



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 10, 2026 – 09:11 AM UTC

PDB ID : 6T9E / pdb_00006t9e
Title : Crystal structure of a bispecific DutaFab in complex with human PDGF
Authors : Kimbung, R.; Logan, D.T.; Beckmann, R.; Jensen, K.; Speck, J.; Fenn, S.; Kettenberger, H.
Deposited on : 2019-10-28
Resolution : 2.99 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 ⓘ 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
Xtriage (Phenix)	:	2.0
EDS	:	3.0
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

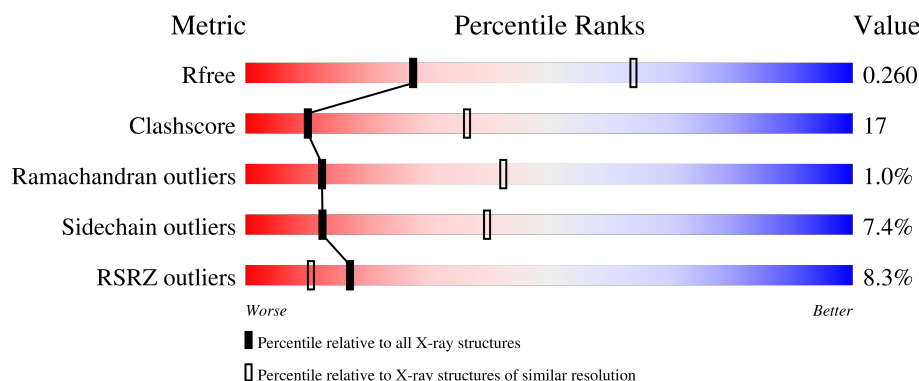
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.99 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	3580 (3.00-2.96)
Clashscore	190562	3904 (3.00-2.96)
Ramachandran outliers	187476	3761 (3.00-2.96)
Sidechain outliers	187428	3764 (3.00-2.96)
RSRZ outliers	180081	3579 (3.00-2.96)

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	AAA	220	10% 60% 31% • 5%
1	HHH	220	10% 62% 29% • 5%
2	BBB	214	10% 58% 36% • •
2	LLL	214	7% 61% 34% • •
3	CCC	109	4% 61% 23% • • 13%

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Mol	Chain	Length	Quality of chain
3	DDD	109	4% 63% 17% 6% 12%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7935 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 DutaFab mat VH chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	AAA	209	Total	C	N	O	S	0	0	0
			1578	1001	260	311	6			
1	HHH	209	Total	C	N	O	S	0	0	0
			1578	1001	260	311	6			

- Molecule 2 is a protein called DutaFab mat VL chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	BBB	207	Total	C	N	O	S	0	0	0
			1626	1023	273	325	5			
2	LLL	208	Total	C	N	O	S	0	0	0
			1628	1025	273	325	5			

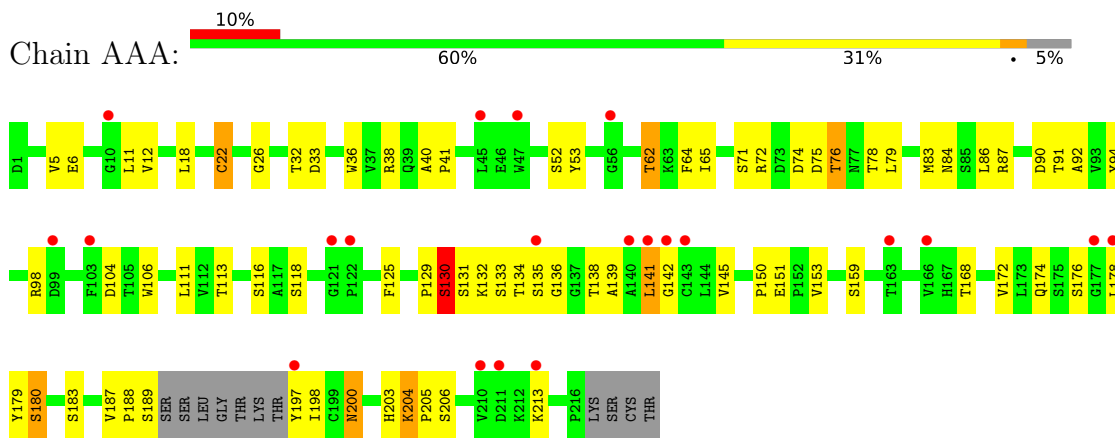
- Molecule 3 is a protein called Platelet-derived growth factor subunit B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	CCC	95	Total	C	N	O	S	0	0	0
			759	471	145	134	9			
3	DDD	96	Total	C	N	O	S	0	0	0
			766	476	146	135	9			

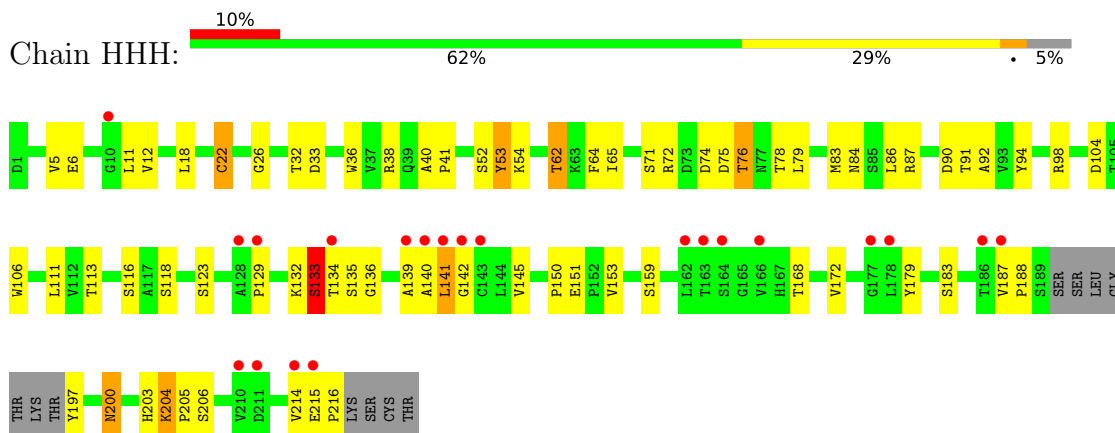
3 Residue-property plots [i](#)

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.

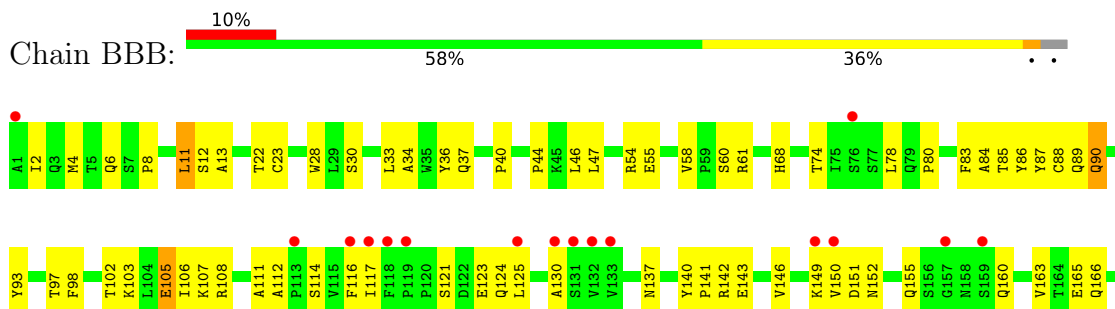
- Molecule 1: DutaFab mat VH chain

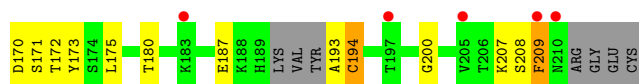


- Molecule 1: DutaFab mat VH chain

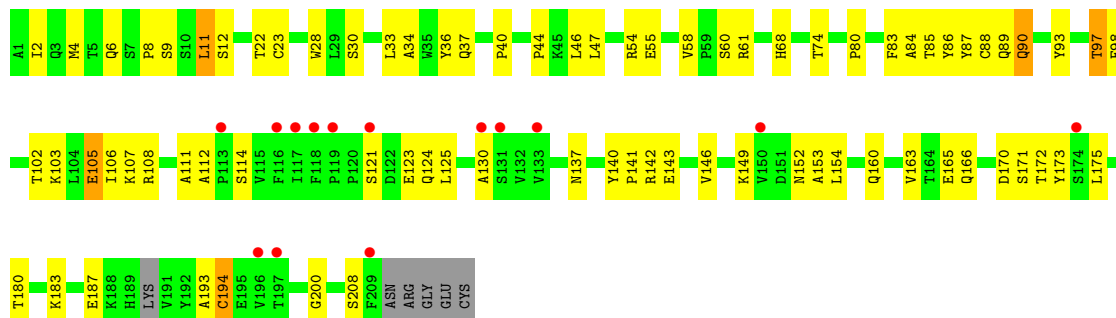


- Molecule 2: DutaFab mat VL chain

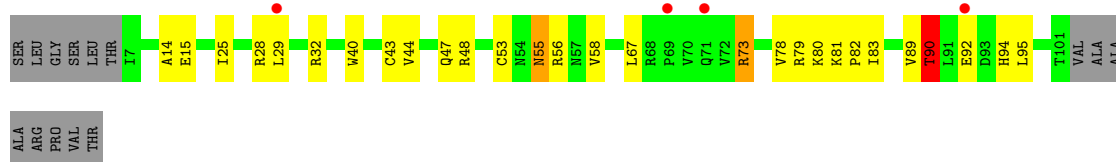




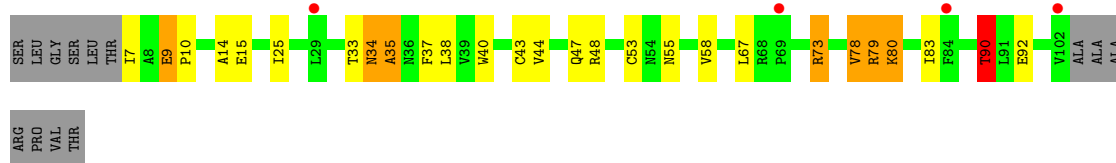
• Molecule 2: DutaFab mat VL chain



• Molecule 3: Platelet-derived growth factor subunit B



• Molecule 3: Platelet-derived growth factor subunit B



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	89.30Å 75.47Å 116.50Å 90.00° 110.58° 90.00°	Depositor
Resolution (Å)	29.73 – 2.99 29.73 – 2.99	Depositor EDS
% Data completeness (in resolution range)	97.8 (29.73-2.99) 97.8 (29.73-2.99)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.94 (at 3.00Å)	Xtriage
Refinement program	REFMAC 5.8.0257	Depositor
R, R_{free}	0.253 , 0.304 (Not available) , 0.260	Depositor DCC
R_{free} test set	1451 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	43.9	Xtriage
Anisotropy	0.571	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 42.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.000 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.81	EDS
Total number of atoms	7935	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.86% 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

5.1 Standard geometry

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	AAA	0.57	0/1619	1.04	1/2206 (0.0%)
1	HHH	0.55	0/1618	1.05	1/2202 (0.0%)
2	BBB	0.54	0/1667	1.06	3/2263 (0.1%)
2	LLL	0.55	0/1669	1.05	3/2266 (0.1%)
3	CCC	0.52	0/770	1.21	3/1040 (0.3%)
3	DDD	0.52	0/777	1.18	1/1050 (0.1%)
All	All	0.55	0/8120	1.08	12/11027 (0.1%)

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
3	DDD	0	1

There are no bond length outliers.

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	CCC	90	THR	CA-CB-OG1	-8.29	97.16	109.60
3	DDD	90	THR	CA-CB-OG1	-8.15	97.38	109.60
2	BBB	209	PHE	CA-CB-CG	7.27	121.07	113.80
1	HHH	62	THR	CB-CA-C	6.45	121.50	110.79
1	AAA	62	THR	CB-CA-C	6.41	121.43	110.79

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	DDD	7	ILE	Peptide

5.2 Too-close contacts

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	AAA	1578	0	1521	74	0
1	HHH	1578	0	1521	57	0
2	BBB	1626	0	1555	73	0
2	LLL	1628	0	1553	55	0
3	CCC	759	0	778	25	0
3	DDD	766	0	787	21	0
All	All	7935	0	7715	267	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 17.

The worst 5 of 267 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:HHH:197:TYR:CD2	1:HHH:214:VAL:O	2.00	1.13
1:AAA:132:LYS:HE2	2:BBB:207:LYS:HD2	1.30	1.12
3:CCC:78:VAL:CG1	3:CCC:83:ILE:HD13	1.83	1.07
1:AAA:132:LYS:HZ2	2:BBB:208:SER:C	1.62	1.07
1:HHH:215:GLU:C	1:HHH:216:PRO:N	2.15	1.04

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	AAA	176/220 (80%)	160 (91%)	13 (7%)	3 (2%)	7 30

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	HHH	204/220 (93%)	190 (93%)	12 (6%)	2 (1%)	12	42
2	BBB	203/214 (95%)	190 (94%)	12 (6%)	1 (0%)	24	58
2	LLL	204/214 (95%)	193 (95%)	11 (5%)	0	100	100
3	CCC	93/109 (85%)	84 (90%)	9 (10%)	0	100	100
3	DDD	94/109 (86%)	84 (89%)	6 (6%)	4 (4%)	2	11
All	All	974/1086 (90%)	901 (92%)	63 (6%)	10 (1%)	12	42

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	AAA	131	SER
3	DDD	35	ALA
3	DDD	79	ARG
3	DDD	80	LYS
1	AAA	135	SER

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	AAA	174/184 (95%)	158 (91%)	16 (9%)	8	31
1	HHH	174/184 (95%)	158 (91%)	16 (9%)	8	31
2	BBB	183/189 (97%)	171 (93%)	12 (7%)	15	44
2	LLL	182/189 (96%)	169 (93%)	13 (7%)	13	41
3	CCC	87/98 (89%)	84 (97%)	3 (3%)	32	64
3	DDD	88/98 (90%)	82 (93%)	6 (7%)	14	43
All	All	888/942 (94%)	822 (93%)	66 (7%)	13	40

5 of 66 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	LLL	83	PHE

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Mol	Chain	Res	Type
2	LLL	105	GLU
2	LLL	194	CYS
2	BBB	151	ASP
2	BBB	137	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 [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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	HHH	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	HHH	215:GLU	C	216:PRO	N	2.15

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, 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(Å²)	Q<0.9
1	AAA	209/220 (95%)	0.99	21 (10%)	12	8	27, 52, 111, 157	0
1	HHH	209/220 (95%)	0.99	21 (10%)	12	8	22, 52, 109, 146	0
2	BBB	207/214 (96%)	0.94	21 (10%)	12	8	21, 57, 131, 159	1 (0%)
2	LLL	208/214 (97%)	0.93	14 (6%)	24	14	23, 59, 119, 134	0
3	CCC	95/109 (87%)	0.80	4 (4%)	40	25	28, 51, 107, 141	0
3	DDD	96/109 (88%)	0.83	4 (4%)	40	25	29, 51, 110, 130	0
All	All	1024/1086 (94%)	0.94	85 (8%)	17	11	21, 54, 118, 159	1 (0%)

The worst 5 of 85 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	HHH	140	ALA	4.2
1	AAA	178	LEU	3.9
2	LLL	117	ILE	3.8
1	AAA	140	ALA	3.7
1	HHH	186	THR	3.7

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.