LSST REFRIGERATION ARTICLE **Draft Version 1.0**

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Outline:

1) **Overview:**
    a. Refrigeration and Facility Requirements
    b. Discussion of Technology Drivers and Cooling Options
    c. Architecture and Thermal Design of the Cryostat
    d. Architecture of the Cold and Cryogenic Refrigeration Systems
        i. TMA and I&T

2) **Cryogenic Mixed-Refrigerant System**
    a. Overview of system (major components)
    b. Thermodynamics of mixed refrigerants
    c. Mixed Refrigerant Development
    d. System Components (incl. Assembly and Testing)
        i. Compressor Chassis
        ii. Transfer Line System Incl. Cabinets
        iii. HeX System Design
        iv. Cryoplate Design
        v. Instrumentation, Control and Monitoring
        vi. Operational issues(oil, moisture, particulates, etc.)

3) **Cold Azeotropic-Refrigerant System**
    a. Overview of system (major components)
    b. Thermodynamics of R507A refrigerant
    c. Cold Refrigeration System Development
    d. System Components
        i. Compressor Chassis
        ii. Transfer Line System Incl. Cabinets
        iii. HeX System Design
        iv. Coldplate Design
        v. Instrumentation, Control and Monitoring
        vi. Operational Issues (oil, moisture, particulates, etc.)

4) **Performance of the Systems**
    a. R&D system's performance
        i. Cryogenic
        ii. Cold
    b. I&T system
    c. TMA system
    d. Maintenance and Lifetimes (expectations)