



# wwPDB X-ray Structure Validation Summary Report

Mar 4, 2026 – 08:26 PM UTC

PDB ID : 7UJ7 / pdb\_00007uj7  
Title : Estrogen Receptor Alpha Ligand Binding Domain Y537S Mutant in Complex with RU39411  
Authors : Fanning, S.W.; Greene, G.L.  
Deposited on : 2022-03-30  
Resolution : 1.68 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 : 4-5-2 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

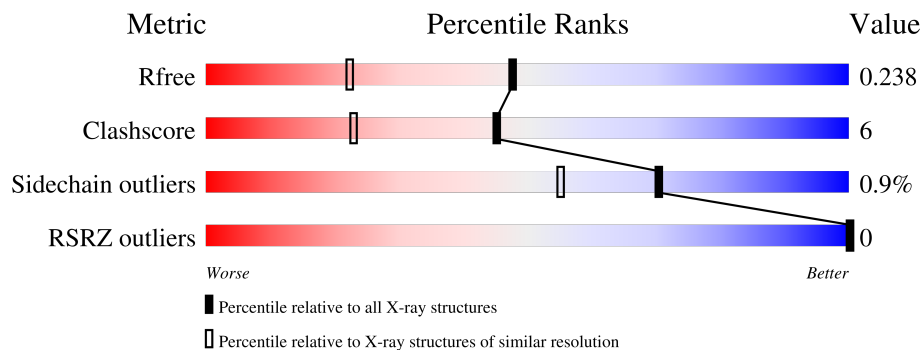
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.68 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	1054 (1.68-1.68)
Clashscore	190562	1078 (1.68-1.68)
Sidechain outliers	187428	1067 (1.68-1.68)
RSRZ outliers	180081	1055 (1.68-1.68)

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	263	 71% 11% 18%
1	B	263	 75% 9% 16%
1	C	263	 71% 9% 20%
1	D	263	 73% 11% 15%

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 7604 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 Estrogen receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	D	223	1761	1129	300	317	15	0	4	0
1	B	222	1758	1132	294	316	16	0	6	0
1	A	216	1702	1092	290	305	15	0	2	0
1	C	211	1688	1086	282	306	14	0	5	0

There are 72 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	292	HIS	-	expression tag	UNP P03372
D	293	HIS	-	expression tag	UNP P03372
D	294	HIS	-	expression tag	UNP P03372
D	295	HIS	-	expression tag	UNP P03372
D	296	HIS	-	expression tag	UNP P03372
D	297	HIS	-	expression tag	UNP P03372
D	298	GLU	-	expression tag	UNP P03372
D	299	ASN	-	expression tag	UNP P03372
D	300	LEU	-	expression tag	UNP P03372
D	301	TYR	-	expression tag	UNP P03372
D	302	PHE	-	expression tag	UNP P03372
D	303	GLN	-	expression tag	UNP P03372
D	304	SER	-	expression tag	UNP P03372
D	305	MET	-	expression tag	UNP P03372
D	381	SER	CYS	conflict	UNP P03372
D	417	SER	CYS	conflict	UNP P03372
D	530	SER	CYS	conflict	UNP P03372
D	537	SER	TYR	engineered mutation	UNP P03372
B	292	HIS	-	expression tag	UNP P03372
B	293	HIS	-	expression tag	UNP P03372
B	294	HIS	-	expression tag	UNP P03372

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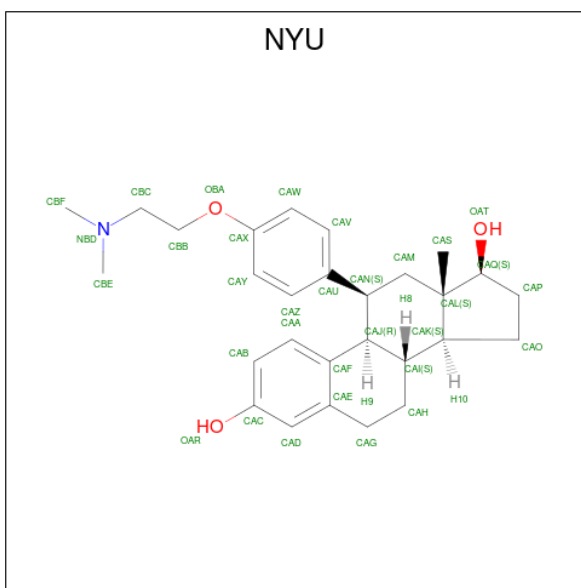
Chain	Residue	Modelled	Actual	Comment	Reference
B	295	HIS	-	expression tag	UNP P03372
B	296	HIS	-	expression tag	UNP P03372
B	297	HIS	-	expression tag	UNP P03372
B	298	GLU	-	expression tag	UNP P03372
B	299	ASN	-	expression tag	UNP P03372
B	300	LEU	-	expression tag	UNP P03372
B	301	TYR	-	expression tag	UNP P03372
B	302	PHE	-	expression tag	UNP P03372
B	303	GLN	-	expression tag	UNP P03372
B	304	SER	-	expression tag	UNP P03372
B	305	MET	-	expression tag	UNP P03372
B	381	SER	CYS	conflict	UNP P03372
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B	537	SER	TYR	engineered mutation	UNP P03372
A	292	HIS	-	expression tag	UNP P03372
A	293	HIS	-	expression tag	UNP P03372
A	294	HIS	-	expression tag	UNP P03372
A	295	HIS	-	expression tag	UNP P03372
A	296	HIS	-	expression tag	UNP P03372
A	297	HIS	-	expression tag	UNP P03372
A	298	GLU	-	expression tag	UNP P03372
A	299	ASN	-	expression tag	UNP P03372
A	300	LEU	-	expression tag	UNP P03372
A	301	TYR	-	expression tag	UNP P03372
A	302	PHE	-	expression tag	UNP P03372
A	303	GLN	-	expression tag	UNP P03372
A	304	SER	-	expression tag	UNP P03372
A	305	MET	-	expression tag	UNP P03372
A	381	SER	CYS	conflict	UNP P03372
A	417	SER	CYS	conflict	UNP P03372
A	530	SER	CYS	conflict	UNP P03372
A	537	SER	TYR	engineered mutation	UNP P03372
C	292	HIS	-	expression tag	UNP P03372
C	293	HIS	-	expression tag	UNP P03372
C	294	HIS	-	expression tag	UNP P03372
C	295	HIS	-	expression tag	UNP P03372
C	296	HIS	-	expression tag	UNP P03372
C	297	HIS	-	expression tag	UNP P03372
C	298	GLU	-	expression tag	UNP P03372
C	299	ASN	-	expression tag	UNP P03372
C	300	LEU	-	expression tag	UNP P03372

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Chain	Residue	Modelled	Actual	Comment	Reference
C	301	TYR	-	expression tag	UNP P03372
C	302	PHE	-	expression tag	UNP P03372
C	303	GLN	-	expression tag	UNP P03372
C	304	SER	-	expression tag	UNP P03372
C	305	MET	-	expression tag	UNP P03372
C	381	SER	CYS	conflict	UNP P03372
C	417	SER	CYS	conflict	UNP P03372
C	530	SER	CYS	conflict	UNP P03372
C	537	SER	TYR	engineered mutation	UNP P03372

- Molecule 2 is 11alpha-{4-[2-(dimethylamino)ethoxy]phenyl}estra-1(10),2,4-triene-3,17beta-diol (CCD ID: NYU) (formula: C<sub>28</sub>H<sub>37</sub>NO<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
2	D	1	Total	C	N	O	0	0
			32	28	1	3		
2	B	1	Total	C	N	O	0	0
			32	28	1	3		
2	A	1	Total	C	N	O	0	0
			32	28	1	3		
2	C	1	Total	C	N	O	0	0
			32	28	1	3		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	158	Total 158	O 158	0	0
3	B	139	Total 139	O 139	0	0
3	A	140	Total 140	O 140	0	0
3	C	130	Total 130	O 130	0	0



LEU	L469	E470	E471	H474	T496	L497	Q498	Q499	Q500	H501	K520	G521	M522	L525	TYR	SER	MET	LYS	SER	LYS	ASN	VAL	VAL	P635	L539	M543	L544	D545	ALA	HIS	ARG	LEU	HIS	ALA	PRO	THR	SER
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## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	58.11Å 58.98Å 87.88Å 101.83° 90.01° 119.51°	Depositor
Resolution (Å)	29.22 – 1.68 29.22 – 1.68	Depositor EDS
% Data completeness (in resolution range)	94.0 (29.22-1.68) 94.0 (29.22-1.68)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.47 (at 1.68Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, $R_{free}$	0.198 , 0.240 0.201 , 0.238	Depositor DCC
$R_{free}$ test set	5270 reflections (4.68%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	23.9	Xtrriage
Anisotropy	0.144	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 40.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.460 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	7604	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.02% 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: NYU

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	0.84	1/1728 (0.1%)	0.90	0/2330
1	B	0.75	0/1794	0.81	0/2427
1	C	0.80	0/1718	0.89	6/2321 (0.3%)
1	D	0.80	0/1788	0.92	0/2413
All	All	0.80	1/7028 (0.0%)	0.88	6/9491 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	490	MET	SD-CE	-6.51	1.63	1.79

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	470	GLU	CA-C-N	8.24	131.83	120.63
1	C	470	GLU	C-N-CA	8.24	131.83	120.63
1	C	470	GLU	O-C-N	7.13	130.28	122.15
1	C	471	GLU	CA-C-N	-6.45	111.00	120.28
1	C	471	GLU	C-N-CA	-6.45	111.00	120.28

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	1702	0	1721	20	0
1	B	1758	0	1760	23	0
1	C	1688	0	1713	17	0
1	D	1761	0	1780	24	0
2	A	32	0	0	0	0
2	B	32	0	0	0	0
2	C	32	0	0	0	0
2	D	32	0	0	0	0
3	A	140	0	0	7	0
3	B	139	0	0	0	0
3	C	130	0	0	4	0
3	D	158	0	0	2	0
All	All	7604	0	6974	82	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 82 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:B:342:MET:HE3	1:B:410:LEU:HD11	1.35	1.06
1:B:342:MET:HE3	1:B:410:LEU:CD1	1.92	0.99
1:A:490:MET:HE2	3:A:1025:HOH:O	1.69	0.91
1:D:424:ILE:HA	1:D:427:MET:HE3	1.59	0.85
1:A:421:MET:HE2	1:A:425:PHE:CZ	2.12	0.83

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

There are no protein backbone outliers to report in this entry.

### 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	185/238 (78%)	183 (99%)	2 (1%)	65	47
1	B	192/238 (81%)	191 (100%)	1 (0%)	81	72
1	C	188/238 (79%)	187 (100%)	1 (0%)	81	72
1	D	193/238 (81%)	190 (98%)	3 (2%)	55	32
All	All	758/952 (80%)	751 (99%)	7 (1%)	70	55

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	358	ILE
1	A	466	LEU
1	C	358	ILE
1	A	537	SER
1	D	496	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	513	HIS
1	A	501	HIS
1	A	398	HIS
1	A	476	HIS
1	B	519	ASN

### 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

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
2	NYU	C	901	-	36,36,36	0.58	0	50,54,54	0.76	1 (2%)
2	NYU	B	901	-	36,36,36	0.62	0	50,54,54	0.82	1 (2%)
2	NYU	D	901	-	36,36,36	0.59	0	50,54,54	0.67	0
2	NYU	A	901	-	36,36,36	0.64	0	50,54,54	0.70	1 (2%)

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	NYU	C	901	-	-	2/10/53/53	0/5/5/5
2	NYU	B	901	-	-	2/10/53/53	0/5/5/5
2	NYU	D	901	-	-	2/10/53/53	0/5/5/5
2	NYU	A	901	-	-	2/10/53/53	0/5/5/5

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	901	NYU	CAU-CAN-CAJ	2.46	117.50	113.25
2	A	901	NYU	CAU-CAN-CAJ	2.31	117.25	113.25
2	C	901	NYU	CAU-CAN-CAJ	2.22	117.08	113.25

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	901	NYU	CAJ-CAN-CAU-CAZ

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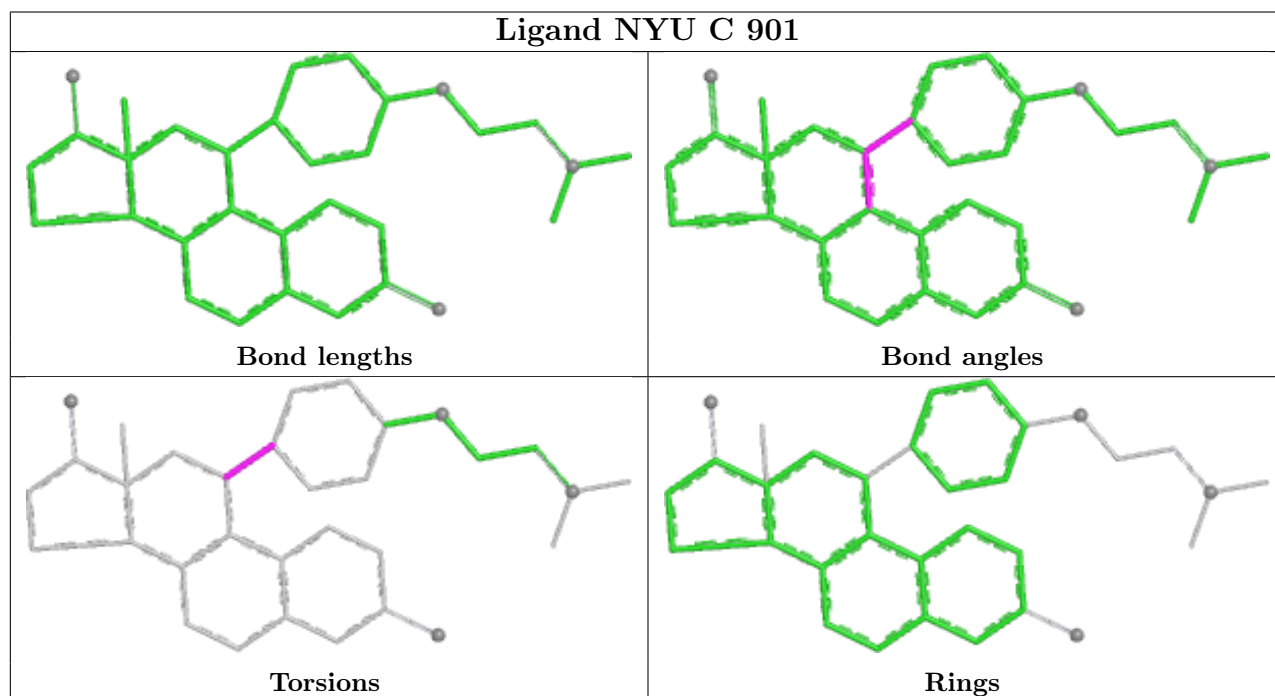
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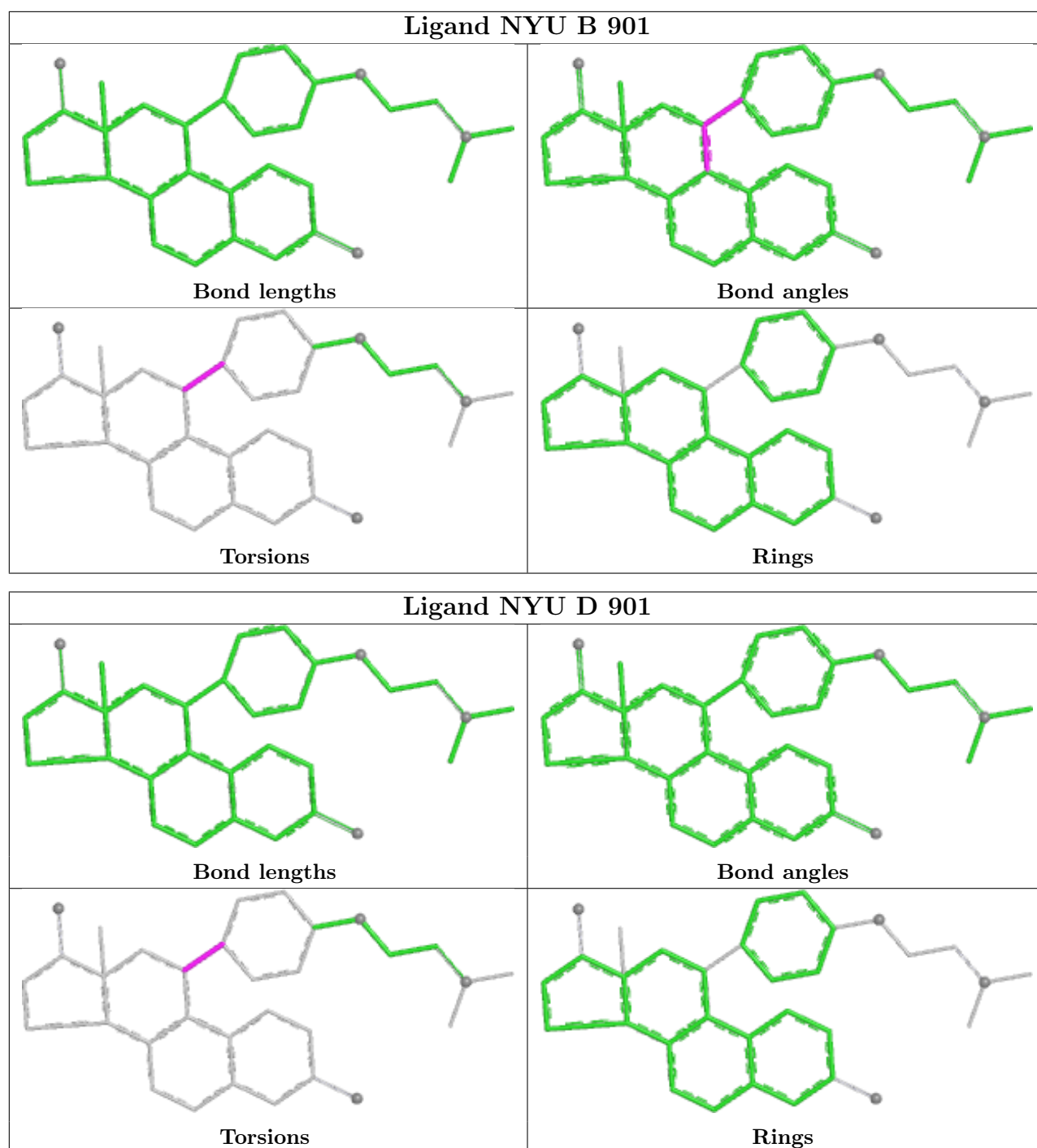
Mol	Chain	Res	Type	Atoms
2	D	901	NYU	CAJ-CAN-CAU-CAV
2	B	901	NYU	CAJ-CAN-CAU-CAV
2	B	901	NYU	CAJ-CAN-CAU-CAZ
2	C	901	NYU	CAJ-CAN-CAU-CAV

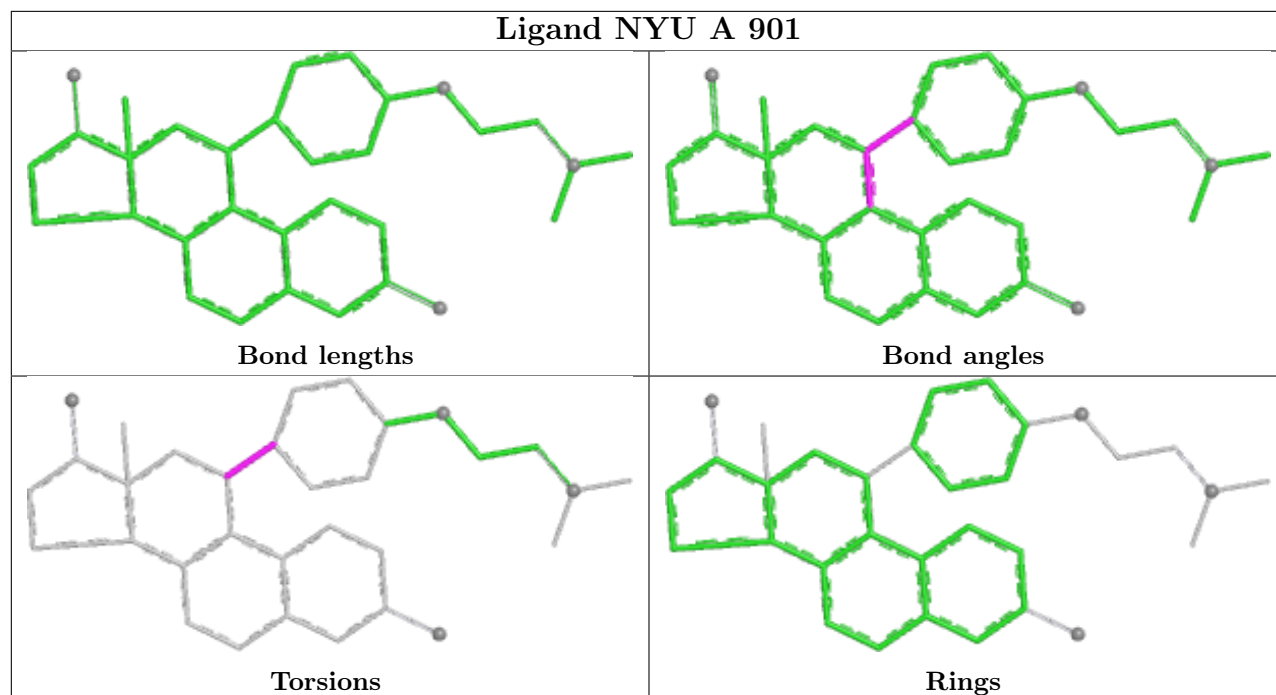
There are no ring outliers.

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 [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	216/263 (82%)	-0.97	0 100 100	11, 32, 56, 69	4 (1%)
1	B	222/263 (84%)	-0.88	0 100 100	11, 36, 60, 81	7 (3%)
1	C	211/263 (80%)	-0.91	0 100 100	12, 35, 57, 79	6 (2%)
1	D	223/263 (84%)	-0.93	0 100 100	10, 32, 55, 66	5 (2%)
All	All	872/1052 (82%)	-0.92	0 100 100	10, 34, 57, 81	22 (2%)

There are no RSRZ outliers to report.

### 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](#)

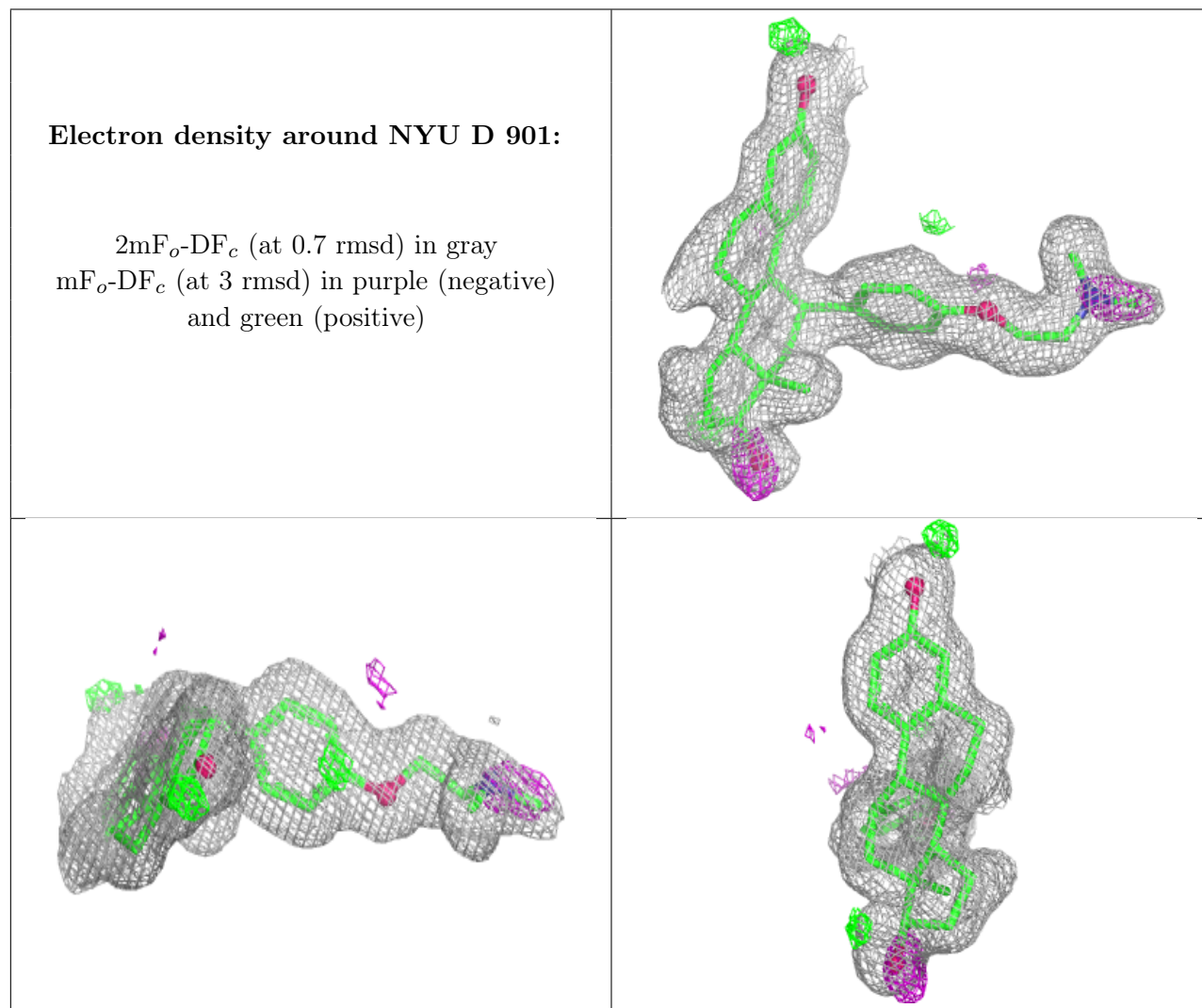
There are no oligosaccharides in this entry.

### 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, 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.

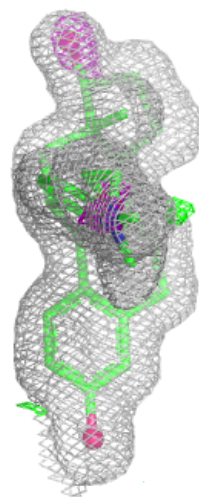
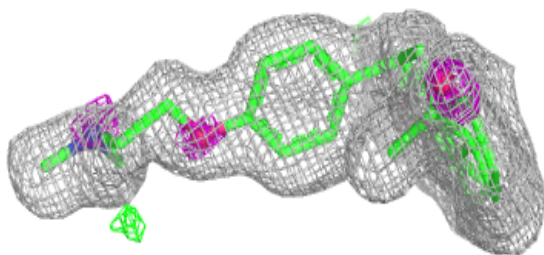
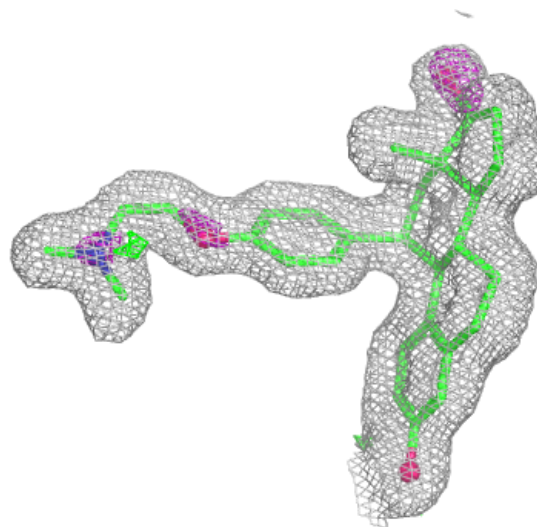
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	NYU	D	901	32/32	0.99	0.03	20,20,20,20	0
2	NYU	B	901	32/32	0.99	0.03	20,20,20,20	0
2	NYU	A	901	32/32	0.99	0.03	20,20,20,20	0
2	NYU	C	901	32/32	0.99	0.03	20,20,20,20	0

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.



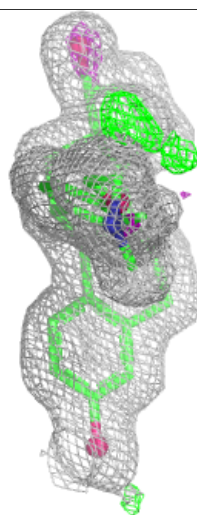
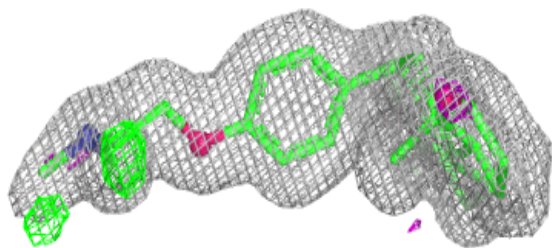
**Electron density around NYU B 901:**

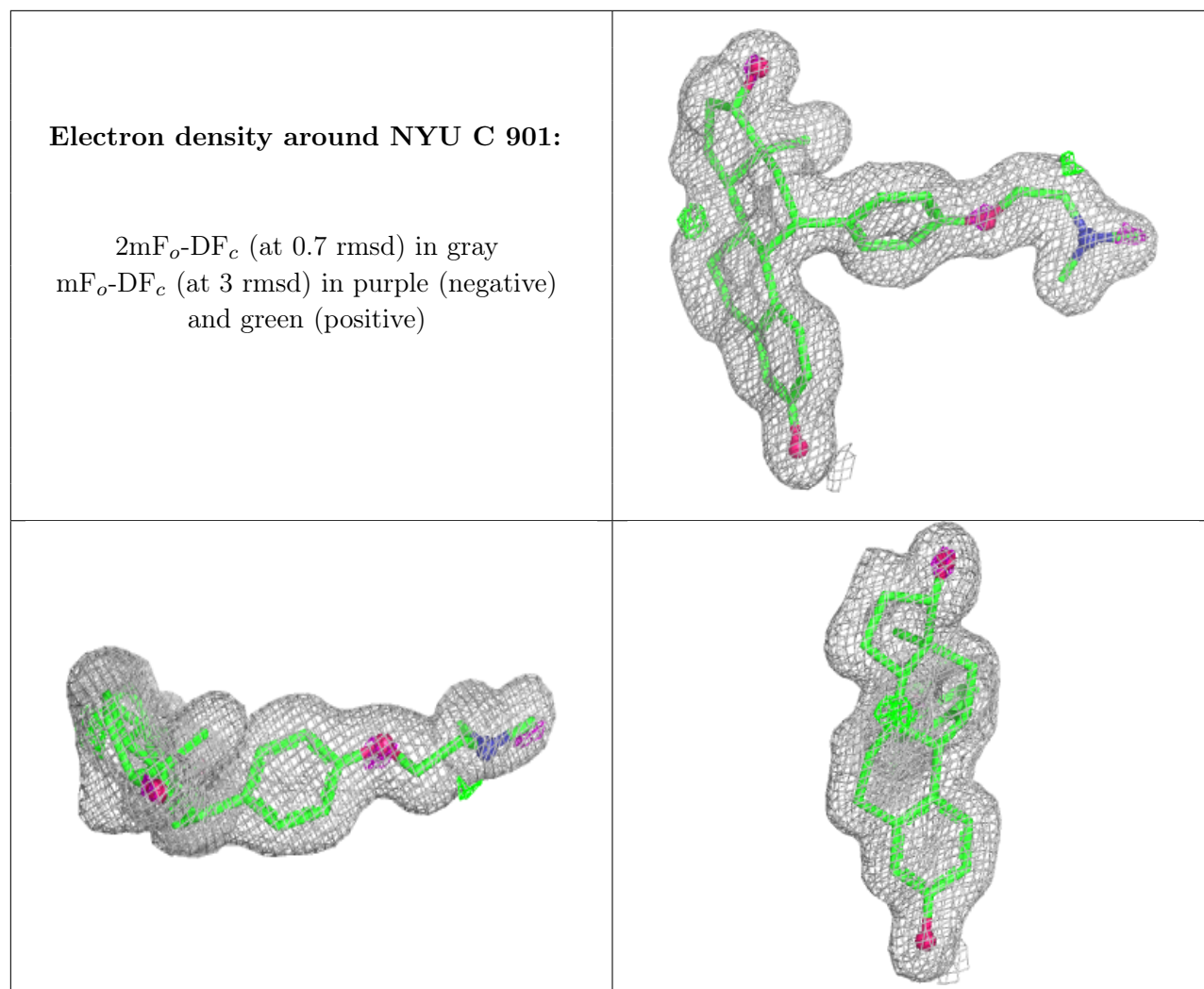
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around NYU A 901:**

$2mF_o-DF_c$  (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.