多功能电子束检测装备



- 成立于2014年2月,2014年12月在亦庄经海产业园揭牌
- 团队主要来自汉民和KLA-Tencor等半导体装备公司,落户亦庄
- 具有 完成首台国产多功能电子束图形检测系统的系统集成,

CDSEM/Inspection功能,预计2018年6月进入客户验证阶段

客户进行产线测试的商谈

- 完成了自主研发的高速高精度电子光学系统(EOS),达到国际先进水平
- 获得2017年浸没式光刻机研发的02专项课题
- 正在申请2018年电子束检测系统02专项(定向申请单位)
- 装备是芯片制造产业链中最为盈利的行业,检测装备的预计市场将达年100 亿美元,潜力巨大

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子束检测技术的市场前景





已达整个检测和 2016年电子東产品,

2020年

in process control

E-beam penetration

E-beam gaining share in wafer inspection

US\$mn

2,500

2,000

测量市场的43%

其它半导体领域: 126亿人民 包括非半导体: 203亿人民币 缺陷检测60亿人民币

40%

30%

20%

10%

%0

S0S0E

2019E

2018E

2017E

2016E

2015E

2014

2013

2012

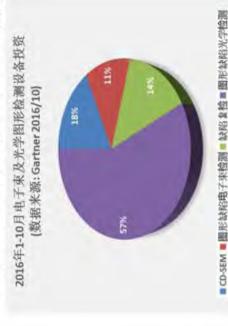
2011

2010

Optical Patterned Wafer Inspection

E-Beam Patterned Wafer Inspection -EBI as % of wafer inspection market

EBI/CDSEM/ReviewSEM合计



Source: Gartner

每年200亿元人民币

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000'1

1,500

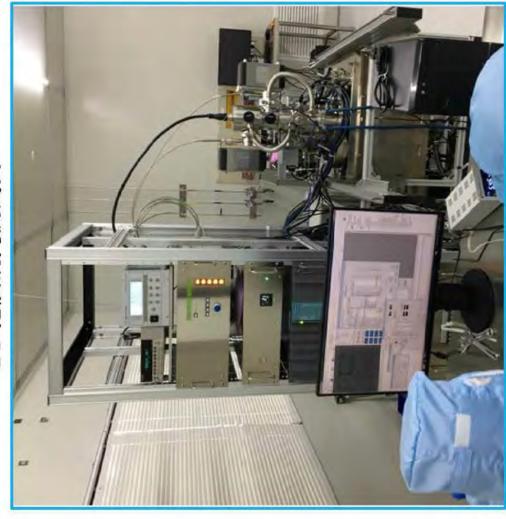
自主研发电子束成像 (EOS)系统







电子枪及镜筒测试台



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集成电路制造中检测设备的市场需求



• Gartner (2017年3月)

集成电路前端工艺生产设备2016年投资362亿美元

工艺检测设备2016年投资近47亿美元,约为前端工艺生产设备的13%

随着自动化程度的提高,参照其他成熟产业,预计检测设备将达到设备总投 入的约30%,可望近100亿美元的市场



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- 成立于2014年1月, 位于美国硅谷
- 核心研发团队来自ASML/Brion和新思、Mentor等,位于美国 硅谷
- 提供20纳米以下集成电路掩模优化设计的大型商业软件

国际先进水平,性能优于该领域主流公司的同类产品

- 核心的fullChip ILT技术具有世界领先水平
- 本产品应用市场规模在年4-5亿美元以上
- 团队被世界第一的芯片供应商选为10 nm及以下制程OPC/RET 的首选技术提供者

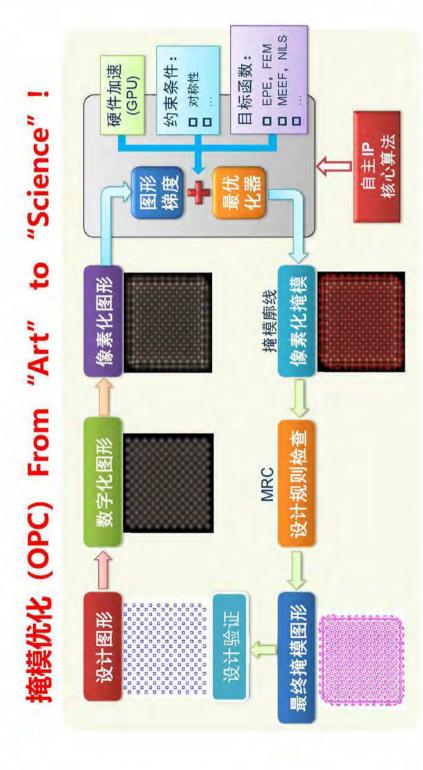
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XTAL核心技术



首次使全芯片反向光刻(ILT)实用化, 产品受到世界第一的芯片制造商的重视

站在本领域世界的最前沿



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美国 BCS 公司



成立2014年,美国硅谷和德克萨斯州, 技术团队主要来自TI等公司

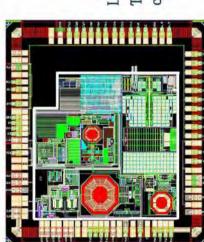
提供高速超低功耗模拟IP核以及物联网芯片设计核心技术,应用领域NB-IOT

和Halow等物联网芯片设计

掌握高速ADC/DAC设计的核心技术

用户: ARM、SONY和LG等

随着物联网的普及,市场规模巨大



Total Rx current of 18.3mA and Tx current of 22mA at max power LTE Cat NB-IOT Transceiver

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国Avatar公司

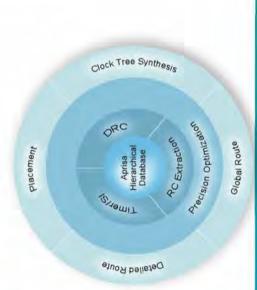


- 成立于2017年6月,于美国硅谷
- 原Atoptech的团队、产品和客户
- EDA工具供应商, P&R工具拥有和主流的新思科技等竞争的能力,

积电的reference flow

三星等

EDA的总体市场达年60亿







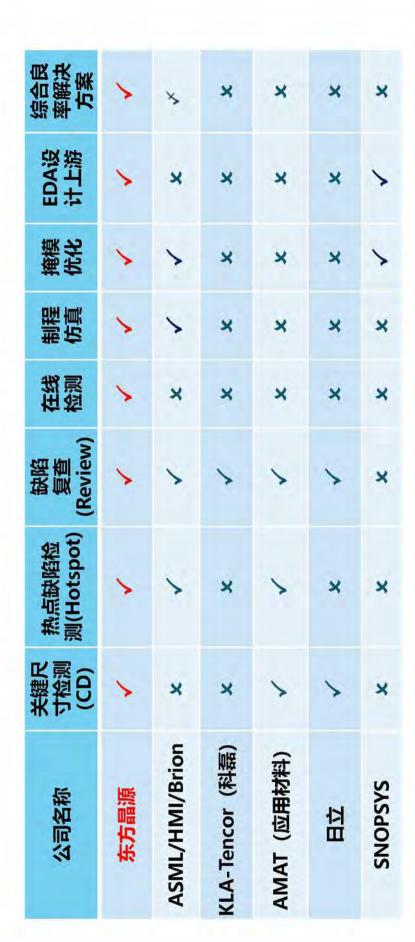
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HIGHLY CONFIDENTIAL XTAL00277787

竞争对手分析



目标:提供完整的芯片制造前端检测和优化解决方案, 功能和成套是我们的特点和创新

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1. 公司和团队介绍

2. 行业发展趋势

・核の下品を出わり

心结的異效力聚

大約

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东方晶源合并财务预测



单位: 万元

项 目	2017	2018	2019	2020	2021	小计
人 小 主营业务	6,800.00	15,833.80	23, 568.80	34, 567, 80	60, 257, 52	141, 327, 92
域:主营业务成本	5, 232.67	6, 238, 15	7,430.50	9,314,40	18,974.17	47, 189, 89
主营业务税金及附)	00.00	1,413,72	2, 368, 94	3,973.70	6, 577, 56	14, 633, 93
三、主营业务利润	1, 567, 33	8, 181, 93	13, 769, 36	21, 279, 69	34, 405, 79	79, 204, 10
加:其他业务利润			F 10 10 10 10 10 10 10 10 10 10 10 10 10			
田華 不 草:)	2, 276, 32	4, 461.01	4,852.06	5,369,43	5, 990, 27	22, 549, 09
管理费用	887.13	937.79	985,00	1,086.98	1,204.61	5, 111, 52
财务费用	720.00	920,30	1,040,00	828, 52	254, 19	3, 752, 71
资产减值损失						
三、营业利润	2, 316, 12	1,863,13	6,892.29	13, 994, 76	26, 956, 72	47, 390, 78
加:投资收益						0.00
外 那件						0,00
营业外收入						0.00
减: 营业外支出						00'00
四、利润总额	2, 316, 12	1,863,13	6, 892, 29	13, 994, 76	26, 956, 72	47, 390, 78
减: 所得税 (25%)	00.00	465,78	1,723.07	3,498.69	6, 739, 18	12, 426, 73
五、净利组	2,316,12	1,397.35	5, 169, 22	10, 496, 07	20, 217, 54	34, 564, 06

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5亿人民币

吸引 用途:

场拓展等

PO或引入新的投资方

2020年-2022年

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- 司的联合,致力于提供制程检测、优化和良率提升的成套装备和系统解决 东方晶源立足于纳米级检测和数据优化两大核心技术,通过关联或伙伴公 方案
- 公司已初步完成了具有国际领先水平的技术、产品和人才布局
- 管理团队,在过去的4年期间积累了引进高端人才的丰富经验并形成了快 东方晶源打造的亦庄-硅谷的事业平台,吸引了完整的国际化一流技术和 凍漏道
- 硅谷的XTAL公司和PCS已实现盈利,预计于2018年实现公司总体盈利并 高速增长;目标是在3-5年内实现公司全体上市
- 感谢领导的支持,也欢迎国内外的资金参与,共同实现公司的快速发展和 成果分享

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Chip Manufacturing Yield Improvement Technology and Series Products Dongfang Jingyuan Electron (Beijing) Company Limited

January 13, 2018

HIGHLY CONFIDENTIAL

XTAL00277764

TR EX 1554B.0002 DJEL

Outline

- 1. An introduction of the company and team
- 2. Industry development trend
- 3. Core products and market
- 4. Economic return projections
- 5. Summary and financing plan

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XTAL00277765

An Introduction of the Company

Product directions:

- Nanoscale inspection equipment and related software and hardware products
- Lithography and process modeling optimization series products

Company interview:

- Set up by an expatriate team and headquartered in Yizhuang, Beijing, with affiliates at locations including the Silicon Valley of the United States
- Has undertaken research and development subjects such as Ministry of Science and Technology 2017 lithography special project 02
- Is the Ministry of Science and Technology 2018 electronic beam inspection special project 02 targeted application unit

United States branch Headquarters in

Beijing, China

Japanese branch

Shenzhen branch

Headquarters building (Yizhuang, Beijing)

Beijing headquarters in Yizhuang

The Silicon Valley branch, San Jose,

United States

The company has a registered capital of 200 million yuan RMB. The investor is one of the top 500 enterprises in China (200th) – China Orient Group (a company publicly listed in Hong Kong, code HK: 00581)

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The Development Path and Technical Deployment of the Company

2013	2012
Set up YieldSphere and together with	Proposed process optimization + CD –
Hitachi market, researched and Nvidia,	SEM yield solution to Hitachi for the first
Qualcomm, Samsung, TSMC and GSC,	time
etc.	
2015	2014
Received more than 30 million US Dollars	Set up Dongfang Jingyuan (Beijing) and
of products sales contracts and was	XTAL United States and created an
involved in making arrangements overseas	internationalized team
in core IP business	
2017	2016
Set up Zhongke Jingyuan as a joint venture	Completed preliminary research and
with Institute of Microelectronics Chinese	development of key technologies, including
Academy of Sciences, to focus on the	electronic beam and process optimization,
research and production of nanoscale	etc. and formed core intellectual property
electronic beam inspection systems	rights
2018	Received 02 Special Project Support from
Completed product sales of electronic	the Ministry of Science and Technology
beam inspection equipment and	(research and development of immersion
lithography, and sought merger and	lithography computational lithography and
acquisition opportunities to achieve	completed acquisition and merger of EDA
product supplies of whole sets of	Company and Avatar overseas
technology	

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XTAL00277767

Dongfang Jingyuan's Independently Controlled Key Technology Deployment

Chip product definitions

Chip product definitions	DCC (ID) 1 1 ID 17
System indexes	PCS (IP core): simulates IP and Internet of
	things chip designs and became an
	international technology leader in
	simulation IP
	Existing customers: ARM, Samsung,
	Toshiba and Sony, etc.
Architecture designs	
Logical function designs	Avatar (P&R, controlled by Dongfang
	Jingyuan): Physical designs, P&R,
	technologies and products that compete for
	new ideas internationally
	Existing customers: 14, including Samsung
Circuit designs	
Physical designs	
Physical demonstrations	XTAL (OPC/RET, controlled by Dongfang
	Jingyuan): The team was selected as the
	preferred OPC technology provider for
	Samsung 10 nm and below
Mask manufacturing	
Wafer manufacturing	Dongfang Jingyuan (electronic beam
Packaging test	inspection equipment, manufacturing
	process modeling and optimization):
	calculation lithography software tools,
	SEPA series of electronic beam graphic
	inspection systems
	I

Finished Products

The technologies and products of the company that are being deployed are being demonstrated and applied in the development and production of the most leading-edge products

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Dongfang Jingyuan's structure and international deployment

Dongfang Jingyuan (Yizhuang, Beijing) Has already undertaken special project 02 (research and development of immersion lithography)

Controls 90%	2018 electronic beam inspection special project 02 targeted application unit		Indirectly controls ~70%	Indirectly controls 100%	Largest shareholder ~27%	
Zhongke Jingyu		XTAL (United	States	Avatar (origina (United States)	PCS (United St	ates)
Participated in stocks Institute of Mic		participated in 3 stocks Samsung Ventu				

Based in Yizhuang, connected to the Silicon Valley and looking at the world!

Global integration of technologies, talents, market and funds!

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Company founder and general manager Zongchang Yu

- Doctorate degree from the Department of Mechanical Engineering, Harbin Institute of Technology
- Dongfang Jingyuan: Company founder, director and general manager
- XTAL of the United States: Founder, director and CEO
- Avatar IS of the United States: Founder, director and CEO
- PCS Company of the United States: Acting director
- More than 20 years of experience in integrated circuit technologies and management, major work experience
- ASML/Brion, Senior product research and development manager, manager, worldwide application support, lithography optimization and computational lithography product research and development and technical support
- KLA-Tencor, senior design engineer, group leader, participated in wafer and mask inspection equipment research and development and technical support
- ULVAC (Japan, semiconductor manufacturing equipment), senior design engineer, participated in research and development of critical manufacturing process dimension inspection equipment
- 6 United States patents, with 17 patents pending
- New startup project in 2017, also recipient of Kirin Talent prize

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Company founder and technical director Li Jiangwei

- Doctorate degree from the Department of Mechanical Engineering, Stanford University of the United States
- Dongfang Jingyuan: Company cofounder, director and technical director
- XTAL of the United States: Cofounder and CTO
- Avatar IS of the United States: Cofounder, director and technical consultant
- More than 20 years of experience in first-hand product research and development and team management, is familiar with the development of large distributed business software systems, online massive data processing, highly efficient graphic engine and large parallel optimization algorithms
- Major work experience
- ASML, research and development director, responsible for the architectural design of Brion computational lithography products
- Synopsys: Synopsys is the largest EDA company in the world. Senior research and development engineer
- TMA Inc.: Provided TCAD (semiconductor manufacturing process computer aided design), for use in the simulation and optimization of semiconductor component and manufacturing process. Senior research and development engineer
- Avanti Corp.: Developed and commercialized full chip optic correction products based on physical models for the first time. The product was adopted by Intel and became an industry standard
- Major results:
- Products developed and widely applied: Lithography simulation and demonstration software, optical correction software, resolution enhancement technologies and software and lithography optimization software, etc.
- Chief expert judge of state 863 big data of China

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Dongfang Jingyuan's Team Competition Other: 15% Doctorate degrees: 40%

Masters degrees: 45%

Yizhuang team: 45% of the technical team have overseas work and study experience

- The Silicon Valley Yizhuang career platforms built by Dongfang Jingyuan have attracted a complete first class internationalized technical and management team and accumulated high end talent
- The core team consists of senior members from various industries and has witnessed the entire research and development process from 500 nm to 5 nm
- Currently, XTAL Company of the United States has 40 persons, PCS Company has about 30 persons, Avatar Company has 100 persons and the Dongfang Jingyuan (Beijing and Shenzhen) expatriate team has more than 20 persons
- Through this platform, support and services are provided from around the world for Dongfang Jingyuan in Yizhuang, resulting in synchronized development with the latest technologies in the world

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Major Experience of Team Members

Company name	Products participated in
ASML	OPC/LMC/SMO/modeling, lithography optimization, matching
	and projection objective lens heat control technology
HMI Hermes	Electronic beam defect inspection system (EDI), SuperVona
Microvision	data processing platform and algorithms
KLA-Tencor	Inspection learning equipment: 23XX wafer bright field defect
	inspection, AIT wafer dark field defect inspection, Klarity,
	Prolith Starlight, TeraScan, 5XX series products
NuFlare	6000 – 9000 series electronic beam mask direct writing system
Hitachi Technology	CDSEM/ReviewSEM
Synopsys	Computational lithography software tools, including OPC/RET,
Mentor	etc.
Graphics	

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XTAL00277773

TR EX 1554B.0011 DJEL

Outline

- 1. An introduction of the company and team
- 2. Industry development trend
- 3. Core products and market
- 4. Economic return projections
- 5. Summary and financing plan

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XTAL00277774

An Extended Research and Development Cycle and Increased Cost Separation of design firm and foundry

Trend • Separation of design firm and foundr Challenge A long research and development cycle

• Chip diversification — Manufacturing process research,

development and optimization

– Mask version change (# of tapeout)

Foundry Manufacturing Manufacturing process Trial production Mass

process test production

development (HVM)
PDK Test OPC OPC
graphics

SPICE Manufacturing process hot spot mask V1
Design firm Chip design Experimental mask V1
Design Gff Chip performance

Design firm Chip design Design Sign Off Chip performance Low yield demonstration analysis analysis

Design and demonstration Low performance Low yield analysis

analysis

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XTAL00277775

Technology and product development trend Integrated solutions Chip product definitions

System indexes	2009: ASML proposed the concept of holistic lithography for the first time;
Architecture designs	2014: Optic inspection was introduced, which deepened research and
_	development of holistic lithography
Logical function designs	2016: Acquired HMI Hermes Microvision for 3.1 billion US Dollars and
	introduced electronic beam inspection in its products;
Circuit designs	2017: Joined EDA developer Cadence to extend into a greater range
Physical designs	
Physical demonstrations	Joined Cadence upstream
Mask manufacturing	Acquired HMI Hermes Microvision downstream
Wafer manufacturing	
Packaging test	

Finished Products

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TR EX 1554B.0014 DJEL

Dongfang Jingyuan Is Dedicated to an Integrated Yield Solution

DPU (Hybrid Computing Platform)

Manufacturing process modeling, simulation and automatic optimization Production

Lithography Etcher

User interface

(GUI) Inspection

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XTAL00277777

TR EX 1554B.0015 DJEL

Outline

- 1. An introduction of the company and team
- 2. Industry development trend
- 3. Core products and market
- 4. Economic return projections
- 5. Summary and financing plan

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XTAL00277778

Research, Development and Sales of Multifunctional Electronic Beam Inspection Equipment

- Set up in February 2014 and unveiled at Yizhuang Jinghai Industrial Park in December 2014
- The team has mainly come from semiconductor equipment companies including HMI and KLA-Tencor and has settled down in Yizhuang
- We have completed system integration of the first domestically made multifunctional electronic beam graphic inspection system, which has CDSEM/Inspection functions. It is expected to enter the customer demonstration stage in June 2018. We have conducted production line testing negotiations with the relevant customers
- We have completed independently developed high-speed, high precision electronic optical system (EOS), which has reached an advanced international level
- We have received special 02 project subject for 2017 immersion lithography research and development
- We are applying for 2018 electronic beam inspection system special 02 project (a targeted application unit)
- Equipment is the most profitable industry in chip manufacturing industry chain. The projected market for inspection equipment will reach 10 billion US Dollars annually, with a huge potential

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Market Prospects for Electronic Beam Inspection Technologies

- 2016 electronic beam products, which have reached 43% of the entire inspection and measurement market
- 2020
- Defect inspection 6 billion RMB
- Other non-semiconductor fields: 12.6 billion yuan RMB
- Including non-semiconductors: 20.3 billion yuan RMB

EDI/CDSEM/ReviewSEM total

Investments in electronic beam and optic graphic inspection equipment between January and October 2016

(Source: Gartner 2016/10)

■ CD – SEM ■Graphic defect electronic beam inspection ■ Defect a re-inspection ■ Graphic defect optic inspection

Total volume of markets related to electronic beam technology: 20 billion yuan RMB per annum

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TR EX 1554B.0018 DJEL

Independently Developed Electronic Beam Imaging (EOS) System

Electronic gun and barrel test platform Electronic gun

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XTAL00277781

Market Demand for Inspection Equipment in Electronic Circuit Manufacturing

- Gartner (March 2017:
- Invested 36.2 billion US Dollars in front end integrated circuit process and production equipment in 2016
- Invested nearly 4.7 billion US Dollars in process inspection equipment in 2016, approximately accounting for 13% of the front end process and production equipment
- With a rising level of automation and with reference to other mature industries, it is expected that inspection equipment will reach approximately 30% of the total equipment input and is expected to become a market of nearly 10 billion US Dollars

Semiconductor manufacturing process	IC design and mask manufacturing	Oxidation	Lamination	Possible target market: 10 billion US Dollars/year
Test Possibility test Finished product inspections	Semiconductor ins	pections	Lithography	Front end process If the return on emerging markets for manufacturing process optimization
Packaging			Etching	is considered, the target market will
Cutting	Protest	Metal layer	Injection	be even larger

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XTAL00277782

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XTAL Company of the United States

- Set up in January 2014 and located in the Silicon Valley of the United States
- The core research and development team came from ASML/Brion and Synopsys and Mentor, etc. and is located in the Silicon Valley of the United States
- Provides large commercial software for optimized designs of integrated circuit masks under 20 nm, has an internationally advanced level and the performance is better than similar products of mainstream companies in the field
- The core fullChip ILT technology is at a leading level of the world
- The application market scale of this product is more than 400 million 500 million US Dollars a year
- The team has been selected as the preferred technology provider by the number 1 chip supplier for OPT/RET manufacturing process 10 nm and under

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XTAL00277783

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XTAL's - Pigment-based Mask Optimization System

- Made inverse lithography technology (ILT) practical for the first time and standing at the leading edge in the world in this field!
- The product is taken seriously by the number 1 chip manufacturing in the world

Mask optimization (OPC) From "Art" to "Science!"

Design graphics Digital graphics Pigmented graphics Hardware acceleration (GPU)

Graphic gradient Limiting conditions:

□ Symmetry

Design Optimizer demonstration

MRC Mask profile
Final mask graphic Design rule Pigmented mask

Final mask graphic Design rule Pigmented mask inspection

Independent IT core algorithm

HIGHLY CONFIDENTIAL XTAL00277784

PCS Company of the United States

- Set up in 2014, in Silicon Valley and the State of Texas of the United States. The technical team mainly came from companies including TI, etc.
- Provides a high-speed, low consumption simulated IP core and Internet of things chip design core technology, applies Internet of things chip design such as NB IOT and Halow fields, etc.
- Possesses core technology for high-speed ADC/DAC designs
- Users: ARM, Sony and LG, etc.
- The market size is huge with popularization of Internet of things

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Avatar Company of the United States

- Set up in June 2017 in Silicon Valley of the United States
- Originally Atoptech team, products and customers
- EDA tool provider, P&R tools have the capability to compete with mainstream Synopsys Technology, etc. and have been selected as reference flow of TSMC for several years in a row
- Customers: Samsung and others
- The overall EDA market can reach 6 billion US Dollars a year

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A Competitive Analysis

Company name	Critical dimension inspections (CD)	Hot spot defect inspections (hot spot)	Defect review	Online inspection	Manufacturing process simulation	Mask optimization	EDA design upstream	Comprehensive yield solution
Dongfang Jingyuan	✓	>	✓	√	✓	→	✓	✓
ASML/ HMI/ Brion	×	>	√	×	✓	→	*	√
KLA- Tencor	×	×	√	×	×	×	×	×
AMAT (Applied Materials)	√	√	√	×	×	×	×	×
Hitachi	✓	×	✓	×	×	✓	✓	×
Synopsys	×	×	×	×	×	✓	✓	×

Objective: Provide a complete chip manufacturing front end inspection and optimization solution and a series of software and hardware products. Being multifunctional and in whole sets is our characteristics and innovation

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Outline

- 1. An introduction of the company and team
- 2. Industry development trend
- 3. Core products and market
- 4. Economic return projections
- 5. Summary and financing plan

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Consolidated Dongfang Jingyuan Financial Projections

Unit: in 10,000 yuan

Item	2017	2018	2019	2020	2021	Subtotal
I. Revenue from	2017	2010	2019	2020	2021	Buototai
main business						
Less: Cost of						
main business						
Main business						
taxes and						
surcharges						
II. Profit from						
main business						
Add: Other						
business profit						
Less: Operating						
expenses						
Management						
fees						
Financial						
expenses						
Asset						
impairment loss						
III. Operating						
profit						
Add:						
Investment gain						
Subsidy income						
Non-operating						
income Less: Non-		+				
operating						
expenditures						
IV. Total profit						
Less: Income		+				
tax (25%)						
V. Net profit						
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Outline

- 1. An introduction of the company and team
- 2. Industry development trend
- 3. Core products and market
- 4. Economic return projections
- 5. Summary and financing plan

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Financing Plan

• Scale of financing: 500 million yuan RMB

• Purpose: Attract high end talent, accelerate product research and development, scale of production and market development, etc.

• Exit mechanism: IPO or introduce new investors

• Exit date: 2020 – 2022

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Summary

- Dongfang Jingyuan is based on two major core technologies, including nanoscale inspection and data optimization and by joining affiliates or partner companies, is dedicated to providing whole sets of equipment and system solutions for manufacturing process inspections, optimization and yield improvement
- The company has initially completed technologies, products and talent deployments with an internationally leading level
- The Yizhuang Silicon Valley career platform built by Dongfang Jingyuan has attracted an internationalized first class technical and management team and in the past four years, has accumulated experience in attracting high end talent and has formed a rapid path
- XTAL Company in the Silicon Valley and PCS have achieved profitability. The company is expected to achieve its overall profitability and grow rapidly in 2018; the goal is to achieve overall public listing for the company within 3 to 5 years
- We are grateful to the leadership for its support and also welcome fund participation at home and abroad, to jointly achieve rapid development and results sharing of the company

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Thank You for Your Support!

An Optimization Company!

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