FD2 X-ARAPUCA

Requirements and Specifications v0

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Introduction

- More directed towards the design stage of the detector module
- In some cases there are requirements but we don’t have mature specifications
- Feedback between the engineering design and physics needs
- Acknowledgements to Carla C., Ryan R. and Dave W. for conversations and insights
- Mistakes are all mine

FD2 X-ARAPUCA Activity	Requirement	Specification
Integration	1. Must fit inside cathode module envelope 2. Deflection under load should not damage membrane or cathode mesh 3. Weight of module should be consistent with above requirement 4. Mounting system must accommodate relative expansion/contraction/motion of module and cathode during filling, testing and operation	1. Maximum size of 740 mm x 650 mm x 50 mm 2. < 5 mm 3. < 12 kg 4. ? (most probably translates to a clearance)

FD2 X-ARAPUCA Activity	Requirements	Specifications
Design	1. Cryo-reliability of module structure 2. Installation flexibility w.r.t. cathode window 3. Cryo-reliability of WLS-SiPM interface 4. Delay choice of the exact nature of the interface 5. Allow pathway for non-WLS bar path to the SiPM	1. FR-4 G10 (warp aligned) or SS 304 for structural material. SS 18-8 or 304 for fasteners 2. Located in any of the 16 windows (needs spec on cable/fiber routing, bending) 3. SiPMs mounted on flex Kapton PCB. Uniform spring loading. 4. Design should be adaptable for non-glued (spherical/cylindrical divots) or glued interface 5. 4mm thick WLS bar for 6mm sensor

FD2 X-ARAPUCA Activity	Requirements	Specifications
Design	1. Stability and alignment of WLS bar (translation and rotation) 2. Spacing between WLS bar and dichroic filter should provide a pathway for photons 3. Dichroic filters and their pTp coating should not be damaged during installation and transportation 4. Minimal re-assembly at installation site	1. Locating pins(?); number? position? 2. Between 2-10 mm (?); minimal structural elements on the inside 3. pTp deposition window and tolerance; vibration and translation tolerance 4. Shipped as 3 sub-assemblies

FD2 X-ARAPUCA Activity	Requirements	Specifications
Design	1. Dichroic filter window size should be maximized within structural and safety constraints 2. Minimize shadowing between frame and filters	1. Reasonable comfort with 100 mm x 200 mm. Could this be pushed further? 2. Optimization of WLS bar size taking into account filter edge and SiPM shielding; optimization of width and thickness of ribs (currently at 3-4 mm x 6 mm); optimization of filter-rib depth profile (top-middle-bottom)