4.1

Half Rate

GSM

Global System for Mobile Communications

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The GSM Half Rate Story

- When will the ETSI speech CODEC algorithm and integration be completed?
- Why do we need Half Rate?
- When do we need it?
- How will it be implemented?
- What will it cost to implement?

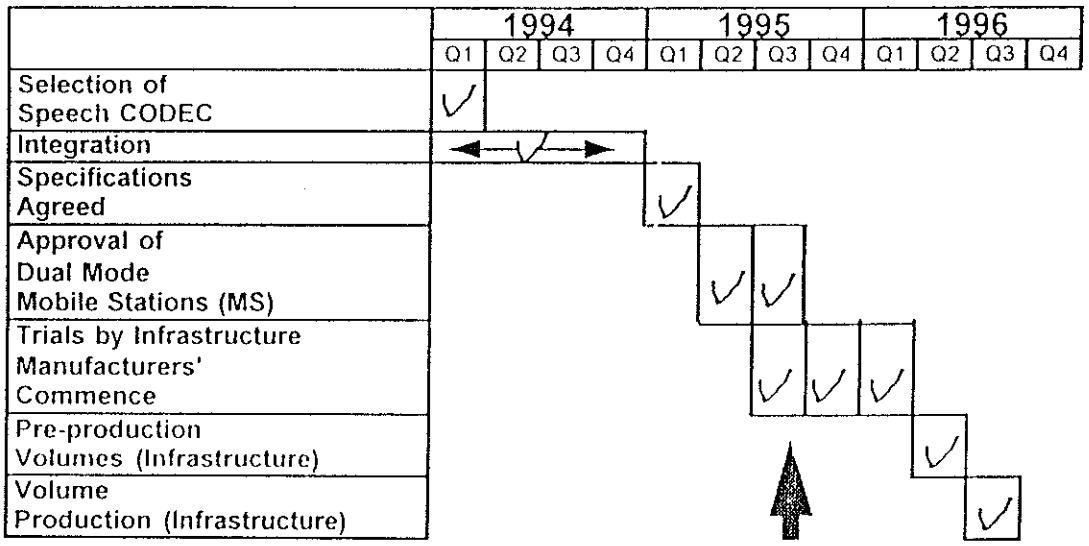
GSM Half Rate (HR) Spec Timescales

- Half Rate CODEC selection
  - January 1994
- Integration with Phase 2 Air - interface
  - During 1994
- Specification for integration of HR
  - Q1 1995
- Type approval of dual mode mobiles
  - Q2 1995

The Market Need for GSM Half Rate

- Extends GSM "spectrum efficiency"
- To increase the traffic channel capacity of existing networks
- To significantly reduce infrastructure network expansion costs
- To improve network trunking efficiency

When Do We Need GSM Half Rate?



How Will Half Rate be Implemented

- Some new boards for transcoder and Base Station (BTS) units
- New software for the BSS and OMC RF sub-systems
- New dual mode Mobile Stations (MS)
- No special re-planning of network
- Adoption of 8Kbit sub-multiplexed switching!

How Will it cost to Implement Half Rate?

Operators*

- Some BTS Base Station and XCDR transcoder board changes
- New BSS software downloaded

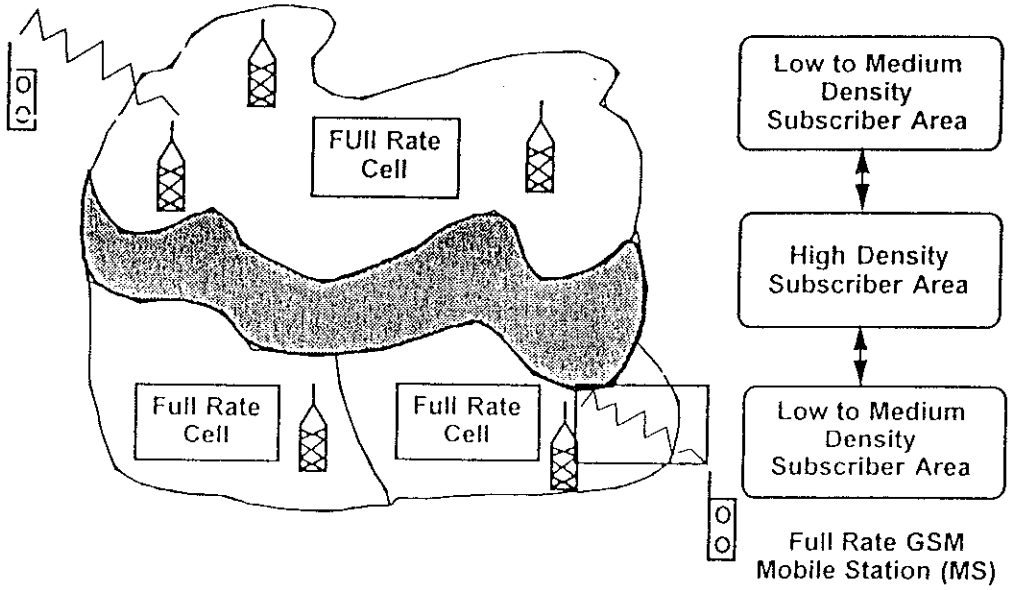
Users

- Retain Full Rate Mobile Stations
- Offered new Dual Mode/Rate Mobile Stations in 1996

* Infrastructure savings to operators is substantial, in achieving almost 2 times capacity

GSM Dual Mode Mobile Stations

Dual Mode GSM Mobile Station (MS)



Dual Rate Not Half Rate

- Half Rate is, in reality, part Dual Rate
- Half Rate transcoders and BTS Base Stations will have the ability to handle both algorithms for
  - Half Rate and - Full Rate
- Operators will have the ability to handle either Dual Rate or Full Rate Mobile Stations (MS)

Half Rate Speech Quality

- More robust algorithm
- Improved error protection
- Reduced date speed at 3.6Kbits/sec

SIMILAR AS FULL RATE

Capacity Improvement by Half Rate VS. TACS

- Assumption : 4x3 Reuse pattern for GSM
  5% GOS in air interface
  Not consider control channel for GSM and TACS
- Case I : 5MHz Frequency band
- Case II : 10MHz Frequency band

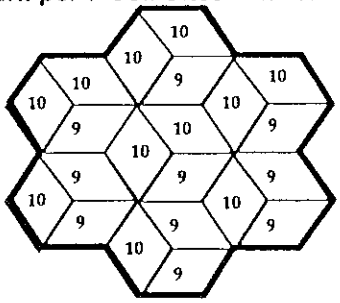
MOTOROLA
International Cellular Infrastructure Division
GSM Half Rate

Capacity Improvement by Half Rate VS. TACS

Case I : 5MHz Band, 7x3 reuse pattern for TACS

TACS channels : 5 / 0.025 = 200

Erl. per 7 Cell Sites = 122.1

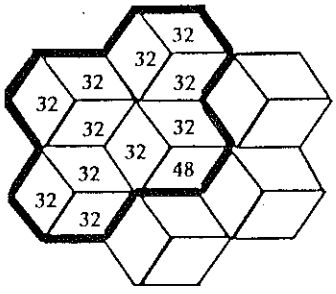


Based on 28 Cell Sites:

No. of channels : 200x4 = 800

Erl. : 122.08x4 = 488.4

GSM carrier : 5 / 0.2 = 25
GSM half rate channels : 25x16 = 400
Erl. per 4 Cell Sites = 336.7



Based on 28 Cell Sites:

No. of channels : 400x7 = 2800

Erl. : 336.7x7 = 2356.9

Channel Number Improvment: 2800 / 800 = 3.5

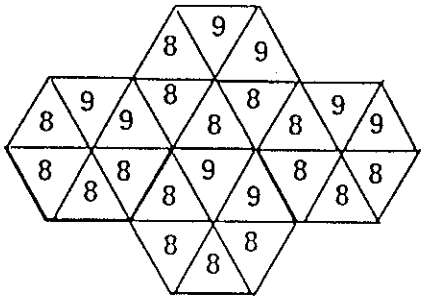
Erl. Improvment: 2356.9 / 488.4 = 4.8

Capacity Improvement by Half Rate VS. TACS

Case I : 5MHz Band, 4x6 reuse pattern for TACS

TACS channels : 5 / 0.025 = 200

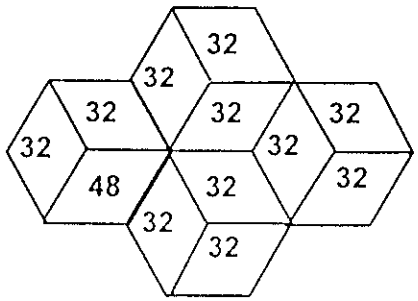
Erl. per 4 Cell Sites = 115.6



GSM carrier : 5 / 0.2 = 25

GSM half rate channels : 25x16 = 400

Erl. per 4 Cell Sites = 336.7



Channel Number Improvment: 400 / 200 = 2

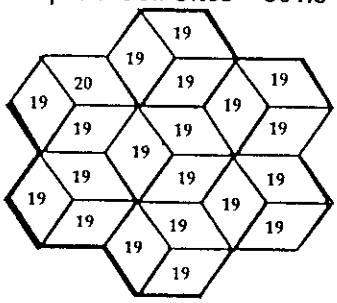
Erl. Improvment: 336.7 / 115.6 = 2.9

Capacity Improvement by Half Rate VS. TACS

Case II: 10MHz Band, 7x3 reuse pattern for TACS

TACS channels : 10 / 0.025 = 400

Erl. per 7 Cell Sites = 301.5



Based on 28 Cell Sites:

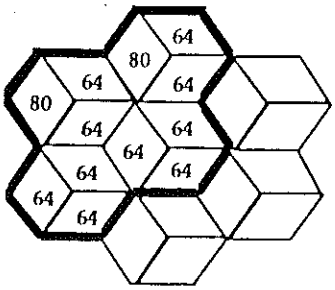
No. of channels : 400x4 = 1600

Erl. : 301.5x4 = 1206

GSM carrier : 10 / 0.2 = 50

GSM half rate channels : 50x16 = 800

Erl. per 4 Cell Sites = 735.6



Based on 28 Cell Sites:

No. of channels : 800x7 = 5600

Erl. : 735.6x7 = 5149.2

Channel Number Improvment: 5600 / 1600 = 3.5

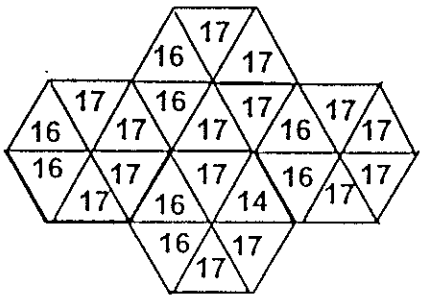
Erl. Improvment: 5149.2 / 1206 = 4.3

Capacity Improvement by Half Rate VS. TACS

Case II : 10MHz Band, 4x6 reuse pattern for TACS

TACS channels : 10 / 0.025 = 400

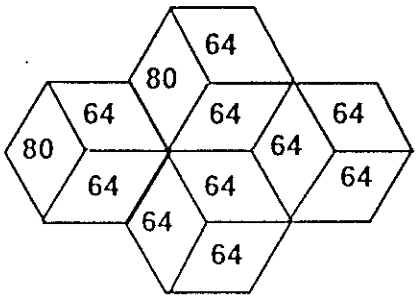
Erl per 4 Cell Sites = 291.7



GSM carrier : 10 / 0.2 = 50

GSM half rate channels : 50x16 = 800

Erl per 4 Cell Sites = 735.6



Channel Number Improvment: 800 / 400 = 2

Erl. Improvment: 735.6 / 291.7 = 2.5

Capacity Improvement by Half Rate VS. TACS

Summary Table

Scenario	Reuse Pattern	Channel Number Improvement	Erl. Improvement
Case I	7x3 Reuse for TACS	3.5	4.8
5MHz	4x6 Reuse for TACS	2	2.9
Case II	7x3 Reuse for TACS	3.5	4.3
10MHz	4x6 Reuse for TACS	2	2.5