Optical modeling of VISAR and PDV probes

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NSTec, Los Alamos Operations

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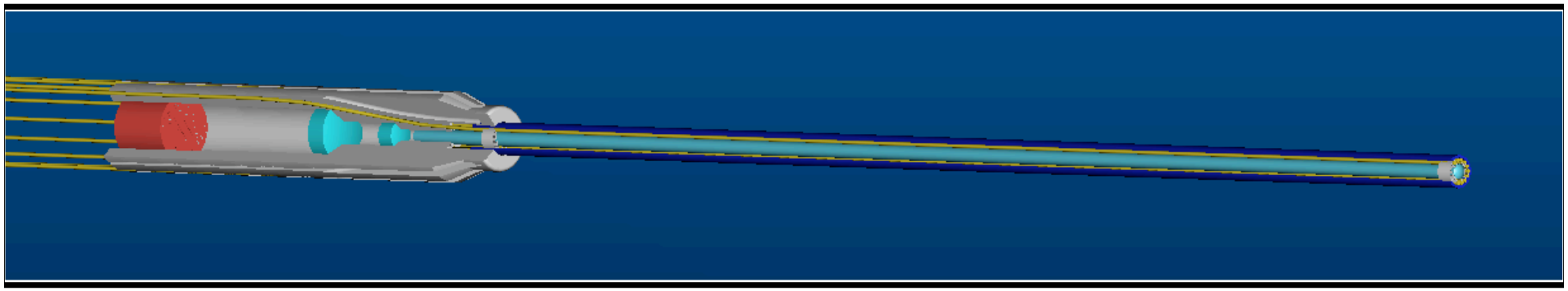
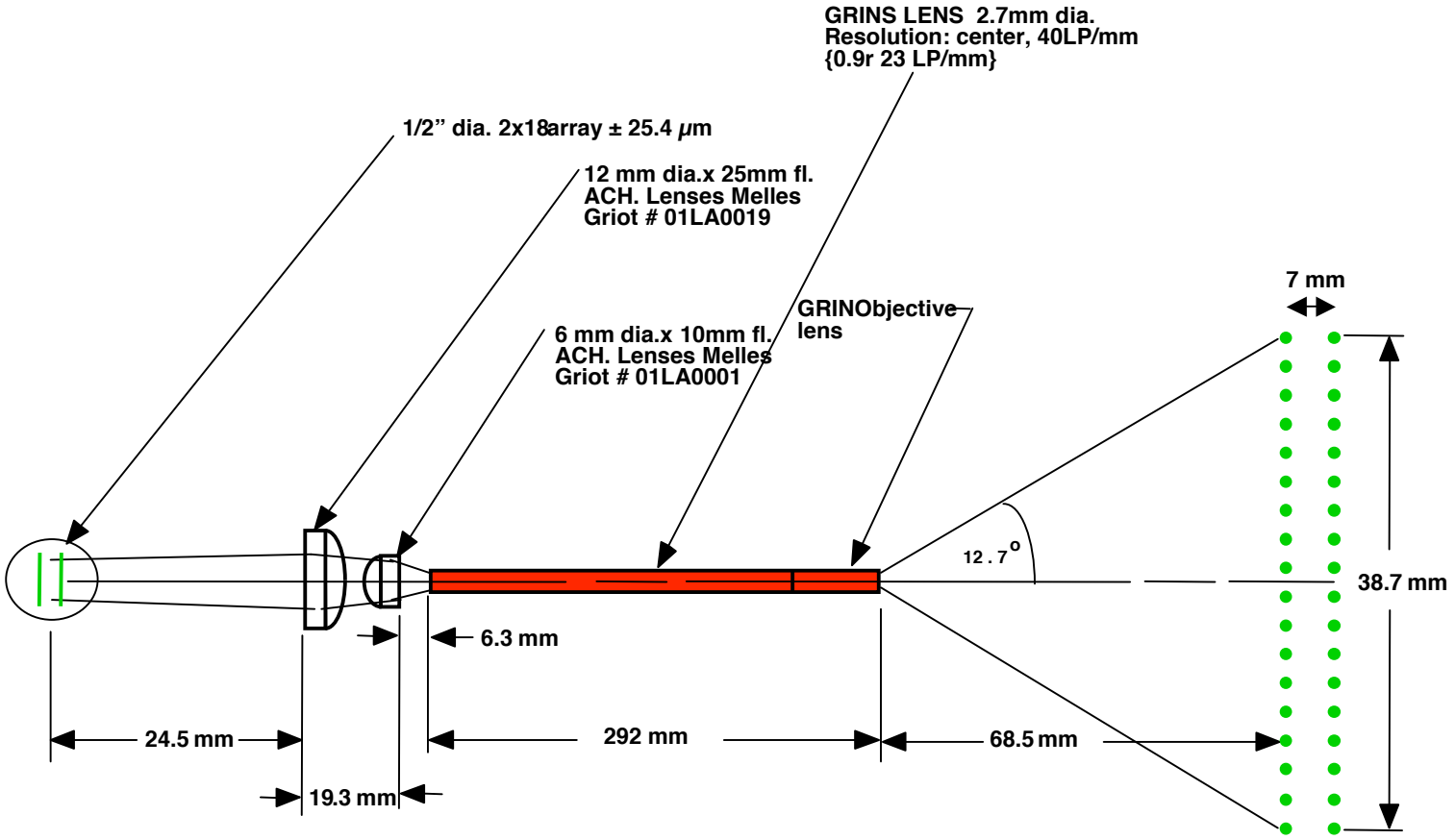
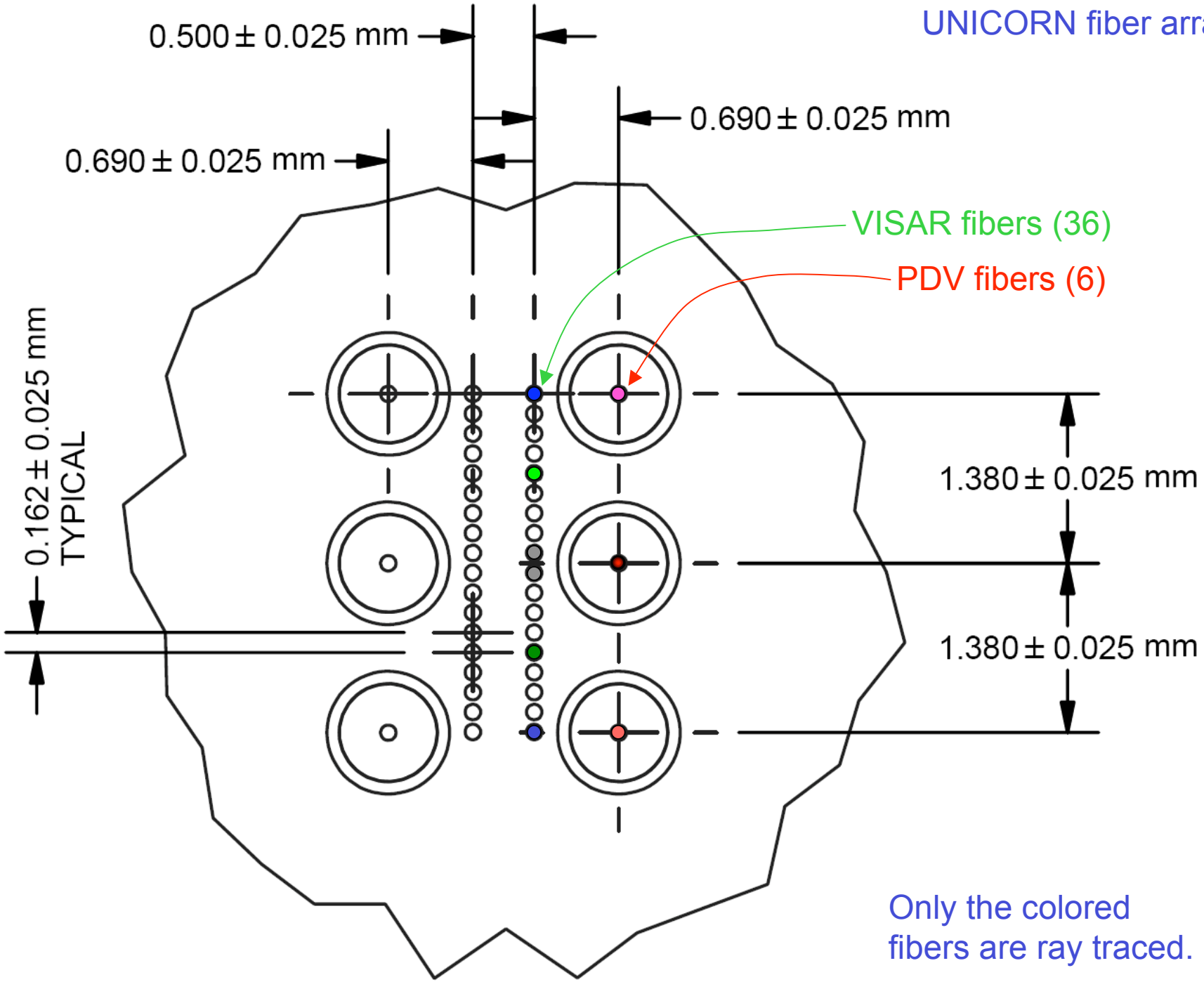


GRIN (Gradient Index) VISAR/PDV probe collection system for UNICORN



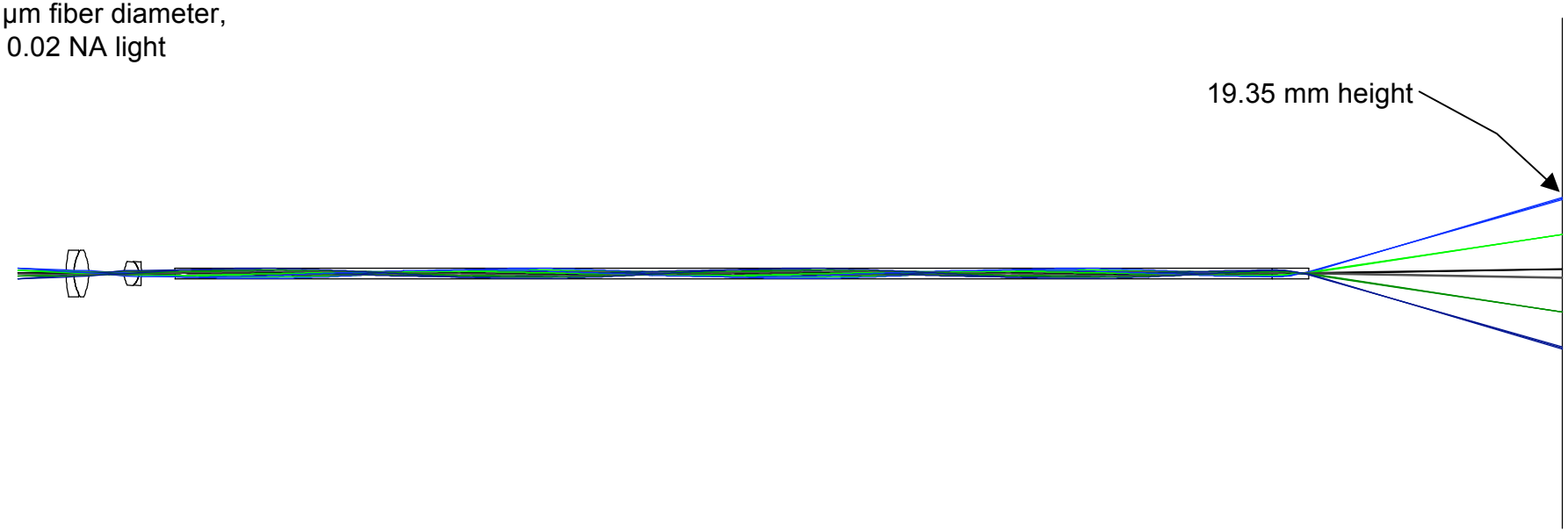
Rev:03/01/06
Mike Shinas
DX-3, LANL

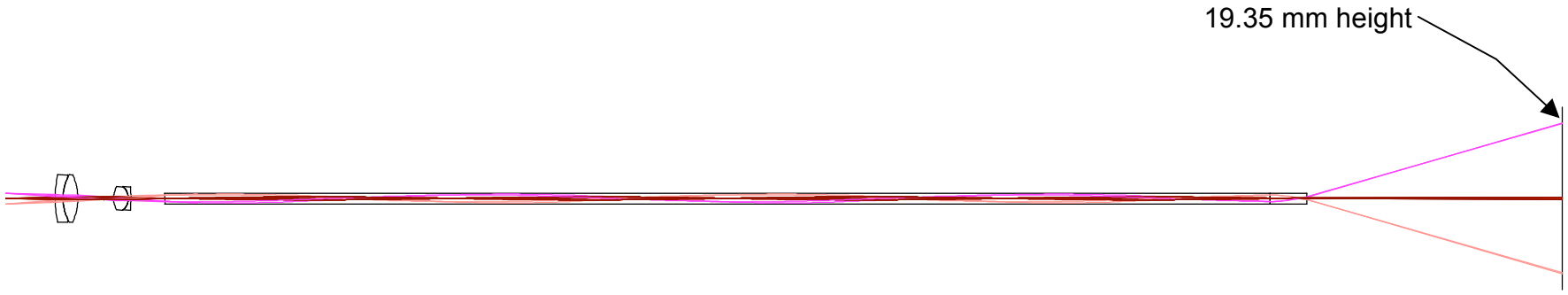

UNICORN fiber array
0.500 ± 0.025 mm
0.690 ± 0.025 mm
0.690 ± 0.025 mm
VISAR fibers (36)
PDV fibers (6)
0.162 ± 0.025 mm
TYPICAL
1.380 ± 0.025 mm
1.380 ± 0.025 mm
Only the colored
fibers are ray traced.

Option 1

current UNICORN VISAR/PDV probes

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light





PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

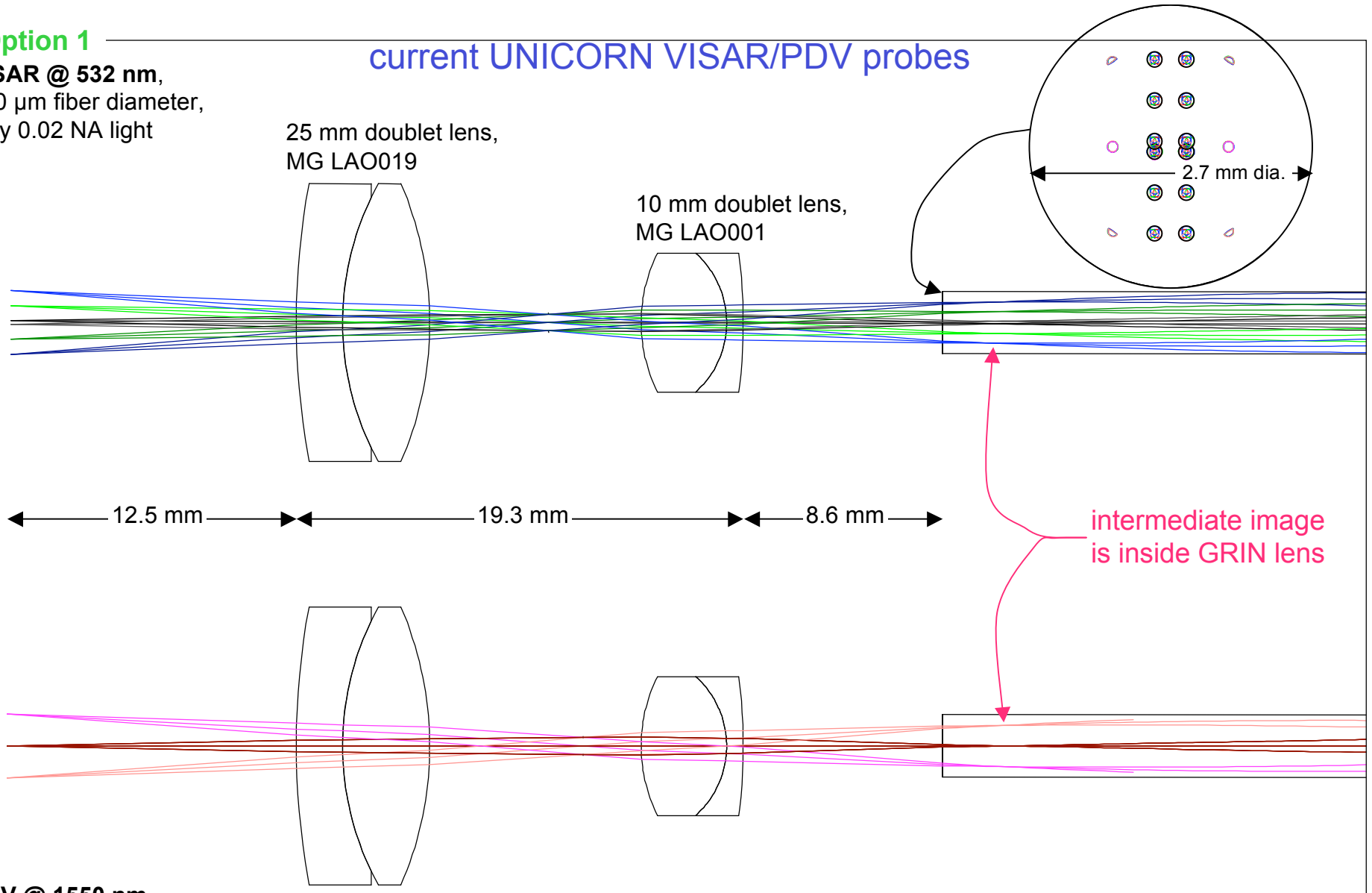
42.00 MM

UNICORN_V7.len Positions: 1-2 RMM 26-Mar-06

Option 1

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light

current UNICORN VISAR/PDV probes



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UNICORN_V7.len

Positions: 1-2 RMM 26-Mar-06

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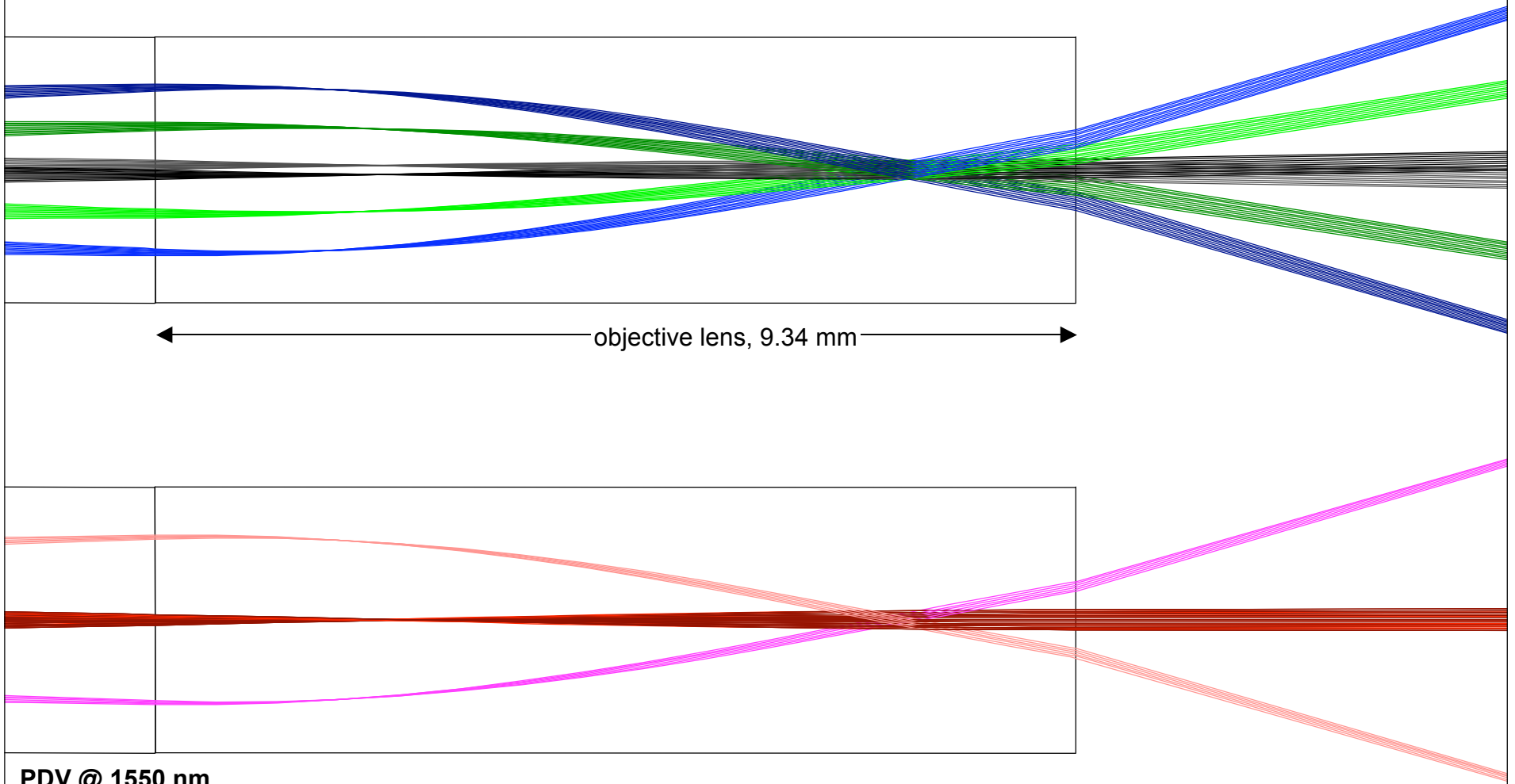

PDV @ 1550 nm,
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1.50 MM

UNICORN_V7.len

Positions: 1-2 RMM 26-Mar-06

Option 1

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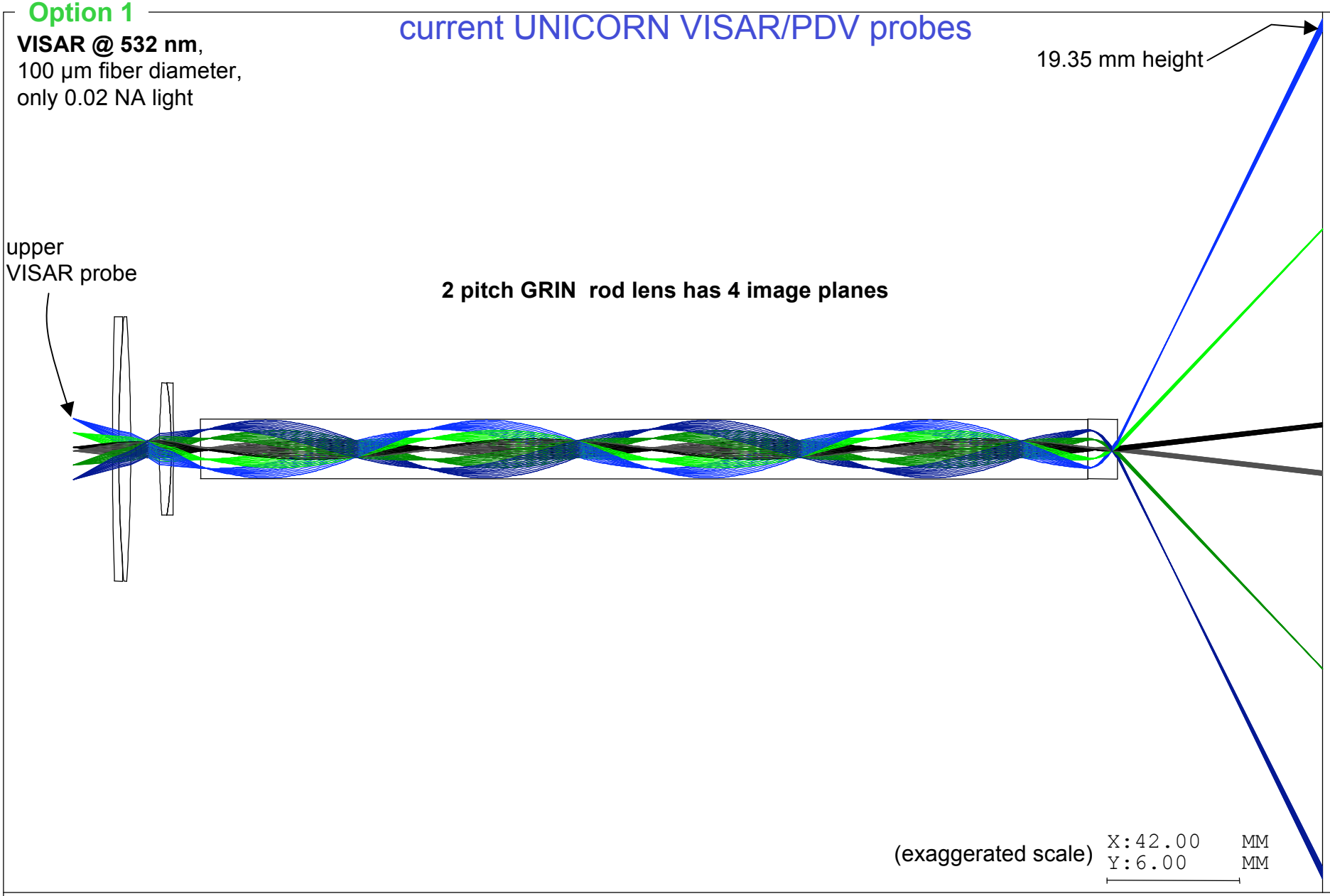
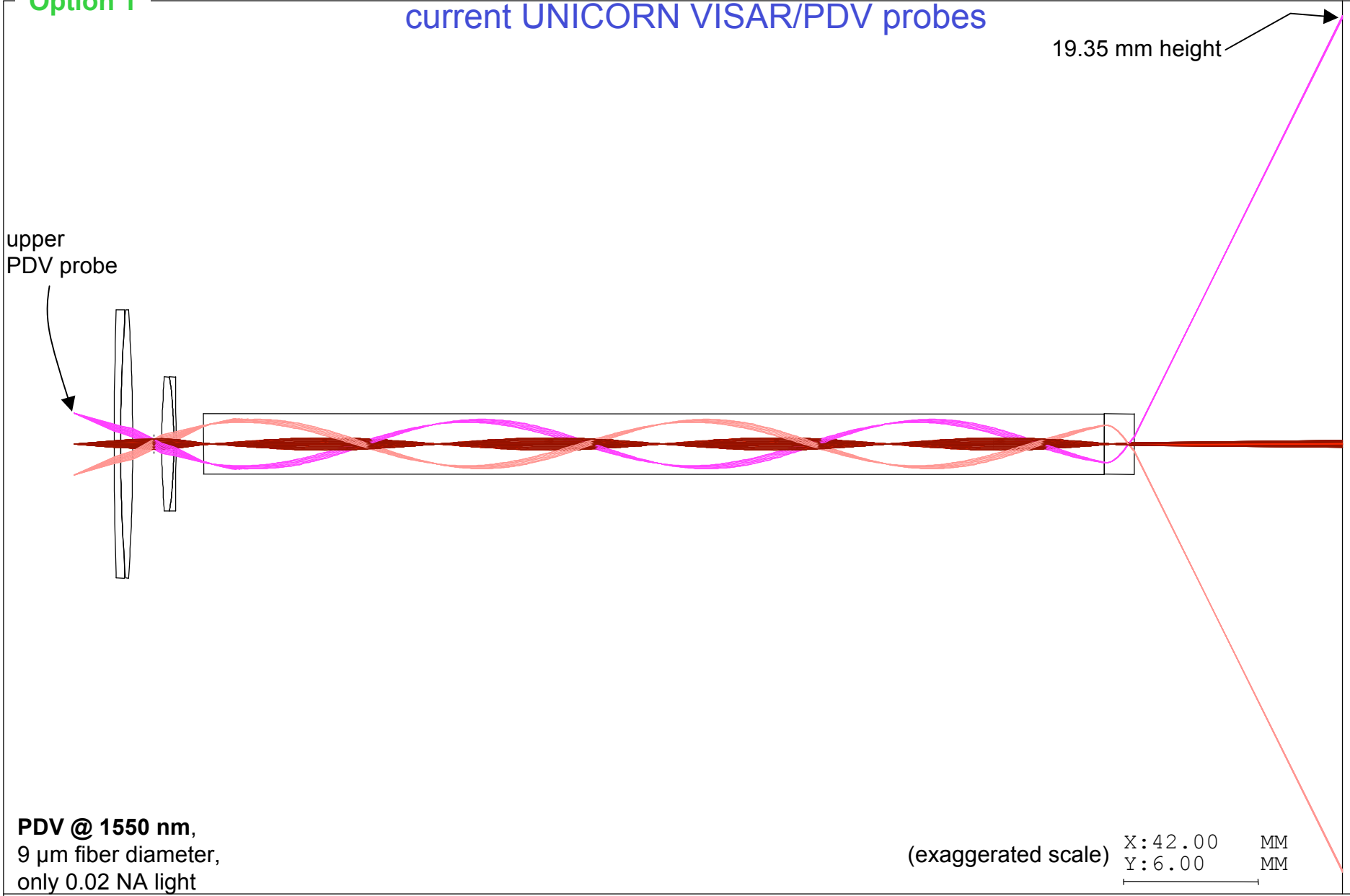


UNICORN_V7.len Position: 1 RMM 26-Mar-06

Option 1

current UNICORN VISAR/PDV probes



PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

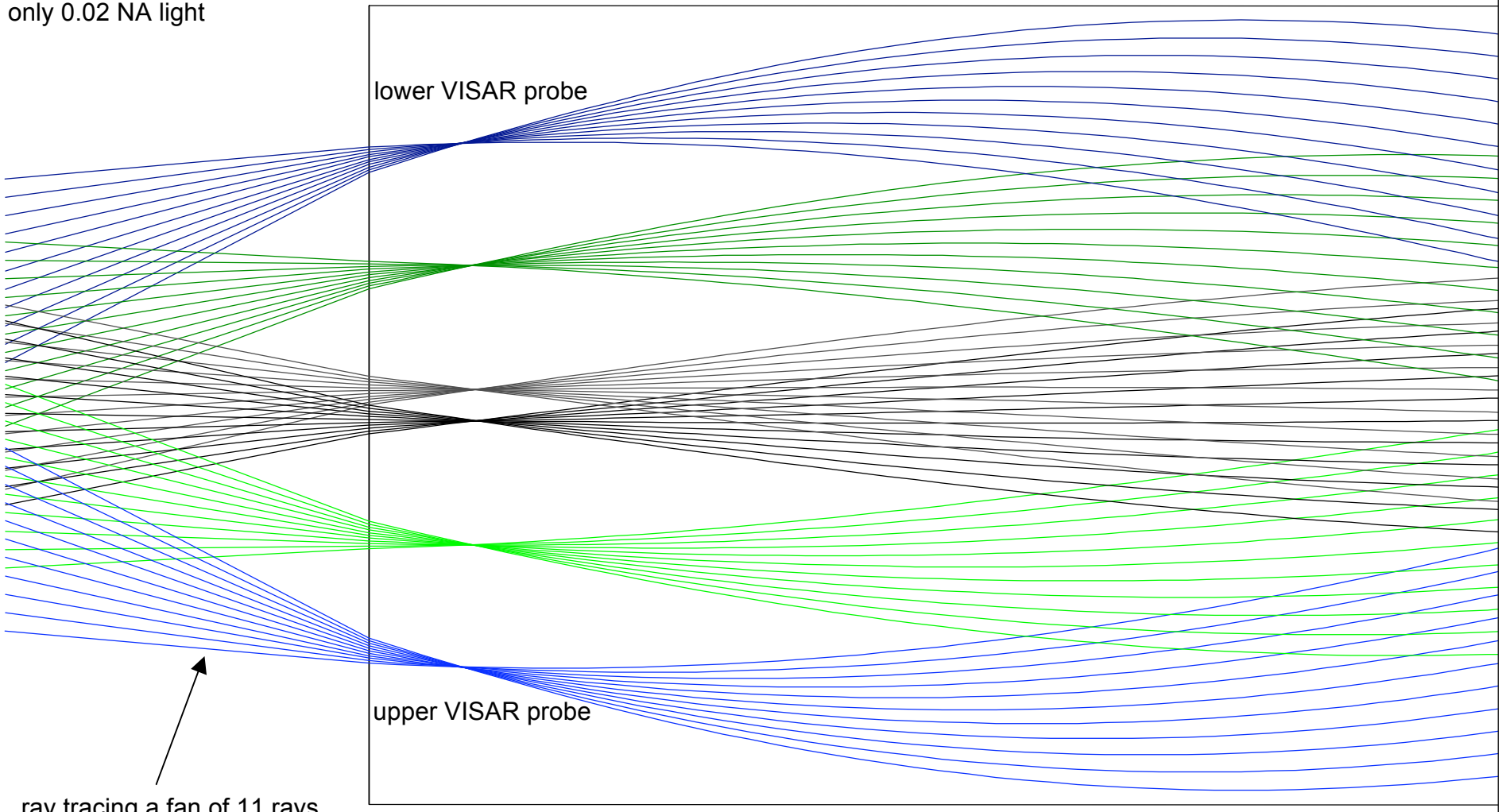
(exaggerated scale) X:42.00 MM
Y:6.00 MM

UNICORN_V7.len Position: 2 RMM 25-Mar-06

Option 1

current UNICORN VISAR/PDV probes

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light

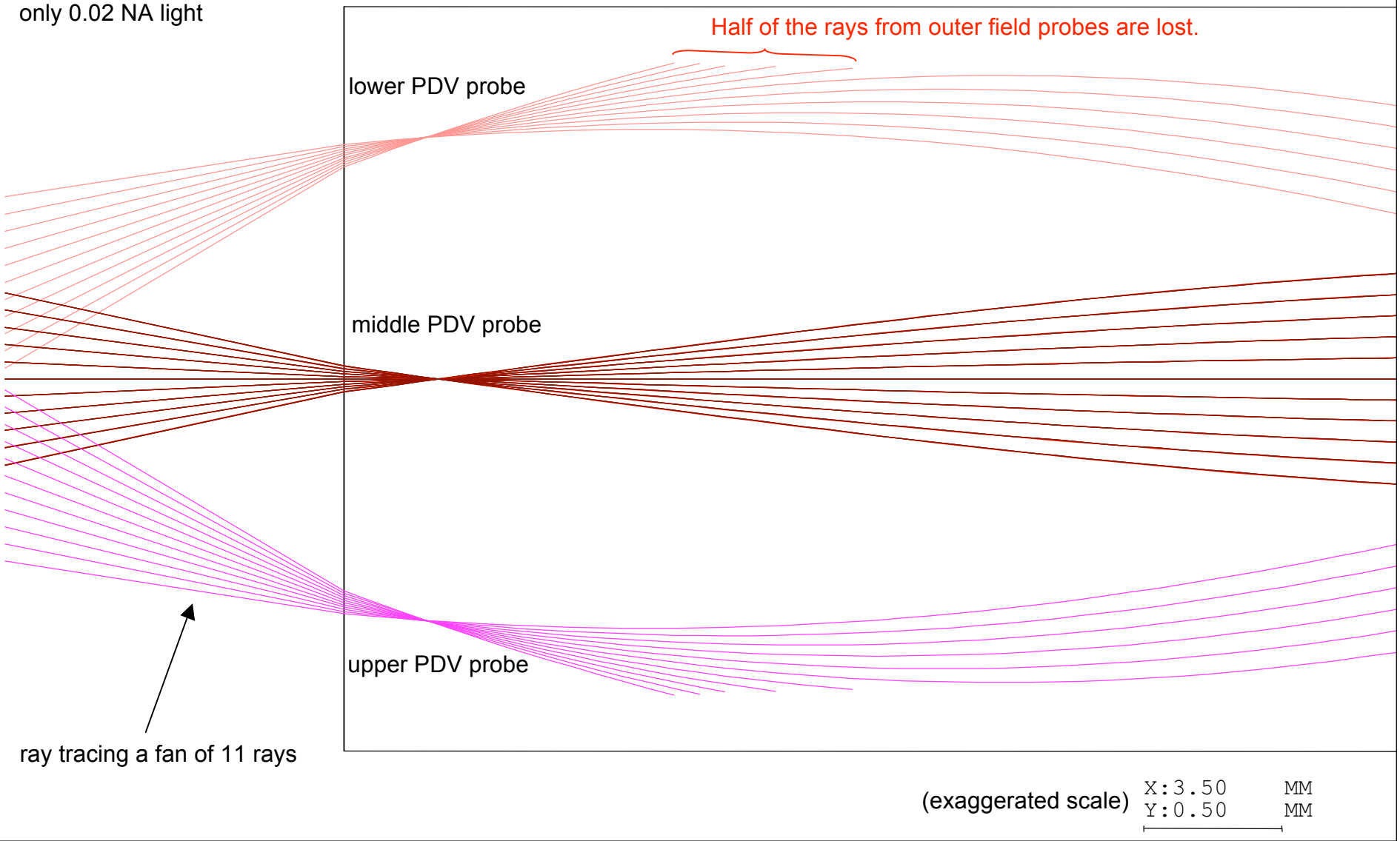


UNICORN_V7.len Position: 1 RMM 26-Mar-06

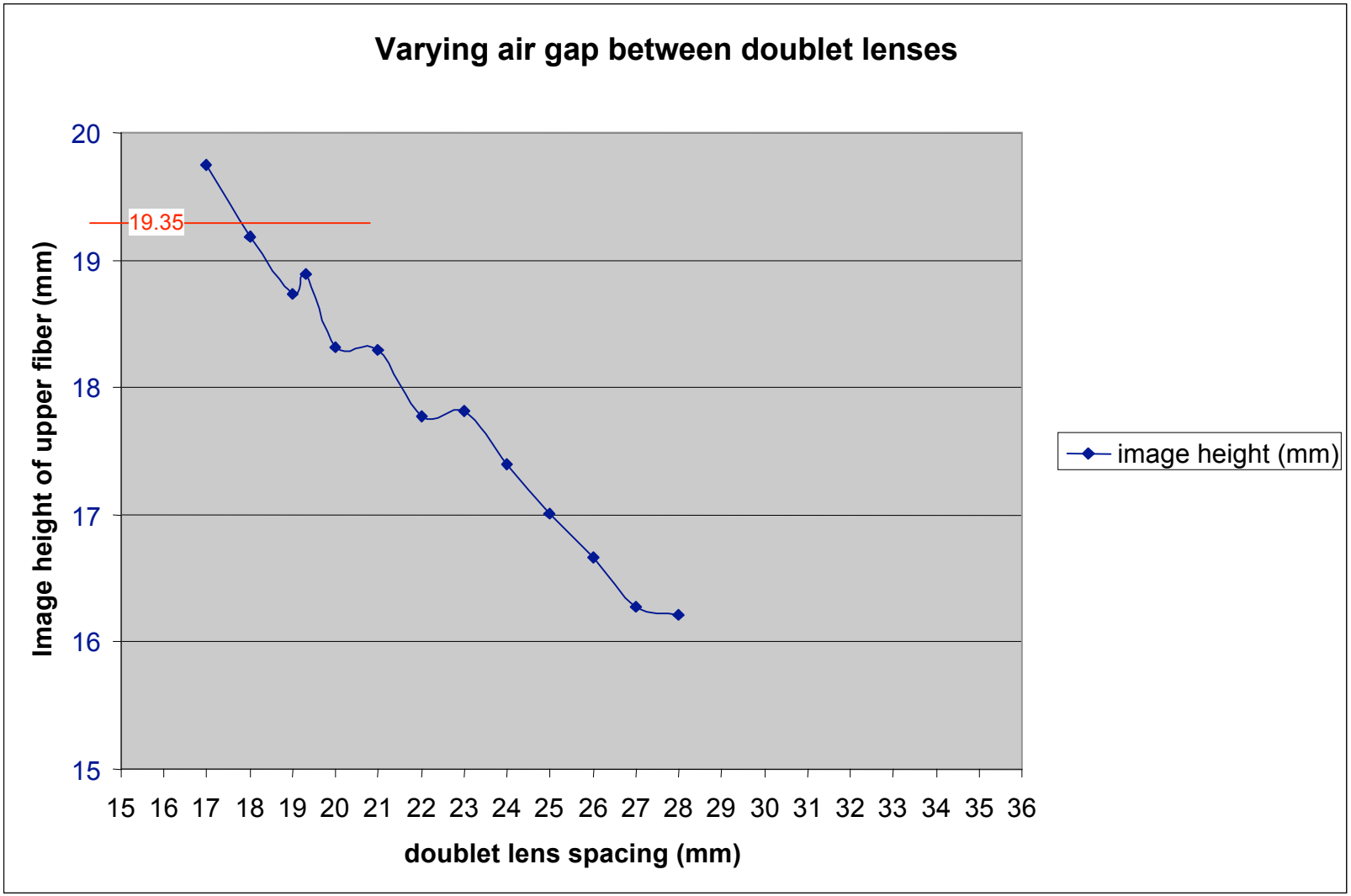
Option 1

PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

current UNICORN VISAR/PDV probes



UNICORN_V7.len Position: 2 RMM 25-Mar-06

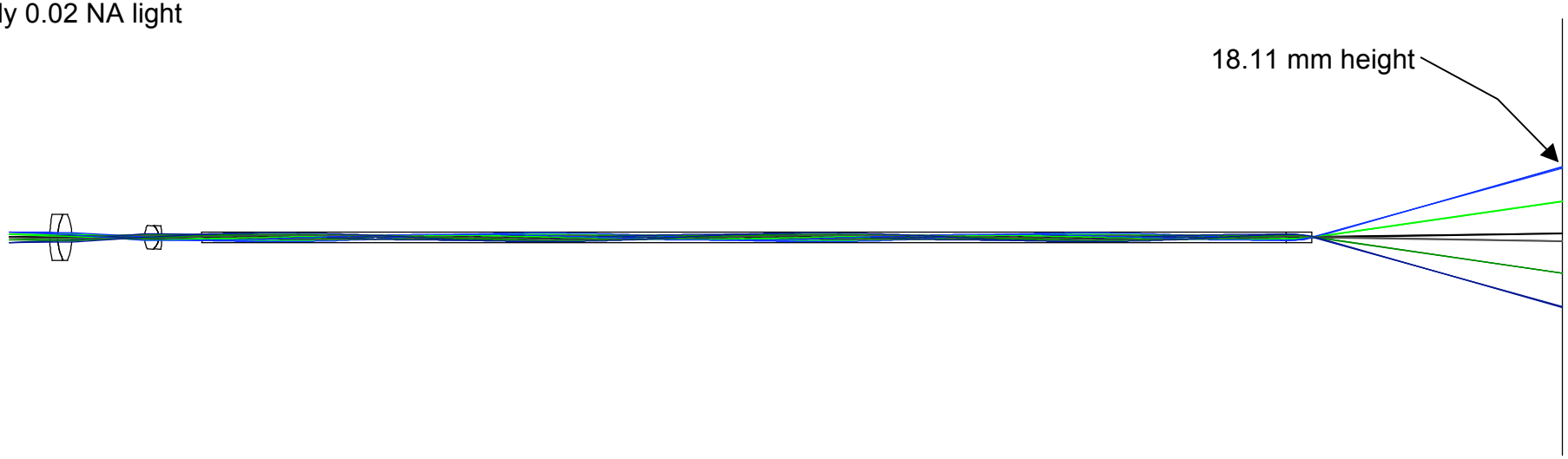


Changing the air gap between the doublet lenses changes the magnification at the target, which is not good. 19.35 mm is the desired image height.

Option 2

new proposed UNICORN VISAR/PDV probe

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light



PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

42.00 MM

UNICORN_V8.len Positions: 1-2 RMM 27-Mar-06

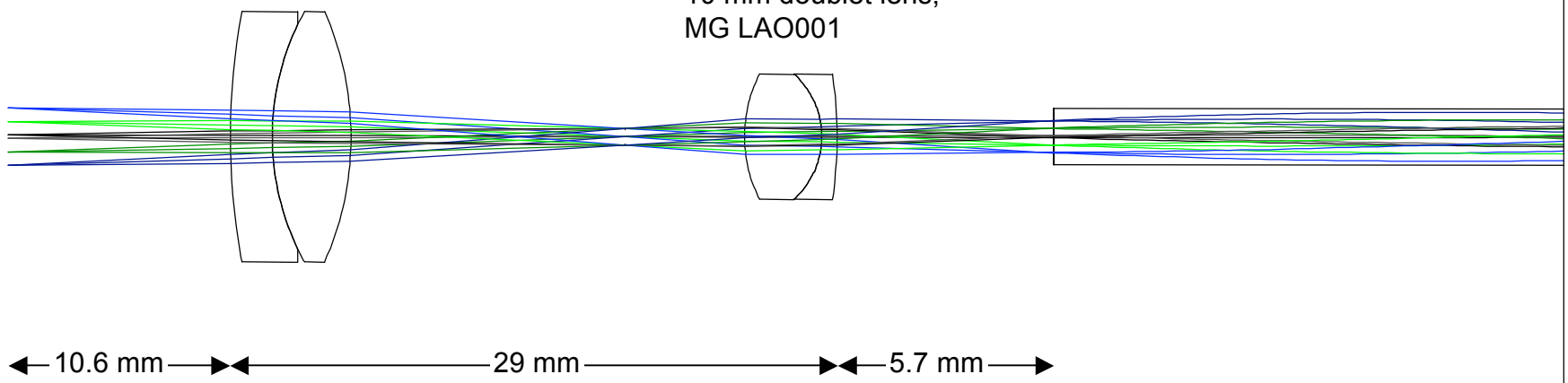
new proposed UNICORN VISAR/PDV probe

Option 2

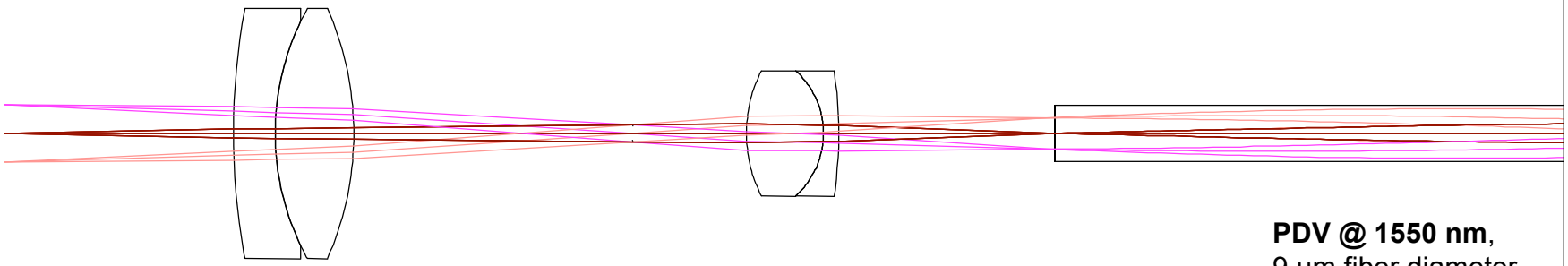
VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light

25 mm doublet lens,
MG LAO019

10 mm doublet lens,
MG LAO001



10.6 mm — 29 mm — 5.7 mm



PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

8.00 MM

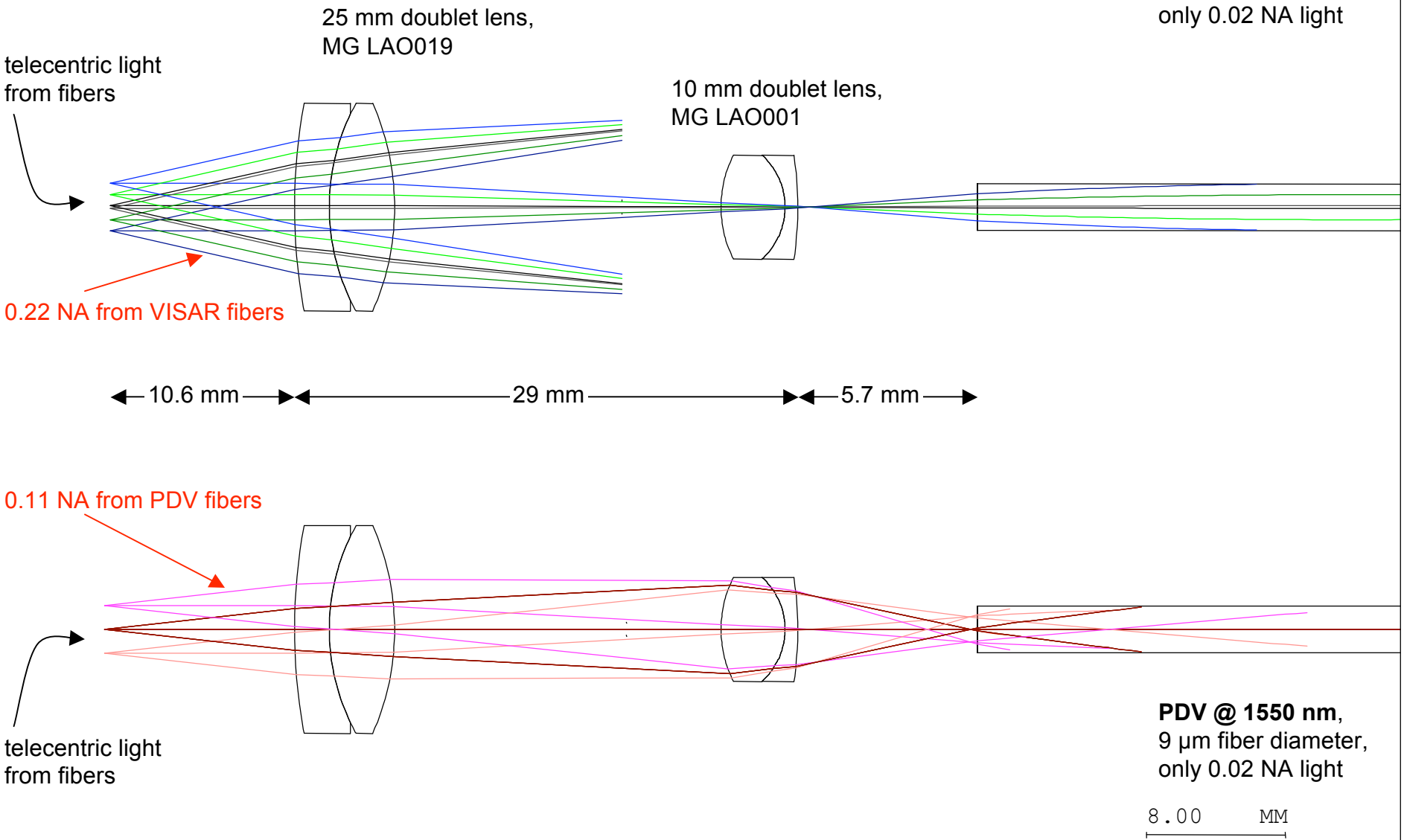
UNICORN_V8.len

Positions: 1-2 RMM 27-Mar-06

new proposed UNICORN VISAR/PDV probe

Option 2

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light



PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

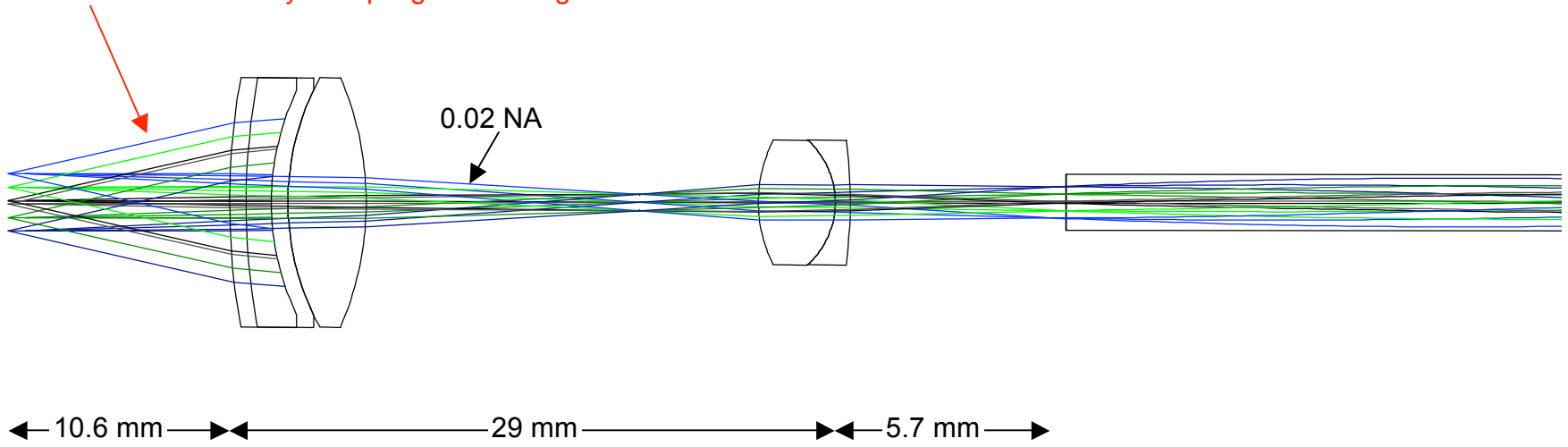
UNICORN_V8.len Positions: 1-2 RMM 27-Mar-06

new proposed UNICORN VISAR/PDV probe

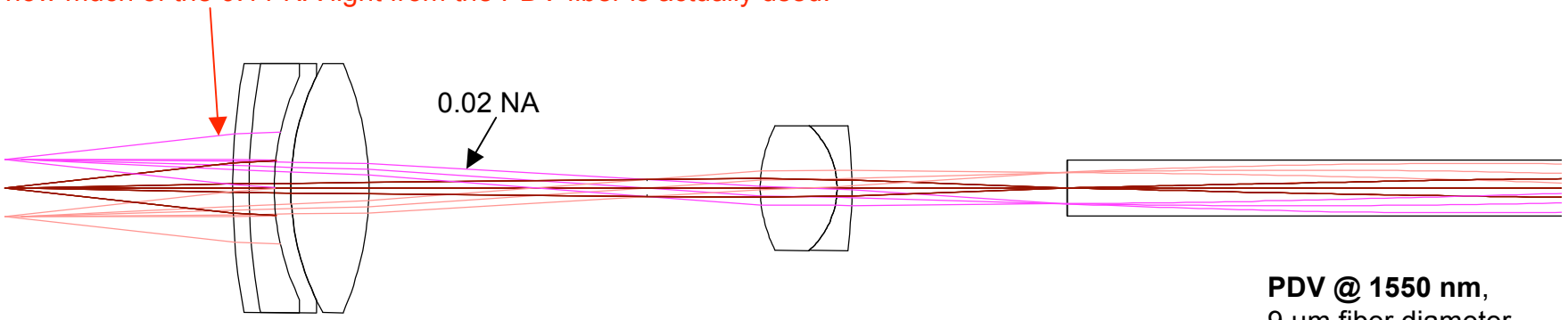
Option 2

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light

Shows that VISAR fibers easily accept light from target.



Shows how much of the 0.11 NA light from the PDV fiber is actually used.



PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

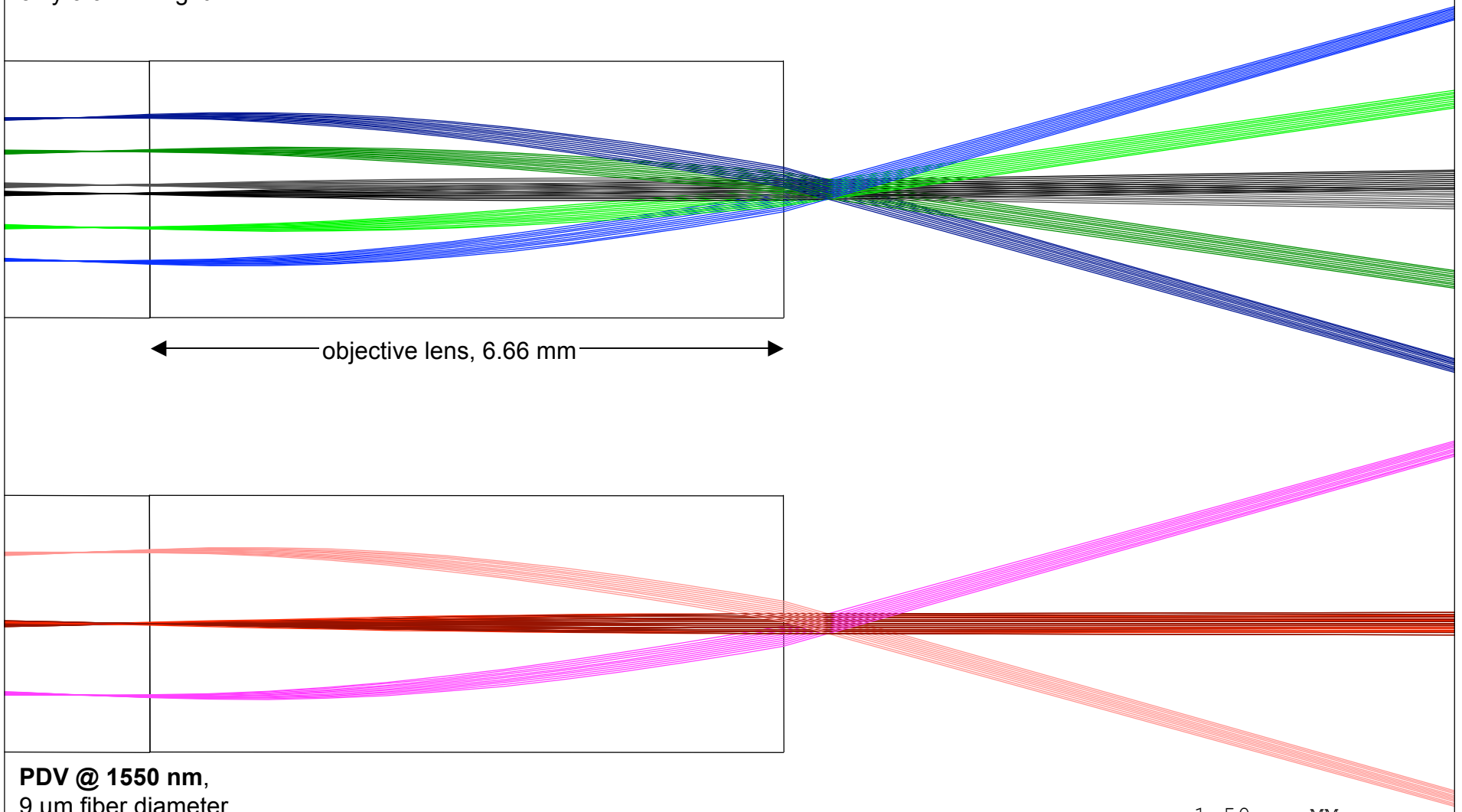
8.00 MM

UNICORN_V8.len Positions: 1-2 RMM 27-Mar-06

Option 2

new proposed UNICORN VISAR/PDV probe

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light



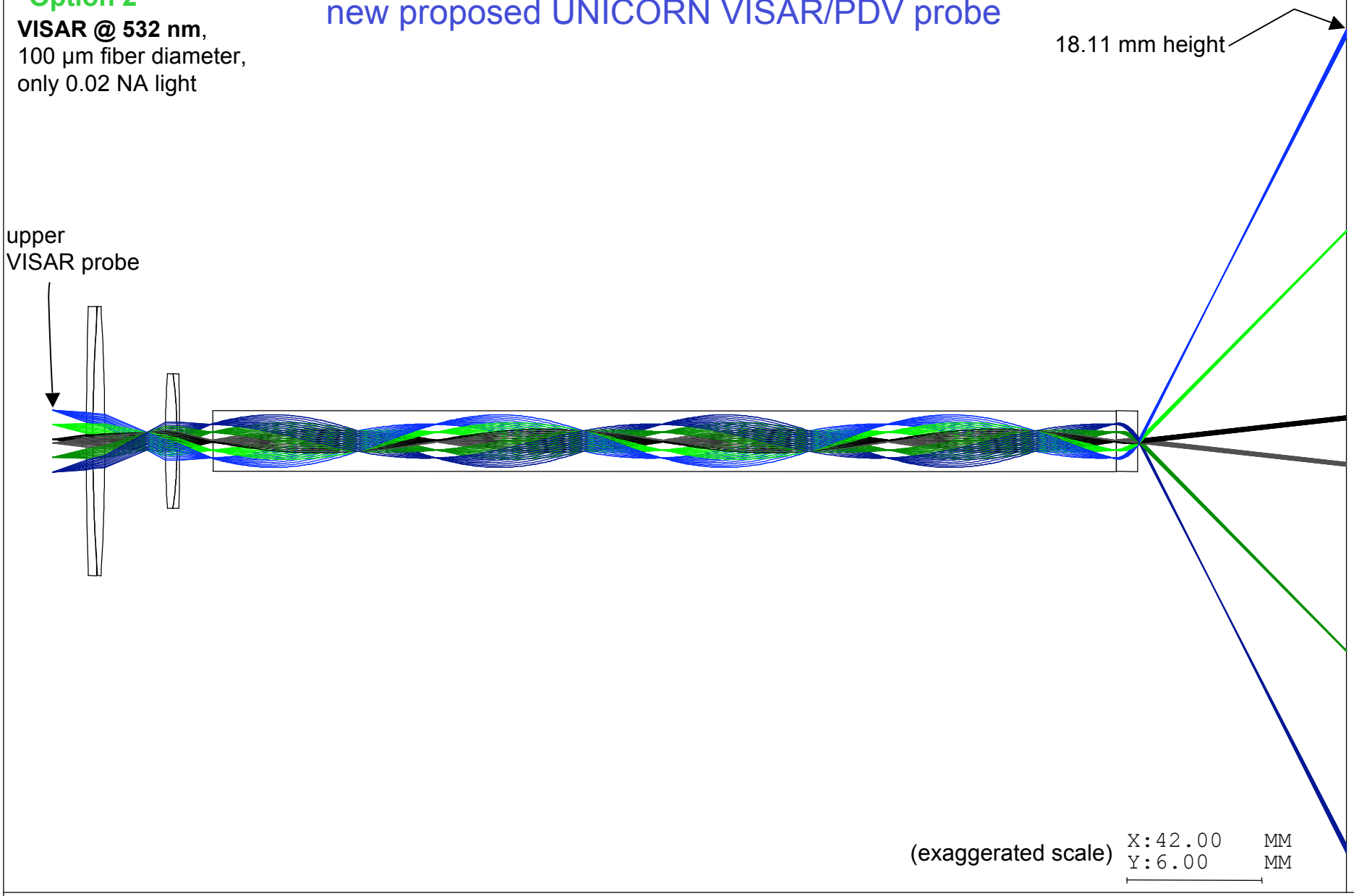
PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

UNICORN_V8.len Positions: 1-2 RMM 27-Mar-06

Option 2

new proposed UNICORN VISAR/PDV probe

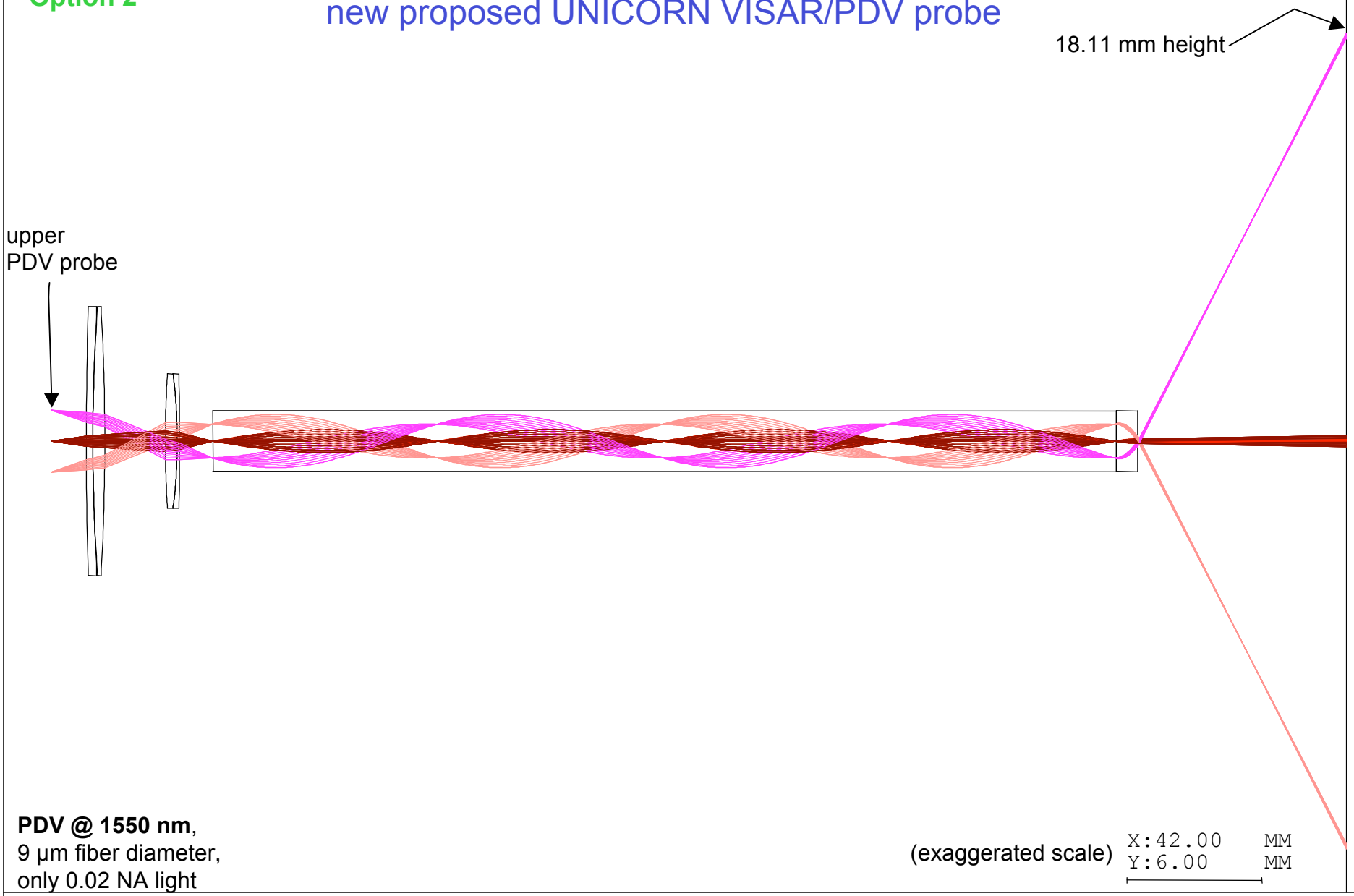
VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light



UNICORN_V8.len Position: 1 RMM 27-Mar-06

Option 2

new proposed UNICORN VISAR/PDV probe

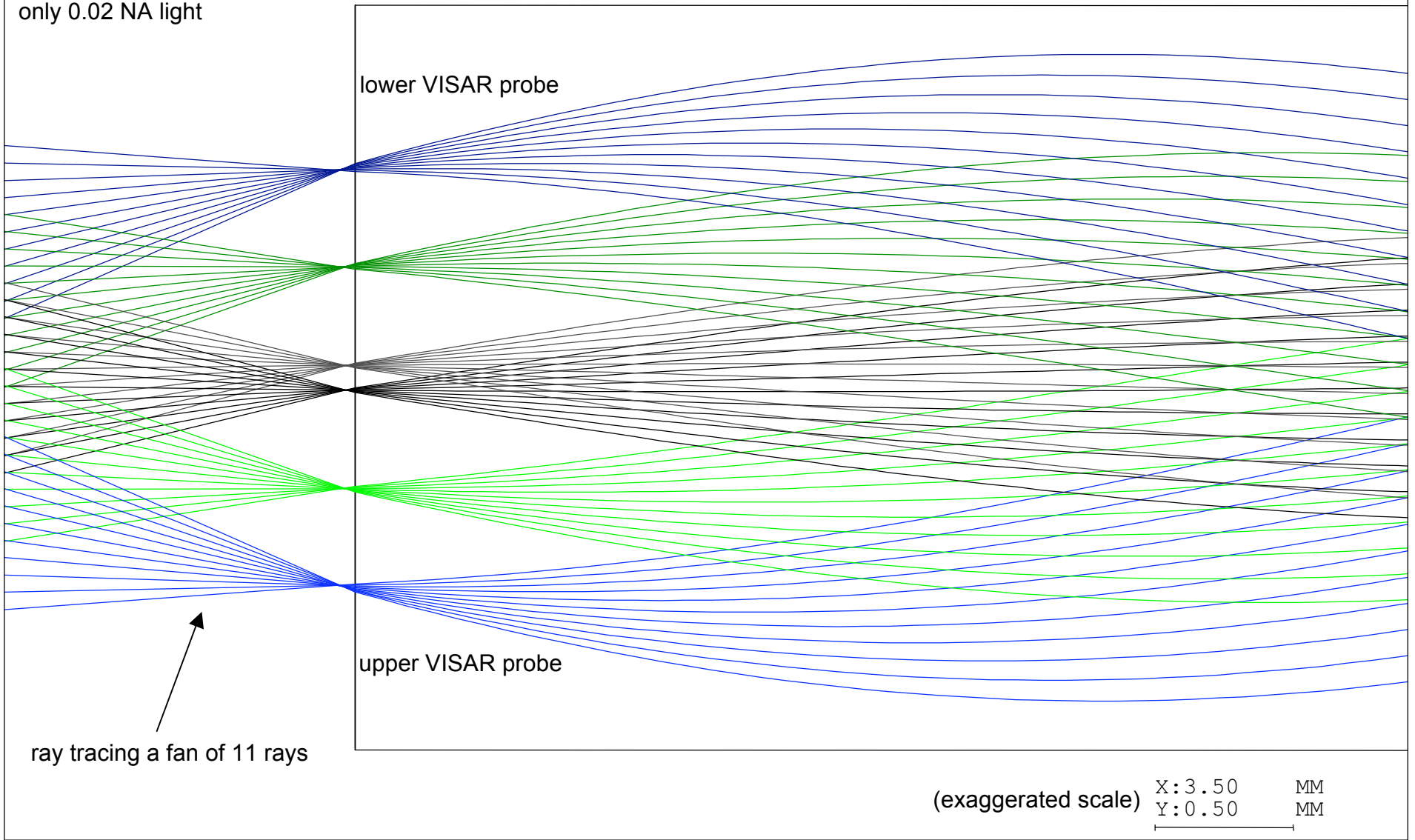


UNICORN_V8.len Position: 2 RMM 27-Mar-06

Option 2

VISAR @ 532 nm,
100 µm fiber diameter,
only 0.02 NA light

new proposed UNICORN VISAR/PDV probe

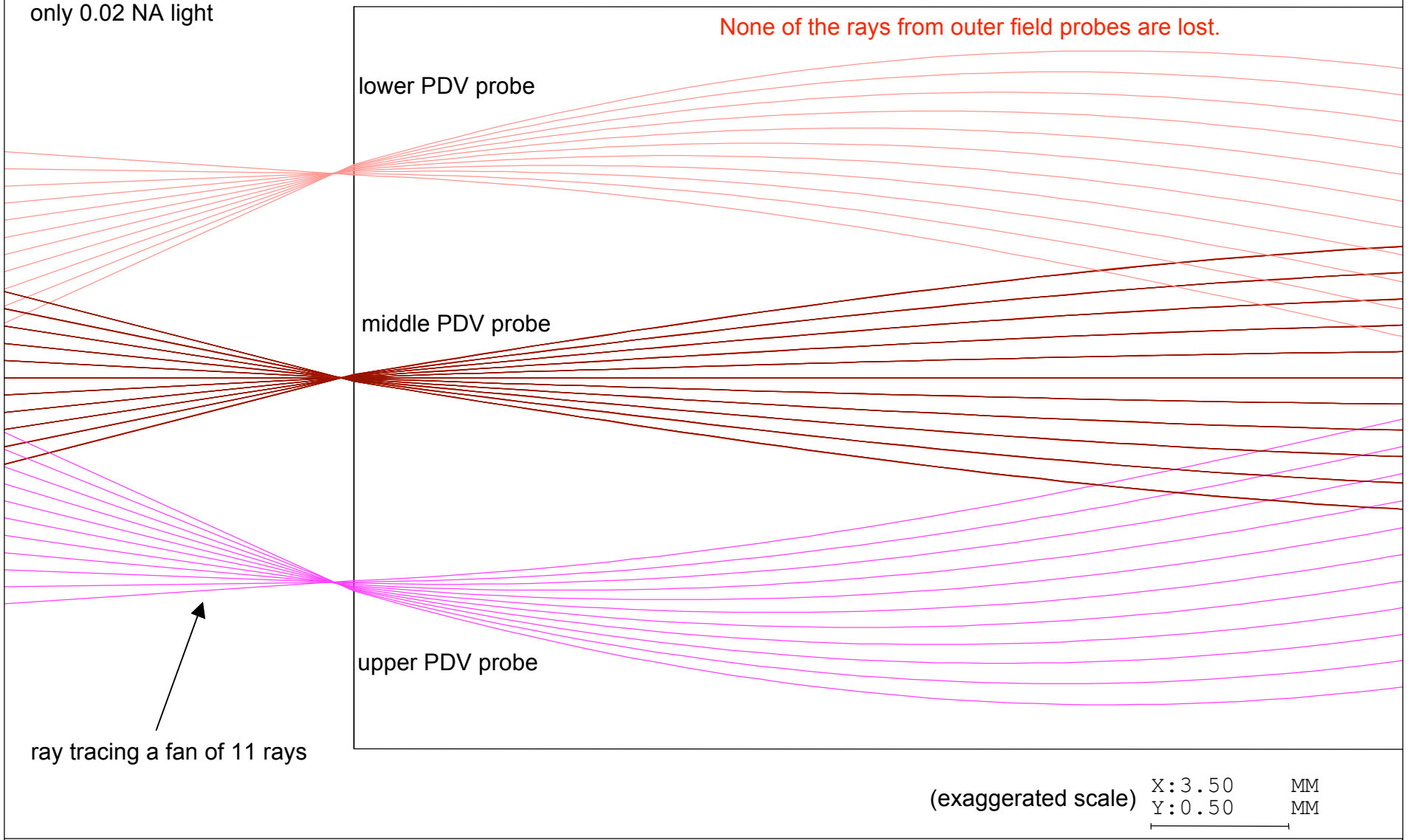


UNICORN_V8.len Position: 1 RMM 27-Mar-06

Option 2

PDV @ 1550 nm,
9 µm fiber diameter,
only 0.02 NA light

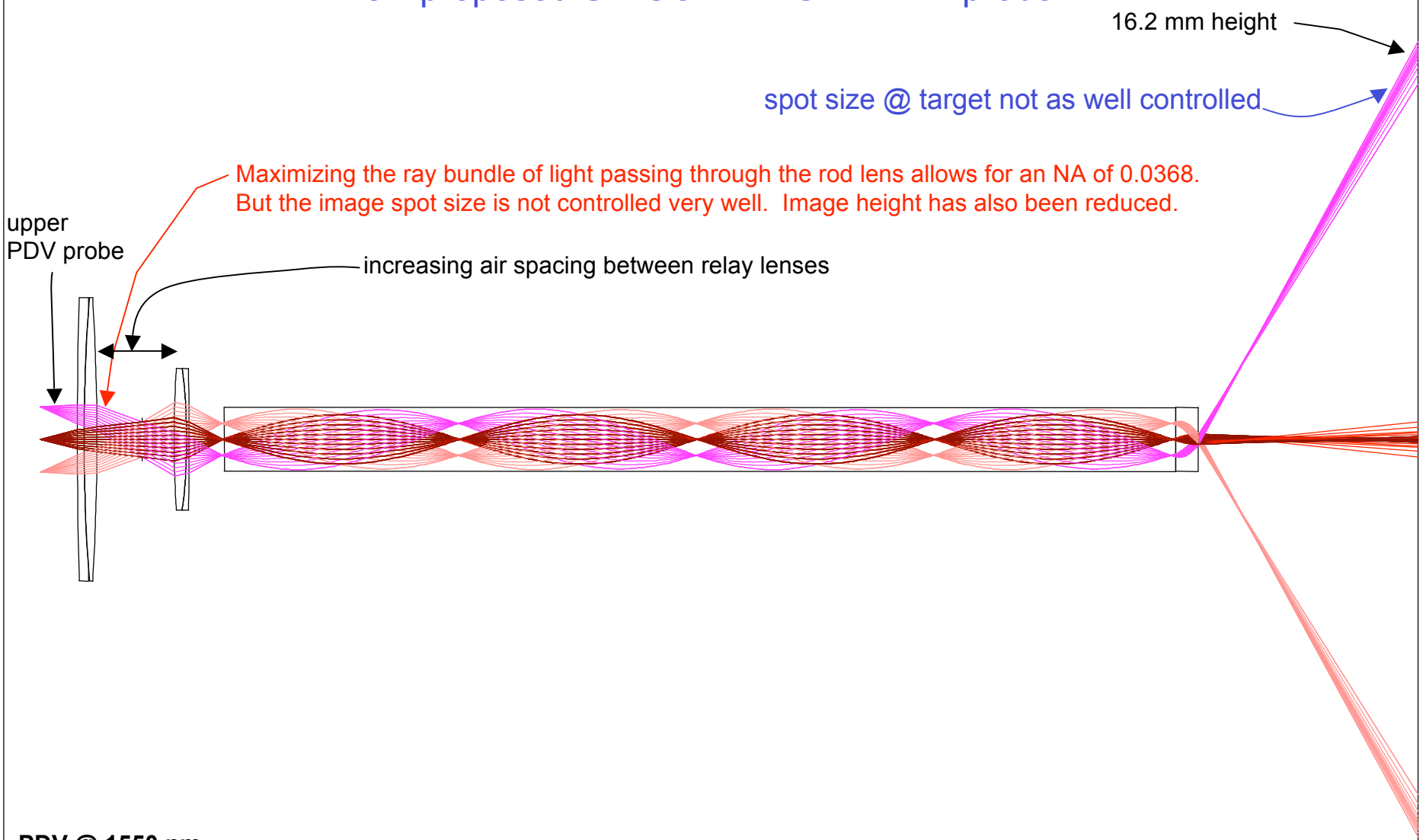
new proposed UNICORN VISAR/PDV probe



UNICORN_V8.len Position: 2 RMM 27-Mar-06

Option 2

new proposed UNICORN VISAR/PDV probe



PDV @ 1550 nm,
9 µm fiber diameter,
only 0.0368 NA light

(exaggerated scale) X:42.00 MM
Y:6.00 MM

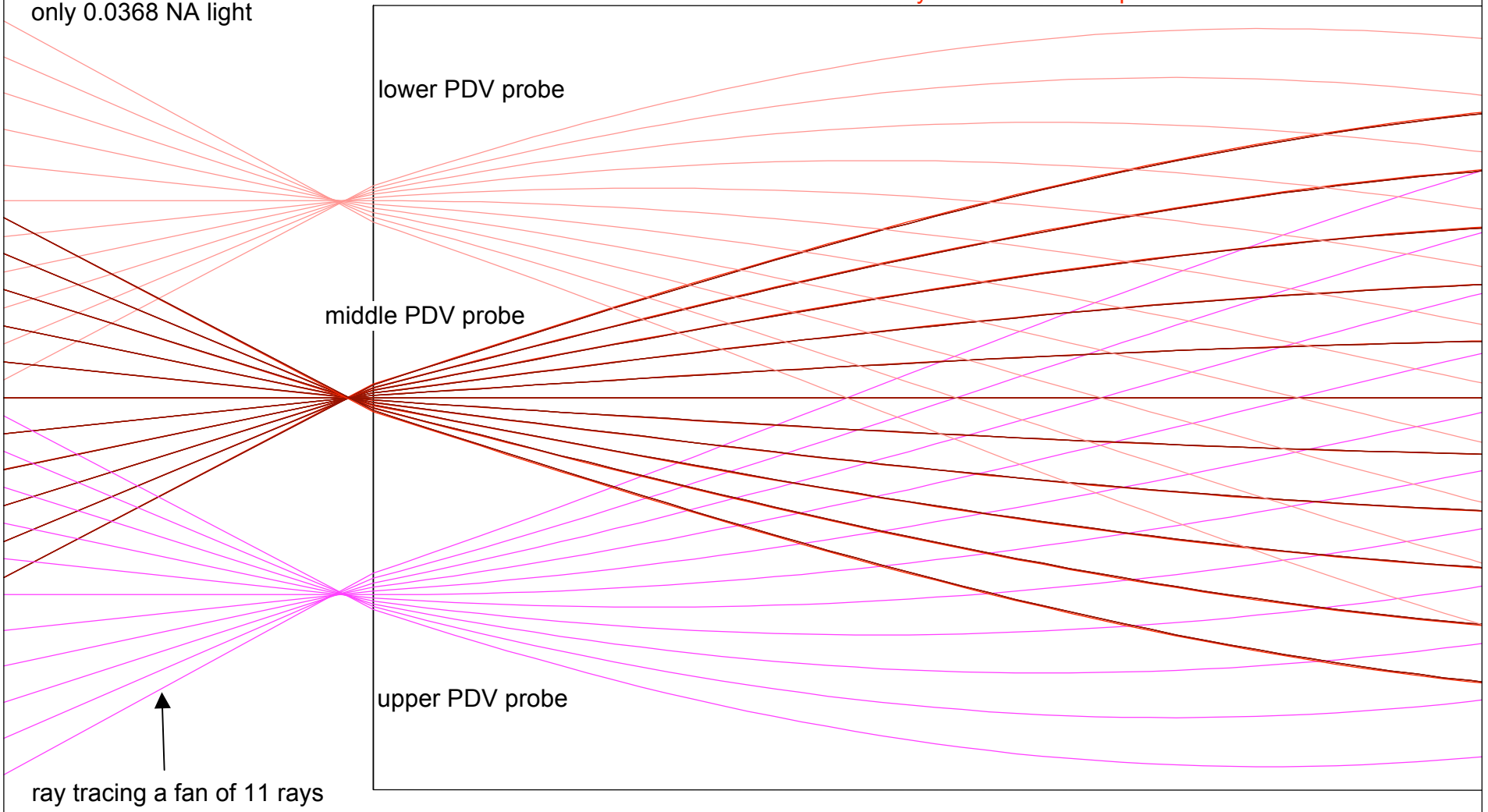
UNICORN_V8b.len Position: 2 RMM 29-Mar-06

Option 2

PDV @ 1550 nm,
9 µm fiber diameter,
only 0.0368 NA light

new proposed UNICORN VISAR/PDV probe

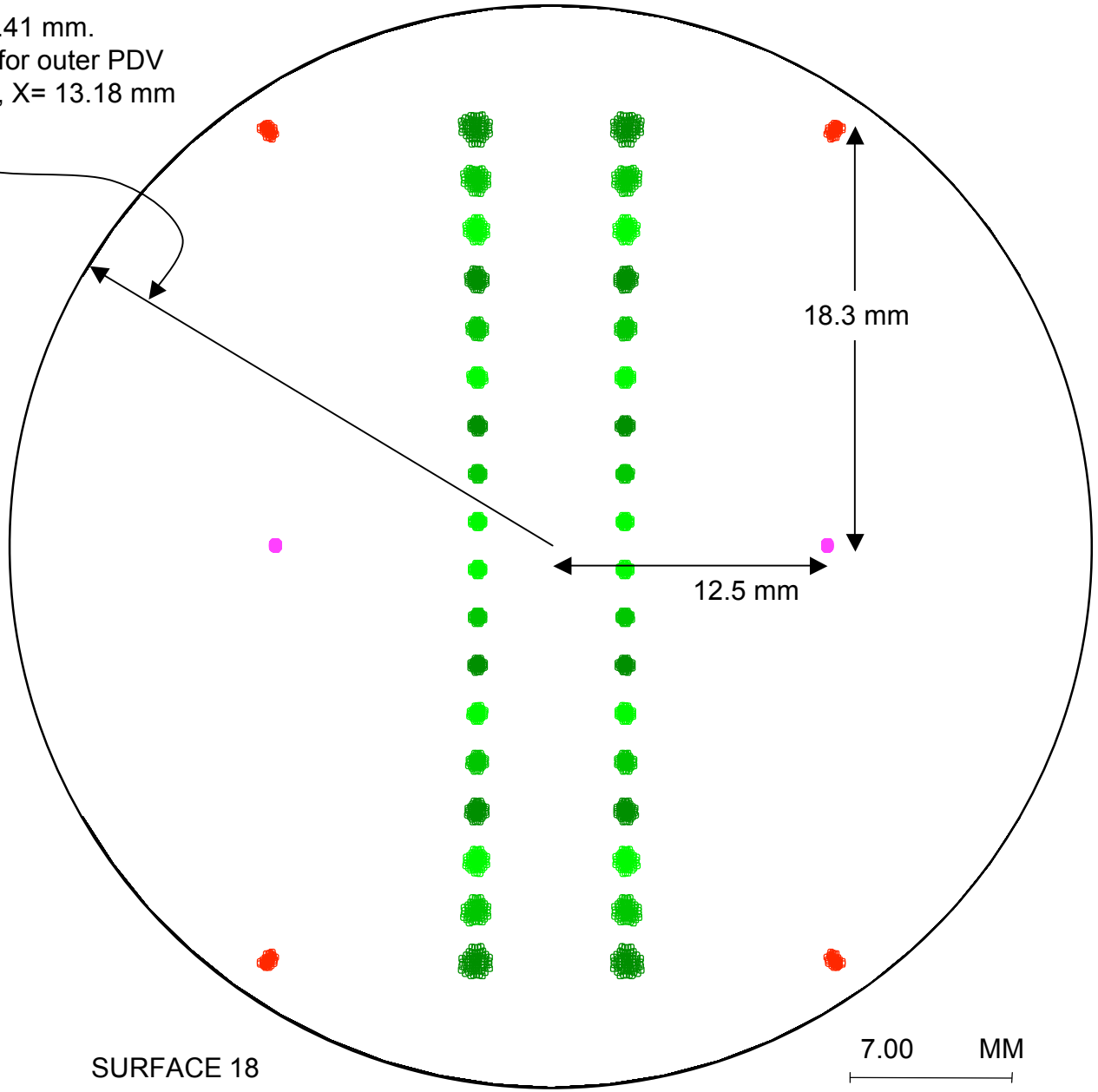
None of the rays from outer field probes are lost.



UNICORN_V8b.len Position: 2 RMM 29-Mar-06

new proposed UNICORN VISAR/PDV probe

Circle diameter is 23.41 mm.
Design specification for outer PDV spot is Y= 19.35 mm, X= 13.18 mm



SURFACE 18

UNICORN_V10a.len

7.00 MM

RMM 23-Apr-06