NFOETE

NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4

APPENDICES

DOCUMENT NAME:	**NFOETE - NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4 APPENDICES**

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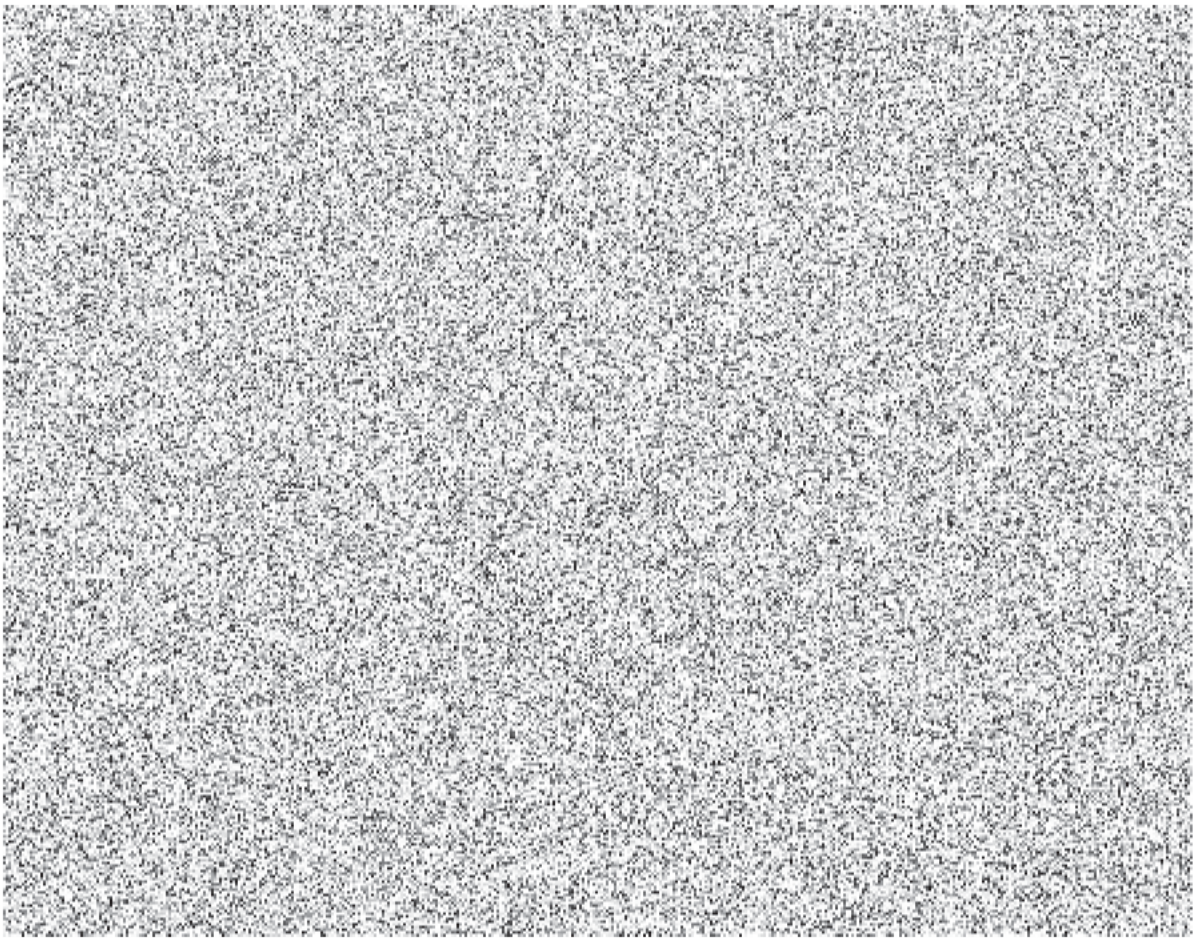
IN WITNESS WHEREOF the Owner and the Supplier have hereby signed the above listed NFC Appendices.



NFOETE

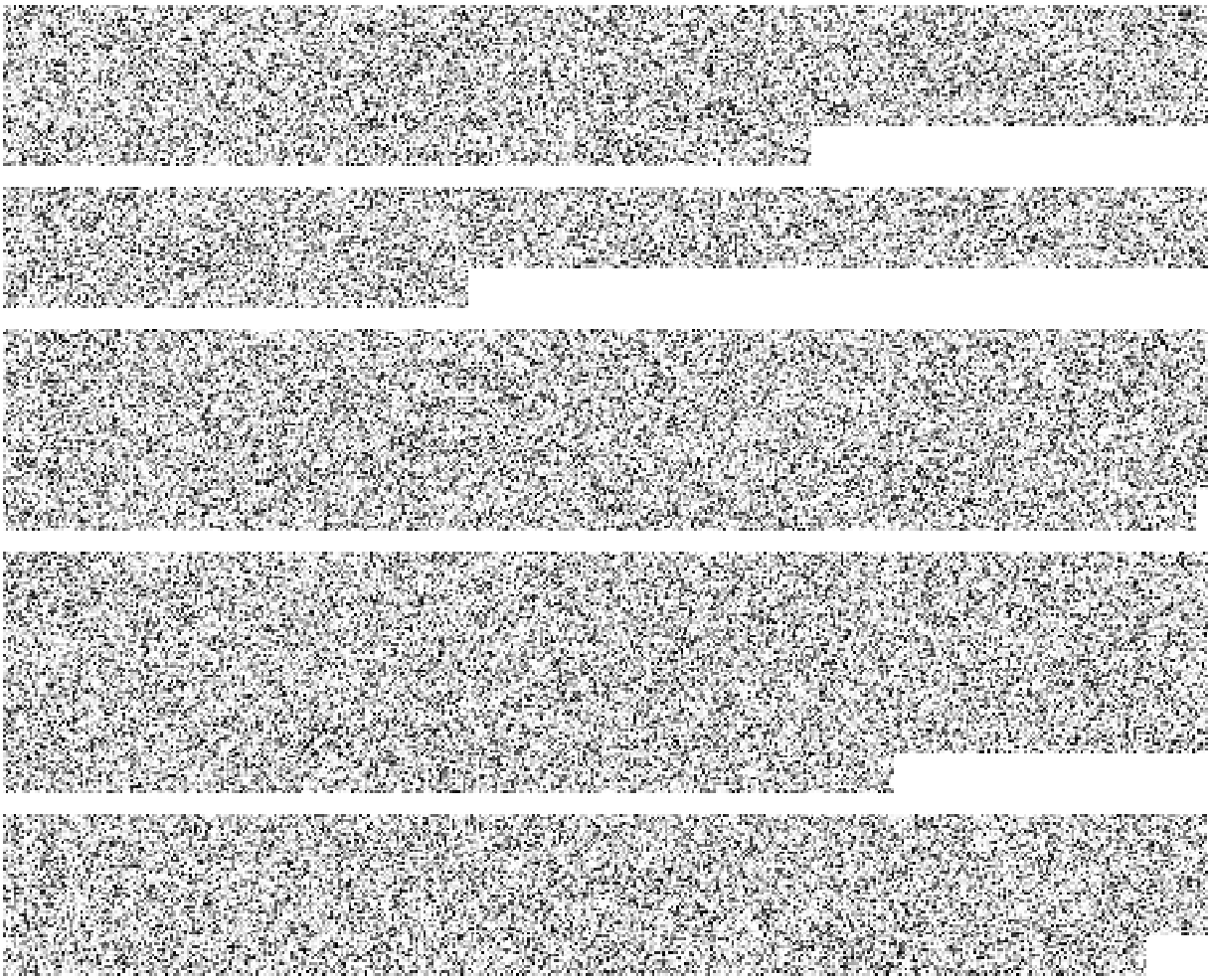
NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4

APPENDIX A

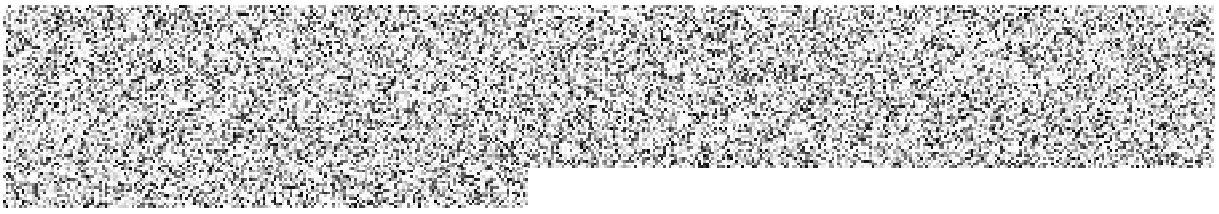
DOCUMENT NAME:	**NFOETE – NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4 APPENDIX A**

A - FUEL ASSEMBLY AND CORE COMPONENTS DESIGN CRITERIA AND DESIGN PARAMETERS

A.1 FUEL ASSEMBLY AND CORE COMPONENTS DESIGN CRITERIA



A.1.1 FUEL ASSEMBLY DESIGN CRITERIA



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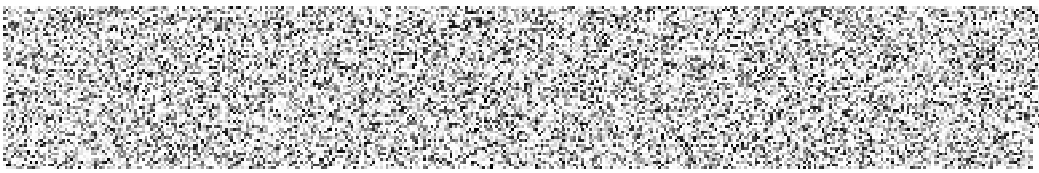

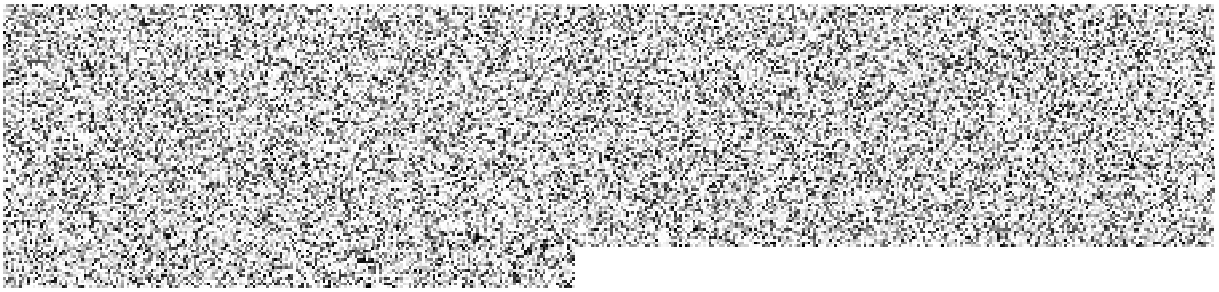

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A.1.2 FUEL ROD DESIGN CRITERIA

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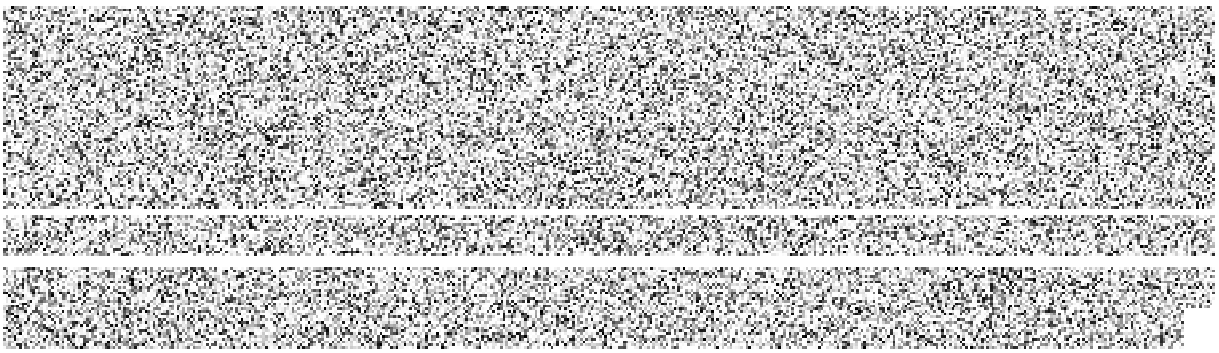

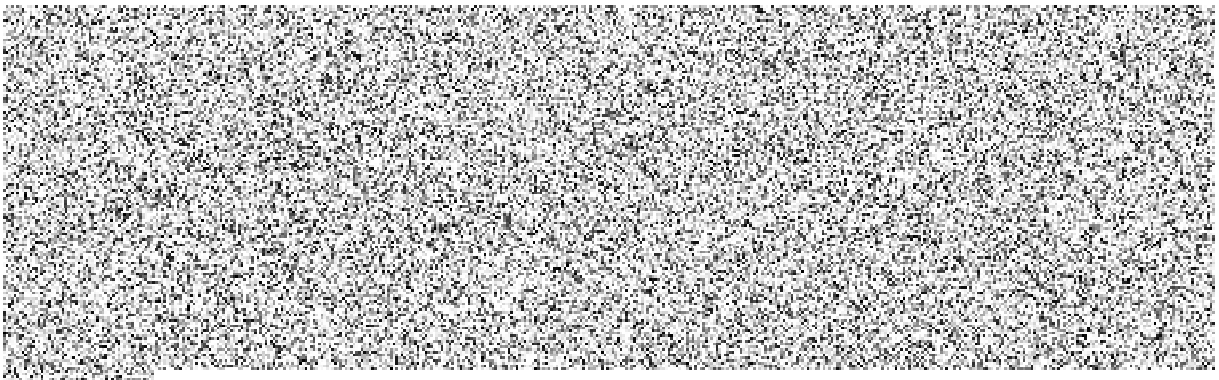

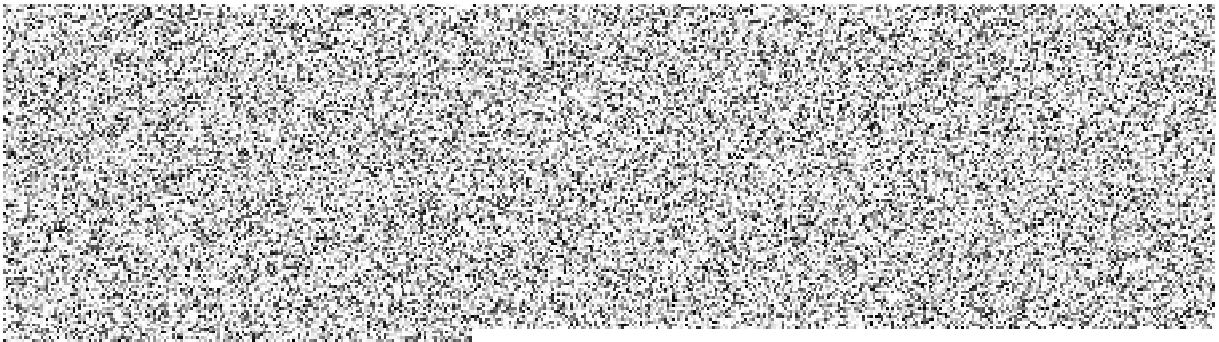

A.1.3 CEA DESIGN CRITERIA

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A.1.4 NSA DESIGN CRITERIA

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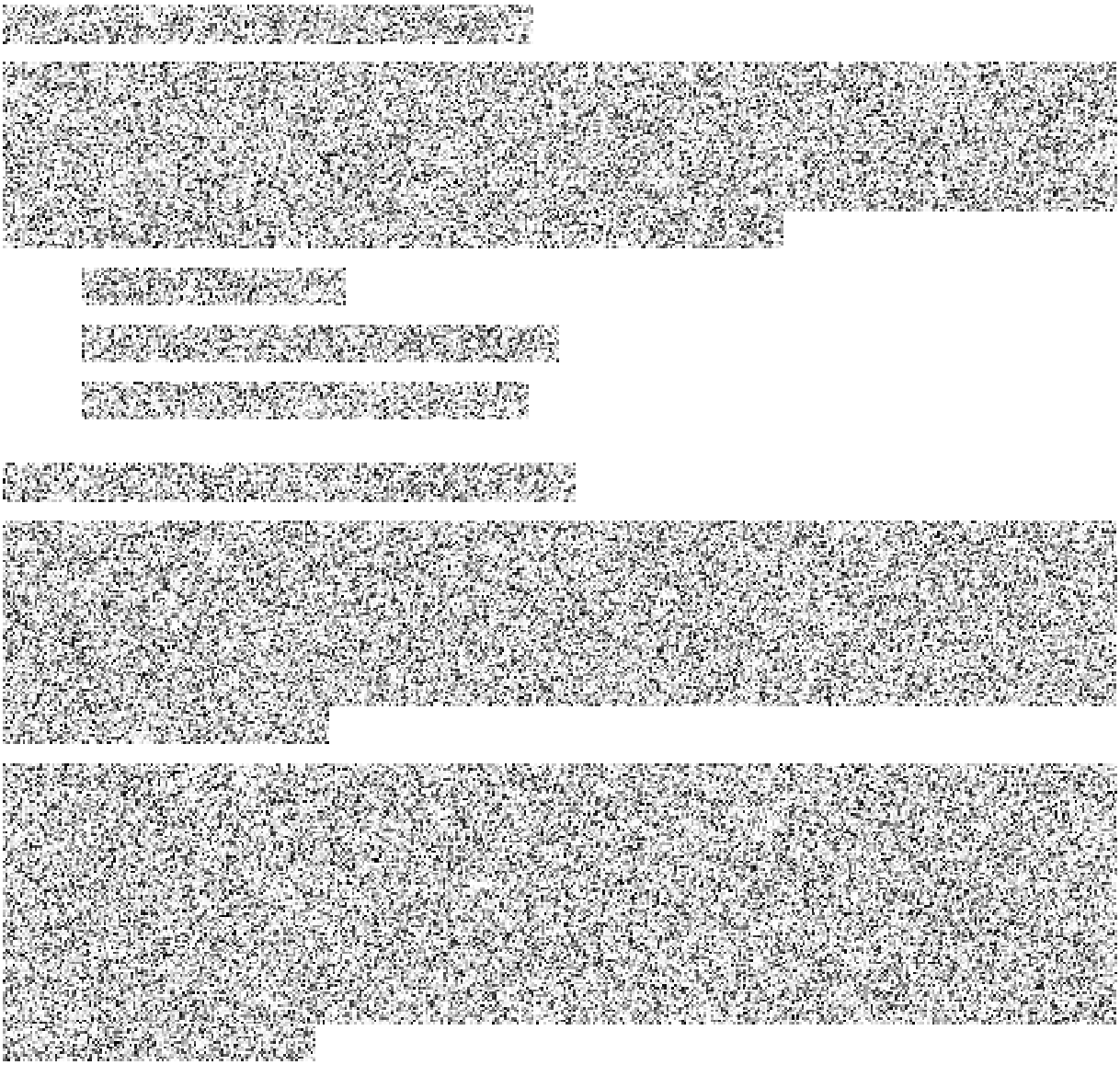
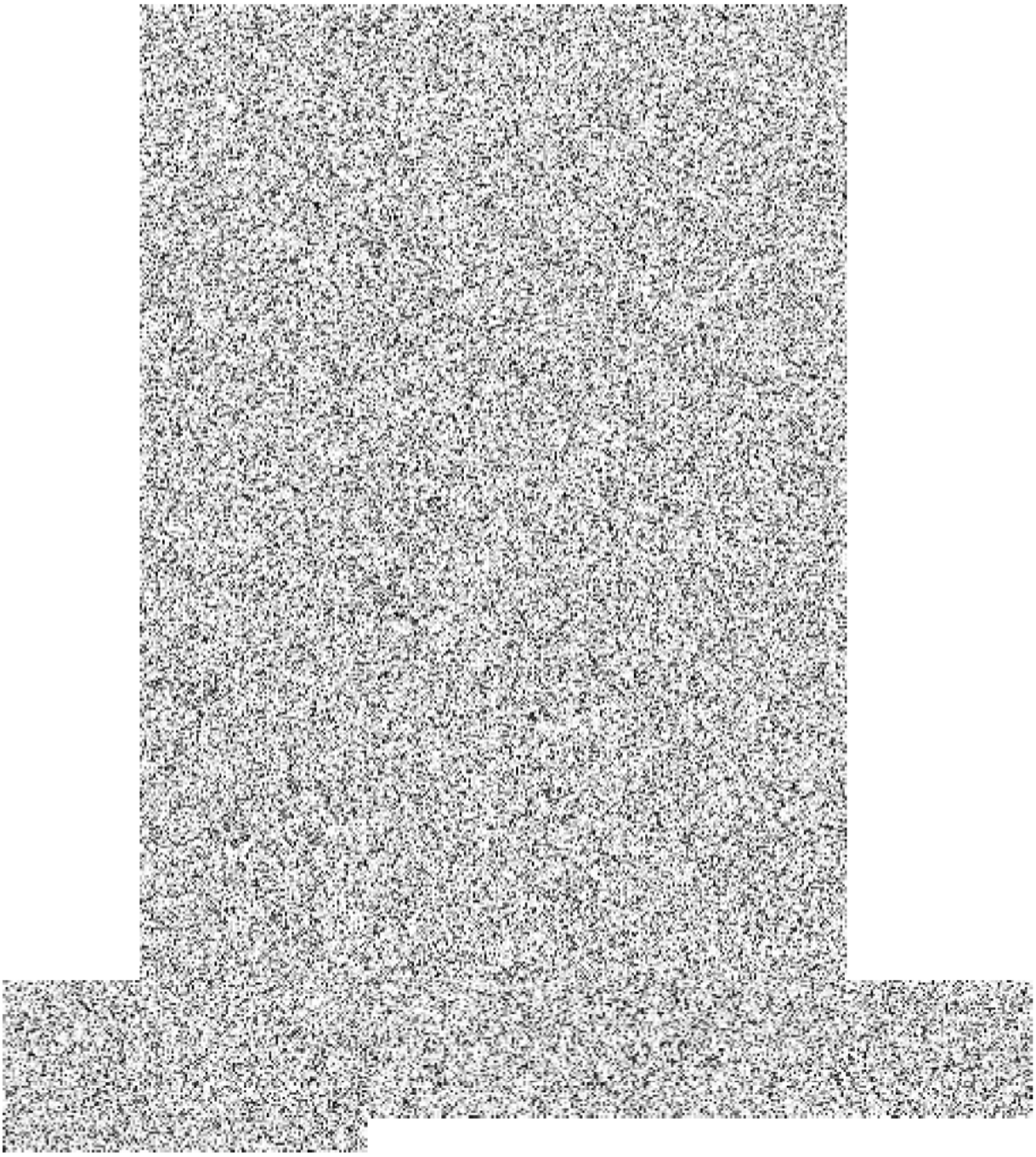
A.2 FUEL ASSEMBLY AND CORE COMPONENTS DESIGN

A.2.1 SAFETY CLASSIFICATION OF FUEL SYSTEM



A.2.2 DESCRIPTION OF FUEL ASSEMBLY



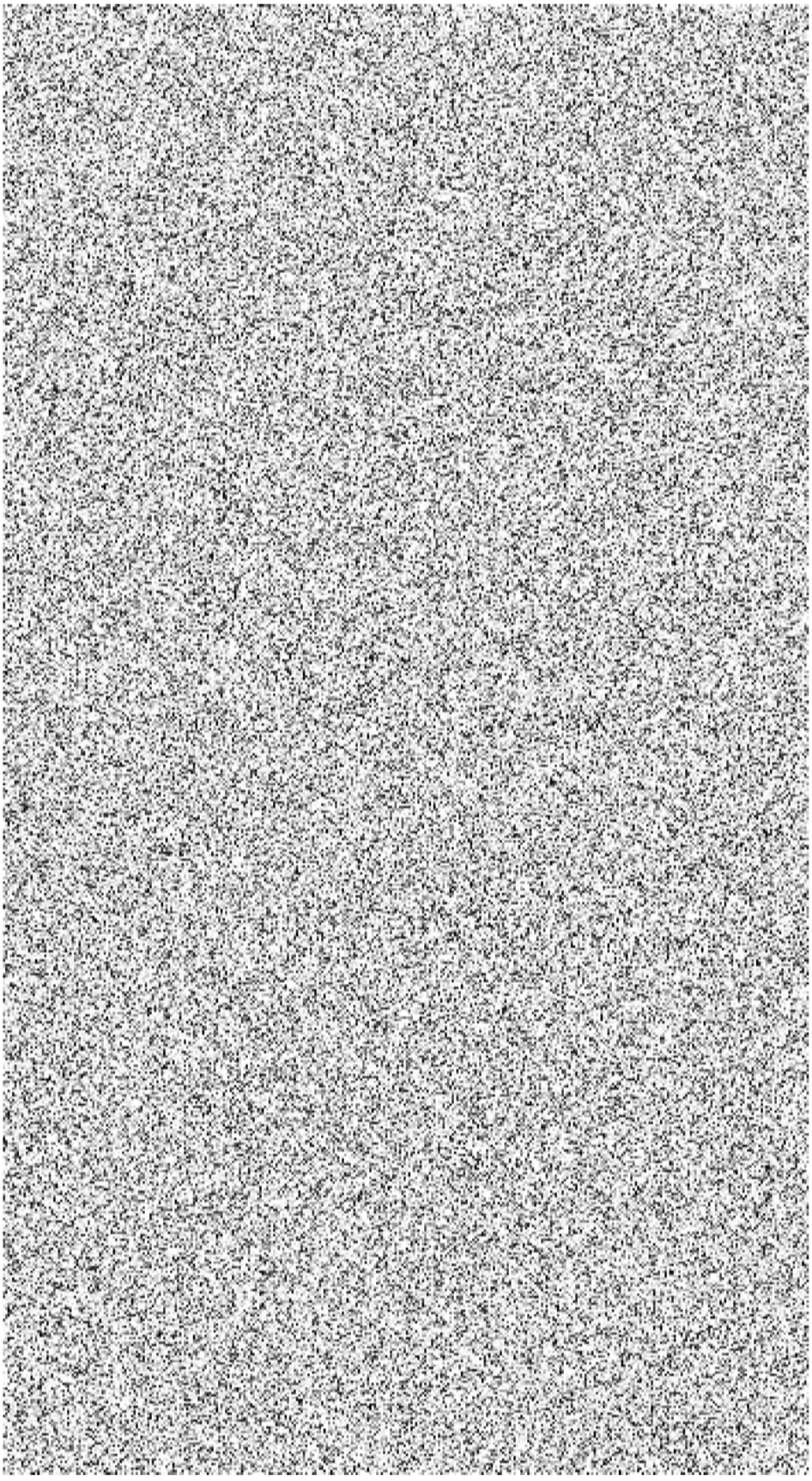


Figure A.2 Mid Grid

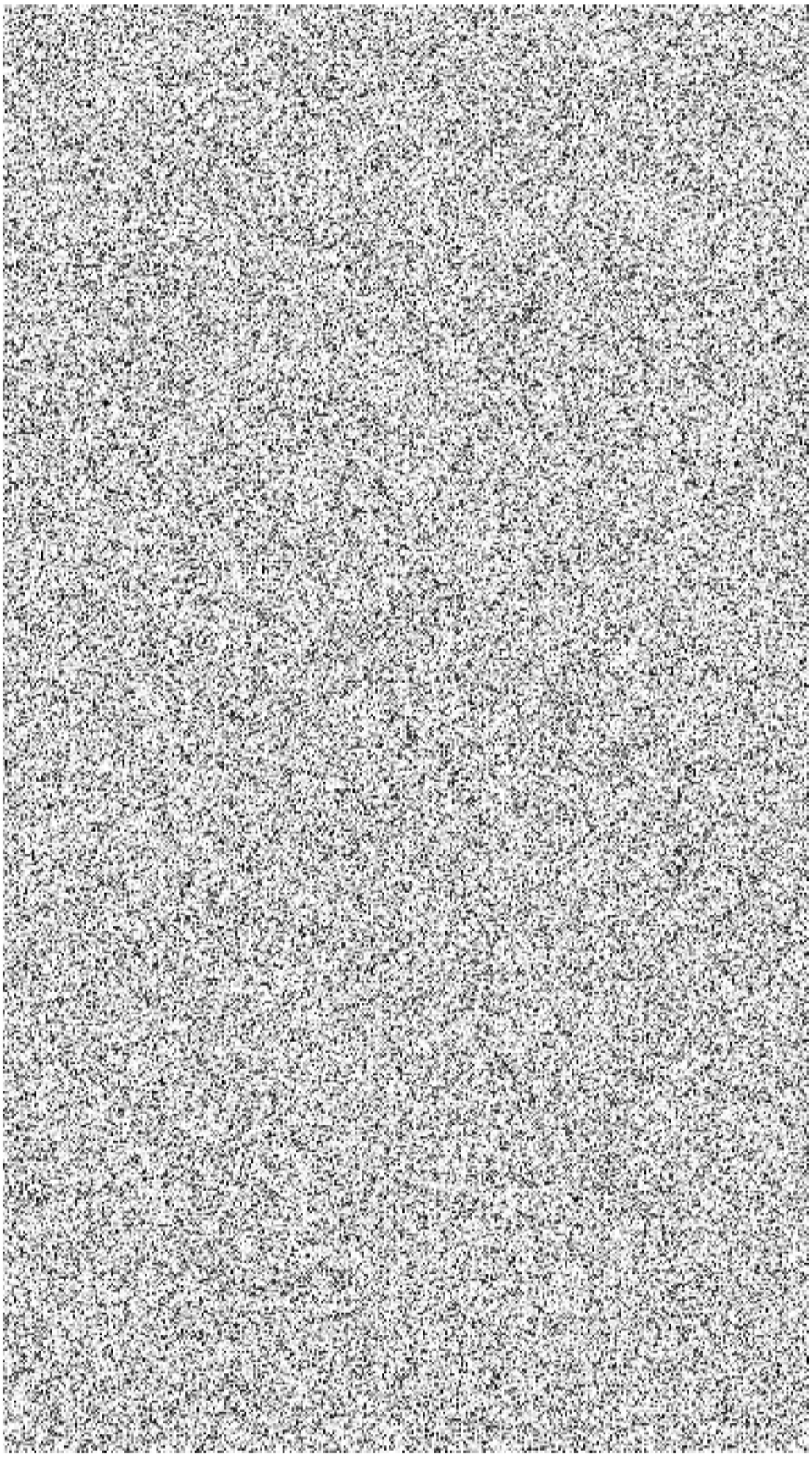


Figure A.3 Top Grid

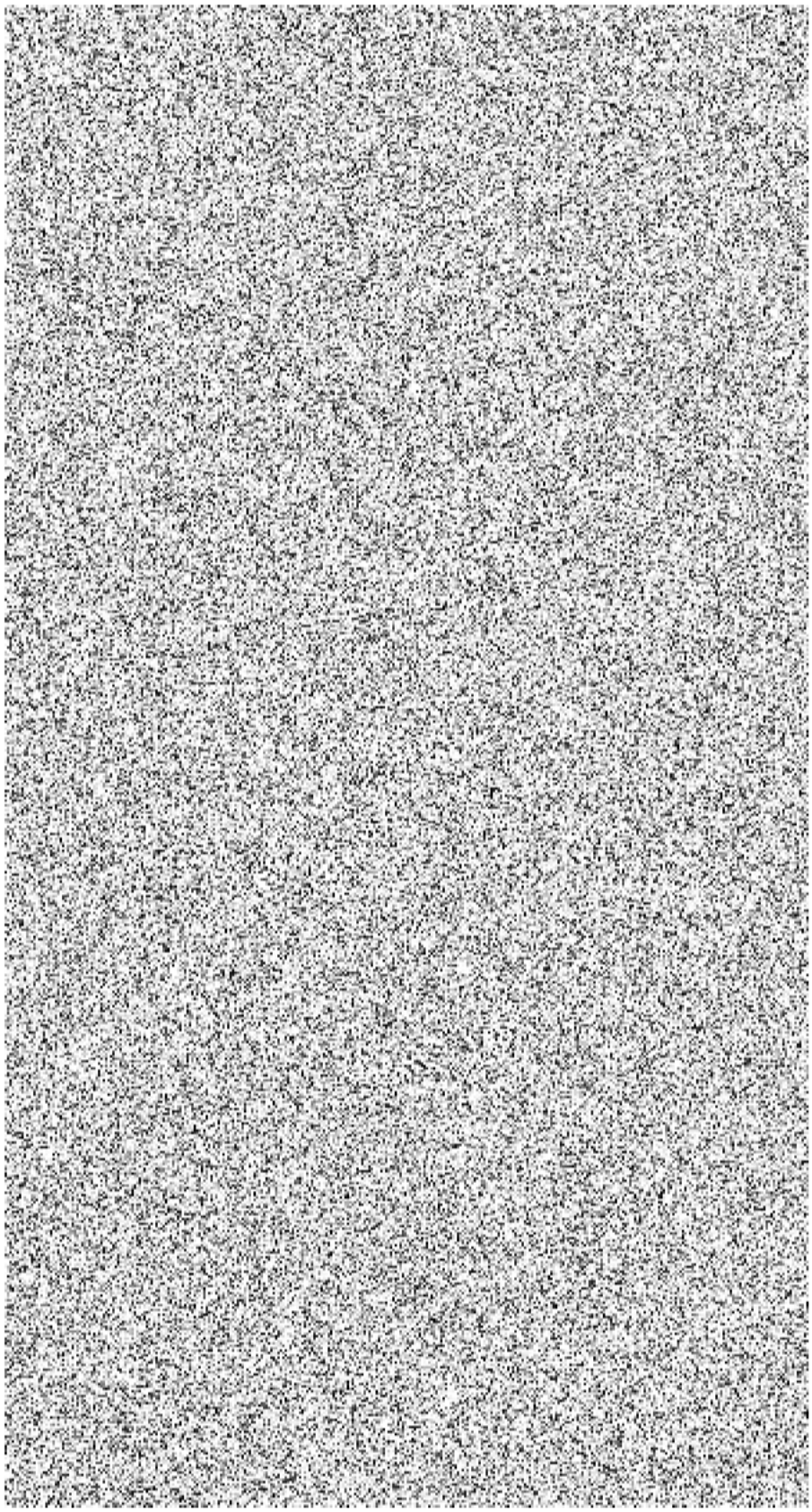


Figure A.4 Debris Filtering Bottom Grid

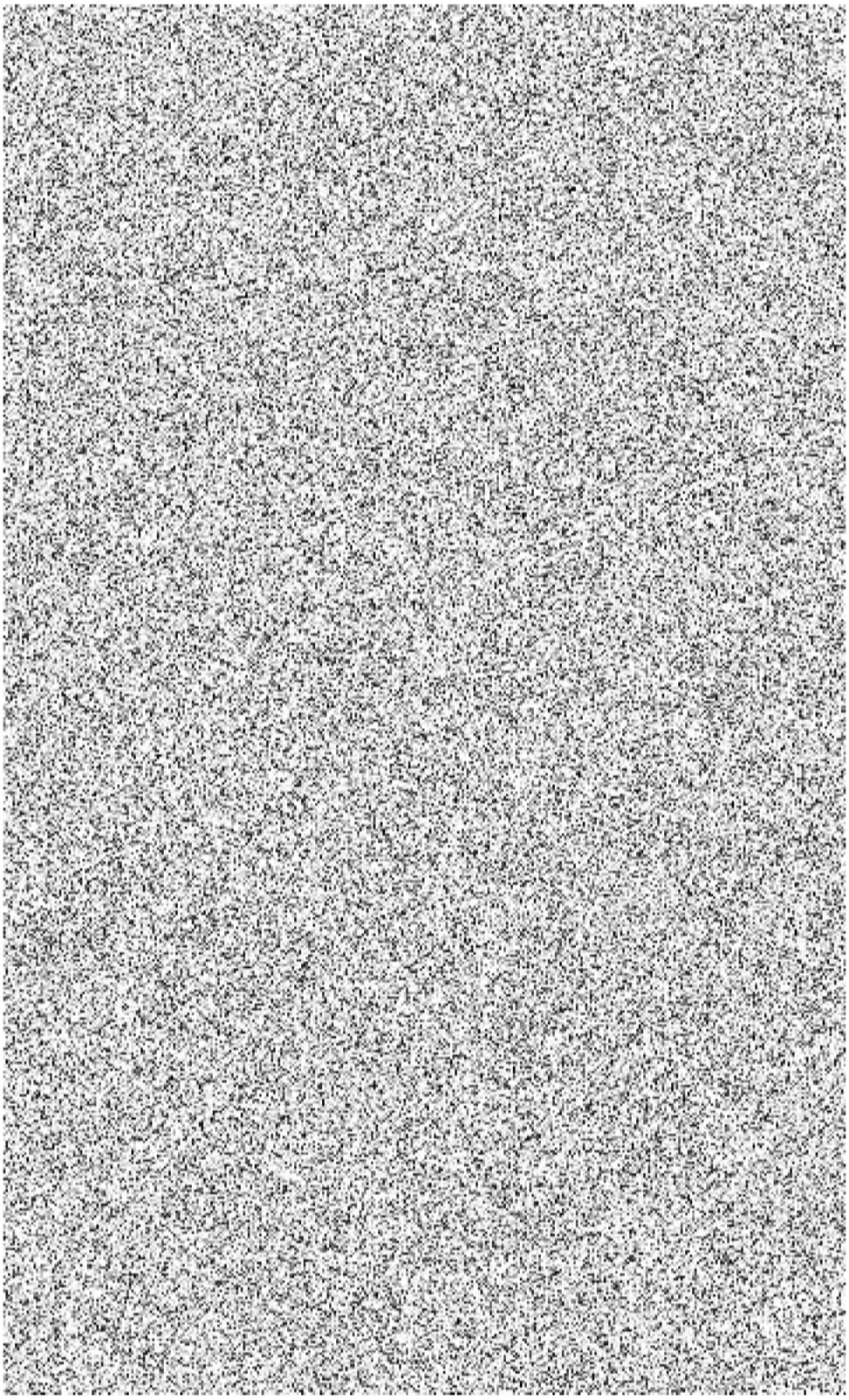
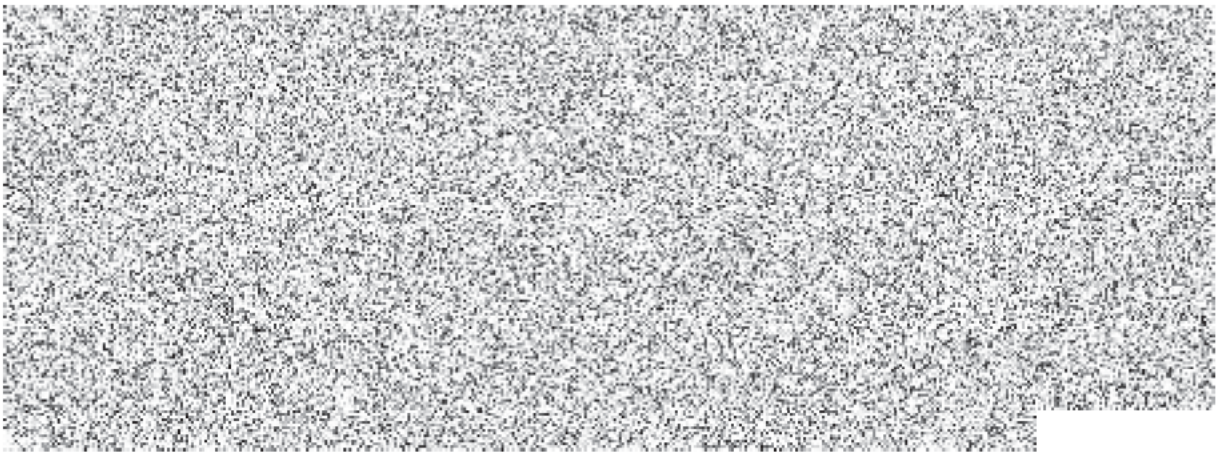


Figure A.5 IFM Grid



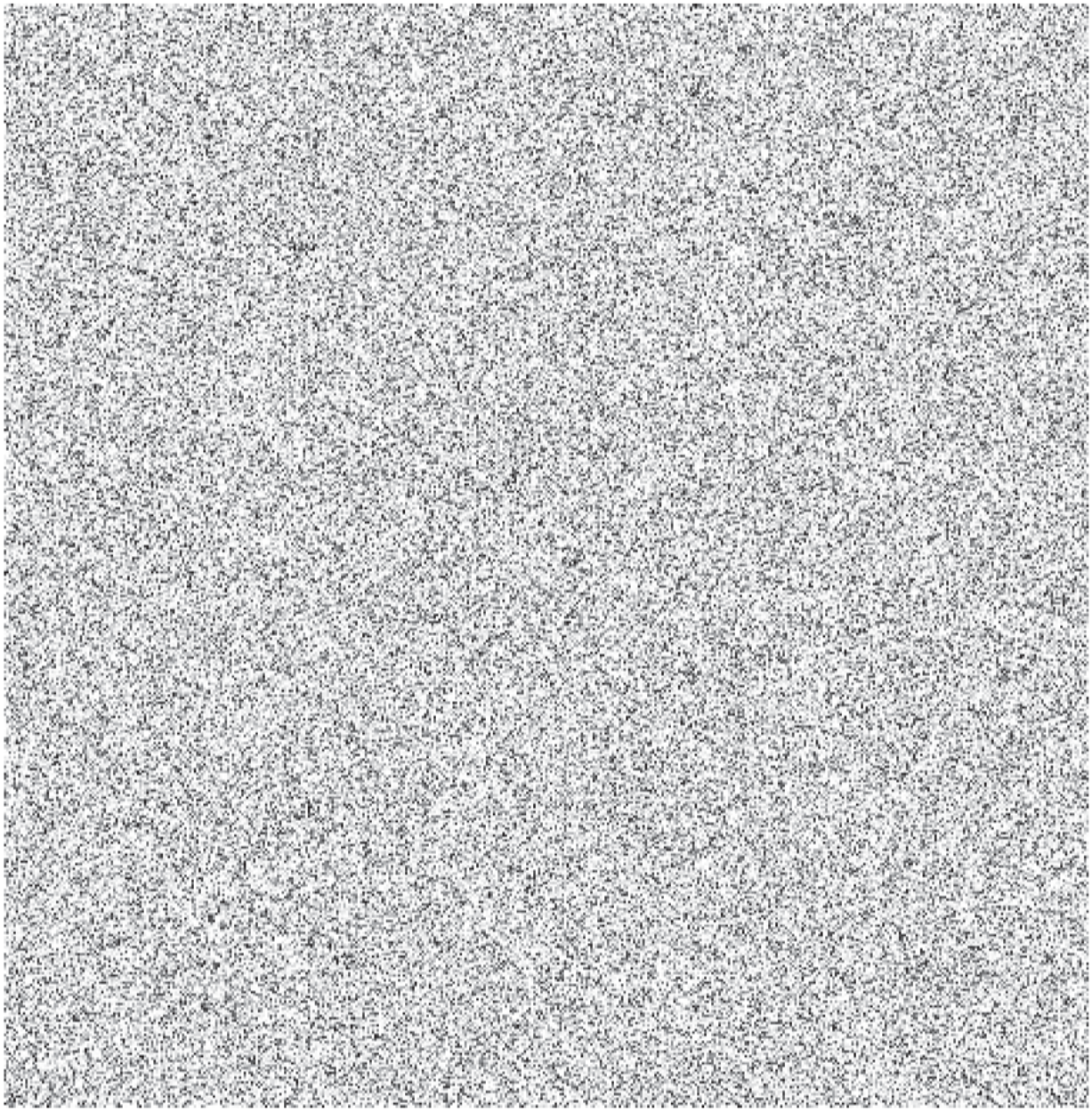


Figure A.6 Configurations of Mid Grid

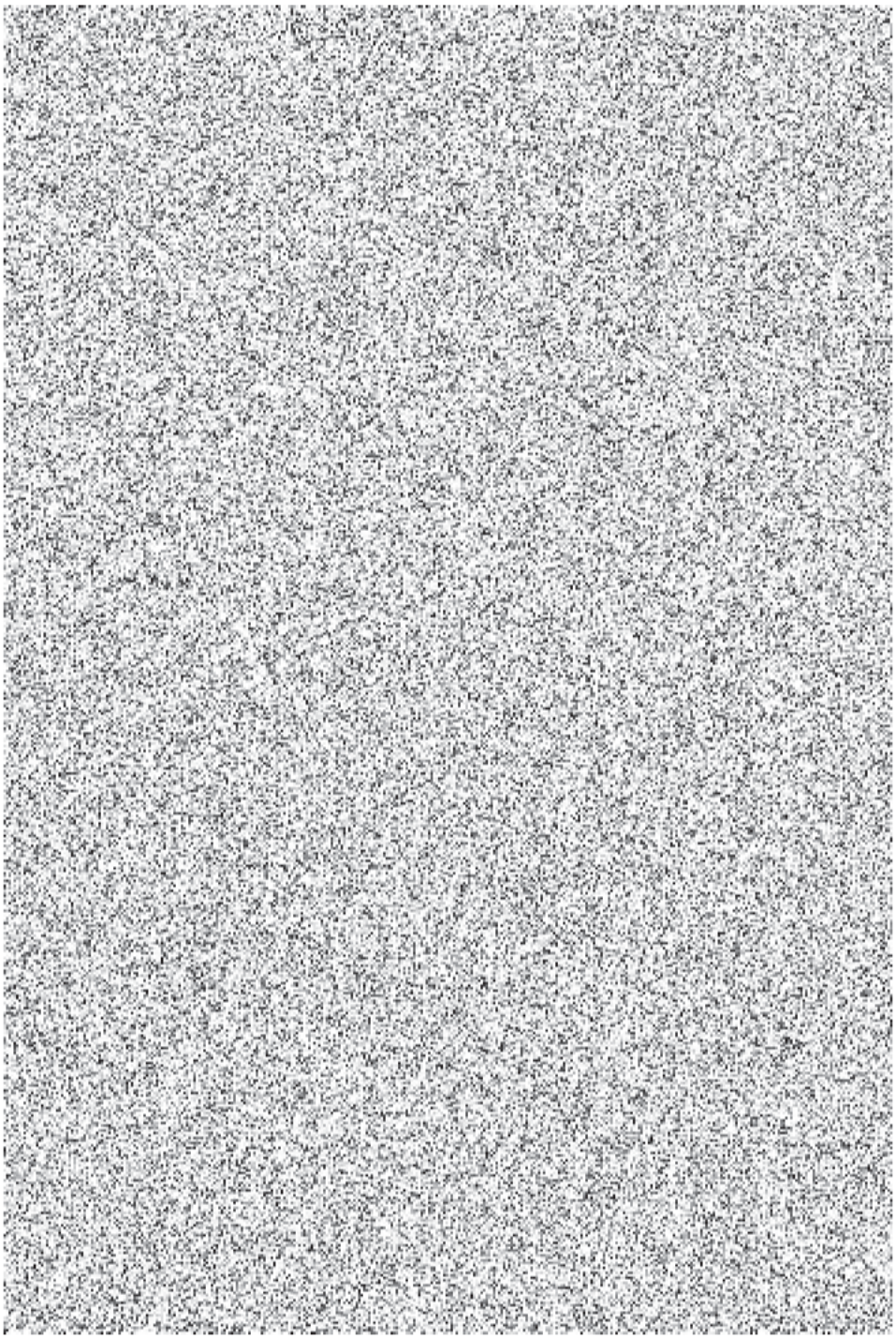
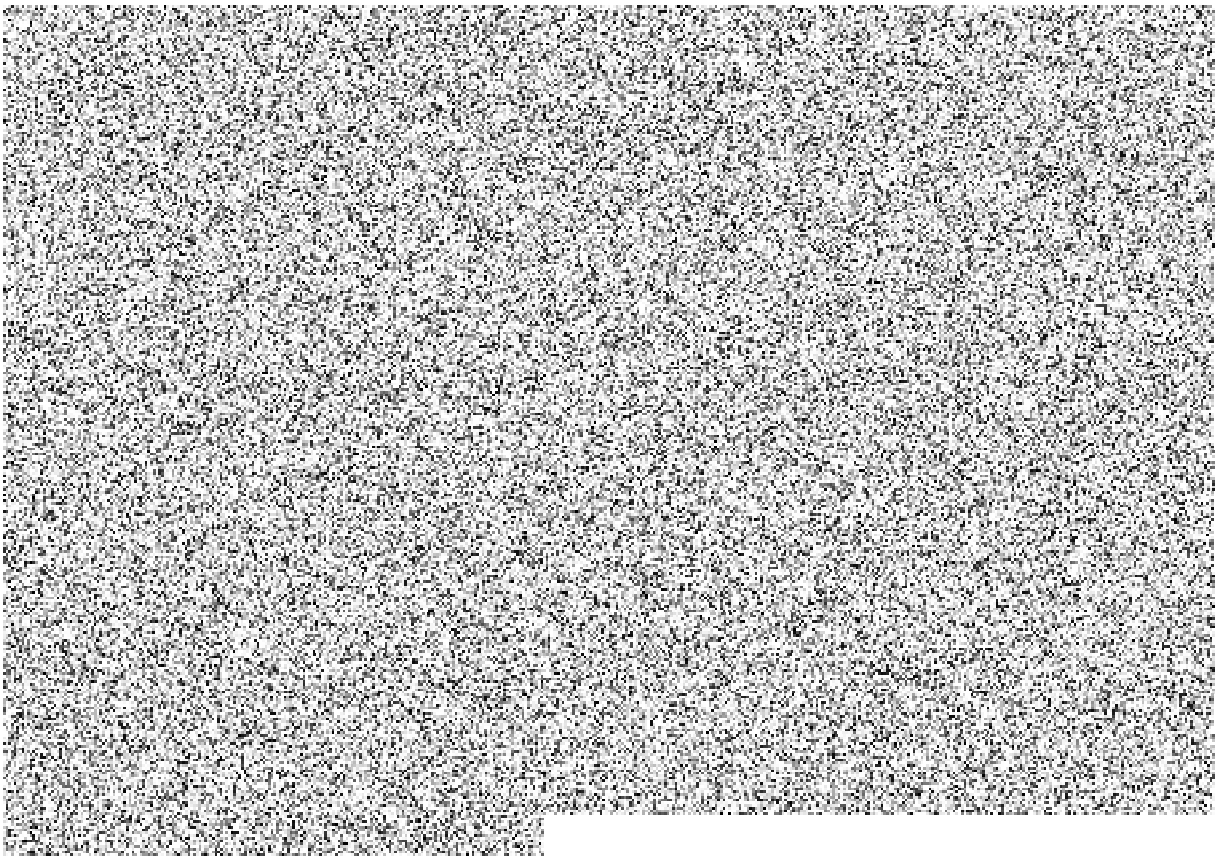


Figure A.7 Grid/Guide Thimble and Instrument Tube Joint & Connection



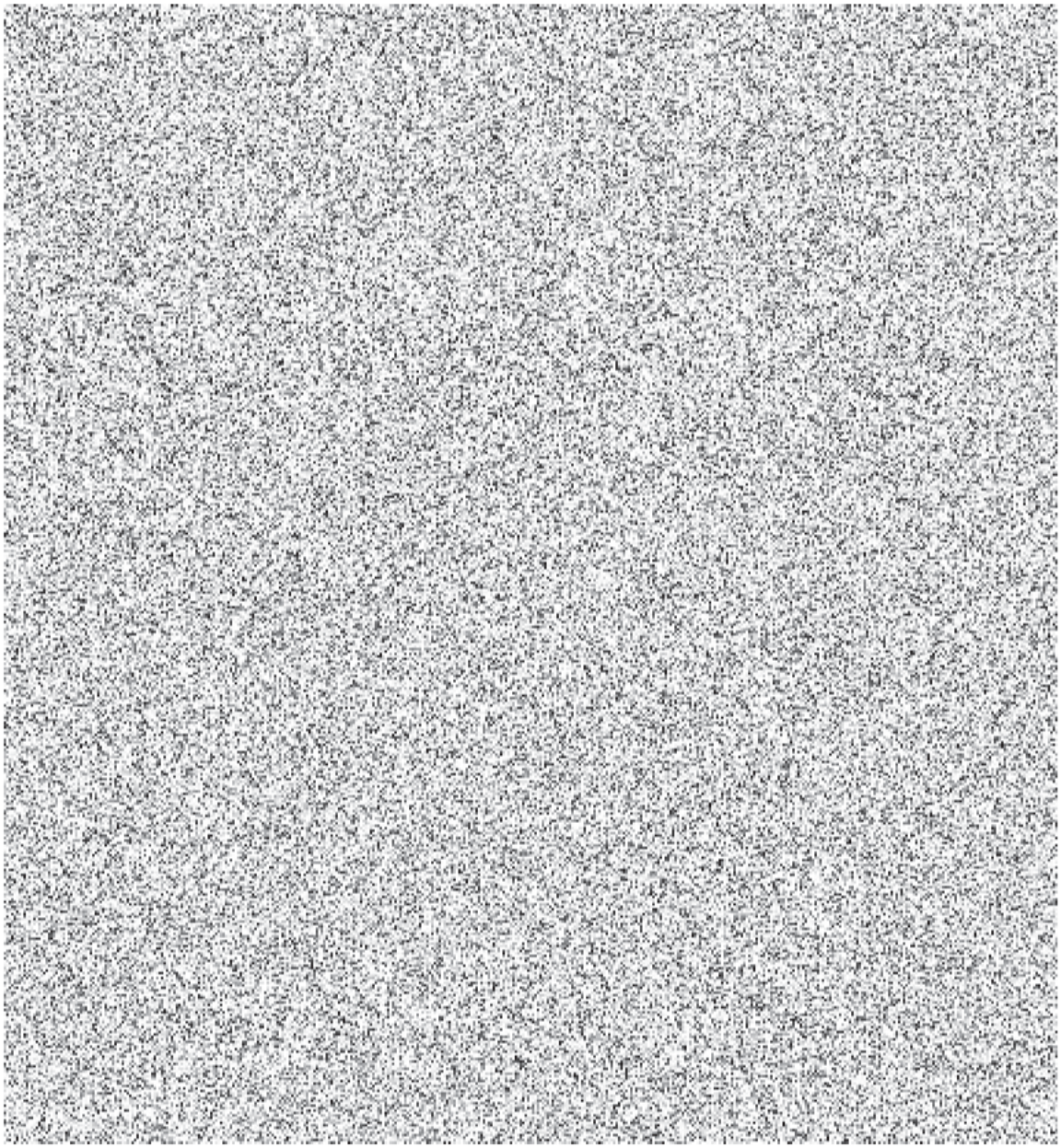
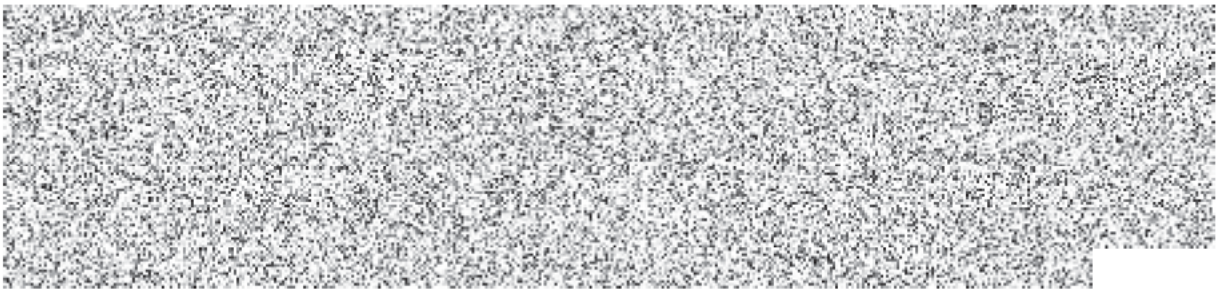


Figure A.8 Top Nozzle



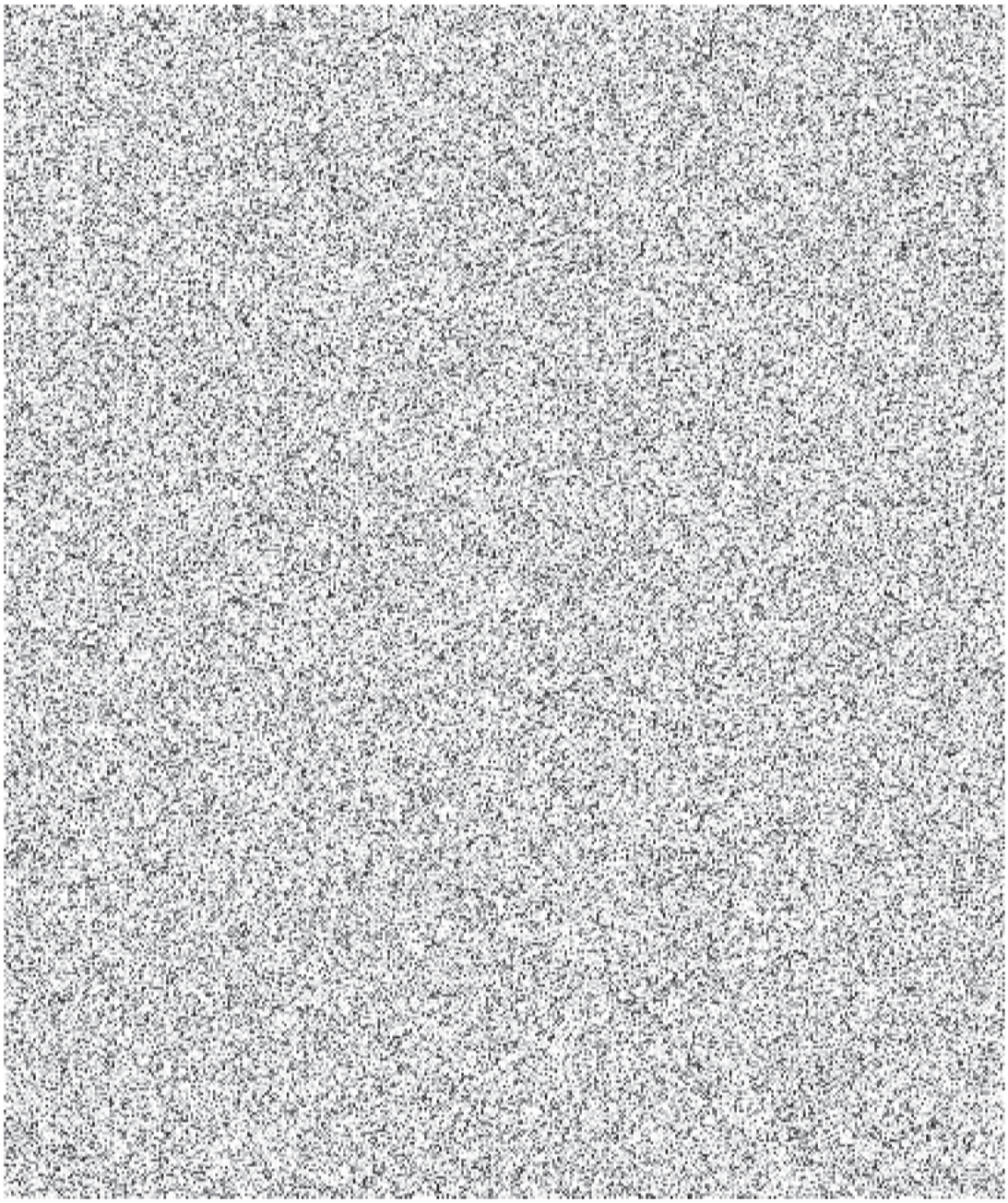


Figure A.9 Bottom Nozzle

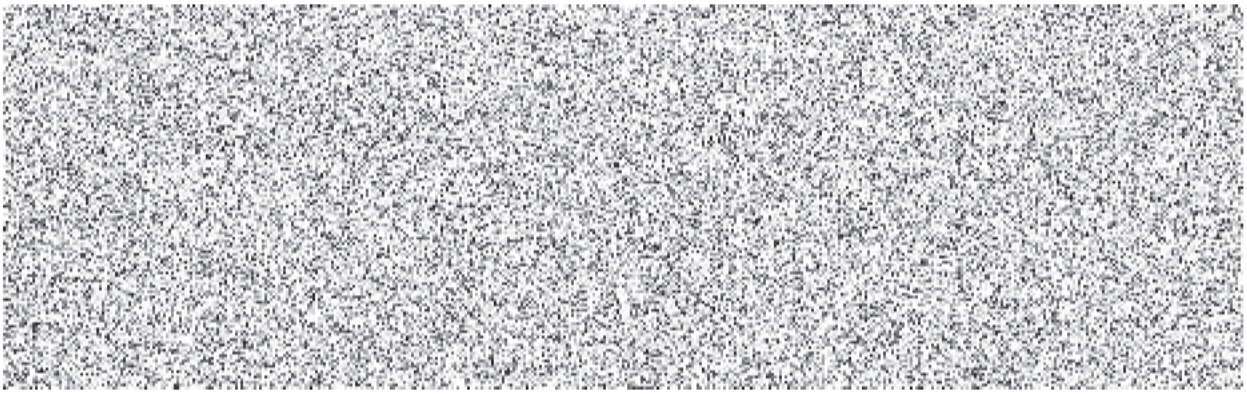


Figure A.10 Skeleton Assembly

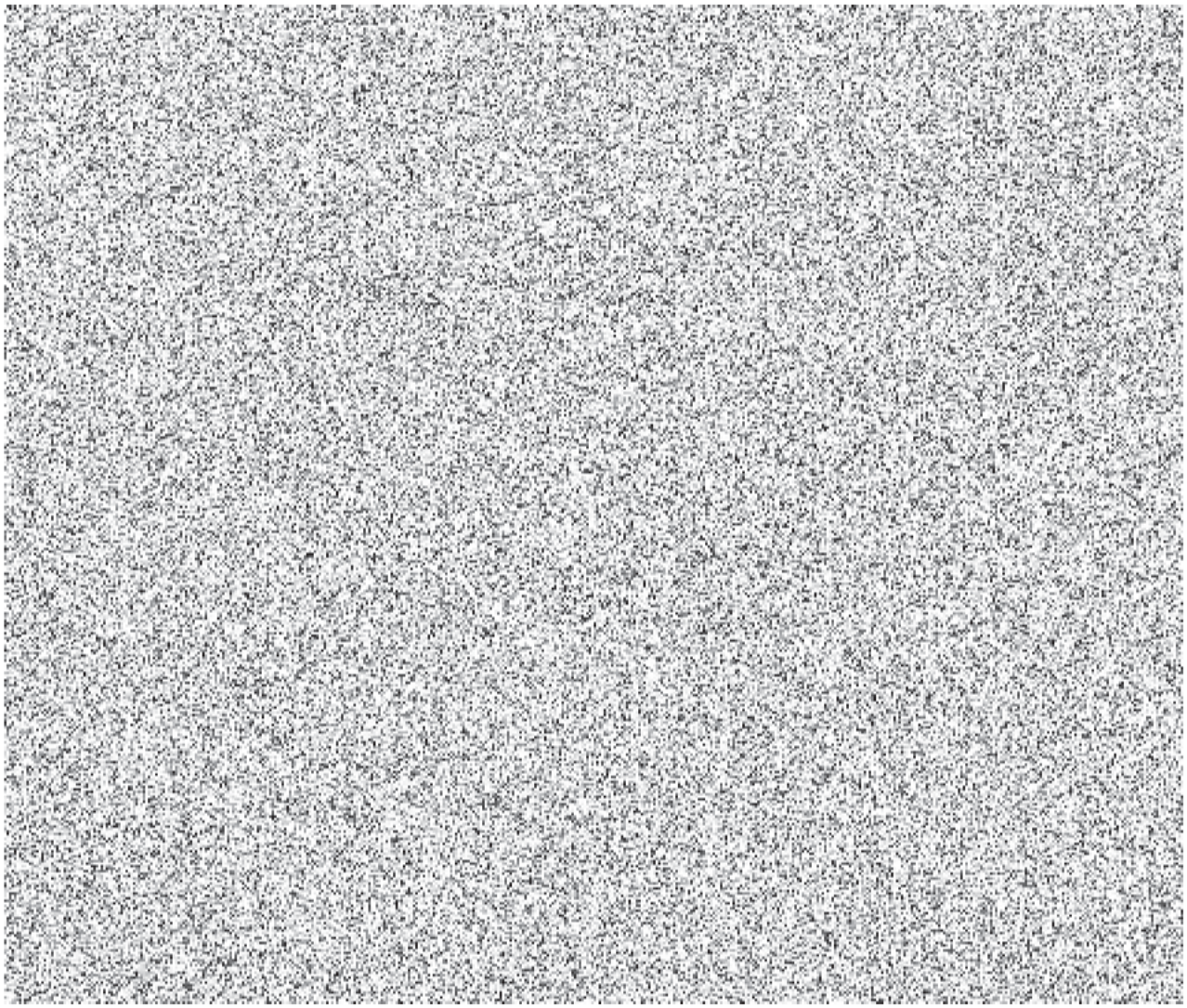
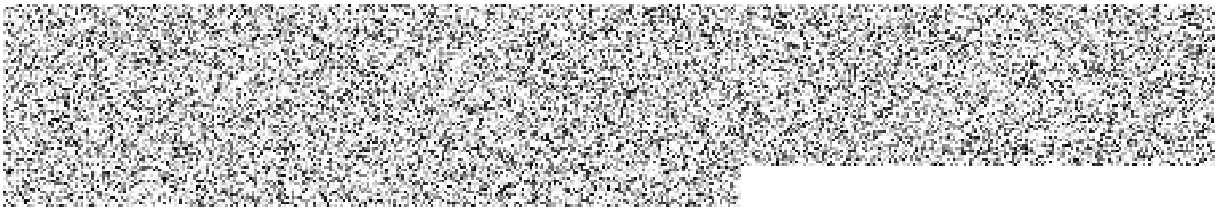
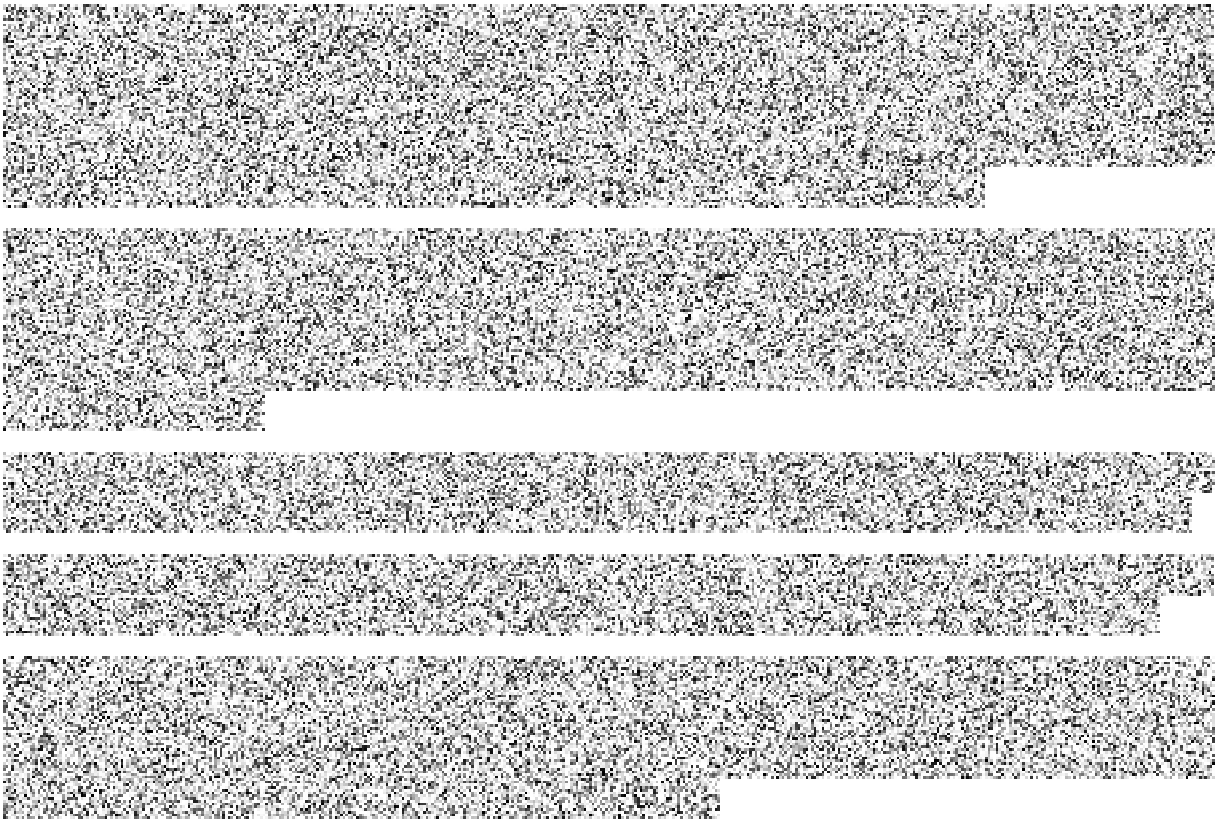


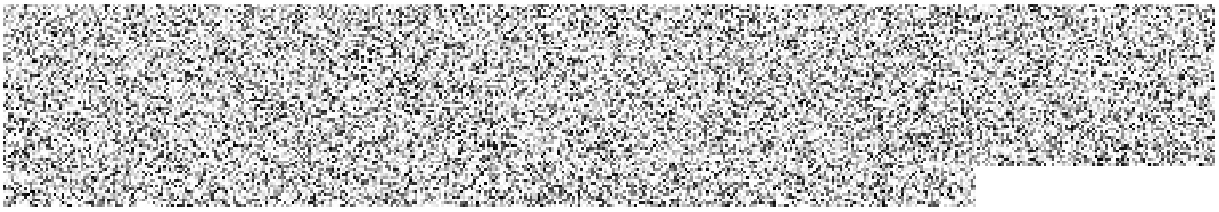
Figure A.11 Fuel Rod (left) and Burnable Absorber Rod (right)



A.2.3 DESCRIPTION OF CONTROL ELEMENT ASSEMBLY



A.2.4 DESCRIPTION OF NEUTRON SOURCE ASSEMBLY



A.3 NOT USED

A.4 TECHNICAL DATA

A.4.1 TECHNICAL DATA SHEETS

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Table A.4.1: Fuel Assembly Parameters & Specifications

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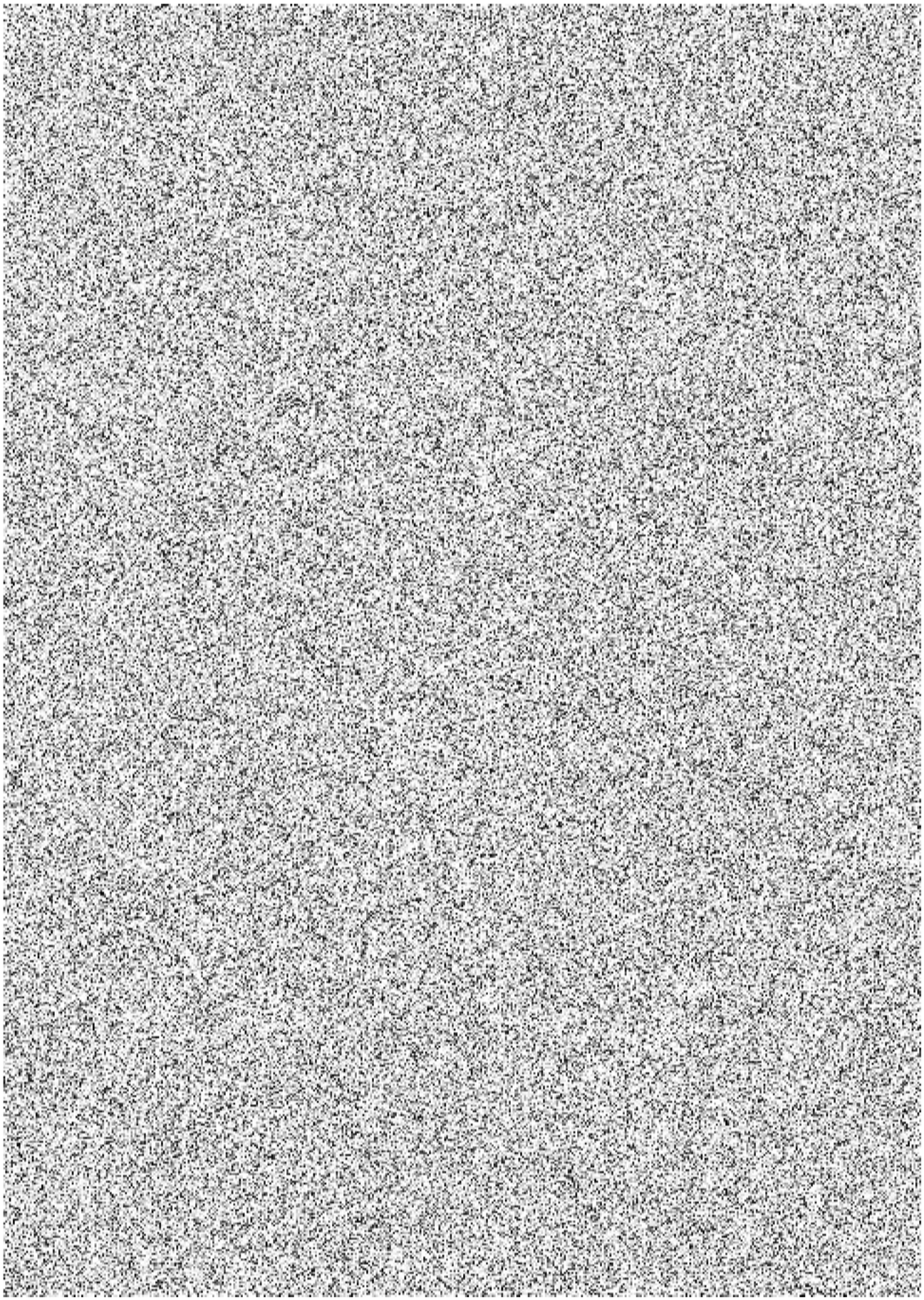
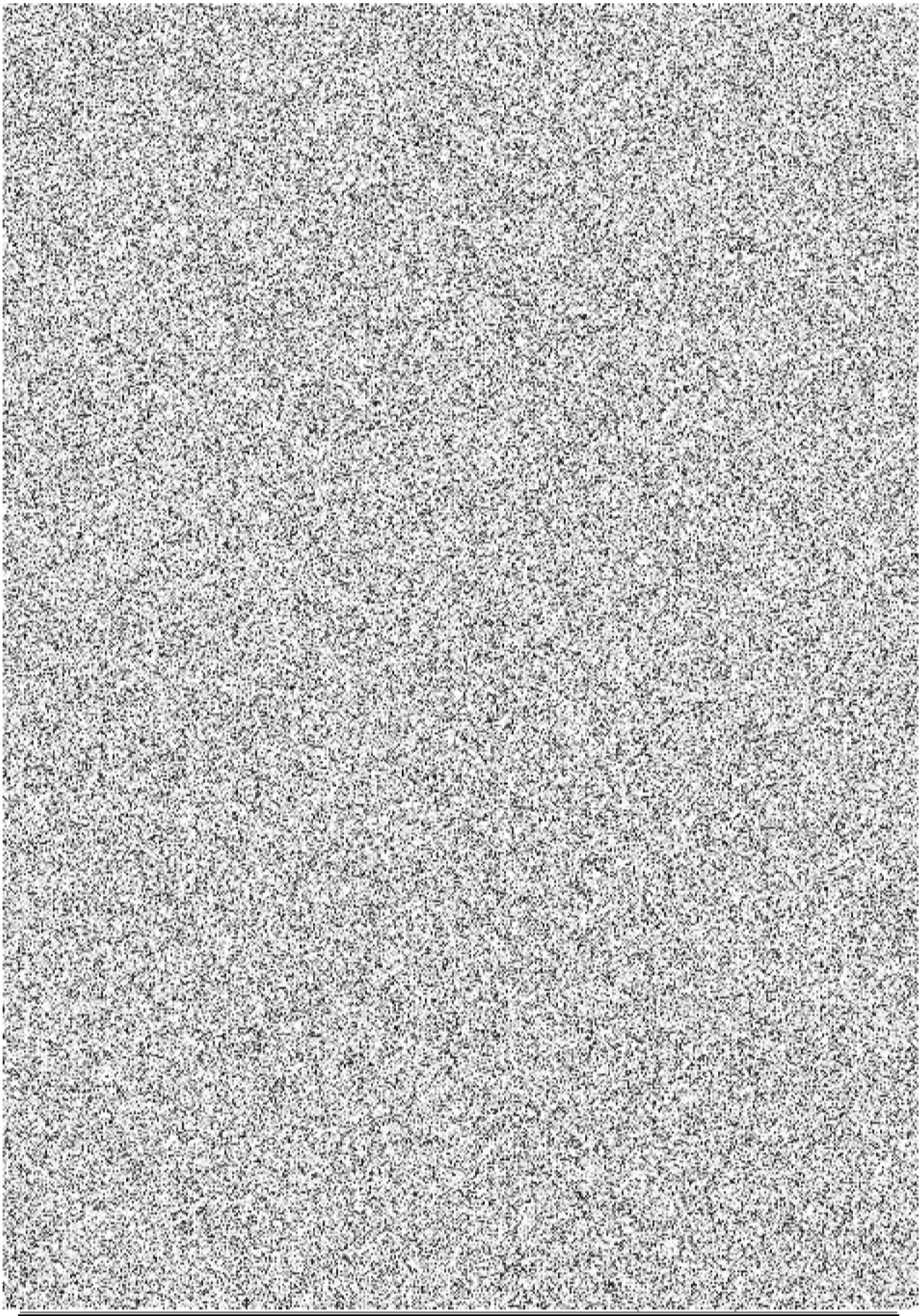
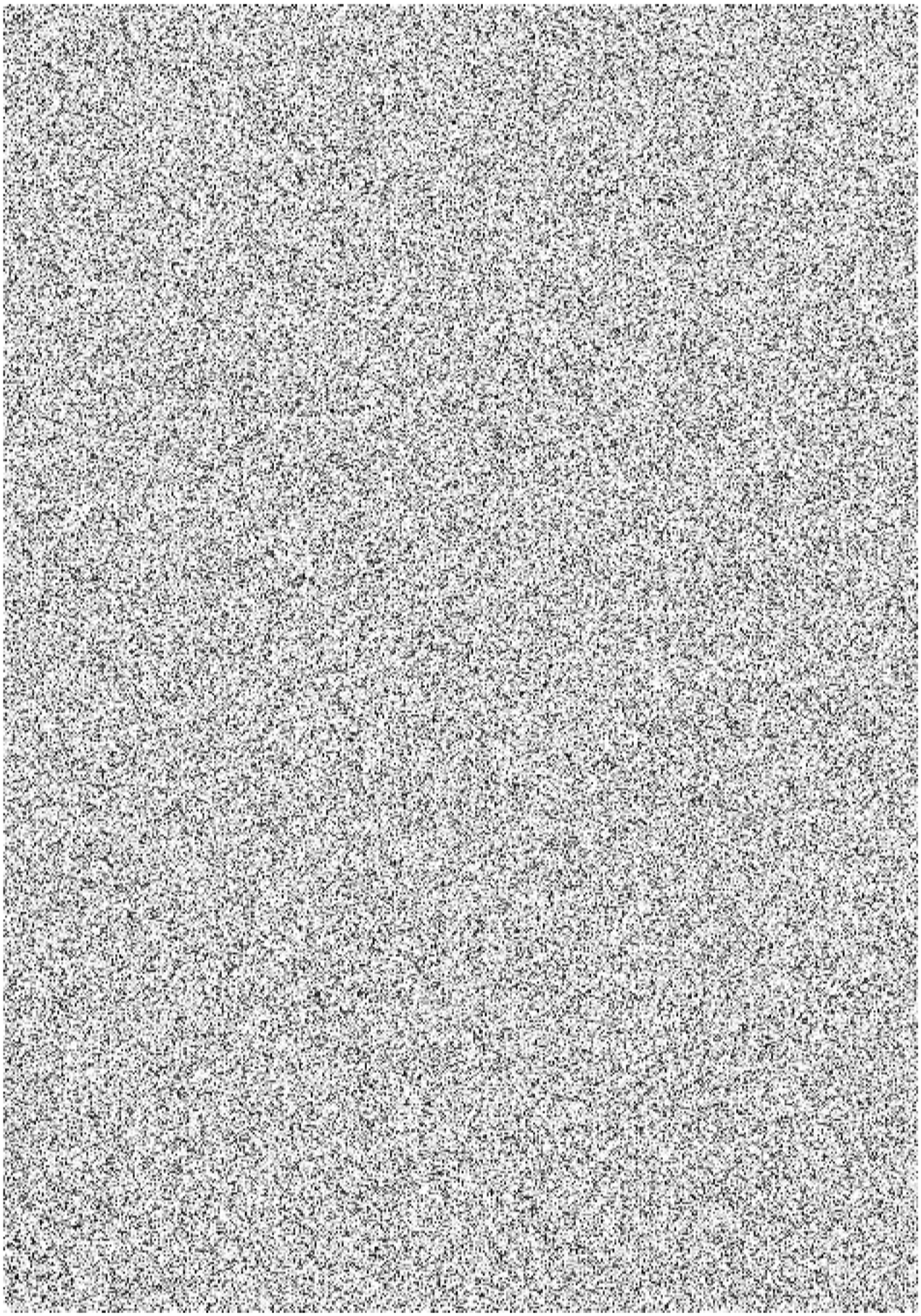
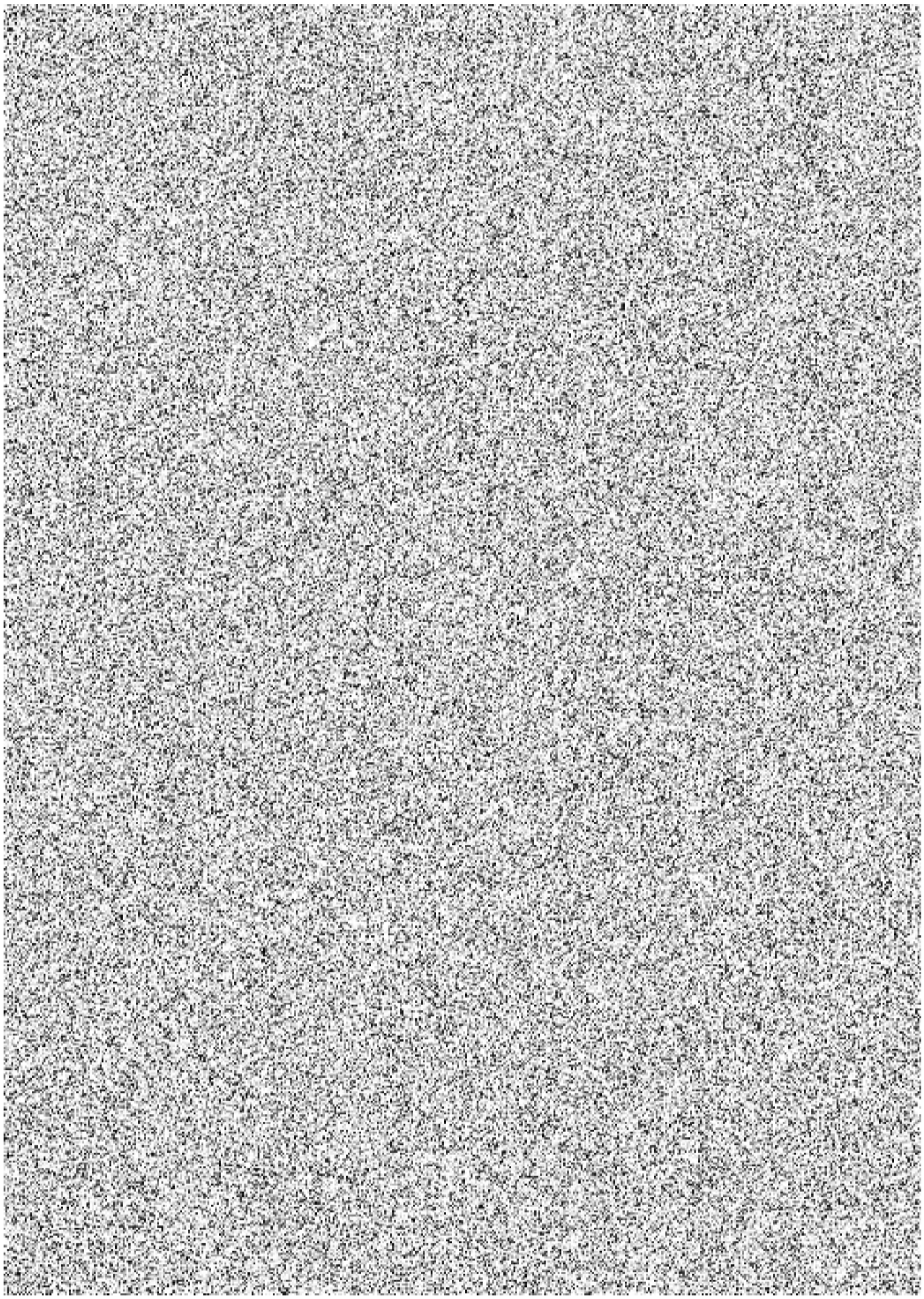
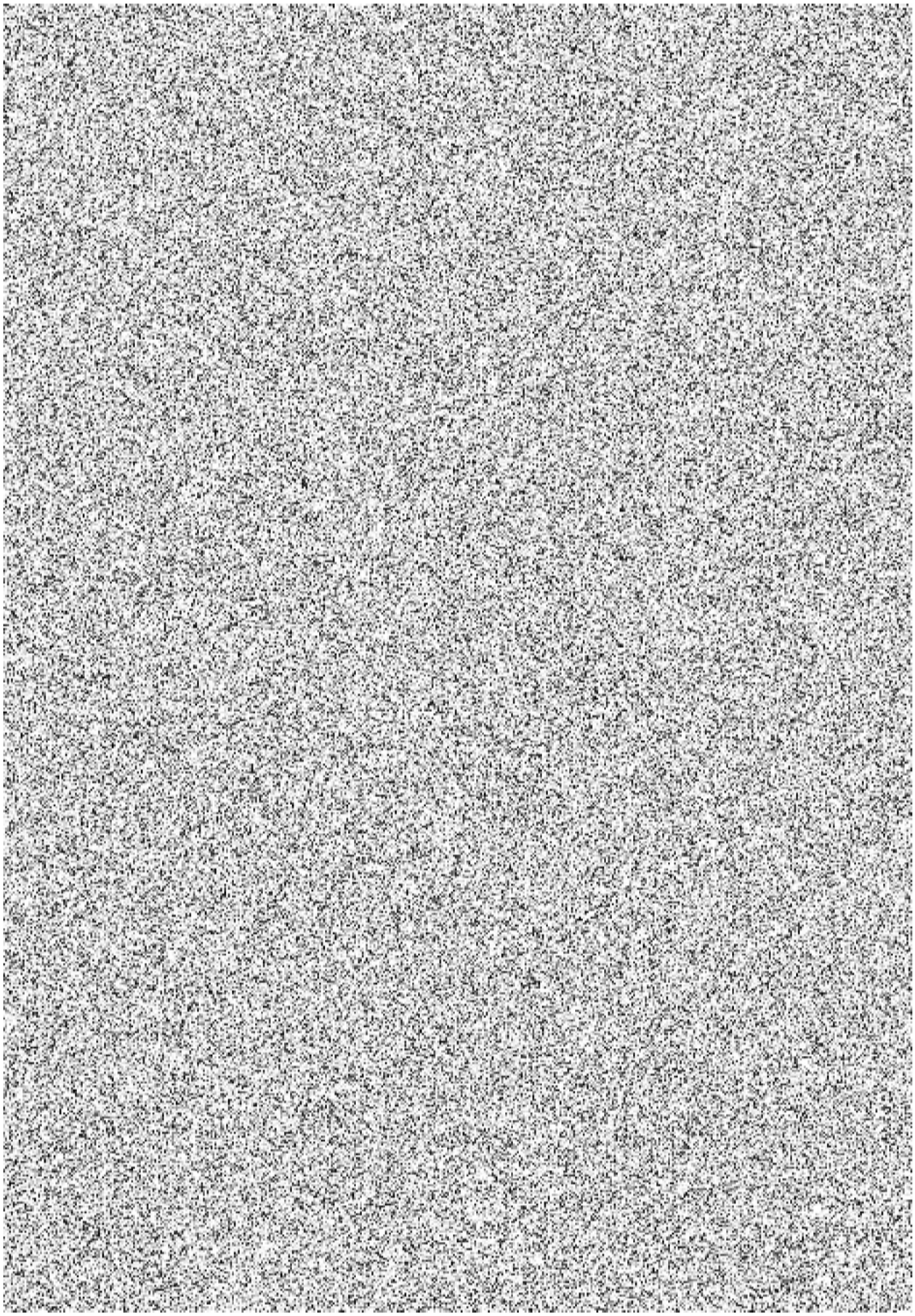
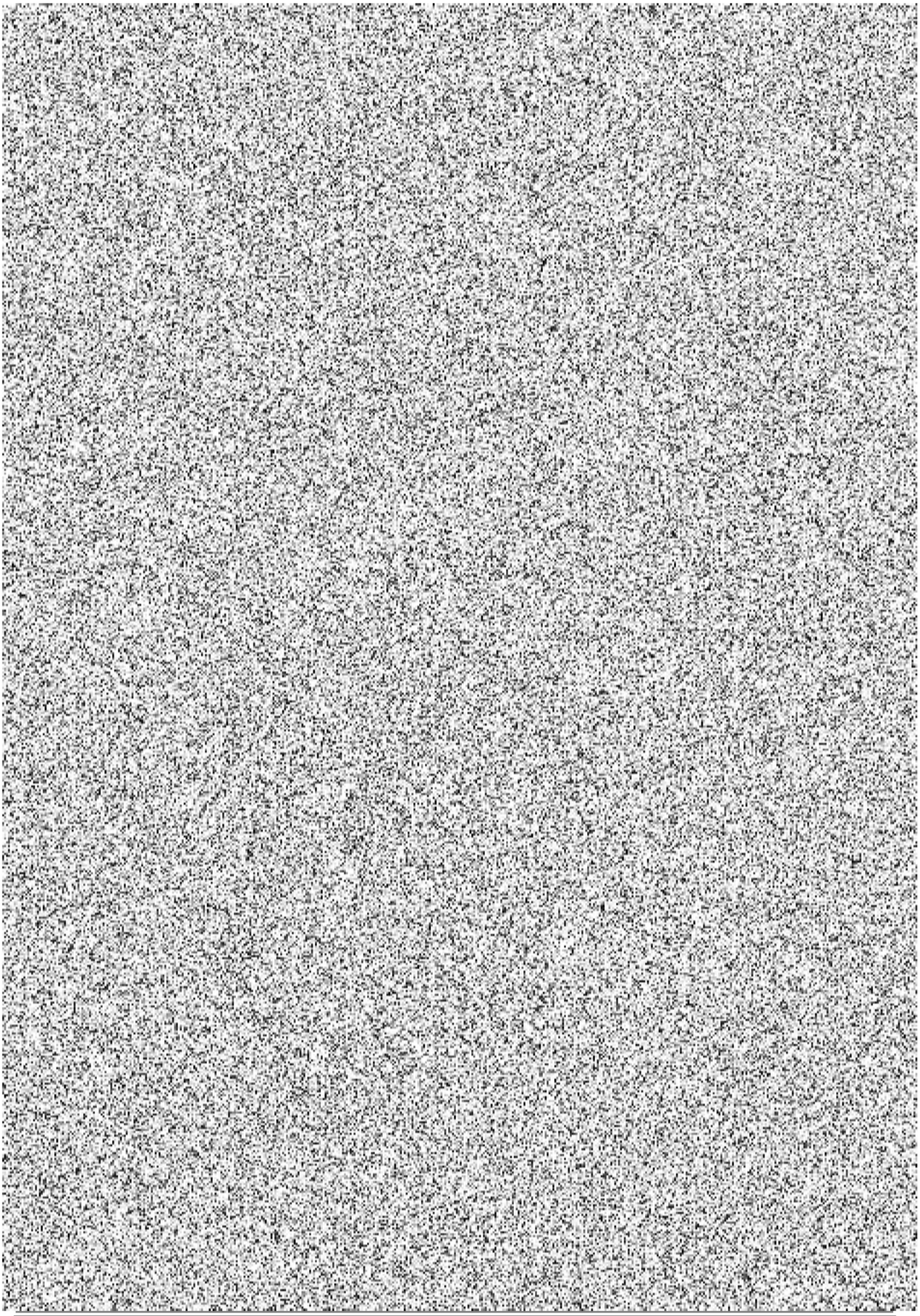


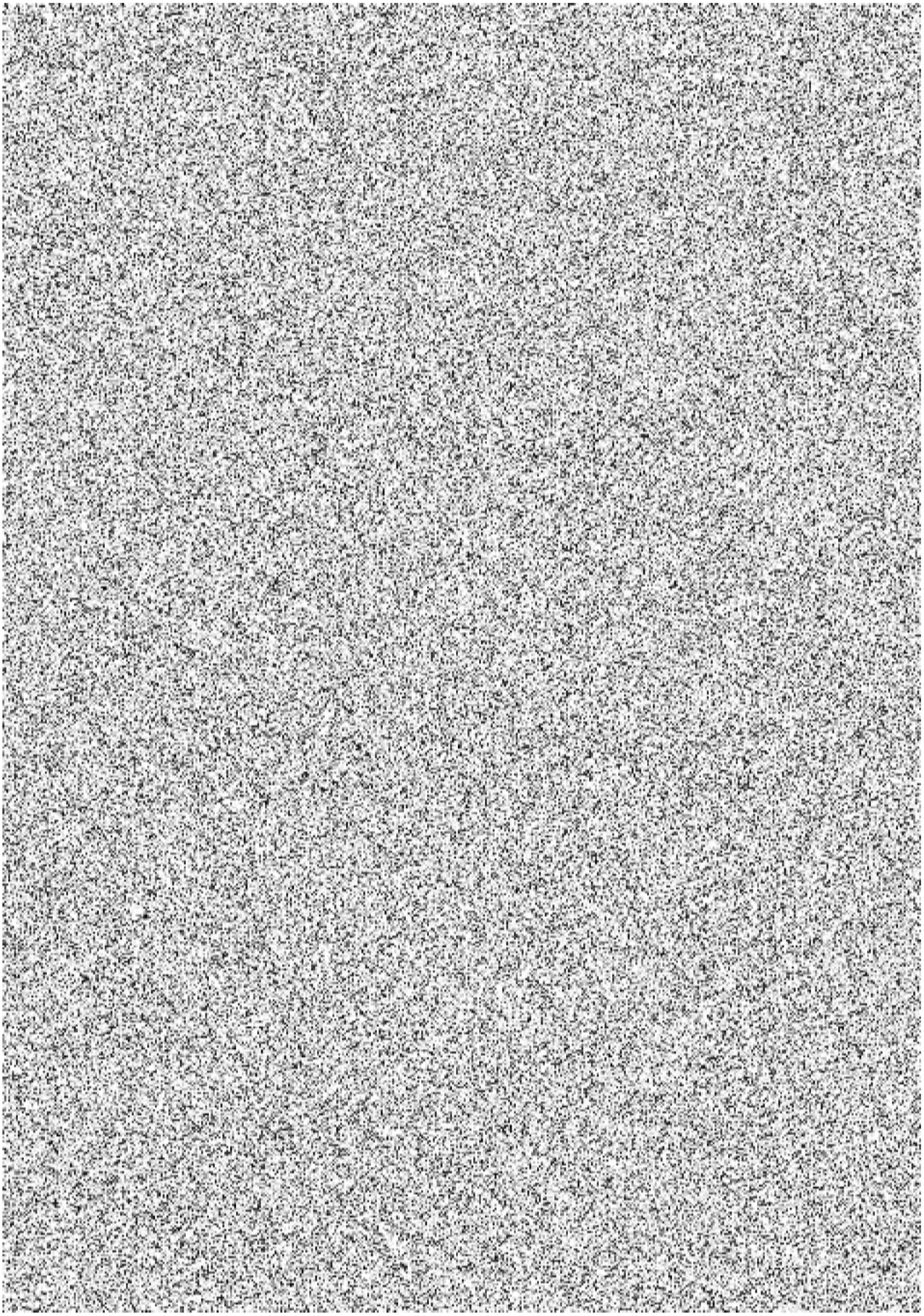


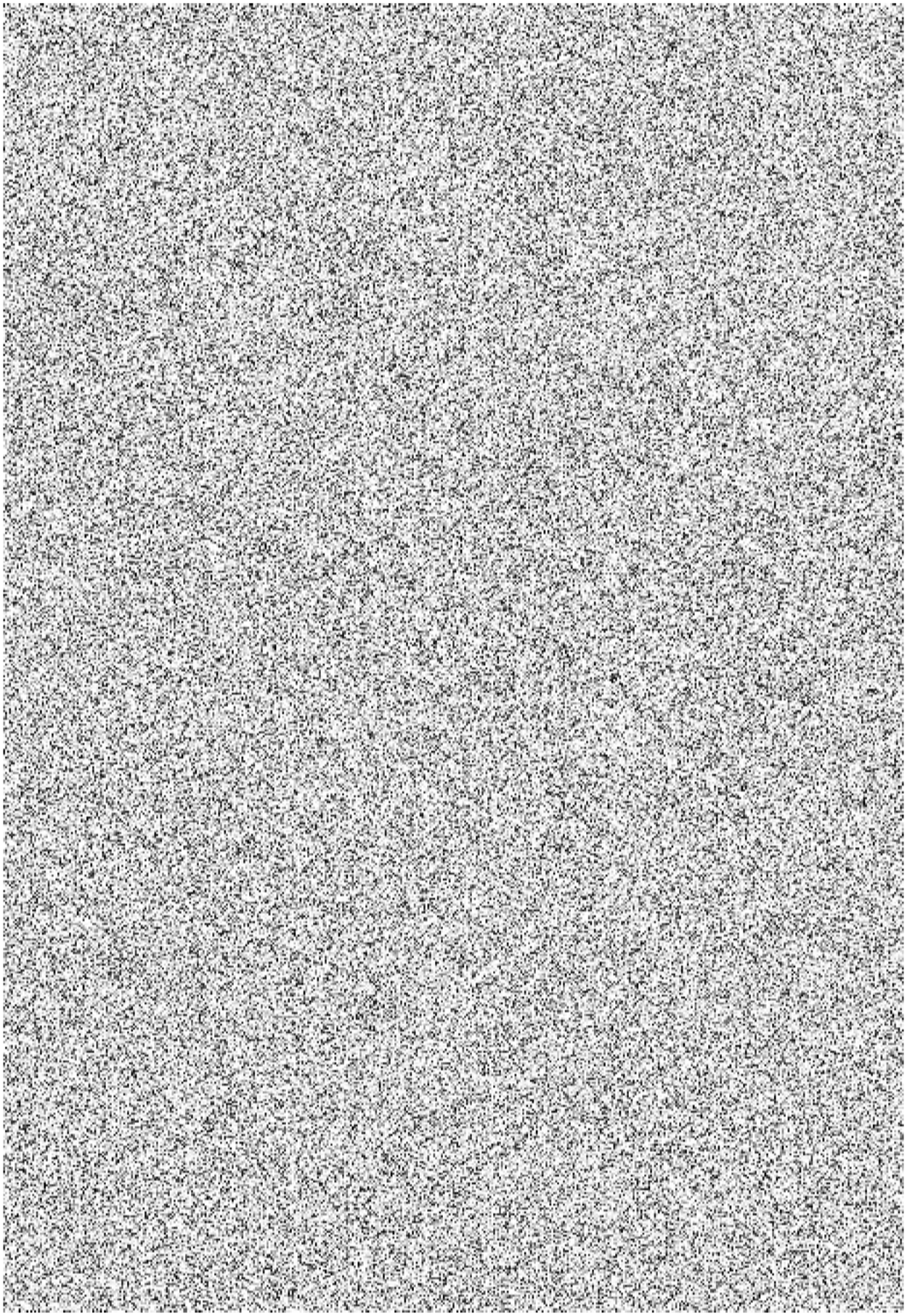


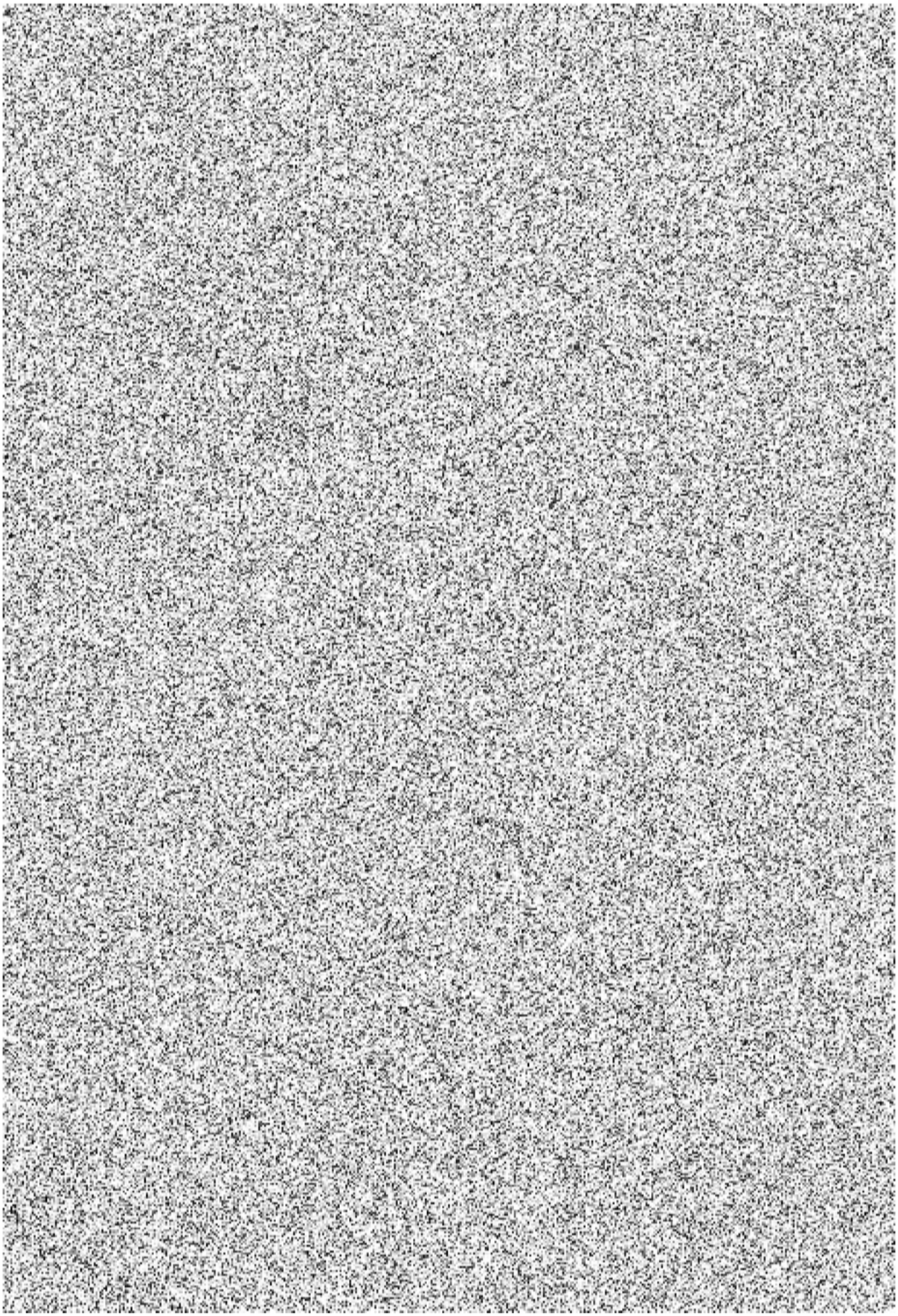


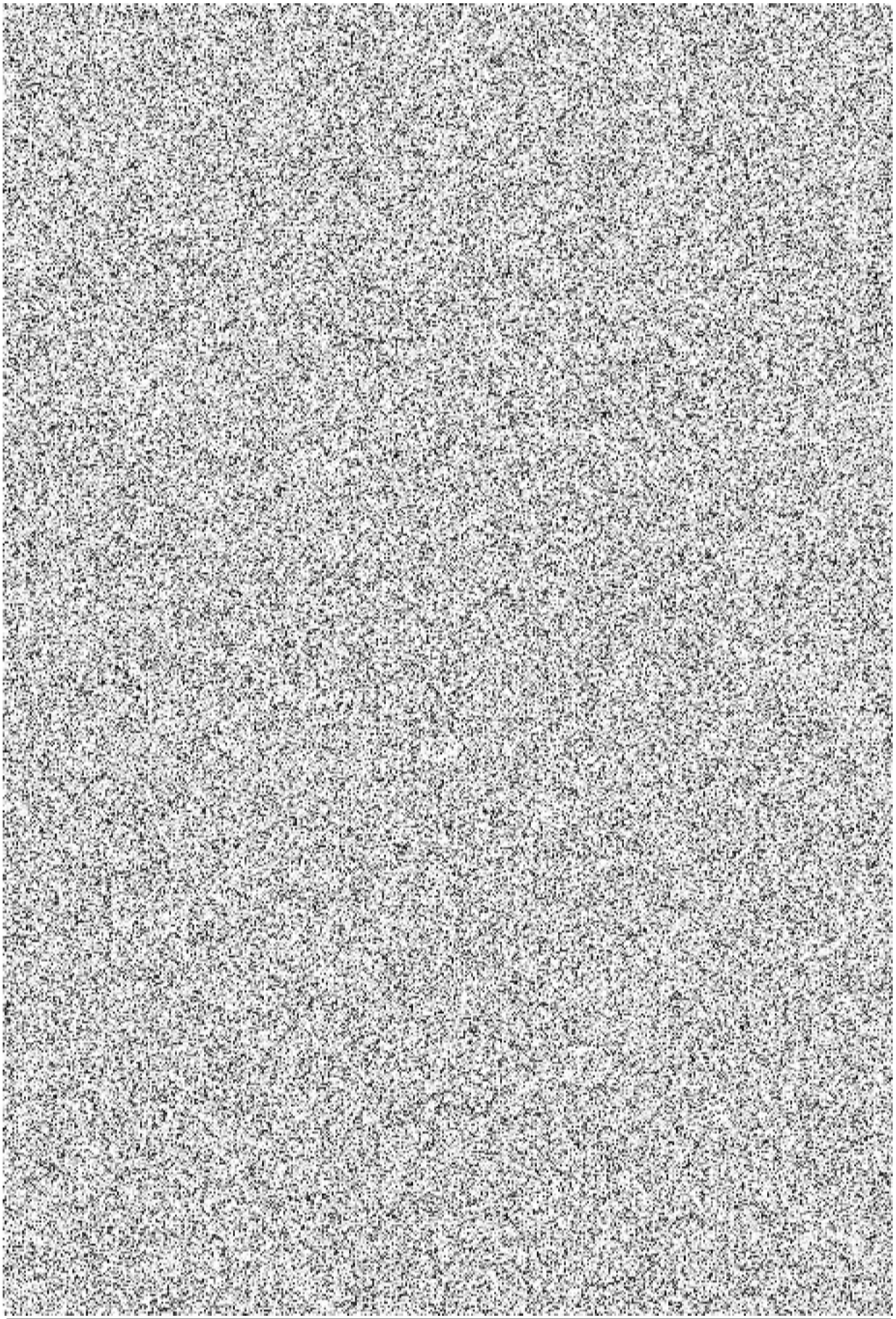


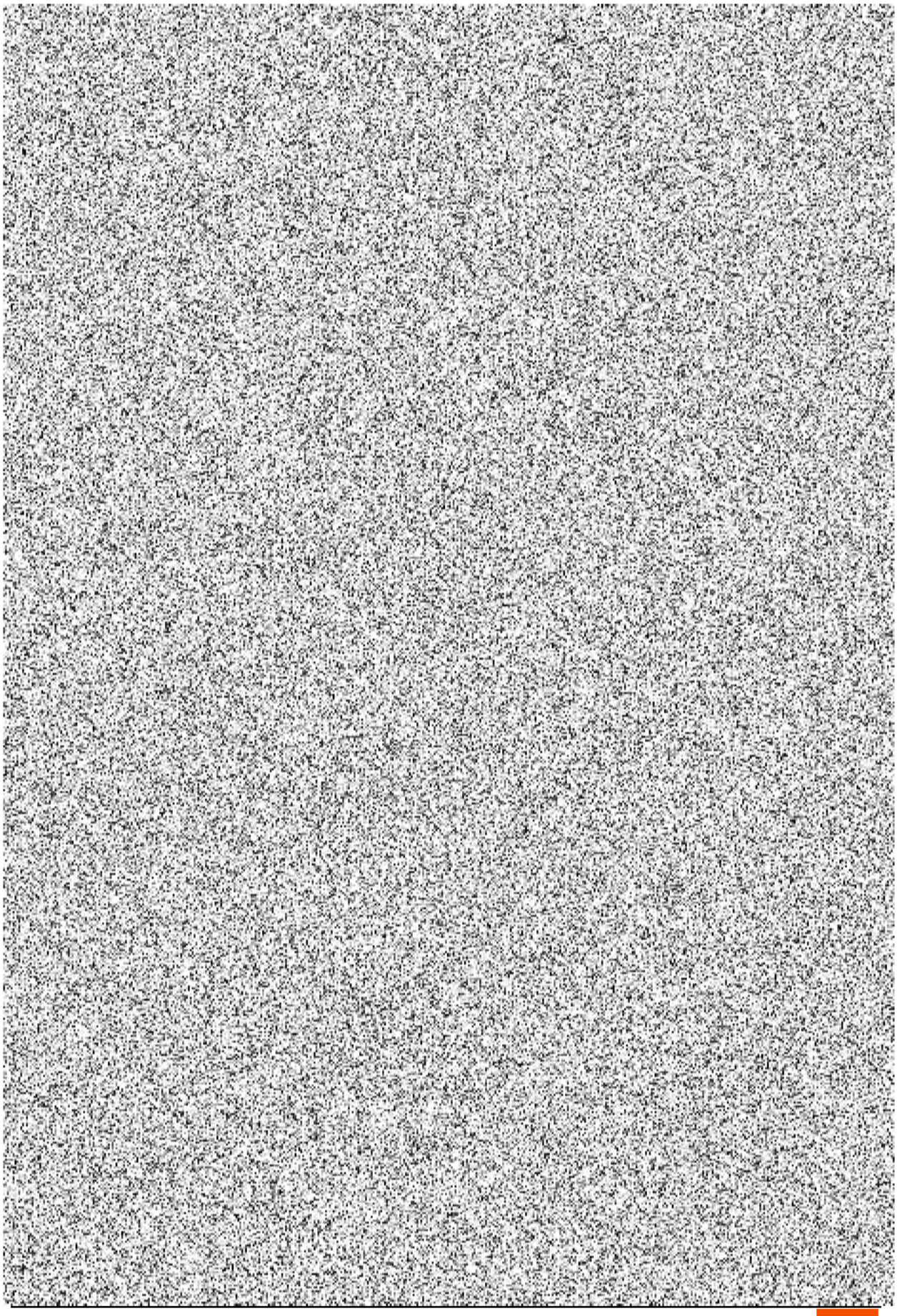












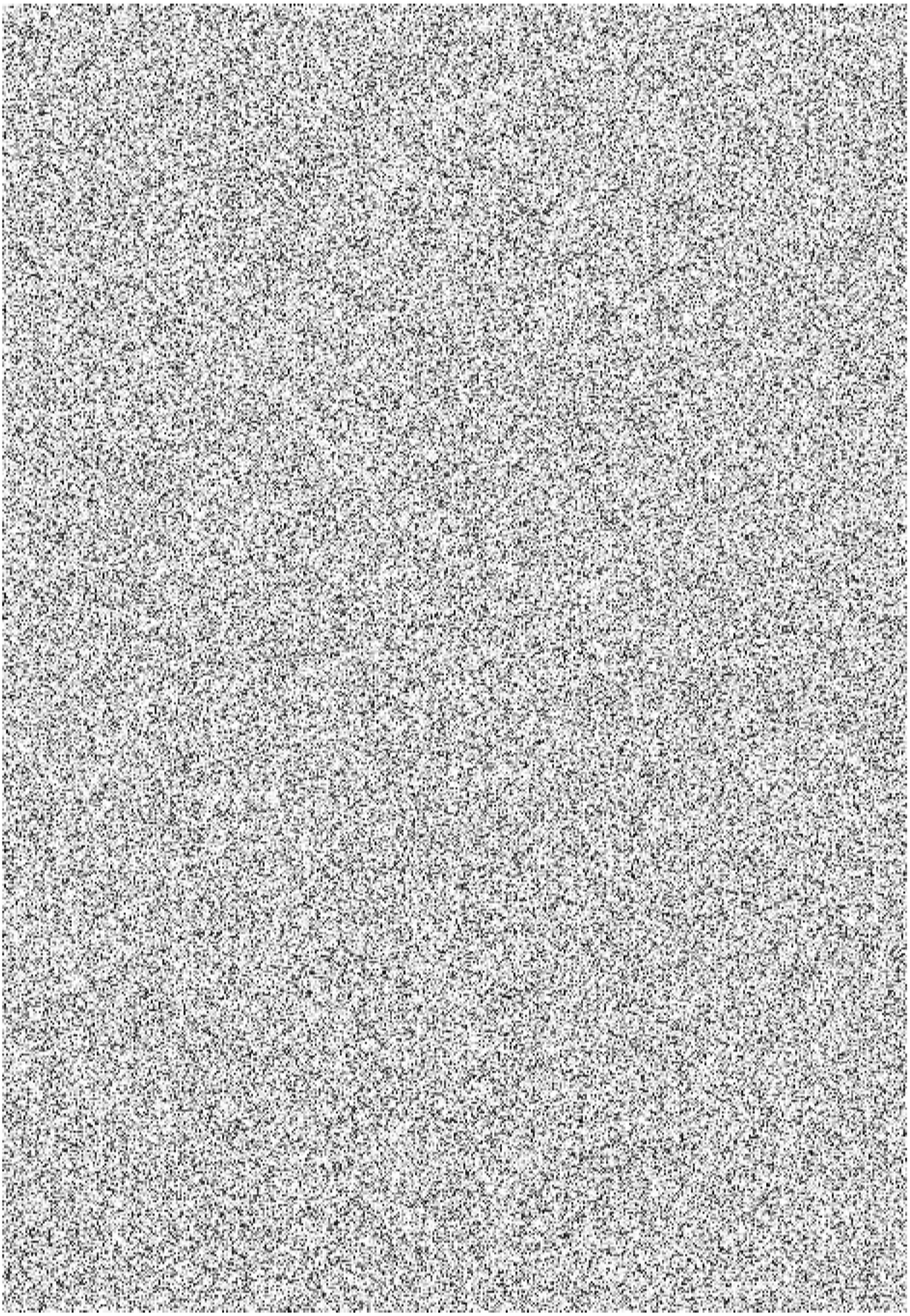
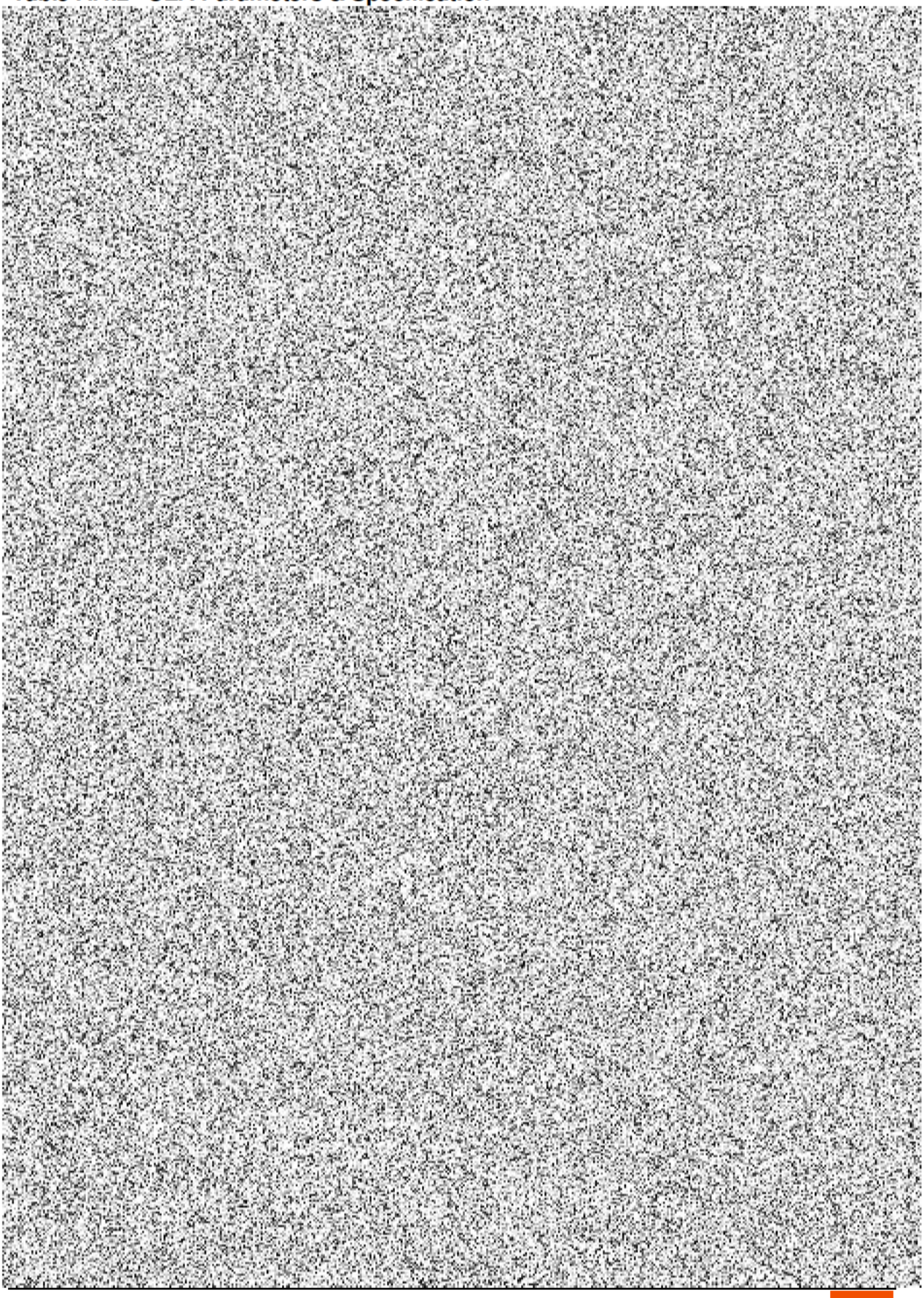
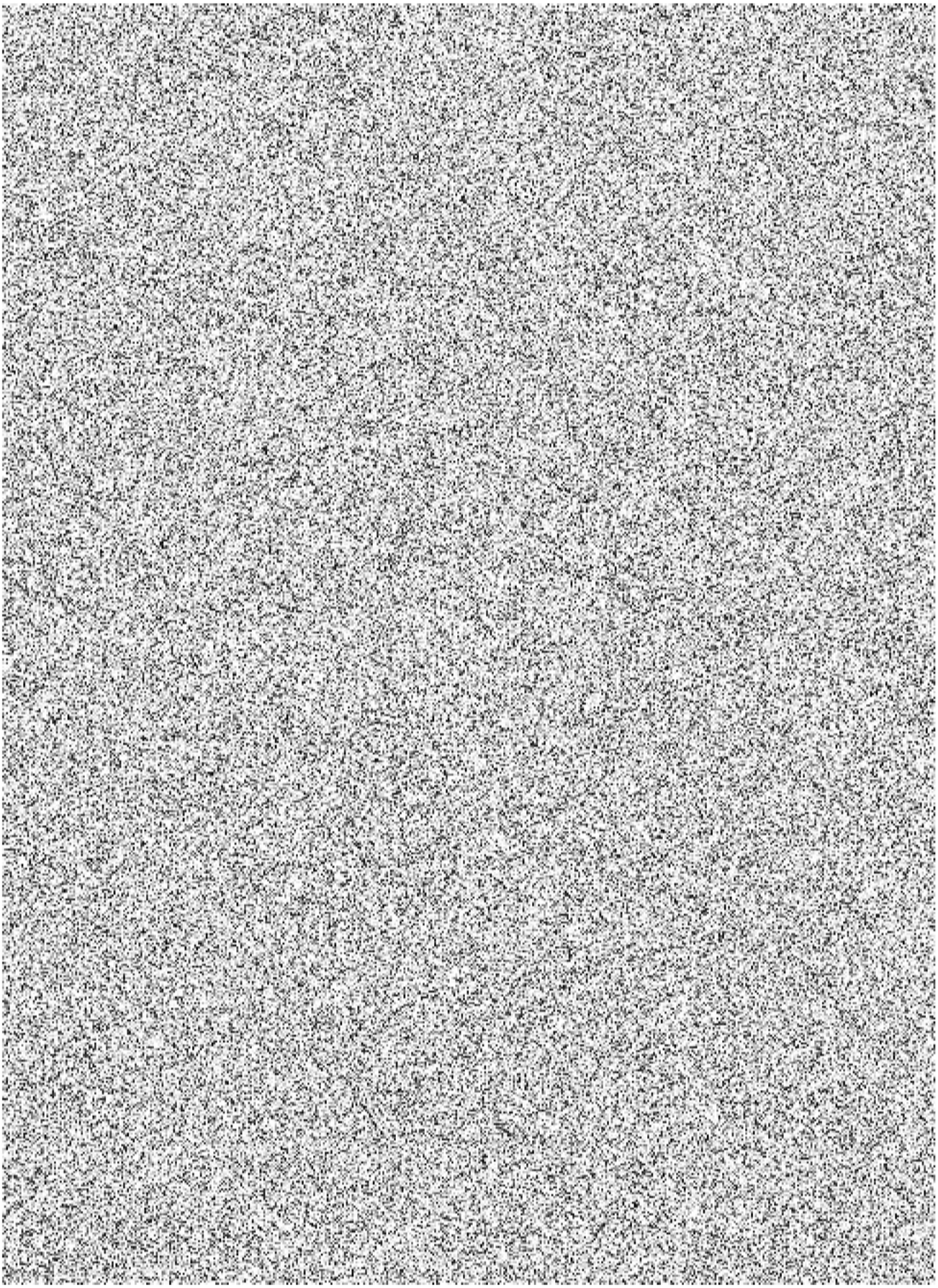
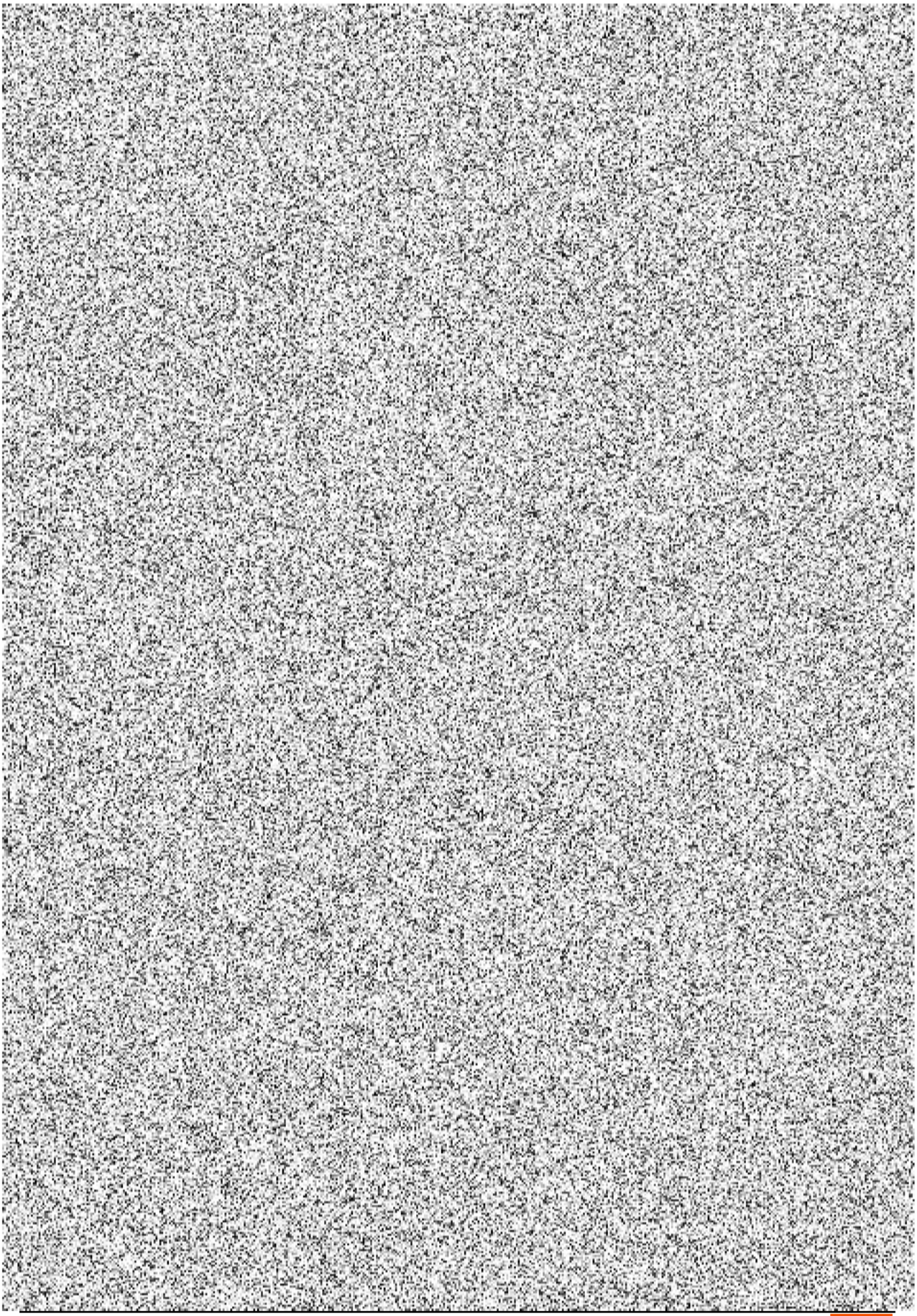
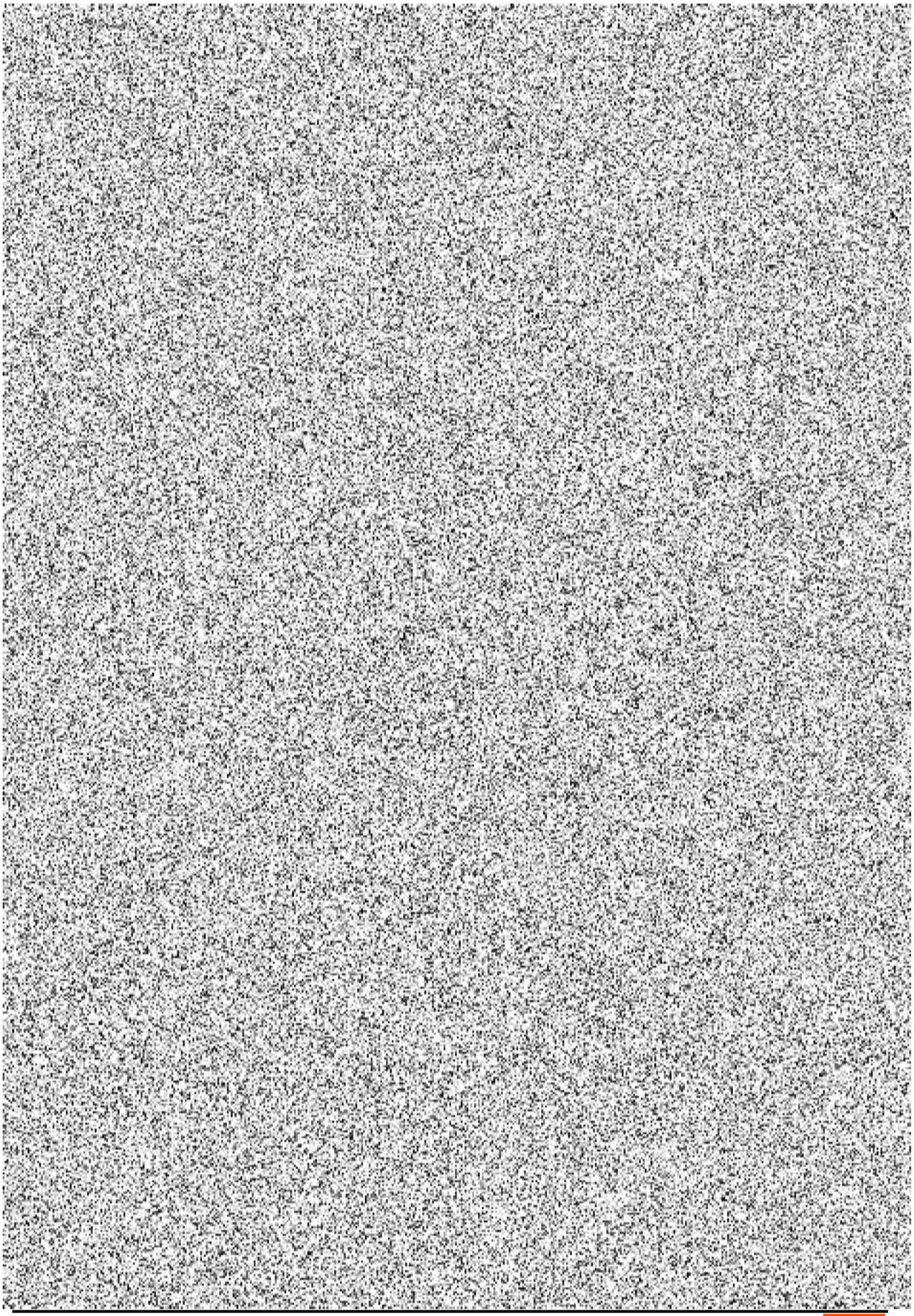


Table A.4.2 CEA Parameters & Specification









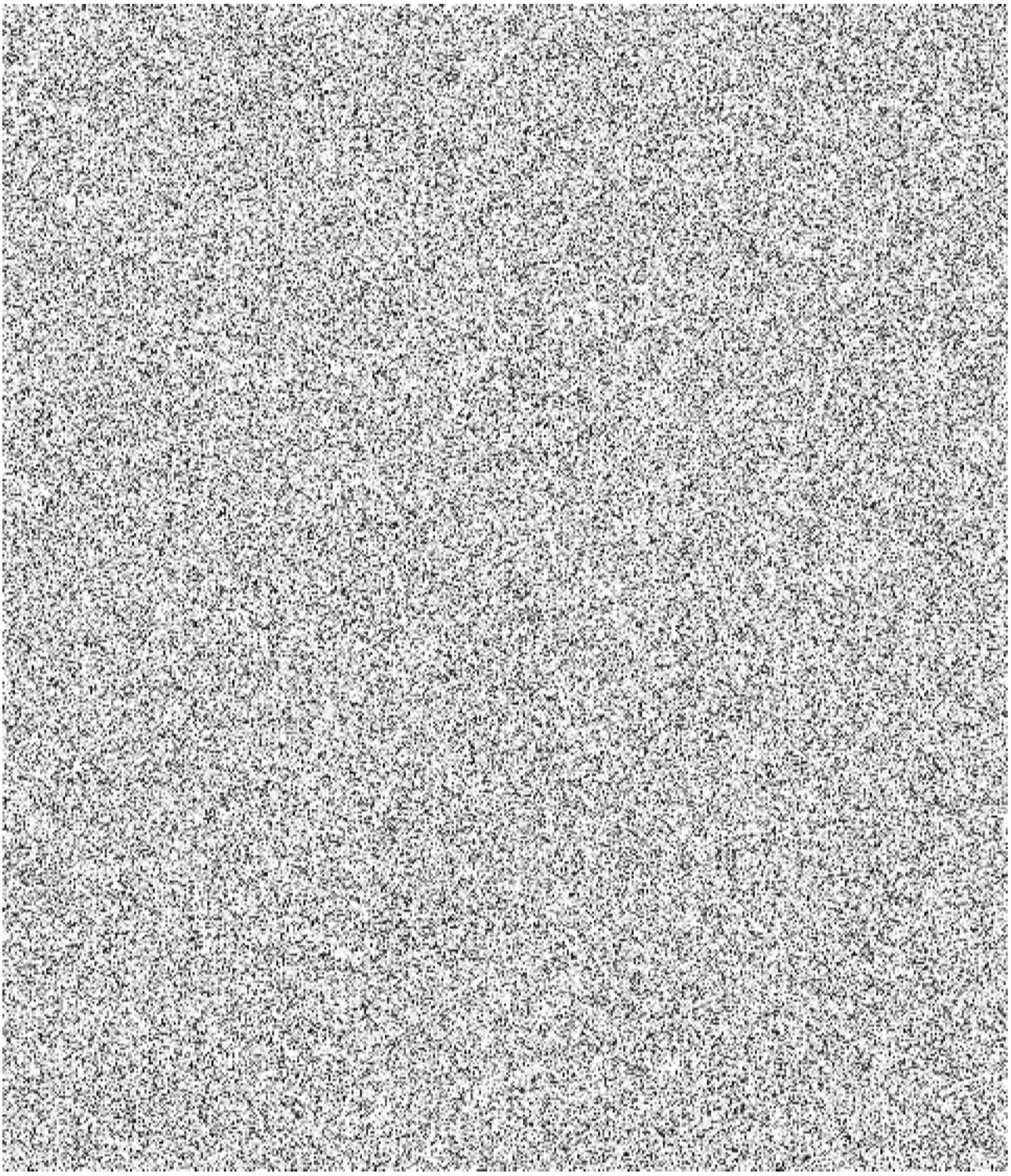
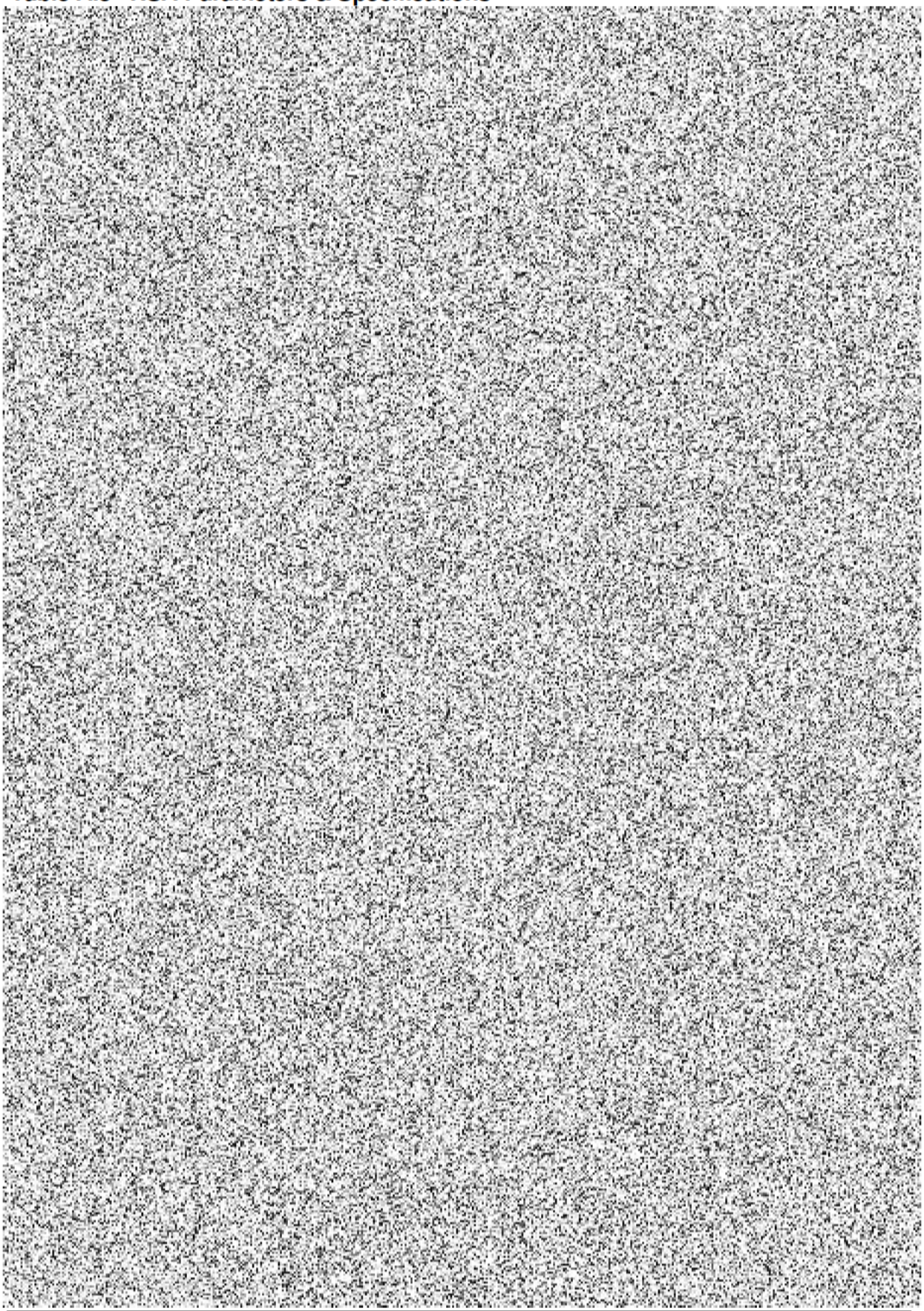
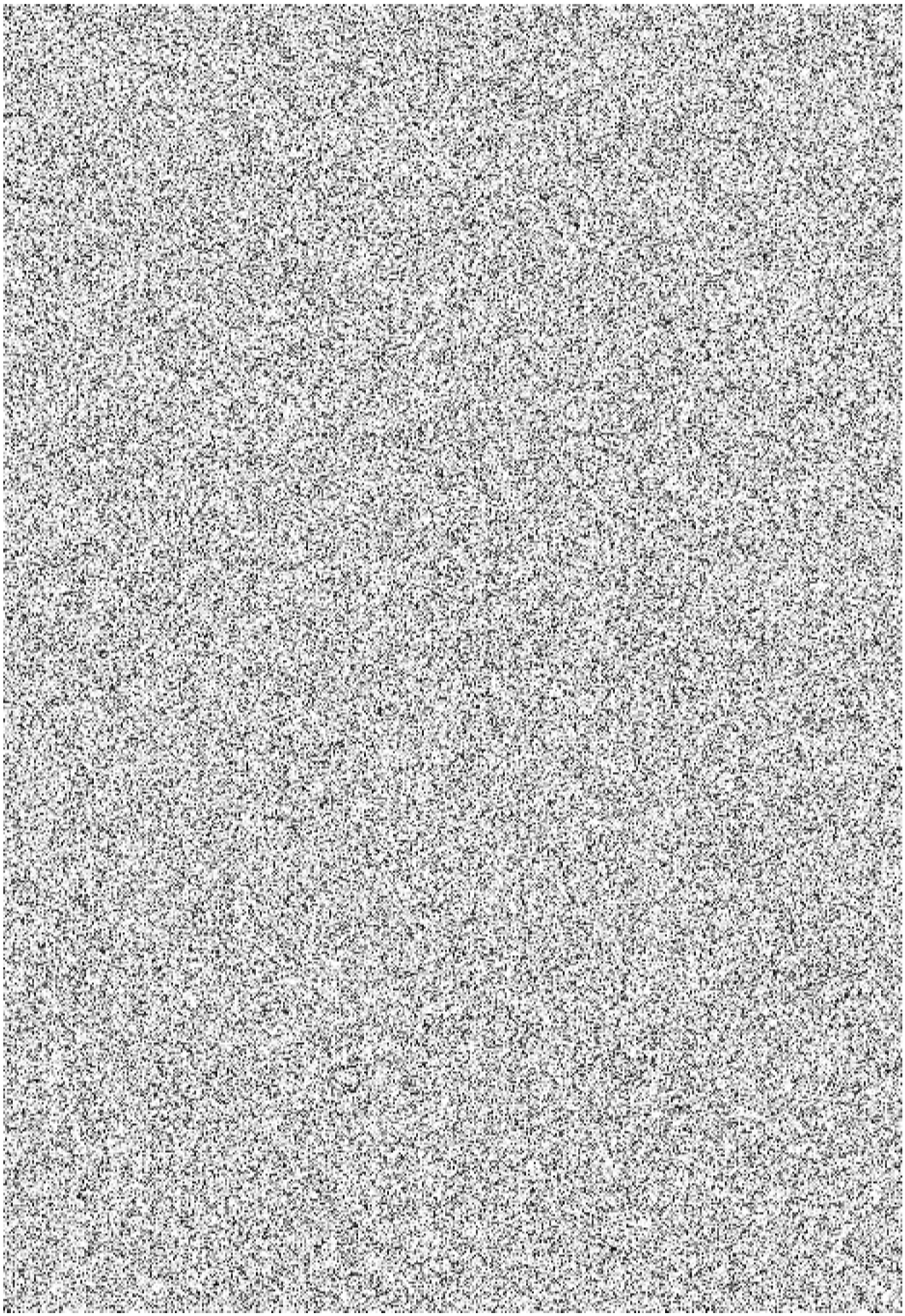
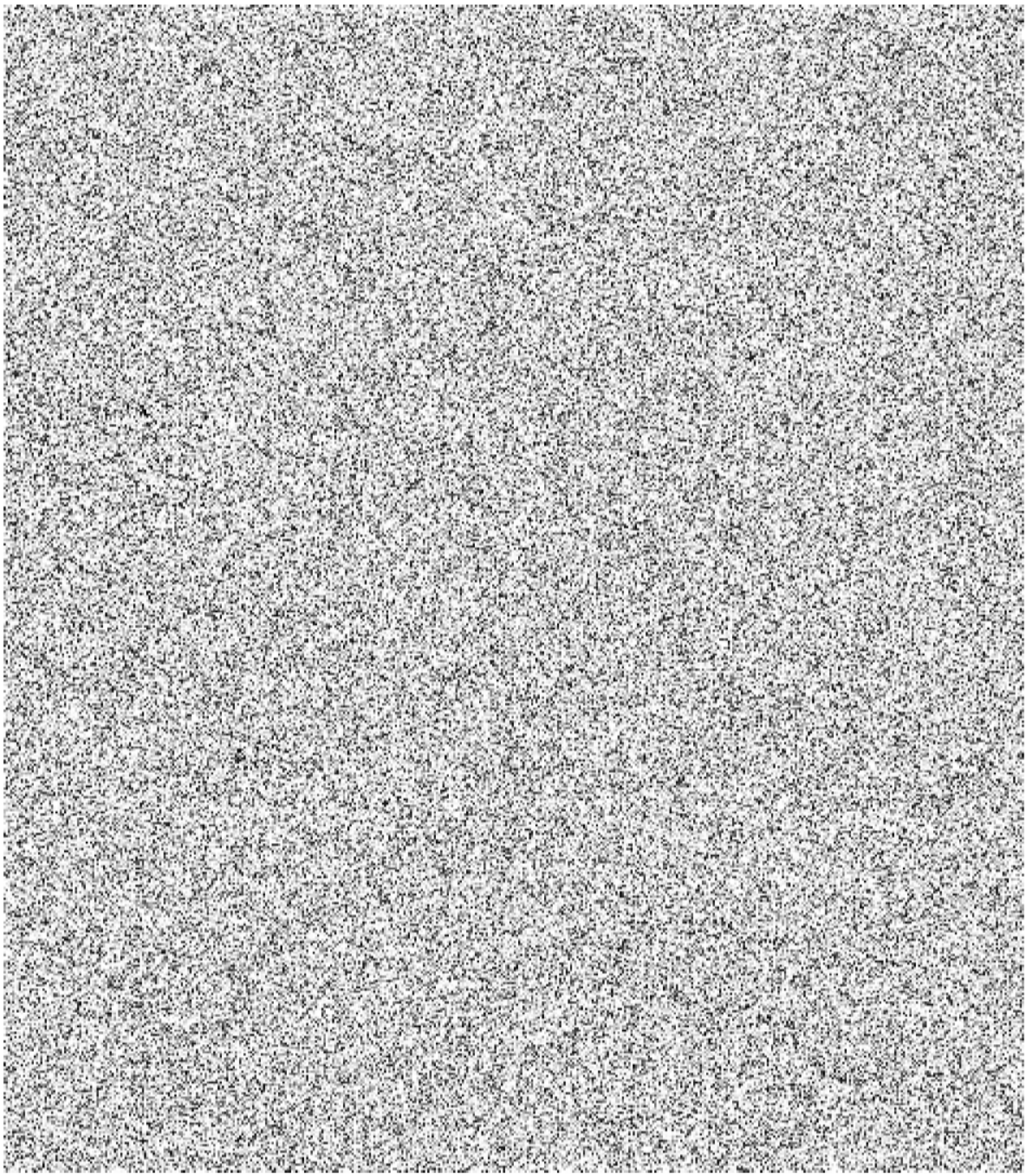


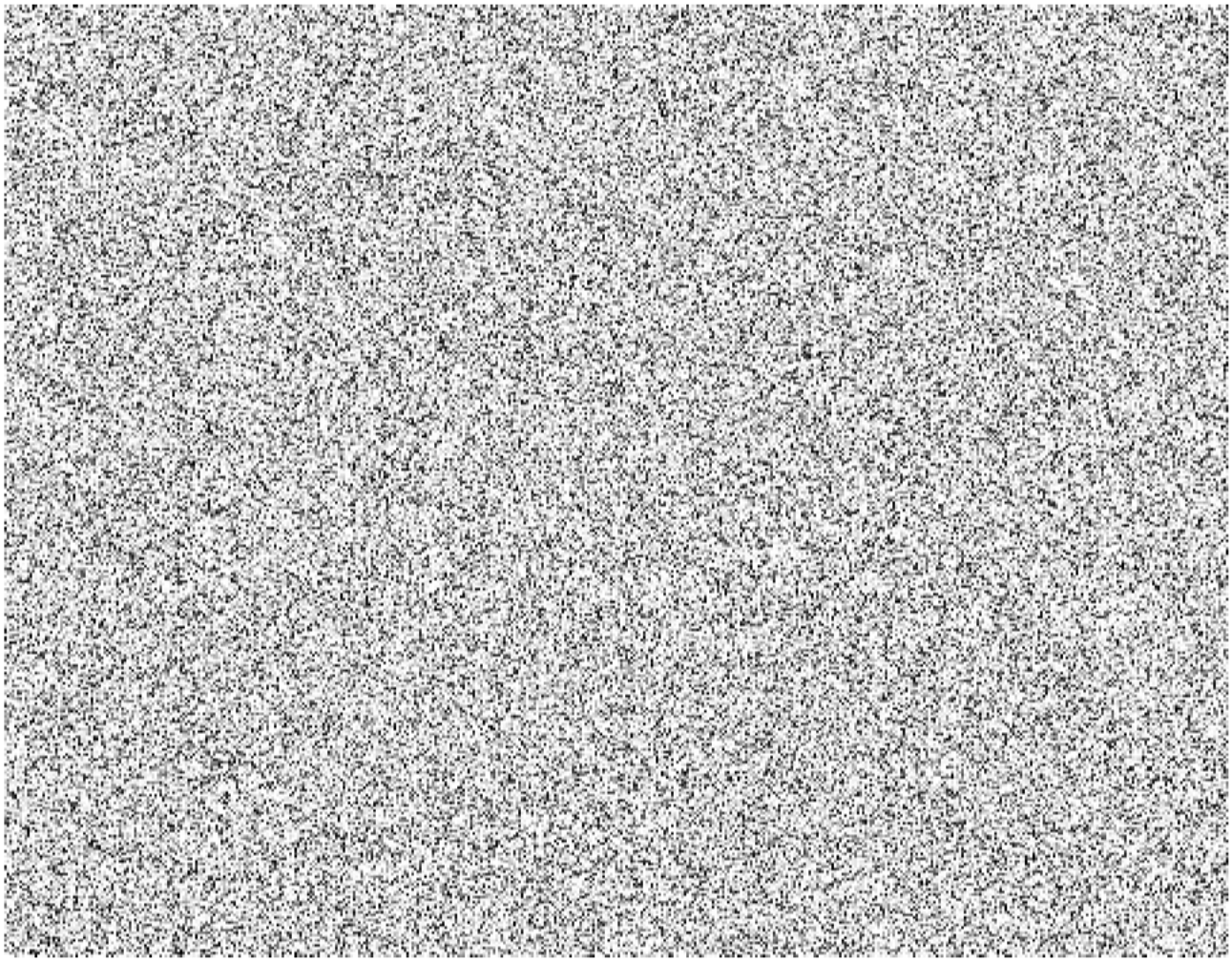
Table A.3 NSA Parameters & Specifications

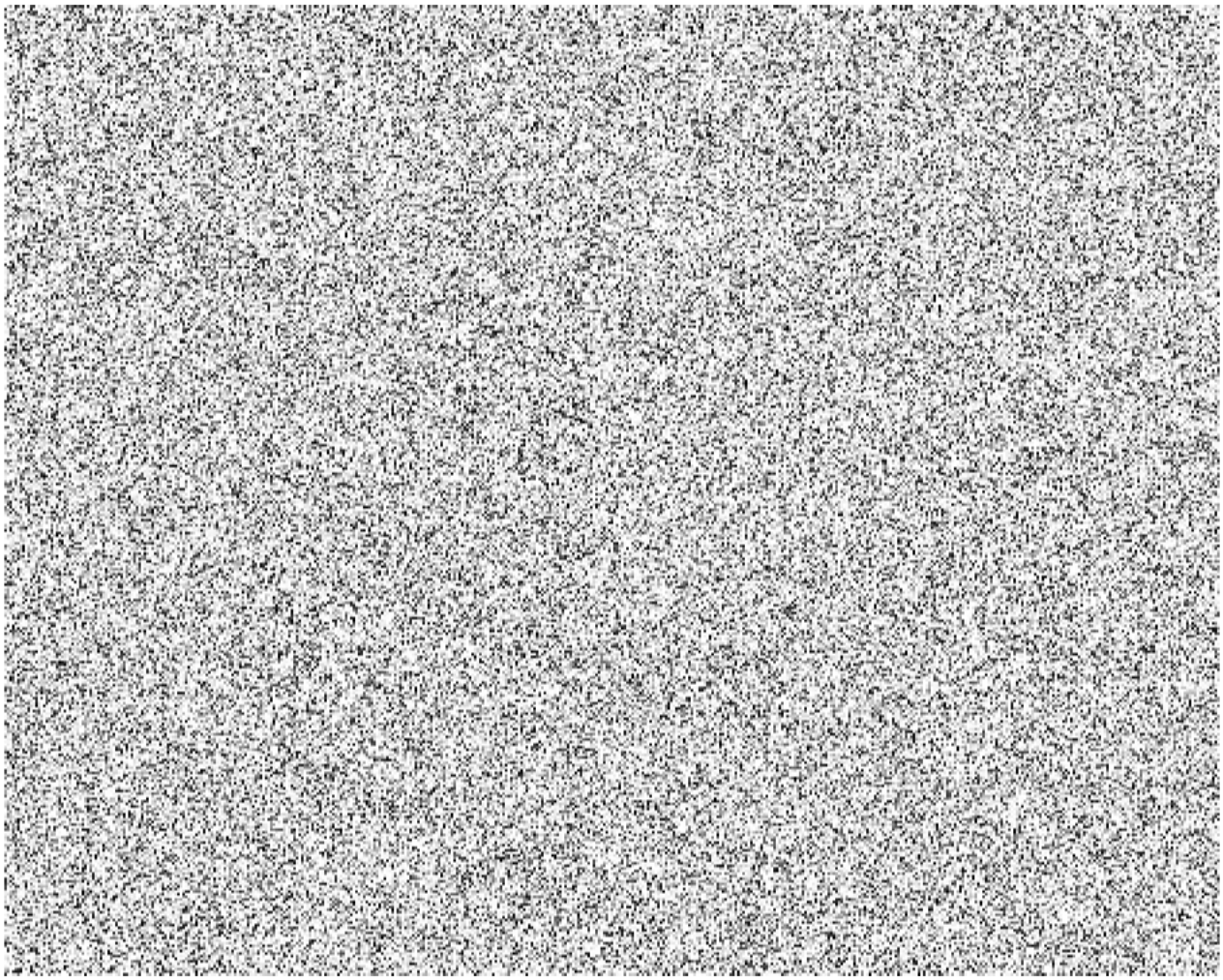


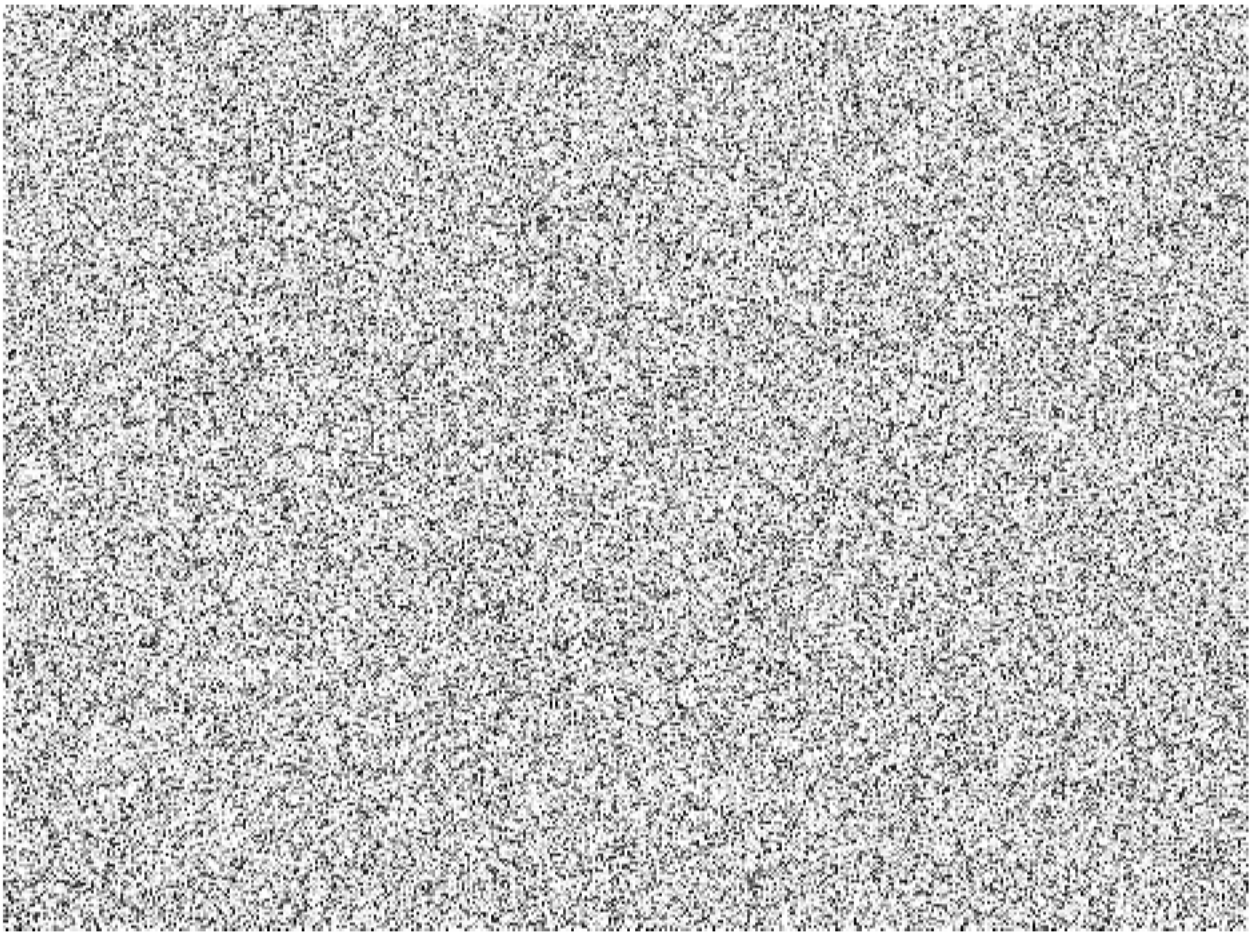


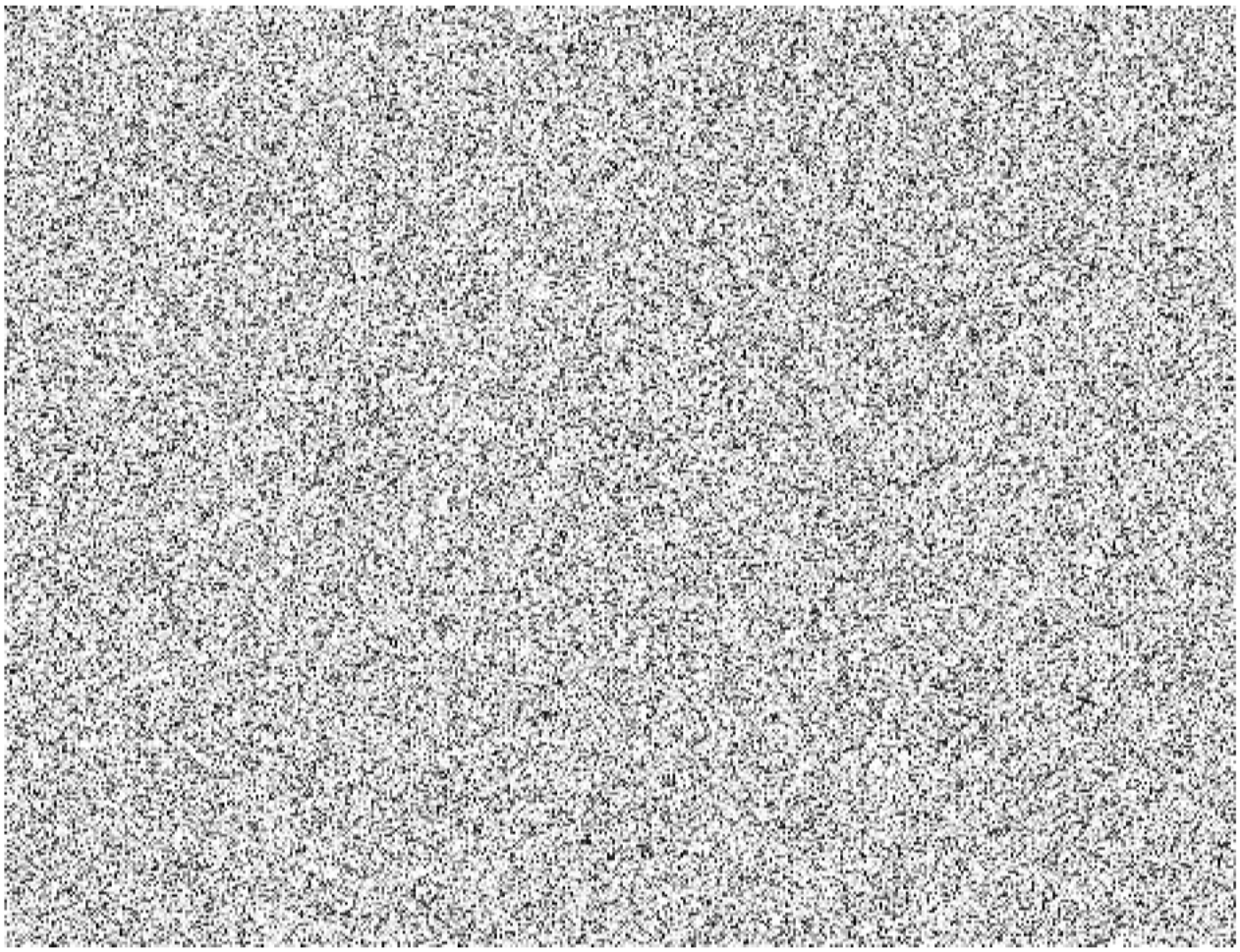


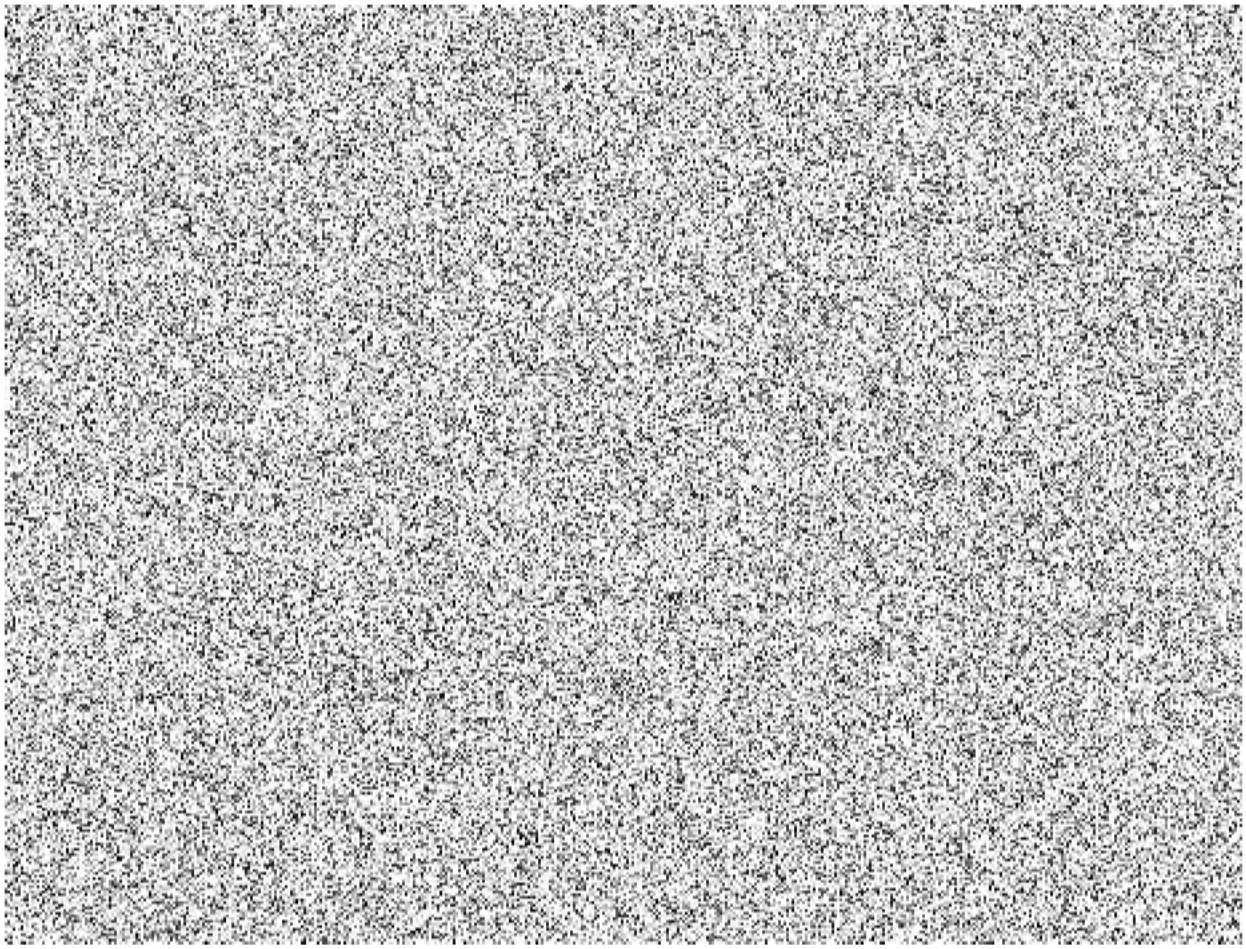
A.4.2 DIMENSIONED OUTLINE DRAWINGS

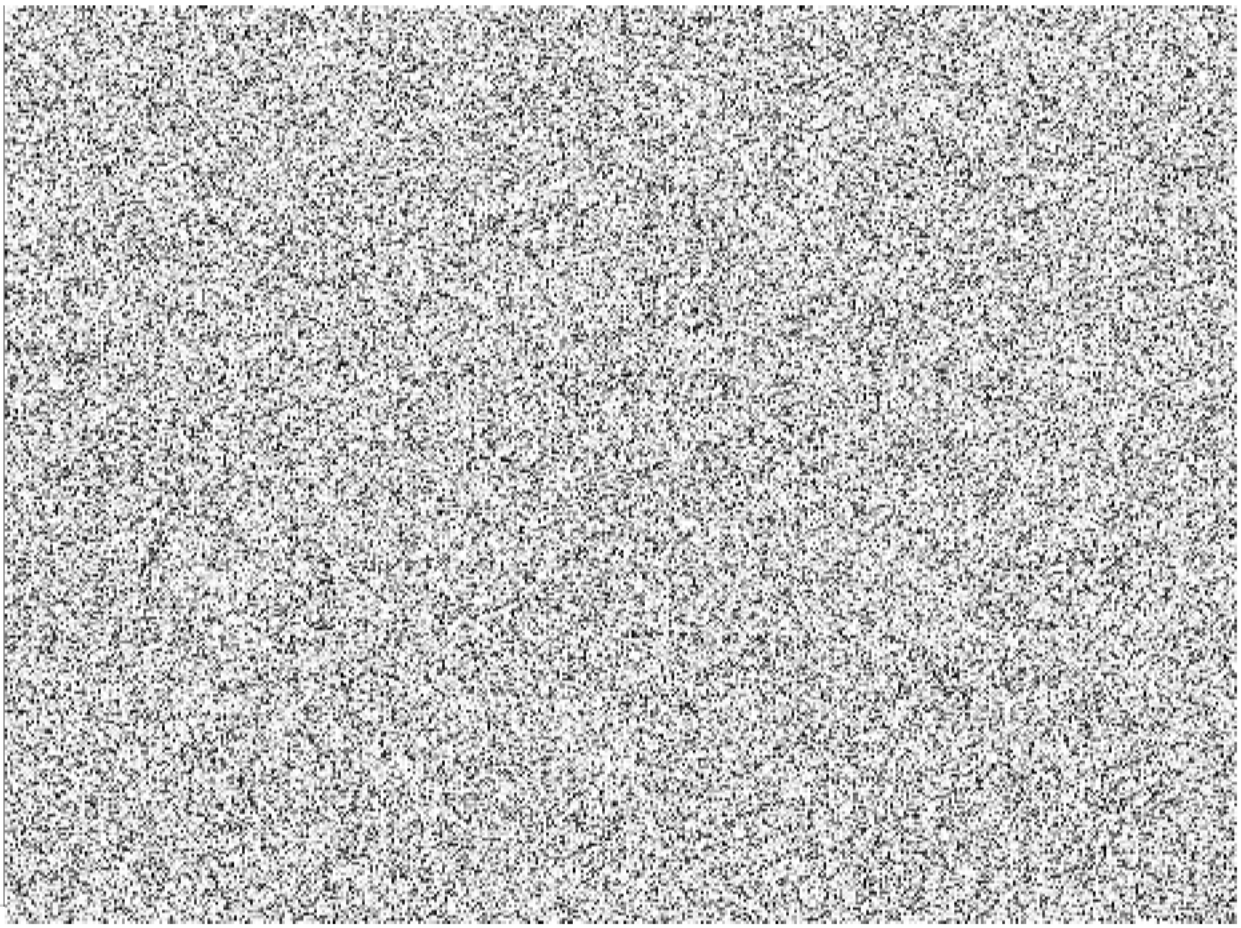


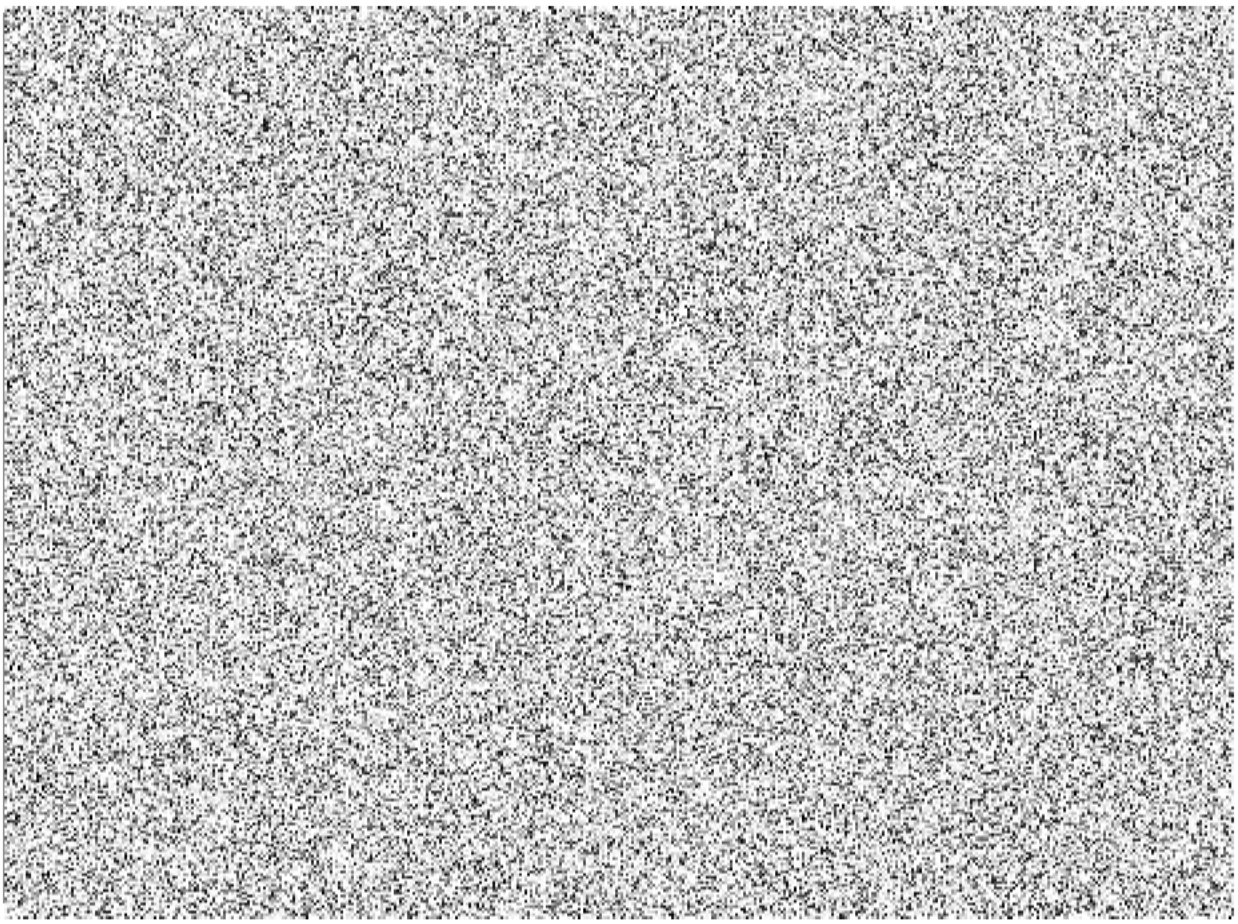


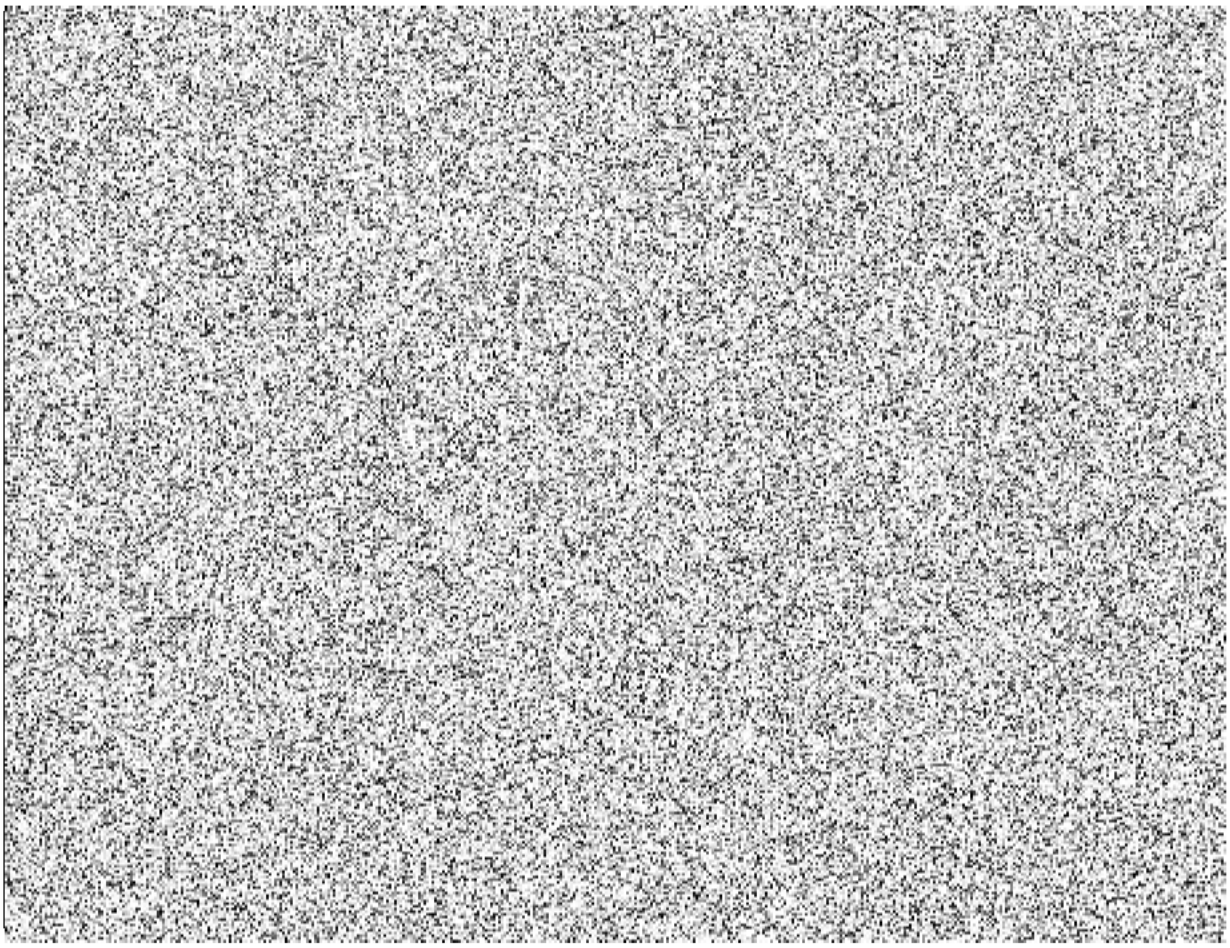


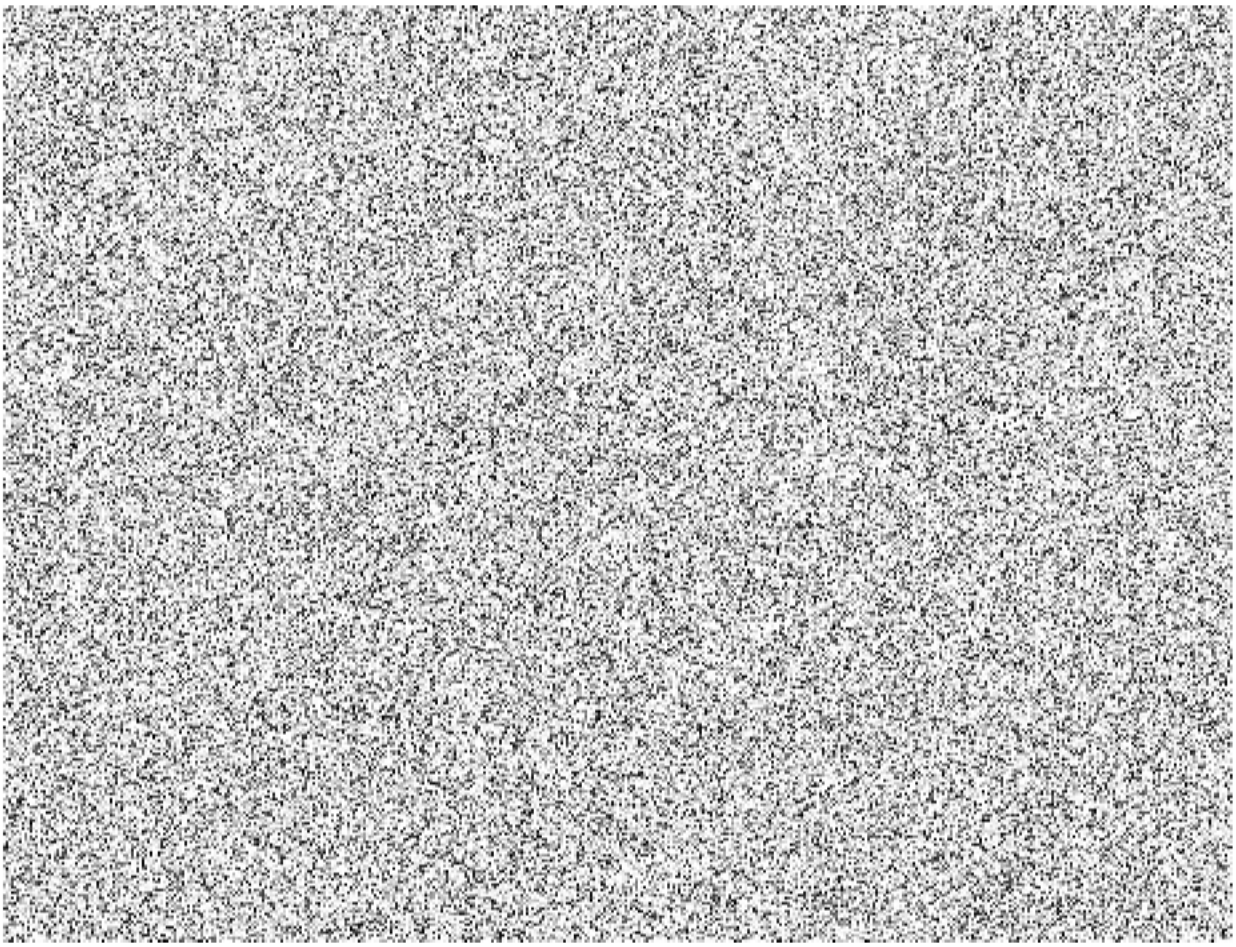


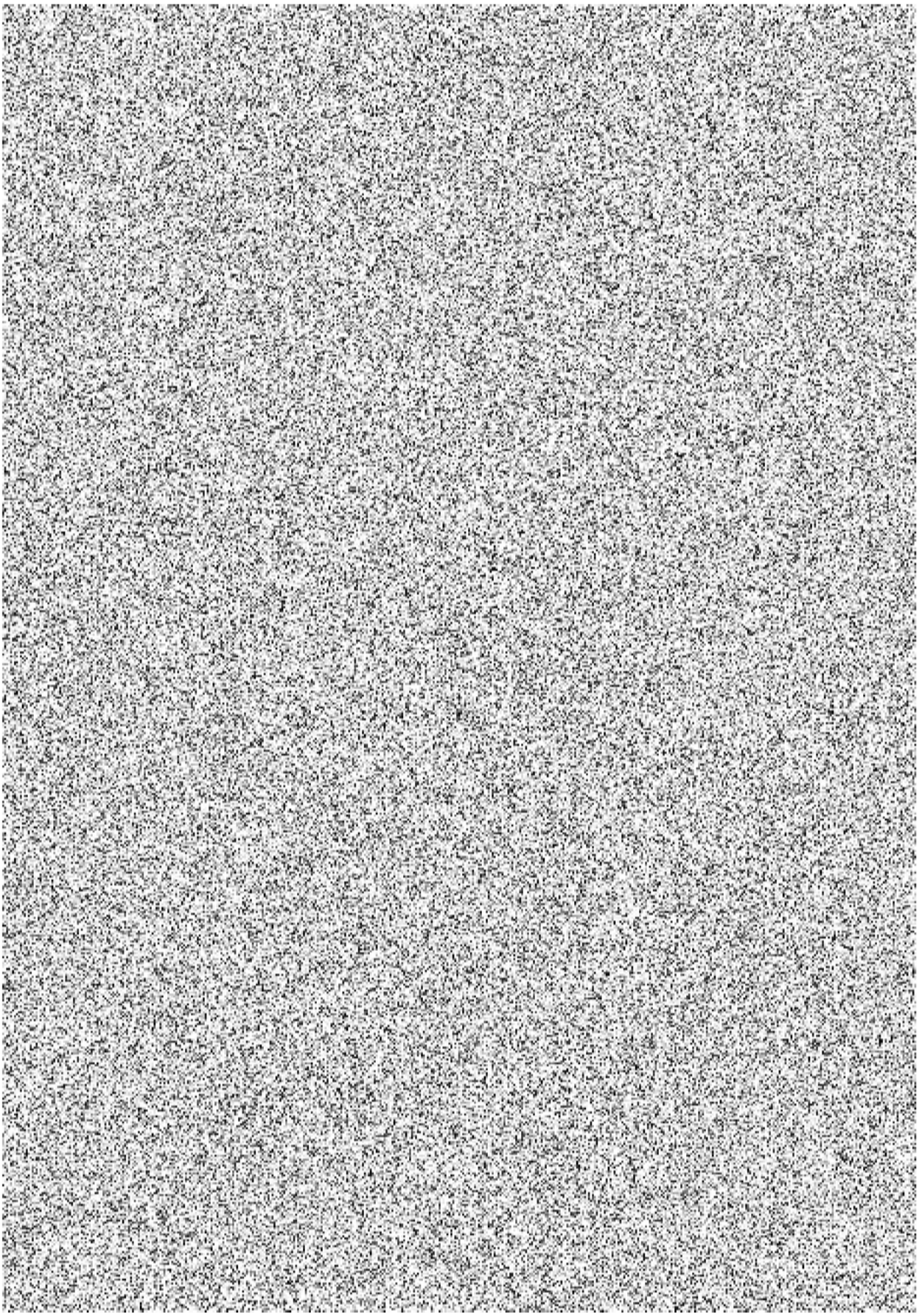


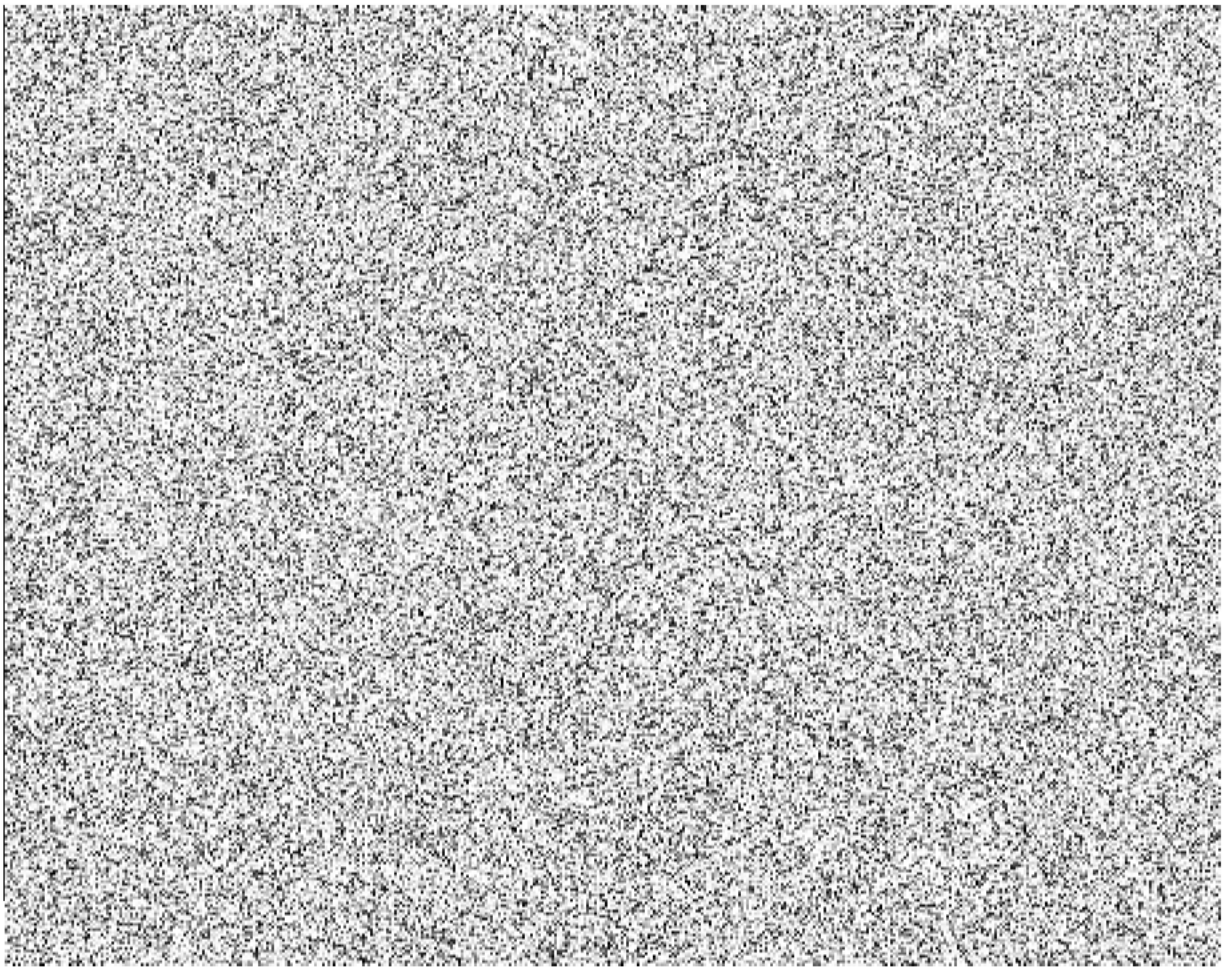


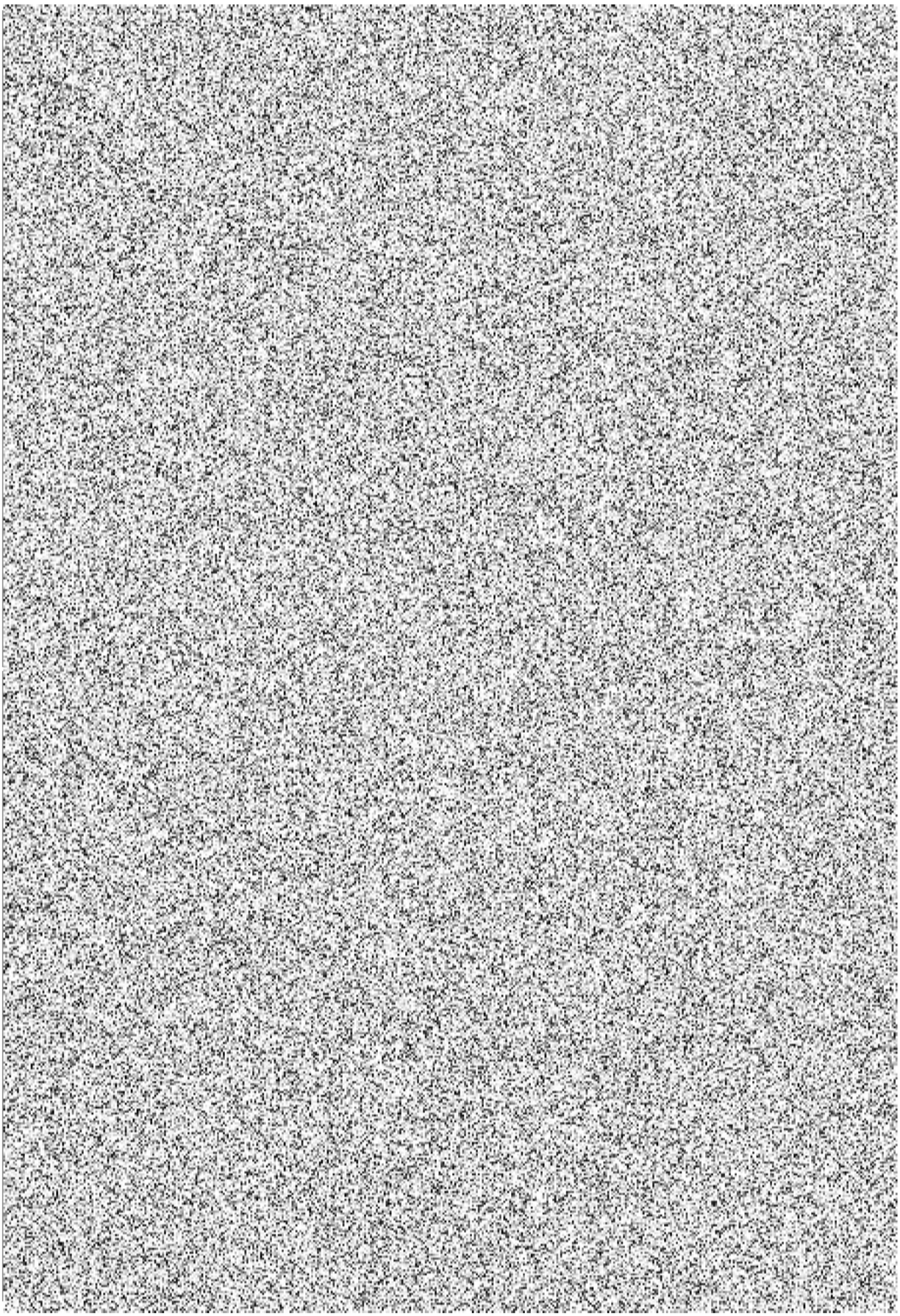


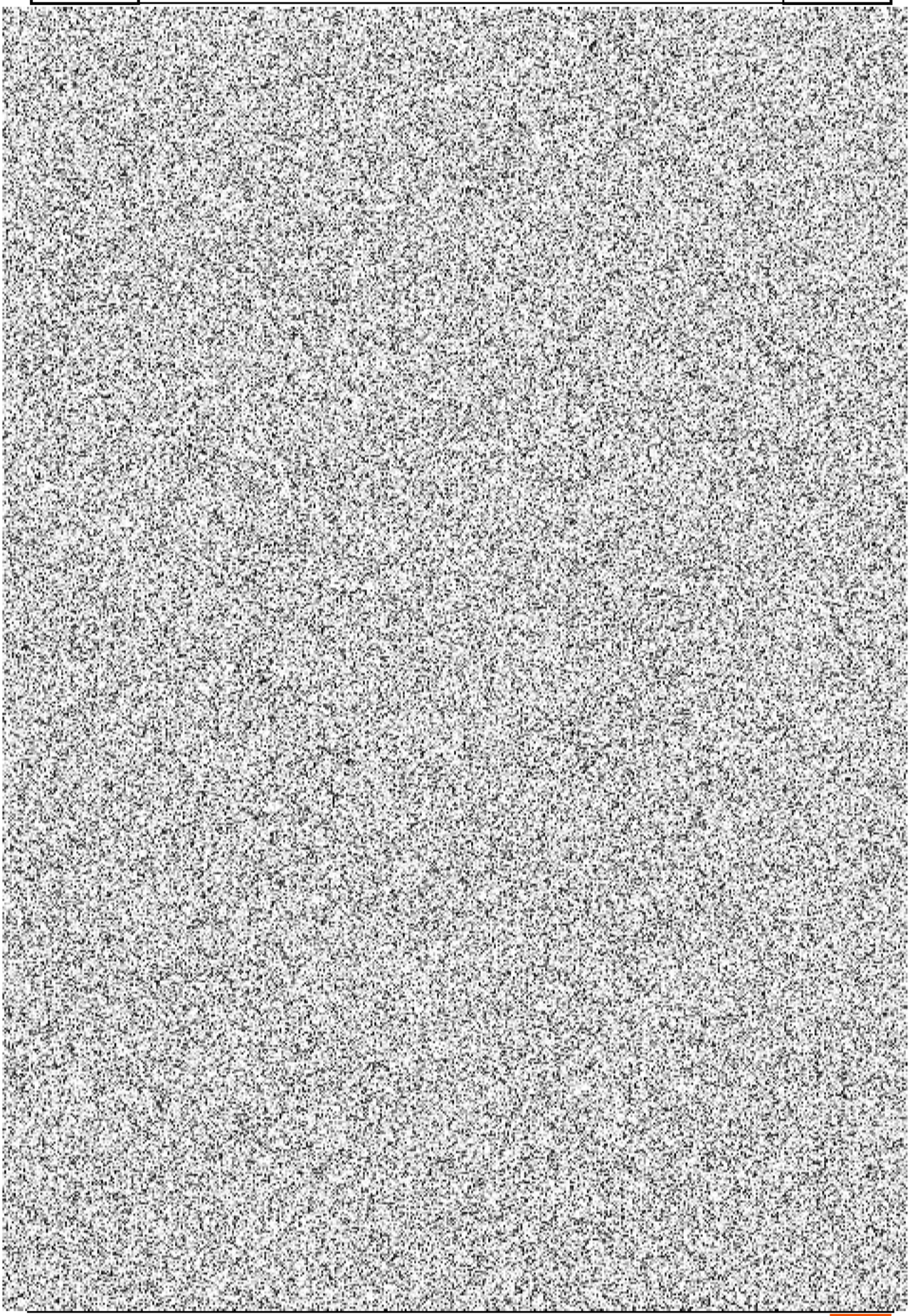


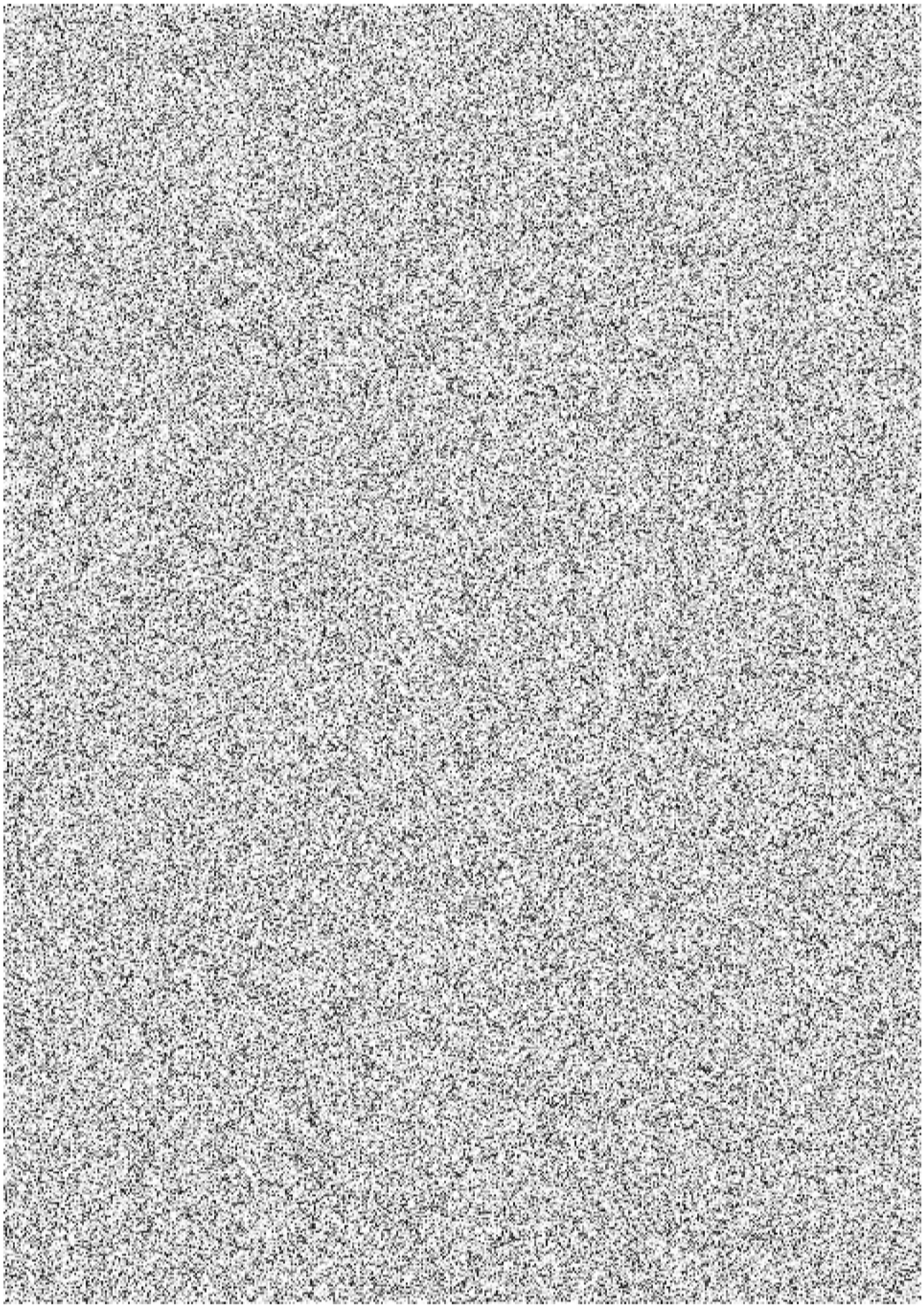


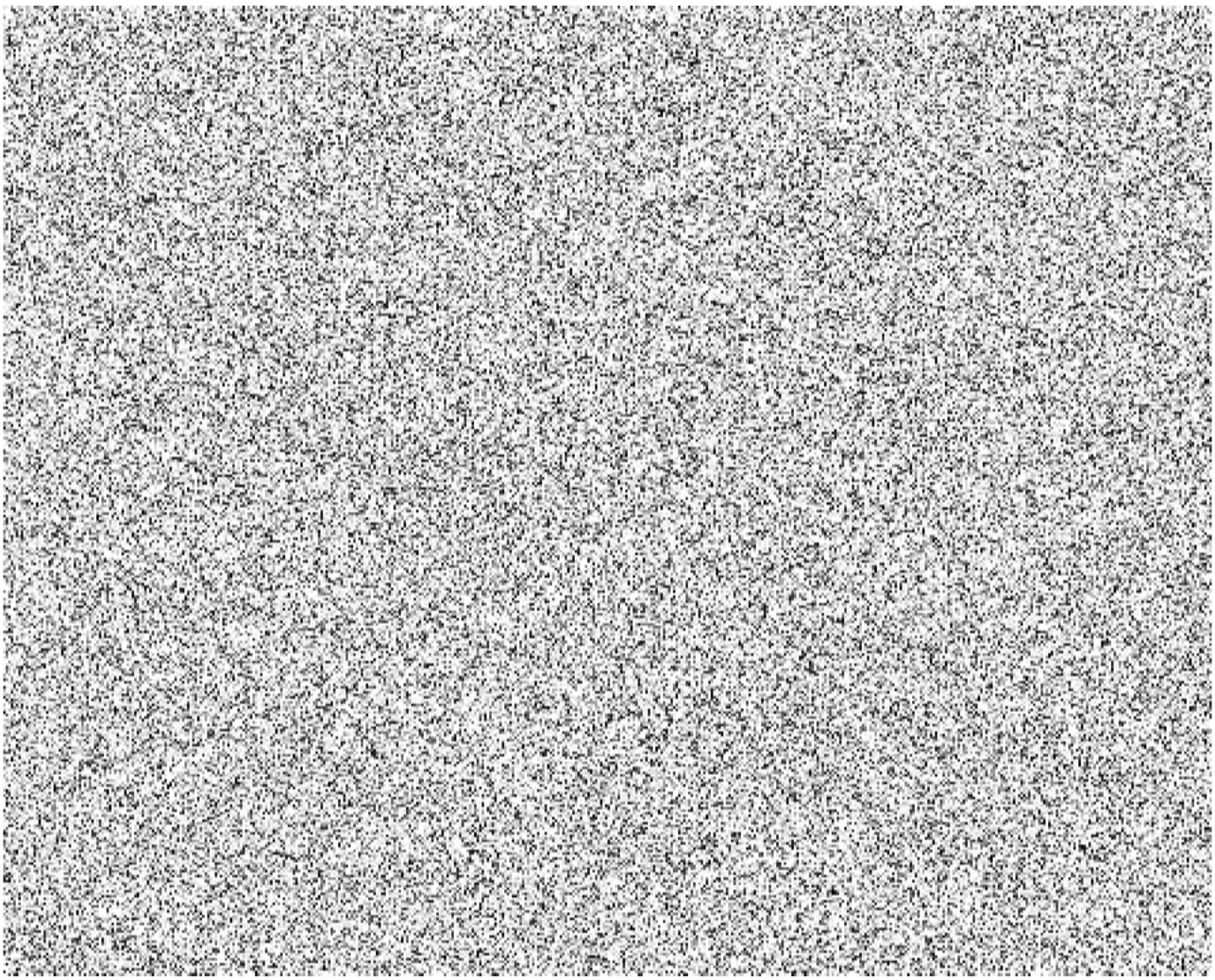












NFOETE

NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4

APPENDIX B

DOCUMENT NAME:	**NFOETE – NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4 APPENDIX B**

B - LIMITATIONS AND CONDITIONS FOR FUEL ASSEMBLY AND CORE COMPONENTS HANDLING, OPERATION AND STORAGE

B.1 LIMITATION AND CONDITIONS FOR TRANSPORT / MANIPULATIONS / HANDLING / INSPECTION

B.1.1 TRANSPORT PACKAGE

[redacted]

Documents that include detailed information from B.1 to B.6 will be supplied according to Appendix E.

B.1.1.1 Description of the Transport Package

The design basis of Transport Package is described in relevant document and shall be provided according to NFC Appendix E.2 49). Figure B.1.1 shows the package used in transport of Fuel Assembly.

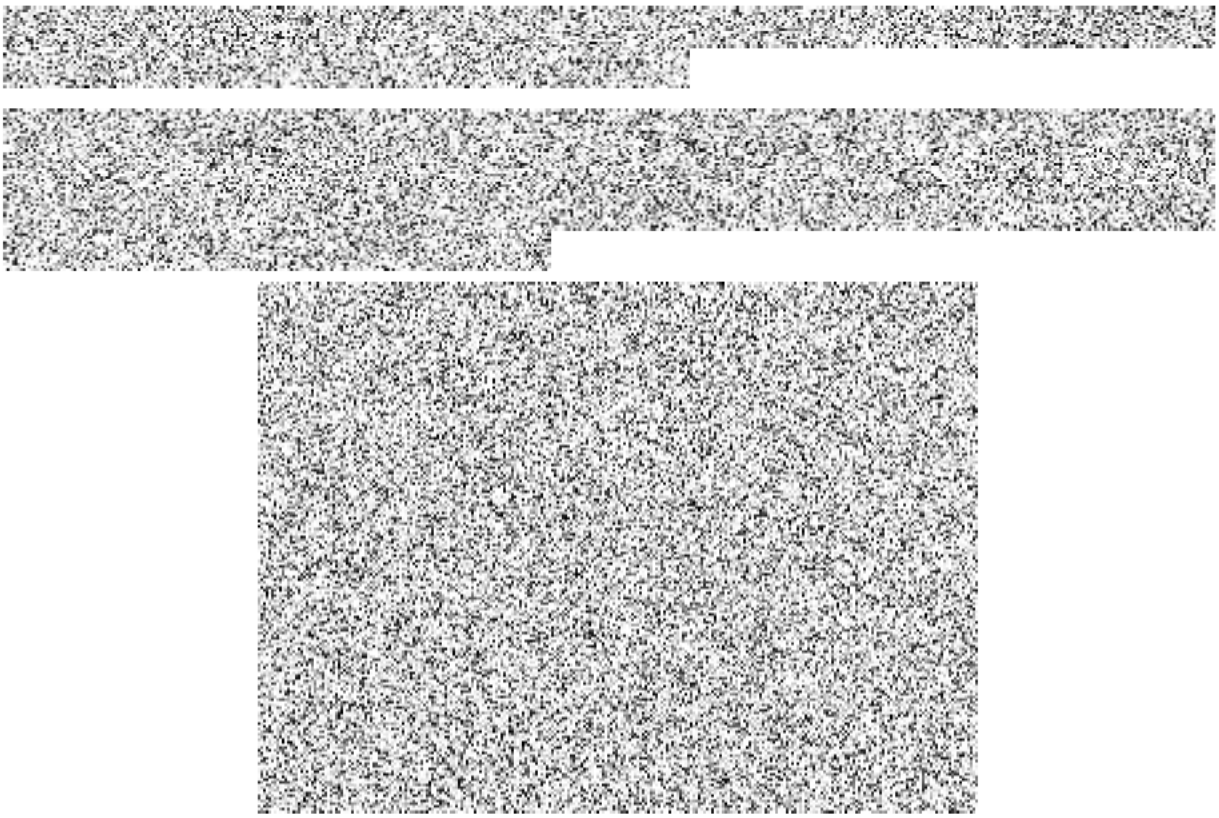
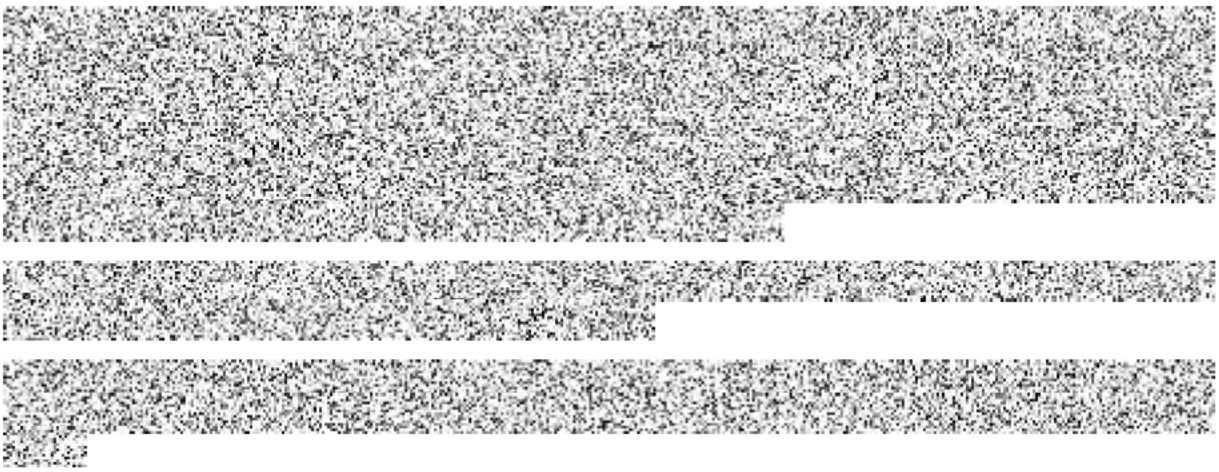


Figure B.1.1 Transport Package

B.1.1.2 Limitations and Conditions for Transport Package

Limitations and conditions for transport of Transport Package will be provided by the relevant document. It includes precautions regarding transport and handling of the Transport Package. It also includes initial condition and procedures for unloading of Fuel Assemblies from Transport Package as well as conditions for return. Specific information such as positions, accelerations, and limitations on manipulation of Transport Package will be included in Appendix E.2 49).

Limitations and conditions for Core Components Transport Packages will be provided in the document according to NFC Appendix E.2 49). Requisites before handling the Transport Package and instructions for lifting and installing / removal of Transport Package cover will be included.



B.1.2 FUEL HANDLING SYSTEM

The basic function of the FHS is to remove spent Fuel Assemblies and Core Components from the reactor and to replace them with new Fuel Assemblies and Core Components. This system also functions to receive and store new Fuel Assemblies, store and ship spent Fuel Assemblies. Especially, FHS and related tools provide the functionality to assemble and disassemble the Control Element Assembly (CEA).

B.1.2.1 Functional Requirement

The purpose of the design of the FHS has been that refuelling should be accomplished with (1) maximum safety, (2) a minimum probability of mishandling, thereby avoiding, damage to the Fuel and reactor components, (3) efficiency of equipment and procedures to reduce reactor downtime, and (4) as low as reasonably achievable radiation exposures.

B.1.2.2 Functional Characteristics

The FHS consists of the equipment, tools, and procedures for refuelling the reactor. The system provides for safe and rapid handling and storage of Fuel Assemblies and Core Components from receipt of new Fuel Assembly and Core Components to shipment of spent Fuel Assembly and Core Components as described in Section 2.1.2.1, Part II, Volume VI. The overall system is composed of a number of sub-systems. A list of the equipment which makes up the sub-system are

[redacted]

B.1.2.3 Fuel Handling Equipment

[redacted]

B.1.2.4 Overhead Crane

[redacted]

B.1.2.5 Making New Fuel be Upright and Lifting from Transport Package

[redacted]

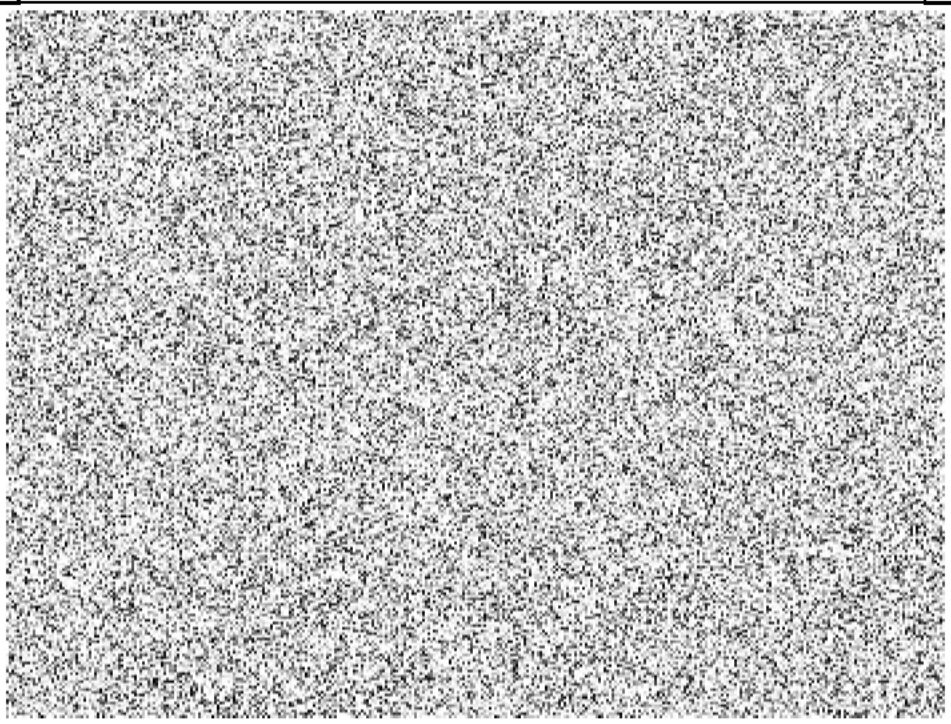


Figure B.1.2 Erect the T-frame

B.1.2.6 Seating, Inspection and Disengagement of new fuel inspection stand

B.1.3 FUEL RECEIPT INSPECTION

The steps and requirements for new fuel receipt and inspection procedure including Core Components are described in relevant document and shall be provided according to NFC Appendix E.2 48). The detailed inspection procedures will be provided to Owner with adequate training program described in NFC Appendix J. The summary of precautions and limitations for fuel receipt and inspections are described as follows:

B.1.3.1 Precautions for First Core Fuel Receipt Inspection

[redacted]

B.1.3.2 Limitations during Receipt Inspection

[redacted]

B.1.4 LIMITATION AND CONDITIONS FOR FUEL ASSEMBLY

The detailed limitations and conditions for transport / manipulation / handling of Fuel Assembly derived by fuel design shall be provided according to Appendix E.2 48).

B.1.5 LIMITATIONS AND CONDITIONS FOR CORE COMPONENTS

The detailed limitations and conditions for transport / manipulation / handling of Core Components derived by their design shall be provided according to Appendix E.2 48).

B.2 LIMITATIONS AND CONDITIONS FOR STORAGE

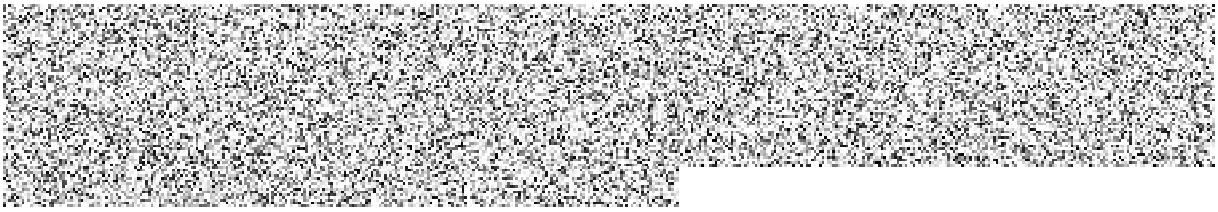
B.2.1 LIMITATIONS AND CONDITIONS FOR TRANSPORT PACKAGES

The basic conditions and work standard for storage and maintenance of Transport Package will be provided through relevant document according to Appendix E.2 49).

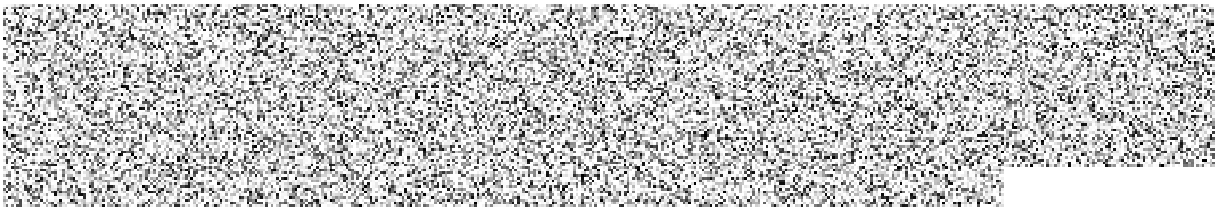
B.2.2 STORAGE OF FUEL ASSEMBLY

The Fuel Storage System (FSS) is provided to store Fuel Assemblies and Core Components. The relevant documentation for the equipment will be provided under EPC contract.

B.2.2.1 New Fuel Storage Pit



B.2.2.2 New Fuel Storage Rack



B.2.2.3 Fuel Handling Area Overhead Crane

The Fuel Handling Area Overhead Crane with a cask handling hoist and a Fuel handling hoist is mounted on the rail that extends the entire length of the fuel handling area. The Fuel handling hoist is used for handling the new Fuel container and new Fuel Assemblies.

[redacted]

B.2.3 STORAGE OF CORE COMPONENTS

[redacted]

B.2.3.1 Cask Loading Pit

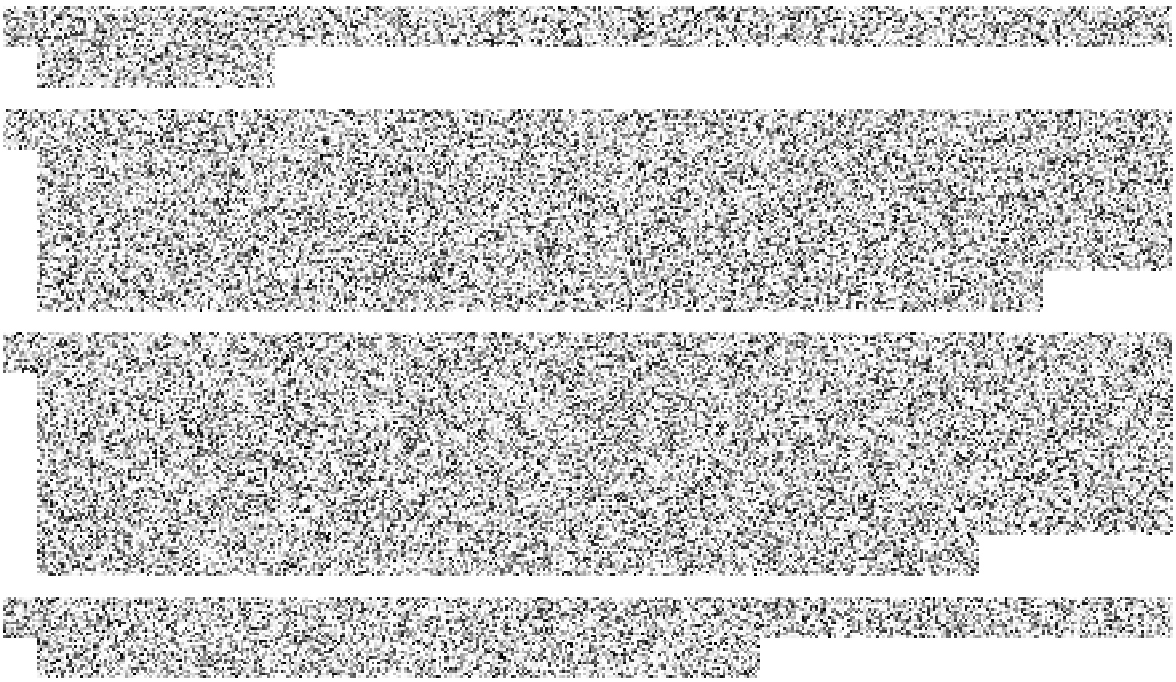
[redacted]

B.2.3.2 Spent Fuel Pool and Fuel Handling Machine

B.2.4 LIMITATIONS AND CONDITIONS

The detailed limitations and conditions for storage of Fuel Assembly and Core Components derived by their design shall be provided according to Appendix E.2 48). It shall be in terms of design bases and instructions on storage of Fuel Assembly. Following information shall be included:

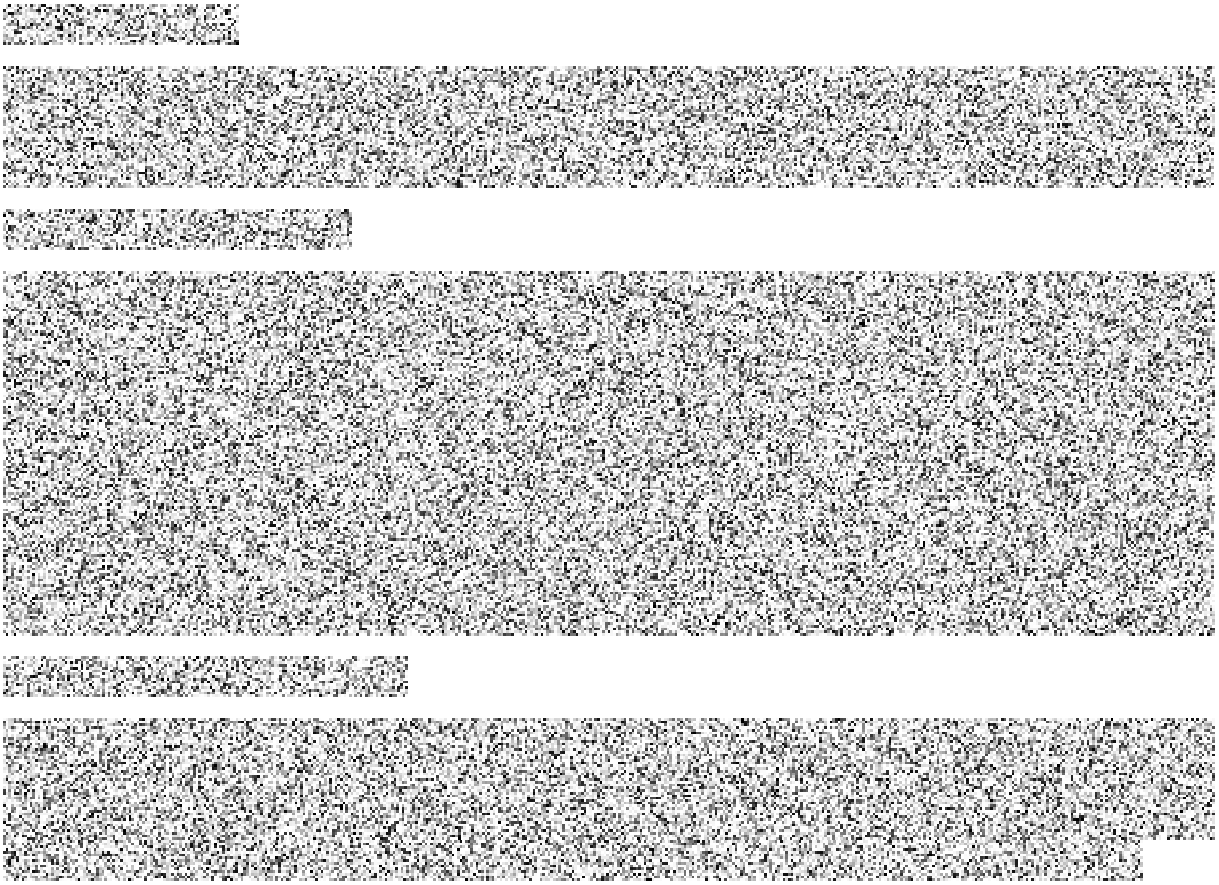
An operator shall monitor a load monitoring device during the process of lifting or lowering of Fuel Assembly as described below:



B.3 LIMITATIONS AND CONDITIONS FOR WET STORAGE, TRANSPORTATION IN SPENT FUEL POOLS AND FUEL RELATED WORKS ON FRIE

B.3.1 LIMITATIONS AND CONDITIONS FOR WET STORAGE

B.3.1.1 Plant Structure / System related to Wet Storage

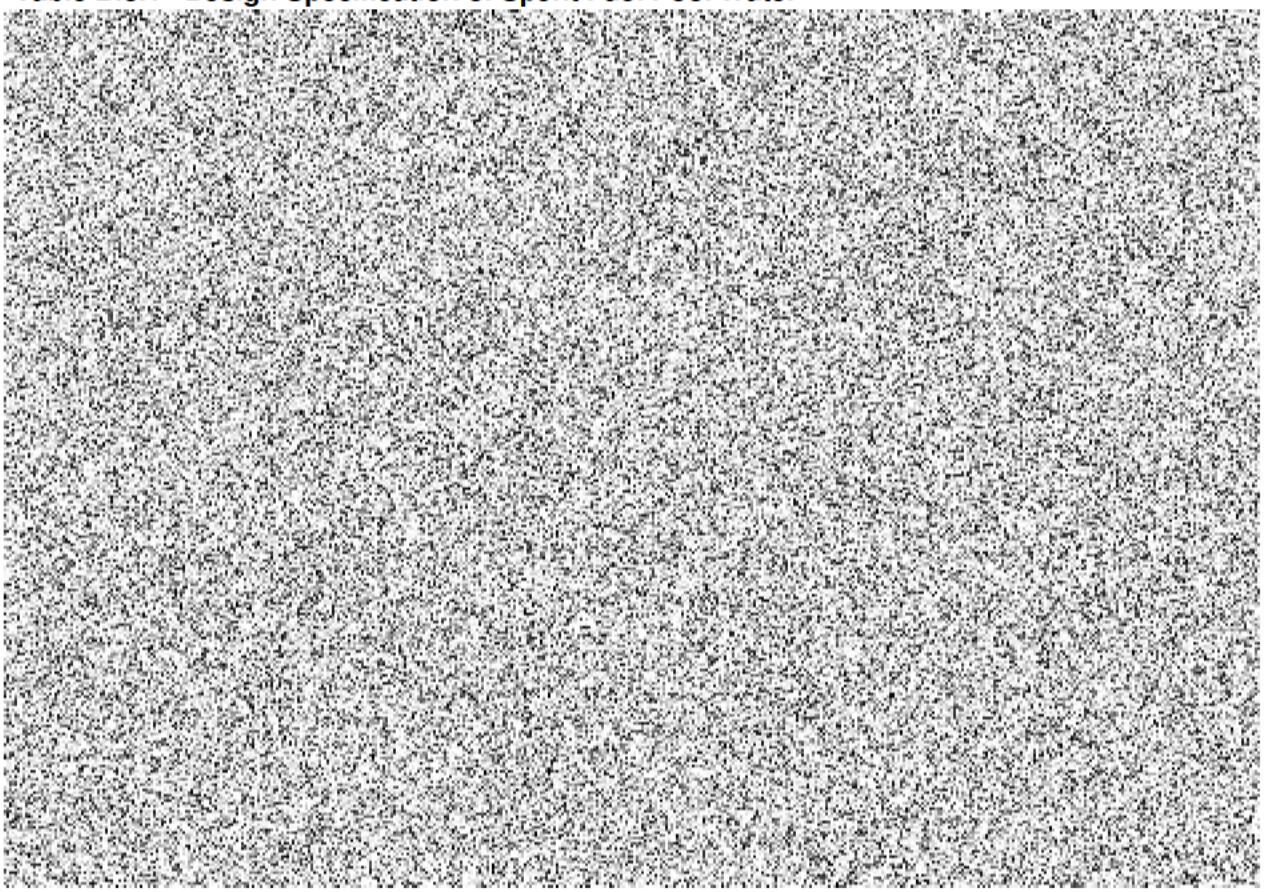


B.3.1.2 Conditions for Wet Storage

Water Quality

Water quality for wet storage is based on Chemistry Design Guideline for APR1000 Standard Design in Table B.3.1.

Table B.3.1 Design Specification of Spent Fuel Pool Water



B.3.1.3 Limitations and Conditions for Wet Storage of Burned Fuel

B.3.2 TRANSPORTATION IN SPENT FUEL POOL

[redacted]

B.3.3 FUEL-RELATED WORK IN SPENT FUEL POOL

The Fuel Repair and Inspection work is described in Appendix O. The related document on Post Irradiation Inspection Program (PIIP) and Fuel Repair service shall be provided according to NFC Appendix E.2 50). The relevant methodology and training shall be provided in Appendices H and J.

[redacted]

B.3.4 LIMITATION AND CONDITIONS FOR WET STORAGE

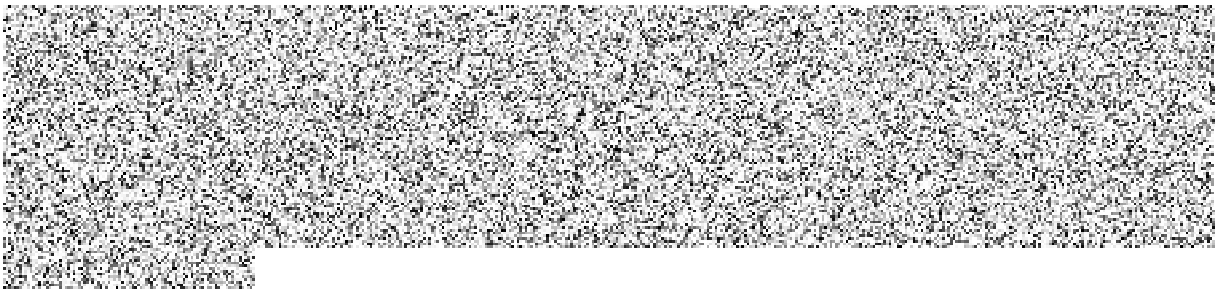
The operator shall closely monitor a load cell indicating device during withdrawing or loading the Fuel Assembly.

[redacted]

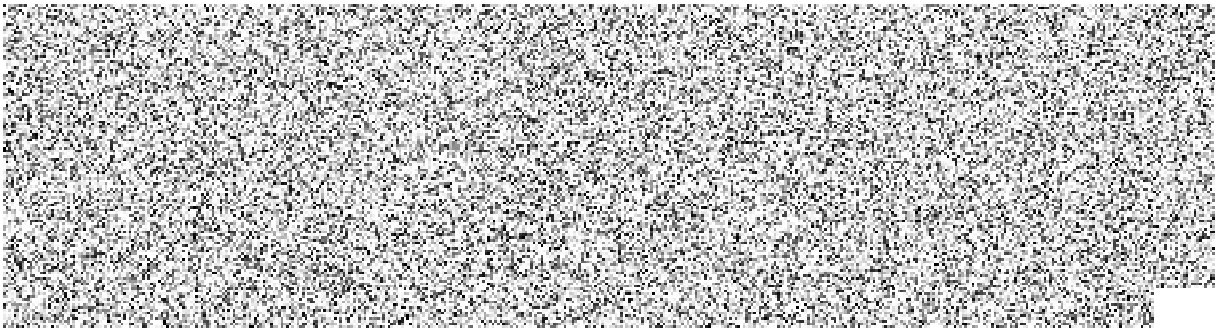
B.4 LIMITATIONS AND CONDITIONS FOR CORE (UN)LOADING AND SHUFFLING

B.4.1 LIMITATION DURING FUEL POSITIONING

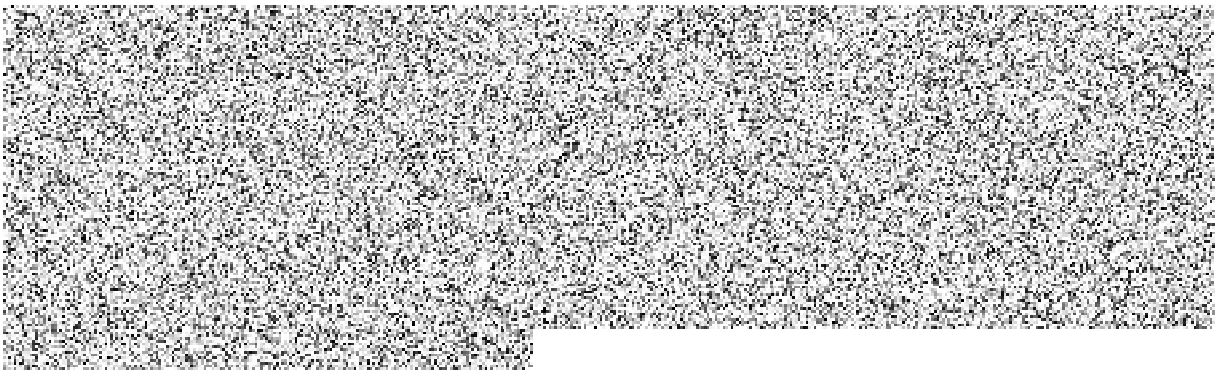
B.4.1.1 Loading

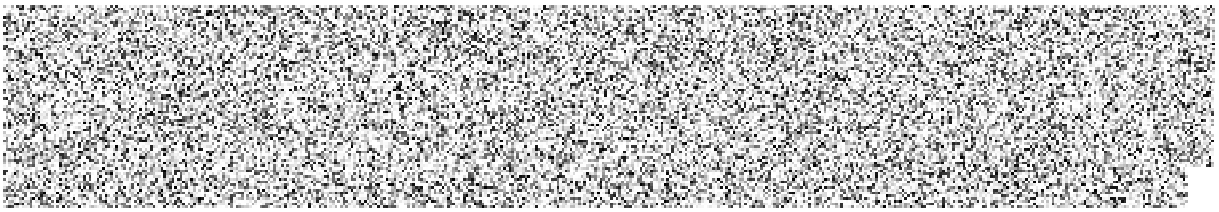


B.4.1.2 Unloading



B.4.1.3 Refuelling

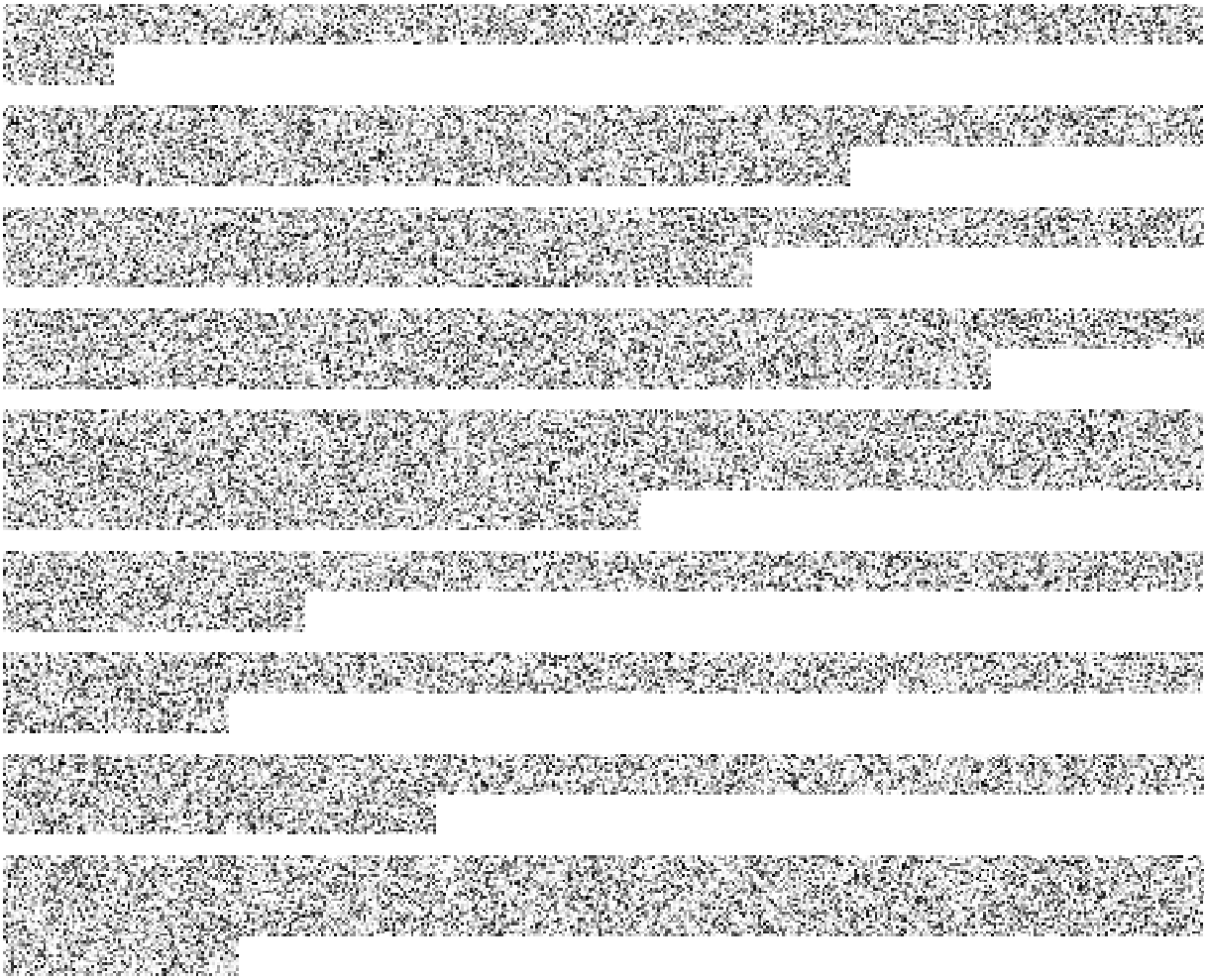




B.4.2 LIMITATIONS AND CONSTRAINTS FOR FUEL LOADING / UNLOADING

Loading / Unloading of Fuel Assembly shall take place in open water to minimize the effect of contact with other assemblies and/or reactor internals.

Spent Fuel Handling Machine and Refuelling Machine



B.4.3 FUEL ASSEMBLY TEST DURING OUTAGE

B.5 LIMITATIONS AND CONDITIONS FOR IN-CORE OPERATION

Limitation and conditions for fuel system in-core operation including relevant training shall be provided to Owner in agreed format.

B.5.1 UNIT START-UP TEST

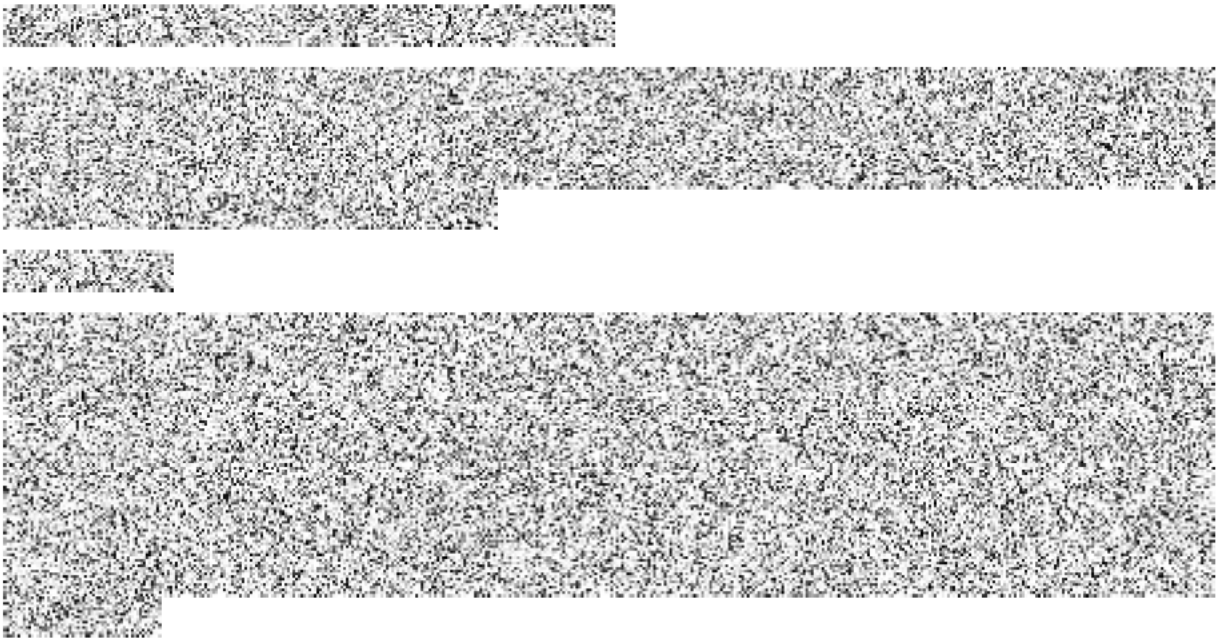
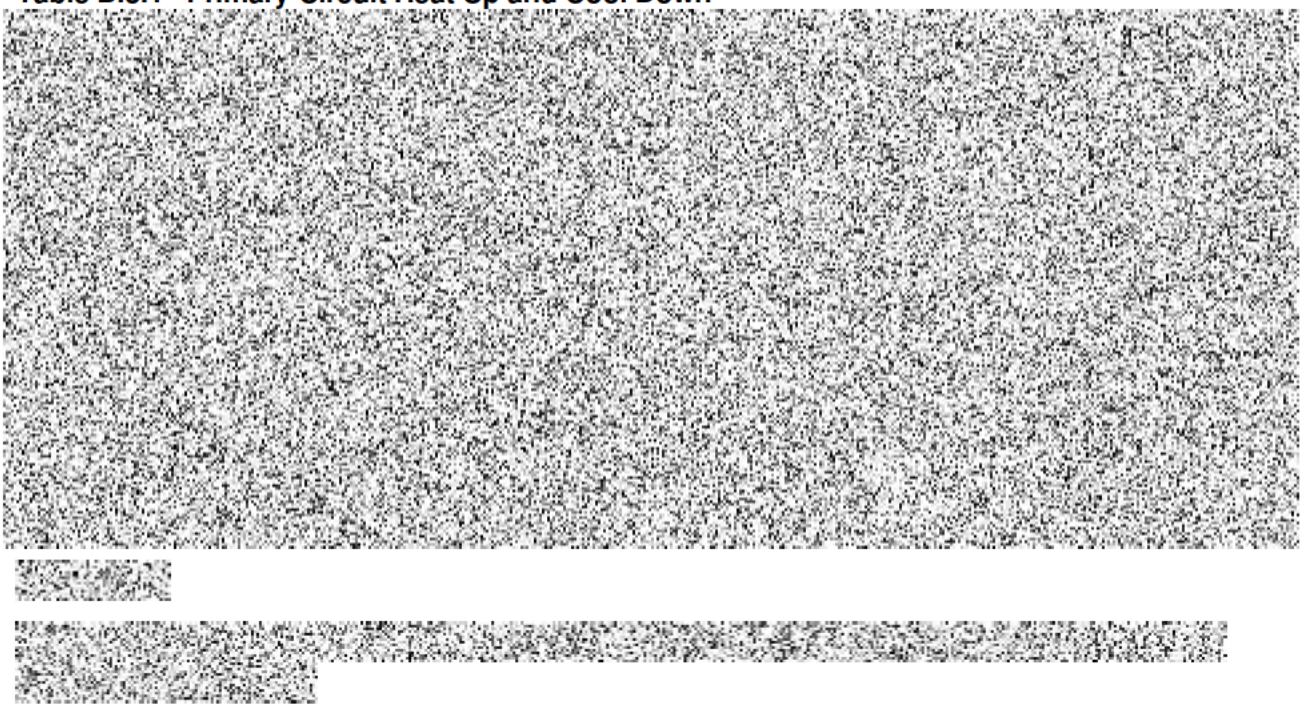


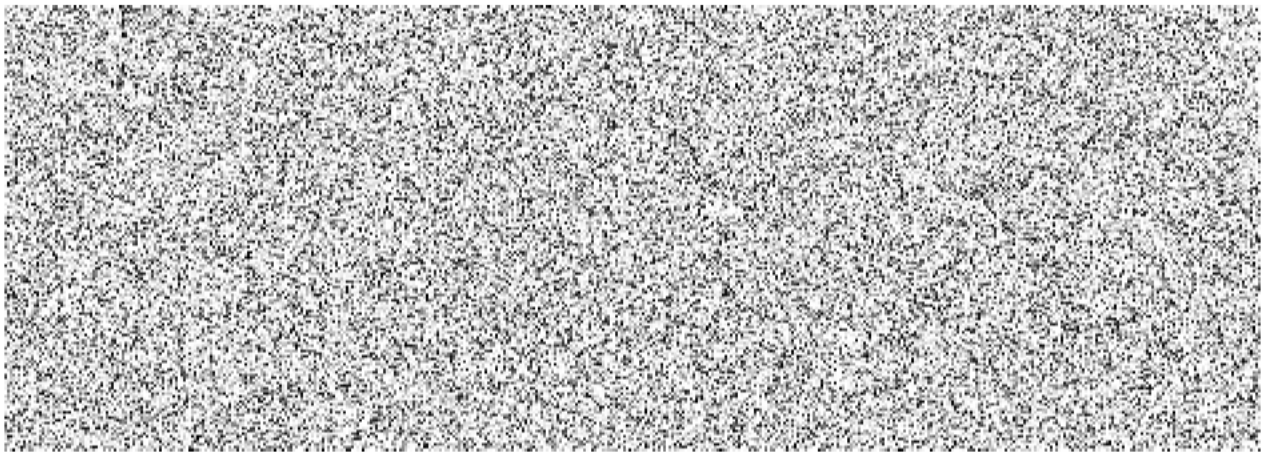
Table B.5.1 Primary Circuit Heat Up and Cool Down



[redacted]

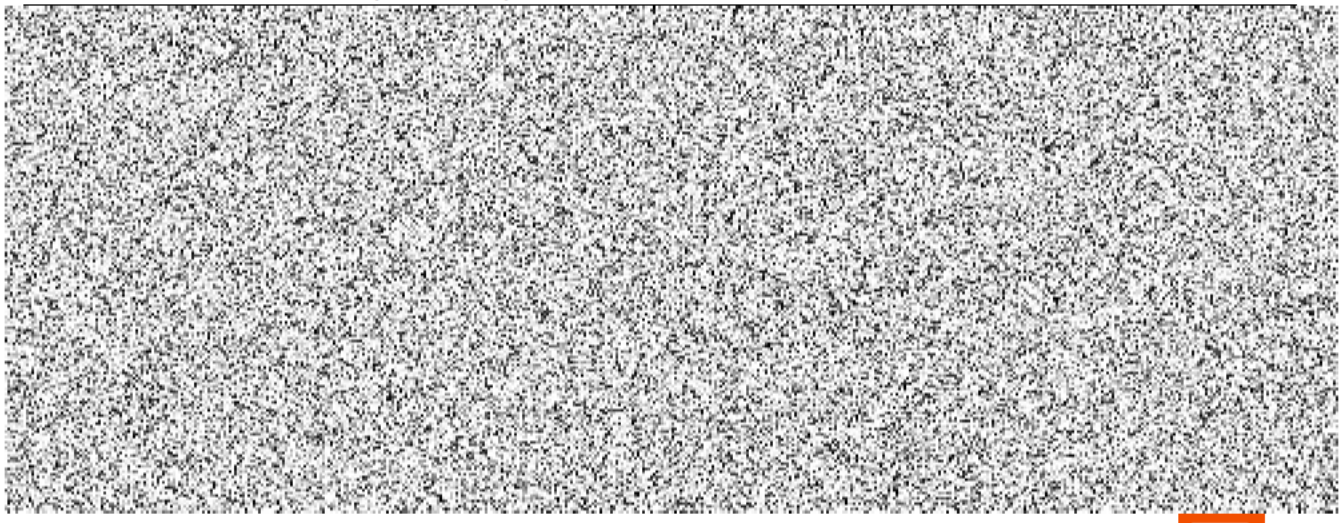
Table B.5.2 Specification of Reactor Coolant for Start-up

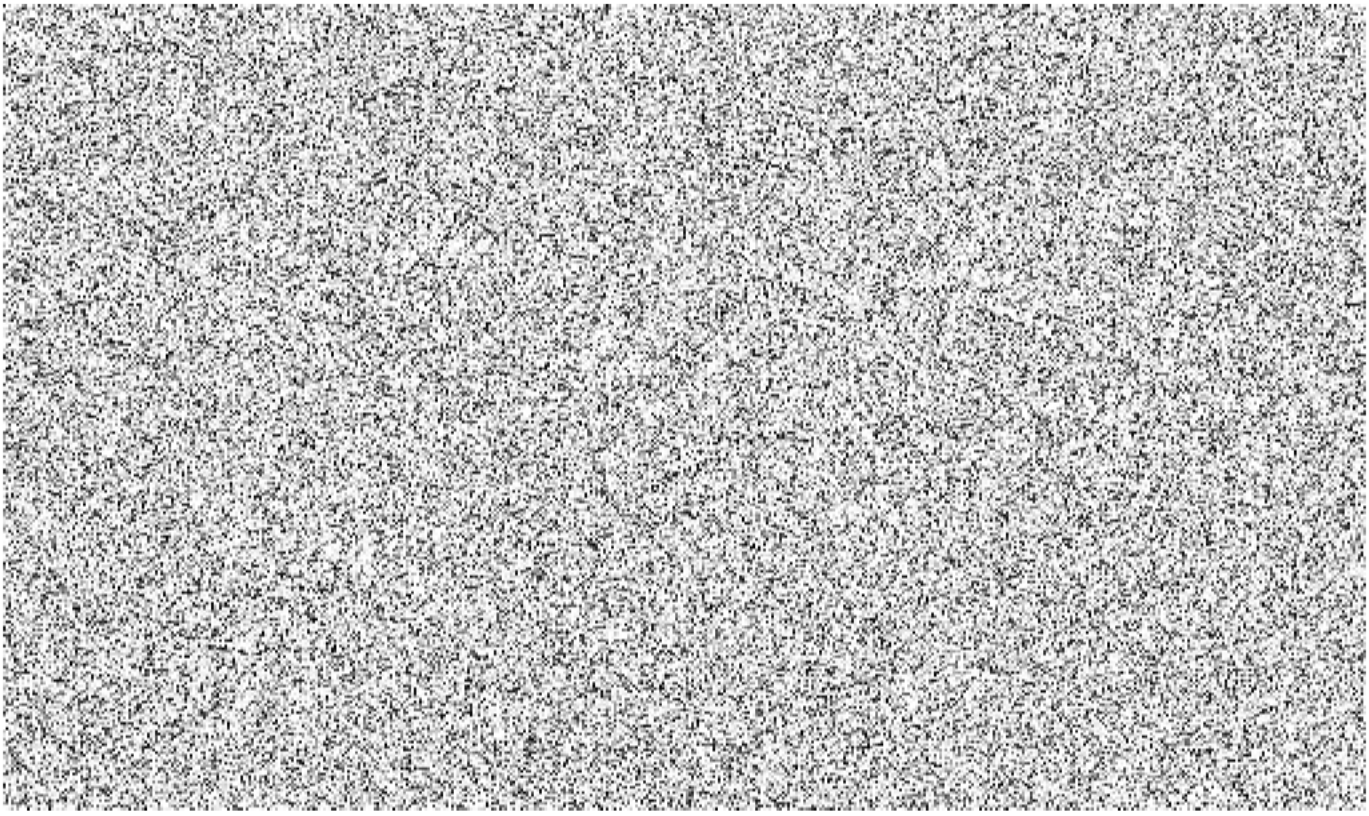
[redacted]



B.5.2 CORE OPERATION

Table B.5.3: The main operational parameters

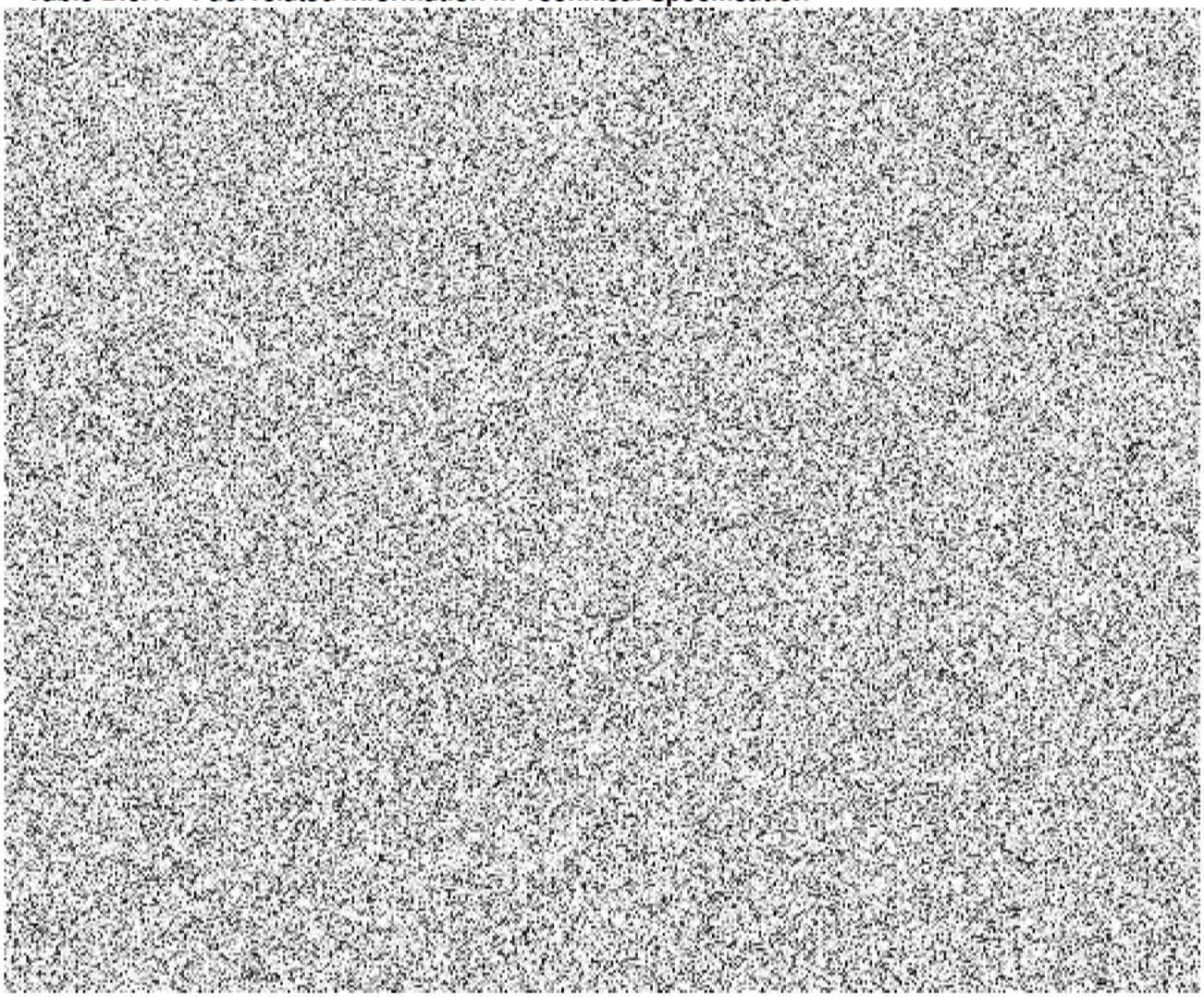




B.6 LIMITATIONS AND CONDITIONS STATED IN PLANT TECHNICAL SPECIFICATION (NUCLEAR FUEL AND CORE COMPONENTS RELATED SUMMARY FROM TECHNICAL SPECIFICATIONS)

The limitations and conditions of Fuel Assembly and Core Components related are described in Technical Specification Section 3.1 and 3.2. Fuel related information in Technical Specification will be provided according to Appendix E.2 9). Technical Specification will include contents in Table B.6.1.

Table B.6.1: Fuel related Information in Technical Specification



NFOETE

NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4

APPENDIX C

DOCUMENT NAME:	**NFOETE – NUCLEAR FUEL CONTRACT FOR TEMELÍN NPP UNITS 3 AND 4 APPENDIX C**

C - CORE DESIGN CRITERIA, REFERENCE CYCLING SCHEME, CORE DESIGN FLEXIBILITY AND CONSTRAINTS

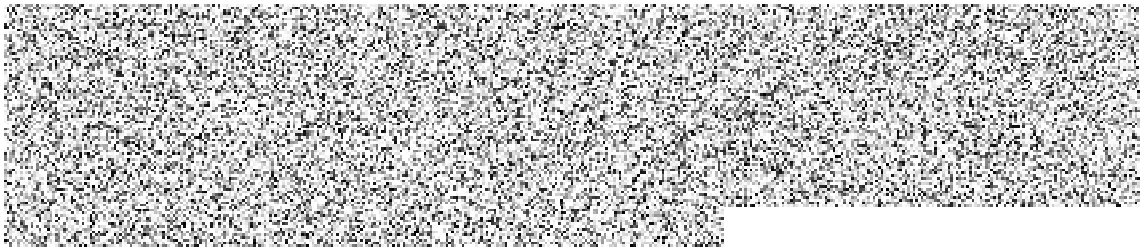
C.1 GENERAL CORE DESIGN CRITERIA

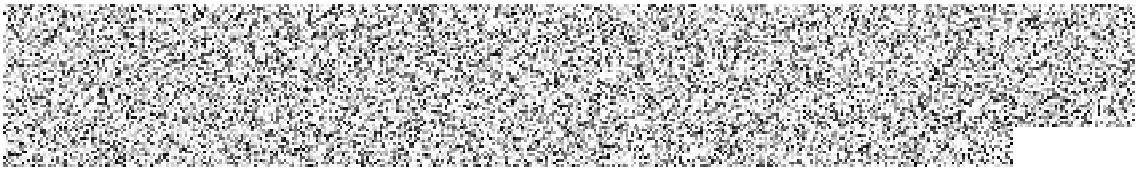
C.1.1 NUCLEAR DESIGN

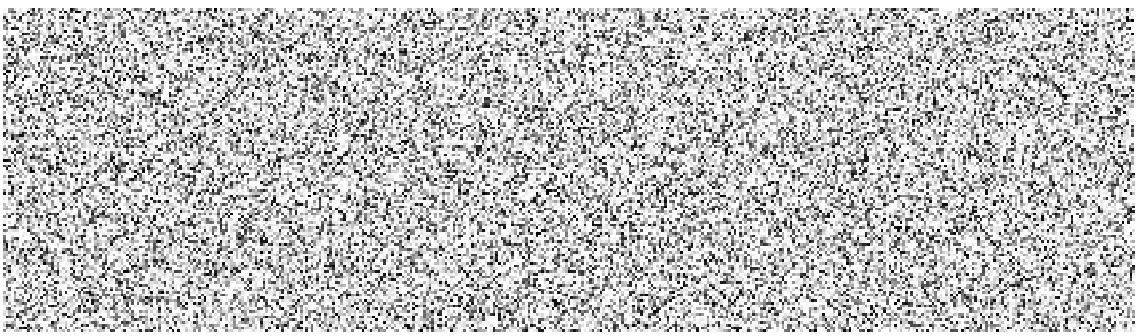
[redacted]

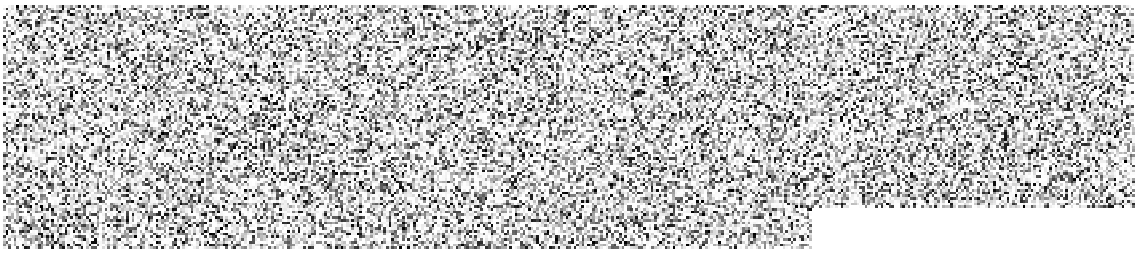
C.1.2 THERMAL HYDRAULIC DESIGN

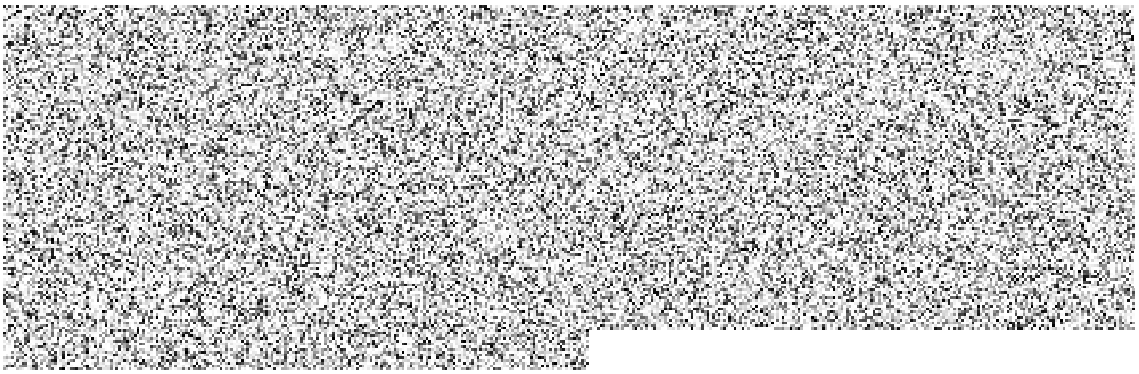
[redacted]

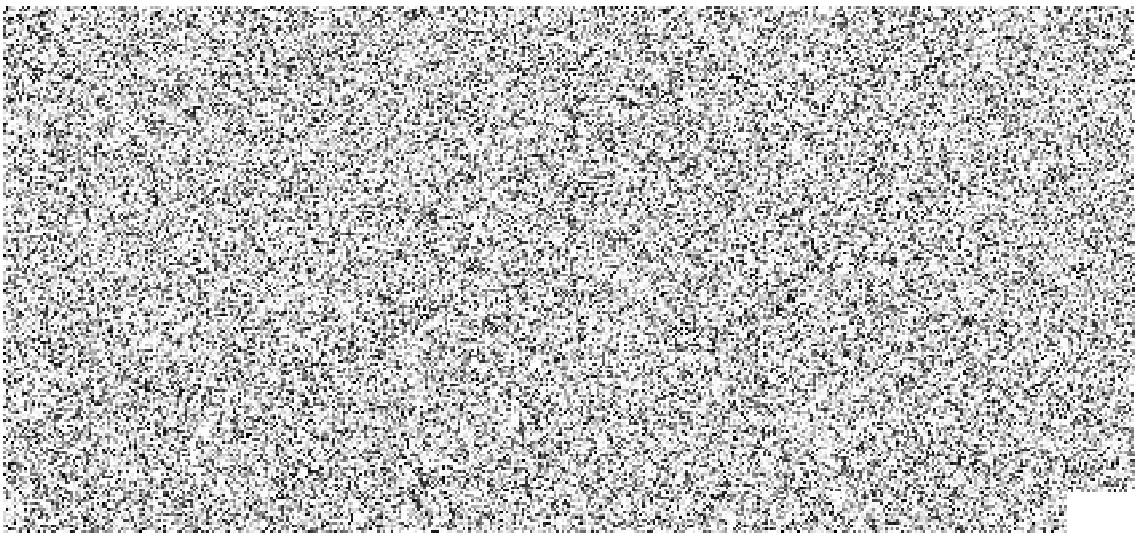


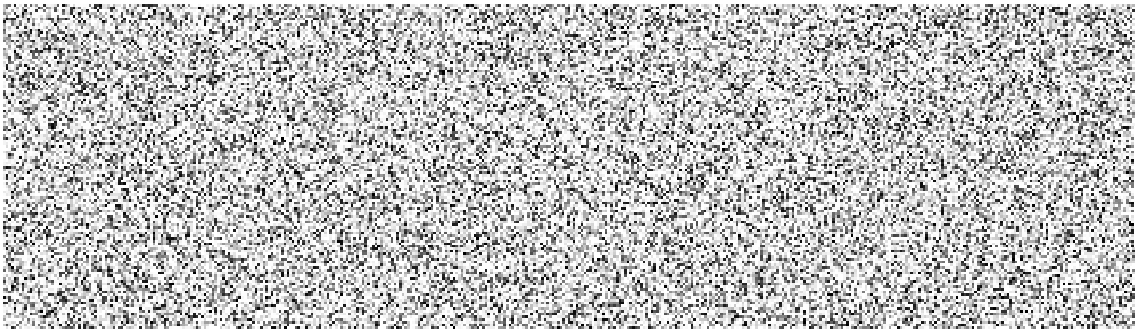












[redacted]

C.1.3 FUEL ROD DESIGN

[redacted]

C.1.4 FUEL ASSEMBLY DESIGN

[redacted]

C.1.5 [redacted] DATA PREPARATION

[redacted]