

Estimated Background Rates for d_2^n

- MC simulation by Degtyarenko et al. (tested in Halls A and C)
- Online cuts include:
 - BB magnet sweeps particles with $p < 200 \text{ MeV}/c$
 - GEN BB trigger: shower+pre-shower+scint
 - ↳ provide $\sim 10:1$ online hadron rejection (or better)
 - $\sim 550\text{--}600 \text{ MeV}$ threshold on shower
 - 4–5 p.e. threshold on Cherenkov
 - ↳ heavily suppress random background
 - ↳ negl. pion contamination ($\sim 100 \text{ Hz}$ knock-ons)
- Total estimated trigger rate (GEN trig + Cherenkov): 2–5 kHz

Online
triggers

e^-	2-5 kHz
e^+	<1 kHz

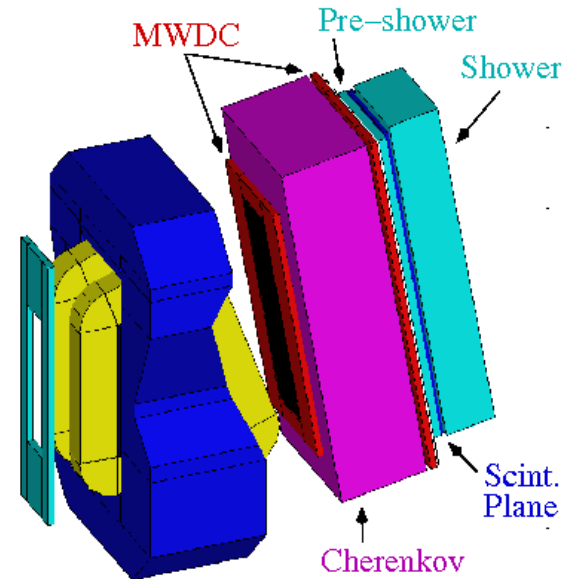
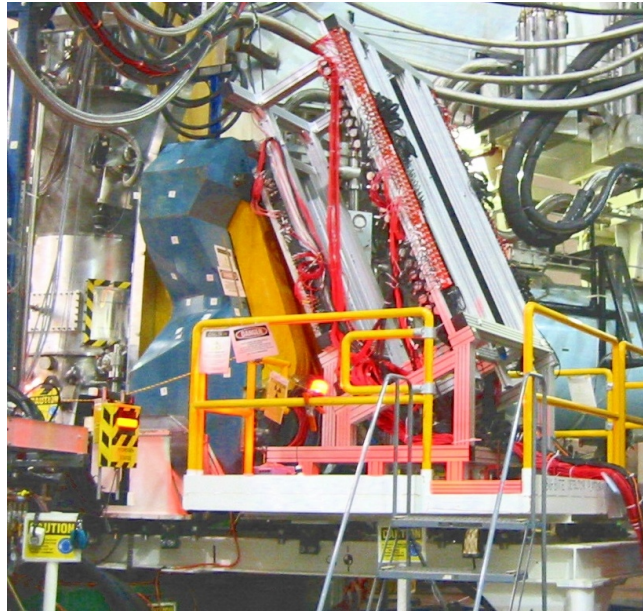
π^-	90 kHz
π^+	90 kHz
p	50 kHz
n	50 kHz

Removed via
online cuts

Cherenkov Design Parameters

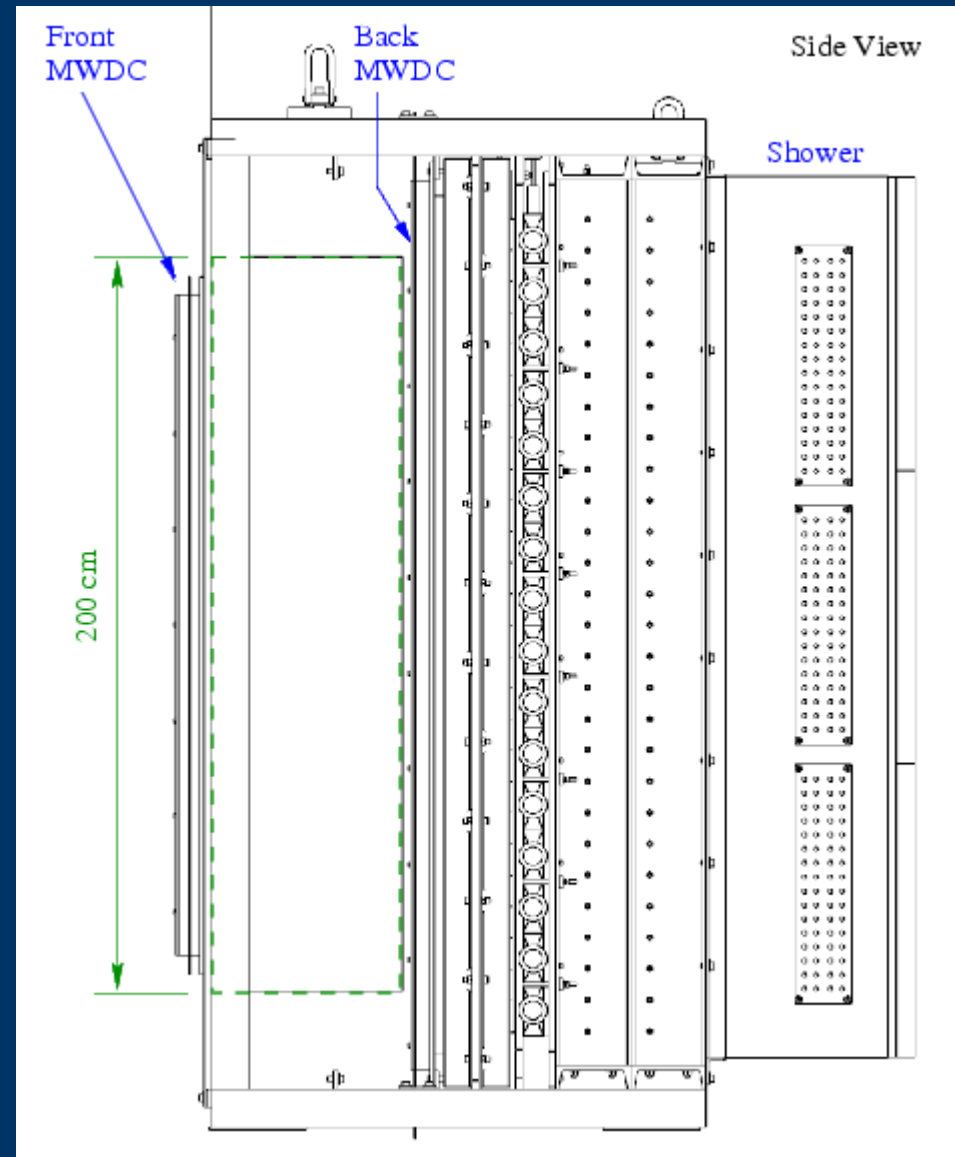
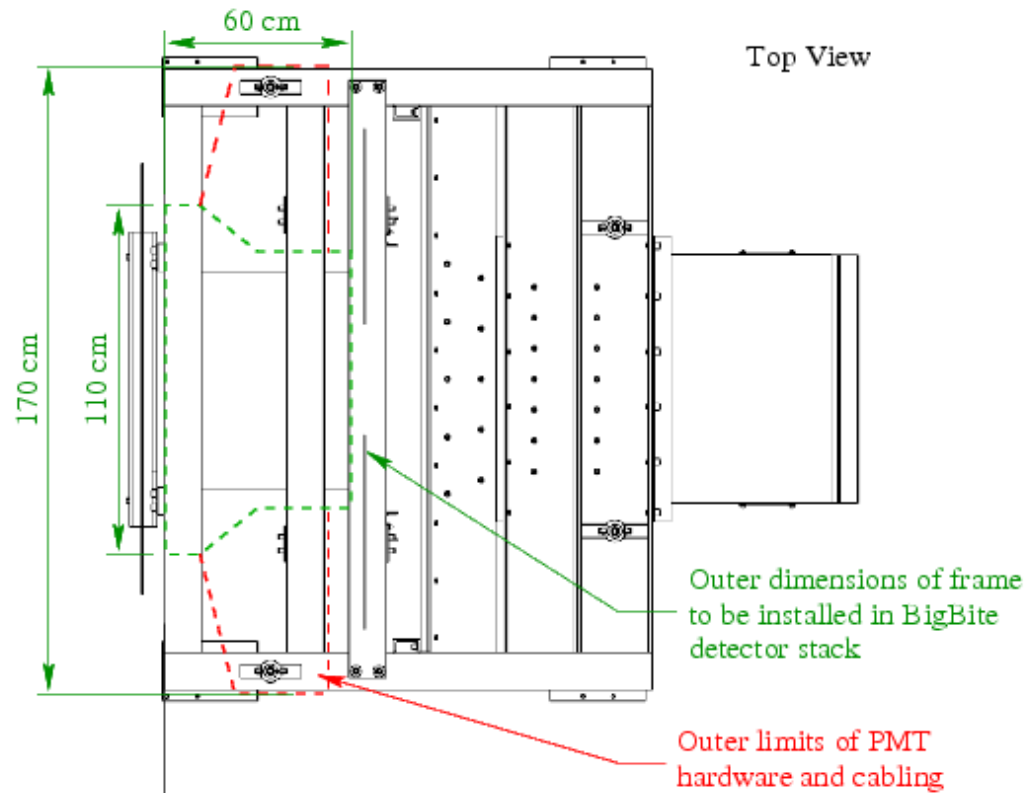
- Dimensions: 200cm x 60cm x 60cm
 - ➔ located in gap between first and second wire chamber with minimal modifications to BigBite frame
- Radiator gas: C_4F_{10} (or Freon12)
 - ➔ $n = 1.0015$ (1.0011)
 - ➔ π threshold: 2.51 GeV/c (2.98 GeV/c)
 - ➔ ~25 (16) photo-electrons / 40 cm electron track
 - ↳ Quartz PMT (5" Photonis XP4508)
 - ↳ mirror reflectivity: ~90%, 10% loss at PMT-gas interface (2 mirror reflections)
 - ➔ >99% efficient with 4-5 p.e. threshold
 - ↳ negl. pion contamination
 - ↳ **minimum** π/e rejection ratio 1000:1 online

BigBite with the Gas Cherenkov

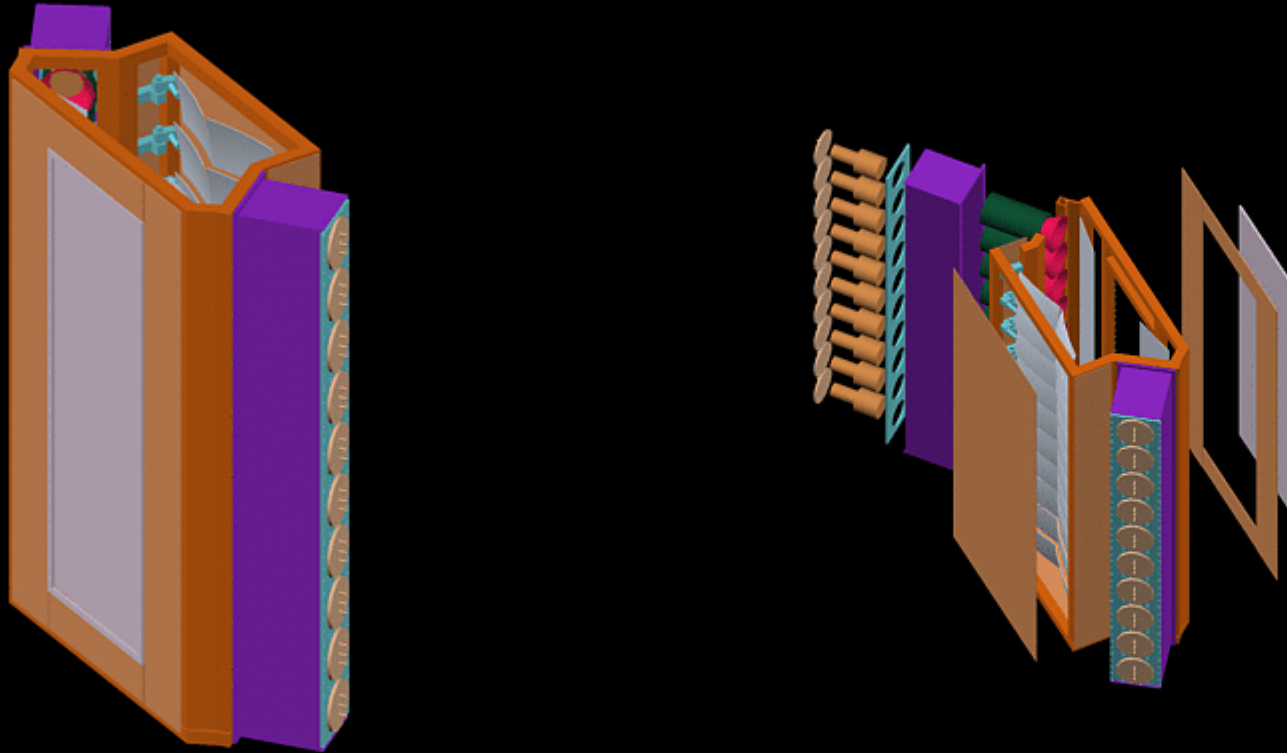


- non-focusing, large acceptance, open geometry
- $\Delta p/p = 1 - 1.5\%$ (@ 1.2 T) $\sigma(W) = 50$ MeV
- angular resolution 1.5 mr, extended target resolution 6 mm
- large solid angle: 64 msr
- detector package
 - ➔ 2 MWDCs, segmented trigger, Pb-glass shower
 - ➔ Gas Cherenkov (new)

Cherenkov Frame

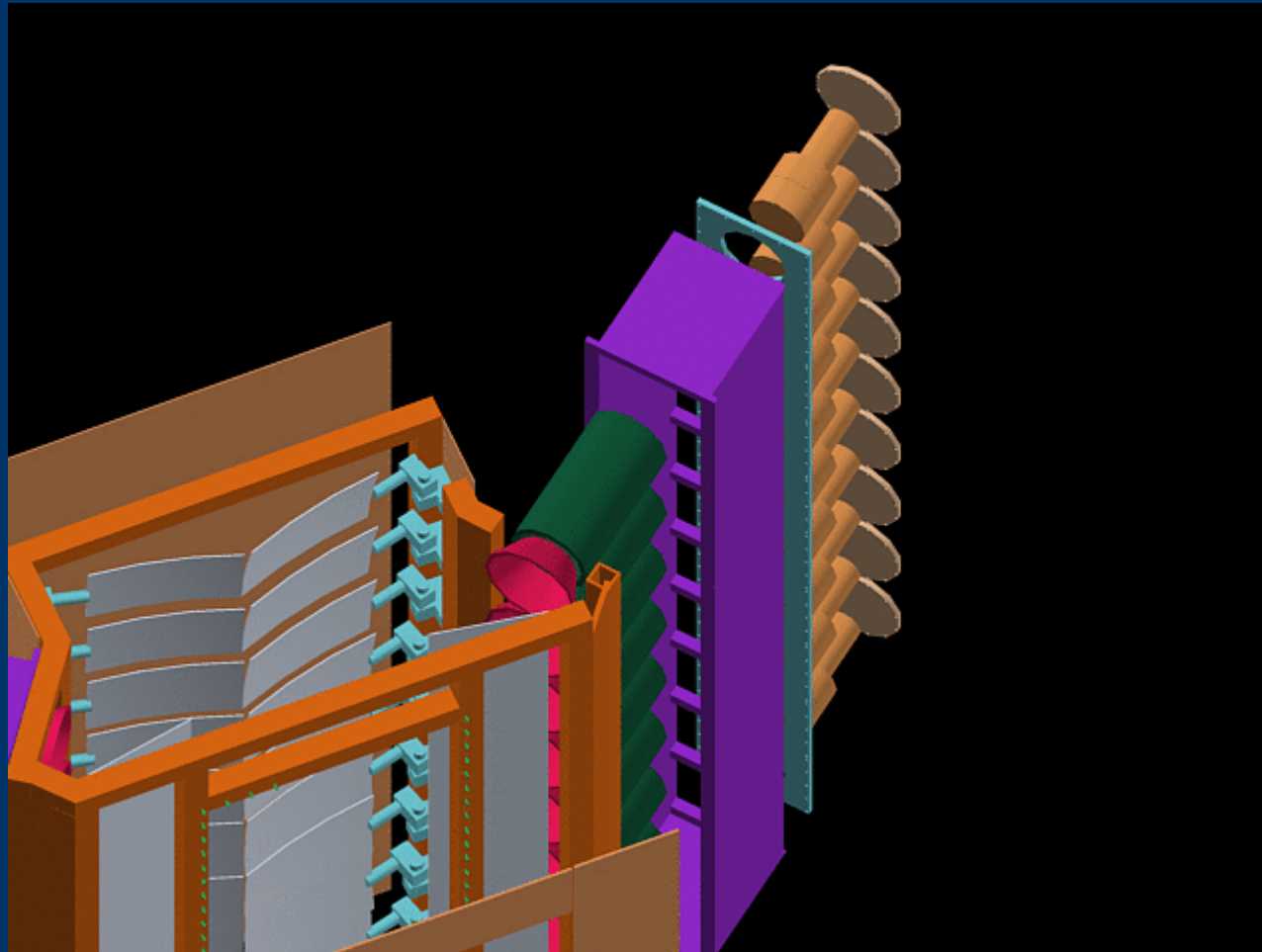


Cherenkov Frame



Engineer at Temple (Ed K.) is currently working shop drawings – this model will be forwarded to Al Gavalya to be integrated into the BigBite Frame.

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Cherenkov Mirrors

- Since last meeting I've been working with the following vendors:
 - OptiForms, Spectrogon, OptiMax, Denton Vacuum, Spectral Systems, Sydor Optics, Esco Products, Alpine Research, Cosmo Optics, Model Optics
- Mixed success...



Cherenkov Mirrors

- Most Promising Options
 - Eagle Glass Specialties, Inc.
 - ~\$200/blank for spherical/flat mirrors, not coated
 - Model Optics
 - Quote for all three pieces (flat/spherical/conical)
 - Very expensive total cost ~\$1000/unit(!)
 - dominated by outsourced coating cost \$500+ per mirror
 - Conical blank (polished Al) roughly \$300/unit
 - Cosmo Optics
 - Did mirrors for FermiLab Cherenkov (have experience)
 - ~\$165/mirror for flat mirrors, **coated**
 - **This is 1/5 the cost Model Optics quoted for the same part!?**
 - Working on quotes for the spherical and conical mirrors. A spherical blank arrived last Thursday for our evaluation.

Cherenkov Mirrors

- Options:
 - Best/Simplest:
 - Cosmo Optics comes through as promised with all mirrors at reasonable cost (~\$30k—40k)
 - Best/More Involved
 - Choose best vendor(s) for blanks only (~\$16k)
 - spherical+flat: \$200/blank (~\$9k for 44 mirrors)
 - conical: \$300/blank (~\$7k for 22 mirrors)
 - Coat them at CERN
 - \$\$\$? (unknown cost, Zein-Eddine is looking into it)
 - Pretty good
 - Fall back to original “10” mirror design
 - Cost within original budget (\$42k) even if we purchase and coat all mirrors from Model Optics
 - Delivery: 8—10 weeks after receipt of order

Time Frame

- Mirrors
 - 8—10 weeks is a good bet
 - 8—10 weeks after order for Model Optics
 - 6 weeks for coated flat mirrors from Cosmo Optics
 - 5—6 weeks for coated flat mirrors from Sydor Optics
 - Frame
 - 8—10 weeks, based on SANE experience
 - shop for SANE Cherenkov frame underwent a change of management – they have done an excellent job in the last few months
 - Gas
 - 8—10 weeks
 - Bottom line
 - Orders in to vendors by late-April, early-May to hit our Summer 2007 target (2 months to finalize terms)
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Cherenkov Costs

Component	Units	Cost/unit	Sub-total
Cerenkov frame/mounting hw/fittings			\$20k \$30k
Primary Mirrors (spherical)	10+2	\$2000	\$42k \$24k
Secondary Mirrors (flat)	10+2	\$1000	(\$20k) ¹ \$12k
Pseudo-Winston Cones [†]	10+2	\$500	Purchased \$6k
PMT, base, μ metal shield (UV glass) [‡]	10+2	\$3000	\$36k
Gas Handling System:			(?) \$3k
Quartz optical windows*:	10+1	\$500	\$6k
C ₄ F ₁₀ gas: (cost/fill [§])		\$2600	—
Daily consumption (atm. press. fluctuations)		\$26/day	—

¹ NOTE: Mirror prices are dominated by worst-case coating cost (CERN @ \$1000/mirror).