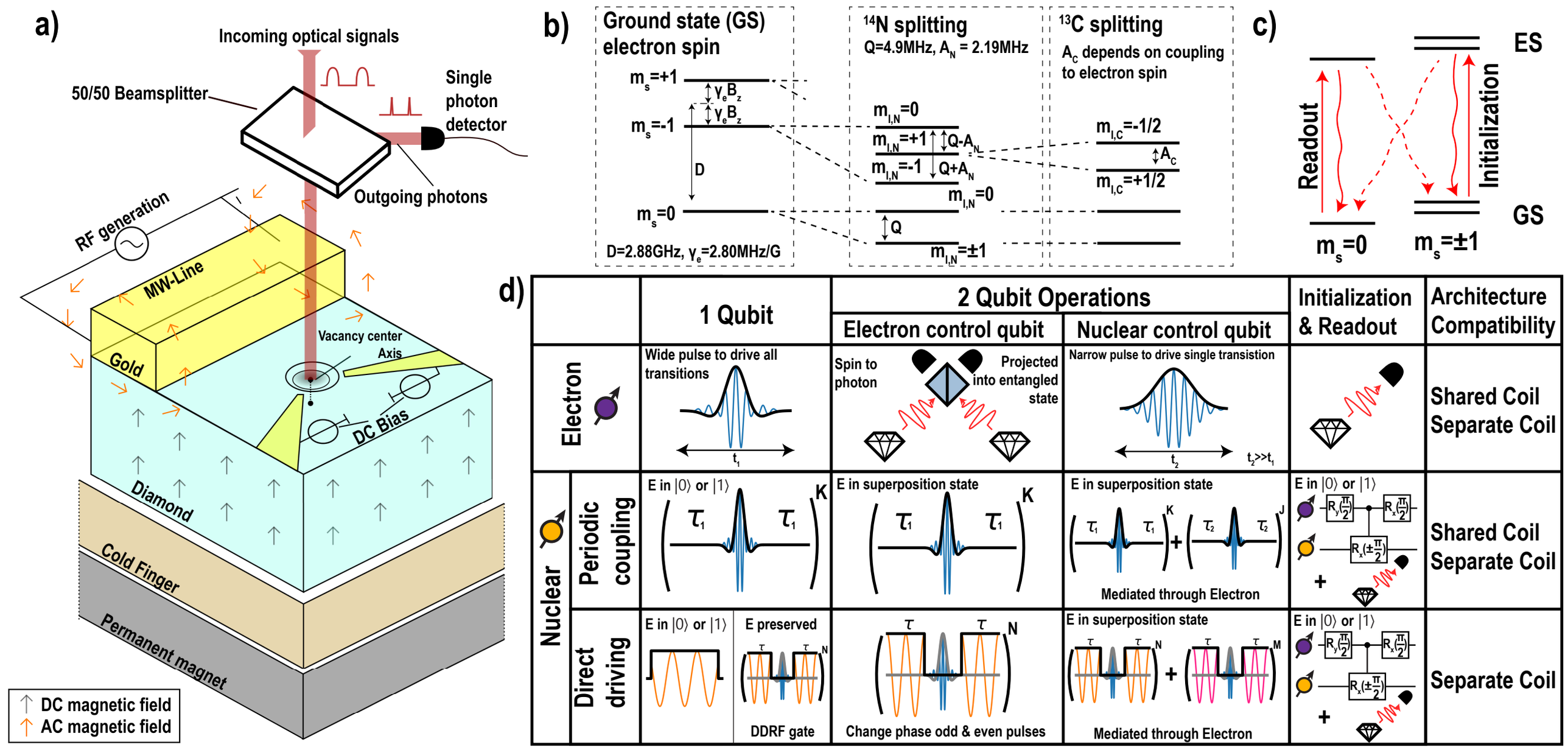
a)
Incoming optical signals
50/50 Beamsplitter
Single photon detector
Outgoing photons
RF generation
MW-Line
Gold
Vacancy center Axis
DC Bias
Diamond
Cold Finger
Permanent magnet
DC magnetic field
AC magnetic field
b)
Ground state (GS) electron spin
m_s=+1
m_s=-1
m_s=0
$\gamma_e B_z$
$\gamma_e B_z$
D
D=2.88GHz, γ_e=2.80MHz/G
^{14}N splitting
Q=4.9MHz, A_N = 2.19MHz
$m_{I,N}$=0
$m_{I,N}$=+1
$m_{I,N}$=-1
Q-A_N
Q+A_N
$m_{I,N}$=0
Q
$m_{I,N}$=±1
^{13}C splitting
A_C depends on coupling to electron spin
$m_{I,C}$=-1/2
A_C
$m_{I,C}$=+1/2
c)
ES
GS
Readout
Initialization
m_s=0
m_s=±1
d)
1 Qubit
2 Qubit Operations
Electron control qubit
Nuclear control qubit
Initialization & Readout
Architecture Compatibility
Electron
Wide pulse to drive all transitions
t_1
Spin to photon
Projected into entangled state
Narrow pulse to drive single transistion
t_2
t_2>>t_1
Shared Coil
Separate Coil
Nuclear
Periodic coupling
E in |0⟩ or |1⟩
E in superposition state
Mediated through Electron
Shared Coil
Separate Coil
Direct driving
E in |0⟩ or |1⟩
E preserved
DDRF gate
Change phase odd & even pulses
Mediated through Electron
Separate Coil