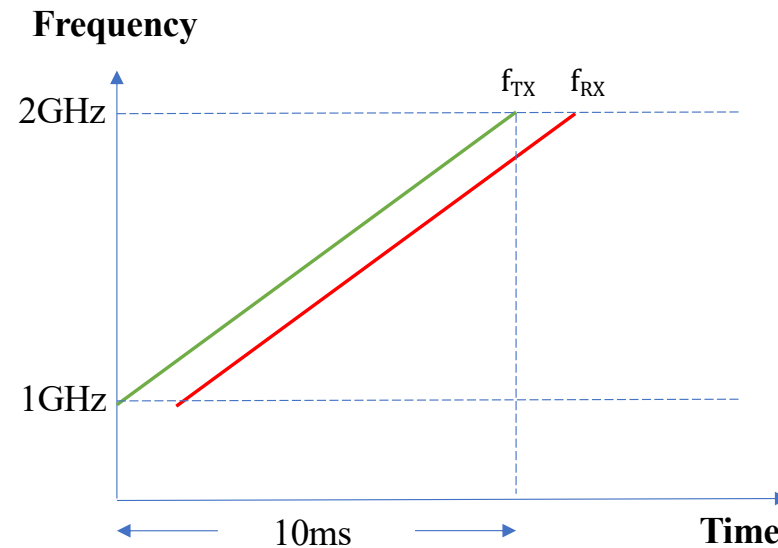
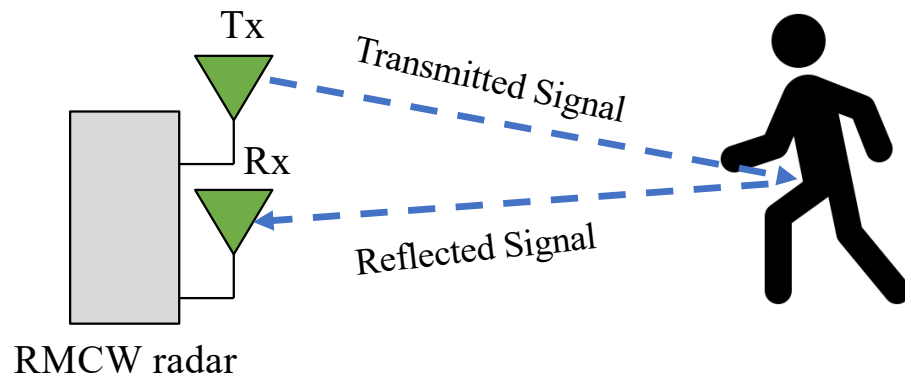


COMP4336/9336

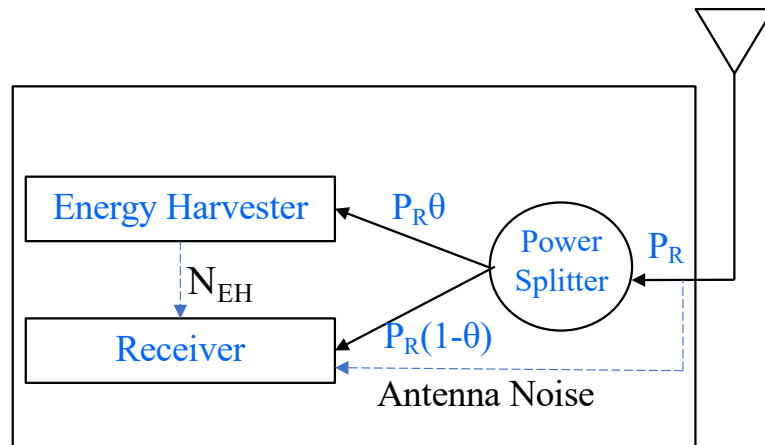
Final Exam Case Study 1

2020 Term 2

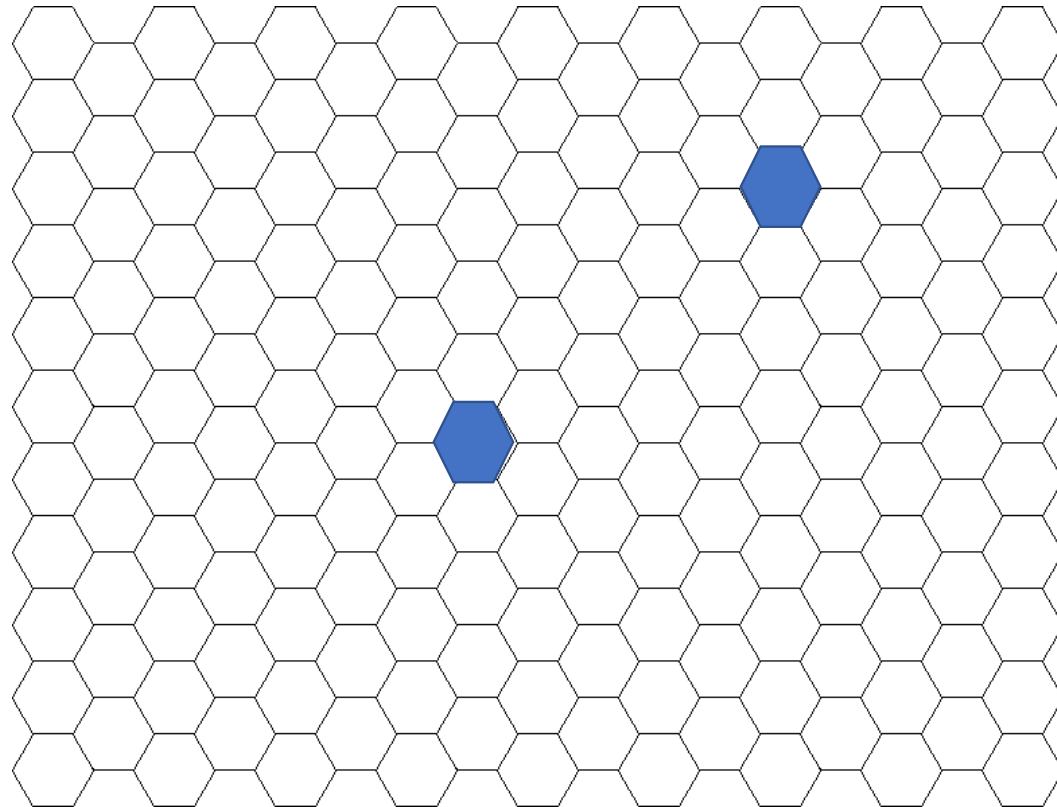
Case 1.1: Observation at an FMCW radar (not drawn to scale)



Case 1.2: The case of a noisy SWIPT. Simultaneous energy harvesting from the same antenna produces an additional noise, N_{EH} , for the receiver. Let us assume that N_{EH} has the same power as the *antenna noise* experienced in the receiver irrespective of any energy harvesting in the device.



Case 1.3: Cellular clustering and co-channel cells. Two co-channel cells are shown by the two *filled* cells.



Case 1.4: Sensor data upload using BLE (Bluetooth 4). A sensor is deployed to detect unusual vibrations in a bridge. Each time it detects an unusual vibration, it records its time and vibration information in a packet and buffers it in the internal memory for uploading them to a nearby server using BLE. The BLE of the sensor sleeps most of the time but it wakes up once every 100ms, transmits all buffered data to the server, and then goes back to sleep again. The packets contain only a few bytes and hence can be transmitted within a few microseconds over the BLE connection. The following table shows packet generation times at the sensor for 10 packets.

Packet #	Generation Time at the Sensor
1	1ms
2	2ms
3	70ms
4	85ms
5	90ms
6	202ms
7	250ms
8	252ms
9	260ms
10	270ms

Case 1.5: Beam training in 802.11ad. Assume a PBSS, where all stations have 12 antenna sectors. The following table shows the sector pairs learned from sector level beam training among 6 stations, A to F. For example, the first row of the table shows that A would use its sector #1 to communicate with B, while B would use its sector #7 to communicate with A.

Station Pair	Sector Pair
(A,B)	(1,7)
(A,E)	(4,12)
(B,E)	(7,2)
(B,F)	(9,10)
(C,D)	(10,4)
(A,F)	(2,7)
(E,F)	(3,7)