

## The Large Hadron Rap

Twenty-seven kilometers of tunnel under ground  
Designed with mind to send protons around  
A circle that crosses through Switzerland and France  
Sixty nations contribute to scientific advance  
Two beams of protons swing round, through the ring they ride  
'Til in the hearts of the detectors, they're made to collide  
And all that energy packed in such a tiny bit of room  
Becomes mass, particles created from the vacuum  
And then...

LHCb sees where the antimatter's gone  
ALICE looks at collisions of lead ions  
CMS and ATLAS are two of a kind  
They're looking for whatever new particles they can find.  
The LHC accelerates the protons and the lead  
And the things that it discovers will rock you in the head.

We see asteroids and planets, stars galore  
We know a black hole resides at each galaxy's core  
But even all that matter cannot explain  
What holds all these stars together – something else remains  
This dark matter interacts only through gravity  
And how do you catch a particle there's no way to see  
Take it back to the conservation of energy  
And the particles appear, clear as can be

You see particles flying, in jets they spray  
But you notice there ain't nothin', goin' the other way  
You say, "My law has just been violated – it don't make sense!  
There's gotta be another particle to make this balance."  
And it might be dark matter, and for first  
Time we catch a glimpse of what must fill most of the known 'Verse.  
Because...

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Antimatter is sort of like matter's evil twin  
Because except for charge and handedness of spin  
They're the same for a particle and its anti-self  
But you can't store an antiparticle on any shelf  
Cuz when it meets its normal twin, they both annihilate  
Matter turns to energy and then it dissipates

When matter is created from energy  
Which is exactly what they'll do in the LHC  
You get matter and antimatter in equal parts  
And they try to take that back to when the universe starts  
The Big Bang – back when the matter all exploded  
But the amount of antimatter was somehow eroded  
Because when we look around we see that matter abounds  
But antimatter's nowhere to be found.  
That's why...

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The Higgs Boson – that's the one that everybody talks about.  
And it's the one sure thing that this machine will sort out  
If the Higgs exists, they ought to see it right away  
And if it doesn't, then the scientists will finally say  
"There is no Higgs! We need new physics to account for why  
Things have mass. Something in our Standard Model went awry."

But the Higgs – I still haven't said just what it does  
They suppose that particles have mass because  
There is this Higgs field that extends through all space  
And some particles slow down while other particles race  
Straight through like the photon – it has no mass  
But something heavy like the top quark, it's draggin' its \*\*\*  
And the Higgs is a boson that carries a force  
And makes particles take orders from the field that is its source.  
They'll detect it....

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Now some of you may think that gravity is strong  
Cuz when you fall off your bicycle it don't take long  
Until you hit the earth, and you say, "Dang, that hurt!"  
But if you think that *force* is powerful, you're wrong.  
You see, gravity – it's weaker than Weak  
And the reason why is something many scientists seek  
They think about dimensions – we just live in three  
But maybe there are some others that are too small to see  
It's into these dimensions that gravity extends  
Which makes it seem weaker, here on our end.  
And these dimensions are "rolled up" – curled so tight  
That they don't affect you in your day to day life  
But if you were as tiny as a graviton  
You could enter these dimensions and go wandering on  
And they'd find you...

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[Lyrics by Katherine McAlpine ("alpinekat")]