

# Review Report

Report to AREVA NP for Contract 15TEEGN1019

Ref: LR-A/2015/APV1501000

Date: 28 September 2015

Period: 19 May 2015 to 25 September 2015



Contents

1. Executive summary ..... 3

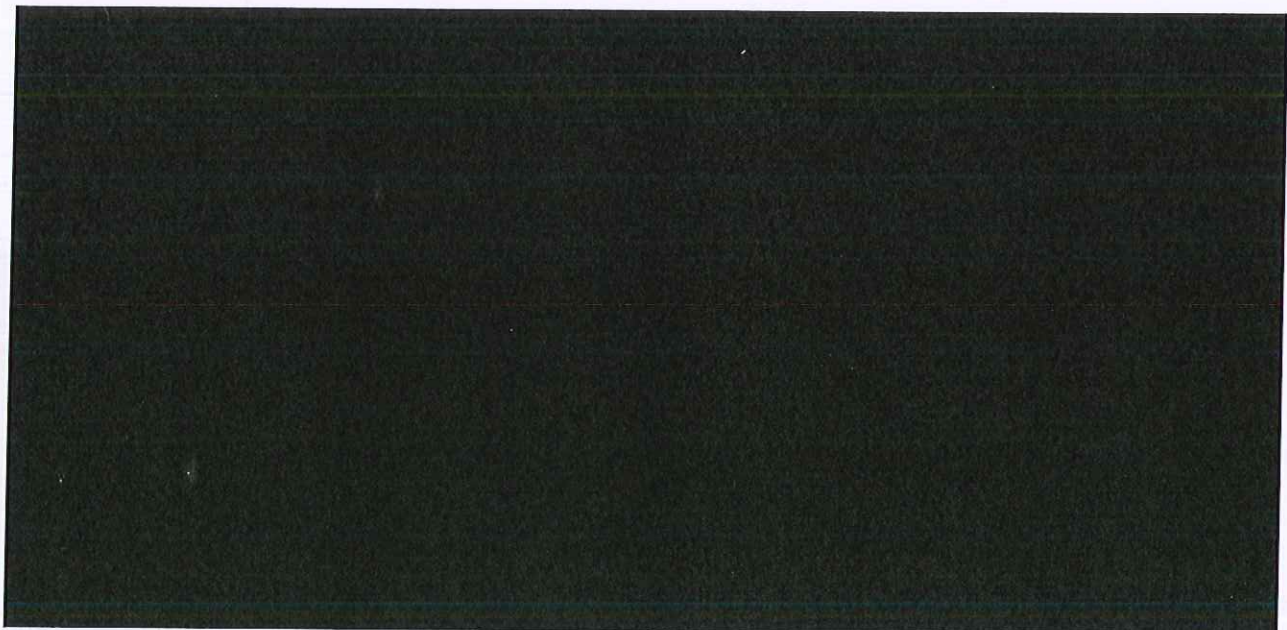
2. Introduction ..... 4

3. Methodology ..... 4

4. Interim reports ..... 5

5. Some terms used in this report..... 5

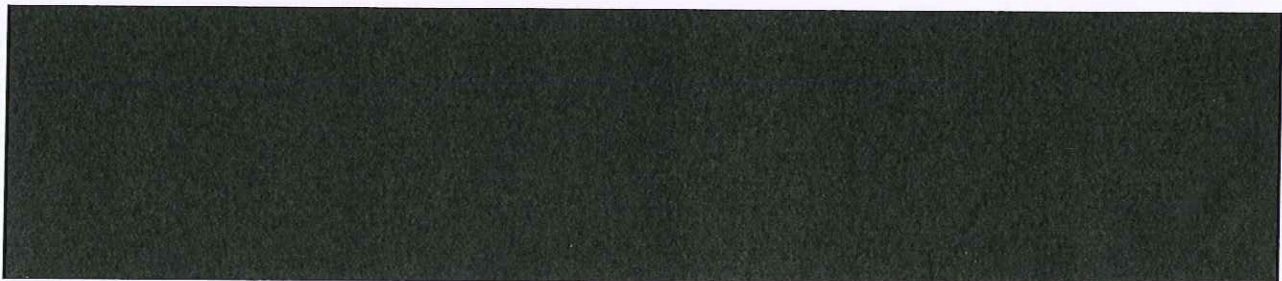
6. General discussion..... 6



8. General conclusions..... 17

9. Detailed conclusions ..... 18

10. Recommendations..... 20



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00	28 September 2015	25 September 2015	First Issue	AREVA NP

## 1. Executive summary

AREVA NP requested Lloyd's Register APAVE (LR-A) to "examine how and in which way AREVA Creusot Forge (ACF) quality assurance system, procedures, practices and organisation were and are used to demonstrate and to record the conformity of the products toward regulatory and contractual requirements."

Following meetings held at ACF on 19 and 20 May 2015, representatives of ACF and LR-A met at ACF in June and July 2015 in accordance with an agreed plan. The main technique adopted was interview with some audit checks. In preparing this report, analyses were carried out against the terms of reference for this review and against IAEA GS-R-3. There are six general conclusions, 38 detailed conclusions and 14 recommendations in the report.


Attention is drawn to three areas which require particular focus by AREVA:

### (1) Quality systems and root cause analysis of all negative findings including non-conformances

In general since 2010 activities at ACF are well-organised and controlled. 


The report recommends an evaluation to decide if ISO 9000, ASME and SAP systems are sufficient for the business in which AREVA HE operates and / or if elements of these systems are counter-productive to quality and nuclear safety objectives.



### (3) Qualification of plant and processes

The report recommends reviewing product qualification programmes and on completing qualifications for new plant and processes.

Overall, the review showed evidence of a quality and safety culture. Further reinforcement of this culture is planned by AREVA HE.

It is not possible to reach an overall conclusion of confidence in activities before 2010 from earlier Management Review reports. To increase confidence, further specific investigations would be required. The report recommends maintaining existing management and technical records to enable specific investigations that may be required in future.

## 2. Introduction

Lloyd's Register APAVE (LR-A) responded to an enquiry from AREVA NP to carry out a review of AREVA Creusot Forge (ACF). AREVA NP set the following objectives for the Review:

- "Examine how and in which way Creusot Forge quality assurance system, procedures, practices and organisation were and are used to demonstrate and to record the conformity of the Products toward regulatory and contractual requirements as well as international standards set by Creusot Forge's costumers and national safety authorities (hereinafter collectively referred as the "Requirements") including but not limited to:
  - RCC-M Code
  - French law and more specifically:
    - Arrêté du 12 décembre 2005 relatif aux équipements sous pression nucléaires (hereinafter referred as "ESPN")
    - Arrêté du 7 février 2012 fixant les règles générales relatives aux installations nucléaires de base;
  - ASME Code;
  - NSQ-100;
  - 10 CFR 50 app B, that is a law from the United States of America;
  - International Atomic Energy Agency Safety Guide IAEA GS-R-3;
- "Examine the technical relevance of all technical processes implemented at Creusot Forge in order to ensure that the review will lead to a comprehensive inventory of all potential issues.
- "Evaluate the proficiency level and the quality and nuclear safety culture within the current organisation."

The Methodology section of this report explains that the Terms of Reference in the AREVA enquiry and subsequent contract were developed into a programme of eight blocks for investigation mainly by interview. The Methodology section also refers to the analyses in Appendices 2 and 3 of the report, produced after the interviews were concluded. The tables in Appendix 2 demonstrate the extent to which the terms of reference were met and relate to some of the conclusions. The table in appendix 3 of the report relates to IAEA GS-R-3.

## 3. Methodology

An initial series of meetings held at ACF on 19 and 20 May 2015 considered the approach to collect facts related to the required deliverables grouped under eight blocks that had been part of the LR-A response to the enquiry. ACF agreed to prepare a plan of the availability of their personnel who would respond to the topics in the eight blocks. This plan is included in Appendix 1 to this report. Notes of this meeting are incorporated in the reports on each of the eight blocks in this report.

A series of visits was arranged in accordance with the plan and representatives of ACF and LR-A met at ACF. The technique adopted was by interview, accepting most of the material and information presented and occasional sampling in an audit technique. The selection of samples for audit was random and not intended to have statistical significance. The LR-A personnel involved were also experienced auditors and since they identified deficiencies, it is considered that the sample selections were useful illustrations.

At all stages of the interviews, at least one representative of LR-A was a fluent or native French speaker.

In preparing this report, analyses were carried out against the terms of reference for this review and against IAEA GS-R-3, included in appendices to this report. Since IAEA documents were not used directly by ACF, they were considered a useful external point of reference for this review. The annexes also

respond to specific deliverables and evaluation principles that were stated in the terms of reference for this review.

In seven of the eight blocks on the Report section of this document, there is a Discussion leading to Conclusions and Recommendations which are grouped later in the report.

## 4. Interim reports

Progress reports were issued by LR-A to the Steering Committee in advance of their telephone conference meetings on 19 June, 2 and 16 July 2015. LR-A took part in these telephone conferences.

## 5. Some terms used in this report

ACF refers to AREVA Creusot Forge

AREVA HE or HE refers to AREVA Heavy Equipment Division

AREVA NP refers to AREVA NP SAS, registered office at Tour AREVA, 1, place Jean Millier, 92400 Courbevoie, France

ASME refers to the American Society of Mechanical Engineers Codes

ESPN refers to the French Arrêté du 12 décembre 2005 relatif aux équipements sous pression nucléaires

KPI refers to Key Performance Indicators

LR-A refers to Lloyd's Register Apave Limited registered office at 71 Fenchurch Street, London, EC3M 4BS. UK

NDT refers to Non-destructive Testing

QA refers to Quality Assurance

RCC-M refers to Design and Construction Rules for Mechanical Components of PWR Nuclear Islands, published by AFCEN

**Steelmaking** includes all aspects of manufacture of liquid steel through ladle processing to casting and solidification of ingots.

Note: Steelmaking is currently carried out by ArcelorMittal Industeel in a factory adjacent to ACF.

TOFD refers to Time of Flight Diffraction

Note: this is an NDT technique

## 6. General discussion

This report gives an overview of a wide range of activities, some of which are quantifiable (e.g. statistics from internal audits) and others which are subjective (e.g. safety culture).

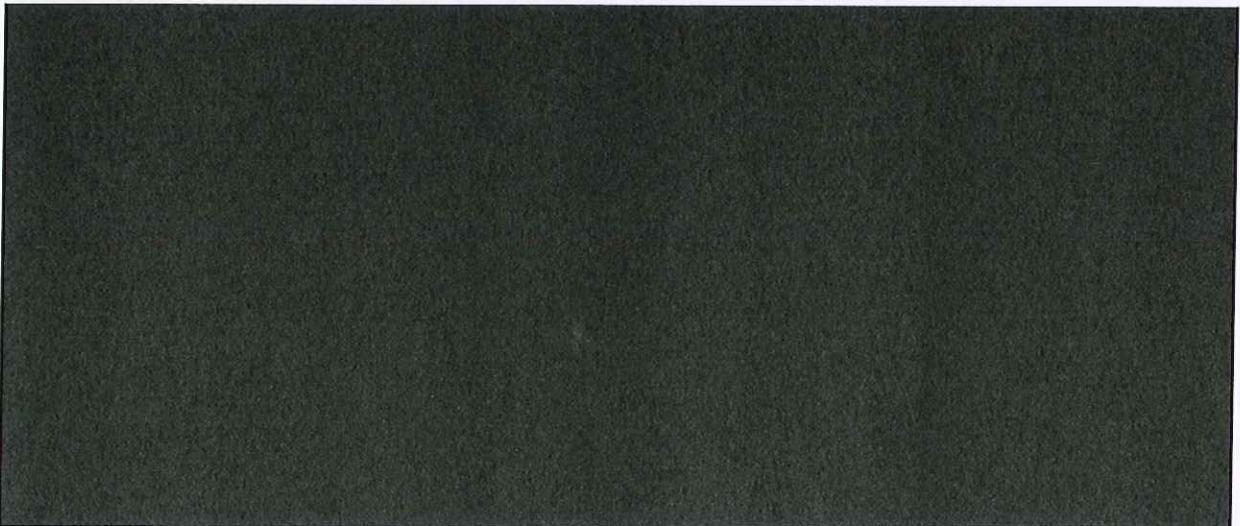
Although there has been a documented quality system with formal procedures and associated documentation for some 10 years at ACF, the report only includes some details and indicates trends for the period from 2004 to 2010.

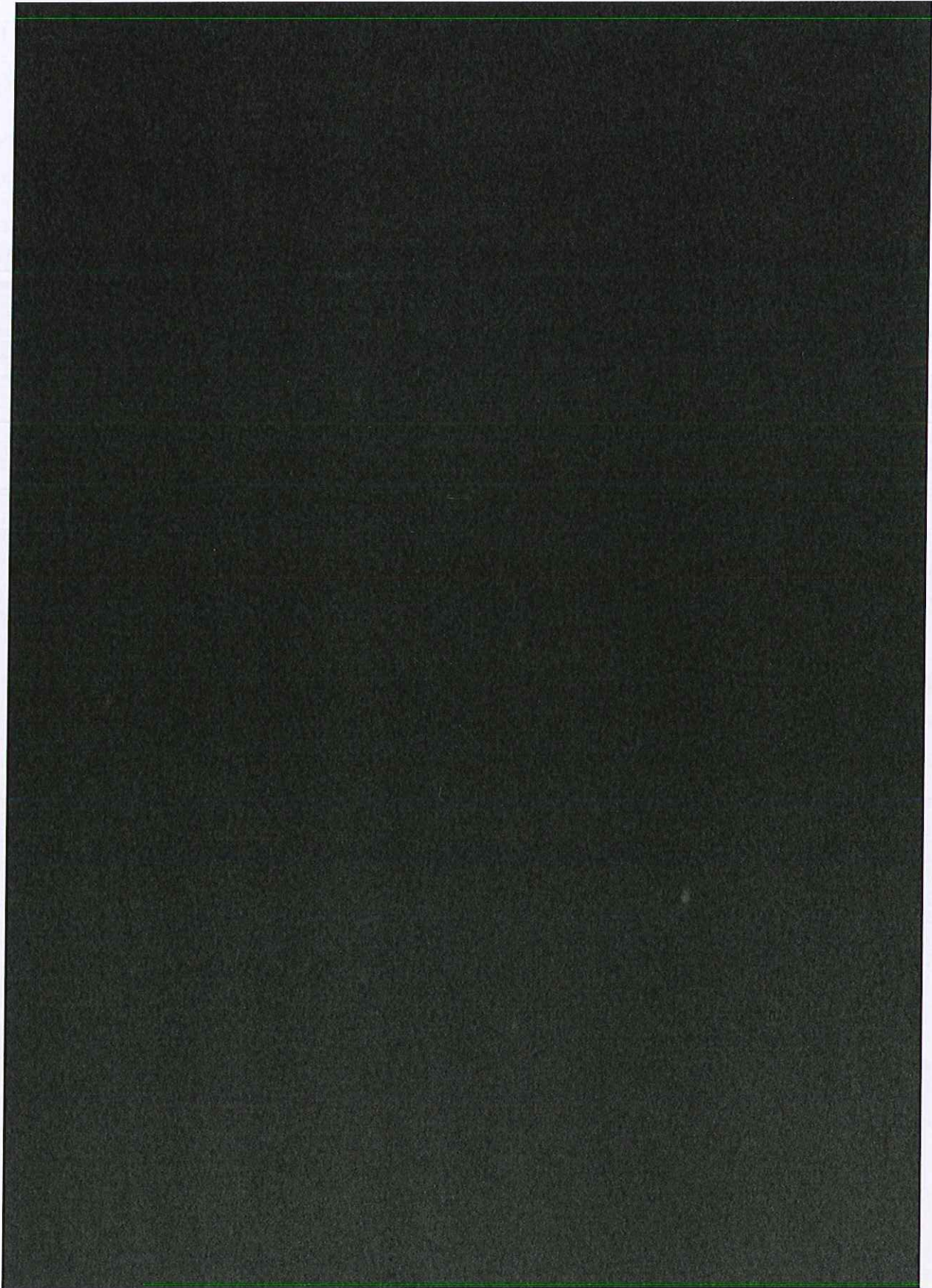
The objectives of this review have therefore been met for the period after 2010. If answers to specific questions relating to the historic situation prior to 2010 are required, they would be more efficiently answered by *ad hoc* investigations.

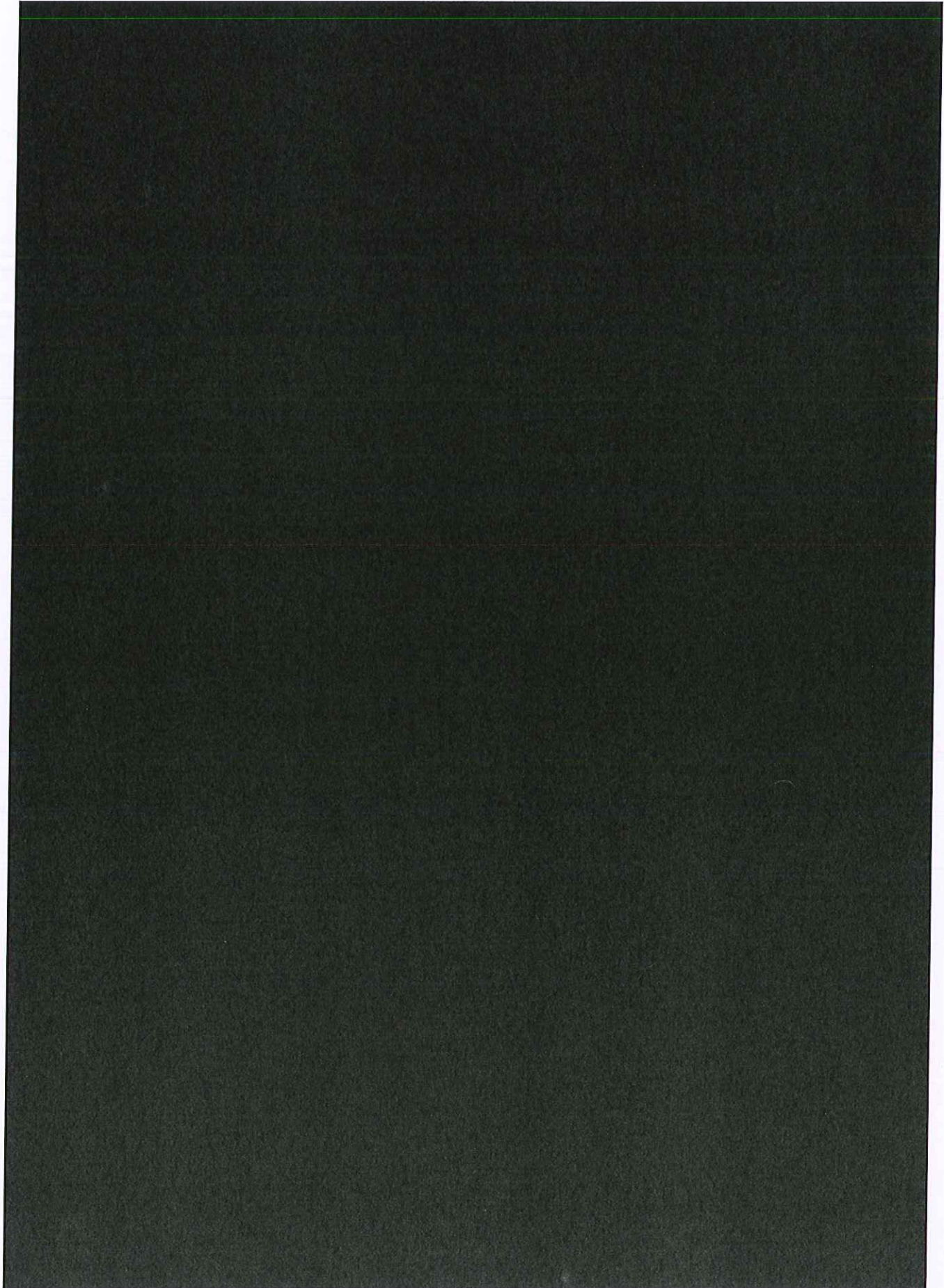
In most cases, responses to questions were accepted based on statements put forward by the ACF personnel or by their illustrations from those paper or electronic records that were presented. Some responses were explored in more depth using an audit technique. In an audit, some of the responses would be classed as non-conformances or other negative findings. However it was not the purpose of this review to carry out an audit and the deficiencies were not reported as such: they were simply drawn to the attention of those involved. It was not intended to check that action was taken on the specific deficiencies as part of the review.

It is generally accepted that quality systems in line with ISO 9001 and / or the ASME Code as held by ACF, indicate a basic management system. However over-emphasis on procedures and compliance and following routines such as internal audits for their own sake may detract management's focus from business objectives. One of the Recommendations in this report is to evaluate if ISO 9000, ASME and SAP systems are sufficient for the business in which AREVA HE operates and / or if elements of these systems are counter-productive to quality and nuclear safety objectives.

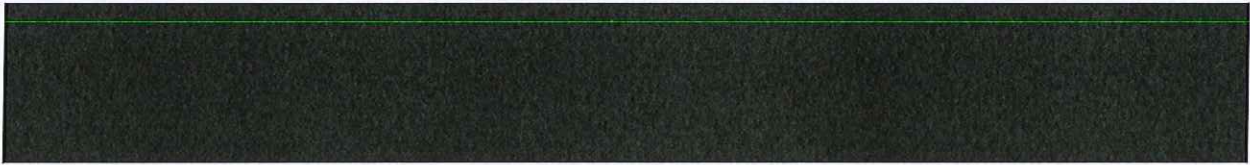
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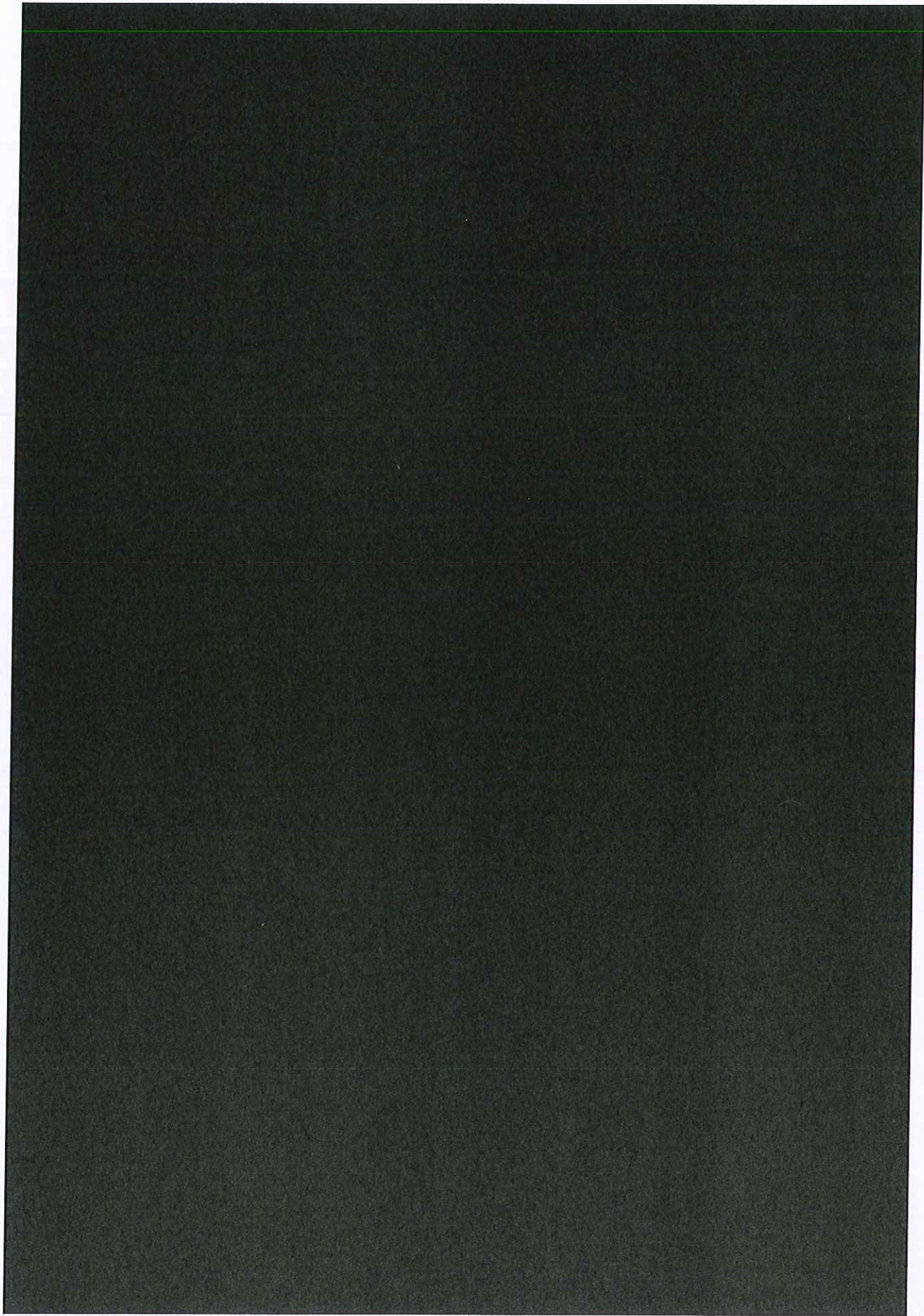


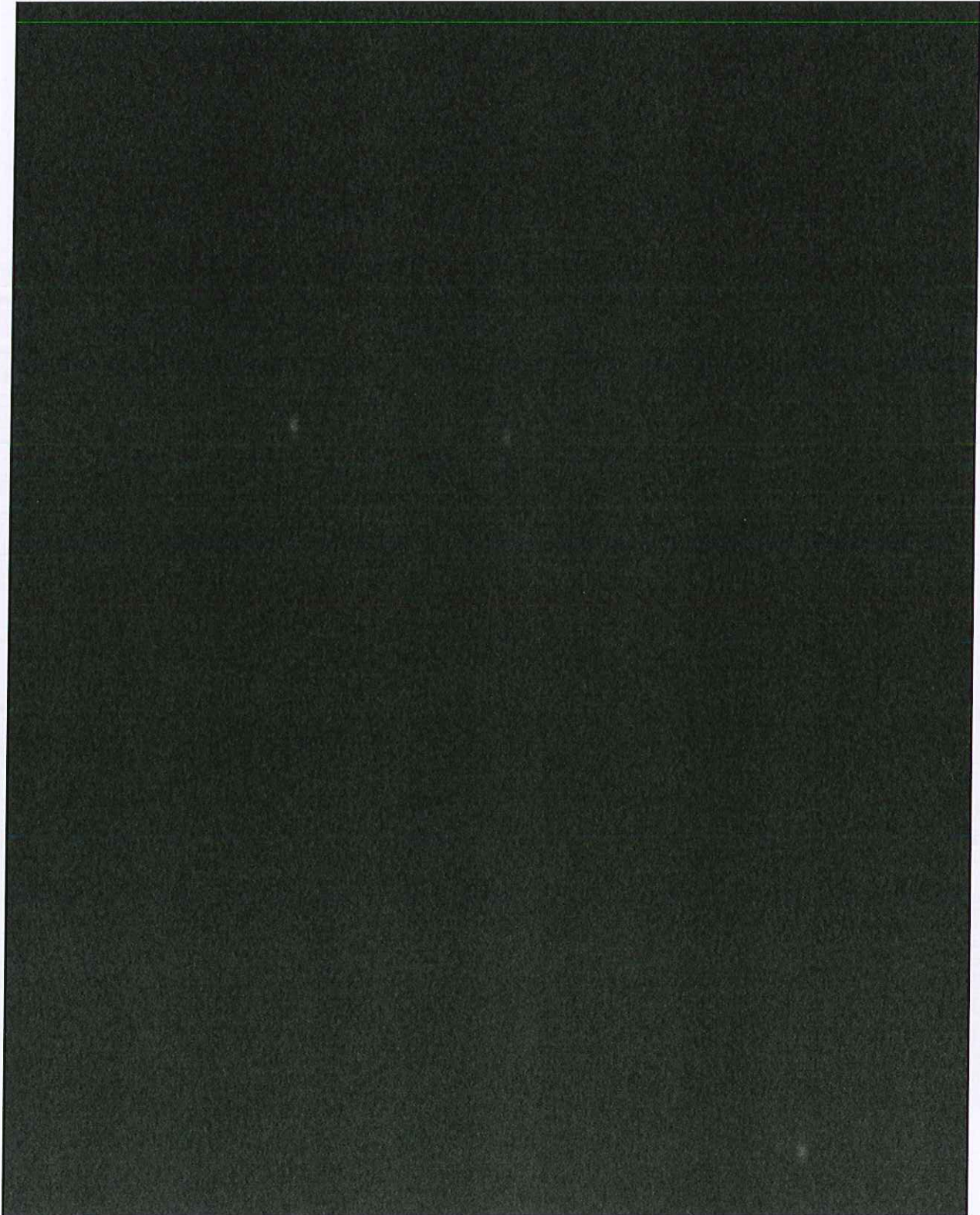


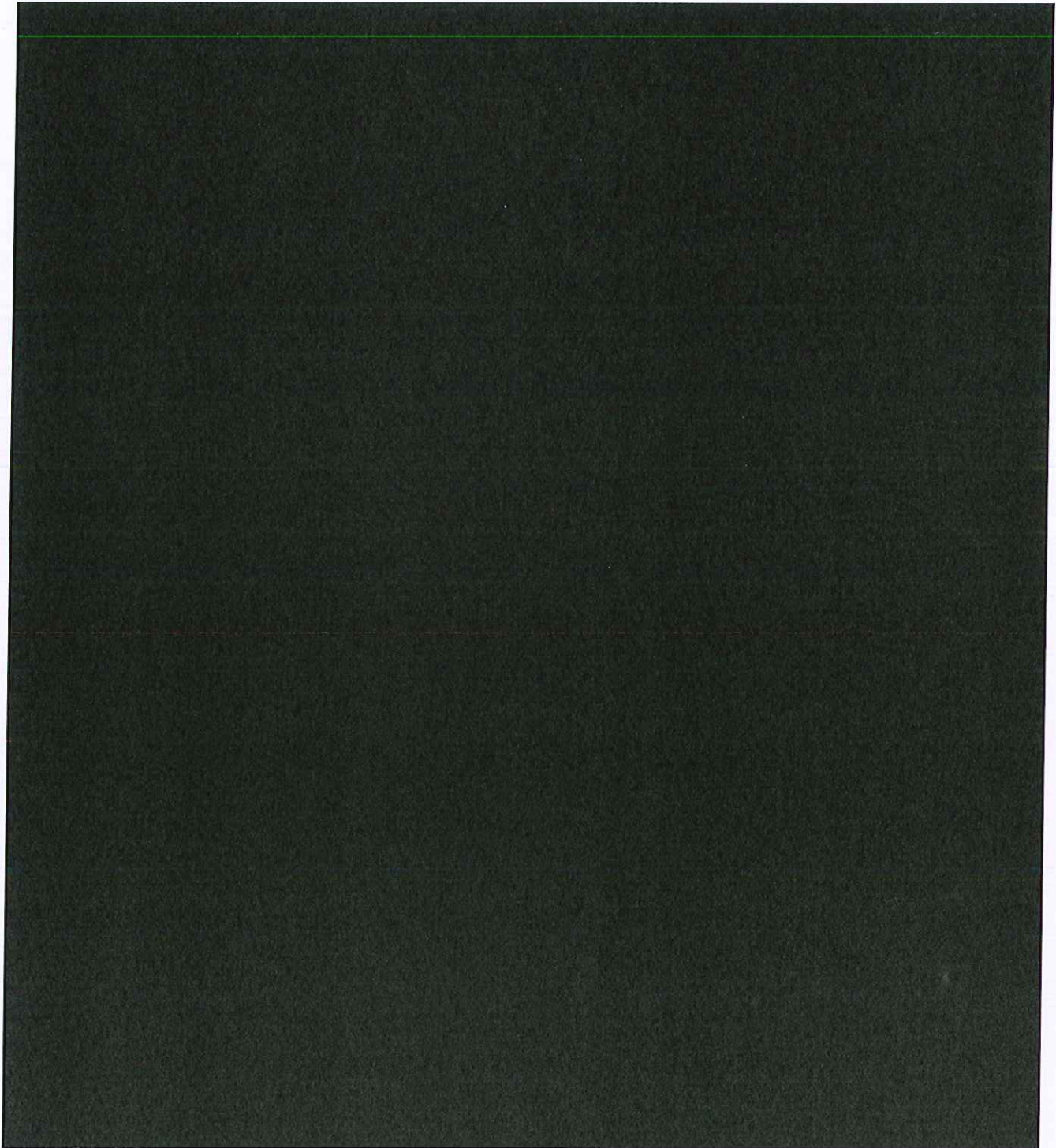


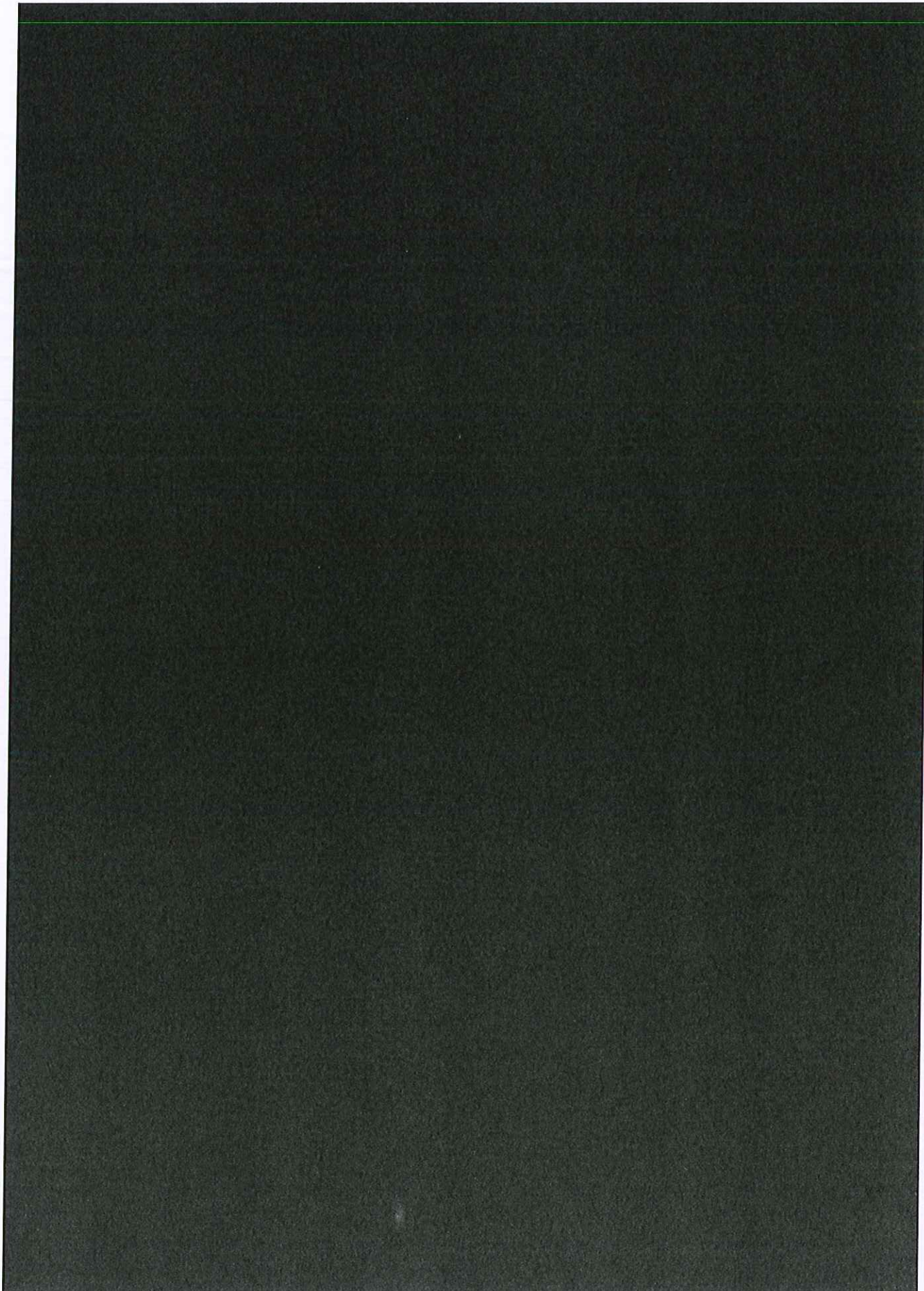


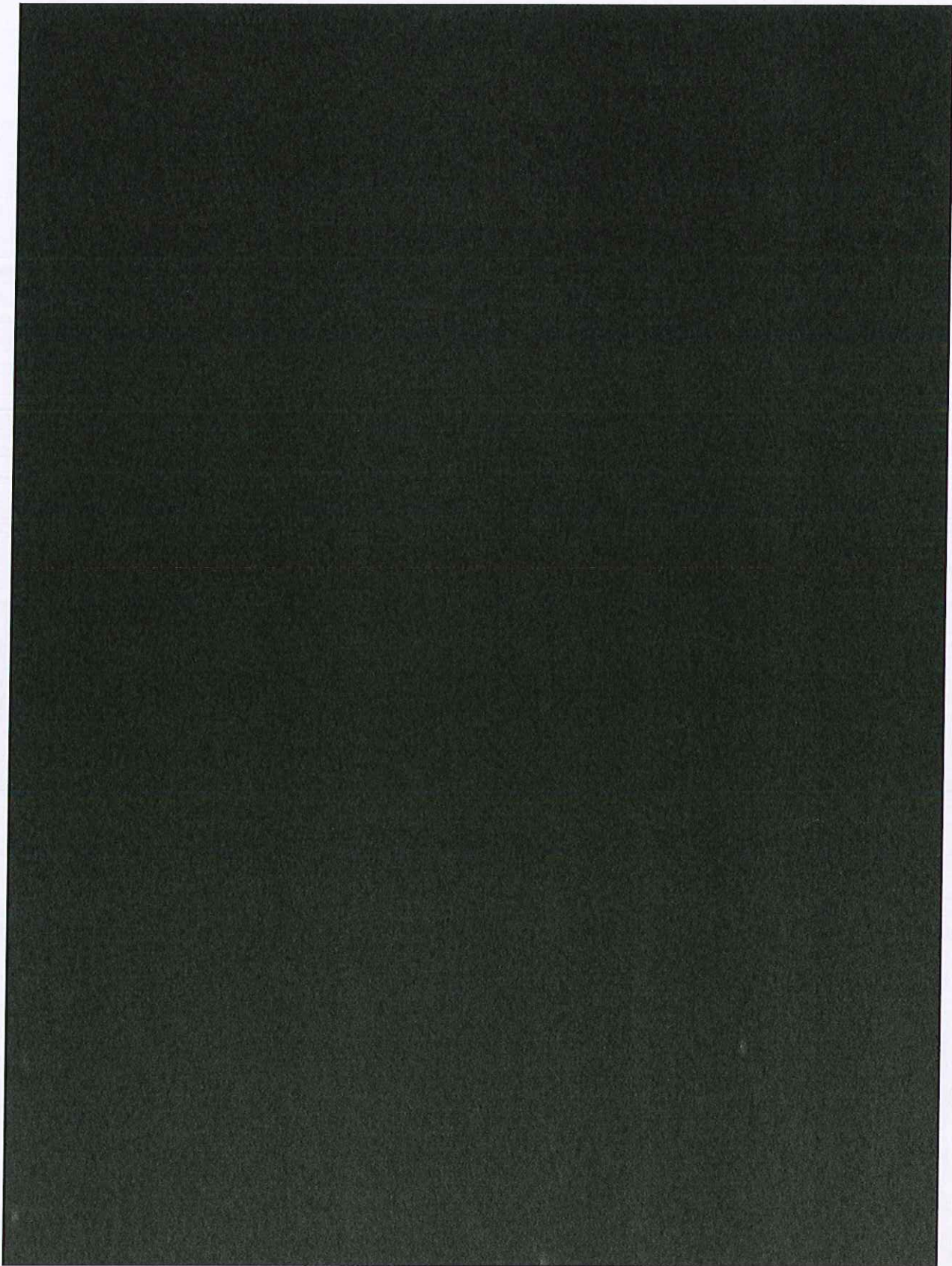


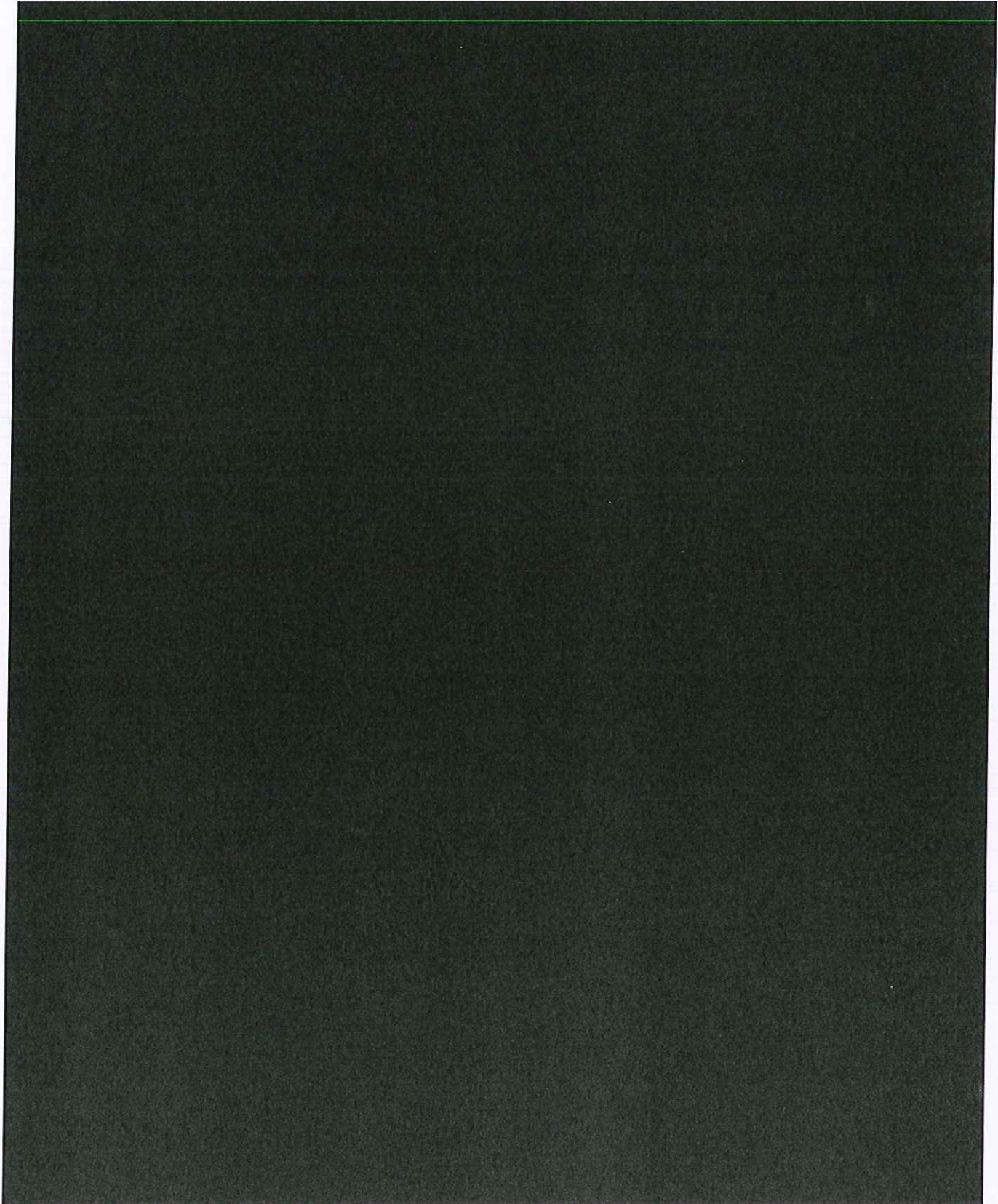


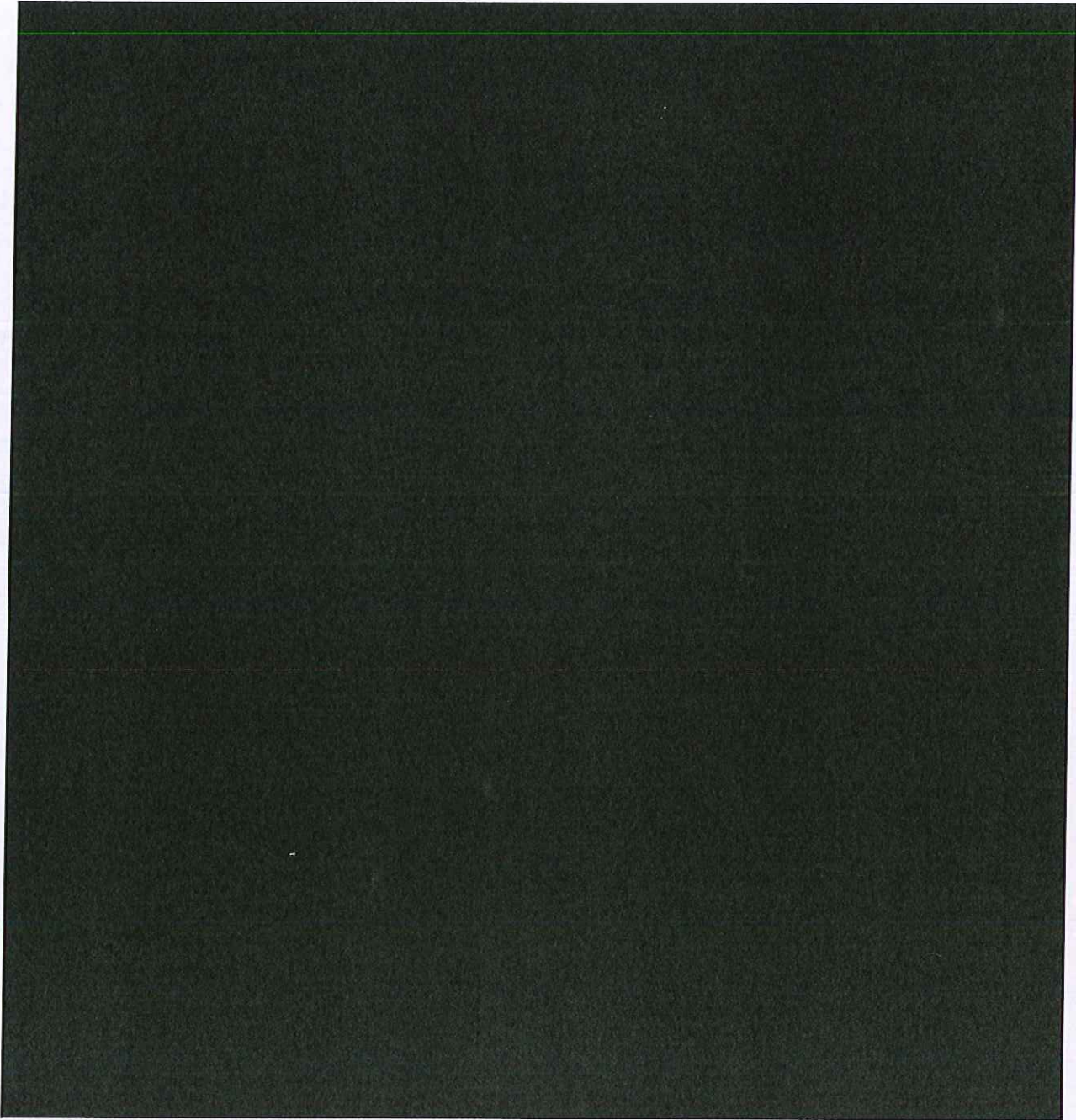














## 8. General conclusions

- (I) The review achieved its objectives subject to the following qualifications:
  - (I a) In respect of the "comprehensive inventory of all potential issues", it should be noted that the review was limited to the scope covered and the availability of personnel. There may be additional issues prompted by the review process and by this report for AREVA to develop.
  - (I b) Evaluation of the quality and safety culture is subjective and based on the evidence provided or readily visible. This evaluation was not subject to rigorous testing at all levels throughout the organisation.
- (II) The review showed that, since at least 2010, there is evidence of a quality and safety culture and currently, activities at ACF are well-organised and controlled.
- (III) It is not possible to reach an overall conclusion of confidence in activities before 2010 from earlier Management Review reports. To increase confidence in the period prior to 2010, further specific investigations would be required.

(IV) 

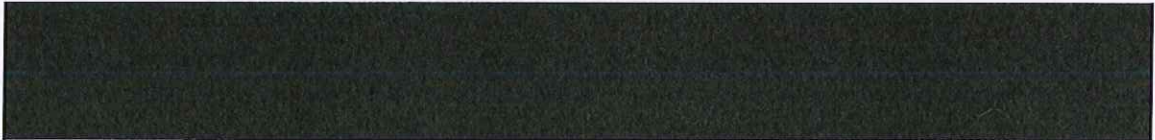
(V) 

(VI) 

## 9. Detailed conclusions

- 1 There has been a documented quality system at ACF with formal procedures and associated documentation for some 10 years.
- 2 The ISO 9001 and ASME systems may detract from a comprehensive management system through focussing on compliance issues rather than a system for the management of regulatory and other aspects related to the product application.  
See also conclusion 26 and Recommendation b.
- 3 The AREVA organisation integrated St Marcel and Creusot Forge under Heavy Equipment Division (HE) with effect from 2015. This has not adversely impacted the internal process for quality purposes.
- 4 ACF is now part of HE and understands its role in respect of analysis of risks.
- 5 The current empirical approach to hazard analysis may be improved if a more systematic methodology would be accepted by the French Authorities.
- 6 There is a risk that the cumulative effect of a series of "minor" changes are considered acceptable without requalification, since revisions to qualification documents were not assessed back to the original specification and qualification.  
See Recommendation h

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13 A formal system exists for quality planning and shop travellers.

14 

15 The quality and planning functions work effectively but there may be overlapping activities.

16 Assessments of the control and effectiveness of processes are carried out in relation to manufacturing.

17 [Redacted]

18 Preparation, identification and traceability of samples for testing was good.

19 The manufacturing plant had been divided into 13 areas for safety and the "Scope" project involved people in their own safety and the safety of others.

20 [Redacted]

21 [Redacted]

22 [Redacted]

23 [Redacted]

24 [Redacted]

25 [Redacted]

26 SAP will roll out for full implementation in January 2016.

27 (Planned) Maintenance does relate to product risk concepts.

28 There is limited input of best practice from external organisations.  
See Recommendation I

29 Management review is conducted annually. It is not possible to reach an overall conclusion of confidence in activities before 2010 from earlier Management Review reports. To increase confidence in the period prior to 2010, further specific investigations would be required.

30 [Redacted]

31 [Redacted]

32 Diagnostics from Management Review for the Le Creusot and St Marcel sites include Quality, Health, Safety and Environment.

33 [Redacted]

34 The HR function for AREVA HE has a formalised approach to stating job requirements and to addressing training needs to enable personnel to fulfil job requirements with KPIs and grading of competence. Annual assessments are carried out.

35 Induction training by the Quality function is well-established and includes competencies in technical, quality system and regulations. However, repeat indoctrinations are overdue for several people.

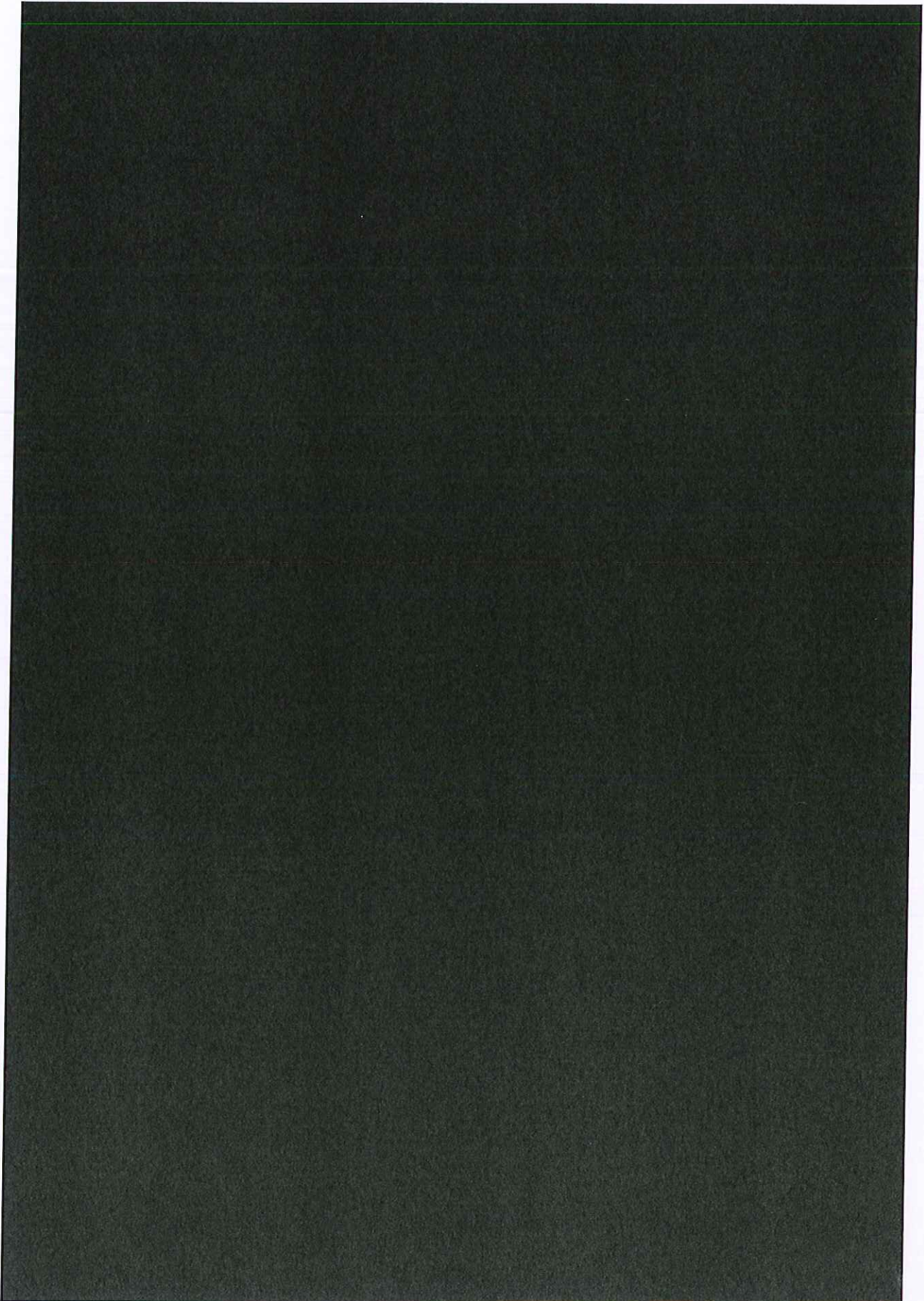
36 The basic technology of forging ingots is understood.

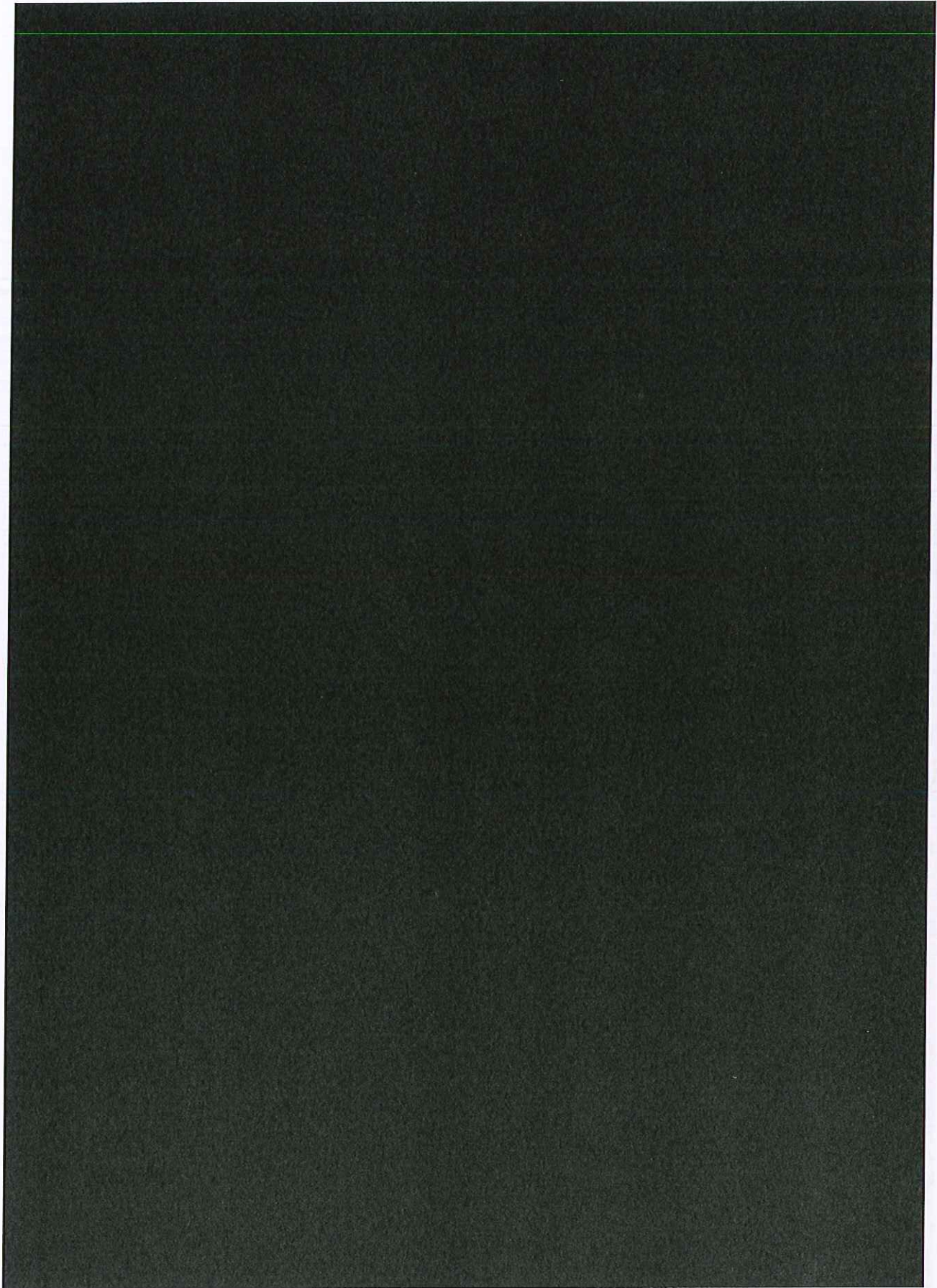
- 37 It is unclear if findings and conclusions from R&D are always implemented in production.
- 38 Personnel from the technical function carry out development work but their activities may be subordinate to production and not always implemented.  
See Recommendation j

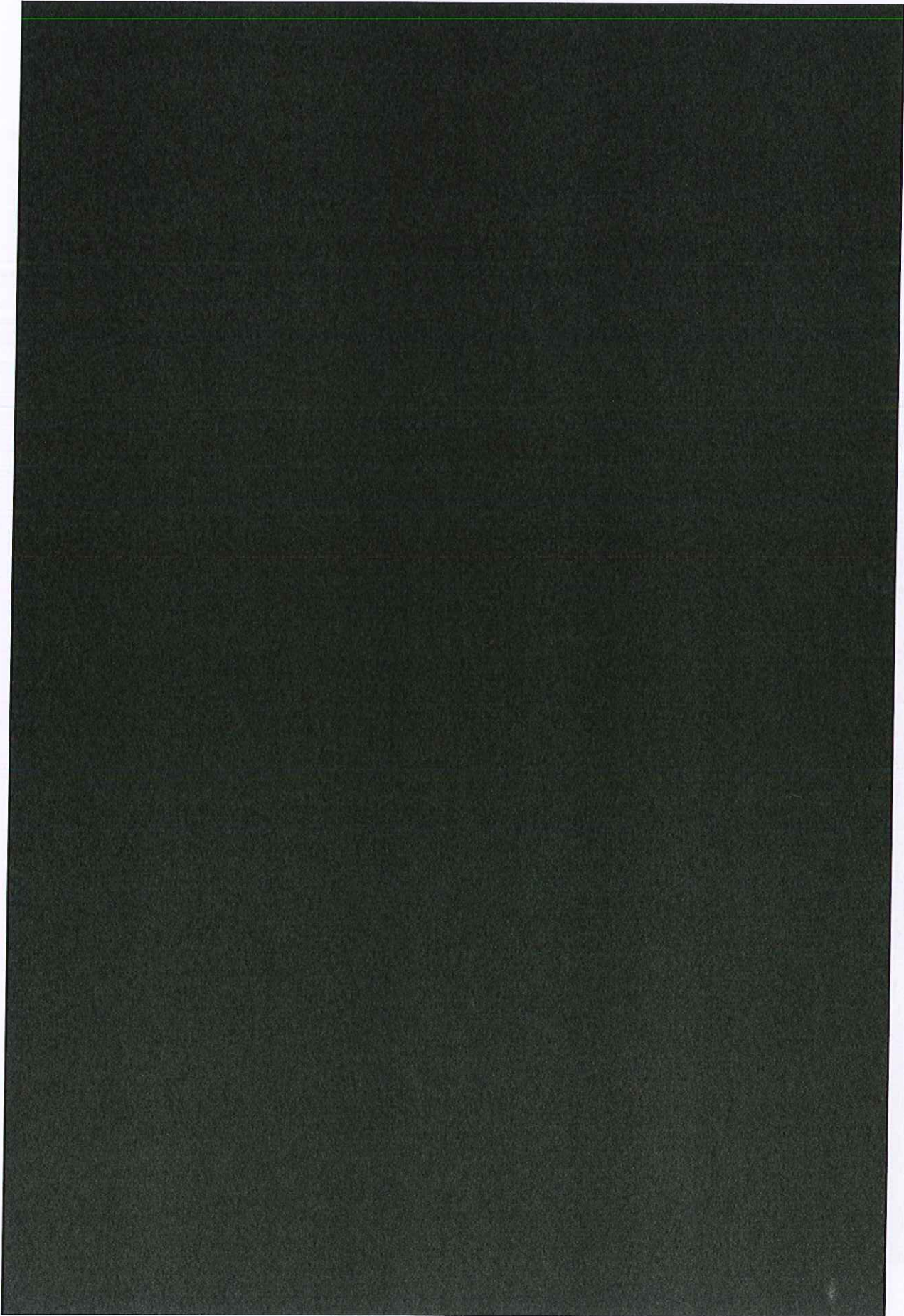
## 10. Recommendations

- a. Plan the actions, priorities and resources required to address all the General and Detailed Conclusions and Recommendations in this report;
- b. Evaluate if ISO 9001, ASME and SAP systems are sufficient for the business in which AREVA HE operates and / or if elements of these systems are counter-productive to quality and nuclear safety objectives;
- c. [REDACTED]
- d. [REDACTED]
- e. Obtain accreditation for own test laboratories;
- f. Use only accredited laboratories for external testing where reliance is placed on the results;
- g. Recognise and manage negative findings in internal audits irrespective of whether they are classed as non-conformances, observations or areas for improvement;
- h. Review new and existing product qualification programmes to ensure that they are comprehensive and complete, and apply a similar approach for all future orders;
- i. [REDACTED]
- j. Increase reliance on automation and dynamic instrumentation;
- k. Carry out comprehensive root cause analysis for all negative audit findings and other non-conformances;
- l. Identify other similar non-competitive businesses to share understanding and develop best practice;
- m. Maintain existing management and technical records to enable specific investigations that may be required in future in particular historical data after 2004 as well as more recent matters such as the findings of the LR-A Audit of ACF in 2012 and data on 18/20 MND5.
- n. Continue to promote the quality and safety culture.

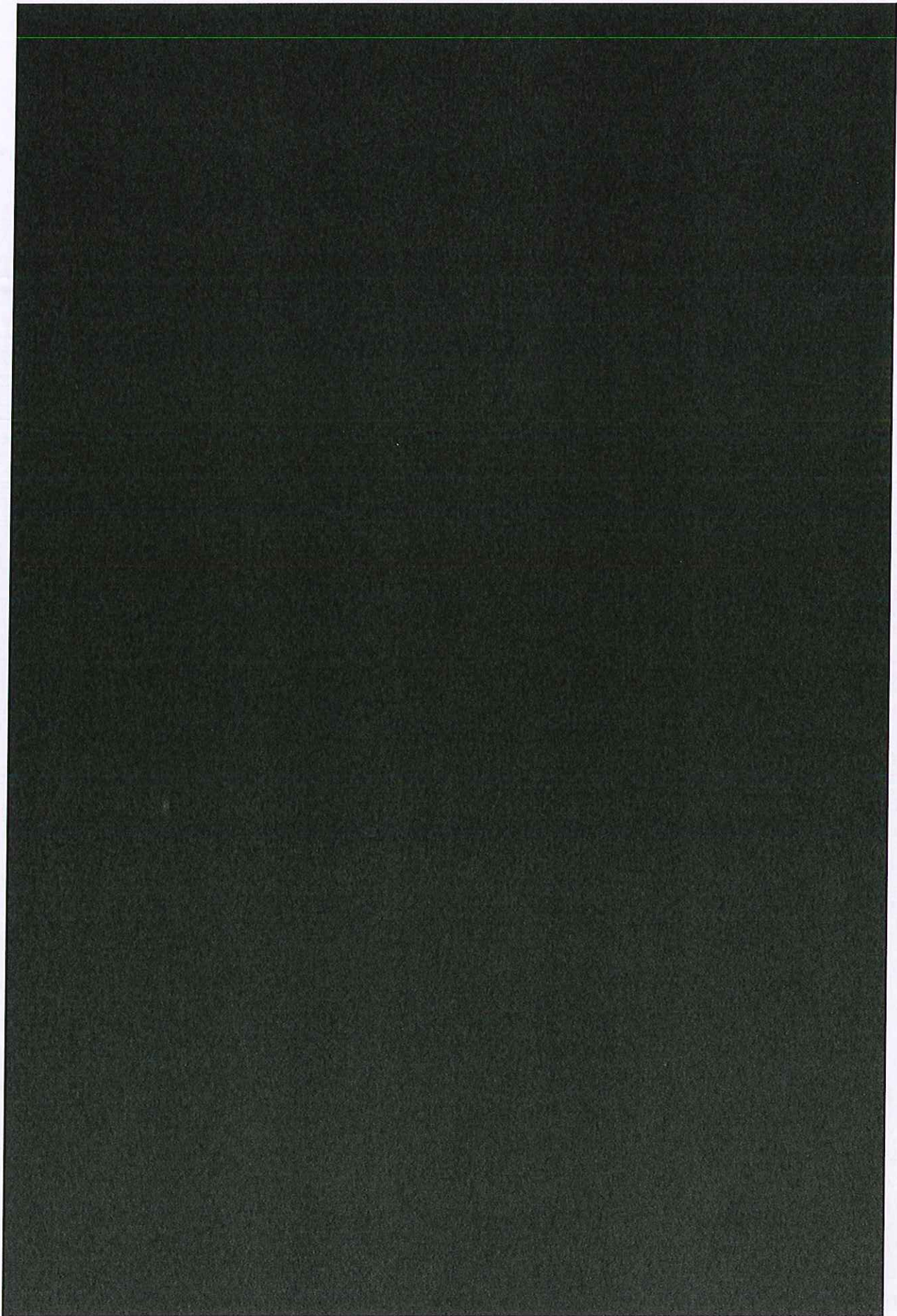
**Appendices**

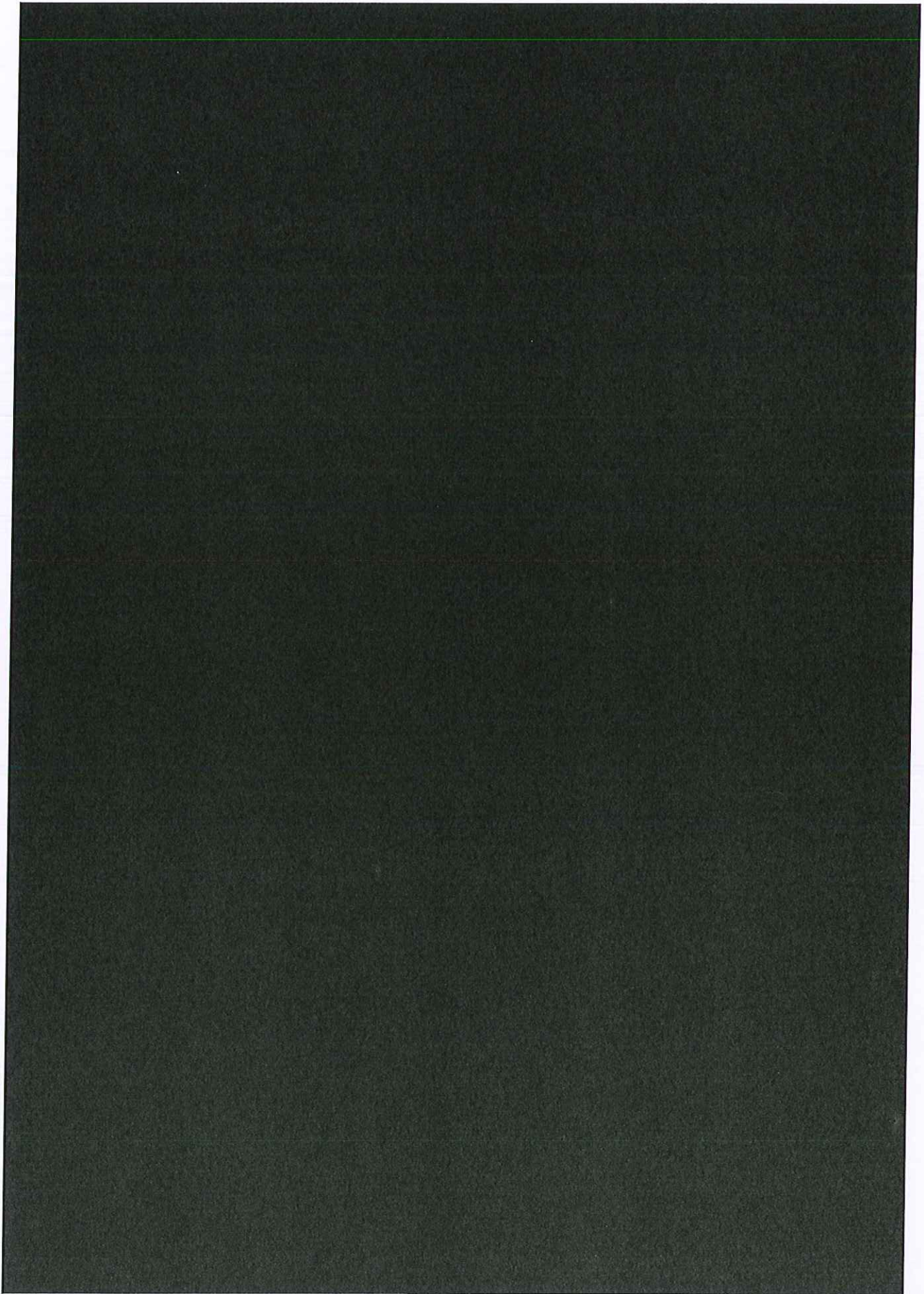


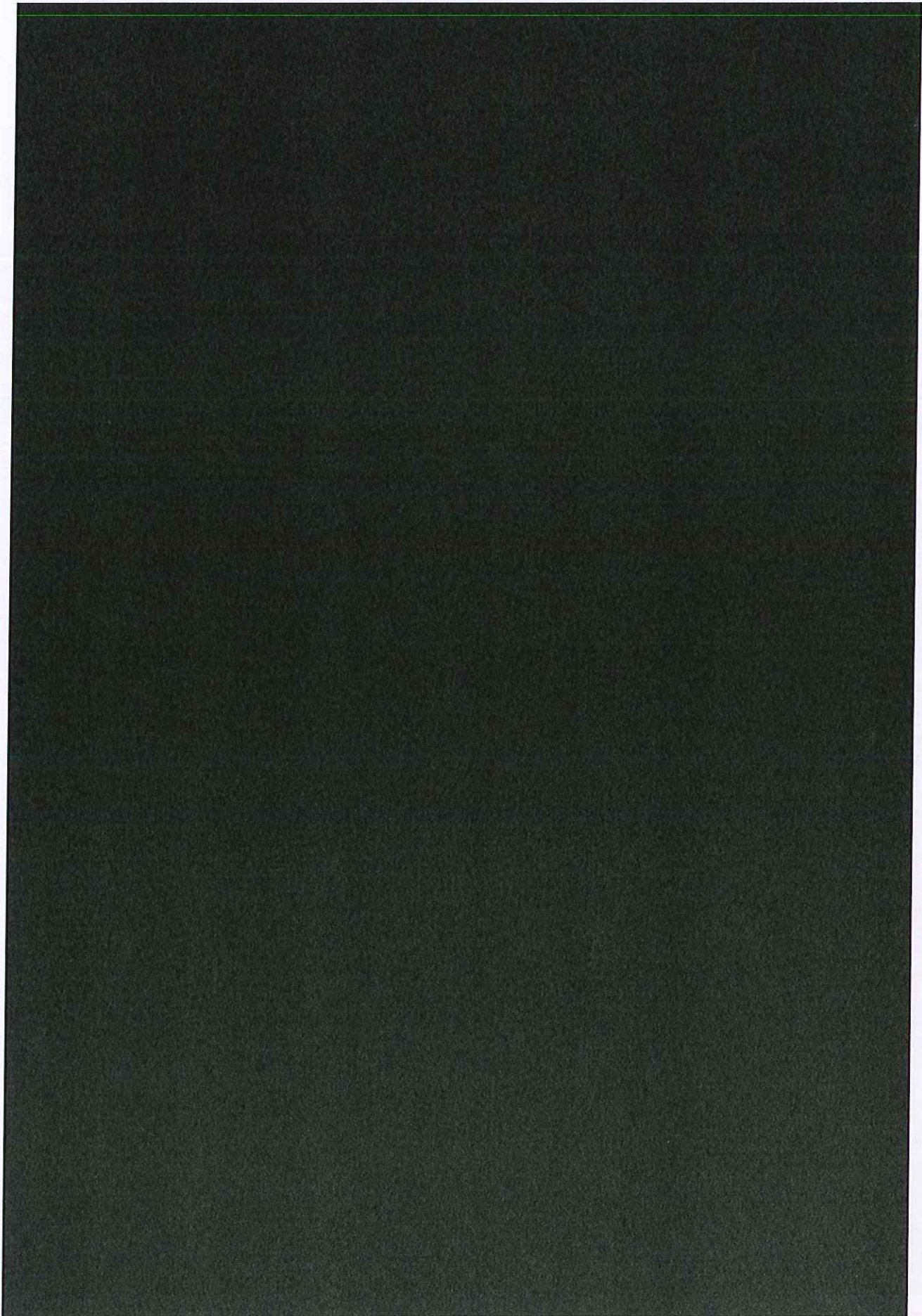


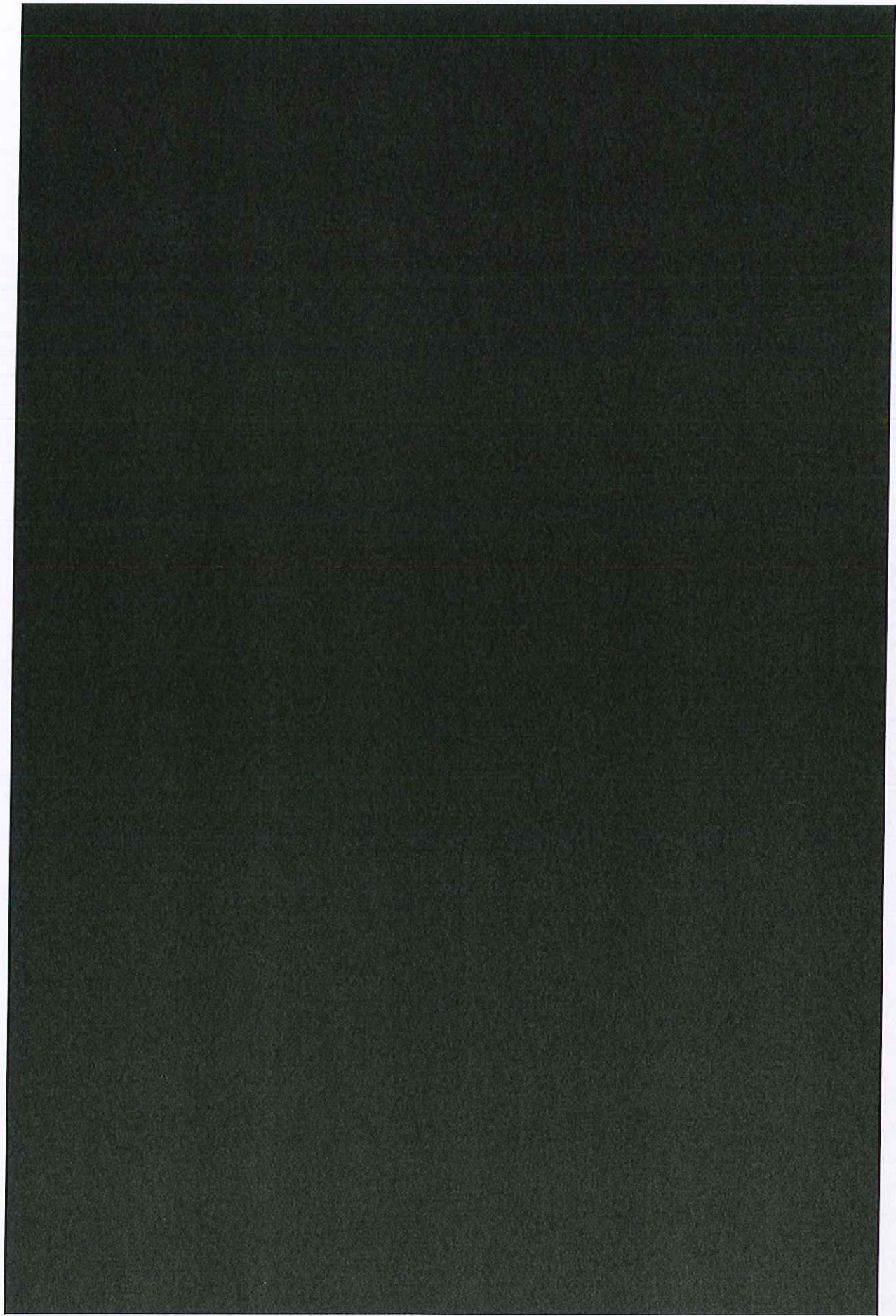


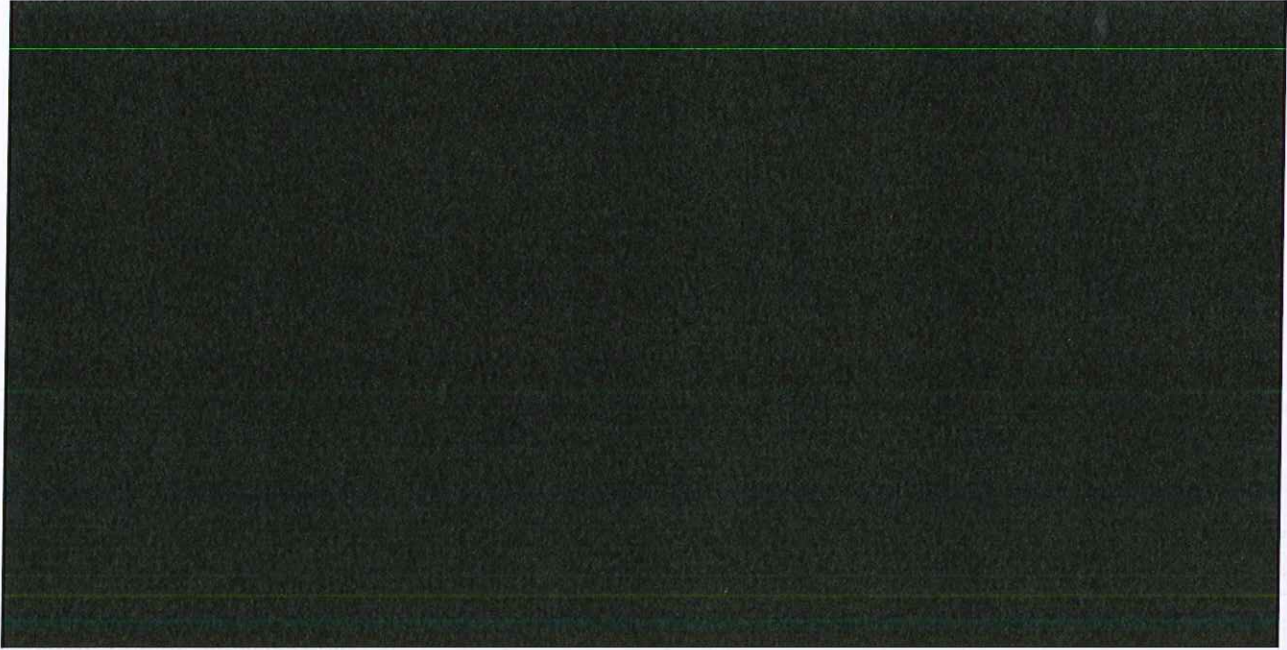


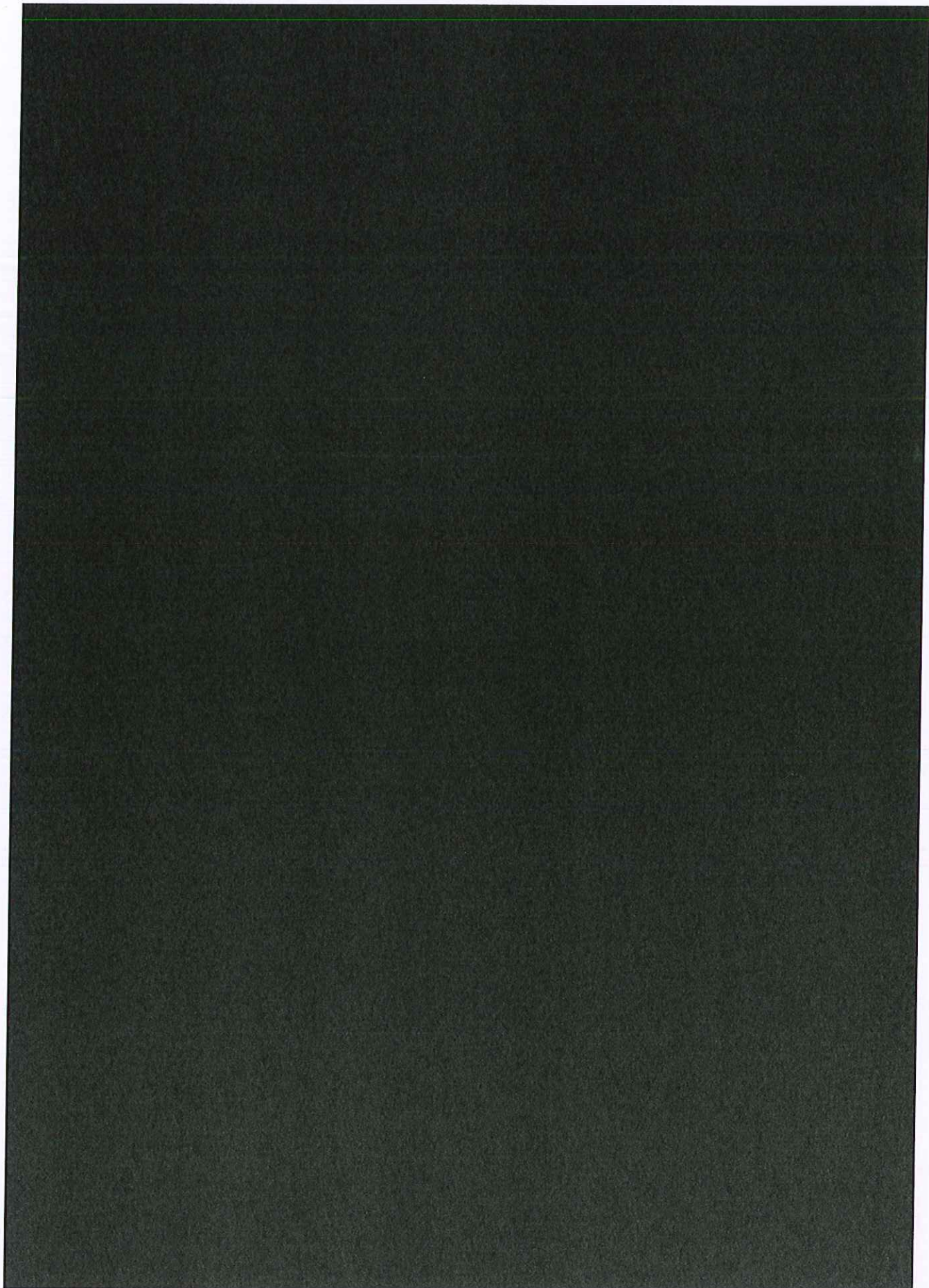


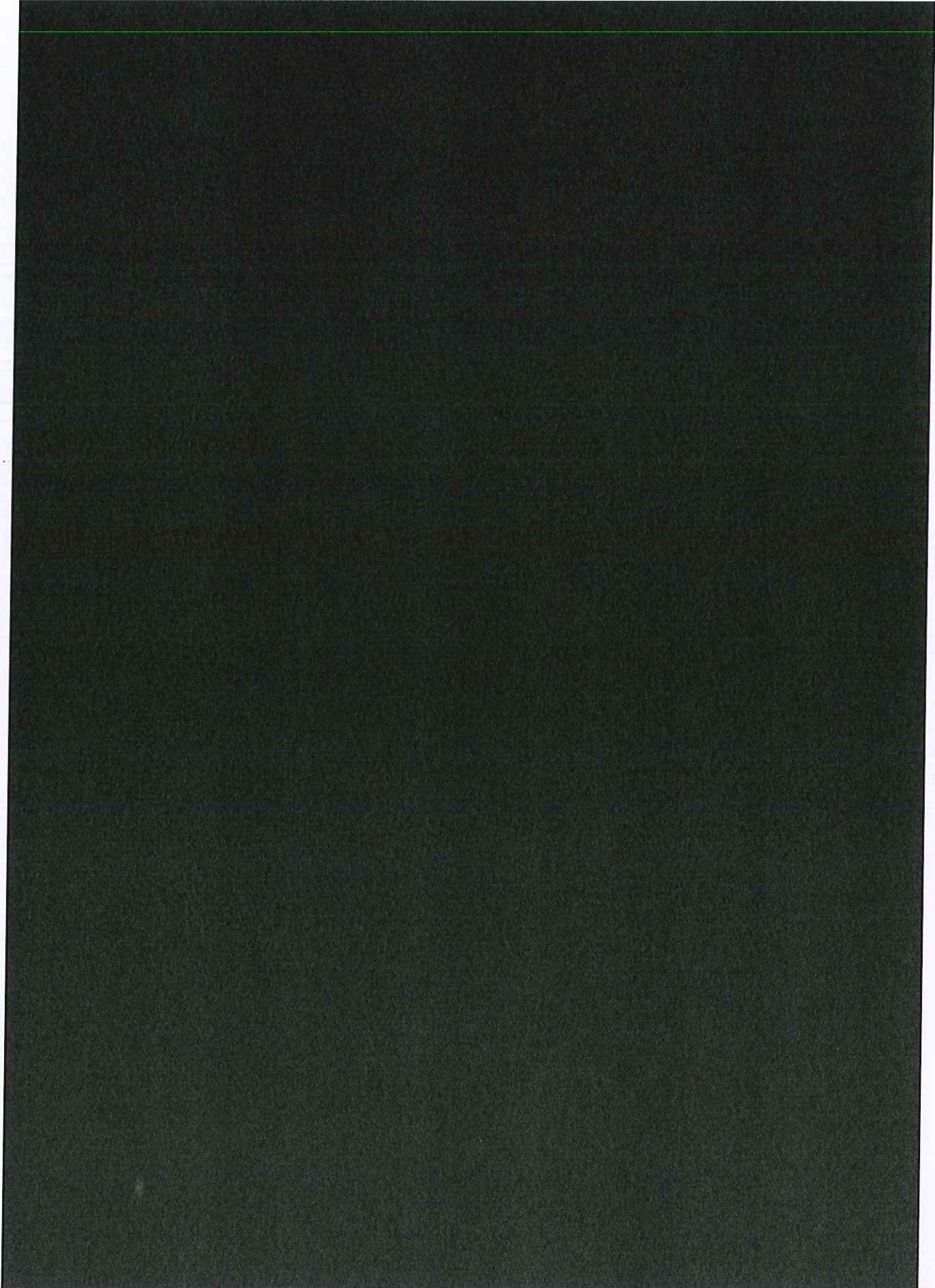


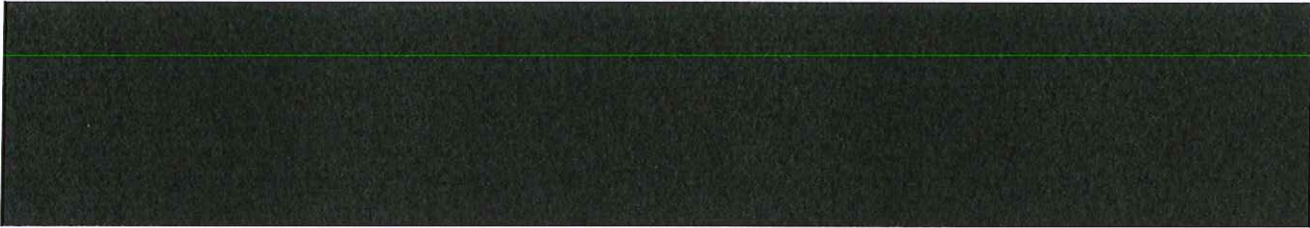




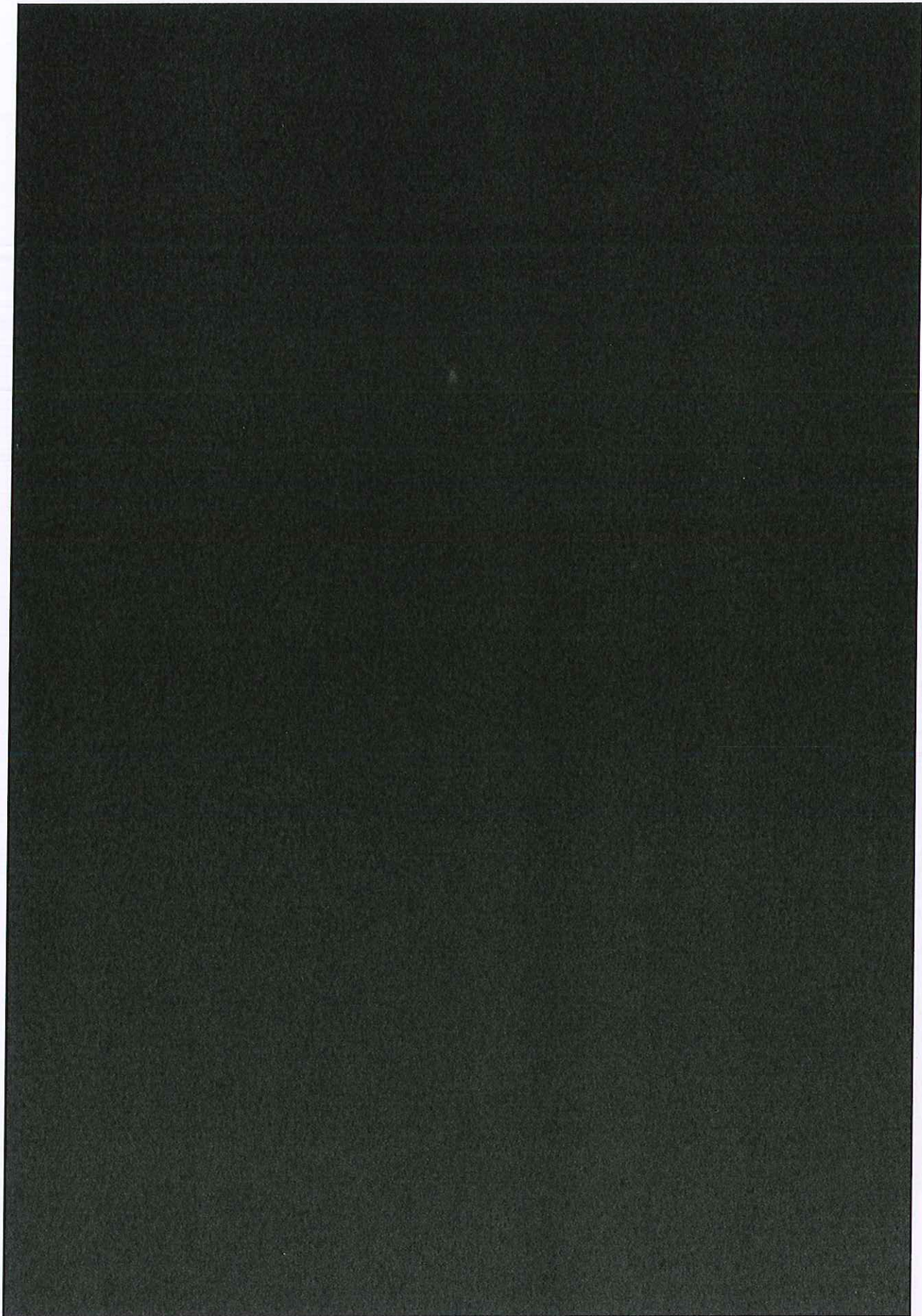


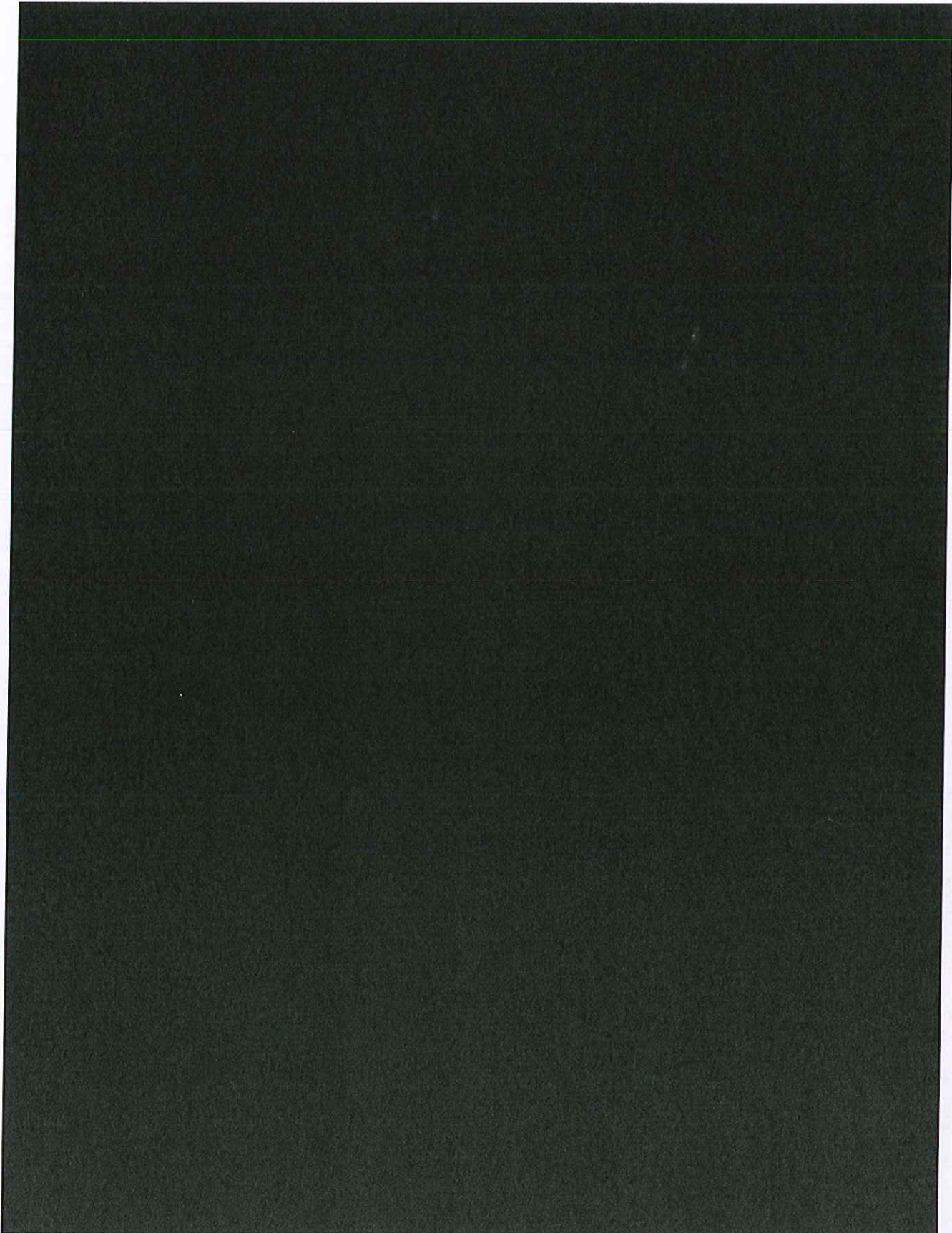












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