Patenting in Telecom in India – A Case Study

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Executive Summary:

This study covers:

✓ An overview of Indian telecommunication market and the patenting trend of major telecommunication companies
✓ Analysis of patent filing trend of major telecommunication companies
✓ Landscape study of patenting in India in telecommunication related technologies
✓ The correlative analysis of growth of the Indian telecommunication market and the increase in patenting by major telecommunication companies
✓ Observations and broad strategic insights
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Objectives of the Study

The objectives of this study are:

- Identify the key players in the Indian telecommunication sector and their patent filing trends in India.
- In which technical areas are the telecommunication companies actively filing in India?

The findings from this study may offer compelling facts in relation to the Indian IP strategy of telecommunication companies such as:

- Assessment of Indian patent filings of telecom players;
- Overview of trends in IP protection relating to mobile communication technologies in India; etc.

Methodology

The methodology included framing research questions, defining a set of objectives, identifying a search strategy, analyzing the search results using business intelligence gathered around the research topic, and building patent maps and landscapes using software tools. To achieve this objective, the following activities were performed:

- Substantial searches were conducted using our internal database namely CIPI (Clairvolex IP Information System) the first of its kind comprehensive electronic database of Indian IP records.
- The obtained literature was categorized into different technology levels.
- Results obtained were further worked upon to derive useful IP business intelligence.
Search Details

- The period covered for the analysis was from 2005 until November 30, 2010. Since some of the patent applications may not be published until 18 months from the filing date, the patent applications which were filed in 2009, but not published by November 30, 2010, are not included in the study.
- The study was focused on analyzing patent applications corresponding to telecommunication domain only.
1. India’s Telecom Story

India has a fast growing telecommunication industry. The recent growth in the Indian telecommunications sector is due to factors such as policy reforms, low tariffs, cheaper handsets and a highly competitive market. India’s mobile phone market is now considered as the fastest growing in the world, with the overall tele-density increasing to 62.51 in October 2010.

1.1 India’s Tele-density

| Number of telephone subscribers in India at the end of October-10 | 742.12 Million |
| Wireless subscription | 706.69 Million |
| Wireline subscription | 35.43 Million |
| Overall growth rate during the month of October | 2.61% |
| Wireless subscriber growth rate | 2.76% |
| Wireless Tele-density | 59.52 |
| Overall Tele-density | 62.51 |

Source: Telecom Regulatory Authority of India

- India is ranked 3rd in the world in respect of network size.

- **18.98 Million** new additions in wireless users by October 2010.
1.2 Wireless Subscriber Base and Tele-density

Mobile services were commercially launched in India in August 1995. In the initial 5-6 years, the average number of monthly subscribers added ranged between 0.05 to 0.1 million leading to the total mobile subscriber base amounting to 10.5 million in December 2002. However, after a series of government initiatives such as expansion of mobile telephony to the rural areas, ensuring the affordability of services, and building private partnerships, the monthly subscriber base has increased to about 15 million per month by 2010.

In the last 5 years, India’s telecom industry continued to grow at the rate of 64.51%. In the coming years, the market is expected to grow further with the entry of new players. The addition of around 15 million mobile subscribers
every month in the recent past is a good indicator of the market potential. As shown in the bar graph of FIG. 2, the mobile subscriber base has increased 25 times within the last 5 years.

India uses both GSM and CDMA technologies to service mobile phone users. In March 2010, the cumulative GSM and CDMA mobile subscriber base in the country was 584.32 million.

According to the CDMA Development Group (CDG), India is the world's second-largest CDMA market\(^1\). Globally, the two Indian providers, Reliance Communication (RCOM) ranks 2\(^{nd}\) and Tata Teleservices 4\(^{th}\) among the top CDMA operators.

The CDMA users' growth in India can be attributed to factors such as the range of affordable devices and the introduction of CDMA2000 voice and data services into urban and rural areas.

### 1.3 Revenue Figures

According to the “Indian Telecom Services Performance Indicator Report” released by TRAI, the Gross Revenue (GR) and the Adjusted Gross Revenue (AGR) for the Telecom Sector in the quarter ending June-10 stood at INR 49,392.75 Crore (US$ 10.64 billion) and INR. 30,481.93 Crore (US$ 6.57 billion) respectively\(^2\).

It is also pertinent to note that despite the recession in the global market, the Indian economy grew at around 7% in 2009-10 implying overall strength of the Indian economy.

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\(^2\) Source: [http://www.trai.gov.in/WriteReadData/trai/upload/Reports/52/5octoblerindicatorreporton13oct.pdf](http://www.trai.gov.in/WriteReadData/trai/upload/Reports/52/5octoblerindicatorreporton13oct.pdf)
1.4 Projected Growth

- Mobile phone production is estimated to grow at a CAGR of 34% from 2009 to 2011 amounting to 150 million handsets by 2010.
- Revenues are estimated to grow at a CAGR of 30% from 2009 to 2011 to US$ 13.6 billion.

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Most of the world's leading telecommunication companies actively protect their IP in India. Qualcomm has filed maximum number of patent applications in India totaling 1951 during the period of 2005-2009, followed by Ericsson AB at 1232, Nokia at 1154, Samsung at 1103, Motorola at 626, Research in Motion 558, LG at 403, and Sony Ericsson at 363.

*Note: Data corresponding to 2009 includes patent applications which were filed in 2009 and published by November 30, 2010*
2.1 Patent filing trend of telecommunication companies in India

The graph shows that Qualcomm and Sony Ericsson have shown sustained increase in their filing trend from 2005-2009. In addition, Ericsson, Nokia and Samsung also filed a huge number of patent applications with maximum filings in the year 2007. However, there is a slight reduction in their filing activities in 2008 and 2009. LG filed maximum patent applications in the year 2007. RIM has been more or less consistent whereas Motorola’s patent filings have been on a decline during 2005-2009.
2.2 Patent filing trend of telecommunication companies in India - Taxonomy-wise distribution

The taxonomy-wise distribution shown in the above graph compares the number of patent applications of telecommunication companies in the corresponding taxonomies. The table below summarizes the owners having maximum and minimum number of applications in the respective taxonomy.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Taxonomy</th>
<th>Player (s) having maximum number of patent applications</th>
<th>Player (s) having minimum number of patent applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electric Communication Techniques</td>
<td>Qualcomm (1711)</td>
<td>Sony Ericsson (239)</td>
</tr>
<tr>
<td>2</td>
<td>Electric Elements</td>
<td>Ericsson AB (44)</td>
<td>Nokia/LG (7)</td>
</tr>
<tr>
<td>3</td>
<td>Computing</td>
<td>Samsung (233)</td>
<td>LG (32)</td>
</tr>
<tr>
<td>4</td>
<td>Electronic Circuitry</td>
<td>Ericsson AB (58)</td>
<td>LG (2)</td>
</tr>
<tr>
<td>5</td>
<td>Acoustics/Musical Instrument</td>
<td>Nokia (32)</td>
<td>Samsung/RIM/Sony Ericsson (3)</td>
</tr>
<tr>
<td>6</td>
<td>Measurement</td>
<td>Qualcomm (23)</td>
<td>LG (0)</td>
</tr>
</tbody>
</table>
2.3 Patent filing trend of telecommunication companies in India – IPC-R Subclass Map

The maximum number of Indian patent applications filed by telecom players falls under IPC Subclass H04L which in general relates to transmission of digital information that covers data transmission, telegraphic communication, and methods or arrangements for monitoring. The definitions of the top IPC Subclasses are given below:

<table>
<thead>
<tr>
<th>IPC Subclass</th>
<th>Definition</th>
<th>IPC Subclass</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>H04L (2178)</td>
<td>Transmission Of Digital Information</td>
<td>H04Q (1264)</td>
<td>Methods, circuits, or apparatus for establishing selectively a connection between a desired number of stations (normally two), or between a main station and a desired number of substations (normally one) for the purpose of transferring information via this connection after it has been established</td>
</tr>
<tr>
<td>H04B (1070)</td>
<td>Transmission</td>
<td>G06F (800)</td>
<td>Electric Digital Data Processing</td>
</tr>
<tr>
<td>H04N (528)</td>
<td>Pictorial Communication</td>
<td>H04M (378)</td>
<td>Telephonic Communication</td>
</tr>
<tr>
<td>H04J (109)</td>
<td>Multiplex Communication</td>
<td>G10L (108)</td>
<td>Speech Analysis Or Synthesis</td>
</tr>
<tr>
<td>H03M (77)</td>
<td>Coding, Decoding Or Code Conversion</td>
<td>H01Q (77)</td>
<td>Aerials</td>
</tr>
<tr>
<td>H04W (65)</td>
<td>Wireless Communication</td>
<td>G01S (57)</td>
<td>Radio Navigation</td>
</tr>
<tr>
<td>G06T (52)</td>
<td>Image Data Processing</td>
<td>H04H (51)</td>
<td>Broadcast Communication</td>
</tr>
<tr>
<td>G06Q (49)</td>
<td>Data Processing Systems Or Methods, Specially Adapted For Administrative, Commercial, Financial, Managerial, Supervisory Or Forecasting Purposes</td>
<td>H04R (16)</td>
<td>Loudspeakers, microphones, gramophone pickups or like acoustic electromechanical transducers</td>
</tr>
<tr>
<td>G01R (15)</td>
<td>Electric and magnetic variable measurement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.4 Patent filing trend of telecommunication companies in India: IPC-R Subclass V/s Telecom Players

Figure 7

A comparative IPC-R sub-class wise analysis of the number of published patent applications of the various telecommunication companies reveals that:

- **Ericsson AB** is dominant in protecting its inventions corresponding to IPC classes:
  - H01Q (26) which in general relates to aerials covering primary active radiating elements and secondary devices for absorbing or for modifying the direction or polarization of waves radiated from aerials

- **Qualcomm** has maximum number of applications corresponding to:
  - H04B (318) which covers the systems and methods for transmission of information-carrying signals, wherein the transmission is independent of the nature of the information, and
further includes monitoring and testing arrangements and the
suppression and limitation of noise and interference

- H04L (709) which in general relates to transmission of digital
information covering transmission of signals having been supplied
in digital form and includes data transmission, telegraphic
communication, or methods or arrangements for monitoring

- H04Q (392) covering applications corresponding to methods,
circuits, or apparatus for establishing selectively a connection
between a desired number of stations, or between a main station
and a desired number of substations for the purpose of
transferring information via the connection and selective calling
arrangements over connections already established. In either
case, the connection may be by means of electric conductors or
electromagnetic waves

- H04N (164) covering systems and methods for transmission or
reproduction of arbitrarily composed pictures and circuits specially
designed for dealing with pictorial communication signals, e.g.
television signals, as distinct from merely signals of a particular
frequency range

- H04W (42) which relates to wireless communication networks

- G06T (17) covering arrangements for geometrically modelling
objects and arrangements for analysing the geometric attributes
of an image of an object

- G01S (20) which covers beacon systems, direction finders and
radar systems and includes systems for determining distance or
velocity without using reflection or re-radiation

- Sony Ericsson is dominant in protecting its inventions corresponding to
IPC classes:

  - H04M (82) which covers telephonic communication systems
combined with other electrical systems and testing arrangements
peculiar to telephonic communication systems
o H04R (7) which includes loudspeakers, microphones, gramophone pick-ups or like transducers producing acoustic waves or variations of electric current or voltage

Nokia has maximum number of applications corresponding to IPC classes:

o H04H (21) which covers distribution of entertainment or informative matter simultaneously to a number of receiving stations over transmission lines or over radio waves and recording of the use made of the broadcast service

o G10L (32) relating to speech recognition

Samsung leads the competitors in IPC classes:

o H04J (27) covering technologies related to circuits or apparatus for combining or dividing signals for the purpose of transmitting them simultaneously or sequentially over the same transmission path and monitoring arrangements there for

o H03M (20) which in general relates to coding and decoding

o G06F (201) which in general is related to electric digital data processing that includes information retrieval, constructional details, digitizers, interaction techniques with GUI, and security arrangements

o G06Q (13) which includes data processing systems or methods which are specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes

RIM takes over the competitors in applications corresponding to IPC class G01R (6) which in general is related to measuring all kinds of electric or magnetic variables; testing of electric or magnetic devices etc.
2.5  Filing Trend of Patent Applications of top 3 IPC Sub-classes

2.5.1 Filing Trend of H04L Patent Applications

2.5.2 Filing Trend of H04Q Patent Applications
2.5.3 Filing Trend of H04B Patent Applications

![Graph showing filing trend of H04B Patent Applications for various companies over years 2005 to 2009.](image)
2.6 Patent filing trend of telecommunication companies in India: Detailed IPC-R Subclass Group based distribution

Chart 1

Chart 2

Chart 3

Chart 4
3 Findings

The overall patent filing in India has multiplied over the past few years.

Our analysis of patent filings in India by telecommunication companies shows that all the key players in the space are actively filing patent applications in India. We see a decline in the filings by Motorola. We find Qualcomm leading the filings with Ericsson AB closely behind. We further tried to analyze if there is a correlation between the increase in the patent filings and the tele-density.
A. Patents filed V/s Tele-density

Our analysis shows that there is a direct correlation between the two.

Telecommunication companies are increasingly filing patent applications in India, which is proportionate to the growth in their market share and the overall increase in the growth of the market which is in turn triggered by the overall increase in the number of mobile phone users. The readings of the statistics for the years 2005-09 reflect an upward trend in both the variables.

Figure 8

Source: 2005: http://www.trai.gov.in/WriteReadData/trai/upload/PressReleases/20/pr6jan06.pdf
B. Analysis – Technology V/s Patent Applications

Figure 9

Qualcomm’s filings are primarily in areas such as electric communication techniques (87.6%). The remaining filings are in areas such as electric elements (0.8%), computing (5%), electronic circuitry (1.5%), acoustic (1.1%), and measurement (1.1%).

Samsung has maximum number of patent applications relating to electric communication techniques (73%), followed by computing (21.1%), electronic circuitry (2.4%), electric elements (1%), acoustic (0.3%) and measurement (0.2%).

LG’s patent applications cover electric communication techniques (79.9%). The remaining space is shared by applications related to technical areas of computing (7.9%), acoustic (6.4%), electric elements (1.7%) and electronic circuitry (0.4%). It does not have patent applications related to measurement.
Sony Ericsson’s filings are mainly in areas such as electric communication techniques (65.8%), followed by computing (16.2%), electric elements (6%), measurement (3%), electronic circuitry (1.3%), and musical instrument (0.8%).

Sony Ericsson’s filings are mainly in areas such as electric communication techniques (65.8%), followed by computing (14.4%), electric elements (6.4%), measurement (3.2%), electronic circuitry (1.4%), and musical instrument (0.8%).

RIM’s patent applications are primarily directed at technologies relating to electric communication techniques (53.7%) and computing (31%). The remaining space is shared by technologies related to electronic circuitry (2.5%), electric elements (2.3%), measurement (1.6%), and acoustic (0.5%).

Ericsson’s Indian patent applications primarily relate to electric communication techniques (81.6%), followed by computing (6%), electronic circuitry (4.7%), electric elements (3.5%), acoustic (1.4%) and measurement (1.7%).

Motorola’s filings are directed at electric communication techniques (67.8%), followed by computing (14.5%), electronic circuitry (3.8%), electric elements (3.1%), acoustic (1.9%) and measurement (2.6%).

Nokia’s patent filings cover electric communication techniques (76.5%), followed by computing (15.49%), acoustic (2.7%), electronic circuitry (1.9%), measurement (1.6%) and electric elements (0.6%).
Appendix

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Figure 1: Wireless Subscriber Base and Tele-density
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Figure 5: Taxonomy-wise patent application distribution of the telecommunication companies
Figure 6: IPC-R Subclass Map
Figure 7: IPC-R Subclass V/s Telecom Players
Figure 8: Patents filed V/s Tele-density
Figure 9: Technology V/s patent application
## Annexure

<table>
<thead>
<tr>
<th>Class Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H04B 3/00</td>
<td>Line transmission systems</td>
</tr>
<tr>
<td>H04B 5/00</td>
<td>Near-field transmission systems, e.g. inductive loop type</td>
</tr>
<tr>
<td>H04B 71/00</td>
<td>Monitoring; Testing</td>
</tr>
<tr>
<td>H04B 7/00</td>
<td>Radio transmission systems, i.e. using radiation field</td>
</tr>
<tr>
<td>H04B 10/00</td>
<td>Transmission systems employing beams of corpuscular radiation, or electromagnetic waves other than radio waves, e.g. light, infra-red</td>
</tr>
<tr>
<td>H04B 15/00</td>
<td>Suppression or limitation of noise or interference</td>
</tr>
<tr>
<td>H04B 1/00</td>
<td>Details of transmission systems</td>
</tr>
<tr>
<td>H01Q 11/00</td>
<td>Electrically-long aerials having dimensions more than twice the shortest operating wavelength and consisting of conductive active radiating elements</td>
</tr>
<tr>
<td>H01Q 3/00</td>
<td>Arrangements for changing or varying the orientation or the shape of the directional pattern of the waves radiated from an aerial or aerial system</td>
</tr>
<tr>
<td>H01Q 21/00</td>
<td>Aerial arrays or systems</td>
</tr>
<tr>
<td>H01Q 9/00</td>
<td>Electrically-short aerials having dimensions not more than twice the operating wavelength and consisting of conductive active radiating elements</td>
</tr>
<tr>
<td>H01Q 5/00</td>
<td>Arrangements for simultaneous operation of aerials on two or more different wavebands</td>
</tr>
<tr>
<td>H01Q 1/00</td>
<td>Details of, or arrangements associated with, aerials</td>
</tr>
<tr>
<td>H04J 14/00</td>
<td>Optical multiplex systems</td>
</tr>
<tr>
<td>H04J 3/00</td>
<td>Time-division multiplex systems</td>
</tr>
<tr>
<td>H04J 13/00</td>
<td>Code multiplex systems</td>
</tr>
<tr>
<td>H04J 11/00</td>
<td>Orthogonal multiplex systems</td>
</tr>
<tr>
<td>H04J 1/00</td>
<td>Frequency-division multiplex systems</td>
</tr>
<tr>
<td>H04H 20/00</td>
<td>Arrangements for broadcast or for distribution combined with broadcast</td>
</tr>
<tr>
<td>H04H 60/00</td>
<td>Arrangements for broadcast applications with a direct linkage to broadcast information or to broadcast space-time</td>
</tr>
<tr>
<td>H04H 5/00</td>
<td>Stereophonic broadcast systems</td>
</tr>
<tr>
<td>H04H 9/00</td>
<td>Recording the use made of the broadcast service</td>
</tr>
<tr>
<td>H04H 1/00</td>
<td>Broadcast distribution systems</td>
</tr>
<tr>
<td>H04N 11/00</td>
<td>Colour television systems</td>
</tr>
<tr>
<td>H04N 13/00</td>
<td>Stereoscopic television systems; Details thereof</td>
</tr>
<tr>
<td>H04N 3/00</td>
<td>Scanning details of television systems; Combination thereof with generation of supply voltages</td>
</tr>
<tr>
<td>H04N 9/00</td>
<td>Details of colour television systems</td>
</tr>
</tbody>
</table>
H04N 1/00: Scanning, transmission or reproduction of documents or the like, e.g. facsimile transmission; Details thereof
H04N: Pictorial Communication
H04N 7/00: Television systems
H04N 5/00: Details of television systems
H04M 7/00: Television systems
H04M 17/00: Prepayment telephone systems
H04M: Telephonic Communication
H04M 15/00: Metering arrangements; Time-controlling arrangements; Time-indicating arrangement
H04M 3/00: Exchanges: automatic; manual
H04M 19/00: Current supply arrangements for telephone systems
H04M 11/00: Telephonic communication systems adapted for combination with other electrical systems
H04M 1/00: Substation equipment
H04L 13/00: Details of the apparatus or circuits for transmitting or receiving dot-and-dash codes or Apparatus or local circuits for transmitting or receiving codes wherein each character is represented by the same number of equal-length code elements
H04L 27/00: Modulated-carrier systems
H04L 25/00: Baseband systems
H04L 1/00: Arrangements for detecting or preventing errors in the information received
H04L 5/00: Arrangements affording multiple use of the transmission path
H04L 9/00: Arrangements for secret or secure communication
H04L 7/00: Arrangements for synchronizing receiver with transmitter
H04L 29/00: Arrangements, apparatus, circuits or systems, characterized by a protocol
H04L: Transmission of Digital Information
H04L 12/00: Data switching networks
H04Q 9/00: Arrangements in tele-control or telemetry systems for selectively calling a substation from a main station, in which substation desired apparatus is selected for applying a control signal thereto or for obtaining measured values there from
H04Q 70/00:
H04Q 5/00: Selecting arrangements wherein two or more subscriber stations are connected by the same line to the exchange
H04Q 3/00: Selecting arrangements
H04Q: Selecting
H04Q 7/00: Selecting arrangements to which subscribers are connected via radio links or inductive links
H04Q 11/00: Selecting arrangements for multiplex systems
H04Q 1/00: Details of selecting apparatus or arrangements
G06F: Electric Digital Data Processing
G06F 21/00: Authentication
G06F 19/00: Digital computing or data processing equipment or methods, specially adapted for specific applications
G06F 13/00: Interconnection of, or transfer of information or other signals between, memories, input/output devices or central processing units
G06F 1/00: Details
G06F 9/00: Arrangements for programme control e.g. control unit
G06F 7/00: Methods or arrangements for processing data by operating upon the order or content of the data handled
G06F 3/00: Input arrangements for transferring data to be processed into a form capable of being handled by the computer; Output arrangements for transferring data from processing unit to output unit, e.g. interface arrangements
G06F 17/00: Digital computing or data processing equipment or methods, specially adapted for specific functions
G06F 15/00: Digital computers in general; Data processing equipment in general
G06F 12/00: Accessing, addressing or allocating within memory systems or architectures
G06F 11/00: Error detection; Error correction; Monitoring
H03M 13/00: Coding, decoding or code conversion, for error detection or error correction; Coding theory basic assumptions; Coding bounds; Error probability evaluation methods; Channel models; Simulation or testing of codes
H03M 7/00: Conversion of a code where information is represented by a given sequence or number of digits to a code where the same information is represented by a different sequence or number of digits
G06Q: Data Processing Systems or Methods, Specially Adapted For Administrative, Commercial, Financial, Managerial, Supervisory Or Forecasting Purposes
G06Q 99/00: Subject matter not provided for in other groups of this subclass
G06Q 90/00: System or methods specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes
G06Q 50/00: System or methods specially adapted for a specific business sector, e.g. health care, utilities, tourism or legal services
G06Q 40/00: Finance, e.g. banking, investment or tax processing; Insurance, e.g., risk analysis or pensions
G06Q 30/00: Commerce, e.g. marketing, shopping, billing, auction or e-commerce
G06Q 20/00: Payment schemes, architectures or protocols
G06Q 10/00: Administration, e.g. office automation, reservation; Management, e.g. resource or project management
G10L 21/00: Processing of the speech signal to produce another audible or non-audible signal, e.g. visual, tactile, in order to modify its quality or its intelligibility
G10L 19/00: Speech analysis-synthesis techniques for redundancy reduction, e.g. in vocoders; Coding or decoding of speech
G10L: Speech Analysis or Synthesis; Speech Recognition
G10L 11/00: Determination or detection of speech characteristics
G10L 15/00: Speech recognition
G10L 13/00: Speech synthesis; Text to speech systems
H04W 64/00: Locating users or terminals for network management purposes, e.g. mobility management
H04W 72/00: Local resource management, e.g. selection or allocation of wireless resources or wireless traffic scheduling
H04W 88/00: Devices specially adapted for wireless communication networks, e.g. terminals, base stations or access point devices
H04W 28/00: Network traffic or resource management
H04W 36/00: Handoff or reselecting arrangements
H04W 4/00: Services or facilities specially adapted for wireless communication networks
H04W: Wireless Communication networks
H04R 29/00: Monitoring arrangements; Testing arrangements
H04R 3/00: Circuits for transducers
H04R: Loudspeakers, Microphones, Gramophone Pick-Ups or like Acoustic Electromechanical Transducers; Deaf-Aid Sets; Public Address Systems
G01S 13/00: Systems using the reflection or radiation of radio waves, e.g. radar systems
G01S 1/00: Beacons or beacon systems transmitting signals having a characteristic or characteristics capable of being detected by non-directional receivers and defining directions, positions, or position lines fixed relatively to the beacon transmitters; Receivers co-operating therewith
G01R 31/00: Arrangements for testing electric properties; Arrangements for locating electric faults; Arrangements for electrical testing characterized by what is being tested not provided for elsewhere
G01R 3/00: Apparatus or processes specially adapted for the manufacture of measuring instruments
G01S 7/00: Details of radio detection finding system
G06T 13/00: Animation effects in two dimensional (2D) images, e.g. using sprites
G06T 1/00: General purpose image data processing
G06T 7/00: Image analysis, e.g. from bit-mapped to non bit-mapped
G06T 15/00: Three dimensional (3D) image rendering, e.g. from a model to a bit-mapped image
G06T: Image data processing or generation
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