

MINERAL OIL

WHY MINERAL OIL?

- No expensive filtration system needed as with water detectors
- Refractive index provides more Cerenkov light from neutrino interactions

Several important tests performed to aid in decision of which oil to use:

- Attenuation length
- Transmission shape
- Index of refraction
- Fluorescence

Blind testing done on all bid samples.

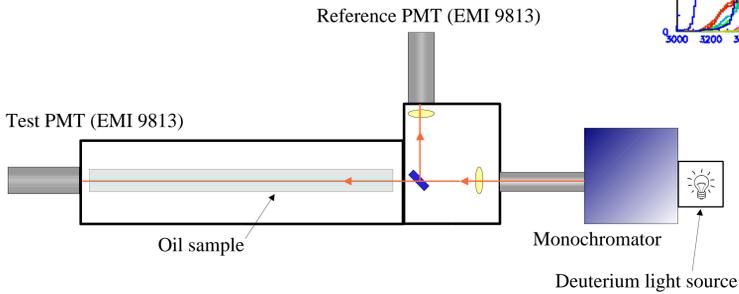
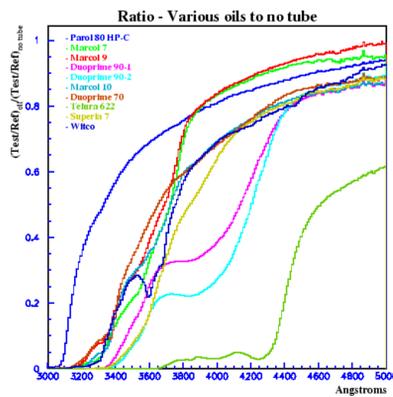
TRANSMISSION SHAPE

- Data taken are the ratio of

$$\frac{\text{Test PMT}}{\text{Reference PMT}} = \frac{\text{Light transmitted through oil}}{\text{Reference light at that wavelength}}$$

- Test range is 3000 – 5000 Å in steps of 10 Å
- ~ 90% of the light travels through the oil sample
- ~ 10% of light travels to reference PMT

- Setup provides *relative* attenuation length of different oils and *shape* of transmission curve



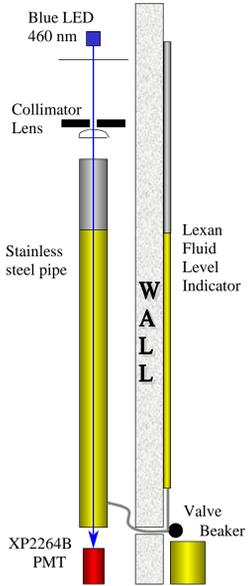
BASED ON THE RESULTS OF THESE TWO TESTS, WE CHOSE MARCOL 7 FOR USE IN THE DETECTOR

ATTENUATION LENGTH

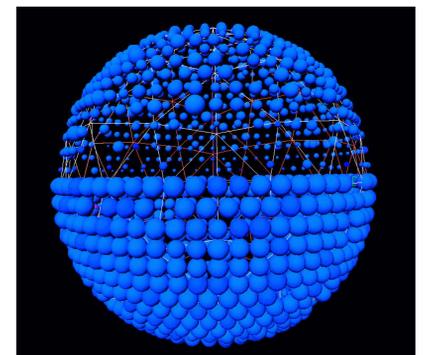
- Attenuation length determined by measuring intensity of blue light as a function of path length in oil

- Goal: measure attenuation lengths as large as 20 m with an error better than ± 2.5 m.

Oil Sample	Attenuation Length (m) FIT
Telura 622	2.21 \pm 0.01
Superla 7	9.84 \pm 0.09
Witco	10.79 \pm 0.11
Duoprime 90-2	12.76 \pm 0.14
Duoprime 70	13.96 \pm 0.16
Duoprime 90-1	14.33 \pm 0.19
Marcol 10	14.52 \pm 0.18
Parol 80 HP-C	15.41 \pm 0.21
Marcol 9	23.65 \pm 0.46
Marcol 7	26.45 \pm 0.59

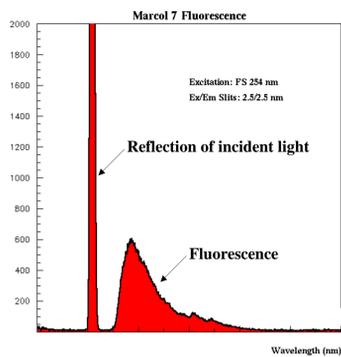


LASER EVENT DETECTOR HALF-FILLED WITH MARCOL 7

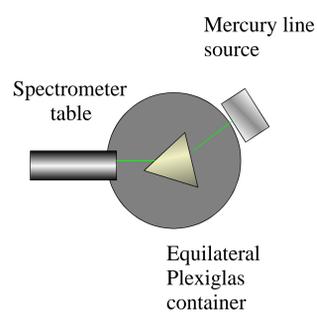


OTHER OIL TESTS

FLUORESCENCE

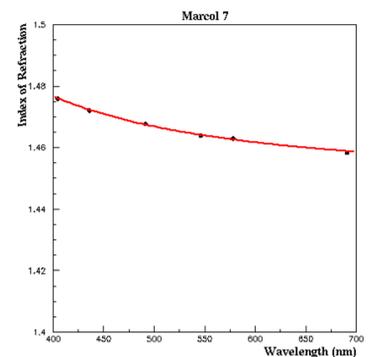


- Fluorescence tests performed on 3 cm³ volume sample of oil to check for unusual features
- All oils tested were normal

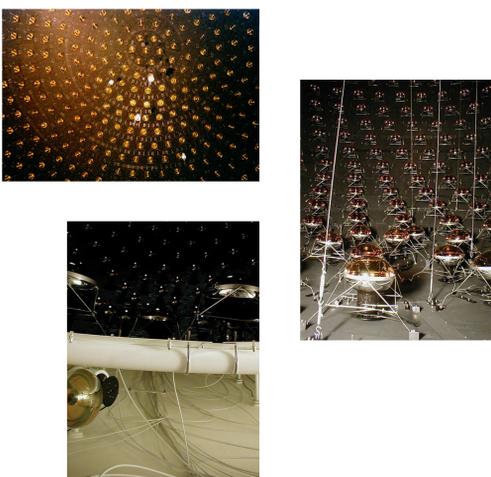


INDEX OF REFRACTION

- Container rotated on table until minimum deflection observed
- Index of refraction measured for six lines of the mercury spectrum
- Indices of refraction are fit to a "one resonance" model for dense media



INSIDE THE DETECTOR



OIL ARRIVES AT FERMILAB



OIL FILL BEGINS

