

# Integrative Structure Validation Report

October 09, 2025 - 04:38 PM PDT

*The following software was used in the production of this report:*

*IHMValidation Version 3.0*


*Python-IHM Version 2.5*

*MolProbity Version 4.5.2*

PDB ID	9A0X   pdb_00009a0x
PDB-Dev ID	PDBDEV_00000069
Structure Title	USP7 UBL 1-2 domains in complex with DNA polymerase iota peptide 438-448
Structure Authors	Ashton NW; Valles GJ; Jaiswal N; Bezsonova I; Woodgate R
Deposited on	2020-12-11

*This is a PDB-IHM Structure Validation Report.*

*We welcome your comments at [helpdesk@pdb-ihm.org](mailto:helpdesk@pdb-ihm.org)*

*A user guide is available at [https://pdb-ihm.org/validation\\_help.html](https://pdb-ihm.org/validation_help.html) with specific help available everywhere you see the  symbol.*

*List of references used to build this report is available [here](#).*

## 1. Overview

### 1.1. Summary

*This entry consists of 20 model(s). A total of 5 dataset(s) were used to build this entry.*

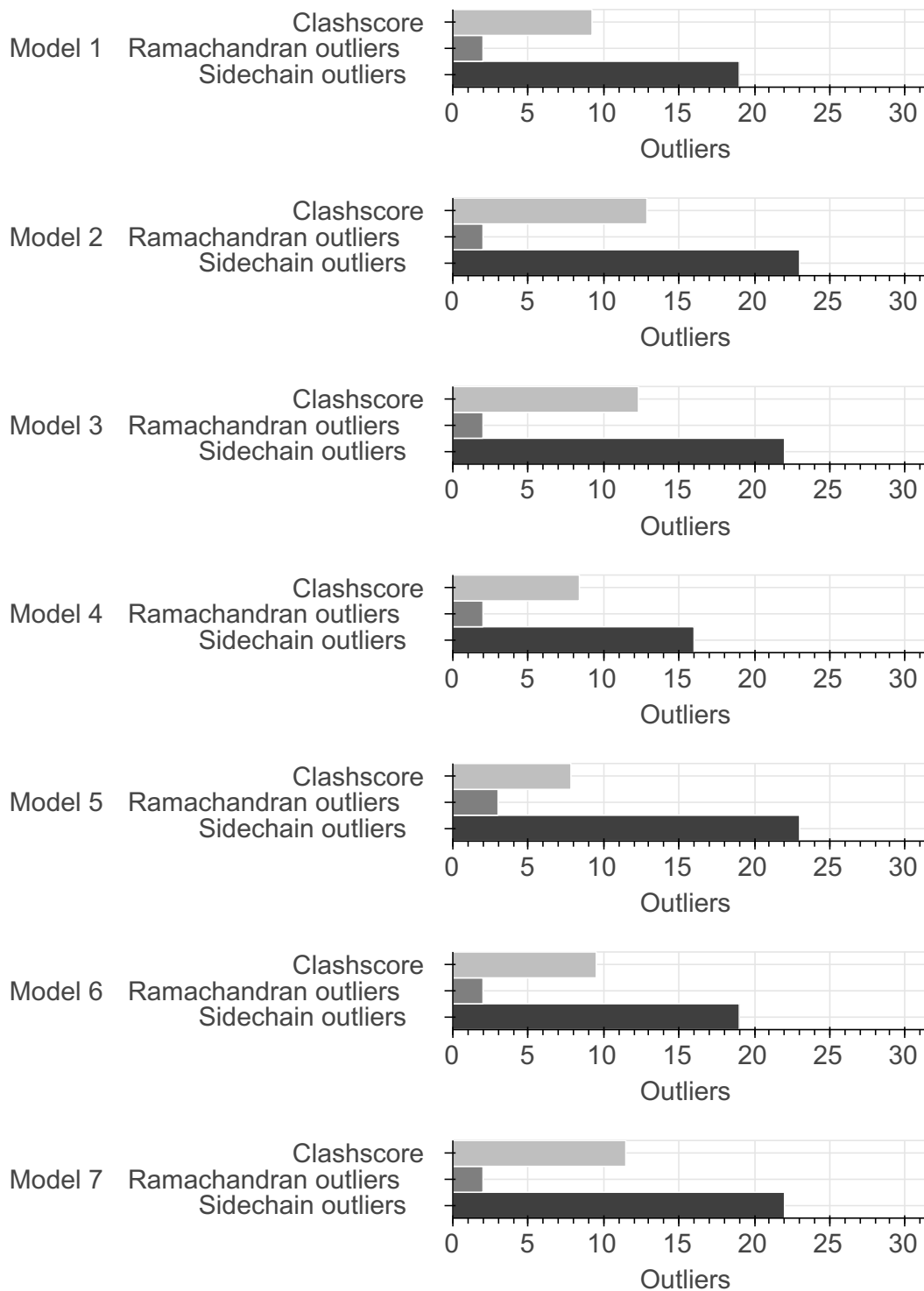
Name	Type	Count
Mutagenesis data	Experimental data	1
NMR data	Experimental data	1
Experimental model	Starting model	1

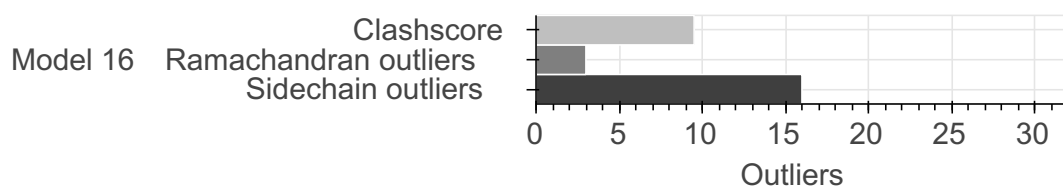
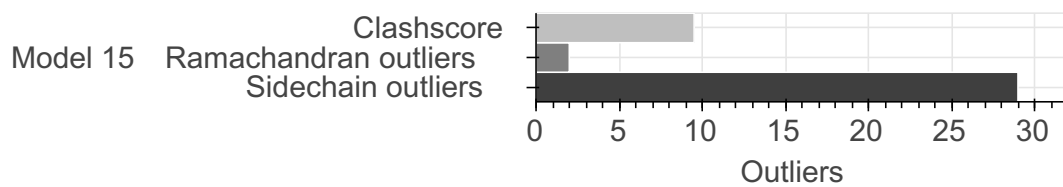
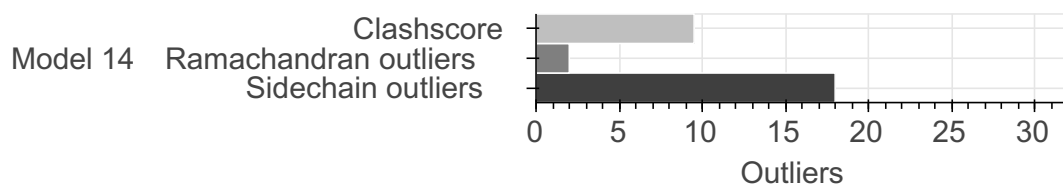
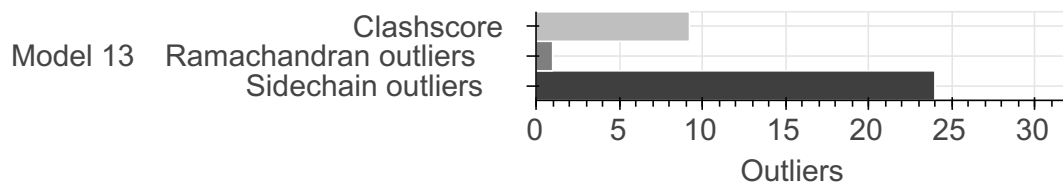
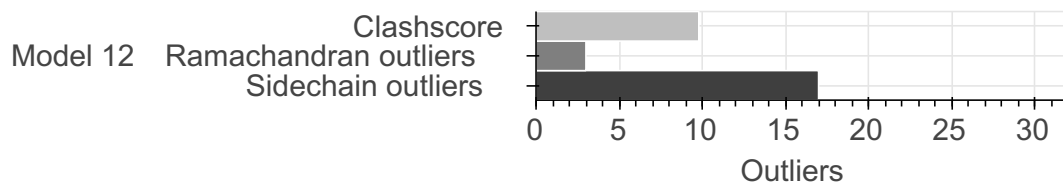
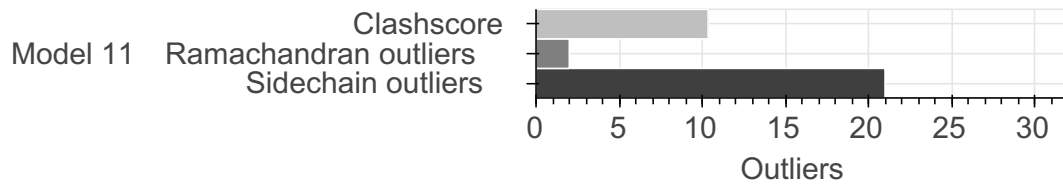
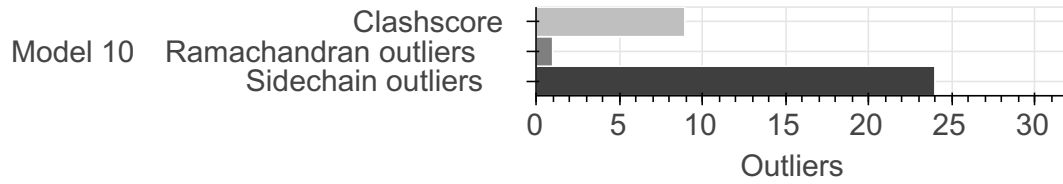
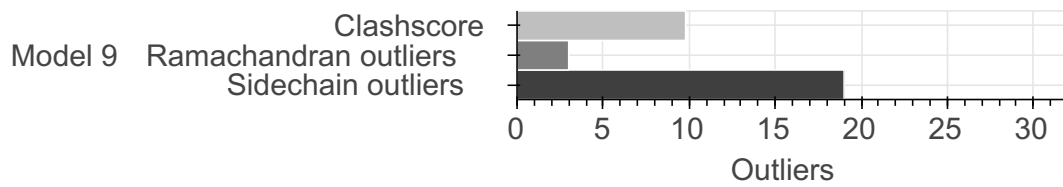
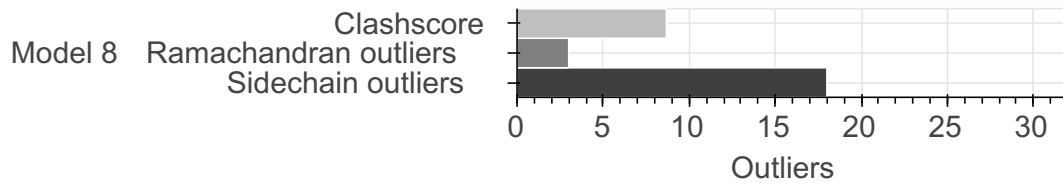
Name	Type	Count
Comparative model	Starting model	2

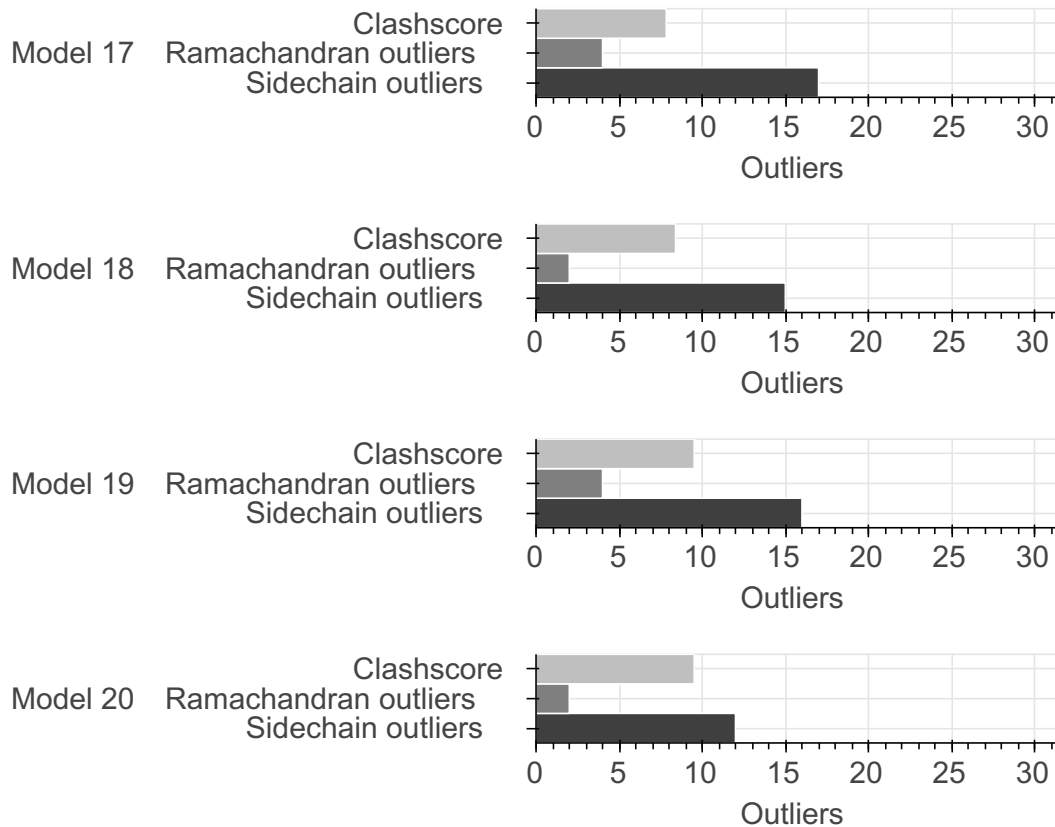
## 1.2. Overall quality ?

This validation report contains model quality assessments for all structures, data quality and fit to model assessments for SAS and crosslinking-MS datasets. Data quality and fit to model assessments for other datasets and model uncertainty are under development. Number of plots is limited to 256.

### Model Quality: MolProbity Analysis ?







## 2. Model Details ?

### 2.1. Ensemble information ?

This entry consists of 0 distinct ensemble(s).

### 2.2. Representation ?

This entry has 1 representation(s).

ID	Model(s)	Entity ID	Molecule name	Chain(s) [auth]	Total residues	Rigid segments	Flexible segments	Model coverage/ Starting model coverage (%)	Scale
1	1-20	1	DNA polymerase iota peptide 438-448	A	11	1-11	-	100.00 / 100.00	Atomic
		2	USP7 UBL 1-2 domains	B	214	1-214	-	100.00 / 100.00	Atomic

### 2.3. Datasets used for modeling ?

There are 5 unique datasets used to build the models in this entry.

ID	Dataset type	Database name	Data access code
1	Comparative model	Not available	Not available
2	Comparative model	Not available	Not available

ID	Dataset type	Database name	Data access code
3	Experimental model	PDB	<a href="#">pdb_00005gg4</a>
4	NMR data	BMRB	26782
5	Mutagenesis data	Not available	<a href="#">10.1016/j.jmb.2020.166733</a>

## 2.4. Methodology and software ?

This entry is a result of 1 distinct protocol(s).

Step number	Protocol ID	Method name	Method type	Method description	Number of computed models	Multi state modeling	Multi scale modeling
1	1	Not available	docking	Not available	Not available	False	False

There are 3 software packages reported in this entry.

ID	Software name	Software version	Software classification	Software location
1	<a href="#">MODELLER</a>	Not available	model building	<a href="https://salilab.org/modeller/">https://salilab.org/modeller/</a>
2	<a href="#">HADDOCK</a>	Not available	model building	<a href="http://haddock.science.uu.nl/services/HADDOCK/">http://haddock.science.uu.nl/services/HADDOCK/</a>
3	<a href="#">PYMOL</a>	Not available	model building	<a href="https://pymol.org/2/">https://pymol.org/2/</a>

## 3. Data quality ?

### 3.4. NMR ?

Validation for this section is under development.

### 3.4. Mutagenesis ?

Validation for this section is under development.

## 4. Model quality ?

For models with atomic structures, MolProbity analysis is performed. For models with coarse-grained or multi-scale structures, excluded volume analysis is performed.

### 4.1b. MolProbity Analysis ?

Excluded volume satisfaction for the models in the entry are listed below. The Analysed column shows the number of particle-particle or particle-atom pairs for which excluded volume was analysed.

#### Standard geometry: bond outliers ?

There are no bond length outliers.

#### Standard geometry: angle outliers ?

There are no bond angle outliers.

#### Too-close contacts ?

The following all-atom clashscore is based on a MolProbity analysis. All-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The table below contains clashscores for all atomic models in this entry.

Model ID	Clash score	Number of clashes
1	9.23	33
2	12.87	46
3	12.31	44
4	8.39	30
5	7.83	28
6	9.51	34
7	11.47	41
8	8.67	31
9	9.79	35
10	8.95	32
11	10.35	37
12	9.79	35
13	9.23	33
14	9.51	34
15	9.51	34
16	9.51	34
17	7.83	28
18	8.39	30
19	9.51	34
20	9.51	34

There are 687 clashes. The table below contains the detailed list of all clashes based on a MolProbity analysis. Bad clashes are  $\geq 0.4$  Angstrom. The output is limited to 100 rows.

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
B:119:ASP:HB3	B:122:HIS:HB2	0.99	3	2
A:9:LYS:HD2	B:177:VAL:HG11	0.89	18	2
B:103:THR:HG21	B:107:GLU:HG3	0.87	13	4
B:64:MET:HE3	B:100:PHE:HB2	0.83	14	6
B:37:LYS:HB3	B:88:ILE:HB	0.83	12	17
B:175:GLU:HB2	B:183:GLU:HB2	0.82	16	1
B:23:TYR:HB2	B:28:VAL:HG21	0.82	19	5
B:60:ARG:HB3	B:102:GLU:HB3	0.79	11	8
B:22:MET:HA	B:22:MET:HE3	0.78	14	11
B:159:MET:HE1	B:173:LEU:HD21	0.76	14	13

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
B:105:ASP:HB3	B:106:PRO:HD3	0.75	7	12
B:8:ILE:HB	B:31:THR:HB	0.75	8	9
B:141:CYS:HB3	B:162:ARG:HB3	0.74	10	7
B:82:ASP:HB3	B:85:LYS:HE2	0.74	7	2
B:11:GLU:HA	B:14:PHE:HD2	0.72	7	1
B:11:GLU:HG3	B:14:PHE:HD2	0.71	10	2
B:13:GLN:HB3	B:28:VAL:HG23	0.71	12	9
A:7:LYS:HG2	B:198:GLU:HG2	0.71	11	1
A:7:LYS:HE2	B:198:GLU:HB3	0.70	11	1
B:12:ASP:HB3	B:108:LEU:HD12	0.70	20	2
B:178:LYS:HE2	B:181:LEU:HD22	0.69	3	3
B:120:LYS:H	B:120:LYS:HD3	0.69	5	2
B:118:PHE:HB2	B:123:ASP:HB2	0.68	3	1
B:7:GLN:HG2	B:32:VAL:HG22	0.68	1	1
B:8:ILE:HD13	B:99:ILE:HB	0.68	17	8
B:148:ILE:HD13	B:199:LEU:HD21	0.68	5	1
B:45:VAL:HG12	B:56:GLN:HG2	0.68	15	8
B:12:ASP:HA	B:108:LEU:HB2	0.67	5	1
B:64:MET:HE2	B:100:PHE:HB2	0.67	7	11
B:127:PHE:HE2	B:202:GLY:HA2	0.67	11	8
B:11:GLU:HA	B:14:PHE:CD2	0.66	7	7
B:165:PHE:HE2	B:209:LYS:HD2	0.66	6	1
B:105:ASP:HA	B:112:GLY:HA3	0.65	3	2
B:21:ASP:HA	B:73:ARG:HH21	0.65	2	2
B:148:ILE:HA	B:192:LEU:HD11	0.65	3	1
B:170:SER:HB2	B:210:ASP:HB3	0.64	5	9
B:52:MET:HA	B:52:MET:HE2	0.64	9	3
B:129:LYS:HD3	B:204:ILE:HG21	0.64	19	1
B:24:ASP:HB3	B:27:LYS:HB3	0.64	11	6
B:104:VAL:HG13	B:105:ASP:H	0.63	3	6
B:21:ASP:HA	B:73:ARG:NH2	0.63	15	3
B:175:GLU:HB3	B:183:GLU:HB2	0.63	17	6
B:193:ASP:HA	B:199:LEU:HD22	0.62	8	1
B:86:THR:HB	B:89:GLU:HG3	0.62	20	7
A:10:ASP:HA	B:69:ASN:HA	0.62	12	1

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
B:41:LEU:HD12	B:85:LYS:HD2	0.61	2	4
B:175:GLU:HG3	B:185:ILE:HD11	0.61	11	2
B:66:ALA:HB2	B:72:LYS:HE2	0.61	16	1
B:107:GLU:HG2	B:108:LEU:H	0.60	9	4
B:4:MET:HB3	B:37:LYS:HG2	0.60	1	2
B:127:PHE:HB2	B:204:ILE:HG12	0.60	20	10
B:62:TRP:HB2	B:100:PHE:HB3	0.60	1	5
B:148:ILE:HA	B:192:LEU:HD12	0.60	4	2
B:9:VAL:HG22	B:100:PHE:HA	0.60	2	1
B:5:GLN:HB3	B:96:PRO:HB3	0.59	5	8
B:60:ARG:HH22	B:116:PRO:HG2	0.59	9	2
B:55:PRO:HG2	B:58:GLN:HB2	0.59	12	2
B:58:GLN:HB3	B:104:VAL:HB	0.59	14	4
B:156:LEU:HB2	B:157:PRO:HD3	0.59	15	15
B:163:ALA:HB2	B:207:PHE:HE2	0.59	16	5
B:146:THR:HG21	B:155:LEU:HD21	0.59	6	3
A:9:LYS:HD3	B:178:LYS:HD2	0.59	16	1
B:134:LYS:HE2	B:214:ASN:HA	0.58	7	1
B:175:GLU:HB2	B:185:ILE:HD11	0.58	15	2
B:63:PRO:HA	B:99:ILE:HD13	0.58	12	15
B:163:ALA:HB2	B:207:PHE:HZ	0.58	2	1
B:62:TRP:HB3	B:74:PRO:HB2	0.58	10	2
B:156:LEU:HB3	B:157:PRO:HD3	0.57	7	1
B:171:LEU:HD23	B:209:LYS:HA	0.57	13	14
B:174:TYR:HB3	B:182:THR:HG22	0.57	7	6
B:155:LEU:HD11	B:192:LEU:HD21	0.57	5	3
B:64:MET:HB2	B:98:THR:HB	0.57	1	6
B:190:VAL:HG23	B:195:ALA:HB2	0.57	1	1
B:9:VAL:HG22	B:30:TYR:HB3	0.57	13	1
B:119:ASP:H	B:123:ASP:HB2	0.57	17	2
B:174:TYR:HB2	B:206:VAL:HB	0.56	1	2
B:12:ASP:HA	B:108:LEU:HD12	0.56	7	3
B:37:LYS:HD3	B:88:ILE:HD12	0.56	13	1
B:82:ASP:HB2	B:85:LYS:HD3	0.56	15	2
B:105:ASP:H	B:106:PRO:HD2	0.56	15	8

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
B:13:GLN:HB3	B:28:VAL:HG13	0.56	2	2
B:8:ILE:HD11	B:44:PHE:HZ	0.55	8	3
B:59:ILE:HB	B:101:LEU:HD12	0.55	5	1
B:60:ARG:H	B:102:GLU:HB3	0.55	1	1
B:48:LEU:HD21	B:101:LEU:HD11	0.55	4	1
B:128:LEU:HB2	B:141:CYS:HB2	0.55	2	3
B:4:MET:SD	B:37:LYS:HA	0.55	15	5
A:4:HIS:HB2	B:200:MET:HE2	0.55	20	3
B:123:ASP:HA	B:147:PRO:HA	0.55	18	3
B:211:ASP:HB3	B:214:ASN:ND2	0.55	19	3
B:56:GLN:HA	B:59:ILE:HG12	0.55	10	4
B:127:PHE:HE1	B:202:GLY:HA2	0.55	8	2
B:48:LEU:HD21	B:101:LEU:HG	0.55	3	1
B:178:LYS:HG2	B:181:LEU:HD22	0.54	12	1
B:127:PHE:CE1	B:202:GLY:HA2	0.54	19	1
B:129:LYS:HE3	B:204:ILE:HG21	0.53	20	2
B:129:LYS:O	B:206:VAL:HA	0.53	6	7
B:73:ARG:HD3	B:202:GLY:O	0.53	7	2
B:41:LEU:HB2	B:85:LYS:HE3	0.53	6	1
B:86:THR:O	B:90:LEU:HG	0.53	7	2

### Torsion angles: Protein backbone ?

*In the following table, Ramachandran outliers are listed. The Analysed column shows the number of residues for which the backbone conformation was analysed.*

Model ID	Analysed	Favored	Allowed	Outliers
1	221	204	15	2
2	221	205	14	2
3	221	206	13	2
4	221	206	13	2
5	221	209	9	3
6	221	210	9	2
7	221	207	12	2
8	221	208	10	3
9	221	205	13	3
10	221	211	9	1

Model ID	Analysed	Favored	Allowed	Outliers
11	221	205	14	2
12	221	211	7	3
13	221	208	12	1
14	221	209	10	2
15	221	208	11	2
16	221	208	10	3
17	221	203	14	4
18	221	209	10	2
19	221	206	11	4
20	221	207	12	2

There are 9 unique backbone outliers. Detailed list of outliers are tabulated below.

Chain	Res	Type	Models (Total)
B	82	ASP	19
B	105	ASP	19
B	27	LYS	2
B	81	ALA	2
A	9	LYS	1
B	21	ASP	1
B	107	GLU	1
B	112	GLY	1
B	202	GLY	1

### Torsion angles : Protein sidechains

In the following table, sidechain rotameric outliers are listed. The Analysed column shows the number of residues for which the sidechain conformation was analysed.

Model ID	Analysed	Favored	Allowed	Outliers
1	205	163	23	19
2	205	160	22	23
3	205	162	21	22
4	205	167	22	16
5	205	157	25	23
6	205	163	23	19
7	205	160	23	22
8	205	168	19	18
9	205	165	21	19

Model ID	Analysed	Favored	Allowed	Outliers
10	205	166	15	24
11	205	158	26	21
12	205	168	20	17
13	205	167	14	24
14	205	164	23	18
15	205	158	18	29
16	205	166	23	16
17	205	168	20	17
18	205	165	25	15
19	205	159	30	16
20	205	168	25	12

There are 88 unique sidechain outliers. Detailed list of outliers are tabulated below.

Chain	Res	Type	Models (Total)
B	135	THR	19
B	146	THR	17
B	149	SER	16
B	98	THR	14
B	101	LEU	14
B	103	THR	14
B	114	THR	14
B	86	THR	12
B	107	GLU	12
B	41	LEU	11
B	182	THR	11
B	191	SER	11
B	82	ASP	10
B	31	THR	9
B	40	SER	9
B	68	SER	9
B	27	LYS	8
B	104	VAL	8
B	92	ASP	7
A	1	SER	6
B	12	ASP	6

Chain	Res	Type	Models (Total)
B	170	SER	6
B	189	ASP	6
B	5	GLN	5
B	21	ASP	5
B	30	TYR	5
B	49	SER	5
B	57	ASP	5
B	186	GLN	5
B	9	VAL	4
B	22	MET	4
B	79	ASN	4
B	154	ASP	4
B	201	ASP	4
A	5	SER	3
A	9	LYS	3
A	10	ASP	3
A	11	THR	3
B	39	SER	3
B	71	THR	3
B	93	ASN	3
B	111	SER	3
B	117	LYS	3
B	177	VAL	3
B	198	GLU	3
B	203	ASP	3
B	11	GLU	2
B	26	GLU	2
B	51	THR	2
B	61	LEU	2
B	78	ASP	2
B	108	LEU	2
B	120	LYS	2
B	123	ASP	2
B	166	ILE	2
B	176	GLU	2

Chain	Res	Type	Models (Total)
B	178	LYS	2
B	205	ILE	2
B	211	ASP	2
A	8	MET	1
B	20	ASN	1
B	25	GLU	1
B	33	PHE	1
B	43	GLU	1
B	46	GLN	1
B	48	LEU	1
B	52	MET	1
B	54	PHE	1
B	60	ARG	1
B	64	MET	1
B	65	GLN	1
B	72	LYS	1
B	73	ARG	1
B	77	LEU	1
B	84	ASN	1
B	115	LEU	1
B	136	ARG	1
B	139	ASN	1
B	141	CYS	1
B	144	ILE	1
B	156	LEU	1
B	175	GLU	1
B	180	ASN	1
B	181	LEU	1
B	184	ARG	1
B	192	LEU	1
B	204	ILE	1
B	208	GLN	1

## 5. Fit to Data Used for Modeling Assessment

#### 5.4. NMR ?

Validation for this section is under development.

#### 5.4. Mutagenesis ?

Validation for this section is under development.

---

### 6. Fit to Data Used for Validation Assessment ?

Validation for this section is under development.

---

#### *Acknowledgments*

*The development of integrative model validation metrics, implementation of a model validation pipeline, and creation of a validation report for integrative structures are funded by NSF awards to the [PDB-IHM team](#) (DBI-1756248, DBI-2112966, DBI-2112967, DBI-2112968, and DBI-1756250) and awards from NSF, NIH, and DOE to the [RCSB PDB](#) (DBI-2321666, R01GM157729, and DE-SC0019749). The PDB-IHM team and members of the [Sali lab](#) contributed model validation metrics and software packages.*

*Dr. Jill Trewhella, Dr. Dina Schneidman, and members of the [SASBDB](#) repository are acknowledged for their advice and support in implementing SAS validation methods. Team members from the labs of Dr. Juri Rappsilber, Dr. Alexander Leitner, Dr. Andrea Graziadei, and members of [PRIDE](#) database are acknowledged for their advice and support in implementing crosslinking-MS validation methods. We are grateful to Dr. Shruthi Viswanath for discussions about uncertainty assessment of integrative structural models.*

*Members of the [wwPDB Integrative/Hybrid Methods Task Force](#) provided recommendations and community support for the project.*