LAMPS Solenoid Magnet

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LAMPS Review
March 31st, 2014

High Energy LAMPS (LAMPS-H) Experimental Setup

18.5*A* MeV< E_{beam} < 250*A* MeV

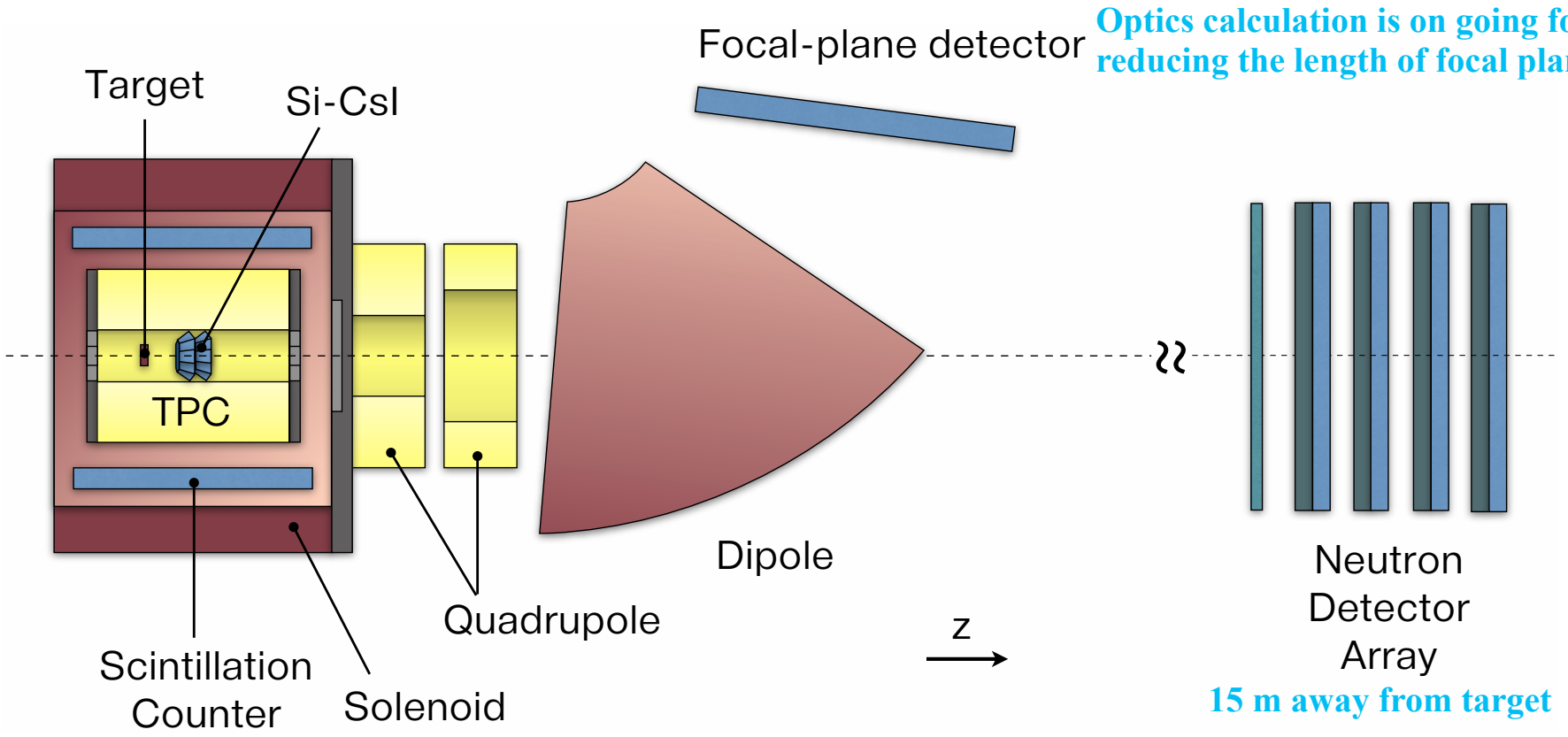
For Heavy-Ion Collision Experiments

-Example of Reactions:

Central and peripheral collisions

$^{50,54}Ca + ^{40}Ca$, $^{68,70,72}Ni + ^{58}Ni$, $^{106,112,124,130,132}Sn + ^{112,118,124}Sn$,

$^{96,100,104}Ru(^{88,92,96}Zr) + ^{96}Ru(^{96}Zr)$ ➔ **when it is available**

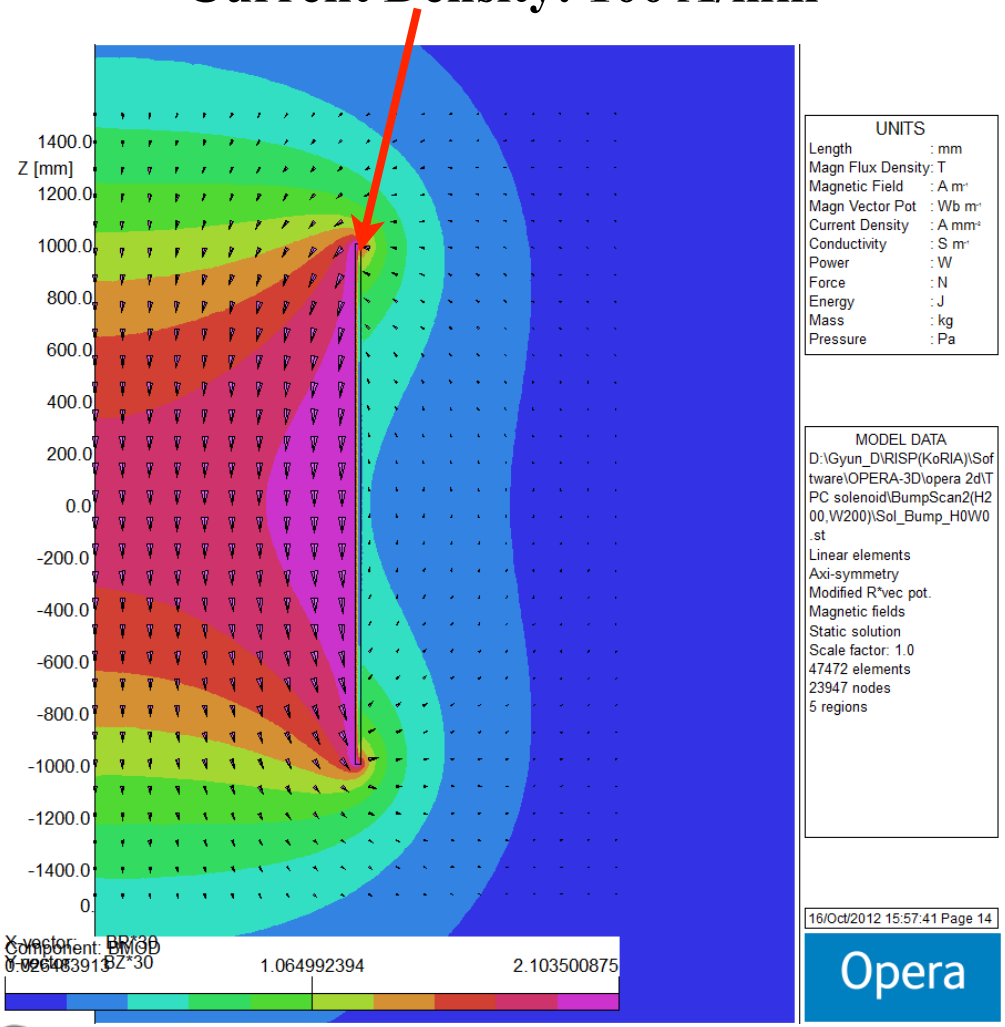


Solenoid Magnet Design

Based on OPERA-3D Calculation

Coil

- **Length: 2 m**
- **Radius: 1m**
- **Thickness: 20 mm**
- **Current Density: 100 A/mm²**



LAMPS Solenoid Requirement

- Cylindrical shape
- To cover TPC
  (r = 0.5 m, l = 1.2 m) with homogeneous B-field
- $B_{operation}$: ~ 0.5 T
- $B_{max.}$: ~ 1T
- $\Delta B/B < 2$ %

Magnetic Field at the center = 1.76 T
Standard deviation at TPC = 6.5%

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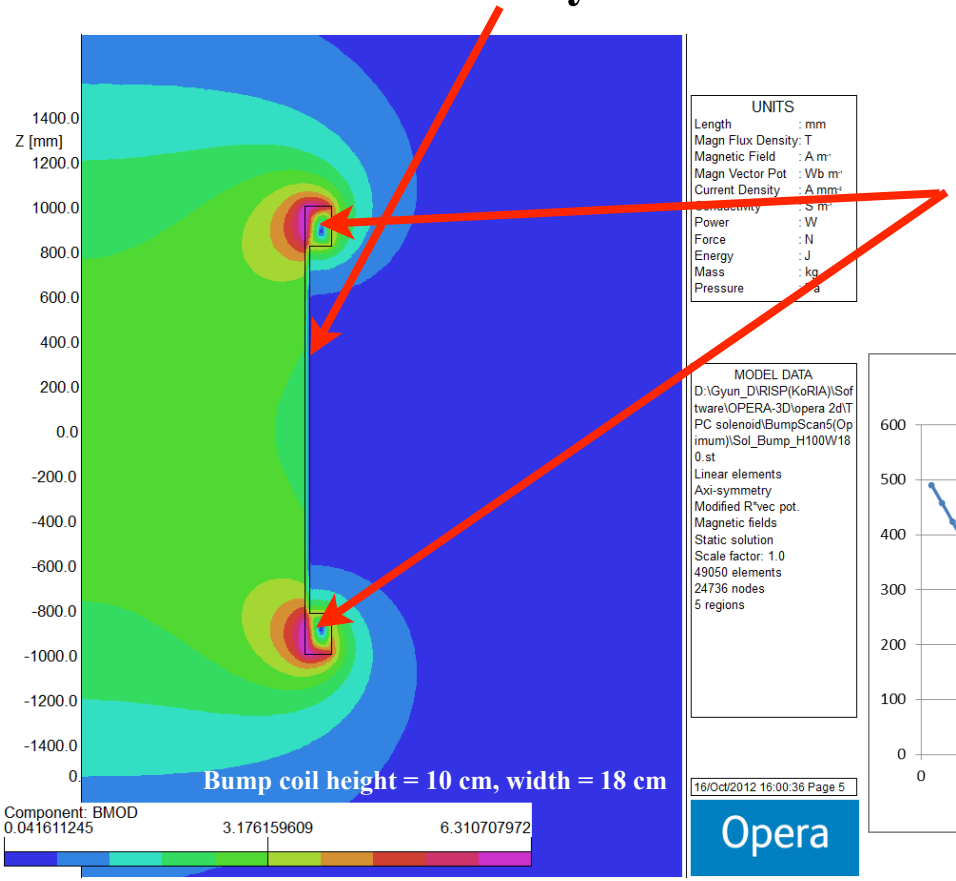
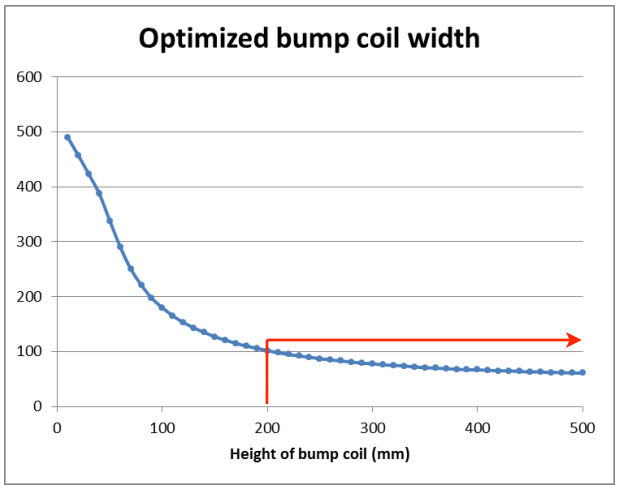
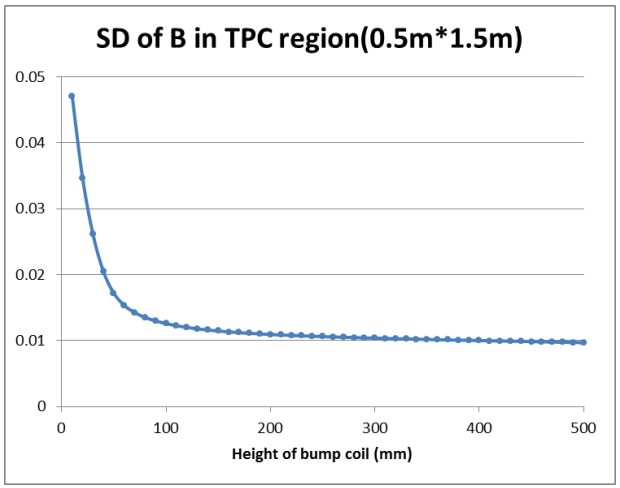


Bump coils

- **Act like Helmholtz coil**
- **Varying height & width**





Standard Deviation < 1.5%
with bump coil height > 20 cm

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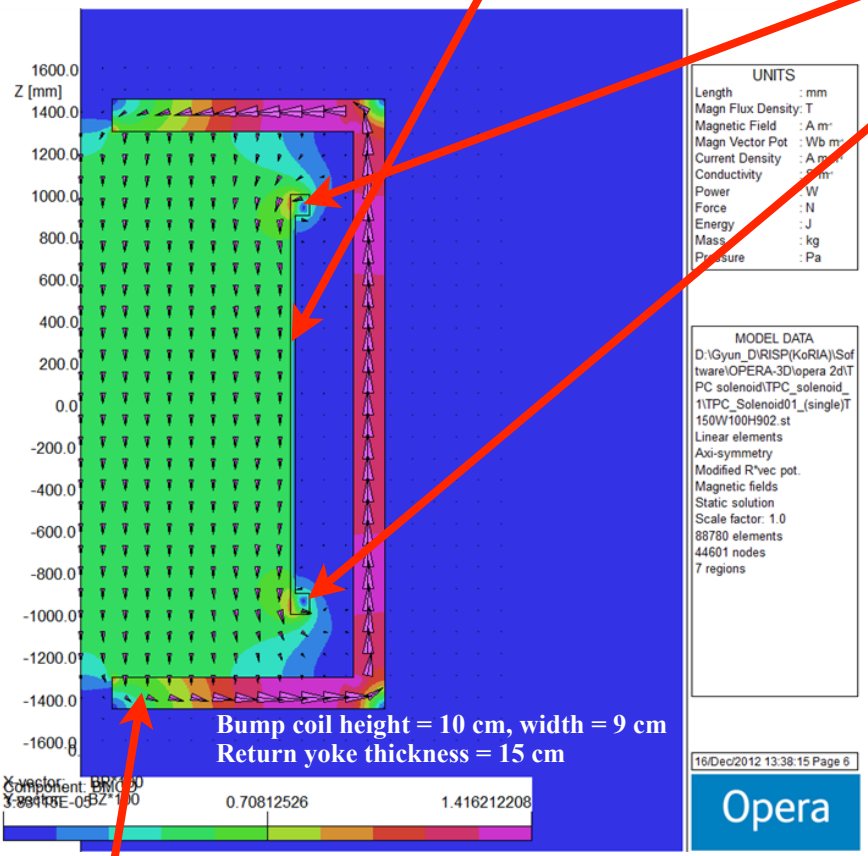

Return yoke

- **Varying height & width**

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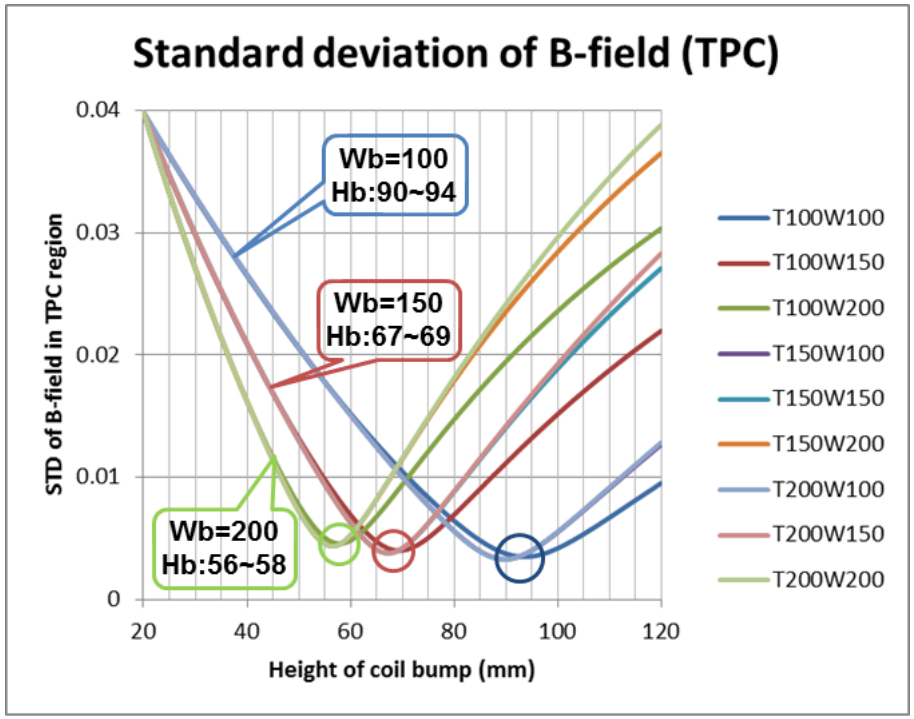
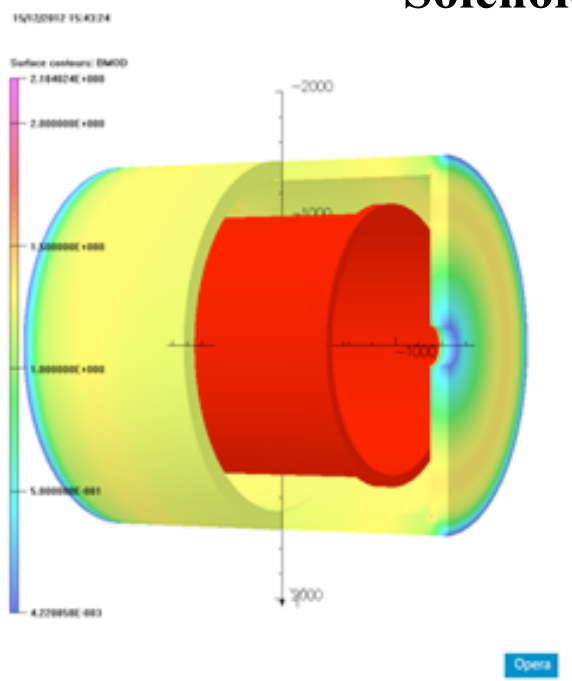


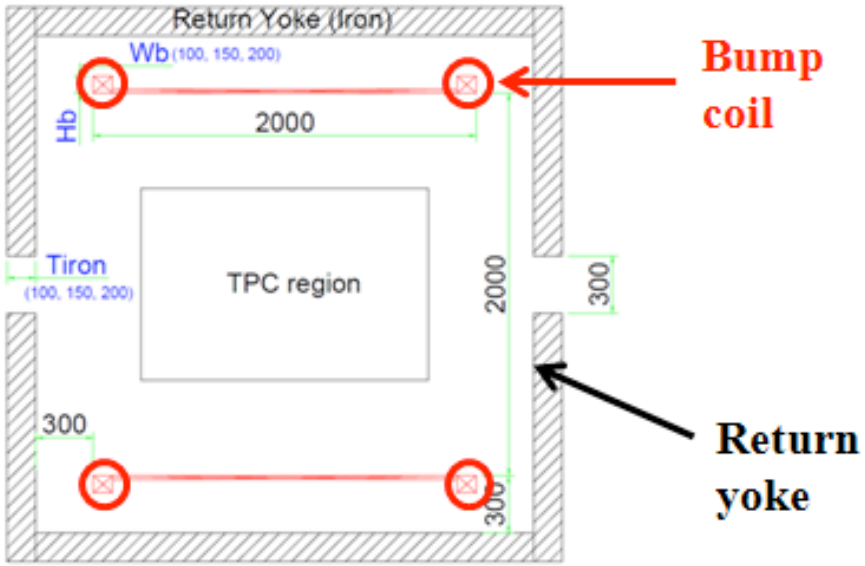
Wb = Width of Bump coil (mm)
Hb = Height of Bump coil (mm)
TXXX → XXX = thickness of Return Yoke (mm)
WXXX → XXX = Width of Bump Coil (mm)

Minimum Standard Deviation: 0.33% - 0.46%

Solenoid Magnet Design

Solenoid design





Total size: 2.6 x 2.6 m^2
- Cylindrical shape
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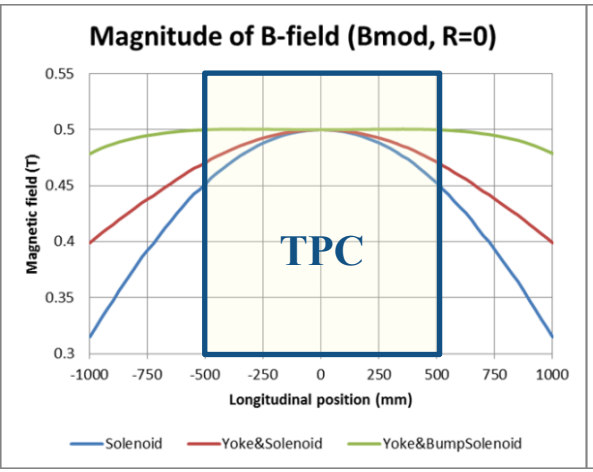

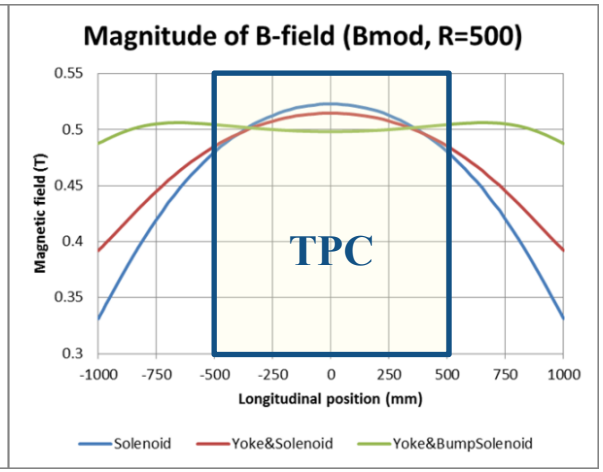

Deviation of magnetic field

-75 ~ 75 cm	Solenoid Coil	Solenoid with Return Yoke	Solenoid with Return Yoke & Bump Coil
ΔB_{mod} (R = 0 cm)	0.107 T	0.062 T	0.006 T
ΔB_{mod} (R = 50 cm)	0.103 T	0.070 T	0.008 T
ΔB_z (R = 50 cm)	0.110 T	0.072 T	0.008 T
ΔB_r (R = 50 cm)	±0.076 T	±0.043 T	±0.008 T

•Solenoid magnet design is completed (Need to figure out production feasibility)

➢Communicate with domestic and foreign magnet companies

Feasibility of Solenoid Magnet Production

RAON

견 적 서

JHENG

견 적 서

경기도 안산시 상록구 사사동 119-61 안산테콤단지
TEL : 031-416-1774, FAX : 031-419-1774

No. D13-0307-01

Date. 2013년 3월 7일

수신	기초과학연구원	발신	영업총괄팀
참조	김영진 박사님	담당	유명종 팀장
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◆ 귀원의 무궁한 발전을 기원합니다.

◆ "Superconducting Solenoid Magnet"에 대하여 아래와 같이 견적합니다.

No	품명	규격	단위	수량	단가(원)	금액(원)
	Solenoid Magnet					829,300,000
1	NbTi 초전도 wire (25kM)	1mm2	Roll	6	62,500,000	375,000,000
2	무산소동	99.99%	kg	200	30,000	6,000,000
3	SUS304(2M*4M)	2T	ea	60	300,000	18,000,000
4	알루미늄	99.9%	kg	3,000	20,000	60,000,000
47	기타 제반 경비			1	100,000,000	100,000,000
	합계					2,018,900,000
	세액					201,890,000
	총계(천원 이하 절삭)					2,220,790,000

~ 2.1 M USD

◆ 비고

1. R & D 비용 제외
2. 표준 공급 기간 : 주문(계약)후 500일 이내
3. 제품 보증 기간 : 12개월
4. 견적 유효 기간 : 발행 후 4주 이내
5. 납품처 : 발주자의 지정 장소(국내)
6. 결제 조건 : 납품 후 현금 결제
7. 결제 계좌 : 신한은행 100-025-881544 예금주 : 제이에이취엔지니어링㈜

◆ 문의 사항이 있으시면 연락 부탁 드립니다.

Superconducting
R&D: at least 1 year
Production: 500 days

IBS
김영진 연구원님 귀하

주 식 회 사 금 룡 테 크
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TEL:054)279-1812, 1825 FAX:054)279-1299

제 출 일 : 2013년 9월 27일

제 작 명 : Solenoid magnet 제작.

견적금액 : 금일십칠억오천오백육십삼만삼천원정.

(₩1,755,633,000) V.A.T 포함

1. 납 기 : 계약후 15개월
2. 견적 유효일 : 견적 발송일로 부터 15일
3. 지 불 조 건 : 선수금 %, 중도금 %, 잔금 %
4. 비 고 : 제출 후 30일 후는 견적 무효임

순 번	모 델 명 및 규 격	단 위	수 량	단 가	금 액	비 고
1	Solenoid Magnet - 0.6 Tesla - ID:1800, OD:2500 L:3080 - Weight : 70 ton	set	1	1,596,030,000	1,596,030,000	
2	V.A.T.	%	10		159,603,000	
	TOTAL				1,755,633,000	

천단위미만절사 (0)

~ 1.7 M USD

Normal
R&D: at least 1 year
Production: 15 months

Solenoid Magnet Plan

- Contact foreign magnet production company
- Make a decision about magnet option (superconducting or normal conducting) in 2014
- Selection most promising company for R&D in 2015
- Start to produce from 2017

Thank for your attention!