

Integrative Structure Validation Report

October 09, 2025 - 04:41 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

pyHMMER Version 0.11.1

PDB ID	9A2R pdb_00009a2r
PDB-Dev ID	PDBDEV_00000176
Structure Title	Model of E. coli AtpA by in-cell photo-crosslinking MS and deep learning
Structure Authors	Stahl, K.; Graziadei, A.; Dau, T.; Brock, O.; Rappsilber, J.
Deposited on	2023-02-03

This is a PDB-IHM Structure Validation Report.

We welcome your comments at helpdesk@pdb-ihm.org

A user guide is available at 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

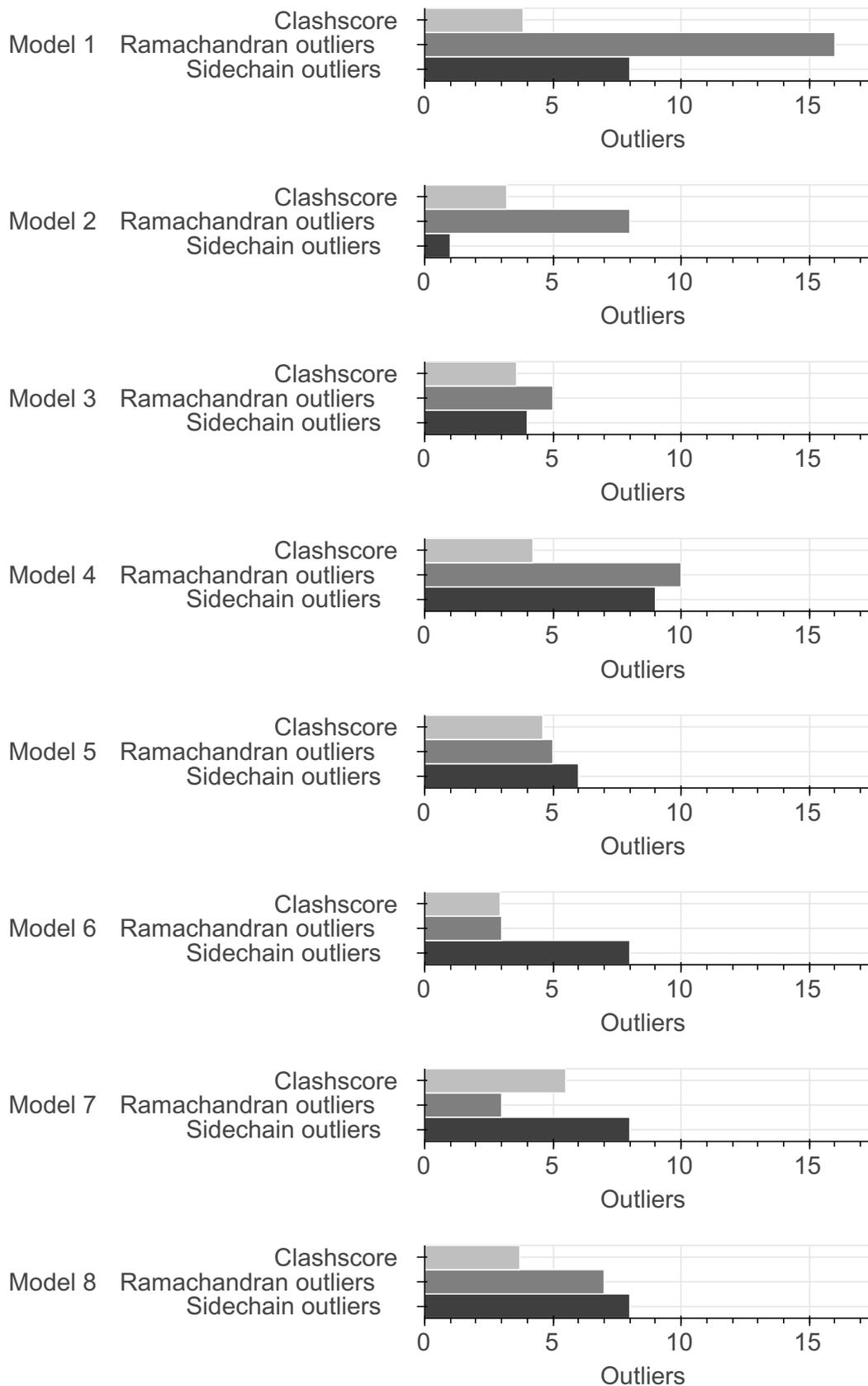
This entry consists of 10 model(s). A total of 1 dataset(s) were used to build this entry.

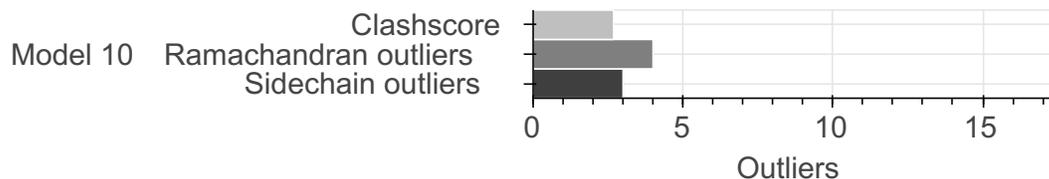
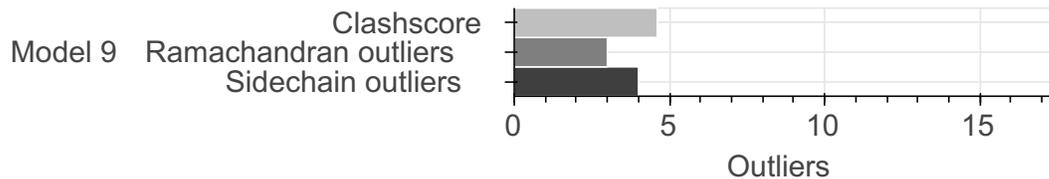
Name	Type	Count
Crosslinking-MS data	Experimental data	1

1.2. Overall quality

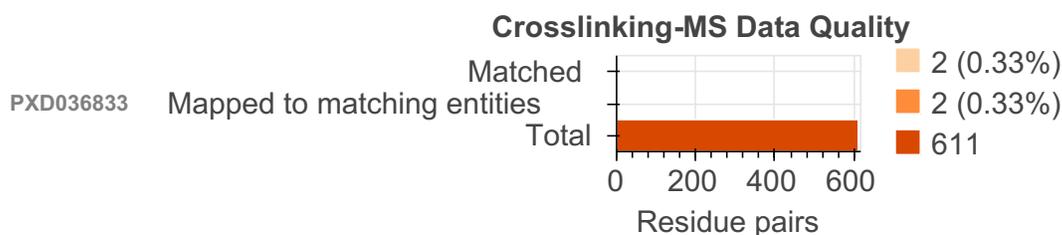
This validation report contains model quality assessments for all structures, data quality and fit to model assessments for SAS and crosslinking-MS datasets. Data quality and fit to model assessments for other datasets and model uncertainty are under development. Number of plots is limited to 256.

Model Quality: MolProbity Analysis

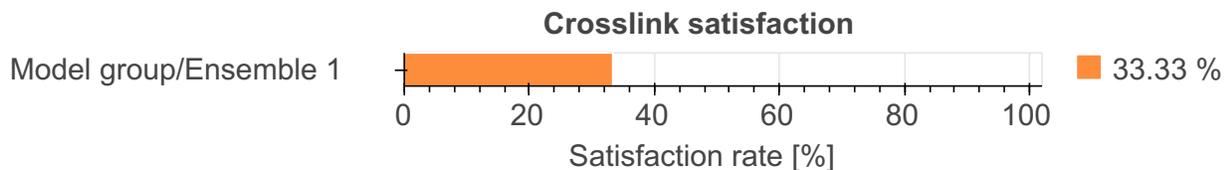




Data Quality ?



Fit to Data Used for Modeling ?



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	1-10	1	P0ABB0	A	513	-	1-513	100.00 / 0.00	Atomic

2.3. Datasets used for modeling ?

There is 1 unique dataset used to build the models in this entry.

ID	Dataset type	Database name	Data access code
1	Crosslinking-MS data	jPOSTrepo	JPST001851

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	AlphaLink	AlphaLink with 10 msa subsamples	Not available	10	False	False

There is 1 software package reported in this entry.

ID	Software name	Software version	Software classification	Software location
1	AlphaLink	1.00	model building	https://github.com/lhatsk/AlphaLink

3. Data quality

3.2. Crosslinking-MS

At the moment, data validation is only available for crosslinking-MS data deposited as a fully *compliant* dataset in the *PRIDE Crosslinking* database. Correspondence between crosslinking-MS and entry entities is established using *pyHMMER*. Only residue pairs that passed the reported threshold are used for the analysis. The values in the report have to be interpreted in the context of the experiment (i.e. only a minor fraction of in-situ or in-vivo dataset can be used for modeling).

PXD036833

Number of entities in the crosslinking-MS dataset: 1102

Number of entities in the entry: 1

Matching entities:

Entity ID	Molecule name	Crosslinking-MS Entity ID	E-value	Exact match
1	P0ABB0	dbseq_P0ABB0_target	0.00	True

Residue pairs stats:

Source	Total	In matched entities	Total matched
9A2R	3	3 (100.00%)	2 (66.67%)
PXD036833	611	2 (0.33%)	2 (0.33%)

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 2 bond length outliers in this entry (0.01% of 39380 assessed bonds). A summary is provided below.

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
A	365	ARG	CZ-NH2	4.07	1.28	1.33	7	1
A	161	ARG	CZ-NH2	4.00	1.28	1.33	8	1

Standard geometry: angle outliers ?

There are 271 bond angle outliers in this entry (0.51% of 53270 assessed bonds). A summary is provided below.

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
A	149	GLY	C-N-CA	7.84	135.81	121.70	2	1
A	317	VAL	C-N-CA	6.71	133.78	121.70	5	1
A	369	ASN	OD1-CG-ND2	6.57	116.03	122.60	5	1
A	22	VAL	CA-CB-CG2	6.52	121.49	110.40	7	1
A	261	ASP	C-N-CA	6.49	133.38	121.70	3	5
A	434	LYS	C-N-CA	6.47	133.34	121.70	2	1
A	433	GLN	OE1-CD-NE2	6.13	116.47	122.60	8	3
A	150	TYR	C-N-CA	6.08	132.64	121.70	2	1
A	394	ARG	NH1-CZ-NH2	6.07	111.41	119.30	5	1
A	250	ARG	CD-NE-CZ	5.97	132.76	124.40	1	2
A	435	GLN	OE1-CD-NE2	5.96	116.64	122.60	7	8
A	420	GLN	OE1-CD-NE2	5.91	116.69	122.60	1	9
A	266	GLN	OE1-CD-NE2	5.90	116.70	122.60	6	4
A	177	ALA	C-CA-CB	5.86	119.30	110.50	7	1
A	186	GLN	OE1-CD-NE2	5.84	116.76	122.60	1	2
A	322	GLY	C-N-CA	5.73	132.01	121.70	4	1
A	261	ASP	CA-CB-CG	5.69	118.29	112.60	1	1
A	262	ASP	CA-CB-CG	5.67	118.27	112.60	3	1
A	382	GLN	OE1-CD-NE2	5.55	117.05	122.60	4	2
A	325	THR	CA-CB-CG2	5.47	119.79	110.50	4	1

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
A	287	PRO	CA-N-CD	5.44	104.39	112.00	10	1
A	342	PRO	C-N-CA	5.41	131.43	121.70	8	1
A	172	GLN	OE1-CD-NE2	5.37	117.23	122.60	2	9
A	303	ARG	NE-CZ-NH2	5.37	124.03	119.20	5	1
A	291	PHE	CA-CB-CG	5.33	108.47	113.80	5	2
A	381	ALA	N-CA-CB	5.31	102.43	110.40	8	1
A	511	GLN	OE1-CD-NE2	5.26	117.34	122.60	2	10
A	181	ASP	CA-CB-CG	5.18	117.78	112.60	3	3
A	444	GLN	OE1-CD-NE2	5.17	117.43	122.60	6	7
A	144	GLN	OE1-CD-NE2	5.15	117.45	122.60	1	8
A	377	VAL	CA-CB-CG2	5.15	119.15	110.40	8	1
A	283	ARG	C-N-CA	5.09	130.86	121.70	6	1
A	272	GLN	OE1-CD-NE2	5.09	117.51	122.60	4	6
A	300	ARG	NE-CZ-NH2	5.08	123.77	119.20	6	4
A	333	GLN	OE1-CD-NE2	5.05	117.55	122.60	3	7
A	370	PRO	N-CA-C	5.02	124.65	112.10	7	1
A	349	THR	CA-C-N	4.97	126.14	116.20	6	1
A	342	PRO	N-CA-CB	4.96	108.45	103.00	5	2
A	289	ASP	CA-CB-CG	4.93	117.53	112.60	9	2
A	281	PRO	C-CA-CB	4.92	119.44	110.10	5	1
A	324	LEU	C-N-CA	4.91	130.55	121.70	4	1
A	352	GLN	OE1-CD-NE2	4.91	117.69	122.60	6	7
A	185	ASN	OD1-CG-ND2	4.86	117.74	122.60	9	2
A	399	GLN	OE1-CD-NE2	4.82	117.78	122.60	7	10
A	336	ASP	C-N-CA	4.77	130.29	121.70	3	1
A	328	PRO	N-CA-CB	4.77	108.25	103.00	2	1
A	287	PRO	N-CA-CB	4.75	108.22	103.00	2	1
A	349	THR	C-N-CA	4.75	130.24	121.70	10	1
A	423	HIS	CB-CG-CD2	4.71	125.08	131.20	10	1
A	344	ASN	OD1-CG-ND2	4.71	117.89	122.60	8	2
A	425	GLN	OE1-CD-NE2	4.68	117.92	122.60	5	7
A	147	GLN	OE1-CD-NE2	4.68	117.92	122.60	4	5
A	152	ALA	N-CA-CB	4.64	103.44	110.40	7	1
A	27	ASN	CA-CB-CG	4.64	107.96	112.60	1	1
A	157	ILE	CA-C-N	4.63	123.85	116.90	10	1

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
A	346	ILE	CA-CB-CG2	4.61	118.34	110.50	5	2
A	148	THR	C-N-CA	4.60	129.98	121.70	9	1
A	349	THR	CA-CB-OG1	4.60	116.50	109.60	7	1
A	49	GLN	OE1-CD-NE2	4.59	118.01	122.60	6	9
A	484	GLN	OE1-CD-NE2	4.58	118.02	122.60	2	10
A	140	GLN	OE1-CD-NE2	4.58	118.02	122.60	2	4
A	380	ALA	C-N-CA	4.57	129.93	121.70	8	1
A	150	TYR	N-CA-C	4.56	123.76	111.00	2	1
A	394	ARG	NE-CZ-NH2	4.55	123.29	119.20	5	1
A	316	GLU	CA-C-N	4.54	125.28	116.20	5	1
A	235	GLN	OE1-CD-NE2	4.52	118.08	122.60	1	4
A	163	GLN	OE1-CD-NE2	4.49	118.11	122.60	7	5
A	438	PRO	N-CA-CB	4.48	107.93	103.00	9	1
A	318	LYS	C-CA-CB	4.48	101.59	110.10	5	1
A	286	PHE	CA-C-N	4.43	123.55	116.90	2	2
A	488	GLN	OE1-CD-NE2	4.42	118.18	122.60	3	9
A	408	GLN	OE1-CD-NE2	4.41	118.19	122.60	2	10
A	435	GLN	N-CA-C	4.41	123.34	111.00	2	1
A	160	GLY	C-N-CA	4.40	129.63	121.70	1	1
A	375	SER	C-N-CA	4.40	129.61	121.70	8	1
A	347	SER	C-CA-CB	4.39	118.45	110.10	6	1
A	155	SER	C-CA-CB	4.39	118.44	110.10	7	1
A	158	PRO	N-CA-CB	4.38	107.81	103.00	8	1
A	18	GLN	OE1-CD-NE2	4.37	118.23	122.60	2	9
A	2	GLN	OE1-CD-NE2	4.34	118.26	122.60	6	10
A	310	GLU	CA-CB-CG	4.33	105.45	114.10	5	1
A	26	HIS	CB-CG-CD2	4.31	125.59	131.20	3	3
A	20	ASN	OD1-CG-ND2	4.30	118.30	122.60	7	2
A	42	HIS	CB-CG-CD2	4.29	125.62	131.20	3	1
A	200	GLN	OE1-CD-NE2	4.26	118.34	122.60	6	2
A	351	GLY	C-N-CA	4.23	129.32	121.70	9	1
A	26	HIS	C-N-CA	4.20	129.25	121.70	9	1
A	233	ALA	N-CA-CB	4.18	104.13	110.40	9	1
A	479	HIS	CB-CG-CD2	4.18	125.77	131.20	9	1
A	302	ALA	C-CA-CB	4.17	116.76	110.50	1	1

Chain	Res	Type	Atoms	Z	Observed (Å)	Ideal (Å)	Model ID (Worst)	Models (Total)
A	26	HIS	CA-CB-CG	4.15	109.65	113.80	4	1
A	139	ARG	CD-NE-CZ	4.12	130.17	124.40	3	1
A	154	ASP	CA-CB-CG	4.11	116.71	112.60	3	1
A	158	PRO	CA-N-CD	4.10	106.26	112.00	1	1
A	14	GLN	OE1-CD-NE2	4.09	118.51	122.60	3	3
A	250	ARG	NE-CZ-NH1	4.08	125.58	121.50	5	1
A	340	PHE	C-CA-CB	4.06	117.81	110.10	4	1
A	453	ARG	NE-CZ-NH2	4.02	122.81	119.20	1	1
A	352	GLN	C-N-CA	4.00	128.90	121.70	5	1

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	3.84	30
2	3.20	25
3	3.58	28
4	4.22	33
5	4.61	36
6	2.94	23
7	5.50	43
8	3.71	29
9	4.61	36
10	2.69	21

There are 304 clashes. The table below contains the detailed list of all clashes based on a MolProbity analysis. Bad clashes are ≥ 0.4 Angstrom. The output is limited to 100 rows.

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
A:74:VAL:HG11	A:233:ALA:HB2	0.86	5	4
A:359:LEU:HD11	A:401:ARG:HH21	0.84	9	1
A:156:MET:HE1	A:390:SER:HB2	0.84	7	1
A:62:ILE:HD11	A:95:LEU:HD22	0.81	8	5
A:393:ILE:HD13	A:448:LEU:HD22	0.79	2	1
A:74:VAL:CG1	A:233:ALA:HB2	0.75	3	5
A:153:VAL:HG22	A:448:LEU:HD21	0.75	8	1
A:156:MET:HE1	A:390:SER:CB	0.74	7	1

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
A:177:ALA:HB3	A:365:ARG:NH2	0.74	7	1
A:179:ALA:HB2	A:329:ILE:HD12	0.71	1	1
A:353:ILE:HG23	A:368:VAL:HG13	0.70	3	1
A:166:LEU:CD1	A:349:THR:HB	0.70	7	1
A:180:ILE:HD11	A:208:VAL:HG22	0.68	5	2
A:166:LEU:HD11	A:330:ILE:HD12	0.68	8	1
A:152:ALA:O	A:156:MET:HE2	0.67	9	1
A:166:LEU:HD11	A:330:ILE:CD1	0.66	8	1
A:346:ILE:HG23	A:376:ARG:HH22	0.65	5	1
A:346:ILE:HG23	A:352:GLN:HE22	0.65	3	1
A:346:ILE:HG23	A:376:ARG:NH2	0.65	5	1
A:179:ALA:HB2	A:329:ILE:HD11	0.65	3	1
A:177:ALA:HB3	A:365:ARG:HH21	0.64	7	1
A:172:GLN:CD	A:374:VAL:HG21	0.64	2	1
A:62:ILE:CD1	A:237:LEU:HD11	0.64	4	1
A:153:VAL:HA	A:156:MET:HE2	0.63	7	1
A:38:VAL:HG21	A:276:LEU:HD13	0.63	1	1
A:286:PHE:CD2	A:287:PRO:HA	0.63	2	1
A:430:LEU:HD22	A:456:LEU:HD11	0.62	8	7
A:198:ILE:HD11	A:239:PRO:HG3	0.62	9	4
A:150:TYR:CD1	A:366:PRO:HD3	0.61	5	1
A:173:THR:CG2	A:357:THR:HG23	0.61	9	1
A:381:ALA:HB1	A:490:GLY:HA3	0.61	8	2
A:317:VAL:HG12	A:318:LYS:H	0.61	5	1
A:381:ALA:HB1	A:490:GLY:O	0.61	6	1
A:306:ALA:HB2	A:321:THR:HG22	0.60	2	1
A:393:ILE:CD1	A:448:LEU:HD22	0.60	2	1
A:62:ILE:HD12	A:237:LEU:HD11	0.60	4	2
A:385:ILE:HG12	A:492:TYR:HB2	0.60	6	4
A:386:MET:HE1	A:444:GLN:CD	0.60	5	1
A:159:ILE:HD11	A:166:LEU:HD22	0.59	6	1
A:156:MET:SD	A:386:MET:HE1	0.59	9	1
A:156:MET:SD	A:368:VAL:HG22	0.58	9	1
A:153:VAL:HG21	A:431:LEU:HD22	0.58	8	1
A:166:LEU:HD13	A:349:THR:HB	0.58	7	1

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
A:351:GLY:HA3	A:372:ILE:HG21	0.58	9	1
A:155:SER:HA	A:386:MET:HE3	0.57	5	1
A:377:VAL:HG11	A:386:MET:HG3	0.57	9	1
A:173:THR:HB	A:355:LEU:HB2	0.57	7	1
A:281:PRO:HB2	A:286:PHE:CE2	0.56	10	1
A:157:ILE:HB	A:378:GLY:HA3	0.56	1	1
A:153:VAL:HG11	A:448:LEU:HD22	0.56	7	1
A:341:VAL:HG12	A:343:THR:CG2	0.56	6	1
A:168:ILE:HG22	A:175:LYS:HE2	0.56	1	1
A:270:TYR:CD2	A:293:LEU:HD11	0.55	10	1
A:306:ALA:HB2	A:321:THR:CG2	0.55	2	1
A:270:TYR:CG	A:293:LEU:HD11	0.55	10	1
A:205:ILE:HD13	A:225:VAL:HG13	0.55	4	5
A:159:ILE:CD1	A:166:LEU:HD22	0.55	6	1
A:74:VAL:HG12	A:233:ALA:HB2	0.55	1	3
A:386:MET:HE1	A:444:GLN:HB2	0.55	3	1
A:236:TYR:CD1	A:273:ILE:HD13	0.55	4	1
A:166:LEU:HD22	A:291:PHE:CZ	0.55	5	1
A:166:LEU:HD11	A:367:ALA:HB2	0.55	2	1
A:150:TYR:CZ	A:178:LEU:HD12	0.54	3	1
A:146:VAL:HB	A:367:ALA:HB2	0.54	10	1
A:342:PRO:CG	A:366:PRO:HA	0.54	4	1
A:179:ALA:HB2	A:329:ILE:CD1	0.54	1	1
A:166:LEU:HD11	A:349:THR:CG2	0.53	7	1
A:21:VAL:HG12	A:23:SER:HB2	0.53	5	1
A:150:TYR:CE1	A:366:PRO:HD3	0.53	5	1
A:168:ILE:CD1	A:178:LEU:HD12	0.53	10	1
A:337:VAL:HG11	A:373:SER:HB3	0.53	4	1
A:179:ALA:HB1	A:259:ILE:HG21	0.53	5	2
A:156:MET:CE	A:390:SER:HB2	0.53	7	1
A:145:PRO:HD2	A:379:GLY:HA2	0.52	6	1
A:145:PRO:HB3	A:378:GLY:HA2	0.52	7	1
A:166:LEU:C	A:372:ILE:HD11	0.52	7	1
A:166:LEU:HG	A:328:PRO:HG2	0.52	7	1
A:142:VAL:HG11	A:160:GLY:HA3	0.52	5	2

Atom 1	Atom 2	Clash(Å)	Model ID (Worst)	Models (Total)
A:146:VAL:HB	A:377:VAL:CG1	0.52	7	1
A:153:VAL:CG2	A:448:LEU:HD21	0.52	8	1
A:170:ASP:C	A:175:LYS:HZ3	0.52	8	1
A:151:LYS:NZ	A:447:VAL:HG11	0.52	3	1
A:337:VAL:HG21	A:373:SER:CB	0.51	4	1
A:134:PRO:HB3	A:303:ARG:HD3	0.51	7	1
A:142:VAL:HG23	A:344:ASN:ND2	0.51	6	1
A:137:ILE:HD12	A:372:ILE:HD11	0.50	1	1
A:149:GLY:HA3	A:185:ASN:ND2	0.50	9	1
A:151:LYS:HZ3	A:468:GLU:CD	0.50	5	1
A:156:MET:HG2	A:166:LEU:HB2	0.50	2	1
A:151:LYS:HE3	A:433:GLN:HB2	0.50	7	1
A:310:GLU:CD	A:318:LYS:C	0.50	5	1
A:38:VAL:HG21	A:276:LEU:HB3	0.50	2	2
A:148:THR:CG2	A:340:PHE:CZ	0.50	6	1
A:64:LEU:HD12	A:74:VAL:HG21	0.49	8	3
A:153:VAL:HG21	A:431:LEU:CD2	0.49	8	1
A:174:GLY:HA3	A:360:PHE:CE1	0.49	7	1
A:325:THR:HG22	A:342:PRO:HB2	0.49	9	1
A:161:ARG:HH22	A:321:THR:HB	0.49	8	1
A:385:ILE:HD11	A:492:TYR:H	0.49	7	1
A:343:THR:HG21	A:346:ILE:HG13	0.49	6	1

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	511	471	24	16
2	511	489	14	8
3	511	500	6	5
4	511	481	20	10
5	511	487	19	5
6	511	492	16	3
7	511	493	15	3
8	511	489	15	7

Model ID	Analysed	Favored	Allowed	Outliers
9	511	488	20	3
10	511	485	22	4

There are 45 unique backbone outliers. Detailed list of outliers are tabulated below.

Chain	Res	Type	Models (Total)
A	285	ALA	5
A	21	VAL	4
A	22	VAL	4
A	377	VAL	3
A	24	GLU	2
A	25	ALA	2
A	26	HIS	2
A	27	ASN	2
A	343	THR	2
A	345	VAL	2
A	373	SER	2
A	20	ASN	1
A	23	SER	1
A	134	PRO	1
A	135	GLY	1
A	150	TYR	1
A	151	LYS	1
A	157	ILE	1
A	158	PRO	1
A	159	ILE	1
A	161	ARG	1
A	162	GLY	1
A	174	GLY	1
A	264	SER	1
A	267	ALA	1
A	283	ARG	1
A	287	PRO	1
A	288	GLY	1
A	289	ASP	1
A	323	SER	1

Chain	Res	Type	Models (Total)
A	335	GLY	1
A	337	VAL	1
A	338	SER	1
A	339	ALA	1
A	349	THR	1
A	350	ASP	1
A	354	PHE	1
A	358	ASN	1
A	367	ALA	1
A	368	VAL	1
A	369	ASN	1
A	372	ILE	1
A	374	VAL	1
A	376	ARG	1
A	435	GLN	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	407	390	9	8
2	407	390	16	1
3	407	394	9	4
4	407	393	5	9
5	407	391	10	6
6	407	391	8	8
7	407	381	18	8
8	407	390	9	8
9	407	399	4	4
10	407	393	11	3

There are 29 unique sidechain outliers. Detailed list of outliers are tabulated below.

Chain	Res	Type	Models (Total)
A	11	LEU	10
A	374	VAL	7
A	166	LEU	4

Chain	Res	Type	Models (Total)
A	377	VAL	4
A	317	VAL	3
A	343	THR	3
A	357	THR	3
A	10	GLU	2
A	337	VAL	2
A	492	TYR	2
A	6	THR	1
A	19	PHE	1
A	21	VAL	1
A	22	VAL	1
A	181	ASP	1
A	188	ASP	1
A	243	CYS	1
A	262	ASP	1
A	284	GLU	1
A	292	TYR	1
A	324	LEU	1
A	340	PHE	1
A	341	VAL	1
A	342	PRO	1
A	349	THR	1
A	353	ILE	1
A	360	PHE	1
A	368	VAL	1
A	421	LEU	1

5. Fit to Data Used for Modeling Assessment ?

5.2. Crosslinking-MS ?

5.2.1. Restraint types ?

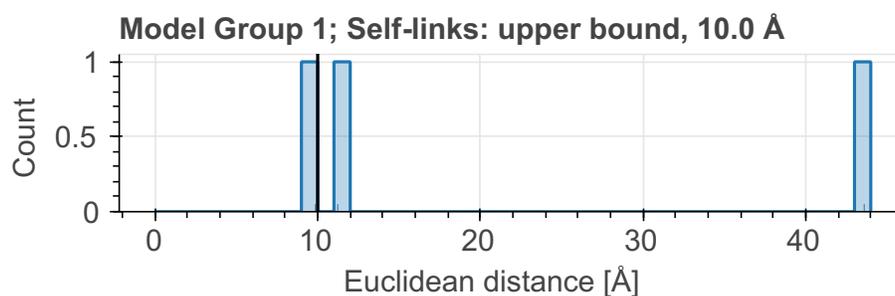
This table summarizes information about crosslinker(s) used for data generation, and how crosslinking information was translated into actual modeling restraints. Restraints assigned "by-residue" are interpreted as between CA atoms. Restraints between coarse-grained beads are indicated as "coarse-grained". Restraint group represents a set of crosslinking restraints applied collectively in the modeling.

There are 3 crosslinking restraints combined in 3 restraint groups.

Linker	Residue 1	Atom 1	Residue 2	Atom 2	Restraint type	Distance, Å	Count
L-Photo-Leucine	LEU	CA	TYR	CA	upper bound	10.00	1
L-Photo-Leucine	ALA	CA	LEU	CA	upper bound	10.00	1
L-Photo-Leucine	LEU	CA	PRO	CA	upper bound	10.00	1

Distograms of individual restraints

Distograms (i.e., histogram plots of distances) provide an overview of distributions of distances between residues for which chemical crosslinks were identified. The shift of the distogram relative to the threshold value may indicate a poor model. Restraints with identical thresholds are grouped into one plot. Only the best distance per restraint per model group/ensemble is plotted. Inter- and intramolecular (including self-links) restraints are also grouped into one plot. Distance for a restraint between coarse-grained beads is calculated as a minimal distance between shells; if beads intersect, the distance will be reported as 0.0. A bead with the highest available resolution for a given residue is used for the assessment.



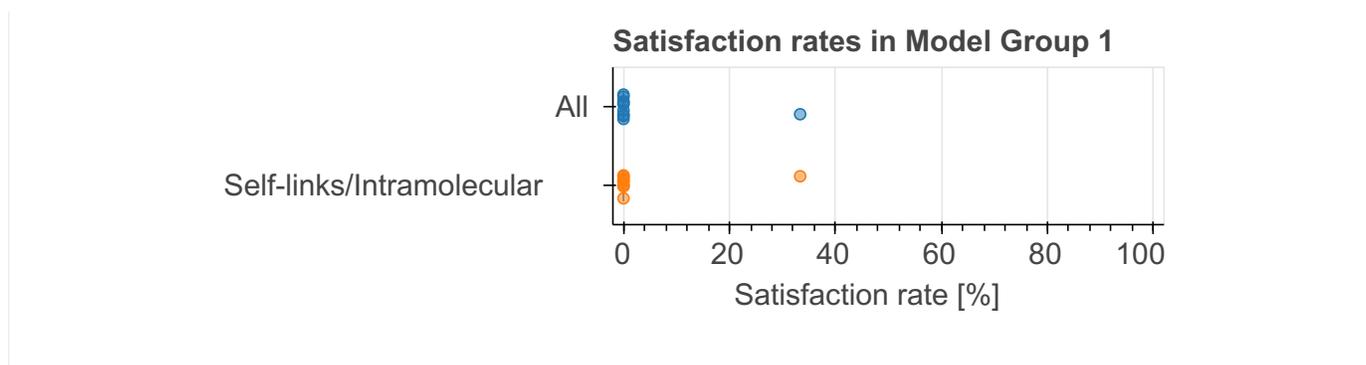
5.2.2. Satisfaction of restraints ?

Satisfaction of restraints is calculated on a *restraint group* (a set of crosslinking restraints applied collectively in the modeling) level. Satisfaction of a restraint group depends on satisfaction of individual restraints in the group and the conditionality (all/any). A restraint group is considered satisfied, if the condition was met in at least one model of the model group/ensemble. The number of measured restraints can be smaller than the total number of restraint groups if crosslinks involve non-modeled residues. Only deposited models are used for validation right now.

State group	State	Model group	# of Deposited models/Total	Restraint group type	Satisfied (%)	Violated (%)	Count (Total=3)
1	1	1	10/10	All	33.33	66.67	3
				Self-links/ Intramolecular	33.33	66.67	3

Per-model satisfaction rates in ensembles

Every point represents one model in a model group/ensemble. Where possible, boxplots with quartile marks are also plotted.



6. Fit to Data Used for Validation Assessment ?

Validation for this section is under development.

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