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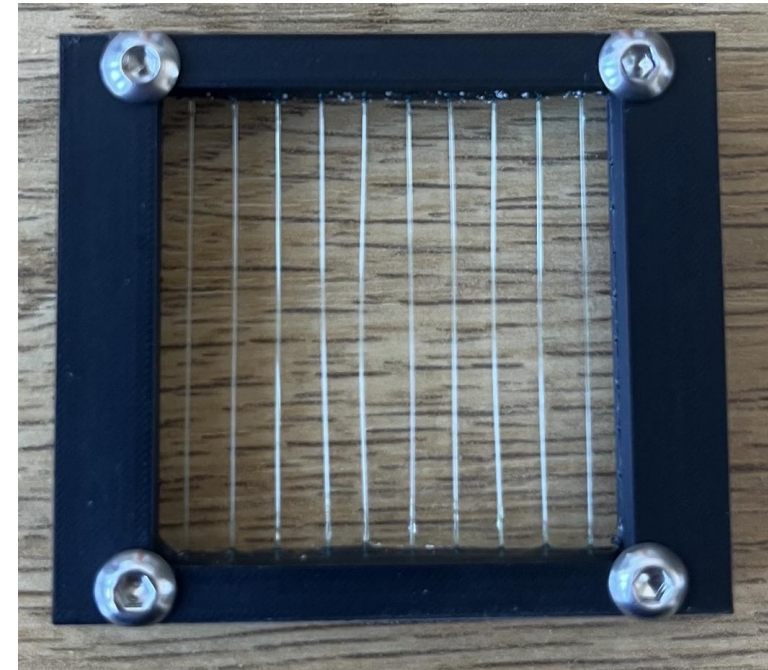
Science and Engineering



Sparse fibre plane, hollow fibre simulation

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ZEMAX simulation of 1 m hollow plastic fibre

1010 mm long hollow fibre simulated. Hollow core of vacuum is 1.0 mm diameter, cladding layer of PMMA (wrong plastic, fibre is made from a silicone but not far off in r.i.) is 3.0 mm outer diameter. Wavelength of 491 nm (peak of scintillating fibre).

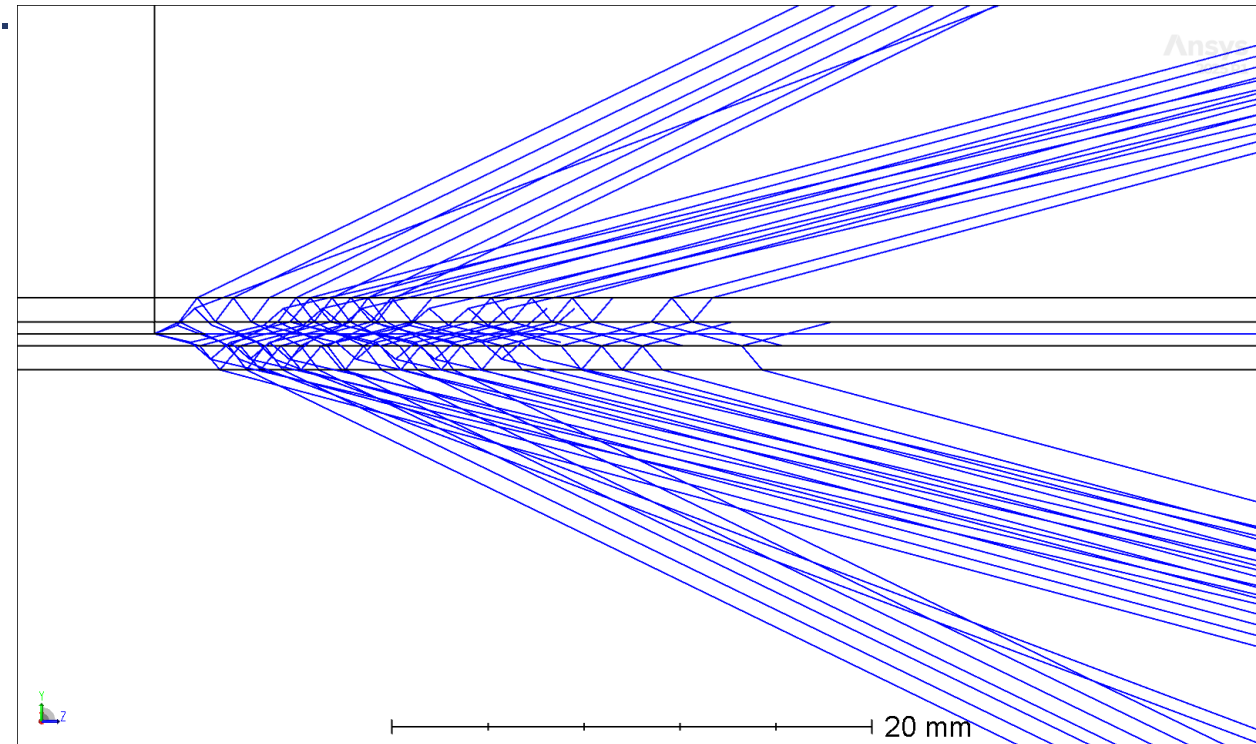
Detector planes at 100, 200, 500 and 999 mm from the source, each detector a 3×3 mm rectangle.

Source is a point with cone angle of 30°

1W power launched, 4 million primary rays traced.

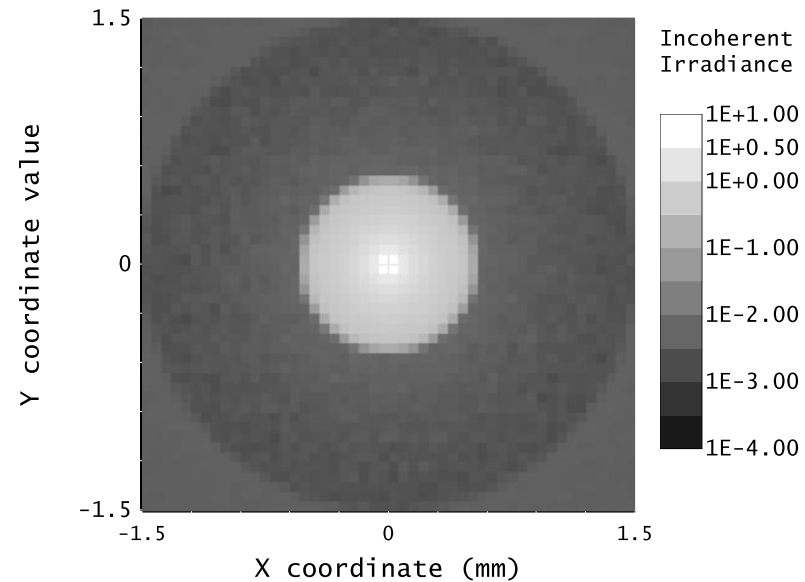
A possible hollow fibre option is *Saint Gobain Life Sciences Tygon™ 3350 Sanitary Silicone Tubing* which has an “Ultra-smooth inner bore” which should reduce scattering.

Available in the UK from Fischer Scientific (15 m would cost £205 inc VAT)



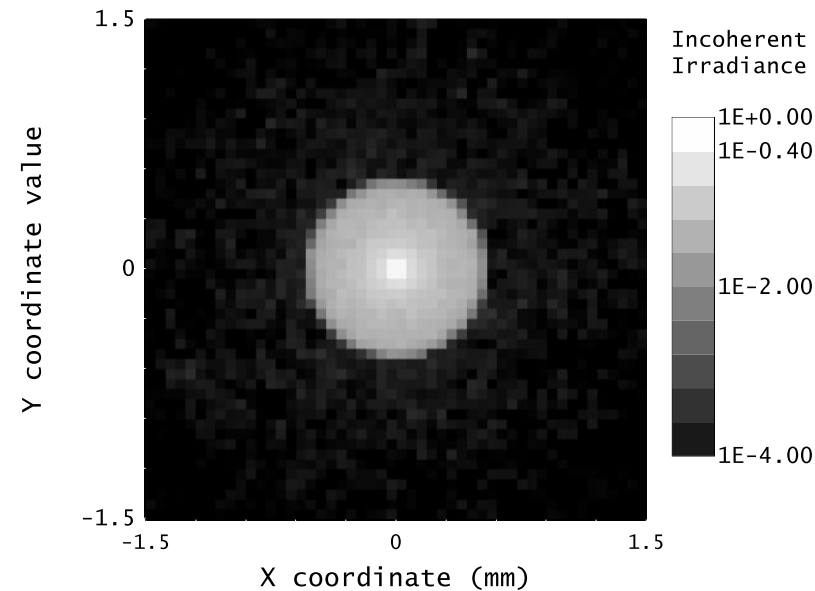
ZEMAX simulation of 1 mm diam. hollow fibre

Note that 999 mm from source is still inside the fibre.



Detector Image: Incoherent Irradiance	
Fibre Test for PoPLaR 01/05/2026 Detector 4, NSCG Surface 1: Size 3.000 W X 3.000 H Millimeters, Pixels 50 W X 50 H, Total Hits = 3945274 Peak Irradiance : 9.4341E+00 Watts/cm ² Total Power : 1.1001E-02 Watts	School of Phy Queen Mar PMMA_Ho1 Confi

100 mm from source



Detector Image: Incoherent Irradiance	
Fibre Test for PoPLaR 01/05/2026 Detector 7, NSCG Surface 1: Size 3.000 W X 3.000 H Millimeters, Pixels 50 W X 50 H, Total Hits = 168561 Peak Irradiance : 7.3222E-01 Watts/cm ² Total Power : 8.0876E-04 Watts	School of Phy Queen Mary PMMA_Ho1 Confi

999 mm from source

Total power as % of launched power

100 mm: 1.1%

200 mm: 0.5%

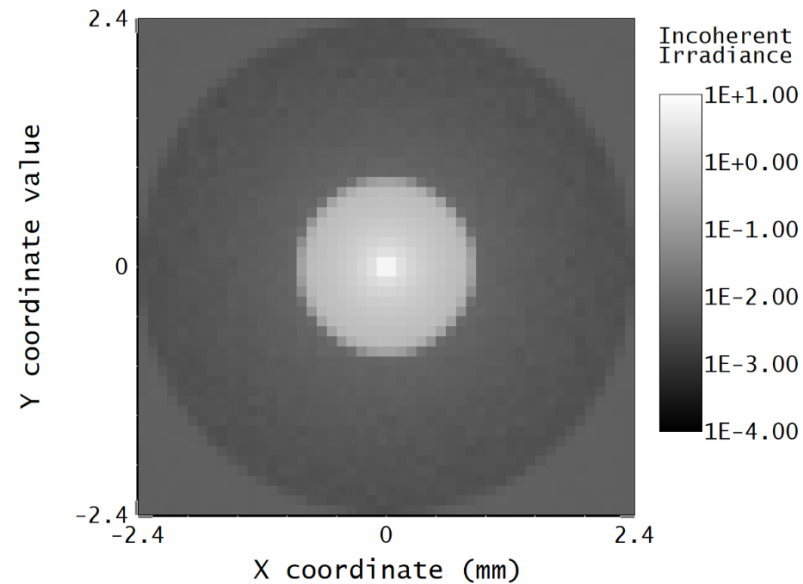
500 mm: 0.18%

999 mm: 0.08%

Preliminary data, treat with caution! Note that any bends will increase the attenuation.

ZEMAX simulation of 1.6 mm diam. hollow fibre

Note that 999 mm from source is still inside the fibre.

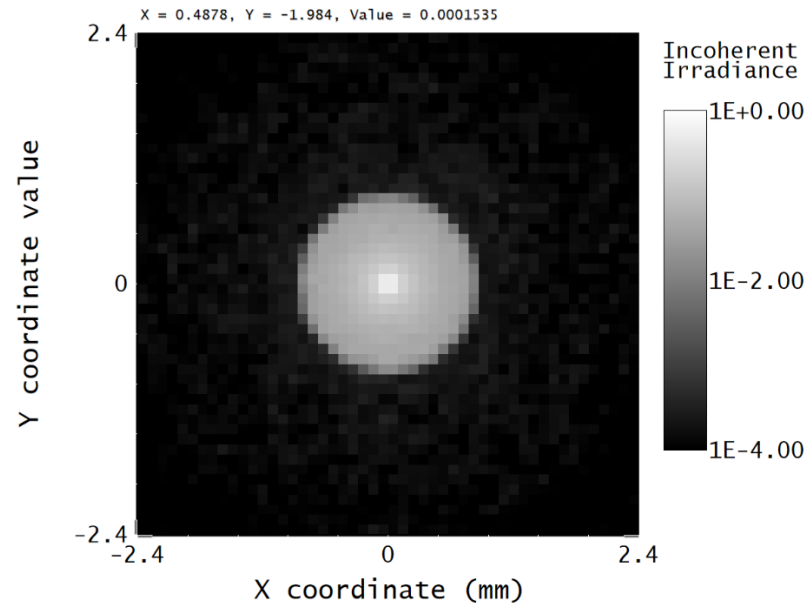


Detector Image: Incoherent Irradiance

Fibre Test for PoPLaR
28/05/2026
Detector 4, NSCG Surface 1:
Size 4.800 W X 4.800 H Millimeters, Pixels 50 W X 50 H, Total Hits = 6395283
Peak Irradiance : 6.1147E+00 Watts/cm²
Total Power : 1.8738E-02 Watts

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PMMA_Ho1
Conf



Detector Image: Incoherent Irradiance

Fibre Test for PoPLaR
28/05/2026
Detector 7, NSCG Surface 1:
Size 4.800 W X 4.800 H Millimeters, Pixels 50 W X 50 H, Total Hits = 475140
Peak Irradiance : 4.8960E-01 Watts/cm²
Total Power : 1.3915E-03 Watts

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PMMA_Ho
Conf

Total power as % of
launched power

100 mm: 1.9%

200 mm: 0.9%

500 mm: 0.3%

999 mm: 0.14%

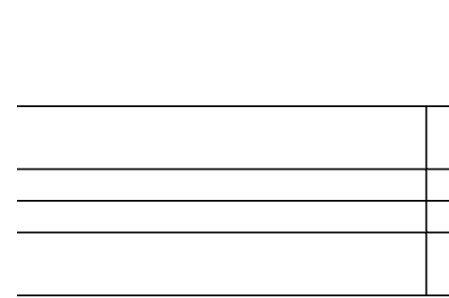
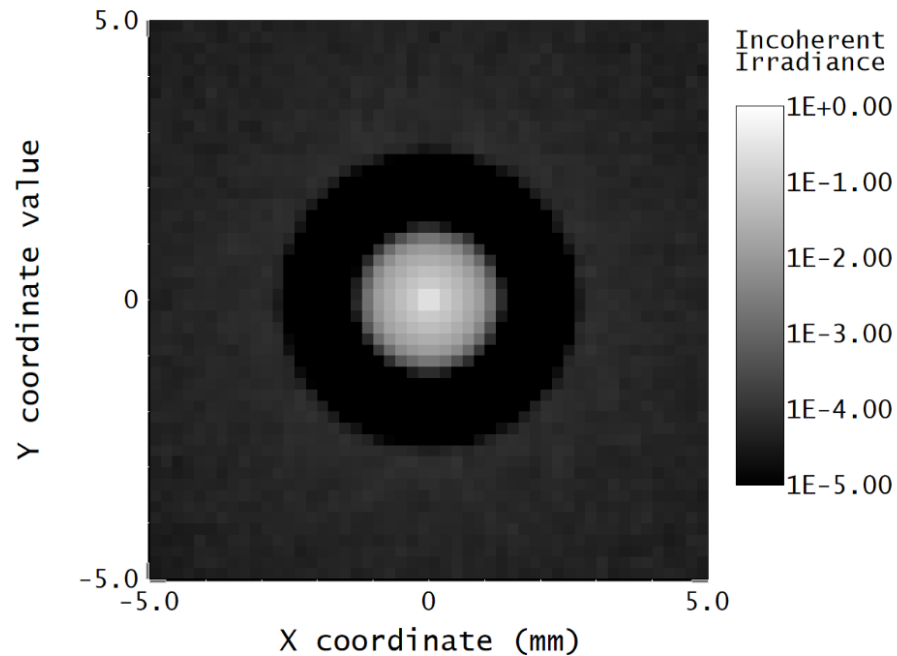
Preliminary data, treat with caution! Note that any bends will increase the attenuation.

100 mm from source

999 mm from source

ZEMAX simulation of 1.6 mm diam. hollow fibre

Note that 1009 mm from source is 10 mm from external end the fibre.



Location of detector plane

10 mm

Detector Image: Incoherent Irradiance

Fibre Test for PoPLaR
28/05/2026
Detector 8, NSCG Surface 1:
Size 10.000 W X 10.000 H Millimeters, Pixels 50 W X 50 H, Total Hits = 524603
Peak Irradiance : 2.2909E-01 Watts/cm²
Total Power : 1.4038E-03 Watts

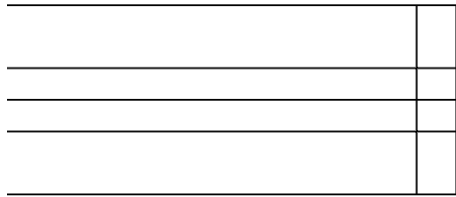
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Preliminary data, treat with caution! Note that any bends will increase the attenuation.

1009 mm from source

ZEMAX simulation of 1.6 mm diam. hollow fibre



A 10 mm thickness viewport into the vacuum chamber plus external lens + camera will be added to the simulation.

Two contender lenses shown below.

10 mm



4.5 mm FL $f\# = 2$



6 mm FL $f\# = 1.4$

1009 mm from source

Next steps

A 10 mm thickness borosilicate viewport into the vacuum chamber plus external lens + camera will be added to the simulation;

I have ordered a length of the 1.6 mm ID hollow fibre;

I have ZEMAX “black box” lens descriptions of two possible lenses, from Edmund Optics, for the cameras I bought for LhARA;

I have recently located another UK source of Pt-cured hollow fibre – Trelleborg. Quote requested for SMF3-2050.

Platinum Cured Silicone Tubing

Standard Size Tubing

Manufactured in a controlled environment under GMP guidelines and certified to USP class VI

SFM3-1050 to SFM3-7050 TUBING

Metric Sizes	Imperial Sizes			
Part No.	I.D. mm	Wall mm	O.D. mm	Std length Metres
SFM3-1050	0.30 (+/-0.07)	0.17 (+/-0.05)	0.63	15.24
SFM3-1350	0.50 (+/-0.07)	0.22 (+/-0.05)	0.93	15.24
SFM3-1550	0.63 (+/-0.07)	0.27 (+/-0.05)	1.19	15.24
SFM3-1750	0.76 (+/-0.10)	0.45 (+/-0.05)	1.65	15.24
SFM3-1850	0.78 (+/-0.10)	1.60 (+/-0.07)	3.96	15.24
SFM3-2050	1.01 (+/-0.10)	0.58 (+/-0.07)	2.15	15.24
SFM3-2350	1.47 (+/-0.12)	0.22 (+/-0.07)	1.95	15.24
SFM3-2650	1.57 (+/-0.12)	0.43 (+/-0.07)	2.41	15.24
SFM3-2850	1.57 (+/-0.12)	0.81 (+/-0.07)	3.17	15.24

