DEC. 1975: LAGEOS 1 OPTICAL TESTS

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MAY 11, 2016


P&H
5
7
A
B

MEASUREMENTS & VARIABLES

- **TARGET SIGNATURE**
  - **PULSE SPREADING**
  - **PULSE DISTORTION**
  - **VARIATIONS IN CG CORRECTION**
- **LIDAR CROSS-SECTION**
  - **ABSOLUTE VALUE & VARIATION IN FAR FIELD (WRT VELOCITY ABBERATION)**
  - **WAVELENGTH & POLARIZATION DEPENDENCE**
- **MEASUREMENT VARIABLES**
  - **LASER WAVELENGTH AND MODE (CW vs PULSE)**
  - **POLARIZATION**
  - **RECEIVER POSITION IN FAR FIELD**
  - **LAGEOS ORIENTATION**

PULSE SPREADING & DISTORTION

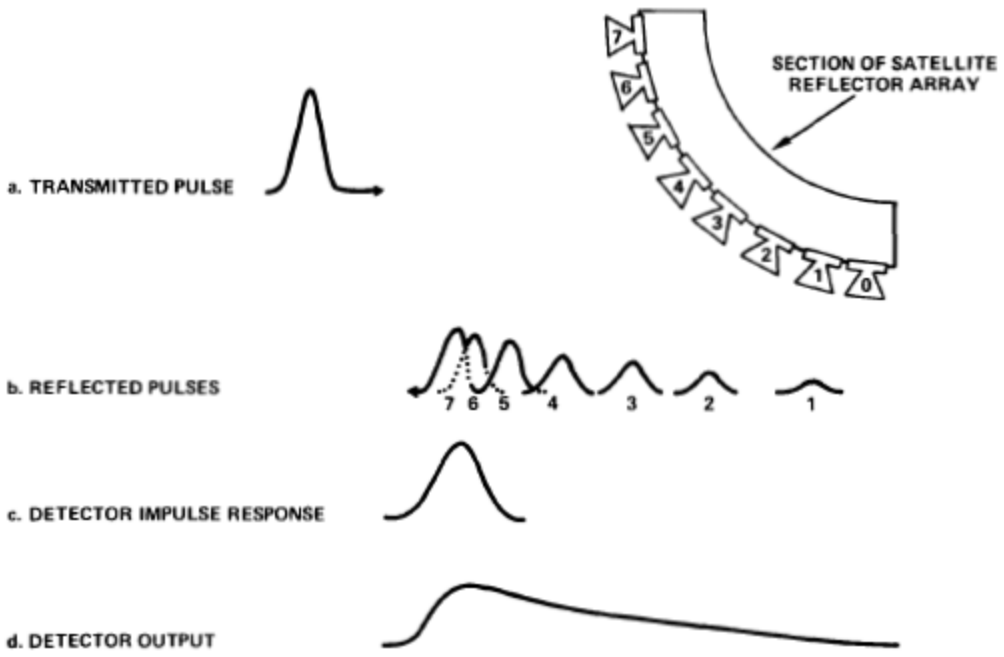
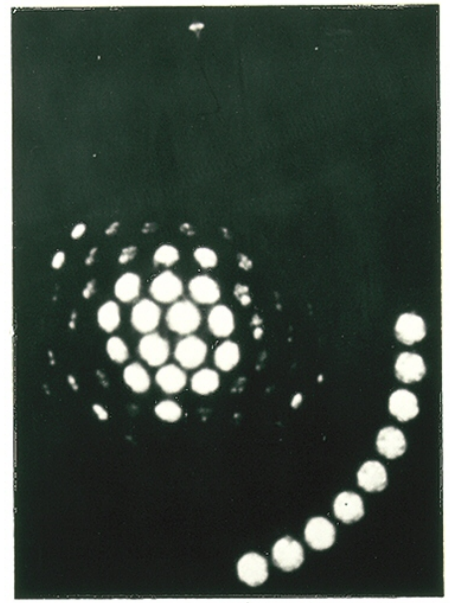


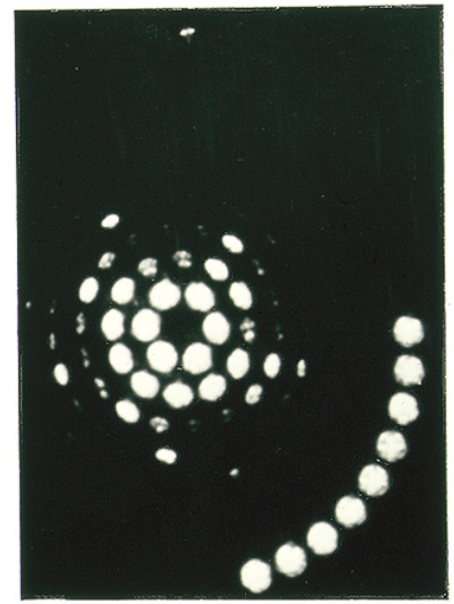
Fig. 12

LAGEOS IMAGES FOR VARIOUS ORIENTATIONS

a.



b.



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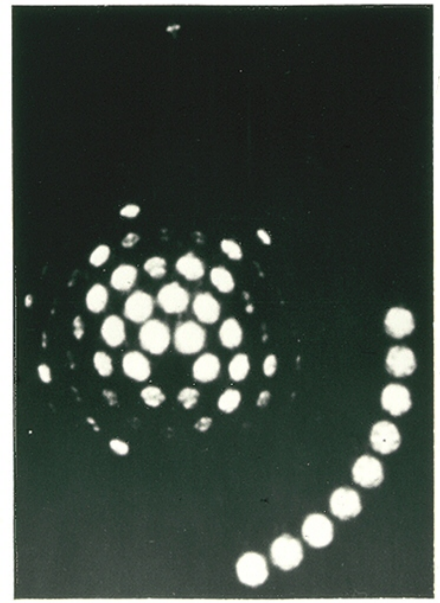
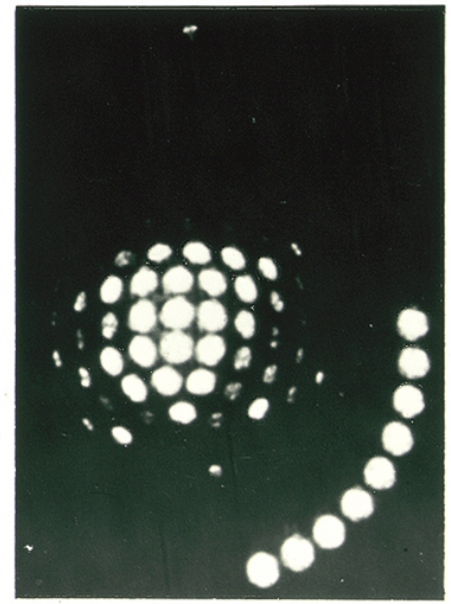
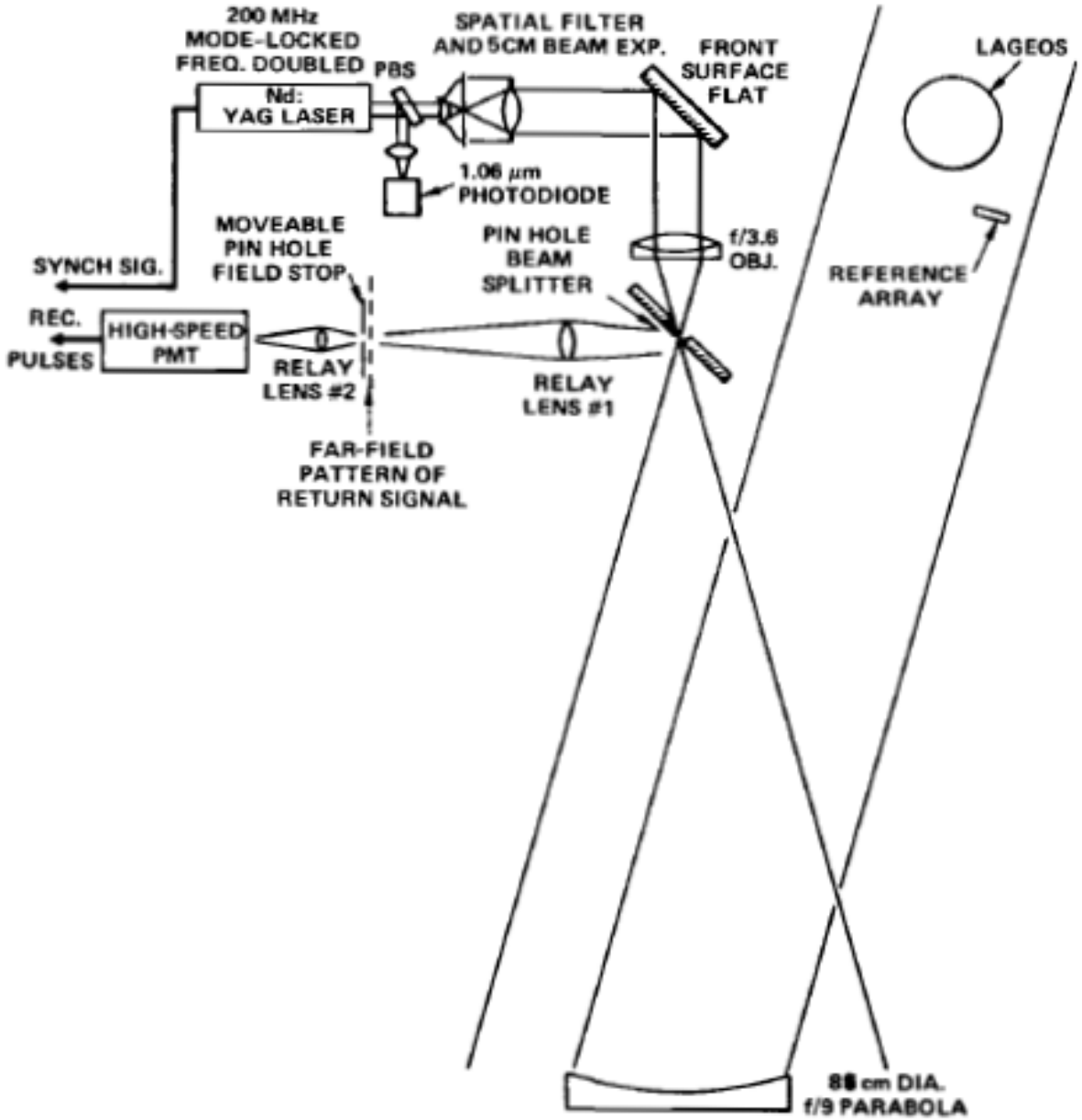
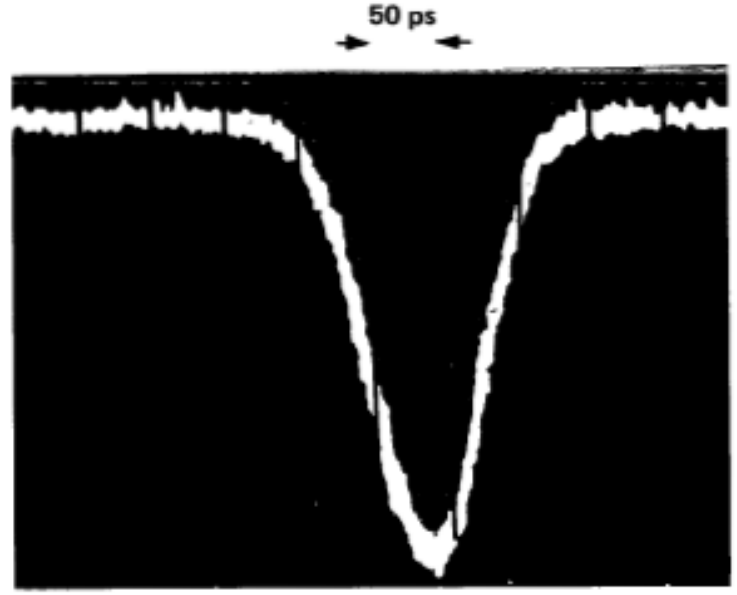


d.



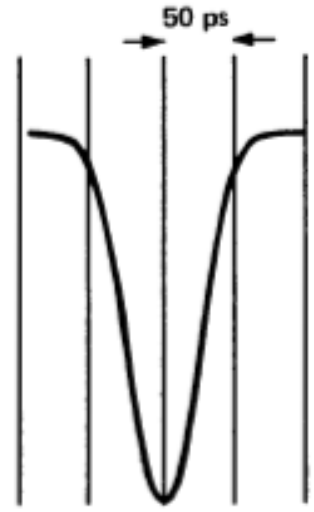
TEST SYSTEM ELECTRO-OPTICS



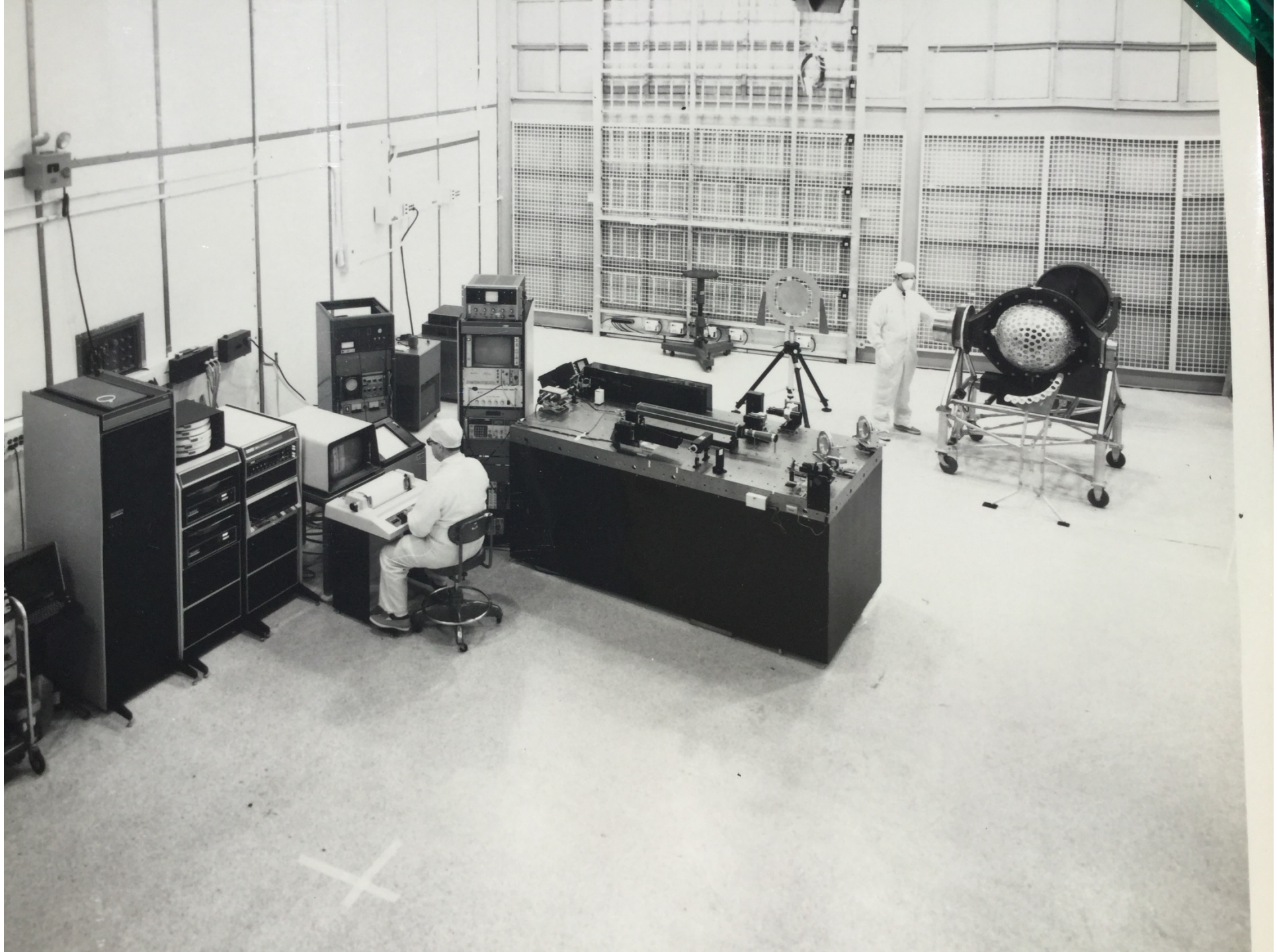


λ = 1.06 MICROMETERS
FULL WIDTH AT HALF MAXIMUM: 90 ps
PULSE MEASURED BY GaAsSb PHOTODIODE

Figure 4a. Nd:YAG laser mode-locked pulse.



λ = 0.53 MICROMETERS
FULL WIDTH AT HALF MAXIMUM: 60 ps

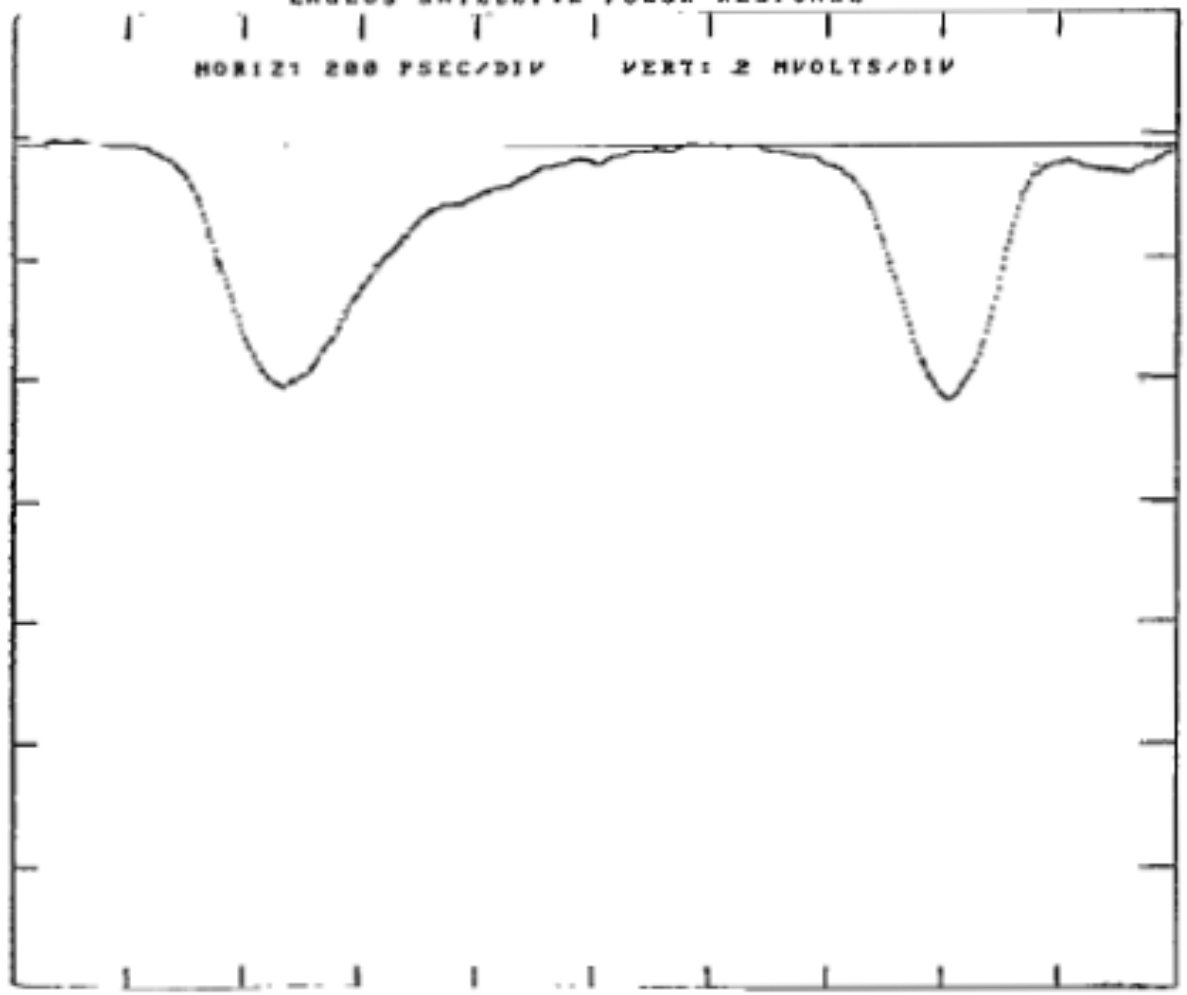


**** LAGEOS TEST DATA ****

DATE : 14-JAN-76
TIME : 11:00:00

DISPLAY FRAME : IR143

LAGEOS SATELLITE PULSE RESPONSE



LASER WAVELENGTH : .532 MICRONS
SATELLITE LATT: 0 DEG LONG: 56 DEG
OF AVERAGED WAVEFORMS : 200 7 ELEMENT SMOOTHING

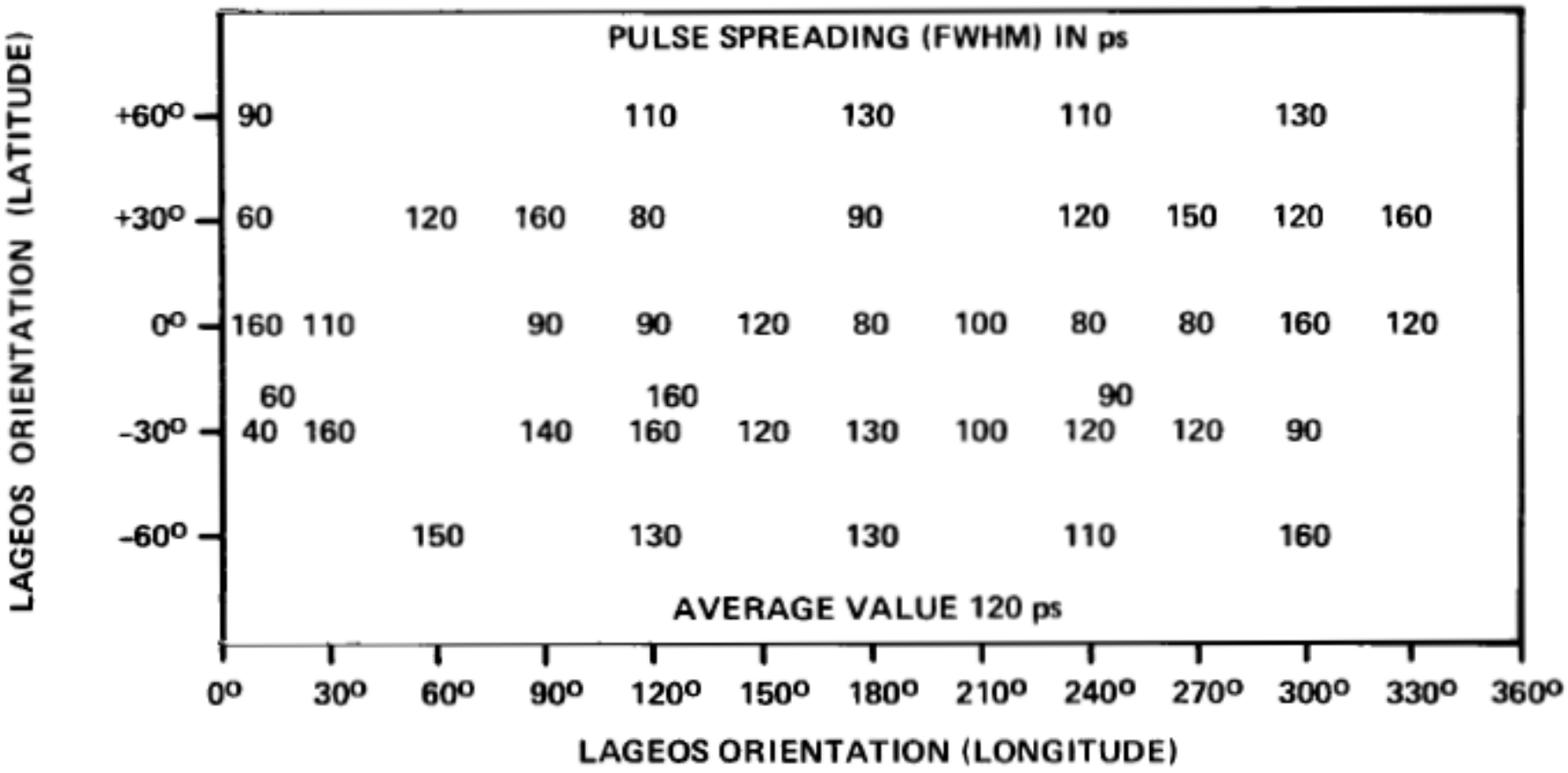
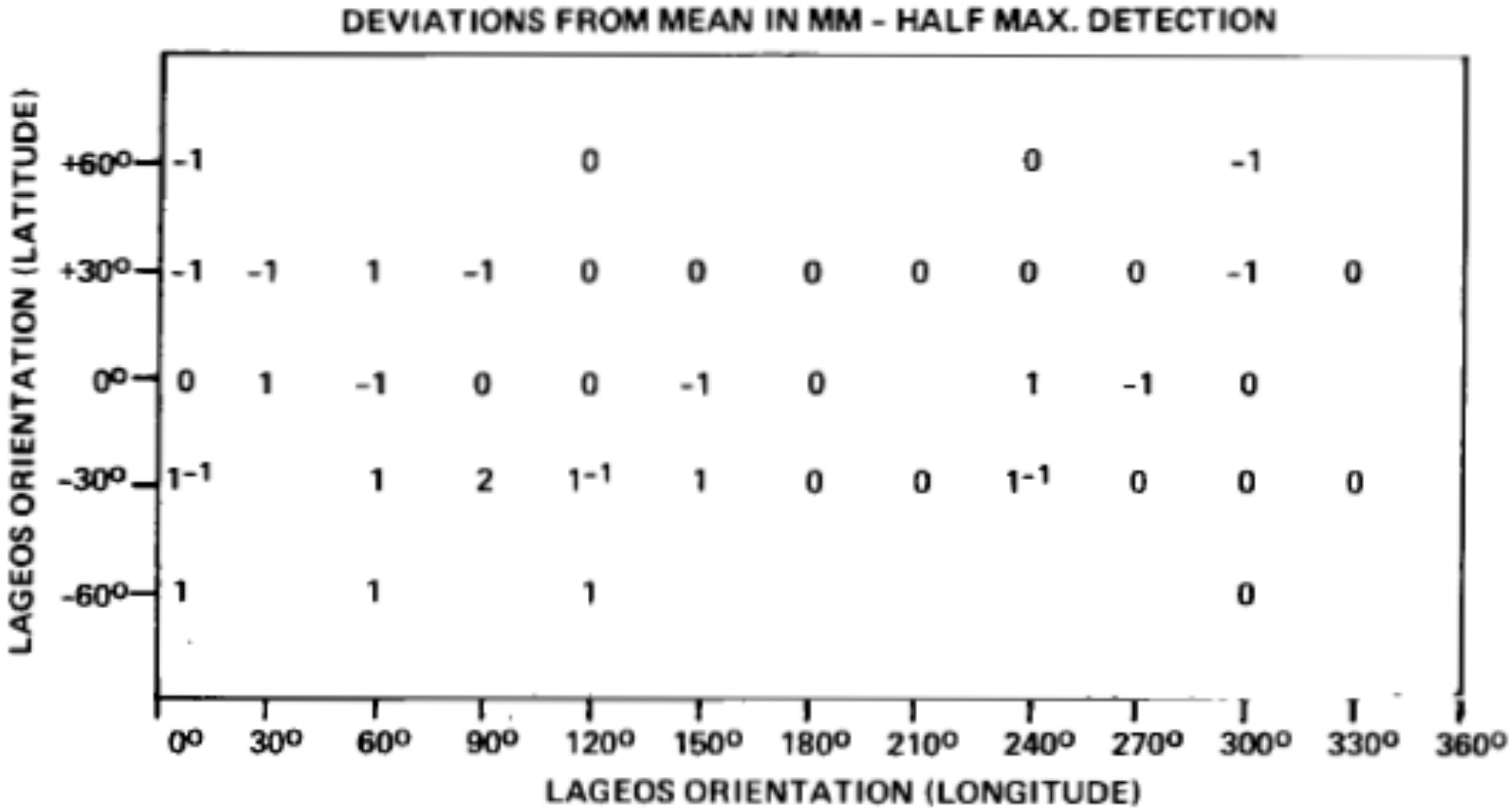


Figure 13. Pulse spreading induced by Lageos.

CG CORRECTION-----MEAN=251 mm



EFFECTS OF COHERENT FADING------RESULTS FROM CROSS-SECTION MEASUREMENTS + RETRO

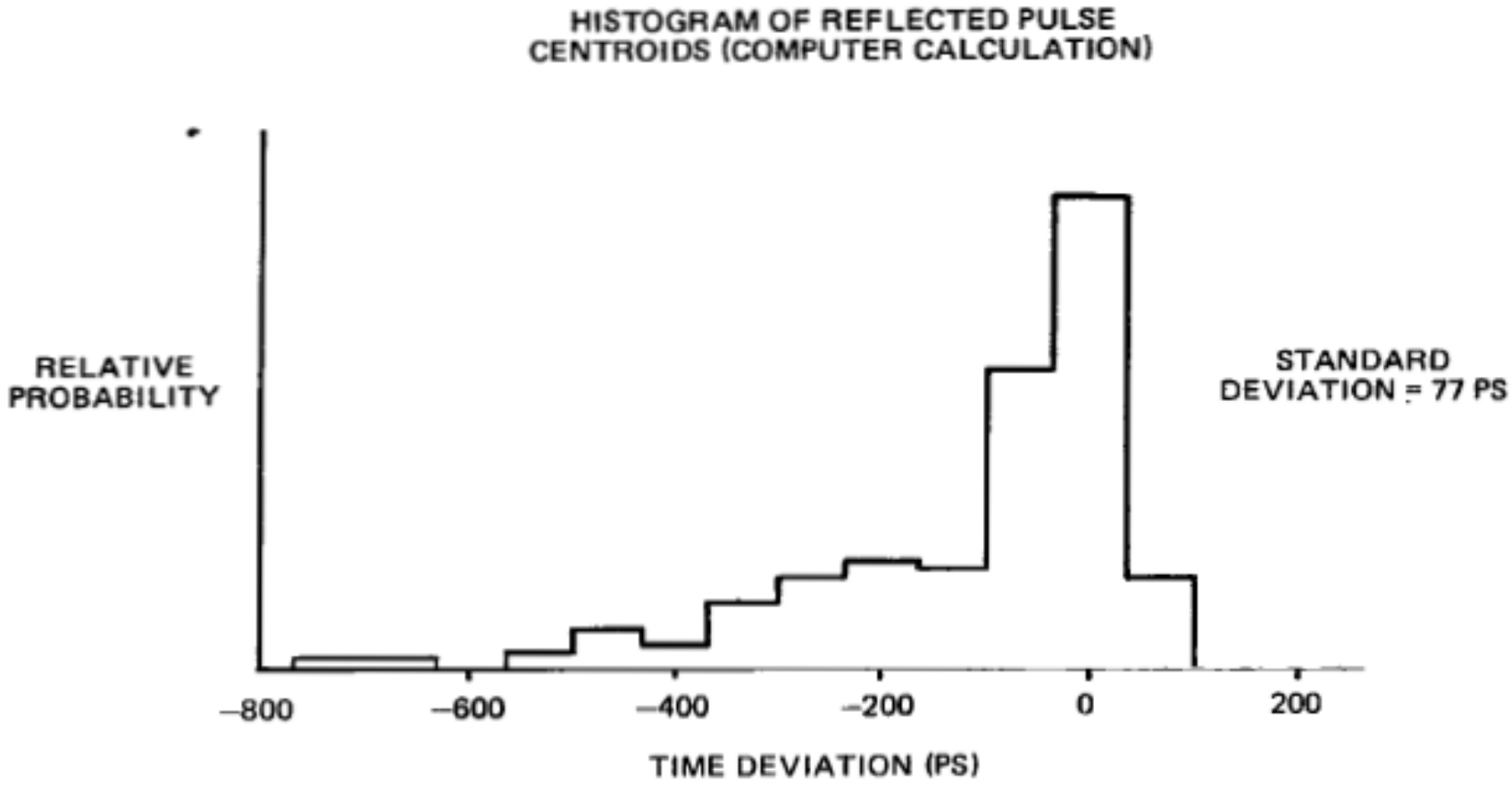


Figure 21. Lageos pulse shape variations due to coherent fading.

LAGEOS OPTICAL CROSS-SECTION

- KEY PARAMETER IN DETERMINING RECEIVED SIGNAL LEVEL
- MEASUREMENTS MADE AT 4 WAVELENGTHS
- EMPHASIS ON FAR FIELD ANNULUS (34-38 uR) TO ACCOUNT FOR VEL. ABBERATION
- DESIGN GOAL-----10 MILLION SQ. METERS

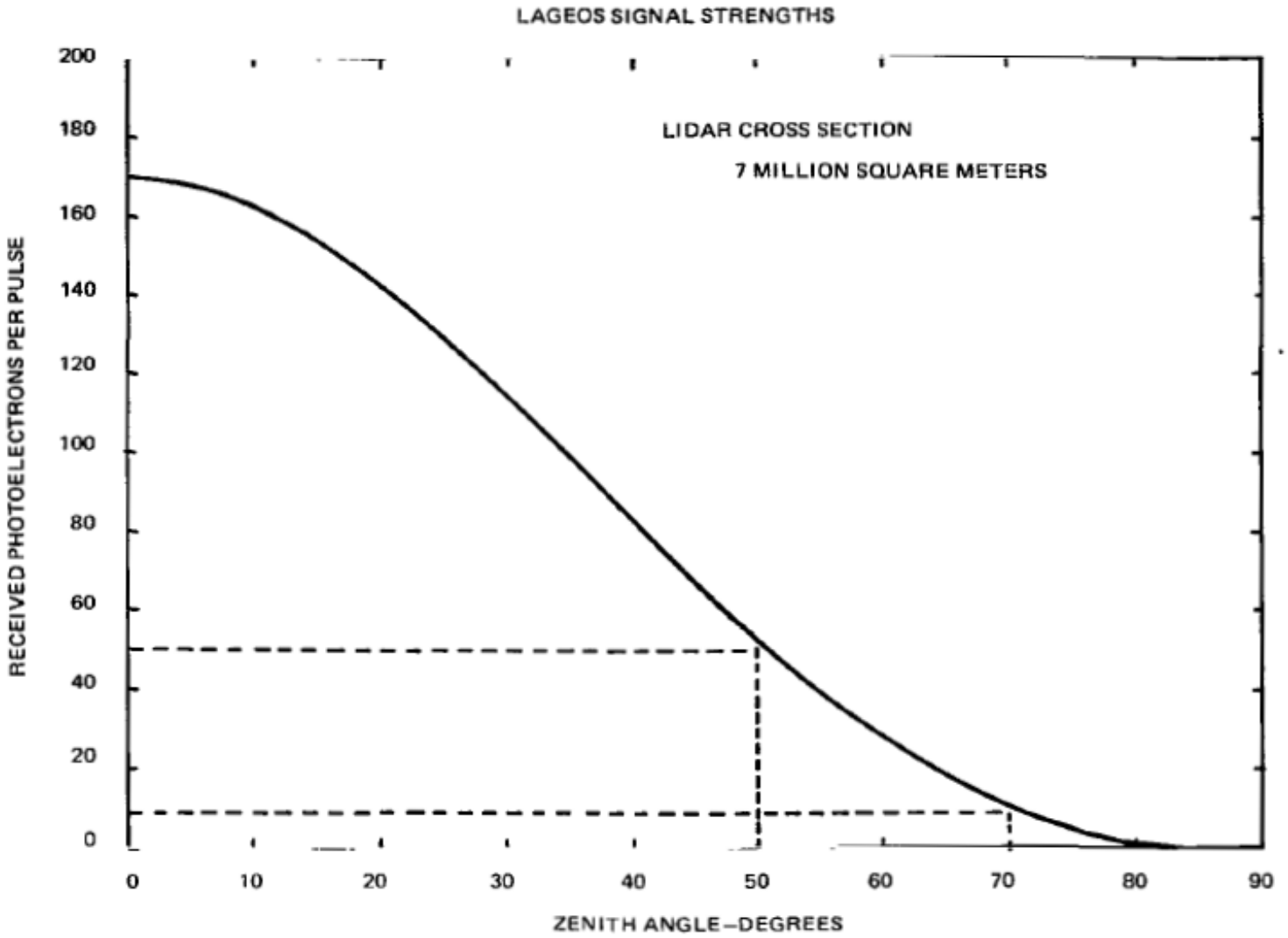
LASER RANGING SYSTEMS---CIRCA 1976

Table 2
Parameters of Existing and Proposed
Laser Tracking Stations

Tracking Station	(Å)	E_T (joules)	η (%)	D_R (cm)	τ_O (%)	Θ_T (mrad)	τ_P	P_S ($M^2 \times 10^{25}$)
SAO 1	6943	0.50	3.0	51	34	0.6	0.5	0.20
SAO 2	6943	0.50	3.0	51	34	0.6	0.5	0.20
SAO 3	6943	0.50	3.0	51	34	0.6	0.5	0.20
MOBLAS 2	6943	0.25	2.5	51	15	0.25	0.5	0.22
MOBLAS 1	6943	0.80	2.5	41	15	0.15	0.5	1.24
MOBLAS 3	6943	0.80	2.5	51	15	0.15	0.5	1.91
MOBLAS 4*	5320	0.25	10.0	75	26	0.20	0.5	3.86
MOBLAS 5*	5320	0.25	10.0	75	26	0.20	0.5	3.86
MOBLAS 6*	5320	0.25	10.0	75	26	0.20	0.5	3.86
MOBLAS 7*	5320	0.25	10.0	75	26	0.20	0.5	3.86
MOBLAS 8*	5320	0.25	10.0	75	26	0.20	0.5	3.86
STALAS	5320	0.25	10.0	61	0.15	0.10	0.5	5.90

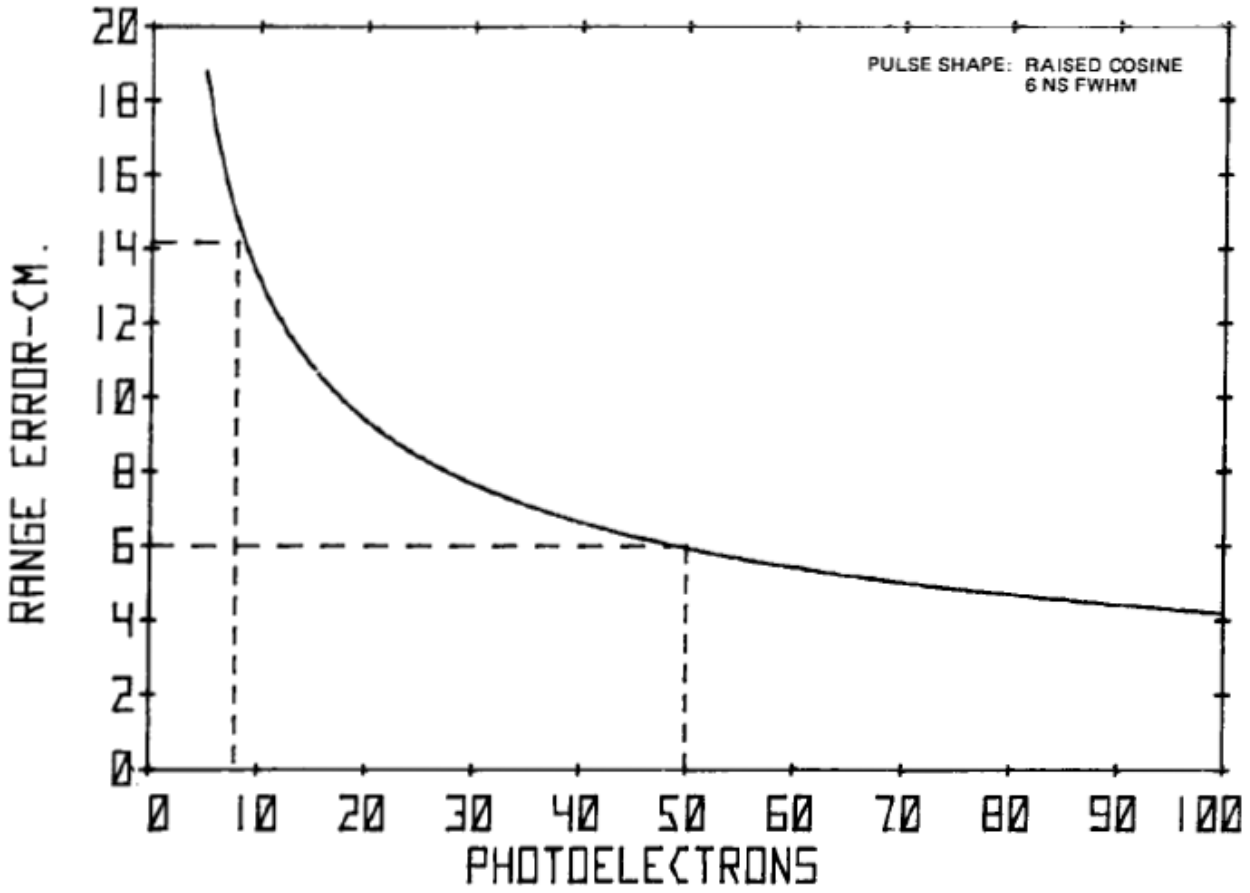
*Under development

LINK ANALYSIS RESULTS-------STALAS



(SINGLE SHOT) RANGE PRECISION VS RECEIVED SIGNAL STRENGTH

-CENTROID DETECTION-



LAGEOS OPTICAL CROSS-SECTION

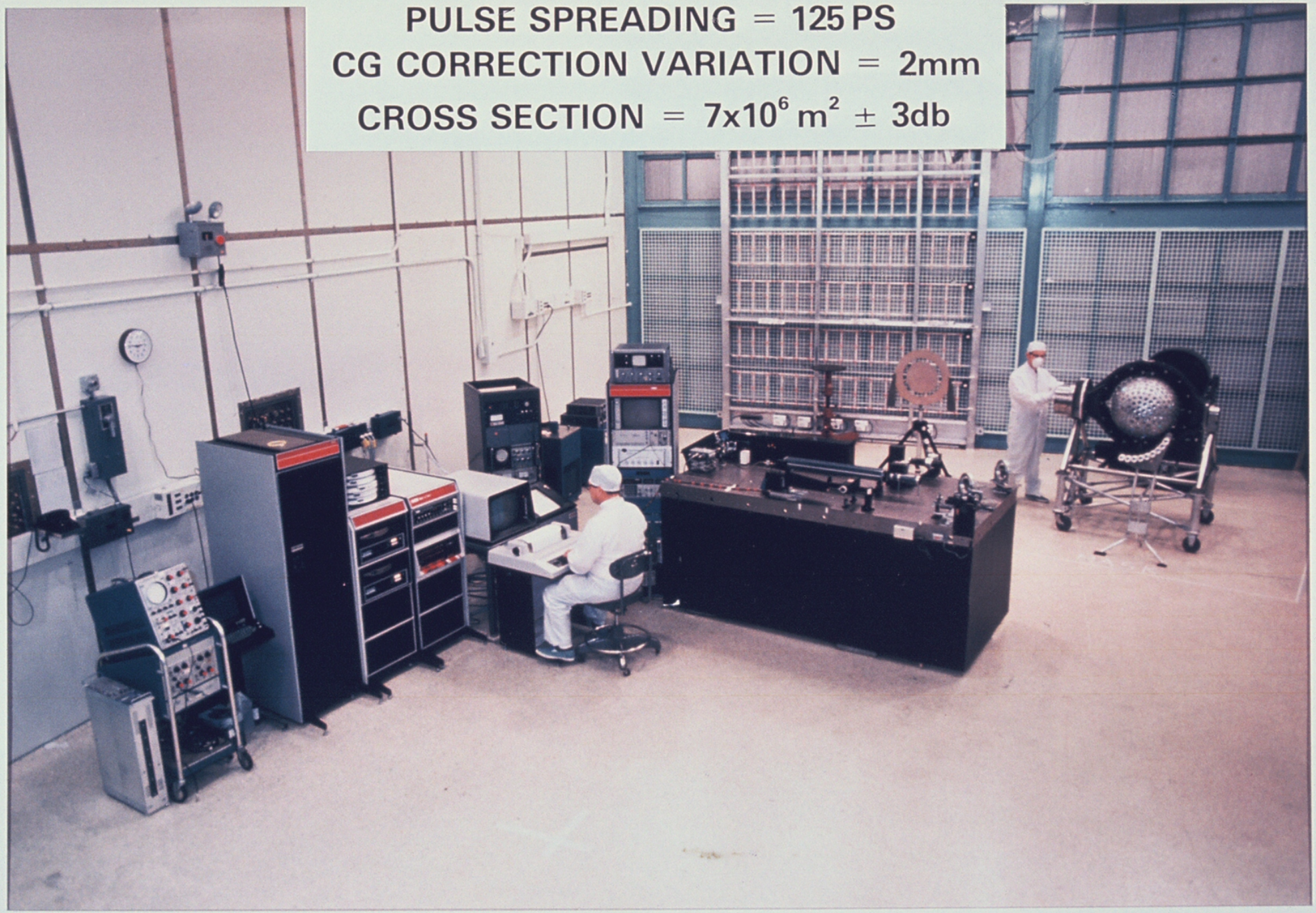
- *RESULTS*
  - *.44 um_____4.3E6*
  - *.53um_____7.1E6*
  - *.63um_____5.3E6*
  - *1.06 _____5.7E6*

  - *+/- 3 db VARIATION WITH LAGEOS ORIENTATION FOR DIFFERENT POLARIZATIONS…UNCOATED CCRs*

PULSE SPREADING = 125 PS

CG CORRECTION VARIATION = 2mm

CROSS SECTION = 7×10^6 m^2 ± 3db




April 12, 1976
Aviation Week
& Space Technology
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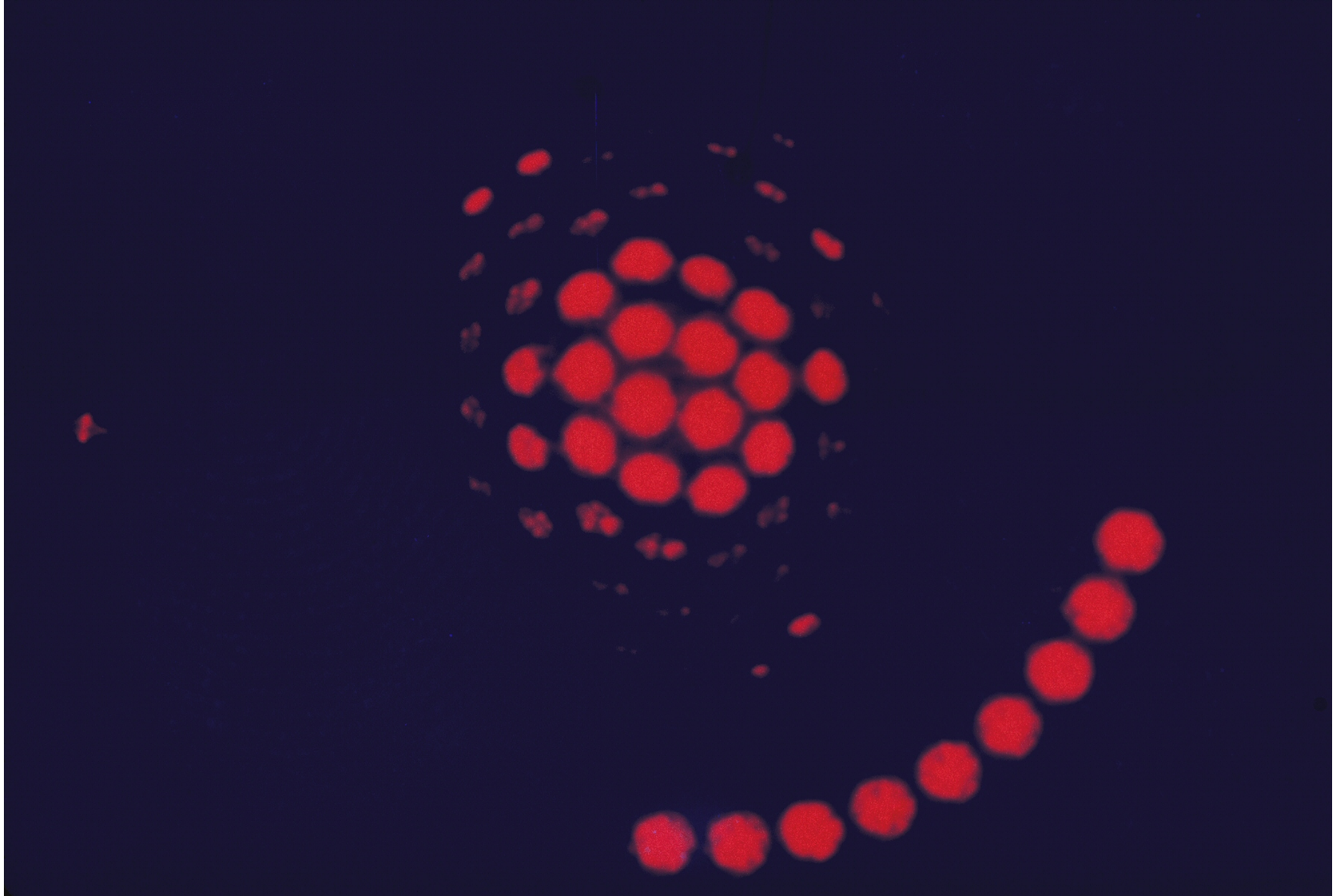
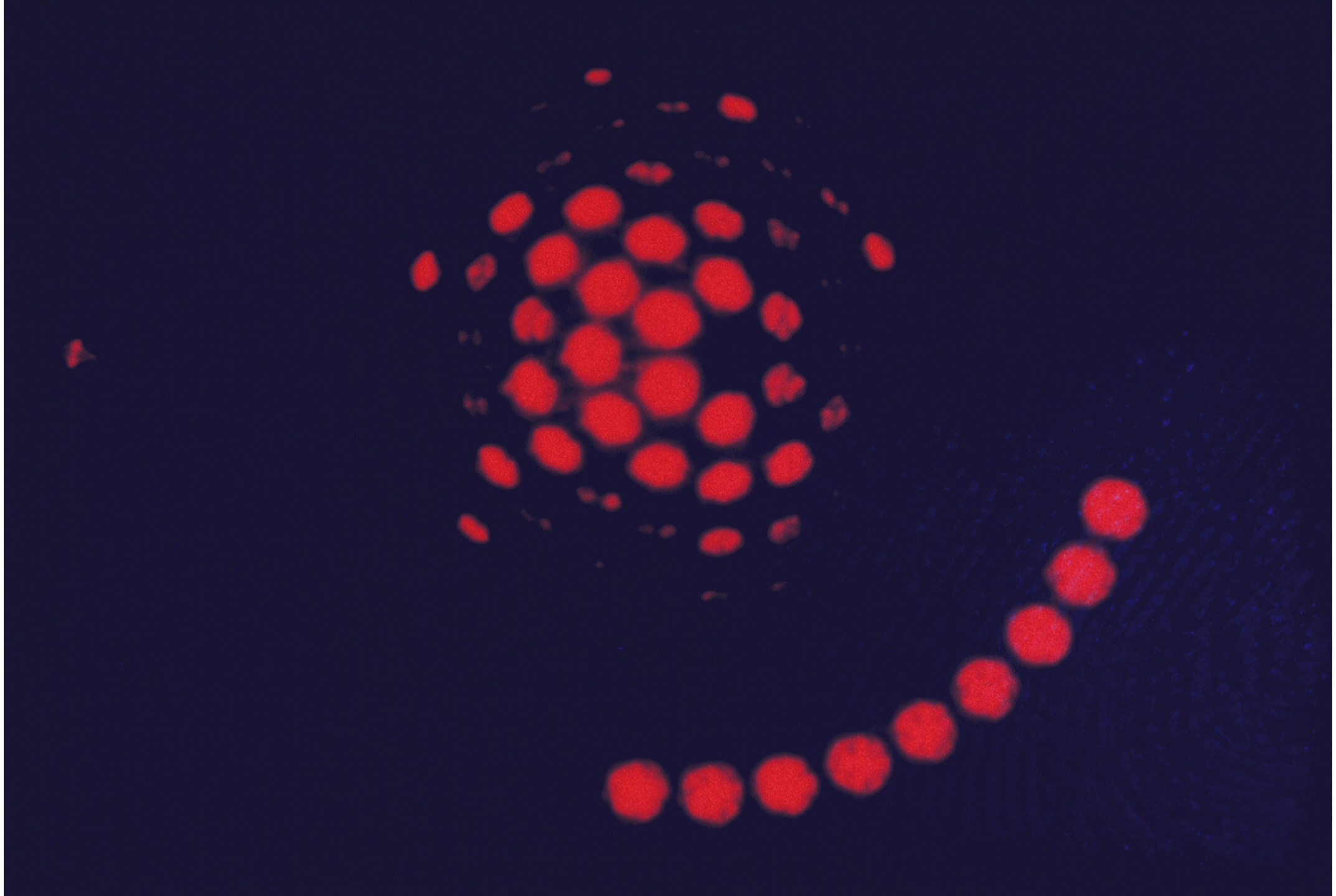
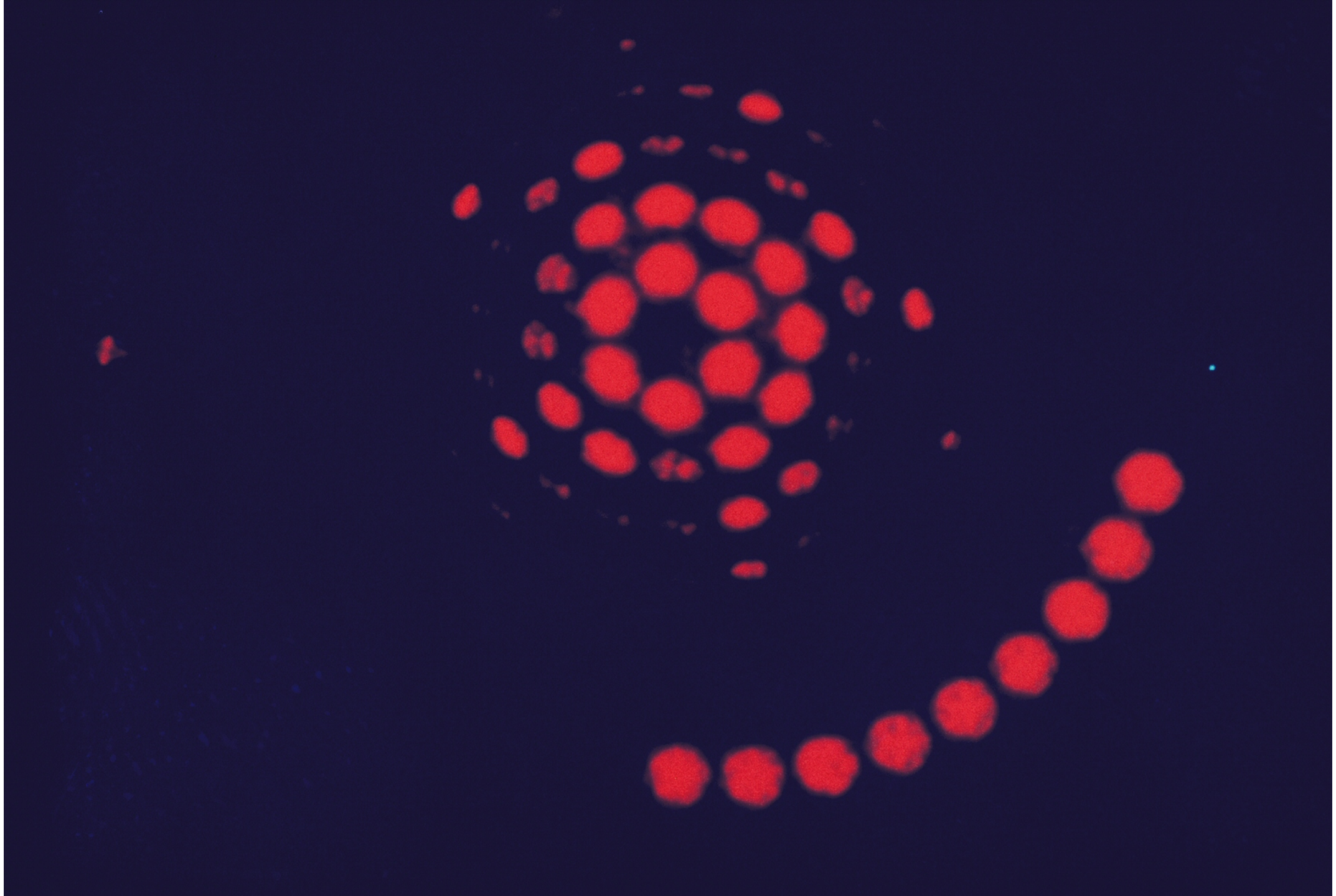
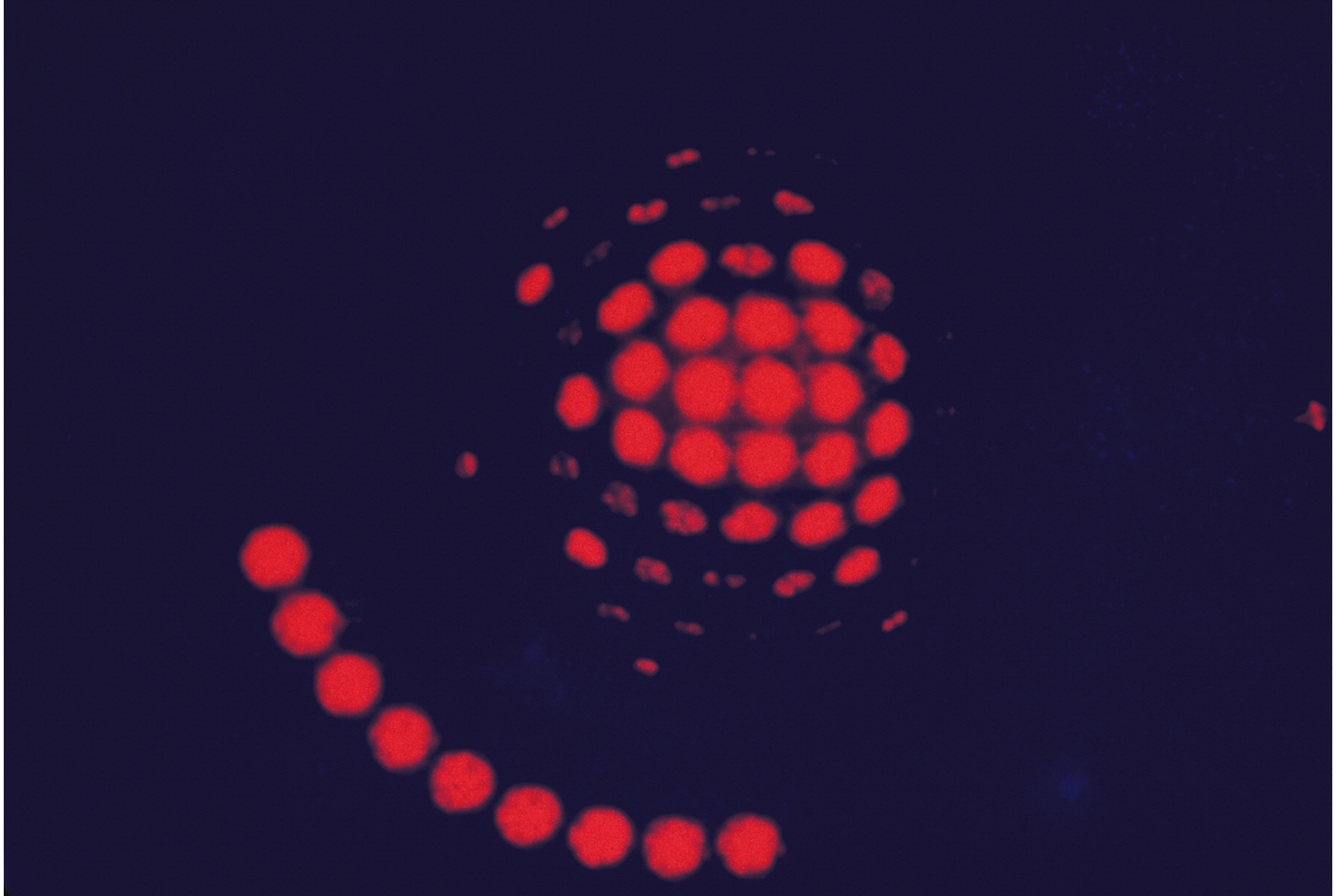
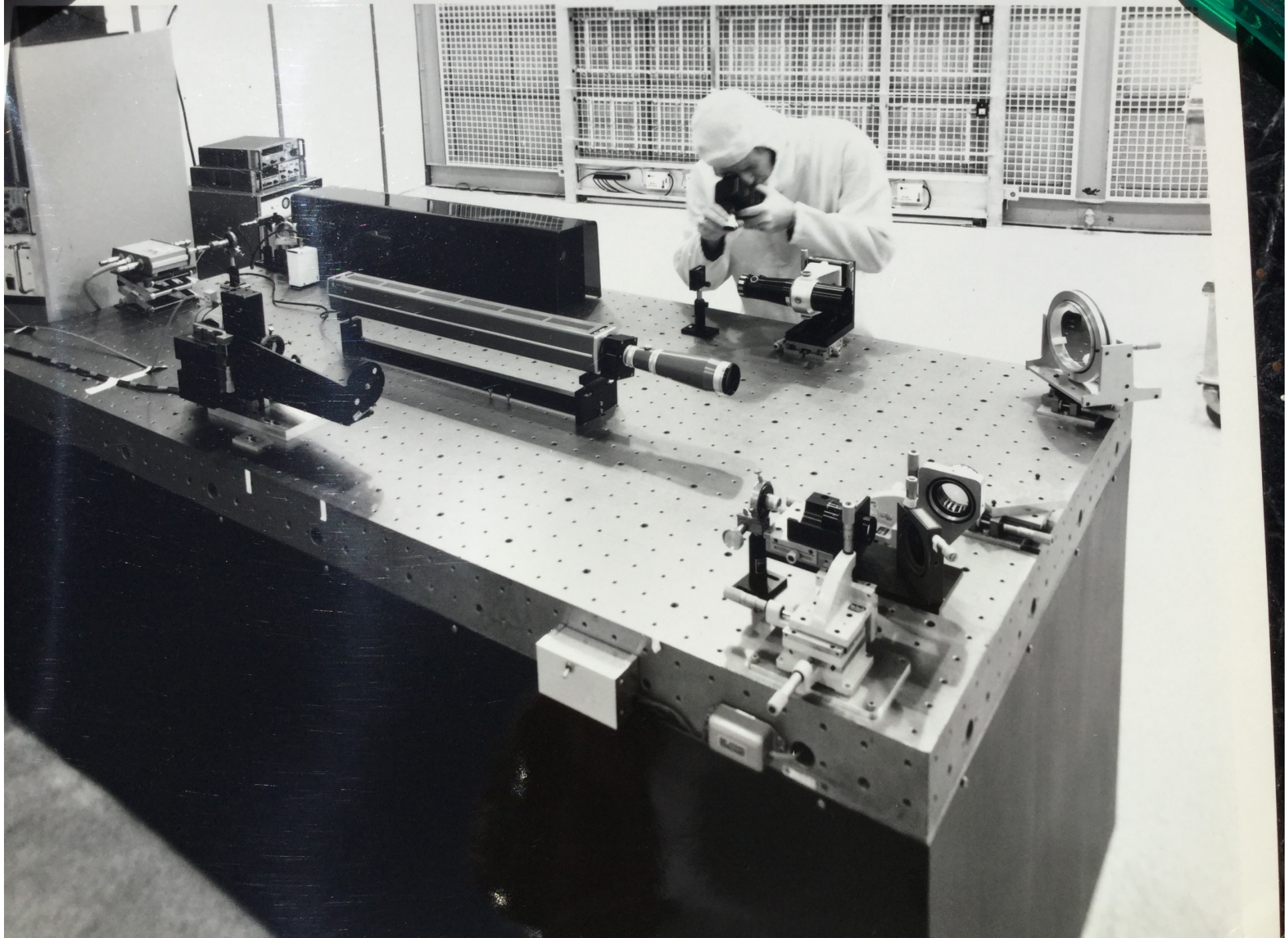
LAGEOS laser test
94,640 copies of this issue printed
Cover
NASA Marshall Space Flight Center Laser Geodynamic Satellite (LAGEOS) undergoes laser ranging tests at the Goddard Space Flight Center. Short-pulsed neodymium yttrium aluminum garnet laser provided the green beam. Launch of the 906-lb. spacecraft is scheduled for next month. NASA photo by Gary Iglarsh.
Aviation Week & Space Technology, April 12, 1976











Prelaunch Testing of the Laser Geodynamic Satellite (LAGEOS)