

# ILC Research and Development WBS

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## 1. Parameter Optimization

### 1.1 Bunch Charge and Train Length

1.1.

### 1.2 Beam Stability

1.2.

### 1.3 Beam Emittance

1.3.

## 2. Beam Dynamics Studies

### 2.1 Single-Particle Dynamics

2.1.1 Lattice Design

2.1.2 Acceptance

2.1.3 Optics Measurement and Correction

2.1.4 Low-Emittance Tuning

2.1.5 Polarization

2.1.6 Transverse Jitter Stabilization

2.1.7 Longitudinal Jitter Stabilization

### 2.2 Multi-Particle Dynamics

2.2.1 Single-Bunch Impedance

2.2.2 Multi-Bunch Impedance

2.2.3 Electron Cloud

2.2.4 Ion Effects

2.2.5 Other Collective Effects

### 2.3 Integrated Dynamics Studies

2.3.1 Integrated Dynamics Studies

## 3. Technical Subsystem or Component Development

# ILC Research and Development WBS

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## 3.1 Vacuum

3.1.1 Vacuum Chamber

3.1.2 Vacuum Pumps

3.1.3 Vacuum Diagnostics and Controls

3.1.4 Vacuum Valves

## 3.2 Permanent Magnets

3.2.1 Dipoles

3.2.2 Quadrupoles

3.2.3 Sextupoles

3.2.6 Damping Wiggler

## 3.3 Normal-Conducting Magnets

3.3.1 Solenoids

3.3.2 Dipoles

3.3.3 Quadrupoles

3.3.4 Sextupoles

3.3.5 Higher-Order Multipoles

3.3.6 Steering Magnets

3.3.7 Skew Quadrupoles

## 3.4 Superconducting Magnets

3.4.1 Solenoids

3.4.2 Dipoles

3.4.3 Quadrupoles

3.4.4 Sextupoles

3.4.5 Higher-Order Multipoles

3.4.6 Damping Wiggler

## 3.5 Kickers

3.5.1 Damping Ring Injection/Extraction Kickers

3.5.2 Damping Ring Abort Kickers

3.5.3 Post-Damping Ring Abort Kickers

# ILC Research and Development WBS

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## **3.6 Damping Ring RF Systems**

### **3.6.1 RF System**

### **3.6.2 RF Cavities**

### **3.6.3 Klystrons**

### **3.6.4 RF Controls (Low-Level RF)**

## **3.7 Instrumentation and Diagnostics**

### **3.7.1 Beam Intensity Diagnostics**

### **3.7.2 Beam Position and Phase Diagnostics**

### **3.7.3 Beam Size and Bunch Length Diagnostics**

### **3.7.4 Higher-Order Beam Diagnostics**

### **3.7.5 Other Instrumentation and Diagnostics**

### **3.7.6 Integrated Instrumentation and Diagnostics Systems**

## **3.8 Feedback Systems**

### **3.8.1 Damping Ring Bunch-by-Bunch Feedback Systems**

## **3.9 Control Systems**

### **3.9.**

## **3.10 Supports and Alignment Systems**

### **3.10.1 Normal-Conducting Magnet Supports**

### **3.10.2 Superconducting Magnet Supports**

## **3.11 Collimation**

### **3.11.1 Pre-Damping Ring Collimation Systems**

### **3.11.2 Post-Damping Ring Collimation Systems**

## **3.12 Beam Dumps**

### **3.12.1 Low-Power Beam Dumps**

### **3.12.2 High-Power Beam Dumps**

## **3.13 Multiple Systems**

### **3.13.1 Systems Integration**

## **4. Experimental Studies and Test Facilities**

# **ILC Research and Development WBS**

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## **4.1 Experimental Studies**

### **4.1.1 Experimental Studies**

## **4.2 Test Facility Development**

### **4.2.1 Test Facility Development**