



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 16, 2017 – 04:26 PM EDT

PDB ID : 4XXD  
Title : Crystal Structure of mid-region amyloid beta capture by solanezumab  
Authors : Hermans, S.J.; Crespi, G.A.N.; Parker, M.W.; Miles, L.A.  
Deposited on : unknown  
Resolution : 2.41 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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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
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20029824
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-20029824

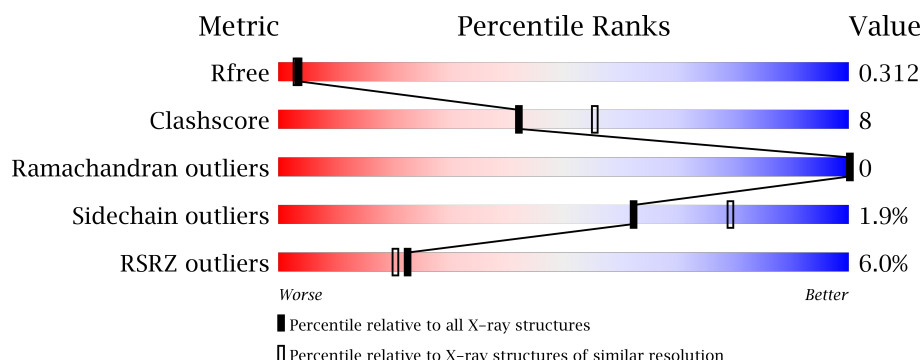
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.41 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	3709 (2.44-2.40)
Clashscore	112137	4241 (2.44-2.40)
Ramachandran outliers	110173	4178 (2.44-2.40)
Sidechain outliers	110143	4179 (2.44-2.40)
RSRZ outliers	101464	3740 (2.44-2.40)

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  $\geq 3$ , 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	219	<div> <div>3%</div> <div>85%</div> <div>13%</div> <div>.</div> </div>
1	D	219	<div> <div>12%</div> <div>74%</div> <div>21%</div> <div>.</div> <div>.</div> </div>
2	B	223	<div> <div>%</div> <div>87%</div> <div>5%</div> <div>8%</div> </div>
2	E	223	<div> <div>6%</div> <div>75%</div> <div>16%</div> <div>.</div> <div>8%</div> </div>
3	C	17	<div> <div>12%</div> <div>53%</div> <div>12%</div> <div>35%</div> </div>

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Mol	Chain	Length	Quality of chain
3	F	17	 <p>6% 47% 6% 47%</p>

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 6854 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 Fab Light Chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	218	Total	C	N	O	S	0	0	0
			1686	1060	286	335	5			
1	D	217	Total	C	N	O	S	0	0	0
			1677	1055	285	332	5			

- Molecule 2 is a protein called Fab Heavy Chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	206	Total	C	N	O	S	0	0	0
			1525	961	256	302	6			
2	E	206	Total	C	N	O	S	0	0	0
			1528	964	257	301	6			

- Molecule 3 is a protein called Amyloid-beta fragment.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	11	Total	C	N	O	0	0	0
			85	57	12	16			
3	F	9	Total	C	N	O	0	0	0
			75	52	10	13			

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	76	Total	O	0	0
			76	76		
4	B	66	Total	O	0	0
			66	66		
4	C	3	Total	O	0	0
			3	3		
4	D	56	Total	O	0	0
			56	56		

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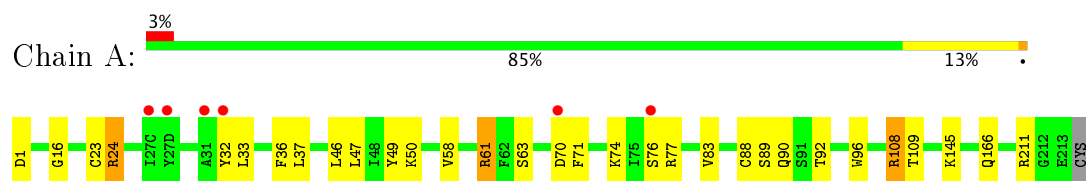
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	E	75	Total	O	0	0
			75	75		
4	F	2	Total	O	0	0
			2	2		

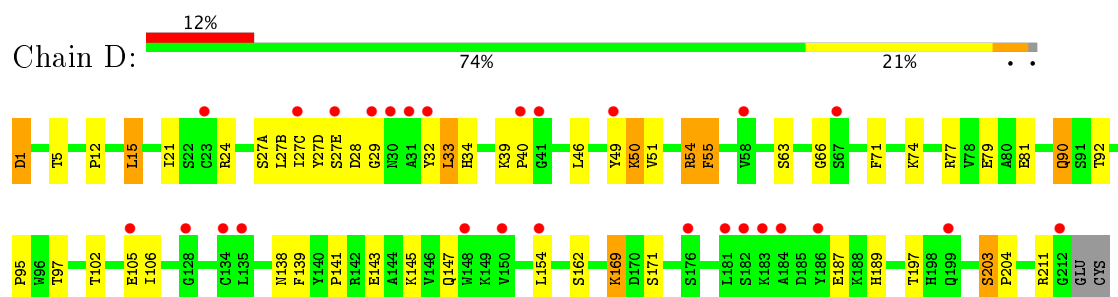
### 3 Residue-property plots [i](#)

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.

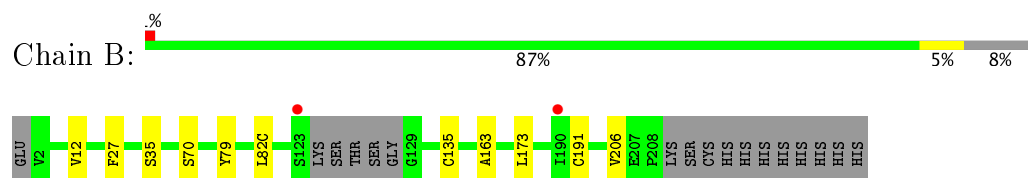
- Molecule 1: Fab Light Chain



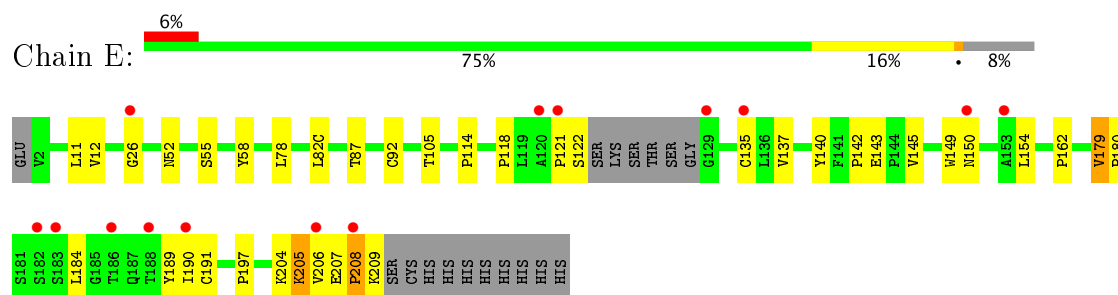
- Molecule 1: Fab Light Chain



- Molecule 2: Fab Heavy Chain



- Molecule 2: Fab Heavy Chain

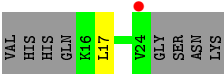


- Molecule 3: Amyloid-beta fragment





● Molecule 3: Amyloid-beta fragment



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	38.80 Å 73.56 Å 92.12 Å 109.91° 93.64° 93.31°	Depositor
Resolution (Å)	46.56 – 2.41 46.57 – 2.41	Depositor EDS
% Data completeness (in resolution range)	97.7 (46.56-2.41) 86.5 (46.57-2.41)	Depositor EDS
$R_{merge}$	0.12	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.21 (at 2.42 Å)	Xtriage
Refinement program	BUSTER 2.10.0	Depositor
R, $R_{free}$	0.249 , 0.290 0.265 , 0.312	Depositor DCC
$R_{free}$ test set	1793 reflections (5.26%)	DCC
Wilson B-factor (Å <sup>2</sup> )	30.6	Xtriage
Anisotropy	0.748	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.27 , 39.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.88	EDS
Total number of atoms	6854	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 19.86 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 9.8675e-03.*

<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](#)

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	0.51	0/1725	0.71	2/2343 (0.1%)
1	D	0.74	1/1716 (0.1%)	0.87	10/2331 (0.4%)
2	B	0.46	0/1559	0.73	2/2125 (0.1%)
2	E	0.48	1/1562 (0.1%)	0.79	4/2128 (0.2%)
3	C	0.40	0/86	0.68	0/114
3	F	0.43	0/76	0.70	0/101
All	All	0.56	2/6724 (0.0%)	0.78	18/9142 (0.2%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	40	PRO	N-CD	9.94	1.61	1.47
2	E	208	PRO	N-CD	5.52	1.55	1.47

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	184	LEU	CB-CA-C	9.99	129.19	110.20
2	B	27	PHE	N-CA-CB	-8.07	96.07	110.60
1	A	211	ARG	NE-CZ-NH1	7.72	124.16	120.30
1	D	39	LYS	CB-CA-C	7.71	125.82	110.40
1	D	138	ASN	N-CA-C	7.14	130.28	111.00

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	1686	0	1649	19	0
1	D	1677	0	1643	48	0
2	B	1525	0	1502	8	0
2	E	1528	0	1510	28	0
3	C	85	0	82	1	0
3	F	75	0	74	1	0
4	A	76	0	0	0	0
4	B	66	0	0	0	0
4	C	3	0	0	0	0
4	D	56	0	0	2	0
4	E	75	0	0	0	0
4	F	2	0	0	0	0
All	All	6854	0	6460	101	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 8.

The worst 5 of 101 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:D:147:GLN:OE1	1:D:154:LEU:HD11	1.64	0.98
2:E:190:ILE:HG12	2:E:205:LYS:HD2	1.43	0.96
2:E:118:PRO:HB3	2:E:206:VAL:HG22	1.52	0.91
1:A:36:PHE:HE2	1:A:89:SER:OG	1.57	0.87
1:A:36:PHE:HE2	1:A:89:SER:HG	0.89	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	216/219 (99%)	207 (96%)	9 (4%)	0	<b>100</b> <b>100</b>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	215/219 (98%)	203 (94%)	12 (6%)	0	100	100
2	B	202/223 (91%)	193 (96%)	9 (4%)	0	100	100
2	E	202/223 (91%)	192 (95%)	10 (5%)	0	100	100
3	C	9/17 (53%)	8 (89%)	1 (11%)	0	100	100
3	F	7/17 (41%)	7 (100%)	0	0	100	100
All	All	851/918 (93%)	810 (95%)	41 (5%)	0	100	100

There are no Ramachandran outliers to report.

### 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	194/195 (100%)	189 (97%)	5 (3%)	51	71
1	D	193/195 (99%)	187 (97%)	6 (3%)	45	65
2	B	172/188 (92%)	172 (100%)	0	100	100
2	E	172/188 (92%)	169 (98%)	3 (2%)	66	81
3	C	9/15 (60%)	9 (100%)	0	100	100
3	F	8/15 (53%)	8 (100%)	0	100	100
All	All	748/796 (94%)	734 (98%)	14 (2%)	62	79

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	54	ARG
1	D	55	PHE
2	E	122	SER
1	D	1	ASP
1	D	169	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	76	ASN
1	D	90	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](#)

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](#)

There are no ligands in this entry.

### 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	218/219 (99%)	0.36	6 (2%) 53 50	22, 35, 52, 76	0
1	D	217/219 (99%)	0.87	27 (12%) 4 4	22, 50, 81, 103	0
2	B	206/223 (92%)	0.17	2 (0%) 82 80	12, 27, 52, 76	0
2	E	206/223 (92%)	0.43	14 (6%) 18 16	14, 30, 70, 120	0
3	C	11/17 (64%)	1.17	2 (18%) 1 1	33, 38, 60, 78	0
3	F	9/17 (52%)	1.09	1 (11%) 6 5	40, 44, 58, 86	0
All	All	867/918 (94%)	0.48	52 (5%) 23 20	12, 36, 67, 120	0

The worst 5 of 52 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	27(E)	SER	6.5
2	E	206	VAL	5.8
1	D	183	LYS	5.6
1	D	67	SER	5.0
3	F	24	VAL	4.2

### 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 carbohydrates in this entry.

### 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.