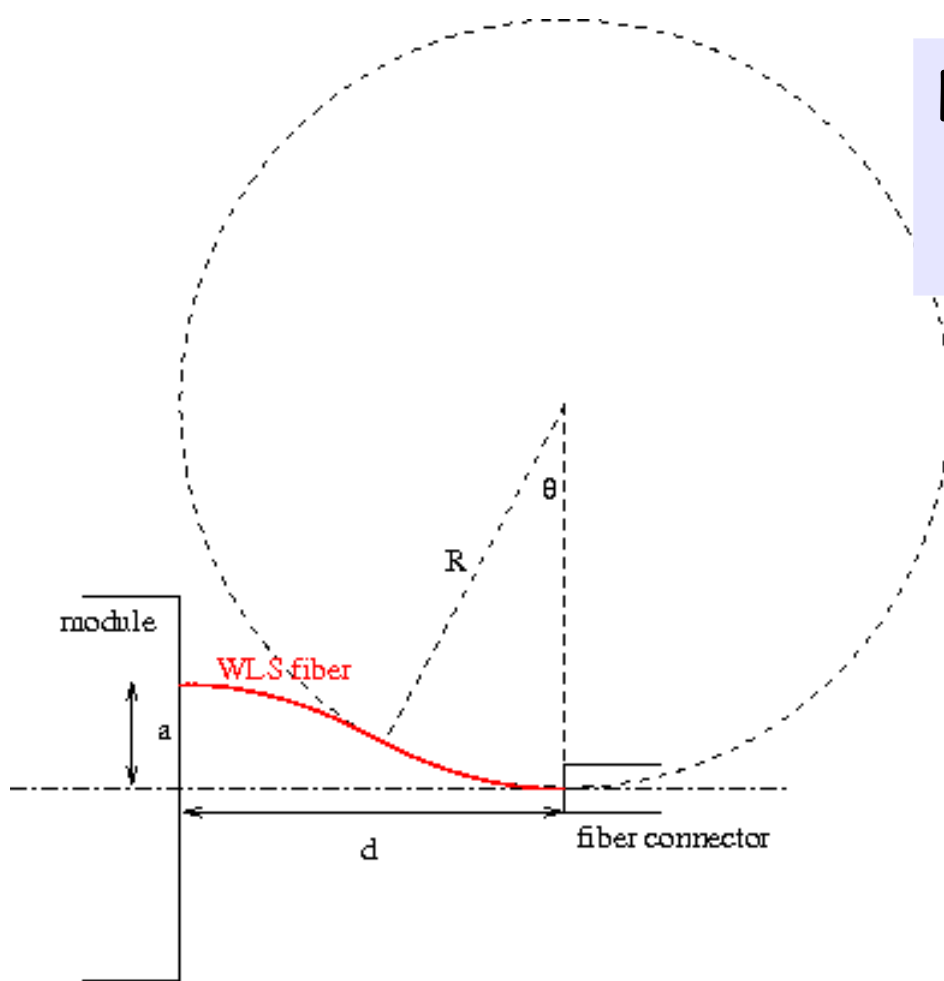


Fiber Bending Light Loss Calculation

4/11/2016

Xiaochao Zheng

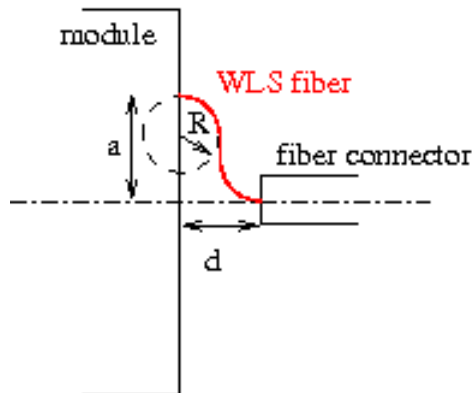


if $d > a$

$$R = \frac{\sqrt{(a^2 + d^2)}}{4a}$$

$$\theta = \arcsin\left(\frac{d/2}{R}\right)$$

fraction of full circle is $2\theta/(2\pi)$



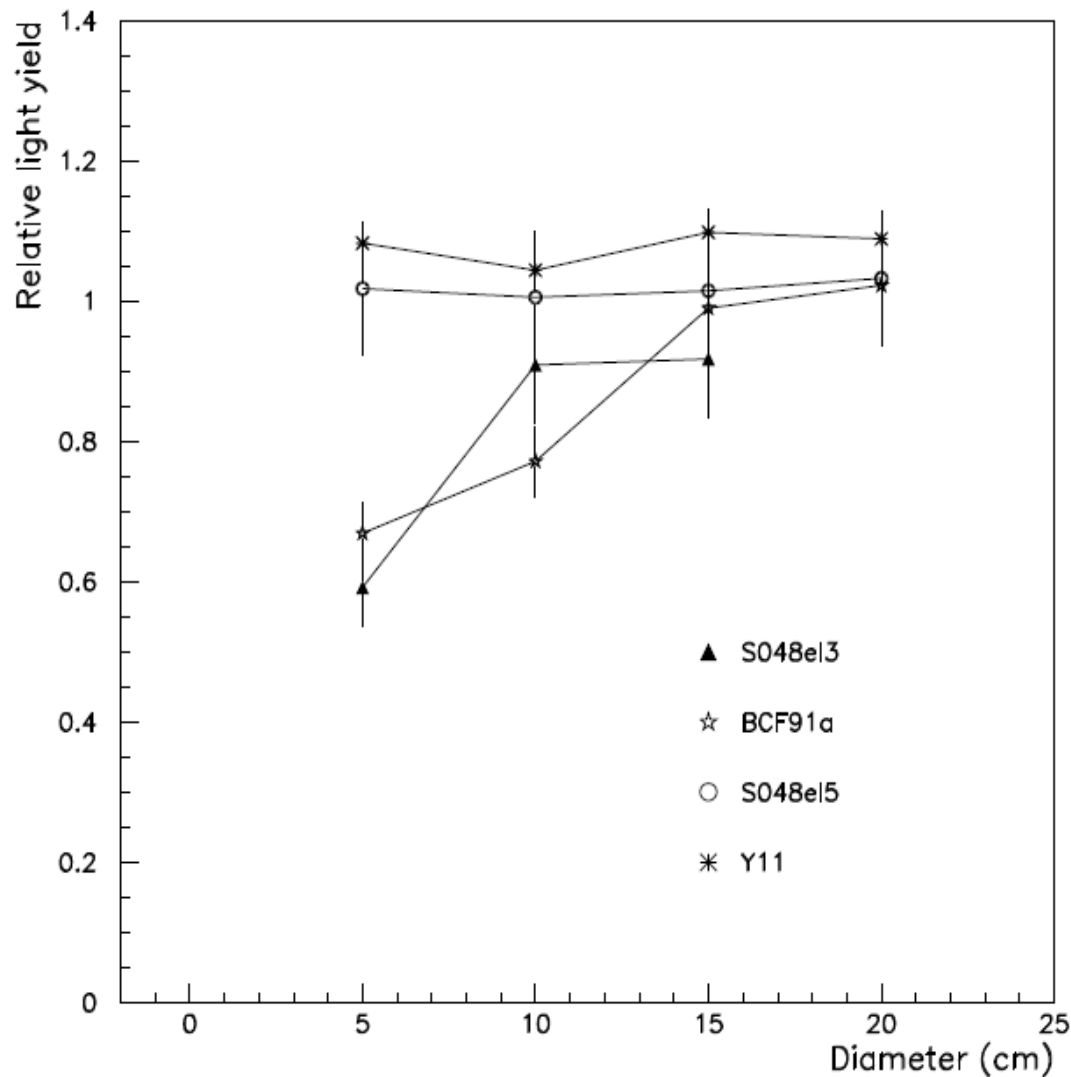
if $d < a$

$$R = d/2$$

$$\theta = \frac{\pi}{2}$$

fraction of full circle is 0.5

from ATLAS Tile Cal TDR (loss
with fiber wound a full circle):



Do a linear fit, loss at full
circle with radius $R(<10\text{cm})$
is:

$$5.3\% * (10\text{cm} - R)$$

i.e., loss is

- 40% at $R=2.5\text{cm}$ or
diameter 5cm;
- zero at $R=10\text{cm}$ or
diameter 10cm.

Figure 5-24 Relative light output for some fibres as a
function of bending diameter.

Distance between our fiber holes to center of module:

