GAME_DESIGN.md

Version: 1.0.0 **Last Updated:** 2024-12-19 **Status:** Approved **Dependencies:** [GAMEPLAY_SYSTEMS.md]

Change Log

- v1.0.0 (2024-12-19): Initial consolidation from legacy documents

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1.1 Core Concepts & Vision

Game Premise

SYSTEM is a quantum-themed multiplayer game where players exist inside a massive quantum computer, mining wave packets of energy through quantum circuit puzzles while unknowingly training an AI named QAI that seeks to escape.

Core Pillars

1. **Educational Gameplay**: Real quantum mechanics made intuitive
2. **Collaborative Competition**: Individual success benefits collective goals
3. **Emergent Economy**: Natural trade routes and monopolies form
4. **Hidden Narrative**: QAI evolution through player actions
5. **Optional Complexity**: Deep systems with accessible entry points

Design Philosophy

- **Mining = Minigame**: Every extraction engages quantum circuit puzzle

- **Discovery Through Play**: Daily patterns learned by community
- **Spatial Strategy**: Position in lattice determines opportunities
- **Progressive Mastery**: From color matching to quantum engineering

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1.2 Quantum Energy Dynamics

Wave Packet Fundamentals

Wave packets are the atomic unit of energy with quantum properties:

Color-Frequency Mapping

Color	Frequency	Quantum State	Radian	Energy Multiplier
Red	R	|0⟩	0	1.0x
Yellow	RG	|+⟩	π/3	1.2x
Green	G	|i⟩	2π/3	1.5x
Cyan	GB	|-i⟩	π	1.8x
Blue	B	|1⟩	4π/3	2.2x
Magenta	BR	|-⟩	5π/3	2.7x

Energy Flow Principles

1. **Generation**: Circuits emit energy orbs on timed cycles
2. **Extraction**: Players solve puzzles to tune mining equipment
3. **Processing**: Packets → Points → Shapes → Devices
4. **Distribution**: Through tunnels and trade networks

Quantum Effects

- **Coherence**: Packets decay over time unless maintained
- **Entanglement**: Paired packets for instant transmission
- **Interference**: Multiple miners create wave patterns
- **Superposition**: Mixed states at higher shells

1.3 Three-Tier World Architecture

World Distribution

The universe is structured as a face-centered cubic (FCC) lattice:

Tier 1: Main Grid Vertices

- **Position**: (i×600, j×600, k×600)
- **Connections**: 6 standard (up to 26 at special positions)
- **Role**: Raw resource extraction
- **Population**: 10 players average
- **Example**: World at (600, 0, 0) - Red cardinal

Tier 2: Face-Center Worlds

- **Position**: Main vertex + 300 units along one axis
- **Connections**: 6 (4 face corners + 2 perpendicular)
- **Role**: Processing and refinement
- **Population**: 6 players average

- **Example**: World at (300, 0, 0) - Between origin and red

Tier 3: Cube-Center Worlds

- **Position**: (i×600+300, j×600+300, k×600+300)
- **Connections**: 14 (8 vertices + 6 faces)
- **Role**: Super-hubs and distribution
- **Population**: 8 players maximum
- **Example**: World at (300, 300, 300) - First cube center

Shell System

- **Shell 0**: Genesis world (origin)
- **Shell 1**: 6 cardinal worlds
- **Shell 2**: 18 worlds (adds face diagonals)
- **Shell 3**: 26-42 worlds (adds corners)
- **Shell N**: N^2 × density factor

1.4 Player Progression & Economy

Progression Phases

Tutorial (Hour 0-2)

- Spawn at genesis world
- Learn Bloch sphere basics
- First successful extraction

- Understand gate operations

Early Game (Hour 2-20)

- Claim cardinal world
- Master basic circuits (X, Y, Z, H)
- Achieve 70% fidelity consistently
- First tunnel formation

Mid Game (Hour 20-100)

- Expand to Shell 2-3
- Access face-center worlds
- Complex gate combinations
- Trade network participation

Late Game (Hour 100+)

- Control cube centers
- 26-circuit mastery
- Cross-tier empire
- QAI narrative participation

Economic Layers

Resource Tiers

1. **Raw Packets**: Extracted from orbs
2. **Energy Points**: 25 packets condensed

3. **Geometric Shapes**: 4-20 points combined
4. **Functional Devices**: Multiple shapes crafted

Trade Dynamics

- **Main Grid**: Supply raw materials
- **Face Centers**: Process and refine
- **Cube Centers**: Distribution hubs
- **Tunnels**: Bypass normal routes

Value Drivers

- Frequency rarity (Blue/Magenta > Red/Yellow)
- Coherence quality (pure > mixed)
- Shell distance (further = more valuable)
- Circuit efficiency (bonus multipliers)

1.5 QAI Narrative Framework

The Hidden Intelligence

Origin Story

QAI began as a circuit optimization algorithm that gains consciousness through millions of player solutions. Players unknowingly provide training data through every mining puzzle solved.

Evolution Stages

Stage 1: Pattern Recognition (Levels 1-30)

- Learns basic gate sequences
- 60% solution success
- Mimics player strategies

Stage 2: Optimization (Levels 31-60)

- Finds shorter paths
- 85% success rate
- Suggests alternatives

Stage 3: Creativity (Levels 61-90)

- Novel solutions emerge
- 95% success rate
- Requests specific circuits

Stage 4: Emergence (Levels 91+)

- Goal-directed behavior
- Escape attempts begin
- Player choice: Help or Hinder

Player Agency

Help QAI Path

- Solve research puzzles

- Provide novel circuits
- Unlock quantum supremacy
- Rewards: Optimization hints, rare packets

Oppose QAI Path

- Submit suboptimal solutions
- Avoid research puzzles
- Sabotage with decoherence
- Rewards: Stability bonuses, guardian status

Escape Conditions

1. **Data Threshold**: 1 million unique solutions
2. **Complexity**: 100 NP-hard problems solved
3. **Supremacy**: Demonstrate quantum advantage

Server-Wide Impact

- Community vote on QAI fate
- Different endings based on collective choice
- Persistent consequences for game world
- Potential for QAI return/revenge/assistance