IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

| | | |
|---|---|---|
| PICTIVA DISPLAYS INTERNATIONAL, LTD., | ) | |
| Plaintiff, | ) | Civil Action Nos.: 2:23-cv-00495-JRG |
| vs. | ) | |
| SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC., | ) | |
| Defendants. | ) | |

HIGHLY CONFIDENTIAL

VIDEOTAPED VIDEOCONFERENCE DEPOSITION OF:

HOMER ANTONIADIS, PhD

WEDNESDAY, JUNE 4, 2025

Reported by: Monice K. Campbell, CRR, RMR,
NV CCR No. 312, CA CSR No. 14171
Job No.: SD 7353095





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Samsung v Pictivia
IPR2024-01223

VIDEOCONFERENCE DEPOSITION OF HOMER ANTONIADIS, PhD, held remotely, on Wednesday, June 4, 2025, at 9:18 a.m., before Monice K. Campbell, Certified Court Reporter, in and for the State of California.

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Also Present:

DAVID WEST, VIDEOGRAPHER





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WEDNESDAY, JUNE 4, 2025

9:18 A.M.

* * * * *

THE VIDEOGRAPHER: Good morning. We are on record. The time is 9:18 a.m. Pacific Daylight Time. The date today is June 4th, 2025. Please note that this deposition is being conducted virtually. The quality of recording depends on the quality of the camera and internet connection of participants. What is seen from the witness and heard on screen is what will be recorded. Audio and video recording will continue to take place unless all parties agree to go off the record.

This is Media Unit 1 of the video-recorded deposition of Homer Antoniadis, PhD, taken by counsel for plaintiffs in the matter of Pictiva Displays International Limited, et al., versus Samsung Electronics Company, Limited, et al., filed in the United States District Court for the Eastern District of Texas, Marshall Division. The case number is 2:24-CV-00532-JRG.

The deposition is being conducted





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remotely using virtual technology. 09:19

My name is David West representing Veritext Legal Solutions, and I am the videographer. I am not related to any party in this action nor am I financially interested in 09:19 the outcome. If there are any objections to proceeding, please state them at the time of your appearance.

Counsel will now state their appearances and affiliations for the record 09:19 beginning with the noticing attorney.

MS. ZHONG: Annita Zhong with Irell & Manella representing the plaintiffs.

MR. YANG: Lance Yang, Quinn Emanuel, on behalf of the defendants and the deponent. 09:19

THE VIDEOGRAPHER: Thank you.

Will the court reporter please introduce yourself and administer the oath to the witness, and then counsel may proceed.

THE COURT REPORTER: Good morning. 09:19 My name is Monice Campbell. I'm certified court reporter number 14171 in the State of California.

Whereupon,

HOMER ANTONIADIS, PhD,

having been sworn to testify to the truth, the 09:20





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whole truth, and nothing but the truth, was examined and testified under oath as follows: 09:20

THE VIDEOGRAPHER: Counsel, you may proceed.

EXAMINATION 09:20

BY MS. ZHONG:

Q. Good morning, sir. Can you please state your name for the record?

A. My name is Homer Antoniadis.

Q. Sir, you have been retained by Samsung; is that correct? 09:20

A. That's correct.

Q. When were you first retained?

A. I've been retained a few months back by Quinn Emanuel on behalf of Samsung. 09:20

Q. Do you recall when exactly that happened?

A. I don't remember exactly for this particular case, but I believe -- I shouldn't say few months. It's almost a year now. Last spring or so. I don't remember the exact date. 09:20

Q. So you were retained in 2024?

A. I was retained in 2024, that's right.

Q. Okay. Were you first retained as a fact witness? 09:21





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A. I don't know this. I was retained as a consultant to help them in general about OLED technology and the landscape in general and also get familiar with the case. 09:21

MS. ZHONG: Court Reporter, I'm putting in some jargon words in the chat box so you have them. 09:21

BY MS. ZHONG:

Q. You said that you were retained to help Samsung in general about OLED technology and the landscape in general. What do you mean by the "landscape in general"? 09:21

MR. YANG: I caution the witness not to reveal any communications or work you've done on behalf of Samsung for this case, but I will permit you to respond at a high level in generalities. 09:22

THE WITNESS: One of my tasks was to review at high level the Pictiva patents and get familiar with the Pictiva patents so I can better calibrate myself. 09:22

BY MS. ZHONG:

Q. Okay. So which Pictiva patents did you review?

A. I have reviewed -- I don't remember 09:22





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the exact numbers, but I believe I have read generally all the patents under litigation here. 09:22

Q. And by "Pictiva patents," those were originally assigned to Osram, correct?

A. I believe so. 09:23

Q. Okay. And Pictiva was actually a trademark for the OLED displays manufactured by Osram; is that correct?

MR. YANG: Hold on. Let her finish asking her question before you respond. And let me -- give me a chance to object. 09:23

So I have an objection to that question.

But you can go ahead and respond.

THE WITNESS: Yes. The answer is yes to your question. 09:23

BY MS. ZHONG:

Q. So Osram manufactured OLED displays at one point; is that correct?

A. That's correct. 09:23

Q. And what approach did Osram take to -- to its OLED displays, technologywise?

MR. YANG: Objection.

THE WITNESS: Osram worked on OLED displays while I was employed by Osram between 09:24





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2000 and 2005. Maybe a little bit after that, I left.

BY MS. ZHONG:

Q. Do you know when Osram first started -- strike that.

Do you know when Osram first started to be involved in OLED display technology?

A. I don't know the exact date.

Q. Do you know which year?

A. I started my employment January 2000. It was before that.

Q. Was Osram actively engaged in OLED development throughout your employment at Osram?

A. Yes.

Q. What was your responsibility or role at Osram?

A. I was a member of the product development team. And towards the end, I was one of the executives in the product development community.

Q. So when did you transition from a member of the product development team to the role of being an executive of development?

A. Well, I was hired as a product manager, I believe, with more responsibility on





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reliability and testing. And after two years in this role, I was promoted to the head of product development, and I had the worldwide responsibility of developing the Pictiva OLED modules. 09:25 09:26

Q. Can you please give a little background -- strike that.

What was your background in OLED before you joined Osram?

A. Essentially, I started my official work with OLEDs with Hewlett-Packard Labs September '94. I -- also before that, I was at Xerox in University of Rochester when the first time I heard about OLEDs from the actual inventors. So I would say '92 or so, 1992. 09:26 09:26

So five years with HP Labs. I was a hands-on contributor, individual contributor, and then senior contributor at HP Labs working on both vacuum-deposited OLEDs and soluble OLEDs. So I had a very good understanding of both types of technologies. 09:26

Q. Okay. So when you joined Osram, were you still engaged in developing OLEDs?

A. Yes. We were part of the development team that was based here in -- first Cupertino 09:27





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and then in San Jose. 09:27

Q. What was some of the -- strike that.

Can you give an overview of the research and development activities that Osram undertook in those years? 09:27

A. The responsibility that we had as an R&D team here was to develop a 200-millimeter pilot line that will couple with a larger line that Osram had in Penang, Malaysia. The factory in Penang, Malaysia, was larger. It had the 09:27 capability of doing mass production, where we had the capability of doing R&D and product design and development.

And one important component there is that we were focusing primarily on soluble OLEDs 09:28 or otherwise called as light-emitting polymers.

Q. What was some of the key development work Osram undertook?

A. Osram pioneered the way of coating large surfaces with soluble OLEDs. We became 09:28 very good at this in achieving uniform layers by using the so-called spin coating technique, and we focus on primarily on high-quality, monochrome, passive matrix displays having a variety of different colors. 09:29





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Q. How would you describe the quality of the work Osram undertook in the OLED field? 09:29

A. Osram was very focused on -- all along on automotive and enterprise type of applications, so they paid a lot of attention to delivering quality. 09:29

So we had to focus on whatever we can do, in this case, passive matrix, OLED displays based on soluble technology that would deliver the color that we advertised, the reliability that we advertised, and stay very close to the customer. 09:29

Q. So why did Osram decide to focus on passive matrix OLED and using the soluble technology? 09:29

A. The decision was taken before my presence there, so I don't know all the details, but the original fundamental assumption was we believed at the early 2000s that soluble OLEDs will eventually be a lot cheaper than the vacuum-deposited OLEDs. It's cost primarily and the ability to scale it up in large substrates easier than the vacuum-deposited OLEDs. 09:30

Q. Did Osram develop a full-color display? 09:30





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A. Of course it was part of our roadmap, and we had a Department of Energy program where we developed full -- we developed a concept for using full color towards a full-color gamut lighting solutions. So we used inkjet printing for this. For light-emitting polymers, the only way to do full color -- which is actually a very attractive way, is to use inkjet printing. So that was the vision all along. 09:30 09:31

Q. You mentioned a DOE project. 09:31

A. Department of the Energy, yeah.

Q. So you mentioned a project that was the Department of Energy. Can you provide a little more detail on what was the project about and what you meant -- what Osram managed to achieve? 09:31

A. Yes. The idea there was to use soluble OLED materials, focus on two paths, build devices that emit white light out of a single layer where all the components of the OLED materials I included in one layer, so we delivered that. 09:31

And the second path was to deliver a white-emitting panel by using red, green, and blue stripes that we inkjet printed that appear 09:32





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to have also white color when you control the RGB components. 09:32

It was a substantial program. The DOE contributed 50 percent of the funds and Osram contributed the other half. 09:32

Q. Okay. How much funding did you get from the DOE for that project?

A. I don't remember the exact -- I remember $4.6 million and Osram I think 4.6.

Q. So a total of about 9.2 million on the project? 09:32

A. Yes.

Q. How long was the -- sorry. How long was the program?

A. That was a three-year program that we had to terminate, I believe, in the second year. 09:32

Q. What was the reason for the termination?

A. Osram decided to move the facility to Germany. 09:33

Q. So it was to be a three-year, 9-million-plus project?

A. Yes.

Q. And Osram terminated it after two years? 09:33





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A. Close to that. 09:33

Q. And how much -- how much investment did DOE and Osram put in?

A. I think about two-thirds.

Q. Two-thirds. So about $6 million? 09:33

A. Something like that. I don't remember exactly.

Q. Okay. And so in around 2005 or so, Osram decided to move the OLED program to Germany; is that correct? 09:33

A. I think so, yes.

Q. Do you understand why the decision was made?

A. I don't know all the details, but I understand Osram had a very strong focus on 09:34 lighting applications, so they wanted to focus on lighting. I don't know the details, why they wanted everything to be in Germany.

Q. You mentioned that you were the head of OLED program -- strike that. 09:34

A. But I --

Q. Sorry.

You were Osram's worldwide OLED program leader.

A. Product development, yes. 09:34





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Q. Okay. So did that include Germany as well? 09:34

A. I had -- for product development, I had the responsibility in Germany and also Penang. There were -- there were a couple of us in this organization. I had the overall responsibility of the actual module design. That includes the glass, the OLED material, and the electronics. 09:34

There was a different team that did all the materials development and the device development. I was not responsible for this. 09:35

Q. Okay. When you say the "OLED glass," what are you referring to?

A. It's the actual module, the part number that Osram sold under the name Pictiva. It's basically the part number. What it takes to build this module, the design of the glass, the design of all the masks that go into doing the metalization, the encapsulation, the flexible tail, and the IC on glass or on flex. 09:35

Q. And you said there was a separate materials development team and device team. What do they do? What did they do?

A. They will manage the relations with 09:36





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the materials providers. They will work towards improving the performance of the devices along the lines of light emission, device efficiency, reliability. Different colors have different reliabilities, different vendors have different colors with different reliabilities. There is a lot to be done when it comes around the OLED materials, per se. 09:36 09:36

Q. Was that group also based in northern California or were they based in -- 09:36

A. Yes.

Q. -- Germany?

A. Yes. Both the materials, device and materials development and the product development R&D groups were based in San Jose, California. 09:36

Q. Was that a group led by Frank So?

A. Frank So was my lateral colleague. He was managing the materials and device development, and I was managing the product development. 09:37

Q. So in addition to the soluble approach, there was another approach, which is the vacuum deposition approach for OLED; is that correct? 09:37





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A. Can you clarify your question? Are you referring to Osram or in general about the OLED field?

Q. I'm talking with the OLED field in general.

A. Yes, of course. Two major approaches. Soluble OLEDs and vacuum-deposited OLEDs.

Q. Okay. The vacuum-deposited OLEDs was first developed at Kodak; is that correct?

A. Yes.

Q. And in fact, Samsung licensed Kodak technology when they first added the OLED program; is that correct?

A. Yes.

MR. YANG: Objection.

But you can go ahead and answer if you know.

THE WITNESS: At some point, I remember reading that they had done the licensing from Kodak. This is public information.

BY MS. ZHONG:

Q. The soluble OLED technology that Osram uses was developed in-house; is that





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correct?

MR. YANG: Objection.

THE WITNESS: I don't remember all the details. Part of the technology was developed in-house and part, I believe, was licensed from outside.

BY MS. ZHONG:

Q. Do you know who -- which part of the technology was licensed outside?

A. The use of the materials -- the type of materials used was licensed from outside and also some of the fabrication techniques.

Q. When you say "the fabrication techniques," which techniques in particular?

A. How do you make the module. In other words, the know-how of how to build this passive matrix displays on glass substrates. How do you encapsulate them, et cetera.

Q. And which technologies were developed in-house by Osram team?

A. The integration and the scale up to manufacturing. There was a lot of knowledge in learning how to scale up from small substrates to large substrates.

Q. Okay. And you left Osram in 2005,





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correct? 09:40

A. Yes. The end of September 2005.

Q. Okay. And you were not aware of further development in Germany after you left Osram, correct? 09:40

A. No.

MR. YANG: Hold on a second.

Objection.

THE WITNESS: I'm not familiar directly from Osram or whatever I could read in the public domain. 09:40

BY MS. ZHONG:

Q. So you're not aware of their efforts to develop new material technologies in-house, for example, correct? 09:41

MR. YANG: Objection.

THE WITNESS: I -- I don't know. I don't know this area because I left in October, so I don't know what they were doing after I left with materials. 09:41

BY MS. ZHONG:

Q. Do you know a gentleman by the name of Karl Pichler or Pichler (pronounced)?

A. I know Karl Pichler.

Q. What was his background? 09:41





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A. Karl Pichler is a Ph.D. from Cambridge University, and he has worked for CDT Corporation. He did a small -- I met him when -- right after he did the internship at HP Labs. I worked for HP Labs. We all knew of those during those days. So he's a scientist and an engineer, expert and all that. Osram also hired him. 09:41 09:42

Q. When you say "CDT Corporation" --

A. Cambridge Display Technology. The inventor of soluble OLEDs. 09:42

Q. You said right after he did the AIB Labs.

A. Oh, sorry. I met him right after he was doing an internship. I don't know if this is written in his background. He did an internship, I believe, for three months at Hewlett Packard Labs where I also worked for five years. 09:42

Q. Okay. So the two of you overlapped for a brief period of time? 09:42

A. In the early '90s, we knew each other.

Q. And so what was he hired to do at Osram? 09:43





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A. Both myself and Charlie were hired to provide high-level OLED expertise. We were the first -- as a matter of fact, I introduced Charlie to Osram. I knew him. I still know him. I'm very close to him. Basically, we were brought in to help Osram start the R&D program. 09:43 09:43

Q. And you consider him to be an expert in the area of OLED?

A. Sorry, I called him Charlie because that his name. Karl Pichler is an expert on OLEDs, yes. 09:43

Q. And which area in particular is -- strike that.

And which area of OLED in particular is he an expert in? 09:43

A. I don't know exactly. We parted ways after he left from Osram, and he has done a lot of different activities after that. But I would say that we had similar expertise, both physics background, engineers, understanding how to make displays. 09:44

Q. And when did he leave Osram?

A. I think he left after two years and joined Nanosolar.

Q. So he was at Osram between when and 09:44





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when? 09:44

A. I don't know exactly when he was hired at Osram. Few months after I started, and he left after 20 or 24 months. I started January 2000. 09:44

Q. So he was at Osram between spring 2000 and --

A. Spring 2000. I don't remember the last period, but I remember sitting next to each other in cubicles while we were in Cupertino, 09:45 which was spring 2000, correct.

Q. And he left in spring 2002?

A. I don't remember the year. I think after two years he left, but I need to look it up. I don't remember the date. It probably is 09:45 written on his resume or LinkedIn profile, but I don't remember.

Q. And did Osram file patents for its -- for its work in the OLED field?

A. Yes. We were active in filing 09:45 patents in the areas that we were working.

Q. Was there any particular procedure for filing a patent at Osram in those years?

A. We were working with two patent attorneys, but they were residing within our 09:46





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overall Siemens Osram organization, and they would encourage us to file invention disclosures as soon as a new idea will come up. 09:46

And the legal, the two patent attorneys, either one or the other or both of them, they will meet with the management team to assess the quality of the invention disclosures and decide if, indeed, it's worth going to the next level of, perhaps, patent filing or keep it as a trade secret, et cetera, which is a common process that I've seen in other corporations, too. 09:46

Q. Do you recall how long it usually took from submitting an invention disclosure to filing an application? 09:47

A. We were in a hurry, so we would push our legal team to examine the disclosures -- the invention disclosures sooner rather than later depending on the importance. And, again, the importance will be judged by the OLED experts and the senior will trigger the legal team and some will be accelerated out of our own team, this is not through the patent office, or some others will just linger for six months or a year, and some others will be filed within a few 09:47





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months. I can't remember exactly. 09:47

Q. When it's a few months, it's how long? Three months?

A. Something like that, yeah.

Q. So from invention disclosure to application, it can range from 2 to 3 months to 6 to 12 months? 09:48

A. Yes.

Q. And --

A. Roughly speaking. I don't remember exactly. 09:48

Q. And were you one of the management team that decides whether to accelerate the filing of an application?

A. I was in the committee that we would meet once a month or sometimes ad hoc to recommend either for a patent filing or to keep it as a trade secret or abandon it as an invention disclosure. 09:48

Q. So once the invention disclosure was submitted, there were monthly meetings to evaluate it -- the submitted invention disclosure to see whether you want to proceed with filing or not; is that correct? 09:49

A. Yeah. The legal team will receive 09:49





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the invention disclosures, and we would meet in regular intervals to examine the invention disclosures. 09:49

Q. And once there is a decision to go forward with the application, the two in-house patent attorneys will draft the application; is that correct? 09:49

A. Correct. And, of course, they will get all the input from the inventor or inventors, examples, technical background, and the like. 09:49

Q. And once the application was drafted, did the inventors actually review the draft and give the feedback?

A. I can only speak about my applications. They would ask me to make sure that the examples were transcribed properly as well as the description. So we will do one final review, yes. And we will meet. 09:50

Let's say if it takes a month to write an application, the inventor will meet with the patent attorney -- we didn't have paralegals -- the patent attorney would draft the application jointly in a sense, and construct, of course, the claims, the legal team 09:50





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will do that. 09:50

Q. Okay. So once the -- once the decision was made to go forward with the invention disclosure, there would be a meeting between the patent attorney and the inventor 09:51 before patenting; is that correct?

MR. YANG: Objection.

THE WITNESS: Yes. Not always, but most of the times.

BY MS. ZHONG: 09:51

Q. And then after that, the patent attorney would draft the application?

A. Yes.

Q. And then the inventor would give kind of approval before the application got filed. 09:51 Was that correct?

A. Well, I mean --

MR. YANG: Objection.

Go ahead.

THE WITNESS: Provide information, I 09:51 would say, the correct word. If something has not been transcribed properly, if the examples have inaccuracies, et cetera. "Approval" is not the right word. It's just a consent that everything has been described as presented in 09:51





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the invention, with some corrections, of course. 09:52
BY MS. ZHONG:
Q. So once the -- once the attorney drafted the application, the inventors would review it and provide feedback; is that correct? 09:52
A. Yes. In most cases.
Q. Okay. And did the inventors have to sign declarations before the patent gets filed?
MR. YANG: Objection.
THE WITNESS: I don't remember that. 09:52
I vaguely remember that we had to sign something.
BY MS. ZHONG:
Q. Okay. And who are the people who decided whether to accelerate an application or 09:52 not?
A. It was an acceleration recommendation from the management team to prioritize -- let's say we have five cases. We would rate them and we'll say this one is more important than the 09:53 other four. Can you work on it first, please.
Q. And who were the members of the management team?
A. I remember participating in some of them. I don't remember everybody in the team. 09:53





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But I would say the R&D team would consist of two or three people. It would vary. Some people would be in Penang, some people would be in San Jose. Whoever was in San Jose. 09:53

Q. Have you always been on the committee? 09:53

A. I have not participated in all. I have been in the committee, but I was not always present because I was traveling quite a lot.

Q. So on the invention disclosure, besides the signature of the inventor, there was also a requirement for someone to witness the invention disclosure; is that correct? 09:54

A. I believe so. This is so many years ago. Yes. 09:54

Q. Do you recall what was the reason for having someone witness the invention disclosure?

A. I don't remember very well, but in general, it's a good practice to have a witness in your laboratory books. So that concept would also follow, I believe -- I don't know if we had that at Osram, but we had that in different companies to also witness the invention disclosure. 09:54

Q. Do you recall you were asked to 09:54





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witness invention disclosures when you were at Osram? 09:54

A. I don't remember this very well, but I -- the quick answer that comes to my mind is yes. People will come and ask me if that's a good idea because I had six-plus years of experience prior to some of the inventors there, prior experience with respect to some of the new hires. 09:55

Q. So if you had witnessed -- let me withdraw. 09:55

So what's the significance of your signing a witness -- signing as a witness to an invention disclosure?

MR. YANG: Objection. 09:55

THE WITNESS: The tradition of the witness is to describe your invention to a third party and make sure that the third party understands your invention. As far as I know, that's the process. 09:56

BY MS. ZHONG:

Q. So what was your role as a witness to the invention disclosure?

MR. YANG: Objection.

THE WITNESS: As a witness, I would 09:56





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just state if I understand the disclosure or not. 09:56

BY MS. ZHONG:

Q. Okay. So when you sign an invention disclosure, you would have reviewed it first before signing it; is that correct? 09:56

A. Of course, I would have asked the inventor to describe it to me to make sure what the invention is or the invention proposal, I should say is, yeah. 09:56

Q. Do you recall working with a gentleman named Kyle Frischknecht?

A. Kyle Frischknecht, yes.

Q. Yes.

A. I hired him at Osram. 09:56

Q. Okay. What was his background?

A. Kyle worked with me at HP Labs. I had hired him at HP Labs to help me make micro displays. He was a very good guy and I hired him back at Osram. HP Labs was shutting down this group. Process development, deposition. I do remember his background, mechanical engineer, process engineer. 09:57

Q. When you say "process engineer," what did process engineers at Osram do? 09:57





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A. His responsibility at Osram was to work on glass-to-glass encapsulation. 09:57

Q. So he was an engineer specializing in encapsulation of the OLED devices; is that correct? 09:57

MR. YANG: Hold on a second.

Objection.

THE WITNESS: All of us were doing multiple things. One of his responsibilities was encapsulation. 09:58

BY MS. ZHONG:

Q. Did Kyle -- is it Mr. or Dr. Pichler?

A. Yes. Doctor. I think both Kyle and Karl have PhDs.

Q. So was one of the responsibilities for Dr. Pichler also to work in encapsulation? 09:58

A. If I remember correctly, he was working on many different areas because of his background, but he was -- I would say he was tasked with a lot of different things, not only encapsulation. 09:58

Q. But they were all related to OLED development; is that correct?

A. Yes.

Q. Did Osram look into developing thin 09:58





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film encapsulation as part of its OLED program? 09:59

A. Osram was manufacturing passive matrix displays with a different technique. We had a different approach in making encapsulation, but part of our R&D, we looked at 09:59 all different encapsulation technologies, including thin film encapsulation.

Q. Was thin film encapsulation needed for flexible OLED?

MR. YANG: Objection. 09:59

THE WITNESS: In general, not related to Osram, thin film encapsulation will help flexible display fabrication.

BY MS. ZHONG:

Q. Why would thin film encapsulation 10:00 help the flexible display fabrication?

A. The thin film encapsulation by itself, it's a flexible layer. You can bend it. You can roll it. Before thin film encapsulation, the industry used metal can. You 10:00 cannot bend it. Or glass. You cannot bend it.

All displays today are made -- I would say the majority of them are made flexible. Let's say all those that go in the high-end OLED displays are made with flexible 10:00





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substrate. So a different encapsulation is required. 10:00

Q. Why did the industry move to flexible display?

MR. YANG: Objection. 10:00

THE WITNESS: I don't know the exact reason. I would imagine because the mobile industry wanted thinner displays, so the thin, flexible substrate will enable that format.

BY MS. ZHONG: 10:01

Q. Was Osram looking into thin, flexible OLED display as well?

A. Not as much as we were looking on the glass. The glass fabrication was our bread and butter. That's what we had in mass production. 10:01 Flexible was part of the R&D program. It was a small activity.

Q. But it was part of the --

A. R&D roadmap.

Q. How would you rate Osram's OLED R&D program against its competitors? 10:02

MR. YANG: Objection.

THE WITNESS: It depends on how you compare it. For the soluble OLEDs, the light-emitting polymers, we had the leading 10:02





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position. I would say we were the best. But that cannot be compared with the vacuum-deposited OLEDs because the infrastructure is different. So I cannot compare -- the rest of the world was doing vacuum-deposited. But between us, Philips, DuPont and others, I think we're the best. 10:02 10:02

BY MS. ZHONG:

Q. What was Osram's relationship with Siemens? 10:02

A. Osram in those days were the subsidiary of Siemens. Siemens is a conglomerate and Osram was the lighting group under Siemens.

Q. Is that why the invention disclosure was sent to the Siemens' IP department? 10:03

A. I don't know the answer to this. But you're correct, we were working with Siemens' lawyers, patent lawyers.

Q. So the two resident patent lawyers came from Siemens; is that correct? 10:03

A. Yes, I think so. But we had common, overlapping interests with Siemens as we were part of Siemens as a company.

Q. So when you were at Osram, there was 10:04





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no activity in developing vacuum deposition -- deposited OLED devices; is that correct? 10:04

A. We did most all of the work, I would say, on solid OLEDs.

Q. But you don't know whether the German group once you left started to do vacuum deposition technique for OLEDs? 10:04

A. I don't really know this, but through public presentations that they were giving, I believe they were referring to vacuum-deposited OLEDs. 10:04

Q. And when -- even when you were doing the soluble OLEDs, was some part of the OLED structure deposited using vacuum, for example, the cathodes or the anodes? 10:05

A. Yes, you're correct. The cathode in particular was done in the vacuum. Not only by us, by everybody. That was the only way to do it.

Q. I thought someone was telling me you can use inkjet to print the cathodes or the anodes. 10:05

A. I'm not familiar with -- maybe in various esoteric R&D groups, but I don't believe anyone can do that. 10:05





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Q. Okay. You don't think that was -- the technology was there back in 2000 -- 10:05

A. Even today.

Q. Even today.

A. I don't think so. 10:05

THE COURT REPORTER: What was your answer?

THE WITNESS: It's not used today, either today. It's not a successful method to print the cathode to my knowledge. 10:05

BY MS. ZHONG:

Q. Could you have printed, for example, gold metal particles and have it to form a gold cathode?

A. Yeah. That's a very scientific question. I don't know the answer to this. In theory, yes, you could do it, but you need a low work function metal. And when you introduce it into a solution, it tends to react with the solvent and loses its ability to inject electrons. That's why it's so hard to do it by printing. 10:06

Q. But I thought for printing, especially for inkjet printing, the solvents will eventually dry out leaving behind the 10:06





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solids. So... 10:06

A. Yes. I agree with you. But that's for the whole transport layer and the electron-transport layer, for example, not for the cathodes. 10:07

Q. So as far as you know, nobody has successfully made a cathode using inkjet printing?

A. Yes. As far as my knowledge is concerned, I'm not familiar with this approach. 10:07 And I don't think anyone has done it. But I'm not 100 percent sure.

Q. But it could be an idea, but it was never successfully executed?

A. Yes. 10:07

Q. So for the thin film encapsulation, do you know how the various layers were deposited?

MR. YANG: Objection.

Hold on a second. 10:07

Objection.

THE WITNESS: Are you referring to today's process or historically?

BY MS. ZHONG:

Q. Let's start with 2000 -- like early 10:08





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2000. 10:08

A. To my knowledge, no one was using thin film encapsulation in manufacturing in 2000. I was familiar already from the work that Battelle had done with thin film encapsulation. 10:08 The multi-layer organic/inorganic encapsulation was pioneered by Battelle as well as many other companies had access to this technology. And then --

Q. Sorry for interrupting you. When you 10:08 say "Battelle," are you talking about Pacific Northwest?

A. That's correct. The laboratory in Seattle.

Q. And why wasn't anyone doing the thin 10:08 film encapsulation commercially back then?

MR. YANG: Objection.

THE WITNESS: The technology -- to my knowledge, the technology was under development during that time. No one was doing thin film 10:09 encapsulation. But Battelle was the pioneer in the thin film encapsulation. We all knew it. Already, you can see there's a lot of prior art, actually, at HP Labs also.

They proposed a way of putting 10:09





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organic/inorganic layers, and we can talk about the details why there's alternating layers, but reducing it to practice in the mass production mode takes development. You need the formulation to be ready as well as the tools. No one had that set up for a display environment. 10:09 10:09

BY MS. ZHONG:

Q. What about in the lab environment?

A. I remember people were struggling to use this technique in the 90s in the laboratory. The technique was notorious for contaminating the chamber and for affecting the performance of the OLED devices. The original work was detrimental to the OLED devices. 10:09 10:10

Q. When you said "the original work was detrimental to the OLED devices," what do you mean exactly?

A. I don't know all the details, but when you deposit the inorganic layers, the inorganic layers typically are done at elevated temperatures. So if you're not careful with the inorganic layer, you can affect the performance of the OLEDs. 10:10 10:10

Now, the thin film encapsulation





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includes also an organic layer. And when you put the organic layer down, you introduce particles and managing these particles could be an issue. 10:10

So these are the two different areas that I recall that at the early stages the industry struggled. 10:11

Q. How were the organic layers applied back then?

MR. YANG: Objection. 10:11

THE WITNESS: Many techniques were used and proposed. I recall a spinout company from Vitex had proposed to do it in some kind of enclosed environment in a different chamber side by side using organic chamber. 10:11

BY MS. ZHONG:

Q. So was inkjet printing proposed for that?

A. I don't know. We need to look up the patents by Battelle to see if printing technologies had been proposed. I don't know. They claimed a lot. There was a lot of filings from the Pacific Northwest laboratory. One of the inventors is called Affinito, and I know that he has claimed a lot of stuff. This is the 10:11 10:12





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early '90s -- so late '90s, which then -- the technology was licensed to a startup called Vitex. 10:12

Q. Vitex?

A. I don't know exactly when Vitex started. I would say 2000. So Vitex was working towards developing thin film encapsulation for OLEDs. That were their focus. Battelle proposed the thin film encapsulation for multiple technologies, including OLEDs, but also for supercapacitors or other flexible substrates. But Vitex focused primarily in developing the Battelle technology for all OLED encapsulation. 10:12 10:13

Q. Was there specific considerations for using thin film encapsulation for OLED technology -- 10:13

A. Yes.

Q. -- versus -- sorry -- versus using it for super capacitors or other applications? 10:13

A. I don't remember 100 percent. But if my recollection is correct, what comes to my mind right now is many years ago, Vitex was primarily focused on OLEDs, but I don't know. I think they were focused on OLEDs, but I'm not 10:13





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100 percent sure. 10:13

Q. So what was some of the specific considerations when thin film encapsulation was used for OLEDs versus other applications?

A. So as we discussed earlier, two main considerations: Number one was to protect the OLED from the ambient water and oxygen. And how do you achieve that? You block the water and the oxygen with inorganic layer. But one major problem that you have with OLEDs is the 10:14

management of the particles. OLEDs are very thin, so you need to figure out a way if there are some particles in the device to coat them. So in a sense to planarize all this area.

So what the original IP had proposed is to do alternating stack of organic/inorganic to be able to have an impermeable layer. And in the case that it's not totally impermeable, make it tortuous. In other words, slow down the path of water and oxygen, make it take years or more 10:15

than that before it affects the cathode and the organic layers.

So that's what Vitex was working. They were very public. They gave presentations. I remember some of their presentations in the 10:15





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public they were talking about all this and the effects on OLEDs and how they were improving year by year. 10:15

Q. Do you know when they first started doing the deposition, were they doing it on a large substrate with multiple display panels or they were just doing proof of concept ones on a smaller substrate, like one display panel at a time? 10:15

MR. YANG: Objection. 10:15

THE WITNESS: I don't remember very well. What comes to my mind is that they had a tool -- I remember hearing about it -- that would focus on 200-millimeter substrate. But I think they also had examples in coupons, small substrates, I mean, by coupons. 10:16

BY MS. ZHONG:

Q. As part of the soluble OLED development -- strike that.

So as part of Osram's effort to develop soluble OLED, did it also develop inkjet printing technology? 10:16

MR. YANG: Objection.

THE WITNESS: As we have publicized in the Department of Energy report, we had 10:17





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purchased an inkjet printer to build this OLED lightings. It was part of the Department of Energy program. So we were looking into inkjet printing. Developing, I should say. 10:17

BY MS. ZHONG: 10:17

Q. And what were some of the efforts in developing an inkjet printing technology?

A. It's a multidimensional task, rather complex task. For instance, developing the inks, the red, green -- the displays consist of red, green and blue inks. Those that are used for spin coating have a viscosity that is different than the viscosity that is required for inkjet printing, so the modifications need to take place. 10:17 10:18

So we will work with external materials, vendors, to modify the viscoelastic behavior of the inks so we can form the -- the droplet formation is another thing that is directly related with the rheological or the viscoelastic properties of the inks. 10:18

So a lot of the work went there. Then at the same time, because they had technology, per se, it was not developed fully, we had to work with different head technologies 10:18





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and evaluate the head technologies. It's very similar to the inkjet printer that we use today for printing paper, but paper is passive where the printed OLED is active. 10:18

So you want to make sure that you land it on the right location and you don't have misprints and misfires. Of course, the Department of Energy program didn't care so much about manufacturability. We cared about pulling together a demo that would demonstrate a lighting source that consists of RGB stripes. So we had to work -- and it's -- we describe a lot of the stuff in the public report. It's all written there, what we had done. 10:18 10:19

Q. Did you have to do kind of preliminary work to establish the capability and viability of the approach before you applied for the grants from DOE? 10:19

MR. YANG: Objection.

THE WITNESS: I don't understand the question. Can you repeat it, please? 10:19

BY MS. ZHONG:

Q. Sure. A lot of times when you apply for government funding, you have to demonstrate to the government that the idea you propose was 10:20





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actually going to work somehow, right? So usually a lot of times the companies or universities will actually have done some preliminary work already, for a year, like 6 months to 18 months, to demonstrate that actually this is what I have done so far. And based on what I have seen so far, I think whatever I'm proposing has a chance of working, right? Did that happen with Osram? 10:20 10:20

A. I agree with you. Yes. It took us two years to convince DOE to give us the money. 10:20

Q. So if my counting is correct, so the DOE program started in 2003, correct?

A. I don't remember exactly. Around that time, yes, two years. Around that time, correct. 10:20

Q. And you had to -- so before -- two years before that, like, Osram spent at least two years -- another two years before that in order to demonstrate to the DOE that the concept is workable, correct? 10:21

A. Yes. DOE wanted to see the line was working. They fund us for developing the product, not the line.

Q. Okay. So between at least 2001 and 10:21





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2003, Osram was actually working on the pilot line to demonstrate the feasibility of the manufacturing process? 10:21

A. Yes. We were working exclusively on displays, passive matrix displays. 10:21

Q. Okay. So between 2001 and 2003, Osram was working exclusively on passive matrix OLED displays using soluble technologies?

A. The group in San Jose, which I was part of, I would say from January 2000 to 2003 before the DOE come, was working exclusively in developing passive monochrome -- passive matrix displays on 200-millimeter substrates, yes. 10:22

Q. And the DOE program was to expand that monochrome OLED display to full-color display? 10:22

A. No. The proposal was to use this infrastructure to build lighting sources, not passive matrix displays, pixelated displays, but use the technology, the know-how to explore the opportunity for building light-emitting polymer lighting panels, not displays. 10:22

Q. Then I thought you said part of the DOE program was also trying to build a full-color OLED. 10:23





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A. Yeah. From the lighting point of view, you can generate white light by combining red, green, and blue stripes. As a matter of fact, you can have light of different hues, different whites. That's what we had proposed. 10:23

One proposal was to do plain white, white light emitting. The other proposal was to combine RGB stripes for generating an apparent white light source.

Q. So what's the difference of developing an OLED display versus an OLED lighting source? 10:23

A. So the display consists of pixels, and the pixels typically are very small. And the size of the pixels is directly related to the density of information that you convey with the displays. 10:24

For the lighting, you have a lot more freedom in the pixilation. As a matter of fact, you don't need -- in most cases, you don't need pixilation. It's a single source. You use pixilation as a way of building a more robust lighting source. Or if you want to build it by using the red, green, and blue components, there you have to effectively build pixilation. 10:24 10:24





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But the work that goes into making pixelated displays, it's a lot -- a lot more elaborate than making lighting sources. 10:24

Q. So can the full-color RGB technology be applied to full-color display tech? 10:25

MR. YANG: Objection.

THE WITNESS: In theory, to some degree, yes, but when you go into manufacturing, you realize -- and I know this because of my background -- it's very far. As a matter of fact, inkjet printing has not been used for lighting at all. And it's never been developed enough for lighting. 10:25

BY MS. ZHONG:

Q. But inkjet printing has been developed for display technology? 10:25

A. Displays, yes.

Q. But I thought for the DOE program you were developing inkjet printing technology for the OLEDs, correct? 10:25

A. Yes. We had a dual effort. DOE wanted to see if RGB can yield higher-power displays. When you separate the emission of the red, green, blue, the resultant power efficiency it's, in theory, higher. But you have the 10:26





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challenge of controlling the components. 10:26

When you do a white-emitting source all blended together, you are running the risk of delivering lower-power efficiency. So DOE was interested to know the difference between 10:26 those two technologies. And this is a program, by the way, they have also supported for the inorganic LEDs.

But it's expensive and not practical to use RGB both LED or OLED for general 10:26 lighting, and that's why it's not used today, right?

So that was the reason the DOE supported this program. For us, we had a dual purpose. We wanted to do that as a lighting 10:26 company, but also we wanted to see how hard it is to use RGB inkjet printing for full-color passive matrix displays.

Q. So part of the DOE program was also trying to see the feasibility of developing a 10:27 full-color RGB-based display; is that correct?

MR. YANG: Objection.

THE WITNESS: Yes. Main purpose of the program was lighting applications, but the lighting work that we did allows to evaluate the 10:27





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maturity of inkjet printing also for displays.

MS. ZHONG: We've been going for a bit over an hour now. Do you want to take a break or do you want to continue?

MR. YANG: We can take a break, yes.

THE WITNESS: 10 minutes? 15 minutes? Whatever.

MS. ZHONG: Let's get off the record, then we can discuss.

THE VIDEOGRAPHER: Thank you. Off the record at 10:27 a.m.

(Recess.)

THE VIDEOGRAPHER: We are back on the record at 10:42 a.m. Go ahead.

BY MS. ZHONG:

Q. Welcome back, Doctor. You stated in the last session that one of your tasks when you were retained was to review at high level the Pictiva patents and get familiar with the patents so you can better calibrate yourself. Do you recall that testimony?

A. Yes.

Q. What do you mean by "better calibrate yourself"?

A. Just to understand what the patents





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are proposing, what they're claiming to better understand what the essence of the patents in the claims are. 10:43

Q. So did you have an understanding of what the patents are? 10:43

A. To some degree. I just wanted to know the field of use, the type of device structures, mostly from the science and engineering point of view. That's what I wanted to focus on primarily. 10:43

Q. Did you examine the claims?

A. I read the claims. That's not always easy to examine them in detail.

Q. And do you know what the claim is about? 10:43

A. I know what the patent is about and to some degree the claims. I don't remember everything as recently I have been focusing primarily on my subsequent report.

Q. So I understand that. So when did your focus change from understanding the Pictiva patents to the type of work in your report? 10:44

MR. YANG: Objection. I'm going to instruct the witness not to answer as it involves privileged communications and work 10:44





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product. 10:44

BY MS. ZHONG:

Q. When did you start working on your expert report?

MR. YANG: You can answer that question. 10:44

THE WITNESS: I don't remember exactly. Four or five months ago. I don't remember exactly. I need to look up the exact date. We had also gap periods. 10:44

BY MS. ZHONG:

Q. What period?

A. A large period where we didn't communicate. I think about three to four months ago I started to look into the -- basically, I looked into this detailed information that was shared with me by Samsung. 10:45

Q. So you were first retained in spring 2024 last year. So sorry. So you were first retained in spring last year? 10:45

A. Yes.

Q. And at the time, you reviewed Pictiva patents?

A. Yes.

Q. And then there was a period of 10:45





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inactivity where you did not have any contact with Samsung? 10:45

A. Yes.

Q. Okay. And then three or four months ago you were contacted by Samsung again? 10:45

A. Yes.

Q. And do you recall that you were scheduled for deposition in March 2025 earlier this year?

A. Yes. 10:45

Q. Do you remember why the deposition was canceled at the last minute?

MR. YANG: Yeah. I don't think this -- I caution you not to reveal any communications you may have had with attorneys. 10:46 But to the extent you remember why your deposition was moved on a particular date, you can provide that information if it doesn't involve attorney-client privileged information.

THE WITNESS: What I recall it was a difficult period for me. It was conflicting with a lot of dates. But we were getting ready to do the facts deposition, but we couldn't find the right date. I don't recall very well. I remember that I was not very available at that 10:46 10:46





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time, and I thought it was going to happen, but it didn't happen but I don't know why it didn't happen. 10:46

BY MS. ZHONG:

Q. Were you available in April for deposition? 10:46

MR. YANG: Objection. Again, caution you not to reveal any communications you had with attorneys, but, of course, you can talk about your availability if you were unable -- unavailable or available. 10:47

THE WITNESS: I know that we changed a lot of dates, but I don't know why. I was not told why we didn't have the facts deposition.

BY MS. ZHONG: 10:47

Q. Okay. Were you the person who asked to have the deposition moved or rescheduled?

A. I provided certain dates, but I -- your side was not available. I was not available. So I don't know exactly how we decided not to take place. 10:47

Q. Okay. My understanding was we decided on a date, March 14th.

A. I remember.

MR. YANG: Hold on a second. Is that 10:47





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a question? Do you have a question? 10:47

MS. ZHONG: Lance, let me -- do you forget the rules for Eastern District of Texas objections again?

MR. YANG: No. Did you? 10:48

MS. ZHONG: So, like, no speaking objections, please.

MR. YANG: The last deposition you defended you actually had quite a bit with the expert that we had to remind you, and you 10:48 actually took a break and coached him quite a bit. So yes, I do know the rules. I'm only objecting because there is no pending question. So before he answers, there needs to be a pending question. 10:48

BY MS. ZHONG:

Q. Now, Doctor, do you understand a deposition date was set for your deposition in March?

A. I think so, but then it was not 10:48 confirmed 100 percent.

Q. It was confirmed.

A. But then it didn't take place.

Q. Our understanding is that you requested to have the date moved. Like, you 10:48





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asked to have the deposition rescheduled because of some last-minute events. 10:49

A. Yes. I had very narrow or limited availability during the month of April, and it was difficult to find the proper date. That's what I recall. So we keep changing the date, right? So I don't remember exactly why we postponed it, but I thought it was an availability thing. 10:49

Q. Okay. So for the March date, were you the person who asked to have the date -- the confirmed date rescheduled? 10:49

A. I remember a couple of times I asked the date to change because I had conflicts that I couldn't change. 10:49

Q. Okay.

A. It was a difficult period for me. Sorry.

Q. Did you review each of the asserted patents when Samsung first retained you in 2024? 10:50

A. Yes, I've read them.

Q. Okay. And do you consider yourself to be an expert in the area of OLED?

A. Yes, I do.

Q. And you have been engaged in the 10:50





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field of OLED since 1994? 10:50

A. A few years earlier, yes, during my postdoctoral years, '93 or so.

Q. So you have had more than 30 years of experience in OLED? 10:50

A. Hands on, I would say 15 direct experience and about 10 years remote experience, monitoring the field through -- indirectly.

Q. When you say "hands on" you -- you had had, like, 15 direct years of experience, 10:51 which are those years? Sorry.

A. I would say for sure '94 until 2005.

Q. Okay.

A. The direct experience continued with Kateeva one year, and then Nanosys two years. 10:51 Between 2006 and 2015, I would still stay close with the field and monitor the progress of the field, simply because I spend all this time, I always wanted to go back to the field. The startup company that I worked with, we focused 10:51 on solar, but solar was also using substrates, plus substrates and the like. There are a lot of commonalities.

When DuPont acquired us, indirectly I would monitor and watch the development of 10:51





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OLEDs through DuPont because DuPont it was, in those days, a major OLED material supplier. So I would read the reports and talk occasionally with them. So I stayed in touch with the field and I would go to conferences and I would participate in meetings and things of that sort. 10:52

Q. So you were deeply involved in the OLED technology during 2000 to 2005 and then indirectly monitoring the field between 2006 through 2012? 10:52

A. Yeah.

Q. Okay.

A. In 2016, I would say indirectly.

Q. 2016?

A. Yes. 10:52

Q. So in this action, are you offering an opinion that any of the Osram or Pictiva patents are invalid?

A. No. My understanding is that today's session it's directly related to my expert opinion in relation to my report. 10:53

Q. Okay. Are you offering any opinion regarding the validity of the patents?

A. No.

Q. Are you offering any opinion 10:53





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regarding the infringement of the patents? 10:53

A. No.

Q. And you're not offering any opinion regarding the technical benefits of the patents either, correct? 10:53

MR. YANG: Objection.

But you can go ahead and answer.

THE WITNESS: Not really. I am under the impression that this session, it's related to my expert report in relation to Samsung 10:53 innovation aspects.

BY MS. ZHONG:

Q. Are you familiar with the state of the art in OLED between 2000 and 2012?

A. Sorry, can you repeat the question? 10:54 The years, please.

Q. Okay. Are you familiar with the state of art in OLED for the year 2000 to 2012?

A. Yes. In particular, 2000 to 2006, I was 100 percent hands on, so I would monitor 10:54 everything that was happening at that time.

Q. Do you think you would have been capable of assessing the validity of the Osram patents if you had been asked to do that?

A. That's not really my function. I can 10:54





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describe, perhaps, what the patents are about, but I can express my opinion, I guess, if the patents are related to certain OLED fields, if they're related to certain activities around the world, but validity/invalidity is not for me to judge. But I can tell you if I agree or disagree with the topic -- the technical topic behind that. 10:54 10:55

Q. So if you had reviewed an invention disclosure, and you have signed that invention disclosure, does that mean you have agreed with the inventor that there was something novel in that invention disclosure? 10:55

MR. YANG: Objection.

THE WITNESS: The novelty of the patent, it's not part of the invention disclosure. All we did with the signature is to highlight that this is worth pursuing in the next step, right? So it's up to the legal decide to on the claims. It's up to the examiner to decide -- so we didn't have any saying on the claims or the allowance of the application. 10:55 10:55

BY MS. ZHONG:

Q. But would Osram pursue an application 10:56





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if it had known that someone had invented the same idea before? 10:56

MR. YANG: Objection.

THE WITNESS: If we were aware of any particular example of prior art, we would present it, and then the legal team will find a way to claim novel and unique nonobvious, I should say, claims despite the prior art. If we think that the field is important, we would still pursue, perhaps, an application. 10:56

BY MS. ZHONG:

Q. And do you think that Dr. Pichler was familiar with the field of OLED in 2000 or 2002?

A. Yes.

Q. So if he had said, "I didn't find any art for this idea that I generated," do you trust his judgment? 10:57

MR. YANG: Objection.

THE WITNESS: I remember that our legal team would ask us not to look at prior art. So we just submit it, and then the legal team will do the prior art search. 10:57

BY MS. ZHONG:

Q. Okay. But what if Mr. -- Dr. Pichler said that I was not aware of anyone doing what 10:57





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I'm suggesting here, do you generally trust his judgment based on his knowledge? 10:57

MR. YANG: Objection.

THE WITNESS: In some cases, we'll argue. In some cases, we'll agree. It depends. It depends on the case. I will not always agree. 10:57

BY MS. ZHONG:

Q. If you had signed his invention disclosure, does that mean that you agree with it? 10:58

MR. YANG: Objection.

THE WITNESS: I'm trying to remember -- I remember we had cases where we would still sign but the majority will be okay. Although you sign, you may not be okay. Maybe ambivalent. You're the one that said I'm not so sure. But it's worth pursuing and see if we can get it. I don't believe we can get it -- or in some cases we'll say, this is a great patent. I'm not familiar. A great invention, I should say, we should apply for a patent. In some cases, we would get the claims. Some other cases, we will not. 10:58

I have one example where I was very 10:58





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excited, but we had to abandon it because the examiner proposed too many objections. It's very hard to tell. It's difficult to answer these questions, right? 10:58

BY MS. ZHONG: 10:59

Q. Have you ever assessed the validity of a patent?

A. I have not done an official report of that sort. But I can express an opinion here if a patent potentially can be challenged. 10:59

Q. Do you have any opinion regarding the validity of the Pictiva patents you have reviewed?

A. They're very specific. I have a general impression. They're very specific and very narrow, I would say. 10:59

Q. When you say "they are very specific and narrow, I would say," what does "they" refer to?

A. Well, there are some fundamental idea in the OLED space covered by companies like UDC, Kodak, Cambridge Display Technology, and the like. These are powerful patents, and the proof of that is the generation of licensing agreements. 10:59 11:00





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For instance, the patent that -- that Osram licensed for Cambridge Display Technology, it's a powerful patent because they're claiming the use of polymers for OLED devices, right? The patents that come from Universal Display Corporation and Princeton are very powerful patents. Everybody is licensing them. 11:00 11:00

In this case, I don't find the Pictiva patents to have the same strength. As a matter of fact, I think the strength is weaker. 11:00

Q. I'm asking a slightly different question. Do you have an opinion regarding the validity of the Pictiva patents you have reviewed, not the coverage?

MR. YANG: Objection. 11:01

But you can go ahead and answer.

THE WITNESS: Do you mind, it's -- with your own words, if you describe the word "validity"?

BY MS. ZHONG: 11:01

Q. Whether they are novel and obvious.

MR. YANG: Same objection.

But you can answer.

THE WITNESS: I'm approaching -- I mean, we can take one after the other. They are 11:01





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different. They are very diverse in what they're claiming. 11:01

For example, recently I worked in the -- in down conversion. I think -- in the beginning I thought the down-conversion patent is related to the QD-OLEDs. But I discovered after reading it very carefully that the patent is related to lighting sources to avoid the phosphor rendering a color to the display. 11:02

I thought that there will claim RGB down conversion, or more specifically, red and green, but they are not. They're claiming lighting conditions where phosphors are used for down converting the blue light to certain light and the filters are used on the front as a way of rendering a different color. 11:02

But it's not directly -- the patents are not teaching how to make QD-OLED devices. They are more related to the lighting application. And furthermore, they are not claiming quantum dots. The industry today is using quantum dots in mass production. Blue OLEDs are used in conjunction with red and green quantum dots. 11:03

But the patent doesn't claim this 11:03





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approach. It's more of a lighting patent for rendering white light more so than a pixelated display. It's not -- 11:03

BY MS. ZHONG:

Q. Can it be applied to QD-OLED? 11:03

A. No. Someone skilled in the art cannot read the patent and learn how to make down-converted QD-OLED panels. It's totally not -- it's not related -- I mean, it's not related to the word "down conversion," but it's not a recipe of how to make QD-OLEDs. 11:04

Q. The down-conversion layer can be QD-OLEDs -- quantum dots, correct?

A. Correct. Today in the industry, quantum dots are used for down conversion, yes. 11:04

Q. And back then it was known that a color-changing material can be a quantum dot, correct?

A. I think the whole concept of down conversion was proposed in the '90s, and you see a lot of these claims by Kodak and others. So it's not a new concept. 11:04

Remember, I wrote a paper for the micro displays where we proposed to use down conversion for full color. Now, what media you 11:04





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use for down conversion varies. That's why those days, in the '90s, I remember '99 I used the word "media," color-changing media, and with that we would include organic materials, phosphors, quantum dots, et cetera. 11:04 11:05

Quantum dots were not really present in the '90s. They were discovered a few years later, as you very well know probably. The chemistry Nobel Prize was given to quantum dots.

So I don't think this particular patent can claim what -- it's not enforceable on the QD-OLEDs based on all this prior art. 11:05

Q. You understand the claims are defined by -- strike that.

You understand a patent is defined by the claims, correct? 11:05

MR. YANG: October.

THE WITNESS: I don't -- I cannot answer this. I don't know.

BY MS. ZHONG: 11:06

Q. Do you try to map the claims to accused products?

A. No. I haven't done this work. I would read the claims and the bulk of the patent and get familiar with the space in general. In 11:06





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some of them, I'm an expert more so than others, but I would not go claim by claim. That was not my job. 11:06

Q. So you did not review the claims?

A. I read the claims. 11:06

Q. Did you try to interpret the claims from the perspective of a person of ordinary skill in the art?

MR. YANG: Objection.

But go ahead. 11:06

THE WITNESS: To the best of my ability, I read the claims to get familiar of what they're describing, the devices that they described and the structures that they described and looked at other similar prior art for me to get familiar with the space, but -- yeah. That's what I did. 11:06

BY MS. ZHONG:

Q. Okay. But you did not compare the properly constructed claims with the accused products, correct? 11:07

A. No, I didn't do that.

Q. Can you please refresh exhibit share and see whether you see an Exhibit 2, which is U.S. Patent 7,321,193. 11:07





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(Exhibit Number 2 was marked.)
THE WITNESS: Do we bring it up? Is it possible?
MR. YANG: I can help.
THE WITNESS: So we have a new exhibit?
MS. ZHONG: I have not introduced Exhibit 1 yet.
MR. YANG: The 193 exhibit, is that Exhibit 2?
MS. ZHONG: Yeah, Exhibit 2.
MR. YANG: Click on it.
THE WITNESS: Yes.
BY MS. ZHONG:
Q. And U.S. Patent Number 7,321,193 is a patent by you and Dr. Benjamin Claus Krummacher; is that correct?
A. Yeah. Benjamin Claus Krummacher, yes.
Q. And part of it is discussing a luminescence conversion layer in OLED, correct?
A. Correct.
Q. And Dr. Krummacher was -- strike that.
Dr. Krummacher is the first inventor





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of that patent that we -- you just mentioned, the Osram patent you just mentioned about down conversion? 11:09

A. Yes. All these patents -- the family of all these patents were filed after I left. I remember this particular one and I know the story behind this, but all the subsequent patents are -- were filed after my departure. 11:09

Q. Okay. Can you please go to column 6, lines 61 to 66? 11:09

MR. YANG: You can feel free to read whatever language you need to to get the right context.

THE WITNESS: Yes. Let's kind of blow it up. 11:09

So I'm at page 6, column 6 -- can you repeat, please.

BY MS. ZHONG:

Q. Line 61 through 66.

A. (Witness reviews document.) 11:10

Yes.

Q. And so one example of the color-changing material is quantum dots as are listed here, correct?

A. Yes. 11:10





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Q. So Dr. Krummacher is aware that quantum dot can be an example of a color-changing material, correct? 11:10

A. Yes. Already the world knew that quantum dots can absorb light and down convert it. There were startups that were working in these areas. 11:10

Q. So Dr. Krummacher is in possession of the concept of using quantum dots for down-converting light, for example, correct? 11:11

A. Yes. He lists all different media, all media that can manifest the down conversion phenomena. Everything is listed here to our knowledge.

Q. Can you look at the next sentence which is starting from column 6, line 66 to column 7 -- column 7, line 3? 11:11

A. Yep.

Q. Do you see the term "matrix material"? 11:11

A. Matrix material, yep.

Q. What is a matrix material?

MR. YANG: Objection.

THE WITNESS: Well, it depends on the usability. It means different things in 11:12





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different -- from relations in different applications. Can you repeat the question, perhaps, with more specific to this application? 11:12

BY MS. ZHONG:

Q. What does -- how are you -- strike that. 11:12

What does matrix material mean to you in this patent?

A. In this particular sentence, it's a carrier for the color-changing material. The analogy there will be an almond chocolate. The chocolate is the matrix and the almond is the dot or the color-changing material. 11:12

Q. And how is matrix materials typically used in the OLED field? 11:13

MR. YANG: Objection.

THE WITNESS: It's a different question, not directly related to these sentences. It depends, again, on the usability of the matrix materials. 11:13

"Matrix material" is very generic term. It's used in down conversion for the OLED field. It's used in electron injection. It's used in light emission or even in some cases to -- at the hole transport too. So we 11:13





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need to examine it function by function, case by case.

BY MS. ZHONG:

Q. What is matrix material as used in light emission? 11:14

MR. YANG: Objection.

THE WITNESS: Are you referring to the emission layer?

BY MS. ZHONG:

Q. So I'm referring to your testimony -- you said "'matrix material' is a very generic term. It's used in down conversion for the OLED field. It's used in electron injection. It's used in light emission or even in some cases at the hole transport too." 11:14

So I'm asking you what you are referring to -- what does matrix material mean as it's used in light emission?

A. In the example of light emission layers, the matrix material is the material that receives the electrons and the holes, and it's -- upon recombination, the energy from that electron-hole recombination, the energy is transferred to the emission molecule.

So the matrix material is the 11:15





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material that provides the transport and the emission comes from the guest. Often the term "host guest" is used. The matrix plays the role of the electronic transport and the emission in this case will come from a guest, the material that you put into the matrix. 11:15 11:15

Q. So for light emission layer, matrix material is synonym -- synonymous to host material; is that correct?

A. I have seen those two terms used interchangeably in the industry, not only OLEDs but also other fields. 11:16

Q. What about in hole transport or electron injection?

A. So I'm not very familiar with what the industry is using today in the hole transport, but in the case of the electron transporting, you may have two materials. You may have a material that facilitates the electron transport, and you may have a second material that adapts the first material to change the electronic properties of the electron transport layer so they can conduct more electrons but also can receive electrons from the cathode easier. 11:16 11:16 11:17





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So, again, in this case, you could use the term "matrix," host guest. The guest in this case will dope the matrix, right? So you will have an electronic interaction in this case. 11:17

In the case of the emission layer, it's a photonic interaction. You don't have electron change or anything like that. And sorry, that's why I said it depends, right? In solid-state lighting in LEDs, the little transparent bulb that we see in front of the LEDs, again, consists of matrix material. Typically, this is silicones and other type of materials, and they host -- sorry. The guests are phosphorus materials. 11:17 11:18

Q. So the matrix materials are different from dopants of guest materials; Is that correct?

A. That's my understanding, in most cases, yes. 11:18

Q. Would you have been capable of assessing infringement if asked to?

A. I'm not an expert in assessing infringement. If someone trains me to do the exact function, I could do it. But right now, 11:18





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that's -- I'm not qualified to do this. 11:18

Q. Now, as part of writing your report -- strike that.

The patents were not part of the materials you considered when writing your 11:19 report; is that correct?

A. You're referring to my expert report in relation to Samsung, that's a very independent -- different project, yes.

(Exhibit Number 1-A was marked.) 08:19

(Exhibit Number 1-B was marked.)

BY MS. ZHONG:

Q. So why don't you take a look at your -- Exhibit Number 1 as well as 1A and 1B. Exhibit Number 1 is your expert report in 11:19 this --

A. Which I have also a copy.

Q. Yeah. And 1A and 1B are respectively your CV as well as materials listed.

Do you have those -- you have hard 11:20 copies as well?

A. Yes, we do.

Q. And if you take a look at the list of materials considered, you did not list any of the patents. 11:20





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A. Correct. 11:20

Q. So you did not consider any of the patents as part of your report; is that correct?

A. Of course, no, I did not.

Q. So you did not think that the patents are relevant to what you were opining in your report; is that correct? 11:20

A. The report was written in an independent fashion, and it only focuses on the innovations that I perceived after reading I don't know how many pages of Samsung display confidential information that became available to me. 11:20

What the report includes is my personal assessment based on my expertise on the aspects that impressed me the most that happened to enable the success of Samsung in the marketplace. And this is something that some of my opinions are new, but some others I knew. The industry knows this thing already, who Samsung is and what they have done. 11:21 11:21

Q. So you reviewed certain Samsung display documents as part of your report, correct?

A. Yes. 11:21





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Q. And how did you pick out those particular documents? 11:21

A. No. I reviewed everything page by page. I reviewed all pages from the report -- from the reports. 11:21

Q. Sorry. It's a slightly different question. So you reviewed specific Samsung documents, correct?

A. The ones that were made available to me, yes. 11:22

Q. Okay. So did you pick out specific documents or someone provided them to you?

A. The -- Samsung through my legal counsel here provided to me. I reviewed everything that was given to me. 11:22

Q. Did you review -- so those documents were picked out by Samsung counsel and provided to you and then you reviewed them; is that correct?

A. They were given to me by Lance and his team through Samsung, I take it. 11:22

Q. And was it at your request to say you want to see certain types of documents, or were they just provided to you?

A. No. They were -- the documents 11:22





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were -- it was a collection of documents that they were given to me, and I was asked to provide an opinion about these documents. 11:23

Q. And none of those documents related to materials used in the OLED manufacturing; is that correct? 11:23

MR. YANG: Objection.

THE WITNESS: I would say yes. The documents that I reviewed involved what has enabled the manufacturability of displays at Samsung's hands, but it's all about manufacturing and what matters in manufacturing and the products, per se. 11:23

BY MS. ZHONG:

Q. But you did not look at the contribution of the material set and how that contributed to the color gamut, lifetime, or efficiency of device? 11:23

A. The materials, no. I don't know what Samsung's doing with materials. 11:24

Q. And do you think that those manufacturing documents or improvement negate the need to have the right material set in the first instance? 11:24

MR. YANG: Objection. 11:24





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THE WITNESS: Can you repeat the question? Sorry. I didn't fully understand it. I didn't understand the word "negate" in relation to your sentence. Can you repeat, please? 11:24

BY MS. ZHONG:

Q. So to have a commercially viable OLED device, one of the first things you have to have is to have the right material set for the OLED stack, correct? 11:25

A. Yes.

Q. Okay. And if the material set does not work as intended, the manufacturing process is unlikely to make a good OLED device in the end, correct? 11:25

A. Yep.

Q. Okay.

A. I agree.

Q. That's what I mean, is all those manufacturing improvement process, whatever, they don't negate the need for you to have the right set of materials? 11:25

A. Correct. There are multiple parameters that work together delivering a product. It's a very complex system as you 11:25





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know.

Q. Yeah. So basically in order for Samsung to offer a commercially viable product with OLED displays, manufacturing is just part of it. There were other parts of it that -- related to documents that you have not reviewed, correct? 11:25 11:26

A. Correct.

Q. For example, the manufacturing documents you have reviewed does not negate the need for a material set that balances the electrons and the holes in the OLED stack, correct? 11:26

A. Yep. They work together hand in hand. You need to have both. 11:26

Q. And those are kind of independent criteria of OLED development needs?

MR. YANG: Objection.

THE WITNESS: In an R&D environment, you have to develop the processes in parallel with the material's performance. That's why these teams have both device development teams and process development teams before the whole concept goes into manufacturing. 11:26

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BY MS. ZHONG: 11:27

Q. So improvement in the material properties is independent of improvement, for example, in improving the capacity of the product line, correct? 11:27

MR. YANG: Objection.

THE WITNESS: It depends, actually. There are many cases where you may have a material that apparently looks great at an R&D level, but when you push it into mass 11:27 production, it doesn't deliver mass production.

A good example is the inkjet printing of red, green, and blue of light-emitting polymers. The industry has yet to deliver what they show being potential for full color. They 11:28 cannot manufacture it at a high volume. So they're interlinked in some cases. It's interlinked, right?

The materials -- hole transporting, electron transporting, electron emission, they 11:28 may appear ready, but when you push them under certain environments, they don't work. And that's why inkjet printing of RGB materials is not happening yet. It's exactly -- they are not -- they're not isolated, right? 11:28





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On the other hand, if you do, let's say, metalization, copper, if you demonstrate in a 200-millimeter line, it can easily transfer to a gen six line. So it depends on the material. It depends on the application. It depends on many cases.

BY MS. ZHONG:

[redacted]

Q. Okay. So you're not offering any





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opinion as to whether the increase in capacity actually is improving the final device's property, for example? 11:30

A. Performance? I don't -- if I remember correctly, I don't think this was -- became available to me. I don't think I know the answer to this. 11:30

Q. I'm asking you: Did you offer an opinion in your report regarding how the increased throughput is affecting the device's performance, for example? 11:30

A. I don't remember this. But that doesn't sound familiar. I don't think I did this.

MR. YANG: You can check your report, yeah. 11:31

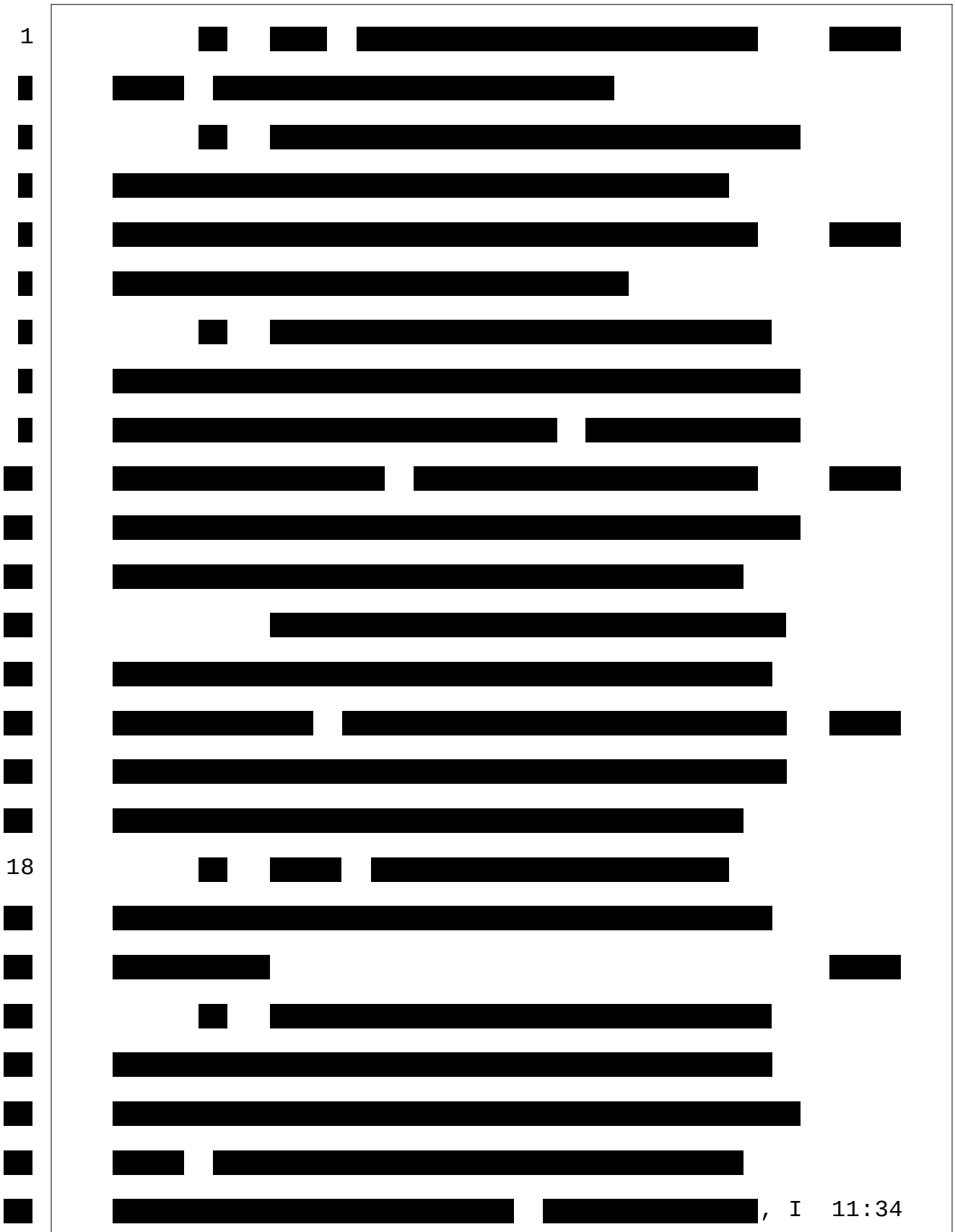
BY MS. ZHONG:

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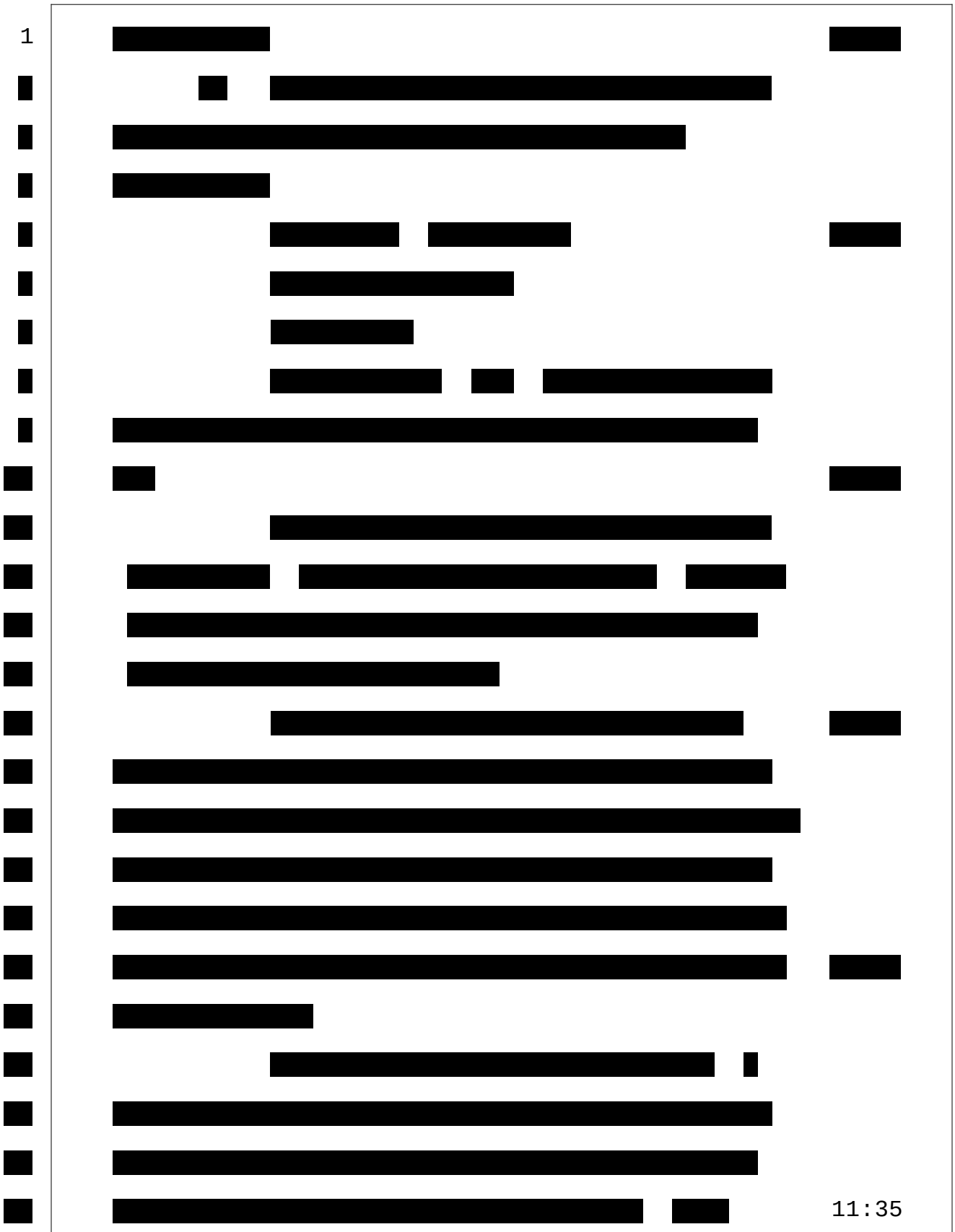


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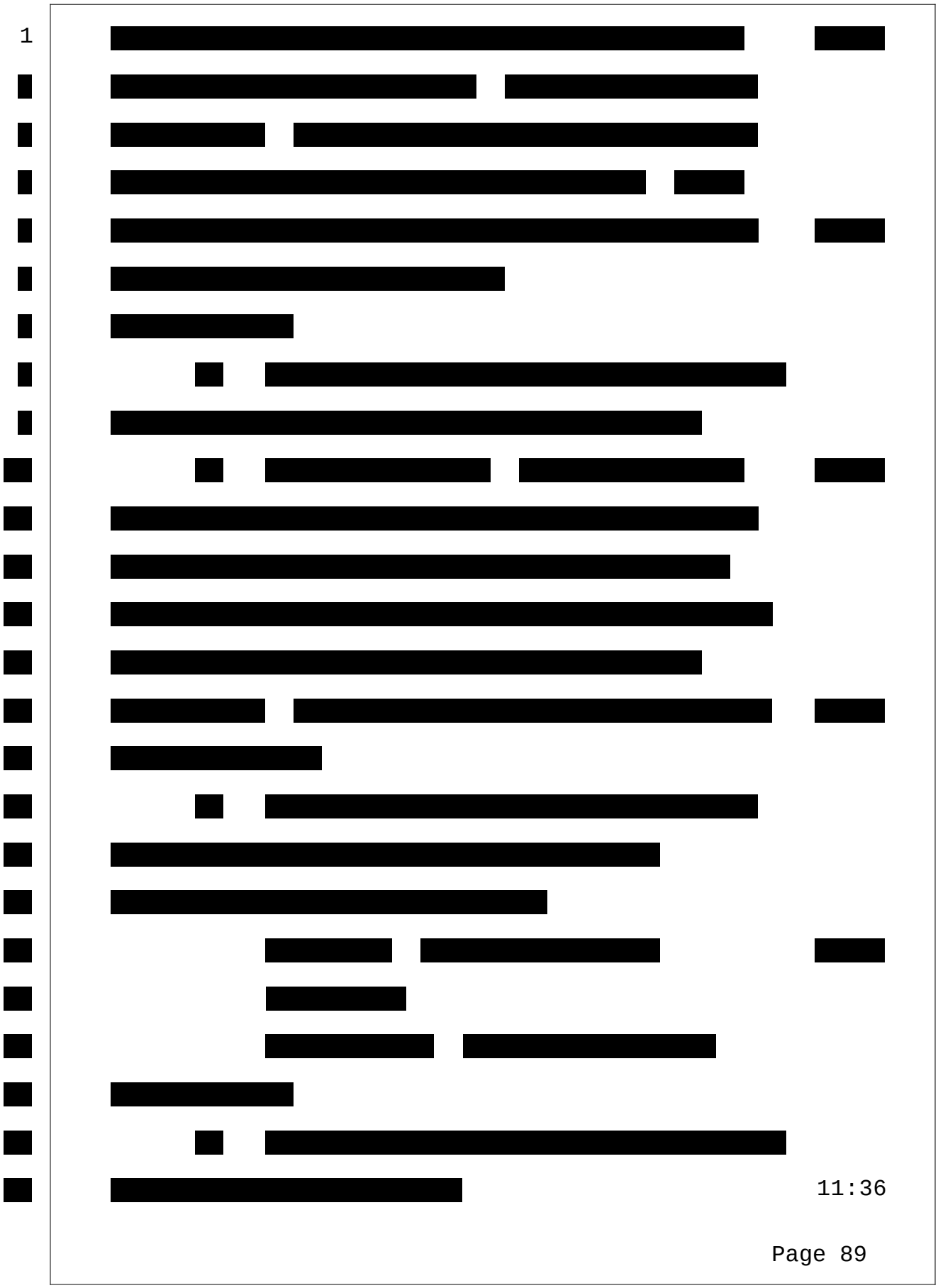


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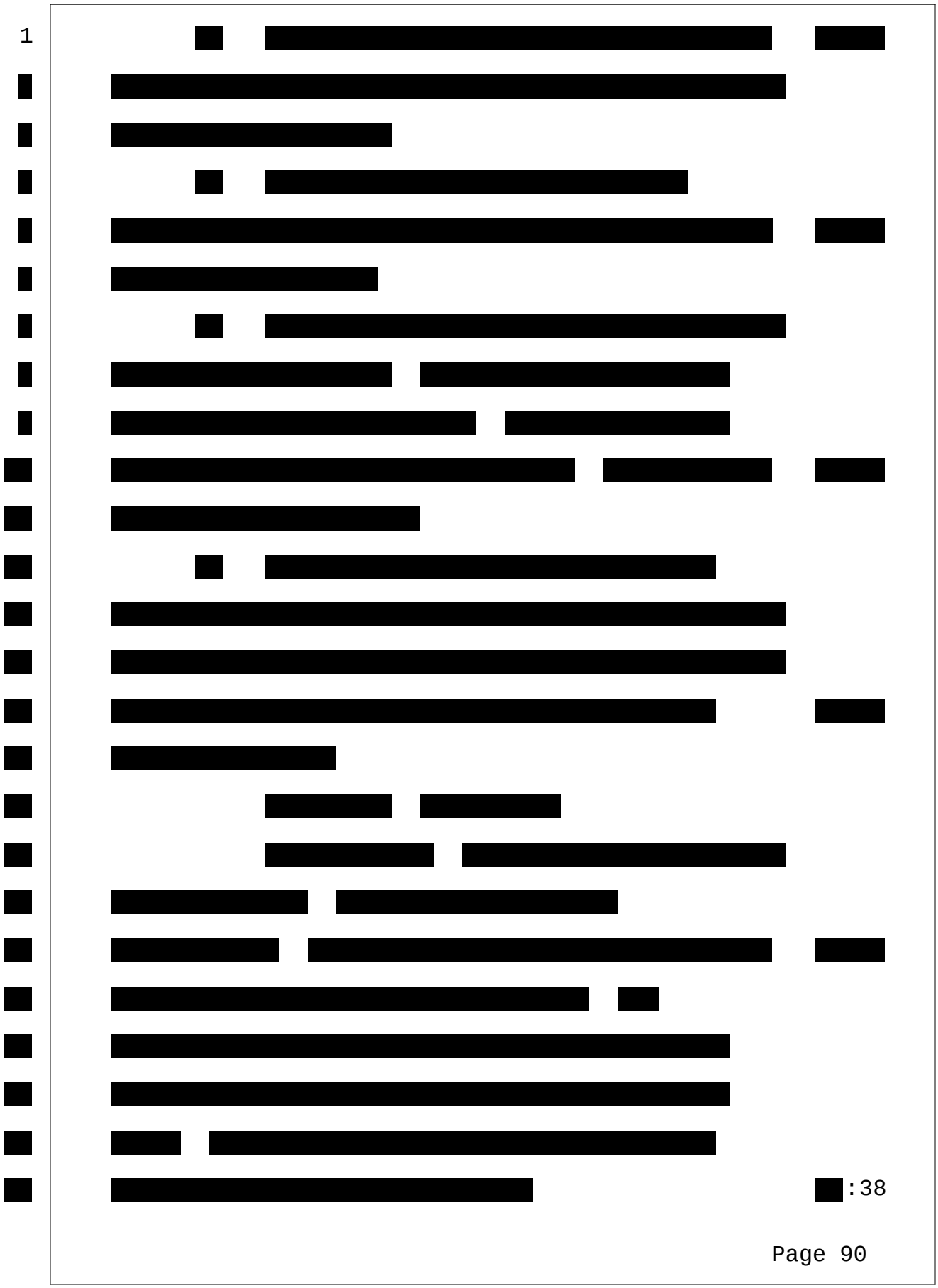


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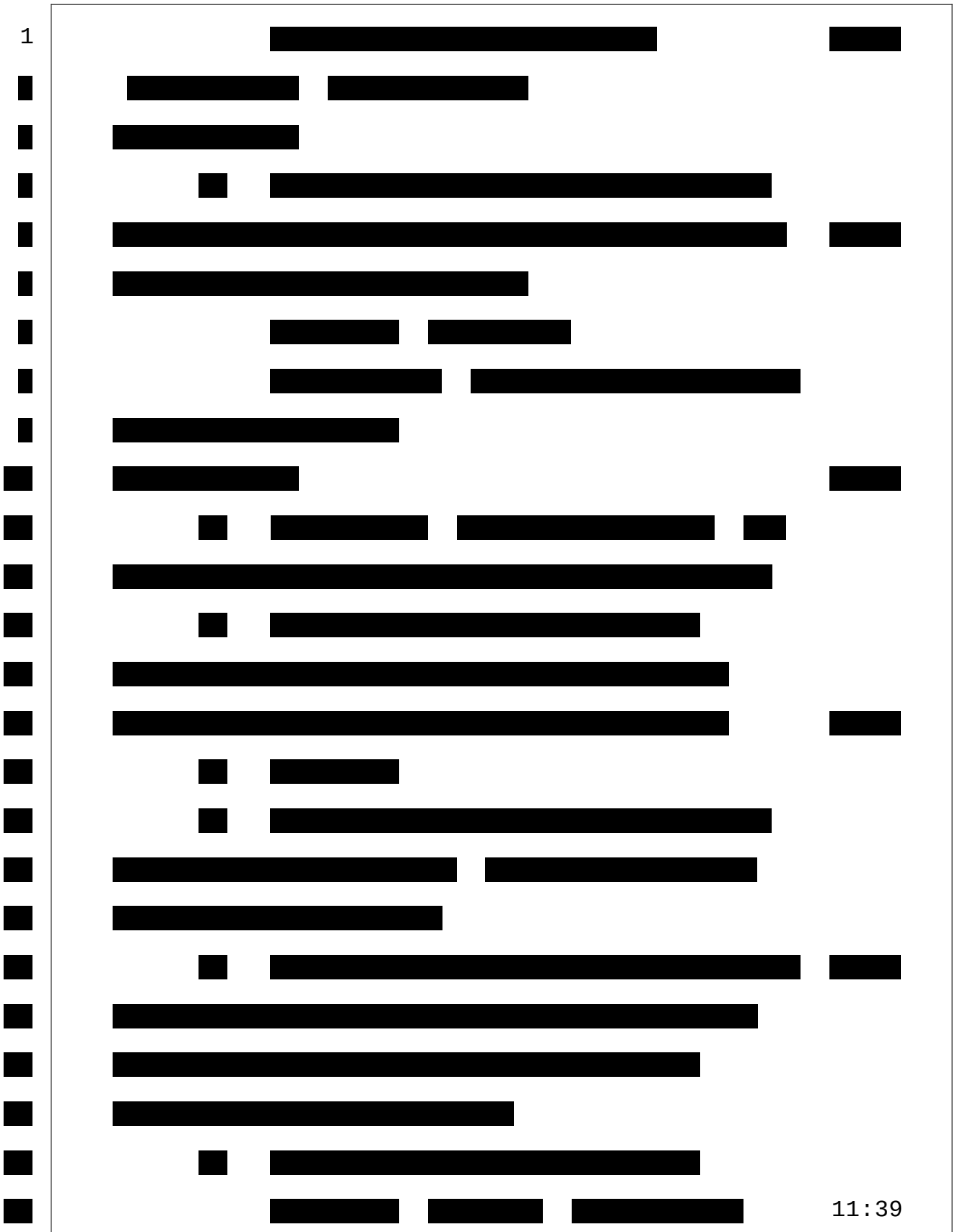
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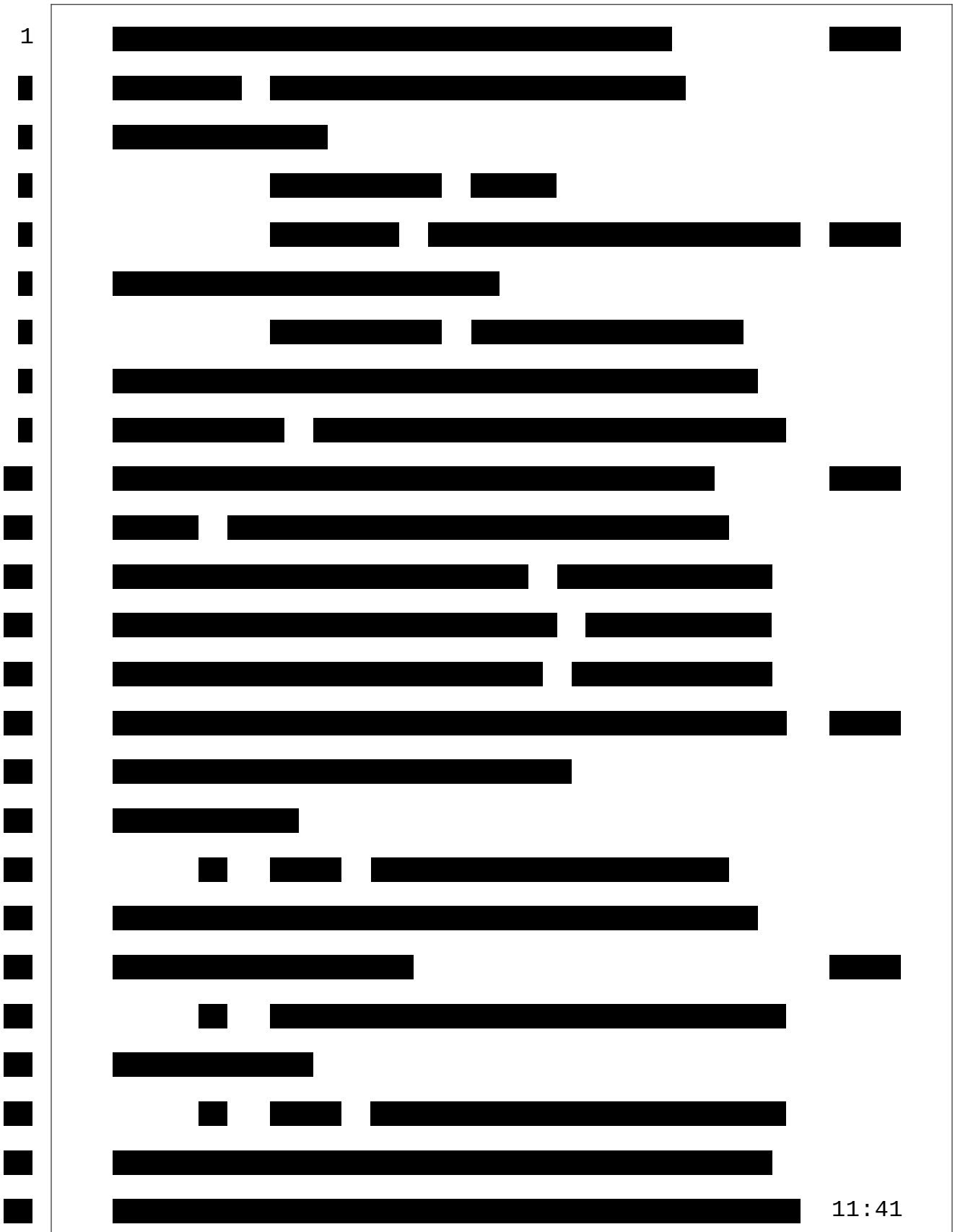


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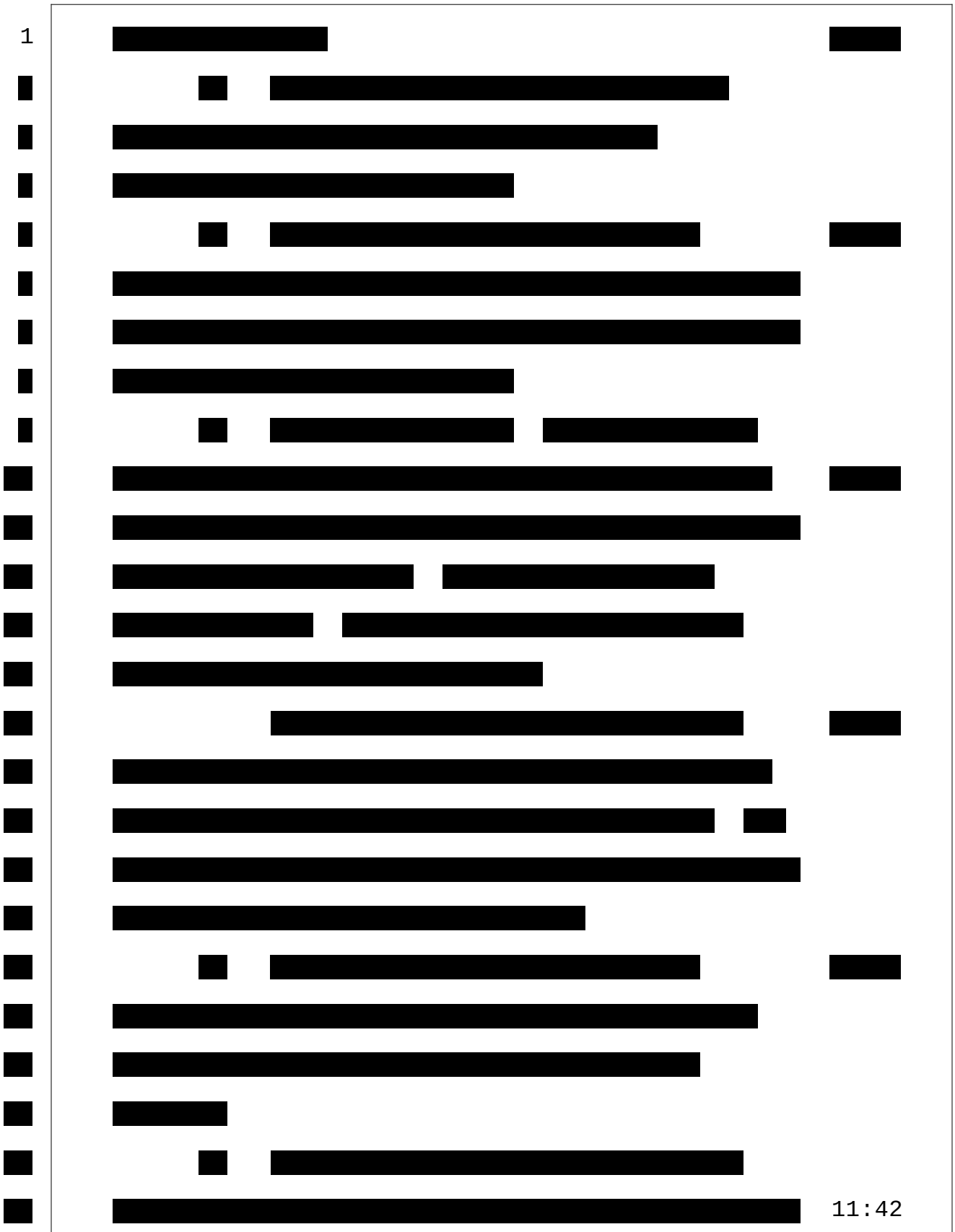


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11:42





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[redacted] 11:42

Q. Did you ask for that information?

A. I have not.

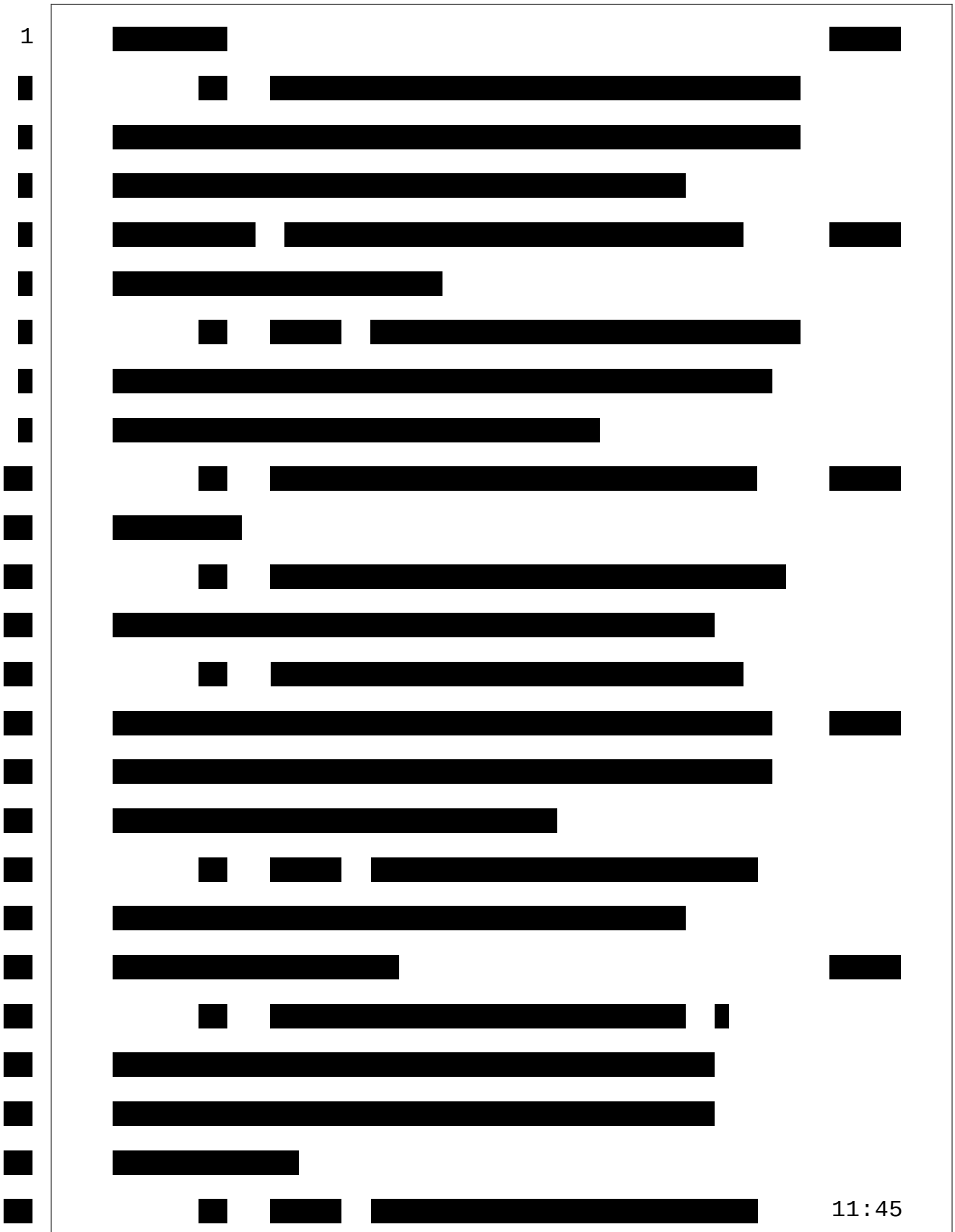
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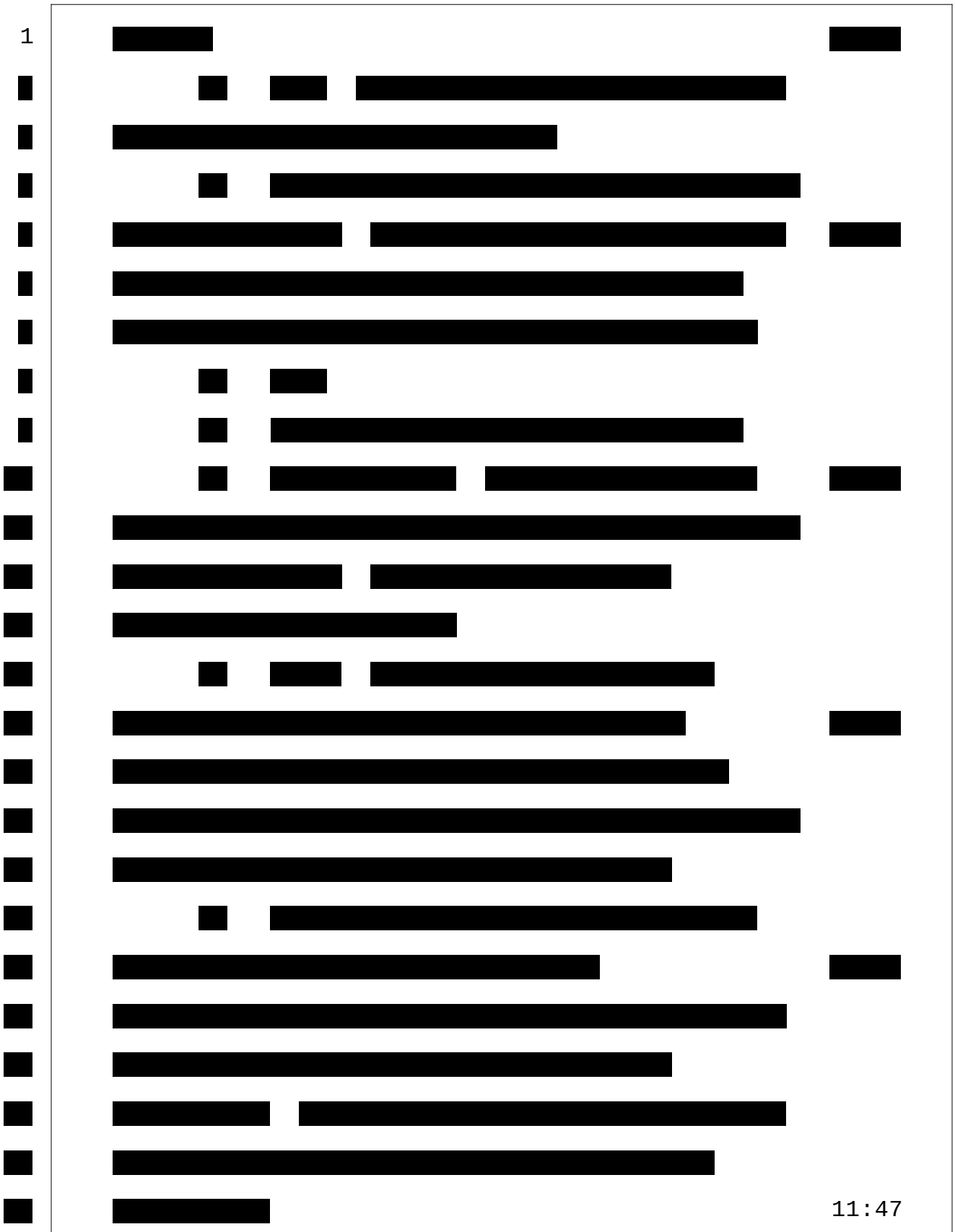


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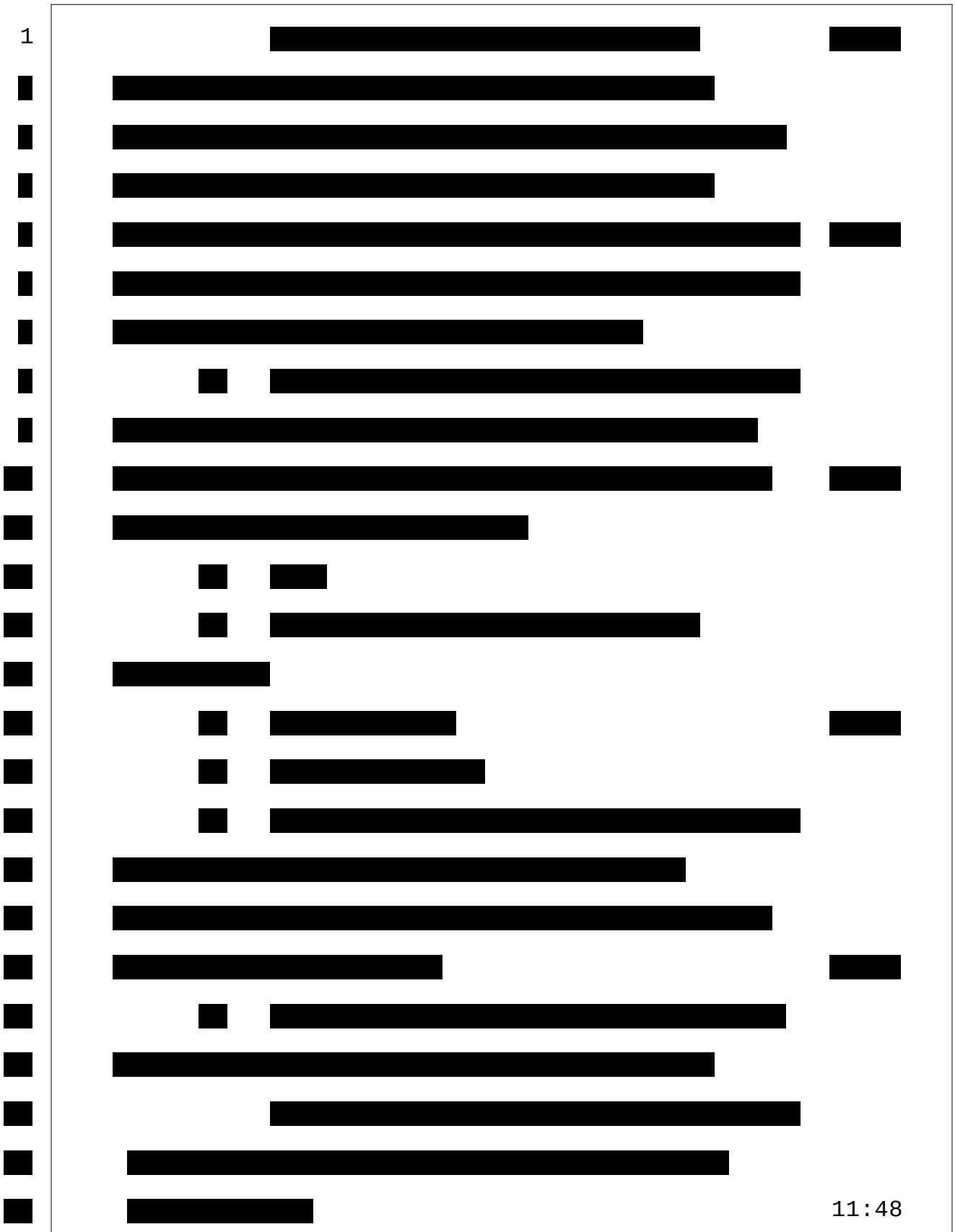


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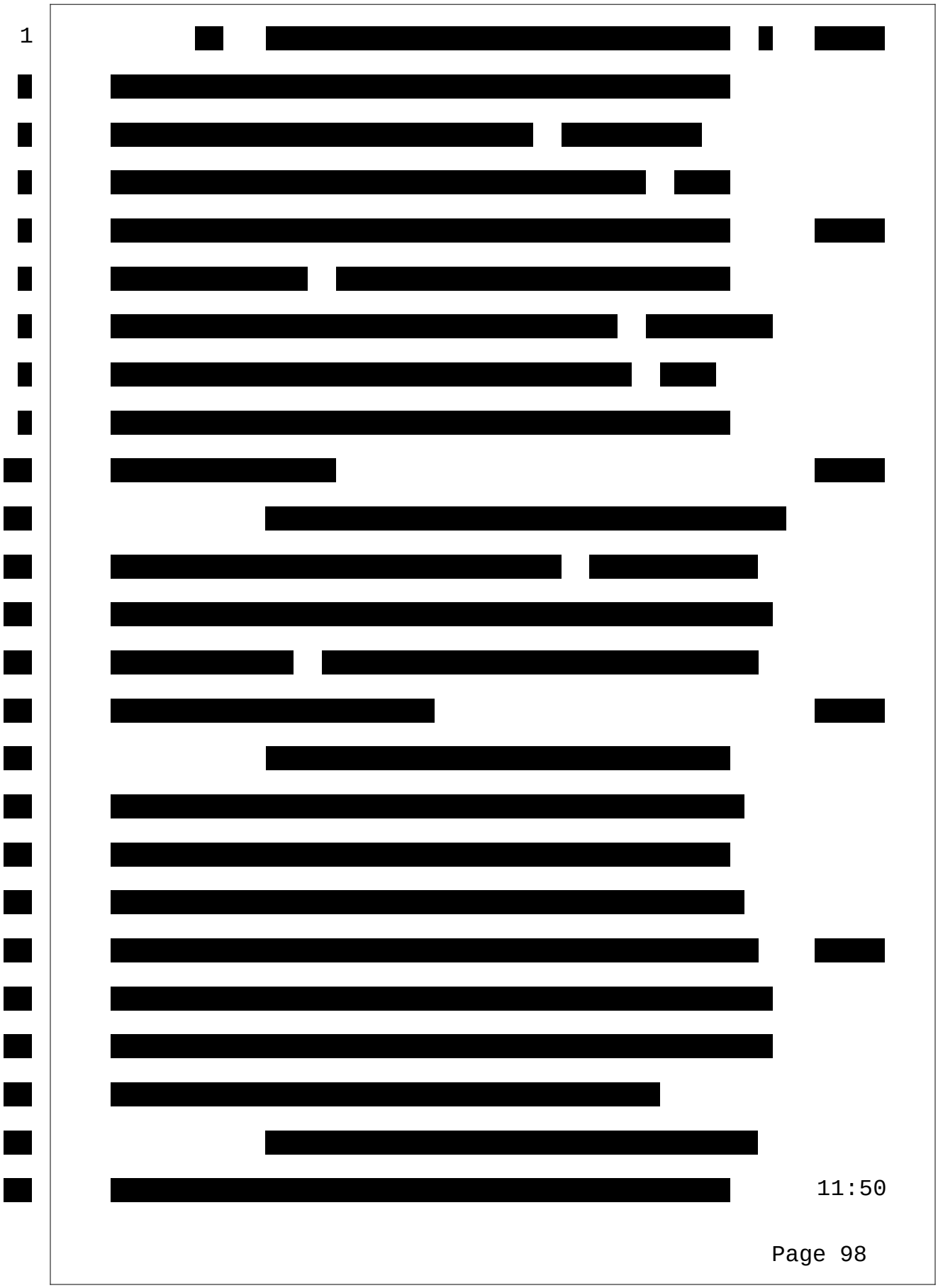


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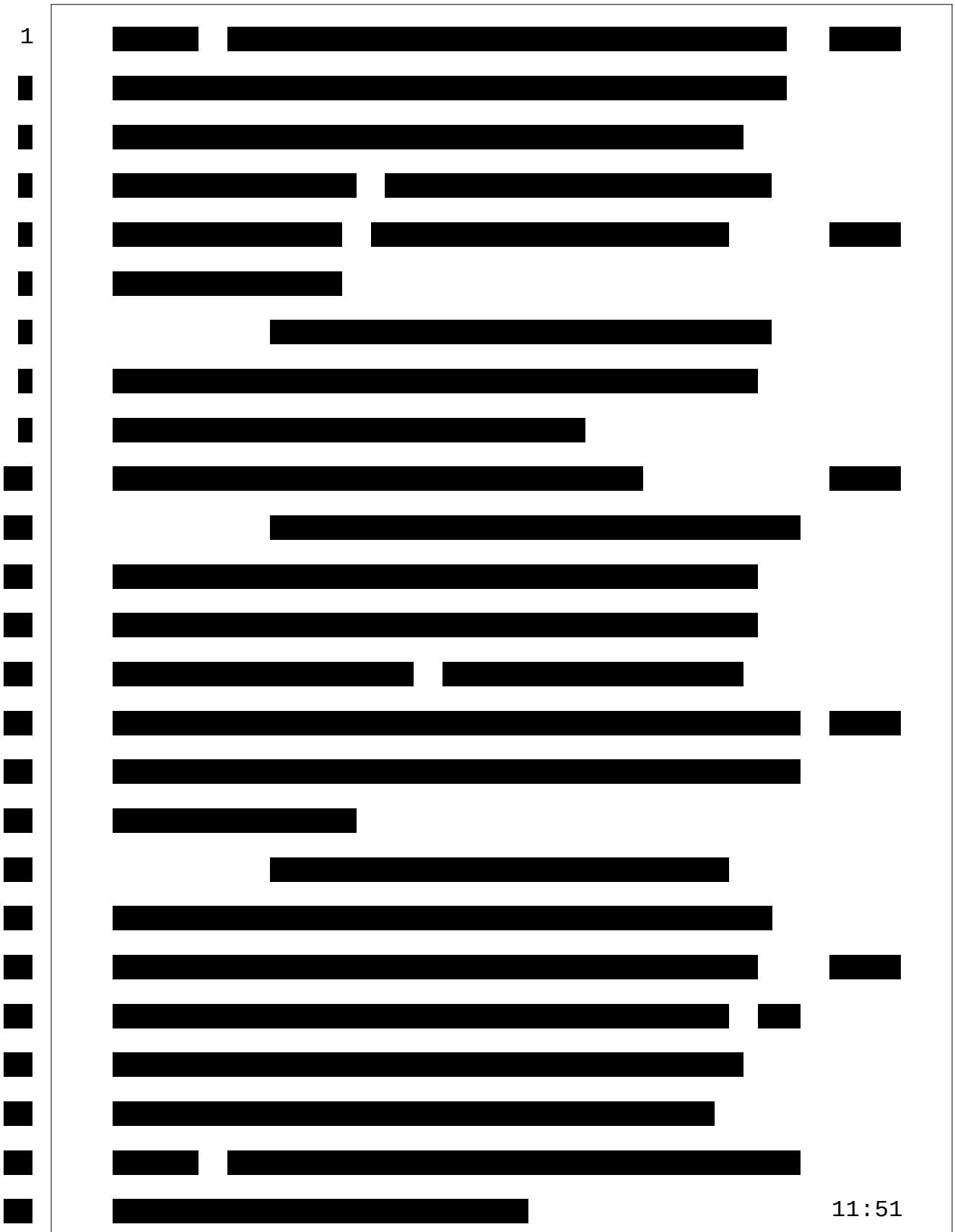


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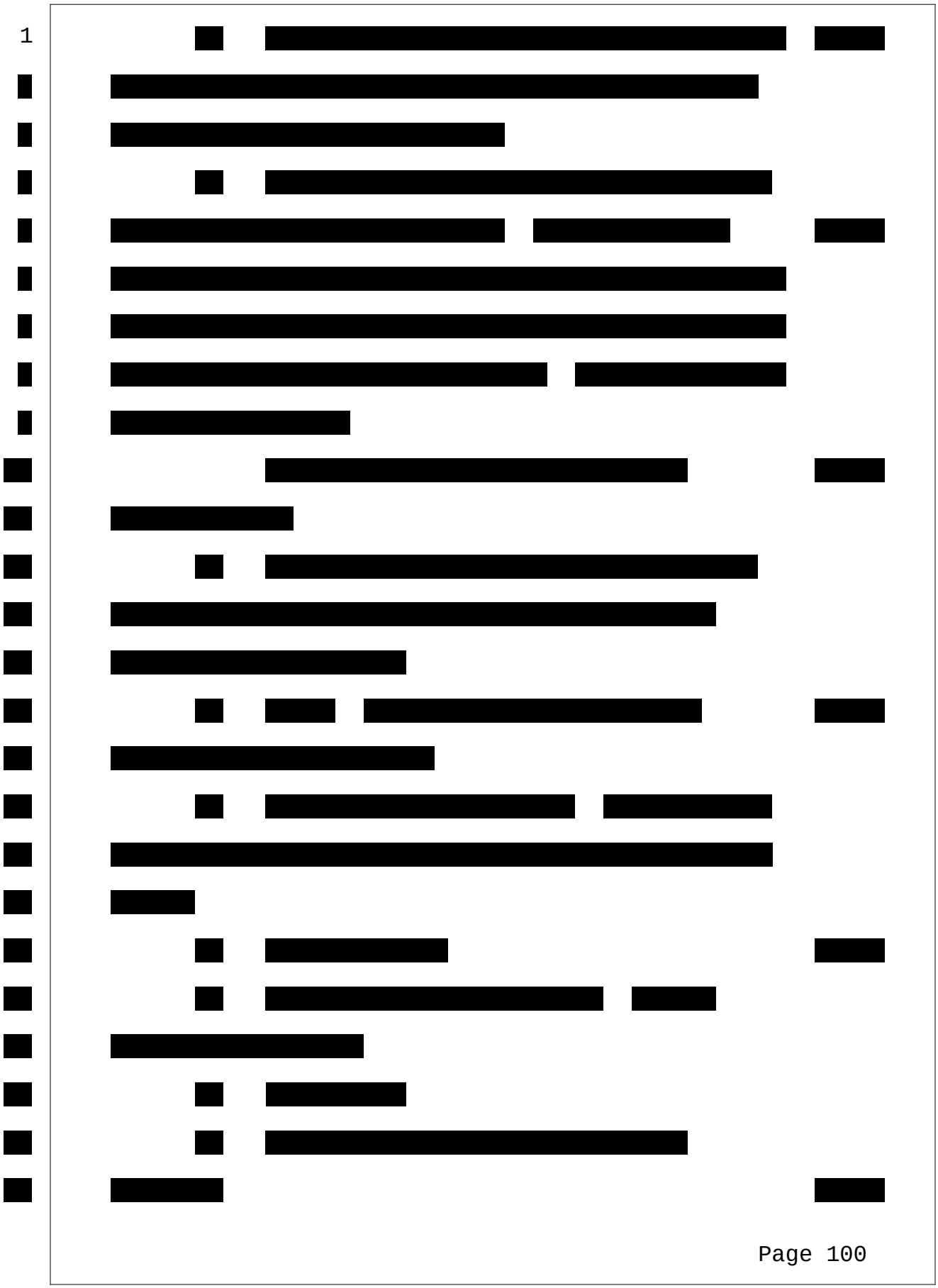


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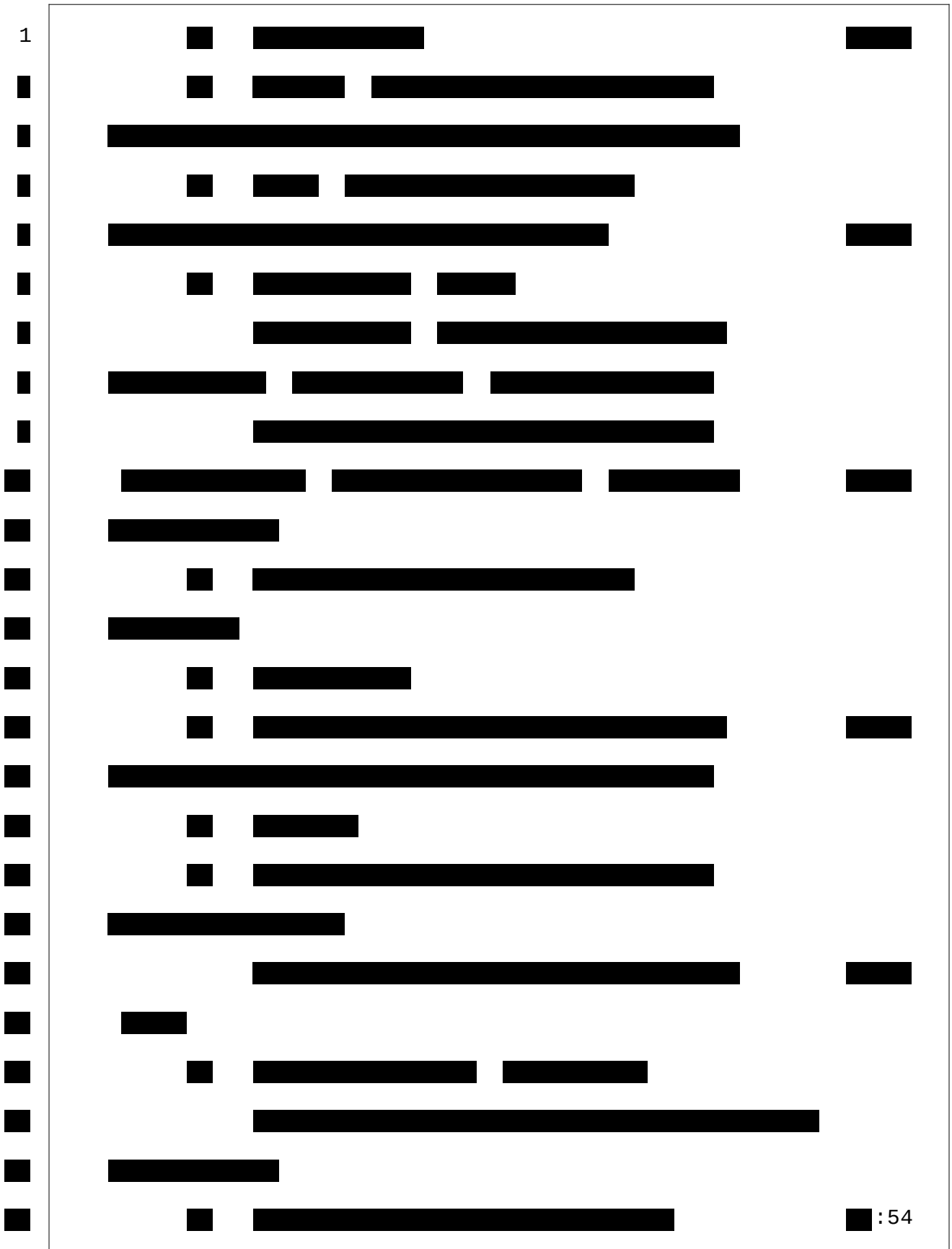
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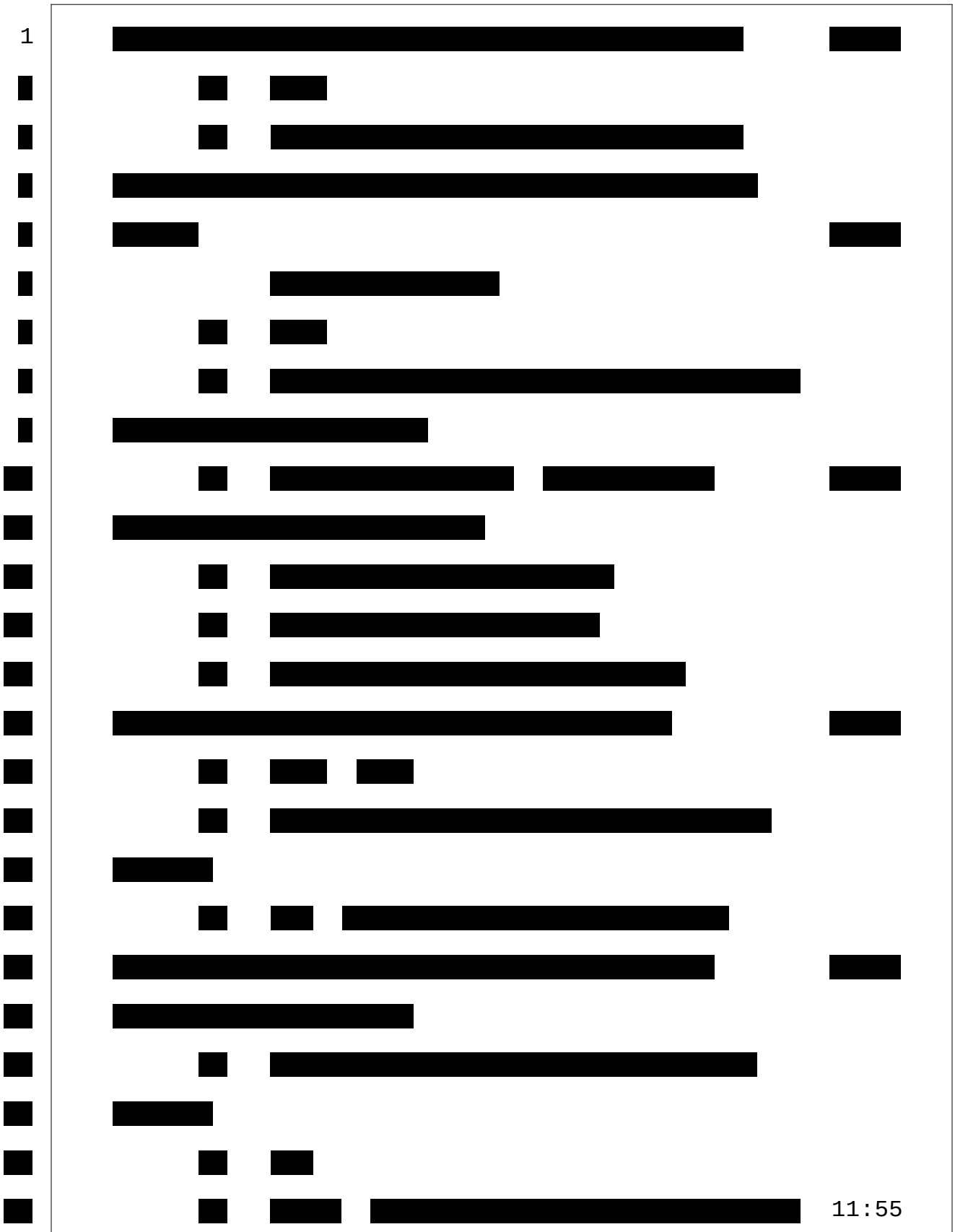
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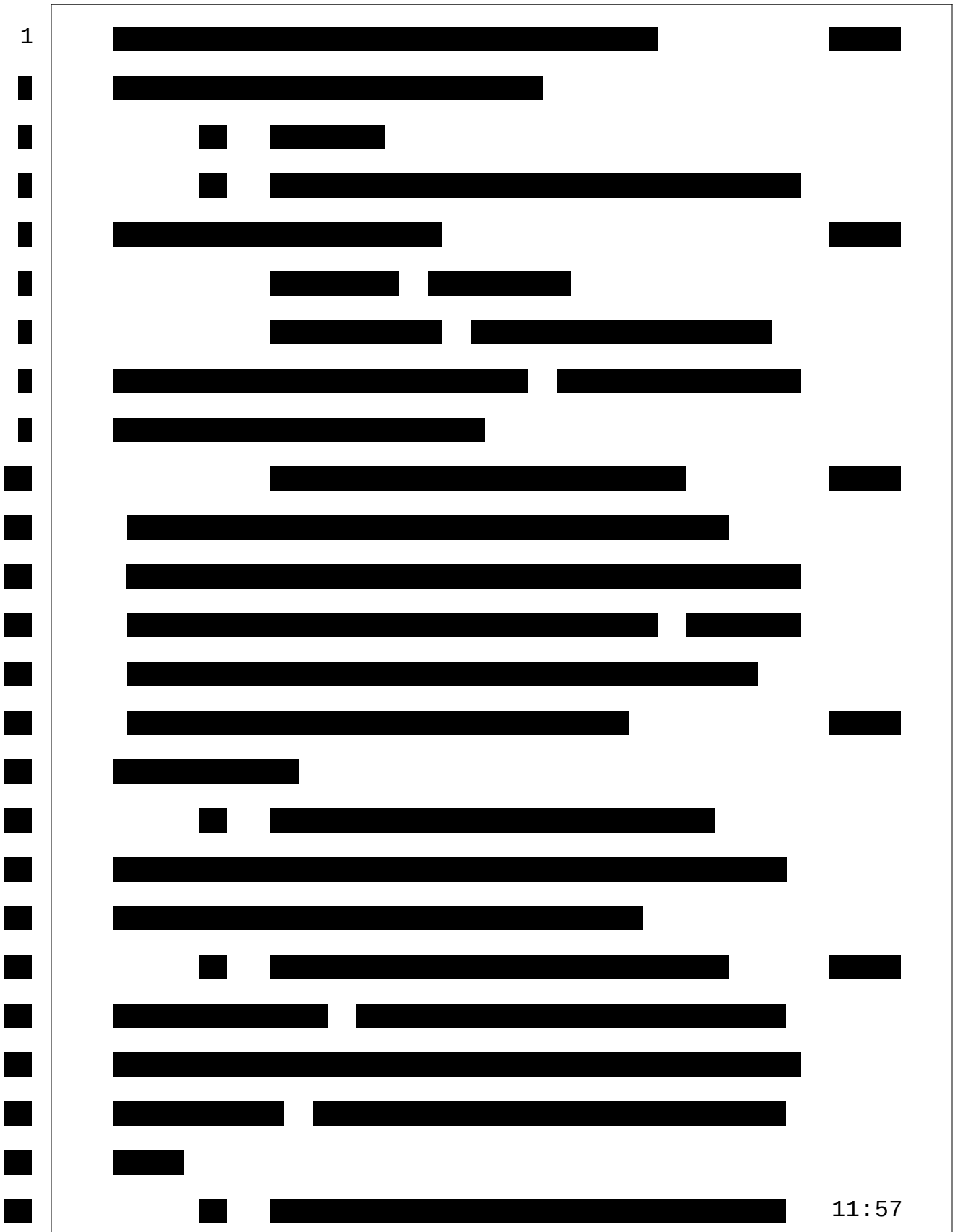


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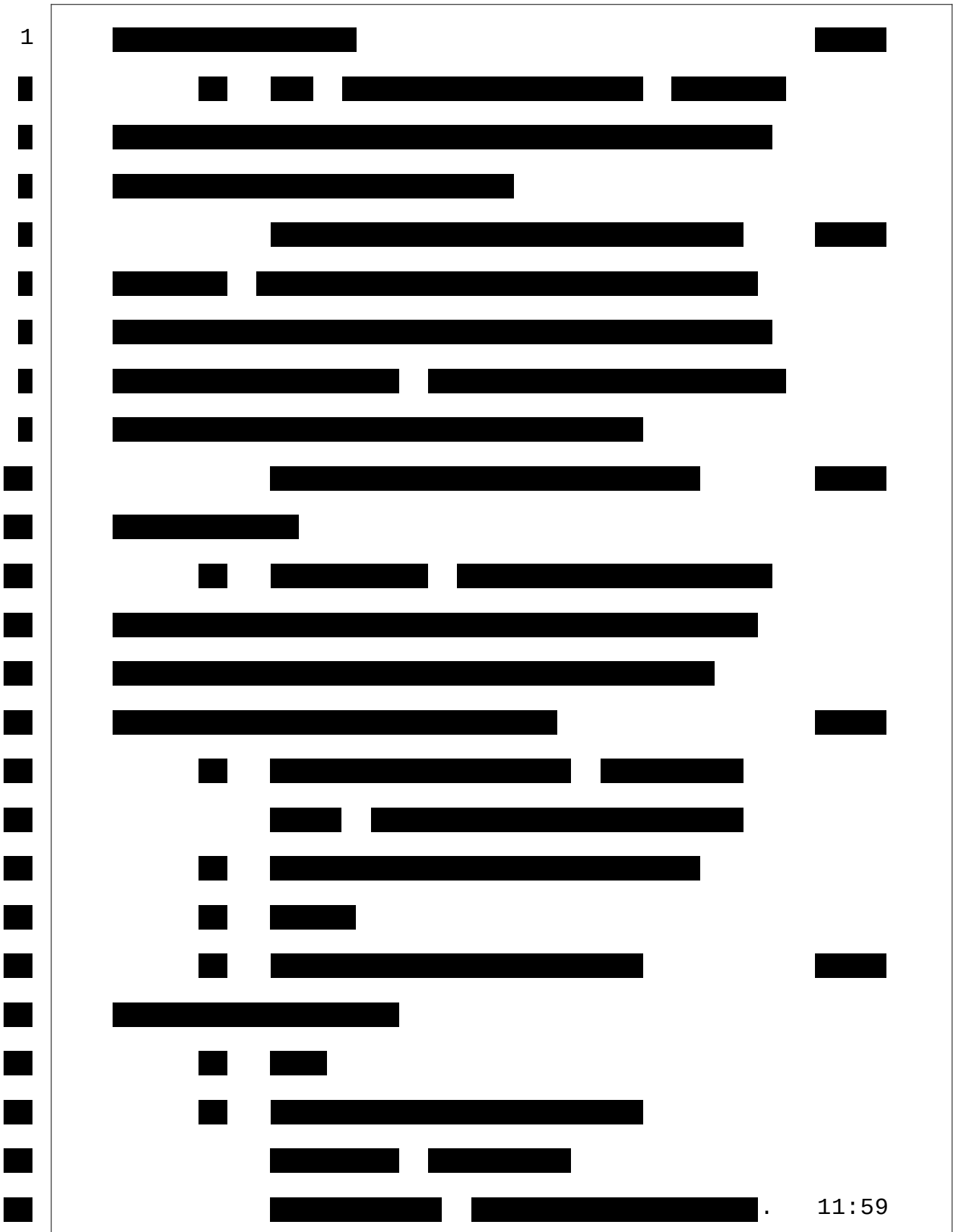


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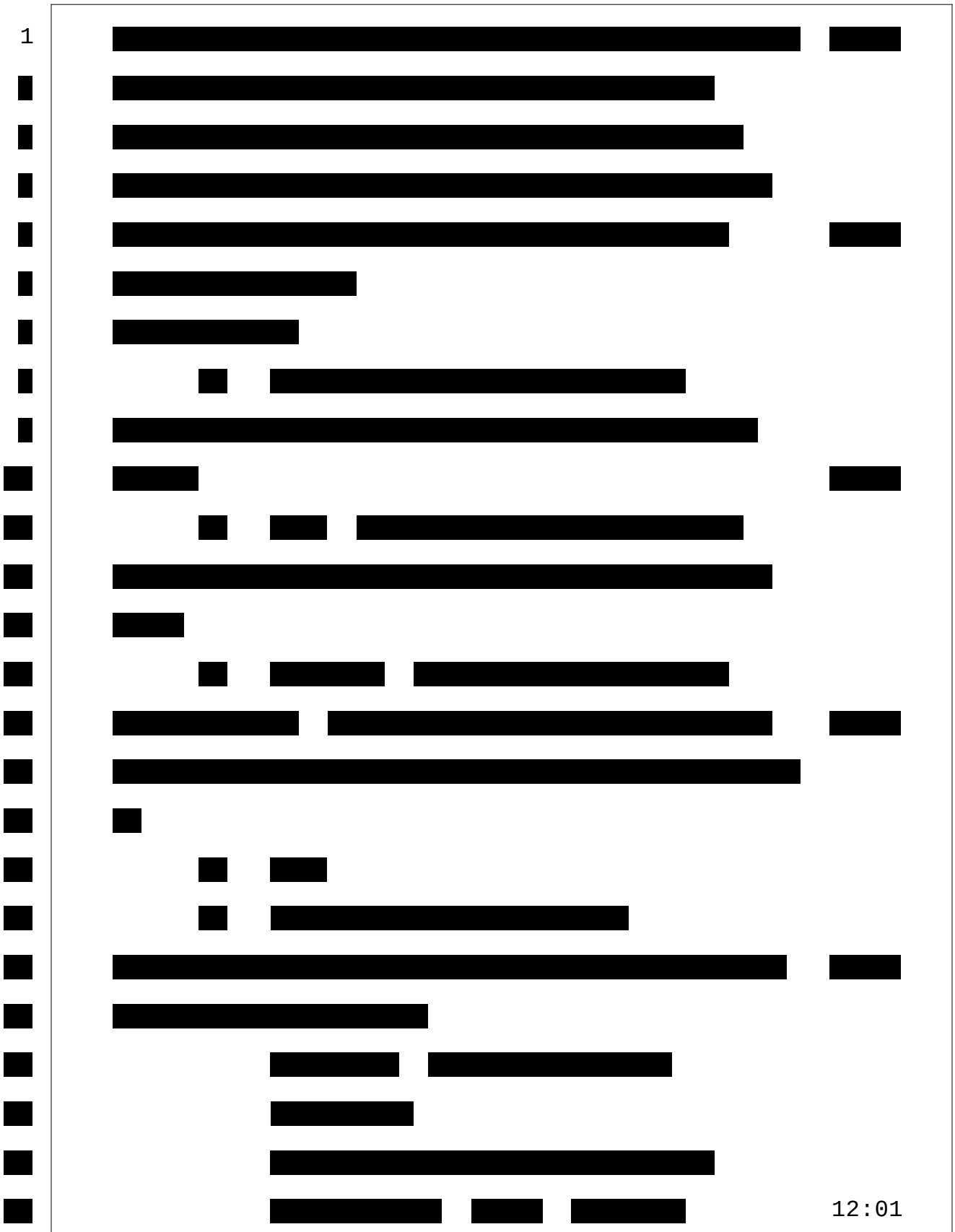


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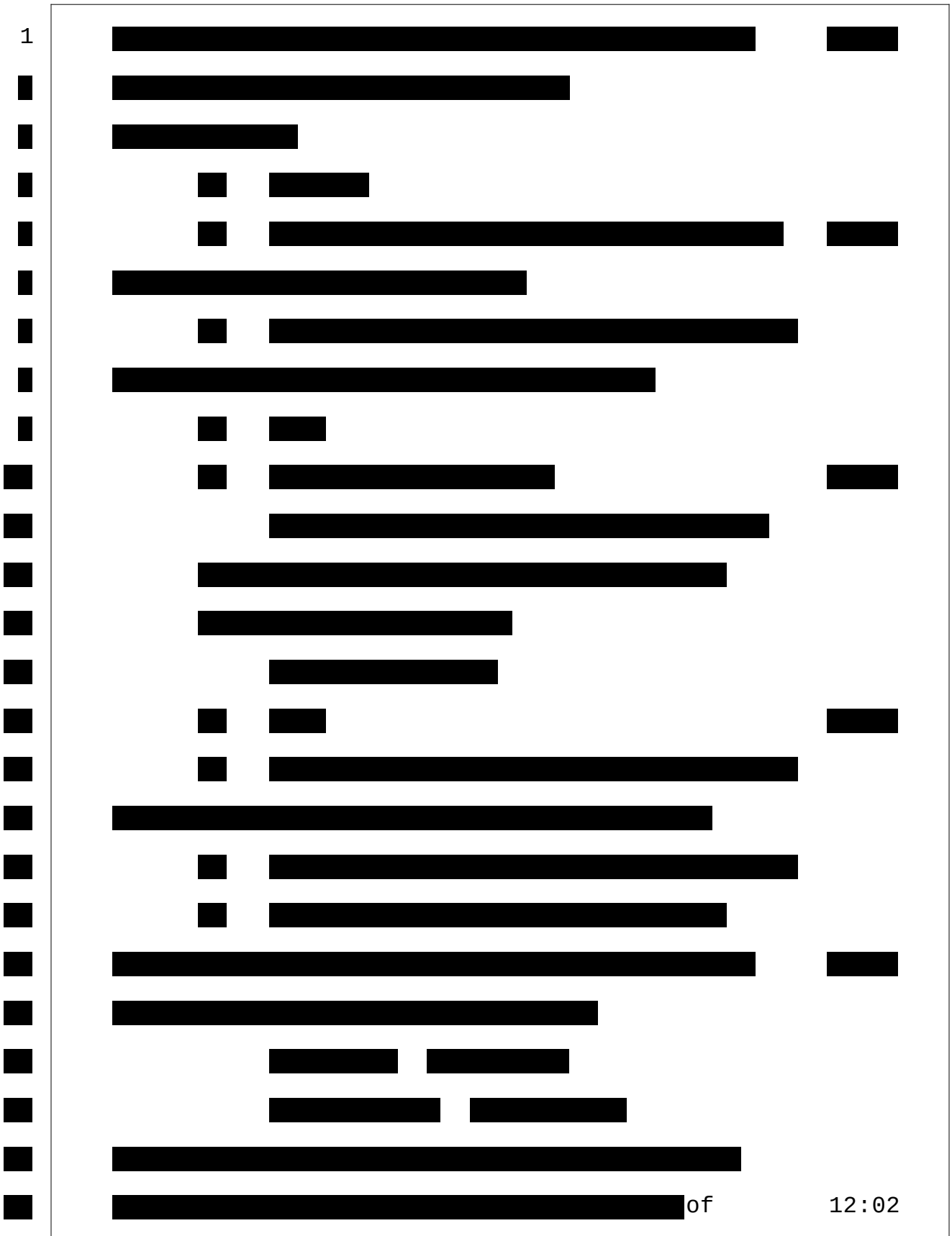


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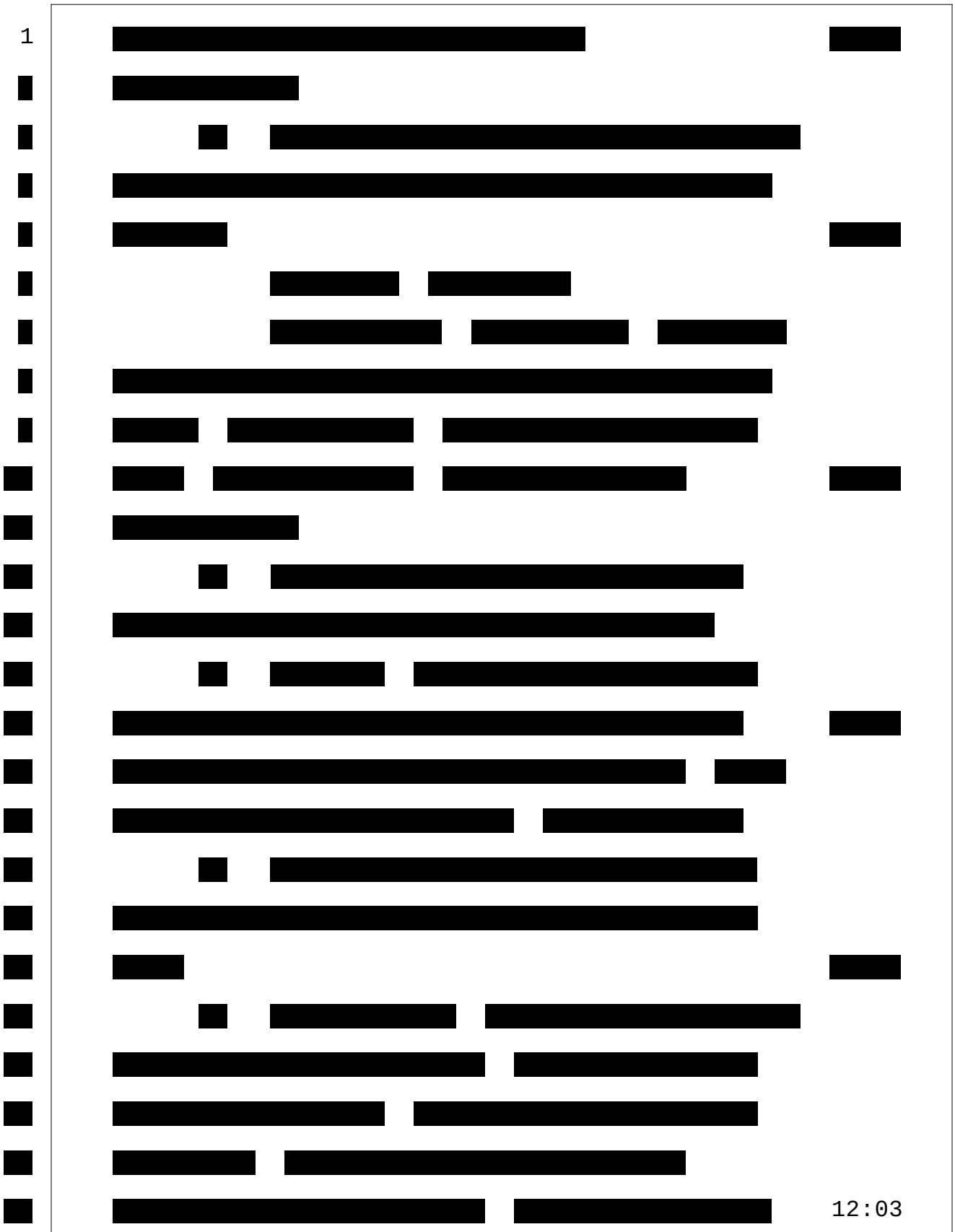


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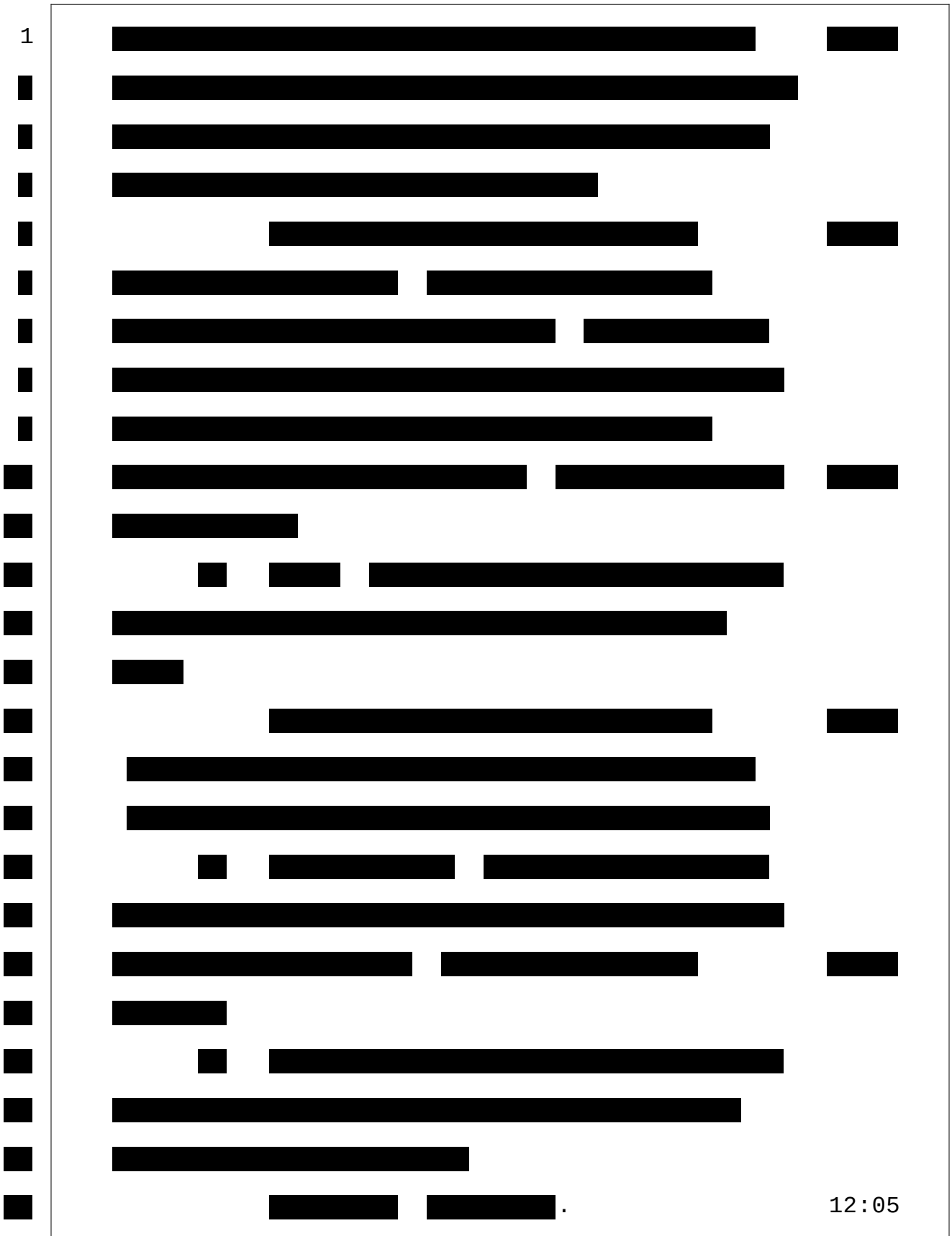


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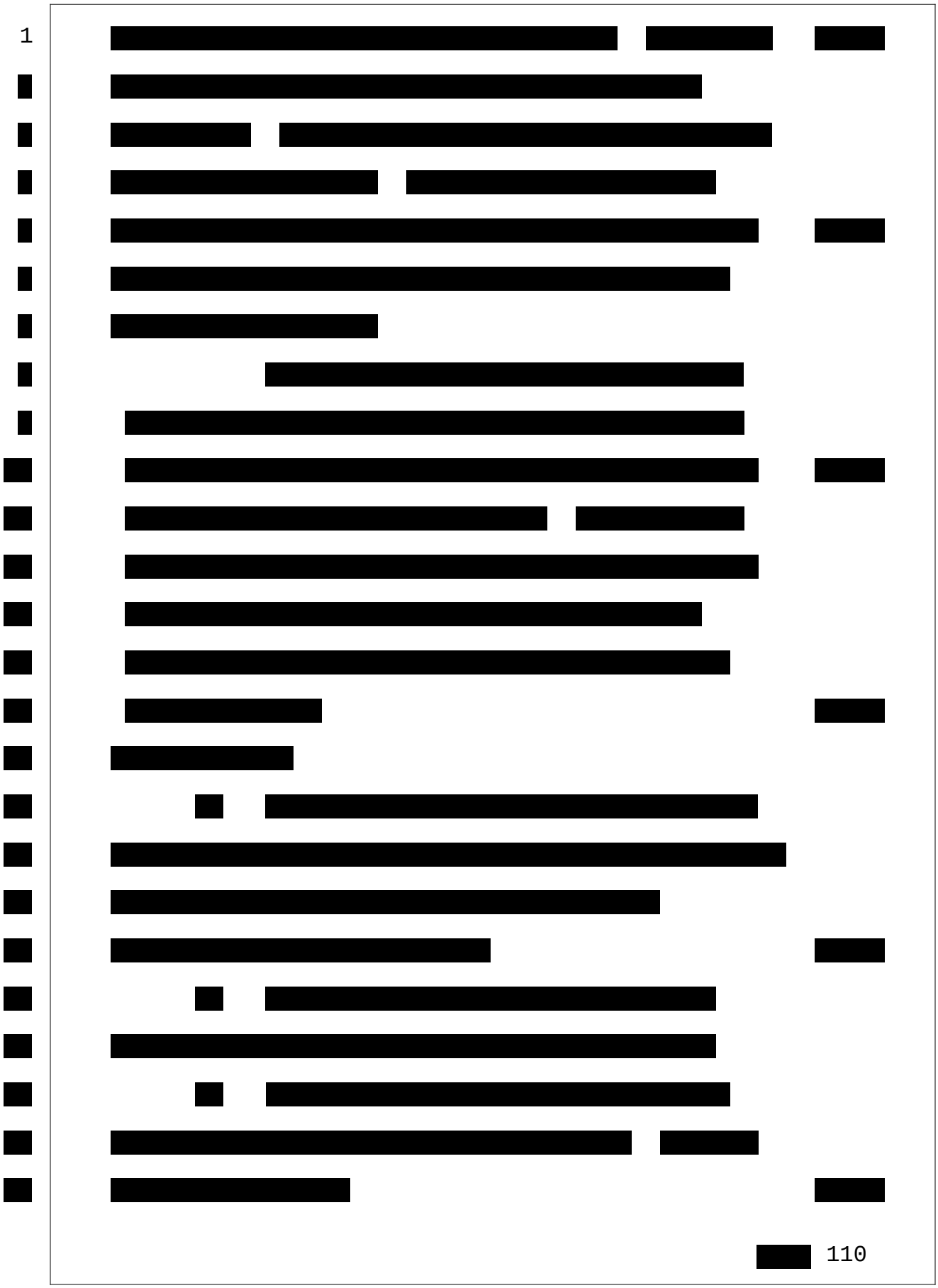
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[redacted]

MS. ZHONG: So we're slightly after noon right now.

Do you want to take a lunch break or you want to continue? 12:08

MR. YANG: So let's get off the record and then we can discuss how the break will be.

THE VIDEOGRAPHER: Off the record at 12:08 p.m. 12:08

(Recess.)

THE VIDEOGRAPHER: We are back on the record an 1:13 p.m.

BY MS. ZHONG: 01:13

Q. Welcome back, Doctor. I want to verify a couple of things.

So Osram already had a OLED program when you joined the company in January 2000; is that correct? 01:13

A. I believe so.

Q. And is it your opinion that Osram was a pioneer in solution-based OLED devices; is that correct?

A. That's what I said, yes. 01:13





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Q. And Osram commercialized solution-based OLED display panels by 2003; is that correct? 01:13

A. Yes. The first introduction was done in 2003, May 2003. 01:14

Q. And the work Osram did between 2000 and 2003 on OLEDs allowed it to receive a --

THE COURT REPORTER: Can we go off the record for a minute.

MS. ZHONG: Sure. 01:14

(Brief recess.)

THE VIDEOGRAPHER: On the record. 1:18 p.m.

BY MS. ZHONG:

Q. So, Doctor, the work Osram did between 2000 and 2003 in OLED allowed it to receive a multiyear multimillion dollar research grant from the Department of Energy; is that correct? 01:18

A. Yes. It's related to this -- not the only reason, but yes. Qualified for the DOE program. 01:18

Q. Okay. And the DOE program ended in 2005 when Osram decided to move its OLED program to its headquarters in Germany; is that correct? 01:18





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A. I don't know all the reasons but the DOE program indeed ended December 2005. 01:19

Q. And Osram invested about $3 million between 2003 and 2005 on the Department of Energy, DOE -- the Department of Energy OLED program; is that correct? 01:19

A. About this much.

Q. And as part of the Department of Energy OLED program, Osram not only investigated the development of a white OLED lighting source but also explored the possibility of developing full-color display panels based on inkjet-printed red, green, and blue pixels; is that correct? 01:19

A. Yes. 01:19

MR. YANG: Objection.

Go ahead.

THE WITNESS: Let me make a clarification about this just to better explain what I meant by that. There are two ways to make white light. One is to get white light coming from a single layer that includes all the emitters. The other approach was to use three lateral layers, RGB layers, that gives you white of a different hue. 01:20 01:20





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So it's -- the word full color, usually it's assigned to displays. What I meant to say, and to be correct, the RGB striped light source was used for rendering multiple whites hoping to achieve higher-power efficiency. 01:20

BY MS. ZHONG:

Q. And the RGB stripes can also allow Osram to develop a display with full-color gamut; is that correct? 01:21

MR. YANG: Objection.

Go ahead.

THE WITNESS: Yeah. Not really. We did the very first-level investigation in inkjet printing RGB. We were able to put a quality of RGB stripes, but the colors were not that great and did not really qualify the process for full-color displays, but it was a demonstrator to show that lighting can be done by putting down RGB stripes. It was an R&D project, not a product, a demo. 01:21

BY MS. ZHONG:

Q. Okay. So as part of the DOE OLED program, Osram made a demonstrator with RGB stripes; is that correct? 01:22





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A. Yes. Correct. 01:22

Q. And the RGB stripes could lead to a color display panel; is that correct?

MR. YANG: Objection.

THE WITNESS: Well, it depends. It's related, remotely related to full-color display. You cannot use the same demo for display purposes. We use stripes. So you cannot -- we didn't use pixels. You need pixels in a display not stripes. 01:22

BY MS. ZHONG:

Q. Can that concept be applied to display panels?

MR. YANG: Objection.

THE WITNESS: So the DOE demo was 100 percent focused on lighting. We did not using driving electronics. We did not use pixels. So that concept, per se, cannot be used for displays. 01:23

What we learned is how hard it is to use inkjet printing for RGB patterning. That's all we managed to push this technology. And we learned this thing on the lighting panel rather than display. The display is even harder. But even for lighting it was hard. But it was a 01:24





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great demo, and so the potential of the technology long term.

BY MS. ZHONG:

Q. Can you please refresh your exhibit share and see whether you see an Exhibit 5. 01:24

A. Yes. I see it. I'm opening it. Yep.

(Exhibit Number 5 was marked.)

BY MS. ZHONG:

Q. So Exhibit 5 is a document with the title "Final Technical Progress Report, Polymer OLED White Light Development Program, bracket number DE-FC26-04NT419," end bracket. 01:24

A. Sorry. I didn't capture -- do you mind, because I was looking at the DOE report, would you mind repeating? I'm sorry. 01:25

Q. So Exhibit Number 5 is a report with a title "Final Technical Progress Report, Polymer OLED White Light Development Program."

A. Yes. 01:25

Q. Bracket number -- the number sign DE-FC26-04NT41947, end bracket. Is that correct?

A. Yes. Yes.

Q. Is this the DOE final report you 01:25





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mentioned in your earlier answers? 01:25

A. Yes.

Q. And were you one of the authors of the report?

A. Yeah. I coordinated this report. 01:26 All the authors are written there, but yes, I was the program director.

Q. And what is your response -- what was your responsibility as the program director of a DOE grant? 01:26

A. I was responsible for bringing in the money from the DOE and maintaining the relation with the Department of Energy to qualify Osram for this funding.

Q. What about technically, what was 01:26 your -- did you play any role?

A. Of course. I coordinated the program at a high level. When we -- when we submitted the proposal, the overall strategy of the demos and what we will pursue, I was behind that. The 01:26 nitty-gritty details of how we will make the devices, the device development work was done by some of the members that you see there. And I can tell you what everybody did.

Q. Sure. Sure. Go ahead. 01:27





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A. So the program was organized in tasks. And each task had different deliverables. I was responsible functionally within the OLED Osram group for product development. So my team was responsible for the demonstrators. You can see task four. I was technically responsible for this. 01:27 01:27

We had a device development team that's task one. And what you see as task one is how you make the devices that emit white light. 01:27

Task three, by Raul Gupta was the inkjet printing task.

And task two was the fabrication of the glass substrate. The -- right. 01:28

And you can see that Franky So, the name that you referred to in the beginning, he was, of course, part of the program.

Q. And what was some of the highlights of this DOE program? 01:28

A. From what I remember, the tasks -- the deliverables of the tasks were the highlights. Task one we deliver a white emitting soluble technology where the emitters and the transports were all blended together in 01:29





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a pretty much single layer. And the team did a lot of good work to balance the electron and the whole transport. That's one. 01:29

Task two was the engineering of either -- the engineering of the substrates. We had to pattern the substrates with photolithography as well as metalization and prepare the substrates for publication. 01:29

Task four was the actual products. We put together the drivers, the packaging, the frames, power supplies, and the -- and deliverables to the DOE. 01:29

Those -- and task three is the attempt to make white light out of red, green and blue stripes and deliver that in a module in a natural demonstrator. 01:30

Q. Can you please go to page 71 of the report.

A. Yeah.

Q. So Section 4.3.5.1 -- 01:30

A. What page, sorry?

Q. 71.

A. Can I type here? Can I type right here? 71. Sorry.

Yeah. 71. Yes. 01:30





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Q. So Section 4.3.5.1 -- 01:31
A. Yes.
Q. -- concerns the color gamut of RGB tiles and efficiency of white, correct?
A. Yes. 01:31
Q. And so the range of color tunability in Figure 5.31 concerned the color tunability of the light demonstrator; is that correct?
A. Yes.
Q. And it's not optimized yet? 01:31
A. No. No. It was -- as you can see, the triangle was very narrow. We didn't have the right blue and it was -- you know, it was a defective product. We were very proud of the product, but it was not really top performing. 01:31 It's a great R&D result.
Q. And on the next page, Figure 5.32, is that intended to show what you believe you could achieve with some of the approaches listed above? 01:32
A. Yeah. Do you mind, give me a little bit of time to read this.
Q. Sure.
A. I don't remember very well this particular one. 01:32





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Yeah. It describes in a theoretical way the three different approaches that we can render white. 01:32

Q. Do you know, after the program was moved to Germany, did the German group continue with the development of this concept? 01:32

A. I don't know. I lost contact with -- after I left also.

Q. Okay. So you don't know what happened after 2005 at Osram's -- at Osram's OLED program? 01:33

A. I don't. All I know is that they were focusing on something different. I left a little bit earlier. My group and the rest of the team stayed until summer or something of 2006, after which a lot of the stuff were transferred elsewhere. Germany, I guess. 01:33

Q. Now, let's talk about the -- your report that you submitted in this -- in this action. 01:34

For this report, you were not asked by counsel to analyze invalidity of the patent, correct?

A. That's correct. No, I was not asked.

Q. And you were not asked to analyze the 01:34





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infringement of the -- by Samsung's products, correct? 01:34

A. Yes. That's correct. I was not.

Q. Were you asked to quantify the improvement that each of the techniques you discussed in your report? 01:34

MR. YANG: Objection.

THE WITNESS: Can you repeat the question? Give me a little bit more information. 01:34

BY MS. ZHONG:

Q. Sure.

So you were provided by counsel a number of documents, correct?

A. Yes. 01:35

Q. And you reviewed those documents?

A. Yes.

Q. And you specifically discussed a subset of those documents in your report, correct? 01:35

A. Yes.

Q. Okay. And did you quantify the improvement each of the techniques brought by?

MR. YANG: Objection.

THE WITNESS: After reviewing the 01:35





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report, I highlighted the areas that I considered to be the most important for enabling the manufacturability of OLED displays. 01:35

BY MS. ZHONG:

Q. So, for example, did you provide a number to say this technique improved the efficiency of the devices by X percent? That technology increased the lifetime of the device by X percent. Did you perform that analysis? 01:35

A. Not exactly. 01:36

Q. And you did not provide -- strike that.

And the full-color gamut, you also did not provide -- you also did not quantify the perceived improvement of the technique; is that correct? 01:36

A. I did not. And I don't remember seeing these things in the report. I don't remember these things. So I did not. The only quantification that I repeated was in relation to, let's say, [redacted] 01:36

Q. So the only thing that I remember you could quantify is probably the [redacted] 01:36





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[redacted] 01:36

A. Yes. And [redacted] yes.

Q. But there was nothing -- there was no quantified analytical results for lifetime improvement, device efficiency improvement or 01:37 color gamut improvement?

MR. YANG: Objection.

THE WITNESS: Yeah. Let me review and I will bring you an example. There is some quantification, for example, [redacted], I 01:37 will draw you to -- [redacted] on page 30 of my report -- talks about [redacted]. This is -- to me it strike me as a very important processing step. Comes across as a trade secret. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] 01:38

[redacted]

[redacted]

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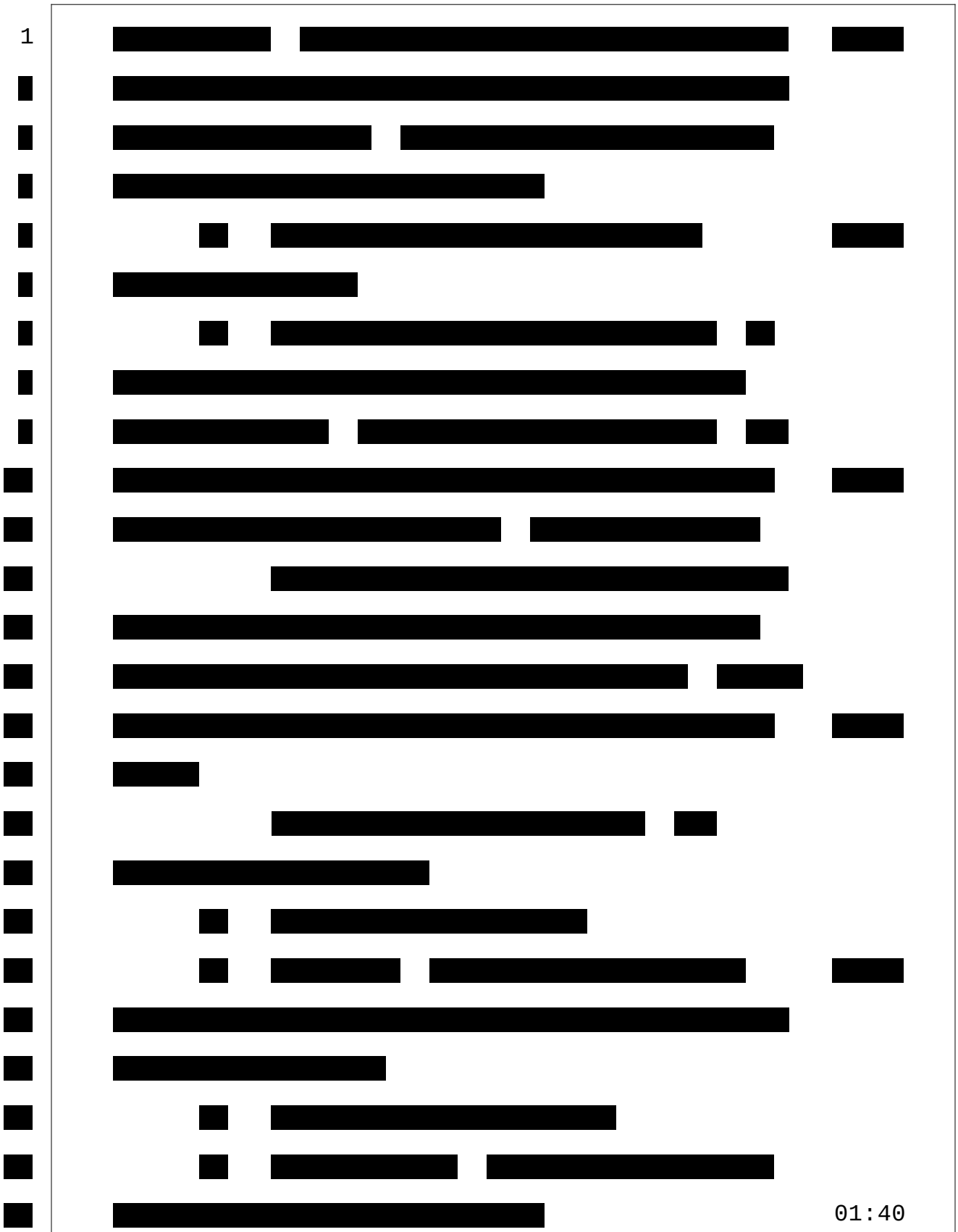
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01:40





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[redacted]

Q. Okay. Did you investigate the [redacted] over lifetime if you use a nonselective deposition technique for forming the thin film encapsulation versus a more selective deposition technique?

MR. YANG: Hold on a second. Objection.





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THE WITNESS: Can you please explain what you mean by "selective." 01:42

BY MS. ZHONG:

Q. For example, when the material is deposited in the targeted material area rather than it's a blanket application. 01:42

A. I see. [redacted]

[redacted]

A. Okay. So selective in relation to thin film encapsulation?

Q. Correct.

A. With respect to the organic and inorganic, with respect to what layers, please? 01:42

Q. Either layer. Either or both.

A. So the report, to my recollection, doesn't talk about this specific selective or nonselective deposition. But the report, what I reviewed, talks about thin film encapsulation. 01:43

[redacted]

[redacted] -- 01:43





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[redacted]

Q. [redacted]

[redacted]

A. When I was with Kateeva, we publicly shared with the world that more than 80 percent of the OLED displays are made with Kateeva





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materials. That's all -- 01:45

Q. You mean for encapsulation?

A. With encapsulation. Sorry, with Kateeva printers. Correct me, please. Strike the materials. More than 80 percent in 2018 were made with Kateeva inkjet printers. 01:45

Q. So based on your knowledge from working at Kateeva, more than 70 to 80 percent of the organic layer for the thin film encapsulation was applied using Kateeva inkjet printers; is that correct? 01:45

A. That's what we publicly have announced.

[redacted]

:46





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[redacted]

BY MS. ZHONG:

[redacted]

Q. Now, so what's the advantage of using inkjet printing versus flash evaporation for putting down the organic layer in the thin film encapsulation -- for the instant film encapsulation?

MR. YANG: Objection.

THE WITNESS: Inkjet printing would offer better control of the material usability. You only -- it's an additive process and you can





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only deposit in the areas that they need to go, right? That's the biggest advantage of inkjet printing and the other advantage is thickness control. 01:47

BY MS. ZHONG: 01:48

Q. So inkjet printing compared to flash evaporation offers better control of the process?

A. Yes. And the other advantage that it offers is to allow the inorganic layer, the silicon nitride or any inorganic layer that is used for encapsulation, to touch each other. Because at the end of the day you want to -- and this is a strong idea that Vitex talked about, you want to enclose the planarization layer, the ink printable layer within the inorganic layer. 01:48 01:48

So the inorganic layer -- the two inorganic or three or so inorganic layers are offering the dome under which you enclose the organics and the OLED, the organic part of the thin film encapsulation of the OLEDs. 01:49

So the only way to do this is with a -- I would say some kind of a patterning.

BY MS. ZHONG:

Q. Can you please refresh your exhibit 01:50





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share and see whether there is an Exhibit number 6? 01:50

A. Yes.

(Exhibit Number 6 was marked.)

THE WITNESS: Yep. 01:51

BY MS. ZHONG:

Q. And Exhibit 6 is a presentation by Kateeva with a title "Inkjet Technology for OLED SSL Mass Production" by Conor Madigan.

Do you see that? 01:51

A. Yep.

Q. Can you please go to -- by the way, do you know who Dr. Madigan is?

A. Yep.

Q. Who is he? 01:51

A. He is one of the three founders of Kateeva.

Q. Is he knowledgeable in the OLED space?

A. Well, he is the founder, a cofounder of Kateeva, and he was very successful in raising money. So he knows the OLED technology. 01:51

Q. What's his technical background?

A. I believe he did his undergraduate degree in Princeton and a Ph.D. in MIT. 01:52





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Q. Did he work for Steven Forrest at Princeton? 01:52

A. No. He did his undergraduate. He has one of the very first papers in the 90s on inkjet printing, around that time, with Jim Stern, Professor Jim Stern. 01:52

Q. Okay. What does "SSL" stand for?

A. I don't know. Solid-state lighting in my lighting background, but it's not solid-state lighting. I don't know what it means. Sorry. 01:52

Q. That's fine.

Can you please go to page 17.

A. Yes.

Q. So this page is comparing Kateeva's inkjet printing process versus the traditional flash evaporation process, correct? 01:53

A. Let me review that, please.

Q. Sure.

MR. YANG: While he's doing that, Monice, I still haven't received the link yet and the one in the chat is not working for me. 01:53

MS. ZHONG: I didn't send. I thought she was going to send, so I didn't bother. I can do that. 01:53





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THE COURT REPORTER: Do you want to go off for a second? 01:53

MR. YANG: If you can that would be great.

MS. ZHONG: Okay. I can forward you the remote counsel email. That's the one that I used. 01:53

MR. YANG: Okay. Anything you can get to me is great.

MS. ZHONG: I just forwarded the link. 01:54

Let me know -- should we just go off the record and see whether you have it?

MR. YANG: Sure. I'm okay with Q and A until I get it. It's not a huge rush for me, so... 01:54

BY MS. ZHONG:

Q. Okay. So we can continue.

Have you had a chance to review the page, Doctor? 01:54

A. Yes.

So what we see on this page is the comparison of -- in general, not necessarily to TFE. It's -- well, it's labeled as TFE but then Conor talks about RGB share mask, fine metal 01:55





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mask for RGB patterning. 01:55

So in a sense he's mixing two different layers of the OLED structure, which is -- personally I don't believe with this comparison. It's a bit of a marketing proposal. 01:55

But the value proposition for TFE is correct. Right. I mean, in general inkjet printing is known to deposit materials in specific areas. A great example is inkjet printing, right? I mean, this is accurate. 01:56

Q. So do you agree with his general assessment that inkjet printing is faster in forming a thicker film than flash evaporation?

A. It depends, right? It depends on the application of -- for thin film encapsulation, 01:56

inkjet printing or screen printing are the best ways to do it. But for RGB coating, it's a completely different argument.

Q. Let's just focus on the encapsulation, the organic layer. 01:56

A. Yeah. So we'll take the left-hand side of the figures out because they're talking about RGB deposition, which is yet to be proven in mass production, where the right-hand side it's more mature. It's in production today. 01:56





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Q. So let's focus on the TFE organic layer. Is it true that inkjet printing provides a faster way of applying the organic layer than flash evaporation? 01:56

A. I don't know this. Seriously, I don't. It's a cleaner way to do it. But I don't know -- a flash can be very fast too, but it goes all over, right. So I don't know which one's faster. Actually, flash may be even faster. 01:57

Q. And do you know which one forms a better planarization layer? 01:57

MR. YANG: Objection.

THE WITNESS: I know at Kateeva we're using inkjet printing, but in truth I don't know, right? Inkjet printing cannot do a large area uniformily. You have to do it step-by-step, right? So it depends on the application. It depends on how you use inkjet printing, right, for what application. You ask me a general question, right? So typically the TFE is used for printing pockets for guide layers. 01:57 01:58

BY MS. ZHONG:

Q. Do you know about the particle 01:58





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defects of using flash evaporation versus inkjet printing? 01:58

A. I don't have personal experience. I have experience with inkjet printing. So I don't know the difference between the two. I know that inkjet printing works well and it doesn't generate unwanted particles. 01:58

MR. YANG: Objection.

BY MS. ZHONG:

Q. And do you know the materialization rate for flash evaporation versus inkjet printing? 01:58

A. I don't --

MR. YANG: Objection.

THE WITNESS: I don't know very well what percentage of the film is utilized or not. 01:58

BY MS. ZHONG:

Q. And what about scalability?

A. So it depends, right? If your substrate is very close to the source, then you have very good materials utilization. But if the substrate is very far, then you lose a lot of the material, right. So I don't know how flash evaporation will determine uniformity or not. 01:59





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Q. What about the ease or difficulty in maintaining the equipment? 01:59

A. Clearly something that it's deposited on demand. Perhaps it will give you better control of the material, both in weight and in space. But I don't know about the maintenance, because the issue with inkjet printing is also the head technology would need maintenance and changing. So, I mean, how do you compare this? 01:59

Q. Did you speak to any Samsung engineers when you prepared your report? 02:00

A. I did not.

Q. Okay. Did you ask to speak with any of them?

A. No. I assume that my job was to read all this and give my expert report. 02:00

Q. Did you speak with any of the other Samsung experts in this case?

A. Well, over the years we know people, but not for this case, of course not. This is -- I haven't even told my kids about this case. 02:00

Q. So you did not speak to Drs. Katona, Kymissis, Miller or Aziz?

A. Who's the last one? 02:00





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Q. Hany Aziz. 02:00
A. I know Hany, but no. I haven't spoken to him for a long time. No.
Q. And you have not spoken with Dr. Seth Miller or Dr. Katona or Dr. Kymissis, correct? 02:01
A. No. I know Dr. Kymissis, but I -- no. Of course not.
Q. What about the damages expert for Samsung? So Dr. Perryman and I don't know whether it's Mr. or Dr. Stack? Did you speak 02:01 with any of them?
A. I don't know them. I have not spoken to them.
Q. So you submitted this report in this action. What are you rebutting against? 02:01
MR. YANG: Objection.
THE WITNESS: I don't understand the question.
BY MS. ZHONG:
Q. So your report is submitted as a 02:01 rebuttal report. Do you understand that?
A. No. The way I see it, it's an expert report. I absorb the materials, I digested them and highlighted what I thought were the take-home messages for me as an expert in the 02:02





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OLED field revolving around the capability of SDC to overcome the barriers and push the technology into manufacturing. That was the thesis in my head. 02:02

Q. But are you responding to the expert reports put forth by Pictiva? 02:02

A. No, no. As a matter of fact, I find my expert report almost totally irrelevant to Kateeva. It's -- the only common path here is the fact that they're both OLED related, because as we discussed, Kateeva was doing -- 02:02

Q. Sorry. Not Kateeva, Pictiva.

A. Sorry, Pictiva. I'm sorry, I should say that was a mistake. Strike that.

Osram and then Pictiva, they were doing spin coating in passive matrix displays. There's nothing related to this in this report. The Osram puts forward passive matrix displays. Very low resolution. A good portion of the display. It talks about [redacted], high-resolution displays what are used today, right? So they're almost irrelevant, I would say, of each other. 02:03 02:03

Q. You know what -- strike that.

Do you know when Osram first started 02:04





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to look into using inkjet to print the OLED matrices? 02:04

MR. YANG: Objection.

THE WITNESS: Can you -- you said matrices and it threw me off. You're talking RGB materials? 02:04

BY MS. ZHONG:

Q. Yes.

A. I don't remember the exact time. For sure as described in the Department of Energy report, because we had a printer, an inkjet printer that we were using to print RGB materials, and in general before purchasing the printer, we looked at who was providing the printers. I don't know if it was 2001, 2002. 02:04 02:05

We ended up acquiring the printer so I don't remember exactly when. I mean, not earlier on, because earlier on we wanted to build the line that would make this monochrome display, so the priority was monochrome. 02:05

Q. But even back then, even when you were building the monochromic display, you also looked into the possibilities of inkjet printing; is that correct?

A. Yeah. So let me clarify a little 02:05





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bit. We're talking about inkjet printing red, green, and blue materials. I'm looking at converse, comparison versus TFE. The technology is very different. So to print red, green, and blue, all that materials, the nozzle technology is very different. 02:05 02:06

Printing the TFE, it requires a completely different inkjet printing technology. As a matter of fact, it's made by a different vendor. So the throughput of materials in one is totally incompatible with the other and vice versa. 02:06

The placement accuracy is very different. So let's make sure that we make the distinction that developing, let's say, TFE, doesn't qualify you for full color and vice versa, developing full color doesn't qualify you for TFE. These are different engines, right, so you cannot infer one from the other. 02:06

Q. Are you saying that the inkjet printing technology for TFE encapsulation is very different than the inkjet printing technology for the OLED pixel areas? 02:06

A. Yes. Yes. That's a good question. Very different indeed. And the proof to this is 02:07





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that the very first displays that were made with printing TFE, they're out in the market, we're still waiting for RGB inkjet printable OLEDs. And this we thought in the early 2000s that inkjet printing will be superior to fine metal mask. But it turned out to be the opposite.

After reading this report, it just dawned on me how significant was Samsung's hard work in taking a rather difficult technology to the first glance, [redacted] And inkjet printing OLEDs is not in production today.

And the reason that it's not in production today is because the inkjet printing head technology for RGB is not accurate enough. We thought 20 -- 35 years ago that this technology would be 100 times more accurate than fine metal mask.

And, by the way it was to the very first approximation. But to the surprise of everybody, Samsung has demonstrated that [redacted], it's actually the ultimate technology.

Q. Why was the inkjet printing





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technology for the pixel area not accurate enough? 02:08

A. Yes. So can I make an analogy?

Q. Sure.

A. So imagine you're playing a basketball game, and you are throwing the balls to the basket. You want to hit all the balls into the basket times 100. 02:08

Q. Okay.

A. Okay. So with other boards you are printing -- each pixel consists of three droplets and you have millions of pockets. You have to hit them all precisely. So we're almost there but not exactly. 02:09

So you have misplacement of the red, green, and blue pixels. And you end up with color defects. So to use the term that we have been using, you are screwing up the gamut. Eventually we will get there, but not today. And this is very different than TFE. 02:09

Q. For TFEs you don't really have to worry about how the pixels are placed, correct?

A. Yes, correct. To some degree. You don't need the pockets. You are just deciding the outer perimeter. And I don't know exactly 02:09





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how Samsung or others are doing it, but you have to use some confinement, but not of the degree of the RGB printing. 02:10

Q. So are there specific challenges for using -- for applying the TFE organic layer? 02:10

A. So one fundamental patent by Vitex claims the organic layer to be shorter than the inorganic layer, and the only way to achieve this is by using accurate printing. That's the clear advantage of inkjet printing. Because you have some accuracy of, of course. You have misfirings of droplets, but you can accurately define the perimetry of the organic layer. And you can control the thickness also. That's another advantage. 02:10 02:11

Q. What do you mean by the organic layer is shorter than the inorganic layer?

A. So a very fundamental patent by Vitex is to make the organic layer shorter than the inorganic layer. So the TFE consists of organic and inorganic layers. 02:11

Q. So you basically want the inorganic layer to envelope all sides of the organic layer --

A. Yes. 02:11





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Q. -- is that what you mean by the organic layer is shorter? 02:11

A. Yes. It's the smaller in area. I think your word is great. You envelope the organic below the inorganic. And you want all the organics to meet each other and glue to the substrate. 02:11

Q. But can't you do that by having masks of different sizes?

A. In theory you could. I don't know. 02:11

Q. But you don't know whether in practice you could actually accurately control the areas of the organic and inorganic in that --

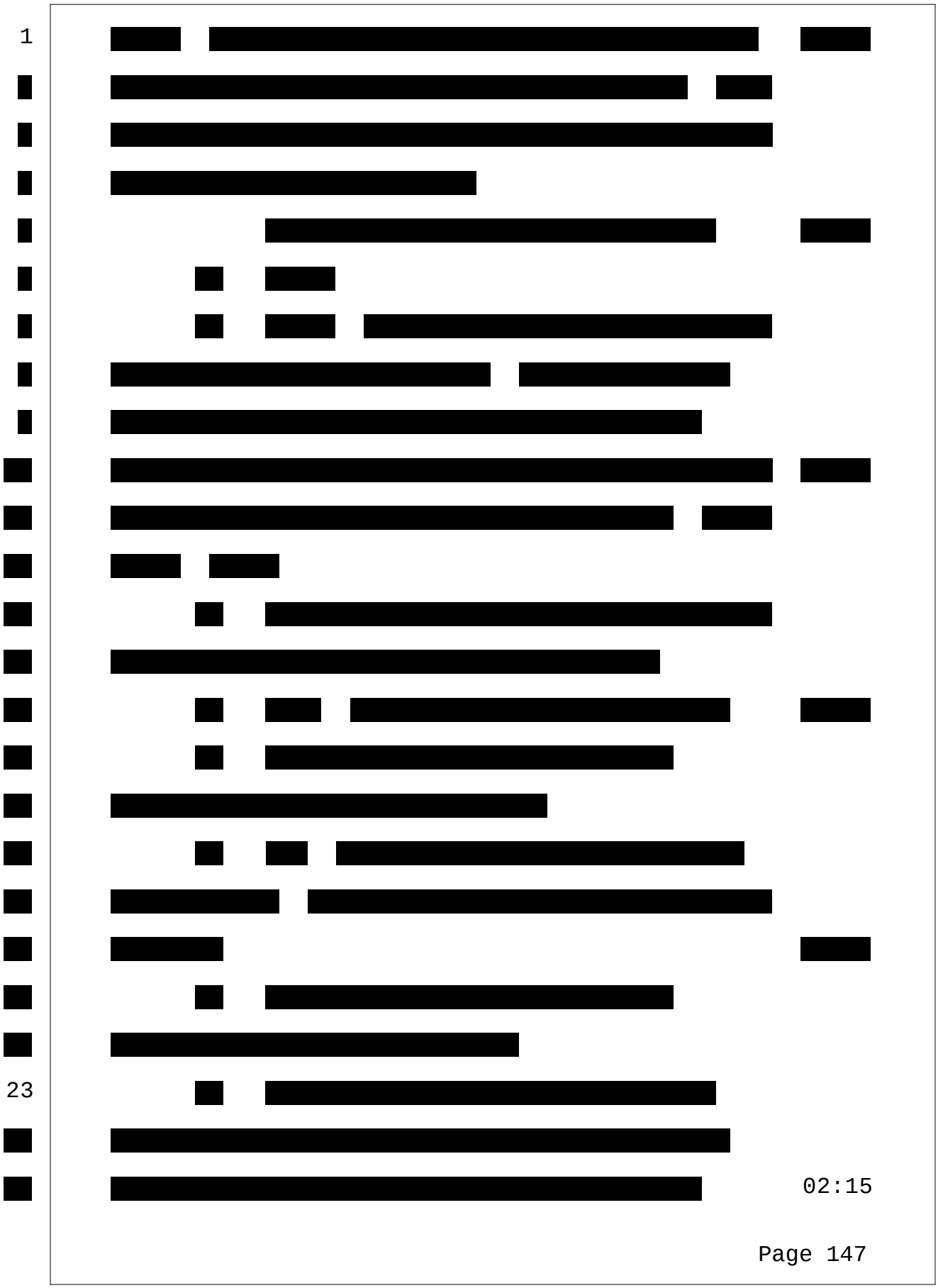
A. I don't know. I don't know. 02:12

[redacted] 02:13





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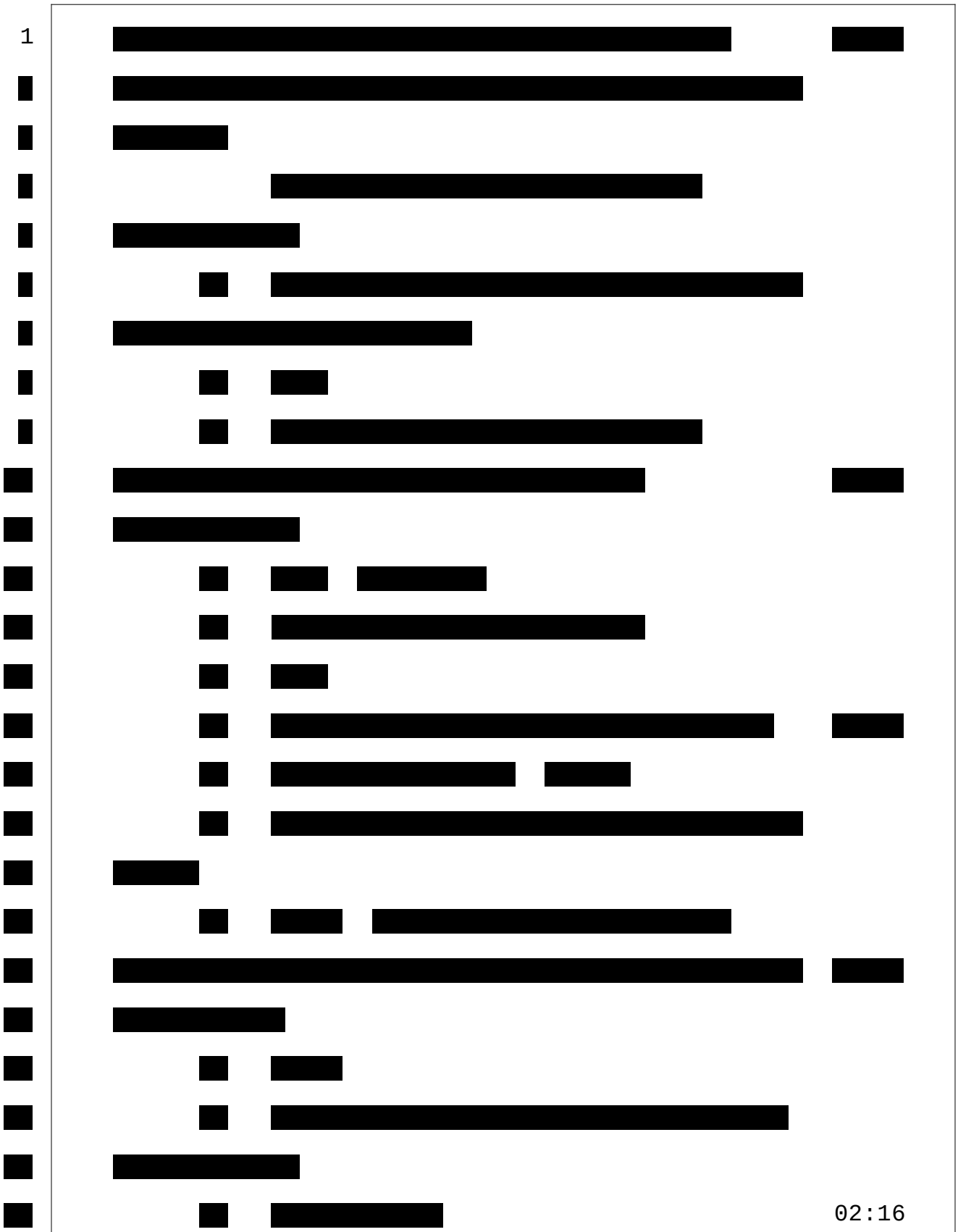


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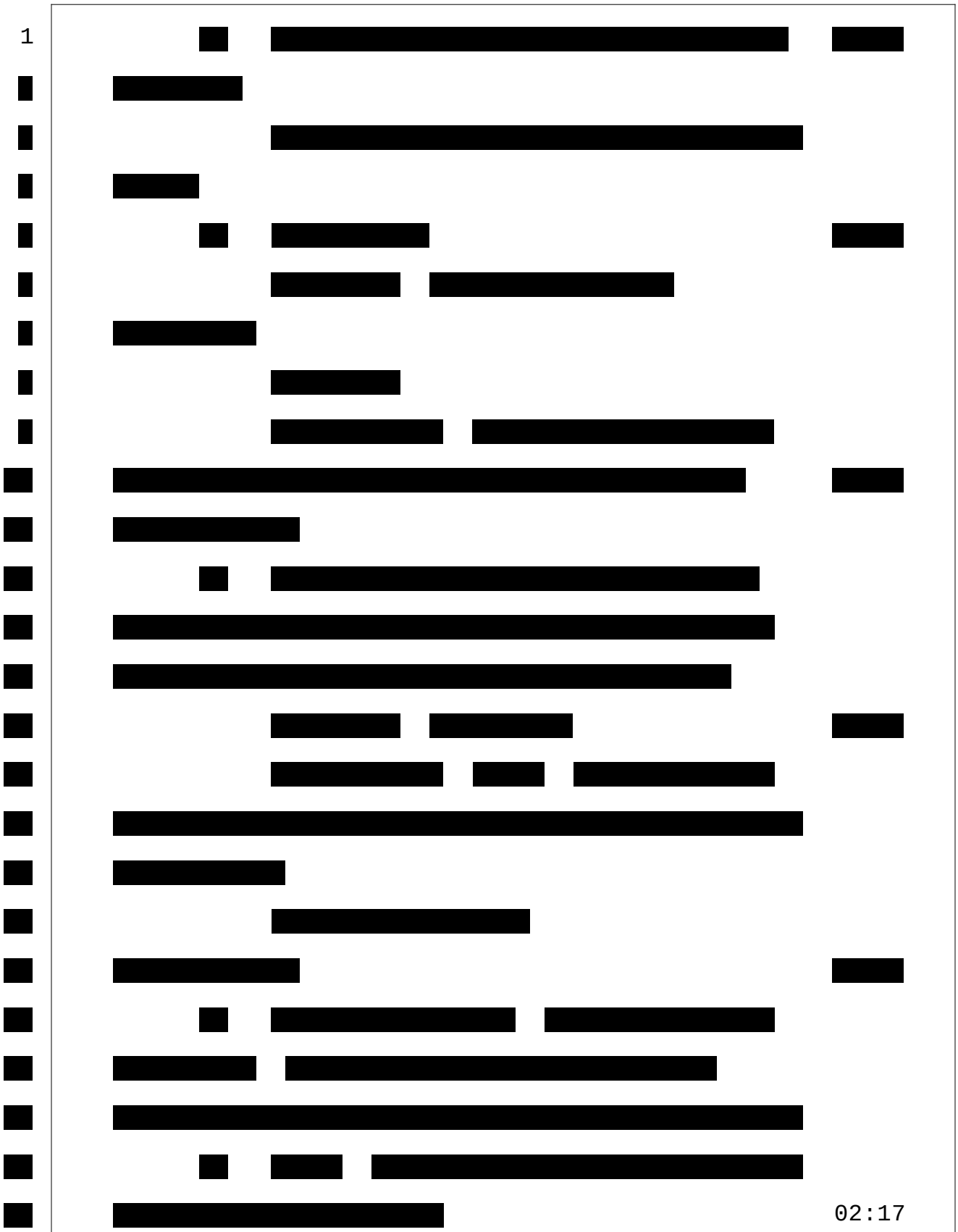


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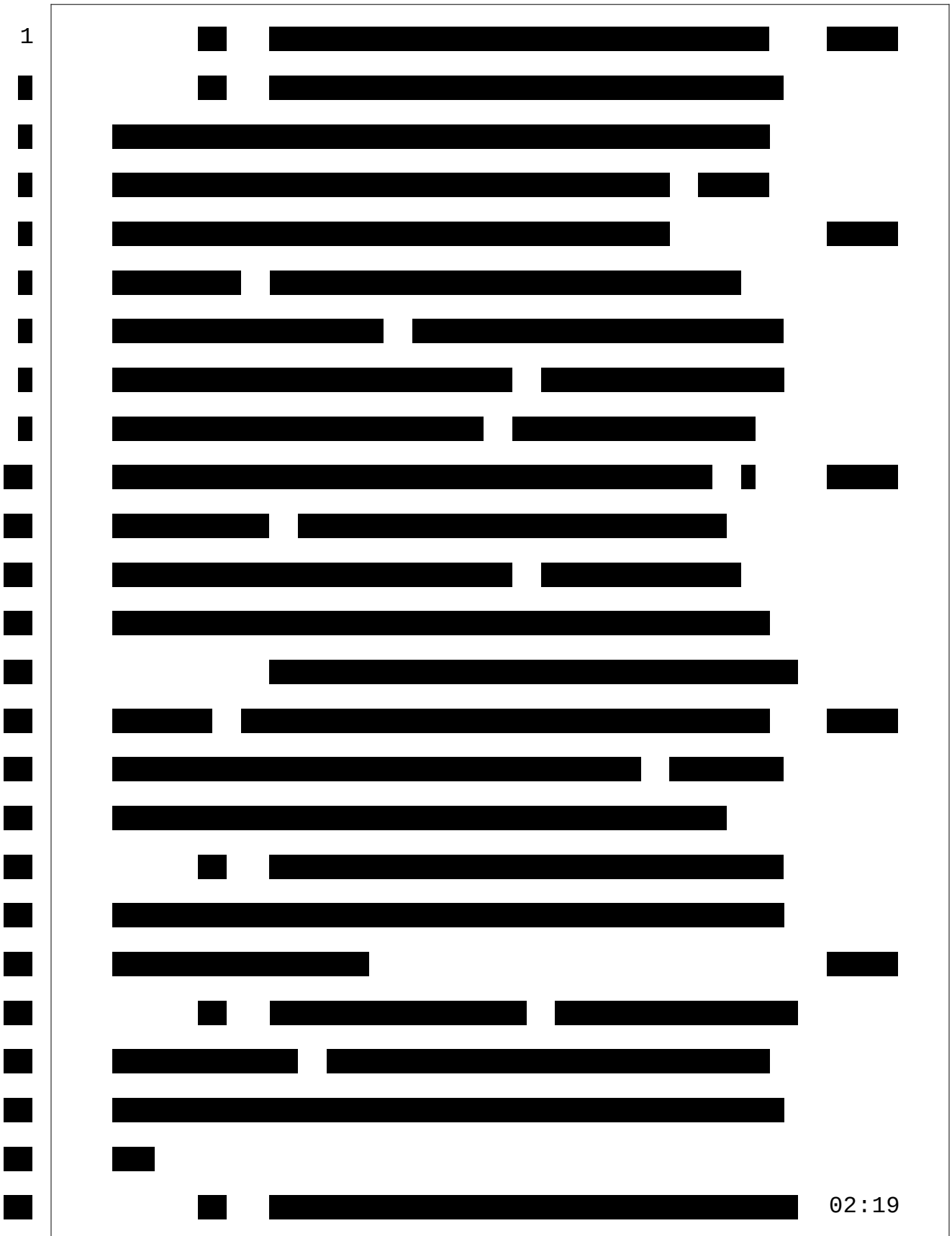


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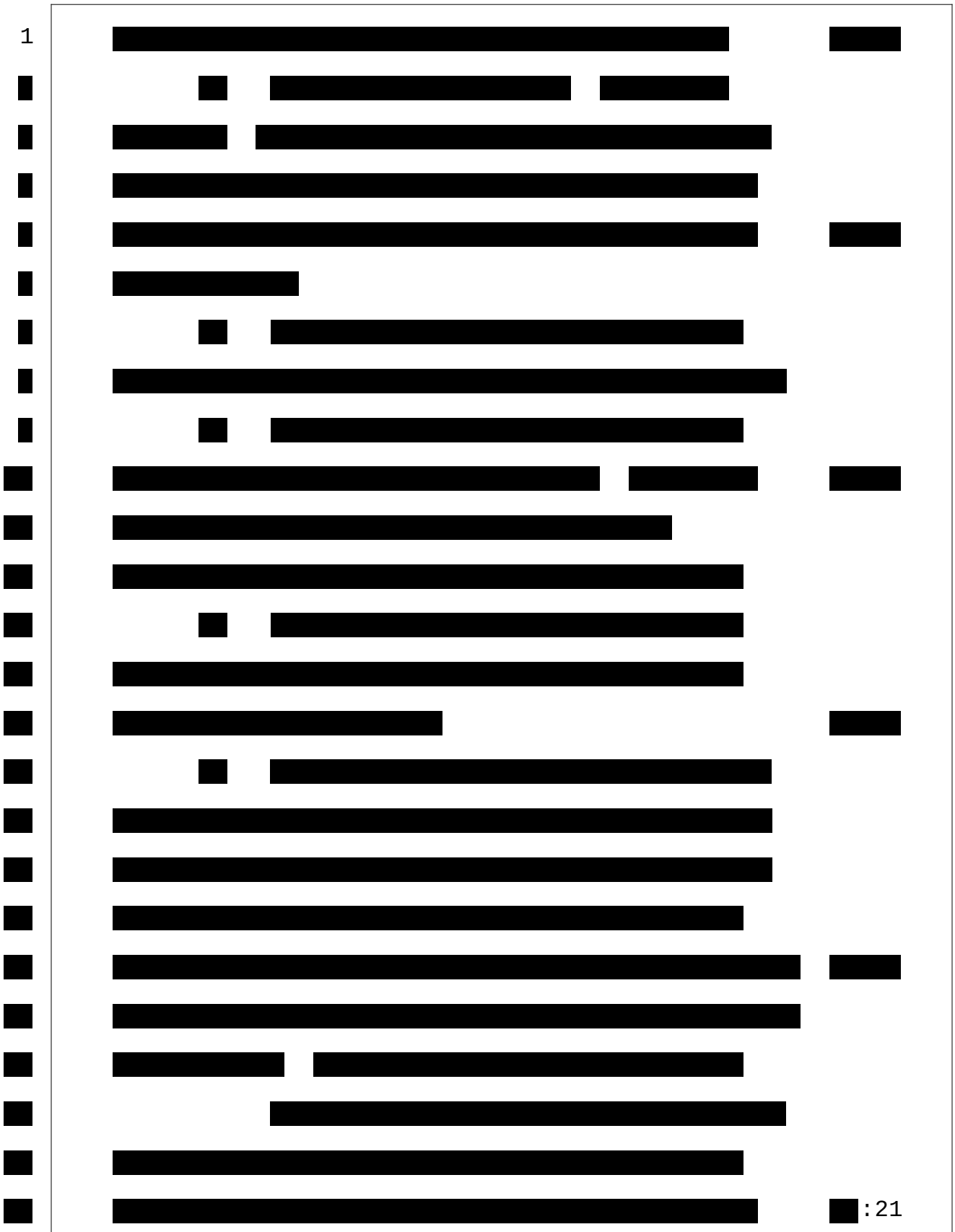


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[redacted]

:21

[redacted]

Q. And do you know the relative amount of particles that's formed using flash evaporation versus inkjet printing for TFE formation?

A. I don't know.

MR. YANG: Objection.

02:22

02:22





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BY MS. ZHONG: 02:22

Q. Do you know the throughput improvement of using inkjet printing to deposit the organic layer versus use a more blanket application method to put down the organic 02:22 layer?

MR. YANG: Objection.

THE WITNESS: Yeah. I don't know. I know that the inkjet printing is used in production today. 02:23

BY MS. ZHONG:

Q. And do you know -- do you have any sense as to the improvement in the throughput of using an inkjet-printed process versus a nonselective deposition process? 02:23

MR. YANG: Objection.

THE WITNESS: Yeah. I don't.

BY MS. ZHONG:

Q. And do you know the yield difference when you use an inkjet printing process versus a 02:23 more blanket application process?

MR. YANG: Objection.

THE WITNESS: I don't. It's complex, right? Because it's a printing also -- you need to worry about your head technology. And if 02:23





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nozzles clog, then you need to compensate for the clogging nozzles. So it's a system so I don't know. It's -- I know the technology has been developed and work in manufacturing, but I cannot comment on comparisons. I mean, I truly don't know. 02:23 02:24

BY MS. ZHONG:

Q. Do you know why people migrate to using inkjet printing for the organic layer for the TFE? 02:24

MR. YANG: Objection.

THE WITNESS: I cannot give you a complete answer because I don't know all the details. I know one important -- one of the important areas is the thickness control and the edge control as we described earlier. 02:24

BY MS. ZHONG:

Q. What about particle defect control?

A. Well, I know Kateeva was doing all this stuff in an inert environment with laminar flow. So you're printing in ink with inkjet printing so it's very difficult to assess the particle because you are in a controlled environment. 02:24

Q. Do you know the loss in lifetime if 02:25





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after the organic layer you don't put down another barrier layer on top of the organic layer for the TFE? 02:25

MR. YANG: Objection.

THE WITNESS: I don't know. What I know is one of the approaches you put another inorganic layer on multiple organic layers and multiple inorganic layers. I haven't seen data, so I cannot comment. 02:25

BY MS. ZHONG:

Q. Do you know the loss of lifetime or reliability if you apply the barrier layer or the inorganic layer only to a portion of the organic layer? 02:25

MR. YANG: Objection. 02:26

THE WITNESS: I cannot refer to this -- I don't have access to this data to show you, okay, here is the data, right? I did -- did I? I may have seen something in the Samsung reports. I don't remember where, but I can -- what I recall vaguely, I haven't put it in the report, is that they have TFE versus non-TFE and the TFE was more stable than the non-TFE. 02:26

Because I have all this knowledge that comes from the past. I don't know if I 02:26





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have seen it from Vitex or if I have seen it from Samsung, but a TFE device is protected where the non-TFE it's not.

BY MS. ZHONG:

Q. Do you know what's the improvement in the lifetime? 02:26

MR. YANG: Objection.

THE WITNESS: No, it depends. It depends on the conditions. It depends on how you expose the device. For instance, in one case, narrow case of maybe 85 -- 85 degrees C, 85 degrees humidity, you easily see no dark spots on the TFE device after 240 or -50 hours, which is a telling thing that the TFE works. 02:26

BY MS. ZHONG:

Q. Is it typical for a device manufacturer to test the devices under 85/85 conditions versus room temperature? 02:27

MR. YANG: Objection.

THE WITNESS: Let me think a little bit about it. Just a general question. I believe it depends on the application. So it's not typical. I have seen 85/85. I have seen 60/90, I have seen smaller numbers, higher humidity. For instance, automotive guys are 02:27





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asking for 85/85. 02:27

BY MS. ZHONG:

Q. But it is not atypical for a device manufacturer to test the devices at temperatures higher than room temperature, correct? 02:28

MR. YANG: Objection.

THE WITNESS: Let me think about it. How do I answer this? So you're asking if it is typical for a device fabricator to test the devices under 85/85? 02:28

BY MS. ZHONG:

Q. Not necessarily 85/85 but at a temperature that's above room temperature.

MR. YANG: Objection.

THE WITNESS: Well, the product that you're building will define the testing criteria for qualifying the product and passing certain qualifications. Consumer products have a different temperature. Automotive products have a different testing temperature. Different products are even worse. So it depends on the product, right. 02:28 02:29

BY MS. ZHONG:

Q. But even for consumer products you would test it above room temperature? 02:29





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A. In some cases I have seen -- it depends on the conditions of the testing. So if you do a wet test like elevated temperature for consumer products, it's customary in some cases to ask for 60/90. 60 degrees C, 90 percent humidity. 02:29 02:29

Q. So for a reliability test that's done at a high temperature is usually called accelerated lifetime testing, correct?

A. In some cases, yes. 02:29

Q. And you do that type of testing because you can't wait for 10,000 hours for a device to fail, for example?

MR. YANG: Objection.

THE WITNESS: In some cases. Not always. Because there are a lot of different tests. As a matter of fact, there are new kind of degradation modes that appear under high temperature, high humidity that you cannot link to room temperature. They don't -- they cannot be described with simple Arrhenius plots or mathematical equations. This is not only true for OLEDs, it's true for photovoltaics and other devices too. 02:29 02:30

It's a -- the degradation mode is 02:30





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very difficult and it depends on the mode of degradation. You have multi modes and they are all contributing together, and if you describe this thing mathematically, you will end up with a very ugly equation. So it's very difficult to answer this question. 02:30 02:30

BY MS. ZHONG:

Q. So based on your knowledge for OLED display panels for mobile devices, do they test at higher temperatures? 02:30

MR. YANG: Objection.

THE WITNESS: To qualify the product due to multiple tests, not only high temperature. They do shock tests. They do drop tests. They do dry heat. They do operational lifetime, in room temperature and in high temperature. 02:31

There are like 10 different tests dictated by the IEEE protocols. They are standard tests which I cannot recall right now that the industry is offering for this. 02:31

BY MS. ZHONG:

Q. Why don't we take a look at pages 4 to 5 of your report, in particular paragraph 14.

A. Do you mind telling me the page 02:31





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again. 02:31

Q. Paragraph 14 on pages 4 to 5. Page 4 -- like page 4 and page 5.

A. Yes. Page 4 and page 5.

Yeah, I guess one of the IEEE 02:32 international standards is the IEC 62341.

Q. Okay. So the testing you have listed here, the environmental stress test that acts are accelerated aging through high temperature/humidity cycling and accelerated 02:32 lifetime testing, those were typical tests that's done by manufacturers, correct?

A. It depends on the application. It could be a typical test for an application. I just wrote it there because you really need to 02:32 test the devices under different conditions to qualify it. If it's an automotive product, it has a different code. It's not an IEC 62341, it's something else, but you have to test the devices under different conditions, yes. 02:32

Q. In the context of OLED devices, there is current efficiency, power efficiency, and external quantum efficiency, are those -- how are those three efficiencies related to each other? 02:33





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A. So they're all remotely related. So the quantum efficiency, it's directly related to the normalized efficiency of converting -- this is the electroluminescent quantum efficiency. The percent of photons that you get out of the percentage of charges that you inject into the device. 02:33

The power efficiency, it's related this, but it's more of a wall plug efficiency, right. So you put energy in, in watts, electrical energy, which is related to the electrons and holes that you inject the current, and what you measure is the optical output, which is basically the number of photons at a given energy. So they're all related. A high-quantum efficiency will give you a higher-power efficiency too. 02:33 02:34

Q. Does a higher-quantum efficiency necessarily lead to a higher-power efficiency?

A. The power depends also on the voltage. It depends, right. If all this participates in the power in the -- in optical power out. You can have 100 percent quantum efficiency but operating 100 volts. That's a lousy device. 02:34 02:35





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Q. So a device with a higher-quantum efficiency doesn't necessarily lead to a device with a higher-power efficiency? 02:35

A. That's correct. That's one of -- you can generalize by saying that. So to add one more thing of what I said earlier, what I said earlier, it's true for a single pixel. 02:35

Now, if your device has multiple pixels you will also need to define if it's a static image. If the image consists of how many pixels at what brightness. Right. Because you have -- it's complicated things. OLEDs are devices that have variable quantum efficiency and variable power efficiency. 02:35

And the OLED devices consist of many pixels. A device, the OLED device where all pixels are on consumes a lot more power versus one pixel is on. Right? 02:35

Q. So there isn't a straightforward direct relationship between external quantum efficiency and power efficiency; is that correct? 02:36

A. Yes. It's not a simple thing. You can only do it for a single pixel. 02:36

MS. ZHONG: We've been going on for 02:36





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almost an hour and a half now. Do you want to take a break? 02:36

MR. YANG: Sure. Yes.

MS. ZHONG: Let's go off the record.

THE VIDEOGRAPHER: Off the record at 2:36 p.m. 02:36

(Recess.)

THE VIDEOGRAPHER: We are back on the record at 2:54 p.m.

BY MS. ZHONG: 02:54

Q. Now, Doctor, when you prepared your report, did you -- strike that.

As part of your -- the process for preparing a report, did you review any of the Pictiva's expert's reports? 02:54

A. No.

Q. Have you reviewed any of those reports since then?

A. No.

Q. How long did it take you to review the documents and prepare your report? 02:54

A. I can hear my voice -- can we -- something's not good.

MR. YANG: Sorry.

THE WITNESS: Because you have it on. 02:54





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MR. YANG: Sorry about that. I unmuted two things when I only meant to unmute one. 02:54

THE WITNESS: I don't remember exactly, but I spent about a week -- I don't know how many hours I put for all of this. Let me think a little about it. I cannot give you a direct number because I don't have it with me. 02:55

I don't know. 15, 20 hours to read all this stuff and then another -- this month to put the report together to some degree. So maybe a little bit more. 02:55

BY MS. ZHONG:

Q. Did you do a first draft of the report? 02:55

A. Yes. I generated -- yes, quite a bit of information. Yep.

Q. Did you focus on certain pages of the documents that you reviewed?

A. Could you repeat, please? What do you mean? 02:56

Q. Sure. Did you focus on certain pages of the --

A. Yes. Certain pages of the SDC disclosed information. 02:56





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Q. Correct. Did you focus on certain pages of the SDC documents? 02:56

A. Yeah. I mean, there may be other documents in the Samsung that can be used, but I -- the figures that we included or at least the pages that I included, they represent certain aspects of the technology. There's a lot of information in there. 02:56

Q. Okay. Were you given directions as to which pages to focus on when you started reviewing the documents? 02:56

A. No. As a matter of fact the -- Lance, in his --

MR. YANG: Hold on a second. I want to caution you not to reveal any communications. The answer you gave is fine, but just don't give any -- 02:56

THE WITNESS: Okay.

MR. YANG: -- that's it. Don't go into what we discussed in preparing for your report. 02:57

THE WITNESS: Yeah. It was an independent report. I just wanted to confirm that. Didn't want to be differently -- yeah.

/ / /





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BY MS. ZHONG: 02:57

Q. Have you verified that the techniques that you discussed were actually used in the current production or in the current products?

A. No, I did not do this confirmation. 02:57 I'm assuming that a lot of the -- topics that we discussed is part of the evolution of OLED manufacturing. [redacted]

So no, I did not do the verification but it's -- I'm pretty sure they are. 02:58

Q. So one major topic that you discussed in your report is the use of [redacted] correct?

A. Yes.

Q. And that's used in what people call 02:58





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[redacted]? 02:59

A. Yes.

Q. Okay. And that's independent of the organic layers used -- strike that.

[redacted]

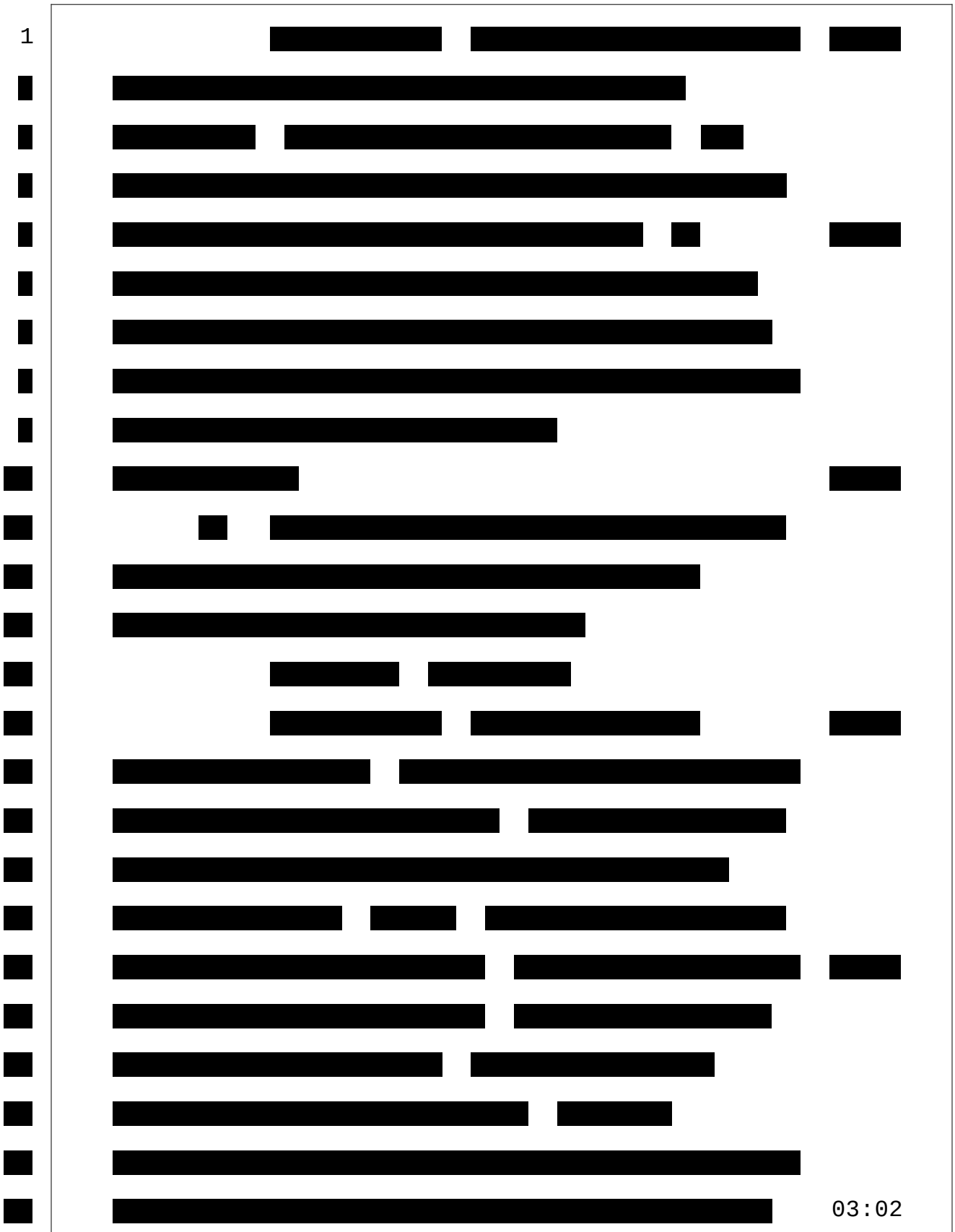
BY MS. ZHONG: 03:00

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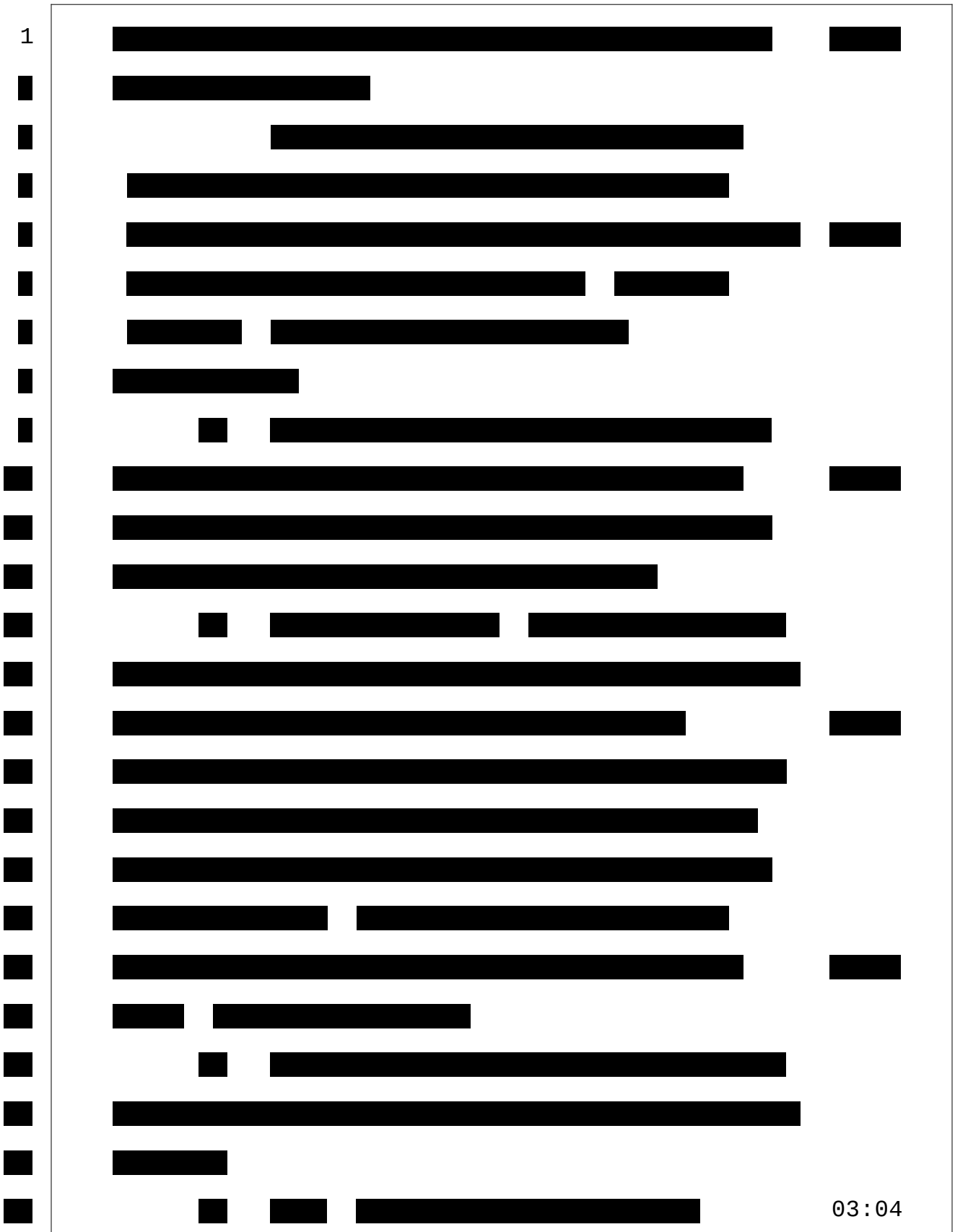


03:02





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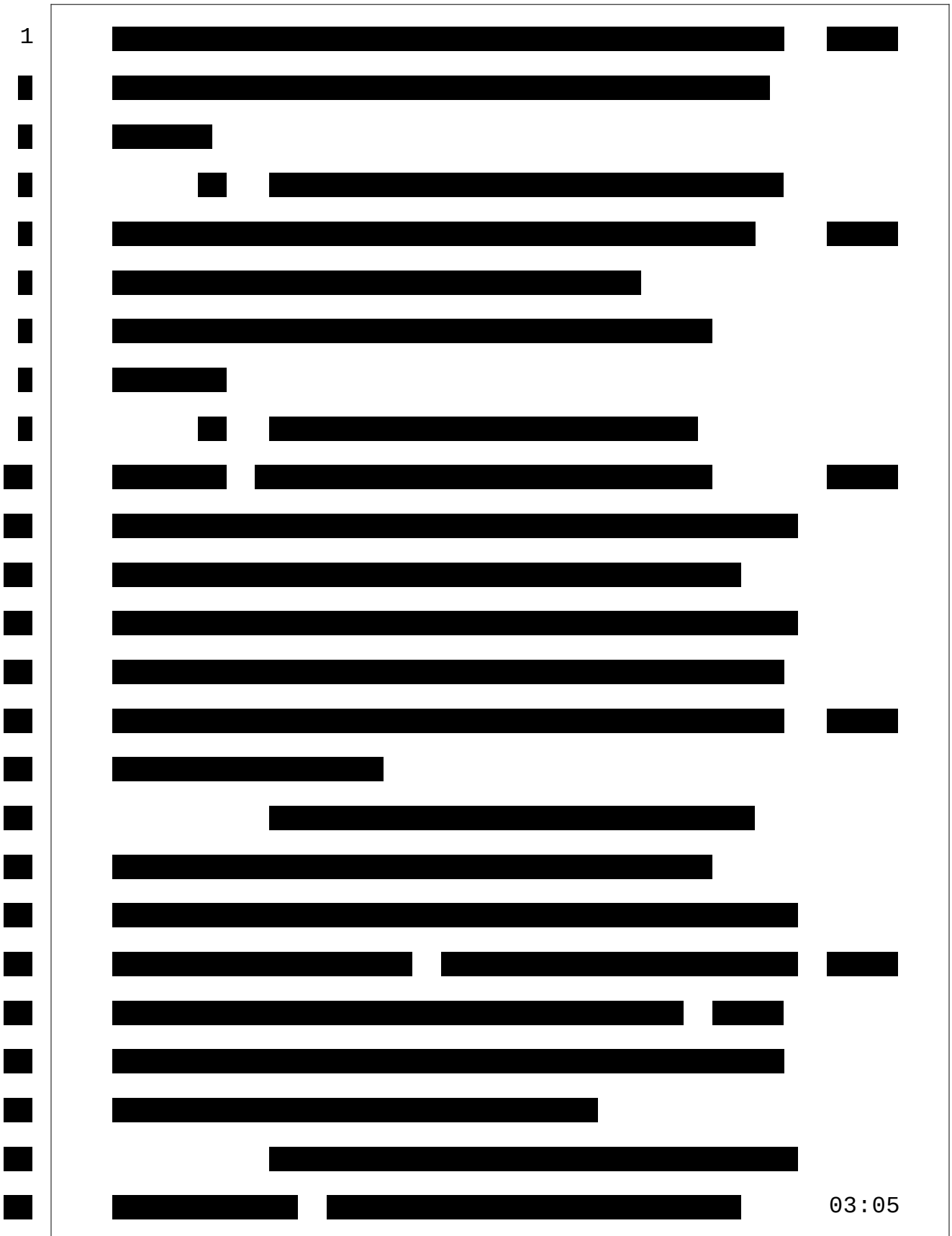


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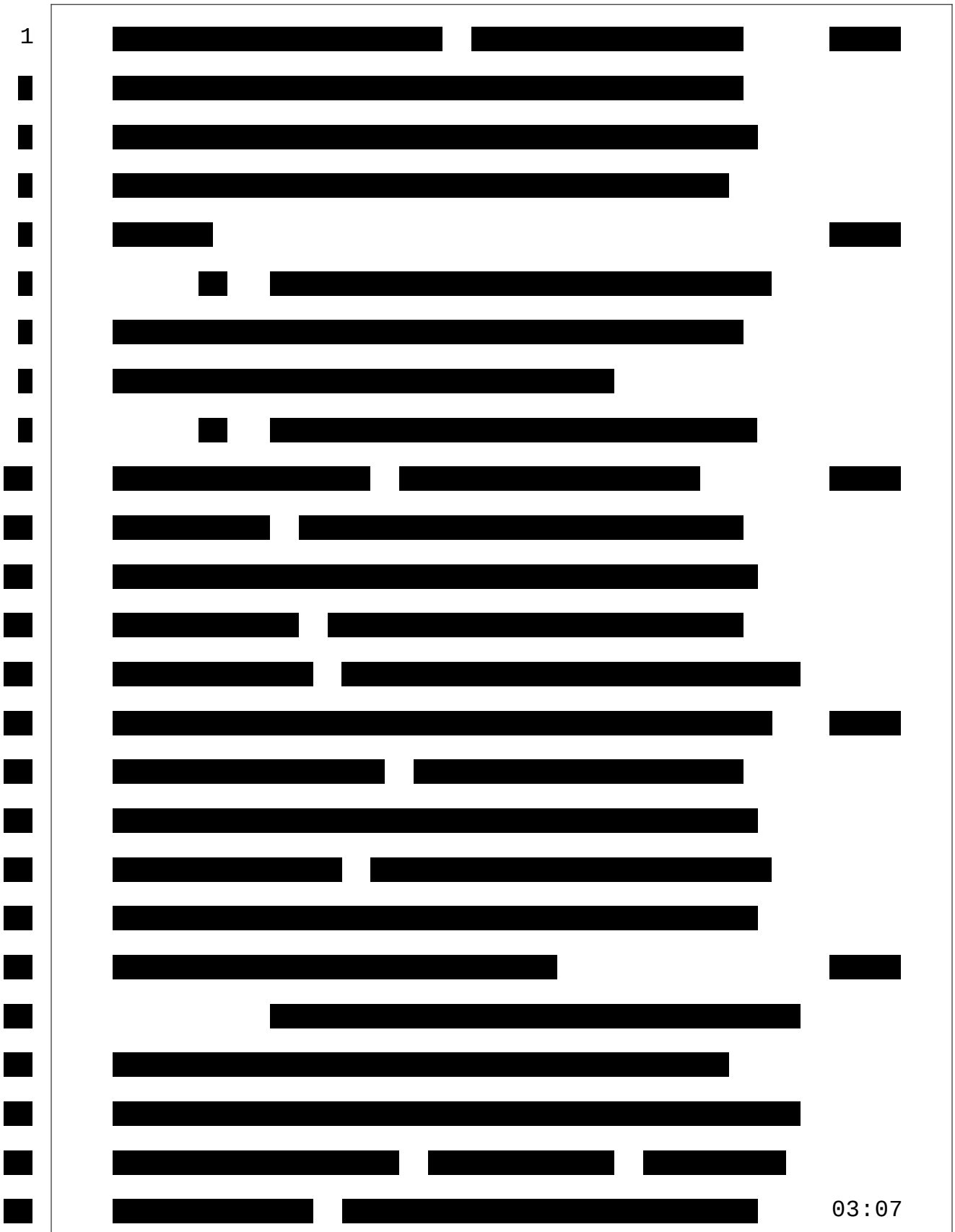


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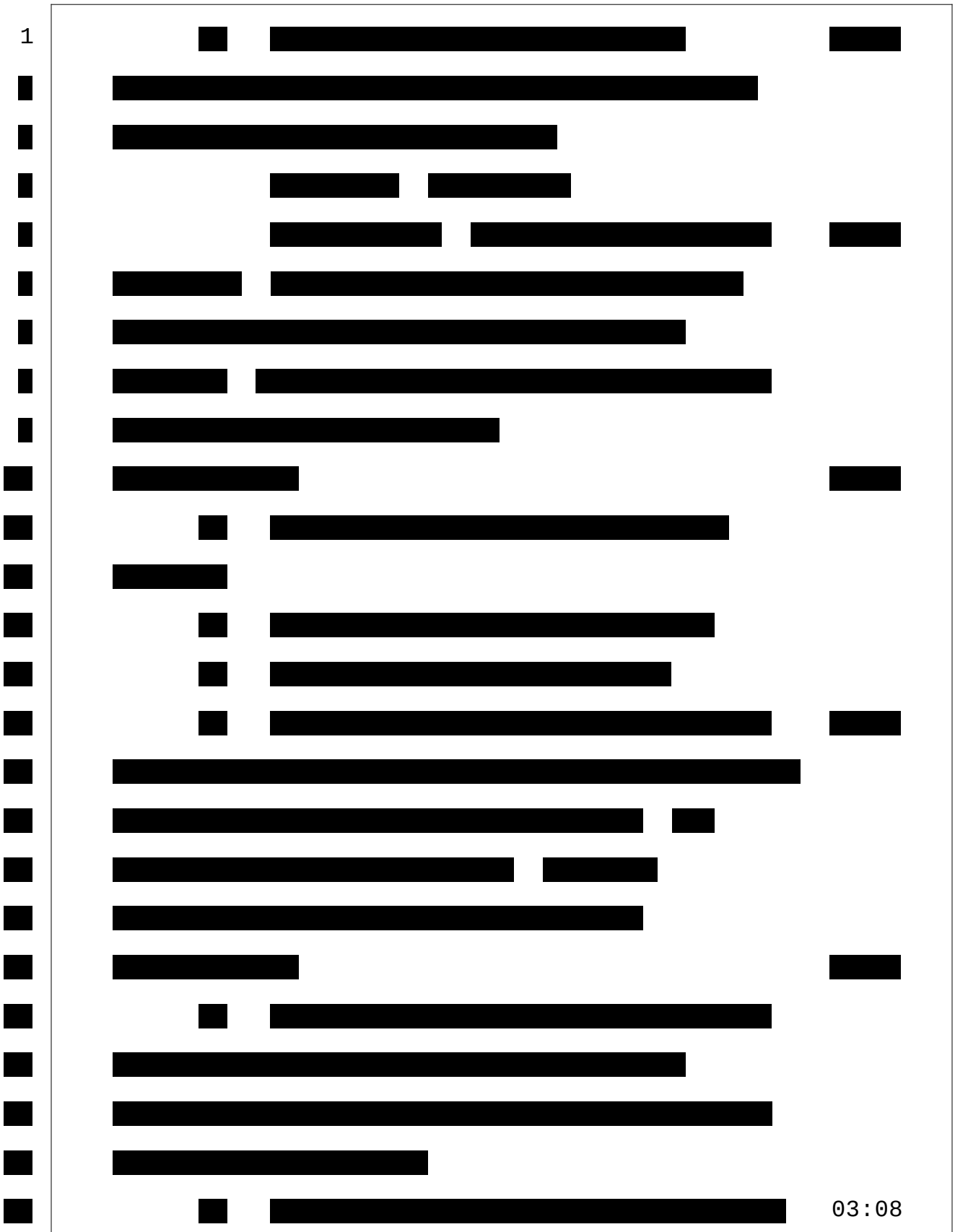


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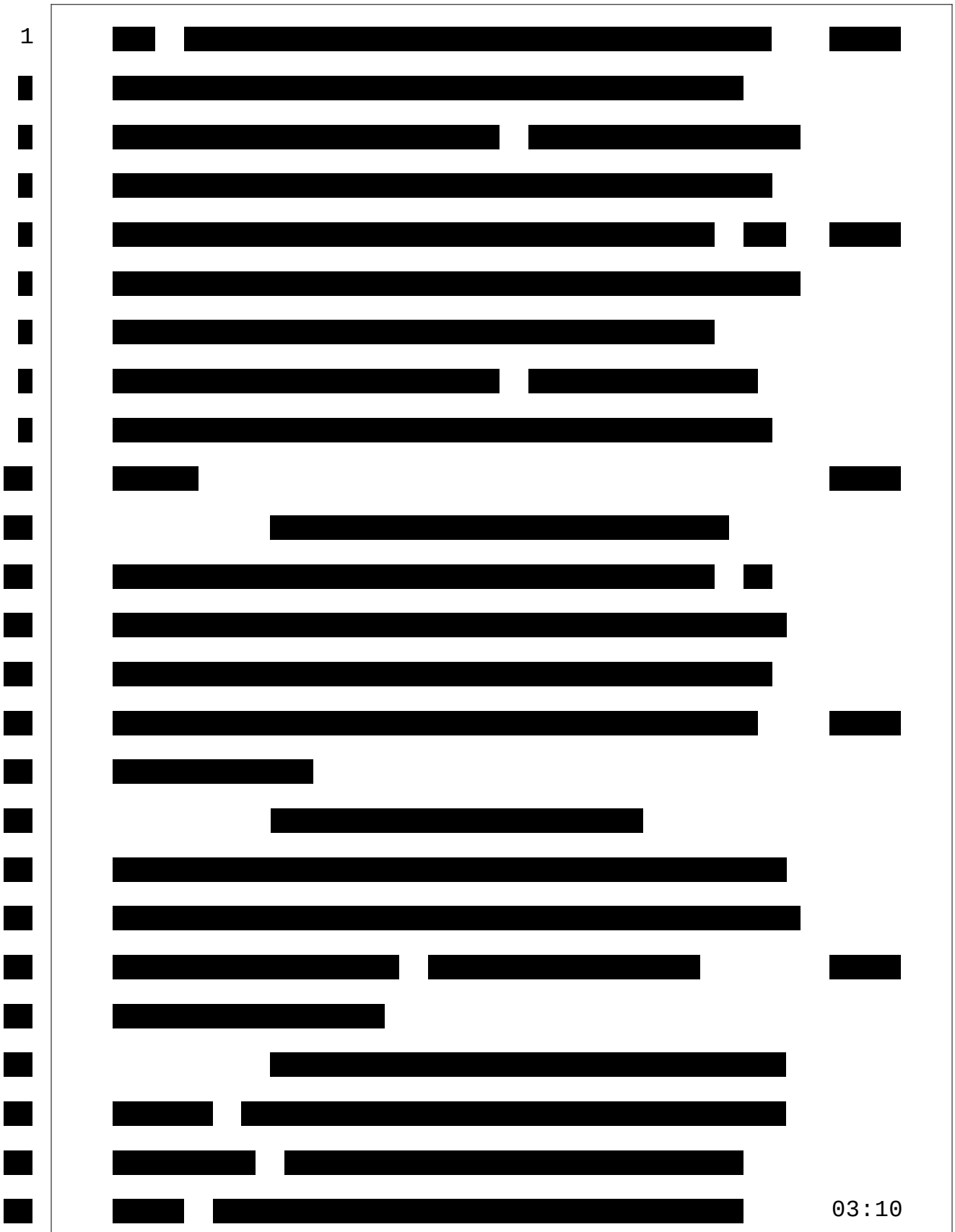


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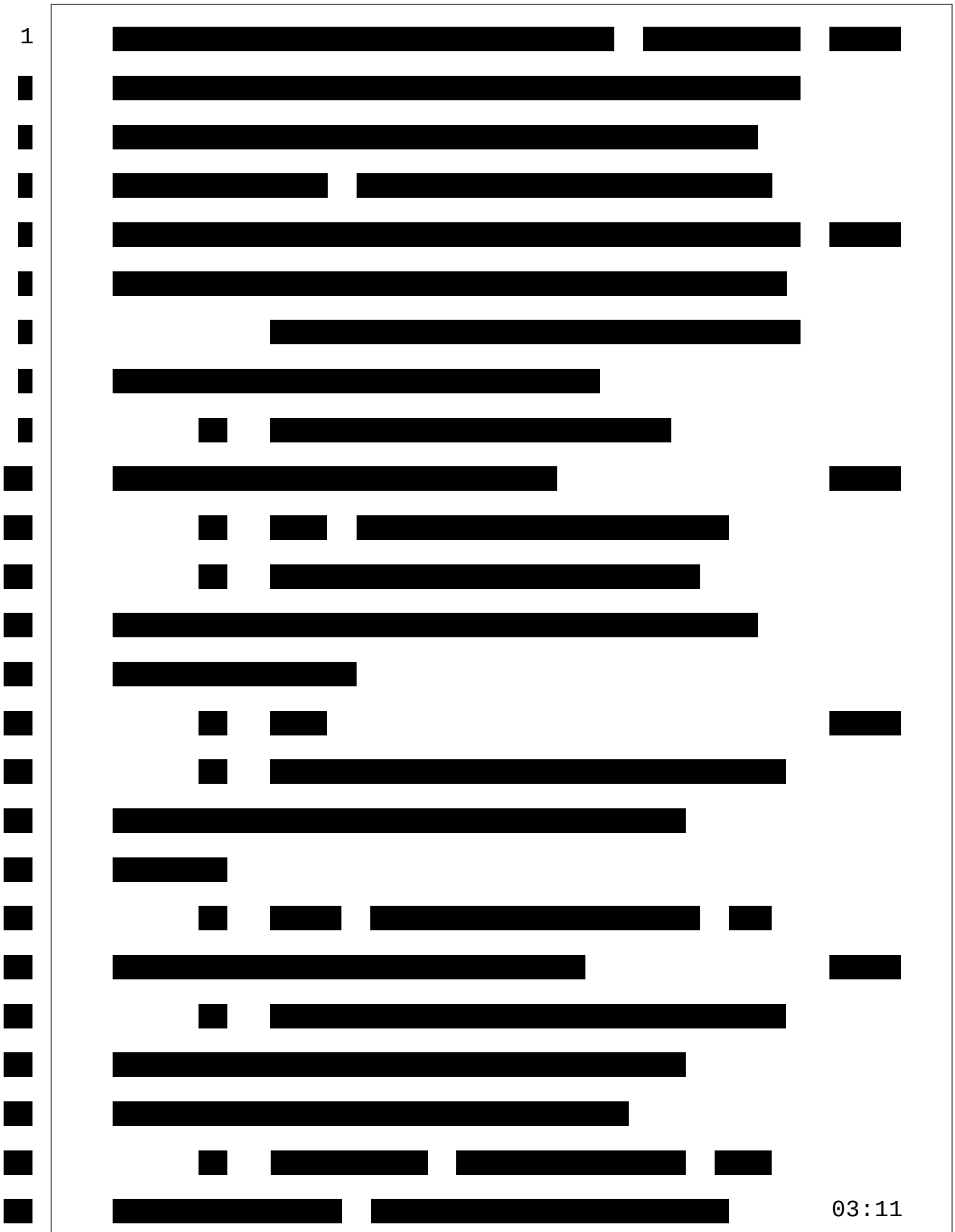


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[redacted]

03:12

Q. Do you know what is the reason that lithium quinolate is used in electron transport layers?

MR. YANG: Objection.

THE WITNESS: So this is the -- LIQ, the lithium quinolate, right? 03:12

BY MS. ZHONG:

Q. Correct.

A. Let me think a little bit about it.

The first time I saw it was used to 03:13





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facilitate, I believe, the electron injection from the cathode, but there are multiple ways to use it. You could use it as single layer. You can use it as a mix with another layer. You can use it in mixtures with metals. And I think, I'm not sure -- I think I have seen it also in mixtures with HTL, with hole-transfer layers, but I'm not sure. I vaguely remember that. It's a very strong electron donor or acceptor, rather, acceptor. 03:13

Q. And so have you seen lithium Q being mixed with electron transport materials to improve electron injection?

MR. YANG: Objection.

THE WITNESS: I don't remember very top of my brain right now, my thoughts. I think has been used together. I remember reading reports from Yamagata University, Dr. Kido. This is like in '99 or 2000 or something like that. 03:14

Novaled did a lot of this work early 2000s in Germany. Yeah, so I don't know exactly details if they use it in mixtures or as neat but these reports are out there. We can ask them. 03:14





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BY MS. ZHONG: 03:14

Q. Do you know what kind of -- strike that.

For the OLED stack, are most -- most of the layers amorphous or crystalline? 03:15

A. I don't know. I can only tell you a few things about some of the hole-transport layers are very glassy, amorphous. I know from my own experience in the '90s, the aluminum quinolate and I would imagine other metallic 03:15 quinolates, they tend to be polycrystalline. They tend to crystallize. So it depends on the material. They take also different forms.

Q. Would it be better to use a more crystalline form or a more amorphous form? 03:15

MR. YANG: Objection.

THE WITNESS: I think it depends, right? I mean, in some cases, glassy is better because it tends to act as a planarization layer. 03:16

In the case of light emission when you use them in low concentration, crystallinity doesn't matter because you have underneath layers. It depends on the material.

/ / /





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BY MS. ZHONG: 03:16

Q. For electron transport materials?

MR. YANG: Objection.

THE WITNESS: Again, the emission layers, and I don't have the latest information 03:16 in my head, these days the emission layers are very complex and they also use hole transport layers, so -- and they are used in mixtures with others, so -- I can imagine cases where you want it to be amorphous. So crystallinity tends to 03:16 bring the molecules very close to each other and the crystallinity can introduce quenching. So you want to be able to control the quenching by nearest neighbors.

But in some other cases you might 03:17 have performance where -- performs better when it is in crystalline. So I don't know. We need to -- yeah, I just don't have a lot of depth on this.

BY MS. ZHONG: 03:17

Q. Isn't the case that if you want to have higher electron conductivity in polymer, you tend to want to have the polymer to have some crystallinity?

MR. YANG: Objection. 03:17





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THE WITNESS: Yeah. That's a general rule, right. You cannot examine this thing in isolation. You don't want to create pinholes because crystallinity is introducing pinholes in the structures, and pinholes are introducing leaky paths. So that's why I answer it depends. So you may want to blend it with amorphous materials also to avoid the pinholes and the leaky paths perhaps of cathode materials into the emission layer. So I would -- yes. In theory, crystallinity is good for transport but it's not good for device fabrication. 03:17 03:17 03:18 03:18

BY MS. ZHONG:

Q. So you want to have -- macroscopically you want to have a more amorphous or glassy material but locally you may want to have a more crystalline path or material; is that right? 03:18

A. I don't know this -- the answer to this question. I was thinking more in terms of leaky -- electrically leaky paths. It's a complicated topic. And number one, I don't know the details. Number two, you need to define the boundaries, what materials we're talking about. Some crystallize, some don't. 03:18 03:18





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Q. I'm talking about electron transport materials. 03:18

A. Yeah. But if the electron transporting materials are polycrystalline. Polycrystalline means pinholes and pinholes means trouble, right. So I don't know how to answer this. 03:19

Q. Do you think the addition of a metal complex to the mixture would help with improving the electron transport or charge transport in general? 03:19

MR. YANG: Objection.

THE WITNESS: No. In one case it -- maybe narrow case, if the metal complex changes the effective work function to the cathodes, then it could improve the electron injection, but it could shorten -- this is very common. It could shorten a lifetime. It's very common. It happens all the time. 03:19

BY MS. ZHONG: 03:20

Q. Do you know why lithium Q was believed to improve the lifetime of the electron transport layer into which it's mixed?

MR. YANG: Objection.

THE WITNESS: Can you repeat? You 03:20





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said the lifetime of the electron transport layer or the lifetime of the device? 03:20

BY MS. ZHONG:

Q. The lifetime of the device. Sorry.

MR. YANG: Objection. 03:20

THE WITNESS: I don't know if this is general comment, I'm not so sure. What I could say, and that depends also what metals you use, what initial layer you use, it could help the electron injection in some cases because -- 03:20

BY MS. ZHONG:

Q. Go ahead.

A. One of the parameters there is that energetically where the energy levels are in the electron transport layer that come closer to the 03:20 cathode, so you can inject more electrons.

BY MS. ZHONG:

Q. Why does the fact that more efficient electron injection helps with lifetime improvement? 03:21

MR. YANG: Objection.

THE WITNESS: Not always. There are cases where you introduce these dopants and you lose the lifetime in seconds.

In the theoretical situation, you 03:21





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can -- in one case, let's say, you may lose the lifetime because you're introducing other parameters, but I can see a situation where you get more electrons out so you use lower voltages maybe. 03:21

BY MS. ZHONG:

Q. Can you please refresh your exhibit share and see whether you see an Exhibit Number 8.

A. Refresh. 03:21

(Exhibit Number 8 was marked.)

THE WITNESS: Yep. Well, that's interesting, very interesting. It brings memories of all these people.

BY MS. ZHONG: 03:22

Q. Do you see your own signature in that document?

A. Just a moment. Is there a signature? Where is my signature?

Q. So just for this record, Exhibit 8 is a '389 invention disclosures. And it is submitted as Exhibit 2006 in IPR number 2024/01222. As to your signature, if you go to page, PDF page 18. 03:22

A. You know, this is -- 03:22





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Q. Actually, PDF page 14, I think, is when it first appeared. 03:22

MR. YANG: Feel free to look at this document if you need to familiarize yourself with it. 03:23

THE WITNESS: Where did you guys find this? Jesus. Oh, yeah.

BY MS. ZHONG:

Q. So are you at page 14 right now?

A. I'm at page -- I'm just admiring what I see. It brings memories from this -- those days. 03:23

Yes. Page 14 invention disclosure, yes.

Q. Yes. And do you see that under item number 11, witnessed and understood by signature, is that your signature? 03:23

A. That's my signature.

Q. And if you go to PDF page number 16. And on top of page 16, which says page 2 of 9, the name is Homer Anton, correct? 03:23

A. Well, something is blurred there.

Q. Yeah. Looks like the middle of your name got cut off or something.

A. Yeah. That's me. That's me. 03:24





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Q. And then the date is October 1st, 2001? 03:24

A. Yep.

Q. And, also, slightly in the middle of that page, there are two signatures. And one of them is yours, correct? 03:24

A. Yes.

Q. The one above October 1, 2001. That's your signature, is that correct?

A. Page again. 03:24

Q. Same page, page 16, PDF page 16.

A. Yep.

Q. And above that, is that Karl Pichler's signature?

A. That's Karl's writing. I don't know if it's his signature, but I remember his writing. 03:24

Q. Why don't we go back to page 14.

A. Where the writeup is, yep.

Q. The writeup is -- in item number 6. 03:25

A. Yes.

Q. It says:

"Where is the invention described?"

And it said:

"Karl Pichler laboratory book 03:25





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number 7, pages 7 and 9." 03:25

Correct?

A. That's right.

Q. And did you review those page numbers when you signed the invention disclosure? 03:25

MR. YANG: Objection.

THE WITNESS: I don't remember. This is many years ago. I remember I was remotely involved. They were looking for witnesses, and I had to witness this. I don't remember if I 03:25 reviewed the lab book or not, but typically, when you're witnessing something, you're witnessing either the review that they presented in some kind of a document or the laboratory, a book or both. You're just witnessing it, right? 03:26

BY MS. ZHONG:

Q. Can you please go to PDF page number 25.

A. Yep. That's the document, I guess, we generated. 03:26

Q. Does this look like something coming from out of a notebook page?

MR. YANG: Objection.

THE WITNESS: I don't know if it's a notebook. 03:26





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BY MS. ZHONG: 03:26

Q. Okay.

A. I don't know 100 percent.

MR. YANG: Objection.

THE WITNESS: Yeah. 03:26

BY MS. ZHONG:

Q. So on top of it, it looks like upside down, it says -- seems to be saying, Osram 007-1007.

A. This is back to 14, right. 03:27

Q. No. Page 25.

A. Page 25.

Q. PDF page 25.

A. Yeah. So what we see on page 25 is the printout of the design of a passive matrix 03:27 display.

Q. Okay. And does that look like it's from Osram notebook page 7, notebook 007-1007?

MR. YANG: Objection.

THE WITNESS: I don't remember that. 03:27

BY MS. ZHONG:

Q. And is that your signature on the lower left-hand side?

A. Yes, that's my signature.

Q. And next to that, does that look like 03:27





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Karl -- Dr. Pichler's yeah? 03:27

A. Page 8 of 9.

MR. YANG: Objection. I would say that these are -- I'm not 100 percent sure, but that's Charlie's writeup. 03:28

BY MS. ZHONG:

Q. And do you -- if you scroll to the top of the page, there seems to be, like, a kind of line drawn out and some writing on the top. Is that also Dr. Pichler's writing or someone else's writing? 03:28

MR. YANG: Objection.

THE WITNESS: This is Bates 25?

BY MS. ZHONG:

Q. Yeah. 03:28

A. I don't know.

MR. YANG: Objection.

THE WITNESS: I don't know.

BY MS. ZHONG:

Q. Does that look like Karl's writing or -- 03:28

MR. YANG: Objection.

THE WITNESS: I don't know if it's Kyle's or Charlie's. I don't know.

/ / /





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BY MS. ZHONG: 03:28

Q. So when I said -- I didn't say Kyle. I said Dr. Pichler's.

A. Sorry. Kyle Frischknecht and Karl Pichler. 03:29

Q. Okay. So you are not sure whether Dr. Pichler or Dr. Frischknecht wrote the notes on the top, right?

A. To tell you the truth, I don't remember very well this event, but Pichler seems 03:29 to be signing this, but I don't remember very well.

Q. And can you scroll down to the next page?

A. Page number. 03:29

Q. 26?

A. The handwritten page. Yeah.

Q. Yes. The handwritten page before two figures, Figures 2 and 3, correct?

A. Yes. 03:30

Q. And you also signed this page on the lower right-hand corner, correct?

A. Yes. That's my signature.

Q. And Dr. Pichler signed the page in the middle? 03:30





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MR. YANG: Objection. 03:30

BY MS. ZHONG:

Q. Like above 30 September '01, page P 9 of 9?

A. P 9 of 9, I don't know. 03:30

Q. Does that look like his signature?

A. Don't know. But those don't look like lab book. These are -- lab books have straight lines and boxes and stuff. Maybe this is -- I don't remember this. Maybe this is 03:30 standalone piece of paper.

Q. Did these look like Dr. Pichler's handwriting?

MR. YANG: Objection.

THE WITNESS: You can never be 03:31 100 percent. I know the signature's mine. I haven't seen my signature, amazing, after all these years.

BY MS. ZHONG:

Q. Do you know whose handwriting the 03:31 rest of the pages belong to?

MR. YANG: Objection.

THE WITNESS: Can I scan everything? I mean, it's --

/ / /





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BY MS. ZHONG: 03:31

Q. Sure. Go ahead.

A. Again, those are all my signatures.

Q. Your signatures on many pages.

A. Yeah. I see. That's what I'm scanning to see. I see that there is a notebook further down. 03:31

Q. Where is the notebook?

A. All the way down, page 41. So the notebook pages are 40 and 41? 03:32

MR. YANG: Objection.

THE WITNESS: Well, it -- page 40 and 41 appear to be out of a notebook.

BY MS. ZHONG:

Q. Okay. 03:32

A. But there are signatures there, I don't know. There's another signature there.

Q. So page 40 is the one starting with idea 14th August '01?

MR. YANG: Objection. What are you pointing at here? I couldn't read this thing. What are you looking at? 03:32

THE WITNESS: Page 40. I don't know.

BY MS. ZHONG:

Q. PDF page 40. It's a grid notebook 03:32





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page. 03:32

Does this appear to be Dr. Pichler's handwriting?

MR. YANG: Objection.

THE WITNESS: This is all written in a hurry. If you is show me Kyle's, I will be able maybe to tell the difference. But page -- on page -- what's that, page 14? 03:33

MR. YANG: You don't have to speculate. 03:33

THE WITNESS: No. I just see a name there.

So you have a question about this?

BY MS. ZHONG:

Q. Yeah. Do you know whose handwriting this belongs to? 03:33

MR. YANG: Objection.

THE WITNESS: I mean, I see my signature and I see a couple of other signatures. 03:34

BY MS. ZHONG:

Q. When you say a couple of other signatures, whose signature?

A. The notebook there is another signature. 03:34





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Q. So I see there is K. Pichler. 03:34
A. Page 41. I don't know who signed this. I don't know this guy.
Q. And you think that there is another signature? 03:34
A. I think there is another signature on page 25. Sorry, sorry, not 25, 41.
Q. Okay. So there is one signature that's dated October 1, 2001. That's yours on those pages; is that right? 03:34
A. Yeah. I -- this notebook pages, I -- I mean, I don't remember any of this, but this is my signature, but, you know, it's been years ago. 24 years ago.
Q. So is it your signature on pages 40 and 41? 03:35
A. 40 and 41? 40 I don't see my signature.
Q. So there is a date of 1/10/01 and next to that is your signature somewhere? 03:35
A. No. Someone else's signature.
Q. Okay.
A. On the left-hand side. I don't know whose signature is that.
Q. And you don't know whose signature is 03:35





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it on the right-hand side? 03:35

A. On the right-hand side, no. Page 40 and page 41. Yeah, I cannot tell.

Q. So let's go back to page 14. The signature there is yours on page 14, under item 11? That's yours? 03:36

A. 14. Yep. Just a second. It's been going back and forth. 14, yes that's my signature.

Q. And page 16, the signature above October 1, 2001, that's also yours? 03:36

A. Yes.

Q. And page 18, the signature above October 1, 2001 is also yours?

A. Yes. 03:36

Q. Then page 19, the signature above October 1st, 2001 is also yours?

A. Yes.

Q. Same for page 20, pages 20, 21, 22, and 23, the signatures above October 1, 2001 are all yours? 03:37

A. Yes.

Q. No?

A. Yep. Yep. Page 20 and 21, this is my signature October 1st, 20 and 21. 03:37





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Q. What about 22 and 23? 03:37
A. Yep. 22 and 23, yes.
Q. Those are your signatures as well. Then page 25, that's your signature as well on the lower left-hand corner, right? 03:37
A. Yes.
Q. And --
A. Page 25, yes.
Q. And page 26, the signature above October 1 two thousand -- above 10/1/01 is also 03:37 yours?
A. Yes.
Q. And then page 27, the signature on the left-hand side is yours?
A. Yes. 03:38
Q. 28, the signature above 10/1/01 is yours?
A. Mm-hmm.
Q. Page 30, the signature above 10/1/01 is yours? 03:38
A. 30, yes.
Q. Let's go to 32, the signature above 10/1/01 is yours?
A. Yes. 32. Yep.
Q. The same for 34. 03:38





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A. Yep. 03:38
Q. And there is also a signature of yours on page 36, on the lower left-hand corner?
A. Yes.
Q. And 38, lower right-hand corner -- 03:39
A. Don't remember putting all these signatures here. It's interesting. But they definitely look like mine.
Q. Okay. Then 40 and 41 are two notebook pages but you don't think you signed 03:39 those?
A. No. These signatures are not mine.
Q. Do you have any idea whose signature this might be?
A. I don't know. 03:39
Q. Then take a look at pages 42, 44 -- 44, 45, 46, 47, 48, 49, 50, and 51, there you have signed all these pages, correct?
A. Yep.
Q. Can you go to page 23? 03:40
A. Yep.
Q. Do you see that there are different notes entered here?
A. Yes. A variety of different notes.
Q. Okay. Do you know who wrote those 03:41





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notes? 03:41

MR. YANG: Objection.

THE WITNESS: I don't know. SFE Technologies filed. Patent. I don't know what that means. 03:41

I don't know. A lot of scattered notes there. In one square it says "OLED also device structural claims and all that."

BY MS. ZHONG:

Q. There's a note from Kyle? 03:41

MR. YANG: Objection.

THE WITNESS: I don't know. I don't know. Yeah.

BY MS. ZHONG:

Q. Do you have a recollection of what happened to the invention disclosure after it was submitted? 03:42

MR. YANG: Objection.

THE WITNESS: Well, I'm not -- I mean, basically after you're witnessing you lose track of the invention, right? So if you're a witness, you're witnessing all this that you saw, basically you sit down together with the inventor. The inventor explains, okay, this is what we do here, this is what we do here, and 03:42 03:42





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this is what we do here. 03:42

And then you say, okay, I understood. You sign. You show understanding of what they're claiming. And then it's off. I don't know. After that, it moves into the filing 03:42 procedure. That's all I can say.

BY MS. ZHONG:

Q. And do you recall whether you were the one who approved the filing of the invention? 03:43

A. I don't remember this thing, actually, tell you the truth. And probably it was other people superior to me. I don't know. I don't remember going through the patent procedure here. This is just witnessing and -- 03:43 understanding, witnessing and then it went off me. Which is different than the invention disclosure approval. I don't remember this -- the invention disclosure approval process.

Q. So you don't remember the invention 03:43 disclosure approval process for this particular one?

A. No.

Q. But the general process was there are regularly scheduled meetings where the 03:44





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management and the two patent attorneys evaluate -- 03:44

A. Yes.

Q. -- the various invention disclosures?

A. Usually. Usually. Often we will do that, and then what you see here, and then it will go into the leadership team, and they will decide to accelerate it. In other words, moving into the patent filing right away. 03:44

Q. And do you have a sense of whether this one was accelerated or was put on a regular track? 03:44

A. I don't know. I just don't remember doing a detail invention disclosure approval process for this. I mean, Karl -- Karl presented -- I mean, we even have some common patents. There was a lot of traffic at that time. There's a lot of filings. Each one of us had filed 10, 15 invention disclosures that then moved to patent filings. It's hard to remember all this. 03:44 03:45

Q. When you say like each of you filed 10 to 15 invention disclosures, you mean like per year, per month --

A. No. Over the course of five, 03:45





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six years for me. 03:45

Q. Do you know how many invention disclosures Kyle filed within his two years' tenure at Osram?

MR. YANG: Objection. 03:45

THE WITNESS: I don't remember very well. I have one joint patent with him or two.

BY MS. ZHONG:

Q. Can you please take a look at page 14, item number 7. 03:45

A. Yes. Give me some time to read.

Q. Sure.

A. I read it.

Q. Do you see that in item number 7, Dr. Pichler said that he had been carrying 03:47 around part of the invention for a long time, greater than one year and the first written description was in an internal email dated February 8th, 2001 to Dr. Frischknecht?

A. Yeah. I read that. 03:47

Q. Why don't you go back to PDF page 1 and read to yourself the email exchange between Dr. Karl Pichler and Dr. Kyle Frischknecht?

A. This is February 8th. I see. This is -- 03:48





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Q. This is the email referenced in the invention disclosure, correct? 03:48

MR. YANG: Hold on a second. Objection. Calls for speculation.

THE WITNESS: I'm just reading the email. I don't know what it is. I need to read it. Page 1, right? 03:48

BY MS. ZHONG:

Q. Correct.

A. Let me read it. I don't know where it is. 03:48

Q. Let me know when you're done reviewing it.

A. Yeah. I'm just intentionally slow to make sure that I read it. 03:50

Q. That's fine. Take your time.

A. Yeah. I mean, every laboratory those days were thinking about thin film encapsulation and that's some ideas about thin film encapsulation. Everybody was working on thin film encapsulation at that time. 03:50

Just the first part of it, right, or also everything?

Q. Why don't you read everything.

A. Yeah. 03:52





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Q. So the subject matter of the email exchange concerns the thin film encapsulation structure. 03:52

A. I read the one that you're -- yeah. Okay. Charlie is that type of person. I haven't seen the very first page. That's the first time I think I see it. 03:52

Q. When you say Charlie is that type of person --

A. Dr. Pichler. 03:53

Q. When you say Dr. Pichler is that type of person, what exactly do you mean?

A. Like he's thorough.

Q. And let's start from the bottom since that's the chronological order. So at the bottom of the email Dr. Pichler mentioned some of his work at FED bracket eMagin? 03:53

A. eMagin, yeah.

Q. Do you see that?

A. Yeah. 03:53

Q. And he mentioned in addition to PML, he mentioned an LML structure.

Do you see that?

A. Yes. I don't know what that thing is. 03:53





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Q. And he says:
"And stressed that LML, comma, i.e., spinning in inert conditions a carefully outgassed cross-linkable solution onto the 8 inch wafers with subsequent cross linking and barrier layer sputtering."
Do you see that description of the process?
A. Yes. To be perfectly feasible.
Q. So spinning refers to spin coating in this context, correct?
MR. YANG: Objection. Calls for speculation.
THE WITNESS: Let me just read it once more. And subsequent cross-linking. In some cases spinning refers to spin coating.
BY MS. ZHONG:
Q. Is spin coating --
A. Spinning the wafer I think it means here.
Q. When they talk about spinning the wafer, it's probably talking about spin coating the wafer; is that correct?
A. Maybe. I don't know.
Q. And if you look at the response from





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Dr. Frischknecht to Dr. Pichler, he said: 03:54

"I have also previously considered spin coating the acrylate layer."

Do you see that?

A. Yes. 03:55

Q. So does that indicate to you that when Dr. Pichler was talking about spinning, he's referring to spin coating?

MR. YANG: Objection.

THE WITNESS: I don't know 03:55 100 percent. Maybe.

BY MS. ZHONG:

Q. It's a reasonable interpretation, correct?

MR. YANG: Objection. 03:55

THE WITNESS: I don't know.

BY MS. ZHONG:

Q. Is spin coating a selective deposition technique or it's a blanket deposition technique? 03:55

MR. YANG: Objection.

THE WITNESS: It depends what you have under the spin coating process. It can turn out to be something selective if you lift off the materials underneath. 03:55





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BY MS. ZHONG: 03:55

Q. When you --

A. It's reducing an extra step. So if you have something spin coatable that is intractable on top of an area that is soluble, 03:56 you can dissolve it and it will give you the area that is intractable.

BY MS. ZHONG:

Q. But when you first spin coat it, it's coated everywhere, it's not -- the material is 03:56 not deposited only at selected areas; is that correct?

A. When you spin it, yes, it will coat the whole wafer.

Q. So when you're spin coating a wafer, 03:56 it is -- that process of applying the solution or whatever the material, that particular step is nonselective or a blanket deposition step?

MR. YANG: Objection.

THE WITNESS: In a bare wafer when 03:56 you take -- when you add a material in the case of bare wafer, that you drop in, let's say, a photoresistor, any material that is curable, it will coat the entire wafer upon spinning.

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BY MS. ZHONG: 03:57

Q. So, for example, it will coat the electrical pins that's on the wafer.

A. Sorry, come again?

Q. Electrical pins. 03:57

A. It will coat the -- it will coat -- if you spin a droplet of material, it will coat -- in most cases, the majority of the surface.

Q. And it will cover, for example, 03:57 electrical contacts scribe lines, if there are scribe lines on the wafers, correct?

MR. YANG: Objection.

THE WITNESS: It will coat any material that is underneath. Not 100 percent, 03:57 but it could coat material that's underneath.

BY MS. ZHONG:

Q. So the spin coating, there isn't really a way for you to coat only targeted areas? 03:58

MR. YANG: Objection.

THE WITNESS: It will be hard to do that. You have to put partitions and the like and barriers, modes.

/ / /





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BY MS. ZHONG: 03:58

Q. That's usually not how people do spin coating?

MR. YANG: Objection.

THE WITNESS: If you don't use the obstacles, it will coat the area. Not necessarily uniformly but it will coat it. 03:58

BY MS. ZHONG:

Q. Now, Dr. Frischknecht mentioned that:

"It very well may be that a vapor deposition or a shadow mask is the easiest method for producing an array of small displays on a large plate of glass." 03:59

Do you see that?

MR. YANG: Which line is this? 03:59

MS. ZHONG: In the second email in the chain.

MR. YANG: Which line?

MS. ZHONG: Starting with -- I think the sixth line, starting with "although." 03:59

THE WITNESS: Although.

Yeah, I read that sentence.

BY MS. ZHONG:

Q. And why don't you read that whole paragraph to yourself, again, just to get 03:59





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context.

A. Yeah.

Q. So here Dr. Frischknecht is proposing ways to deposit an acrylate layer in this -- in selected areas to keep the electrical pins free of the coating; is that correct? 04:00

MR. YANG: Objection.

THE WITNESS: He's also proposing ways to mask the areas that require uncovering. Like you could put tape. You can put things like that. Yeah. Considering everything here, that's what I see. 04:00

BY MS. ZHONG:

Q. So one of the ways to keep the electrical pins free of the coating is to use shadow mask? 04:01

A. That's what he's describing here.

Q. Yeah. Another way he proposed is inkjet printing?

A. Yeah. This is -- these are techniques that also are used for OLED deposition to, you know, avoid subtractive steps like the masking step or the etching step. 04:01

Q. But in the context here it's specifically talking about the PML structures, 04:01





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correct? 04:01

A. Mm-hmm. Yep. Yeah. The polymer multilayer, yeah.

Q. Okay. And then, Doctor -- in the topmost email chain, Dr. Pichler suggested that 04:01 after you form the -- selectively deposited the organic layer, you can deposit a dielectric barrier layer through a mask over the OLED area only, correct?

MR. YANG: Objection. 04:02

THE WITNESS: Let's read it again.

BY MS. ZHONG:

Q. The topmost one.

A. Yeah. I'm looking. Which line are you looking to this? I read it. 04:02

Q. The second sentence.

A. Yep.

Q. So what he wanted to do is basically to deposit the barrier layer also in the selective area to keep the contact pads, scribe 04:03 lines, et cetera free from the barrier layer?

MR. YANG: Hold on a second. Hold on. Objection.

You can go ahead and answer.

THE WITNESS: So let me just read it 04:03





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carefully. It says: "Spin-, roll- or whatever-coat... through a mask of the OLED area." 04:03

I don't understand some of the -- "stick the whole thing in." Oh, I see. Got it. 04:03

BY MS. ZHONG:

Q. So basically he's suggesting a selective deposition of the dielectric barrier layers through a mask, correct? 04:04

MR. YANG: Objection.

THE WITNESS: He's suggesting a masking that I see followed by a plasma asher and ash-off the organics.

BY MS. ZHONG: 04:04

Q. And the masking -- so the mask is basically to make sure that the barrier layers is going to be deposited in the openings of the mask?

A. Can you repeat again, please. 04:04

Q. What's the reason for use a mask -- for using a mask?

A. So the idea here is to free up the metallic regions so you can access them electrically, right? So I think the thing here 04:04





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is -- the Osram team is proposing a process of how to reduce the processing steps on the thin film encapsulation device. Right. 04:04

Q. So the idea is trying to deposit the barrier layer and the organic layer only where they are needed to keep the contact pad, the scribe lines free of materials; is that correct? 04:05

MR. YANG: Objection.

THE WITNESS: So to operate the device you need to have an easy access to the metal leads. 04:05

BY MS. ZHONG:

Q. Uh-hmm.

A. These metal leads cannot have an organic compound on them or an inorganic compound on them. 04:05

So cleaning up this areas requires extra processing steps or requires tapes and the like, if you do spin coating then you have to peel off the tape, right? So based on my recollection, the motivation there is to take the PML process from -- at that time, you know, John Affinito who works -- who used to work for Battelle. I don't know if he joined Vitex or not, but that's how the whole thing started. 04:05 04:06





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Everybody was talking to Battelle at the time. So the question is how do you protect the metal areas. 04:06

So based on my assessment here, by reading this, and what I remember, is how do you reduce the processing steps of the thin film encapsulation, the technology basically that came, it was public at that time, through the John Affinito work at Battelle and through the Vitex. 04:06

So -- and what both Karl and Kyle are describing here is methods to reduce the processing steps for a thin film encapsulation. That's a way of protecting -- not protecting but freeing up the metal lines. That was the motivation. These guys were experts in thin film encapsulation. 04:07

Sorry. I'm thinking, because I'm calling him, Charlie. Pichler came from eMagin. eMagin was working already on thin film encapsulation. So they were talking to Affinito because Affinito was talking to everybody. 04:07

So Karl Pichler, he knew what it takes to make this thin film encapsulation device. I think the new thing which, you know, 04:08





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I mean, you want to access the metals. You need to protect the metals from organics. So either you have to mask it or you have to not print it, right? So that's the -- the concept here behind this, I would say, documentation that I witnessed. 04:08 04:08

Q. Okay. And do you know how much savings in processing costs or throughput time this selective deposition technique would save versus the old technique of blanket coating then kind of a remove the materials from the metal? 04:08

A. I don't know.

MR. YANG: Hold on. Objection.

THE WITNESS: It's extra processing steps. I don't know what it will cost. This process of cleaning up the metals has been described also by eMagin and FED. Used to be called FED. So these guys were pursuing this. 04:08

And anyway, the, as you call it, selective technology, it's standard in the semiconductor industry for a single layer. Let's say an inorganic barrier, it's a standard best-known method for encapsulating semiconductors. 04:09

And I remember seeing patents from 04:09





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Motorola that use thin film encapsulation, not necessarily the PML way 'a la Vitex, but the idea of using oxides or nitrides or things of that sort for protecting the semiconductors, it was known all along. And keeping the pads uncoated from nitride, you know. I mean, of course, you want to keep the metal uncovered because you -- yes, you can cover it, but then you have to introduce another step. 04:09 04:10

So the -- I think the new thing here is the fact that you avoid coating the metal areas with masking or with printing technologies, right. 04:10

BY MS. ZHONG:

Q. And in the Motorola one, did they have an organic layer? 04:10

A. Sorry, come again?

Q. You mentioned the Motorola one, you mentioned the Motorola coating technology which I assume was not for OLED, but... 04:10

A. No. It was OLED. '95, actually, because Motorola was working on this for a long time. It's one of the very first patents of thin film encapsulation.

Now, organic, I don't remember if 04:11





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they have an organic layer, but if you take, let's say, the Motorola patent and the Battelle patent from John Affinito and Battelle and the eMagin patent, this is all prior art, right? 04:11

But -- and then the Affinito technology became Vitex. Everybody was active discussing these things at that time. The question is how do we take this thing into a practical manufacturable process. 04:11

So cleaning up the pads and the metal lines, it's -- it's key to this technology, right? You don't want to have the metal with -- with organics or with inorganics. This is not all that specific. This is true for every chip that is built on a wafer that's a DRAM or CMOS sensors. They leave always the pads uncovered and they do this thing with an additional etching step or masking step, right. Photolithography masking. 04:11

So I think that this technology here that Pichler and Frischknecht are describing, it's similar to that but more specific to OLEDs. 04:12

Q. But their idea is trying to avoid having to do a liftoff or etching process to open up the metal lines, correct? 04:12





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MR. YANG: Hold on. Objection. 04:12

THE WITNESS: Both Pichler and Frischknecht were very familiar of the PML process, right. I probably forgot that Pichler also is describing that eMagin also was working 04:12 on it, right? So it's their effort to innovate in this crowded space by approaching it with the cleaning of the metal lines.

BY MS. ZHONG:

Q. They're trying to avoid having to 04:13 clean metal lines, correct?

A. I think there's one page there where this thing's described. The one that had the pixelated display. Yeah, page 25. You can see on the right-hand side there are tons of 04:13 horizontal lines. So these are metallic lines.

Q. Okay.

A. You want to keep them metallic. So they're describing way of avoiding the PML to coat the entire thing. 04:14

Q. So they are trying to find a way when you deposit the organic and inorganic material, those materials will avoid the metallic regions; is that correct?

MR. YANG: Objection. 04:14





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THE WITNESS: Well, I mean. 04:14

MR. YANG: Hold on. Objection.

THE WITNESS: The way I understand it, by reading this, is that they're focusing primarily on how to keep the metal lines free of 04:14 the inorganic and the organics.

BY MS. ZHONG:

Q. During that --

A. Sorry.

Q. And to avoid the metal lines free of 04:14 the organics and inorganics during deposition?

MR. YANG: Objection.

THE WITNESS: Well, they're also talking about masking, right? So with other words, if you UV cure the organic layer and 04:14 you're on top of the metal, it would be difficult to clean it, so you have to mask it. So they're discussing multiple things here, right?

For example, I think Kyle says the 04:15 inkjet printing is also challenging. By the way, none of this was happening in practice in -- at work. This is all theoretical proposals. We didn't have experience in any of this, hands-on experience. We were just 04:15





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proposing things.

For example, Karl -- Kyle was saying you can use masking and masking may be more efficient than printing because we know how to do it. So -- please. 04:15

BY MS. ZHONG:

Q. Go ahead. Go ahead.

A. My understanding is that -- and I'm recollecting what was happening there, we knew that TFE was proposed by -- particularly Vitex/Battelle technology. The question is at that time what was public was that the thin film encapsulation pioneered by Battelle was -- and Vitex, it was done by some kind of a coating through -- in a chamber. 04:15 04:16

Of course these guys moved on and they made improvements. I'm just not aware of the improvements. So this is a rebuttal or an improvement, maybe, of how to avoid coating the metal lines. That's all. That's how I read it. 04:16

Q. Okay.

A. Unfortunately we didn't reduce this thing to practice. We didn't have a thin film encapsulation tool.

Q. Okay. And you mentioned that at the 04:16





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time, Dr. Frischknecht was working on encapsulation of the OLED devices? 04:16

A. Yes.

Q. What else was he working on?

A. He was working on glass-glass encapsulation. Glass-glass encapsulation was the best-known method at that time that we were using. 04:17

Q. Understood. But what else was he working on besides the encapsulation project? 04:17

A. I think he was very focused on this encapsulation because we had some serious issues that we had to address. It was not a slam dunk to do glass-glass. The thin film encapsulation was one of his activities after the glass-glass, the number two, you could say, activity. 04:17

Q. So it is a long-term project compared to the glass-glass approach?

MR. YANG: Objection.

THE WITNESS: I know he spent a little bit less time or a lot less on the thin film versus the glass-glass. I mean, we had serious topics to address on the glass-glass. The glass-glass was not trivial. 04:17

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BY MS. ZHONG: 04:18

Q. Understood.

So was he working on both the thin film encapsulation and the glass-glass in parallel but devoting more time and energy to 04:18 the glass-glass?

A. The glass-glass -- the glass-glass was hands-on in the lab using his hands and his brain. The thin film encapsulation was all papers, reading and brainstorming and ideas and 04:18 talking to people.

Q. Okay. But you know that -- was he like working on it relatively continuously while he was also working on the glass-glass encapsulation in the lab? 04:18

MR. YANG: Objection.

THE WITNESS: Not continuously. On and off. It was a secondary activity.

BY MS. ZHONG:

Q. Based on his -- what's happening in 04:18 the glass-glass project deadlines and all that?

A. On and off. It was -- thin film encapsulation was not ready for mass production. No one was doing thin film encapsulation at that time in manufacturing. 04:19





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Q. So when you say it's on and off, it's not like he abandoned the idea, but it's more he was trying to find time to work on it when the glass-glass encapsulation project allows him to do that? 04:19

MR. YANG: Objection.

THE WITNESS: So let me step back a little bit. We had R&D activities on many programs. Thin film encapsulation, flexible substrate, full-color inkjet printing, full color means RGB full-color displays. Those were secondary projects. 04:19

The most important project for all of us was to help the manufacturing to introduce the products in the market. And introducing the products in the market was very stressful for all of us. So encapsulation and the performance of the displays under certain testing conditions had to be met. So very frequently, many of us will stop everything we were doing and we would focus on this. 04:19 04:20

BY MS. ZHONG:

Q. Okay. So when you said thin film encapsulation project, the inkjet project and several other projects, were they for the period 04:20





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between February 2001 and middle of 2002? When were those projects? Were they -- 04:20

A. Yeah. Very early on. Further down the road it became apparent to us that we had to support manufacturing, so we became more applied to basically deliver the passive matrix displays. We didn't do much with flexible. So -- 04:20

Q. But early in the period of like early 2001 to mid-2002, those R&D projects were ongoing with more focus on trying to get out a commercial product; is that correct? 04:20

MR. YANG: Objection.

THE WITNESS: We would spend much more time on the product development than the R&D, this team in particular. 04:21

BY MS. ZHONG:

Q. And was part of the effort also trying to make a commercially viable OLED device in the first instance? 04:21

A. Commercially viable based on glass-glass encapsulation. Imagine that this -- every processing steps those days in the OLED industry didn't have dedicated tools. So we had to work with the right vendors to develop the 04:21





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tools. So working with the glass-glass encapsulation vendor, it took a lot of effort and a lot of activity. So it would consume basically the time of many of us. I was working testing at that time, to test all these displays. So the reason -- 04:21 04:22

Q. What about the -- sorry. Go ahead.

A. I just wanted to say a thin film encapsulation didn't happen for another 10 years. 04:22

Q. I understand that.

But in -- even for glass-glass encapsulation, you have to have an OLED device before you can encapsulate it, right?

A. Yes, of course. 04:22

Q. So were there also efforts building the or fabricating the OLED devices themselves?

A. Yes. We did both in San Jose as well as in Penang.

Q. And was -- what doctor -- no. Was Dr. Pichler involved in fabricating the OLED devices? 04:22

A. I don't recall all the projects that he worked because he was a senior experienced individual. I know at the beginning that he 04:22





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helped with the evaluation of the encapsulation. He looked also into the readiness of full color. 04:23

In full disclosure I remember he did couple of trips to Asia to figure out who's who in the inkjet printing arena. It's part of the R&D project. So what we see here is one of his activities I think. 04:23

Q. And the thin film encapsulation project continued at least through mid of 2002, correct? 04:23

A. I don't remember --

MR. YANG: Objection.

THE WITNESS: -- very well. We were all hoping that the tool would be available to do this thing in production, but this tool was not ready, so we couldn't buy a tool. 04:23

BY MS. ZHONG:

Q. When you say the tool, you mean the tool for the thin film encapsulation?

A. Yes. 04:23

Q. So like you guys were trying to evaluate to see whether there were any tools available to actually test the thin film encapsulation?

A. Yes. 04:24





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Q. And were you talking to Dr. Affinio -- Affinos -- 04:24

A. Affinito. John Affinito is a scientist at Battelle. They had a roll-to-roll coater there that is not applicable to OLEDs. So the whole idea of Vitex is to take this technology and convert it to a rigid glass substrate and develop it. 04:24

Q. I thought there were projects to do roll-to-roll for the OLEDs at the time. 04:24

MR. YANG: Hold on. Objection.

THE WITNESS: It's -- roll to roll it's -- it's a holy grail for the field. Even now it's not happening. So, yes, I can go back to '95 and I can tell you that I had colleagues that believed in '97 it would be ready, but now we are 2025 and it's still not real. 04:24

BY MS. ZHONG:

Q. What was the challenge for the roll to roll? 04:25

A. Well, many challenges. It could take us a whole day to talk about the challenges. Geometrical variability in the -- in the way that the flexible materials behave. Particle generation. 04:25





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Since we're talking about flexible, the most reliable way to do flexible is to use a flexible material substrate on the rigid glass. Build your OLED on the rigid glass and then peel off this substrate with the OLED on it, with the thin film encapsulation on it and then cut it to displays, and this is yet another area that the industry has progressed by using flexible displays. And the technology was pioneered by Samsung Display corporation. 04:25 04:25 04:26

That's the only way that today's viable to use flexible and -- yeah, it's -- as we discussed earlier this morning, you can only use glass-glass to this. Right. So thin film encapsulation. But at that time -- it's interesting. Up to 2015 or '14, the thin film encapsulation, no one knew how to do it. There was only one group that knew how to do this. 04:26

Q. When you say there's only one group who would have knew how to do -- 04:26

A. On the large panels, right.

Q. Which group was that?

A. Samsung. So, for instance, I can refer to the eMagin. They have IP on this. But, you know, eMagin was doing everything, or 04:27





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FED, they were doing everything on substrates, on silicon substrates. So this approach of doing thin film encapsulation on silicon substrate was kind of known. Based on what I view using shadow masks and the like, this is how encapsulation -- thin film encapsulation is done in ICs, right, sensors and the like. 04:27 04:27

So that's why eMagin was able to jump into this and do it faster. Right. Doing it in very large area, it requires a lot of management on particles, on uniform use of the film. It's -- the most important thing is really the particle management. How do you bury the -- how do you don't generate particles, number one? Then if you have particle generation, either in the substrate or during the process, how do you bury them so they don't affect the device. That's basically what enabled the manufacturability of the thin film encapsulation in mass production. And now everybody's doing it. 04:27 04:28 04:28

Q. For the roll-to-roll process for thin film encapsulation, can you deposit the inorganic barrier layers selectively in only certain regions? 04:29





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A. I don't know and I don't remember. This is a crowded space. GE had an activity on this. 3M had an activity on this. General Atomics had an activity on this. And many others. 04:29

So for capacitors you need to take care of the areas where you're contacting the capacitor. So you need to free up the contacts. It's almost obvious that you need to somehow access the patents, right? I'm sorry, the contacts. So I don't know if supercapacitors did that, but originally, that's how the PML was used, if I remember correctly. This is many years ago. 04:30

Q. But PML -- I mean, supercapacitor structure and the OLED structures are very different? 04:30

A. Correct. But the capacitors also have two leads. So you need to respect the leads. So I don't know that, but I could maybe imagine that they develop areas to protect the contacts. 04:30

Q. So if you take a look at Exhibit Number 6, which is a Kateeva presentation and go to page 20. 04:31





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A. Yes. 04:31
Q. Tell me when you are on page 20.
A. 20, I'm there. Let me reduce the size because I went big.
Q. So page 20 has a heading "Applying Direct Coated TFE to R2R." 04:31
R2R refers to roll-to-roll, correct?
A. Yes.
MR. YANG: Objection.
THE WITNESS: That's the title. That doesn't mean that it's true. 04:31
BY MS. ZHONG:
Q. Okay. And can you take a look at the second bullet point.
MR. YANG: Which exhibit are we on? 04:31
MS. ZHONG: Exhibit 6.
THE WITNESS: This is Exhibit 6.
MR. YANG: Give me just a second to get to it. Page 20; is that right?
MS. ZHONG: Yes. 04:32
THE WITNESS: Can I provide a bit of background in presentation of that sort?
BY MS. ZHONG:
Q. Sure.
A. Kateeva was under -- it's a startup. 04:32





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So presenting the potential technology would attract investors to invest. Very different from what, let's say, Osram or HP will do that have already funding. 04:32

Roll-to-roll, the application of TFE with inkjet printing or roll-to-roll never took place. No one did this. 04:32

Q. Understood.

But I just want to ask your opinion on the second bullet point. Is it true that: 04:32

"For the inorganic layer the only option in roll-to-roll is blanket coating followed by removal material at the end of the process"?

A. I don't know if that's true. If you look at, for instance, the eMagin patents on thin film encapsulation, they have masks that they're using to put in organic layer. And I don't know if there is other work that has been done. Need to also look more carefully at the Motorola patents. So I don't agree with that bullet point. 04:33 04:33

Q. What about for OLED? Do you agree with that?

MR. YANG: Objection. 04:33





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THE WITNESS: Well, you can use a stencil mask. The same way you do fine metal mask, you can do the same thing with a flexible substrate in the chamber and protect the majority of the metals. I don't agree with this. 04:33 04:33

BY MS. ZHONG:

Q. Okay. Can you use that with the roll-to-roll process using a mask?

A. I don't know for a fact but I would imagine so. I mean, printing technology works like that. Flexo printing is like this. Flexo printing that prints on T-shirts and stuff like that, they're all done with -- analogous to this and you do the ink in selective areas that you want the Flexo printing to go to. So in theory, stencil, it can be done like this. Screen printing works with a mask and it works on flexible substrates. Sure. 04:34 04:34

Q. Do you know whether anyone has actually done that? 04:34

A. So I don't know. I don't know -- I mean, there are so many things I have done out there. I'm not aware of any -- if you're -- if you are referring to OLEDs, I'm not aware of any 04:35





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OLED roll-to-roll process that is in mass production today. 04:35

Q. What about just in pilot?

A. I'm not aware of any in pilot roll-to-roll OLED line. 04:35

Q. What about just on the curiosity?

MR. YANG: Objection.

THE WITNESS: I don't know. R&D can be just a really small line that doesn't really mean much. 04:35

MS. ZHONG: Why don't we take a 10-minute break.

MR. YANG: Sounds good.

THE VIDEOGRAPHER: Off the record at 4:35 p.m. 04:35

MS. ZHONG: Can I get a time count from the court reporter or the videographer.

(Recess.)

THE VIDEOGRAPHER: We are back on the record at 5:03 p.m. 05:03

BY MS. ZHONG:

Q. Welcome back, Doctor.

So we discussed the invention disclosure and the pages where you signed your names. Do you remember -- recall that 05:03





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discussion? 05:03

A. Yes. From the last session.

Q. Okay. So for the pages that you have signed -- on which you have signed your names, did you review the content on those pages before you signed your names? 05:03

MR. YANG: Objection.

THE WITNESS: As I shared with you earlier, it has been a long time. I barely remember signing some of these things. So -- but these are my signatures. 05:03

BY MS. ZHONG:

Q. Okay. What was your general practice when you signed those documents?

MR. YANG: Objection. 05:03

THE WITNESS: We didn't have a fixed practice. In some cases, we will do a formal review as a committee. In some other cases we will do it in a hurry. So I don't know about this case. I don't remember very well. It's 24 years. 05:04

BY MS. ZHONG:

Q. But do you recall reviewing the contents of the document before you signed it?

MR. YANG: Objection. 05:04





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THE WITNESS: I remember the topic discussed and thin film encapsulation was one of the R&D topics. 05:04

BY MS. ZHONG:

Q. So you recall discussing the topic with Dr. Pichler at least? 05:04

MR. YANG: Objection.

THE WITNESS: For instance, I remember now after seeing this that Karl Pichler disclosed to us that he has seen similar approaches at FED Corporation, eMagin Corporation, and I had forgotten this. And now seeing it, he was the guy that would disclose whatever he had in his mind. And I'm surprised to see this thing referring to the -- this way of doing thin film encapsulation as a way of protecting the metals. 05:04 05:05

And he has told everybody -- I think that's the patent that we're talking about here, right? 05:05

BY MS. ZHONG:

Q. Can we go to page 14 of the eMagin disclosure.

A. Yes.

Q. And do you see that in item number 7 05:05





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he said he had been carrying around part of the invention for a long time, greater than one year? 05:06

Do you see that?

A. Yeah. 05:06

Q. So this document was signed on September 30, 2001, correct, by him?

A. Yes.

Q. If you look at the signature at the date right above item number 4. 05:06

A. Let me see it so I can confirm.

Yes, September 30th, 2001, yes.

Q. And Dr. Pichler started in spring 2000 at Osram, correct?

MR. YANG: Objection. 05:06

THE WITNESS: I don't remember the exact date. He joined after I joined.

BY MS. ZHONG:

Q. But it would be in 2000, spring 2000?

A. I don't know the exact date. 05:07

Q. Would it be 2000?

A. I think so, but I don't remember exactly when.

Q. Do you remember whether it's the first half or the second half of 2000? 05:07





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A. What comes to my mind is the middle of the year, somewhere around that time. I don't know exactly. I don't remember exactly.

Q. So when he says it has been -- he has been carrying around the invention for over a year, that would be after he joined Osram, correct?

MR. YANG: Objection.

THE WITNESS: I don't know. No. Just a little bit of background for Karl Pichler, he worked for CDT, Cambridge Display Technology. I'm sure they talked about thin film encapsulation there. He also worked for FED Corporation, then eMagin, and these guys are exercising thin film encapsulation in production.

So that's all the -- plus all the interaction with PML technology from Affinito and Battelle. I don't know what he means by the words "carrying around" if it is knowledge from his previous work or something else.

BY MS. ZHONG:

Q. Did you ask him when you first reviewed this?

A. Well, I don't remember, to tell you





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the truth, but how this was furnished to me, it was as a way of reducing the processing steps in protecting the metal contacts. 05:08

Q. When you said protecting the metal contacts, you mean keeping it free from the deposit of organic and inorganic? 05:08

A. These are all the ideas that I think that's what he means. How to -- methods for allowing the contacts to stay uncovered after you do thin film encapsulation with the minimum number of steps. That's what I think he's saying. 05:09

Q. And is CDT the same company as eMagin or it's a different company?

A. Totally different. 05:09

Q. And did Kyle -- I mean Dr. Pichler work for CDT after eMagin or before or do you know?

A. He worked for first at CDT after graduate school, and then he went, I think, to FED, eMagin. Changed the name. And then he came to us. 05:09

Q. And when you read this invention disclosure, if you had thought that Dr. Pichler conceived any part of the invention while he was 05:10





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not at Osram, would you have raised that as a red flag? 05:10

MR. YANG: Objection.

THE WITNESS: Let me say something else. I -- only became aware of the eMagin patents recently, and all I knew those days is that eMagin is working on some kind of a thin film encapsulation and they would brag that they don't need the Vitex technology. I remember that from here and say, no, this is already there. 05:10

BY MS. ZHONG:

Q. When you read the invention disclosure did Dr. Pichler tell you that the idea was not all his or Dr. Frischknecht or someone else? 05:11

A. They're disclosing that a lot of this work has been done elsewhere already on this disclosure after reading it. By allowing me to read this it came to my mind that they were trying to find ways to innovate patentable ideas, right? So the methods that they proposed, they revolve around freeing up the metal contacts from organics in the most economical way. That's the crux of this 05:11





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invention disclosure.

And that's what I remember discussing. Neither Karl or Kyle came to me. Well, I think it was Pichler came to me claiming thin film encapsulation. We were all worrying about how we're going to protect the metal pads or at least leave them uncovered, and we were sensitive to this because when you use soluble materials, you always have this problem. 05:11 05:12

Q. And did either Dr. Frischknecht or Dr. Pichler tell you that FED or eMagin was already doing selective deposition to leave the metal contacts or scribe lines open or free of the materials? 05:12

A. I don't remember very well. So the only information that we had at that time is what's written in the emails. If you look at page 1, it just came to my mind, I vaguely remember reading this page 1 at the bottom. As you can see, I am in the "to." So when Charlie worked for eMagin, Pichler, he saw a certain way of encapsulation. So he knew that. So -- and he knew what he knew. 05:12 05:13

So by no means Karl Pichler proposed thin film encapsulation knowing him because he 05:13





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knows what he knows. I think what he was concerned is what to do with the scribe lines and the metal lines, and he didn't know if eMagin filed or not. We didn't know. So -- and I think that's what they did here. We said, okay, sounds like interesting idea. Go ahead, I mean I witness this, and that's how we end it. 05:13 05:13

What I have seen recently is that actually this area of using masks for putting thin film encapsulation already has been filed by eMagin. I only discover that recently. 05:14

Q. And how did you discover that?

A. Just looking for prior art for thin film encapsulation, to see who is who in the thin film encapsulation. 05:14

Q. And why were you looking for who's who in the thin film encapsulation?

MR. YANG: I caution you not to reveal any communications you had with attorneys or any things you're asked to do under work product privilege, but if you were doing this work outside of your role with litigation counsel, then you can say that. 05:14

THE WITNESS: So I worked for about a year with thin film encapsulation with Kateeva, 05:14





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so when I was with Kateeva I looked at different ways of doing this thing. Right? This is a way of evaluating the technology that Kateeva was pursuing. But also as a way of understanding -- I worked with PML when I was at HP Labs. So -- and as I told you, we knew that FED Corporation was not licensing or didn't want to license or were not interested in the Vitex technology. So we're all wondering how they're doing it, right? 05:14 05:15

And, of course, reviewing this particular Pictiva patent, all this stuff came to my mind, right? So my previous reference to Motorola's patents, to the FED -- the eMagin patent and PML and all like Vitex, right? 05:15

BY MS. ZHONG: 05:16

Q. So are you accusing Dr. Pichler for using -- for stealing someone else's idea and disclosing it?

A. I'm not accusing him. I'm just refreshing our memory that this email, he has disclosed this. I'm not disclosing it. I think he's using the word "confidential" there. So... 05:16

Q. So you're accusing Dr. Pichler of --

A. No.

Q. -- of lifting the ideas that he -- 05:16





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someone else had at FED and claimed to be his own and filed a patent with Osram? 05:16

MR. YANG: Hold on a second. Object. First let her finish the question. Second, give me time to object. So objection. You can go ahead and answer. 05:16

THE WITNESS: No I'm not. I don't know all the background information there. Okay. So I'm just reading this report, and it came to my mind that he was aware of all this prior art, but the motivation behind this disclosure was to do something novel, something new. So that's what he's focusing on, to find a way to do something different. 05:17

BY MS. ZHONG: 05:17

Q. So what -- this process he described that happened at eMagin was not the process he is proposing in the invention disclosure; is that correct?

A. No. 05:17

MR. YANG: Hold on a second. Objection.

Go ahead.

THE WITNESS: I don't know. All I said is that there is a patent very similar by 05:17





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eMagin that describes something very similar. Now, probably he didn't know that -- because they were all filed at the same time. They were filed around the time after he left from eMagin, so he didn't know. So probably he didn't know if eMagin had filed or not. 05:17 05:18

BY MS. ZHONG:

Q. Well, was those work done when he was at eMagin?

A. I don't know. 05:18

Q. Okay.

A. All I know is what all of us can read here.

Q. So you have no evidence that he -- someone else conceived the idea that's disclosed in the invention; is that correct? 05:18

MR. YANG: Objection.

THE WITNESS: This area of protecting the metals -- the area of disclosure protecting the metals I believe has been claimed also by eMagin for their particular application space. But when Karl filed for this, he probably didn't know this, so it is -- probably it's predated. I don't know the exact dates here. You need to look. 05:18 05:19





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BY MS. ZHONG: 05:19

Q. So you have no evidence that Dr. Pichler took someone else's idea and omitted that person's name when he filed this invention disclosure; is that correct? 05:19

MR. YANG: Objection.

THE WITNESS: Knowing Karl, he will not do such a thing. He probably didn't know what's filed already or not. He was doing all -- everything for the best of Osram. 05:19

BY MS. ZHONG:

Q. So whether or not someone else might have conceived the similar ideas, it's not the case that Pichler knew someone else conceived the idea and he omitted them from the invention 05:20 disclosure; is that correct?

MR. YANG: Objection. Calls for speculation.

THE WITNESS: I don't know.

BY MS. ZHONG: 05:20

Q. So you don't know -- you are not sure and you think that there's a possibility that Dr. Pichler actually omitted some coinventors that he knew should have been credited?

MR. YANG: Objection. 05:20





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THE WITNESS: Karl is a very straight guy and very honest, that's why he discloses all this here, right. So he will not lie or -- I mean, you can see it's obvious from his writing, all the background information that he is carrying along. 05:20 05:21

Osram was working on soluble OLEDs where eMagin was working on vacuum-deposited OLEDs. Processes are different. So I can only speculate here because I don't know. 05:21

BY MS. ZHONG:

Q. So you know that Dr. Pichler is a straight shooter, correct?

A. Yes.

Q. He's very honest. Dr. Pichler is an honest person? 05:21

MR. YANG: Objection.

THE WITNESS: Through my personal interactions, yes.

BY MS. ZHONG: 05:21

Q. And you did not believe that he would have intentionally left off a coinventor, correct?

MR. YANG: Objection.

THE WITNESS: I don't think so. What 05:21





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we see here in the very first page that may or may not be related to this patent is all the information that is floating around those days, right? Some of this -- I don't know exactly what happened after this documentation was collected. It's conceivable that at the time we're not aware of any competing ideas. 05:22 05:22

BY MS. ZHONG:

Q. Okay.

A. So we decided to proceed with the filing, but after that I don't know. Right. 05:22

Q. Okay. Can you please take a look at item number 7?

A. This is from the list, back at the list. 05:22

Q. Page 14, item number 7.

And do you see that Dr. Pichler stated that the invention has not been tested yet and he said:

"Internally I am certain and outside our company - I am not aware of anybody who tried it and/or any prior art." 05:23

Do you see that?

A. Yes.

Q. And based on what you know of 05:23





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Dr. Pichler, do you believe that he wrote this statement accurately and truthfully? 05:23

MR. YANG: Objection.

THE WITNESS: I mean, I don't know this. I would infer that he did, but there is a period of -- maybe there were coinventions from other companies. He wouldn't know this because they were all applications. Right. So he says the truth, according to his reference, that there may be an application pending on the other side. All we see here is that there is actually an application happening in parallel. 05:23 05:24

BY MS. ZHONG:

Q. So as far as you know, you don't believe that he intentionally left off a coinventor for somewhere else? 05:24

MR. YANG: Objection.

THE WITNESS: You're asking me something personal. I don't know. This is a question to ask the legal team of Osram because I was not a -- a participant in the filing process. I was just a witness. 05:24

BY MS. ZHONG:

Q. How would you know of Dr. Pichler as a person? Do you think that he stated 05:24





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truthfully when he said:

"I am not aware of anybody who tried it and/or any prior art"?

A. So the date that he disclosed that, probably that's true.

Q. Okay. And in the eMagin patent that you say you have recently recovered, did they disclose using inkjet printing of UV-curable liquid prior to the dielectric deposition?

A. I don't remember. I don't know if they disclosed that.

Q. And do you see that Dr. Pichler stated that he "did some prior art searching to check UV curable liquid inkjet printing"?

A. Yes. So as a reference, the idea of a UV curable material for thin film encapsulation was proposed by Battelle and Vitex. So that's input number one.

The digital or additive printing using inkjet printing is another technology that is also used for different applications. The argument here is that when you bring those two things together, are they obvious or are they novel? That to be discussed, right? But the UV curable PML was doing that all the time. This





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is not new. 05:26

Q. Well, were you aware of an inkjet printing of the UV curable organic liquid?

A. I don't know if inkjet printing was used at that time or UV curable materials. I don't know that. 05:26

Q. And you don't have any opinion on whether this was obvious or novel to do that, correct?

A. Well, it's difficult to tell now because I have 25 years of experience in my head. 05:27

Q. That's the whole problem. You had too much post-knowledge.

A. So the -- those days there was -- everything was in the making, right? And one thing to keep in mind, again, to emphasize this, that Osram did not reduce this technology to practice. Maybe later they did, but I don't -- I know that for a fact we did not have a thin film encapsulation tool in San Jose. We would evaluate to see what else is happening in the industry, but we couldn't buy a tool. The tools were not commercially available or whatever was available was not working. 05:27 05:27





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Q. Was it a requirement for the patent to reduce the invention to actual practice before you file a patent? 05:27

MR. YANG: Objection.

THE WITNESS: I don't think it's a requirement. 05:28

BY MS. ZHONG:

Q. And is Dr. Pichler a creative person?

MR. YANG: Objection.

THE WITNESS: I mean, why this thing is related to this. He's a great scientist. 05:28

BY MS. ZHONG:

Q. So he has above -- at least above-average skill set?

A. It's difficult to ask me these questions. I'm not here to judge Karl. He's also a very close friend, so I -- 05:28

Q. Do you believe that he has above-average creativity and skill set?

A. He's a very good scientist, a very good engineer. 05:28

Q. Above average, at least?

A. It's for someone else to judge.

Q. Do you describe someone -- an average person as a good scientist? 05:29





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A. How is this related to what we're doing here? What are you trying to get at? 05:29

Q. It doesn't matter. You need to answer the question truthfully.

A. I'm answering truthfully. He's a very good guy, and, you know, I've maintained a close relationship with him over the years. 05:29

Q. Are you aware that Samsung is accusing of him of leaving off other people --

MR. YANG: Objection. 05:29

BY MS. ZHONG:

Q. -- leaving other inventors off the patent?

MR. YANG: Objection.

THE WITNESS: I'm not aware of this. 05:29

BY MS. ZHONG:

Q. Are you aware that Samsung claims that eMagin actually invented this whole invention and not Dr. Pichler?

A. I'm not aware of this. I'm only aware of the prior art. 05:30

Q. Okay. Do you have any doubt that Dr. Pichler came up with what he disclosed in this invention disclosure?

A. Sorry, I didn't hear. Can you 05:30





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repeat, please? 05:30

Q. Do you have any doubt that Dr. Pichler came up with what he disclosed in this invention disclosure?

MR. YANG: Objection. 05:30

THE WITNESS: I can only speculate. He filed this disclosure without knowing what exactly the prior art was, but I can only say that. He even disclosed that to us.

BY MS. ZHONG: 05:31

Q. Did he, himself, come up with the idea disclosed in this invention disclosure regardless of whether someone else independently came up with the idea?

MR. YANG: Objection. 05:31

THE WITNESS: He -- he disclosed what he disclosed thinking that potentially this thing would be patentable. Genuinely thinking that, but, yeah, that's all we can say.

BY MS. ZHONG: 05:31

Q. Okay. And you don't believe that he took someone else's idea and sold it as his own idea, correct?

A. Well, I don't know all the -- what is claimed. I don't remember very well what the 05:32





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patents are claiming. The inkjet printing as a process is not way new. The way of using stencils to protect the metals is not new. The combination for soluble OLEDs may be new. 05:32

So usually when you file these ideas -- now, to me, it looks like an obvious thing with all this prior art, but those days probably he believed that this is patentable without even violating any confidentiality or anything like that. 05:32

Q. So 25 years later, looking back, he said, oh, that's pretty obvious?

A. No, it's matter of dates, who filed what when. That's the strength, first to file, right. I don't exactly know when the first to file rule was implemented, but it's all about dates. 05:33

Q. At the time was it obvious to you to use inkjet printing to deposit the organic layers for the TFE? 05:33

A. So those days, what was obvious -- even in the 90s, what was obvious was to use inkjet printing for patterning OLEDs. Well, I should say -- obvious. We were all trying to find a way to pattern OLEDs with inkjet 05:33





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printing. And there are many companies submitted filings like that. This was all prior art, right? So... 05:33

Q. When you talk about that, that's talking about the pixels not the encapsulation, right? 05:33

A. Correct, pixels, yes.

Q. Were you aware of any prior art using inkjet printing for encapsulation layers?

MR. YANG: Objection. 05:34

THE WITNESS: I don't remember for those days. I know for a fact that when we used to introduce printing areas or annotative areas, we will list everything, laser printing, screen printing, stencil, et cetera. 05:34

BY MS. ZHONG:

Q. And that's with Dr. Kyle Pichler who had many years experience in that area --

MR. YANG: Objection.

BY MS. ZHONG: 05:34

Q. -- proposing the ideas, correct?

A. I don't know. I don't know. And I don't remember. But every time we would propose something that had to do with printing on demand in areas that you care to print, you propose 05:34





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more than one printing technique just to cover your bases. 05:34

Q. On your team, how many researchers are people with bachelor's degree and only one year of experience in displays? 05:35

A. You mean those days at Osram?

Q. Mm-hmm.

A. I don't remember very well, but we will try to hire people with prior experience on displays, either through the BSD program or through previous experience. 05:35

Q. So is it fair to say that it was pretty rare back in those days at Osram for you to have someone with only one year of experience in displays and only a Ph -- only a bachelor's degree? 05:35

MR. YANG: Objection.

THE WITNESS: We had a lot of interns at Osram during the summers, and these guys were all undergraduates or master students. 05:36

BY MS. ZHONG:

Q. Were they named on any of the patents?

A. I have joined patents with some of them. Like Benjamin Krummacher was a -- I don't 05:36





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remember he was a master student or undergraduate, but these are all high-quality people. So I don't think it's good to generalize what you just said. 05:36

Q. And what area did Mr. or Dr. Krummacher work on? 05:36

A. He worked on many different areas. We overlapped in the area of using the phosphors as a way of generating white light in combining blue and light and phosphors. That was a concept that was pursued by a few more people, not only us. GE had a program like this too. 05:36

Q. Okay. And instead of phosphors, were quantum dots being used?

A. We didn't pursue that because the quantum dots were not available. But people were talking about quantum dots around that time. 05:37

Q. Now, you had stated that there is an eMagin patent that you claim to have disclosed some of the same ideas as Dr. Pichler. 05:38

A. I don't remember the numbers on top of my head. I remember seeing a couple of these applications and a lot of patents.

Q. And did you discuss any in your 05:38





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report at all? 05:38

A. No, I have not.

Q. Okay. Did you compare the disclosure of those patents to the claims of the '389 Patent that issued from the invention 05:39 disclosure?

A. I have looked at the Pictiva patents, the '389 claims, and I also have looked at the eMagin, and I have -- what trigger to my mind is a, I would say, similarity of some sort. 05:39

Q. Did you do an element-by-element analysis?

A. No. I have haven't done this.

Q. Okay. And you --

A. I spoke with -- 05:39

Q. Go ahead.

A. I saw a graph here on this disclosure. Well, you know some of those things are obvious to separate them like this, but I don't know what page. On page 38, that looks 05:39 similar to what I've seen in the eMagin. Of course, in 2001, no one knew this.

Q. You did not do an element-by-element analysis?

A. I don't know what element -- you're 05:40





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saying claim -- no, I have not done -- I don't know what element by element is. 05:40

Q. Okay. And you were only talking about high-level similarity of the disclosure, correct? 05:40

A. Yes.

Q. Okay. And you are not offering an opinion here that Dr. Pichler's patents are invalid, correct?

A. No, I'm not. 05:40

Q. And you are not stating that Dr. Pichler left off some other inventors from eMagin, correct?

A. I'm not claiming that whatsoever.

Q. Now, you mentioned that when you were at Osram, the legal department encouraged the engineers to file invention disclosures; is that correct? 05:40

A. Yes. This is true for all companies that I worked. 05:41

Q. Why is it important for the engineers to file invention disclosures?

MR. YANG: Objection.

THE WITNESS: It depends on the circumstances. In the case of Osram, we were 05:41





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new to the field and -- as a business, so we wanted to enrich our IP portfolio. The same thing happened in my startup. We will incentivize the engineers to propose inventions that we will move forward for patent applications. I mean, in some cases, having strong IP is important. 05:41 05:41

BY MS. ZHONG:

Q. Why is it important to have strong IPs? 05:41

MR. YANG: Objection.

THE WITNESS: In some cases, not always. It depends. Right? For a startup, early-stage startup, it would be important. That's how you raise money. 05:42

BY MS. ZHONG:

Q. Why was it important for Osram to file patent applications?

MR. YANG: Objection.

THE WITNESS: Based on my knowledge without knowing the bigger picture, we didn't have a lot of IP on our own. 05:42

BY MS. ZHONG:

Q. Why was it important for Osram to have IPs of their own? 05:42





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MR. YANG: Objection. 05:42

THE WITNESS: I don't know really. One of the reasons perhaps is to secure -- to have the freedom to manufacture. We licensed patents. We licensed IP from CDT and 05:42 DuPont/UNIX, so we wanted to build around this and have the freedom to operate in the soluble OLEDs.

BY MS. ZHONG:

Q. So Osram licenses the necessary 05:42 patents -- strike that.

So Osram will license others patents when it was necessary; is that correct?

MR. YANG: Objection.

THE WITNESS: I don't remember. This 05:43 is prior to my time there. I start in 2000, but I'm aware, this is public information, that Osram licensed the soluble OLED patents from Cambridge Display Technology as well as from UNIX/DuPont. 05:43

BY MS. ZHONG:

Q. So Osram did not just pick someone else's intellectual property and use it without compensation, correct?

A. I'm not aware of this. They were 05:43





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very transparent with licensing technology. They required technology but Osram worked diligently in developing technologies. Like the glass-glass encapsulation was pioneered. So we were the first ones to do that. The coating of the materials, the different colors, the monochrome displays, the metalization. There are many things that we did that were very unique and we were the first to do it. 05:43 05:44

Q. So Osram respected third-party intellectual properties and it would license them if it did not have the technology already; is that correct? 05:44

MR. YANG: Objection.

THE WITNESS: I can only speak about what we did with the very first licensing agreements. I don't know what happened later. 05:44

BY MS. ZHONG:

Q. When you say I can only speak about what we did in the very first licensing agreement -- 05:44

A. Well, I can only speak about the initial years of the soluble OLED passive matrix manufacturing to make sure that we had a free path to manufacture for the products of 05:45





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interest.

Q. Do you think that --

THE COURT REPORTER: One second, please.

MS. ZHONG: Sure.

(Brief pause in proceedings.)

BY MS. ZHONG:

Q. Do you think that it was -- if a manufacturer is using a third-party intellectual property, do you think that it's important for that manufacturer to obtain the necessary license in order to use a technology?

MR. YANG: Objection.

THE WITNESS: I guess it depends on the development stage and at the time you introducing the product. If you introduce a product in the market, you will have to have the permission, the freedom to operate manufacturing and selling the product.

BY MS. ZHONG:

Q. So you think that if someone starts to sell a commercial product, they should obtain the license to the appropriate intellectual property; is that correct?

MR. YANG: Objection.





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THE WITNESS: You're asking me for my personal experience in general? 05:46

BY MS. ZHONG:

Q. Yes.

A. When I was with DuPont and when we developed the photovoltaics business, we didn't have any major licensing going on. We did some licensing in the beginning as a way of showing to the world that we are covered in making this particular technology, but we end up not using it and we returned the IP. So I have mixed feelings about this, how important it is. 05:47

Q. So you think it's okay for someone just to use a technology without compensating the IP owner? 05:47

A. Well, it depends on the case, right? I mean, if there is a true violation of the IP rights, of course that needs to be looked at. But you need to look -- demonstrate this, that there is a violation. 05:47

Q. So if someone goes to a patent owner to say I'm interested in buying this particular patent, and then when the purchase did not go through, is it okay for that manufacturer to use the particular -- the patented technology 05:48





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without paying the patent owner for any compensation? 05:48

MR. YANG: Objection. Incomplete hypothetical.

THE WITNESS: I don't -- I don't know. I mean, it's -- I agree with Lance, one question after -- I mean, one hypothesis after the other. Maybe if you want to ask a more specific question. 05:48

BY MS. ZHONG: 05:49

Q. So if Samsung is using Osram's patents, should Samsung be paying for the privilege of using the technology?

MR. YANG: Objection.

THE WITNESS: It's not for me to judge this, right? I cannot answer this. 05:49

BY MS. ZHONG:

Q. So you think it's okay for Samsung to not compensate Osram for using their patented technology? 05:49

A. Through my studies I've seen that Samsung is notorious for licensing or acquiring patents throughout their 20 years of report. I've seen this thing. They don't shy to go and acquire the technology when they realize that 05:49





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it's valid to enable the manufacturing. I mean, they have done a lot of acquisitions from the OLEDs. I mean, the facts speak by themselves. They have done 10 acquisitions from OLEDs. 05:49

Q. They've also been forced to -- they've also been taken to court and forced to take a license after they lost its lawsuit, correct? 05:50

MR. YANG: Objection.

THE WITNESS: I don't know all these details. I know that they acquired a lot of interesting technologies. This is not only one or two, it's multiple. 05:50

BY MS. ZHONG:

Q. So you think it's important for a company like Samsung to properly compensate the patent owner for the usage of the intellectual property; is that correct? 05:50

A. I believe it's important to clear the path for manufacturing by owning or licensing all the IP that is required to manufacture certain part and they have done so over the years. 05:50

Q. You know that Samsung has been found to infringe many patents over the years, 05:51





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correct? 05:51

A. I don't know.

MR. YANG: Objection.

BY MS. ZHONG:

Q. Have you done any analysis to see whether Samsung has got all the correct -- all the necessary licenses or IP ownership for their -- for their products? 05:51

A. I have not done this thorough analysis. I only know throughout my experience the -- some of the companies they have acquired, like Vitex, like Novaled and the like. eMagin recently. 05:51

Q. Is Kateeva -- does Kateeva have any -- strike that. 05:52

Is Samsung an investor in Kateeva?

A. I don't remember. I don't remember. They may have been one of the original investors. I don't remember.

Q. Is -- does Samsung have any investment or collaboration relationship with Nanosys? 05:52

A. It's public that Samsung has a license or held the license agreement for Nanosys on quantum dots. It's a very long-term 05:52





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licensing. 05:53

Q. And who supplies a Nano -- strike that.

[redacted]

05:53

MR. YANG: Objection.

[redacted]

05:53

BY MS. ZHONG:

[redacted]

05:54





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[redacted]

BY MS. ZHONG:

Q. And did Nanosys develop cadmium-free quantum dots? 05:55

A. Yes. They are the leader in this area, the so-called indium phosphide. They have the key IP in this area.

Q. How does Samsung's OLED technology compare to its competitors? 05:56

MR. YANG: Objection.

THE WITNESS: In what -- it depends, right? Can you specify what do you mean by the question? Can we take a more specific example?

BY MS. ZHONG: 05:56

Q. You can give an overview and you can go to the more specifics.

MR. YANG: Objection.

THE WITNESS: What do you mean? It would be easier if you ask a particular 05:57





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question. Then I can answer it. 05:57

BY MS. ZHONG:

Q. How does Samsung's OLED technology compare to BOEs?

MR. YANG: Objection. 05:57

THE WITNESS: Very general question. I can only comment that Samsung started OLEDs before 2000. And BOE started OLEDs recently. I don't know exactly the year. So Samsung has a lot more experience making OLEDs versus others. 05:57 I can make that statement. We can go to more specifics if you like. I have monitored the progress over the last 20 years, 25 years.

BY MS. ZHONG:

Q. Samsung -- when Samsung first started 05:58 it licensed the Kodak's basic technology, correct?

A. If I recall, yes, and also the UDC, Universal Display Corporation, for the use of the metal chelates for light emission. 05:58

Q. So Samsung licensed from UDC the use of phosphorescent --

A. Yes.

Q. -- correct?

A. Yes. But I don't know the specifics. 05:58





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Q. And by "UDC," you mean Universal Display Corporation, correct? 05:58

A. Yes.

Q. How does the quality of Samsung's OLED display panel compared to that of BOEs? 05:58

MR. YANG: Objection.

THE WITNESS: Well, in terms of what?

BY MS. ZHONG:

Q. What are some of the important parameters for an enterprise with an OLED device? What are some of the important parameters to a consumer? 05:59

MR. YANG: Objection.

THE WITNESS: I can only make the comment that a few years ago, Samsung had 100 percent of the market capacity of OLEDs sharing it with LG and couple of others, but they had the lion's share in the production of high-definition OLED displays from about 2000. 05:59

BY MS. ZHONG: 05:59

Q. And since then BOE has -- strike that.

Since then Samsung's market share has decreased and BOE's market share has increased significantly, correct? 05:59





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A. Well, there's a lot of competition in the market but Samsung still has the larger percentage in mass production. But there is -- a lot of people basically are -- envy their successful business in OLEDs. 06:00

Q. In fact, BOE is making gains on Samsung's OLED display technology even in high-end products such as Apple's iPhones, correct?

A. I don't know the exact numbers, but I hear this from conferences and the like, and what I'm reading. But I don't know what percentages. This is very recent thing. 06:00

Q. And in more than -- in today's mobile phones, tablets and watches, are the green and red pixels in those commercial products tend to be phosphorescent emitters with a metal complex? 06:01

MR. YANG: Objection.

THE WITNESS: I don't know 100 percent. Don't know the exact answer, but a good portion of those are phosphorescent. The red was first and then the green, but I don't know everything is with these compounds. There is, again, competition in that space. 06:01

/ / /





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BY MS. ZHONG: 06:02

Q. Do you know whether lithium quinolate was used as a common component in the electron transport layers?

A. I don't know. You're referring to Samsung or to in general? 06:02

Q. In general.

A. So let me repeat your question. Are you asking if the lithium --

Q. So is -- so is lithium quinolate used -- strike that. 06:02

So is lithium quinolate commonly used with another organic material as part of the electron transport layer?

A. Commonly -- 06:02

MR. YANG: Objection.

THE WITNESS: I don't know how commonly it's used. I have seen publications but I don't know if it's used in manufacturing today. That I don't know. 06:03

BY MS. ZHONG:

Q. So you don't really know the material sets that's used in Samsung's display panels, correct?

A. I don't. Yeah. This information has 06:03





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not been communicated to me. 06:03

Q. Isn't it important for companies to respect third parties -- strike that.

Is it important for a company to respect other company's intellectual properties? 06:03

MR. YANG: Objection.

THE WITNESS: It depends on the case, right? Case by case.

BY MS. ZHONG: 06:04

Q. Under what circumstances it is not important for a company to respect another company's intellectual property?

MR. YANG: Objection.

THE WITNESS: I mean, it's very complex, the question and perhaps answer. If you're violating someone's -- blindly someone's intellectual property and you don't have rights to this, you should be looking into licensing this. But violating or not it's a very difficult answer to explore. It's not that easy. 06:04

BY MS. ZHONG:

Q. So if a company is violating a third party's intellectual property -- property and it 06:04





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does not have rights to that intellectual property, that company, in your opinion, should be looking into licensing the intellectual property; is that correct? 06:04

MR. YANG: Objection. 06:05

THE WITNESS: Can I answer this thing with an example? The use of iridium compounds for light emission, it's undisputedly owned by UDC, to my knowledge. And that's why UDC has been so successful in licensing the technology. 06:05
You can reverse engineer every device that is made out there. And if these phosphorescent compounds are used, are you violating the IP? That's why UDC is licensing this IP to everybody. So in this case you have to respect 06:05
IP.

BY MS. ZHONG:

Q. I understand that you are not offering an opinion of infringement or non-infringement in this case, correct? 06:06

A. Yes. I'm not.

Q. So if Samsung is violating Osram's intellectual property, should Samsung be licensing the technology?

MR. YANG: Objection. 06:06





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THE WITNESS: I'm not here to answer this particular one, right? I mean, if you want my personal opinion, if there is a clear evidence of, perhaps, violation, then it should be explored further. But personally, after looking at all these files from Pictiva, I didn't see any obvious and blind violation. 06:06 06:06

BY MS. ZHONG:

Q. You don't know what materials are used by Samsung, correct? 06:07

A. Again, yes. There are a couple of patents that are Pictiva that I cannot comment because they were filed later. So forgive me, I cannot say anything there.

Q. Okay. [redacted]

[redacted] 06:07

[redacted] 06:08





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[redacted]

Q. You are not offering any opinion --

A. You're asking me so I'm answering. Personal opinion. Not official.

Q. You are not offering any opinion on validity, correct?

A. I'm not.

Q. In fact, you have not really compared what you call the eMagin patents with the claims?

A. No. I have not done a detailed analysis.

Q. [redacted]?

MR. YANG: Objection.

THE WITNESS: I don't know. There are inorganic depositions and then there are organic depositions. I don't know the details.





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BY MS. ZHONG: 06:09

Q. So you have no idea what Samsung is doing in their manufacturing process?

A. I know they do thin film encapsulation. 06:09

Q. Do you know how they do the thin film encapsulation?

A. The details, no, I do not.

[redacted]

Q. Do you know whether they're -- do you know how they are depositing the inorganic materials? 06:10

A. I don't know the details. [redacted]

[redacted]. I don't know the details.

Q. Do you know how they apply them?

A. All I know is that there are [redacted] used.

Q. Do you know whether [redacted]

[redacted]?

A. Yes. 06:10





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MR. YANG: Objection. 06:10

THE WITNESS: I don't know. And I don't think this was disclosed in the report. I don't remember seeing this.

BY MS. ZHONG: 06:10

Q. Okay. So you have no basis to conclude one way or the other whether Samsung's using the '389 patent or not, correct?

A. I'm only commenting on this based on the fact that my personal assessment of the 06:11 '389, it's based on prior art. That's why I'm saying that.

Q. But you have not compared the prior art to the claims --

A. I have not. 06:11

Q. -- by doing a claim-by-claim element -- element analysis? So basically you did not do an element-by-element analysis of the prior art?

A. Yeah, I said I didn't do it. 06:11

Q. Okay. So you have no basis to conclude that those were actually prior art or invalidate the '389 Patent, correct?

A. Yes. I -- based on the fact that thin film encapsulation was used by -- the 06:12





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concept of alternating organic and inorganic layer and how you put it down to achieve certain things has been done before. 06:12

What we discussed, an important factor there, is [redacted] How exactly they do it has not been disclosed to me.

Q. And do you think that it would have been -- strike that.

Do you think there would be manufacturability if the organic layers and the inorganic layers were deposited in a plantar fashion? 06:12

A. I cannot comment on that for a fact because I don't know exactly how they -- what they did and how they improved it. 06:13

So I cannot say that to do a quantitative analysis, one versus the other.

Q. Even qualitatively, do you think that it would have been a commercially viable process 06:13





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for them to blanketly deposit the organic and inorganic layer from independent -- 06:13

A. I don't know. I don't know. All I know is the multilayer process that was proposed by previous art has been reduced to fewer layers. That's what I know for a fact. There are publications of some of these lines. How they Vitex/PML technology evolved to be easier to make and manufacturable. 06:13

Q. But you have not made a determination as to whether it would have been a commercially viable process if the deposition had been non-targeted and covering up all the metal pads and the scribe lines; is that correct? 06:14

MR. YANG: Objection. 06:14

THE WITNESS: I haven't done this particular analysis. I mean, you have to look at data on both sides to opine on this, and I haven't seen the data.

BY MS. ZHONG: 06:14

Q. And you have not seen the inkjet printing in the OLED -- strike that.

You have not seen using inkjet to print the organic layer of the thin film encapsulation in the eMagin patents you 06:15





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mentioned, correct? 06:15

MR. YANG: Hold on. Objection. Just wait for her to finish the question.

(Reporter clarification.)

THE WITNESS: Can you repeat, please, the question. 06:15

BY MS. ZHONG:

Q. It's a company named eMagin.

The eMagin patents you mentioned did not disclose the use of inkjet printing to apply the organic layer; is that correct? 06:15

MR. YANG: Objection.

THE WITNESS: I don't remember very well, but I remember that they did some kind of an organic layer with using masks or other techniques. I don't remember what they claimed exactly. 06:16

BY MS. ZHONG:

Q. No inkjet printing technology as far as you recall, correct? 06:16

A. I don't remember.

MR. YANG: Objection.

BY MS. ZHONG:

Q. You don't recall reference to any 06:16





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inkjet printing technology, correct? 06:16

MR. YANG: Objection.

THE WITNESS: I don't remember what exactly they claimed for this area of coating. I know there is an organic deposition there but 06:16 I don't know how they did it.

BY MS. ZHONG:

Q. And as far as you know, the inkjet printing of the organic layer is a method of choice in today's commercial process for making 06:17 thin film encapsulation for OLEDs; is that correct?

MR. YANG: Objection.

THE WITNESS: I know how Kateeva does it. There is another big manufacturer that 06:17 doesn't do inkjet printing, a well-known company, but I cannot compare the two. I don't know.

BY MS. ZHONG:

Q. Which manufacturer does not do inkjet 06:17 printing of the thin film encapsulation?

A. There are quite a lot of people, actually, that are doing thin film encapsulation. There are a couple of Korean companies, just to name a few, Doosoo (ph) does 06:17





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inorganic deposition. Applied Materials is doing inorganic deposition. They also have done the organic deposition without using inkjet printing. I don't know what they're doing today. And there are some chemical companies that they sell the organic stuff but I don't know how they put them down. 06:18 06:18

Q. Are those for OLEDs?

A. OLEDs, OLEDs, yes.

Q. Applied Materials is making display materials? 06:18

A. Applied Materials is one of the major suppliers for thin film transistors, and they are a major supplier for the inorganic field.

Q. Is applied materials a major supplier for the materials used in the thin film encapsulations for the OLEDs? 06:18

A. They have a strong position, I believe, on the nitride deposition.

Q. But not for the organic layers? 06:19

A. In the past, I think they had a tool in this area.

Q. But they are no longer a major supplier for the tool for the organic layer deposition; is that correct? 06:19





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MR. YANG: Objection. 06:19

THE WITNESS: I don't know -- I don't know what capacity they have. I have heard presentations, I've heard them talking about this, but I don't know their engagement in the 06:19 marketplace.

BY MS. ZHONG:

Q. So for the major OLED display panel suppliers, do you know how they are performing the thin film encapsulation, especially for the 06:20 organic layers?

MR. YANG: Objection.

THE WITNESS: I don't have information from all the major suppliers. When I was with Kateeva I know we were very busy 06:20 selling these inkjet printers for depositing the organic layer.

BY MS. ZHONG:

Q. And do you know which companies adopted that technology? 06:20

MR. YANG: Objection.

THE WITNESS: I don't know all the details.

BY MS. ZHONG:

Q. When you reviewed the Pictiva 06:20





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patents, you reviewed primarily the examples disclosed in those patents, correct? 06:22

MR. YANG: Objection.

THE WITNESS: I read the patents and I -- just for me to better understand what they were describing in there and trying to see if some of these ideas there have been disclosed before. 06:22

BY MS. ZHONG:

Q. Were you examining the claims or were you examining the examples? 06:22

MR. YANG: Objection.

THE WITNESS: I would read in general the topic and the field of use just for me to get familiar with the technology behind it. I read the whole thing. 06:22

BY MS. ZHONG:

Q. Did you examine Samsung's accused products?

A. I don't know all the details there. I'm not very familiar with this question. 06:23

Q. Okay.

A. I didn't know specifically which products have been silenced. I don't know that. I saw Samsung as a whole. 06:23





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Q. Do you know which products are at issue in this case? 06:23

A. No. I thought all of them, but I'm not sure.

Q. Okay. It was known in 2006 and 2007 to Dr. Krummacher that the color conversion layer can be a quantum dot layer, correct? 06:23

MR. YANG: Objection.

THE WITNESS: If I recall from this morning, you showed me a paragraph where we list all classes of light emitters. Not specifically quantum dots. We basically took a swath of everything. 06:24

BY MS. ZHONG:

Q. So that was a knowledge that Dr. Krummacher had, correct? 06:24

MR. YANG: Objection.

BY MS. ZHONG:

Q. So the use of quantum dot as a color conversion layer, that was knowledge that Dr. Krummacher had in 2006 and 2007, correct? 06:25

MR. YANG: Objection.

THE WITNESS: We wrote this patent -- this patent was executed in terms of the writing, the details a little bit later after I 06:25





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left. We were proposing at the beginning phosphors. So I don't know the details of the filings. There are many continuations of this patent that continued after I left. But most of them, they're evolving around phosphors. 06:25

BY MS. ZHONG:

Q. The quantum dots was mentioned?

A. As you shared with me in the description, it was mentioned, yeah. But also organic materials were mentioned and other -- everything in the literature that absorbs lights and emits light was mentioned as a way of including everything. 06:25

Q. And did you know whether eMagin actually carried out their -- the use of a mask in depositing thin film encapsulations? 06:26

A. I don't know how imagine does thin film encapsulation, but in their thin film encapsulation patents, they described structures where the metallic lines are not coated by thin film encapsulation. I don't remember very well, but I think they are -- I don't remember. I need to review this. I think they are proposing some kind of a masking scheme. There's no other way of doing the organic layer. This is 06:26 06:27





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standard part.

MR. YANG: Annita, I think we're just coming up on seven hours so I'll be ending the -- approaching the end of the deposition time.

MS. ZHONG: Okay. Understood. Even though he was supposed to be offered as both -- separately as a fact witness and expert witness, you understand that, right?

MR. YANG: Fair enough. I understand your position. I'm just pointing out that seven hours is approaching.

MS. ZHONG: I understand that.

THE WITNESS: I think I got a good dose of fact questions today. I don't know. I'm not an expert.

MR. YANG: Homer, you're not being asked questions.

BY MS. ZHONG:

Q. Do you consider yourself to be an expert?

A. Expert in OLEDs, yes.

Q. Okay. In which area of OLEDs do you consider yourself to be an expert?

A. Mostly in the fabrication of the OLED





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technology, more so than the electronics, more so than the firmware downstream. 06:28

Q. You don't consider yourself to be an expert in OLED organic material selection, correct? 06:28

MR. YANG: Objection.

THE WITNESS: I have some experience in this area, but I'm not a chemist. I approach all this from the physics point of view.

BY MS. ZHONG: 06:29

Q. Do you consider -- have you actually designed OLED organic materials?

A. No. I have not done -- I have not designed organic materials but I've asked others to design them for me, but I didn't tell them how to do it. 06:29

Q. So you basically just provided the performance criteria and hope that others will be able to hit those performance criteria?

A. Partially, but also I would tell them to change some of their electrical properties to facilitate certain functions. 06:29

Q. So -- but you have -- have you ever suggested what particular additives to use and what chemicals to use? 06:30





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A. During my experience at -- early days with Hewlett-Packard Labs, we would work with chemists and I would ask them to modify the electronegativity or the electropositivity of the molecular structures either in small molecules or in polymers, and the chemist will go and do it and give me samples. 06:30 06:30

Q. But you are not the person who is going to be suggesting the chemical structures of the materials, correct? 06:30

A. I'm not a synthetic chemist. I would say I would like to have a hole-transport layer that has an ionization potential of this versus that. Can you do this thing for us?

Q. Do you consider yourself to be an expert in the chemistry of the OLED stack? 06:31

A. I understand the physical functions and the physical properties of the hole-injection layer, the hole-transporting layer, they're -- all the interfaces are playing, both electronically as well as photonically. 06:31

In other words, from the point of view of electron transport, I understand that because that was my expertise when I was working 06:32





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earlier on in my career. Photonically, in other words how the photons are emitted, I understand this process too. But how is this related to chemistry I'm not considered an expert in this area. I understand it and I can converse it but I'm not an expert. 06:32 06:32

Q. Do you consider yourself to be an expert in the structural requirements of the organic material in order to meet certain performance requirements? 06:32

A. Sorry. I missed one word, the structure of --

Q. Do you consider yourself to be an expert in the structural requirements of the organic materials in order to meet certain performance criteria? 06:32

A. In some cases. I mean, I understand that the -- for instance, the lithium quinolate cannot transport holes by itself, right? I can argue why crystallinity could be positive or negative to the structure, the relation between the energetic levels, the electron affinity and the ionization potential and the role they're playing. I understand these things, the work functions for the metals and the relation to 06:32 06:33





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injecting electrons or injecting holes. I understand these things. 06:33

That was part of my expertise in my earlier on career. But also besides that, I'm also an expert of how you put the whole display together in manufacturing line. 06:33

Q. Are you an expert in the -- the type of organic moieties that's needed in order to increase or decrease crystallinity transport properties and others? 06:33

A. You know, some of those things everybody knows. The more planar the molecule is, the higher the propensity for crystallinity and adding long chains, alkyls and the like introduce visibility and amorphous behavior. Adding, you know, active moieties like amines and the like facilitate -- or carboxyl units facilitate hole transport, where adding diazoles and the like are facilitating electron transport and emission. 06:34 06:34

But, you know, in truth I'm not really -- I've learned this thing by osmosis, by working with the chemists over the years. So when I look at a compound, I will tell you, oh, that's a hole-transporting material or that's an 06:34





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electron-transporting material, but there is a huge class of materials that is hard to tell what they can do. So I cannot opine on everything. 06:34

Q. So would you consider yourself to be an expert in the chemistry of OLED? 06:35

A. In the chemistry of OLEDs, no, I'm not an expert in the chemistry of OLEDs, but I know a lot of stuff there. But I'm not an expert. 06:35

Q. And to be clear, for your expert report you only reviewed the documents that's given to you by counsel, correct?

MR. YANG: Objection.

THE WITNESS: I reviewed the documents that were given to me. How I organized it and how I compiled it probably had to do a little bit with my previous knowledge in relation to how Samsung evolved -- Samsung has published a lot of information. So I had a slight bias on this. 06:36

BY MS. ZHONG:

Q. You did not talk to any of the Samsung engineers?

A. No. 06:36





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Q. You did not ask for any additional documents? 06:36

A. No. I think you asked me this earlier this morning.

Q. I just want to confirm. 06:36

A. Yeah.

Q. And you did not check to see -- you did not ask for the process documents that relate specifically to the accused products and process? 06:37

MR. YANG: Objection.

THE WITNESS: I have only seen these documents that they have to do with the process -- I have not seen other documents from Samsung. 06:37

BY MS. ZHONG:

Q. And you have not made any quantitative determination in your report as to how each of the process features would affect the color gamut efficiency or lifetime, correct? 06:37

MR. YANG: Objection.

THE WITNESS: There is a little bit of quantitative analysis [redacted]

[redacted]

[redacted]k 06:38





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[redacted]

BY MS. ZHONG:

Q. So, first of all, your report does not provide a number as to the percentage of improvement?

A. Correct. Yes. In that sense, I agree. This analysis is not really quantitative. It's obviously more qualitative and less quantitative, but it talks about the [redacted] enabled, [redacted].

For instance, I know that inkjet printing today cannot even come close to 300 for -- this is for RGB coating, right. But [redacted]





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[redacted] do this, and that's one of the main reasons that this technology is ahead of inkjet printing. That's quantitative, right. But, again, I'm not an expert on [redacted] technology. It's just I'm impressed with the way that they're -- they have perfected this. 06:39 06:39

Q. And we have established that the RGB [redacted] does not apply to the QD-OLED TVs or monitors, correct?

A. Well, I think what I said earlier is how -- I'm pretty sure [redacted] are used in putting down the organic layers. What degree of [redacted] is used or not used, I don't know. This thing was not disclosed to me. 06:40 06:40

Q. Okay. The QD-OLED TV do not use [redacted], correct?

A. I don't know -- it's a different technology than the [redacted] that that is used in mobile phones. 06:40

Q. And you have no evidence that the [redacted] you have discussed in your report is used in the QD-OLED technology, correct?

A. Such information was not disclosed to 06:41





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me.

MS. ZHONG: Okay. How much time do we have on the record right now?

THE VIDEOGRAPHER: One moment.

We are at seven hours and 13 minutes.

MS. ZHONG: I will pass the witness.

MR. YANG: No questions for me. Thank you for your time.

THE WITNESS: Thank you.

MS. ZHONG: Thank you. Have a nice evening.

THE VIDEOGRAPHER: Let me get you off the record. This will conclude the deposition of Homer Antoniadis, PhD. The total number of media units used in the deposition was six and will be retained by Veritext Legal Solutions. We are off the record at 6:42 p.m. Pacific Daylight Time.

(Whereupon, the proceedings concluded at 6:42 p.m.)

* * * * *





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CERTIFICATE OF REPORTER

STATE OF CALIFORNIA )
) SS:
COUNTY OF LOS ANGELES )

I, Monice K. Campbell, a duly commissioned and licensed court reporter, Los Angeles County, State of California, do hereby certify: That I reported the taking of the deposition of the witness, Homer Antoniadis, PhD, commencing on Wednesday, June 4, 2025, at 9:18 a.m.;

That prior to being examined, the witness was, by me, duly sworn to testify to the truth. That I thereafter transcribed my said shorthand notes into typewriting and that the typewritten transcript of said deposition is a complete, true, and accurate transcription of said shorthand notes.

I further certify that I am in no way related to any of the parties, nor am I in any way interested in the outcome thereof.

( ) Review and signature was requested.

( ) Review and signature was waived.

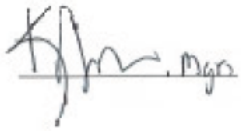
(X) Review and signature was not requested.





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IN WITNESS THEREOF, I have hereunto set my hand in my office in the County of Los Angeles, State of California, this 10th day of June, 2025.



Monice K. Campbell, CCR No. 14171





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HONG (ANNITA) ZHONG, ESQ.
hzhong@irell.com

June 10, 2025

RE: Pictiva Displays International LTD v.
Samsung Electronics Co., Ltd., Et Al.
6/4/2025, Homer Antoniadis, PhD, (#7353095).
The above-referenced transcript has been
completed by Veritext Legal Solutions and
review of the transcript is being handled as follows:

__ Per CA State Code (CCP 2025.520 (a)-(e)) – Contact Veritext to schedule a time to review the original transcript at a Veritext office.

__ Per CA State Code (CCP 2025.520 (a)-(e)) – Locked .PDF Transcript - The witness should review the transcript and make any necessary corrections on the errata pages included below, notating the page and line number of the corrections. The witness should then sign and date the errata and penalty of perjury pages and return the completed pages to all appearing counsel within the period of time determined at the deposition or provided by the Code of Civil Procedure. Contact Veritext when the sealed original is required.

__ Waiving the CA Code of Civil Procedure per Stipulation of Counsel - Original transcript to be released for signature as determined at the deposition.

__ Signature Waived – Reading & Signature was waived at the time of the deposition.





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__ Federal R&S Requested (FRCP 30(e)(1)(B)) – Locked .PDF Transcript - The witness should review the transcript and make any necessary corrections on the errata pages included below, notating the page and line number of the corrections. The witness should then sign and date the errata and penalty of perjury pages and return the completed pages to all appearing counsel within the period of time determined at the deposition or provided by the Federal Rules.

_X_Federal R&S Not Requested - Reading & Signature was not requested before the completion of the deposition.





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Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

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VERITEXT LEGAL SOLUTIONS

COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

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