502	QGL	O-C-C1-C2
2	A	502	QGL	C12-C13-C14-C15

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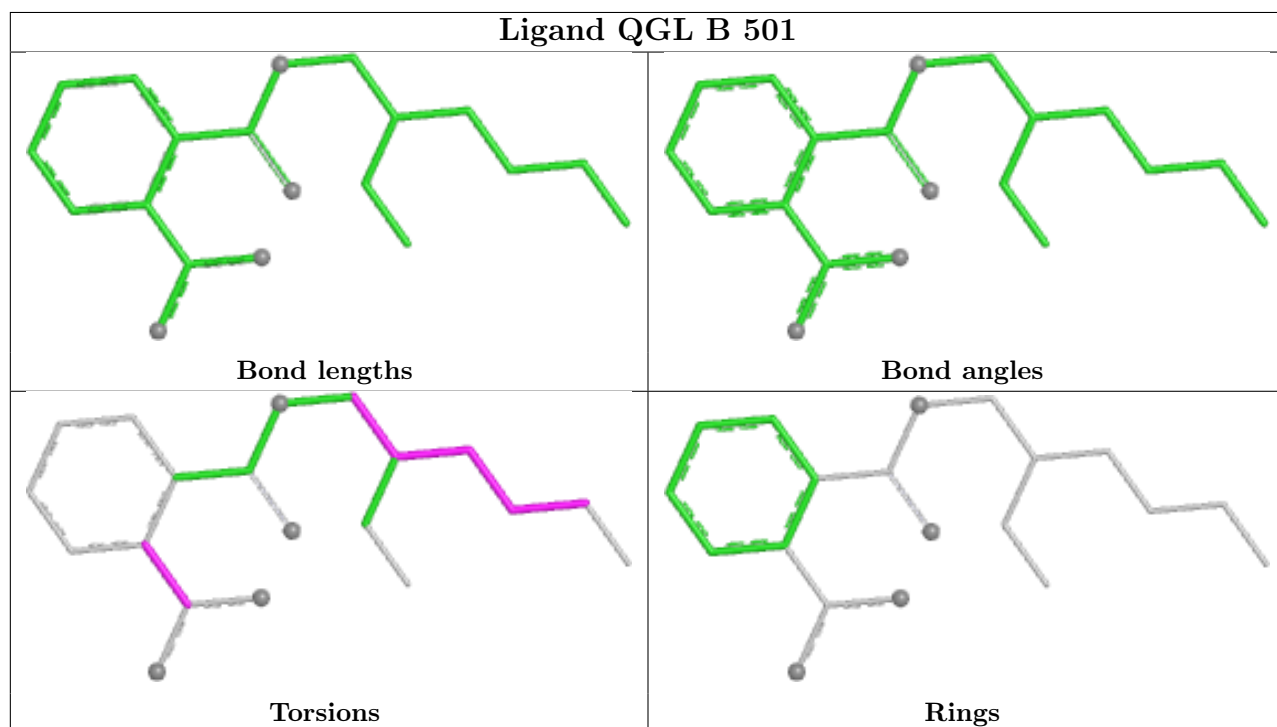
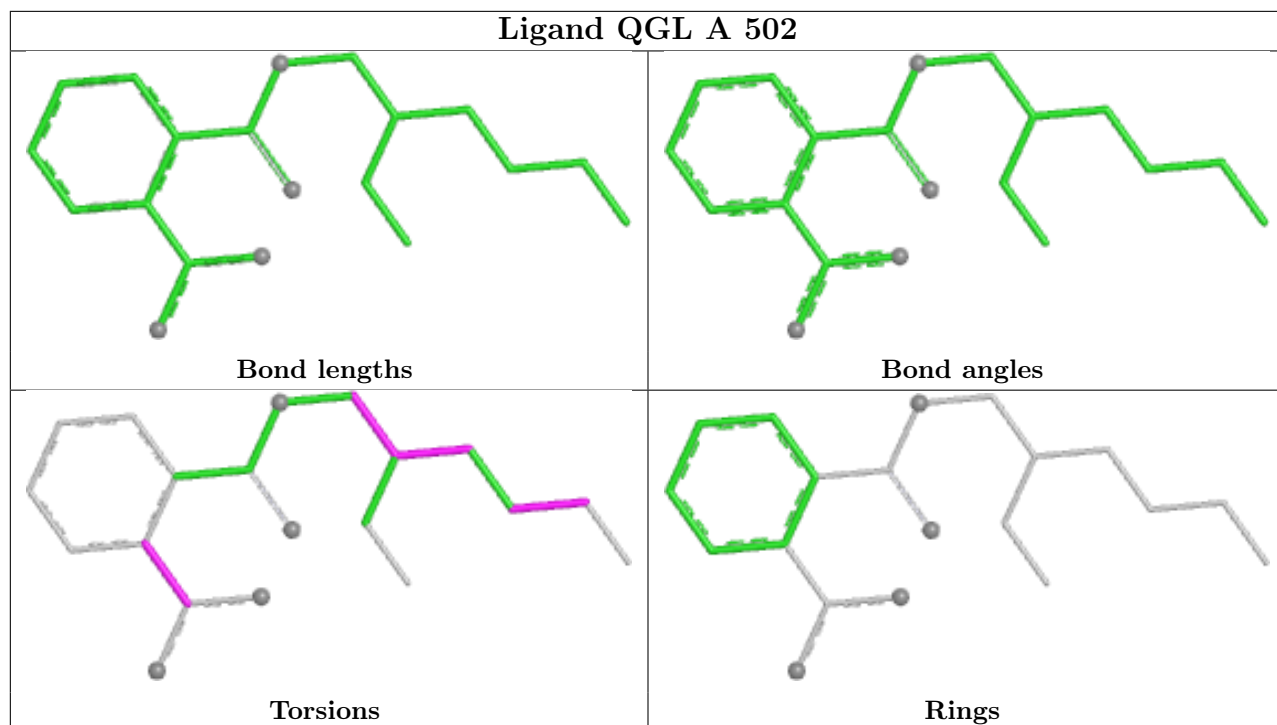
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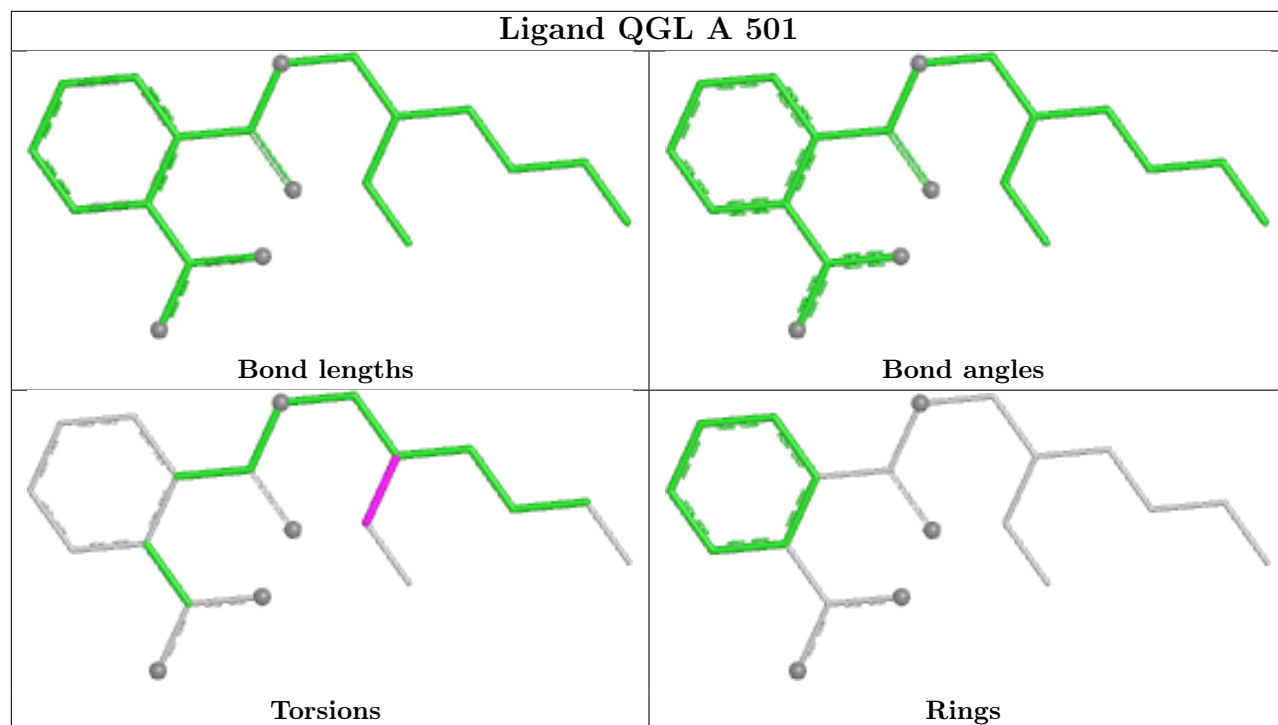
Mol	Chain	Res	Type	Atoms
2	B	501	QGL	O-C-C1-C2
2	B	501	QGL	C13-C12-C9-C10
2	B	501	QGL	O3-C-C1-C2
2	A	501	QGL	C11-C10-C9-C8
2	B	501	QGL	C13-C12-C9-C8
2	A	502	QGL	O3-C-C1-C6
2	A	502	QGL	O-C-C1-C6
2	B	501	QGL	O-C-C1-C6
2	B	501	QGL	O3-C-C1-C6
2	B	501	QGL	C12-C13-C14-C15

There are no ring outliers.

No monomer is involved in short contacts.

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 than 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 any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. 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

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	259/283 (91%)	0.53	18 (6%) 23 22	34, 65, 100, 124	1 (0%)
1	B	261/283 (92%)	0.70	26 (9%) 12 11	33, 70, 123, 139	1 (0%)
All	All	520/566 (91%)	0.62	44 (8%) 16 16	33, 67, 115, 139	2 (0%)

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	363	PHE	5.6
1	B	479	TYR	4.9
1	A	477	TYR	4.7
1	B	473	TYR	4.4
1	A	359	PRO	4.3
1	B	267	ILE	4.2
1	B	465	LEU	3.8
1	A	363	PHE	3.7
1	B	268	THR	3.7
1	A	241	THR	3.4
1	B	241	THR	3.4
1	A	239	GLY	3.2
1	B	266	HIS	3.1
1	A	240	LYS	2.9
1	B	262	ILE	2.7
1	A	275	LYS	2.7
1	A	465	LEU	2.7
1	B	264	PHE	2.7
1	B	360	PHE	2.7
1	A	262	ILE	2.7
1	A	311	LEU	2.6
1	A	360	PHE	2.6
1	B	327	TYR	2.6
1	B	243	ASP	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	224	LYS	2.5
1	B	232	LYS	2.5
1	B	247	PHE	2.4
1	A	253	ASN	2.4
1	A	256	MET	2.4
1	B	237	LEU	2.3
1	A	358	LYS	2.3
1	B	361	GLY	2.2
1	B	452	LEU	2.2
1	A	464	SER	2.1
1	B	475	ASP	2.1
1	B	242	THR	2.1
1	B	464	SER	2.1
1	B	359	PRO	2.1
1	B	445	ILE	2.1
1	B	412	ASN	2.1
1	B	461	THR	2.1
1	A	242	THR	2.0
1	A	244	LYS	2.0
1	A	252	MET	2.0

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](#)

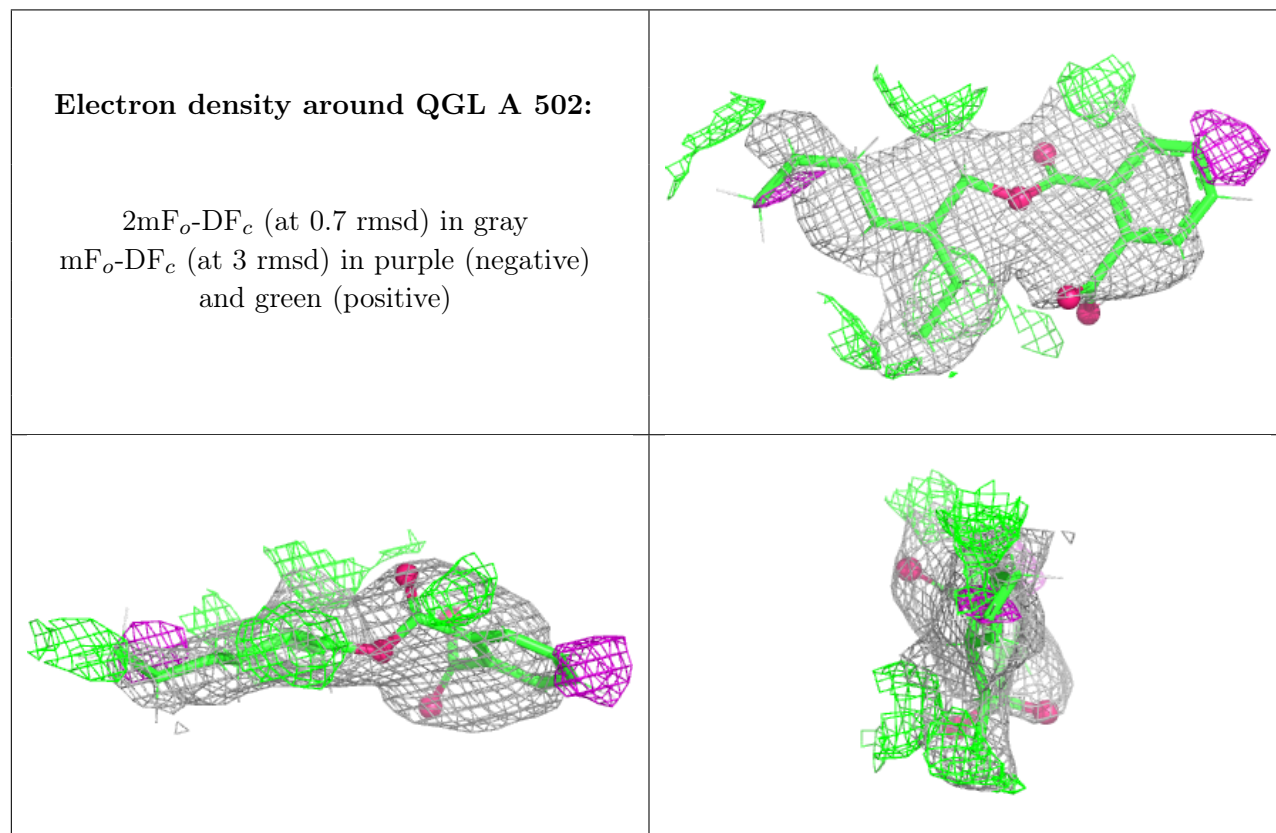
There are no oligosaccharides in this entry.

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, 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.

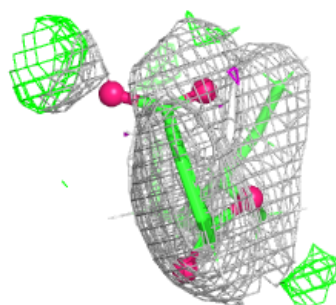
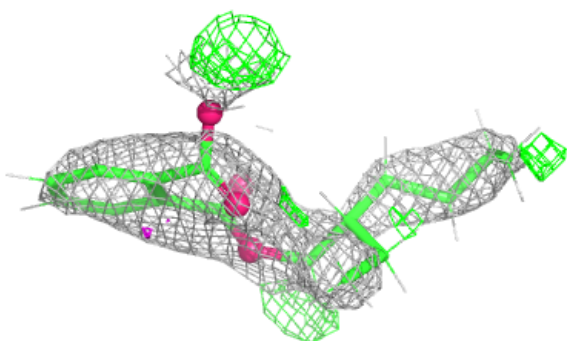
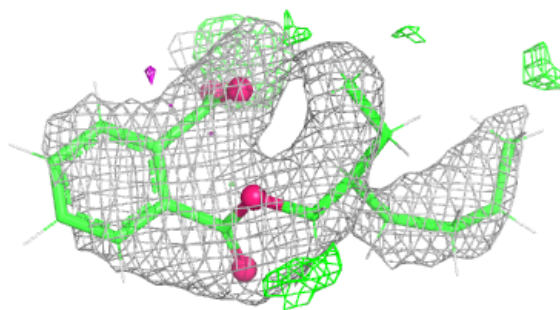
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	QGL	A	502	20/20	0.72	0.23	58,89,117,129	0
2	QGL	B	501	20/20	0.76	0.19	63,84,108,117	0
2	QGL	A	501	20/20	0.80	0.20	73,90,108,110	0

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.

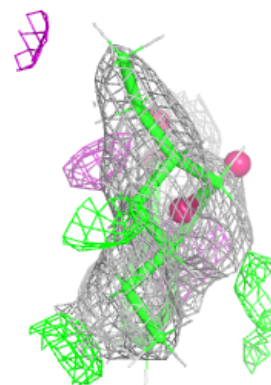
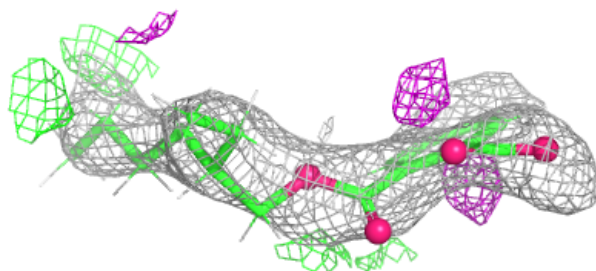
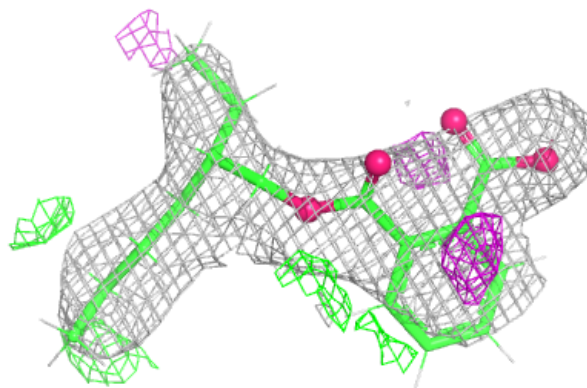


Electron density around QGL B 501:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around QGL A 501:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.