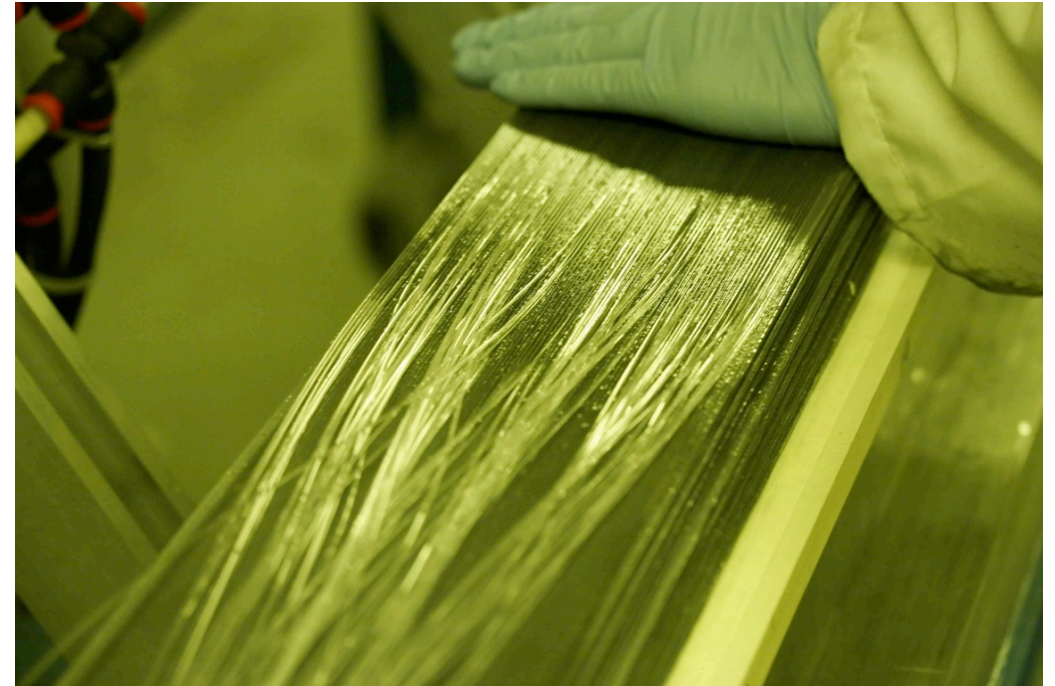


BCAL fibre quality assurance shipments 1-5



z. papandreou and a. semenov

university of regina

calorimetry working group

October 15, 2009

thanks to:

J. Chan, B. Giesbrecht, A. Heinrichs, S. Krueger, T. Li, L. Sichello, Y. Sun,
K. Vuthitanachot, A. Watson, Y. Yongzhe

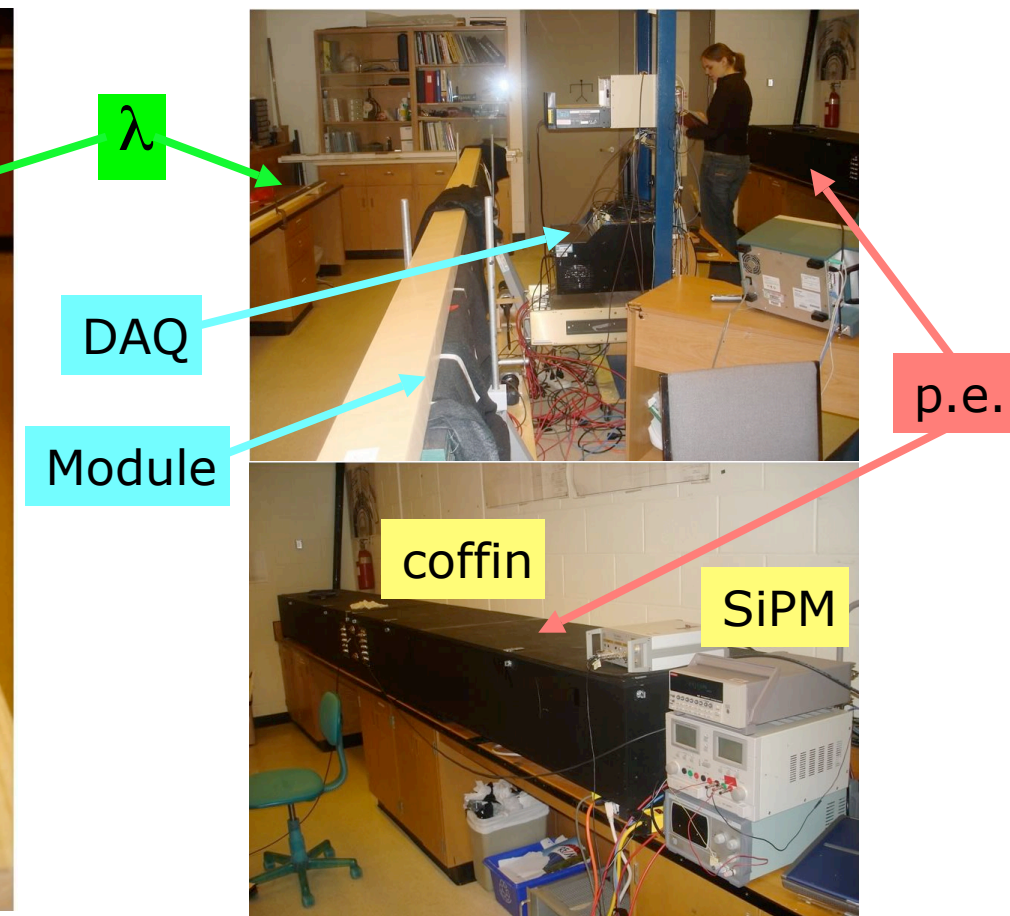
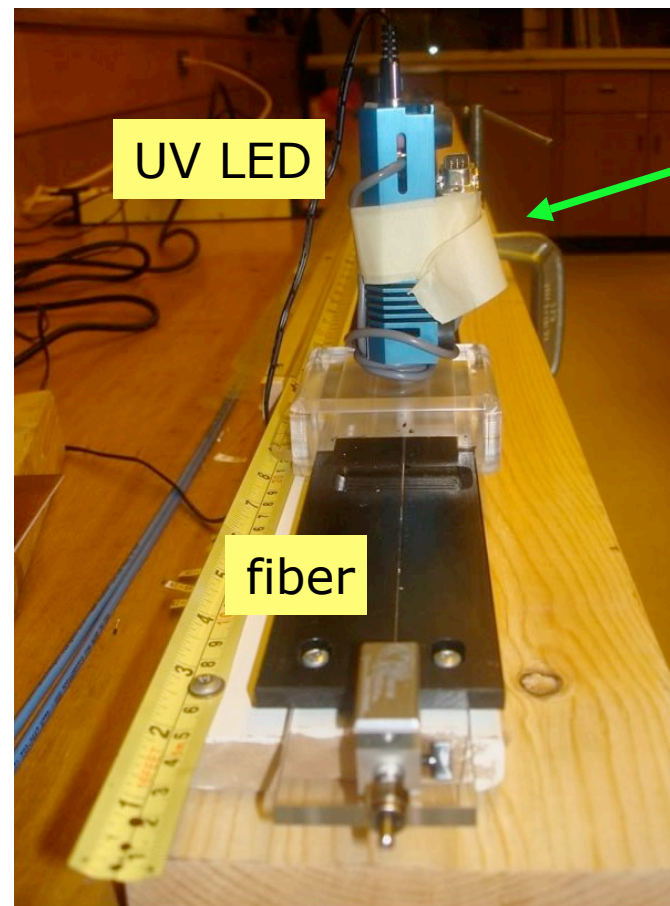
fibre testing lab

- First article

- Regina data
- JLab data
- GlueX-doc-1317
- **Bench Reference**

- Production (Regina)

- ☒ Condition/packaging
- ☒ Diameter
- ☒ Attenuation length: LED, photodiode current
- ☒ N_{pe} at 200cm: ^{90}Sr , PMT, external trigger

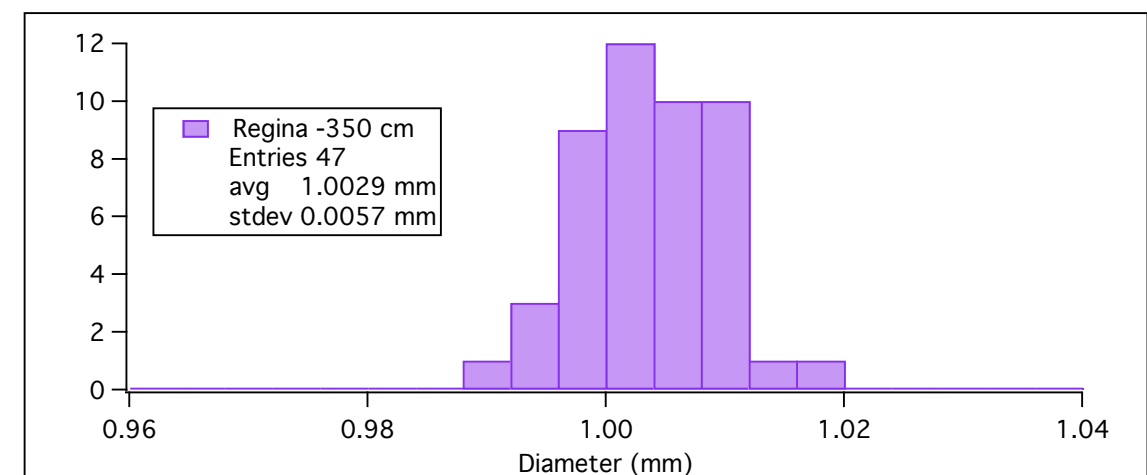
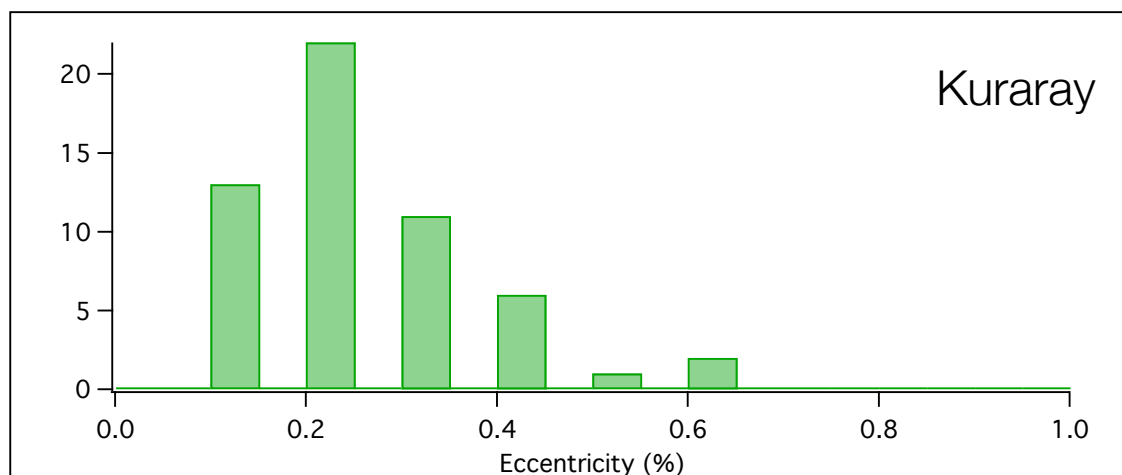
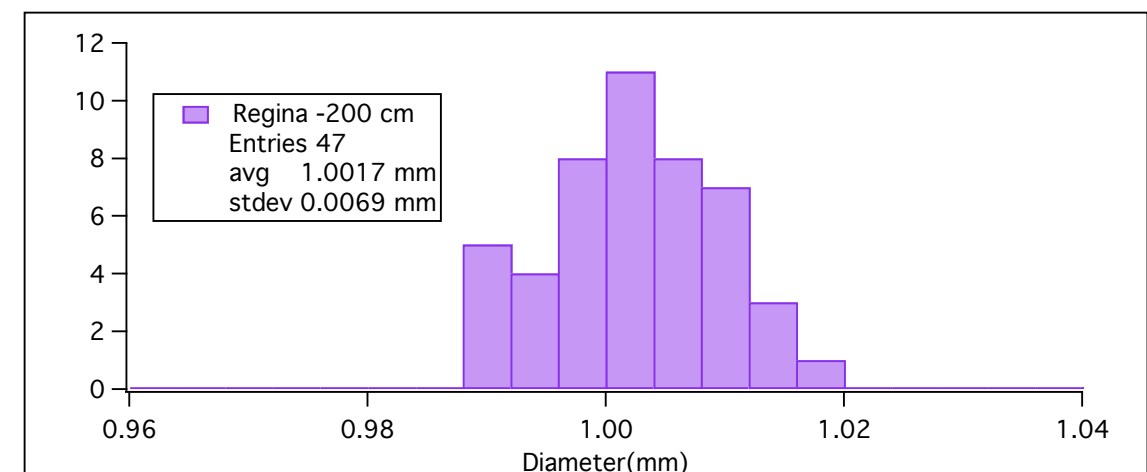
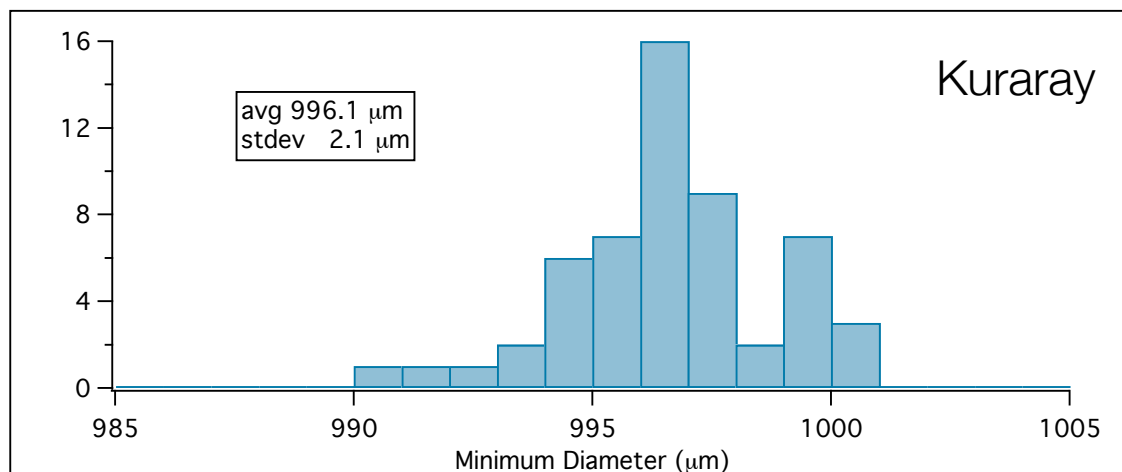
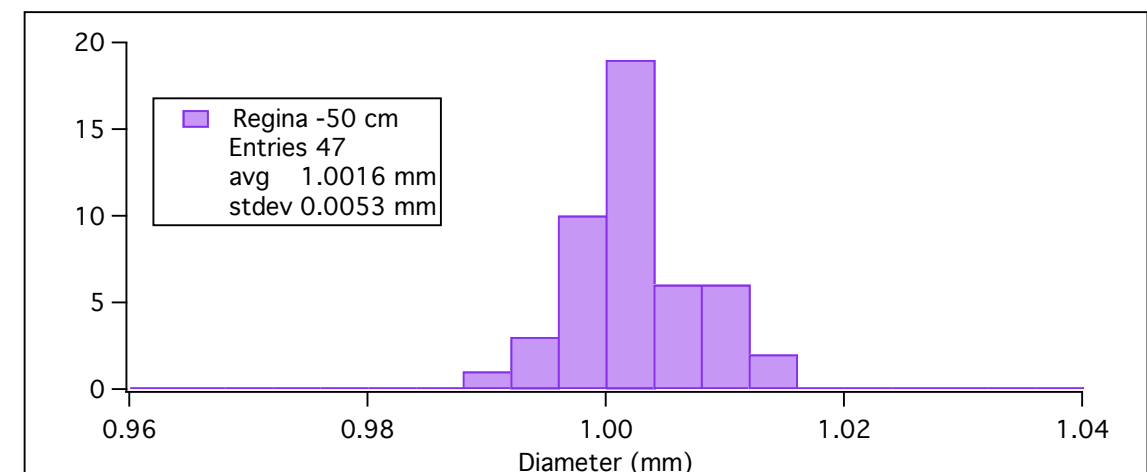
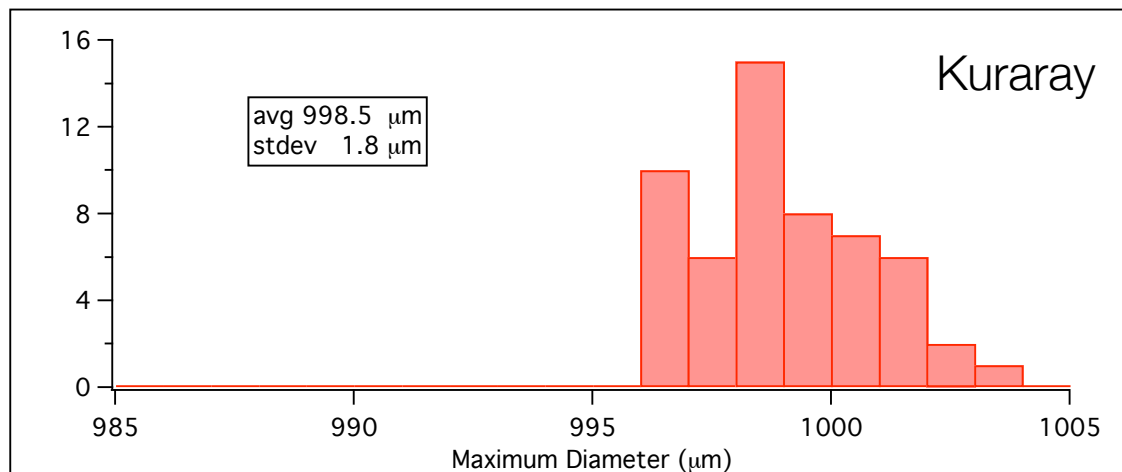


30-40 fibres per day
at each station

fibre diameter uniformity

First article

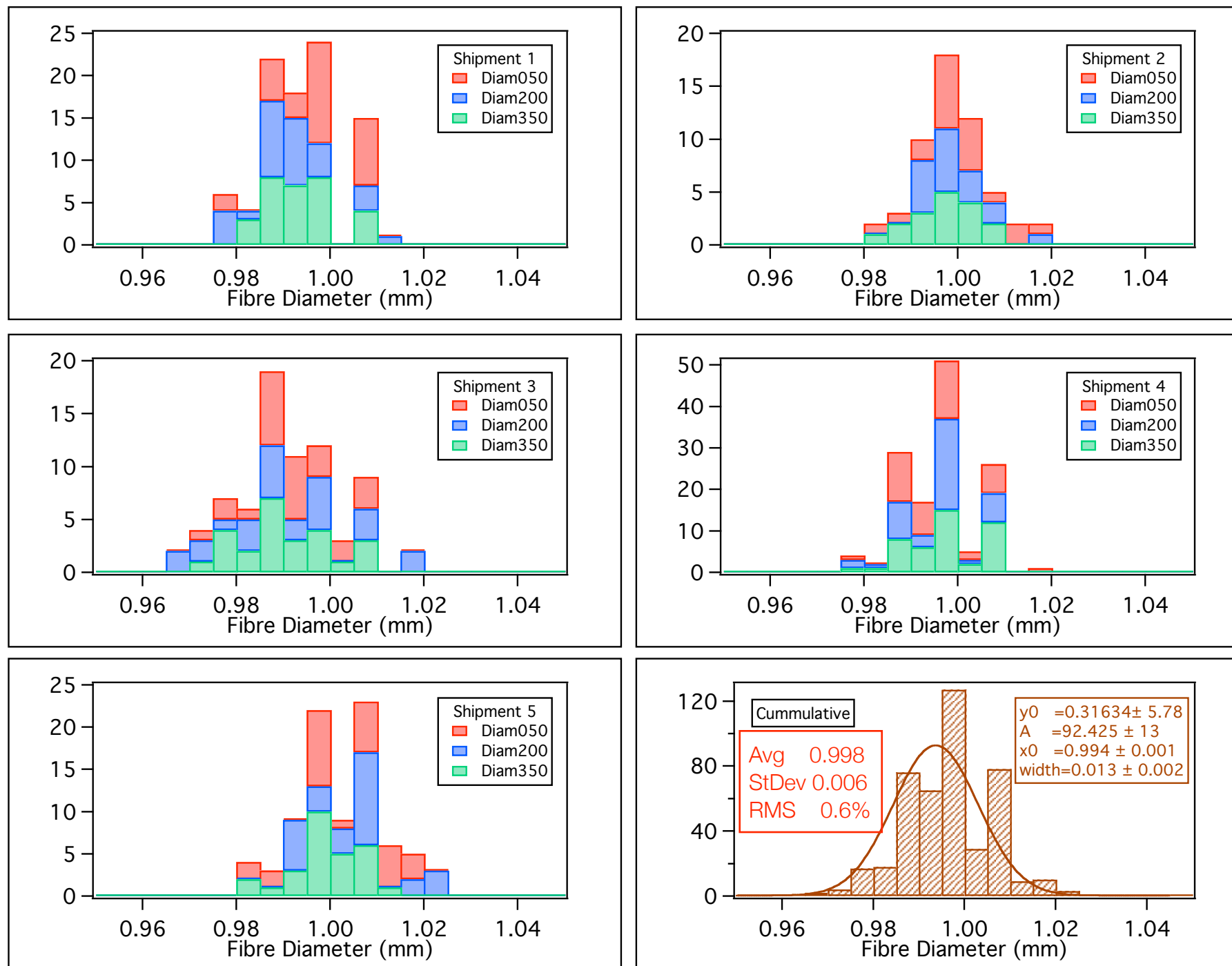
Spec: 1.00mm, RMS<2%



fibre diameter uniformity

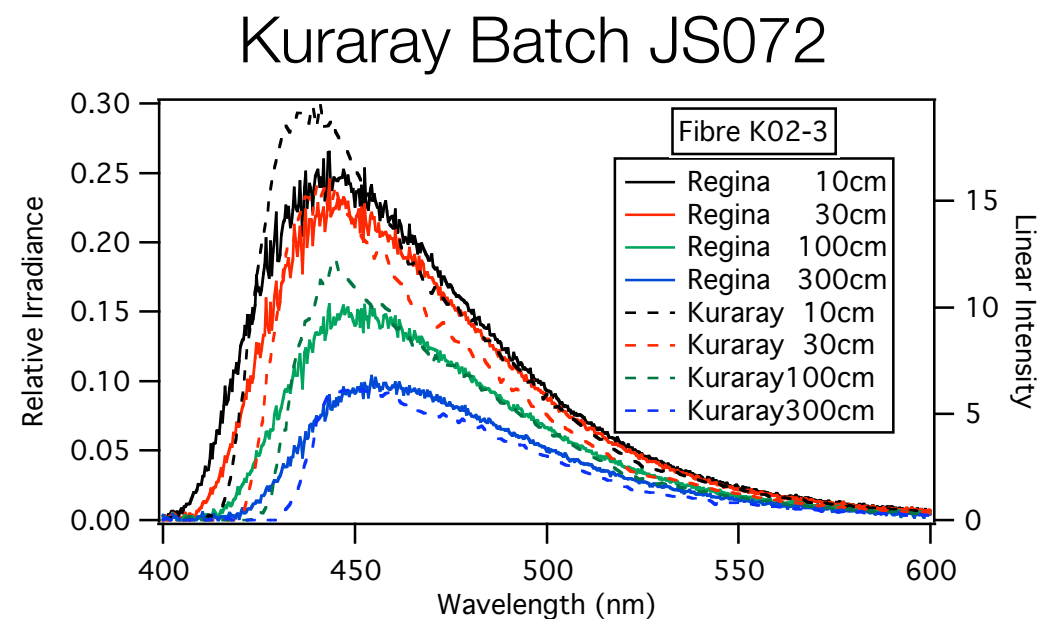
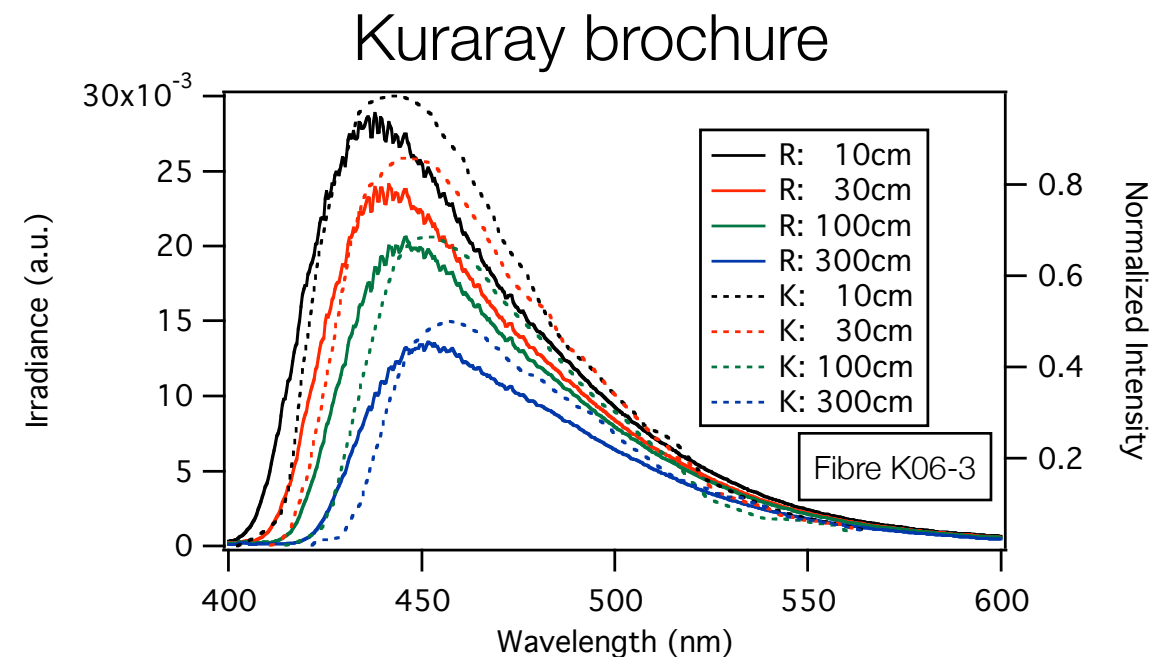
Shipments 1-5

Spec: 1.00mm, RMS<2%



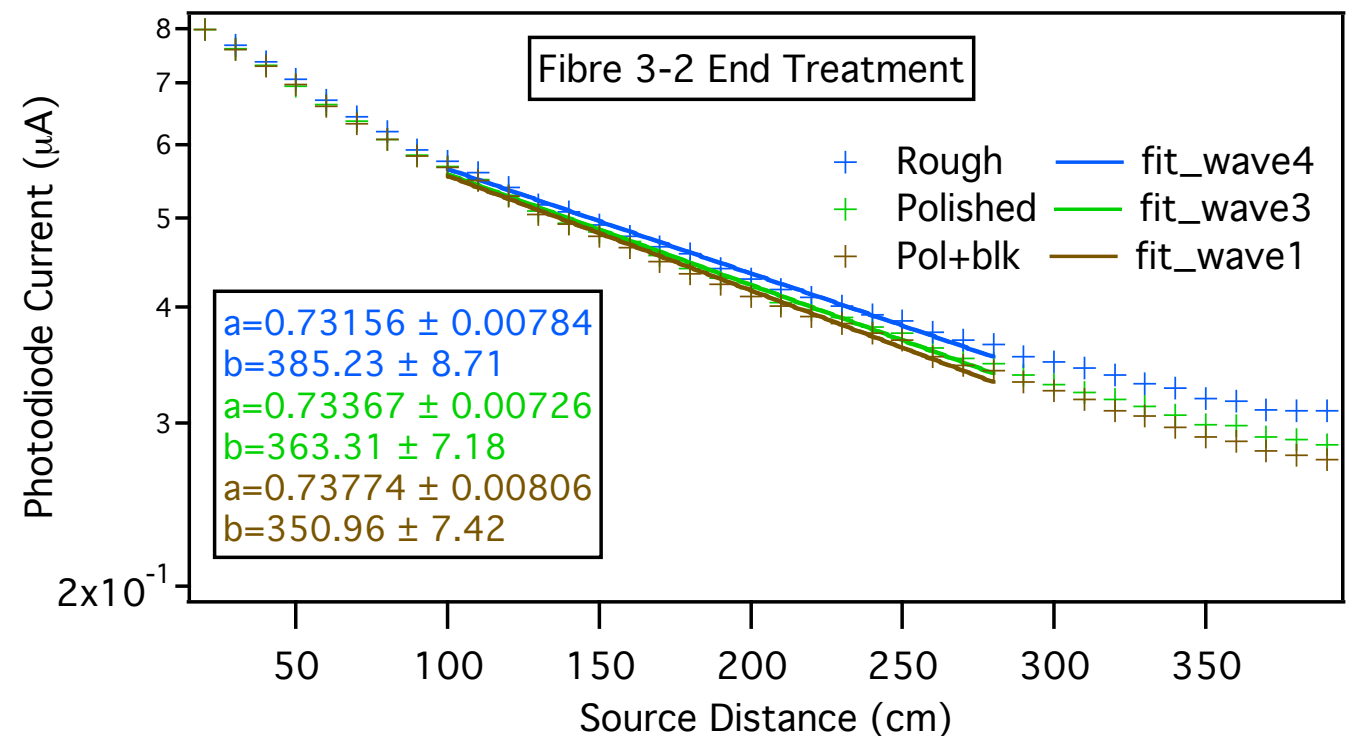
fibre spectral response - preliminary

- qualitatively the spectra measured at Regina agree with the Kuraray data
- integrals are close, but shapes are different
- response is acceptable and scales by distance in a similar fashion
- spectra from production fibres have been acquired; analysis is pending



fibre end treatment

- rough cut gives 10% higher attenuation length over polished and blackened and 8% higher over rough+black
- optical grease increases light transmission by up to 8%
- JLab and Regina have studied these effect; new measurements from Regina have been acquired on production fibres; analysis pending



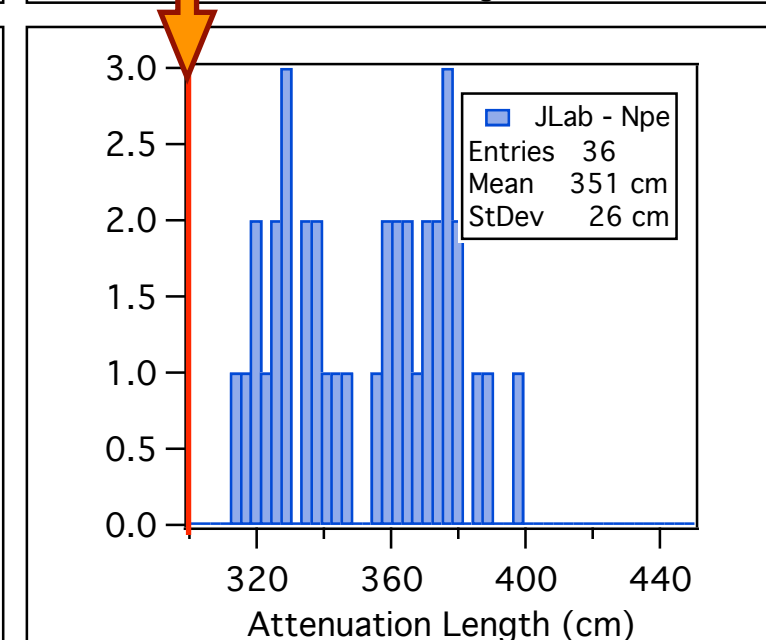
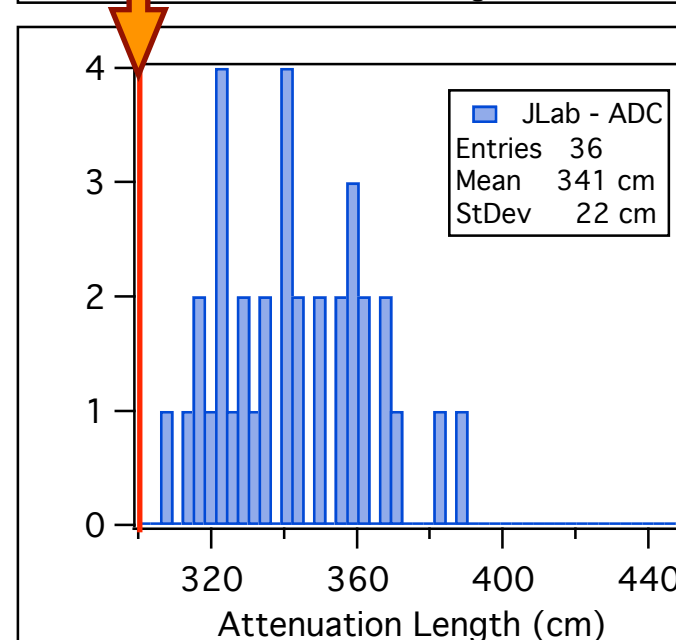
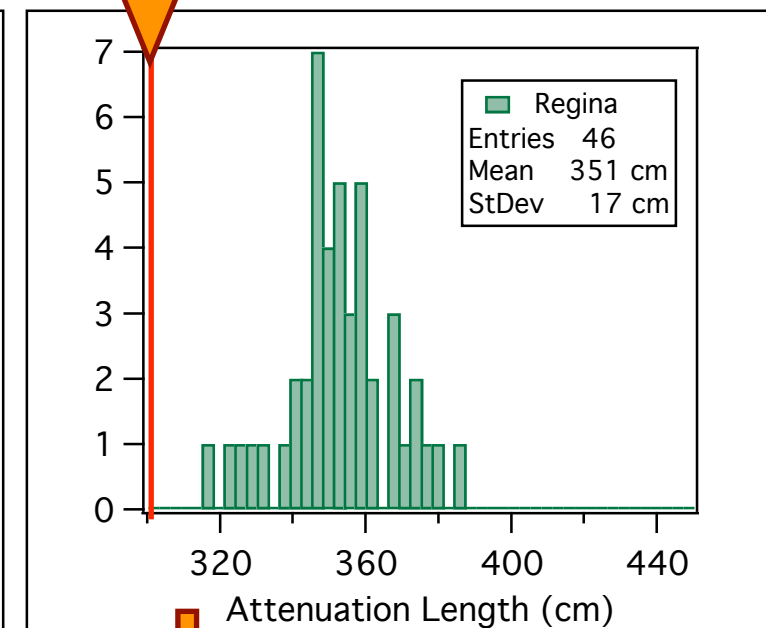
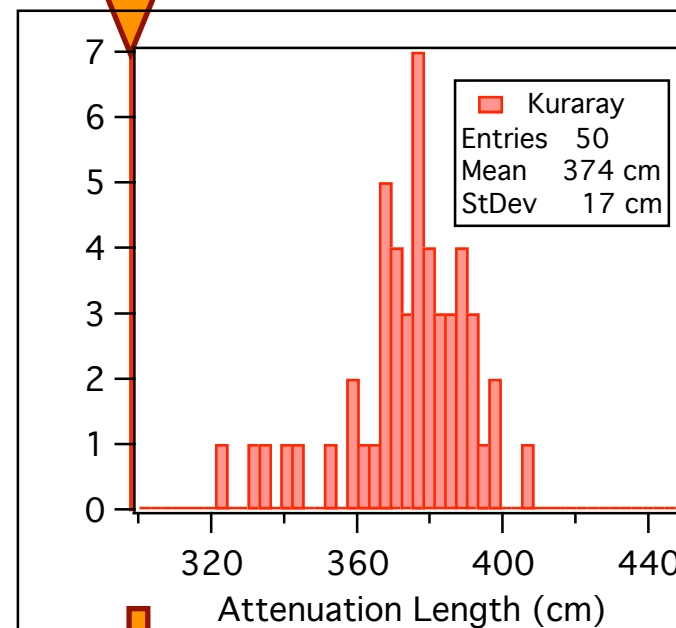
fibre attenuation length

First article

Spec: >300cm, RMS<10%

Spec: bulk/effective atten length

- **Kuraray**: both methods
 - UV LED scan, PMT, mV output
- **Regina**: far end polished, black
 - LED scan, picoammeter, photodiode current
- **JLab**: far end factory, black
 - ^{90}Sr scan, PMT, ADC-Npe

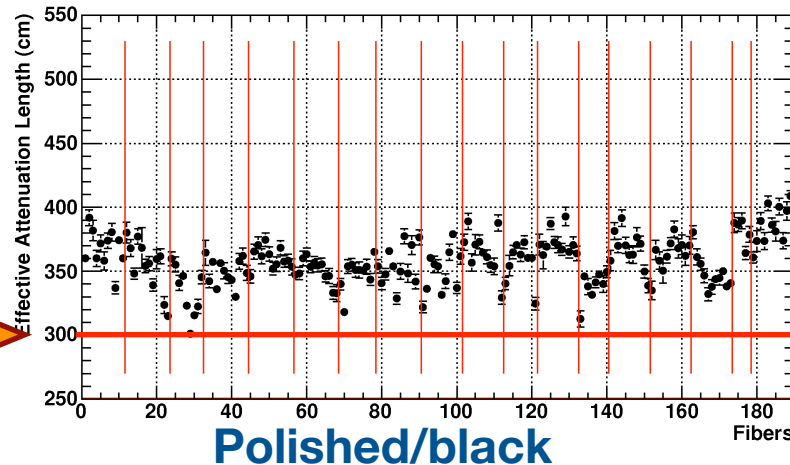


fibre attenuation length

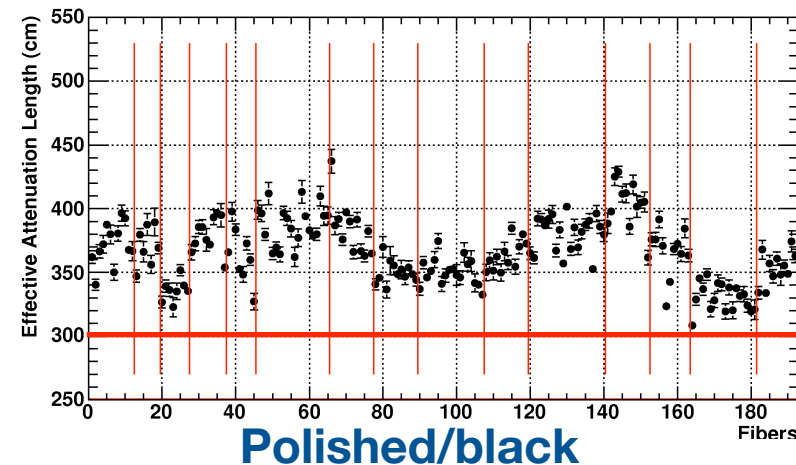
Shipments 1-5

Spec: >300cm, RMS<10%

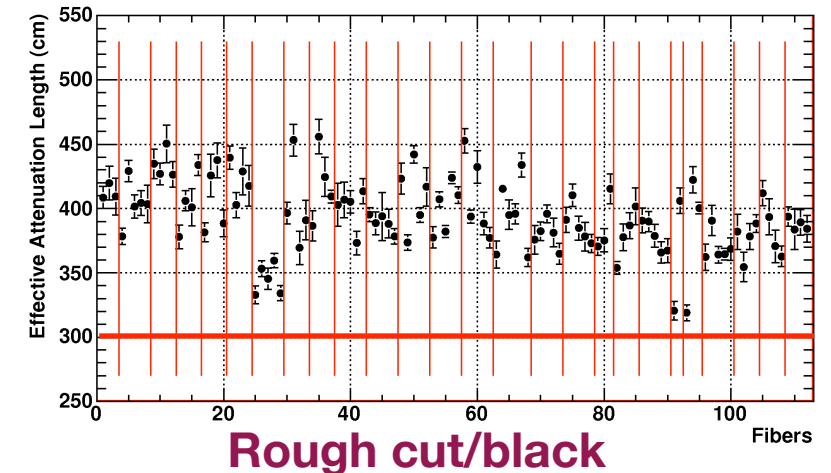
1st shipment: Attenuation Length with Photodiode



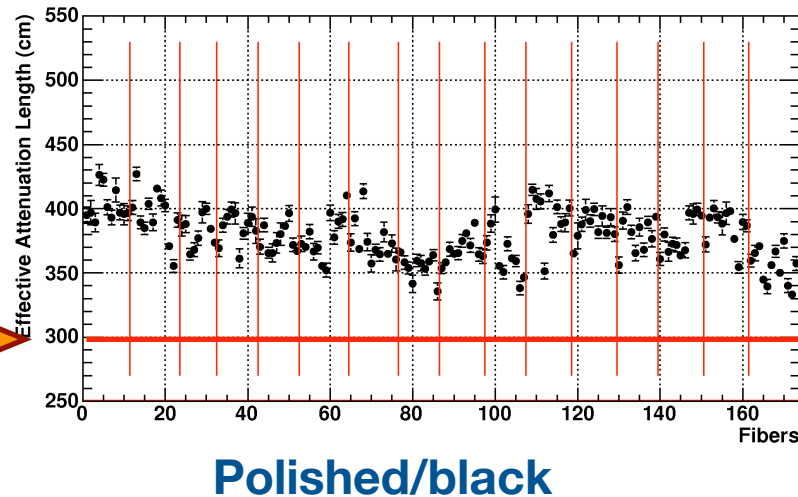
3rd shipment: Attenuation Length with Photodiode



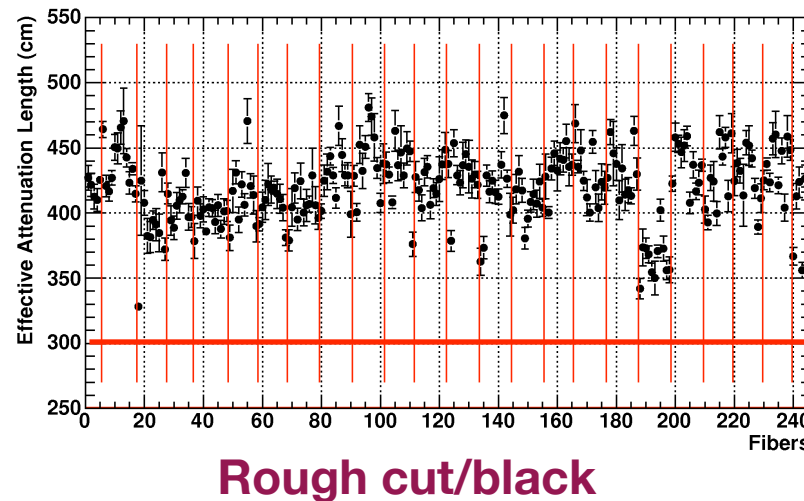
5th shipment: Attenuation Length with Photodiode



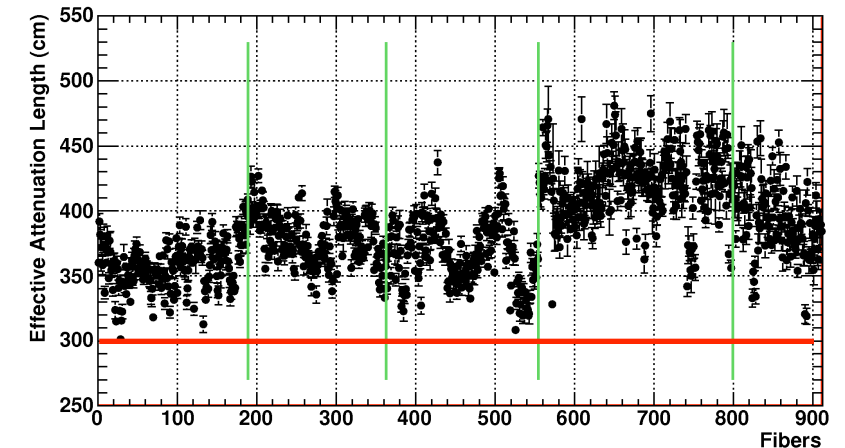
2nd shipment: Attenuation Length with Photodiode



4th shipment: Attenuation Length with Photodiode



Shipments 1-5: Attenuation Length with Photodiode

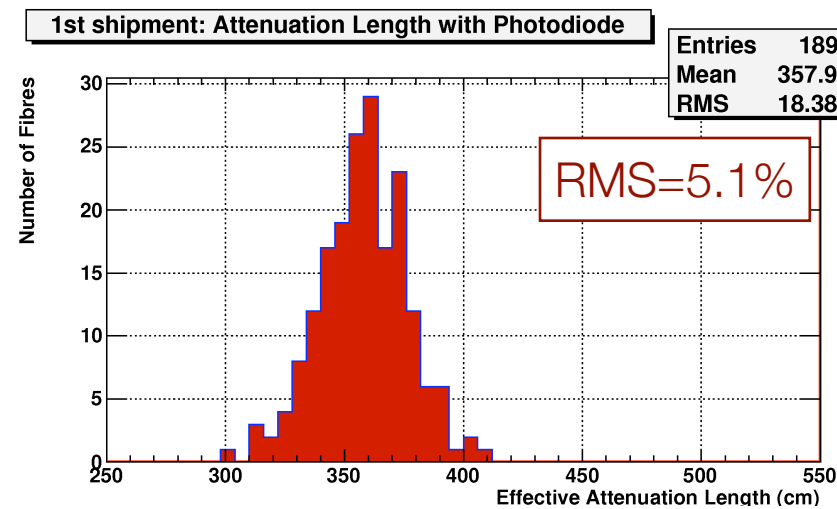


Batch-to-batch variation
Shipment-to-shipment change

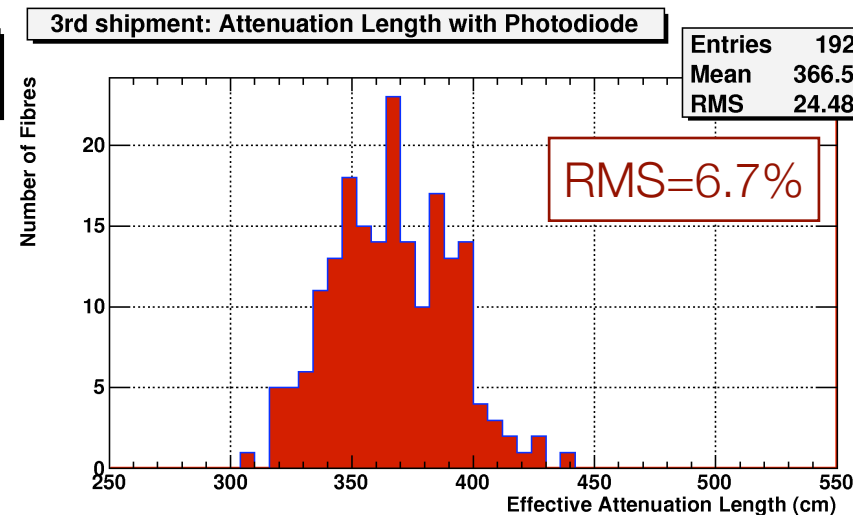
fibre attenuation length

Shipments 1-5

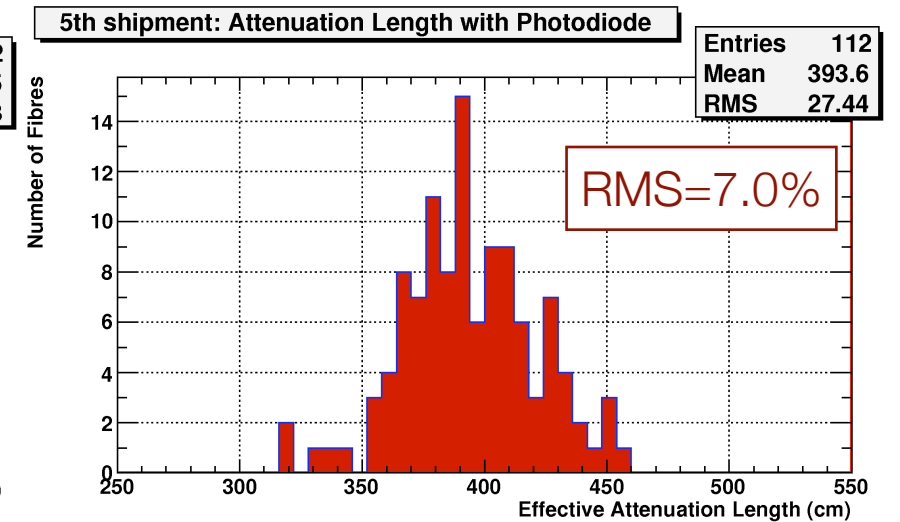
Spec: >300cm, RMS<10%



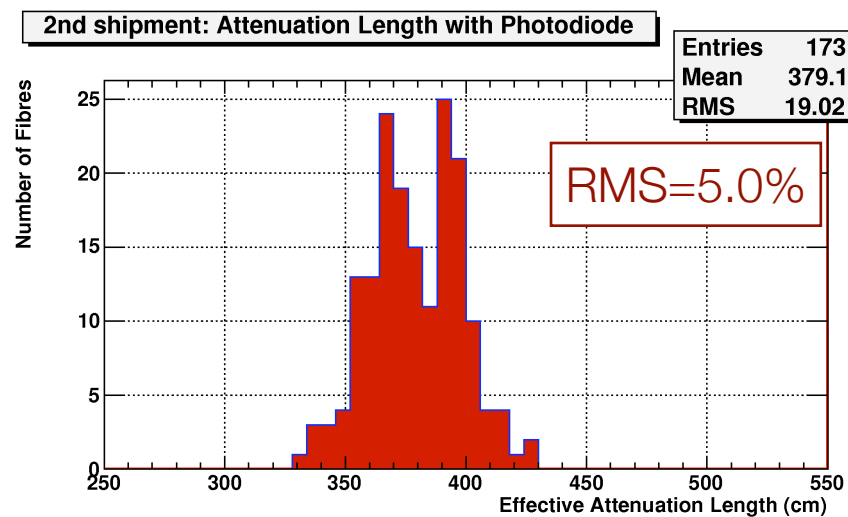
Polished/black



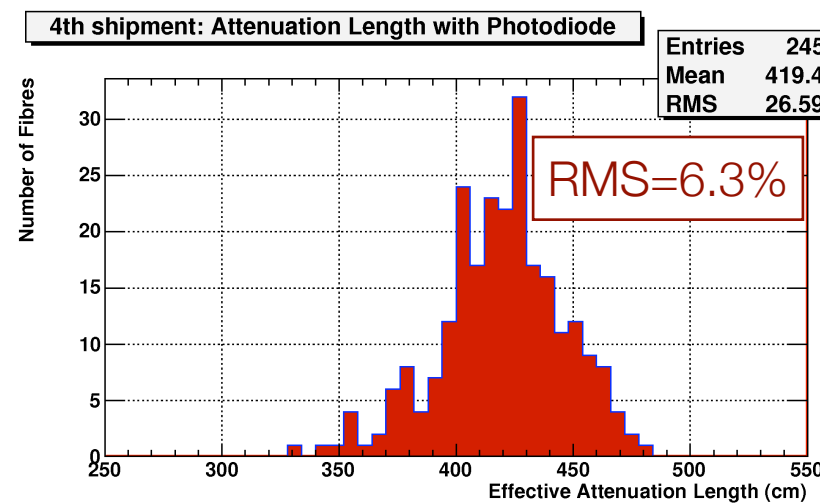
Polished/black



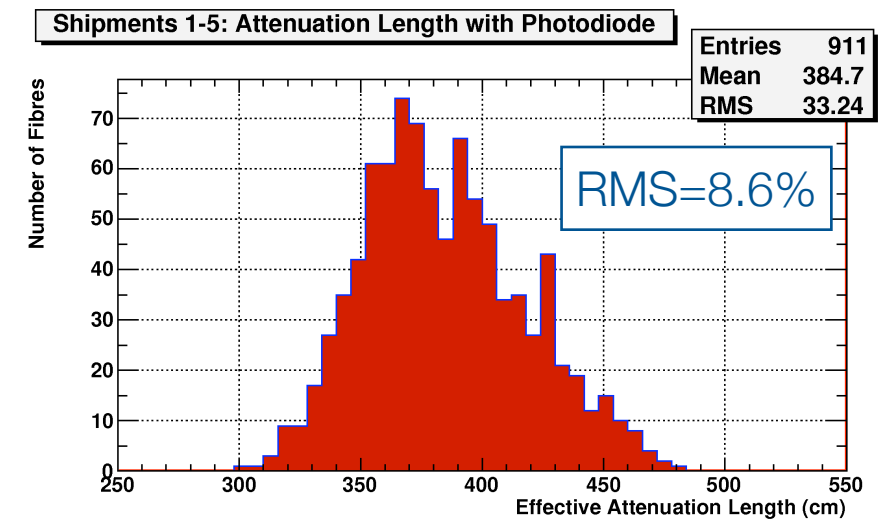
Rough cut/black



Polished/black



Rough cut/black



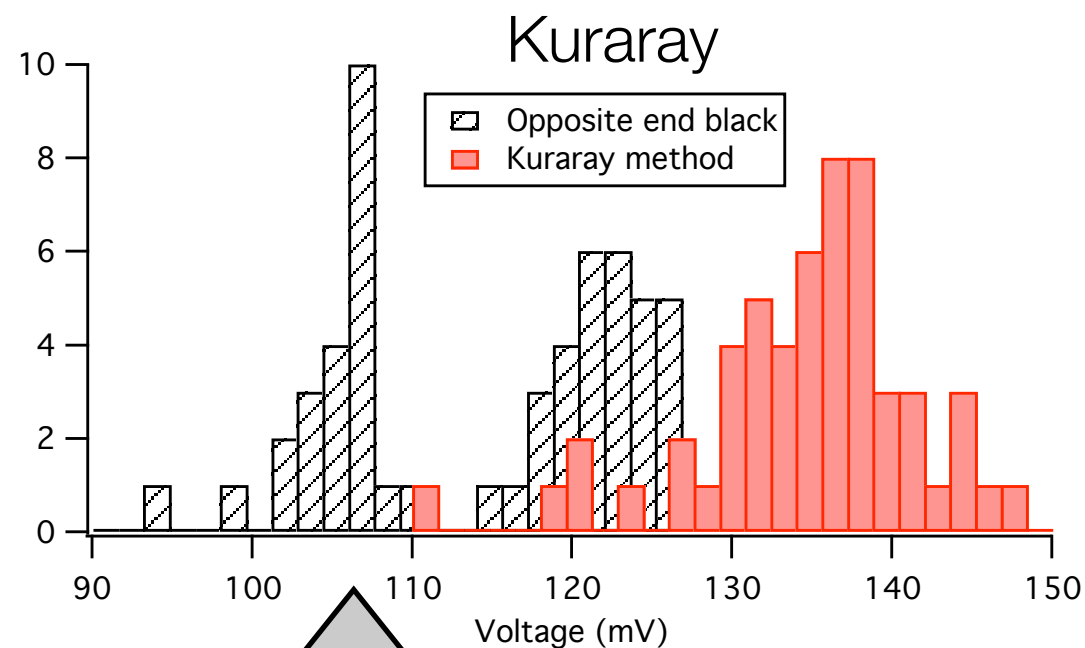
Batch-to-batch variation
Shipment-to-shipment change

fibre photoelectrons

First article

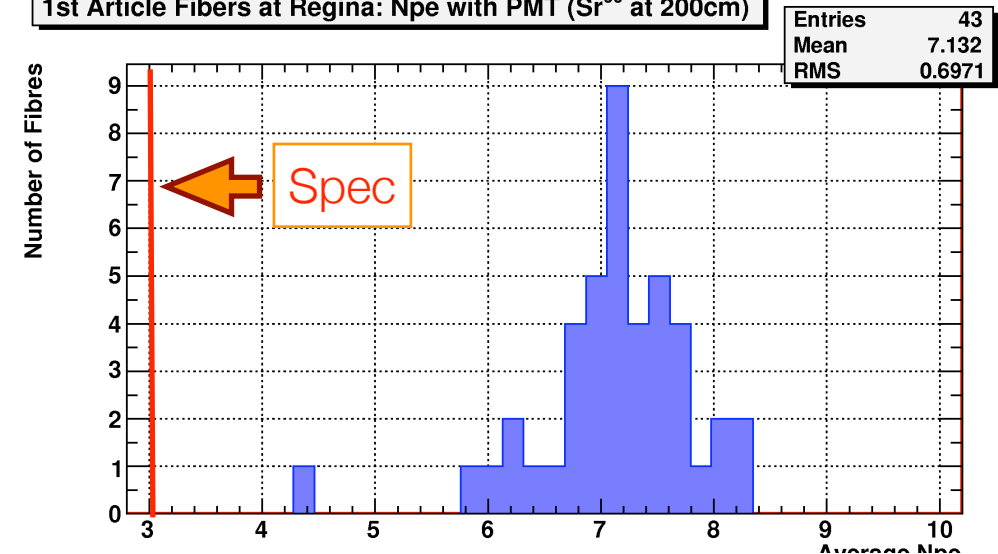
Spec: >3 p.e., RMS<15%

Measurement at 200cm

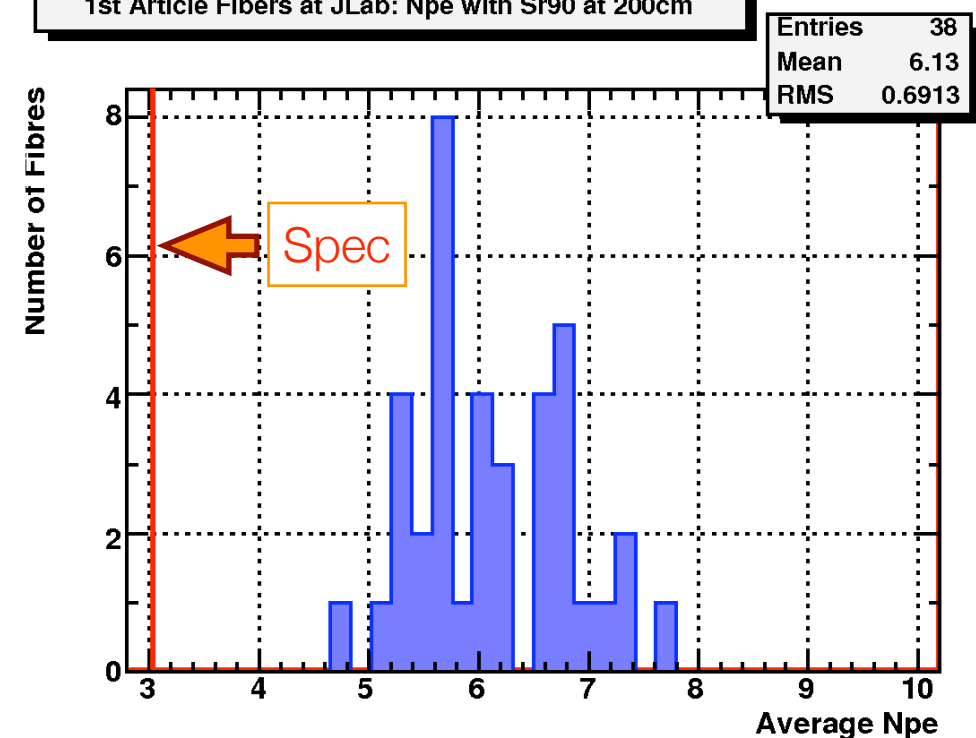


Use this one
(Regina & JLab blacken)

1st Article Fibers at Regina: Npe with PMT (Sr^{90} at 200cm)



1st Article Fibers at JLab: Npe with Sr^{90} at 200cm

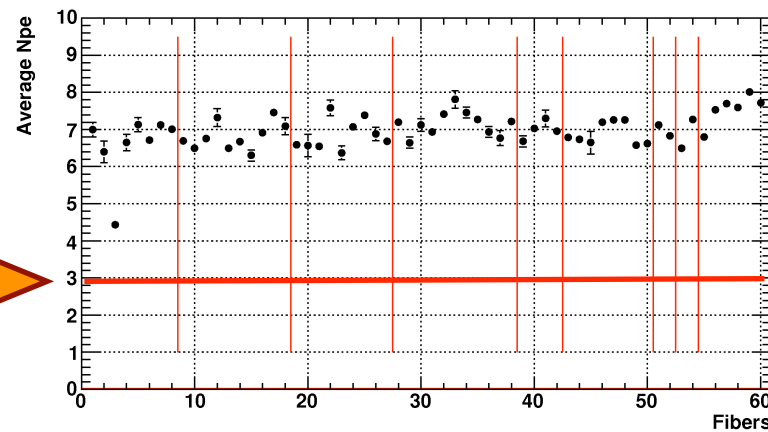


fibre photoelectrons

Shipments 1-5

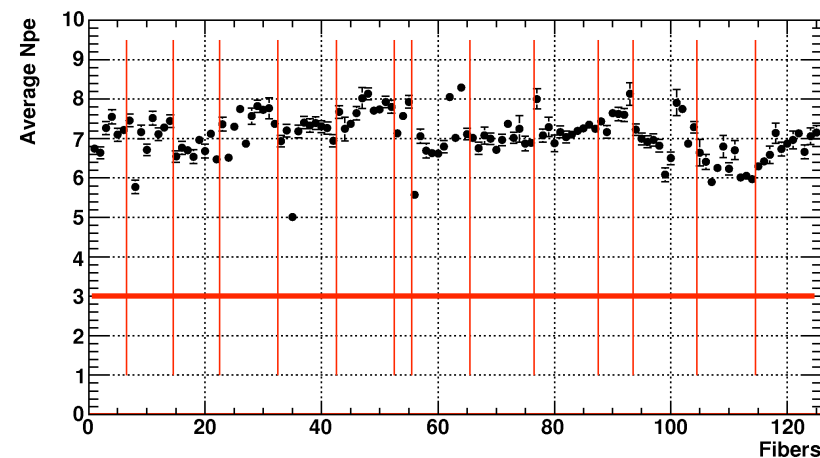
Spec: >3 p.e., $\text{RMS} < 15\%$

1st shipment: Npe with PMT



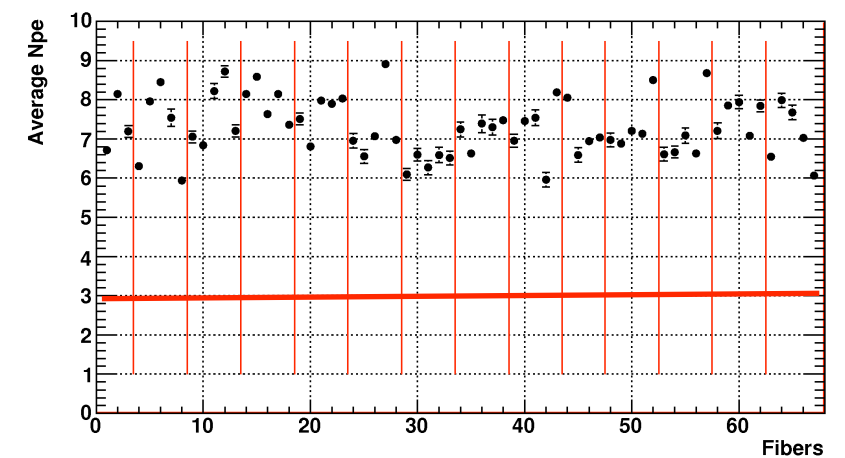
Polished/black

3th shipment: Npe with PMT



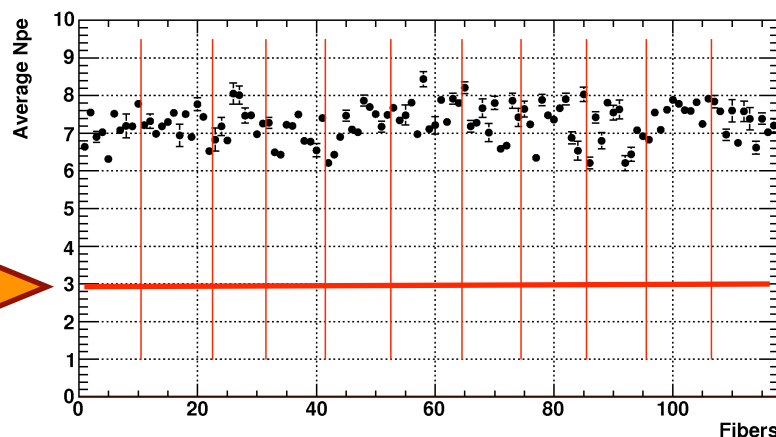
Polished/black

5th shipment: Npe with PMT



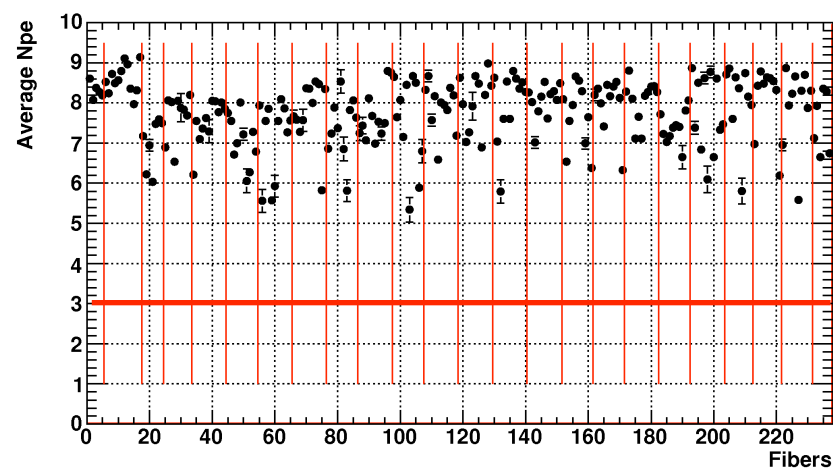
Rough cut/black

2nd shipment: Npe with PMT



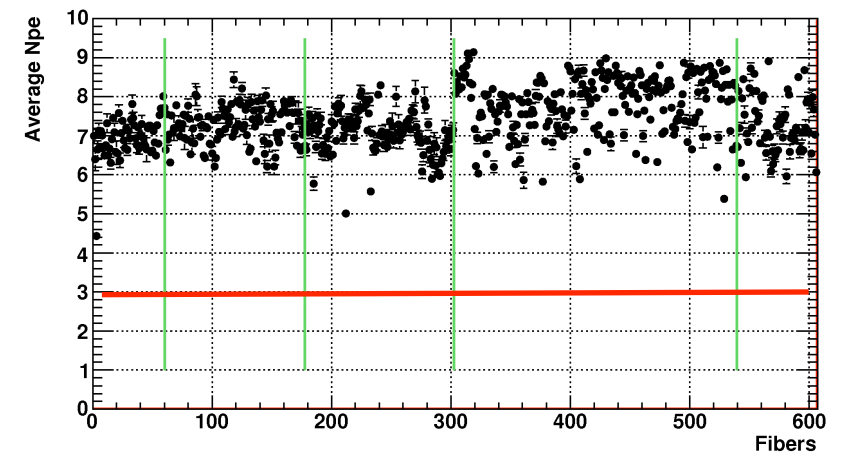
Polished/black

4th shipment: Npe with PMT



Rough cut/black

Shipments 1-5: Npe with PMT



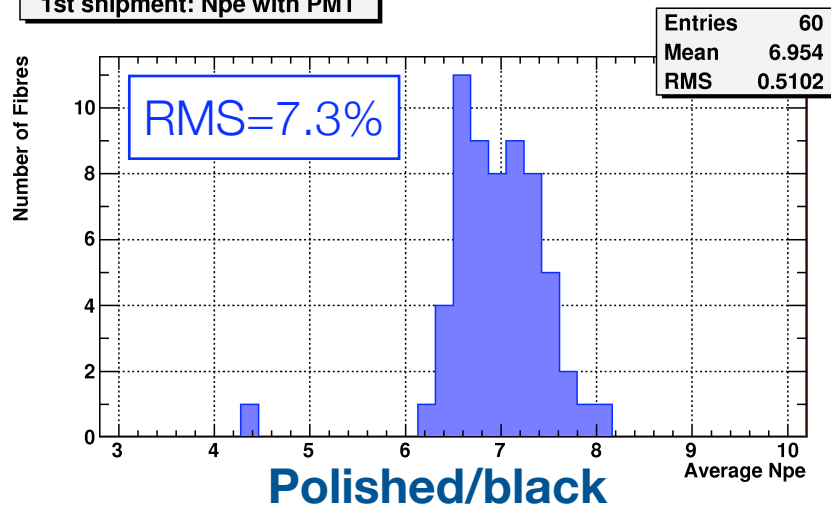
Batch-to-batch small variation
Shipment-to-shipment spread

fibre photoelectrons

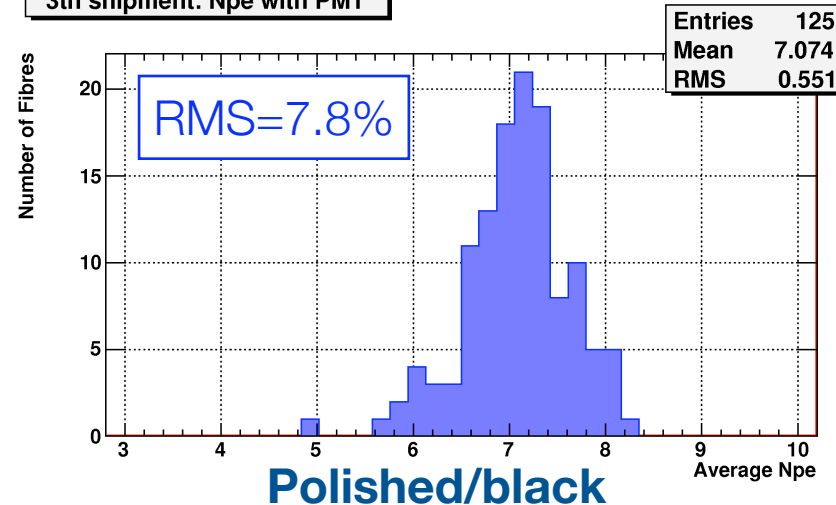
Shipments 1-5

Spec: >3 p.e., RMS<15%

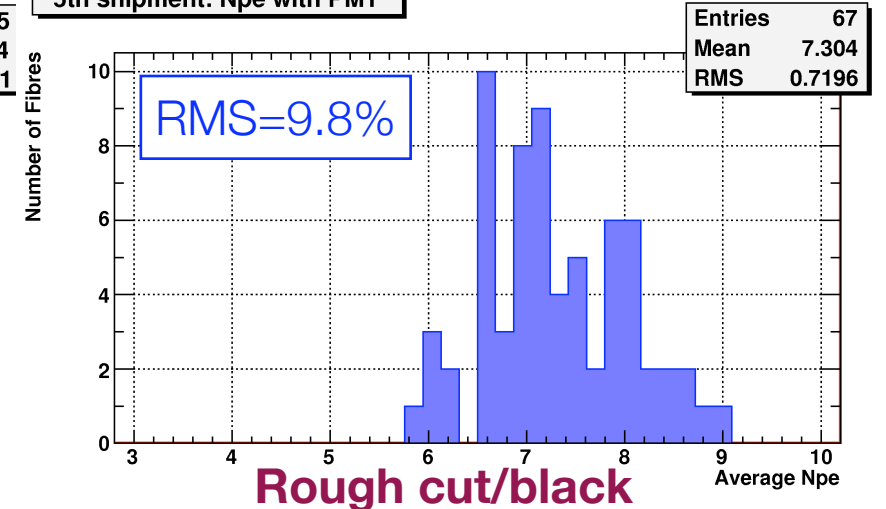
1st shipment: Npe with PMT



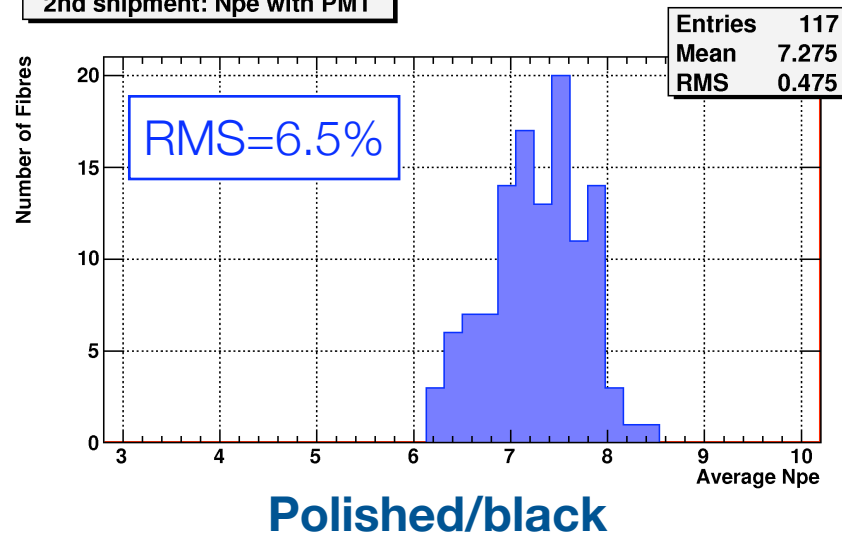
3th shipment: Npe with PMT



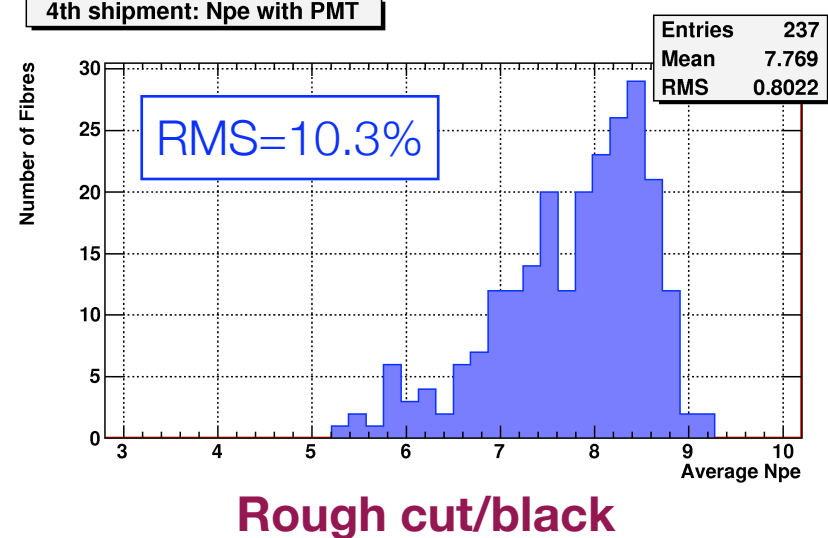
5th shipment: Npe with PMT



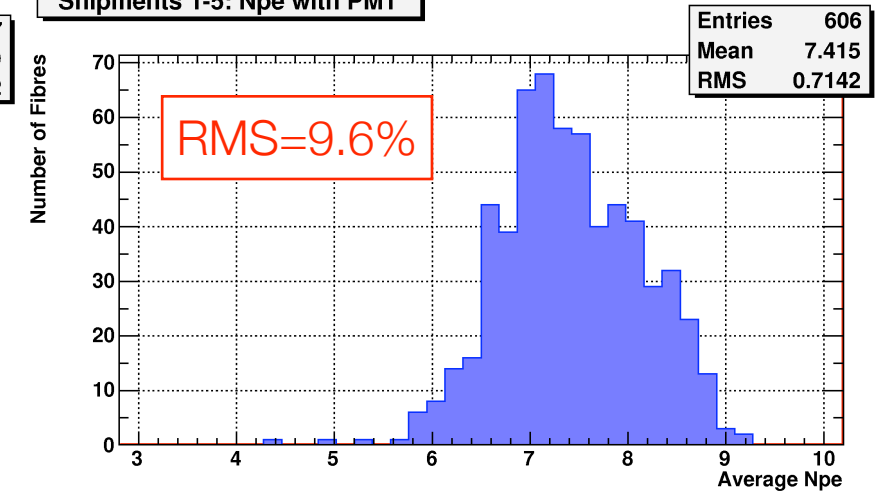
2nd shipment: Npe with PMT



4th shipment: Npe with PMT



Shipments 1-5: Npe with PMT



Batch-to-batch small variation
Shipment-to-shipment spread

fibre QA summary

- there are batch-to-batch variations,
- there is shipment-to-shipment drift but...
- fibres meet contract specifications:
 - both within each shipment
 - and cumulatively

- Feedback to Kuraray: *'First Article' report sent; by Oct. 31 send Shipment 1-5 report containing these plots, and Customer Satisfaction Survey*

