
Preliminary Module/Cassette Prototyping Plan

Julianna Abel, Tom Chase, Andy Furmanski, Ken Heller
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De-Risking the Module/Cassette

Prototype	Goal	Risk	Risk Level
Mini-Modules	Assess the part fit, assembly methods, and light seal quality with real manufacturing techniques and electronic components	Mechanical/Electrical interface is poor or light leaks are detected	Medium
Full-Scale Non-Functional Cassette	Test structural integrity, cable packaging, and rigging and handling strategies	Out of plane deformation prohibits insertion	High
Full-Scale Functional Cassette	Assess system functionality and test final full-scale manufacturing methods and rigging and handling strategies.	Injection Molded Manifold has dimensional or structural issues, variation in scintillator dimensions	Low



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The most risk lies in the structural stability and handling – prototype and test this first



Full Scale Non-Functional Cassettes

Goal: Test structural integrity, cable packaging, and rigging and handling strategies

Same as “Final”

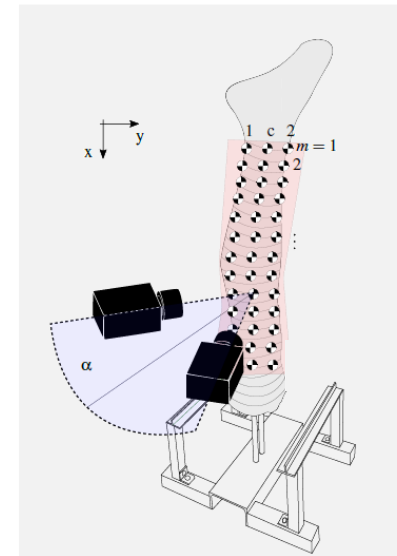
- Crimping and gluing technique
- Structural materials
- Extruded components

Different from “Final”

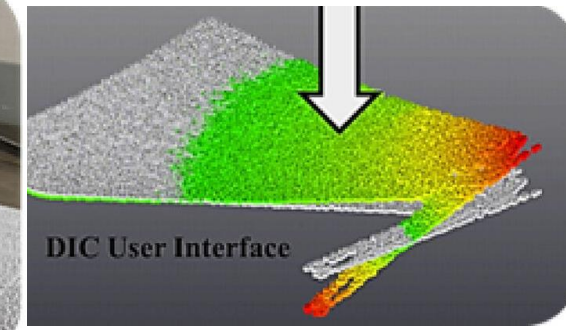
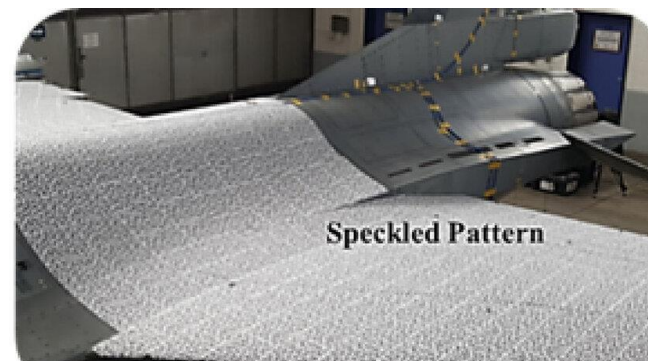
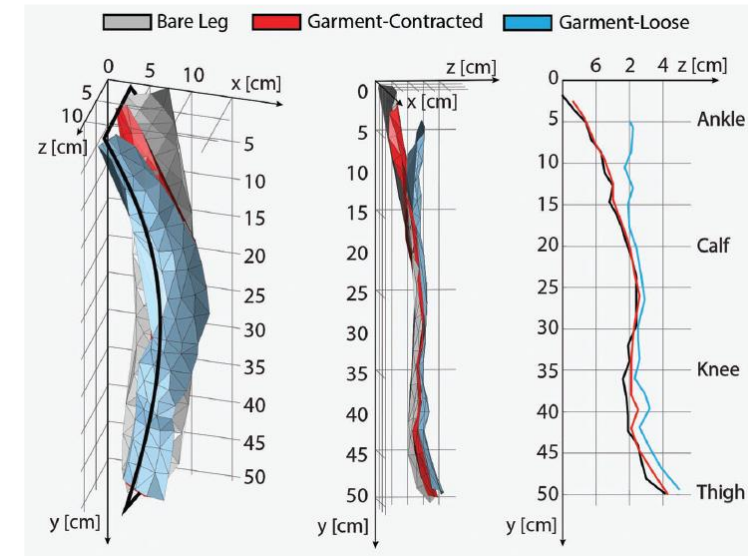
- Scintillator material (possibly)
- IM molded components will be 3D printed
- Cables

Testing Methodology

- Qualitative observations on handling
- Digital Image Correlation (DIC) to quantify out-of-plane deformations during stand-up and sliding (Julianna’s experimental system)



Granberry et al., Adv. Mat. Tech, 2019



Mallya et. al

Mini-Modules

Goal: Assess the part fit, assembly methods, and light seal quality with real manufacturing techniques and electronic components

Same as “Final”

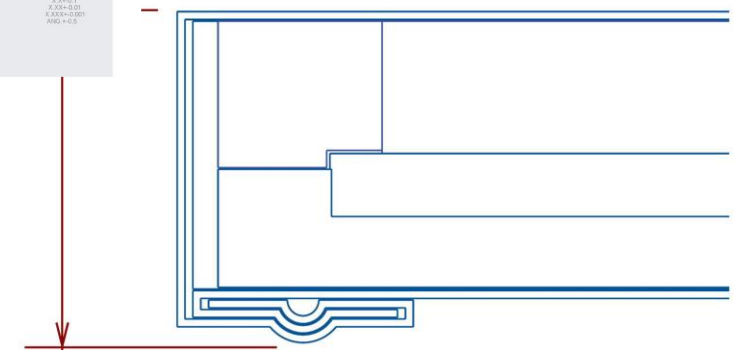
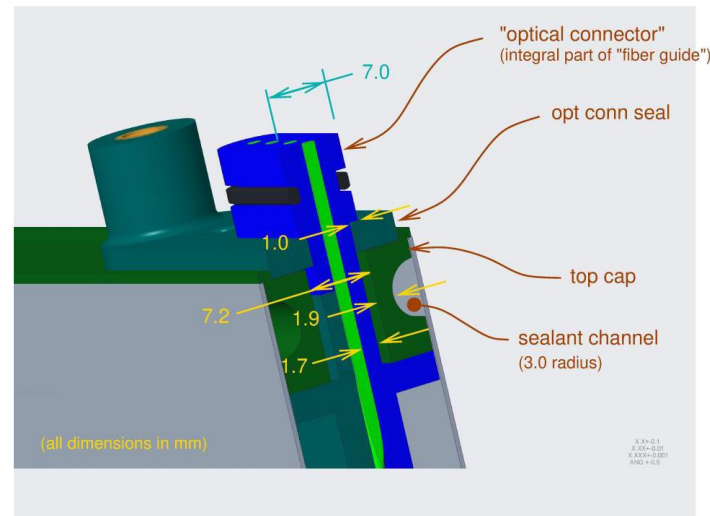
- Crimping and gluing technique
- Structural materials
- Extruded components
- Scintillator material (?)
- Electronics (?)

Different from “Final”

- IM components
- Cables

Testing Methodology

- TBD Functional light seal assessment



Max thickness for 16 mm thick extrusions: 22 mm
(allowing 0.5 mm glue thickness on front & back
+ 1 mm tolerances)

Full-Scale Functional Cassettes

Assess system functionality and test final full-scale manufacturing methods and rigging and handling strategies.

Same as “Final”

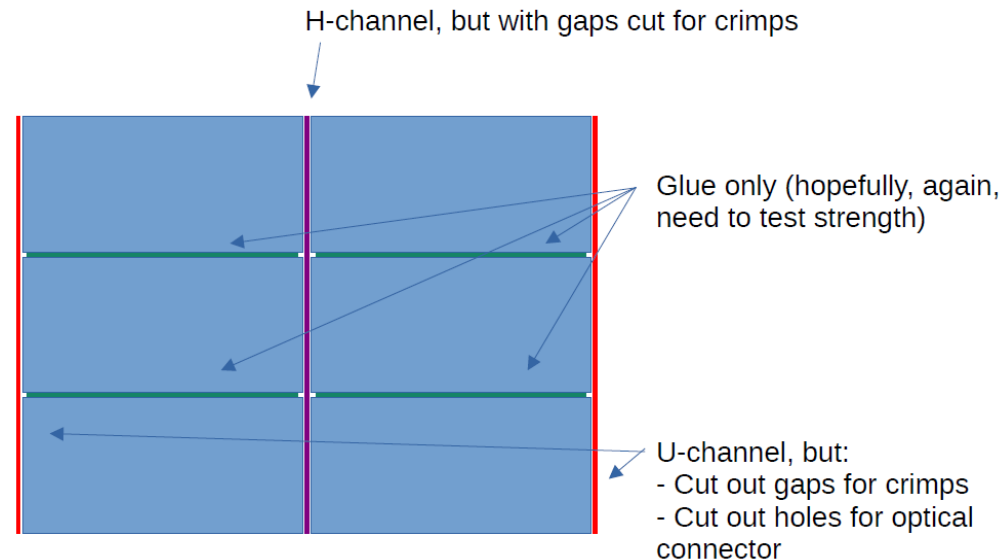
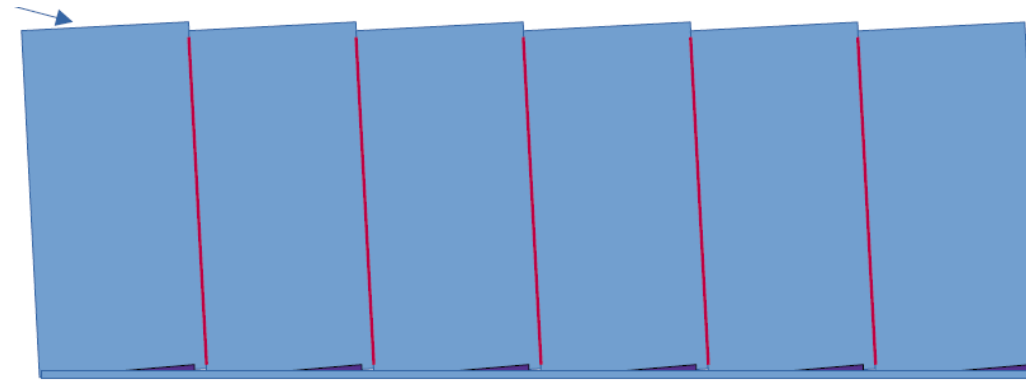
- Everything

Different from “Final”

- Nothing, unless assessment

Testing Methodology

- Structural – DIC
- Functional



Mini-Experiments

- UHMW Polyethylene sliding under load over time
- Adhesive testing



Timeline

Prototype
Mini-Modules
Full-Scale Non-Functional Cassette
Full-Scale Functional Cassette



One year combined, ideally in parallel.
If in series, 1st Full-Scale Non-
Functional Cassette then Mini-Modules

