

Glue Table

Company	Product Name	Viscosity (centipoise) Water: 1cp	Thermal Conductivity w/(m-K)	Cure Time @ Temp	Strength (psi & N/mm^2)	Working Hours	Density	Electrical resistivity ohm-cm	Radiation Hardness	Type?	Link/Notes
Desired values		< 20 000	1	temp ~ 22C time: ~1 day	See currently used glue: SE 4445 CV Kit			High	For 2000 fb-1: 1.3E16 neq/cm2 and 1GRad = 10 MGy	Glue (epoxy), Gel, or Tape	
Candidate Glues											
AI Technology	Prima-Bond: EG7655-LV1	70000 cp	1.7 ± 10%	4 hr @85 C	LapShear > 800 psi	"reworkable at 80-100 C"		1E+14	CERN test: prerad: 340 psi	Flexible epoxy adhesive	EG7655-LV also exists. It has viscosity 80k cp We will ask if we can have the glue without the dopant loading.
AI Tech	ME7638-RC	10k cp	3					1E+14			
AI Tech	CGR 7015		2					1E+14		Cool-Grease	
AI Tech	CoolBond CP7138		4					1E+14		Tape	Tape: Tack free dry film Preforms 3-12 mils (thick)
AI Tech	TackFilmRTK 7659		11.4								
AI Tech	Tack Film 7755		1.7								
AI Tech	TP 7209		1.4					"good"		thermal plastic film	
AI Tech	TP 8205		5.7					"good"		thermal plastic film	
Polytec	TC418	40k-60k	1.6	48 h @ 23C	Young mod: 40 N/mm^2 Lap shear: 2.9 N/mm^2				Tested at cern: before radiation: peel strength 350, after 325 psi	Glue/ Epoxy (flexible)	Being tested as good options by John Matheson. Also listed here: https://indico.cern.ch/event/718423/contributions/3002853/attachments/1650032/2638799/20180515_MaterialQualification.pdf
Polytec	TC 423	45k	3					1E+14			Glass transition temp 64C
EpoTek	T7110	1.4K-2k	1					2 E13		epoxy	RT cure. Suggested by EpoTec
EpoTek	921-FL new	9-15k	1.1					>6E13		Smooth flowing paste	Suggested by EpoTec. Curing: 100°C / 20 Minutes
Dow Corning	3-6751	10k	1.1	50hr @100C 40hr @125C 10hr @150C	555 psi 3.82 N/mm^2	-	-	7.20E+13			"Low modulus; low viscosity; heat curable; UL94 V-0 rating " https://www.ellsworth.com/products/by-market/consumer-products/thermally-conductive-materials/adhesives/dow-3-6751-thermally-conductive-adhesive-gray-1-kg-kit/

Dow Corning	3-6753	11k	1.4	50hr @100C 40hr@125C 10hr @150C	540 psi 3.72 N /mm ²	-	-	7.20E+13			"Low modulus; low viscosity; contains 7-mil (178 micron) glass beads for bond line control "
Dow Corning	3-6651	32k	"good"							Encapsulant	Two-part; grey; Low modulus; low viscosity; good thermal conductivity; UL 94 V-0 rating
Dow Corning	3-6655	33k	"good"							Encapsulant	Low viscosity; soft; excellent thermal conductivity; UL 94 V-0
Dow Corning	Thermally Conductive Gel Gray: SE 4445 CV Kit	14000	1.26	45mins @ 125 C	-	skin irritant	2.4 gm/cc	7E+15	conflicting results KEK result: Preradiation strength: 0.1 N/mm Post radiation: 0.025 N/mm (cracked)	Gel (silicone based)	Ellsworth Adhesives IBL current glue
Ruled out: (reason for being ruled out is in Red)											
EpoTek	T 710919	40k-70k	1.3	"sets harder than SE4445"	Lap Shear 1434 psi			> 5E+12	Cern peel strength tested: before rad: 1400 psi, after: 600 psi	Epoxy (flexible)	Being tested as good options by John Matheson
Stycast	2850FT	64000 for Catalyst 9 and 23 LV	1.25 for Catalyst 9 1.02 for 23 LV		lhcb tested up to 10 N				tested up to fluence of 6 to 8x10 ¹⁵ MeVneq/cm2		https://lartpc-docdb.fnal.gov/0000/000059/001/stycas2850.pdf Adhesive tested by LHCb
Masterbond Supergel 9A0										epoxy gel	could be used in combination with something stronger (J Matheson)
Dow Corning	SE4486	19k	1.53	120 hr @ 24C	240 psi 1.65 N /mm ²	-	-	2.00E+14	-	-	https://www.ellsworth.com/products/by-market/consumer-products/thermally-conductive-materials/adhesives/dow-corning-se4486-cv-thermally-conductive-adhesive-white-330-ml-cartridge/

AI Technology	Prima-Bond: EG7655	300000 cp	1.7 ± 10%	4 hr @85 C 2 hr @100C 1 hr @125C 30 mins @150 C 120h @ 25 C	Die Shear 2546-2795 psi Push-off Strength >1500 psi Lap Shear : 1000 psi 6.9 N/mm^2	skin irritant	2.3 gm/cc	>1E+14 (150C/60 min)	KEK result: Preradiation peel strength: 0.25 +- 0.15 N /mm Post radiation: 0.35 +- 0.04 N /mm	Glue	https://www.ellsworth.com/products/by-manufacturer/ai-technology/thermally-conductive-materials/adhesives/ai-technology-prima-bond-eg7655-epoxy-paste-adhesive-2-oz-kit/ https://www.aitechnology.com/product/prima-bond-eg7655/ Datasheet Being tested by CERN. See pg 8
Dow Corning	Q3-3600	4.7k	0.77	60hr @100C 30hr @150C	-	-		1.00E+13			Dow CorningSE4445
Dow Corning	SE4410	3.5k	0.92	30hr @150C	370	-	-	1.00E+15		Encapsulants	Two-part; low viscosity; Heat cure; moderate thermal conductivity; UL 94 V-0 rating
Dow Corning	Q3-3600	4.7k	0.77	60hr @125C 30hr @150C	NA	-	-	1.00E+13		Encapsulants	
Dow Corning	SE4440-LP	3.6k	0.83	30min @120C	NA	-	-	1.00E+15		Gel	
Dow Corning	SE4446CV	22k	0.95	7hr @RT 3.5hr @100C 2.5hr @125 1.9hr @150C	NA	-	-	1.00E+15		Gel	
Dow Corning	Sylgard 186	66.7(k)	0.21	25min@100C 15min@125C 15min@150C	305	-	-	5.00E+15			Sylgard® 186 Silicone Elastomer Being tested at CERN
Huntsman	Araldite 2011	30-45k cp	0.22 W/m*K @23C	7-10 hrs room temp	Avg lap shear strength: 1) 17-25 MPa (metal-metal) 2) 10-20 (plastic-plastic) Peel: 0.2 N /mm				tested up to fluence of 6 to 8×10 ¹⁵ MeVneq/cm ² .		Adhesive tested by LHCb. Also on the CERN list for testing
AI Technology	Prima-Bond: EG7658	305000	3.67 W/m C	4 hr @85 C 2 hr @100C 1 hr @125C 30 mins @150 C	Lap Shear: 1800 psi 6.9 N/mm^2	skin irritant			KEK result: Preradiation strength: 0.55 +- 0.05 N/mm Post radiation: 0.4 +- 0.08 N/mm	Glue	https://www.aitechnology.com/uploads/pdf/products/dieattach/eg7658t.pdf

Huntsman	Araldite 2020	150k cp		16 hrs @23C, 3 hrs @ 40C	Avg lap shear strength: 1) 13-25 MPa (metal-metal) 2) 2-7 (plastic-plastic)						Being tested at cern
3M (goes to space with NASA)	Scotch-Weld Epoxy Adhesive (2216)	80000	0.0326 W/mK	90 min @ 24 C	Overlap Shear: 464 E 3 psi @ 24 C 3200 N /mm ²					Glue (epoxy)	Used by nasa for mars missions Also used by FERMI LAT
AMEC Thermasol	MPC 25 Thermal Insulator, Phase Change Material		4 W/mK	Temperature Resistance: 4						Wax	AMEC Thermasol MPC25 Datasheet
AMEC Thermasol	MPC 801			Temperature Resistance: 8.0						Wax	
AMEC Thermasol	MPC 315			Temperature Resistance: 5.0						Elastomer	
3M	High Temperature Acrylic Adhesive 100 (9461P)		0.18		Peel Adhesion: LHC-b tested up to 10N				tested by LHCb up to fluence of 6 to 8×10 ¹⁵ MeVneq/cm ²	Epoxy	3M 9461P Adhesive tested by LHCb
3M	VHB Tape 5909	-	bad. 0.08	Temperature Resistance: Short Term: 121 C Long Term : 82 C 72 hr to set	Peel Adhesion: N/100mm			720 kg/m ³	tested at cern: 60 psi before and after radiation	Tape	3M VHB Tape 5909 . Being tested at CERN

List of adhesives being irradiated and tested by CERN group: https://indico.cern.ch/event/718423/contributions/3002853/attachments/1650032/2638799/20180515_MaterialQualification.pdf

List of materials

Currently in	
Polytec TC418	2-parts epoxy
Epotek T7109	2-parts epoxy
Dymax 9-20801	UV cure TIM
Epolite FH-5313	2-parts epoxy
Polaris PF7006A	2-parts epoxy
Tra-Bond F112	2-parts adhesive
SE4445	2-parts adhesive
EG7655	2-parts epoxy
EG7658	2-parts epoxy
3M VHB5909	Tape
Araldite 2020	2-parts epoxy
Araldite 2011	2-parts epoxy
Tesafix 4962	Tape
UHU Endfest 300	2-parts epoxy
Dymax 9001	Encapsulant
Dymax 9001 v3.7	Encapsulant
Dymax 9101	Encapsulant
Sylgard 186	Encapsulant

In the next batch	
Epoxyhars L + Verharder W300	2-parts epoxy
Poly-Pox THV 500 + Harder 355	2-parts epoxy
Loctite Hysol EA 9396	2-parts epoxy
PCE-HT 3350/57	-
PCE-FILM-SA80	-
PCE-HTC-1800	-

