

1)

2)

I. "巨大科學" ?

. 1993 SSC(Superconducting Super Collider) 20 2
가

小國

가 가

가

1. 歷史

20 1930 Cyclotron 가 Radiation Laboratory
(Lawrence Berkeley Laboratory) Ernest O. Lawrence 1932 Cyclotron
1954 Bevatron .1)

2

가 가 가

Bevatron 1000 , 1960 가 가 1950 2 5
가 가 가 1 , 1970
SSC 80 ~120
SSC European Center for Nuclear Research(CERN)
가

. SSC

가
가

가

2. : 對

OECD 2가
高價 SSC, VLT(Very Large Telescope), Giotto space
probe,

가

地球生物體/

가

/

IGBP(International Geosphere Biosphere Programme), WCRP(World Climate Research Programme), GCOS(Global Climate Observing System), (Human Genome Programme; HGP) 가

가

人力 財政

가

가

脫

情報 共有

가 全地球的

가

II.

1. 天文學

가 諒解覺書(MOU)

條約

European Space

Agency(ESA), European Southern Observatory(ESO)

가

가

1985 - 86 ISTP(International Solar Terrestrial Programme) , radio very long base line interferometry(VLBI)

가

移民勞動許可, 關稅

1)

가)

Very Large Telescope(VLT) (,) : ESO 8 가

Keck 2 Telescope() :

Subaru() :

Gemini(;) : , , , , ,

Big European Telescope() : ()

Magellan(,) :

Hobby - Eberly Telescope(HET) (, ,) : -

Big Binocular Telescope(, ,) : ,

)

Square Kilometer Array :

Millimeter Array :

)

X - Ray Multi - Mirror Mission(XMM) : ESA 2

Far Infrared and submillimetRic Space Telescope(FIRST) : (ESA)

Advanced X - Ray Astronomy Facility(AXAF) : (NASA)

INTEGRAL : (ESA) ,

COBRAS - SAMBA/STARS : (ESA)

ASTRO - E :

VLBI(Very Large Baseline Interferometry) Space Observatory(VSOP) :

Spectrum Roentgen Gamma(SRG) : - , 2

) /

ROSETTA : ESA() - NASA()

Intermarsnet : ESA() - NASA()

MORO : ESA()

Cassini/Huygens : NASA() - ESA()

Return to the Moon :

) ,

Laser Interferometer : National Science Foundation(NSF)

VIRGO :

Kamioka Nuclear Decay Experiment(Kamiokande II) :

Sudbury Neutrino Observatory(SNO) :

)

Satellite Test of Equivalent Principle(STEP) : (ESA)

Gravity Probe B(GPB) : (NASA)

2. Condensed Matter

가

1)

중短期 가 가

가) Steady flux

1. Institut Laue Langevin(ILL;) : 1971 가 , 1994

2. LLB - ORPHEE() : 1980 가

3. HMI - BER2() : 1978 가 , 1991

4. BRR(가) : 1960 가 , 1992

5. (, Brookhaven HFBR)

) Spallation sources

1. ISIS RAL() : 1985 가

2. SINQ() :

3. IBR - 2() : 1984 가 .

가가

가 (50~100%).
steadyflux ILL, pulsed

spallation sources	ISIS	IBR - 2가	"pulsed"	spallation sources
			steady high flux beam	
JRR3 - JAERI()				가
higher flux		monocromatros		
spallation sources	steady flux			가

相補的

- pulsed spallation sources
- high flux integrated flux steady flux

2)

European Spallation Source(ESS) :

U. S. Pulsed Spallation Source : Department of Energy(DOE).

FRM - II(Garching bei Munchen,) :

PIK(St. Peterburg Russia) :

AUSTRON :

New Research Reactor for Australia(Lucas Heights,) : ANSTO().

IRF(Irradiation Research Facility) : ,

3) Major synchrotron radiation sources

Advanced Proton Sources(APS)

(Argonne National Laboratory,) : (DOE).

Advanced Light Source(Berkeley,) : (DOE).

SPRing - 8(,) : Science and Technology Agency(STA).

BESSY - II(Berlin,) :

MEXS(Daresbury,) :

SOLEIL() :

KEK - TRISTAN Main Ring(,) : National Laboratory for High Energy Physics(KEK)

Synchrotron Radiation Research Center(Hsinshu,)

Swiss Light Source(SLC) (Villigen,) : , detectors

3.

1)

가)

가
KTB(Kontinentales Tiefbohrprogramm der Bundesrepublik Deutschland)

가 International Council of Scientific Unions(ICSU),
International Lithosphere Program(ILP) . KTB 7,200m, Kola
12,500m 가 가
hole

1975 가
(1985~1992 48). ODP 가 가
(ESF) 12 가 (, ,), , 舊 hole drilling 가
가 European Science Foundation
deep drilling rigs가 . OECD
shallow drilling 가 . KTB가 deep
가 가 deep drilling
가
Ocean Drilling Program(ODP) 가

)

US Deep See Drilling Project(DSDP) , COSOD(Conference on
Scientific Ocean Drilling) I(1981) COSOD II(1987) JOIDES(Joint
Oceanographic Institutions for Deep Earth Sampling) Resolution

ODP 가 가
hole 가
가 가
가 가

)

가 / drilled hole 觀測網 shallow
drilling very deep drilling

)

ODP : (NSF), , , , , , European Science Foundation(ESF)
consortium

Ocean Drilling plan in the 21st Century(OD21)

International Continental Drilling Programme(ICDP) : MOU가

2)

Operational Oceanography

가

Global Ocean Observing System(GOOS) . GOOS Intergovernmental Oceanographic Commission(IOC), World Meteorological Organization(WMO), United Nations Environmental Programme (UNEP), International Council of Scientific Union(ICSU) . 200

100

가) : Commission of the European Communities, DGXII; ESA; Intergovernmental Oceanographic Commission(IOC); Scientific Committee on Oceanic Research(SCOR) of ICSU; WMO

3) Earth observation space missions

World Climate Research Programme(WCRP) International Geosphere Biosphere Programme(IGBP) . Human Dimension of Global Environmental Change Programme(HDP)

가

가 Intergovernmental Panel on Climate Change(IPCC) Scientific Committee on Problems of the Environment(SCOPE)

WCRP, IGBP, HDP

, 가

相補性

, 舊

가 中·東部

가)

Global Change Research Programmes(WCRP IGBP)

WCRP : /IGBP :

Earth Observing System(EOS) : [NASA, National Ocean and Atmospheric Administration(NOAA)], (ESA)

EPS/METOP(Eumetsat Polar System) : (Eumetsat, ESA), (NOAA)

Envisat 1&2 : ESA.

Advanced Earth Observation Satellites(AEOS) : National Space Development Agency(NASDA), NASA, National Space Agency(CNES)

Tropical Rainfall Measuring Mission(TRMM) : (NASDA), (NASA)

4. 核融合

1) International Thermonuclear Experimental Reactor(ITER)

, European Atomic Energy Community(Euratom), ,
 . ITER : 1) deuterium - tritium
 磁氣 2)

30 ITER , 가 15 가 . ITER 8
 . ITER 1000MW

ITER 400 . ITER 가가
 . ITER 가
 1) (Conceptual Design Activities); 2) (Engineering Design
 Activities); 3) 4) 4 가
 ITER 4 가가

ITER 가 1998 , 2005 . ITER 1993 \$69
 가 \$80 ~100 가

1998 1

ITER 2005 2025

2)

Osk Ridge National Laboratory Large Coil Task(LCT) General Atomics
 DIII - D 가 . LCT 가 ITER 가
 가 DIII - D 가 upgrade . ITER 가
 14MeV

Euratom Treaty . Euratom Treaty 磁氣
 the EU)가 5 EC (Council of
 80%

14 Culham 가 . JET Joint European Torus(JET) Euratom
 . JET 가 370 . 1991 JET D - T
 JET 가 7.1Million
 . JET (, ,
 JET . 1996 ITER Pumped) , D - T

3)

Magnetic Fusion Energy(MFE) Programme : (DOE)

International Thermonuclear Experimental Reactor(ITER) : (DOE), (STA), , EU(DGXII).

Superconducting Tight Aspect Ratio Experiment(STarX) (,) : () ,

5. High Energy Particle Physics

high energy hadron collider [Large Hadron Collider(LHC)가]
 large electron - positron linear collider가 . High Energy Particle Physics

< 1 >

프로젝트	시 기	명목자본비용
Bevatron(U. S.)	1950년대	\$ 1000만
Stanford Linear Accelerator(U. S.)	1960년대	\$ 1.15억
Fermilab Tevatron(U. S.)	1980~90년대	\$ 2.5억
Continuous Electron Beam Accelerator Facility(U. S.)	1970년대	\$ 5100만 ^a
Relativistic Heavy Ion Collider(U. S.)	1990년대	\$ 5.95 억 ^a
Superconducting Super Collider(U. S.)	1980~90년대 ^b	\$ 80~110 억 ^a
Large Hadron Collider(Europe)	1990년대 ^c	\$ 23억 ^d

- a 총프로젝트 예산; b 1993년 프로젝트 종료; c 2005에서 2008 완공 계획
- d 미국 예산으로 동일한 회계기준을 사용한다면 LHC 예산은 약 2배 정도(\$ 40에서 50억) 증가할 것이다. 이 수치는 또한 총 \$20억 정도의 탐지기를 포함하지 않은 것이다.

(< 1 >). 準 high luminosity B factories가 2 B factories
 Collider upgrade(LEP - II, CERN) upgrade injector, Large Electron Positron
 Synchrotron 準 UNK - 600(Protvino) proton
 / non - accelerator detector

1)

B meson factory(PEP - II) (Stanford,) : (, DOE)(), detectors

B meson factory(,) : (KEK)

Large Hardon Collider(LHC, CERN) (Geneva, Switzerland) : Europe(CERN), (MOE), (DOE,), Israel, Canada, india

UNK(Serpukhov,) :

Electron - positron linear collider(EPLC)

6. 生命科學

1)

DNA (HGP) DNA . 20
10 가 가
4가 , DNA , ,

National Institutes of Health(NIH) 가 가 (DOE)
1 7000 , OECD ,
가 가 가 . OECD
mapping

HGP
(Human Genome Diversity) 가 .
가 . HGP

1991 NIH가 DNA ().
DNA . HGP
DB

Human Genome Organization(HUGO)
700 () , , , .
HUGO . HUGO

2)

Human Genome Project :

Diversitas : 가

가.

配分 :

豫測 : . 1

가 : 評價節次 .

【 】

1) 「 」 (97 - 32) 1

2) 1 (Tel: 02 - 250 - 3248)

1) Cyclotron Bevatron 가 1939 가 Lawrence