Annexure 5

of Research Methodology: Patent Landscaping in the Indian Mobile Device Market

Taxonomy with categorisation and sub-categorisation of patents

Level 1	Level 2	Scope Notes
Communication		
	Power control and optimization of RF signals	Techniques for transmission power control in uplink and downlink to optimize/increase efficiency of RF signal transmission and includes power allocation
	Signaling, routing and switching	Packet routing techniques between user equipment (UE) and base stations, MME, gateway, and nodes such as routers and switches | Peer-to-peer networks
		Synchronization of receiver with transmitter based on clock, phase, synchronous, frame delay, lock, recover regenerate, bit stuffing |Includes clock generation and has correction | Care of address |Beacon transmission | Paging
		Includes signaling methods such as request-acknowledgement loops between UE and base station | Includes layout or design of a cellular telephone system, the arrangement of cells and base stations, or novel methods of operating the network involving signaling, and paging | Includes exchange and system specific aspects specific to mobile telephone networks |Includes selection transmission modes
	Call and data management	Registering a mobile subscriber, location registers, covers billing and usage aspects of data network services, tracing caller IDs, topology of the network, ringing, call screening, and call handling | Handover techniques used in roaming | Selection of networks and cells
	Error prevention, detection, and	Includes techniques related to error prevention, detection and correction | Monitor

	correction	redundancy and BER | Various coding schemes such as block codes and convolutional codes |Includes interleaving as well | Turbo codes and puncturing
	Bandwidth control and optimization	Methods to increase bandwidth efficiency.
		Methods to increase bandwidth and speed of data transmission, includes frame aggregation, packet aggregation, and increased link rate | Quality of Service (QoS) | Channel state or quality estimation (CSE or CQI)
		Resource allocation by base station and adjustment by UE during uplink communication
		Echo cancelling, noise reduction, and diversity systems (improve quality and reliability of wireless link)
	Multiple access methods and network protocols	Includes description of network protocols, CDMA and other multiple access methods, network protocol conversion, encapsulation, and tunnelling
		Structure of data packets and headers
	Passband modulation	Modulation techniques such as TDM, FDM, FSK, PSK, spatial multiplexing, and OFDM
	Security	Encryption techniques such as RSA, WPA, and hashing algorithms in wireless communication
	Location reporting	Location reporting techniques in a wireless communication system that is required for GPS and location based services
Operational blocks		
	Antenna structures and interfaces	Design of antenna interfaces such as MIMO and placement of antenna for beamforming.

	Security	Password, access code, access keys, card reader, DRM, digital certificates and signatures
	RF Transceivers	Systems for amplifying the signal prior to transmission through antenna | Equalisers | PLL and DLL | Filters
		Includes RF mixers and splitters to divide data stream into sub data streams
	Data converters	Includes baseband data conversion units such as ADCs and DACs
	Application processing	Interpreting and executing commands from the user interface (UI) | Connected to components such as PMIC, LCD display, Bluetooth, camera, Wi-Fi modules for processing inputs received from these components to execute essential tasks
	Baseband	Includes all radio electronic components and is connected to the RF transceiver | Responsible for processing received analog signals from the RF transceiver | Generating and transmitting pre-coding matrix.
	Power Management	Techniques of power management in mobile phones and integrated circuits (ICs) used therein
Memory		
	Memory	Types and structure of memories that may include RAM, ROM, flash memories, and external media.
		Memory management unit and controller, translation buffers and page tables for virtual memory addressing and translation
Sensors		
	Gyroscope	Sensor to enable identification of orientation of the device
	Accelerometer	Sensor to enable identification of speed and inertia of the device

	Touchscreen	Structure of the touch sensor and type of touchscreen such as resistive and capacitive
		System for identifying data received from touchscreen, conditioning of touch data and controlling of the touch sensor
	Camera	Primary and secondary camera sensor types and structures. Examples: CMOS and CCD sensors
		System for processing and conditioning data received from camera sensor. May include systems for image stabilization and exposure control.
		Sensor assembly to implement zoom levels, movement and rotation of sensors.
	Proximity	Sensor controllers to control operation of the IR sensors
	Magnetometer	Instruments used for measuring magnetic forces, especially the earth's magnetism.
	Light sensor	Includes controlling display brightness based on how much ambient light is present
Sound, image and video		
	Audio and video processing	Audio sensor such as microphone to sense audio of user
		Systems and sensor assembly to reduce ambient noise and interference
		Signal processing techniques for post-processing of audio prior to provision to speaker.
		Audio and video coding such as MPEG, H.264 and video processing
		Audio outputs such as speakers
	Image processing	Processing of images at pixel level

Body design		
	Body design	Optimum placement of components during assembly of the phone	Includes internal construction i.e. PCB mounting, constructional aspects of display.
Energy storage		
	Battery	Battery structure and type such as LIPO, Li-ion
	Wireless charging	Inductive charging mechanisms and assembly
Display		
	Screen technology and display circuit	Different types of screen technologies such as: LED, LCD backlight, AMOLED, LCD, S-LCD, SC-LCD.
		Includes novel details of display circuitry and the typical additional uses of displays on telephone sets
	Display protection	Different types of display protection such as Gorilla Glass 3 or sapphire protective glass
Software		
	Basic phone applications	Includes functions performed by the operating system (OS) of the phone such as displaying of text message, searching, file management, ringtone management, etc.
Connectable Interfaces		
	Interface	Design and structure of interface such as USB, Audio Jack, Charging ports, micro-HDMI, SIM card slots, and memory card slots
		Examples: USB controller, HDMI controller, and USB pre-driver circuit.