FDD GSM (Global systems for Mobile communication

(1) uplink frequency: 890 to 915 MHz
BW = 25 MHz

(2) Down link frequency: 935 to 960 MHz
BW = 25 MHz

(3) Guard band between uplink and downlink
= 935 − 915 = 20MHz

(4) GSM is actually FDMA/TDMA/FDD
↓
uplink downlink in frequency domain

(5) Why FDMA/TDD
Uplink frequency from 890 to 915 MHz is divided into 124 Frequency Slots with
Each Frequency Slot BW = 200 KHz or .2 MHz

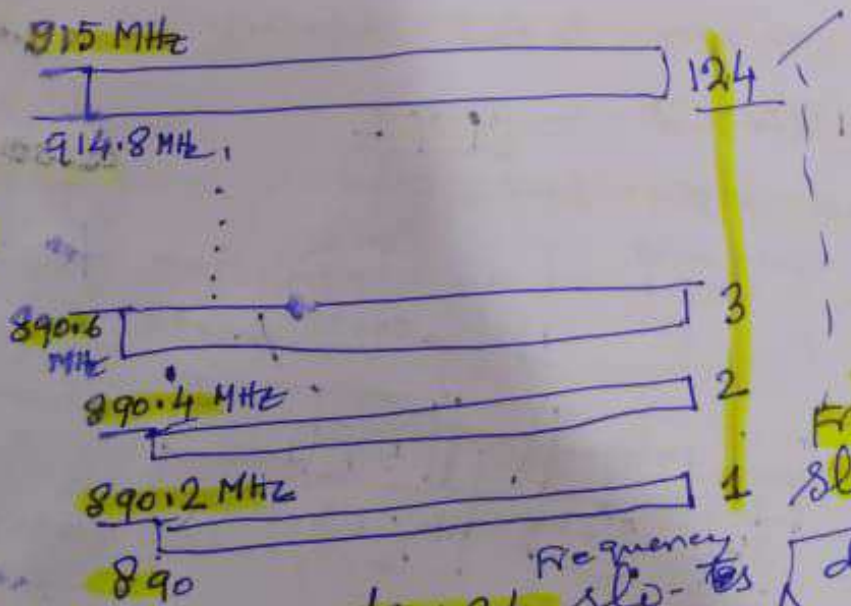

Fig 1

(6) Each of 1 to 124 Frequency Slots are divided into 8 time slots → Each is a channel.

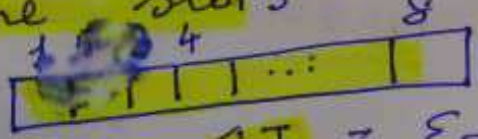

Fig 2

2Th frequency slot
1 ≤ i ≤ 124.

ΔT = Each Slot duration = 0.5 ms

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(7) Each uplink time slot (= uplink channel) of a numbered as (u, FNO, K)

u = uplink

FNO = Frequency slot number $1 \le FNO \le 124$

K = Time slot NO $1 \le K \le 8$

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(8) Similarly downlink frequency 935 to 960 MHz is divided into 124 frequency slots

Each frequency slot of BH = 200 KHz

Each frequency slot is divided into 8 time slots.

Each time slot is a downlink channel.

Downlink channels are numbered as

(d, FNO, K) where d = downlink

FNO = Frequency slot number

$1 \le FNO \le 124$

$1 \le K \le 8$ ⇒ Time slot Number

(9) How many total uplink channels:

$= 124 \times 8 = 992$

Total downlink channels also 992

(10) Each Time slot slot has following format.

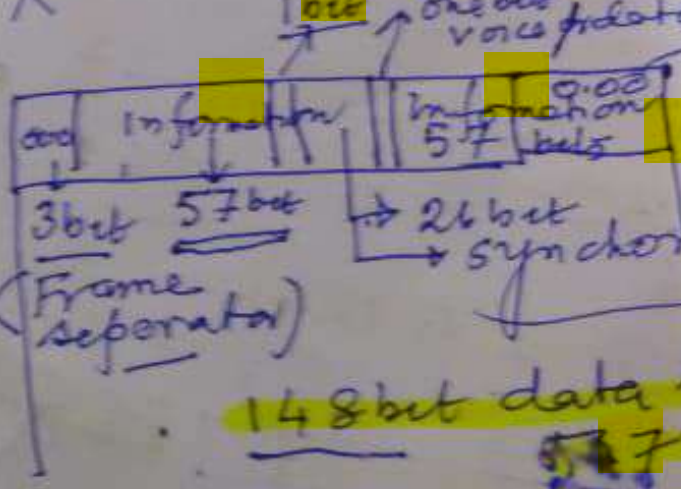
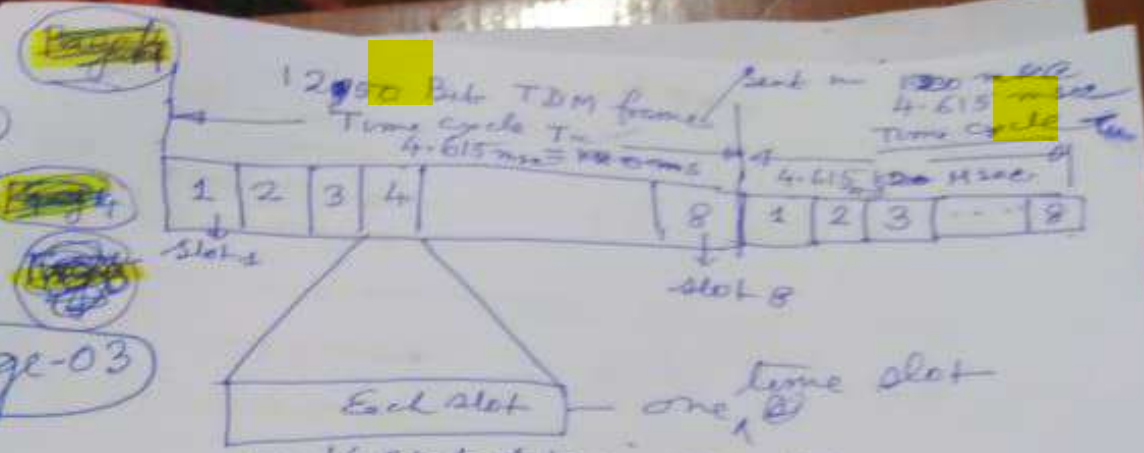


Fig 2.

148 bit data frame sent in



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Each slot — one time slot

JT=148 bit data in 547 μsec

11. Cells = Seven hexagonal cells.

Figure 5

8 Cell

Each cell is having a base station

Total uplink channels = 992

These channels are divided in 7 sets

Each set contains (Total uplink channels / Total downlink channels) / cell

$= 7 \overline{)992}\ \overline{)141} \approx 140$ channels

$\begin{array}{r} 7 \\ \hline 29 \\ 28 \\ \hline 12 \end{array}$

Similarly, having 140 / Per cells.

12 To "Make a call between 2 mobiles we require one uplink and one downlink channels.

3. Total 140 calls possibles per cells.

4. But There is also space divisions Multiplexing here SDM

8th cell which far Apart can share the frequency of 1st cell. → channels

Shall 9 can share ~~frequency~~ channels of cell 4

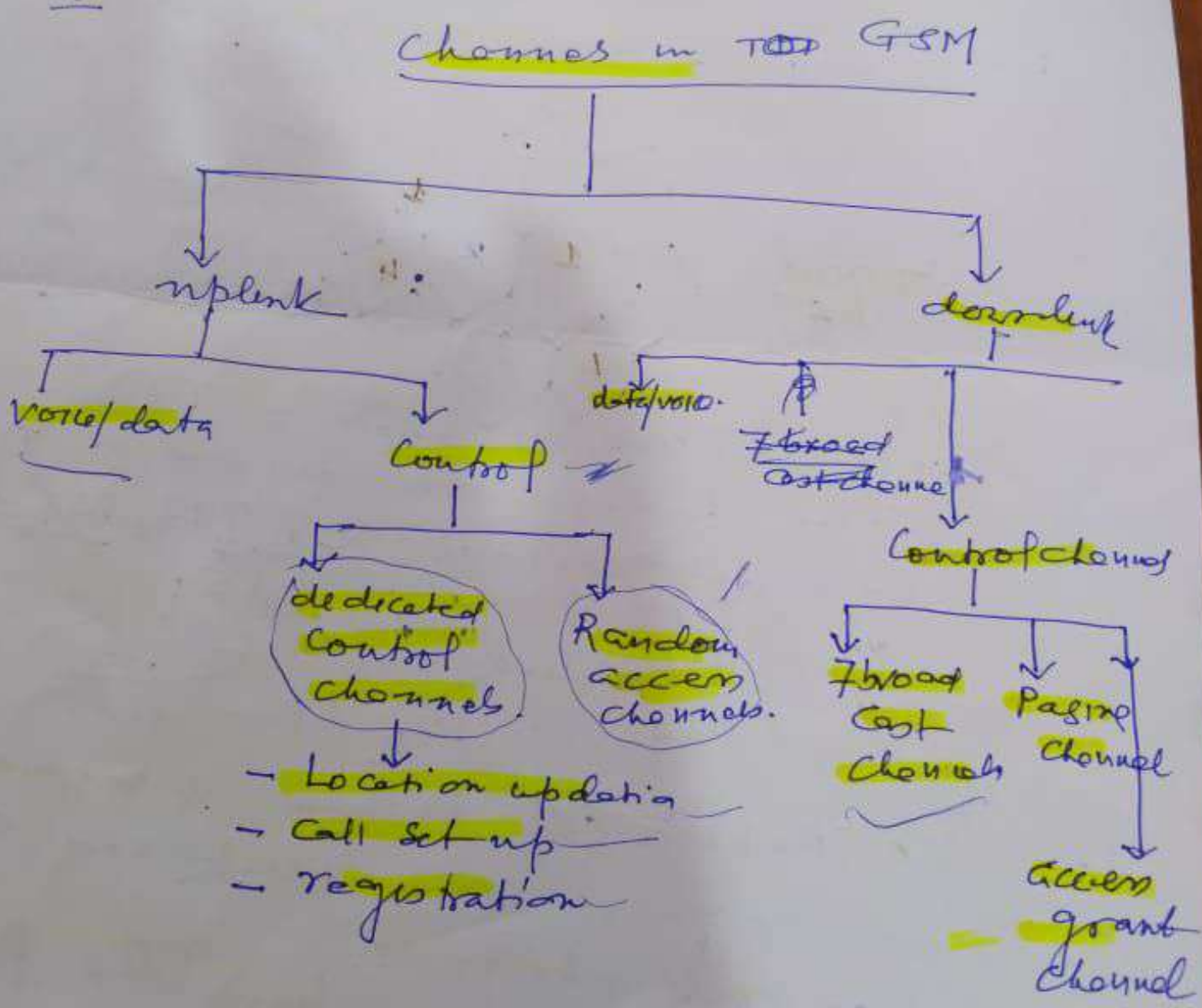
So if a city has n no of cells

say n = 100

How many simultaneous calls possible in a city = 140 × 100

= 14000 Calls / calls.

15



(5) Handoff

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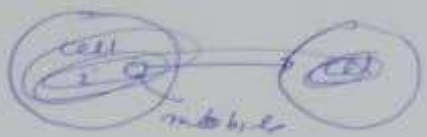

mobile station MS moving from cell 1 to cell 2

⇒ Handoff

- MS is registered under cell 1 by dedicated control channel.
- MS while moving to cell 2 its signal strength goes below a threshold.
- MS sends a request to its base station for a disassociation with K and reassociation with base 2 using dedicated control channel.

Handoff takes place (order for voice ⇒ No problem for MS) for data ⇒ data loss for few milliseconds.