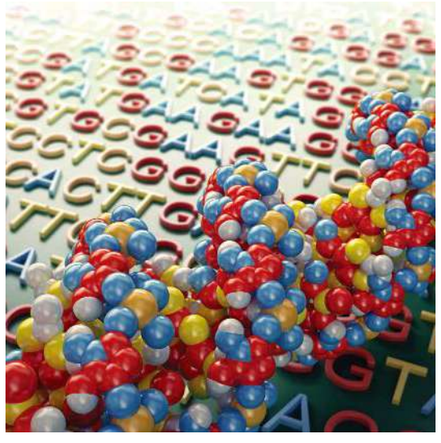
Targeted Sequencing Overview

Celemics has developed and delivered over 1,000 different customized panels. Our target enrichment method is capable of specifically isolating your genomic loci of interest out of the whole genome and increasing the sensitivity of detecting genetic mutations by producing higher coverage & in-depth sequencing data.

END-TO-END CUSTOMIZATION



PANEL DESIGN

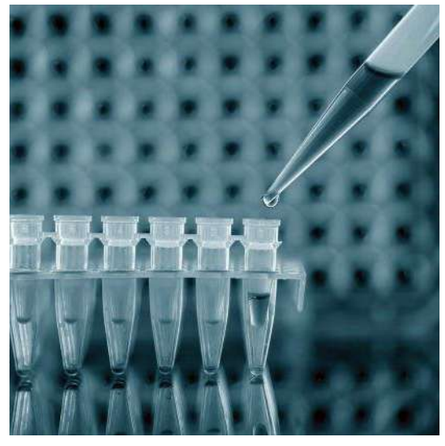
- Elaborately designed NGS panels comprised of your genes of interest
- Interactive discussion with customer prior to designing the panel (e.g., GC-rich, Homologous regions)
- Supported by advanced technology for probe design and reagent optimization
- Panel expansion possible through simple gene addition
- Alternative protocols in case required instruments are not available

SUPERIOR PERFORMANCE

- Market leading target enrichment kits
- Maximized cost-effectiveness
- Pre-capture pooling and high panel performance enables additional cost and labor savings

IN-HOUSE TEST & REBALANCING

- Adjustments to performance and functionality through thorough in-house validation test for every designed panel
- Detailed QC results encompassing wet-lab experiments, NGS run, and bioinformatics analysis provided to customer
- Rebalancing service possible through request
- Able to increase depth and coverage of a specific area if requested
- Finalize your order after reviewing QC results



DATA ANALYSIS

- Technical support available for customers new to NGS analysis
- Provides bioinformatics analysis services and tools from FASTQ to clinical report by request

OUTSTANDING PERFORMANCE OF TARGETED SEQUENCING

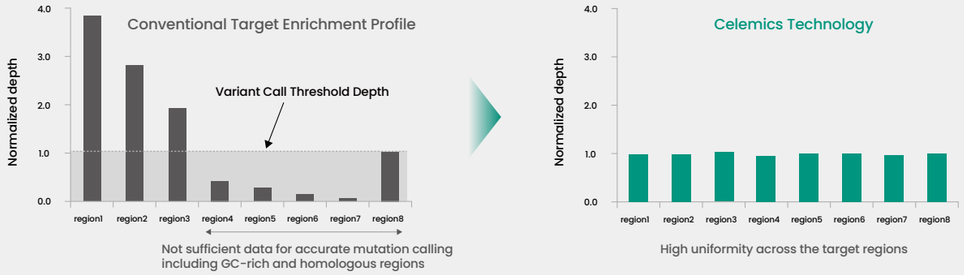
At Celemics, we support our customers through target hybridization-based NGS services and products individually designed and manufactured by experienced researchers and technicians. We have established a robust system for customized design panels and developed a variety of kits according to our customer's needs. All Ready-to-Use kits are completely validated and provide the best performance in the market. Our research team has designed and manufactured over a thousand customized panels and promises to offer the best quality product and service to our customers.

Key Features

1. Exceptional panel performance achieved by hybridization-based target capture method	Overcome limitations of amplicon-based NGS analysis with thoroughly validated hybridization-based target capture method High uniformity and coverage achieved by Celemics proprietary probe design technology
2. Assess all types of mutations with high sensitivity and specificity	Superior analytical performance compared to competitor products in detecting SNV, InDel, CNV, and rearrangement in a single NGS run with maximized sensitivity and specificity and minimized NGS noise enabled by Celemics unique molecular barcode assay and robust bioinformatics pipeline
3. Robust performance of assessing DNA and RNA across various specimen quality	Compatible with poor-quality and low-amount specimens such as FFPE, solid tumor, liquid biopsy, etc.
4. Efficient capture of 'Hard-to-Capture' regions	Analyze the clinically significant mutations embedded in GC rich or homologous regions, which are frequently masked by competitors
5. Wide compatibility with NGS instruments and automation platforms	Compatible with all NGS Instruments from Illumina, Thermo Fisher Scientific, Pacific Bioscience, MGI, and Oxford Nanopore Provides enzymes for DNA fragmentation as a substitute for sonicators
6. Flexible panel content: number of reactions of your choice and Gene Add-on Service	Save costs by ordering the number of reactions required for your experiment Expand your panel with minimum cost, time, and effort by simply adding or combining panels and genes of your interest

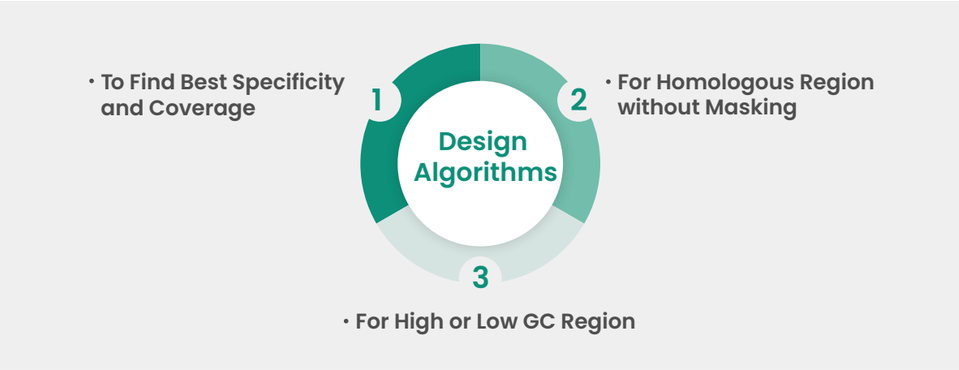
PROBE DESIGN TECHNOLOGY

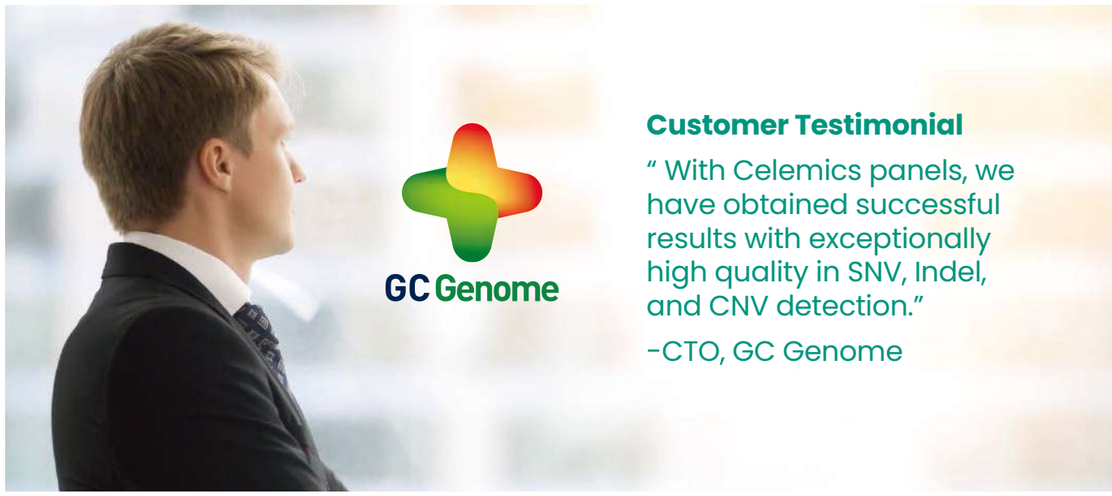
Market Problem and Celemics' Answer



Proprietary Probe Design Algorithm

Based on extensive wet-lab target capture experimentation for every customized panel



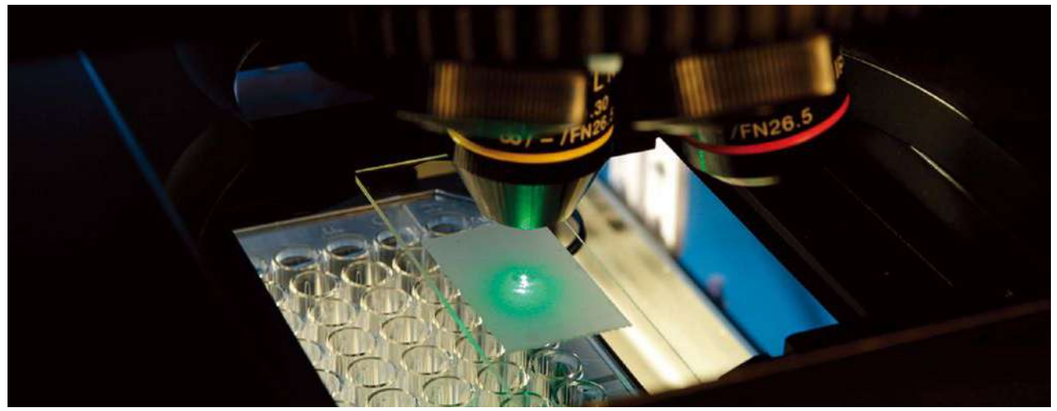


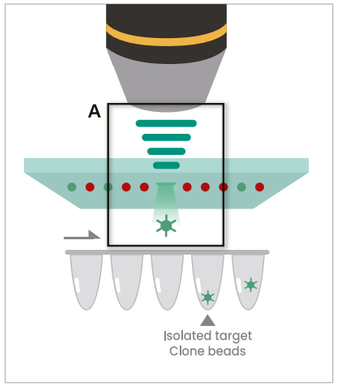
PROBE DESIGN TECHNOLOGY

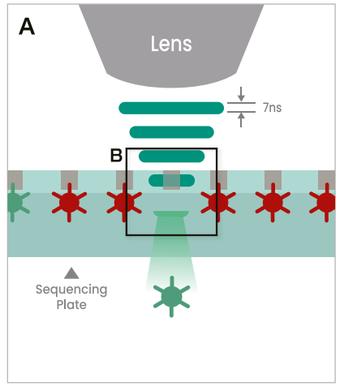
Proprietary Probe Manufacturing Technology

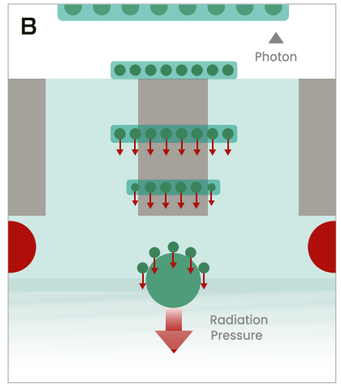
- Reduces complexity in handling complex oligo pools
- Enables extremely low-biased probe pool with handling individual probe sets
- Allows for cost-effectiveness and high-performance: advantage from pool-based probes and individually synthesized probes
- Achieves superior lot-to-lot uniformity for repeated orders due to proprietary 2-step probe synthesis technology

MSSIC Technology: Massively Separated and Sequence Identified Cloning

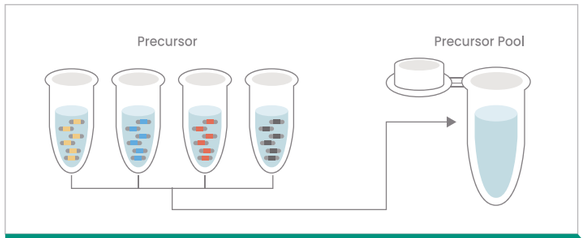




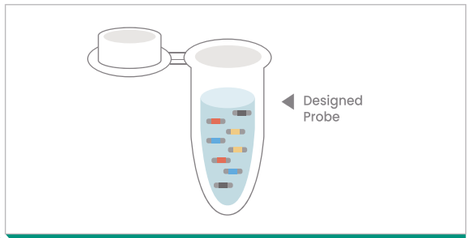




Two step probe manufacturing



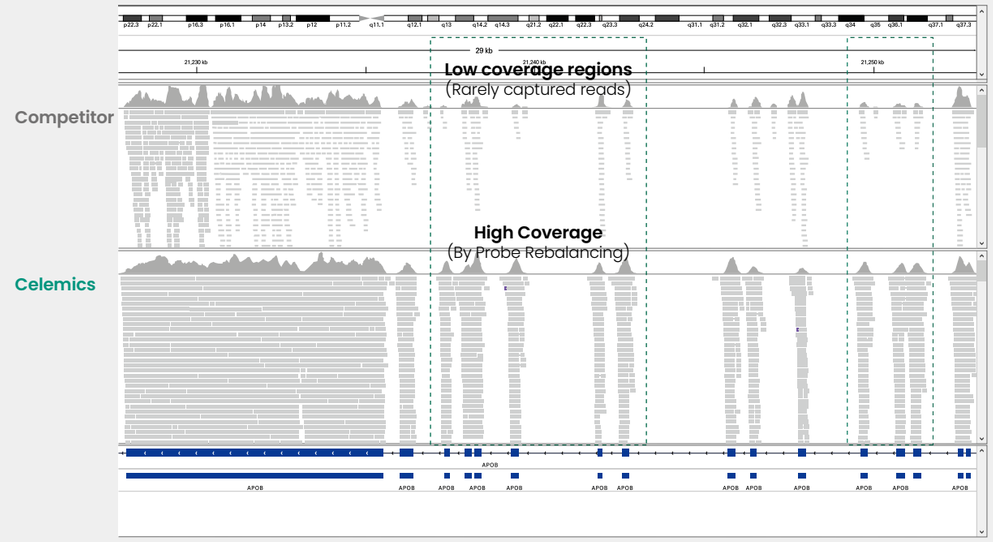
STEP 1. Manufacturing and Pooling of Precursor



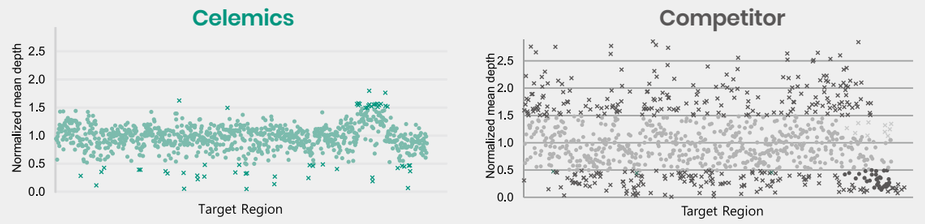
STEP 2. Optimized NGS Panel

TARGETED SEQUENCING PANEL PERFORMANCE

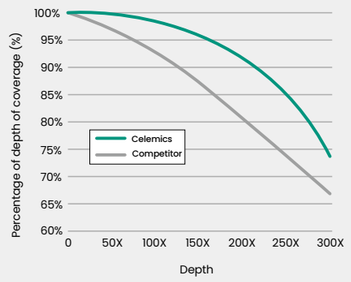
1. High Coverage Panel Compared to Competitor Products



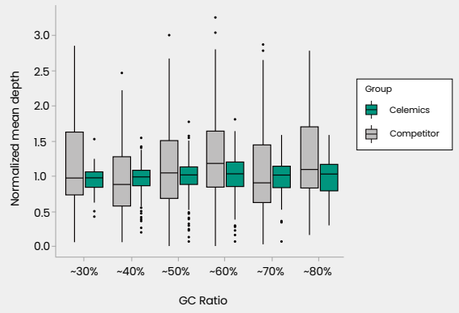
2. Higher Uniformity Across Target Regions



3. Superior Coverage Depth Over Target Regions



4. Superior Capture Performance Across GC Percentage

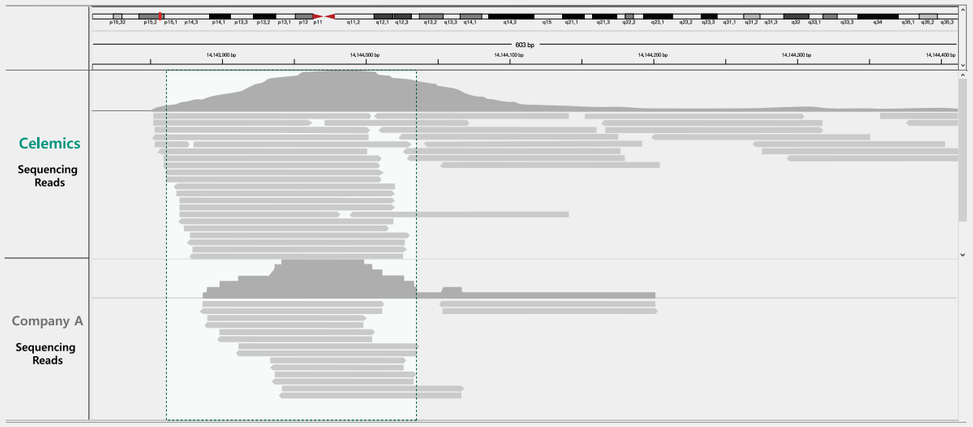


** Target region of both panels (BED file) are identical.
** Number of reads are the same for the results from both panels.

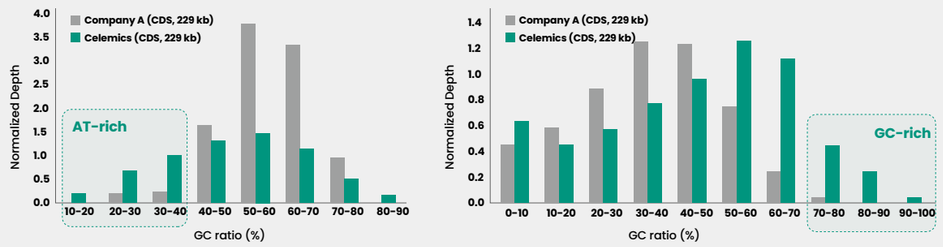
Targeted sequencing allows for sequencing with higher accuracy by specifically targeting the genomic regions of interest. The optimization process of the probes and reagents is essential for each of the different NGS platform types. Celemics has established the design technologies for the probes and reagents for various applications and achieved superior uniformity and depth of coverage compared to competitor products.

SEQUENCING PERFORMANCE OF CELEMICS PANEL FOR HARD-TO-CAPTURE REGIONS

1. Higher Depth compared to Company A Targeting Against the Same Target Area



2. Better Uniformity across AT- and GC-rich Regions

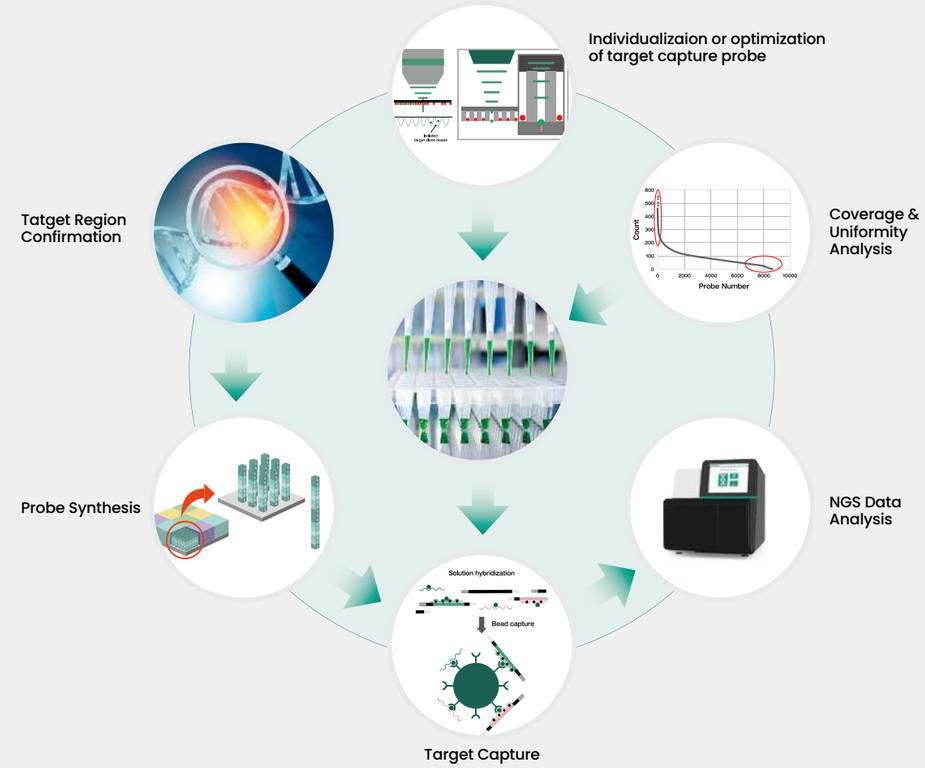


Even the most advanced NGS techniques have been challenged by GC-rich and homologous regions that are often masked or omitted by competitor services. Such a challenge is overcome by Celemics proprietary probe design technology which enables successful sequencing of GC-rich, AT-rich or homologous regions upon request. We also provide Homolog Report when the requested region includes homologous regions. Customers can then decide whether to include the regions in the order.

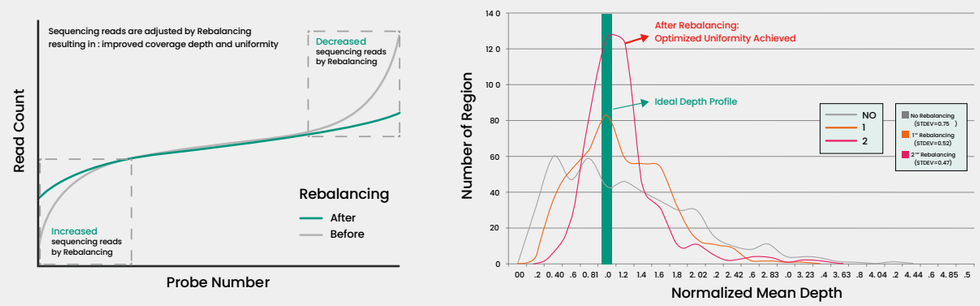
Our customers performed validation tests comparing Celemics' customized panels with our competitors'. For the competitor product, they performed validation tests based on competitor's recommended protocols for the same target regions. They also used the same sequencing amount for the fair experiment. As a result, customers selected our customized panels due to the high capture efficiency even with a lower amount of sequence data.

PILOT TEST & REBALANCING

Overview of Celemics Rebalancing Technology



Capture Uniformity Analysis



For customized targeted sequencing panels, we conduct in-house performance tests of requested panels and deliver the test results to customers. We also provide rebalancing services in case the customer requests for a specific area or overall performance improvement. The service includes redesigning probes against the requested regions and optimizing reagents to best meet our customers' needs.

EXAMPLE OF ctDNA ANALYSIS USING PROPRIETARY MOLECULAR BARCODES

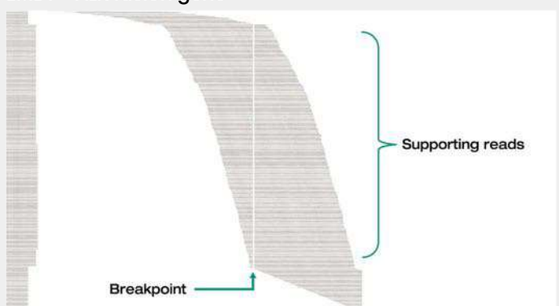
Performance Verification using Reference Material: 100% Sensitivity and Specificity

				0.5% VAF			1% VAF			WT		
	Gene	DNA change	AA change	VAF	VAF	VAF	VAF	VAF	VAF	VAF	VAF	VAF
Seracare	NRAS	c.182A>G	p.Q61R	0.96%	0.55%	0.78%	1.09%	0.98%	1.44%	0.06%	0.00%	0.00%
	PIK3CA	c.1633G>A	p.E545K	0.57%	0.69%	0.24%	1.18%	1.13%	0.38%	0.00%	0.00%	0.00%
	PIK3CA	c.3140A>G	p.H1047R	0.42%	0.33%	0.45%	0.81%	0.93%	0.94%	0.00%	0.00%	0.00%
	PIK3CA	c.3204_3205insA	p.N1068fs*4	0.51%	0.45%	0.51%	0.86%	0.95%	0.87%	0.00%	0.00%	0.00%
	EGFR	c.2310_2311insGGT	p.D770_N771insG	0.38%	0.36%	0.42%	0.48%	0.86%	0.78%	0.00%	0.00%	0.00%
	EGFR	c.2369C>T	p.T790M	0.44%	0.48%	0.48%	0.77%	1.23%	1.05%	0.00%	0.00%	0.00%
	EGFR	c.2573T>G	p.L858R	0.56%	0.51%	0.74%	1.58%	1.39%	0.85%	0.00%	0.00%	0.00%
	BRAF	c.1799T>A	p.V600E	0.51%	0.52%	0.47%	0.78%	0.70%	0.45%	0.00%	0.00%	0.00%
	PTEN	c.741_742insA	p.P248fs*5	0.31%	0.55%	0.51%	1.16%	1.30%	1.52%	0.00%	0.00%	0.00%
	KRAS	c.35G>A	p.G12D	0.43%	0.34%	0.62%	1.16%	0.89%	0.91%	0.00%	0.00%	0.00%
	ATK1	c.49G>A	p.E17K	0.69%	0.37%	0.35%	0.65%	0.66%	1.01%	0.00%	0.00%	0.00%
	TP53	c.818G>A	p.R273H	0.40%	0.47%	0.41%	1.84%	1.14%	0.86%	0.03%	0.05%	0.00%
	TP53	c.743G>A	p.R248Q	0.47%	0.44%	0.50%	0.90%	0.88%	0.85%	0.02%	0.07%	0.00%
	TP53	c.723delC	p.C242fs*5	0.43%	0.40%	0.41%	0.87%	0.85%	0.72%	0.00%	0.00%	0.00%
	TP53	c.524G>A	p.R175H	0.71%	0.66%	0.71%	1.19%	1.13%	1.02%	0.06%	0.05%	0.03%
	TP53	c.263delC	p.S90fs*33	0.50%	0.81%	0.53%	1.31%	1.55%	1.37%	0.09%	0.01%	0.06%
			Avg. (%)	0.52%	0.50%	0.51%	1.04%	1.04%	0.94%	0.02%	0.01%	0.01%

Accurate CNV and Gene Rearrangement Analysis with FFPE Samples Due to High Coverage Uniformity

	Panel A (400 kb)		Panel B (2.2 Mb)	
CNV	100 ng	50 ng	100 ng	50 ng
MET	Detected	Detected	Detected	Detected
MYCN	Not in 400 kb panel target region		Detected	Detected

EML4 - ALK fusion gene



We have conducted complete validation test for each Ready-to-Use panel and proved its superior performance compared to competitor products. The products are highly optimized for accurate and efficient assays even with poor quality and low-amount samples such as FFPE, ctDNA, etc. As shown in the table above, we have successfully performed CNV and rearrangement analysis from 50 ng of FFPE samples.

COST-EFFECTIVE SEQUENCING

Significantly reduced cost in Sample Prep, Target Enrichment Kit, and Sequencing

1. Sample Prep consumables developed and provided by Celemics for the highest optimization include CeleMag™ Clean-up Bead, CeleMag™ Streptavidin Bead, CLM Polymerase, and EP-kit (one-step workflow from Fragmentation to End-repair and A-tailing).
2. Pre-capture pooling reduces costs per sample.
3. Celemics has secured technology for proprietary probe design and manufacturing, significantly reducing costs of our Target Enrichment Kit.
4. Celemics panels have shown superior performance compared to competitor product in terms of uniformity and on-target ratio, enabling high-quality, cost-effective sequencing.

CELEMICS FEATURES & BENEFITS

1. Hybridization-based capture	2. Maximized Efficiency allows Market Leading Capture Performance	3. Hybridization Enhancer Technology and Enzymatic Library Preparation
4. User-friendly Bioinformatics Software	5. Reduced NGS costs by Pre-capture pooling with no compromise on quality	6. Molecular barcode and bioinformatics for ultra-low VAF mutations
7. CAS for bioinformatics analysis	8. Flexible panel content with Gene Add-on Service	9. Default wet-lab QC for every customized panel
10. Minimal lot variation due to proprietary 2-step probe manufacturing technology	11. Compatible with all NGS instruments and automation platforms	12. Capture the 'Hard-to-Capture' regions
13. Optimization of species-specific blockers for maximum performance for agriculture and animal research	14. Improved Probe Design by Rebalancing Service only available in Celemics	15. Robust, Rapid, Reliable Customization