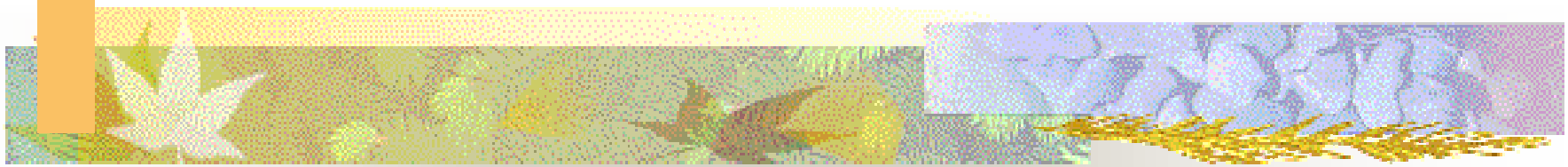
Reliability Experience at the SRS



Fault Analysis and Related Actions

Cheryl Hodgkinson

Contents

- Introduction
- Reliability Data
- Fault Analysis
  - Year 00-01 (April to March)
  - Year 01-02 (April to December)
- Possible Causes for the Reduction in Efficiency
- Proposed Actions
- Conclusions

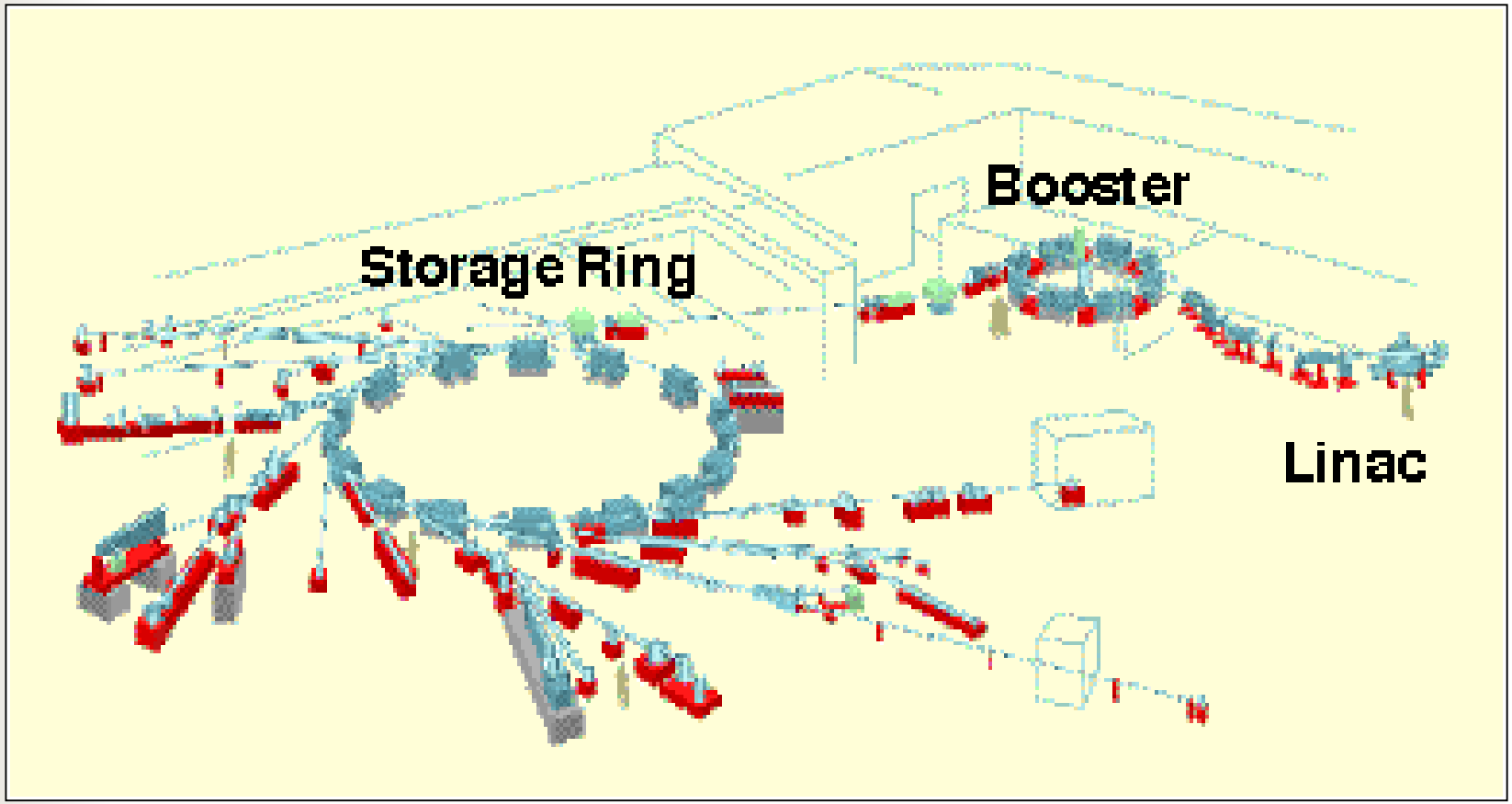
Introduction – SRS History

- World's first dedicated synchrotron radiation source
  - Conceived in 1974 and built between 1975 and 1980
    - To reduce costs equipment was used from existing high energy accelerator, NINA
  - First light for users in 1981
- There have been a number of upgrades

Introduction - Upgrades

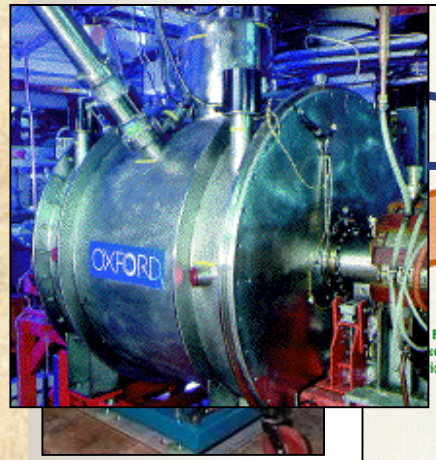
- High Brightness Lattice
  - In 1986 to reduce emittance
  - Another Quadrupole installed in each straight section
- 6 Tesla Superconducting Wavelength Shifter
  - In 1992
- Two 2 Tesla Multipole Wiggler Magnets
  - In 1998
  - New storage ring configuration required

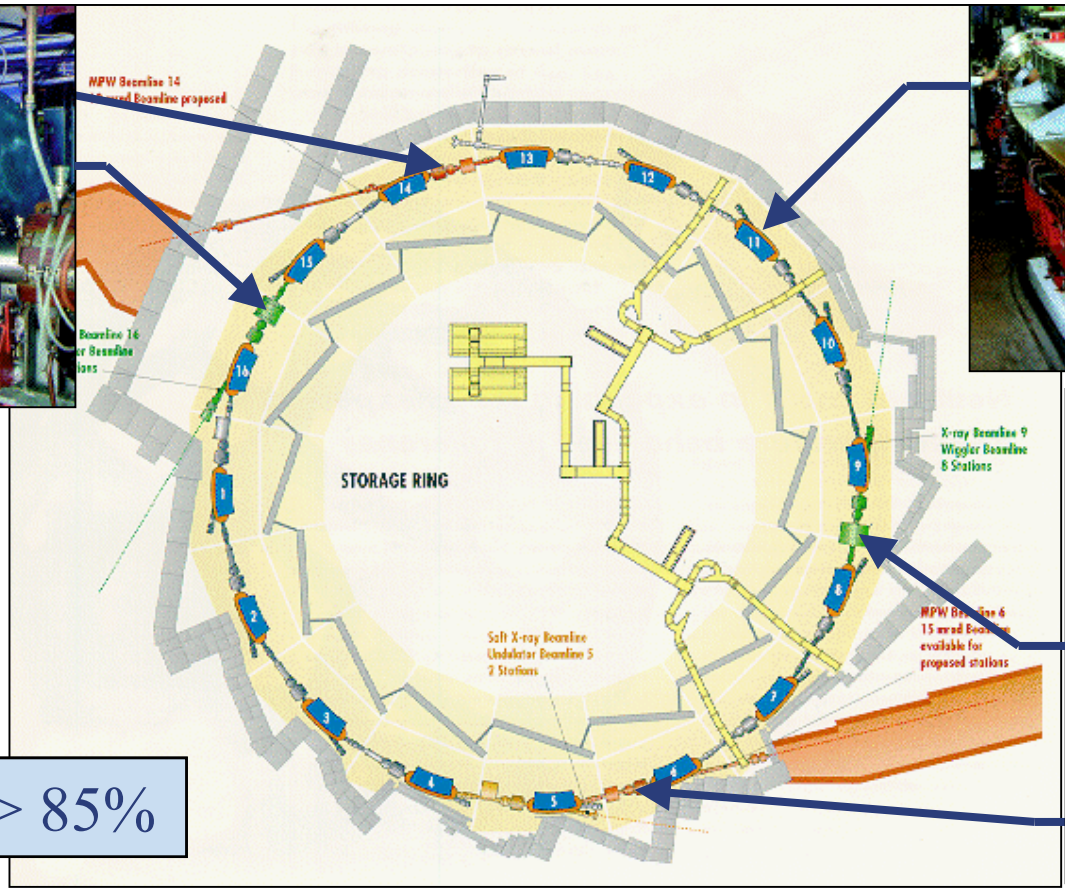
Introduction - The SRS

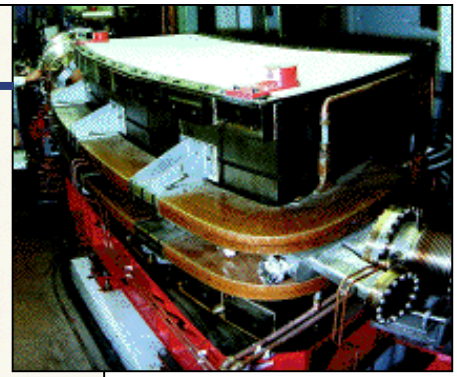


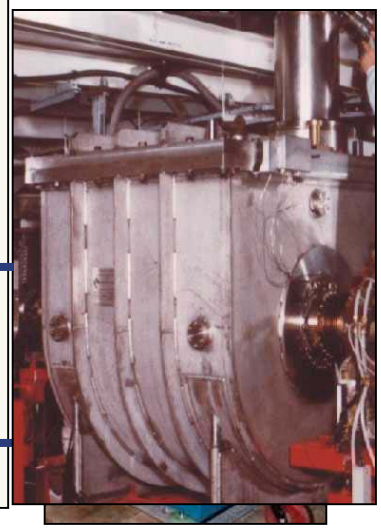
SRS Operations

6000 hours per year for users



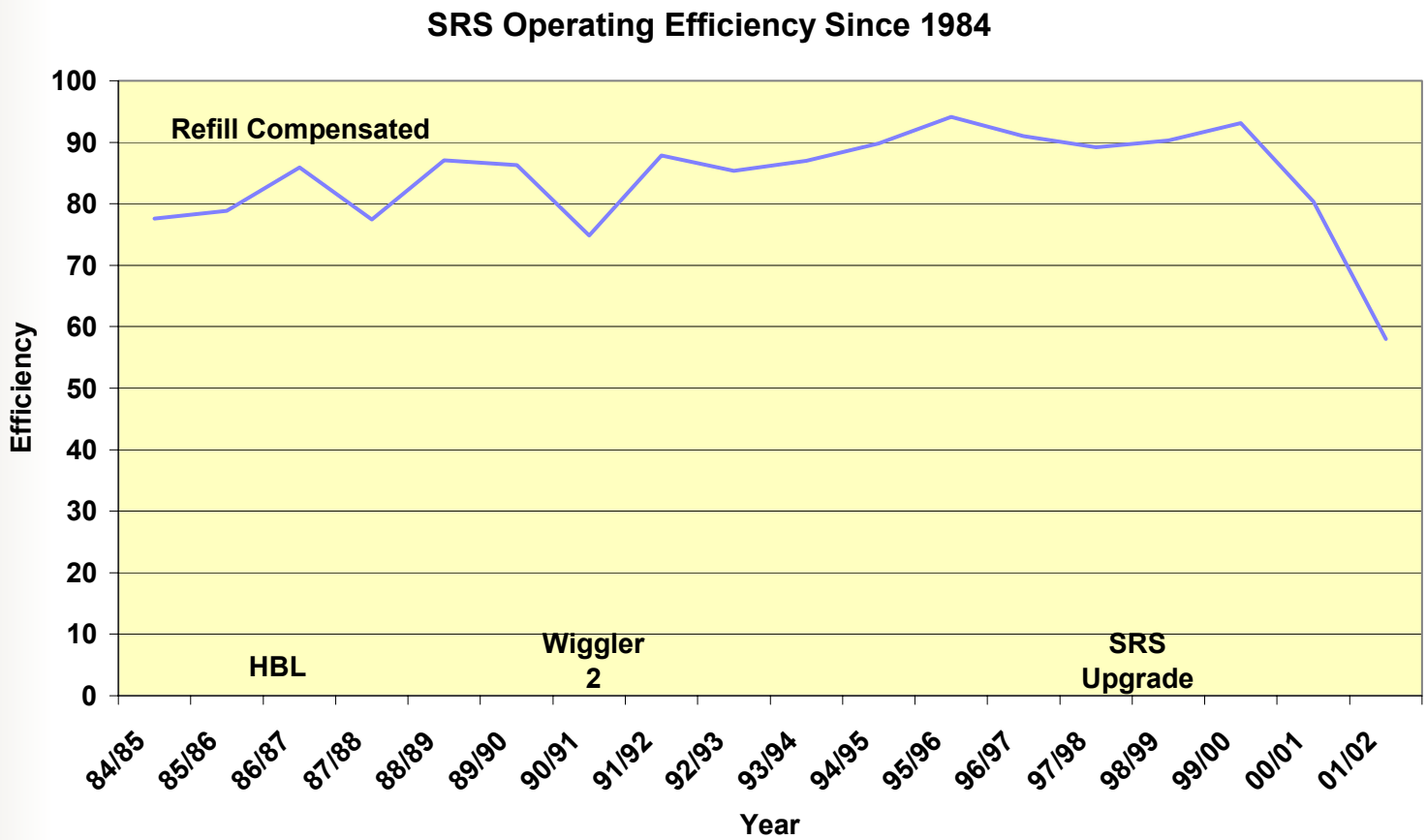






Efficiency > 85%

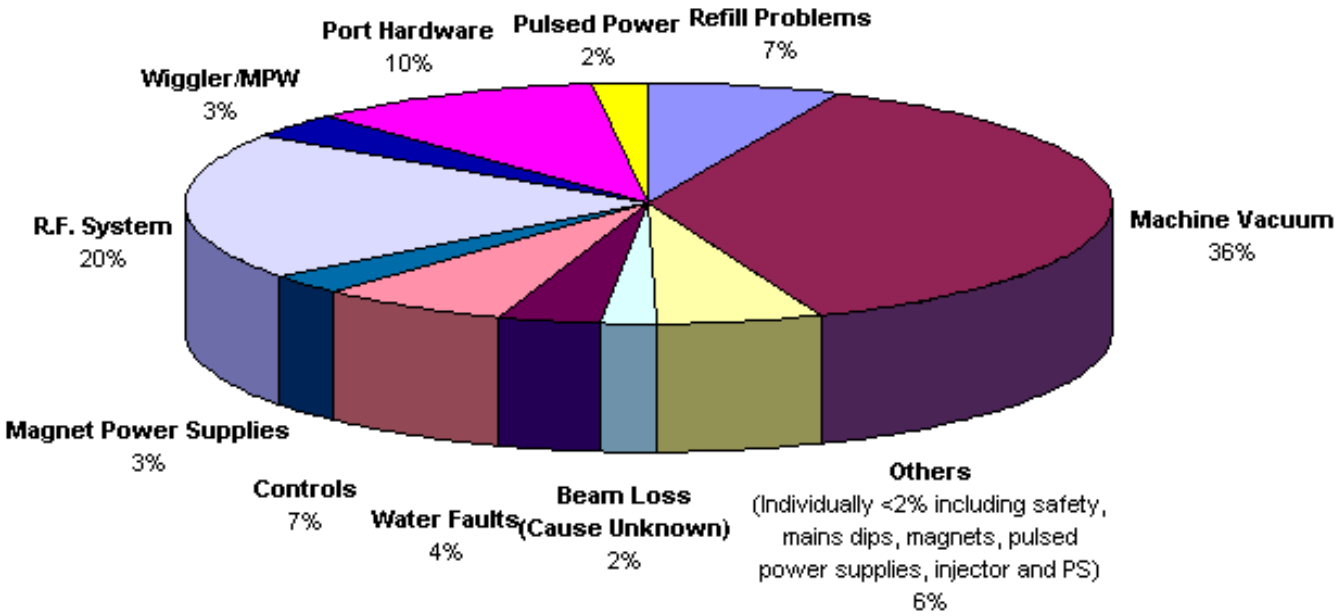
Reliability 1984 - 2002



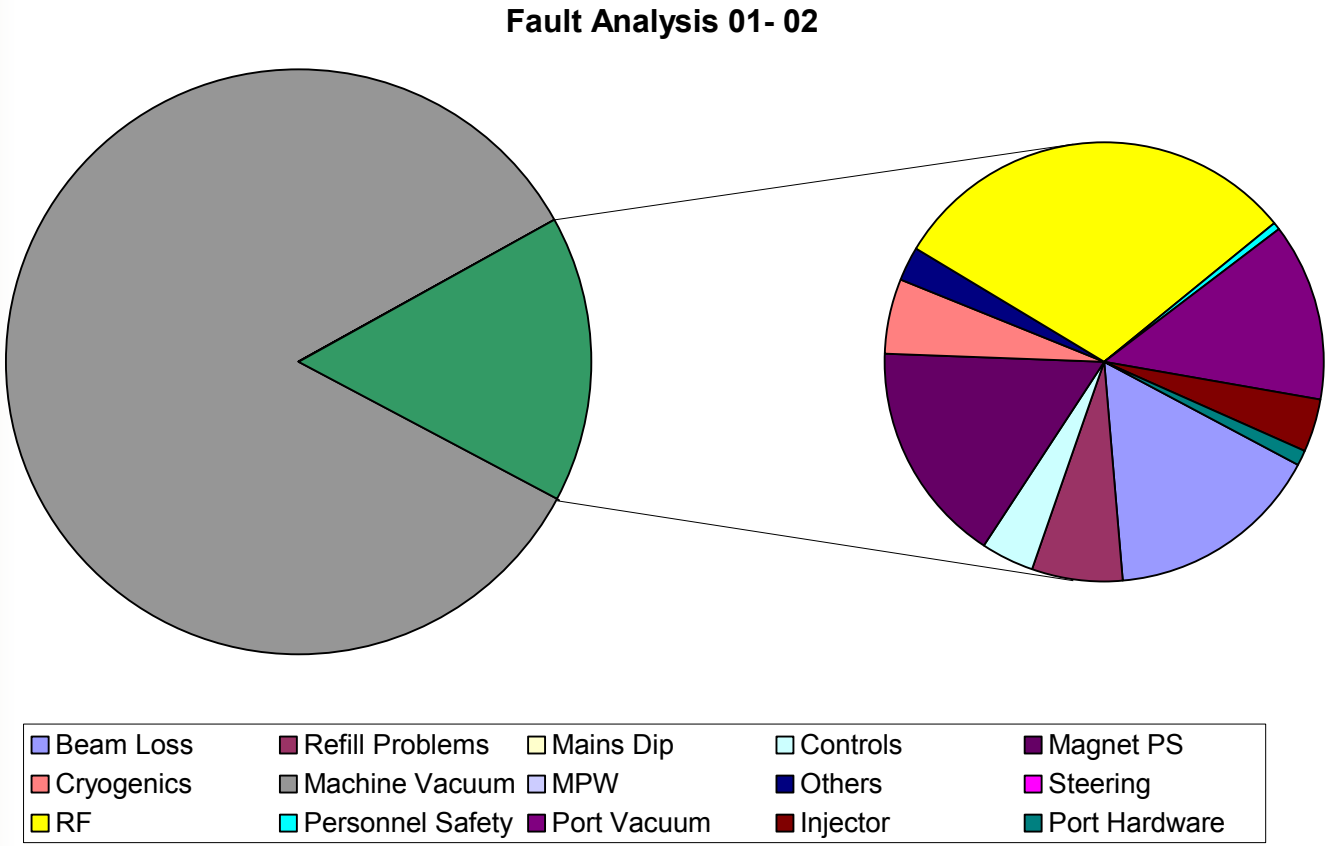
Summary 2000-2001

SUMMARY TABLE			
	Multibunch	**Singlebunch**	**Total**
Scheduled Hours	4734	673	5407
Achieved Hours	3672	403	4075
Start-up and Commissioning			288
Number of User Fills	302	33	335
Shutdown Hours			2352
Injection Hours			271
Fault Hours			1064
Mean Time Between Failure (hours)			29
MB Operating Efficiency (%) with Injection Allowance			77
SB Operating Efficiency (%) with Injection Allowance			51
Beam Studies			312

Fault Allocations 2000-2001



Fault Allocations 2001-2002



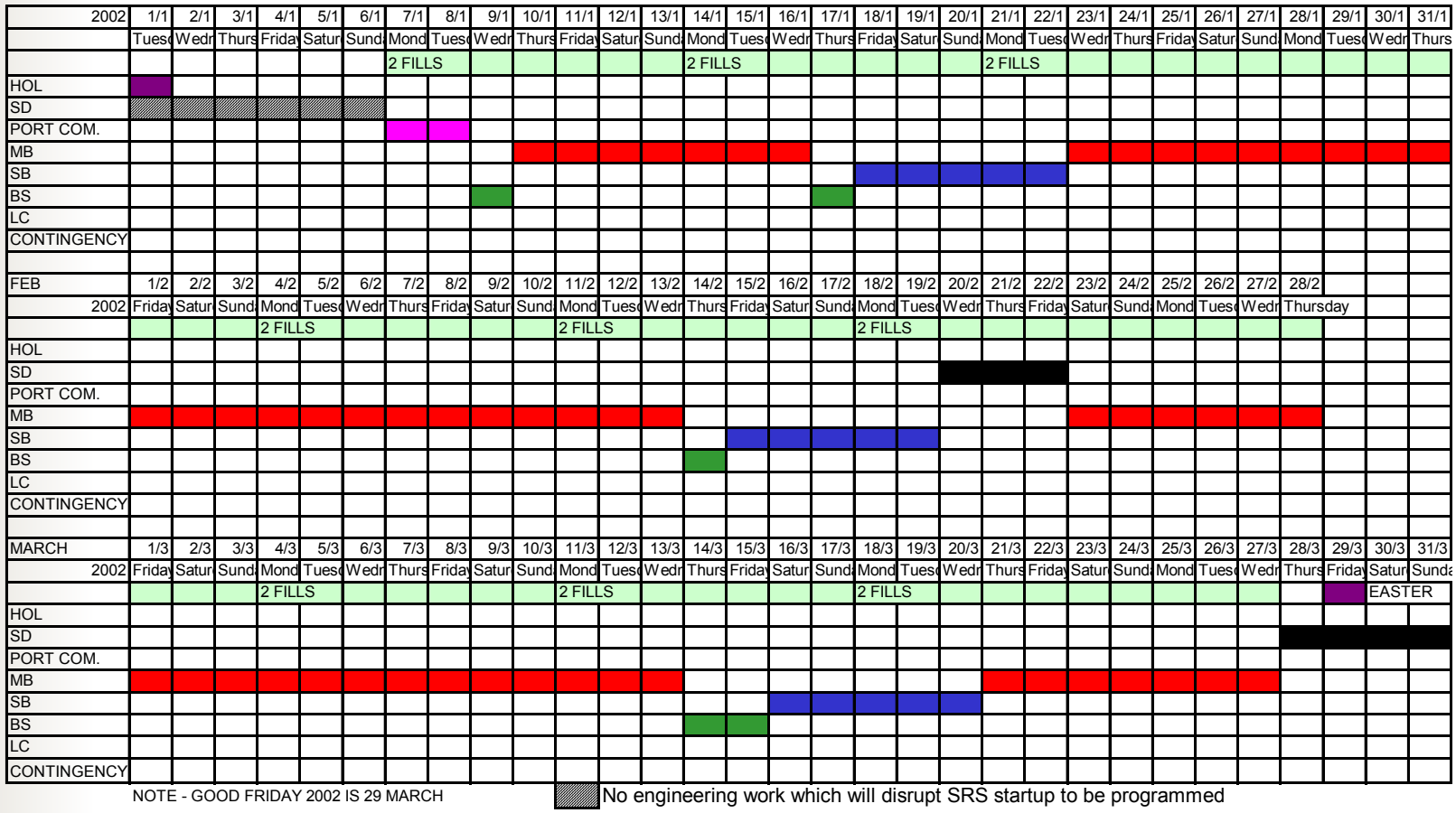
Possible Causes

- Fault Diagnosis
  - No transient parameter recording
  - Can take several beam losses before fault is found
- Age of Equipment
  - Technical Risk Assessment
  - Continuous modernisation
  - Ease of Repair

Possible Causes

- Succession Planning
  - Age Profile of the Staff
  - Restructuring
- Scheduling
  - User Schedule
  - New Project Demands

Typical Schedule



Proposed Actions

- Capital Investment
  - Several key items identified
  - New storage ring klystron power supply in 2002

Proposed Actions

- Maintenance
  - Conflict with new projects
  - Monthly group leader meeting
  - Bid for more time in the schedule
  - Restructuring of technical groups during shutdowns

Proposed Actions

- Risk Assessment
  - Identify risks and place responsibility for mitigating the risk with appropriate people
  - Formal technique
    - SRS control parameters
    - Facility inventory
    - Updated schematics

Proposed Actions

- Risk Assessment
  - Guide words

Mechanical Assembly	Mechanical Services	Electrical Assembly	Electrical Services	Vacuum Systems	Control Systems
Power Supplies	Motor Systems	Radiation	Personnel Safety	Spares	Air
Water	Cables	Information	Obsolescence	Knowledge	Responsibility

Risk Assessment Example

Risk Gun	Likelihood	Impact	Risk Exposure	Discussion	Action and Responsibility
Between 1 and 2 weeks loss of operations due to mechanical failure of the conflat gun assembly and ceramic tube	Low 1	High 3	Low 3	The spare assembly is the original using wire seals, which was replaced due to poor reliability.	Procure new conflat spare. J Manning
Operational delay and inefficiency due to present reliance on two highly experienced shift staff. One due to retire in months and the other in up to 4 years	Medium 2	High 3	Medium 6	The RF group has always exploited the skills of shift staff that were responsible for the original engineering of LINAC systems. With retirement approaching, succession planning both on and off shift is necessary	Assign technical staff to understudy our existing experts immediately. D M Dykes/C L Hodgkinson

Conclusions

- There is no evidence of systematic failure which indicates the life of the SRS is limited
- As with any machine ongoing modernisation is essential
- The results of a comprehensive technical risk assessment must be acted upon

Acknowledgments

The author would like to acknowledge the assistance of the technical group leaders in this drive to improve efficiency. I would also like to thank the operations team members, who have complied the SRS monthly statistics from 1984.