	Er ont Doc		N PAGE	Form Approved OMB No. 0704-0188
maintaining the data nei including suggestions to VA 22202-4302, and to	eded, and completing and review reducing this burden, to Wash the Office of Management and	I is estimated to average 1 hour pe wing the collection of information Whigton Headquarters Services, Ow Buchet Parannak Besting Collection	r response, including the time for review Send comments regarding this burden ectorate for information Operations and	ming instructions, searching existing data sources, gatherin estimate or any other aspect of this collection of informatic People. 1215 listing country of the collection of informatic
1. AGENCY USE (	ONLY (Leave Blank)	2. REPORT DATE 14 Jul 97	3. REPORT TYPE Toterim	AND DATES COVERED
4. TITLE AND SUE	BTITLE		2CCI IM	14 May 97 - 14 Jul 9
Optimization of Properties of a New Material for Electronic and Magnetic Applications				Contract N00014-97-C-0209
6. AUTHOR(S)				
Dr Dr	. Jack Olse . Steven Kin	n m		
7. PERFORMING C	RGANIZATION NAME	(S) AND ADDRESS(ES)		8 PED5021////2 02
50 Harrison Street				REPORT NUMBER
Hoboken, NJ 07030				
	, 10 0,050			SKI 0001
SPONSORING/M	ONITORING AGENCY	NAME(S) AND ADDRESS	S(ES)	
DCMC Springfield				AGENCY REPORT NUMBER
Bldg 1 ;	ARDEC			
Pleatin	ny, NJ 0708	36-5000		
. SUPPLEMENTAP	RY NOTES			
Ī_	DISTRIBUTION S	TATEMENT A		T20. DISTRIBUTION CODE
	DISTRIAUTION S Approved for p Distribution	TATEMENT <b>A</b> ublic release; Unlimited		120. DISTRIBUTION CODE
ABSTRACT (Maxir	DISTRI <sup>®</sup> UTION S Approved for pr Distribution num 200 words)	TATEMENT <b>A</b> ublic release; Unlimited		126. DISTRIBUTION CODE
ABSTRACT (Maxin The moleculi	DISTRIAUTION S Approved for pr Distribution num 200 words) ar beam epitaxy (	TATEMENT A ublic release; Unlimited MBE) system is be	ing prepared for the t	reparation of manganese
ABSTRACT (Maxin The moleculi arsenide/gall	DISTRIMUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr	MBE) system is be MAS/GaAs) composed	eing prepared for the prite films. The chamb	preparation of manganese per has been evaluated for
ABSTRACT (Maxin The molecular arsenide/gall quality of the	DISTRIAUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A pres	MBE) system is be ablic felectes; Unlimited MBE) system is be aAs/GaAs) composes soure in the 10 <sup>-8</sup> To	eing prepared for the prite films. The chamb	preparation of manganese per has been evaluated for within hours without
ABSTRACT (Maxing the molecular arsenide/gall quality of the bakeout. The bakeout.	DISTRIMUTION S Approved for pr Distribution mum 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all met	MBE) system is be assure in the 10 <sup>-8</sup> To tal valve connected	eing prepared for the prite films. The chamb fr range was obtained to the turbo pump w	preparation of manganese ber has been evaluated for within hours without ras found to leak through
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The the valve sea	DISTRIAUTION S Approved for p Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all met ting when the val	MBE) system is be nAs/GaAs) composes unlimited To tal valve connected ve was closed. Re	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made	preparation of manganese per has been evaluated for within hours without as found to leak through on the chamber and on the
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The the valve sea Boostivac ion	DISTRIMUTION S Approved for pr Distribution mum 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all met ting when the val n pump controller	MBE) system is be ablic release; Unlimited MBE) system is be aAs/GaAs) compose sure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re	eing prepared for the prite films. The chamb fir range was obtained to the turbo pump w pairs are being made	preparation of manganese per has been evaluated for within hours without ras found to leak through on the chamber and on the
ABSTRACT (Maxin The molecul arsenide/gall quality of the bakeout. The bakeout. The the valve sea Boostivac ion	DISTRIBUTION S Approved for p Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all menting when the val n pump controller	MBE) system is be nAs/GaAs) composes ssure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made	preparation of manganese ber has been evaluated for within hours without as found to leak through on the chamber and on the
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The the valve sea Boostivac ion Drawings hav Professor Tar	DISTRIBUTION S Approved for pr Distribution mum 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all me ting when the val n pump controller we been prepared margo has agreed	MBE) system is be an As/GaAs) composes sure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re- to provide access	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made the in the molecular be	preparation of manganese per has been evaluated for within hours without as found to leak through on the chamber and on the eam source.
ABSTRACT (Maxin The molecul arsenide/gall quality of the bakeout. The bakeout. The the valve sea Boostivac ion Drawings hav Professor Tan large are Mn	DISTRIBUTION S Approved for p Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all me ting when the val n pump controller we been prepared margo has agreed As/GaAs samples	MBE) system is be nAs/GaAs) composes ssure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re for the effusion cel to provide access to . The effusion cell	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made the in the molecular be to her commercial MI is are available for de	preparation of manganese ber has been evaluated for within hours without as found to leak through on the chamber and on the eam source. BE system to produce position and it will be
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The the valve sea Boostivac ion Drawings hav Professor Tan large are Mna possible to ex	DISTRIAUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all me ting when the val n pump controller we been prepared margo has agreed As/GaAs samples cactly reproduce t	MBE) system is ben As/GaAs) composisure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re- for the effusion cell to provide access to . The effusion cell he deposition cond	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made to her commercial MI is are available for dep itions of Rothberg an	preparation of manganese per has been evaluated for within hours without as found to leak through on the chamber and on the eam source. BE system to produce position and it will be d Harbison's work that
ABSTRACT (Maxin The molecul arsenide/gall quality of the bakeout. The bakeout. The the valve sea Boostivac ion Drawings hav Professor Tan large are Mn possible to ex was cited in t	DISTRIBUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all me ting when the val n pump controller we been prepared margo has agreed As/GaAs samples cactly reproduce t he SBIR proposa	MBE) system is be MBE) system is be As/GaAs) compose sure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re for the effusion cell to provide access to . The effusion cell he deposition cond l. SKION will util	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made is in the molecular be to her commercial MI is are available for dep titions of Rothberg an ize AES, RHEED and	preparation of manganese per has been evaluated for within hours without as found to leak through on the chamber and on the eam source. BE system to produce position and it will be d Harbison's work that t LEED to provide in situ
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The the valve sea Boostivac ion Drawings hav Professor Tan large are Mni possible to ex was cited in t analysis to es	DISTRIAUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all mer ting when the val n pump controller we been prepared margo has agreed As/GaAs samples cactly reproduce t he SBIR proposa tablish optimal gr	MBE) system is ben As/GaAs) composisure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re- for the effusion cell to provide access to . The effusion cell he deposition cond l. SKION will util rowth parameters.	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made to her commercial MI is are available for dep titions of Rothberg and tize AES, RHEED and	preparation of manganese ber has been evaluated for within hours without ras found to leak through on the chamber and on the eam source. BE system to produce position and it will be id Harbison's work that i LEED to provide in situ
ABSTRACT (Maxin The molecul arsenide/gall quality of the bakeout. The bakeout. The the valve sea Boostivac ion Drawings hav Professor Tar large are MnA possible to ex was cited in t analysis to es	DISTRIBUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all men ting when the val n pump controller we been prepared margo has agreed As/GaAs samples cactly reproduce t the SBIR proposa tablish optimal gr	MBE) system is be As/GaAs) compose sure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re for the effusion cell to provide access to The effusion cell he deposition cond 1. SKION will util rowth parameters.	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made is in the molecular be to her commercial MI is are available for dep titions of Rothberg an ize AES, RHEED and	preparation of manganese per has been evaluated for within hours without as found to leak through on the chamber and on the eam source. BE system to produce position and it will be d Harbison's work that I LEED to provide in situ
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The the valve sea Boostivac ion Drawings hav Professor Tan large are Mni possible to ex was cited in t analysis to es	DISTRIZUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all met ting when the val n pump controller we been prepared margo has agreed As/GaAs samples cactly reproduce t he SBIR proposa tablish optimal gr	MBE) system is be As/GaAs) compose sure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re- to provide access to The effusion cell he deposition cond l. SKION will util rowth parameters.	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made is in the molecular be to her commercial MI is are available for dep titions of Rothberg an ize AES, RHEED and ganese arsenide	preparation of manganese per has been evaluated for within hours without as found to leak through on the chamber and on the eam source. BE system to produce position and it will be ad Harbison's work that I LEED to provide in situ
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The bakeout. The the valve sea Boostivac ion Drawings hav Professor Tan large are Mn possible to ex was cited in t analysis to es UBJECT TERMS molecular bea gallium arsen	DISTRIBUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all me ting when the val n pump controller we been prepared margo has agreed As/GaAs samples cactly reproduce t the SBIR proposa tablish optimal gr am epitaxy ide	MBE) system is be As/GaAs) composed asymptotic for the effusion cell to provide access to the deposition cond stal value connected ve was closed. Reference to provide access to the effusion cell he deposition cond stal value connected to provide access to the deposition cond the deposition cond	eing prepared for the p tite films. The chamb rr range was obtained I to the turbo pump w pairs are being made Is in the molecular be to her commercial MI is are available for de titions of Rothberg an tize AES, RHEED and ganese arsenide tu analysis	preparation of manganese per has been evaluated for within hours without as found to leak through on the chamber and on the eam source. BE system to produce position and it will be ad Harbison's work that d LEED to provide in situ
ABSTRACT (Maxin The molecul arsenide/gall quality of the bakeout. The bakeout. The the valve sea Boostivac ion Drawings hav Professor Tar large are Mn. possible to ex was cited in t analysis to es UBJECT TERMS molecular bea gallium arsen	DISTRIAUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all men ting when the val n pump controller we been prepared margo has agreed As/GaAs samples tactly reproduce t the SBIR proposa tablish optimal gr am epitaxy ide FICATION 18. SECUE	MBE) system is be MBE) system is be As/GaAs) compose sure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Re to provide access to to provide access to provide access to to provide acces	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made is in the molecular be to her commercial MI is are available for dep titions of Rothberg an ize AES, RHEED and ganese arsenide tu analysis	Preparation of manganese per has been evaluated for within hours without ras found to leak through on the chamber and on the eam source. BE system to produce position and it will be the Harbison's work that d LEED to provide in situ 15. NUMBER OF PAGES 3 16. PRICE CODE ATION 20. LIMITATION OF ABSTRACT
ABSTRACT (Maxin The moleculi arsenide/gall quality of the bakeout. The bakeout. The the valve sea Boostivac ion Drawings hav Professor Tan large are MnA possible to ex was cited in t analysis to es UBJECT TERMS molecular bea gallium arsen	DISTRIZUTION S Approved for pr Distribution num 200 words) ar beam epitaxy ( ium arsenide (Mr e vacuum: A press e bakeable all me ting when the val n pump controller we been prepared margo has agreed As/GaAs samples cactly reproduce t he SBIR proposal tablish optimal gr am epitaxy ide FICATION 18. SECUP OF THE unc 1.	MBE) system is benas/GaAs) composisure in the 10 <sup>-8</sup> To tal valve connected ve was closed. Reference for the effusion cell to provide access to the deposition cond l. SKION will util rowth parameters. man in si ATY CLASSIFICATION IS PAGE assified	eing prepared for the p tite films. The chamb rr range was obtained to the turbo pump w pairs are being made is in the molecular be to her commercial MI is are available for de titions of Rothberg an ize AES, RHEED and ganese arsenide tu analysis	Preparation of manganese per has been evaluated for within hours without ras found to leak through on the chamber and on the eam source. BE system to produce position and it will be to Harbison's work that 1 LEED to provide in situ 15. NUMBER OF PAGES 3 16. PRICE CODE ATION 20. LIMITATION OF ABSTRACT

t . •

.

## Progress Report Item No: 0001AA

## Title of the Project:

Optimization of Properties of a New Material for Electronic and Magnetic Applications

Topic No.: Contract No.: Contract Starting Date: Contract Ending Date: Contractor:

BMDO 97-014 BMDO N00014-97-C-0209 May 14, 1997 December 14,1997 SKION Corporation 50 Harrison Street Hoboken, NJ 07030

> Prepared By: Drs. J. Olsen & S. Kim Principal Investigator SKION Corporation Report Date: July 14, 1997

DTIC QUALITY INSPECTED &

19970717 187

Following the proposed statement of work, we have spent the first month of our contract preparing the MBE system for deposition.

## The Summary of the activities performed in the period from May 14 to July 14, 1997:

- The molecular beam epitaxy (MBE) system at Stevens is being put in order for the preparation of manganese arsenide/gallium arsenide (MnAs/GaAs) composite films. The Stevens MBE system is a custom built, bakable ultrahigh vacuum R&D tool, equipped with a bakable Pfeiffer-Balzers turbo pump, a bank of Perkin Elmer ion pumps, and a titanium sublimation pump. The chamber is fitted for Auger electron spectrometry (AES), reflection high energy electron diffraction (RHEED), and low energy electron diffraction (LEED). The chamber has been evaluated for quality of the vacuum: A pressure in the 10<sup>-8</sup> Torr range was obtained within hours without bakeout. The bakeable all metal valve connected to the turbo pump was found to leak through the valve seating when the valve was closed—A replacement sealing pad and bonnet seals have been ordered. Repairs are also being made to a Boostivac ion pump controller. The system is fundamentally sound and ready for the installation of the effusion cells.
- 2. Drawings have been prepared for the effusion cells in the molecular beam source. Parts and materials suppliers have been investigated in terms of price and delivery time considerations. Parts and materials are being ordered.
- 3. Orders have been placed for various tools, parts, and supplies to be used in this project.
- 4. On April 30, Dr. Rothberg filed a patent application related to the effects of electric fields on these materials.
- 5. Professor Maria Tamargo at the City College of New York has agreed to provide access to her commercial MBE system to produce large area MnAs/GaAs samples. Professor Rothberg had collaborated with the previous owner of this MBE system (Bellcore) to carry out the pioneering work for this project. The effusion cells from the previous work are still in the machine and are available for deposition. This is an exciting development since it will be possible to reproduce exactly the deposition conditions of Prof. Rothberg's work with Bellcore that was cited in the SBIR proposal and in the patent application which was previously mentioned. By using this familiar MBE system, several weeks will be save in sample preparation. It will be possible, then, for SKION to take a more analytical approach with the Stevens MBE

, , . . .

growth and analysis system, utilizing its capabilities for Auger electron spectroscopy, x-ray photoelectron spectroscopy, and low energy electron diffraction to establish optimal growth parameters as well as x-ray diffraction and magnetooptic Kerr effect.

6. An abstract entitled "Electric Field Effects on Magnetic and Optical Properties of MnAs/GaAs (001) Thin Films" was submitted to the Seventh Joint Magnetism and Magnetic Materials - Intermag Conference to be held in San Francisco in January. The work forming the background for the present project will be reported.

معيودة والمعدة



and some some